

IBN HALDUN UNIVERSITY
SCHOOL OF GRADUATE STUDIES
DEPARTMENT OF AIR TRANSPORT MANAGEMENT

MASTER'S THESIS

**EU GREEN DEAL AND TAXONOMY IN AVIATION:
THE CASE OF TURKISH AIRLINES**

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THESIS ADVISOR
ASSIST PROF. NİHAT GÜMÜŞ

ISTANBUL, 2025

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THE CASE OF TURKISH AIRLINES**

**by
AHMET BUĞRAHAN BARDAKCI**

**A thesis submitted to the School of Graduate Studies in partial
fulfillment of the requirements for the degree of Master of Science of
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ISTANBUL, 2025

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ÖZ

HAVACILIKTA AB YEŞİL MUTABAKAT VE TAKSONOMİ: THY İNCELEMESİ

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Tez Danışmanı: Dr. Öğr. Üyesi Nihat Gümüş

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Bu tez, Avrupa Birliği'nin (AB) Yeşil Mutabakatı ve havacılık taksonomisinin Türk Hava Yolları (THY) üzerindeki etkilerini incelemektedir. Karbon emisyonlarını azaltmayı ve sürdürülebilirliği çeşitli sektörlerde teşvik etmeyi amaçlayan AB Yeşil Mutabakatı, havacılık sektörü için önemli zorluklar ve fırsatlar sunmakta, yeni çevresel ve düzenleyici standartlara uyumu gerektirmektedir. Çalışma, THY'nin 2018-2023 yılları arasındaki sürdürülebilirlik raporlarını ele alarak, şirketin taksonomi kriterlerine uyumunu ve operasyonlarına sürdürülebilirliği entegre etme stratejilerini değerlendirmek üzere nitel bir analiz yöntemi kullanmıştır. Bulgular, THY'nin sürdürülebilir uygulamaları benimseme yolunda önemli adımlar attığını, bunlar arasında filo modernizasyonu, sürdürülebilir havacılık yakıtlarının (SAF) kullanımı ve operasyonel verimlilik iyileştirmelerinin bulunduğunu göstermektedir. Bununla birlikte, fosil yakıtlara bağımlılık, finansal kısıtlar ve düzenleyici baskılar gibi sorunlar hâlâ kritik önem taşımaktadır. Araştırma ayrıca Yeşil Mutabakatın Türk havacılık sektörü üzerindeki daha geniş etkilerini vurgulamakta ve sektör uygulamalarının küresel sürdürülebilirlik hedefleriyle uyumlu hale getirilmesine yönelik uygulanabilir öneriler sunmaktadır. THY'nin havacılıkta sürdürülebilirlik uygulamalarını hayata geçirme konusunda lider bir rol üstlendiğini ortaya koyan bu tez, havacılık sektöründe daha çevreci uygulamalara geçişin anlaşılmasına katkı sağlamaktadır. Çalışma, yenilikçilik, yeşil finansman ve uluslararası iş birliğinin uzun vadeli çevresel ve ekonomik sürdürülebilirlikteki önemini vurgulamaktadır.

Bu tez, uluslararası literatürdeki uygulamalarla tutarlı bir SWOT analizi uygulamıştır

Anahtar Kelimeler: AB Yeşil Mutabakat, Havacılık Taksonomisi, Operasyonel Verimlilik, Sürdürülebilirlik, Sürdürülebilir Havacılık Yakıtları, Türk Hava Yolları.



ABSTRACT

EU GREEN DEAL AND TAXONOMY IN AVIATION: THE CASE OF TURKISH AIRLINES

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This thesis examines whether the European Union (EU) Green Deal and aviation taxonomy apply to Turkish Airlines (THY). The EU Green Deal, which aims to reduce carbon emissions and promote sustainability in various sectors, presents significant challenges and opportunities for these sectors. The study used a qualitative analysis method to evaluate the company's compliance with the taxonomy criteria and its strategies to integrate sustainability into its operations by considering THY's sustainability reports between 2018 and 2023.

The findings indicate that THY has taken necessary steps towards the progress of its sustainable practices, including fleet modernization, the use of sustainable aviation fuels (SAF), and efficiencies. However, problems such as fossil fuel-based relationships, financial constraints, and comprehensive pressures continue and will be of critical importance. The research also emphasizes that the Green Deal has a broader scope in the Turkish aviation sector and offers applicable recommendations for aligning sector practices with global sustainability goals. This thesis reveals that THY has led in sustainable aviation practices and contributes to the comprehensive transition to more environmentally friendly practices in the aviation sector. The study emphasizes the long-term temperature and economic sustainability increase of development, green resources, and international cooperation. This thesis applies a SWOT analysis consistent with international literature practices.

Keywords: Aviation Taxonomy, Efficiency, EU Green Deal, Sustainability, Sustainable Aviation Flows, Turkish Airlines.

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Ahmet Buğrahan BARDAKCI
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LIST SYMBOLS AND ABBRVIATIONS

ACI	Airports Council International
ATAG	Air Transport Action Group
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
EASA	European Union Aviation Safety Agency
EC	European Commission
EEU	Eligible Emission Unit
EMS	Environmental Management System
EPA	Environmental Protection Agency
ESG	Environmental, Social and Governance
ETS	Emissions Trading System
EU	European Union
FAA	Federal Aviation Administration
GHG	Greenhouse Gas
ICAO	International Civil Aviation Organization
IATA	International Air Transport Association
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Assessment
MRV	Monitoring, Reporting, Verification
NGO	Non-Governmental Organization
OECD	Organisation for Economic Co-Operation and Development
SAF	Sustainable Aviation Fuel
SDG	Sustainable Development Goals
THY	Turkish Airlines (Türk Hava Yolları)
UNFCCC	United Nations Framework Convention on Climate Change

CHAPTER I

INTRODUCTION

1.1. Subject of the Research

Sustainability is a concept that refers to the sustainable protection of existing resources and situations in the future. This concept has attracted particular attention in recent years with the increasing effects of climate change. Sustainability has gained importance in every sector, as it allows for the effective use of resources and the creation of a recyclable system. It has also been supported by international policy frameworks such as the European Union (EU) Green Deal.

The air transportation sector is undergoing an environmentally friendly transformation as it strives to comply with sustainable development goals and the taxonomy demands of the EU Green Deal. This study analyzes how THY, which uses sustainability policy as a selling point in the aviation sector and has been publishing sustainability reports since 2014, complies with the criteria of the EU Green Deal and the aviation sector taxonomy.

1.2. Purpose of the Research

This study aims to analyze the impacts and implications of the EU Green Deal and aviation taxonomy on Turkish Airlines. The study seeks to address the following questions within the study range:

- What is the EU Green Deal and taxonomy?
- How can the aviation industry adapt and integrate sustainable policy?
- How is Turkish Airlines applying the Green Deal and taxonomy criteria interpreted?
- In what ways have the THY sustainability reports (2018–2023) changed following that?

1.3. Importance of the Research

The EU Green Deal is a package of global policy measures to address climate change. The aviation industry is massively carbon-intensive, so we must ensure it pivots its operations according to the taxonomies.” This study explores how THY can approach the Green Deal and proposes alternatives that can be used as examples for other aviation companies.

1.4. Method of the Research

A qualitative analysis technique was used in this study. The qualitative analysis method allows one to investigate a phenomenon or case in the social sciences in detail. The research methodology is based on the model proposed by Walcott (1994), divided into document analysis, description, and interpretation. The research consists of the following steps:

- i. Research Problem: This research analyses sustainability policies in the aviation industry and the impacts of the EU Green Deal.
- ii. Background: EU Green Deal, the taxonomy's criteria, and aviation facts.
- iii. Data: 2018-2023 sustainability reports released by the Turkish Airlines' corporate website.
- iv. Data Analysis: Description of Turkish Airlines and its compliance with the principal components of taxonomy

1.5. Research Scope and Limitations

It only covers Turkish Airlines and will be analyzed for the sustainability reports 2018-2023. The sources were documentary, and efforts were made to examine the problems in practice and solutions. A limitation of the study is that it restricts analysis to the aerospace industry and does not provide industry comparisons. This study analyses the use of the EU Green Deal and taxonomy criteria in the Turkish air segment and the role of these practices in the SDGs. The role model of Turkish Airlines in this respect is an exemplary model that should be set for the world and the homeland. Methods:

The strategies proposed in THY reports were categorized into taxonomy needs, and future recommendations were provided.



CHAPTER II

LITERATURE REVIEW

2.1. Literature Review

The European Green Deal, proposed by the European Commission in December 2019, is an ambitious plan for the European Union (EU) to become a carbon-neutral economy by 2050. This ambitious plan involves different areas of the economy (e.g., energy, industry, agriculture, and transport) with sustainability as a central focus (European Commission, 2019). A key feature of the Green Deal is to lower greenhouse gas emissions, especially in sectors with high emissions such as aviation. The Green Deal is both a challenge and an opportunity in the aviation sector. Aviation has been one of the most carbon-intensive modes of travel. The industry produces 2-3% of overall carbon dioxide emissions globally. Still, its environmental footprint is expected to rise with the growing levels of passengers and cargo carried (International Air Transport Association, 2020). Tackling this effect, the Green Deal offers several measures such as more ambitious greenhouse gas (GHG) reduction, the production and use of sustainable aviation fuels (SAFs), and an improvement in carbon pricing (European Commission, 2021). The EU taxonomy is a classification system intended to create a list of environmentally sustainable economic activities. This rule is central to the Green Deal and will ensure that investments are channeled into sustainable ventures. In the aviation industry, taxonomy criteria aim to support low-carbon technologies, enhance operational performance, and foster using SAFs. These conditions are becoming increasingly complex to meet, as per recent reports, emphasizing the need for significant efforts in upgrading the air fleets, searching for alternative fuels, modernizing the airports, etc. (Dimitriou & Sartzetaki, 2020). Airlines are implementing more and more sustainability policies to comply with these regulatory requirements. For instance, major European airlines have all pledged to reach net-zero emissions by 2050, through initiatives such as offsetting programs, the use of SAF, and carbon-neutral airport operations (Air Transport Action Group, 2021). Turkish Airlines (THY) is leading efforts to promote sustainability in the Turkish

aviation industry. Entering 2014, we continue to release sustainability reports to provide updates on our ESG activities. These news articles further showcase the willingness of THY to mitigate its carbon footprint by means such as fleet renewal, enhancement of fuel economics, and the use of SAF (Turkish Airlines, 2022).

One of the key pillars of Turkish Airlines' sustainability strategy is its investment in new-generation aircraft that offer lower fuel consumption and reduced emissions. In addition to fleet modernization, the airline has partnered with various stakeholders in the research, development, and commercialization of sustainable aviation fuels (SAFs), which can lead to a 60–80% reduction in lifecycle emissions compared to conventional fossil-based jet fuels (International Civil Aviation Organization, 2021).

However, implementing Green Deal objectives and meeting taxonomy criteria in the aviation industry presents several challenges. Economic constraints constitute a significant hurdle, particularly since environmentally friendly technologies and fuels often entail higher initial costs. Moreover, ensuring compliance with evolving legal and regulatory frameworks may sometimes require considerable resource allocation, even though it can result in long-term efficiencies (Köse, 2020).

Despite these challenges, the transition toward sustainable aviation opens up promising opportunities for innovation and competitive advantage. Embracing sustainability not only encourages technological advancement but also facilitates entry into emerging green markets, ultimately strengthening the global positioning of early-adopting airlines (Flouris & Küçükyılmaz, 2016).

Comparative studies indicate that European carriers are leading in integrating sustainable practices, mainly due to stricter EU regulations and greater access to green financing. European airlines benefit from mechanisms such as the Green Deal's Innovation Fund and the Horizon Europe program, which provide financial incentives and support for sustainability initiatives (European Commission, 2020).

In contrast, airlines based in emerging economies may face greater financial and infrastructural barriers in pursuing similar goals. Nevertheless, active participation in international sustainability frameworks—such as the Carbon Offsetting and Reduction

Scheme for International Aviation (CORSIA)—and strategic collaboration with global actors can help bridge these gaps and enhance environmental performance in developing regions (International Air Transport Association, 2021).

2.2. Definition and Overview of Climate Change

Climate change is a shift in the planet's long-term climate over decades to millions of years. These alterations are predominantly induced by changes in the emissions of greenhouse gases (GHGs) through the natural and, more importantly, anthropogenic sources (IPCC, 2014). Climate change can be attributed to several environmental manifestations, such as global warming, increased global sea levels, intensified incidences of extreme weather, and a noticeable increase in the amount of GHGs in the atmosphere (Hoekstra & Wiedmann, 2014).

Human activities since the Industrial Revolution (in particular the combustion of fossil fuels and large-scale deforestation) have led to a significant increase in atmospheric carbon dioxide (CO₂) and methane (CH₄) (Brander & Davis, 2012). These gases intensify the greenhouse effect as they let the heat from the Earth's surface get in but do not allow it to go out into outer space. This system results in an increasing Earth temperature and then a modification of the climatic course (Wiedmann & Minx, 2008).

In addition to its environmental impact, climate change affects economic and social systems. Agriculture, water resources, energy supply, and public health are the most affected sectors. For example, droughts and heatwaves decrease crop yields, whereas heavy rains and floods damage infrastructure and force the population to flee (IPCC, 2018).

Climate change has now become recognized as a serious global concern, and there has been widespread scientific research on it and frameworks for international cooperation. Key treaties, including the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, acknowledge the imperative for global collaboration to address the reduction of GHG emissions and the adaptation to climate-induced alterations (UNFCCC, 2009; Kyoto Protocol, 1997). Signatory

countries to these conventions agree to work towards (i) reduction targets and (ii) to establish national policies under such targets (UN-IPBES, 2019).

2.3. Climate Change Process and Historical Perspective

Human activities have previously driven climate change. The Industrial Revolution triggered the burning of fossil fuels and elevated atmospheric carbon dioxide (CO₂) and other greenhouse gases (IPCC, 2014). Between the 19th century and the present, activities like industrialization, energy generation, transportation, deforestation, etc, have caused a considerable rise in the emission of greenhouse gases (Greenhouse Gases) in the atmosphere, which in turn resulted in rising global temperature (Hoekstra & Wiedmann, 2014). Evidence suggests that the concentration of CO₂ in the atmosphere was approximately 280 ppm (parts per million) in the pre-industrial era and has since increased to above 400 ppm today (IPCC, 2018). Global average temperatures increased approximately by 0.85°C from 1880 through 2012, with a warming between 1906 and 2005 of 0.74°C (Wiedmann & Minx, 2008). Crucially, key environmental shifts have occurred with climate change, despite increasingly vocal opposition, such as warming oceans, glacial melt, and rising sea levels (UN, 2019). The historical framing of climate change is also tied to political and social transformations. Climate change entered the International public agenda in the 1970s when environmental movements grew and scientific knowledge increased, emphasizing humans as both sources and victims (Brander & Davis, 2012). An important landmark in the evolution of climate change science was the Intergovernmental Panel on Climate Change (IPCC) convening in 1988 under the auspices of the United Nations (IPCC, 2014).

The atmospheric greenhouse effect is a natural process whereby the sun's rays are reflected by the Earth's surface and are trapped. Outgoing long-wave radiation is re-emitted by the greenhouse gases into the atmosphere, leading to the Earth warming (IPCC, 2014). This allows for an average temperature on the Earth such that life is possible. The amount of CO₂, CH₄, and other greenhouse gases emitted by humans indicates that the stock carbon in the atmosphere has increased, which consequently causes global warming (Wiedmann & Minx, 2008). Fossil fuels, deforestation, and industrial practices contribute significantly to global warming. The combustion of

fossil fuels raises CO₂ into the atmosphere, and deforestation lowers carbon sinks (Brander and Davis 2012).

Furthermore, industrial and agricultural processes are the causes of the emission of other greenhouse gases like methane and nitrous oxide (IPCC, 2007). The emission of these gases into the atmosphere is responsible for enhancing the greenhouse effect, and their impact leads to elevated temperatures in the Earth's atmosphere. Among greenhouse gases (GHGs), carbon dioxide (CO₂) has the highest priority, and CO₂ emissions have increased by approximately 35% over the past 60 years, rising from 315 ppm to 420 ppm. As of 13.02.2023, the reading stood at 419.40 ppm (Figure 2.3.1.).

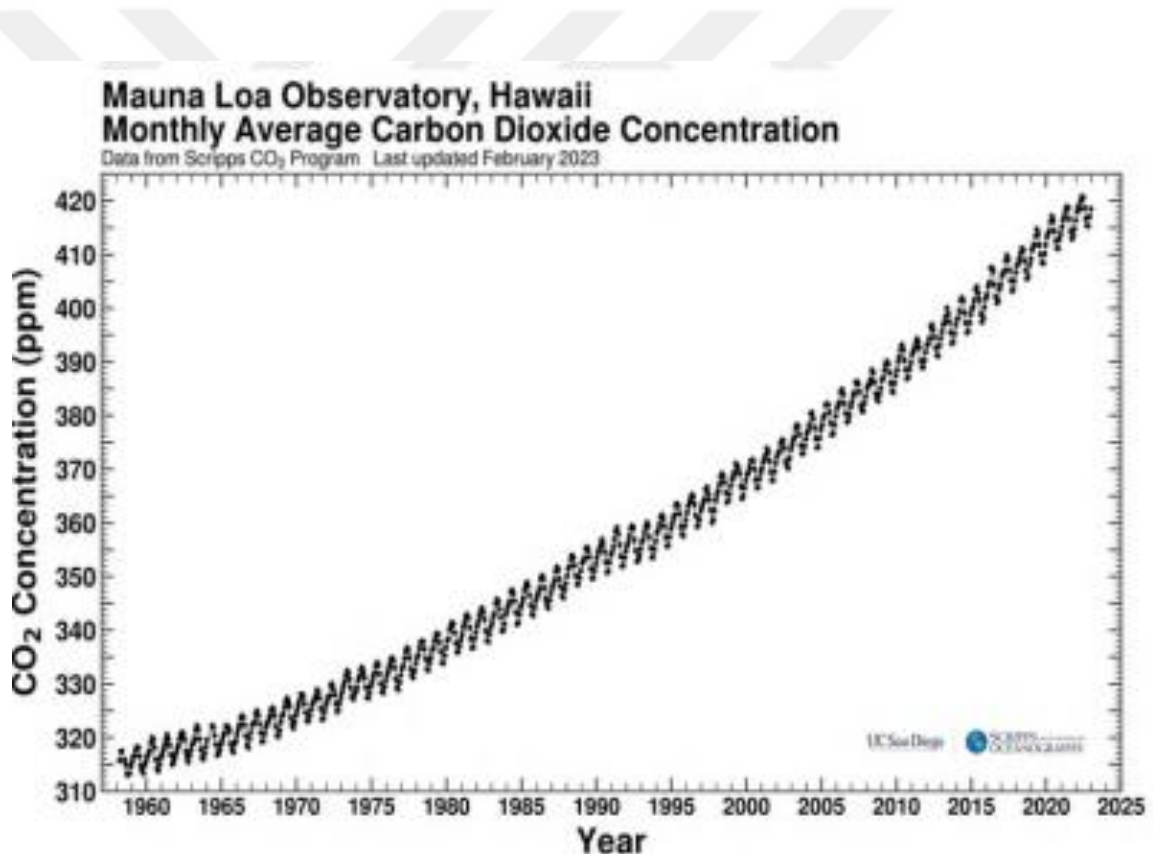


Figure 2.1. Monthly Changes in Average Carbon Dioxide Concentration in the Atmosphere from 1958 to 2023, Mauna Loa Observatory, Hawaii

Reference: https://scrippsco2.ucsd.edu/graphics_gallery/mauna_loa_record/mauna_loa_record.html

According to the "IPCC Special Report on 1.5°C" published in 2022 (IPCC, Global Warming of 1.5°C, 2018), the increase in human-induced warming increased by

approximately 1°C (in the range of 0.8°C - 1.2°C) in 2021 compared to the pre-industrial period, and the increase was in the range of 0.1°C - 0.3°C over ten-year periods. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate.

In a press release by the World Meteorological Organization on climate change (Organization, 2021); as seen in the graph (Figure 1) with projection of average global temperature differences from the 1850s to the present and 2025, all five datasets surveyed by the WMO show that 2011-2020 was the hottest decade on record with a long-term climate change trend, with the six warmest years on record since 2015, and 2016, 2019 and 2020 being the first three of them, with differences in average global temperatures between the three warmest years being 2016, 2019 and 2020 – which were indistinguishably small, show that the average global temperature in 2020 was about 14.9°C, 1.2 (± 0.1) °C above the pre-industrial (1850-1900) level.

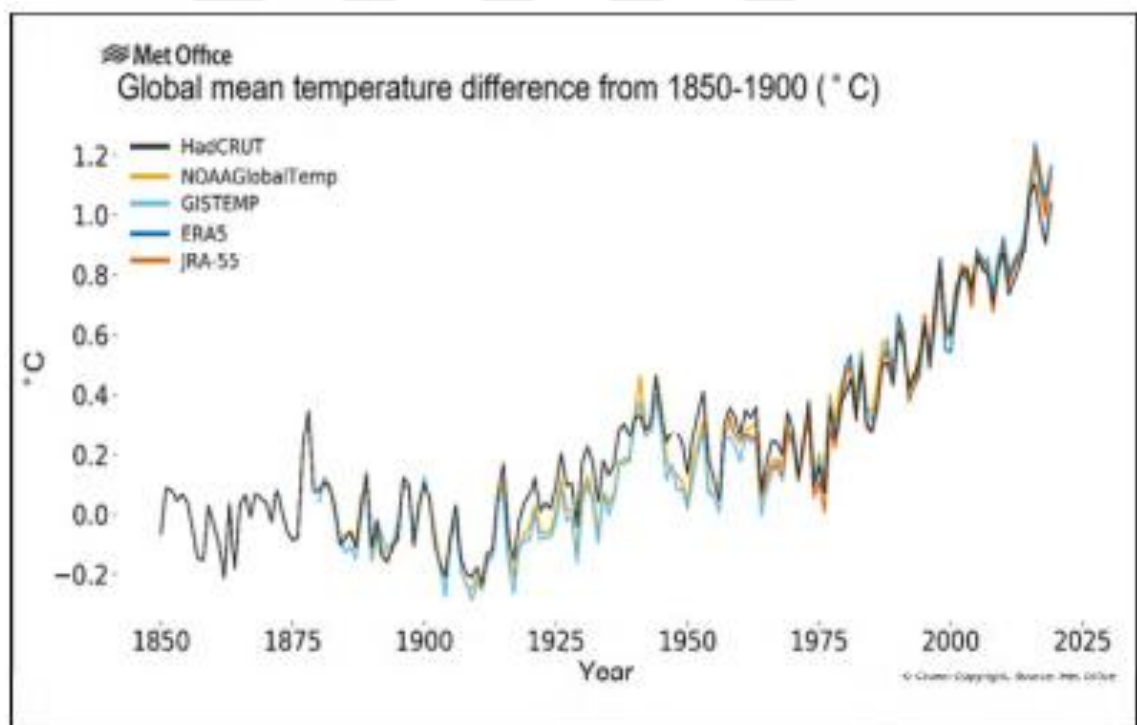


Figure 2.2. Global Mean Temperature Difference (1850-1900 to Present and 2025 Projection)

Reference: <https://public.wmo.int/en/media/press-release/2020-was-one-of-three-warmestyears-record>

Climate change, which is observed through the substantial increase in carbon dioxide and other greenhouse gas emission rates and the apparent shift in temperature values, causes many effects that threaten the global ecosystem and human life. Regional increase in air temperatures, irregular rainfall, increase in natural disasters such as droughts and floods, melting of polar ice caps causing sea water level to rise, increasing ocean temperatures on the marine ecosystem, coastal tourism, and fishing can be counted as some of the direct effects of climate change. For example, in the 20th century, it is seen that in addition to the average sea water temperatures, the sea level increased between 10-20 cm, while the surface temperatures increased by an average of 0.6 ° C (Türkeş M., What is global climate change? Basic concepts, causes, observed and projected changes. Climate Change and Environment, 2008)

In the "IPCC Special Report on Global Warming of 1.5°C, 2018" (IPCC, Global Warming of 1.5°C, 2018), where socio-economic and political constraints on climate-sensitive biophysical conditions of climate change combine to create high vulnerabilities, there is ample evidence that climate change has observable and often seriously adverse effects on humans, and that the nature and severity of these impacts can only be attributed to hazards (e.g., changing climate averages and extremes). Still, on the vulnerability of different communities (including their vulnerability and adaptive capacity) and their exposure to climate threats, these impacts also affect a range of natural and human systems, such as terrestrial, coastal and marine ecosystems and their services; agricultural production; It emphasizes that it involves infrastructure, human health, and other socio-economic systems.

This situation reduces the quality of life and causes increased environmental problems (Karakuş, 2010). In order to minimize the effects of global warming, various agreements and protocols have been signed in the international arena. Among these, the Kyoto Protocol, the Paris Agreement, and the United Nations Framework Convention on Climate Change have an essential place (UNFCCC, 2015). These agreements include targets to reduce greenhouse gas emissions and limit global temperature increase (Council of the EU and the European Council, 2022).

2.4. Reasons for the Emergence of International Environmental Policies

The emergence of worldwide environmental policies is founded on acknowledging serious global environmental problems and the need for coordinated action in response to these problems. Since the mid-20th century, the world environment has witnessed sharp degradation due to the impacts of industrialization and urbanization, thus raising the consciousness of the international community towards the environment (UN, 2012). Global challenges like climate change, loss of diversity, deforestation, and pollution have placed themselves on the agenda as problems that need urgent solutions worldwide (IPCC, 2014). The United Nations Stockholm Conference on Man and the Environment significantly contributed to the development of international environmental policy. The conference was the first large-scale international conference to raise awareness of the global dimensions of environmental problems and the first to establish a statement of principles that became the first United Nations Environment Programme (UN, 1972). Adopted as a result of the conference, the Stockholm Declaration underlined the need to balance sustainability and human well-being and established the fundamental principles of environmental protection policies (UN-IPBES, 2019). The 1992 United Nations Conference on Environment and Development (Rio Summit) in Rio de Janeiro introduced the Framework Convention on Climate Change (UNFCCC), as one salient step toward combating climate change. This convention is a forward-looking approach to bring about international cooperation to control greenhouse gas emissions and reduce the effects of climate change (UNFCCC, 1992). It requires the parties to take several measures to address climate change in accordance with their common but differentiated responsibilities. It promotes each country's response according to its economic and social state (IPCC, 2007). The ecological crisis, for its part, is a cross-cutting issue; it appears now that the environmental footprint of our presence has simply become unsustainable. Solutions to the situation are ultimately rooted in sustainable development and environmental protection concepts. Sustainable development is a strategy that seeks to reconcile economic development and Environmental conservation (Brunori, 2021). In that sense, a number of approaches, which consider renewable energy, energy efficiency, waste, and protection of ecosystems, are pursued (European Commission, 2022).

While climate change is at such a critical point, even with the fastest solutions, the greenhouse gas effect already in the atmosphere threatens our future.

The consequences of recent forest fires leave more damage in proportion to rising temperatures. These changes, which caused the extinction of many species, also greatly reduced agricultural productivity.

Due to this problem that concerns all humanity, governments and scientists have put forward various papers, reports, and international conventions with the studies they have carried out together from the past to the present. Below are some of these studies.

2.4.1. Intergovernmental Panel on Climate Change (IPCC)

The IPCC is an international body that deals with climate change scientifically. It was founded in 1988 in Geneva, Switzerland. Established by the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP), the IPCC was established to guide policymakers and decision-makers in the process of combating and adapting to climate change by evaluating technical, scientific, socio-economic information and studies on climate change.

Based on the risks posed by climate change, the IPCC presents future climate change scenarios, discusses options, and provides the scientific basis for governments to develop their policies. The IPCC, which is open to the participation of all member countries of the WMO and the United Nations, currently has 195 members. Turkey is also one of the member countries. (<https://www.ipcc.ch/about/>)

Reports created by the work of hundreds of scientists are presented every 5 to 7 years. The first report was published in 1990 (FAR), followed by a second in 1996 (SAR), a third in 2001 (TAR), a fourth in 2007 (AR4), a fifth in 2014 (AR5), and the second part of a sixth in 2022 (AR6). (<https://www.ipcc.ch/documentation/>)

The IPCC was awarded the 2007 Nobel Peace Prize for its contributions to the guidance of its impartial information and reports on climate change.

2.4.2. United Nations Framework Convention on Climate Change (UNFCCC)

The UNFCCC (United Nations Framework Convention on Climate Change), which entered into force on March 21, 1994, aimed to create a global response to climate change (<https://iklim.csb.gov.tr/birlesmis-milletler-iklim-degisikligi-cerceve-sozlesmesi-i-4362>). The convention aims to reduce the impact of climate change caused by greenhouse gas emissions, to stop the human-induced impact, and to ensure a sustainable economy. Turkey joined this convention in 2004.

2.4.3. Kyoto Protocol

The protocol, which was prepared in Kyoto, Japan, in 1997, was created as a subtext of the UNFCCC and entered into force on February 16, 2005. It aims to produce international solutions against climate change and global warming. In the Kyoto Protocol, which classifies countries as developed and industrialized in Annex I and developed and rich in Annex II, it was decided that the countries classified in Annex I, unlike the UNFCCC, would reduce their carbon dioxide emissions by 5% compared to 1990.

2.4.4. The Paris Agreement

In order to recover the damages left after the COVID-19 pandemic, the EU Commission has made various initiatives and put forward certain budgets. At the same time, due to the irreversible path in the climate crisis, the EU Commission has deemed an urgent action plan for the world necessary. All these changes are important because they affect the ecosystem and can cause permanent damage. For example, it is estimated that 99% of coral reefs will disappear and the Greenland ice sheet will be lost at a temperature increase of 2 degrees Celsius (European Commission, 2018). For this reason, the European Union has taken the necessity of an urgent climate action plan as a basis.

The Paris Agreement, which entered into force on November 4, 2016, aims to reduce the temperature increase caused by greenhouse gas emissions to less than 2 degrees Celsius compared to the pre-industrial period and draws attention to the fact that all

countries have certain responsibilities in line with this plan. (<https://www.mfa.gov.tr/paris-anlasmasi.tr.mfa>). In line with this goal, the European Union aims to reduce greenhouse gas emissions by at least 55% by 2050, based on 1990 levels, by first making policy changes and then working with all member states.

The European Union has put forward an action plan called the Green Deal to reduce greenhouse gas emissions.

2.4.5. Strategic Plans

The Commission's vision is framed across all EU policies. It was underlined that the Paris Agreement is a key element for the modernization of the industry and economy on the way to the net-zero carbon target. Eight scenarios compatible with the Paris Agreement have been identified, and it has been observed that electricity consumption increases in each scenario. However, it is predicted that by increasing its efficiency, greenhouse gas emissions can be reduced and targets can be achieved.

First of all, energy efficiency plays a central role in this goal. Solutions such as renewable energy alternatives to be used in the heating of buildings, quality insulation materials, and smart buildings play a key role in increasing energy efficiency. However, in order to increase renewal rates in this change, the importance of increasing the adequacy and affordability of financial instruments is emphasized, so that consumer participation is expected to be included in this process.

Secondly, a radical change of the energy system, which is dependent on fossil fuels, is one of the prerequisites. With the transition to clean energy, the primary energy supply is aimed at converting to renewable energy to a large extent. Another great advantage to be obtained from the transformation of energy supply is that oil and gas import dependency will fall sharply by 2050, and approximately €3 trillion will be saved (European Commission, 2018). At the same time, it is aimed to use hydrogen as a raw material in sectors that are targeted to be decarbonized by using it and to meet the needs of different economic sectors, thanks to technologies that enable the conversion of electricity into synthetic gases and liquids, called Power-to-X technologies.

Transportation is another important factor affecting greenhouse gas emissions. In line with the strategic objectives of the Commission, there are actions such as the transition to low- and zero-emission vehicles and the use of efficient, sustainable batteries. However, since it is known that the weight of the batteries used in electric vehicles and the performance of trucks and buses cannot be fully met in long-distance transportation, railways are seen as the best alternative in freight transportation. In addition, alternative fuel production is among the future plans. In order to increase the quality of urban life, it is expected that the digitalization of mobility systems will contribute to preventing traffic, increasing car and bicycle sharing systems, and reducing air pollution and accidents.

The transformation of the industry and a competitive economy will also bring great benefits. The efficient use of recyclable industrial products aims to reduce the input of raw materials and ensure a balance of carbon emissions. In addition, alternatives to raw materials are seen as part of the industrial transformation. At the same time, the modernization of production facilities and the active use of digitalization and automation are factors that increase competitiveness. Carbon capture and use also play a role in the change of the industry, aiming to reduce emissions with alternative solutions such as e-fuels, so much so that it is possible to increase the reuse of all inputs in economic activities.

Strengthening the infrastructure and ensuring a smart network infrastructure, digitalization, and sectoral integration will contribute to the development of the circular economy. In particular, it is planned to ensure the smooth functioning of the transportation sector with the benefit of energy distribution. Another important strategy is to aim to progress by taking advantage of all the advantages of the bio-economy. The use of biomass creates a substitute opportunity in carbon-intensive sectors. New business opportunities will emerge thanks to the circular bio-economy, where agricultural activities are important. Practices that increase the resilience of agricultural lands against climate change increase production and prevent air pollution. Encouraging farmers to reforest land also plays an important role. Cooperating with nature in the balance of excess carbon emissions is very important in the realization of the strategy. Ecosystem-based plans should be a priority, as the protection of forests and wetlands will ensure carbon balance. However, since the productivity of the bio-

economy on land is limited to land, it is necessary to increase the productivity of fresh waters and seas and to fully exploit the biomass potential.

With the implementation of these priority strategies, it will be easier to achieve the carbon-neutral target. In addition to all these, policymakers need to contribute to the implementation of the specified strategies. It is especially important to ensure investments, incentives, R&D studies, and social cohesion.

Increasing sustainable financing and encouraging investors is an effective way to finance the strategic plan. The EU, which allocates a significant budget to ensure environmental and energy efficiency, has provided 70 billion Euros worth of energy union strategy funds (European Commission, 2018). In addition, the carbon tax is seen as an effective tool in green transformation strategies. It is the creation of the tax according to the carbon footprint of individuals and institutions, that is, the implementation of the 'polluter pays' principle. Thus, it is aimed to increase efficiency and reduce greenhouse gas emissions.

International cooperation is required to achieve the goals of these strategies, which were created in line with the Paris Agreement. In this way, it is possible to achieve a global success, experience a great change in the future, and achieve the expected result. High environmental standards, especially in import and export actions between countries, should be one of the important elements of the global economy. At the same time, citizens need to fully adapt to this change. Because in order to ensure this transition, participation, change, and adaptation to daily life are very important. Awareness, such as choosing green products while consuming and turning to green alternatives in transportation, will make a big difference in achieving the goals of reducing the carbon footprint.

As a result, it is essential for the EU to work collaboratively to achieve its net-zero carbon target by 2050. For this reason, member states submit their national climate and energy plans to the European Commission.

2.5. EU Green Deal & Aviation Industry Effect

2.5.1. Overview of the EU Green Deal

The Green Deal, which aims at a circular economy, includes an economic growth strategy in which every individual of the society turns to conscious consumption, resources are used efficiently in production, and greenhouse gas emissions are zeroed. While the Green Deal is defined as a new growth strategy of Europe in order to be a pioneer in climate-friendly industries and to be a standard-setting position in clean technologies; On the other hand, more than 30 EU regulations in terms of industrial policy, climate finance and climate diplomacy have been examined and it has been made an important parameter of trade and the fight against climate change with a new framework. (Fatih Özkadı, 2021).

The Green Deal, which is expected to have a transformative effect on the sectors, is also expected to affect the approach of the sectors to climate change. It will have an impact that changes the way of working and lifestyle in many areas. By creating new policy reforms, a series of changes in consumer behavior are also envisaged, with pricing based on the carbon emissions generated in production. In addition, carbon border regulation, which includes taxation according to the damages caused by use, is among the policy reforms created.

The Green Deal, which attaches importance to energy efficiency, plans to transition to the use of renewable energy in production and consumption to a large extent (European Commission, 2019). With the new and clean energy plans of the member states, it is not limited to the production sector, but also aims to reach every household and provide clean energy sources, including homes, and to provide the financial support that will be needed in this transformation. While the climate crisis is an inevitable threat of our time, the Green Deal underlines the need for rapid planning of all this change. This transition also brings with it many opportunities. In addition to the decrease in costs with digital transformation and sustainable planning, which are the necessity of a carbon-neutral economy, it will also contribute to employment with the emergence of new business lines. For the transformation of the industry, which is of great importance in the EU economy, it is planned to use sustainable products and to

ensure the continuation of production with less waste. It is aimed that all of the packaging used by businesses will be recyclable by 2030, and it is expected that all units will take an active role in the sustainable economy goal by raising awareness of consumers about green products and supervising public procurement (European Commission, 2019). Considering digital technologies as an integral part of sustainable goals, the EU Commission attaches importance to the development and participation of systems such as cloud systems, artificial intelligence, etc. In addition, the renovation of buildings is also on the agenda to ensure energy efficiency. Because it is expected that emissions will be balanced thanks to technological solutions to be used in renovated buildings, green materials, and plans to protect energy efficiency. Greenhouse gases from transportation are an important factor in the progression of the climate crisis. In this context, one of the goals of the EU Commission is to create clean energy alternatives for roads, sea, air, and railways, and to direct users' preferences to green. In particular, an easy transition can be achieved by facilitating the accessibility and use of alternative energy vehicles that will replace fossil fuels (European Commission, 2019).

Innovations in education and training also play a key role in supporting this transition process. Investments are very important for the realization of all these applications. At this point, the Commission has also included certain funding plans in the Green Deal. In summary, with the Green Deal, the EU commission aims to minimize the damage to nature while maximizing the economic benefit by the transition to green that member states will make in production, consumption, and even the daily habits of individuals.

The EU fights climate change through its own policies and cooperation with international partners. One of the most important steps taken in this struggle is the action plan called the Green Deal. With the plan, which envisages a new economic model against climate change, which poses an existential threat to the EU's economic sustainability, all 27 EU member states aim to make Europe the world's first climate-neutral continent by 2050. The first step towards this goal is to reduce carbon emissions by 55% in 2030 compared to 1990 levels. The plan envisages economic growth that covers everyone and every region and is independent of resource consumption. (European Commission 2022a)

Green Basic Process (2019 - 2020), Pilot Phase (2021 - 2023), First Phase (2024 - 2026), Second Phase (2027-2035).

The targets of the Consensus are not limited to the EU economic geography and are aimed at having a global impact. All sectors and all countries trading with the EU must achieve economic growth in line with these objectives. For this reason, the EU both supports neighboring countries and imposes restrictions such as the "Carbon Border Regulation", which envisages a carbon tax for imported products (European Commission 2022b). Such arrangements make it necessary for countries to make a mandatory policy transfer on the subject.

The aviation sector has also taken its place among the targets of the green deal plan as one of the most important sectors that increase greenhouse gas emissions. International aviation emissions were 70% higher in 2020 than in 2005. The European Green Deal, published by the EU Commission on December 11, 2019, revealed that transport emissions should be reduced by 55% by 2030 and 90% by 2050 compared to 1990s levels in order to achieve climate neutrality. According to statistics, carbon emissions from transport in the EU account for ~% 25% of the total. The necessity of a complete transition to smart and sustainable transport in order to achieve the objectives of the agreement is an important agenda item within the scope of the EU's transport policy. In order to reach the 2050 target, it is of great importance to switch to carbon-neutral and clean alternatives not only in aircraft but also in all means of transportation (Servantie 2015a).

Regarding the carbon emissions caused by the civil aviation sector, the European Commission within the EU took a step before the UN. "The Single European Sky", created by the European Commission for safe, efficient and environmentally friendly management of air traffic, is an important step towards increasing the optimization of flight operation processes, although it is regional (Button, Neiva 2013: 74). With this major project, the EU aims for a stronger aviation policy by modernizing and growing its aviation infrastructures, reducing delays and costs, and increasing flight safety and efficiency to ensure environmental sustainability (Servantie 2015b).

2.5.2. Overview of the EU Taxonomy Regulation

The Taxonomy Regulation establishes criteria for classifying economic activities that align with environmental objectives. Focused on six main goals, the regulation has particularly impacted the following areas:

- Climate Change Mitigation

Climate change mitigation (IPCC, 2022) refers to human activities that try to diminish or prevent greenhouse gas emissions and increase their sink potential. The critical objective is to stabilize concentrations of atmospheric greenhouse gases at a level that halts dangerous anthropogenic interference with the climate system (UNFCCC, 2015). Another measures are the move towards renewable sources of energy, an increase in energy efficiency, and the innovation of new low-carbon technologies (IPCC, 2022). Climate change adaptation. The efforts at climate change adaptation are in aviation, and carbon dioxide emission reduction is in the spotlight. Among the most important strategies are advances in aircraft fuel efficiency, the creation and adoption of sustainable aviation fuels (SAF), and the introduction of carbon offset schemes, such as CORSIA (ICAO, 2022). There are era-shaping aviation technologies under extensive development, including electric and hybrid-powered engines and aircraft, as well as hydrogen-powered aircraft (ATAG, 2020).

i. Climate Change Adaptation

The IPCC (2022) defines adaptation to climate change as: The adjustment in natural or human systems in response to actual or expected climate stimuli or their effects that moderates harm or exploits beneficial opportunities. It addresses infrastructure upgrades to weather extreme conditions, climate resilience built into development plans, and sustainable water resource management as well (World Bank, 2021). In the aviation sector, methods of adaptation involve risk management for the impact of changing climate conditions, enhancement of infrastructure to withstand extreme climate conditions, and integration of climate change adaptation in operational planning (EUROCONTROL, 2021). Airports and airlines are increasingly integrating climate adaptation measures into their risk management systems to guarantee the safety and reliable operations of passengers (ACI, 2022).

ii. Sustainable Use and Protection of Natural Resources

The use of resources that meets current needs without compromising the ability of future generations to meet their own needs - or the use and protection of natural resources in a manner that allows satisfying the necessities of the present generations without risking that those of future generations go unsatisfied 1 is the concept of sustainable use and protection of natural resources (Brundtland Commission, 1987). This consists of conservation and sustainable management actions such as sustainable agriculture, forestry, fishing, benefiting water resources and ecosystems (UNEP, 2021). The airline sector gives priority to sustainable resource management through the efficient use of water and energy at airports, sustainable land management, and protection of ecosystems around airports (ACI, 2020). Airports have increasingly embraced a push for international rules such as the Airport Carbon Accreditation program (ACI, 2020) to robustly evaluate and minimise their environmental impact.

iii. Pollution Prevention

Preventive pollution: activities and approaches that seek lower waste, or no waste at all, at the source, rather than waste management. It focuses on reducing the management of pollutants and contaminants in the input streams to industrial production. If we look at cleaner production technologies, more efficient use of resources, recycling, minimizing wastes, etc. (EPA, 2022). Aviation pollution prevention — low emissions and contaminated pollutants (improved engine technology), low solid waste production at airports. Besides, it has to be mandatory for waste management and recycling at airports (ICAO, 2020). Airports have adopted an extensive EMS system to reduce pollutants entering the air, water, and soil (ACI Europe, 2021).

iv. Biodiversity Conservation

Biodiversity conservation refers to the protection, management, and restoration of biological diversity, including species diversity, genetic diversity, and ecosystem diversity (Convention on Biological Diversity [CBD], 2020). Responses can be habitat protection, protected area creation, species conservation programs, and policies to reduce the impact of humans through deforestation, pollution, and habitat division (CBD, 2020). Biodiversity conservation in aviation. For aviation, biodiversity conservation is concerned with preserving ecosystems impacted by airport activities.

Approaches include wildlife-hazard management, habitat restoration efforts, and initiatives to monitor biodiversity in a manner that balances operational safety and ecological considerations (FAA, 2020). Sensitive habitats and species are often protected by airports through local environmental groups (ACI, 2021).

v. Circular Economy

The European Commission, which needs a harmonized economic strategy to achieve climate neutrality, which is the goal of the European Green Deal, has created the Circular Economy Action Plan. It aims to decouple resource use in economic growth and increase competitiveness in order to achieve a climate-neutral Europe by 2050. According to research, it is estimated that the transition to a circular economy will create 700,000 new jobs and increase EU GDP by 0.5%. (European Commission, 2020a)

The new model is expected to be supported by technologies such as artificial intelligence, blockchain, and the internet of things, ensuring the speed of circularity and the independence of raw materials. Thus, the company aims to benefit from the opportunities brought by the Green Deal at the highest level. This plan mainly includes new product policies that aim to consume products, services, and business models without leaving any waste.

The circular economy in aviation encourages waste minimization, resource efficiency, and recycling applications. Airports adopt circular principles with effective waste management, promoting recycling and reuse of materials, airport infrastructure, and passenger waste (ACI, 2022). Industry initiatives predict closed-loop procurement chains and sustainable policies (IATA, 2021).

The aviation sector has been reevaluated under these criteria, resulting in various regulations aimed at reducing carbon emissions.

2.5.3. EU Emissions Trading System - EU ETS

The EU ETS, which was put into practice in 2005 in line with the KP targets to reduce emissions and is the world's first international mandatory carbon system, is an effective system for combating climate change and emission reduction in EU countries. CO₂

emissions from aviation have been included in this system, which includes taxation for each unit ton of carbon emissions, since 2012 (European Commission 2021).

According to a common view, the taxation system is not sustainable, and a global ETS is needed for the aviation industry to tackle this problem, not national or regional. ICAO CORSIA, on the other hand, is an effective platform for maturing this (Holloway 2008: 330). For this reason, EU ETS participating countries have voluntarily participated in the CORSIA Program for the post-2021 period and have decided to take action according to the developments at some points where they have reservations. According to the decision, CORSIA will apply to flights departing from or arriving in countries that are outside the EU ETS and implementing CORSIA. To avoid market distortions, it will maintain a route-based approach and ensure that airlines operating the same routes are treated equally, regardless of their nationality. Before the COVID-19 crisis, ICAO estimated that global aviation emissions could triple by 2050 compared to 2015. (European Commission 2021). CORSIA is the most comprehensive program planned at the global level to prevent this scenario from happening and to improve it.

In this context, within the scope of the EU ETS since 2012, all airlines operating in Europe or outside Europe are required to monitor, report, and verify their emissions and to carry out studies to offset a certain level of emissions from their flights (European Commission 2022a).

2.6. International Sustainability Factors of the Turkish Aviation Industry

It is seen that the Turkish Aviation Industry has achieved a rapid upward trend after the 2000s (Küçükoğlu, 2023). As a developing country, it has become a necessity for Turkey to develop its aviation industry and produce one hundred percent domestic and national high-tech products. Although domestic production opportunities have been gained by creating important infrastructures in various fields with the investments made since the establishment of the aviation industry, this production has neither been made 100% domestic and national, nor has the full continuity of production been ensured yet.

2.7. Turkish Airlines' Sustainability Annual Reports

People cannot predict the future, but if they can analyze and understand their past well, they can build a more sustainable and better future (Costanza et al., 2007: 522).

Sustainability reports for companies have started to become an important determinant of decision-making, competitive success from a strong value chain, and even survival. Investors who do not want to put themselves at risk have now started to bring sustainability reports to the forefront of their evaluation criteria. The fact that investors try to minimize the risks of asset loss that may arise due to climate change and do not want to work with companies that exhibit unethical behavior and are not transparent has made it necessary for companies to publish transparent sustainability reports (Aksoy, 2019: 12).

Sustainable development is a concept that is becoming increasingly important in the world. It has just started to be discussed in Turkey and should be understood by all segments of society. Since sustainable development is not a problem that can be solved by a single individual or social class, it should become one of the strategic priorities of the government and a way of life for the society (Karakuş, 2022).

Sustainability reports are documents that help organizations set goals, measure performance, and manage change to make their operations more sustainable. Sustainability reports make statements about an organization's positive or negative impact on the environment, society, and the economy. Sustainability reporting, therefore, integrates sustainability into the organization's activities and strategies by making abstract issues tangible. Helps to understand and manage

Turkish Airlines Inc. is the leading air transport company in the Republic of Turkey. It was established for domestic and international passenger and goods transportation activities and has taken its place among the world's largest air transportation companies, which has continued to grow rapidly since its establishment in 1933.

Today, Turkish Airlines has one of the youngest and most modern fleets in Europe, with 18 subsidiaries, a capital of TL 1.38 billion, and more than 32,000 employees.

Continuing to grow towards its targets and flying to most countries around the world, Turkish Airlines has expanded its fleet every year. It was informed that 394 passenger and cargo aircraft flew to 342 different destinations and carried 71.8 million passengers and 1.7 million tons of cargo, and landed 472,707 landings at these points (THY, 2022; Airporthaber, 2023; Milliyet, 2023).

From 2020 to 2021, aviation restrictions due to the new coronavirus infection greatly affected the sector. Despite all the ongoing challenges in 2022, THY enabled positive developments both financially and operationally (Erdem, Ercoşkun, 2022).

Due to the increase in demand for tourism, THY has achieved financial and managerial recovery faster than other airlines. The number of domestic passengers carried increased by 26.5%, international flights increased by 88.0% and total passengers increased by 60.3% compared to the previous year, reaching 71.8 million. At the same time, revenue from passenger transportation increased by 124% to \$14.3 billion, while cargo revenues decreased by 7% to \$3.7 billion. Total annual revenue increased by 72% to \$18.4 (THY, 2022).

THY, which has contributed so much to the economy and social environment, has had a serious sustainability policy since 2014 in order to leave a healthy world to future generations, and has been working diligently to implement these policies.

2.7.1. Sustainability Management

It is important to explain sustainability approaches to corporate management and employees, to ensure volunteering, to inform strategic target audiences about developments through media relations, and to monitor sustainability.

Sustainability is about to become one of the most urgent issues in aviation today. The sector is one of the most innovative in high-tech terms. Therefore, it is closely tracked by environmental and green organizations. Turkish Airlines has called its sustainability vision "Tomorrow On-Board" in 2022 to make certain this happens. Operate on common ground wherever in the company. It is designed to create a complete communication model based on the slogan "Tomorrow On-Board," which

also shapes sustainability practices for the future of partnership (THY, 2022; Bıçakcı, 2012; Torum, Yılmaz, 2009).

2.7.2. Sustainability Management Structure

Many factors we face today, such as global warming, loss of biodiversity, depletion and pollution of natural resources, increasing world population, hunger, poverty, discrimination, human rights violations, and corruption, force humanity to seek a new order. It is not easy to manage companies in this global change and to ensure profitable and sustainable growth. In the past, the survival of companies depended on the continuity of their operations. Today, it is aimed to adopt good management practices that are sensitive to the environment and people, and to raise awareness.

The sense of responsibility towards one's own generation and future generations is accepted by all segments of society. Responsibility towards future generations makes the world more livable, promotes environmental protection, and improves people's quality of life. For this reason, companies now need to take into account social and environmental dimensions as well as the financial perspective because it is clearly seen that short-term and profit-oriented approaches are not sustainable in the long term and that such approaches have social consequences.

In this new era, where personal interests are replaced by social interests, the value of businesses is determined according to various criteria that reflect social interests. There is pressure on corporate stakeholders to provide both non-financial information and corporate financial information for companies to develop sustainability strategies, publish sustainability reports, and integrate all these functions into their business processes. In addition, it is seen that companies that consider the expectations of interest groups gain added value. For all these reasons, the company applies the sustainable development approach, which is expressed by taking into account economic, environmental, social, and administrative factors within the company as a whole and effectively reducing the risks and opportunities related to these factors (Aksoy, 2019).

2.7.3. Sustainability Indices

Corporate responsibility is known as the adaptation of economic, environmental, and social factors to the company's activities, decision-making mechanisms, and management principles to create long-term value and to reduce the risks arising from them. As a result of the effects of technological developments in the world on the airline industry, global awareness of natural disasters has increased over the years. In addition to preparing financial statements, companies have also started to prepare social and environmental responsibility reports.

Through these reports, stakeholders want to check not only the financial data of the companies, but also their responsible activities. Companies that care about sustainable development are valued by investors (BIST; Dagestanli, 2023).

Partnership with Turkish Airlines. Let us keep up with global trends and assess the status of the industry. Voluntary participation in performance assessment of national and international indices and sustainability rating agencies that help to meet stakeholder expectations is guaranteed by offering an open communication network for all stakeholders. It is aimed to continue to participate in the performance evaluations of national and international indexes and sustainability rating agencies such as DJSI, FTSE4Good, MSCI, EcoVadis, Sustainalytics, TPI, Borsa Istanbul Sustainability Index, and to increase its performance further. Whose voluntary participation over the given years, yet, because of the measurements conducted by the world's most prestigious rating institutions, the averages as of 2006 have been raised to the higher levels given that the former. According to Sustainalytics, among 69 companies in the 2022 ESG (Environmental, Social, Governance) risk assessment score, the airline sub-industry, THY, is the first for the lower risk category with a 1% sector success rate, which represents the lowest risk category. Based on this performance, the world airline has now moved from the EcoVadis bronze level in 2021 to the silver category in 2022. Turkish Airlines has a high corporate sustainability performance, increased sustainability knowledge and practice, and firms listed on the Borsa Istanbul registry. In 2022, it was listed in the BIST Sustainability Index, as planned. It is presumed to be outside the Sustainability Index and the BIST Participation Sustainability Index. Being not only the first but also the only air carrier

listed on the BIST Sustainability 25 Index, Turkish Airlines also takes the lead on the 2022 sustainability performance of the 47 airline companies assessed by Refinitiv (THY, 2022).

In order to be included in the BIST Sustainability Index, companies

- Overall Sustainability Score of 50 or above,
- Each main heading grade is 40 or above.
- At least 8 of the category grades must be 26 or above (BIST).

2.7.4. Sustainability Priorities

In the global world, no sector is considered separately from the concepts of economic and environmental sustainability and development. However, sustainability in aviation has not reached the desired point, both in the world and in Turkey. Sustainable aviation did not come to the fore as a problem in the process; it was first addressed within the scope of climate change, and importance was given to reducing emission values by considering the emissions it caused.

Activities in the aviation industry are interrelated with many social, economic, and environmental challenges. But they're not all equally important across the sustainability strategies of all companies.”

2.8. Context of the Organization

2.8.1. Identify the Scope of the Social Responsibility Strategy

Turkish Airlines' sustainability strategy is framed by the social, economic, and environmental concerns associated with or caused by the operations, products, or services of their business partners. These issues are prioritized and sorted based on a systematic process developed following the international standards, based on the opinions and inputs from the parties involved, and represent the partnership's strategy for sustainable development. Since the previous reporting period, Turkish Airlines' sustainability focus areas have been adjusted. In the process, global mega risk trends, global initiative report standards, and aviation industry best practices were considered.

Here, social, economic, and environmental problems that are distinct for THY's sustainability projects were identified. While identifying the priority issues, the potential impacts, risks, and opportunities of the 17 Sustainable Development Goals for THY's business, products, and services were considered. A total of 1,434 Turkish Airlines staff completed the survey: 98 were managers, 857 were office workers, and the remaining 479 were cabin crew members. In contrast, 281 external participants, including investors and shareholders, customers, financial institutions and related parties, suppliers, insurance and brokerage companies, responded in the present study, and we considered the respondents' views as selection criteria in the prioritization. Workshops with a mixed group of company executives are often organized to challenge the results coming from these studies, and the results are finally approved by senior management and align with the sustainability priorities. Environmental preferences are tested in three dimensions. It's not that they're not important things, that they're not high-priority things, that they're not even very high-priority things. The important issues e For THY, the authors can list Human-Induced Environmental Disasters, Crises Between Countries, Global Economic Crises, Animal Welfare, Biodiversity Loss, issues with a high priority Contribution to Social Development, Fair Competition, Water Management, Disposable Plastics, very high priority issues: with Sustainable Catering, Noise Management, Responsible Procurement, Chain Management Innovation, Very high priority issues: Flight Safety and Security, Climate Change, Employee Health and Safety, Customer Expectation and Behavior Change, Fleet Modernization and Development, Digitalization, Business Continuity, Talent Management, Waste Management (THY, 2022; Basic, 2022).

2.8.2. Sustainability Strategy

The company has been publishing a sustainability report since 2014. The company's international competitiveness is increasing day by day, and its goals to combat climate change are progressing in parallel with the goals of IATA and ICAO, of which it is a member. Realizing its strategy of combating climate change and reducing greenhouse gases by prioritizing fuel saving and efficiency, THY calculates its greenhouse gas emissions according to the ISO 14064 Greenhouse Gases Standard and has them verified by an independent organization. It balances greenhouse gas emissions from flights covering European airspace with credits obtained from organizations that

provide carbon credits within the scope of the EU ETS. The company is also a participant in the CORSIA program developed by ICAO, including its voluntary phases (THY, 2017; Basic, 2022).

As of 2020, THY offset all 13,074 tons of CO₂ emissions from European flights within the scope of the EU ETS, and prevented a total of 71,695 tons of greenhouse gas emissions with the help of fuel savings made through operational improvements and similar measures to reduce engine power use on the ground. By 2050, the company aims to reduce its net carbon emissions from aviation to half of 2005 (THY, 2020; Basic, 2022).

As can be seen, THY is working to reduce the carbon emission value as a priority in its sustainability strategy, prioritizes awareness by working towards this, and strengthens the strategy through policies that will provide economic development.

2.9. Opportunities in the Era of the Green Deal

2.9.1. Technological Innovations

Sustainable fuels, electric aircraft, and optimized flight operations are shaping the future of the aviation sector. For example, digitization projects and artificial intelligence-supported operational improvements help reduce fuel consumption, leading to cost savings and carbon reduction.

2.9.2. Green Financing Opportunities

Funds and green financing options provided under the Taxonomy Regulation offer critical support to aviation companies. Carbon credit systems and grants for sustainable projects provide solutions in this regard.

Table 2.1. Taxonomy Regulation

Opportunity	Description
Technological Innovations	Investments in new technologies such as SAF and electric aircraft are increasing.
Green Financing	Funds and financing opportunities for sustainable projects.
Public Support	Green projects are viewed more favorably by the public and stakeholders.



CHAPTER III

METHODOLOGY

3.1. Research Design

This study adopts a qualitative research approach supported by document analysis to investigate the compliance and strategic alignment of Turkish Airlines (THY) with the European Union Green Deal and the EU Taxonomy Regulation. The study is designed as a case study, focusing on THY as a representative flagship airline operating in the broader European and global aviation ecosystem. This method allows for an in-depth understanding of how a major airline interprets and incorporates European environmental policies into its strategic and operational frameworks.

3.2. Data Collection

The research relies on secondary data sources, primarily gathered from:

- Annual Reports of Turkish Airlines (2018–2023)
- Sustainability Reports of THY
- Financial Statements
- Press releases and corporate presentations
- Official EU documents and directives related to the Green Deal and Taxonomy Regulation (e.g., EC communications, EASA compliance guidelines, delegated acts)

In addition, reputable third-party sources such as IATA, Eurocontrol, ICAO environmental policy reports, and industry white papers have been utilized to frame the European and global context.

3.3. Data Analysis

The collected documents were analyzed using content analysis methodology, which allows the identification and categorization of recurring themes, policies, and strategic responses of THY in relation to sustainability and environmental compliance.

The analysis consists of two key stages:

- **a) Thematic Coding:**

A coding framework was developed based on the EU Green Deal pillars (climate neutrality, energy efficiency, emissions trading, sustainable mobility) and the EU Taxonomy's six environmental objectives. THY's reports were scanned for explicit and implicit references to these elements.

- **b) SWOT Analysis:**

A detailed **SWOT analysis** was conducted to assess the internal and external factors influencing THY's positioning within the EU's green transformation agenda. This included:

- Strengths (e.g., existing sustainability programs, fleet renewal)
- Weaknesses (e.g., dependency on fossil fuel-based infrastructure)
- Opportunities (e.g., EU-aligned ESG investments, SAF development)
- Threats (e.g., regulatory risks, carbon tax exposure)

The SWOT analysis provides a strategic overview of THY's readiness and alignment with the EU Green Deal and Taxonomy Regulation.

3.4. Justification of Method

The qualitative content analysis of corporate documents is a widely accepted methodology in environmental and corporate strategy research (Bowen, 2009). Given the policy-driven nature of the research problem and the unavailability of large-scale primary data, this method is suitable for extracting strategic implications and compliance signals embedded in corporate narratives and disclosures.

The use of a SWOT framework is justified by its effectiveness in translating qualitative findings into a structured strategic perspective, facilitating managerial and policy recommendations.

3.5. Limitations

This study is limited by its focus on publicly available data, which may not fully reflect internal decision-making processes or undisclosed challenges. Additionally, the findings are specific to THY and may not be generalized across all aviation actors in or outside the EU framework. Future research could incorporate interviews with key stakeholders or comparative analyses with other European airlines.



CHAPTER IV

FINDINGS

4.1. The Impact of the European Green Deal and Taxonomy Regulation on the Aviation Industry: The Case of Turkish Airlines

The European Green Deal, announced by the European Union in 2019, is a comprehensive policy framework that aims to achieve carbon neutrality by 2050 (European Commission, 2019). This deal necessitates transformative changes across several industries, particularly the aviation sector. The Taxonomy Regulation, which supports the European Green Deal, aims to direct investments toward green technologies and projects by classifying economic activities that align with environmental sustainability principles (European Commission, 2020).

The aviation industry faces significant challenges in achieving carbon neutrality due to its reliance on fossil fuels and the underdevelopment of low-carbon alternatives (ICAO, 2022). This article examines the impact of the European Green Deal and Taxonomy Regulation on the aviation sector, with a detailed analysis of Turkish Airlines (THY) as a case study.

4.1.1. Challenges Facing the Aviation Industry

The aviation sector, as a high-carbon-emitting industry, faces intense pressure for transformation under the European Green Deal. This has resulted in numerous technological and financial challenges for the sector (IATA, 2021).

4.1.2. Dependency on Fossil Fuels

The aviation sector heavily relies on jet fuel to meet its energy needs. Due to the high carbon emissions of fossil fuels, this dependency presents a significant obstacle to sustainability goals. Electric and hybrid aircraft technologies are still in their infancy and are not yet capable of meeting the industry's demands (ICAO,2022; European Comission, 2020).

4.1.3. Technological and Financial Barriers

Innovative technologies such as Sustainable Aviation Fuels (SAF) are underutilized due to high costs. The production costs of SAF derivatives are significantly higher than those of conventional jet fuels. Additionally, the supply chain and infrastructure requirements for these fuels are not yet sufficiently developed (IATA,2021; ICAO,2022).

Table 4.1. Technological and Financial Challenges

Challenge	Description
Dependency on Fossil Fuels	Reliance on jet fuel makes emission reduction difficult.
High Technology Costs	Developing SAF and electric aircraft technologies is expensive.
Infrastructure Investments	New technologies require costly infrastructure upgrades.

4.1.4. Regulatory Pressures

Compliance with the Taxonomy Regulation obliges aviation companies to operate in line with environmental objectives. This requires companies to reevaluate their existing operational models (European Comission,2020).

4.2. Opportunities in the Era of the Green Deal

4.2.1. Technological Innovations

Sustainable fuels, electric aircraft, and optimized flight operations are shaping the future of the aviation sector. For example, digitization projects and artificial intelligence-supported operational improvements help reduce fuel consumption, leading to cost savings and carbon reduction (ICAO,2022).

4.2.2. Green Financing Opportunities

Funds and green financing options provided under the Taxonomy Regulation offer critical support to aviation companies. Carbon credit systems and grants for sustainable projects provide solutions in this regard (European Commission,2019).

Table 4.2. Opportunities in Aviation Sector

Opportunity	Description
Technological Innovations	Investments in new technologies such as SAF and electric aircraft are increasing.
Green Financing	Funds and financing opportunities for sustainable projects.
Public Support	Green projects are viewed more favorably by the public and stakeholders.

4.3. Turkish Airlines Sustainability Findings

Since the Second World War, civil aviation has developed rapidly all over the world. However, since this rapid development has rapidly increased the negative effects of aviation on the environment, the term sustainable aviation has become one of the priorities of the sector and has become a new agenda item in recent years (Göktürk & Arıkan,2021).

The global environmental problems that have started to be experienced with the industrialization process have revealed the need for the term sustainability. This concept, which has become important for all kinds of sectors, is especially important

for the aviation industry. The civil aviation sector, which is a rapidly growing sector in Turkey and in the world, has become as important as environmental sustainability, safety, and security issues in recent years, as its negative effects on the environment have increased significantly (Temel, 2022).

The Civil Aviation Law, which entered into force in 1983, has been an important step towards the liberalization of the civil aviation sector in Turkey. During the implementation of the law, there was a significant increase in the number of private airline companies, their fleet capacity, and the share of companies in the sector. Faced with increasing competition during this period, Turkish Airlines started to develop its fleet and improve its service standards (Gökırmak, 2014).

These improvements are among the targets within the scope of sustainability policies. These; It is monitored under headings such as "adopting a corporate governance culture, combating climate change, considering people and the environment while growing, adding value to its stakeholders, establishing a balance between male and female employees, adding value to society, acting in accordance with the principles of ethical behavior, sustainable growth and profitability, supporting innovation, continuous improvement".

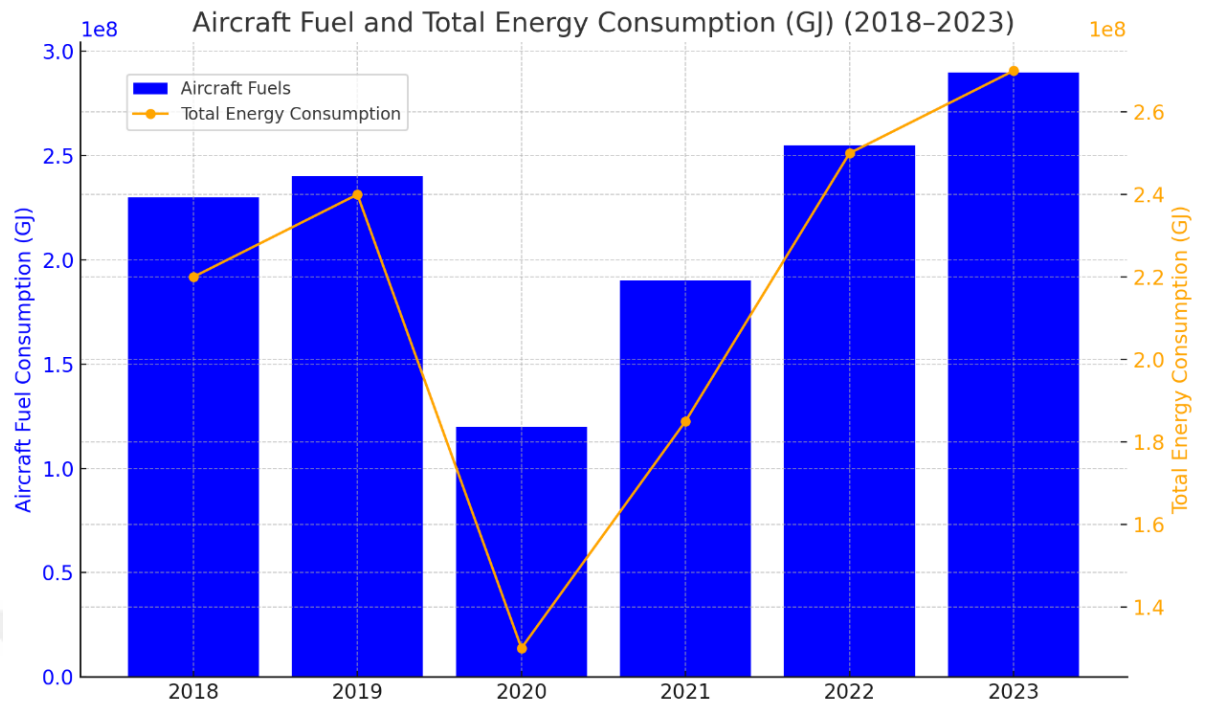


Figure 4.1. Turkish Airlines Aircraft Fuel Consumption (THY, 2023)

As can be seen in Figure 3, there has been an increase in aircraft fuel consumption. The chart illustrates Turkish Airlines' aircraft fuel and total energy consumption from 2018 to 2023, measured in gigajoules (GJ). Aircraft fuel consumption is represented by blue bars, while the orange line shows total energy usage. Over this six-year period, the data reflect key industry trends shaped by both external events and operational changes.

In 2018 and 2019, energy and fuel usage remained consistent, indicating stable operations. However, in 2020, both metrics dropped sharply due to the COVID-19 pandemic, which significantly reduced flight operations worldwide. This decline is most noticeable in fuel consumption, a direct result of grounded aircraft and travel restrictions.

From 2021 onwards, Turkish Airlines showed a strong recovery. Both fuel and energy consumption began to rise, signaling the resumption of flights and increased operational capacity. By 2022, consumption levels had nearly returned to pre-pandemic values.

In 2023, the airline recorded its highest fuel and energy consumption during the period. This sharp increase suggests a full operational rebound, likely driven by rising passenger demand, fleet expansion, and increased international routes. It also reflects the airline’s growing scale and ambition under its sustainability and growth strategy.

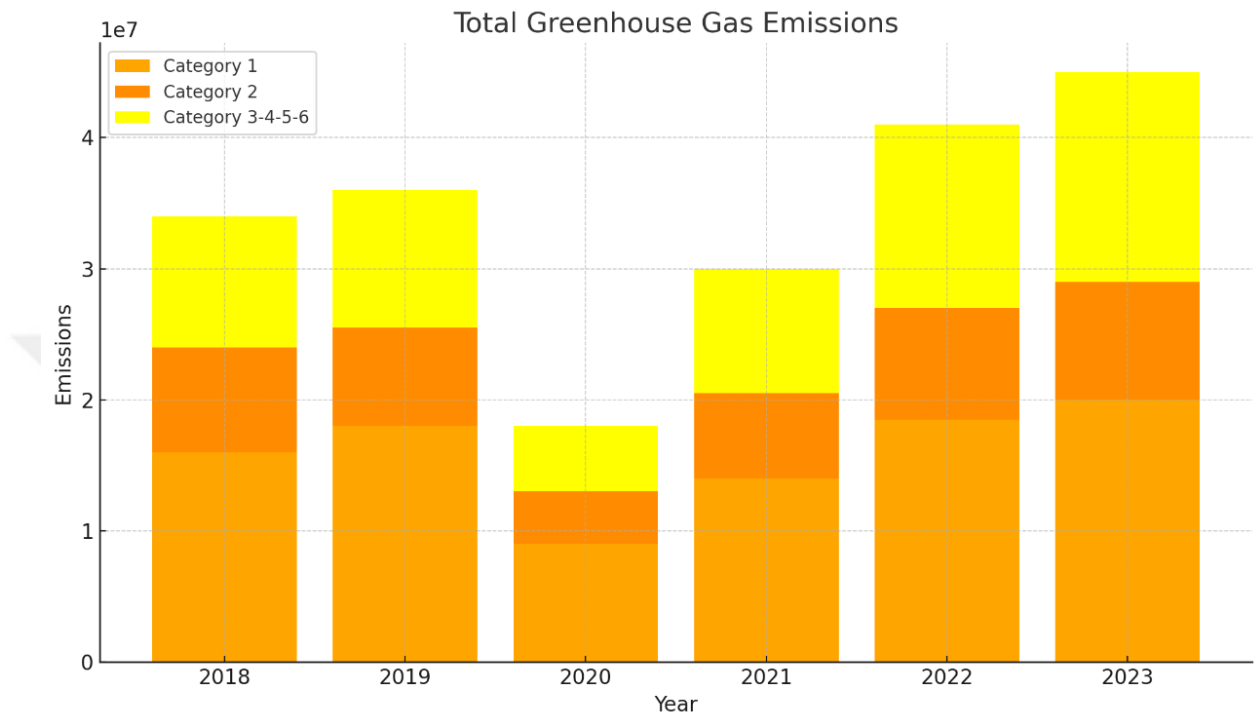


Figure 4.2. Turkish Airlines Non-Aviation Fuel Energy Consumption (THY, 2023)

As can be seen in the image in Figure 4, Turkish Airlines’ total greenhouse gas emissions from 2018 to 2023, categorized into three segments: Category 1 (direct emissions from owned or controlled sources), Category 2 (indirect emissions from the generation of purchased energy), and a combined group of Categories 3, 4, 5, and 6 (other indirect emissions such as fuel- and energy-related activities, transportation, and waste). Each year’s total emissions are represented by stacked bars, with each color showing the contribution of a specific category.

In 2018 and 2019, emissions were relatively stable and moderately high, reflecting steady airline operations. In 2020, there was a sharp decline across all categories, with the most significant drop in Category 1, due to the operational slowdown caused by

the COVID-19 pandemic. However, from 2021 onwards, emissions began to rise again, signaling a recovery in flight activity and energy use.

By 2022, emissions surpassed pre-pandemic levels. In 2023, total emissions reached their highest point in the six-year period. This increase was evident across all categories, particularly in direct and indirect energy-related emissions. The data suggests that Turkish Airlines resumed full-scale operations, possibly expanded its route network, and increased its energy consumption, which in turn elevated its carbon footprint. This trend emphasizes the importance of sustainable practices as operations grow. (Aksoy, 2016. THY, 2022).

Table 4.3. Turkish Airlines Fuel Economy Indicator (THY, 2018–2023)

Year	Fuel Consumption (million tons)	Fuel Savings (tons)
2018	5.3	29,608
2019	5.6	55,492
2020	2.9	22,760
2021	4.2	37,082
2022	5.7	57,581
2023	5.9	71,830

Table 4.3 presents Turkish Airlines' annual fuel consumption and fuel savings data from 2018 through 2023. The years 2018 and 2019 show comparable fuel consumption levels, yet 2019 stands out with significantly higher fuel savings, suggesting improved operational efficiency. In 2020, with the outbreak of the COVID-19 pandemic, global air travel was severely restricted, leading to a drastic drop in fuel consumption (2.9 million tons). Although fuel savings also decreased, this reduction was influenced more by reduced operations than efficiency initiatives.

As operations resumed in 2021 and 2022, fuel consumption rose to pre-pandemic levels. In 2022, Turkish Airlines reached 5.7 million tons in fuel consumption and

saved 57,581 tons, marking approximately 1% in planned savings. This reflects the company's commitment to sustainable aviation through fuel optimization efforts.

In 2023, both metrics reached their peak: fuel consumption increased to 5.9 million tons, while fuel savings soared to 71,830 tons—the highest recorded over the six-year span. This achievement highlights THY's strengthened focus on environmental sustainability, operational optimization, and its ability to implement effective fuel conservation measures even amid increased flight activity.

**Table 4.4. Carbon Emission Credits Delivered to THY Authorities
(THY, 2018–2023)**

Year	EU Emission Credits Delivered (tons CO₂)	ETS	CH Emission Credits Delivered (tons CO₂)	ETS	UK Emission Credits Delivered (tons CO₂)	ETS	Total Emission Credits Delivered (tons CO₂)	Reported Passenger Flights
2018	10,617		–		–		10,617	668
2019	13,240		0		–		13,240	686
2020	13,835		48		–		13,883	669
2021	10,838		0		3,130		13,968	672
2022	6,619		52		2,297		8,968	476
2023	8,420		60		3,100		11,580	623

Table 4.4 summarizes the carbon emission credits submitted by Turkish Airlines (THY) authorities under various Emissions Trading Schemes (ETS): EU ETS, CH ETS (Switzerland), and UK ETS. These credits are part of a broader effort to compensate for carbon emissions resulting from passenger flights. Airlines are obligated to deliver carbon credits to offset their emissions, often acquired through offsetting programs like afforestation, carbon capture projects, or investment in green technology.

Between 2018 and 2020, the total emission credits delivered showed a steady increase, peaking in 2020 at 13,883 tons of CO₂, despite the pandemic's impact on air travel.

This reflects pre-planned obligations and possibly a delay in reporting cycle alignment with actual flight activity.

In 2022, however, a significant drop occurred—only 8,968 tons of CO₂ were submitted, with a notably lower number of reported passenger flights (476). This reduction in credits may suggest a smaller carbon offset requirement due to decreased operational volume during the pandemic's tail end or delays in credit transactions.

In 2023, THY's total emission credits delivered rose to 11,580 tons CO₂ with 623 passenger flights reported. This marks a recovery in both flight operations and emissions obligations. The increase in UK ETS and EU ETS credits indicates THY's growing presence in jurisdictions with active carbon regulation and its continued commitment to environmental compliance. These efforts, tied with its carbon offsetting strategy, signal the airline's ongoing adaptation to sustainable aviation standards and climate-focused governance.

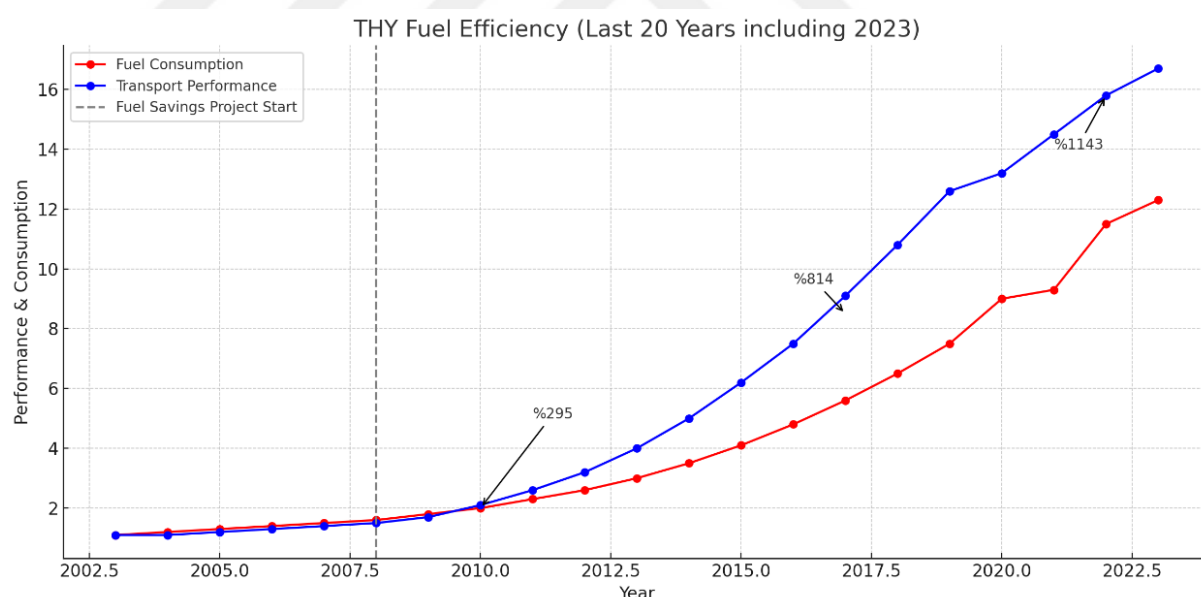


Figure 4.3. Turkish Airlines Fuel Efficiency Graph (THY, 2023)

As can be seen in Figure 4.3, there has been an active increase in fuel savings from 2003 to 2020. When 2008 is taken as the beginning and 2022 as the end, it is observed that transportation performance increased by 1,143% and fuel consumption increased

by 692%. The increase in the difference between fuel consumption and transportation performance is interpreted as an increase in efficiency performance. Among its targets, THY aims to reduce the amount of CO₂ by reducing the amount of fuel used through savings and measures, and to contribute to sustainable aviation.

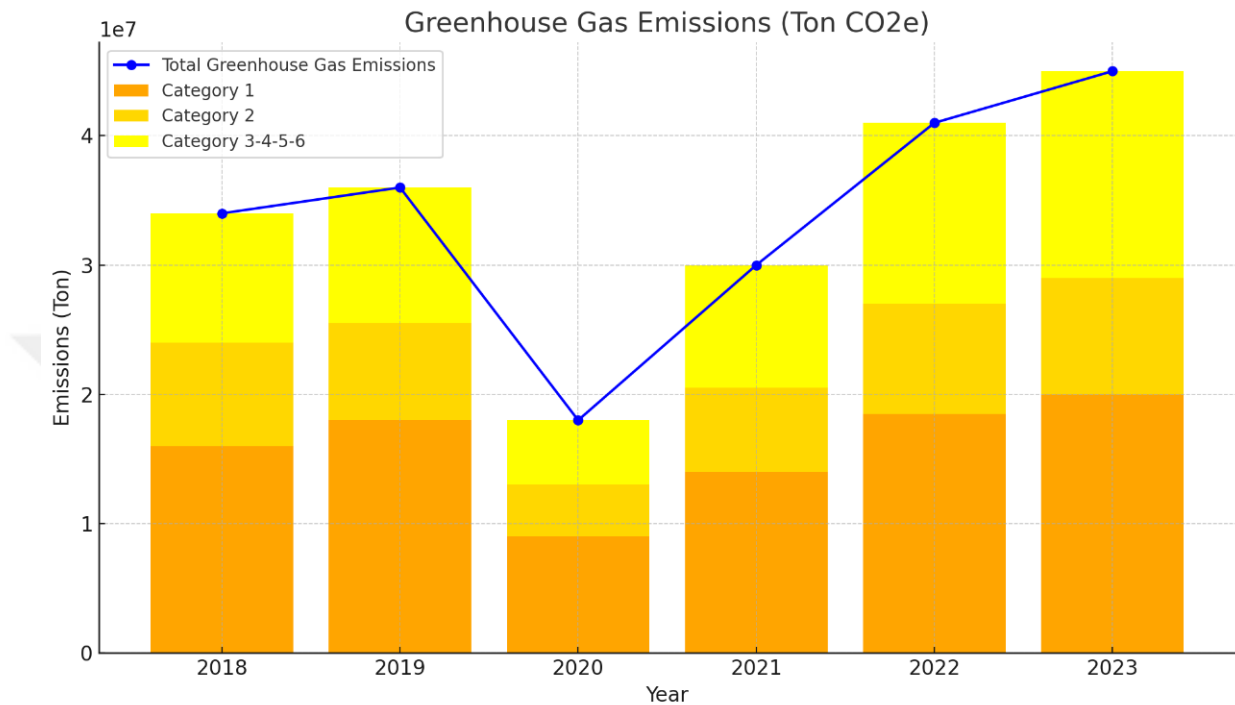


Figure 4.4. Turkish Airlines Greenhouse Gas Emissions (THY, 2023)

The chart illustrates Turkish Airlines’ total greenhouse gas emissions (in tons of CO₂e) from 2018 to 2023, broken down into three main categories: Category 1 (direct emissions from company-owned sources), Category 2 (indirect emissions from purchased energy), and Categories 3-4-5-6 (other indirect emissions such as fuel and energy-related activities, waste, and upstream/downstream logistics). The blue line represents the total annual greenhouse gas emissions.

In 2018 and 2019, total emissions were relatively stable, around 34–36 million tons. However, due to the COVID-19 pandemic in 2020, emissions dropped significantly to approximately 18 million tons. This sharp decline reflects the reduced flight activity and operational slowdown during the global health crisis. In 2021, emissions began to rise again, signaling a gradual recovery in air traffic and business operations.

By 2022, emissions had climbed back to 41 million tons, and in 2023 they reached an estimated 45 million tons—marking the highest value in the six-year period. This increase can be attributed to intensified flight operations, growing passenger demand, and increased global mobility.

While this rise highlights operational growth, it also underscores the need for stronger emission control measures. Turkish Airlines must continue investing in fuel-efficient technologies, sustainable aviation fuels, and carbon offset programs to align with international climate goals and its own sustainability commitments. (Öztürk, 2016, THY, 2023).



Figure 4.5. Turkish Airlines (Hürriyet Newspaper, 2023)

Bolat, Chairman of the Board of Directors and the Executive Committee of Turkish Airlines, emphasized that more than 100 operational optimization projects have been carried out to reduce the carbon footprint since 2008, and that 181,379 tons of greenhouse gas emissions were prevented by saving 57,581 tons of fuel in 2022 (Hürriyet Newspaper, 2023)

4.3.1. Fleet Modernization

Turkish Airlines (THY) has incorporated next-generation aircraft such as the fuel-efficient Airbus A350 and Boeing 787 into its fleet. This step plays a critical role in achieving carbon reduction targets. (THY,2023)

4.3.2. Sustainable Aviation Fuels (SAF)

THY aims to reduce carbon emissions by integrating SAF into its operational planning. The widespread adoption of these fuels is a key element of the company's sustainability strategies. (THY,2023)

4.3.3. Operational Efficiency

Through digitization and improvements in fuel management, THY has achieved lower fuel consumption and carbon emissions (THY,2023; IATA,2022).

Table 4.5. Efficiency Strategies

Strategy	Description
Fleet Modernization	Reducing emissions with next-generation aircraft.
SAF Usage	Integrating sustainable fuels.
Digitization	Achieving fuel savings through operational efficiency.

- **THY’s Sustainability Strategies:** By modernizing its fleet, increasing SAF usage, and improving operational efficiencies, THY aligns with the goals of the European Green Deal.

THY has taken significant steps toward achieving sustainable aviation goals and contributing to Europe's carbon neutrality targets. However, faster industry-wide transformation will require increased investment and innovation. (THY,2023; IATA,2022)

4.4. SWOT Analysis: The Case of Turkish Airlines

Table 4.6. SWOT Analysis Table: Turkish Airlines and the EU Green Deal

Category	Factor	Explanation
Strengths	Extensive Flight Network and Strategic Location	THY's geographic location connects Europe, Asia, and the Middle East, facilitating integration with the EU's sustainable mobility goals. (THY,2023; EC,2022)
	Investment in Modern and Efficient Fleet	Investment in fuel-efficient aircraft like Boeing 787 and Airbus A350 supports lower emissions and compliance with EU standards. (THY,2023; IATA,2022)
	Environmental Certifications and Policies	ISO 14001 certification reflects THY's commitment to environmental management and readiness for regulatory compliance. (THY,2023)
	Sustainability Reporting and Corporate Commitment	Regular ESG and sustainability reports demonstrate transparency and alignment with EU green investment principles. (GRI,2022; THY,2023)
Weaknesses	High Carbon Emissions Due to Long-Haul Operations	Long intercontinental flights lead to high CO ₂ emissions, increasing exposure to carbon pricing under EU legislation. (THY,2023)
	Limited Use of Sustainable Aviation Fuels (SAF)	Low SAF usage limits THY's alignment with EU Taxonomy criteria focused on low-emission activities. (ICAO,2023)
	Gaps in Carbon Market Integration	Limited engagement in carbon trading schemes like the EU ETS may lead to compliance challenges and lost financing opportunities. (EU ETS,2023;EC,2022)
	Infrastructure and Ground Service Challenges	Airport and ground operations infrastructure may require modernization to meet evolving EU environmental benchmarks. (THY,2023)

Table 4.6. (cont.)

Opportunities	Access to EU Green Funds and Climate Finance	EU climate funding can support THY's green transformation projects, including fleet upgrades and energy efficiency initiatives. (EC,2022)
	Expansion of SAF and Biofuel Partnerships	Investment in alternative fuels can reduce lifecycle emissions and ensure long-term regulatory compliance. (ICAO,2023)
	Strengthening ESG Performance and Market Appeal	Improved sustainability ratings enhance investor confidence and align THY with global green investment trends. (GRI,2022; THY,2023)
	Enhancing Corporate Image Through Climate Leadership	Public net-zero or climate pledges can improve THY's reputation and attract environmentally conscious passengers. (THY,2023)
Threats	Regulatory Pressure from EU Carbon Measures	Introduction of new carbon taxes and stricter environmental rules may raise costs and reduce competitiveness in the EU market. (EU ETS,2023)
	Competitive Disadvantage Against Greener Airlines	EU-based airlines that adopt green strategies more rapidly may outcompete THY in sustainability-conscious markets. (IATA,2022)
	Financial Exclusion from Green Investment Pools	Non-compliance with the EU Taxonomy could limit THY's access to sustainable investment funds and increase capital costs. (EC,2022)
	Fast-Paced Policy Shifts and Adaptation Risks	Rapid changes in EU environmental regulations require agile adaptation; delays may result in penalties or operational constraints. (EC,2022)

4.4.1. Strengths

Turkish Airlines (THY) is a member of the world's best airline partnership – Star Alliance, its network encompassing destinations in Europe, Asia, Africa, and the

Middle East. The strategic location enables regional cooperation in line with the EU Green Deal and offers access to several sustainable aviation markets. (EC,2022; THY,2023).

What is more, the investment in a new modern, efficient fleet? THY has invested heavily in more recent, fuel-efficient models like the Boeing 787 Dreamliner and Airbus A350. These airplanes are in line with EU Taxonomy objectives, including emission reduction and lower levels of fuel consumption. (IATA,2022; EC,2022; THY,2023).

Environmental Certifications and Policies. The ISO 14001 certification is maintained for environmental management systems. This shows a basic "compliance" with the EU environmental standards, for the ongoing increase in environmental performance in aviation. Sustainability Reporting and Corporate Commitment THY issues sustainability reports and is committed to monitoring and reducing its carbon footprint. And that transparency will bolster its place within the sustainability frameworks focused on by the EU Green Deal, as well as investors' focus on ESG. (GRI,2022; THY,2023).

4.4.2. Weaknesses

High carbon emissions from long-haul operations. THY operates from a hub and has a long-haul route network, and therefore, its operations produce high levels of CO₂ emissions. This leaves the airline vulnerable as the EU's environmental regulations become more and more restrictive (carbon taxes, emissions limits). (THY,2023; EC,2022). Scarce use of SAF (Sustainable Aviation Fuel) While there is a global push for the development of SAF, Turkish Airlines appears rather behind in pushing these fuels to a wider scale. EU Taxonomy promotes the use of low-emission fuels as an eligible activity, so this is a sore point that needs fixing. (ICAO,2023; EC,2022). Gaps in Carbon Market Integration. In addition, the airline's low engagement with key carbon market instruments like the EU ETS could imply that the airline faces compliance costs or has reduced access to green financing tools. (EU ETS,2023; EC,2022). Infrastructure and Ground Service Challenges. That is not the case for all airport activities or for all ground handling services in relation to EU environmental

performance targets. Infrastructure transition to sustainability with regard to infrastructure may require large capital flows and logistical agreements. (THY,2023; EC,2022).

4.4.3. Opportunities

EU Green Funds and Climate Finance opportunities for ERD sectors. There is substantial financial support available in the EU Green Deal for sustainable transport projects. THY would also benefit from grants or low-interest financing in order to convert more quickly to greener technologies and practices. (EC,2022). Wider Collaboration for SAF and Biofuel Investing in SAF production and forming business relationships with sustainable fuel suppliers could enable Turkish Airlines to cut lifecycle emissions dramatically and ensure easier adherence to regulations. (ICAO,2023). Enhanced ESG Performance and Market Attractiveness. Comparatively strong ESG metrics will enhance THY's attraction among international investors and stakeholders in a world where sustainable investing is becoming standard within the EU's financial ecosystem. (THY,2023; GRI,2022). Improving Company Image with Climate Leadership. Publicly identifying with net-zero or carbon-neutral goals for 2030 and beyond would reinforce the airline's brand image and customer loyalty, especially with travelers who care about the environment. (THY,2023).

4.4.4. Threats

Introduction of new carbon taxes and stricter environmental rules may significantly increase operating costs and reduce Turkish Airlines' competitiveness within the EU market. EU-based airlines that rapidly implement green strategies may outperform Turkish Airlines in sustainability-focused customer segments and regulated markets. (EU ETS,2023; EC,2022).

Failure to comply with the EU Taxonomy criteria may restrict Turkish Airlines' access to sustainable investment funds, leading to higher capital costs and reduced financial flexibility. The dynamic nature of EU environmental regulations demands quick adaptation; delays or inadequate compliance may result in regulatory penalties or operational limitations. (EC,2022).

CHAPTER V

CONCLUSION

This research aimed to see how efficient Turkish Airlines (THY) -the Turkish national flag carrier, which is also one of the biggest airlines in the world- is in terms of integrating its operations, sustainability policies, and investment strategies into the EU Green Deal and EU Taxonomy Regulation. (EC,2022; THY,2023). Using a qualitative document analysis, this paper provides an in-depth understanding of THY's environmental strategies, challenges, and opportunities in light of the changing European regulatory environments. (THY,2023; ICAO,2023). The aviation sector is one of the EU Green Deal's hardest hit industries, since 90% of flights run on fossil fuels and have an associated carbon footprint. This transformation of the sector is essential if the EU is to achieve its 2050 net-zero emissions goal. (EC,2022; EU,2021). The EU Taxonomy Regulation aims to act as a complementary tool, helping guide investments toward sustainable economic activities and establishing standards for what constitutes “green” in investment language. (EC,2022). These policies in combination push airlines to upgrade operations, implement low-emission technology, and enhance such sustainability reporting. (EU,2021; GRI,2022). The results of this case analysis indicate that Turkish Airlines has been implementing some concrete measures regarding environmental sustainability, but radical structure, operation, and strategy innovations are needed to bridge the gap between itself and the EU. (THY,2023). There have been three important developments for THY: rejuvenation of its fleet, increasingly transparent environmental reporting, and the early use of digital solutions to support the improvement in fuel efficiency. (THY,2023; IATA,2022).

5.1. Fleet Modernization and Emissions Reduction

One of the key reasons why Turkish Airlines is a strong player is that the company is procuring new generation jetliners such as the Boeing 787 Dreamliner and the Airbus A350. “These aircraft will directly contribute to THY’s efforts to decrease its carbon

footprint per passenger kilometer. Aircraft emissions are the biggest contributing factor to aviation's environmental impact, and this investment is proof of Turkish Airlines' commitment to supporting the EU's climate neutrality objectives. (THY,2023; IATA,2022). Fleet renewal also enables the company to benefit from operational efficiencies in the long run and to improve the quality of its passenger services. (THY,2023). But despite having one of the most modern fleets in the industry, emissions by THY are high overall, due to the nature of its long-haul routes. The high carbon emissions of international flights and increased EU regulatory risk make THY (Turkish Airlines) particularly vulnerable, and it does not have strong carbon offsetting and abatement measures. (EC,2022; THY,2023). What's more, the airline's exposure to the EU Emissions Trading System (EU ETS) is relatively small, exposing the company to potential compliance costs and green finance accessibility. (EU ETS,2023; EC,2022).

5.2. Sustainable Aviation Fuels (SAF): Untapped Potential

One major drawback highlighted by this study is the lack of use of Sustainable Aviation Fuels (SAF) in THY. Although SAFs are considered an essential enabler of net-zero aviation emissions by both the EU and ICAO, Turkey still lacks significant deployment of SAF. (ICAO,2023; EC,2022). The reasons for this are understandable: production of SAF is still very expensive, the necessary infrastructure is not well developed, and supply chains are not implemented yet, neither in Turkey nor elsewhere in the surrounding areas. (ICAO,2023; THY,2023). However, with the EU Taxonomy focusing on low-carbon fuels as a characteristic of sustainable air transport, a failure to deploy SAF could become a strategic liability. Through collaboration with SAF suppliers or investment in local production, THY can vastly enhance its environmental outlook and tap into financing tools such as green bonds and ESG-linked loans. (EC,2022; THY,2023).

5.3. Digitalization and Operational Efficiency

THY enrolls in digital solutions for better fuel management and flight control. THY also offers digital solutions to better plan its fuel management and flights. AI-supported route planning, optimization of load factors, and preventive maintenance

logistics are just a few ways in which digital tools can help conserve resources and lower emissions. (THY,2023; IATA,2022). These applications lead not only to more sustainability but also to more cost efficiency and customer satisfaction. As part of its digital innovation approach, THY must further develop these types of tools and integrate them with real-time carbon tracking applications for more accurate reporting and greater stakeholder confidence. (THY,2023; GRI,2022).

5.4. Sustainability Reporting and Corporate Governance

THY's ESG is also one of its strengths as a transparency indicator. The carrier issues a sustainable report based on the global framework, including GRI (Global Reporting Initiative) and SASB (Sustainability Accounting Standards Board). (GRI,2022; THY,2023). Introducing this transparency also serves to boost investor confidence and help to bring THY in line with the EU's policy direction in its regulations, the Sustainable Finance Disclosure Regulation (SFDR). (EC,2022). Yet, transparency alone is insufficient. The reports reveal intent but also gaps between intent and implementation. For instance, although THY declares climate targets, these are usually non-binding and without specified deadlines or benchmarks. If THY wants to improve its face with EU regulators and capital markets, it needs to go from talking about what it is doing to what it has done. (THY,2023; EC,2022).

5.5. Financial and Regulatory Risks

According to the SWOT analysis, this study finds that THY faces some external threats. Most notable of these is the introduction of additional carbon pricing solutions inside the EU, namely the upcast EU ETS as well as a potential aviation Carbon Border Adjustment Mechanism (CBAM). These measures may drive significant cost increases for airlines outside the EU Taxonomy. (EC,2022; EU ETS,2023). THY could be exposed to financial sustainability risks if it does not adhere to taxonomy-related criteria, thus becoming disqualified from eligibility for EU green funds, investment pools, and favourable loan conditions. (EC,2022). There is also a changing competitive landscape. European airlines such as Lufthansa and Air France-KLM are surging ahead with their use of SAFs, research into the electrification of aircraft, and green financing. Should THY drag its feet on its green transformation, it is set to lose market

share to these sustainability leaders, particularly on intra-Europe and trans-Atlantic services. (IATA,2022;EC,2022).

5.6. Opportunities for Strategic Transformation

With such risks, however, also emerged considerable opportunities for Turkish Airlines. EU climate finance tools, like the Innovation Fund and InvestEU, provide grants and cheap loans to help companies, including in the auto and chemical sectors, make green renovations. THY can use this money to invest in SAF infrastructure, airport upgrades, and employee training in sustainability-related jobs. (EC,2022; THY,2023). In addition, by publicly embracing net-zero goals and enhancing its ESG performance, THY can appeal to impact investors, institutional partners, and green-savvy passengers (THY,2023; GRI, 2022).

5.7. Policy Recommendations and Strategic Outlook

To successfully navigate the EU's green transition, Turkish Airlines must:

- i. **Scale up SAF usage** through partnerships, government incentives, and local production initiatives. (ICAO,2023; EC,2022).
- ii. **Integrate carbon pricing mechanisms** and improve participation in the EU ETS and other market-based solutions. (EU ETS,2023; EC,2022).
- iii. **Strengthen ESG governance** by setting science-based climate targets with clearly defined KPIs. (GRI,2022; THY,2023).
- iv. **Modernize ground operations and infrastructure** to align with EU environmental benchmarks. (EC,2022).
- v. **Access EU green finance** through proactive engagement with EU institutions and climate investment platforms. (EC,2022; THY,2023).

5.8. Final Remarks

In conclusion, Turkish Airlines is well-positioned to be a leader in sustainable aviation, given its geographic advantage, fleet investments, and corporate commitment to transparency. However, significant operational and strategic adjustments are required to fully align with the EU Green Deal and Taxonomy Regulation. (THY,2023;

EC,2022). The path forward involves embracing technological innovation, improving fuel sustainability, and integrating with Europe’s evolving green finance ecosystem. If managed effectively, this transition will not only secure regulatory compliance but also enhance the airline’s resilience, brand equity, and long-term financial viability in a rapidly greening aviation industry. (THY,2023; EC,2022; IATA,2022).



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