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Soil and Water Pollution Awareness and Fare Purchasing Behaviour of Passengers in Air Carriers

Olcay ÖLÇEN[1] **Büşra ÖNLER**[2]

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Abstract

In this sustainability age, like every sector, also civil aviation transportation should find solutions in order to sustain its own presence. Therefore, international aviational organizations and other players of this industry try to find some solutions recent environmental problems such as Greenhouse Gases Emissions. But also, civil aviation related soil and water pollution problems have got especially decisive and disruptive impacts on environment, human and animal health. What makes this paper more distinct is that it is clearly make an evaluation on water and soil pollution in civil aviation transportation context with real data therefore it serves as a baseline for next papers. 389 people are participated in the survey for this article from Turkey sample. According to article conclusions, the information levels of Turkish passengers toward soil and water pollution are mature level without suspicion, but especially their awareness level toward civil aviation related water and soil pollution can include some problems, for example, consciousness of kerosene is very low. For these reasons, subjects of this article are so illuminative, and findings are interesting.

Keywords: Soil and Water Pollution, Airfares Purchasing Behaviours, Air Carriers.

Toprak ve Su Kirliliği Farkındalığı ve Havayolu İşletmelerinde Yolcuların Bilet Satın Alma Davranışları

Öz

Sürdürülebilirlik çağında her sektör gibi sivil havacılık taşımacılığı da kendi varlığını sürdürebilmek için çözümler üretmelidir. Bu nedenle, havacılık endüstrisinde faaliyet gösteren uluslararası kuruluşlar ve bu endüstrinin diğer oyuncuları, Sera Gazı Emisyonları gibi güncel çevre sorunlarına bazı çözümler bulmaya çalışmaktadır. Ancak sivil havacılıkla ilgili toprak ve su kirliliği sorunları da özellikle çevre, insan ve hayvan sağlığı üzerinde belirleyici ve yıkıcı etkilere sahiptir. Bu makaleyi belirgin kılan, sivil havacılık taşımacılığı bağlamında su ve toprak kirliliği konusunda gerçek verilerle net bir değerlendirme yapması ve bundan sonraki makalelere temel teşkil etmesidir. Makalenin sonuçlarına göre, Türk havayolu yolcularının toprak ve su kirliliğine yönelik bilgi düzeyleri şüpheye yer bırakmayacak şekilde olgun düzeydedir. Ancak özellikle sivil havacılıkla ilgili su ve toprak kirliliğine yönelik farkındalık düzeyleri bazı sorunları içerebilir. Buna örnek olarak kerosen (gazyağı) bilincinin düşük olması verilebilir. Bu nedenlerle, bu makalenin konuları aydınlatıcıdır ve bulgular ilgi çekicidir.

Anahtar Kelimeler: Toprak ve Su Kirliliği, Havayolu Bileti Satın Alma Davranışı, Havayolu İşletmeleri

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INTRODUCTION

The Petroleum and Its Products (PIP) and their negative effects on nature and human health have discussed since many long years. After United Nation Sustainability Goals, these terms have been subjected many special works and individuals, companies, institutions, and states began to create their special ways. The effects of this cumulative revolution have been felt much different part of many different sectors and sub-sectors. And aviation sector felt this revolution deeply and disruptively.

Since the beginning, as a main institution, at the head of civil aviation, International Civil Aviation Organization (ICAO) tried to manage this change or revolution with many regulations. These regulations and measures include aircraft technology improvements, operational improvements, sustainable aviation fuels, and market-based measures such as Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). Especially, with the name of Sustainable Aviation Fuel (SAF), ICAO undertook several serious attempts in order to diminish Greenhouse Gas Emissions (GHGE), respect the areas of high importance for biodiversity, conservation and benefits for people from ecosystems, in accordance with international and national regulations; and contribute to local social and economic development, and competition with food and water should be avoided (2019, Environmental Report Aviation and Environment).According to IATA, there are 12 main principles to govern alternative jet fuel sustainability (IATA 2015 Report on Alternative Fuels). So, it can be understood from those that every little step about sustainable jet fuels needs great considerations and regulations in civil aviation sector. Beside this, it is also understandable that jet fuels also negative impacts on water and soils around the world. If it is thought all flights need a burning process and kerosene is indispensable fuel of all activities, negative impacts of kerosene on air, soil, water, and also human and animal health should be considered. World Health Organization (WHO) stated that kerosene had negative impacts on human health. For example, impacts of kerosene are especially destructive during inhalation after and before burning and direct contact. At the end, kerosene is not only one responsible of water and soil pollution, but there are also other liquids if it is considered to civil aviation activities. Also, carbon footprints of civil aviation sector can give extra explanations on special issues such as produced carbon amount per passenger and kerosene relationships. (Sgouridis et al. 2011, Bofinger and Strand, 2013, Wu, Liao and Liu, 2019).

It is aimed to make a comprehensive analysis about jet fuels and other liquids such as de-icing and anti-icing and their negative impacts on soil, water and human health indirectly in this research. And awareness, perceptions, and behaviour of passengers toward these liquids are collected.

In order to realize this purpose, a deep and comprehensive literature analysis have been subjected. And then, awareness and perceptions of participants toward these liquids are detailed and a framework is created. In first section of Literature Review, an analysis was made about European Union Policies on Bio Jet Fuels. Aviation, Petroleum, and Its Products (PIP) and other industrial fluids and their negative impacts are detailed in second section of literature review. Sustainability activities in civil aviation creates a policy umbrella to reduce negative impacts of pollutants, for this reason, the third section is designed to make analysis

sustainability and aviation sector. Research methodology, questionnaires and analysis were designed in order to reach final conclusions. And related conclusions and discussions were made so as to complete analysis.

1. Literature Review

1.1. European Union Policies on Bio Jet Fuels

The PIP and their negative effects on environment is so critical issue that the biggest institutions in the world such as United Nations (UN) and also international civil aviation organizations such as International Civil Aviation Organization (ICAO), International Air Transport Association (IATA) have been taken serious steps in order to eliminate these effects. At the same time, the European Community alarmed on these effects and European Union Emission Trading Scheme (EU ETS) was born as an answer to create a wide framework and aviation sector added to this scheme. According to classification of Arjomandi and Seufert (2014), many of the most technical air carriers were from China and North Asia whilst many of the best environmental performers were from Europe. They also found that although the number of environmentally oriented full-service carriers was increasing, low-cost carriers were still more environmentally oriented.

Mitigation policies such as EU ETS were a necessary in order to change travel behaviour and induce operational and technological changes in the aviation industry that would result in lower environmental impacts (Anger and Köhler, 2010). And there were some articles criticized EU ETS, for example one of them stated that EU ETS effects on air transport would be relatively small Anger (2010). At the industrial side, Meleo, Nava and Pozzi (2016) simulated a model and found that airfares, revenues and social costs would begin to slightly increase starting from 2016 under the conditions of EU ETS at the same time, they stated that all stakeholders such as Boeing and Airbus (via photovoltaic, fuel cells or bio fuels) and air carriers (through amount of luggage, the flight distance, the environmental performance of aircraft) were involved in these green activities. However, different solutions continued to come as an alternative of aircraft PIP, Araujo et al. (2017) stated that biojet fuels were a good alternatives of PIP and some air carriers had future-oriented agreements with representatives of chemical industries, nonetheless biojet fuels could be insufficient and ineffective because of higher costs, investor uncertainty and poor policy awareness at member state level out of Netherlands (Deane and Pye, 2018).According to Pechstein, Bullerdiek and Kaltschmitt (2020) sustainable aviation fuels were compatible with conventional aviation turbine fuel, supply infrastructure and aircraft but they needed a different and separate logistics to the airport tank farm and these farms were technically unnecessary and both environmentally and economically disadvantageous.

At the same time, the politics and politic institutions were very important, for example, Efthymiou and Papatheodorou (2019) created a framework to understand implementation policy of EU ETS through analysing main suggestions of managers who came from IATA, Air Navigation Service Providers (ANSP), Civil Aviation Authorities (CAA) and Government Institutions and individuals. According to their framework, the collaboration between countries/continents, monitoring, reporting and verification processes, transparency and penalties were highlighted concepts.

In Nordic countries, there were also developments, for example, Baxter, Srisaeng and Wild (2020) classified Norway's efforts to reduce greenhouse gas emissions as follows, i) Air carriers should use sustainable aviation biofuels to reduce their greenhouse gases by %10, ii) Norwegian Government mandated that the aviation fuel industry must mix %0.5 advanced biofuel into jet fuel from 2020 onwards, iii) Norway's ministry of Climate and Environment's goal was that by 2030, %30 of the air carrier fuel would be sustainable in nature and would have a positive climate effect.

1.2. Aviation, PIP and Industrial fluids

Aviation can be considered as important resource of pollution such as water and soil. Aerodromes, airports, maintenance centers and aviation- related grounds are suitable places for these pollutions through PIP, hydraulic and other industrial fluids. As the first-hand utilizer of these grounds, air carriers are great contributor of these pollutions. The policies that aim these pollutions, at the same time can be utilized for diminishing negative effects of PIP on air; also, can be effective and efficient to diminish negative impacts of industrial fluids and PIP on soil and water. If it is talked about negative impacts of some liquid pollutants on water and soil, it must be taken into account quite huge literature, for example, it was found the polluting and unbalancer effects of hydrocarbon fuels - fire extinguishers on soil in a Canadian airport example (Milley et al. 2018) and also the same negative effects in Nordic countries airports (Høisæter, Pfaff and Breedveld, 2019). Koscak et al. (2020) emphasized that maintenance time, innovative and new-designed equipments and devices have gained importance to diminish underwater pollution and soil pollution of winter airport maintenance that was depend on snow and ice. At the same time, Pressl et al. (2019) stated that airport surface had dramatically been affected by high concentrations of de-icing fluids in winter months. Valotto et al. (2018) added that construction activities, anti-icing safety procedures, and brake, tire and road wear and runways are major affected airside areas in terms of heavy pollutants. According to a huge literature, kerosene, as PIP contains high degree of heavy pollutants and metals, is used for burning process and jet propulsion systems (Arinola et al., 2018; Hoang and Pham, 2018), and also alcohol based other fluids had negative impacts on groundwater and ground-soil pollution, farming systems, and health of lives around.

Especially, the effects of PIP and other fluids on small ecosystems and airport-near-fields are more observable. Tourism related-aviation activities had negative effects on islands ecosystems such as Santorini due to heavy metals (Brtnicky et al., 2020) and airports and airport networks especially those that were near kinder garden or playgrounds among the most dangerous factors for children health (Jin et al., 2019). According to Rahim, Pal and Ariya (2019) nano particles and metal contaminants were one of the main causes of air pollution and climate change and these harmful pollutants could affect soils and waters within borders of an airport. Bernardino et al. (2019) maintained that air traffic related heavy metal soil pollution had got negative effects on airport of Rio de Janerio, Brasil. And also Calvo et al. (2020) analysed airports in terms of aquatic toxicity caused from tropical journeys of aircrafts. Beside this, Kim, Lee and Ahn (2019) argued that biofuels were aircraft-technological, economic, and political issue.

1.2. Sustainability and Air Carriers

Like every industry, also aviation industry had felt sustainability revolution so deeply that there have been some reflections of this situation in literature. Efficiency, effectiveness and other dimensions of air transportation discussed and detailed from the viewpoint of sustainability. For example, of the transportation modes in China example, the most sustainable efficient was air transportation in terms both of passenger and freight (Wankeet al, 2020).

Sustainable aviation indicators can be counted as social indicator, economic indicator, and environmental indicator from the perspective of stakeholders, it was very understandable that this grouping methodology showed a conformity with UN Sustainable Goals (Alsarrah, Ajmal and Mertzanis, 2020). However, Sanchez et al. (2018) have suggested a framework that included stakeholder engagement, alliances, and open innovation in order to define aviation sectors against sustainability problematic. Analysis of Amoah's (2020) sheds light on main sustainability issues including environmentally friendly aircrafts, offsetting emission footprint and institutional arrangements and regulations, on the other side he stated that cost pressures, survival threat and deprioritising environmental sustainability initiatives were challenges in new sustainable environment. Low-cost carriers – as a new style of business making in civil aviation- can be subjects of a social and financial sustainable business model framework for example, Rotondo, Corsi and Giovanelli (2019) concluded that i) these sustainable business models did not influence financial performance directly, but they might have role in the long-term financial performance of the firm. ii) The models have influenced the characteristics and effectiveness of sustainable innovation and ought to be accompanied by intelligent managerial activity to be effective. iii) These models have not done faster financial recovery in the aftermath of discontinuity, but it did not make a firm more resilient over a long-term basis. Also, air carrier servitization could lead to sustainable benefits because of its aim lower material and energy consumption (Sharma and Singh, 2017).

The situation of civil aviation industry investigated often after Covid-19 crisis period in terms of alternative transportation means, sustainability issues and maybe biological business management. Ferry connections and fast trains would be an alternative for commercial aviation after Covid-19 crisis period (Kanda and Kivimaa, 2020). Abate, Christidis and Purwanto (2020) stated that the effective issues would be air transport policy, competition and liberalization, air carrier ownership and control, environmental sustainability for this period.

With all their dimensions such as warm glow, self-expressive benefits and nature experiences, green branding wave also was effective in air carrier' management (Hwang and Choi, 2017).

2. Research methodology and sample

So as to make a wide and comprehensive analysis of soil and water pollution, their negative effects and community awareness, attitude and behaviour toward them, research was

designed with using both of the inductive and deductive research reasoning and a qualitative questionnaire analysis.

The passenger seats and volume of cabins are main financial resources of air carriers. Air passengers, cargo or freight owners which are as main targets of demand strategies in civil aviation industry, always make choices between alternatives listed as time specific options and service specific options. On the other side, the air carriers must survive with sound and strict international, regional, and national laws, regulations, and rules. At the same time, with these legal effects and intensive competition within air carriers are main causes of often-deregulated, free market-ruled market structure. So, productivity is so hard that passengers' choices gain very great importance.

However, the level of conscious and understanding toward soil and water pollutions can be relatively low in comparison with greenhouse gases emissions. But, at the end, the liquids such as kerosene which used in civil aviation industry can have negative impacts on human, animal health, ecosystems, and earth sustainability. Nonetheless, the efforts which define bio-jet fuels as an alternative of current jet fuels, derivate new technologies in order to produce new organic fuels or liquids are so beneficial. Also, new aircraft engine technologies are designed and developed for utilizing bio-jet fuels and other dimensions of liquid technologies in civil aviation industry. This paper is designed on the assumption, which passenger's choices, priorities, and expectancies including consciousness of sustainability will redefine and frame this industry in terms of all suppliers, aircraft manufacturers, air carriers, airports, and aerodromes.

In order to create a full analysis about soil and water pollutions are caused from PIPs and other chemicals, the international civil aviation community such as regulators and air carriers and also aircraft manufacturers and their suppliers should reconsider awareness, perceptions, attitudes and behaviours of air passengers toward these liquids. On one side, the negative and destructive effects of these liquids can affect the nature of business in international civil aviation context, on the other side, it has effects on national and regional politics of countries at the end of some social movements can be seen in Nordic Countries and Europe. However, the very oligopolistic nature of aircraft manufacturers can be a cause of many different solutions on these developments such as projects on hydrogen fuel and hybrid engine systems. Depending on these issues, the research question took shape automatically is "the air passengers really want to join sustainability matters in civil aviation". From this point of view a questionnaire is created and an analysis is realized in Turkey Sample.

The reasoning behind the questionnaire of this research was taken from Zhao et al. (2015). This logic includes i) to give respondents enough and necessary information about research field in order to avoid mind confusion and excessive time consumption, ii) to join soil and water protection activism in civil aviation are free for all of the world citizens out of stakeholders of civil aviation industry, iii) to have an infinite judgment about her or his budget and expenses on sustainable or green products and services, whether or not he or she realizes them, is indispensable for everyone in the universe. Under the rule of these suggestions, a questionnaire was formed.

In first section of questionnaire, a demographic analysis is conducted in variables such as gender, age, educational level, and travel frequency, monthly income per person and current occupations and educational backgrounds. Travel frequency can be answer of many things in civil aviation system. Because, every person is a potential passenger candidate of air carriers, for this reason, it is tried to take views of every person on soil and water pollution matters whether or not they are frequent flyers, also this information gives us important answers about preferences of air passengers on air transportation.

The second chapter should be considered as awareness and perception stage. Familiarity of soil and water pollution, the negative effects of aviation sector on water and soil pollution can be considered as important questions, on the other side, sensation about kerosene are very important. Kerosene has diminishing effects not only Greenhouse Gas Emissions via burning, but leakage also to ground water. But also, it has some negative impacts on soil and water and dependent ecosystems in aerodromes, airports, aircraft maintenance centres with some other PIPs and chemical fluids.

The third part of questionnaire will be about the intentions of making extra payments in purchasing of air fares. It is the most important issue, and it gives main characteristics to this research. Especially, the analysis about purchase behaviour can shed light on many things, if the analysis can blend with demographic variables social acceptance, behaviours, and stimulus-response processes of air passengers in community.

Aftermath of preparing questions, sample and population gave birth some other important problems. In order to detect and eliminate population-sample problem, the sample (the total number of air passengers and candidate of passengers in Turkey example) is considered meticulously, after the statistical analyses it is calculated that the with 5% statistical significance total 384 respondents will be enough for sample (for very high numbered population). But extra 5 people were included research. The data was collected randomly; it is tried to reach to views of people from almost all every geographic region of Turkey due to cultural differences. But main focus regions are Middle Anatolian and Marmara regions of Turkey due to population distribution of country and big metropolis such as Istanbul and Ankara.

At the end, questionnaires were shown Appendix 1. And the demographic data are show at Table 1.

Table 1. Basic Information of respondents.

Item	Group	Number (Proportion(%)	Item	Group	Number(Proportion(%))
Gender	Male	189 (48.6)	Age	18-21	84 (21.6)
	Female	200(51.4)		22-30	127 (32.6)
				25-35	1 (0.3)
				31-40	50 (12.9)
				41-47	43 (11.1)
				48-55	35 (9.0)
				56-64	34 (8.7)
				65+	15 (3.9)
MonthlyIncome	3000 ₺ andbelow	128 (32.9)	Education	High School andBelow	31 (8.0)
	3000₺- 4000₺	44 (11.3)		Vocational School	58 (14.9)
	4000₺- 5000₺	51 (13.1)		BachelorDegree	199 (51.2)
	5000₺- 6000₺	38 (9.8)		Master Degree	78 (20.1)
	6000₺ andabove	128 (32.9)		Ph.D. orabove	23 (5.9)
Occupation	Student	121 (31.1)	Region	Aegean	16 (4.1)
	Academician	28 (7.2)		Black Sea	23 (5.9)
	Middle Manager	36 (9.3)		East Marmara	3 (0.8) 193(49.6)
	High Level Manager	7 (1.8)		Mediterranean	16 (4.1)
	Civilservant	71(18.3)		Middle Anatolia	127 (32.6)
	Military Personel	8 (2.1)		Southeastern	11 (2.9)
	Engineer	8 (2.1)			
	Self Employment	33(8.5)			
	Employer	22(5.7)			
	Housewife	8 (2.1)			
	Retired	45(11.6)			

3. Questionnaires

After declaration of UN Sustainability Goals, the countries, regulators, and other fully authorized administrative bodies try to develop reach some objectives about them. Also, the situation is main cause of reconsidering civil aviation industry with all its dimensions. New targets including hydrogen and hybrid aircraft engines, zero carbondioxid emissions-targeted jet fuels, new aircraft designs, and more environment-conscious supplier systems are fruit of these processes. However, with high societal pressure toward sustainable and green products, civil aviation system begins to reframe. The main motivation behind questionnaires is to look at civil aviation system in terms of sustainability and green developments. From this point of view, soil and water pollution are main focus points of questionnaires.

When it is reconsidered the airport caused water pollution impacts on aviation system, it will be confronted with kerosene or PIPs and other liquids again and again. From this logic, beginning from the second chapter of questionnaire, the sustainability and some other information are included in questionnaire in order to able to understand perception, attitude and conscious level of air passengers and potential air passengers. For this reason, a huge and detailed literature searching was utilized.

4. Analysis of Questionnaires and Findings

The first section of questionnaire is about general conscious, sensations and understanding towards soil and water pollution in Turkey sample.

According to survey, there is no important difference between gender groups in terms of familiarity about soil and water pollution. Within women group, i) familiarity decreases with age, ii) familiarity increases with education level, iii) there are no increasing and decreasing relationships in familiarity in terms of revenue, but the lowest level (3000₺ and below) and highest levels (6000₺ and above) are especially very high. Within men group the similar impacts can be seemed.

Frequency of "Do you think there are negative effects of aviation sector on water and soil?" question can be very important and decisive. There is only a difference of 11 between male and female respondents in terms of this question with 8 missing values in 389 respondents. There are 4 positive meaning questions group, beside this there are 2 negative meaning questions group. According to 16 people (4%) there is no relationship between water and soil pollution and aviation sector and also it is so ridiculous. And according to 57 respondents (14%) (34 women and 23 men) air transportation is the most environmentally friendly sector in transportation. With 126 respondents (32%) (71 females and 65 males), majority of sample generally believe that aviation sector has got or may have got negative impacts on soil and water pollution. 97 (25%) people think that there are some negative impacts of aviation on soil and water pollution, but it is less. According to 21 (5%) people (8 women and 13 men), aviation doesn't have direct impacts on soil and water pollution but side effects. According to 54 (14%) people, it is a reality that soil and water pollution are sourced from air transportation activities, but at the end of day, costs are main, unanswered and expensive problems.

Whether or not the respondents have heard about kerosene is another important question, male and female have got same proportions about it. But, according to main finding of this question, 139 females and 133 males, in total 272 respondents (70% of all respondents) did not hear anything about kerosene, and 61 females and 56 males only 117 people (30% of all respondents) had got infrastructural or comprehensive information about kerosene.

The last and main question is about extra amount paying willingness of passengers in return of a policy, which involves increasing soil and water protection, is utilized by air carriers. In terms of gender male and female respondents generally want to pay an extra amount but they do not know or not express it 72 (18% of all respondents) and 75 (19% of all respondents) of all males. Nonetheless, the numbers of reluctant or unwilling 43 females and 39 males (21% of all respondents) cannot be underestimated. Generally younger men and women want

to join sustainability activities via extra fares amounts. 45 females and 33 males 78 (20%) of all respondents want to pay 1% and 3% more. 51 (13%) of all respondents want to pay %3 and %5 more. 14 females and 10 males (24 respondents, 16,20%) want to pay 5% and 10% more if air carriers utilize a policy about soil and water politics.

5. Interpretation of findings and discussion

Water and soil pollution have destructive impacts on environment. Climate change and its devastating impacts on world have been felt on soils and waters. However, the presence of international institutional programmes such as United Nations under the name of UN Environment Programme and European Commissions (EU UNEP) in order to eliminate negative effects of soil and water pollution is another dimension. Besides, especially farm related land and irrigation water pollution could have very distinctive and destructive impacts on nutrition through grassland, farming and pomiculture activities. These impacts are also examined by Inman et al. (2018), they create a framework in order to understand farmer attitudes and behaviours. Tiong et al. (2021) also have emphasized negative effects of water and land pollution on people in northern Malaysia. Okumah and Hackman (2020) examined water pollution and importance of water pollution mitigation in literature. And, according to this research, the familiarities of Turkish people on soil and water pollution have gained importance here, it shows attitudes, conscious and awareness of Turkish people is at satisfying level.

But at the other side, it should be scrutinized here whether or not there has been an also negative effect of aviation sector on soil and water pollution. According to literature, Kent et al. (1999) found that aircraft de-icing/anti-icing fluids have got health destructive and detrimental impacts on environment, indirectly on lives around. It can be concluded here that from papers of Switzenbaum et al. (2000) aircraft de-icing fluids could have unbalancer impacts on environment especially on ground waters. However, Revitt and Worrall (2003) calculated low temperature biodegradation of glycol and acetate-based airport de-icing fluids and concluded that their chemical and damaging impacts on waters. Anger and Kohler (2010) gave a short citation about water pollution in kerosene related aviation environmental pollution matters with other determinants. Analysis of Sulej et al. (2011) showed that de/anti-acing operations, washing and cleaning operations, spills of fuel and lubricants, exhaust fumes and weed removal activities had got polluter impacts on airport runoff waters. Therefore, we understand from literature that civil aviation includes destructive components in terms of civil aviation. Maintenance centers, airport and aerodrome networks situated in rural areas near farmlands are subjected to these negative and side impacts. However, according to general information level of Turkish respondents, it can be concluded that although the ratio is not more less, it is very far to saturation point, if we make a comparison with other Nordic and European countries where important social movements can be seemed sourcing from civil aviation related pollution.

From sustainability politics of AIRBUS and BOEING, considering they are only two important aircraft manufacturers of world, we can conclude that kerosene and kerosene related liquids are very important obstacles in front of greener civil aviation development. For example, Cui and Li (2020) stated that kerosene and rapid growth of civil aviation

business were accompanied with fast-growing carbon emissions, and also kerosene is important resource of cost and important element of energy efficiency (Xu and Cui, 2017), pollution abatement costs (Cui, Li and Lin, 2018 and Li and Cui, 2018). Therefore, it is understood that kerosene is a new specific, scientifically issue and begin to find place in literature in terms of sustainable and green aviation recently. It is natural that there is missing information's about it in Turkey sample in spite of its importance. So, it is very hard to measure awareness, perceptions, attitudes, and behaviours towards it.

The most important and main financial resource of air carriers are fares. At the same time, fares are key determinants of a lot of financial, marketing, and technical issues in air carrier managerial bodies. If it is looked at main issues about airfares in literature, it is confronted with main issues as follows; first of all, the airfares are products of supply and demand equilibrium in civil aviation markets (Mohammadian et al, 2019). Beside this Wang, Zhang and Zhang (2018) and Guo et al. (2018) especially emphasized the importance of impacts of airport concentration and competitive impacts as low-cost carriers in pricing. Ma et al. (2019) added that alternative transportation means had got great impacts on airfares and also politics (Fageda et al, 2017) can count as important variables. Ma et al. (2020) maintained that can be concluded that seasonality had impacts on air fares (Merkert and Webber, 2018; Wen and Yeh, 2017). Therefore, we can conclude that air fares can count not only a financial resource, but also a main determinant in financial and managerial sides of civil aviation. If air carriers want to show a determined, balanced, and stable fare policy, they also should take into account of all variables. Main finding of research, Turkish people generally want to join water and soil saving activities also in civil aviation activities, even they have motivation of extra payment with different amounts. According to research findings, Turkish younger generations will be able to show more sensitivity toward sustainable airfares in terms of soil and water protection without considering gender variables. According to Ceron and Dubois (2020), there is a relationship between development of tourism and increase GHGE. After they debated this context under different scenarios, they stated that biojet fuels can be good alternative of PIP but at the same time, deforestation, preservation of biodiversity, rain fed cultivation can be affected by them.

Conclusions

Majority of respondents, with 93,6 % ratios have understood or totally understood questionnaire. Basically, it can show that the reliability and validity of analysis is realized and creating a level of conscious and value judgment in mind of respondents. It can consider here, this research is the first research in social sciences which including soil and water management in civil aviation, relating soil and water pollution with air fares and it is the very first step measuring willingness and keen of passengers or passenger nominees in terms of eliminating PIPs and other environmental diminishing liquids in at least, Turkey sample. So, the policies and works of manufacturers such as Airbus and Boeing, international institutions such as IATA, ICAO and ACI can confirm this situation, civil aviation under restructuring process in terms of sustainability. There are also some specific articles in terms of pollution and how civil aviation can escape from negative impacts of PIPs, kerosene and other liquids such as Freeman et al. (2015) made a conceptualization about the relationships between air transport and de-icing fluids in environment and they offered an eco-innovative

technology package particularly for subsurface flow treatment wetlands. After Rodziewiczet al. (2020) stated that there were negative impacts of kerosene on airport and especially sewage systems of airports, they offered a bio filter in order to prevail this situation.

Anyhow, according to conclusion of this research, it is showed that Petroleum and It's products such as kerosene and other liquids are used in civil aviation or civil transportation industries with all dimensions from manufacturing to passenger service. The conscious on this industrial and chemical fluids have got an increasing tendency. However, with this tendency, it can be concluded that awareness and familiarity of Turkish People toward soil and water pollution is at satisfying point. But, at the other side, their conscious toward these liquids is at very low level. It strongly is recommendable that the side impacts of this materials are elaborated, and a research centre can be designed for aviation related pollution activities. Air carriers should give more places to these liquids and analysis related these liquids on their sustainability reports and promotion campaigns due to conscious of Turkish passenger towards soil and water pollution. Passengers have got key and decisive roles in air transportation system and due to these roles, sometimes, they can take place in special social movements like "Flygskam", Air carriers should be aware of these situations.

And the same time, as it seems in related articles and this article, it can be concluded that civil aviation related water and soil pollutions can consider as a new research field in following years, in terms of airport networks, air carriers and other industry players and as most visible part of civil aviation, air carriers should consider this situation.

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Appendix- 1. Questionnaire

1. What is your sex?	Male
	Female
2. Where do you live in Turkey?	……
3. What is your age?	18 - 25 yr
	25 - 35 yr
	35 - 45 yr
	45 - 55 yr
	Above 55 yr
4. What is your educational level?	High School or below
	Junior college
	Bachelor degree
	Master degree
	PhD or Above
5. How often do you travel by plane?	Once a year
	Twice a year
	Three times a year
	Four times a year
	Five times and more a year
6. How much do you earn?	Below 3000
	3000 – 4000 Turkish liras
	4000 – 5000 Turkish liras
	5000 – 6000 Turkish liras
	6000 and more.
7. What is your current occupation?	Senior Management
	Middle Management
	General Staff
	Self-employed
	Student
	Emeritus-Retired
	Other

Basic understanding about greenhouse emissions	
8. Please indicate how familiar you are with water and soil pollution?	Not at all familiar
	Not very familiar
	Somewhat familiar
	Very familiar
9. Do you think there are negative effects of aviation sector on water and soil?	Aviation sector have got negative effects on soil and water pollution.
	No, It is so ridicolous !!!
	Yes, It have side effects but not important.
	Yes, the problems can solve only with expensive measures.
	Yes, but it is less.
	No, Aviation sector is the most environmental friendly sector in transportation.
	I have no idea.
10. Have you ever heard the kerosene ?	Yes
	No
The aviation sector is one of the main resources of water and soil pollution. Kerosene (aircraft oil) and some other liquids are basic causes of this situation in airports, aircraft maintenance centers, and other aviation centers.	
11. In order to save environmental health of world and human health in the world. The Using of kerosene and kerosene like liquids should be decreased or more strict safety and security measures should be taken for its negative effects. If airlines have got a such a policy, i am ready to pay, • Not at all, • I am willing to pay more, but I dont know pay how much, • %1 - %3 more, • %3 - %5 more, • %5 - %10 more, • %10 - %20 more, • Above %20.	
12. Could you understand the content of this questionnaire? • Totally understand, • Understand, • Not quite understand, • Totally can not understand.	