

GREENHOUSE GAS EMISSION AWARENESS AND FARE-PURCHASING BEHAVIOUR OF PASSENGERS IN AIR CARRIERS: A SOCIO-DEMOGRAPHIC ANALYSIS

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Abstract: Fares are one of the main financial resources for air carriers, and passengers' intentions and attitudes can have decisive effects on their profitability. This paper is distinct because it underlines and discusses the awareness and attitudes of air passengers towards greenhouse gas emissions. This paper sheds light on passengers' intentions to make extra payments to reduce these emissions with the help of a qualitative questionnaire. An analysis in terms of the socio-demographic variables of the respondents was carried out. It was found that the air passengers' awareness and attitudes and fare-purchasing behaviour towards greenhouse gas emissions of air passengers are at a saturated level. It was also found that air passengers were ready to join sustainability activities via purchasing airfares. These findings are important for air carriers.

Keywords: Greenhouse gases emissions, fares purchasing behaviour, air carriers.

Introduction

During the industrial development stages of many countries, the relationship between economic development and greenhouses gas emissions (GHGE) was thoroughly investigated. For example, China, India, Iran, Indonesia and South Africa were the great five emitters of greenhouse gases from fuel combustions from 1982 to 2016 (Sarkodie & Strezov, 2019). Economic development has an impact on greenhouse gases emissions scores in Russia (Yang *et al.*, 2017).

Following Industrial Revolution, the business world and the mentality of producers have changed rapidly. Productivity became the main driver of every economic activity. With Fordism, the world witnessed great changes in the speed and volume of production. The changes that came with intensive production also had negative effects. One of the biggest impacts was environmental or natural damage. Environmental damage has a lot of different dimensions such as water, sea and ocean pollution, air pollution, and climate change. These damages have negative and disrupting effects on the human and animal body as well

as health, nutritional materials, and general balance and natural resources. These effects were so wild, strong and destructive that all of the countries in the world attempted to develop solutions through international organisations such as the United Nations (UN), Organisation for Economic Co-operation and Development (OECD) and World Bank. The Kyoto Protocol (1997) was reflection of the efforts to save environmental resources, especially from air pollution.

The Kyoto Protocol was the first important step towards saving nature from the destructive effects of GHGE whether it was managed effectively and efficiently (Barrett, 1998; Böhringer, 2003). Babiker *et al.* (2000) explained the main trade paradoxes of the Kyoto Protocol and the international politics behind it by pointing out its effects on developing and wealthier countries' trade relationships. However, with the Kyoto Protocol, GHGE has been consistently and increasingly mentioned in every research field.

Through new articles, new developments in terms of understanding airline emissions emerge. For example, Macintosh and Downie

(2008) imply the importance of domestic and international airline emissions for Australia. According to their analyses, emergency considerations should immediately be taken. Ekici and Sevinc (2021) analysed Turkish Airlines in terms of sustainability, and they discovered that different engine types on Turkish Airlines fleet airliners can be a cause of low GHGE and incur low costs. In terms of sustainability measures in airline companies, cost pressures, survival threats and deprioritising environmental sustainability initiatives should be considered (Amoah, 2020). Another study examined the willingness of passengers to pay extra money to balance carbon emissions among the Malaysian population (Shaari *et al.*, 2020).

The increasing awareness of GHGE had a deep impact on the civil aviation system, according to the websites of main industrial players such as Boeing and Airbus. The International Civil Aviation Organization (ICAO) has realised developments in issues concerning alternative fuels, efficient engine technology, better traffic management and policy mechanisms (such as emissions trading and carbon offsets) with some degree of success. Governments should involve ICAO's process, especially setting new regulations to help the global aviation industry mitigate climate change risks (Capoccitti *et al.*, 2010).

At the same time, according to some authors, there are some criticism against ICAO with regards to GHGE. For example, Liu (2011) stated that although ICAO was a granted authority over GHGE in aviation according to the Kyoto Protocol, the international body has failed this role. However, Liu pointed out that ICAO only had sole regulatory authority for the aviation industry and it ought to have a role in technical expertise and auditing capacity. Preston *et al.* (2012) examined European aviation in the global aviation context and they stated that ICAO was slow to act on emissions, and the European Union (EU) ought to undertake more active, unilateral and decisive roles on emissions. According to an analysis by Lindenthal (2014) on EU's activities within ICAO between 1998 and 2013, the trade

bloc was in a good position, especially in terms of directorial leadership, but its leadership performance was rather modest. Birchfield (2015) stated that after the UN Climate Summit in Copenhagen, the EU made significant progress in the aviation sector, especially on GHGE. The EU determined that its decisive and strong role in ICAO would continue. At the same time, there were some critics on ICAO's policies on sustainability. These policies were very weak considering the growth of international aviation. These policies also defined important items for aviation management, as more awareness and understanding of the environmental effects of aviation activities was gained. The sectoral approach to the UN's Sustainable Development Goals to reach the UN2030 Agenda for Sustainable Development was reassessed (Baledon & Kosoy, 2018). Even though ICAO's regulations on GHGE were controversial, new regulations were successful. The body lead EU into new negotiations and received the support of international air carriers (Gonçalves, 2017).

However, international civil aviation conjuncture and its economic, political, international rules were sound and strict. ICAO's strategies on the issue of emissions of carbon dioxide with their mechanisms could be seen as utilisable, even in the poorest countries of the world. Nonetheless, ICAO's new mechanism ought to be matched to the domestic aims of the wealthiest and strongest technological nations, such as the United States (Vaishnav, 2016). The Carbon Offsetting and Reduction Scheme (CORSIA) was the first emission-mitigation tool for international aviation but it was an ineffective measure in terms of creating a reduction in global aviation emissions (Lyle, 2018; Zhou *et al.*, 2020). Depending on these developments, some compulsory measures, rules and regulations, suggestions were developed. For example, the aviation sector and air carriers could describe their carbon offset schemes accurately, they could ensure true and necessary information to communicate with customers, the carbon offsets programmes were designed to help avoid emissions through the funding of renewable energy projects, forest protection and restoration

activities. These activities had benefits and co-benefits for developing and developed countries (Becken & Mackey, 2017). The projects were supported, reported and financed, and the results were shared meticulously and transparently. The carbon credits were reported and the quality of carbon credit was disclosed. Yuen and Zhang (2011) stated that unilateral efforts might lead to an increase in GHGE and emissions taxes implemented as part of such measures could lead to larger negative impacts on national air carriers than on foreign air carriers, possibly ending with issues with competition.

The carbon dioxide (CO₂) problem of air carriers could be related to many factors such as aircraft type, payload, route taken, weather conditions, number of passengers and the amount of cargo on each flight (Yin *et al.*, 2015). Innovations were made to address the new requirements of eliminating GHGE. The short-haul type of flights would be a good alternative to land-based transportation modes such as train, coach and car travel to reduce GHGE and a country's climate impact, especially for routes that are up to 400 km long (Baumeister, 2019).

In response to the rapid growth of environmental problems related to air transportation, including emissions and noise, aviation authorities and industries have implemented stricter environmental regulations and they established some policies to encourage air carriers to become greener in the early 2000s (Parsa *et al.*, 2019). Cooperation is a more efficient way to eliminate the negative effects of carbon emissions rather than competition (Cui & Li, 2020). The importance of cooperation between air carriers and air carrier alliances added to the air carriers' GHGE abatement costs (Li & Cui, 2018). Cui (2019) criticised ICAO's "Carbon Neutral Growth from 2020" policy in terms of its effectiveness. According to Chao *et al.* (2019), the price of petroleum-based aviation fuel and the growth rate of the carbon price were the two important variables in determining ICAO's next-generation policies such as CORSIA. More research on green air carriers in the world is needed. Air carrier companies have

worked to eliminate GHGE from their activities or they ought to eliminate them according to the policies of international regulators such as ICAO (Migdadi, 2019).

According to Zhao *et al.* (2015), there was a relationship between sustainability matters such as greenhouse and customer purchase intentions. Purchase intentions could provide a lot of answers about social acceptance, community and market acceptance. And these variables were very important in the development of sustainable projects. In parallel with Zhao *et al.* (2015), this paper aims to analyse the relationships between purchase intentions and GHGE. An understanding of purchasing intentions can allow for the establishment of a holistic framework of passengers' attitudes toward GHGE in air carriers. In light of this information, the social sides of GHGE in the civil aviation industry are detailed and discussed in Section 2, and it is explained why GHGE is important for the future of the European aviation sector. The research methodology and main characteristics are stated in Section 3. To create a deeper understanding of the issue of GHGE in air carriers, social and managerial problems on GHGE in air carriers are discussed, and a framework on GHGE is presented, fare-purchasing behaviours in air carriers, and other social dimensions benefiting from the questionnaire are argued, and the results are discussed in detail in Section 4. The conclusions are made in Section 5. This research clearly contributes to an understanding on passenger's consciousness towards a more sustainable airline services in a developing economy such as Turkey.

Social Sides of Greenhouse Gases in Civil Aviation Industry and Theoretical Basis of the Research

It is generally accepted in science that qualitative analysis have a definitive impact on the facts. According to social psychology, attitudes and awareness provides the final shape to behaviour, and behaviours can change under the mediating and moderating effects of education, leadership, propaganda, and media

as time goes by (Kagıtcıbası, 2003). These two acceptances form the theoretical basis of this research. Increasing consciousness, attitudes, and awareness of climate change, especially air pollution, have driven many different social movements around the world. Although the aviation industry contributes only 2% of world's total emissions, stakeholders have also created social movements with regards to the industry. One of the biggest social movements is "flygskam" (flight shame) in Sweden and it has gained considerable traction in Nordic countries as well as other European countries.

According to literature in Europe, there was no relationship between behaviours and attitudes of households on environmental issues in the civil aviation system of Great Britain. Alcock *et al.* (2017) offered some policies to change households' behaviours. Even though Germans supported measures to increase the cost of flying and policies, forcing airlines to reduce emissions, and legislation abolishing subsidies, there were no significant changes in travel behaviour (Gössling *et al.*, 2020). Higham *et al.* (2016) analysed Norway, the United Kingdom, Germany and Australia, and they found that Norwegians were far more willing to accommodate strong government intervention through taxation. They concluded that changing public behaviour required diverse, stronger policy measures that varied within and between societies. The flight shame movement is another motivating factor of this study.

Research Methodology and Questionnaire

For a comprehensive analysis, a specific qualitative methodology and a wide literature review were utilised. The general public's awareness on sustainability has considerably grown in the past years. Soon following the declaration of the UN's Sustainable Development Goals, studies on sustainability changed their directions and reached another level. The political, industrial and engineering, managerial, law, and legal dimensions as well as the economical dimensions of sustainable decisions have been detailed and argued. The

general public's awareness of the use of natural resources has also reached another level.

To solve the issue of GHGE in civil aviation, the responsibilities and duties of each aviation stakeholder group have changed dramatically. Passengers are only one of air carriers' financial resources and in an often-deregulated and free market-ruled context, their choices have a larger effect on the air carriers' behaviour.

The research logic, model and techniques behind the qualitative questionnaire and also this research was taken from Zhao *et al.* (2015). If their research logic is adapted to this study, it can be inferred that (i) out of members of the civil aviation industry, all of the world citizens can join or intend to join civil aviation activities through the purchase of air fares, (ii) the participant can be confused by intensive conceptualisations. For this reason, suggestive and time-saving information can have positive effects on respondents, (iii) it can be concluded that everyone has some sense of their expenses on sustainable products and services, whether or not they realize it. They re-interpreted an electronic magazine questionnaire according to the rules of qualitative scientific research methodologies. It is the most problematic aspect of Zhao *et al.* (2015) but electronic magazines and their impacts on public awareness on a special subject are enormous. Wang *et al.* (2016) justified these relationships between and within British students. According to Falk *et al.* (2007), magazines and newspapers pave the ways for public science interest and free-choice learning, although they address different age groups, vocations and socio-economic considerations. Nisbet *et al.* (2002) and Falk and Needham (2013) also justified the relationship between free-choice learning and reading books and magazines about science and technology using the Internet, scientific documentaries and videos. For LaFollette (1988), popular scientific magazines can form descriptions and discussions about science with laymen. Wade and Schramm (1969) emphasised the impacts of mass media in public affairs, science and health knowledge. For Mussell (2007), magazines can provoke scientific curiosity and stimulate

scientific interests. Therefore, newspapers and magazines can be counted as inspiring objects in scientific research. In this context, Zhao *et al.* (2015) showed how scientist can benefit from other resources in creating qualitative questionnaires.

Depending on these items, a questionnaire was formed through inspiration, observation and intense literature review, and a systematic and qualitative research was conducted. In the aftermath of preparing a questionnaire as in Appendix 1, the sample and population problem might give birth to some other important problems. The qualitative research methodologies can shed light on some specific details in sample and population problems, especially both of the number of universe and samples with other problems of representation. According to the sample and population logic of the main article of Zhao *et al.* (2015), despite intensive population and urbanisation in respondents, the number of samples is low (116 respondents) but the frequency of representations is important. Benefiting from this logic, more attention is given to the frequency of representations than the number of respondents.

A total of 207 completed questionnaires were obtained from respondents, comprising those from different regions of Turkey which is a rapidly developing country in terms of civil aviation. Respondents were selected randomly from Turkey population in 2020 and only those who have the possibility of utilising air transport at least once, regardless of an airline company and routes were selected. Age, gender and income were the main descriptive variables. The data were collected through virtual questionnaire forms hosted on Google, so the locations of the study varied according to participants' hometowns in Turkey.

The questionnaire is divided into three sections. The first section is about the demographical variables. Age, vocation, gender, annual income per person, occupation and educational backgrounds can be counted as the decisive factors in determining fare-purchasing behaviour. At the same time, the habits of

travelling by air carriers can be considered as another important variable in terms of both air carrier companies and consumers and it can be understood through different means such as the frequency of air transportation choice and travelling habits of respondents.

In the second section of the questionnaire, the information levels and understanding of passengers or prospective passengers, regardless of airline, of GHGE is measured. As it is one a popular topic of discussion for more than three decades, GHGE can be assumed to be a generally known issue. However, there can be still some issues in terms of awareness of GHGE. To ensure that respondents have a sound understanding of GHGE, this was a necessity. At the same time, Section 2 has a reminder effect on participants' minds. Some articles illuminated this situation more brightly. For example, the majority of customers wanted to make extra payments to reduce air pollution and GHGE in the Catalonia population (Zahedi *et al.*, 2019). Another article focused on cruise passengers in the Antarctic travel and how GHGE had negative impacts on climate change (Eijegelaar *et al.*, 2010). Another study found that in non-business air transportation of the United Kingdom, income, working status, age and car ownership were significantly related to overall emissions. However, factors related to accessibility, mobility, household location and gender were not related to emissions (Brand & Preston, 2010). Sampei and Usui (2009) drew a general picture of climate change including GHGE and argued that more effective communication of climate change and strategies are an important part of this sustainability context. The second section should be thought as the awareness and perception section. Familiarity of GHGE and the information level regarding GHGE can be considered as important variables. To create an effective framework in GGHE, in the light of their general definitions, some specific questions including familiarity and information level were asked to respondents.

In the third section of questionnaires, the intentions of making extra payments in purchasing airfares were asked. It is the most

important variable in terms of analysing purchase behaviour. Analysing purchase behaviour can be the answer to many things such as social acceptance, perspectives of air carrier community, attitudes of a community toward sustainable products and services, and also the number of extra payments that can be evaluated in the financial dimension. And the main research question is formed as: "Can the people be ready to make extra payments in return of GHGE in air carriers' sample?" The answer to this question sheds more light on the consciousness of sustainability matters.

The literature on air carrier ticketing and fares is vast and, at the same time it is suitable for classification. The classification process can be utilised according to the deregulation and regulation context, ticketing by Internet and alliance, among others, and be turned into one of the main research fields, especially following the United States deregulation of 1978. Keeler (1972), Graham *et al.* (1983), Morrison and Winston (1990), and Brueckner *et al.* (1992) stated that there were relationships between deregulation policies and fares.

Bachwich and Wittman (2017) stated air carriers could change their business models by joining alliances, with different cost structures as well as their effects according to the business style and competition. In the London-Paris market (competition-intensive market) in terms of conventional and low-cost carriers, it was found that market saturation was the most decisive factor in air carrier pricing behaviour (Pels & Rietveld, 2004). Air carrier markets could be separated into different parts and legacy carrier competition had a weak negative effect on average fares. On the other hand, low-cost carriers had some special impacts on airfares, depending on the airport and competition (Brueckner *et al.*, 2013). Here, it is also can be stated that alliances have gained importance. For example, Brueckner (2000) stated that fares charged by air carrier alliances were approximately 25% below those charged by non-allied carriers. However, international air carrier alliances (such as code sharing) and

their positive effects on both the domestic and international markets in terms of fares, and passengers could be discussed (Brueckner, 2001). Alderighi *et al.* (2015) focused on code-sharing in air carriers and they pointed out that the effects were not the same in all passenger fares. Brueckner and Singer (2019) stated that international alliances transformed into different models such as joint ventures or antitrust immunity.

There was a cluster of relationships between air carriers pricing behaviour and air carriers' financial distress such as market shares, operating costs, marketing concentration and firm size (Hofer *et al.*, 2009). According to the model by Atems *et al.* (2019), there may be a relationship between air carrier fares and jet fuel prices. On the other hand, it might be a little bit hard to predict the relationship between jet fuel prices and air travel demands.

Sengupta and Wiggins (2014) determined the main characteristics of fares as carrier type, flight level load factor at purchase, ticket characteristics, measures of peak departure and return times, the date of issue, hedonic factors affecting prices, and online ticketing variables. The Internet also provided benefits in terms of air carrier fares such as control and fare-choosing strategies (Brunger & Perelli, 2008). The Internet raised customers' bargaining power and allowed them to compare different air carriers and choose the most competitive flight in terms of air carrier fares (Izquierdo *et al.*, 2015).

Fierce competition and shrinking profits have compelled air carriers to improve the quality of their services. Passengers have become very meticulous in terms of services they receive, and they tend to shift to air carriers that provide better services. Tangibility, reliability, security, safety and fair pricing have been the main attributes of service quality in air carriers (Gupta, 2018). Zhou *et al.* (2019) indicated that travel cost, journey time, service frequency and seat comfort played important roles in affecting travellers' mode choices. For business trips, air passengers were willing to pay more to reduce journey time

and increase seat comfort and service frequency compared with community respondents. “Safety and punctuality, “fares” and “attention and service during the customer’s journey” were efficient and effective categories of air carrier passengers’ choosing tickets and at the same time air travel frequency and socio-demographic characteristics affected these variables (Munoz *et al.*, 2018). Customer characteristics such as tourist and business travellers, and date of travel had different and distinctive effects on air carrier price behaviour (Martinez *et al.*, 2017).

According to the Kyoto Protocol, the GHGE ratio in the atmosphere must be below 5% in some countries and the main aim of this protocol is to lower the CO₂ ratio in the atmosphere. According to the United States Environmental Protection Agency, CO₂, methane (CH₄), nitrous oxide (N₂O) and fluorinated gases can be counted as greenhouse gases. Chemical and biological burning are the main reasons for GHGE, and

the emission of fluorinated gases are caused by industrial production processes.

In light of the infrastructure of this questionnaire, the basic awareness, gender and income relationships will be considered.

Data Analysis and Discussion

Socio-demographic and Understanding of Respondents’ Analysis

The respondent’s socio-demographic characteristics are present in Table 1. In Sections 2, 3 and 4, the qualitative analysis cross-tabulation methodology will be utilised and the results presented.

The sample, as shown in Table 1, includes 97 men (46.9%) and 110 women (53.1%) which can be considered a balanced gender distribution. In terms of age, there was no balance between different age groups. But the groups were determined as all generations were included.

Table 1: Basic information of the respondents

Item	Group	Proportion (%) (number)	Item	Group	Proportion (%) (number)
Gender	Male	46.9 (97)	Age (years)	18-21	11.1 (23)
	Female	53.1 (110)		22-30	40.1 (83)
				31-40	12.1 (25)
				41-47	13.0 (27)
				48-55	9.2 (19)
				56-64	10.6 (22)
			65+	3.9 (8.0)	
Monthly income	3,000£ and below	24.6 (50)	Education	High school and below	4.8 (10)
	3,000£- 4,000£	13.5 (28)		Vocational school	6.3 (13)
	4,000£- 5,000£			Bachelor Degree	52.2 (108)
	5,000£- 6,000£			Master Degree	27.5 (57)
	6,000£ and above			Ph.D. or above	9.2 (19)
	37.7 (78)				
Occupation	Student	21.7 (45)			
	Academician	14.0 (29)			
	Retired	10.1 (21)			
	Self employed	9.7 (20)			
	Middle management	6.8 (14)			
	Teacher	5.3 (11)			
	Others	32.4 (67)			

The most populous group is the 22-30 age (40.1%) group. The less populous group is the 65+ age group (3.9%). Although there are more respondents in the 22-30 age group than other groups, these groups have a higher tendency of making an air trip regardless of routes. Monthly income is another important variable in determining air carrier fares. The sample shows a balanced distribution in terms of monthly income. The most unbalanced distribution in the sample is the education group. Those with a bachelor's degree and higher qualifications made up most of the respondents. It can be seen that education and income are more important than other variables in fare-purchasing behaviour. The importance of demographic variables has long been debated in literature.

Whether or not respondents are familiar with GHGE is an important question according to our analysis as shown in Figure 1. Approximately 75% of the respondents have an understand of GHGE. Wei *et al.* (2014) showed that the Chinese believed GHGE was the cause of climate change and GHGE's negative effects on human beings but they did not know how they would change their behaviours. On the other side, even though the perceptions of GHGE was not important, it was very important to point out the importance of willingness to escape activities causing GHGE (Grishkat, 2014).

People's awareness of GHGE is another important issue. Considering the sample and participation, it can be concluded that almost

88% (181 people) has general information of at least at the base level as shown in Figure 2. This situation is explained by the concept of awareness according to the psychological awareness approach as every behaviour is a derivative of various awareness types (Kağıtçıbaşı, 2003; Markova, 2017). Mackenzie (2009) warned the public about attitudes towards carbon markets. Young and Middlemiss (2012) explained why sustainability was not a narrow subject and why sustainability ought not to be explained by a single science. They developed a framework that included governments, scientists, the media and other individuals under the umbrella concepts of collaboration, transparency, tolerance and integrative working. In light of this work, some authors can also be more illuminative. For example, according to Guven and Sulun (2017), there was a relationship between renewable energy and GHGE. More comprehensive information must be included in teacher education, according to Guven and Sulun (2017). Du *et al.* (2018) argued for new energy vehicles in a marketing context. In this context, they found that on the adoption of new energy vehicles, (i) subjective norms had a stronger influence, (ii) low carbon awareness had a slight moderating effect and (iii) government policies had a positive significant impacts.

As much as familiarity with GHGE is important, the main ideas of respondents about them are also important. The main information level is investigated in Figure 3. The first question is answered by only five respondents.

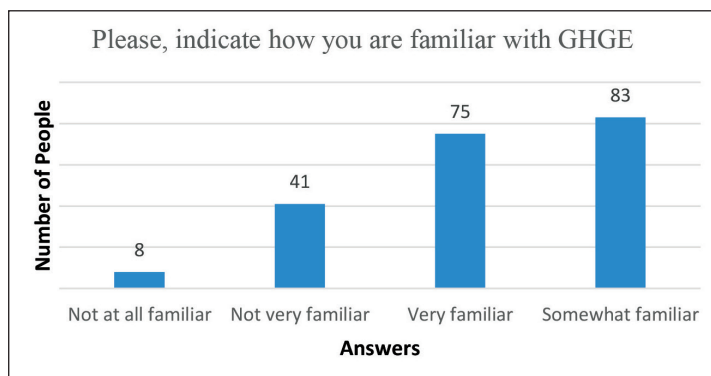


Figure 1: Basic understanding of GHGE

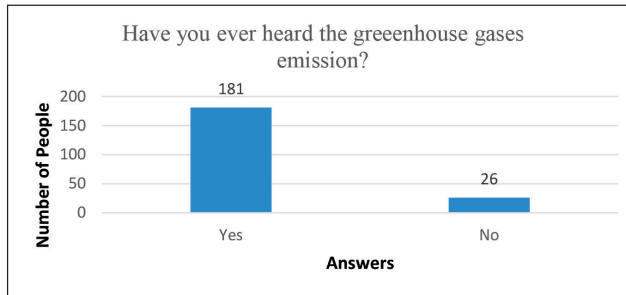


Figure 2: Basic awareness of GHGE

Even though GHGE such as CO₂, CH₄, N₂O and chlorofluorocarbons are colourless according to scientific resources, this question provides evidence about sample homogeneity, making it very critical.

Nine questions were answered by 10 participants for the second section. It is about GHGE costs. GHGE is also examined by different authors not only due to their financial costs but also for their moral costs, depending on people's awareness which was especially high. Investors price firms' GHGE as a negative component of equity value and this valuation discount did not differ between firms that voluntarily disclose their emissions to the Carbon Disclosure Project and firms that did not (Griffin *et al.*, 2017). Besides GHGE costs in terms of profit maximisation and strategies of reducing GHGE in the supply chain, policies in terms of allowing shortages and adjusting the wholesale price, it was important that recycling/manufacturing facilities, corporate social responsibility and innovative technology to reduce GHGE be carried out (Modak *et al.*, 2018). Haites (2018) discussed whether carbon pricing instruments like carbon taxes and emission trading systems, is reduces GHGE costs effectively. He found that emissions trading system allowance prices were generally lower than the tax rates. Most of the countries preferred gas mitigation policies rather than economy-wide tax policies (Gillingham & Stock, 2018). So, a low answer number in the second question is very important. According to 187 respondents, as shown in Figure 3, the effects of health and environmental anxieties are very open, decisive and exact in the decision-making on.

The relationship between GHGE and airports have been detailed by a lot of studies. Yang *et al.* (2018) counted the main emission resources of aircraft as main engines, APUs, ground support equipment, ground access vehicles, private vehicles, stationary sources, airport oil depot and road fugitive dust. Similar research was conducted for Shanghai Pudong International Airport with a similar methodology (Xu *et al.*, 2020). However, the environmental performances of airports were also measured. Airports environmental management variables such as green management and GHGE have been used as the important variables in this model (Chao *et al.*, 2017). Passengers also supported the idea of green airports as stated by Walters *et al.* (2018). So, it can be concluded that GHGE had negative effects on airports. However, two of the respondents answered on the contrary.

GHGE below a 5% ratio are decisive and certain components of the atmosphere are indispensable to human, environmental and natural health. So, it can be accepted as an indicator of the awareness of three of the respondents.

There are also unanswered questions in the questionnaire, as can be seen in Appendix 1. One of the questions is about the relationship between aircraft and GHGE. Next-generation aircraft would be more efficient and environmentally friendly (Baharozu *et al.*, 2017). Lawrence (2009) offered a framework on aviation environmental planning that includes all suppliers and players such as regulators, oil companies, aircraft manufacturers and users. Therefore, it can be concluded that aircraft

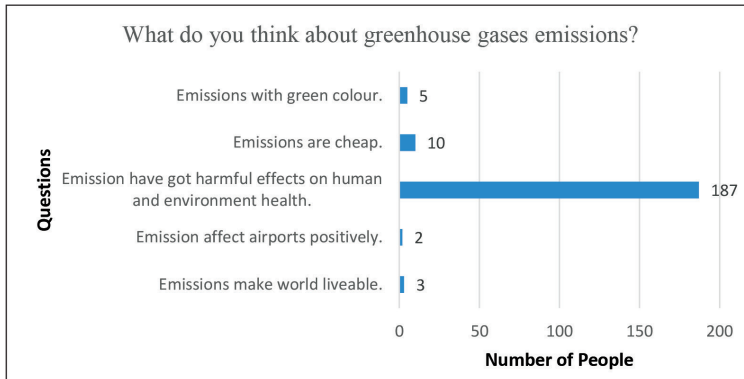


Figure 3: Think about GHGE

manufacturers and aircraft regulators should immediately be included in these sustainability games.

Another question is on household budget and GHGE, materialistic values, poor work-life balance, and the long commuting distance, which might decrease individuals’ subjective well-being and increase greenhouse gas emissions (Andersson *et al.*, 2014). On the other hand, mobility, food and housing were the most important items in terms of carbon emissions in the EU population (Sköld *et al.*, 2018). Even though it could be stated here that there were positive impacts of emissions-saving programmes on household spending, emissions-saving programmes could have negative effects on household budget (Dias *et al.*, 2019).

In Turkey, as shown in Figure 4, passengers were classified according to their willingness to pay an extra amount. Outside of 18.8% (39

people) of all the respondents (207 people), 168 people respondents were keen to pay an extra amount to reduce air carriers’ GHGE. Also, it was very interesting to discover that 37.68% (78 people) of the respondents wanted to pay an extra amount but they did not know the amount. A total of 8.21% (17 people) were willing to pay an extra amount of between 5% and 10%, and 12.077% (22 people) were keen to pay an extra amount of between 3% and 5%. A total of 42% respondents wanted to pay between 1% and 3% more. Finally, 6 people (2.89%) wanted to pay an extra amount of above 10%.

Questionnaire Analysis in terms of Gender

Gender differences had an impact on the research sample. It is really an interesting to see if gender has a definitive impact on sustainability. The results are shown in Figure 5. The majority of the women do not know how

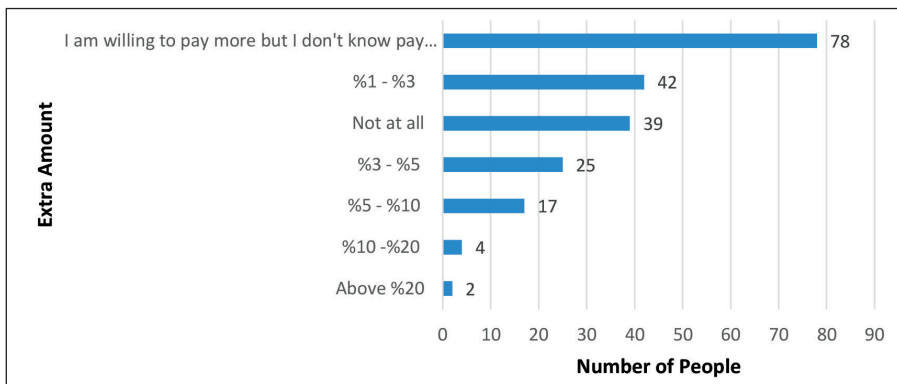


Figure 4: Fare-purchasing behaviour and GHGE in Turkey

much to pay for eliminating GHGE emissions from aviation sectors, even though they are keen to join sustainable activities with 47 (42%) respondents. For men, it can be said that they are relatively less ready to pay an extra amount with 23 (23%) respondents. At the same time, the men in Turkey have the same problem. Although the number of volunteers 31 respondents (31%) are not lower, they have the same problem in terms of fare-purchasing behavior about the ticket price.

Questionnaire Analysis in terms of Income

Although people in Turkey know the negative impacts of GHGE on human and environmental health, a big majority of high- and middle-income respondents do not want to pay more. It is a really interesting finding. However, this

may also be due to household budget planning, GHGE consciousness and aviation sector consciousness. At the same time, respondents who have an income of 3,000 and below want to join sustainable activities but they do not have enough information on the extra amount to pay for tickets. These findings can be seen in Figure 6.

Questionnaires in terms of Age

Age is another important factor and determinant in attitudes towards GHGE. According to age differences, there are also significant differences between generations. The younger generations are keener to pay an extra amount but at the same time, the number of unwilling youngsters is not small. These findings are illustrated in Figure 7.

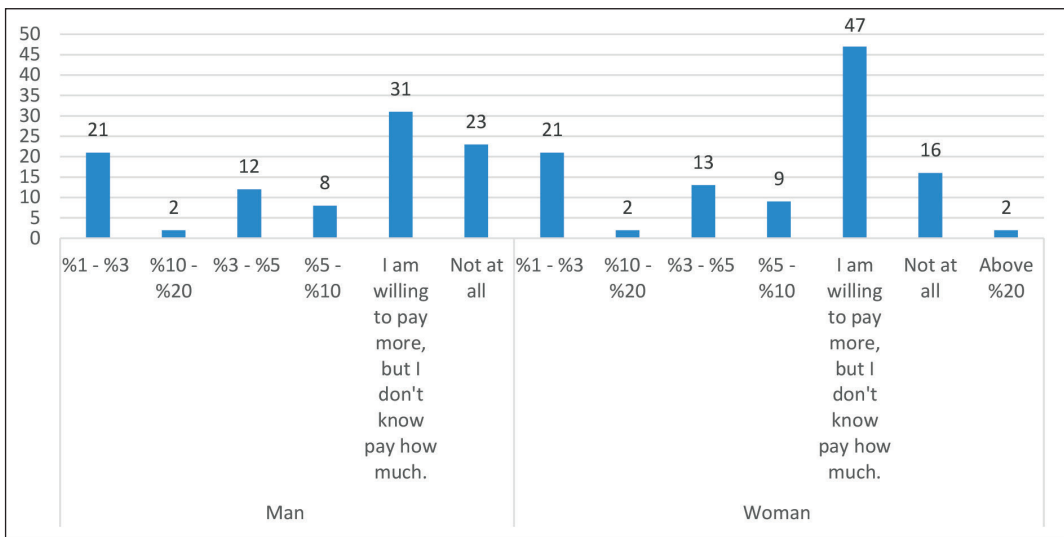


Figure 5: Gender difference effects on the questionnaire

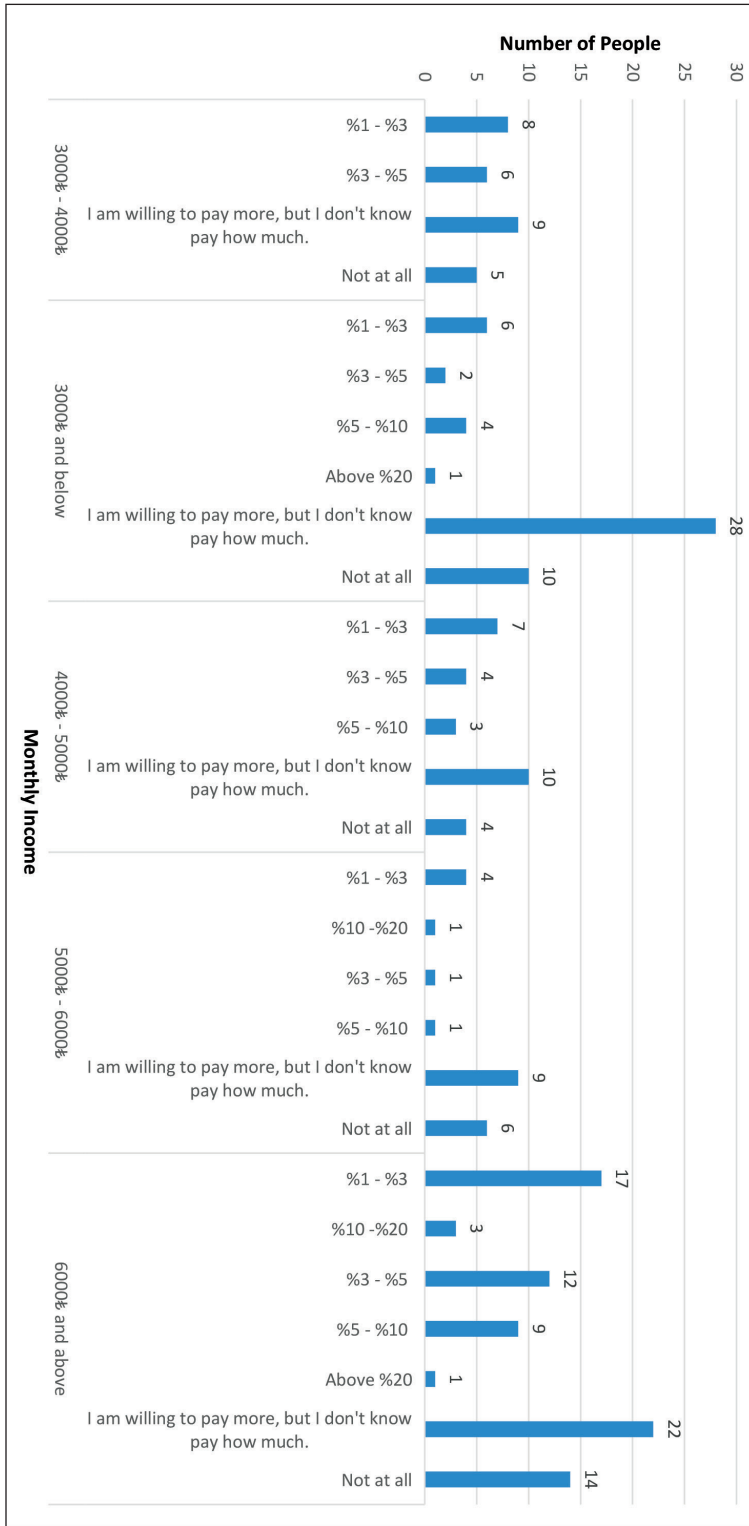


Figure 6: Impacts of income differences on questionnaires

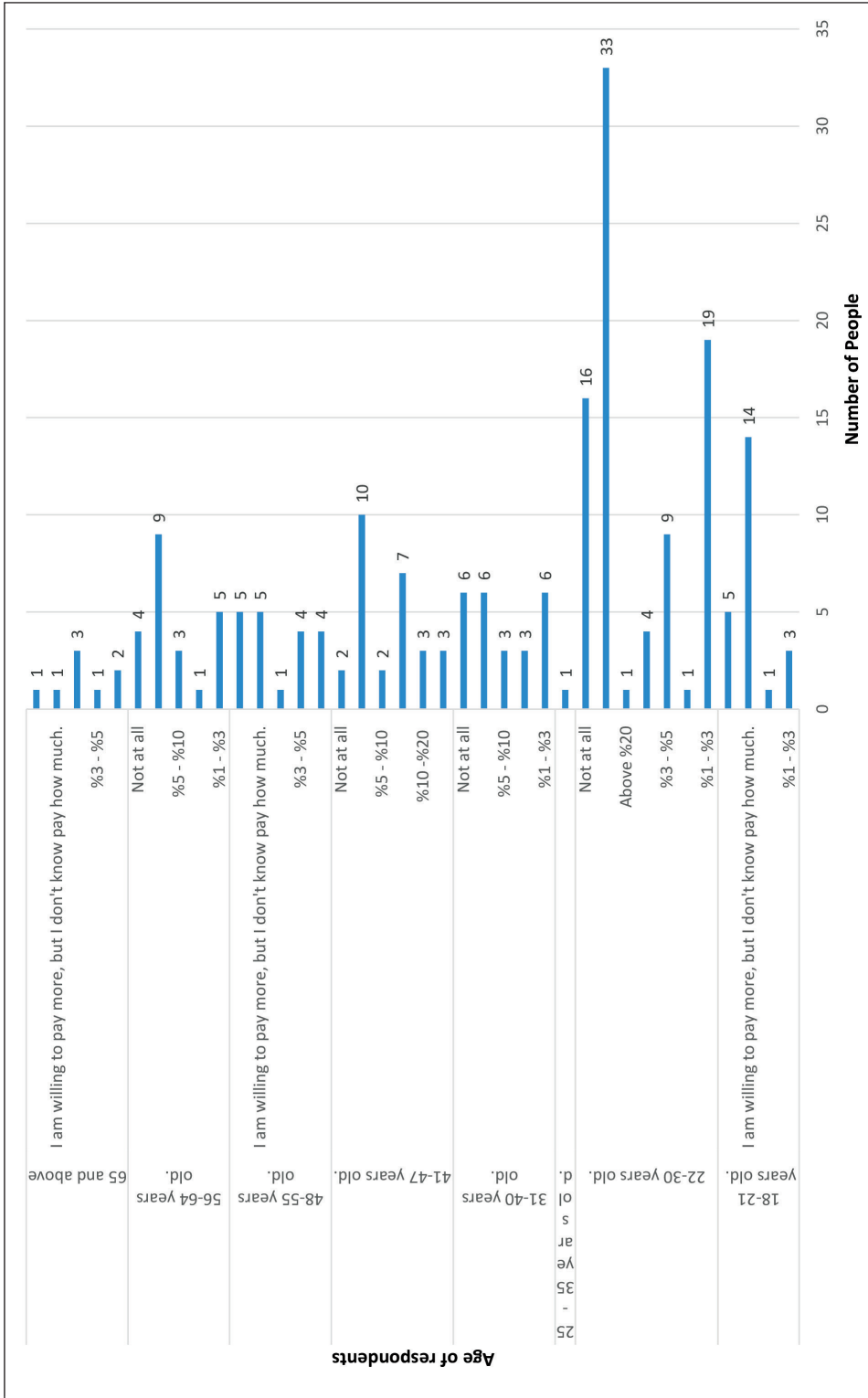


Figure 7: Age and willingness to pay an extra amount

Discussion

In parallel with the research questions, the majority of the respondents wanted to make extra payments to eliminate GHGE from aviation-related activities in Turkey. As the highly preferred option, this is an indicator of awareness, attitudes and behaviours of passengers toward GHGE. If these results relates to the health anxieties of passengers, it can be seen that Turkish air passengers' information level of emissions are at a saturated level. For this reason, future works on different fields such as aviation health management and biological aviation management, can be done. Furthermore, other dimensions of UN Sustainable Goals can also be the subjects of future papers.

On the other hand, social activism with regards to GHGE and climate change are at a very critical level in European countries such as Norway and Sweden, leading to passengers boycotting air carriers, which are the subject of several studies cited in this paper. Passengers' awareness is at a high level in Turkey, and this shows that there is a possibility that these movements have been seen in Turkey. Social activism on GHGE, such as social acceptance can be the subject of next-generation studies with different samples and different hypotheses. Out of this context, Hafezi and Zolfagharinia (2018) have focused on socio-demographic variables in consumer purchasing decisions.

It was found that women wanted to join sustainability activities more than men. This is an important finding and there are a lot of papers on the relationship between gender and green or sustainable products. Taking the available literature on the impact of gender, the expectation of the effects of gender on GHGE is high. Here, the gender impact shows that women have high sensitivity in environmental matters. The gender impacts on green products have been accepted by Liobikiene *et al.* (2017), Sreen *et al.* (2018) and Li *et al.* (2019). However, these effects have been rejected in Cai *et al.* (2017), Cerri *et al.* (2018), Jahanshahi and Jia (2018) and, Cheung and To (2019). According to Hwang and Choi (2017), women generally want to choose green products.

In this current study as well, women wanted to join sustainability activities more than men.

According to the literature on green products, income is another important variable. At the beginning of this project, it was expected that income would have a more significant effect on environmental products depending on their costs. However, the respondents gave similar responses regardless of income. Jo and Shin (2016), Khan and Mohsin (2017) and, Mamun *et al.* (2018) have found a relationship between green products and income. However, Cai *et al.* (2017) found that there was no relationship between the two. The last variable, age is shown to have an effect on sustainable or green products. Johnstone and Lindh (2017) showed that younger, specifically millennial, customers have an increasing awareness of sustainability, hence, age differences were very important in terms of ethical consumerism as stated in this paper. The millennial generation's views on fares was in line with Johnstone and Lindh (2017).

With increasing awareness, consciousness and positive attitudes towards GHGE and their negative effects on the environment and nature, the business has begun to reshape and reconsider its methods. Following the declaration of the Sustainability Development Goals of the United Nations, the transformation has been incredible. At the same time, this change dramatically affected literature, as more studies focused on policies, strategies, and market regulators. Air carriers could not be expected to avoid this. Fares are not only indicators of air carriers' performance but also an intersection point of many important managerial, financial and marketing variables. Besides, they also have a balancing power on all of these variables in the civil aviation industry.

Promoting sustainable and green purchase behaviour is the responsibility policymakers (Liobikiene *et al.*, 2017). Several models on this issue has been established according to the literature. For example, Jaiswal and Kant (2018) developed a model to design a perspective of green marketing policies and strategies. However, the market, in the segmentation analysis had the

highest importance according to this viewpoint. Gössling and Humpe (2020) concluded that the percentile of the most frequent fliers, which are at most, 1% of the world population likely accounted for more than half of the total emissions by air travel passengers and individual users of private aircraft contribute emissions of up to 7,500 t CO₂ per year. Rice *et al.* (2020) stated that women and long-haul passengers in the United States were keen to pay additional ticket prices to reduce GHGE's negative effects. Air carriers are the most visible part of the civil aviation system. Therefore, in order to create and maintain a more sustainable civil aviation system, regulators and other market players such as airports and suppliers, need air carriers' visibility power. In the near future, sustainable products have the potential to be a commodity depending on passengers' will and wish in Turkey. Tickets and fares as the most important financial resource of air carriers can be used as a definition tool to reduce the impacts of GHGE through promotional campaigns, marketing and financial strategies in Turkey.

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Appendix

Appendix 1: Questionnaires

- 1. What is your sex?
 - Male
 - Female
- 2. Where do you live in Turkey?
 -
- 3. What is your age?
 - 18 - 25 years
 - 25 - 35 years
 - 35 - 45 years
 - 45 - 55 years
 - Above 55 years
- 4. What is your educational level?
 - High school or below
 - Junior college
 - Bachelor degree
 - Master degree
 - Ph.D. 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 3,000
 - 3,000 - 4,000 Turkish liras
 - 4,000 - 5,000 Turkish liras
 - 5,000 - 6,000 Turkish liras
 - 6,000 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 greenhouse emissions?
 - Not at all familiar
 - Not very familiar
 - Somewhat familiar
 - Very familiar

9. What do you think are greenhouse emissions? Emissions with green colour
Emissions make world liveable
Emissions are useful for aircrafts
Emissions have got harmful effects on human and environment health
Emissions are cheap
Emissions affect airports positively
Emissions have positive effects on household budget
10. Have you ever heard the greenhouse emissions? Yes
No

Purchase intentions of fares

The aircrafts, airports and airlines are some of the main resources of greenhouse emissions. Greenhouse emissions are gases like:

- Water vapor
- Carbon dioxide
- Methane
- Ozone
- Nitrous oxide
- Chlorofluorocarbons

They have negative impacts on nature and human health.

11. In order to save environmental health of world and human health in the world the greenhouse emissions rate in the air should be diminished. If airlines have got a policy about diminishing greenhouse emissions, I am ready to pay:
- Not at all
 - I am willing to pay more but I don't 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 cannot understand