IBN HALDUN UNIVERSITY
SCHOOL OF GRADUATE STUDIES
MASTER OF SCIENCE IN AIR TRANSPORT MANAGEMENT

MASTER THESIS

SUSTAINABILITY IN FULL SERVICE CARRIERS AND LOW COST CARRIERS: A COMPARISON OF TURKISH AIRLINES AND PEGASUS AIRLINES

ASLİHAN KÖSE

THESIS SUPERVISOR: PROF. MUSTAFA KEMAL YILMAZ

ISTANBUL, 2020

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by

ASLİHAN KÖSE

A thesis submitted to the School of Graduate Studies in partial fulfillment of the requirements for the degree of Master of Science in Air Transport Management

THESIS SUPERVISOR: PROF. MUSTAFA KEMAL YILMAZ

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APPROVAL

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science in Air Transport Management.

Thesis Jury Members

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Prof. Mustafa Kemal Yılmaz	_____	_____
Assoc. Prof. Mine Aksoy	_____	_____
Assoc. Prof. Ali Osman Kuşakcı	_____	_____

This is to confirm that this thesis complies with all the standards set by the School of Graduate Studies, Ibn Haldun University:

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ACADEMIC HONESTY ATTESTATION

I hereby declare that all information in this document have been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name Surname: Aslihan Kose

Signature:

ÖZ

FARKLI İŞ MODELLERİNE SAHİP HAVAYOLU ŞİRKETLERİNDE SÜRDÜRÜLEBİLİRLİK PERFORMANSI: TÜRK HAVA YOLLARI İLE PEGASUS HAVA YOLLARININ KARŞILAŞTIRILMASI

Yazar Köse, Aslihan
Hava Taşımacılığı Yönetimi Yüksek Lisans Programı
Tez Danışmanı: Prof. Dr. Mustafa Kemal Yılmaz
Haziran 2020, 94 sayfa

Havacılık sektöründe yaşanan gelişmeler ve sınırlı kaynaklar nedeniyle sürdürülebilirlik konusu büyük önem taşımaktadır. Havayolu şirketleri olumsuz çevresel ve sosyal etkileri azaltabilmek için iş modellerine sürdürülebilirlik stratejilerini entegre etmek zorundadırlar. Bu stratejilere örnek olarak, çevre dostu uçak tasarımları, alternatif yakıtlar, düşük salınımlı motor tasarımları ve ileri hava trafik yönetimi prosedürleri verilebilir. Bu çalışmada, iki farklı iş modelini benimsemiş olan Türk Hava Yolları (Tam Hizmet Sunan Taşıyıcı) ve Pegasus Hava Yollarının (Düşük Maliyetli Taşıyıcı) 2014-2018 yılları arasında sürdürülebilirlik olgusunu iş modellerine nasıl entegre ettikleri incelenmiştir. Sonuçlar, her iki hava yolu firmasının da sürdürülebilirliğin stratejilerine entegrasyonunda yakıt tüketimini ve salınımı azaltan filo yenilemesi konusunda başarılı olduklarını göstermektedir. Türk Hava Yolları sürdürülebilirlik konusundaki politikalarını ve raporlarını düzenli olarak kamu ile paylaşırken, Pegasus Hava Yolları başta çevresel yönetim olmak üzere sürdürülebilirlik konusundaki yaklaşımını paylaşmakta yetersiz kalmaktadır. Bu açıdan, Pegasus Hava Yollarının sürdürülebilirlik konusunda attığı adımları daha şeffaf bir biçimde kamu ile paylaşması gerekmektedir. Bu açıdan, Türk Hava Yolları iş modelinde sürdürülebilirliği daha başarılı bir şekilde ele almakta ve yapmış olduğu güçlü iletişim ve raporlama ile performansını şeffaf bir şekilde paylaşmaktadır.

Anahtar Kelimeler: Havacılık, Düşük Maliyetli Taşıyıcı, Sürdürülebilirlik, Tam Hizmet Sunan Taşıyıcı, Türkiye

ABSTRACT

SUSTINABILITY IN FULL SERVICE CARRIERS AND LOW COST CARRIERS
A COMPARISON OF TURKISH AIRLINES AND PEGASUS AIRLINES

Student Name Köse, Aslihan
MA in Air Transport Management
Thesis Supervisor: Prof. Mustafa Kemal Yılmaz
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Sustainability is important in aviation industry. The continuous growth and the use of finite natural resources question the sustainability of aviation. Thus, airline companies should implement sustainable business strategies to reduce detrimental environmental and social effects. Strategies in technological improvements may be strong solutions to improve sustainability. These include environmental-friendly aircraft design, use of alternative fuels, low emission engine design, advanced air traffic management procedures. This study explores how two airline carrier types, Turkish Airlines, a Full Service Carrier (FSC), Pegasus Airlines, a Low Cost Carrier, have addressed sustainability in their business models over the period of 2014-2018. The results reveal that both Turkish Airlines and Pegasus have performed well in the strategic integration of sustainability due to the substantial investments in fleet renewal and advancements, that reduce emissions and fuel consumption. While Turkish Airlines follows publicly available policies and publish sustainability reports disclosing the progresses, Pegasus Airlines is not successful in addressing and communicating its sustainability activities to the shareholders and stakeholders. Thus, as a FSC Turkish Airlines' strategies leans more strongly towards sustainability than Pegasus Airlines.

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Keywords: Aviation, Full Service Carrier, Low Cost Carrier, Sustainability, Turkey

DEDICATION

This thesis is dedicated to S. Salih Mansuroğlu, for his endless support and encouragement during this study.

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It is a pleasure to remind the good people in my university for their sincere guidance I received to uphold my efforts on working my thesis.

In writing this thesis, many people contributed in various ways to make my work a reality. First, I would like to deeply thank my family for giving invaluable support and enthusiasm to me. Without their support, it would not be easy to complete this thesis.

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Finally, I apologize and show my respects to all other unnamed people who helped me in various ways when I worked out on my thesis.

I wish the study will be useful on behalf of the community and my colleagues.

Aslihan Köse

ISTANBUL, 2020

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LIST OF SYMBOLS AND ABBREVIATIONS

APU	Auxiliary Power Unit
ASK	Average Seat Kilometer
ATAG	Air Transport Action Group
ATK	Available Ton Kilometer
BIST	Borsa İstanbul
CAEP	Committee on Aviation Environmental Protection
CAPA	Centre for Aviation
CASK	Cost Per Available Seat Kilometer
CDA	Continous Descent Approach
CDP	Carbon Disclosure Project
CG	Centre of Gravity
CO_2	Carbon Dioxide
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CSR	Corporate Social Responsibility
Db	Desibel
DHMI	Devlet Hava Meydanları İşletmesi
DOT	US Department of Transportation
EBITDA	Earnings Before Interests, Taxes, Depreciation and Amortization
EFB	Electronic Flight Bag
EPS	Environmental Pillar Score
ESG	Environmental Social and Governance
ETS	Emissions Trading System
EY	Earnst & Young
FSC	Full Service Carrier
GDP	Gross Domestic Product
GDS	Global Distribution System
GHG	Greenhouse Gas Emissions
GRI	Global Reporting Initiative
LCC	Low Cost Carrier
LF	Load Factor
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization

ICCT	International Council on Clean Transportation
IIRC	International Integrated Reporting Council
ISO	İstanbul Sanayi Odası
IT	Inclusive Tours
MSCI	Morgan Stanley Capital International
NADP	Noise Abadement Departure Procedure
NOx	Nitrogen Oxide
PDP	Public Disclosure Platform
PLF	Passenger Load Factor
ppts	Percentage points
Q&A	Question and Answer
R&D	Research and Development
ROA	Return on Assets
ROE	Return on Equity
RPK	Revenue Per Kilometers
RTK	Revenue Ton Kilometers
SDG	Sustainable Development Goals
SSE	Sustainable Stock Exchanges Initiatives
STP	Sustainable Tourism Programme
TL	Turkish Lira
TOBB	Türkiye Odalar ve Borsalar Birliği
UN	United Nations
UNGC	United Nations Global Compact
UN PRI	United Nations Principles for Responsible Investment
US	United States
USc	US cents
USD	United States Dollar
UNEP	United Nations Environment Program
YFP	Year Framework of Programmes
ZFW	Zero Fuel Weight

CHAPTER I

INTRODUCTION

The aviation industry plays a vital role in the economy by carrying passengers and cargo. The aim is to ensure a safe flight from one place to another. In fact, air transportation vehicles are safer, more convenient and faster than other transportation means. With the enhancements in technology, the aviation industry has grown rapidly in the last couple of decades. This growth that comes up with high technology usage leads the aviation industry to take more environment friendly measures to meet the expectations of stakeholders and to sustain their reputations.

This thesis investigates the sustainability in air transportation and compares the performance of two airline companies operating in Turkey, namely Turkish Airlines and Pegasus Airlines. We first present the theoretical background of sustainability and business models that could be implemented in the aviation industry. Then, we analyze sustainability performance of the airline companies by using their sustainability reports and publicly available information. Finally, we draw conclusions for the future.

1.1. Motivation

Companies and individuals should protect the natural environment and show socially responsible behavior to improve the welfare of society. In this frame, sustainability plays an important role since it has economic, ecological and social aspects. Thus, we can define sustainability as the process of production and consumption of goods and services without harming the society or environment.

Transportation means are sustainable when they provide services in line with sustainability principles, including efficient process management, reduction of CO_2 emissions, fuel savings and environment friendly technologies. Sustainability in aviation is quite significant because the source of greenhouse gas emissions and carbon

dioxide is one of the prominent causes of global climate change. Thus, aviation industry should keep a balance between the dimensions of sustainability (environmental, social, economic) and its missions (accessibility, safety and enhanced mobility).

Although there has been much progress in the aviation industry and sustainability over the last decade there are also some challenges to be solved. Airlines usually focus on meeting their business responsibilities by capitalizing on opportunities, however, it is not easy to keep sustainable development while achieving a satisfactory growth. The aviation industry should adapt technological enhancements to promote sustainability such as environmentally friendly aircraft designs, low emission engine design, advanced air traffic management procedures, use of alternative energy resources, reducing greenhouse emissions.

1.2.Objective

The aviation industry can be divided into several categories such as local versus regional, public versus private, passengers versus cargo, full service carrier versus low cost carrier airlines. This study focuses on two types of categories that are prevalent in the industry, namely full service carriers (FSC) and low cost carriers (LCC). FSC are airlines known as flag ship airlines and their main business is to carry passengers, cargo and do the maintenance. LCC are designed to have a competitive cost advantage over FSCs and are known as low fare airlines.

When we look at these two categories from a sustainability perspective, we may raise two questions: *"How can we define the environmental performance and key performance indicators of Turkish Airlines and Pegasus Airlines as FSC and LCC?"* and *"How does Turkish Airlines as a FSC and Pegasus Airlines as a LCC execute sustainability in their strategies and business models?"*. This study aims to answer these questions by following two steps. First, we analyze company profiles, operational and environmental performance of Turkish Airlines and Pegasus Airlines. In this frame, we use return on assets, return on equity as key financial performance indicators, number of landing, number of passengers, fleet and seat capacity as key operational performance indicators, and carbon emissions, fuel use/savings,

environmental pillar score and noise emissions as key environmental indicators. Second, we make a SWOT analysis by analyzing mission and vision statements of Turkish Airlines and Pegasus Airlines and their business models.

1.3.Outline

The thesis is structured as follows. Chapter 1 provides a brief introduction of the aim, motivation and scope of the study. Chapter 2 briefly reviews the literature and presents some facts for the sustainability, business models employed in the aviation industry. Chapter 3 provides the data, methodology and variables. Chapter 4 discusses empirical findings and finally, Chapter 5 concludes.

CHAPTER II

LITERATURE REVIEW

2.1. Sustainability in Theory and Practice

Current global challenges such as climate change, insufficienct resources, desertification, degradation of land structure and biodiversity stem from excessive consumption of natural resources and lead to emissions and waste of resources. In this frame, changes in consumer behaviors, innovations in organizations and technology and development of appropriate political and economic policies are vital for sustainable development. Thus, it is necessary to create a collaboration among different fields of science such as psychology, anthropology, sociology, neurology, marketing, and behavioral economics to achieve a sustainable environment and society. This section aims to overview sustainability theories to better understand the reasons that drive airlines companies to conduct sustainability activities.

2.1.1. Definition

Humanity faces a number of challenges in many areas. This also includes environmental (global warming, scarcity of resources), and social (increases in inequality) problems. Sustainability issues have as much impact on biosphere and biodiversity as they have on people (Tukker *et al.*, 2008). Challenges such as global warming, energy crisis, famine and economic crises change the habits and living standards of people, while factors such as diversity of goods and services, advertisements, brands, consumers income levels, and habits direct consumers to spend more than they need. In this context, consumer education becomes more important to ensure that every individual in the society is both a prudent and conscious consumer and citizen that does not harm the environment or society (Tan & Lau, 2009). Sustainable development has to meet people's needs without compromising the

opportunities of future generations. It has mainly three components: economic, social, and environmental. In other words, it is an economic process that reduces the negative social and environmental impacts. Companies have significant responsibilities to accomplish sustainable development. They should incorporate social and environmental values into their business activities and to their interactions with stakeholders also called as corporate social responsibity.

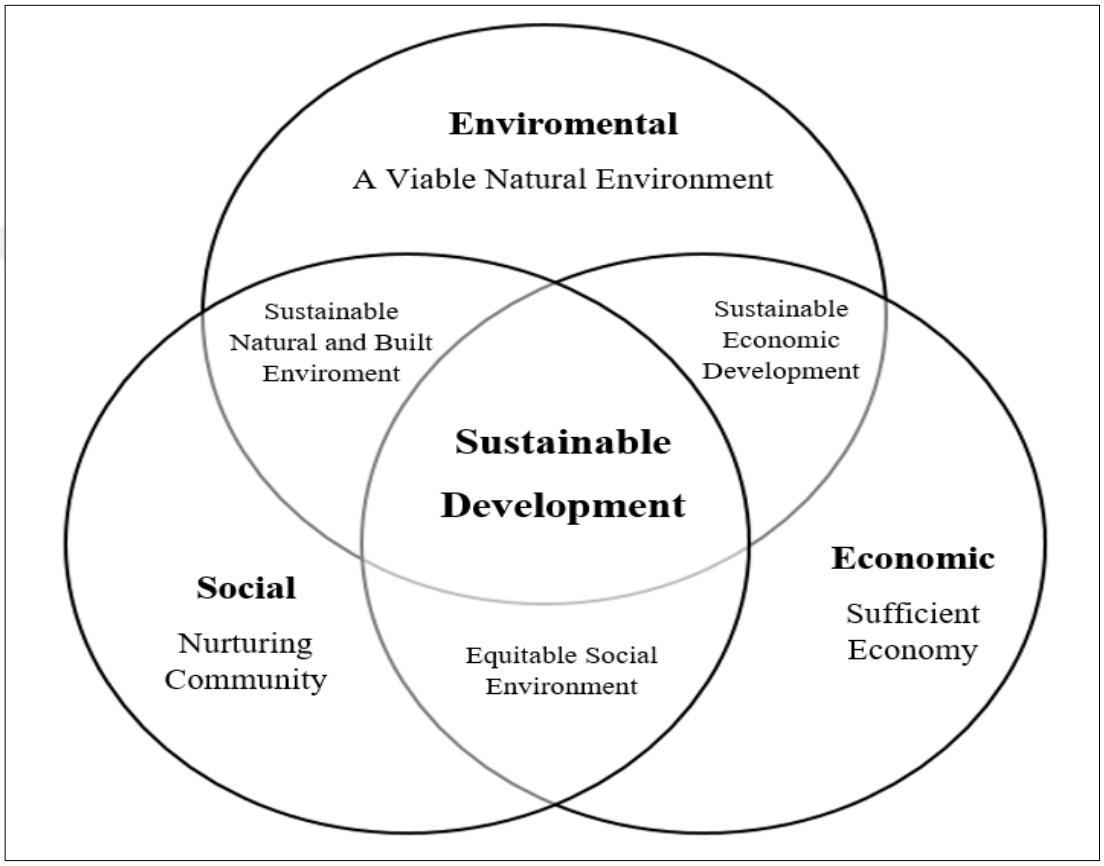


Figure 2.1 Three Pillars of Sustainability (Houngnigbe, 2019)

2.1.2. Sustainability Theories

There are a couple of theories that are closely related to sustainability, including corporate social responsibility theory, stakeholder theory, corporate sustainability theory, and green economics theory. Figure 2.2. summarises them.

2.1.2.1. Corporate Social Responsibility (CSR)

The first interaction of sustainability with the business world took place in the 1930s with the emergence of articles on business social responsibility. However, the existing relationship between companies and social community was first theorized by Howard Bowen in 1953 (Lee, 2008). Bowen (1953) argued that large companies are critical power centers and their long term plans significantly affect social life in various aspects. By defining the term "Social Responsibility", Bowen underlined the obligations of companies in meeting the goals of society (Carroll, 1999). Later, the "social responsibility" term gradually became "corporate social responsibility" (CSR).

A typical example of the studies that draw the theoretical framework of CSR is "Three Dimensional Conceptual Model of Corporate Performance" by Carroll in 1979. In this study, Carroll divided CSR into four main categories, namely economic responsibility, ethical responsibility, legal responsibility and volunteering. In the second dimension, Carroll determined the response strategies developed to social problems by the companies as reactive, defensive, compliance and proactive. In the third dimension, CSR issues are stated as consumption, environment, discrimination, product reliability, job security and shareholders.

Today, an important research topic is to examine the impact of CSR on corporate performance. Orlitzky *et al.* (2003) have demonstrated that there is a clear relationship between financial performance and corporate social performance. Socially responsible firms increase their reputation and attract more institutional capital.

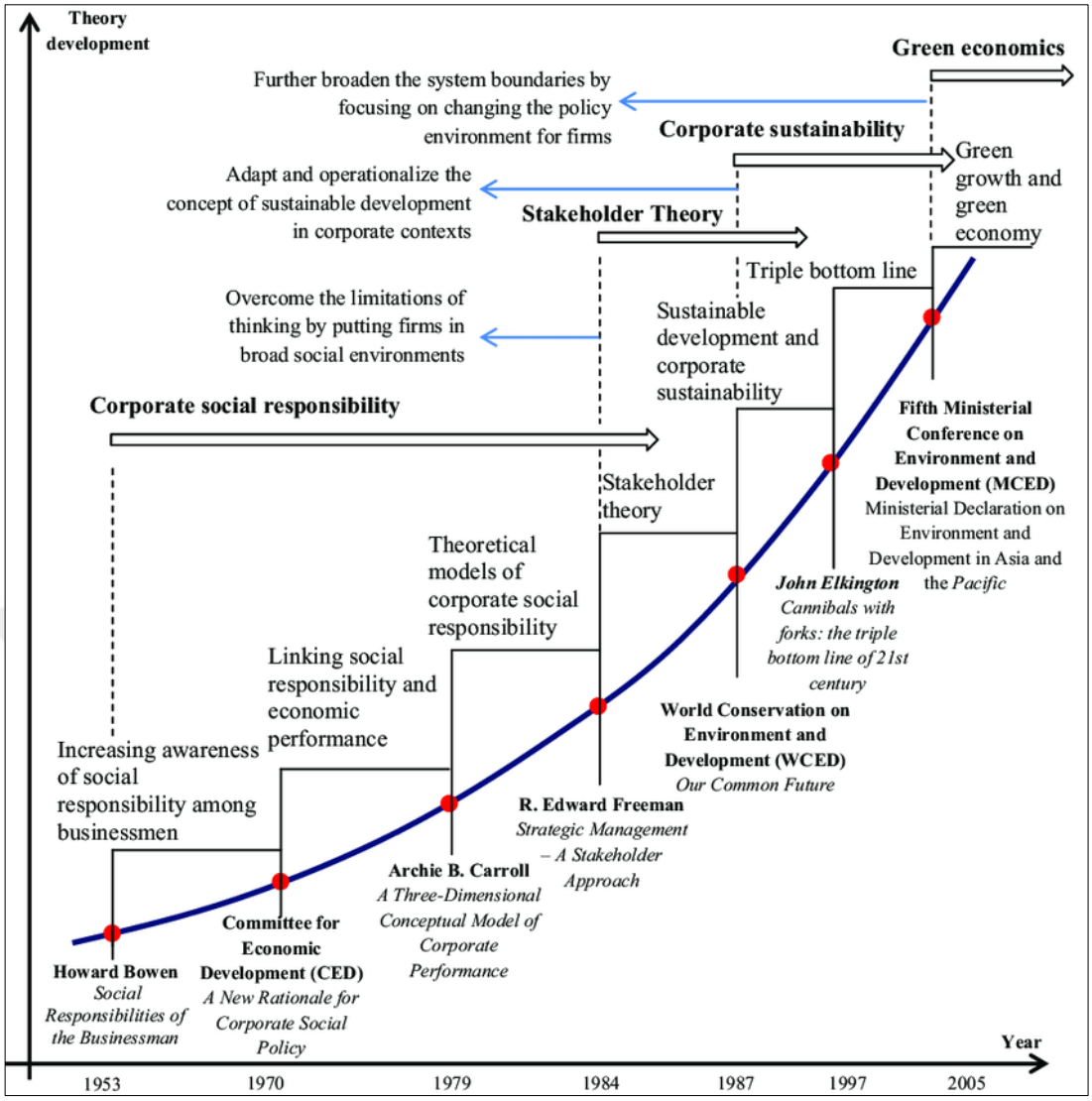


Figure 2.2. Evolving Theories Explaining Sustainability (Chang *et al.*, 2017)

2.1.2.2. Stakeholder Theory

Stakeholder theory was first introduced by Freeman (1983). He emphasized that companies must understand not only their relationships with traditional groups such as customers, employees and suppliers, but also their relationship with non-traditional groups such as governments, environmentalists and special interest groups. Thus, stakeholders may influence the accomplishment of the company's goals. There are primary and secondary stakeholders. The former affect the business more directly than the latter or are more directly affected by company activities (Castka & Parajoga, 2013). Stakeholder theory defines the roles of shareholders and stakeholders. It

emphasizes the duties and responsibilities of companies towards society. Companies should satisfy the expectations of shareholders and other interest groups (Lee, 2008; Zhang, 2016). While the stakeholder theory originally focused on social stakeholders, studies involving non-social stakeholders have been held recently to draw attention to environmental issues (Lozano *et al.,* 2015).

2.1.2.3. Corporate Sustainability

The aim of corporate sustainability theory is to meet the needs of stakeholders and improve corporate performance, while keeping economic, social and environmental dimensions in balance (Ashrafi *et al.,* 2018). Corporate sustainability is often associated with the "triple performance reporting" (Triple Bottom Line) system developed by Elkington in 1997. This concept is concerned with reporting not only economic performance of the company, but also its environmental and social performance. It was widely supported by management, believing that it would make a significant contribution to business sustainability. However, some researchers like Gray (2010) stated that the triple performance reporting system would not really contribute to sustainability, and it is difficult to balance the tension between profit making and sustainability. In this frame, it is important to figure out how sustainable business models could provide competitive advantages, while contributing to the triple performance reporting system (Bocken *et al.,* 2014).

2.1.2.4. Green Economics Theory

Green economy plays an important role in implementing sustainability policies. Green growth is the prerequisite of the green economy in sustainable development and poverty prevention. For the first time, it was discussed in the 5th meeting of the Ministers of Environment and Development of the Asia and Pacific Countries that was held in Seoul in 2005. It was defined as a strategy of creating new business areas and sustainable economic growth necessary for poverty reduction.

The United Nations Environment Program (UNEP) defined green economy as the economy that enables the development of human life and social equality while reducing environmental risks and ecological famines (UNEP, 2011). Green economy

is not an alternative to sustainable development, but sustainability can be achieved by making necessary adjustments in the economy. If the systems that add value to the ecosystem are widely used by the industries, resources will be used more efficiently in economic activities, and will be less harmful to the environment (Chang *et al.*, 2017).

2.1.3. Sustainable Consumption

We define sustainable consumption as the continuation of personal needs without affecting the life and consumption potential of the present and future generations. A responsible consumer takes into account economic, ecological, environmental and social aspects such as the type, number, use and destruction of the product throughout the entire consumption chain. The decision of a responsible consumer is based on some strategies. Consistency strategy refers to products for which the production process is compatible with nature such as renewable energy and organic products. The sufficiency strategy refers to the give-up and boycot of the consumers or reduction in consumption. The efficiency strategy is based on the efficient use of energy and products and selection of equipment or services with low impact on the environment (Terlau & Hirsch, 2015).

There are many political and scientific activities to promote sustainable consumption and production patterns. The Oslo Sustainable Consumption Symposium is one of the pioneering international meetings on sustainable consumption held in 1994. To promote sustainable consumption, it is important to use services and products that provide a better quality of life while minimizing the use of natural resources and toxic materials. Consumers should be aware of using products that endanger their needs. This was the basic principle for the Sustainable Consumption Work Program of the UN Commission on Sustainable Development in 1995 (UNEP, 2001).

Broadly speaking, there are two perspectives on how to achieve sustainable consumption. The first one is the weak sustainable consumption approach based on market approach and technological optimism. The second one is the strong sustainable consumption approach and emphasizes social innovation as a starting point and takes a strategically technological position. Over the last decade, important steps have been taken for sustainable consumption and production models. International events such

as the World Sustainable Development Summit in 2002 enable the evaluation of sustainable demands in the international arena (Baedeker, Liedtke, & Welfens, 2007).

A consumption approach that focuses on sustainable consumption varies based on the welfare and risk aversion perception. Most of the literature are dominated by a weak approach that focuses on increasing consumption efficiency especially by technological advances. However, this approach remains limited in addressing today's sustainability challenges as it leads to some justice issues and neglects general boundaries. A strong sustainable consumption is directly related to the main areas of discussion of growth. In fact, strong sustainable consumption and downsizing are interdependent in this approach. As a comprehensive approach for sustainable development, strong sustainable consumption management is a prerequisite for growth, but at the same time, can not be realized without accepting negative growth socially (Lorek & Fuchs, 2011).

For the scenarios in the future, strong sustainable consumption may transform a path of deterioration from the widely accepted worst case scenario into a promising strategy to prevent the collapse of the ecosystem. Within the scope of sustainable consumption, a planned growth strategy can be compared to a healthy diet undertaken to increase personal well-being, while negative economic growth can be compared to famine (Latouche, 2010). The use of goods and services that meet basic needs and improve the life quality is provided with sustainable consumption. When the use of resources is not moderate, consumption is the source of environmental problems along with the production (Odabaşı, 2004). In this sense, sustainable consumption consists of measures that affect consumer behavior and reduce the harmful effects of their actions (Hass *et al.*, 2005).

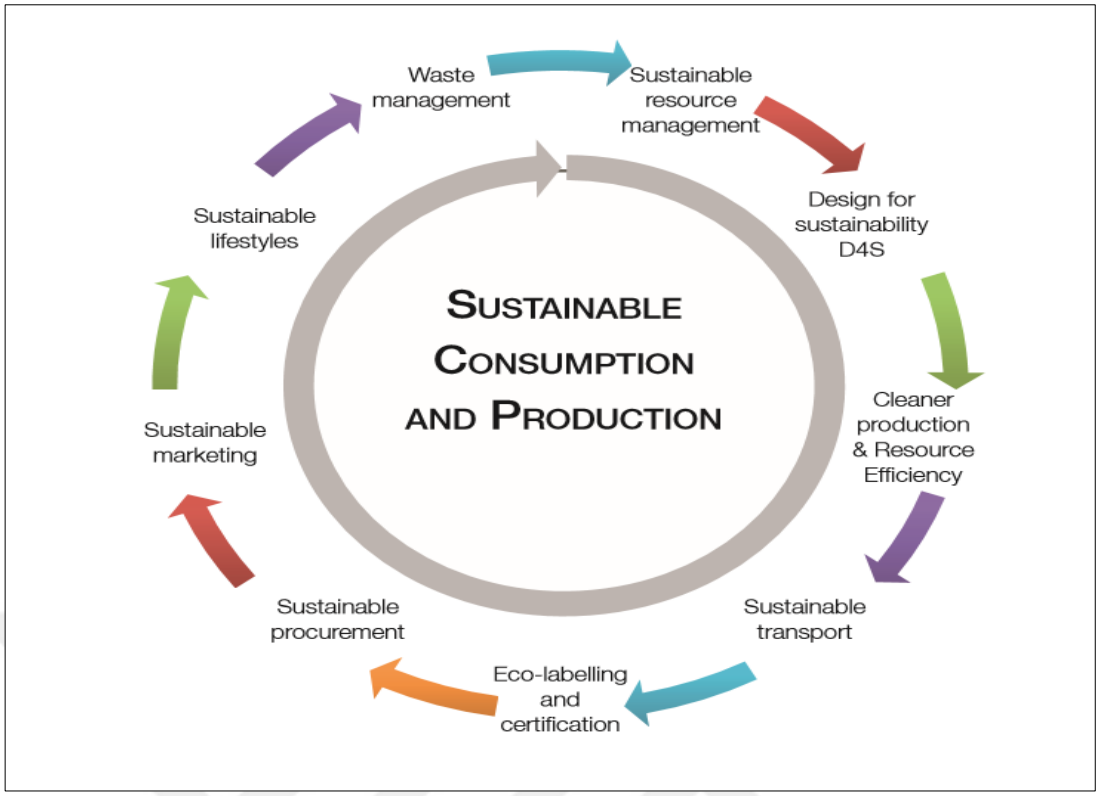


Figure 2.3. Sustainable Consumption and Production Cycle (UNEP, 2010)

Sustainable consumption and production also promote sustainable infrastructure, energy efficiency and access to services, green and environmentally responsible jobs and a better life quality. Implementing sustainable consumption as a holistic approach helps in achieving development plans, social and environmental costs, strengthening economic competitiveness, and consequently reducing poverty. It aims to differentiate between environmental degradation and economic growth by increasing the efficiency of resources. It is important to keep the energy, material and pollution density of all production and consumption functions within the sustainability boundries to contribute to the natural ecosystem.

Sustainable consumption uses a lifecycle approach to increase sustainable management of resources and ensure resource efficiency in production and consumption phases. By this approach, the objectives and actions of sustainable consumption become powerful leverages to accelerate the transition to an environmentally sensitive economy. It helps to protect the environment, contribute to end poverty and achieve the UN Development Goals. It also offers opportunities for

developing countries such as new markets creation, green and environmentally sensitive businesses (e.g. organic food, sustainable transport, sustainable housing, renewable energy), and more efficient resource management. The concept of 3R emerges as an important factor to contribute to sustainability and has a significant impact on life cycle. Table 2.1 shows the 3R (Bener & Babaoğul, 2016).

Table 2.1. Concepts Contributing to Sustainable Consumption

Srl. No	Concept	Meaning
1	Reducing	Minimize waste
2	Reusing	Use again to save if possible
3	Recycling	Turn into use the waste to make it sustainable

2.1.4. Sustainable Transport

The relationship between sustainability and logistics in transportation is important to avoid potential environmental damages. Thus, the principles for sustainability in transportation have to be set up by a transparent policy (Sahan, 2017). Experts treat standardization in reduction of emissions, integration of technologies and ensuring proper connection as basic strategies for sustainability in transportation (Aransson & Brodin, 2006). As Table 2.2. shows, sustainability in transportation is defined in four dimensions (Bartle, 2006). They may be exemplified as process management in firms and low level CO_2 emission in urban mobility. The aim is to reduce the environmental deficiencies, while executing transport activities (Martins, Anholon & Quelhas, 2019).

Table 2.2. Dimensions of Sustainability in Transportation

Factor	Definition
Environmental	Integration of environmental concerns to transportation
Social	Improving quality of life, standard of living, and reducing poverty
Economic	Cost-effective transportation that achieves the highest social return on natural and physical capital
Financial	Creation of sufficient funds to cover operating and capital costs in long run

Studies that have investigated the relationship between transportation and sustainability usually refer to the effects of highway, maritime and air transportation on the atmosphere and human health. Traffic congestion due to increased vehicle ownership especially in developing countries brought the necessity of taking precautions regarding road transport (Colvile *et al.,* 2001). Yang and He (2016) examined the impact of various modes of transport on air pollution and human health in China and found that the health losses of residents in areas was high where air pollution was intense. Çamlıca and Akar (2014) examined sustainability efforts of 29 firms operating in the logistics industry on sustainable transport and identified that companies demonstrate sensitivity to environment by employing various energy policies, and methods such as biodiesel use, solar power generation, training for driving techniques to reduce fuel consumption. Routing efforts towards minimizing distances and vehicle traffic contribute to sustainability as it creates an environmental benefit and a cost advantage by reducing fuel consumption and CO_2 emissions.

Kilkis (2016) examined major airports for sustainability and developed airports sustainability index. Similarly, they defined a sustainable aviation index by combining the indices obtained for airlines. The study contains important contributions not only in terms of enlightening social indicators, but also in terms of unified index guiding relevant institutions. Liu (2014) worked on determining the sustainability of a renewable energy system. He explained different methodologies for sustainability assessment by providing an overview of various sustainability indicators, such as development of a sustainability indicator for formulation strategy, scaling,

normalization, renewable energy systems, applying a weighing and aggregation methodology.

Aydın *et al.* (2015) made exergy analysis on the parts of a turbofan engine and identified losses in the various parts of the engine. Since the exhaust gases of the engines are thrown directly into the atmosphere, it is not possible to recover the exhaust they contain. Therefore, it is considered that the recoverable exergy rate is not so important in the exergic sustainability analysis of aircraft engines. In a similar study, Romero and Linares (2014) argued that increasing exergy efficiency is a good process, but it may not always help achieving sustainability. Moreover, accurate determination of the reference environment is of great importance, especially if the analysis involves chemical exergy in order for the analysis to give reliable results,. Indicators to be defined for sustainability analysis should be measurable and reflect one of the many aspects of sustainability concept, an effect as realistic as possible.

Tona *et al.* (2010) indicated that different environmental conditions used during exergy and thermoeconomic analyses made for a turbofan engine did not affect engine efficiency calculations much, but changed the distribution of irreversibilities between parts of the engine. This may affect component-based improvement efforts. In addition, since the aircraft engine operates in different environmental conditions during the flight, performing the analyses in changing conditions may make the results more reliable (Gogus et al., 2002). However, according to Gadreau et al. (2012), the assumption that the environment is infinite and is not affected by the system will have erroneous results in evaluating the impact of waste exergy on the environment in special cases. It is imperative to exceed initiatives for a comprehensive standard reference environment that gives standard exergy values and instead revert to operation dependent reference cases developed to model specific processes and situations. Using operation dependent reference environments allow exergy to be benefical for many applications and special cases such as efficiency comparisons between disparate systems, inefficiency location identification within a system, inefficiency magnitude identification within a particular system and enabling optimization of a particular system. This may decrease the effectiveness of using exergy as a sustainability indicator.

Also, air conditioning systems in terminal buildings of airports are very important for passengers comfort. They may cause serious energy consumption. A detailed study on low exhaust air conditioning systems was held by Hepbaşlı (2012). He defined many parameters for the exergy-based evaluation of the air conditioning system and the sustainability index. Among these parameters, the sustainability index and the ratio of the renewable part of the exergy source are remarkable. He accepted the ratio of the product of a system component to that component's exergy consumption as the sustainability index. If some part of the exergy resource is renewable, the parameters of exergic renewability and sustainability index are closely related to sustainability.

2.2. Aviation Industry

2.2.1. Aviation Industry in the World

Air transportation is an integral component of the global economy. The impact of the demand on aviation is the key factor for an effective decision making on aviation. The aviation industry is dynamic and it boosts economic growth. It provides 10.2 million jobs worldwide. In 2017, an estimated 4.1 billion passengers were carried by airlines compared to 2.97 billion passengers in 2013. Also, airlines carried almost 62 million tons of freight. It adds USD 704 billion to global gross domestic product (GDP). It also created 11 million indirect jobs through the purchase of services and goods in the airline industry (ATAG, 2018).

Table 2.3 Statistics for Aviation Industry (2014-2018) (ATAG, 2014, 2016, 2018)

	2014	**2016**	**2018**
Jobs supported by aviation worlwide	58.1 Million	62.7 Million	65.5 Million
Aviation's global economic impact[1]	USD 2.4 Trillion	USD 2.7 Trillion	USD 2.7 Trillion
Global GDP supported by aviation	3.4%	3.5%	3.6%
Productivity rate to other jobs[2]	3.6x	3.8x	4.4x

[1]including direct, indirect, induced and tourism catalytic

[2] indicates that aviation jobs are, on avarage, how many times productive than other jobs

On the other hand, global connectivity by aviation industry creates an environmental challenge. Around 859 million tons of CO_2 were emitted in 2017 by civil aviation which is roughly 2% of manmade carbon emissions. The effects of aviation industry to climate change are recognized and the necessary steps are taken to reduce harmful effects to the environment. Aviation implements four pillars strategy: new technology developments (including sustainable aviation fuel), more efficient operations, better infrastructure utilization and a global market-based measure (IATA, 2019).

Although scheduled passenger transportation became stagnant from 2007 to 2009 in the world, it has increased again since 2010. According to the last 3 years figures; in 2016, 3.794 million, with a 6.7 % increase compared to the previous year, and 4.062 million, an increase of 7.1 % in 2017 in comparison to the previous year, and 4.322 million in 2018, a rise of 6.4% in comparison to the previous year. Revenue per Kilometer has also increased from 871,639 in 2016 with 6.1% increase compared to the previous year to 1,004,763 million with 6.2% increase than the previous year in 2018. Table 2.4. shows the progess in some other indicators.

Table 2.4. World Total Revenue Traffic - International and Domestic (ICAO, 2018)

	Passengers		**Passenger-km**		**Freight tons**		**Revenue tonne-km**	
Year	Millions	Annual increase %	millions	Annual increase %	millions	Annual increase %	millions	Annual increase %
2009	2,488	-0.4	4,561,413	-1.1	40.0	-0.8	577,747	-4.3
2010	2,705	8.7	4,924,229	8.0	47.6	19.2	645,596	11.7
2011	2,870	6.1	5,248,140	6.6	48.7	2.2	677,631	5.0
2012	3,004	4.6	5,528,880	5.3	48.0	-1.4	701,269	3.5
2013	3,138	4.5	5,832,564	5.5	49.1	2.3	731,033	4.2
2014	3,316	5.7	6,181,177	6.0	50.7	3.3	773,895	5.9
2015	3,556	7.2	6,644,666	7.5	51.0	0.5	821,174	6.1
2016	3,794	6.7	7,135,773	7.4	52.8	3.7	871,639	6.1
2017	4,062	7.1	7,707,118	8.0	56.6	7.1	945,904	8.5
2018	4,322	6.4	8,257,635	7.1	58.0	2.4	1,004,763	6.2

When we look at load factors globally over the period 2009-2018, we observe that the passenger-km, seat km available and revenue tonne-km almost doubled. Passenger load factor increased from 77% in 2009 to 82% in 2018, while the weight factor increased from 62% to 69% from 2009 to 2018. Table 2.5. shows the figures.

Table 2.5. Trends in Load Factors - International and Domestic (ICAO, 2018)

	Passenger km	**Seat-km available**	**Passenger load factor**	**Revenue tonne-km**	**Weight load factor**
Year	millions	millions	%	millions	Millions
2009	4,561,413	5,948,503	77	577,747	62
2010	4,924,229	6,299,370	78	645,596	67
2011	5,248,140	6,727,814	78	677,631	66
2012	5,528,880	7,010,807	79	701,269	66
2013	5,832,564	7,338,216	79	731,033	67
2014	6,181,177	7,753,755	80	773,895	67
2015	6,644,666	8,281,130	80	821,174	67
2016	7,135,773	8,887,995	80	871,639	67
2017	7,707,118	9,477,045	81	945,904	68
2018	8,257,635	10,105,144	82	1,004,763	69

According to the ICAO statistics in 2018, when we refer to the regional distribution of scheduled traffic, Asia and Pacific region comes first, followed by North America and Europe with the percentages of 33%, 27% and 24% respectively. Table 2.6 provides statistical figures for other parameters, i.e. aircraft km, aircraft departures, freight tonne-km, passengers carried, passenger load factor, passenger km, revenue-tonne km.

Table 2.6. Regional Distribution of Scheduled Traffic in 2018 (ICAO, 2018)

By ICAO statistical region	**Aircraft Kilometres** (millions)	**Aircraft Departures** (millions)	**Passengers Carries** (millions)	**Passenger Kilometres** (millions)	**Passenger Load Factor** %
Total (international and domestic) services					
Europe	13,147	8,930	1,123,001	2,175,225	84
Percentage of world traffic	24.1	23.6	26.0	26.3	
Africa	1,419	1,099	95,188	175,918	73
Percentage of world traffic	2.6	2.9	2.2	2.1	
Middle East	3,647	1,456	228,438	758,419	74
Percentage of world traffic	6.7	3.9	5.3	9.2	
Asia and Pacific	18,022	12,165	1,604,493	2,871,467	82
Percentage of world traffic	33.2	32.2	37.1	34.8	
North America	14,840	11,355	978,402	1,852,183	84
Percentage of world traffic	27.3	30.0	22.6	22.4	
Latin America and Caribbean	3,205	2,819	292,832	424,422	81
Percentage of world traffic	5.9	7.5	6.8	5.1	
Total	54,279	37,823	4,322,354	8,257,635	82

2.2.2. Aviation Industry in Turkey

Aviation industry in Turkey provides an essential economic support to the domestic economy. In 2017, the aviation industry in Turkey generated 1 million jobs. Turkey carried 82.8 million passengers in 2017 and the aviation industry contributed 44.7 billion to GDP in 2017.

Table 2.7 Statistics of the Turkish Aviation Industry (ATAG, 2018)

Turkey	
Airlines	11
Airports	51
Passengers (2017)	82.8 Million
Flights (2017)	591,200
Forecast Passengers (2027)	121.1 Million
Trips Per Capita (2017-2036)	1.03 >> 2.48 (141%)
Aviation Infrastructure Score	4.7
Tourism % of GDP	11.6
Tourism Spend per Arrival (2015)	$674.2
Tourism Competitiveness Ranking	44/136
Connectivity Ranking	14=[196]
Connectivity Score	0.27
CORSIA Volunteer	✓
Airport Accessibility	91.34%

Turkish Airlines had been the only air carrier in Turkey in the international line from 1958 to 1983. The air transportation industry entered into a major development process with the Civil Aviation Law No. 2920 in 1983. After 1983, Turkish Airlines started to develop its fleet within the framework of modernization and standardization program, raised service standards, and head towards international lines. Also, Law No. 2920 allowed the establishment and operation of private airline companies in Turkey. There have been significant increases in the number of private airlines, the fleet capacities

and its share in the civil aviation industry since 1983. However, some of the private airlines faced with problems such as shortage of working capital, operating with old aircrafts, inadequate maintenance, repair and other infrastructure facilities, difficulties in supplying qualified personnel for their operations (Ekinci, 2011).

In the last decade (2009-2018), the flight traffic, including overflight, has increased by 1.89 times, the number of passengers carried has increased by 2.45 times and the cargo amount carried by 3.27 times. The number of domestic and international flights (including direct transit passengers), which was 181,437,004 in 2015, decreased to 174,147,783 in 2016 (4% decrease). In 2017, with the elimination of the political-economic problems, passenger traffic increased by 11.1% to 193,576,844. In 2017, the share of domestic flights in total passengers increased to 57%. In 2018, the number of domestic-international (including direct transit) passengers increased by 9% compared to 2017, reaching 210,947,639. In 2018, the share of domestic lines in the total passenger is 54%. Figure 2.4. gives domestic and international passenger traffic over the period 2009-2018.

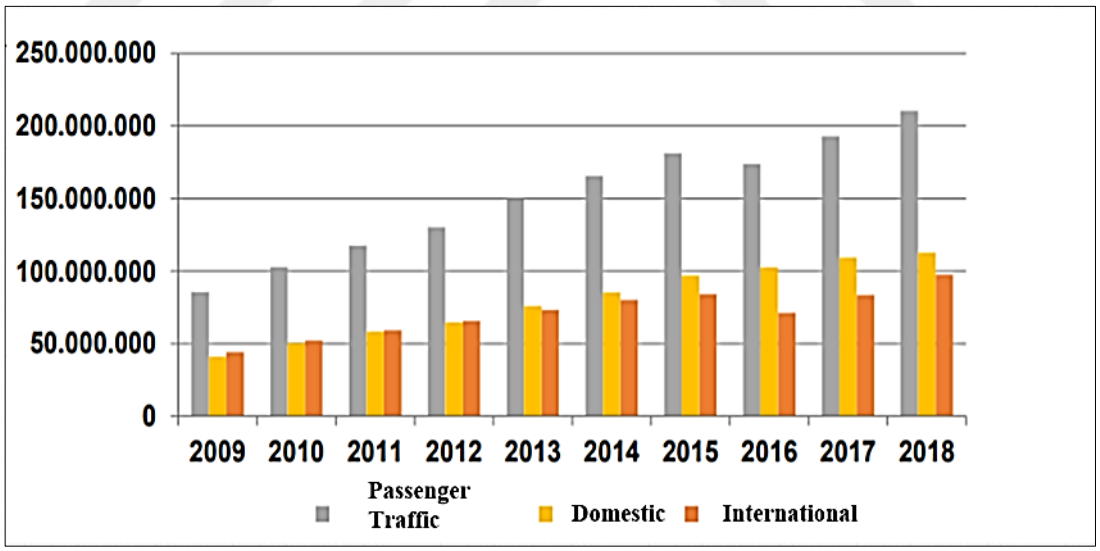


Figure 2.4. International and Domestic Passenger Traffic (TOBB, 2018)

When we compare the Turkish aviation industry to other countries, Turkey is ranked as the 10th according to total services (international and domestic services) of revenue tonne-kilometers and 8th according to international services of revenue tonne-kilometers. Further, Turkey is ranked as the 12th according to total services

(international and domestic) of revenue passenger-kilometers and 8th according to international services of revenue passenger-kilometers. Table 2.8 shows the details.

Table 2.8 Turkish Aviation Industry in the World (ICAO, 2018)

Country or group of countries	REVENUE TONNE-KILOMETRES (millions) (passengers, freight and mail)							
	Total services (international and domestic)				International services			
	Rank number in 2018	2018	2017	Increase or decrease (%)	Rank number in 2018	2018	2017	Increase or decrease (%)
United States	1	192 408	184 130	4	1	69 027	66 425	4
China[4]	2	120 538	108 195	11	3	43 400	38 764	12
Hong Kong SAR[5]		28 323	27 321	4		28 323	27 321	4
Macao SAR[6]		563	494	14		563	494	14
United Arab Emirates	3	55 632	55 930	-1	2	55 632	55 930	-1
United Kingdom	4	39 308	35 943	9	4	38 506	35 156	10
Germany	5	31 852	32 655	-2	5	30 972	31 614	-2
Republic of Korea	6	29 147	27 374	6	6	27 929	26 119	7
Russian Federation	7	27 631	25 529	8	15	15 876	14 824	7
Qatar	8	26 594	24 077	10	7	26 594	24 077	10
Japan	9	26 391	27 090	-3	13	18 278	18 992	-4
Turkey	10	25 859	23 303	11	8	22 481	19 669	14
France	11	25 041	23 943	5	10	19 760	19 001	4
Canada	12	23 754	22 573	5	14	17 863	16 820	6
India	13	22 413	19 358	16	20	9 949	8 940	11
Ireland	14	20 606	18 871	9	9	20 376	18 669	9
Netherlands	15	18 813	18 219	3	11	18 696	18 123	3

Country or group of countries	REVENUE PASSENGER-KILOMETRES (millions)							
	Total services (international and domestic)				International services			
	Rank number in 2018	2018	2017	Increase or decrease (%)	Rank number in 2018	2018	2017	Increase or decrease (%)
United States	1	1 627 875	1 551 965	5	1	467 838	451 578	4
China[4]	2	1 070 347	950 425	13	4	281 490	246 968	14
Hong Kong SAR[5]		158 404	150 194	5		158 404	150 194	5
Macao SAR[6]		5 314	4 611	15		5 314	4 611	15
United Arab Emirates	3	409 367	406 105	1	2	409 367	406 105	1
United Kingdom	4	356 465	323 349	10	3	347 274	314 304	10
Germany	5	242 054	248 024	-2	5	233 645	238 030	-2
Republic of Korea	13	178 239	164 424	8	8	166 232	152 042	9
Russian Federation	6	229 060	205 407	12	16	107 097	95 174	13
Qatar	15	152 223	143 937	6	11	152 223	143 937	6
Japan	11	197 830	191 538	3	17	102 440	97 519	5
Turkey	12	194 991	183 398	6	9	159 345	147 678	8
France	10	201 955	192 910	5	10	155 258	149 163	4
Canada	8	224 308	216 780	3	7	166 339	159 135	5
India	9	221 194	190 344	16	20	88 931	79 240	12
Ireland	7	224 623	204 660	10	6	222 317	202 638	10
Netherlands	20	127 739	121 961	5	13	126 571	121 000	5

2.3. Sustainability in Aviation Industry

Transportation systems make significant contributions to sustainability practices. The aviation industry provides various services and integrity for other transportation systems. The main activities are aerospace industry, airline operators, airports and suppliers. The social, economic and environmental dimensions created by airports directly affect urban, regional and national sustainable growth. Changes in business models in air transportation cause an increase in traffic density. This physically challenges airports to meet the demand in air traffic. They have to develop their physical capacity and this may lead to certain problems in terms of sustainability.

The players in aviation industry have to keep a balance between the targets of transportation (accessibility, safety, enhanced mobility) and the dimensions of sustainability (environmental, economic, and social). These dimensions may sometimes be in conflict. Thus, airline and airport companies should implement appropriate policies in developing new technologies, and improving their operations to increase sustainability (Lutte & Bartle, 2016). Table 2.9 shows potential adverse effects of air transportation system on sustainability (Janic, 2016).

Table 2.9 Possible Adverse Effects of Air Transportation on Sustainability

Economic Effects	Environmental Effects	Social Effects
Facility costs	Climate change	Community liability
Barriers to mobility	Noise	Mobility disadvantage
Users' costs	Air pollution	Esthetic
Congestion	Water pollution	Inequity of impacts
Non-renewable resources depletion	Non-renewable resources depletion	Effects to human health
Accident damages	Damage to habitat and loss	Community cohesion

While airline companies fulfil their business responsibilities by capitalizing on opportunities and increasing growth, they have also to be sustainable. This is not an easy task. Limiting air traffic is not a solution to deal with this challenge since the governments do not want to reduce air traffic (Upham *et al.*, 2012). There have been several steps taken to encourage sustainable development since 1972 (Table 2.10.)

Over the last decade, increasing demand in air transportation has also significantly affected airports and has lead to a capacity increase to meet the demand. Although the expansion of airports matters it is important to decide where to build them for sustainability. The nature of the hub and spoke system add pressure for expansion at key airports and raise some environmental issues such as increased noise, land contamination, impact on surface traffic, ecological effects and disruption of habitats. To avoid these problems, airport companies should take precautions such as using more efficient lighting, heating and cooling tools, i.e. solar panels, electrically powered vehicles and wind turbines (Budd *et al.*, 2013). On this respect, the main sub-sectors that should be analyzed in the aviation industry are; airframe and flight, aircraft propulsion systems, aircraft auxiliary energy systems, airports, air traffic control and aircraft ground services, air vehicles except aircrafts, military aviation, recycling in aviation (Alpman & Gogus, 2017).

Table 2.10. Milestones in Sustainable Development

1972	UN Stockholm Conference
1987	Brundtland Report: Our Common Future Report
1992	Rio Conference: UN Conference on Environment and Development
1997	Kyoto Protocol
1997	Global Reporting Initiative (GRI)
1997	Rio+5 Conference, New York
2000	UN Global Compact, UNGC
2002	UN World Summit on Sustainable Development, Johannesburg
2005	UN Principles for Responsible Investment (UN PRI)
2009	Sustainable Stock Exchanges Initiative (SSE)
2012	Rio+20 Conference
2013	Integrated Reporting Initiative Frame (IIRC)
2014	Resolution A/RES/69/233 Establishment of 10 YFP STP
2015	UN Sustainable Development Goals (SDGs)

The aviation industry and air transport business have international characteristics. Therefore, the problems in sustainability can not be solved easily by only local

solutions. It is only possible to increase the access to trade and tourism globally with sustainable aviation systems in the long run. Technological improvements may be an important solution. This may include environmental-friendly aircraft design, use of alternative fuels, low emission engine design, and advanced air traffic management procedures by modern navigational aids. For example, the International Air Transport Association (IATA) emphasizes on the importance of reducing greenhouse emissions (IATA, 2013). Also, by means of technology, more flexible and efficient flight paths that have performance-based navigation, less fuel consumption and operating costs, less emissions, little or no delays can be created. The International Civil Aviation Organization (ICAO) also sets policies and standards to fulfill the following vision, *"to achieve the sustainable growth of the global aviation system"* (ICAO, 2016).

On the other hand, aviation industry is trying to decrease the level of aircraft noise exposure for the population. The aircrafts have become quieter, thanks to innovative aircraft technologies, optimized takeoff and approach procedures and quieter engines. Active noise abatement by reducing noise caused by aircraft and passive noise abatement by relieving local residents are main focus points for the aviation industry. For example, the noise produced by an aircraft has been reduced by 30 dB or 88 % over the past six decades.

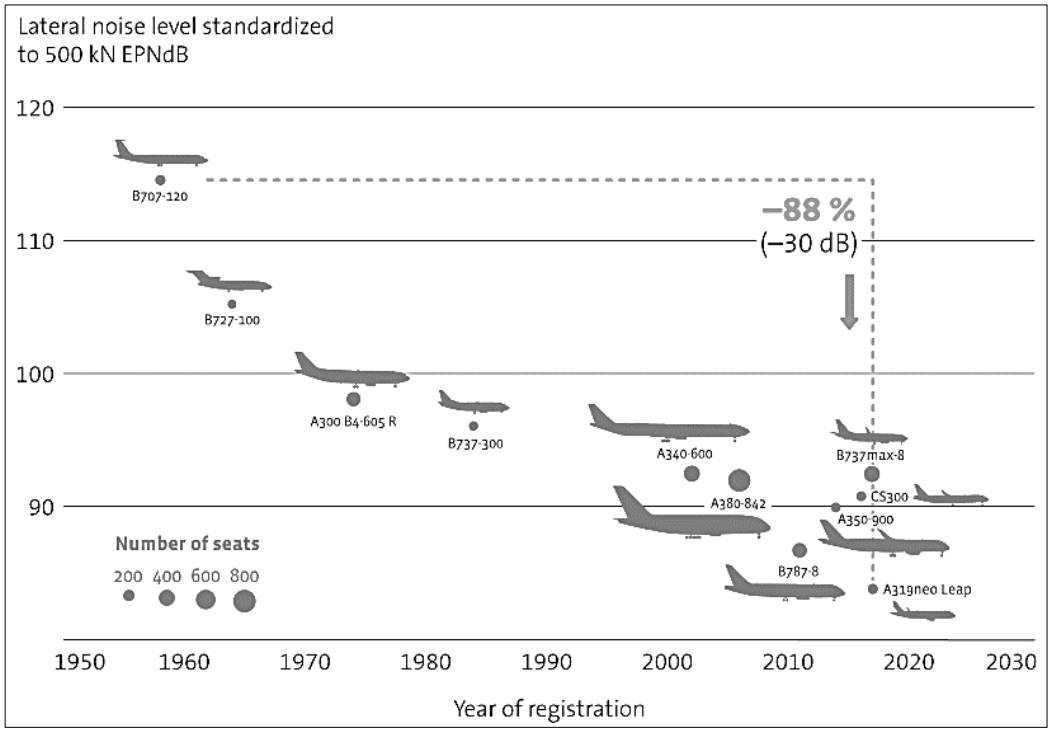


Figure 2.5. Development of Aircraft Noise Emissions (Bdl, 2019)

The aviation industry shows very fast technological and structural changes. On the one hand, large-capacity, fuel-saving, low-noise and emission-level aircraft are developed, on the other hand, the production of small-capacity aircraft that are more suitable for regional transportation continues to grow rapidly. There have also been good progresses in the aviation industry for sustainability. Over the last 40 years, fuel use has been reduced by 70%. According to IATA, fuel burn per passenger kilometer has decline by half since 1990 (McKinsey, 2020). The aviation industry is the pioneer of e-transformation. Not only the ticket, but also the waste of paper in maintenance documents is minimized. However, the routes of aircraft, waiting times, lost time at airports, insufficient traffic controls are still problems to be solved. Despite all efforts, fossil fuel use continues to increase and CO_2 emissions can not be reduced very easily to the expected level.

CO_2 mitigation efforts focused on four elements; technological improvements in aircraft, development of aviation infrastructure, engines and systems, optimisation of operating procedures and, market based measures (including charges, taxes, emissions trading and agreements). Domestic flights greenhouse gas emissions like CO_2 are covered in national regulations, while international flights are subject to the ICAO authority. After some efforts on this field, ICAO Assembly (ICAO, 2013) established a target of achieving Carbon Neutral Growth after 2020, additionally reduction of CO_2 emissions by 50% in 2050. The key factor of this mitigation plan is the availability of biokerosene at great amount, initiating from the next decade. In spite of in depth research in liquid hydrogen, fuel cells or electric power, the use of a different energy source for commercial use seems improbable at least during the next decades and viable applications are now centred in drop-in fuels, however biofuels and technological innovations are aimed to foster the reduction of CO_2 use (Benito & Alonso, 2016).

Aminzadeh (2017) examined the evolvement of commercial air traffic CO_2 emissions in the European Union, the dispersion of the CO_2 emissions per distance band and aircraft type for the six selected countries and found that most of the CO_2 emissions (73%) consist of long distance flights longer than 2,500 km, as expected. Table 2.11 shows the CO_2 emissions in EU 27+2 countries in 2013 classified per distance band. Compared to 2010, there is a decrease of 3.1% in the CO_2 emissions.

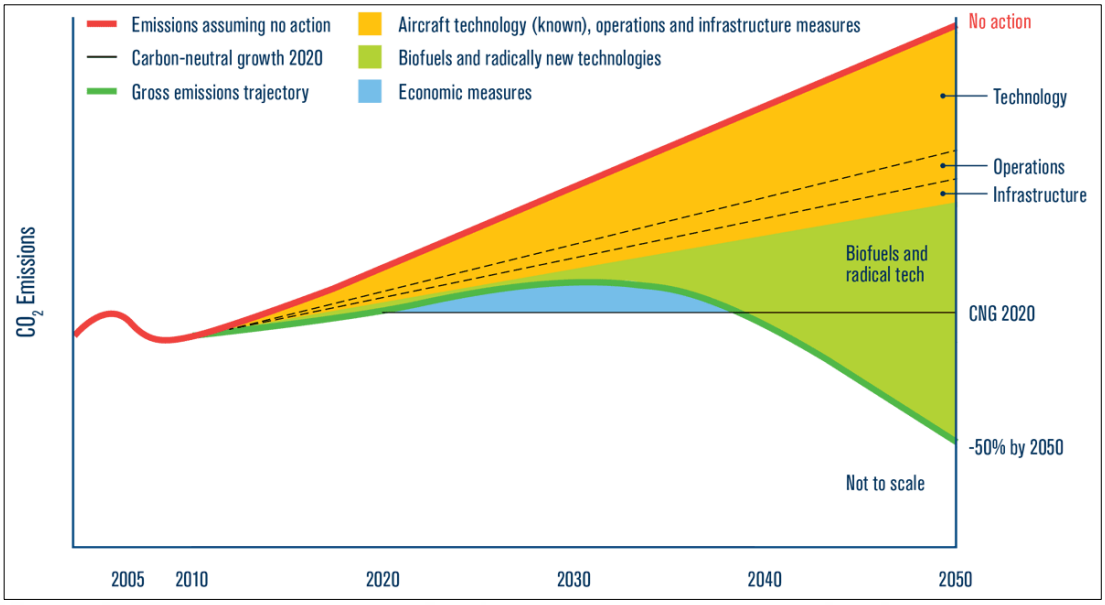


Figure 2.6. ICAO plans to mitigate aviation climate change contribution (IATA, 2013)

Table 2.11. CO_2 Emissions in EU27+2 countries per distance band (Aminzadeh, 2017)

Distance Band	CO_2		Growth (%) 2010 to 2013
	Mtons	% of Total	
< 500	7.9	3.8	-20.2%
500 - 1000	16.3	7.8	-9.2%
1000 - 1500	15.7	7.5	-3.1%
1500 - 2000	15.5	7.4	0.6%
2000 - 2500	11.3	5.4	6.6%
> 2500	142.3	68.1	-2.3%
Total	209.1	100%	-3.1%

Further, Aminzadeh (2017) indicated that 68% of total CO_2 emissions comes from longer distance routes (greater than 2,500 km) which is consistent with carrying 72% of the revenue ton kilometers (RTK). All the distance ranges have been reduced in

CO_2 emissions from 2010 to 2013 except the interval of 1500 to 2500 km. The biggest reduction took place in the short-range interval (<500) with -20.2%.

When we refer to the airlines efficiency with reference to network carriers, network carriers comes first and the LCCs come the second. Table 2.12 shows the energy efficiency among various airline business models. According to Aminzadeh (2017), the average efficiency of the LCCs represents 78% of the value for the network carriers. This shows the cost advantage of LCCs. Approximately 60% of the efficiency of the network carriers consists of IT (Inclusive Tours) or charter carriers.

Table 2.12. Airlines Emissions and Efficiency (Aminzadeh, 2017)

Airline type	**Average Efficiency (kg CO_2/RTK)**	**Difference with respect to (w.r.t.) Network Carriers (=100)**
Network carriers	1.06	100
Low-cost carriers	0.83	78
Regionals	1.84	1.73
ITs or charter	0.60	57

Although companies need large areas of land to construct airports, there is no need to build kilometers of roads for the aircraft movement (for an international airport, an average area of 7 km^2 is enough). As to the departure and destination points, the area requirement is much lower than other transportation systems. There are some sustainability problems with the degradation of flora fauna tissue during landscaping (Torum & Kucukyılmaz, 2009). In 2017, commercial operators used 341 billion liters jet fuel and paid USD 149 billion for it. Also, the CO_2 emission was 859 million tons (ATAG, 2018). Due to increasing air traffic, CO_2 emissions have increased by 80% from 1990 to 2014 (European Aviation Environmental Report, 2016).

Modern aircrafts are 75% quiter than the first ones and advanced new model maintains this declining trend. Even, each generation decreases its noise footprints. This is important because increasing air traffic and number of aircrafts affect people who live

under flight paths. Nearly 2.5 million people were exposed to noise in 2014 in European major airports, and this number is forecasted to increase by 15% from 2014 to 2035 (European Aviation Environmental Report, 2016).

Table 2.13. Statistics of the Aviation Industry (2014-2017) (ATAG, 2015, 2016, 2017, 2018)

	2014	**2015**	**2016**	**2017**
Jet fuel used by commercial operators (Liters)	273 Bn L	294 Bn L	278 Bn L	341 Bn L
Airlines paid for fuel (USD)	210 Bn	181 Bn	226 Bn	149 Bn
Average aircraft occupacy	79%	80%	80%	81%
Tons of carbon dioxide (CO_2)	688 Mn	781 Mn	738 Mn	859 Mn

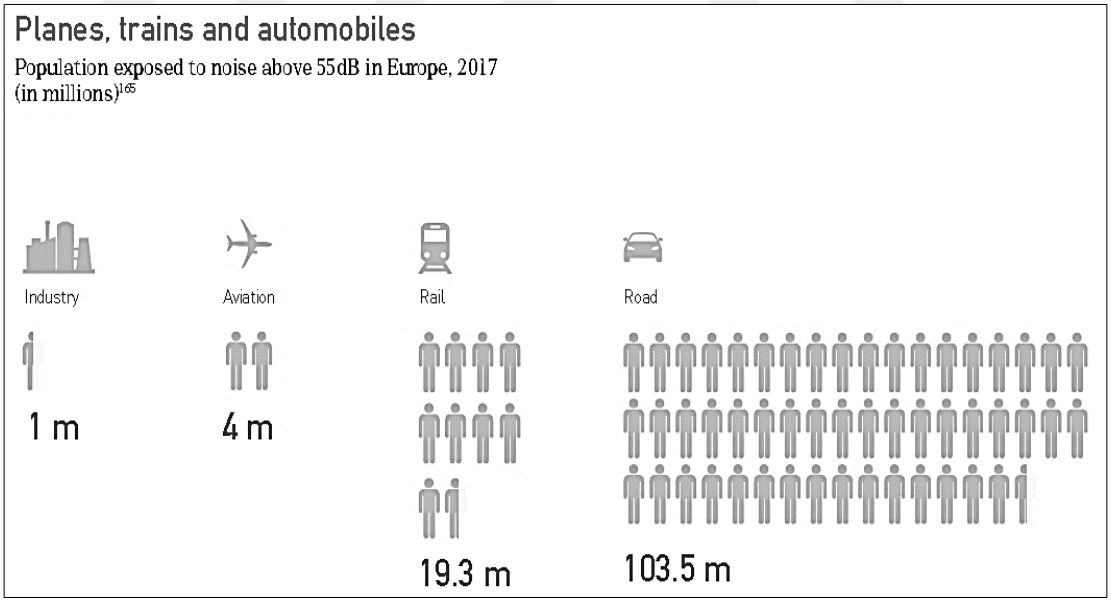


Figure 2.7 Population exposed the noise by planes, trains and automobiles in Europe, 2017 (ATAG, 2018)

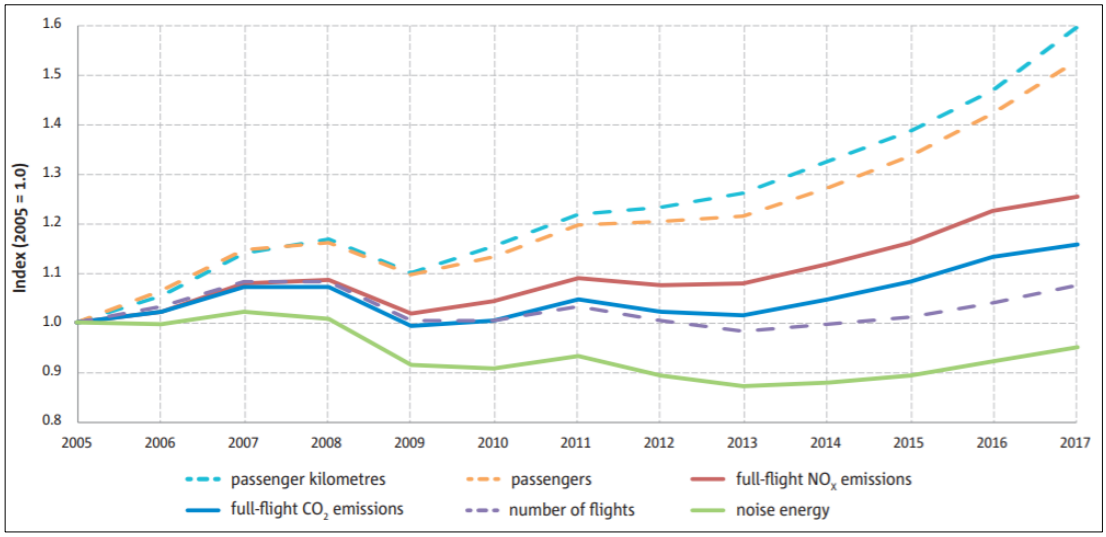


Figure 2.8. Noise and Emission from 2005 to 2017 (European Aviation Environmental Report, 2019)

Some studies examined sustainability in airlines companies. Kotze (2017) investigated Ryanair as a LCC, and Scandinavian Airlines (SAS) as a FSC. He found that Scandinavian Airlines can learn from Ryanair in many ways of its low-cost strategies and this potentially gives benefit to SAS, such as minimization of services, increased focus on digital services, and less waste generation due to maximizing profit. However, Ryanair's low-cost strategy leads to minimazing attempts to address sustainability in its business models. Ryanair can also learn from SAS that conscious efforts towards sustainability need to be made to improve its environmental management and sustainability locations.

Another study empirically examined the Global Reporting Initiative (GRI)-based sustainability reporting and what affects its relationship with firm performance in the aviation industry and showed that leverage and firm size are positively linked with sustainability reporting, while growth, profitability and free cash flow per share do not have significant impacts on sustainability reporting. The study also indicated that growth is negatively linked with application levels of reports. When the effect of sustainability reporting on firm performance is evaluated, no significant results are detected. Thus, sustainability reporting does not seem to play a significant role in enhancing firm performance in the aviation industry (Karaman, Kilic, & Uyar, 2018).

Fleet age is also considered as a feature of airlines' environmental emissions and airline companies concentrate on reducing the average fleet age to be more sustainable. For example, Delta Airlines is renewing its fleet with approximately 25% more fuel efficient aircraft than the aircraft that are replaced. The average fleet age of Delta is 15.2 years that is between those of its competitors American and United Airlines. Thanks to the use of advanced aircrafts, as LCCs like Europe's Wizzair highlights that its unit emissions are half of their legacy competitors. Fot this reason, fleet age is recently coming to the fore. With the orders for 269 more, average fleet age of Wizzair is 5.7 years. The average fleet age of Spirit Airlines with 144 aircraft is 6.1 years in the US. Table 2.14 shows the average fleet age of prominent airlines, i.e. United, Delta and American Alirlines as of mid-Jan-2020.

Table 2.14. Average Fleet Age of Prominent Airlines of US (CAPA, 2020)

Airline	Average fleet age
American Airlines	11.6 years
Delta Airlines	15.2 years
United Airlines	16.1 years

Climate change is a fundamental issue for the aviation industry. Not only does aviation impact on climate change but also the impact of climate change on the aviation industry is important. Greenhouse gas emission is one of the reason of climate change. Therefore, the aviation industry needs to control their environmental effects. Shifting wind patterns, stronger jet stream wind, more extreme weather, warmer air and its results on take-off weigh restrictions and rising sea levels for costal airports may harm the industry. Besides these environmental impacts, social awareness for climate change has increased over the last decades. Consumers have become more sensitive on climate change and its environmental impacts. Public moves, such as Fridays for Future and #flygskam, demonstrates attitude, particulary among millenials (McKinsey, 2020). Governments and multinational organizations such as IATA are publishing new policies on CO_2 and sustainable aviation fuels. Customers unease are

forcing them to make changes. The survey conducted by McKinsey (2020) on flying and climate change shows that half of the partipants are really worried about climate change and young generation is more concerned (Figure 2.9).

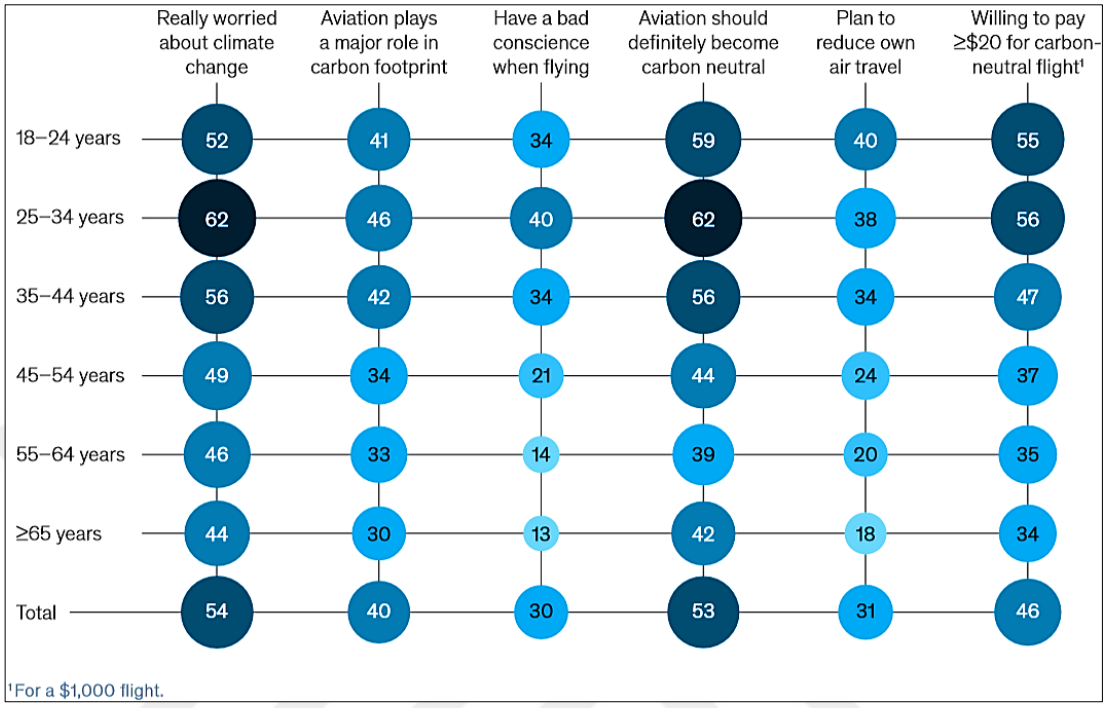


Figure 2.9. Attitudes toward carbon-neutral flying, by age group, % of respondents (McKinsey, 2020)

2.4. Business Models in Air Transportation

Airline companies provide transportation services by providing place and time benefit for people. This service is not only a final product, but also a part of other services, such as holidays, business trips. Therefore, the demand of air transport comes from the demands for other activities. Also, marketing techniques applied by the airlines have an effect on the demand. When we examine the standards of ICAO, we see that civil aviation activities are classified as aircraft manufacturing, maintenance and repair, operating activities of aircrafts, airport construction and operation activities, communication, navigation and air traffic services regulation and operation activities, meteorological activities for aviators and environmental protection activities (ICAO, 2019).

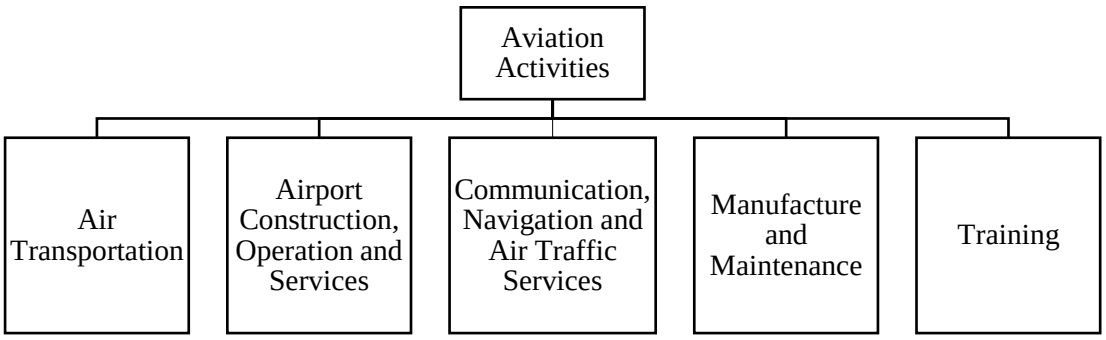


Figure 2.10. Aviation Activities

Aviation activities consist of national and international activities and their supervision. They are quite interdependent and require timely and effective coordination. They can be classified as air transportation, airport construction, operation and services, arrangement and operation of communication, navigation and air traffic services, manufacturing and maintenance and training activities (Gerede, 2002). Air transportation systems provide the transport process by carrying passengers and cargo from one place to another. The inputs of aviation industry are human resources, technology, knowledge and capital apart from goods and services. All civil aviation activities aim to ensure safe flight and to convert the inputs into a variety of services. The air transportation is also a sub-system of the transportation systems. It interacts with other sub-systems, i.e. highway, railroad and maritime.

The costs of airplanes and flights are more expensive than other means of transportation. Costs structure of airline industry is generally measured by the cost per available seat kilometer. It shows the cost required to fly one seat for one kilometer, whether it is empty or occupied. The yield is calculated by dividing total passenger revenues to the number of revenue passenger kilometers. After 1978, with deregulation in the US, most of the major airlines changed their operations to a hub-and-spoke model. The central airport which flights are directed is the hub. The routes that planes depart from the hub airport is the spokes. This model enabled major airlines to get high load factors (Rivkin & Therivel, 2005).

2.4.1. Features of Airline Companies

Air transportation vehicles are safer, more convenient and faster than other transportation vehicles. High technology use has led to the increased trust and demand for airlines. Airline companies are service companies and they give fast and comfortable transportation services for passengers at a certain price. They have an open system. These systems take several elements from the environment with a continuous interaction and give various elements to the environment. In this dynamic structure, they need to improve themselves constantly and adapt new innovations. Since the number of personnel required by the companies increases, the regulation of working hours, the continuous improvement of the quality of services are important points. Airline companies need qualified staff and continuous training to be successful. Thus, beside technology and equipment, they put more emphasis on service quality to create difference in the competitive environment.

There are high barriers to market entry for airline companies. The capital requirement plays a vital role in the establishment of airline companies. Another obstacle is to employ qualified personnel. In the success of airlines a vital role is played by hundreds of staff such as pilots and technical staff. Beside these, fuel and labor costs are extremely high for airline companies. Since they have to employ highly qualified staff, the wages are higher than in other industries. To have certain training and certification is mandatory. The fuel cost is also very important and airline companies look for higher fuel efficiency aircraft and install engines that provide more fuel efficiency. They also evaluate the routes to minimize the costs.

One of the most vulnerable industry to economic fluctuations is the airline industry. During economic recession, people and businesses reduce first their airline expenses. The number of travelling staff or the number of travels decreases. Occupancy rate is also important. It has significant impact on business policy, cost policy and financing decisions. To have more passengers brings more revenues and decreases unit costs (Ekinci, 2011).

2.4.2. Business Models in Aviation Industry

2.4.2.1. ICAO Business Models Classifications

Airline companies are classified into different categories. Table 2.15. shows the classification of airline companies by ICAO (ICAO, 2004).

Table 2.15. Classifications of Airline Companies (ICAO, 2004)

Srl. No	Classifications	Airline Company
1	Type of operation	• Scheduled air carrier • Non-scheduled air carrier • Charter carrier
2	Type of traffic they carry	• Passenger air carrier • Cargo air carrier
3	Their role in national or international markets or the scale of their operations	• Major carrier • Regional carrier • Commuter carrier • Feeder carrier • Mega carrier
4	Marketing and economic issues	• Niche carrier • Start-up carrier • New entrant carrier • Low-cost carrier
5	Ownership structure	• State-owned carrier • Private carrier • Community carrier • Joint venture carrier
6	Not a certain classification	• International carrier • Domestic carrier • National carrier • Flag carrier • Licensed / Certified carrier

2.4.2.2. Classification of US Transportation Department

The US Department of Transportation (DOT) classifies airlines on their annual income: major carriers, national carriers and regional carriers.

a. Major Carriers

Major carriers are airline companies with annual operating revenues of more than USD 1 billion. Examples are American Airlines, US Airways and United Airlines.

b. National Carriers

National carriers are airline companies with an annual operating income between USD 100 million and 1 billion. Even though national carriers operate predominantly within the country or in a particular region, they also serve long-haul flights. Examples of these carriers are AirTran, Frontier, JetBlue, and Midwest Express.

c. Regional Carriers

Regional carriers are airline companies with an annual operating income of less than USD 100 million. They generally serve small residential districts. Atlantic Coast, Atlantic Southeast, American Eagle and SkyWest are some examples of regional carriers (Radnoti, 2002).

2.4.2.3. Full Service Carriers and Low-Cost Carriers

There are two main business models that will be examined within the scope of this study. These are Full Service Carriers (FSC) and Low-Cost Carriers (LCC).

a. Full Service Carriers (FSC)

FSC are airline companies that operate without compromising a particular service quality. They compete with other airlines in all passenger market segments and on all routes. They usually reach customers through global distribution systems and have

complex price and service structures. One of their most prominent features is the use of revenue management to balance the fixed capacities of airline businesses and to maximize revenue against changing demand. FSC strive to achieve a global flight network by using hub and spoke network structures. Their fleet structures have a wide range from regional aircrafts to large-bodied, over-passenger and long-range planes according to their network structures and the lines they serve.

The products of FSC have high standards such as on board free catering and refreshment, comfortable seating, free newspapers or magazines and entertainment in flight. They usually use travel agencies to sell tickets. FSCs offer mainly continental and intercontinental flights and many of them are national flag carriers such as Turkish Airlines, British Airways (Rozenberg, Szabo, & Sebescakova, 2014).

b. Low-Cost Carriers (LCC)

LCC are companies that provide low-priced service to customers as their marketing strategies. The concept of LCC refers to give up some of the services provided by traditional carriers, reduce the costs and offer cheaper prices for the customers. Although there is no specific definition for LCC, there are some common features (Koch, 2010):

- Frequent use of aircraft,
- Standardized fleet configuration,
- Low ticket fares,
- Reduced costs by the abolition of services that generates no revenue,
- Direct flights from point to point at short distance,
- Reduced labor per aircraft.

They make a large part of the brand positioning at low prices and the underlying reason for this is low costs. However, traditional carriers' offerings low prices do not mean that low prices are the basis of brand identity, market positioning and business economics. For example, British Airways and American Airways' offerings low prices are not the same as for Southwest Airlines and Ryanair (Holloway, 2003).

The use of LCC is initiated by the Southwest Airlines in the US in 1973. Yet, no airline adopted this business model until the mid-1980s. The aviation industry which was previously regulated by the Civil Aviation Board began to be managed by market forces after the Airline Liberalization Act in 1978 in the US. Initially, there was an increase in new entrances to the market. Many of them were able to offer lower prices than existing companies by saving on general administrative costs and other expenses. Liberalization allowed many LCCs to enter the market. Until the mid-1980s, increasing alternatives and falling prices were described as a success for the American domestic airline market. Later, large carriers that managed to survive by using their power reached again a superior position in the market at the end of this decade.

After the issuance of Liberalization Act, LCCs that entered to the US domestic airline market had difficulty in sustaining long lasting competition. Although many of them have survived, some of them disappeared after few years. These companies adopted point-to-point flight strategy with old jets. They hired from large carriers and provided cost advantages with cost-saving measures such as catering, minimum distance between seats (Pender & Baum, 2000).

In 2015, global aviation network had carried 3.5 billion passengers on 34 million scheduled departures. It is estimated that this figure would nearly double by 2030. Over the past 25 years, LCCs have had a significant role in this enlargement, and are expected to continue doing so. In 2015, 984 million passengers were carried by LCCs, this figure was equal to 28% of the world total figure (ICAO, 2019). LCCs are now becoming a phenomenon. They can fundamentally change the competitiveness and market structure of airline industry, extending the effects beyond a core market segment limited to recreational passengers or a particular region. As LCCs grow, more competitive is expected, especially in markets with high traffic density. There have been 242 LCCs since 1960s, but only 109 of them are active today. Table.2.16 shows the distribution of LCCs by regions.

Table 2.16. Number of LCCs in the World (ICAO, 2017)

Region	Total	Ceased Operation	Active
Africa	16	5	11
Asia and Pacific	71	22	49
Europe	76	58	18
Latin America and Caribbean	21	10	11
Middle East	8	1	7
North America	50	37	13
Total	**242**	**133**	**109**

According to CAPA, LCCs had a share of 28.8% of all seats worldwide in 2017, while this figure was 27.6% in 2016 and 18.4% in 2008. It increased to 29.0% in 2018. Short/medium haul routes take higher part from this share. For instance, LCC sharing was 40.4% on destinations in Europe in 2017. There is also an increase for the LCC share of seats on destinations between North America and Europe which increased to 8% in 2018 from 0% in 2013. Figure 2.11 shows the share of LCC in global seats from 2008 to 2018.

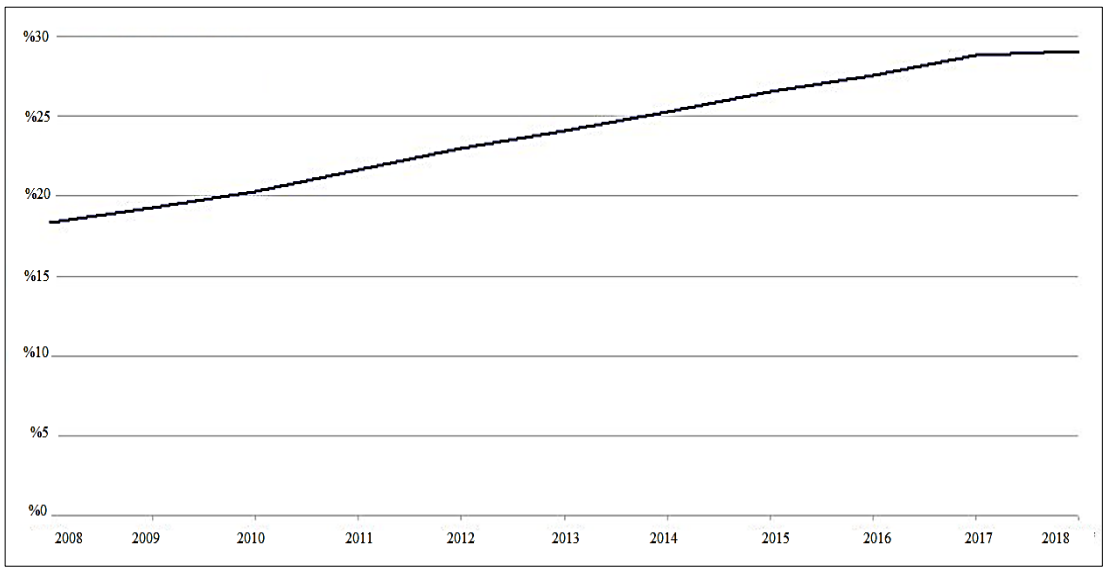


Figure 2.11. LCC share of global seats from 2008 to 2018 (CAPA, 2018)

There are also other differences between FCS and LCCs. One of these is the flight refund or rebooking methods. It is easy to make cancellation or changes for FSC tickets, while changes are very limited for LCCs. Refund policy is very comprehensive for FSC tickets, but very hard to refund for LCC tickets. Also, LCCs have generally high seat denseness but, no free catering service. They do not have generally any possibilities to use connecting flights from carrier's network or another airlines' network. FSCs typically have higher unit revenues than LCCs. However, it is not clear whether they achieve higher margins. Table 2.12. shows characteristics of FSCs and LCCs (Rozenberg, Szabo, & Sebescakova, 2014).

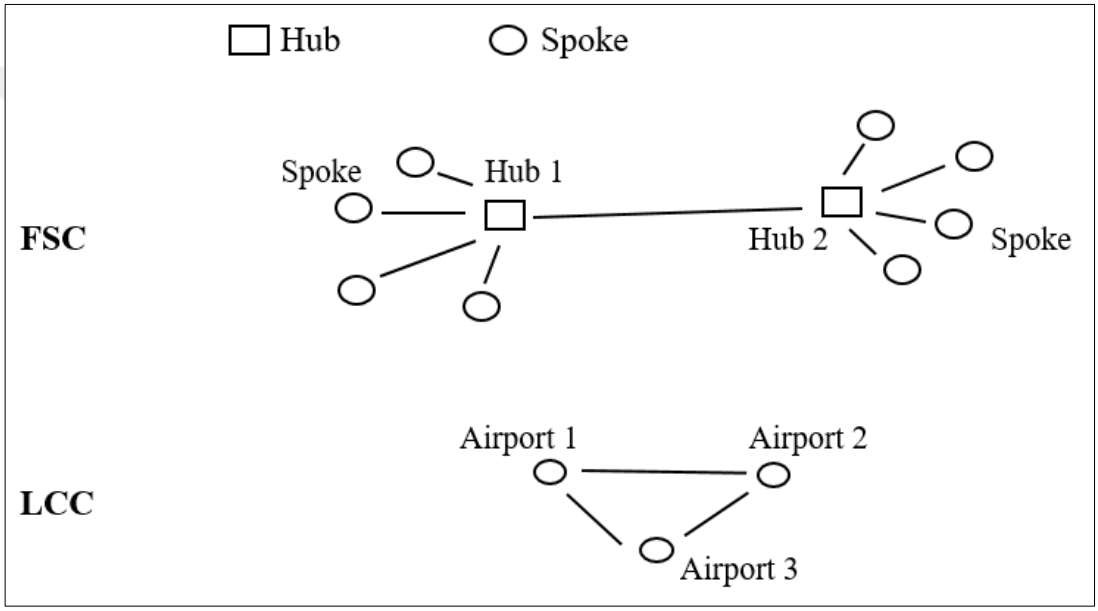


Figure 2.12. Comparison of FSC and LCC Network

Table 2.17. Operational Characteristics of FSC and LCC

Characteristic	FSC	LCC
Generic strategy	Differentiation	Cost minimization
Scale	Large	Smaller
Market	In competition with FSCs Differentiation with class Flight flexibility High service image Using main airports Comprehensive in-flight service and ground services	Cheap sector in the market Segmentation by booking time Little flexibility Basic service quality Outsourced ground services and no catering
Operational and Network Model	Hub and spoke network Multiple hub and spoke linking with feeder routes Moderate capacity utilization (around 60%) Different aircraft type & engines	Point to point Mainly short haul High capacity utilization (about 70 - 80%) Uniform aircraft type
Inventory Management	Complex reservation system Using travel agents	Simple reservation No travel agents

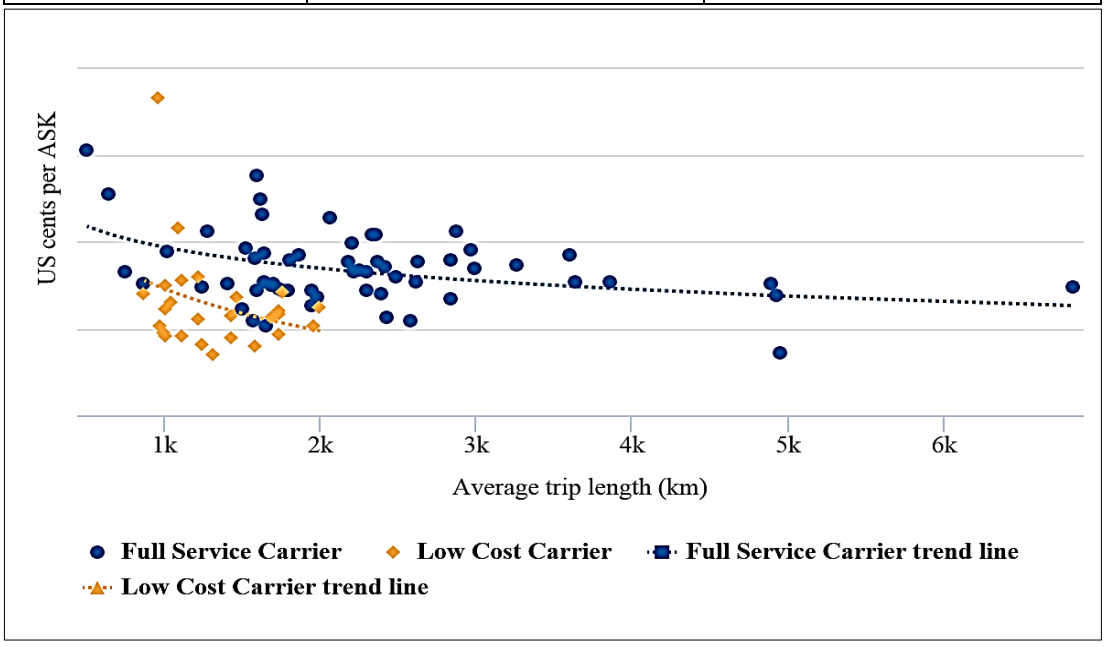


Figure 2.13. Cost per available seat kilometer (CASK, USc) versus average trip length, 2016 (CAPA, 2018)

When regional airlines, FSCs and LCCs are compared according to unit cost for an average trip length, regional carriers have the highest unit cost, followed in decreasing order by FSC and LCCs. Figure 2.14 shows the CASK versus average trip lenght and pitch lines for regional, FSC and LCC business models.

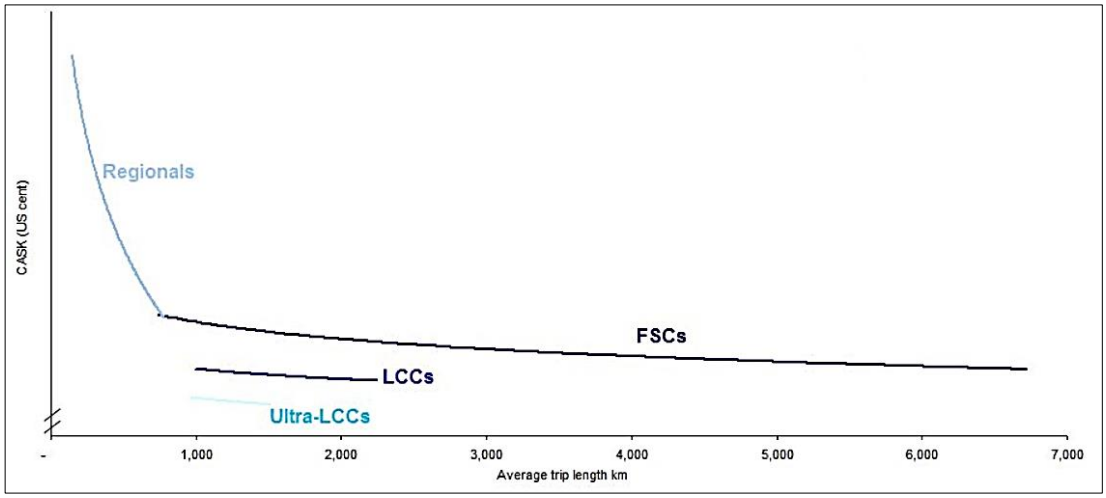
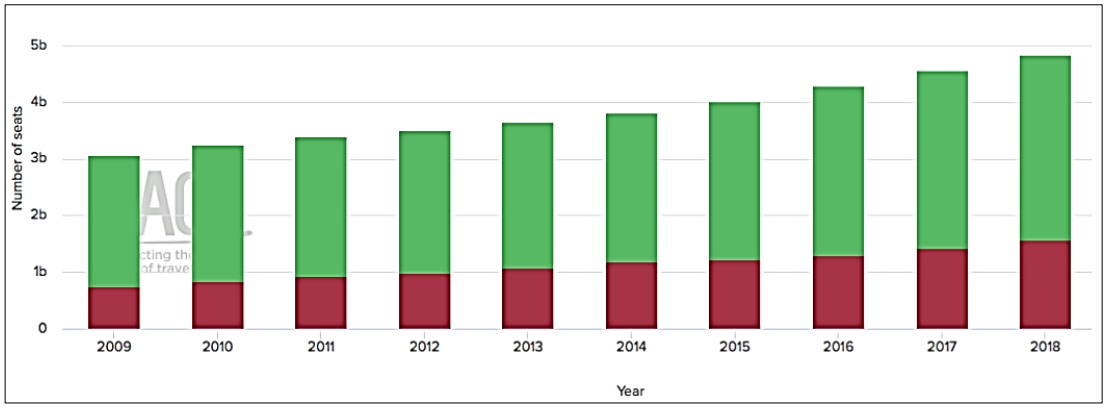


Figure 2.14. CASK (USc) versus average trip lenght and pitch lines for Regional, FSC and LCC business models (CAPA, 2018)

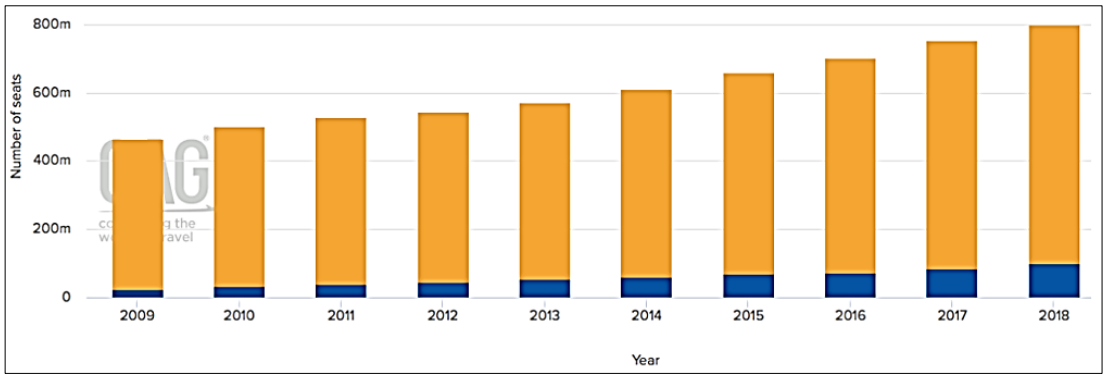
When the global growth of the models within regions are compared, one may see that LCCs are broadening much more rapidly than FSCs. LCCs had 25% of intra-regional seat capacity, equaling to a gain of 8 percentage points (ppts) in 2009. Annual intra-regional seat capacity of LCCs had doubled over the last nine years and increased from 753 to 1,564 million, whereas capacity of FSCs have increased by 41% (Figure 2.15.).



**** LCC (red) and FSC (green)***

Figure 2.15. Global LCC and FSC seats within regions from 2009 to 2018 (CAPA, 2019)

When the global growth of the models to/from regions compared, LCC capacity across regions has quadrupled over the last decade from 26 million to 101 million on a low base, while FSC capacity increased by 61%. LCCs had just 6% of seat capacity that were equating to a gain of 7 ppts between regions in 2009 (Figure 2.16.).



**** LCC (blue) and FSC (orange)***

Figure 2.16. Global LCC and FSC seats to/from regions from 2009 to 2018 (CAPA, 2019)

CHAPTER III

METHODOLOGY

3.1. Sample Selection

There are few studies on sustainability of LCC and FSC airline business models. We aim to close this gap by studying corporate sustainability performance of one FSC and one LCC operating in Turkey, namely Turkish Airlines and Pegasus Airlines. We choose these airlines because they are traded in the stock exchange and their financial and non-finanacial information are available to the public both on their websites and Public Disclosure Platform (PDP).

We employ a case study approach to conduct the analysis. We collect the data and qualitative information from the websites and official reports of the companies, Thompson Reuters Eikon database, and other relevant databases.

3.2. Research Questions and Methodology

We conduct the research mostly by using qualitative analysis. We try to answer two questions. The first one is “How can we define the environmental performance and key performance indicators of Turkish Airlines and Pegasus Airlines as a FSC and LCC?”. In this frame, we review company profiles of Turkish Airlines and Pegasus Airlines for their environmental and financial performance. For this purpose, we set a number of key environmental indicators. Although the data for these key indicators are available for Turkish Airlines, some of them are missing for Pegasus Airlines. The second question is “How does Turkish Airlines as a FSC and Pegasus Airlines as a LCC execute sustainability in their strategies and business models?”. We use sources ranging from research papers, journal articles, company websites, financial, sustainability and annual reports to answer that question. We also make SWOT analyis

to evaluate the business strategies of these two airlines and provide insights for the future.

CHAPTER IV

EMPIRICAL RESULTS

4.1. Turkish Airlines

4.1.1. A General Outlook

Turkish Airlines was established in 1933. It started its flights in August 1933 with a capacity of five planes, 23 seats and 24 personnel, including 7 pilots, 8 machinists, 8 clerks and 1 radio operator. The initial fleet included 2 5-seat King Bird, 2 4-seat Junkers F-13 and a 10-seat ATH-9. In 1947, Ankara-Istanbul-Athens flight took place as the first overseas flight. In 1955, the name was changed to Turkish Airlines. In 1956, the company became a member of IATA. In 1967, the first DC-9 aircraft TC-JAA was leased and joined to the fleet. The first international jet flight Ankara-Istanbul-Brussels flights were made. With the addition of A310 aircraft in 1985, it began flights to the Far East and transatlantic 38 years after the first international flight. In 1989, SunExpress was established by the equal ownership of Turkish Airlines and Lufthansa.

In 1990, Turkish Airlines was included in the scope of privatization and a share of 1.53% was offered to the public. In 1996, Turkish Airlines was awarded by Airbus as the Most Effective User of A340 Aircraft in the world, and Turkish Airlines' pilots served as instructor pilots at Airbus. In 2000, the first commercial flight for the Olympic Games to Sydney was made. Miles & Smiles project as a special passenger program was launched. In 2003, electronic ticket and online check-in applications were initiated. In 2006, Turkish Airlines signed a new partnership with Do & Co Company for the in-flight services for food. It also received ISO 9001: 2000 quality certificate. The protocol stipulating the participation of Turkish Airlines to Star Alliance was signed in 2008.

Turkish Airlines became an airline that has flight to the most countries with its wide network in the world in 2013. It hosted 48 million people in the aircrafts thus, it had the second place in Europe with the highest number of passengers. According to BrandFinance Top 50 Airlines Report, the brand value reached USD 2.2 billion in 2015, while it was USD 1.6 billion in 2012. It has a brand value USD 1.74 billion in 2019 (Turkish Airlines, 2019). As shown in Table 4.1, total passengers carried have increased from 2015 to 2018, reaching to 75.2 million in 2018. The growth rate changes between 2.5% and 11.80% during this period. The company had an EBITDA of USD 3,349 Million in 2018.

Table 4.1. Total Passengers and Growth Rate from 2015 to 2018

Year	**2015**	**2016**	**2017**	**2018**
Total Passengers (Million)	61.2	62.8	68.6	75.2
Passenger Growth Rate (%)	11.80	2.50	9.30	9.50

Turkish Airlines has flights to 124 countries with a fleet of 332 aircraft. It has an average fleet age of 8.2 years. It has 26,739 employees and 46 % of them are female. In 2018, it had USD 12,855 million sales volume, revealing USD 753 million net profit. It carried 1,412,423 tons of cargo. It prevented a total of 93,267 tons of carbon dioxide emissions and achieved 0.2 % fuel efficiency. Figure 4.1 gives a general outlook of the Turkish Airlines.

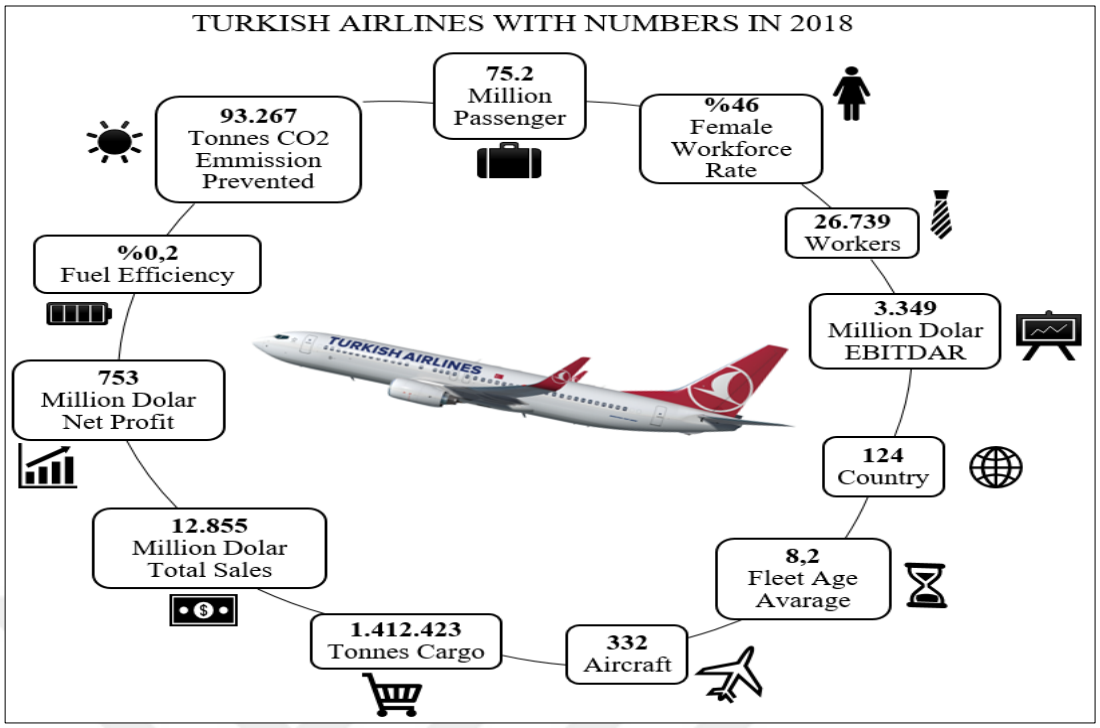


Figure 4.1. Turkish Airlines Outlook in 2018

4.1.2. Key Environmental Indicators

As key environmental indicators, we examine carbon emissions, fuel saving, noise emissions and Environment Pillar Score.

4.1.2.1. Carbon Emissions and Fuel Savings

Turkish Airlines has released carbon emissions figures in its sustainability reports since 2014. Table 4.2. gives the tons of CO_2 prevented and fuel saved from 2014 to 2018. The company has managed to reduce its carbon emissions has been reduced over the years and try to reduce fuel consumption. From 2014 to 2019, 551,327 tons of CO_2 prevented and 175,119 tons of fuel saved. This is due to enhancements in aircraft fleet and strategic decisions on fuel efficiency. It aims to diminish fuel amount consumed per ton-km by 5% until 2025 by normalization the Available ton-km (ATK) weight and range. In line with this goal, the company aims for avoiding 130,000 tons of CO_2 emissions.

Turkish Airlines has started a collaborative process with IATA Green Team. It includes monitoring and measuring fuel efficiency. Further, Turkish Airlines, with the Solena Fuel Corporation signed a non-binding letter of intent in 2013. In 2018, it became a partner of the Renewable Jet Fuel project, which was prepared by Boğaziçi University in line with the target of reducing the carbon emission which is produced by the use of jet fuel (Turkish Airlines Environmental Performance Report, 2018).

In 2016, Turkish Airlines saved 43,975 tons fuel. It also prevented 138,522 tons carbon. With this performance Turkish Airlines was ranked at the 4th place among 20 international airline companies that have flights to Amarica/Canada and Europe by The International Council on Clean Transportation (ICCT).

Turkish Airlines performed 20% more efficient flights in comparison to 2008 with its attempts to enhance fuel efficiency and diminish carbon footprint to preserve the environment and combat climate change (Turkish Airlines Sustainability Report, 2018). The company also has a fuel policy that is predicated on three pillars: improvement of the infrastructure, optimization of the operations and invesments in new technologies. Decrease in aircraft weight lessens fuel consumption and carbon emission. In this frame, 3,000 light nets and 2,000 light pallets were used, SKYLIFE magazine with lesser paper was issued, tablet usage in cabins, steel brakes were changed with carbon brakes and 2,614 baggage containers were substituted for composite containers. Despite these efforts, prevented CO_2 and saved fuel was less than previous years in 2018 due to increasing aircraft number, cargo weight and flights. Table 4.3 shows the increased consumptions of fuel and greenhouse gas emissions.

Turkish Airlines ordered 92 Airbus (A321 NEO) new generation aircrafts and 75 Boeing (B737-9 MAX and B737-8 MAX) which are equipped with 15% higher fuel efficiency rate (Turkish Airlines Sustainability Report, 2018). It has been determined that A321 neo type has 15% less consumption than A321 type. In addition, Nitrogen oxide (NOx) emissions of these new generation environmentally friendly aircrafts are approximately 50% below the ICAO Aviation Environmental Protection Committee (CAEP) / 6 limits (Turkish Airlines Environmental Performance Report, 2018).

With the global warming issue becoming more important, ICAO has set three targets

to reduce emissions in the aviation industry: Achieving an annual average fuel efficiency enhancement of 1.5% from 2009 to 2020, to keep net CO_2 emissions constant in 2020 and by 2050, halving the amount of emissions in 2005. Turkish Airlines are engaged in the project management with "Block off- Block on" method (Turkish Airlines Environmental Performance Report, 2018).

Table 4.2. Tons of CO_2 prevented and tons of fuel saved from 2014 to 2018 (Turkish Airlines Sustainability Report, 2014-2018)

Year	Tons of CO_2 prevented	Tons of Fuel saved
2014	86,916	27,592
2015	85,639	27,187
2016	138,522	43,975
2017	147,283	46,757
2018	93,267	29,608

Table 4.3. Fuel consumption and greenhouse gas emission (Sustainability Report, 2018)

	2015	2016	2017	2018
Fuel consumption (million tons)	4.3	4.6	4.9	5.3
Greenhouse gas emissions (million tons of CO_2 e)	13	15	15	16.7

As mentioned above, Turkish Airlines achieved approximately 29,608 tons of fuel savings and consequently 93,267 tons of carbon emission reduction as a result of its fuel saving practices in 2018. Table 4.4. gives the fuel saving practices carried.

Table.4.4 Turkish Airlines' fuel saving practices (Turkish Airlines Environmental Performance Report, 2018)

APU Policy (Fuel)
APU Policy (Maintenance)
Engine Out Taxi-in
NADP2 (Noise Abadement Departure Procedure)
Reduced Flap Takeoff
Reduced Flap Landing
Idle Reverse on Landing
Engine Out Taxi-out
Commander/Fueller Extra Fuel
CDA (Continuous Descent Approach)
Alternate Selection
Dispatcher/Ops Extra
Route Optimization
ZFW (Zero Fuel Weight plan vs actual)
Statistical Taxi Fuel Planning
Reclear Dispatch
Aframe/Engine Drag/Aerodynamics/Wash/Paint
Aircraft Operational Flight Documents (EFB)
Potable Water Optimization
CG optimization

4.1.2.2. Noise Emissions

There is no statistical data for Turkish Airlines on the noise emissions emitted at various airports or at the home base airport in Istanbul. The company is committed to minimize noise emissions according to its environmental policy. It steps towards its goal of noise reduction with an average fleet age of 8.2. Further, new-generation aircrafts are ordered and they will be delivered by 2023. The procedures are met in pursuant with international and national aviation requirements on noise reduction. The company uses Noise Certificate which enables it to check the noise level limits in the course of take-off and landing at the airports.

4.1.2.3. Environment Pillar Score

Sustainability has three dimensions: social, environmental and economic. The environmental dimension means that the company protects natural resources and minimizes damage to the environment or operates without harming the environment. (Seker, 2020). Environmental Pillar Score is a weighted average score of emissions, environmental innovation and resource use category scores (Nikolova, 2019). The environment pillar score of Turkish Airlines has diminished from 58.61 in 2014 to 45.40 in 2018 (Table 4.5). The reason of the decrease may depend on many variables since ESG scores have dynamic nature and the sub-categories are unknown. The scores usually compose of public data which may not provide information for all indicators.

Table 4.5. Turkish Airlines' Environment Pillar Score (Thomson Reuters Database)

Environment Pillar Score				
2014	**2015**	**2016**	**2017**	**2018**
58.61	49.54	49.53	57.84	45.40

4.1.3. Key Performance Indicators

The key performance indicators may be operational and financial. Table 4.6 shows key performance indicators for Turkish Airlines. Return on assets (ROA) demonstrates how profitable a company is corresponding with total assets. ROA is positive from 2014 to 2018 except 2016, which an exceptional year due to attempted military coup. The calculation of Return on equity (ROE) is dividing net profit by equity capital. It is a measure of how efficaciously management is employing company's assets to create profits. ROE is positive over the period 2014-2018 except 2016. Market capitalization means the total market value of the company's stocks. The average market capitalization for Turkish Airlines is USD 3,751,153.883 from 2014 to 2018.

As to the operational indicators, RPK is the measurement of the demand on market for air transportation and shows number of kilometers traveled by payer passengers (Kenton, 2020). ASK is the supply provided by the airline and is a measure of an airplane's available carrying capacity to generate revenues, and how many seat kilometers are in actuality available for purchase on an airline (Kagan, 2019). For Turkish Airlines, the ASKs are higher than the RPKs over the period 2014-2019. That means Turkish Airlines offer more seats capacity than the demands of the customers. The difference between ASK and RPK for Turkish Airlines is not very big, except the year 2016 which accounts almost 25%. Therefore, it does not affect net profit negatively. The number of passengers has also increased from 54.7 to 75.2 million. The number of landings has increased from 422,521 to 511,064. Fleet and seat capacity have also raised, except in 2018 which has 10 aircraft drop in fleet, and almost 2,000 decrease in seat capacity compared to 2018. Passenger load factor (PLF) can be defined as RPK expressed as a percentage of ASK or total number of seats sold as a percentage of total seat capacity. The average PLF for Turkish Airlines is 78.48 for the period 2014-2018.

Table 4.6. Key Performance Indicators from 2014 to 2018 (Turkish Airlines, 2019)

Indicators	**2014**	**2015**	**2016**	**2017**	**2018**
ROA	4.60%	1.0%	-0.4%	7.5%	6.4%
ROE	15.70%	3.4%	-1.6%	27.4%	24.7%
ASK (million)	135,330	153,209	170,092	173,073	182,031
RPK (million)	106,787	119,372	126,815	136,947	149,169
Number of Landing (Passenger Flights)	422,521	462,767	475,303	483,312	511,064
Number of Passengers (million)	54.7	61.2	62.8	68.6	75.2
Fleet	261	299	334	329	332
Seat Capacity	48.183	56.899	65.993	67.000	65.016
PLF (%)	78.9	77.9	74.6	79.1	81.9

Figure 4.2 shows unit costs of Turkish Airlines. Personnel costs are reduced over the period of 2014-2018 from USc 1.26 to 0.97. Fuel costs are also decreased from USc 2.82 to 2.07, having the lowest value of USc 1.57 in 2016. When we look at the total unit costs, they decreased from USc 7.74 to 6.43, having the lowest value of USc 5.87 in 2017.

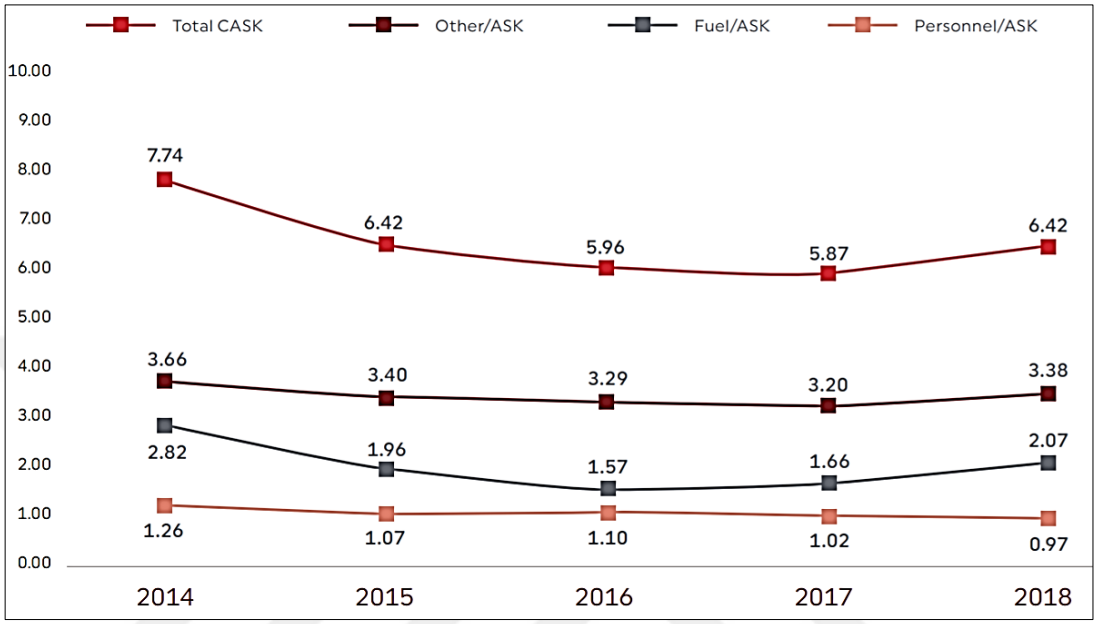


Figure 4.2. Unit Costs (USc) of Turkish Airlines (Turkish Airlines, 2019)

4.1.4 ESG Combined Score and CSR Strategy Score

Sustainability has three dimensions: economic, environmental and social sustainability. The economic dimension is realized by the firm's robust financial structure and profitability. Social dimension consists of improving working conditions of the employees such as health, safety, salary, working time and taking into consideration the quality of life of the society, future generations and the customers. The environmental dimension means that the company protects natural resources and minimize the damage to environment (Seker, 2020).

Environmental, Social and Governance (ESG) performances of the companies positively affect the decisions of investors. Among them Environmental Pillar Score is a weighted average score of Emissions, Environmental Innovation and Resource Use category scores. Social Pillar Score is the weighted average of the Product

Responsibility and Community, Human Rights and Workforce category scores. Corporate Governance Score is the weighted average of the CSR Strategy, Shareholders and Management category scores (Nikolova, 2019). ESG reporting is not only an ethical issue, but also a financially motivated quest for management, best practices and long-term returns (Nasdaq, 2019).

ESG reports on performances increase transparency, reduce information asymmetry, ensure accessibility to management decisions, enforce corporate governance principles, enable long-term investor trust, facilitate access to capital, contribute to profitability, growth and risk management, and increase corporate reputation, increase brand value, provide opportunities, require protecting health, safety, social rights and working conditions of employees, encourage the development of innovative products and services, and contribute sustainable development and national economy (Seker, 2020). Table 4.7 presents ESG scores of Turkish Airlines, including the social, environmental and governance pillar scores for the years 2014-2018.

Turkish Airlines does not provide any data for ESG scoring, therefore Thomson Reuters that makes the assessment may not look at the sustainability reports in detail or find the answer corresponding to the KPI in the report. Thus, a simple and clearly understandable sustainability report is important for evaluation. Turkish Airlines does not have a separate website for sustainability. Sustainability reports are given at the investor relations page on its website. This makes it difficult to access the relevant information. Before ESG evaluation, Thomson Reuters expect companies to respond to the evaluation form to get much more healthy and correct data. This contributes to increasing the ESG score. However, as we learnt from Turkish Airlines, they did not have any initiatives to provide data for ESG scoring to any evaluator. In this regard, Table 4.7 is constructed from publicly available data. Thus, missing KPIs and new added ones for aviation industry may result in increases or decreases in the scores.

Table.4.7. Turkish Airline's ESG Scores, Social Pillar Scores, Environment Pillar Scores and Governance Pillar Scores (2014 – 2018) (Thomson Reuters Database)

ESG Score				
2014	**2015**	**2016**	**2017**	**2018**
62.45	55.75	55.04	50.70	48.47
Social Pillar Score				
2014	**2015**	**2016**	**2017**	**2018**
74.81	67.30	67.38	54.78	50.96
Environment Pillar Score				
2014	**2015**	**2016**	**2017**	**2018**
58.61	49.54	49.53	57.84	45.40
Governance Pillar Score				
2014	**2015**	**2016**	**2017**	**2018**
52.33	49.21	46.81	37.98	48.99

When the CSR / ESG ranking of Turkish Airlines is compared with 19,184 companies, one may note that it is above the average with a score of 55%. The data covers 19,184 businesses from 143 countries, driven by 662 industry-leading ESG/CRS data sources. Figure 4.3. gives the ranking by 2018 and 2019.

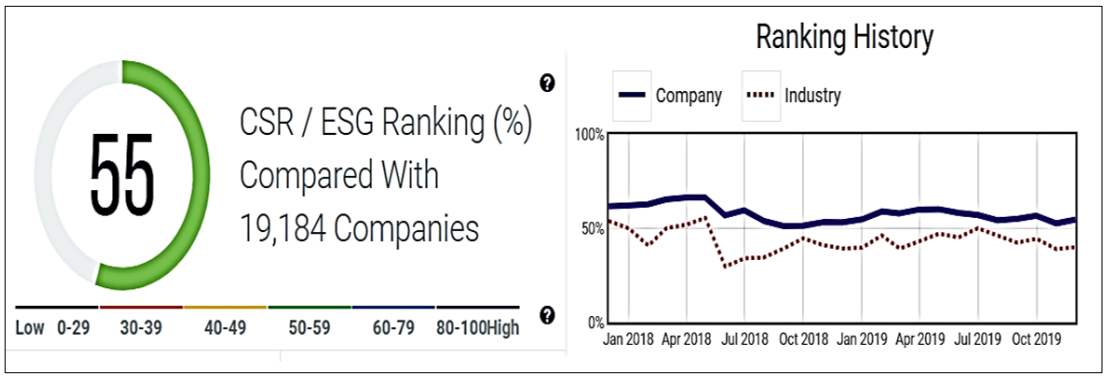


Figure 4.3. CSR / ESG Ranking of Turkish Airlines (CSRHUB, 2020)

Turkish Airlines get an average score among 22 companies in the aviation industry according to ESG scores, and rating distribution. From 2015 to 2018, the score was BBB, then it turned to be BB since November 2018 (Figure 4.4.). The CSR strategy score is an assessment of how well the company integrates CSR principles into its business. When we look at the CSR scores, it has increased from 26.56 to 57.41 except in 2018 where it decreased to 26.92. The company considers sustainability issues in its business model. New action plans are implemented in reporting and company management over the last years. Thus, the increase in CRS score is as expected. However, as mentioned in Section 4.1.2.3, many other variables may affect the score.

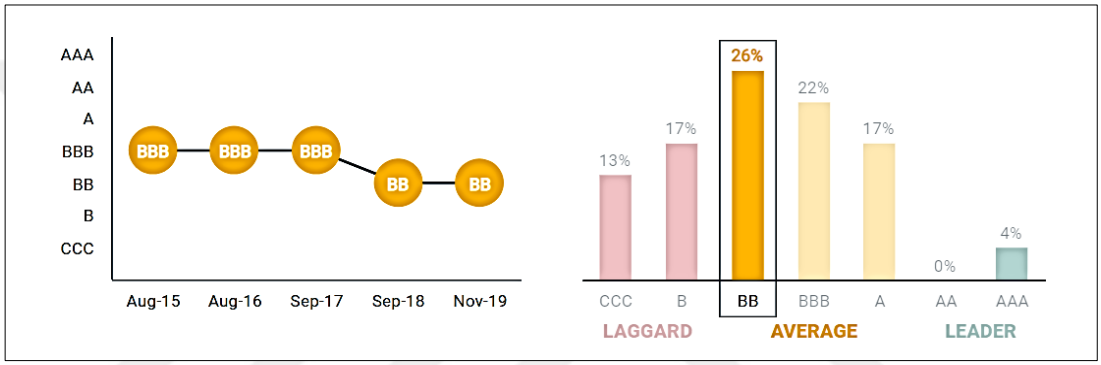


Figure 4.4. ESG Ranking History and Ranking Distribution (MSCI, 2020)

Table 4.8. CSR Strategy Scores of Turkish Airlines (Thomson Reuters Database)

2014	2015	2016	2017	2018
26.56	38.89	40.74	57.41	26.92

4.1.5. Sustainability Reporting and Addressing Sustainability

Sustainability reports provide the companies an overview of their daily activities that cause environmental, social and economic impacts. This reporting is an important tool for presenting company's commitment to a sustainable economy. Understanding and

measuring the environmental, social, economic and governance performance are key elements to set further goals and manage the changes more efficiently. In this context, we may discourse four major benefits of sustainability reporting for organizations. Sustainability reporting is a useful tool for risk management. Risk management and sustainability reporting are two side of the same coin. Sustainability shapes the future of business operating environment and its corporate perception, increasing efficiency and bringing resilience into the business. Increasingly facing environmental risks and social risks lead up the sustainability reporting to become an important tool in risk management. Sustainability reporting may also help to generate savings in organizations. Waste reduction management is one example. Sustainability reporting also helps better decision making and increase in stakeholders trust. Correlation between financial performance and ESG performance increasingly becomes important for the investors. EY Tomorrow's Investment Rules 2.0 (2015) showed that investors are using non-financial disclosures of the companies when they are managing investment decisions. Especially, in Europe, non-financial information has affected investors' decision making most often. Many investors think that ESG integration is a natural component of any active, long term investment process (EY Tomorrow's Investment Rules 2.0, 2015).

Turkish Airlines has published its sustainability reports since 2013. However, the company had started to give wide coverage of environmental information in annual reports since 2008 when it became a Star Alliance member. During 2008-2012, sensitivity on environment and other environmentally important fields such as fuel efficiency had gained serious concentration in annual reports. Finally, Turkish Airlines started to publish a separate report for non-financial information in 2013. The company has also published a Environmental Performance report in 2016 and 2018. In 2016, the Environmental Dimensions report was prepared covering 63 different categories. The company aims to keep these dimensions under control to reduce environmental impacts (Environmental Dimensions of Turkish Airlines, 2016).

Turkish Airlines is quite aware of the responsibility for sustainability. It monitors the amount of water, natural gas, energy and paper consumption and sets annual targets to reduce. There is a 12% reduction in natural gas consumption (4.770.853 sm^3) compared to the previous year in 2018 (Turkish Airlines Sustainability Report, 2018).

Documentation management system is electronic. By this system, paper consumption was 2,391.703 m^2 in 2018 (Turkish Airlines Sustainability Report, 2018).

Turkish Airlines carries out waste management activities within the scope of the "Zero-Waste Project". 258 tons packing waste was sent to recycling at Istanbul location in 2018. It is approximately ten times higher than previous year (26 tons in 2017). 124 tons non-hazardous waste was sent to recycling and 115 tons hazardous waste sent to licensed companies. Also, 28 tons of plastic packages, 1,225 tons of paper packages and 69 tons of glass packages were sent to recycling with contracted firms (Turkish Airlines Sustainability Report, 2018).

To understand how Turkish Airlines addresses sustainability, we analyzed the sustainability reports from 2014 to 2018. Table 4.9. gives the results for four sub-categories (i.e. economic, environmental, social and others). However, reports for last two years do not include social responsibility and sponsorship details. When we checked the annual reports of Turkish Airlines, we find the details in these reports.

Table 4.9. Brief analysis of sustainability reports of Turkish Airlines (2014-2018)

	2014	2015	2016	2017	2018
Number of pages in sustainability report	136	66	57	98	110
1. Economic					
Economic Performance	+	+	+	+	+
Investments	+	+	+	+	+
2. Environmental					
Climate Change	+	+	+	+	+
CO_2 Emission	+	+	+	+	+
Noise Management	+	+	+	+	+
Fuel Saving	+	+	+	+	+
Bio-Fuels	+	+	+	+	+
Waste Management	+	+	+	+	+
Power Consumption	+	+	+	+	+
Paper Consumption	+	+	+	+	+
Natural Gas Consumption	+	+	+	+	+
Water Consumption	+	+	+	+	+
Environmental Policy	+	+	+	+	+
Training and Education for Environmental Awareness			+	+	+
3.Social					
Corporate Safety	+	+	+	+	+
Flight Security	+	+	+	+	+
Security Policy	+	+		+	+
Job Creation	+	+	+	+	+
Employees	+	+	+	+	+
Occupational Health and Safety	+	+	+	+	+
Training and Education	+	+	+	+	+
Innovations	+	+	+	+	+
Customer Satisfaction	+	+	+	+	+
Social Responsibility	+	+	+		
Sponsorship	+	+	+		
4. Others					
Catering	+	+	+	+	+
Awards	+	+	+	+	+
Fleet Information	+	+	+	+	+
Strategic Priorities	+	+	+	+	+
Risk Management	+	+	+	+	+

At the center of the sustainability approach of the Turkish Airlines are stakeholders. Sustainability approaches are shaped by interactions from stakeholders. Table 4.10. gives the sustainability management of Turkish Airlines.

Table.4.10. Sustainability Management of Turkish Airlines in 2018 (Sustainability Report, 2018)

Sustainability Management of Turkish Airlines		
INTERNALS	Shareholders Financial Partners Investors	Minority Rights Strategy Operational and Financial Performance Corporate Governance
	Employees Unions	Business Ethics Cultural Values Freedom of Association and Collective Employee Satisfaction Bargaining Corporate Safety Flight Security Health and Safety & Well-being Performance & Career Development Non-discrimination and Diversity Sustainable Use of Resources
EXTERNALS	Government Regulators Local Authorities	Social and Economical Development Compliance Customer Rights Financial Performance Corporate Safety Flight Security Health and Safety Forestration Noise Management Waste Management
	Certification Bodies	Environmental Management Corporate Safety Flight Security Health and Safety Quality Management Noise Management
	Customers	Accessibility Customer Satisfaction & Service Quality Flight Security Customer Rights Corporate Safety Innovative Products & Services
	Communities	Social and Economic Development Social Responsibility Projects
	Non-governmental Organizations (NGOs)	Corporate Social Responsibility Projects
	Academic Institutions Universities	Employment & Career Opportunities

Concerning the commitment of Turkish Airlines to sustainability, Borsa Istanbul (BIST) Sustainability Index is an another indicator. The Index provides competitive advantage for Turkish companies to effectively manage their corporate sustainability risks and opportunities. The index reflects the companies' approaches to sustainability issues, including consumption of natural resources, global warming, health, safety and employment, and makes an independent assessment of their activities and decisions regarding these issues. Turkish Airlines is included in the Index since November 2015 – October 2016 period.

4.1.6. Business Model of Turkish Airlines

A business model can be described as delivery and capture mechanisms and the design of value creation by a business (Kotze, 2017). Companies create value for their customers and provide benefits to the market. Turkish Airlines aims to maintain the growth above industry averages, minimize accidents, provide the best service, have unit costs equivalent to LCCs, decrease sales and distribution disbursement below the industry averages. It also aims to have loyal customers who are able to make their own flight reservation, ticketing and boarding, and to ensure employees who know the interest obtained from the institution is well proportioned to the added value created. Another aim is to become an airline that embraces the principles of commercial entrepreneurship that establishes business for Star Alliance partners and principles of modern governance that favor the interests of its stakeholders and shareholders.

The mission statement of Turkish Airlines with its identity as a flag carrier is to be a leading European air carrier and a globally active airline, preferably with its variety of products, service quality, flight safety, reliableness and competitiveness (Turkish Airlines, 2019). The impacts of Turkish Airlines on the economy, environment and society is the responsibility of the members of Board of Directors and the Executive Committee. The company is committed to implement sustainability acitivities as a natural part of its business and operations. It conducts performance reviews every year and determines action plans for the future. Turkish Airlines adapts Full Service Carrier as a business model. It offers free catering and refreshment on board. It offers services for Business Class and Economy Class passengers. Applications allow passengers

without baggage to download their boarding pass from the internet and buy tickets in call centers and applications.

The sustainability program of Turkish Airlines is based on four pillars: management, economy, environment and social factors.

- Management pillar covers corporate governance, business ethics and behavior and risk management.
- Economy includes contribution to GDP, job creation, public economy, export, trade, tourism, connectivity and local development in flight destinations.
- Environment consists of climate change, fuel efficiency, greenhouse gas emissions, sustainable biofuels, fleet modernization, waste, noise and water.
- Social pillar has corporate safety, flight safety, customer expectations, and value creation for employees.

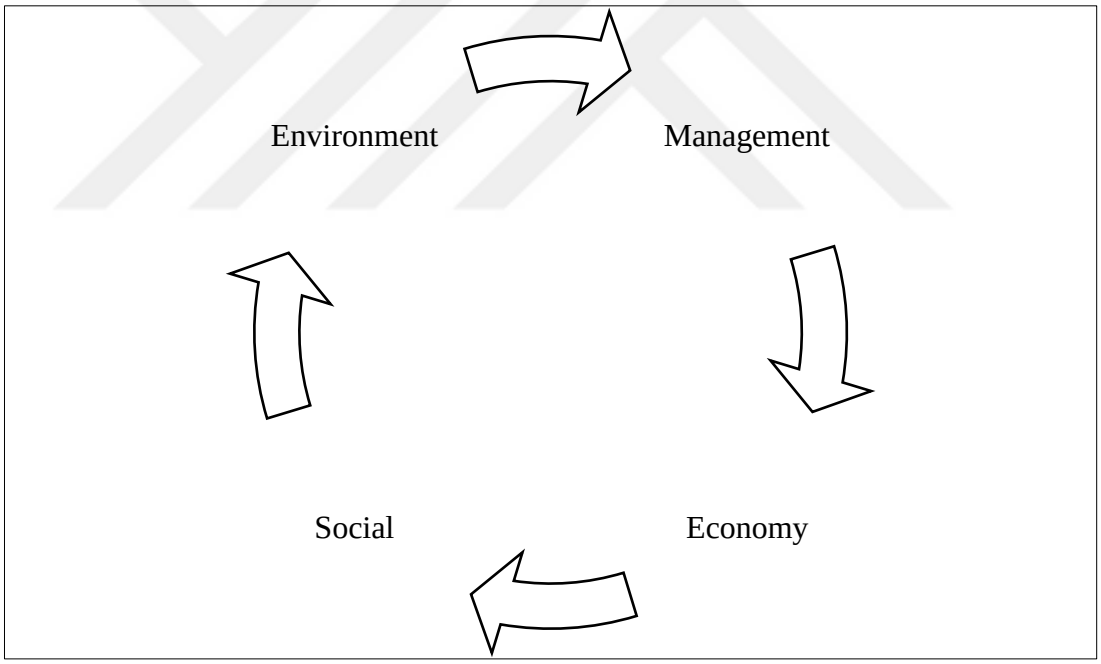


Figure 4.5. Sustainability Program of Turkish Airlines

4.1.7. SWOT Analysis of Turkish Airlines

We use SWOT analysis to clarify the strengths, weaknesses, opportunities and threats of the aviation industry. However, this analysis has some limitations. The inability to

quantify the importance of SWOT factors makes the strategic planning difficult (Bakir *et al.,* 2017). Table 4.11 shows SWOT analysis of Turkish Airlines.

Table 4.11. SWOT Analysis of Turkish Airlines

Strengths	**Weaknesses**
* A global airline worldwide * Service satisfaction and customer satisfaction * 24/7 customer support * Able to travel to many destinations * Online transactions * Sponsorship agreement with many airline companies * Wide distribution network * Strong in domestic market of Turkey * Have a young fleet * Rising market share * Strong financial position	* Ticket prices are expensive * It is a big company, but has few social projects * Extreme Government Intervention * Lack of a clear growth strategy * Lack of R&D studies * High seasonality at occupancy * No shuttle service from the airport
Opportunities	**Threats**
* Well assessment of its geographical location * Ease of transport thanks to the mutual visa liberalization agreements with other countries * Preferred more because of being Turkey's largest airline * Decrease in fuel prices * The increase of air traffic * Continuation of government's investment in transportation infrastructure * High cargo carrying potential * Popular tourist destinations in Turkey	* Customers prefer other companies because of expensive ticket prices * Terrorist acts and wars in the world * With the development of technology, the fleet gets older compared to other airline companies * Fragile structure of the air transport industry * International competition and increased competition in the domestic market * Infrastructure problems * Fuel costs are high and unstable * Continuation of the rise of the LCCs

4.2. Pegasus Airlines

4.2.1. A General Outlook

Pegasus Airlines was founded as a joint venture of Aer Lingus, Net Holding and Silkar in 1990 with a fleet of 2 aircraft in Istanbul and made its first flight the same year. It was purchased by ESAS Holding in 2005 and became the 4th airline as a low-cost carrier operating scheduled domestic flights in Turkey. In 2006, international flights were started from Istanbul to Stuttgart. Over the period 2006-2010, the number of passengers carried on domestic flights has rose by 15%, while the number of passengers carried on domestic flights rose by 42%. In 2011, it became the first airline in the world to integrate with Wireless Groundlink End to End Network Solutions system, which performs bidirectional data transfer. By establishing Turkey's new simulator area with a flight training center, the company participated in the 10% of the world's 582 airlines. It achieved a great success in aviation with the last two technological investments worth of USD 22.3 million

In 2013, 34.5% of the company shares were offered to the public. Pegasus Airlines became Europe's fastest growing airline according to the Official Airline Guide report among the 25 largest airlines in seat capacity in 2013. In 2015, the company added a new cabin simulator, by which preparatory scenarios can be implemented in case of any emergency. Table 4.12 shows the number of passengers carried.

Table 4.12. Traffic Development of Airlines for Europe (million passengers) (Fehrm, 2017)

Rank	Airline	2016	2015	2014	2013	2012	2011	2010	Fleet	Destinations
1	Ryanair	116.8	101.4	86.4	81.4	79.6	76.4	72.7	319	186
2	Lufthansa Group	109.7	107.7	105.9	104.6	103.1	106.3	90.2	602	321
3	International Airlines Grp	100.7	94.9	77.3	67.2	54.6	51.7	50.6	520	248
4	Air France–KLM	93.4	89.8	87.4	78.4	77.5	75.8	70.8	574	231
5	EasyJet	74.5	69.9	65.3	61.4	59.2	55.5	49.7	226	136
6	**Turkish Airlines**	62.8	61.2	54.8	48.3	39.0	32.6	29.1	335	291
7	Aerolot Group	43.4	39.4	34.7	31.4	27.5	16.4	14.1	239	189
8	SAS Group	29.4	27.1	27.3	25.4	25.4	24.7	23.1	156	157
9	Norwegian Air Shuttle	29.3	25.8	24.0	20.7	17.7	15.7	13.0	102	130
10	Air Berlin Group	28.9	30.2	31.7	31.5	29.6	31.8	31.8	128	114
11	**Pegasus Airlines**	24.1	22.3	19.7	16.8	13.6	11.3	8.6	79	102
12	Alitalia	23.1	23.0	23.2	24.0	24.3	25.0	23.4	103	123

Total revenue and scheduled domestic flights have increased from 2014 to 2016. Operating costs also increased while use of fuel decreased (Table 4.13).

Table 4.13. Financial Data of Pegasus Airlines (CAPA, 2018 & Pegasus Airlines Financial Statements, 2017, 2018)

Financial data	**2014**	**2015**	**2016**	**2017**	**2018**
Total Revenue	3.1b	3.5b	3.7b	5.3b	8.2b
Scheduled domestic	915.3m	1.0b	1.1b	1.4b	1.7b
Scheduled international	1.4b	1.7b	1.6b	2.4b	4.0b
Ancillary	532.4m	663.3m	816.6m	1.1b	-
Charter	156.3m	102.6m	114.5m	168.9m	352.5m
Operating cost	2.8b	3.3b	3.8b	4.9b	7.4b
Jet fuel	1.2b	1.1b	985.8m	1.5b	2.7b
Personnel expenses	348.0m	442.6m	645.2	712.6m	883.1m
Handling fees	211.9m	270.3m	309.1m	386.9m	560.5m
Navigation	202.5m	240.0m	257.1m	328.0m	479.7m
Depreciation and amortization	164.8m	176.0m	226.5m	330.0m	538.1m
Operating lease	187.5m	324.6m	466.9m	572.4m	694.2m
Maintenance	158.8m	270.6m	360.6m	419.2m	684.0m
Landing	80.9m	102.1m	124.8m	163.0m	249.5m
Advertising	65.8m	68.1m	70.4m	45.2m	46.1m
Commission	42.5m	54.6m	68.5m	99.9m	128.8m
Passenger service and catering	34.4m	41.0m	47.2m	54.9m	78.2m
Operating profit (loss)	247.4m	177.0m	(137.0m)	-	-
Net profit	143.3m	113.1m	(133.7m)	502.2m	507.3m

In 2018, approximately 30 million passengers were carried, and TL 8.3 billion turnover and TL 507 million annual net profit are generated (Pegasus Airlines, 2019). The company has flights to 42 countries with a fleet of 83 aircrafts and an average fleet age of 5.2 years. It has 5,257 employees. Figure 4.6 gives a general outlook of Pegasus Airlines in 2018.

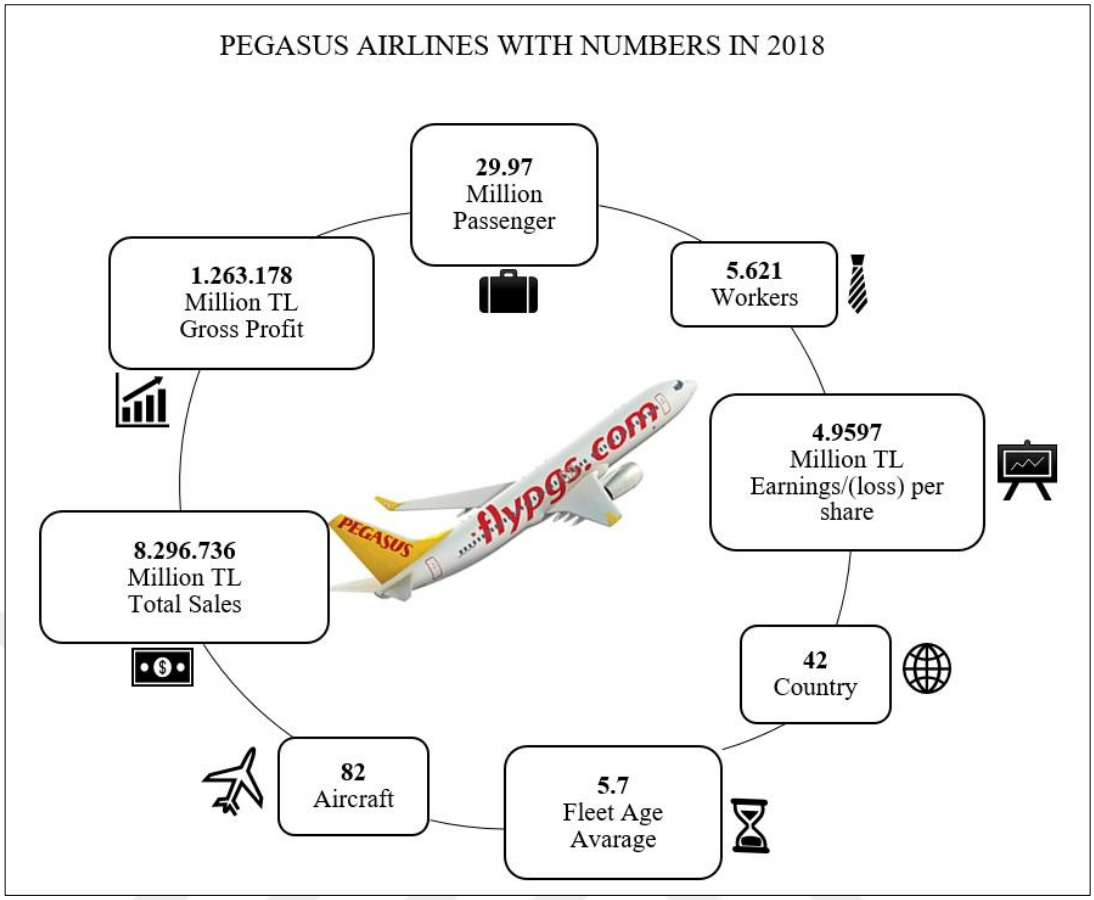


Figure 4.6. Pegasus Airlines Outlook in 2018

4.2.2. Key Environmental Indicators

As key environmental indicators, we examine carbon emissions, noise emissions and Environment Pillar Score for Pegasus Airlines.

4.2.2.1. Carbon Emissions and Fuel

Pegasus Airlines accounts for the carbon emissions that has been released in the past 5 years. Table 4.14. provides increases/decreases in CO_2 emissions and fuel costs from 2015 to 2018. The company has conducted actions aimed at reducing its carbon emission over the years. From 2015 to 2018, increase rate of CO_2 emissions has decreased from 19.45% to 1.3% . Fuel saving data is not available for the company. However, fuel costs have increased from 2015 to 2018. The reasons are the increase in oil prices globally, increase in aircraft number and increase in the kilometers of flights.

Table 4.14. Pegasus Airlines' CO_2 emissions and fuel cost increase/decrease (Pegasus Airlines CDP Climate Change Information Request, 2015-2018).

Year	CO_2 Emissions	Fuel Cost
2015	19.45% increase	4% decrease
2016	16.70% increase	11% decrease
2017	11.8% increase	53% increase
2018	1.3% increase	80% increase

According to the reports issued by 40 airlines on CO_2 emissions in 2017 and 2018, Pegasus Airlines ranked 10th with more than 20 million tons of CO_2 emissions. Figure 4.7. demonstrates the CO_2 emissions for airline companies in 2017 and 2018.

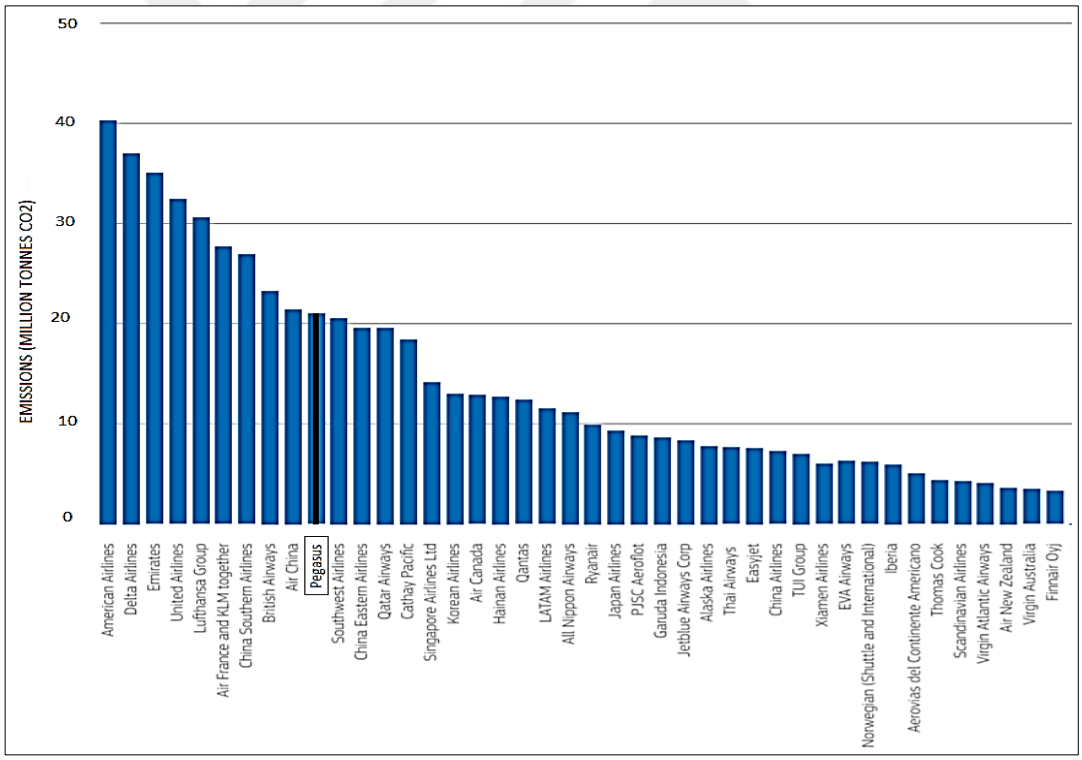


Figure 4.7. CO_2 Emissions in 2017/2018 reported by 40 Airlines (Becken & Pant, 2019)

4.2.2.2. Noise Emissions

The noise pollution in Turkey has dropped according to the Strategic Noise Chart, prepared by Marmara Research Center in coordination with DHMI, covering 40 airports. The main consideration is the use of the new generation aircraft (DHMI, 2018). There is no statistical data for Pegasus Airlines on noise emissions amount emitted at various airports or at its home base airport in Istanbul.

Pegasus Airlines is switching its fleet to new and more fuel-efficient aircrafts that keep costs lower. The fleet is the youngest fleet (average age is 5.7) in Turkey and it is one of the youngest fleet in Europe as well (Pegasus Airlines, 2019). The company aims to increase the efficiency, take actions that are environmental-friendly, and reduce CO_2 and noise emissions (Aviation Turkey, 2019).

4.2.2.3. Environment Pillar Score

The Environment Pillar Score of Pegasus Airlines was 14.59 in 2014 which was lower than Turkish Airlines. However, the data is not available for the other years.

Table 4.15. Pegasus Airlines' Environment Pillar Score (Thomson Reuters Database)

Environment Pillar Score				
2014	**2015**	**2016**	**2017**	**2018**
14.59	-	-	-	-

4.2.3. Key Performance Indicators

The key performance indicators can be financial and operational ratios. Table 4.16 shows performance indicators for Pegasus Airlines.

ROA and ROE are positive for the years 2014-2018 except the year 2016 (-2.8% and -8.8% respectively). The average market capitalization is USD 773,757,904.2 over the years of 2014-2018.

Table 4.16. Pegasus Airlines' Key Performance Indicators from 2014 to 2018 (Pegasus Airlines Annual Reports; Pegasus Airlines Website, 2019)

Indicators	**2014**	**2015**	**2016**	**2017**	**2018**
ROA	4.7%	7.3%	-2.8%	3.0%	4.1%
ROE	16.2%	12.3%	-8.8%	8.7%	12.4%
ASK (million)	24,378	27,969	30,510	32,718	35,543
RPK (million)[3]	19,478	22,095	23,980	27,679	30,389
Number of Landing (Passenger Flights)	-	-	166,691	-	-
Number of Passengers (million)	19.74	22.34	24.14	27.82	29.97
Fleet	55	67	82	76	82
Seat Capacity	10,338	12,561	15,304	14,202	15,315
PLF (%)	79.9	79	78.6	84.6	85.5

When we look at the ASK and RPK, the ASKs are higher than the RPKs. That means Pegasus Airlines offers more seats capacity than the demands of customers. The differentiation between ASK and RPK for Pegasus Airlines is not very big throughout the years. The number passengers who are carried by Pegasus Airlines has increased from 19.74 to 29.97 million. The number of landings is not available except the year 2016 which was 166,691. However, we expect that there is an increase from 2014 and 2018 due to increasing number of passengers carried during this period. Fleet and seat capacity have also increased except the year 2017, where there is a 6 aircraft decrease in the fleet, and almost 1,000 decrease in seat capacity compared to the previous year. The average PLF for Pegasus Airlines is 81.52% which is higher than Turkish Airlines.

[3] Calculated based on Available Seat Km (ASK) and Passenger Load Factor values.

Table 4.17 gives the fuel, personnel and other costs of Pegasus Airlines. Fuel costs have decreased from 2014 to 2016 and then increased from 2016 to 2018. Personel costs and other costs (rent, maintenance, advertisements, service and catering, etc.) have also increased from 2014 to 2018.

Table 4.17. Costs of Pegasus Airlines (Pegasus Airlines Annual Reports, 2014-2018)

Cost (TL)	2014	2015	2016	2017	2018
Fuel	1.171.483.344	1.118.567.032	985.775.955	1.516.097.738	2.729.667.414
Personnel	347.994.931	442.603.089	645.214.424	712.653.223	883.175.422
Other	1.314.840.407	1.750.125.155	2.213.518.330	2.714.622.254	3.866.479.923
Total	2.834.318.682	3.311.295.276	3.844.508.709	4.943.373.215	7.479.322.759

4.2.4. ESG Combined Score and CSR Strategy Score

Table 4.18 shows ESG scores, social pillar score, environmental pillar score and governance pillar score of Pegasus Airlines. The ESG score of the company is 30.83 in 2014 which is lower than the Turkish Airlines. All other scores are lower than Turkish Airlines in 2014, except the Governance Pillar Score. However, the data is not available for the other years.

Table 4.18. Pegasus Airlines ESG scores, Social Pillar Score, Environmental Pillar Score and Governance Pillar Score (Thomson Reuters Database)

ESG Score				
2014	**2015**	**2016**	**2017**	**2018**
30.83	-	-	-	-
Social Pillar Score				
2014	**2015**	**2016**	**2017**	**2018**
26.46	-	-	-	-
Environment Pillar Score				
2014	**2015**	**2016**	**2017**	**2018**
14.59	-	-	-	-
Governance Pillar Score				
2014	**2015**	**2016**	**2017**	**2018**
54.03	-	-	-	-

When the CSR / ESG Ranking of Pegasus Airlines is compared with 19,184 companies, it is difficult to make any comment on the score since there is not enough data (Figure 4.8.).

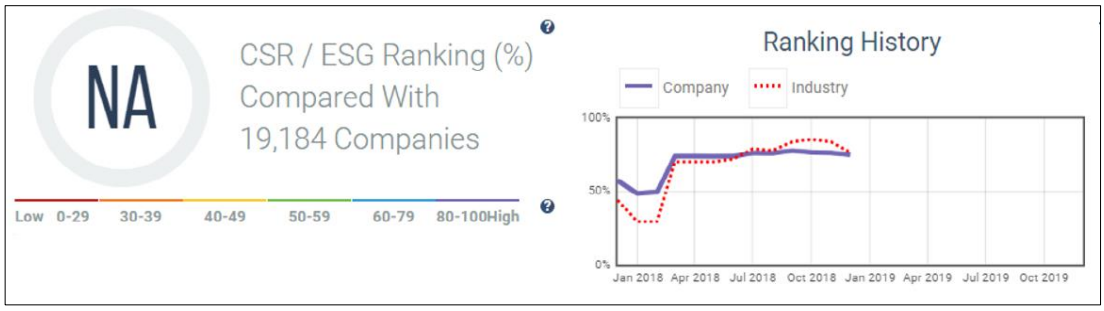


Figure 4.8. CSR / ESG Ranking of Pegasus Airlines (CSRHUB, 2020)

Table 4.19. CSR Strategy Scores of Pegasus Airlines (Thomson Reuters Database)

2014	2015	2016	2017	2018
6.25	-	-	-	-

4.2.5. Sustainability Reporting and Addressing Sustainability

Pegasus Airlines is commited to continuously improve their systems by comprehending emvironmental targets, and increase environmental performance. As mentioned in its environmental policy document, the company is dedicated to prevent pollution and protect the environment. However, Pegasus Airlines does not publish a sustainability report and do not include any valuable information about its environmental and sustainability performance in its annual report.

The company has CDP reports on its website for the years 2014, 2015, 2016, 2017 and 2018. First report published in 2014 is a Climate Change Information Request. The report includes some details about the incentives for the management of climate change. However, those incentivized performance indicators only stay on two points,

emission reduction target and energy reduction target. The risk management process is also simple such as incentives for climate change issues. It is not integrated into multidisciplinary and company wide risk management (Pegasus Airlines CDP Report, 2017). The reports have Q&A format. Thus, it seems that the reports are prepared in the investor relations view rather than environmental concerns.

Pegasus Airlines has an environmental management system certificate (ISO:14001) given by an independent inspection firm. Concerning the commitment of the company to sustainability actions, BIST Sustainability Index is an another important cornerstone. The Index provides competitive advantage for Turkish companies to effectively manage their corporate risks and opportunities. The index reflects companies' approaches to important sustainability issues, including global warming, health, consumption of natural resources, safety and employment, and makes an independent assessment of their activities. Pegasus Airlines is included in the Sustainability Index since November 2016 – October 2017 period. Pegasus General Manager Mehmet T. Nane said that sustainability is a broad concept, from using their aircraft in the most efficient way to minimize environmental impact in their operations to creating added value for all stakeholders (Pegasus Airlines Website, 2020).

Due to lack of sustainability report, we analyzed Pegasus investor relations' webpage to find out information on sustainability attributes. In this section, carbon disclosure project reports and some certificates related to environmental issues are available. There are also health and safety, quality, safety and environmental policies of Pegasus Airlines in this section. However, these policy documents do not contain much and detailed information on sustainability performance of the company.

4.2.6. Business Model of Pegasus Airlines

In the aviation industry, approximately 4-5% of growth rate is expected each year and therefore serious environmental measures should be taken for the future. Every year, the fleets of the airline companies grow and the damages caused to the environment increase. CO_2 emissions from aircrafts have serious effects on human, plant and animal life, climate change and environmental quality. Airbus, Boeing and other aircraft manufacturers continuously work on environmental and passenger-friendly models

that consume less fuel. However, research suggest that air ticket prices should rise by 1.4 percent for at least a year to reduce emissions. LCCs do not take it very seriously in the past years, but they spend some efforts today.

The vision of Pegasus Airlines is to become the leader in economic airline segment in the region with innovative, responsible and rational approach. The mission of the company is to work for its customers to provide them the right to travel by air with its suppliers and business partners. It adapts Low Cost Carrier as a business model. It offers paid catering and refreshment on board. It offers pre-order service to the guests before the flight. The reduction of the costs by the abolition of services that generate no revenue for the company make the tickets less expensive in comparison with full service carriers. Buying tickets are easy, but refunding is not possible in most cases or a penalty fee is applied for the refund. Mobile check-in application allows to pay for extra kg for luggage and online sales option is provided.

The company is committed to improve its system in protecting the environment in line with international standards. The aim of the company is to sustain its services environmentally and economically and to operate efficiently. To achieve this goal, the company invest on fuel efficiency projects to reduce greenhouse gas emissions (GHG). Emissions Trading System (ETS) aims to minimize operational costs. The company also investigates other options such as carbon offsetting possibilities and renewable energy investments. It renews its fleet with more efficient aircrafts because 10% increase in fuel prices result in 3.4% increase in operational costs (Pegasus, 2018).

4.2.7. SWOT Analysis of Pegasus Airlines

Table 4.20 shows the SWOT analysis of Pegasus Airlines.

Table 4.20. SWOT Analysis of Pegasus Airlines

Strengths	**Weaknesses**
* Online transactions * Have a young fleet * The goal of reaching a wide audience * Ticket prices are cheaper * Increasing aircraft use and capacity utilization. * Maintenance and operational costs are at minimum levels because of young fleet. * Being the first to enter the market in its field * It can be flexible (cancelling the lines that bring no profit) * Less hierarchical, team-based organizational structure * Short landing and take-off times, more efficiency * Continuous innovation * Increasing popularity * Establishment of brand perception as a LCC * Continuous promotions and campaigns	* Lack of fleet and transportation * Turkish Airlines being more prominent * Extreme Government Intervention * Baggage shortage * Perception as a local brand * Lack of a clear growth strategy * Catering and services are not sufficient * Lack of R&D studies * Low product / service quality * Uncontrolled growth. * High personnel turnover rate. * Low performance of suppliers affecting customer satisfaction. * High seasonality at occupancy * Social responsibility projects are not sufficient * Less routes and destinations
Opportunities	**Threats**
* Decrease in fuel prices * The increase of air traffic * Emphasis on being a network carrier in addition to its economic flights * Increased internet use. * Opportunities and new destinations in short and medium distance markets (North Africa, Middle East, Russia, Europe) * Growth opportunities with overseas purchases and mergers (Air Berlin, MANAS) * Turkey has a low penetration of the market. * Focus on corporate customers. * Continuation of the government's investment in transportation infrastructure * Popular tourist destinations in Turkey * Most of the sub-support services are provided by contracted organizations	* Most of the sub-support services are provided by contracted organizations. * Fluctuations in fuel prices * Increasing costs * Fluctuations in exchange rates. * Most of the sub-support services are provided by contracted organizations, it affects performance, efficiency and quality * Anadolu Jet brand of Turkish Airlines * Competition with other low cost carriers * Pressure on prices * Terrorist acts and wars in the world * With the development of technology, the fleet gets older in compared to other airlines * Fragile structure of the air transport industry * Infrastructure problems

4.3. A Brief Comparison of Turkish Airlines and Pegasus Airlines

Turkish Airlines adapts Full Service Carrier as a business model, while Pegasus prefers operating as a Low Cost Carrier. Both companies are traded on Borsa Istanbul and included in Borsa Istanbul Sustainability Index. Turkish Airlines is extremely transparent and informative in sustainability practices. The company publishes sustainability report every year since 2013. Pegasus Airlines does not provide extensive information on key environmental indicators like Turkish Airlines. The company does not publish a sustainability report, but provides CDP reports. Although data on key environmental indicators (CO_2 emission, fuel saving and noise emission) are available in CDP reports it is quite difficult to interpret.

Both airlines have performed well in reducing their carbon emmisions over the period 2014-2018. Turkish Airlines has prevented more tons of CO_2 emission, while Pegasus Airlines has decreased the rate of increase in CO_2 emissions. Both companies also aim to reduce fuel consumption. Pegasus Airlines reduces its fuel consumption by means of fuel efficient aircraft and short-haul flights, while Turkish Airlines reduces its consumption by means of fuel efficient aircraft and strategic sustainable decisions. No statistical data for noise emission is available for companies, but both companies have young fleet and this may help reducing noise emission in the future.

ESG scores over the period 2014-2018 are only available for Turkish Airlines. Pegasus Airlines has ESG score only for 2014. CRS ranking is similar to ESG scoring. Turkish Airlines has 55 CRS ranking (%) compared with 19.184 companies. Pegasus Airlines does not have this score. Both companies have environmetal policies and share them on their website. However, Pegasus Airlines gives only very brief information.

Table 4.21. A Comparison of Turkish Airlines and Pegasus Airlines

	Turkish Airlines	**Pegasus Airlines**
Business Model	Full Service Carrier	Low Cost Carrier
Key Performance Indicators	Data Available	Data Available
Key Environmental Indicators		
CO_2 Emission	Data Available	Only flactuation data available
Fuel	Fuel saving data available	Only fuel cost flactuations available
Noise Emission	Data not available	Data not available
ESG Score	Available for each year	Only available for 2014
CRS Ranking	Available	Not available
Sustainability Reporting	Annual Report	Not Published
Environmental Policy	Explained in detail on website	Briefly mentioned on website
BIST Sustainability Index	Since 2015	Since 2016

4.4. Sustainability Guidelines for Airline Companies

To meet their targets the airlines should go on adding value to the economy by integrating a proper sustainability strategy to their business models. In this frame, they have to take some actions to meet various dimensions of sustainability. Table 4.22. provides a check list of sustainability parameters that may guide airline companies.

Table 4.22. Sustainability Parameters for Airline Companies

Economic	Social	Environmental
Market Presence	Corporate Safety	Fuel Efficiency
Economic Performance	Flight Security	Biofuels
Indirect Economic Impacts	Security Policy	Carbon Dioxide (CO_2)
Procurement Practices	Job Creation	Carbon Monoxide (CO)
Sustainable Economy Awareness	Employees	Nitrogen Oxides (NO_x)
	Working Conditions	Sulphur Oxides (SO_x)
	Labour/Management Relations	Unburned Hydrocarbons
	Diversity and Equal Opportunity	Particulate Matter (PM)
	Non-discrimination	Volatile Organic Compounds (VOCs)
	Occupational Health & Safety	Groundlevel Ozone (O_3)
	Training and Education	Noise
	Customer Satisfaction	Biodiversity
	Customer Privacy	Energy Consumption
	Customer Health and Safety	Water Consumption
	Supplier Social Assessment	Paper Consumption
	Public Policy	Natural Gas Consumption
	Socioeconomic Compliance	Water Consumption
	Innovations	Waste Management
	Social Responsibility	Advanced Aircraft & Engines
	Human Rights Assessment	Infrastructure Improvements
	Community Engagement	Environmental Policy
	Sponsorship	Environmental Awareness

To ease the tasks of airlines we also provide short checklists covering a couple of questions to better observe and analyze the sustainability performance of airline companies. Table 4.23 to 4.26 provide these checklists.

Table 4.23. Questions to Environmental Sustainability

No.	Question	Yes	No	Unknown
1	Does the airline take any actions to decrease CO_2 and noise emissions?			
2	Does the airline take any actions to reduce fuel consumption?			
3	Does the airline implement advanced technologies to mitigate negative impacts on biodiversity and global warming?			
4	Does the airline have a specific waste management projects?			
5	Does the airline have natural resources management projects to reduce consumption?			
	FINAL OVERALL SCORE			

Table 4.24. Questions to Social Sustainability

No.	Question	Yes	No	Unknown
1	Does the airline provide jobs with diversity and equal opportunity?			
2	Does the airline ensure training and self improvement opportunities for employees?			
3	Does the airline improve ESG awareness?			
4	Does the airline have community engagement with social responsibility actions?			
5	Does the airline have a community engagement by social responsibility projects?			
	FINAL OVERALL SCORE			

Table 4.25. Questions to Sustainability Awareness

No.	Question	Yes	No	Unknown
1	Does the airline serve environmentally convenient transport solutions?			
2	Does the airline ensure more passenger/freight by sustainable modes?			
3	Does the airline have policies to deal with crisis (economic crisis, epidemics)?			
4	Does the airline provide trainings for sustainability awareness?			
5	Does the airline publish a sustainability report?			
	FINAL OVERALL SCORE			

Table 4.26. Questions to Sustainability Reporting

No.	Question	Yes	No	Unknown
1	Does the airline publish a sustainability report annually?			
2	Does the sustainability report cover all environmental indicators?			
3	Does the sustainability report cover all social indicators?			
4	Does the sustainability report provide extensive information and data?			
5	Does the sustainability report have a clear and understandable content?			
	FINAL OVERALL SCORE			

These checklists would provide some directions for airline companies in meeting their targets for various sustainability dimensions. For these checklists to be helpful, the airlines should set quantitative and qualitative targets to follow up their performance and revise them where necessary according to the local and international standards.

CHAPTER V

CONCLUSION AND DISCUSSIONS

The aviation industry and air transportation have local and international dimensions. The problems that companies face in the aviation industry can not be solved by only local solutions since they have global effects. In this frame, it is only possible to increase the benefits of air transportation with sustainable aviation systems

Sustainability in aviation industry is a golden target, but it is sometimes not quite clear how to achieve it. The growth of aviation and air traffic create some challenges for sustainability. Airline companies have to keep a balance between the targets of transportation (accessibility, safety and enhanced mobility) and the dimensions of sustainability (environmental, economic, and social).

This study examines the sustainability performance of two Turkish airline companies, Turkish Airlines as a Full Service Carrrier, and Pegasus Airlines, as a Low Cost Carrier. In this frame, the study elaborates on their business models, and key environmental indicators from 2014 to 2018. Key environmental indicators include carbon emissions, noise emissions and ESG scores.

The national flag carrier of Turkey is Turkish Airline that travels over 300 destinations worldwide, with its wide distribution network. It adapts Full Service Carrier as a business model. When we analyze the sustainability of Turkish Airlines, major efforts come from the fuel savings, decrease in electricity consumption and natural gas use, among others. The company does research and development and use innovative technologies. It also intends to buy wide body Boeing and Airbus models to support sustainable aviation environmentally.

Turkish Airlines is extremely transparent and informative in sustainability practices.

The company achieved approximately 29,608 tons of fuel savings and consequently 93,267 tons of carbon emission reduction in 2018. The company had 261 aircraft and flew to 108 countries with 54.7 million passenger in 2014. It prevented 86,910 tons of carbon emmision in the same year. In 2018, the company had 332 aircraft and flew to 124 countries with 75.2 million passenger. The company has admirably increased the level of CO_2 prevention over the years. The company had 27,592 tons fuel saving in 2014 and 29,608 tons in 2018. Improvements of the aircraft fleets and strategic decisions on fuel efficiency may be the reasons for this result. Fuel savings have also increased over time. Although there is no numerical data on noise emissions, the company is committed to minimize it. Environmental Pillar Score of the company shows fluctuations over the last five years, the average EPS being 54.48 which is in line with global performance.

Pegasus Airlines implement Low Cost Carrier as a business model. The number of passengers carried and the number of landings have increased over the period 2014-2018. There is also an increase of fleet and seat capacity except in 2017. As to the sustainability, the company aims to reduce fuel consumption and CO_2 emissions with the help of mechanisms such as carbon brake systems. It is the first airline company in Turkey to sign UN Global Compact. Pegasus Airlines plans to buy new aircraft for the reduction of emission and fuel consumption.

Although Turkish Airlines publish sustainability reports every year since 2013 Pegasus Airlines does not publish similar reports. Also, Pegasus Airlines does not publish extended information about key environmental indicators. The company has managed to reduce its carbon emissions over the years, but fuel costs have increased from 2015 to 2018. The reason is the rise in oil prices globally, increase in the number of fleet size and the increase in the kilometers of flights. It is hard to find any data for its CO_2 emissions and no data is available for noise emmisions of Pegasus Airlines. However, the company is switching its fleet to new and more fuel-efficient aircraft for increasing the efficiency, reducing CO_2 and noise emissions.

Pegasus Airlines does not have an environmental pillar score. ESG score is only available for the year 2014, i.e. 30.83. The CSR score was 6.25 in the same year. Thus, it is quite hard to make extensive comparison in ESG scores between two companies

due to missing data. Pegasus Airlines should improve its sustainability reporting.

Last but not least, Turkish Airlines follows a consistent and forward-looking strategy in addressing sustainability matters, whereas Pegasus Airlines rarely shares its policies and quantitative metrics. Both airlines are included in the Borsa Istanbul Sustainability Index. This shows their dedications to the sustainability matters. However, it is quite difficult to make a sound comparison between two companies, not only due to their different business models, but also due to limited publicly available information and data for Pegasus Airlines on its strategies, sustainability reports, ESG scores, and other environmental indicators. Thus, Pegasus Airlines should establish an environmental management system focusing on improving its sustainability and disclosing more information on social and environmental performance metrics.

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