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Araştırma Makalesi ● Research Article

Evaluation of the Climate Change Practices of Civil Aviation Authorities in Terms of Governance Principles

Sivil Havacılık Otoritelerinin İklim Değişikliği Uygulamalarının Yönetişim İlkeleri Açısından Değerlendirilmesi

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ÖZ

Havacılık, günümüz toplumu tarafından tercih edilen ve tercih edilirliği artan bir taşımacılık modudur. Havacılığın iklime olan olumsuz etkileri, teknolojinin yardımıyla minimuma indirilmeye çalışılsa da olumsuz etkiler ortadan tamamen kaldırılamamaktadır. Bu sebeple uluslararası aktörler Birleşmiş Milletler İklim Değişikliği Çerçeve Sözleşmesi, Hükûmetler arası İklim Değişikliği Paneli gibi organizasyonlar yürütmekte, Uluslararası Sivil Havacılık Teşkilatı, Devlet Hava Meydanları İşletmesi, Sivil Havacılık Genel Müdürlüğü ve T.C Ulaştırma ve Altyapı Bakanlığı gibi aktörler sivil havacılık ve iklime yönelik düzenlemeler ve uygulamalar geliştirmektedir. Tüm bu aktörler birbiriyle uyum içerisinde ve etkileşim halinde iş birliği yapmaktadırlar. Yüksek etkileşim, uyumlu iletişim, koordinasyon, iş birliği kavramları temelinde gelişen yönetişim kavramı çalışmamızda tanımlanmakta ve iyi demokratik yönetişimin 12 ilkesi açıklanmaktadır. İklim değişikliği konusunda sivil havacılık aktörlerinin uygulamaları, yönetişim ilkeleri temelinde incelenmekte ve havacılık sektöründen üst ve orta düzey yöneticiler ile gerçekleştirilen görüşmeler sonucu durum değerlendirilmesi yapılmaktadır.

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ABSTRACT

As a mode of transport, aviation has been increasingly preferred each passing day by today's society. Although the negative impacts of aviation on the climate are tried to be minimized using developing technology, these negative impacts cannot be eliminated entirely. Therefore, international actors carry out organizations such as United Nations Framework Convention on Climate Change (UNFCCC), The Intergovernmental Panel on Climate Change (IPCC). The International Civil Aviation Organization (ICAO), as well as national actors in Türkiye such as the General Directorate of State Airports Authority (DHMI), Directorate General of Civil Aviation (SHGM), and the Ministry of Transport and Infrastructure develop regulations and practices for civil aviation and climate. All these actors cooperate in coordination and interaction with each other. The study defines the concept of governance, which has been developed based on the concepts of high interaction, harmonious communication, coordination, and cooperation, and describes the 12 principles of good democratic governance. The practices of civil aviation actors on climate change are examined based on governance principles, and the current situation is assessed by making interviews with senior and middle-level executives from the aviation industry.

1. Introduction

The aviation industry, which has developed rapidly throughout its history, contributes greatly to the national economy through commercial activities while contributing to national prosperity through its social gains. Since the early days of the development of the industry, the number of passengers receiving air transport services has been increasing exponentially. ICAO data reveal that the number

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of passengers, which was approximately 100 million in the 1950s, reached 1 billion in 1976 and 5 billion in 2010 (Yüksel, 2014: 8). Increasing aviation operations cause an increase in the size of negative impacts on climate and environment. Increasing negative impacts on the climate create various global concerns; therefore, several actors resort to various practices to eliminate these problems. Thus, the present study examines the governance actors and practices related to climate change in the civil aviation industry. The study, firstly, addresses the concept of governance, which has become popular in a short period and adopted and used by various disciplines such as public administration, international relations, business, economics, and political science. Then, the relationship between aviation and climate change is described, and the practices of aviation authorities are assessed in terms of governance principles.

2. Concept of Governance

In this section, the concept of governance is defined, which is followed by the characteristics of good and bad governance, four dimensions of governance, two types of it including global governance and national governance, the principles of good democratic governance, and environmental governance.

Governance, which has become one of the frequently used concepts with increasing popularity today, can be defined as working together with others. The concept of governance, which is frequently used in various disciplines such as public administration, business, international relations, law, and politics does not have a commonly accepted single definition (Sobacı, 2007: 220). In 1997, in its publication titled "Reconceptualising Governance Discussion Paper 2", the United Nations Development Programme (UNDP) defined governance as "the exercise of political, economic and administrative authority to manage a nation's affairs." Governance includes methods in which public resources are used to manage social problems. These methods protect the rights and interests of citizens. Healthy, good governance finds solutions to social problems effectively and efficiently by using public resources. The characteristics of good governance are based on accountability, transparency, and public participation (UNDP, 1997: 9). In its report titled "Governance and Development" published by the World Bank in 1992, the characteristics of poor governance are listed as follows: arbitrariness in the application of rules and laws; the presence of regulations, laws, rules that prevent the functioning of markets; the misallocation of resources; the presence of non-transparent decision-making mechanisms (World Bank, 1992: 9).

The roots of governance, a process that emerged as a result of the interrelationship of various actors, spread from Northern Europe. This concept, which dates back to the 16th century, was used in France in the 17th century to try to balance the relationship between society and government. Later in England, this concept criticized the current system and opposed the current oppressive and superior parliamentary and cabinet system. The concept of governance, which has been used in Latin America since the 1980s and in Africa since the 1990s, has developed recently (Özer, 2006: 61).

UNDP classifies and defines the following four dimensions of governance: economic dimension, political dimension, administrative dimension, and systemic dimension.

The economic dimension includes decision-making processes that affect the economic activities of the country and its relations with other economies. Economic governance also has an impact on social issues such as equality, poverty, and well-being.

The political dimension includes the legislative, executive, and judicial bodies, the decision-making and policy implementation of the state, and the free election of the representatives of the citizens.

The administrative dimension covers an efficient, independent, accountable, and open policy implementation system.

The systemic dimension covers the processes and structures that guide political and socioeconomic relations to protect cultural and religious beliefs and values and to provide a better life for all citizens (UNDP, 1997: 10).

2.1. Global Governance and National Governance

Global governance and national governance, which are frequently emphasized governance types in the literature, are explained as follows:

Global governance encompasses international economic and political relations. It is an instrument to find effective solutions to the problems posed by neo-liberal globalization, which aims to minimize the state's intervention in the market. It is the interaction with problems that threaten societies on a global scale. Since the coverage of global governance is very large, it does not deal with problems where only one state can decide on the phenomenon in question. It aims to resolve complex problems that require complex decision-making procedures and high coordination. An effective policy should be developed and implemented to resolve large-scale problems such as humanitarian crises, interstate military crises, economic turmoil, and climate change; then, the results of this policy should be interpreted. Therefore, specialized individuals and various actors are required to ensure all these. Former Secretary General of the United Nations (UN) Kofi Annan emphasized that a state cannot protect itself against problems and threats alone no matter how powerful it is and that all these problems and threats are common and interdependent.

The actors of global governance are states, international organizations, non-governmental organizations, groups, and multinational companies. Governance actors that strive for the protection of peace, security, justice, and human rights

cooperate with each other while dealing with current problems on a global scale. Existing global governance regulations do not include strict rules, but more flexible approaches. They are based on volunteerism and prefer joint action over individual actions (Jang, McSparren, Rashchupkina, 2016).

National Governance, on the other hand, can be defined as a political system that adopts the principle of separation of powers, takes decisions in favor of each individual in the society by focusing on them, and acts benefiting from an accountable, transparent, effective, and efficient public administration. It is a flexible structure formed by various actors from the private sector and non-governmental organizations. The role of national governance is not to offer public services, but to direct the services produced (Bıçkı and Sobacı, 2011: 221). National governance aims to achieve and maintain the development and environmental goals while following certain principles in doing so. However, national governance is not expected to do everything; its main tasks are to promote and facilitate sustainable development activities. Agenda 21, the declaration of the World Summit on Sustainable Development held in Rio de Janeiro, Brazil in 1992, recommends that national governance ensure socially responsible economic development while protecting resources and the environment for the benefit of future generations (Dernbach, 1998: 35-36). National governance is used in four ways. The first represents governance as a general category, which is synonymous with the concept of the political system or state structure. It includes an analysis of the governmental systems i.e. presidential system, parliamentary system, democratic and non-democratic systems, and federal and central systems. The second use is related to public administration. It is about the distribution of political authority from national administrative institutions to local councils, communities, and cities. The third use is related to the governance of certain industries such as education, health, transport, and the environment. The last way of use is related to the analysis of corporate governance (Krahmann, 2003: 325).

2.2. Principles of Good Democratic Governance

In this section, the 12 principles of good democratic governance are explained by using the White Paper, which was published by the European Union in 2001, and the strategies and principles adopted by the Committee of Ministers of the Council of Europe in 2008. The 12 principles of good democratic governance include core values that define a common vision of democratic governance. The 12 principles addressed below are as follows: (1) Participation, Representation, Fair Conduct of Elections, (2) Responsiveness (3) Efficiency and Effectiveness, (4) Openness and Transparency, (5) Rule of Law, (6) Ethical Conduct, (7) Competence and Capacity, (8) Innovation and Openness to Change, (9) Sustainability and Long-Term Orientation, (10) Sound Financial Management, (11) Human Rights, Cultural Diversity and Social Cohesion, (12) Accountability (Firidin and Uzun, 2018: 183; COE, 2022).

2.2.1. Principle of Participation, Representation, Fair Conduct of Elections

It refers to allowing the participation of the public at all stages of the process starting from the preparation of the policies to their implementation. The public has a say in decision-making processes. Decisions are taken in accordance with the wishes and needs of the majority, while those outside the majority are respected in all cases (Okçu, 2007: 304).

2.2.2. Principle of Responsiveness

It refers to the implementation of procedures and rules that can respond to the requests and needs of citizens. Also, in case of complaints, the applications are responded to (COE, 2022).

2.2.3. Principle of Efficiency and Effectiveness

It refers to making the best use of the resources available. It aims to present appropriate policies to citizens in line with clearly defined objectives. Governance will be called good governance when it has a high level of effectiveness and efficiency (Okçu, 2007: 304).

2.2.4. Principle of Openness and Transparency

Decisions are taken and put into effect in accordance with the rules and regulations. Access to the decisions taken and put into effect is always available. The public has access to all information except for the required restrictions. That the language used by the institutions should be clear and understandable by the public will contribute to the increase in trust in these institutions (COE, 2022).

2.2.5. Principle of Rule of Law

Where the rule of law is strong, people support the law not because of fear, but because of the interests, they will gain when the law is effective. All rules to be introduced and all regulations to be made should be objective and in accordance with the law (Johnston, 2006: 3).

2.2.6. Principle of Ethical Conduct

These principles should be observed to ensure that the decisions taken and the policies made are more beneficial for society. If individual interests are ahead of public interests, the process of good governance will be shaken (Firidin and Uzun, 2018: 188).

2.2.7. Principle of Competence and Capacity

Governance actors should maintain and strengthen their professional skills to keep the effectiveness of their outputs at an ideal level. As a result of motivating these actors with

appropriate methods and procedures, these actors are expected to improve their performance (COE, 2022).

2.2.8. Principle of Innovation and Openness to Change

Actors should be open to new situations, experiences, and programs when responding to problems and searching for solutions. They should approach change positively (COE, 2022).

2.2.9. Principle of Sustainability and Long-Term Orientation

Sustainability refers to the ability of people to leave at least as many of the possibilities that we have today to future generations while maintaining their lives and meeting their own demands and needs. This definition reveals that the concept of sustainability has a long-term aspect. Current policies and decisions should not ignore the future generation in terms of their environmental, economic, and social dimensions (COE, 2022).

2.2.10. Principle of Sound Financial Management

Sound financial management ensures the development of regulations, rules, and laws in a sustainable, effective, efficient, and clear manner to achieve the mission of the state and to provide liquidity through the existing resources of the public (Şahin, 2021: 1731).

2.2.11. Principle of Human Rights, Cultural Diversity and Social Cohesion

Human rights always come first. It is respected, protected, and maintained. Discrimination is fought under all circumstances. In particular, disadvantaged community groups have access to basic services. Existing access is maintained (COE, 2022).

2.2.12. Principle of Accountability

Accountability refers to answering the questions and providing the answers. Decision-makers take responsibility for all decisions they make (Kaler, 2002: 328).

Today, businesses are under increasing pressure to be more responsible to society and the environment. Stakeholders such as customers, goods and service providers, and employees of the business, as well as the social communities, want to access both financial and non-financial information. Large-scale global crises, volatile demands, and unpredictable market conditions lead businesses to make sustainable decisions. Accordingly, new business models such as ESG (Environmental, Social, and Corporate Governance) come to the fore. Environmental, social, and corporate governance practices are important for a sustainable environment and corporate social responsibility (Köse, 2021: 465). In the present study, governance is associated with climate, one of the environmental actors.

2.3. Environmental Governance

Industrialization, increasing construction, the desire of countries to grow, etc. have been increasing the damage to natural resources and the environment each passing day. It is known that the damage does not only affect the region where it occurs but its impact spreads to a very large area and has global consequences. A global effort and cooperation are required to reduce the negative impacts of these global consequences. All of the efforts put forward by the administration are called environmental governance (Bal, Algan and Özdemir, 2015: 180). Various actors such as the private sector, governments, international organizations, and non-governmental organizations have been collaborating after joint efforts such as Rio Conference or Kyoto Protocol, which are considered milestones. Environmental governance is also defined as the interaction between formal and informal institutions and actors related to environmental issues, and it includes organizations, regulations, legal rules, policy and financial instruments, state, and public institutions. Nation-states, international organizations such as the United Nations, the World Bank, and the World Trade Organization, multinational corporations, intergovernmental institutions, the private sector, and non-governmental organizations are the Interacting actors.

Global environmental governance offers more comprehensive and alternative solutions regarding methods that are not sufficient at the national level. Good global environmental governance can find effective responses to environmental problems (Sipahi, 2010: 337- 340). Global collaborations are critical in terms of identifying environmental problems and developing solutions, and they allow preparing documents and conducting studies and agreements related to the protection of the environment, which is the priority of international environmental law (Sevük, Azarkan, Erdem and Çelik, 2020: 97).

3. Civil Aviation and Climate Change

The aviation industry has a wide range of stakeholders and activities. The time advantage of air transport helps to manage time effectively, which is one of the most valuable resources of individuals today and makes it preferable. Aviation has become the most prestigious and innovative industry in the world since 1945, and the increasing air traffic has been increasing the size of the environmental impacts, especially the environmental impacts of airlines and airports.

The civil aviation industry is an important sector that causes climate change and the amount of emissions is comparable to large countries. Therefore, national and international government bodies take measures regarding the impact of civil aviation on the climate. Possible actions that can reduce the negative impacts of civil aviation on climate change are

Efficient Operations, Efficient Technologies, Renewable Fuels, Demand Reduction. The international character of civil aviation creates some challenges for governance. It is clear that since the legal authority of the governments is valid within their own national borders, they can force interventions about the emissions of other nation states outside their borders. Emissions from a country will affect the global climate, so no national government can fully solve the climate problem alone (Vandenbergh and Metzger, 2018).

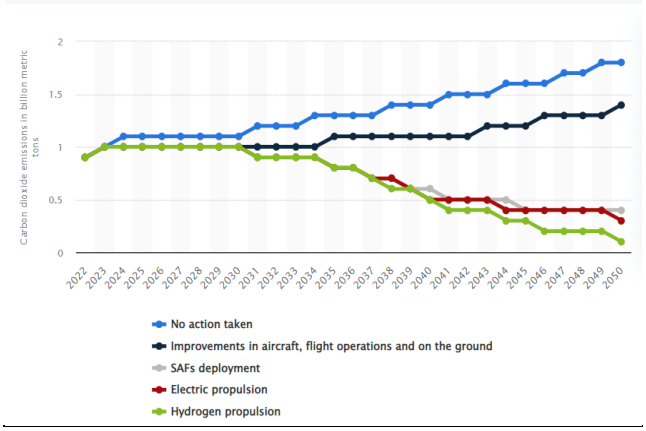
In general, civil aviation has negative environmental impacts on noise, water and air pollution, solid waste, land use, and wildlife. Civil aviation stakeholders try to balance their environmental impacts by using sustainable technologies such as fuel-efficient engines and quieter aircraft designs, as well as their economic and social contributions (HAD/T-11, 2010: 3).

Climate change is one of the most significant global crises today. It is of great importance for both the world and the aviation industry. Climate change causes global warming more than the current situation and deteriorates the ecological balance with the increase in the concentrations of greenhouse gases in the atmosphere. Moreover, it leads to several meteorological events that significantly affect life such as extreme temperatures, excessive rainfall, and excessive drought. Environmental pollution, air pollution, deforestation, increasing population, increasing energy consumption, and global warming can be listed as the main causes of climate change. Since the beginning of the Industrial Revolution after the 1750s, the damage to the environment by people has been increasing rapidly. Similar to the case in other industries, the emission of greenhouse gases (CO2, CFC, CH4, NOx, etc.) due to the operational activities of the aviation sector increases the negative impacts of climate change; however, the share of the aviation industry in the global carbon emission is only 2-3% (Preston and Lengel, 2021: 33). The share of the aviation sector in the carbon emission of the global transportation industry is 12%. The 2020 data reveal that the emission created by international aviation has increased by about 70% compared to 2005; moreover, ICAO estimates that this will increase by a range between 300% and 700% in 2050 (Akdemir, 2020: 6).

According to the Global Carbon Atlas, the United States (US), Russia, and China were the top three countries with the highest carbon footprint in 1990, while Türkiye, Indonesia, and Argentina were the last three countries. In 2018, it was concluded that a 2.5-fold increase was observed in the carbon footprint of Türkiye (Kılıç, Dönmez and Adalı, 2021: 946). According to the 2020 Global Carbon Atlas data, Türkiye ranks 14th in terms of carbon footprint (GCA, 2020). According to the 'Greenhouse Gas Emission Statistics, 1990-2020' data set, which is published by TURKSTAT in 2022 and shows the greenhouse gas emissions by the industries, the power industry has the highest share in the emission with 70.2%, the agricultural industry comes second with 14%, industrial processes and product use comes third with 12.7%, while the waste industry ranks last with 3.1% (TURKSTAT, 2022).

The greenhouse gas emission report prepared by TURKSTAT in 2017 reveals that the road transport sector accounts for 78,706 kilotons of total CO2 emissions from transport sectors (84,659 kilotons) while the aviation sector accounts for only 3,838 kilotons. Aviation is followed by maritime transport with 944 kilotons and other transports with 758 kilotons. With 413 kilotons, railway transport produces the least CO2 emissions. While the road transport sector accounts for 93% of the CO2 emissions produced by the whole transport industry, the air transport sector accounts for only 4.5% (ÇSB, 2017). Comparing the emissions of the transport modes, aviation produces relatively less emission. However, the increase in the volume of air traffic each passing day and the thought that this increase will continue made all aviation stakeholders focus on the concept of sustainability.

Figure 1: Projected CO2 Emissions from The Aviation Industry Between 2022-2050, By Scenario



Source: Statista (2022)

Figure 1 presents the estimates of CO2 emissions from the aviation industry between 2022 and 2050. The graph shows the amount of emissions if no action is taken, the amount of emissions if there are improvements in aircraft, flight and ground operations, the amount of emissions if SAF technology and electricity or hydrogen operation becomes widespread. It is seen that the amount of CO2 released increases gradually when no action is taken. Considering the increasing CO2 emissions, it is essential to take the relevant measures.

In 2021 Aviation Climate Action Plan of United States, it is stated that various policies will be implemented at the level of airlines, airports, manufacturers, passengers and government to achieve climate-related targets. Emissions are expected to be reduced by supporting international initiatives such as the introduction of new and more efficient aircraft into the fleets of airlines, the development of more efficient aircraft and engine technologies, the production of Sustainable Aviation Fuels, and the Carbon Offset and

Reduction Plan for International Aviation (CORSIA). Recognizing that decarbonizing the aviation industry is not easy, reaching net zero emissions by the U.S. aviation industry by 2050 will depend on a number of factors such as the growth rate of the industry and the amount of sustainable aviation fuel use. The US target of net zero emissions by 2050 is supported by the Federal Aviation Administration.

In United States Aviation Climate Action Plan, there are eight different headline such as Aircraft and Engine Technology Development, Operational Improvements, Sustainable Aviation Fuels, International Leadership and Initiatives, Airport Initiatives, FAA Leadership on Climate, Sustainability, and Resilience, Non-CO2 Impacts of Aviation on Climate and Policies and Measures to Close the Gap (FAA, 2021).

In UK, the Climate Change Act of 2008 encouraged the writing of reports explaining how to assess the risks and opportunities arising from changing climate conditions. The law, which should be taken into account by sectors particularly affected by climate change, coordinates government adaptation efforts through the National Adaptation Program (NAP). The Civil Aviation Authority (CAA) is the UK's specialist aviation regulator. Aviation plays a critical role in the UK's economic and social structure.The government requests reporting organizations to voluntarily update their climate change adaptation reports.

The aviation industry aims to reduce the negative impacts on the climate by researching cleaner and more environmentally friendly fuel types, applying cleaner operational procedures, developing more efficient, less noise and emission-producing engine technology. Institutions aim to make aviation operations that cause climate change more sustainable (CAA, 2015).

4. Climate Change Studies of the Civil Aviation Authorities

While the global governance of aviation and climate change is carried out by regulating international authorities such as the International Civil Aviation Organization (ICAO), Airports Council International (ACI), and the International Air Transport Association (IATA), which take and implement relevant decisions, and national governance is carried out by national authorities implementing the requirements such as General Directorate of State Airports Authority (DHMI), Directorate General of Civil Aviation (SHGM), and the Ministry of Transport and Infrastructure in Türkiye. This section provides information about these authorities and describes their practices.

4.1. International Civil Aviation Organization (ICAO)

The Chicago Convention, which was adopted on 7 December 1944 and entered into force on 4 April 1947, constitutes the international framework of international air transport. The Chicago Convention established ICAO as well as establishing basic rules to promote the safe and regular development of aviation. Today, 191 states have signed the Chicago Convention, therefore they have been members of the ICAO. With the adoption of the Standards and Recommended Practices (SARP), this specialized United Nations organization has as taken an active role in laying foundations for ensuring the transformation of international civil aviation from dangerous beginnings to the safest mode of transport. Today, ICAO is observed to be much more engaged in environmental issues than before and allocates significantly more financial resources for these issues (Piera, 2016: 2).

ICAO works on climate mitigation, establishes policies, develops and updates Standards and Recommended Practices (SARPs) and provides guidance documents. While continuing its activities, ICAO also cooperates with United Nations bodies and other international organizations. In order to achieve the global targets set and to make international aviation sustainable, ICAO takes various actions such as improvements in aircraft technology, operational improvements, sustainable aviation fuel technology and CORSIA (ICAO Environment, 2022).

Although ICAO has been discussing environmental protection regarding aviation since the 1970s, climate change issues are relatively new.

(i). The Kyoto Protocol and the United Nations Convention on Climate Change have been signed. Since the Kyoto Protocol assigned the task of managing greenhouse gas emissions from international aviation to the International Civil Aviation Organization (ICAO), the organization has been at the heart of the process. Because aviation is part of human-induced climate change, an intergovernmental framework addressing climate change includes aviation-related provisions. The United Nations Framework Convention on Climate Change (UNFCCC) addresses the transport industry's impact on climate change. On the other hand, the Kyoto Protocol is certainly more related to the climate impact of aviation. Article 2(2) of the Kyoto Protocol gives a clear mandate to ICAO. In Europe, the question of how to handle the impact of aviation on climate has been on the agenda since 1999. In 2001, the Sixth Community Environment Action Programme outlined the European Union's possibility of reducing greenhouse gas emissions from aviation in case the International Civil Aviation Organization (ICAO) would achieve no progress or concrete results (Petersen, 2008: 197).

(ii). Committees on noise pollution and emissions were established to raise awareness, and then these committees were gathered under a single roof. On 5 December 1983, ICAO merged the Committee on Aircraft Noise (CAN) and the Committee on Aircraft Engine Emissions (CAEE) and thus established the Committee on International Aviation Environmental

Protection (CAEP), an interdisciplinary body of experts to formulate recommendations on issues involving the technical, economic, social, and political aspects of the aviation and the environment. After the United Nations Conference on Environment and Development was concluded in 1992, the CAEP's work plan was expanded to include climate change issues related to aviation.

(iii). Policies to reduce greenhouse gas emissions from civil aviation were determined. ICAO has an impressive history of aviation and climate change issues, either directly or indirectly. In 1998, less than a year after the recognition of the Kyoto Protocol, ICAO was assigned to study policy options to limit or reduce greenhouse gas emissions from civil aviation by considering the special report of the Intergovernmental Panel on Climate Change (IPCC) and the requirements of the Kyoto Protocol. Then, CAEP established a work group to study policy options such as costs, fuel taxes, carbon offsetting and reduction schemes, and emissions trading. Three years later, ICAO raised CAEP's recommendation that the emissions trading system is "a cost-effective measure to limit or reduce greenhouse gas emissions from international civil aviation". Although the relevant system could not be adopted in those days, the states voluntarily took measures to reduce the carbon footprint of the aviation sector, and ICAO carried out the task of developing guidance for states. In 2004, it was approved to further develop an open emissions trading system; thus, ICAO continued its feasibility studies. It also established a work group of legal experts to examine the legality of emission-related taxes and greenhouse gas charges. According to CAEP reports, ICAO follows three main standards in establishing a CO2 standard. The first standard provides additional incentives to improve aircraft fuel efficiency and performance. The second standard measures the performance of fuel efficiency in various aircraft types. And finally, ICAO minimizes inefficient incentives. In early 2013, CAEP decided on a common measure for standards (Piera, 2016:13-18).

(iv). In 2016, ICAO established the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) to help reduce greenhouse gas emissions. Global standards for the implementation of the scheme were adopted in 2018. The adopted standards have become effective in all ICAO member countries since 2019. CORSIA is applied on international flights taking place along the lines between the contracting countries. Accordingly, since 2020, it has been aimed to contribute to carbon neutral growth including the emissions from international aviation among the countries willing to participate. The scheme, which covers the period between 2021-2035, is divided into three phases. While the first phase is the pilot study where participation is voluntary (2021-2023), the second phase is the first stage where participation is also voluntary (2024-2027), and the third phase is the second stage where participation is compulsory (2027-2035) (Akdemir, 2020: 9).

4.2. International Airports Council (ACI)

The International Airports Council represents the common interests of airports worldwide in the aviation industry. ACI carries out this by developing policies, programs, and practices for developing international airport standards together with governments, regional ACI members, experts, and international organizations such as ICAO. It contributes to the safety, security, and sustainability of the global aviation industry. The goals of ACI are to support airports to ensure safe, secure air transportation, to encourage cooperation between airports, governments, industry stakeholders, and international organizations, to maximize cooperation and assistance between airports, and to increase public awareness of the social and economic significance of airports (ACI, 2022).

ACI is aware that climate change is a global problem that requires worldwide cooperation and action; therefore, including the issues of climate change, adaptation, and resilience in the airport improvement plans is always on the agenda of general assembly meetings.

(i). Member states support the recovery of airports by providing policies, investments, and incentives to make the civil aviation industry carbon-neutral and more resilient.

(ii). It focuses on a long-term carbon-neutral goal for 2050.

(iii). ACI recommends its members consider multiple solutions for decarbonization and the gradual transition to net zero carbon emissions in the long term and continue to carry out risk assessments as an integral part of main planning (ACIPress, 2020).

(iv). Climate change is a global problem that requires an urgent global response according to the call of the Intergovernmental Panel on Climate Change (IPCC) to achieve net zero carbon emissions by 2050. This long-term carbon target of ACI is related to carbon emissions under the direct control of airport operators, and the contribution of the aviation industry to this global effort will be significant.

With the combination of new technologies, more efficient operations, and infrastructure improvements, more than ten billion tons of CO2 emissions have been prevented by the civil aviation industry since 1990. ACI builds its decarbonization efforts based on these improvements. However, airports should not make this effort alone. In order to achieve this ambitious goal, it should collaborate with all aviation stakeholders, consider the environmental impacts

of aviation activities in the long term, and cooperate with governments and key stakeholders to minimize and reduce these impacts. ACI does not ignore that each airport, country, and region has different conditions. With its long-term carbon target, ACI aims that all airports with the support of local governments adopt the net zero carbon emissions target by 2050, in accordance with their local conditions. During the ACI EUROPE Sustainability Aviation Summit, ACI stated that 235 airports in the region had committed to achieving the net zero carbon emissions target by 2050 while 91 airports had aimed to achieve the net zero carbon emissions target by 2030 (Pressreleases, 2021).

4.3. International Air Transport Association (IATA)

The International Air Transport Association (IATA) is the trade union of the airlines in the world, representing almost 290 airlines and 83% of total air traffic. IATA supports several aviation activities and is involved in the formulation of industrial policies. It helps airlines to operate safely, securely, efficiently, and economically within the framework of clearly defined rules and provides professional support to all industry stakeholders (IATA About Us, 2022).

(i). The IATA member airlines adopted the resolution of committing to achieve net zero carbon emissions from their operations by 2050. This commitment aligns the air transport industry with the Paris Agreement, which limits global warming to 1.5°C.

(ii). Achieving net zero carbon emissions by 2050 will require the elimination of the emissions at source and a combination of carbon-balancing technologies. This combination consists of Sustainable Aviation Fuel (SAF) by 65%, the use of new technologies, electricity, and hydrogen by 13%, infrastructure and operational efficiency by 3%, and carbon balancing by 19% (IATA Environment, 2022).

(iii). SAF is a liquid fuel used in commercial aviation that can reduce CO2 emissions by up to 80%. It can be produced from a number of raw materials such as solid oils, waste oils, and green wastes. While fossil fuels contribute to the overall CO2 level by releasing carbon, SAF recycles CO2 absorbed by the biomass used in the raw material throughout its lifetime. It is estimated that SAF can contribute to almost 65% of the emission reduction that the aviation industry is required to achieve its net zero carbon emissions by 2050.

(iv). In 2008, Virgin Atlantic conducted the first test flight using biofuel. Between 2011 and 2015, 22 airlines operated more than 2,500 commercial passenger flights using up to 50% biofuel blends of raw materials including waste cooking oils and algae. In 2016, sustainable fuel supply through the hydrant system was started at Oslo Airport. At the 73rd IATA General Assembly in Cancun in 2017, IATA members unanimously adopted the resolution on the use of SAF, including a commitment to use fuels that preserve the ecological balance and prevent the depletion of natural resources. By 2022, commercial flights surpassed 450,000, and more than 50 airlines have been using SAF.

The role of governments is to develop policies for efficiently accelerating the commercial production and distribution of SAF. Positive incentives will be the most effective policy tool in this process. Governments should adopt globally accepted sustainability standards, strive for harmonizing standards, include the aviation industry in the existing policies and incentives designed for road transport, and implement higher incentives for aviation (SAF, 2022).

4.4. General Directorate of State Airports Authority (DHMI)

DHMI is responsible for operating airports, providing and operating air traffic control and navigation services in Türkiye. In Türkiye, while DHMI operates some airports itself, it leases the land side of other airports covering terminals, parking areas, etc. to private enterprises through the build-operate-transfer (BOT) model (Kiracı, Battal and Kayhan, 2014: 132). The main purpose of DHMI is to adopt an environmentally sustainable and environmentally friendly airport approach as per the environmental policy while keeping the safety of the activities and flights at the airports at the highest level. Leaving a more livable environment for future generations and realizing this by using technology constitute the basis of environmental policy. DHMI strives for creating passenger- and environmentally-friendly airports and sustainable living spaces and compliance with the fight against climate change. Reducing the consumption of resources and energy are among the primary objectives of DHMI. Thanks to the measures taken against climate change and global warming, 12 airports were granted Level 1 certifications by the Airport Council International (ACI) as part of the Airport Carbon Accreditation (ACA) Program. “Preparation of Climate Change Strategies Project” is carried out by DHMI in collaboration with TÜBİTAK-MAM (the Marmara Research Center of the Scientific and Technological Research Council of Türkiye) to detect the carbon emissions at Gaziantep, Erzurum, Ordu-Giresun, and Milas-Bodrum Airports, to determine the impacts of climate change on these regions and the areas to be affected, and to mitigate these impacts The requirements are met at all airports in accordance with the Zero Waste Regulation published by the Ministry of Environment, Urbanization and Climate Change (DHMI, 2021: 28).

4.5. Directorate General of Civil Aviation (SHGM)

In 1933, the State Airlines Operations Authority was founded under the Ministry of National Defense, and it was assigned to establish a civil airline in the country. In 1954,

State Airlines Operations Authority was affiliated with the Ministry of Transport, and it was renamed the Civil Aviation Department. In 1987, it was renamed the Directorate General of Civil Aviation, which is currently in use. This institution, which is financially autonomous, strives to maintain the safety and security of Turkish civil aviation in accordance with certain standards (SHGM, 2022a).

SHGM is aware of the problems related to environmental issues, energy, and climate change. It implements sustainable aviation policies using environmentally friendly, carbon neutral, growth-oriented, renewable energy types. SHGM carries out Climate Change Adaptation Legislation studies for national civil aviation (SHGM Activity Report, 2021: 7). The Directorate General of Civil Aviation is the authorized body for the execution of CORSIA in Turkiye. The Implementation Instructions of Carbon Offsetting and Reduction Scheme for International Aviation (SHT-CORSIA), which contains the procedures and principles for monitoring CO2 emissions and keeping the required reports, has been published by SHGM. The Environment Unit of SHGM has been collecting data using ICAO Forms and Emission Monitoring Forms since 2014. These data include the tail numbers, flight times, and CO2 emissions of all airline flights. Automatic statistical reports have been generated using the Data Management System since 2022 (SHGM, 2022b).

4.6. Republic of Türkiye Ministry of Transport and Infrastructure

Acting with the mission of providing balanced, accessible, economical, and secure services in transport, maritime, communication, space, and information technologies, improving the quality of life of the society, and contributing to the development of the country, the Ministry of Transport and Infrastructure develop policies in accordance with the legislation of civil aviation. It takes into account the 2030 Agenda of the United Nations (UN), the Paris Agreement on Climate Change, and the EU (European Union) Green Deal in its investment plans. The Ministry has been granting a Green Airport Certificate to airports that meet the relevant criteria since 2009. Accredited airports are included in the Airport Carbon Accreditation (ACA) Program run by ACI. The airports use solar power to minimize the need for electrical energy. Moreover, Türkiye participated in the CORSIA program, which has been developed by the International Civil Aviation Organization, as a volunteer country. The Ministry has been carrying out various studies to minimize carbon emissions from transport (UAB, 2021).

5. Evaluation of the Climate Change Practices of Civil Aviation Authorities in Terms of Governance Principles

The present study was carried out by matching the environmental and governance factors of ESG, one of the new business modeling techniques. Sustainability reports, bulletins, current web pages of aviation authorities, and international and national publications published on aviation and sustainability were used in the study. Although there are numerous publications on aviation and sustainability, the relationship between climate change and governance has rarely been established. Climate change studies have been usually associated with studies and measurements of technical disciplines. The operational activities of the implementing organizations on climate change have not been assessed in terms of governance principles. In the international literature, there are few studies on governance principles and sustainability or climate change. In order to reveal the originality of the study, the studies, which were accessed as a result of the literature review, are listed as follows: Demirci (2015) examined the roles of local governments on climate change in urban areas, which are the source of greenhouse gas emissions, considering the framework of governance theory. Özer (2017) analyzed the actors of climate change governance in Türkiye, making an assessment of the global governance dimension. Ocaklı (2021) addressed international climate change policies and assessed developments in Türkiye considering the governance actors. In these studies, sector matching was not made, and sector-specific results were not studied. Governance provides a concrete organizational perspective to the sustainability goals of climate studies. It evaluates using a conceptual framework, provides a systematic approach, and shows the effectiveness of actors in terms of their importance to stakeholders.

The present study was carried out using qualitative methods. Documents were analyzed, and interviews were conducted during the study. First of all, the reports of the aviation authorities were examined and the actions and measures they took, and their practices and recommendations were listed. The study aims to evaluate the practices offered by the aviation authorities considering governance principles in terms of the extent of their contributions to the aviation industry and their feasibility. In the study, the opinions of the professionals from the aviation industry i.e. those employed at airlines, airport operators, and DHMI, were received. A total of ten senior and middle-level executives were interviewed. Each manager was asked to rate the recommendations of the aviation authorities on a scale of 10 considering the governance principles. This evaluation, which was transformed into a table, was interpreted at the end of the study.

Table 1: List of Civil Aviation Authorities' Solution Proposals on Climate Change

Conventions on Greenhouse Gas Emissions Reduction
CORSIA Program*
2050 Net Zero Carbon Emission Target*
SAF- Biofuel Usage
Airport Carbon Accreditation (ACA) Program*

* The practice is mentioned by several organizations.
Source: The table was developed by the researchers.

The proposals with an asterisk (*) are mentioned by more than one authority, institution, or organization.

The opinions and recommendations of authorities such as ICAO, ACI, IATA, DHMI, SHGM, and Ministry of Transport and Infrastructure presented in Table 1 are listed below.

Table 2: Matrix Evaluation of the Climate Change Studies of Civil Aviation Authorities in Terms of Governance Principles

Recommendations/ Governance Principles	Conventions on Greenhouse Gas Emissions Reduction	CORSIA Program	2050 Net Zero Carbon Emission Target	SAF-Biofuel Usage	Airport Carbon Accreditation (ACA) Program	Total
Participation, Representation, Fair Conduct of Elections	7.5	6.3	7.3	6.9	7.2	35.2
Responsiveness	8.5	8.3	8.3	8.1	7.8	41.0
Efficiency and Effectiveness	7.9	7.3	5.8	5.3	5.9	32.2
Openness and Transparency	8.4	6.5	5.8	7.3	7.3	35.3
Rule of Law	9.2	3.1	8.1	2.3	7.7	30.4
Ethical Conduct	9.4	9.6	9.4	9.6	9.3	47.3
Competence and Capacity	9.6	9.6	9.6	8.4	8.6	45.8
Innovation and Openness to Change	7.1	7.3	7.0	9.5	6.8	37.7
Sustainability and Long-Term Orientation	7.1	7.4	7.4	8.6	7.1	37.6
Sound Financial Management	7.8	7.2	6.8	2.9	5.7	30.4
Human Rights, Cultural Diversity and Social Cohesion	9.0	8.0	7.8	7.6	7.3	39.7
Accountability	9.5	7.1	6.5	5.3	6.8	35.2
Total	101.0	87.7	89.8	81.8	87.5	

Source: The table was developed by the researchers.

Table 2 presents the average scores given during the interviews held with 10 senior and middle-level executives from the civil aviation industry about the evaluation of climate change studies in terms of governance principles. According to the data obtained, there are not very large gaps between the average scores, but there are some differences between the recommendations.

Aviation industry professionals were asked to evaluate the Conventions on Greenhouse Gas Emission Reduction in terms of governance principles, and they gave high scores to principles such as Competence and Capacity, Accountability, Ethical Conduct, Rule of Law, Human Rights, Cultural Diversity and Social Cohesion in the descending order. Considering that they are international conventions signed between countries and governments and guaranteed to be put into effect, that these principles are given high scores is an expected result.

According to the evaluations made for the CORSIA Program, the principles of Competence and Capacity and Ethical Conduct had the highest scores. The fact that the authority carrying out the program is ICAO explains that these two principles have the highest scores. The reason for the principle of rule of law to have the lowest score (3.1) is that the program is still in the voluntary phase and the compulsory phase has not been started yet.

Considering the evaluations about the 2050 Net Zero Carbon Emission Goal, the principles of Competence and Capacity and Ethical Conduct have the highest scores. The international recognition and capacity of the authority and other actors carrying out the target are thought to get these results. The two principles with the lowest scores compared to other principles were Efficiency and Effectiveness, and Openness and Transparency. Regardless of the position of the executives, whether they are employed in the private sector or in a public institution, airline, or airport operator, it has been determined that the said goal is not considered achievable.

Considering the SAF-Biofuel Use, the governance principles of Ethical Conduct, Innovation and Openness to Change, Sustainability and Long-Term Orientation got the highest scores. SAF, which allows a great variety in fuel resources due to its technology, and its use is important in terms of sustainability and change management. The fact that it gets a low score (2.9) in terms of the principle of Sound Financial Management is due to its high costs required for infrastructure, storage, and transfer. Alternative facilities are needed at airports for using SAF in flight operations. All of these facilities require additional investments. The reason why the principle of the Rule of Law is given a low score is that its use is optional and it does not have any legal sanctions as a result of not using it.

Considering the evaluation of the Airport Carbon Accreditation (ACA) Program in terms of governance principles, the principle of Ethical Conduct has the highest score. The average scores of all other principles were found to be similar, and they were scored approximately 7.

6. Conclusion and Suggestions

While greenhouse gas impacts, carbon footprint, climate change, energy, air and water pollution, and biodiversity are listed as the ESG criteria regarding the environmental component, the criteria regarding the social component can be listed as human rights, public relations, customer satisfaction, and investments in social projects. Corporate

criteria include business ethics, board activities, transparency, financial policy, and investments (Sarkar, 2022).

Failure to comply with ESG criteria for businesses becomes more dangerous and risky day by day. Failure to reduce carbon emissions at the desired rate globally leads to major crises such as climate change. Therefore, it is estimated that the pressure on businesses to comply with the ESG criteria will increase. Since there is no mandatory regulation on compliance with ESG criteria, developing countries primarily try to be financially strong due to the economic turmoil they experience; on the other hand, ESG is a priority concept in developed countries. Businesses that want to maintain their market share and satisfy all other stakeholders, especially their customers, are sensitive to complying with the ESG criteria. The biggest factor that will challenge businesses in terms of compliance is the challenge of accessing financial resources (Mezzio, Kenner, Veltmann, Morejon, 2022).

The civil aviation industry should strive to ensure good and democratic governance principles on climate change. In the present study, the measures taken and the practices carried out by the civil aviation authorities were evaluated in terms of 12 principles (participation, representation, fair conduct of elections; responsiveness; efficiency and effectiveness; openness and transparency; rule of law; ethical conduct; competence and capacity; innovation and openness to change; sustainability and long-term orientation; sound financial management; human rights, cultural diversity and social cohesion; accountability) according to the interviews with industry professionals, and Table 3 and Table 4 were obtained.

The following matrix was obtained according to the result of the interviews.

Table 3: Total Scores of Evaluation of Climate Change Studies of Civil Aviation Authorities in Terms of Governance Principles

Recommendations	Total Score
Conventions on Greenhouse Gas Emissions Reduction	101.0
CORSIA Program	87.7
2050 Net Zero Carbon Emission Target	89.8
SAF- Biofuel Usage	81.8
Airport Carbon Accreditation (ACA) Program	87.5

Source: The table was developed by the researchers.

According to the matrix in Table 3, the highest score in terms of governance principles is the Conventions on Greenhouse Gas Emissions Reduction (101). It is followed by the 2050 Net Zero Carbon Emission Goal (89.8), CORSIA Program (87.7), and the Airport Carbon Accreditation (ACA) Program (87.5). SAF-Biofuel Use has the lowest score (81.8). The differences between the average score of Conventions on Greenhouse Gas Emissions Reduction and those of other recommendations are about 14 points. There was no significant difference between the scores of other recommendations. The fact that the decisions and practices are close to each other and in line with the common goal has been effective in obtaining this result. A significant majority evaluated that the recommendations were close to each other considering the principles.

While the Conventions on Greenhouse Gas Emission Reduction were similarly focused on by the participants regardless of their position and organization, SAF-Biofuel Use was relatively more focused on by airline executives, and Airport Carbon Accreditation (ACA) Program was relatively more focused on by the executives of the airport operators.

Table 4: Total Scores of the 12 Principles Evaluated According to the Interviews

The 12 Principles of Good and Democratic Governance	Total Score
Representation, Fair Conduct of Elections	35.2
Responsiveness	41.0
Efficiency and Effectiveness	32.2
Openness and Transparency	35.3
Rule of Law	30.4
Ethical Conduct	47.3
Competence and Capacity	45.8
Innovation and Openness to Change	37.7
Sustainability and Long-Term Orientation	37.6
Sound Financial Management	30.4
Human Rights, Cultural Diversity and Social Cohesion	39.7
Accountability	35.2

Source: The table was developed by the researchers.

Table 4 presents the average scores given for the principles. While the principle of ethical conduct has the highest score (47.3), the principle of competence and capacity comes second (45.8), and the principle of responsiveness comes third (41). No differentiation was observed in terms of these principles considering the scores given by participants, and they gave similarly high scores to the principles regardless of their position either being the owner or the manager.

The principle of sound financial management has the lowest score (30.4). The fact that these recommendations generally require investments or include high-cost processes caused this relatively low average score. For example, the 2021 Biofuel Report Summary of the Turkish National Committee of the World Energy Council states that the share of biofuel remains low in terms of their commercial volume which corresponds to 1% of all fuel used in aviation, and that these are due to the high cost of biofuel and the slow development of this technology (World Energy Council, 2021). Wouter van Wersch, the President of the Airbus Europe Region and Sales, emphasizes that the inadequacy of biofuel supply and its almost five-fold cost compared to jet fuel are significant obstacles in preventing carbon emissions from fuel (Airport Haber, 2022). Considering the principle of sound financial management, the results of the interviews revealed that the managers employed in the private sector remained more reserved compared to the managers employed in public institutions.

The study reveals that measures and practices requiring new

technologies require an entire change for the whole system (air and land side of airports and aircraft). Since the required change will affect all aviation operations, it brings along large investment costs. Since the output of one of these operations constitutes the input of another, the domino effect is felt in the change process.

In order to reduce the negative impacts of civil aviation on climate change, there are many applications such as the use of solar and wind power and electric-powered autonomous ground service vehicles on a global scale. Such practices should be more supported and disseminated. Considering that the impacts of climate change have been felt more and more every day, the importance of all civil aviation authorities and actors meeting on a common ground is increasing.

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