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Valuing air transportation and sustainability from a public perspective: Evidence from the United Kingdom and the United States

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ABSTRACT

One issue with air transportation and sustainability is that although aviation could be considered economically and socially sustainable, it does generate environmental concerns. The aim of this paper is to examine public attitudes towards air transportation and sustainability, in order to determine how individuals value sustainability in relation to air travel. This empirical paper is based on two large survey data sets, one from the East Midlands region of the United Kingdom and one from the East Coast of the United States. After an initial review of relevant literature and policy, a range of attitudinal statements from the surveys are examined. These statements cover the economic and social benefits of air transportation, the contribution of air travel to climate change, and environmental responses. The analysis demonstrates the high value individuals put on the economic and social sustainability aspects of air transportation. Although many acknowledge aviation's contribution to climate change, few are willing to respond in terms of paying more to offset the negative environmental effects of aviation or to fly less. When analysing the value of sustainability by population sub-group, flight frequency and gender are highlighted as key variables in terms of environmental attitudes.

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1. Introduction

The notion of sustainable development has become integral to transportation policy and practice in recent years. Typically defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987), sustainable development has been translated from a global ideal into national policies such as the Sustainable Development Strategy (Department for Environment, Food and Rural Affairs, 2005) in the United Kingdom (UK) and the more recent Sustainable Communities (HUD–DOT–EPA, 2012) focus in the United States of America (US).

This paper aims to examine public attitudes towards air transportation and sustainability, in order to determine how individuals value sustainability in relation to air travel. It is organised as follows. Initially the literature is reviewed that relates to the valuation and measurement of sustainability and attitudes towards flying and climate change. The research questions and methods are then presented. The analysis is based on two air travel survey datasets conducted in the UK and the US respectively. The Findings and discussion section consists of analysis of air transportation and sustainability attitudinal statements of the overall sample and then by different socio-economic characteristics. Finally, implications for managerial practice and contribution to scholarly knowledge are provided.

1.1. The valuation and measurement of sustainability

There is a range of environmental impacts of air transport including, amongst others, global climate change concerns; the development of airports and associated infrastructure; noise and vibration from aircraft (and surface access); water pollution (e.g. surface run-off); local air quality pollutants (e.g. CO, NO_X); and solid waste (scrapped aircraft, waste oil/tyres).

Despite a dip due to the current economic recession, United Kingdom (UK) air travel has increased over the previous ten years. There were 219 million terminal passengers at UK airports in 2011 compared with 167 million in 1999 (Civil Aviation Authority, 2012). It is also likely to experience a long-term growth in demand with a knock-on impact on emissions such as carbon dioxide (CO_2). Climate change has had an increased role over time within the environmental aspects of sustainable development, as shown by its more prominent role within the 2005 UK Sustainable Development Strategy (Department for Environment, Food and Rural Affairs, 2005), and the subsequent Climate Change Act (United Kingdom Parliament, 2008). With the legally binding Climate Change Act target for 2050 being an 80% reduction based on 1990 levels, emissions from other sectors would have to be cut dramatically to allow aviation to follow the existing trajectory (Bows, Anderson, & Upham, 2006; House of Commons, 2006).

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Indicators are often used as a tool to measure sustainability, as demonstrated by the recent United Kingdom example (Department for Environment, Food and Rural Affairs, 2010). The following eight indicators, out of the full list of 68, directly relate to transport (including in brackets how they are measured):

- Aviation and shipping emissions (greenhouse gas emissions from UK-based international aviation and shipping fuel bunkers at airports and ports)
- Road transport (CO_2, NOx, PM10 emissions from all road transport)
- Private cars (CO_2 emissions)
- Road freight (heavy goods vehicle CO_2 emissions)
- Mobility (number of trips by walking/cycling and public transport/taxi)
- Getting to school (children walking/cycling to school)
- Accessibility (differences in access with and without car)
- Road accidents (number killed or seriously injured)

Only the first indicator relates to air transportation and focuses on environmental sustainability. The use of strategies and indicators as a measurement tool is a top-down approach from national governments to value and measure sustainability. It is therefore of interest how members of the public value sustainability, more of a bottom-up approach. This paper takes this perspective to assess public attitudes using air transportation as the sustainability application. One issue in sustainable development is the tension between economic and environmental goals: aviation may be not environmentally sustainable, but it could be considered economically as well as socially sustainable (Upham, Maughan, Raper, & Thomas, 2003).

There are many social benefits that air transportation offers, including the well-being aspects of leisure trips for the general public and the employment opportunities provided. These benefits are not equal across society. Most population groups in the UK have increased the amount they fly as a result of the boom in low-cost airlines, but the increase has been greater in the higher socio-economic bands (Civil Aviation Authority, 2006). Furthermore, the climate change impacts from aviation will adversely affect society and some individuals may have to reduce or stop flying as a result of increased taxes and legislation implemented (Budd & Ryley, 2012, chap. 3).

1.2. Attitudes towards flying and climate change

There is a growing body of research examining attitudes towards air travel and sustainability, often splitting the population up into sub-groups. For instance, a study by Ipsos MORI (2007) determined the air travel behaviour of segments (ranging from the 'ultra greens' to the 'disengaged') based on the receptiveness to policy approaches such as information provision, government regulation and increases in total flight cost (fares or taxes). An interesting finding is that while the 'ultra greens' are classed as frequent flyers that regularly use low cost airlines to fly for short breaks, the 'disengaged' are not really frequent flyers.

Other research applying market segmentation techniques to examine the influence of context on attitudes and behaviour has found 'cognitive dissonance' within general environmental behaviour (Barr, Shaw, Coles, & Prillwitz, 2010) and for transport mode preferences and choice (Barr & Prillwitz, 2012). More specifically, the segments exerting the highest degree of environmental concern in the household context were often those who were more flight dependent in a tourism context. Howarth, Waterson, and MacDonald (2009) also highlight that an individual's awareness and understanding of climate change is often not reflected in their actions with respect to transport, concluding that there is greater need for measures which support change rather than provide information.

This paper attempts to probe more deeply into individual attitudes relating to air transportation applying a sustainability framework across two survey datasets.

2. Research questions and methods

In order to determine how individuals value sustainability in relation to air travel, this paper relies on primary data collected through two questionnaire surveys, conducted in the UK and the US respectively. A questionnaire survey is a data collection technique that enables detailed analysis of individual attitudes and behaviours, although it is noted that there are discrepancies in that individual responses may differ from how they think and behave in practice.

A particular focus of the analysis is on five air transportation and sustainability attitudinal statements within both surveys. A key aspect of the analysis is to examine attitudinal responses by different socio-economic characteristics of the samples. As both surveys contain over 500 respondents, such sub-group analysis was possible. Although it is interesting to compare and contrast the two samples, it is also valuable to build upon previous attitudinal surveys relating to air travel and sustainability (e.g. Ipsos MORI, 2007). It is acknowledged, though, that the attitudes of an individual are not necessarily linked to how they behave. The two surveys, one from the UK and one from the US, are summarised in turn.

2.1. East Midlands Air Travel Survey (EMATS)

There have been three air travel surveys conducted in the East Midlands region of the United Kingdom (UK). This paper concerns results from the first East Midlands Air Travel Survey (EMATS). Data collection for this survey was conducted by the Loughborough University team using postal questionnaires, a low cost method that does not involve high personnel travel costs. That said, there can be difficulties with postal questionnaire surveys in obtaining a representative sample due to low response rates. A self-completion questionnaire was posted out to each household sampled, together with a pre-paid return envelope. The request was for one adult within the household to complete the questionnaire and return it in the envelope provided. Survey design was informed by the Charnwood air travel household survey (Charnwood is a distinct sub-region within the East Midlands region), conducted in October 2006 (Ryley & Davison, 2008). In addition, a pilot postal survey of 67 households was conducted in August 2007, sampling the towns of Barrow-upon-Soar and Woodhouse Eaves within the Charnwood Borough Council area. The EMATS questionnaire contained a vast array of variables relating to air travel attitudes and behaviour, together with background socio-economic and transport information.

The EMATS sampling strategy was to select two sub-areas within each of five local authorities in the East Midlands. The size of the East Midlands region is 15,607 km^2, and it has a mid-2007 population estimate of 4,399,600 (Government Office for the East Midlands, 2009). The five sampled local authorities were: Hinckley & Bosworth, Newark & Sherwood, Northampton, North East Derbyshire, and Nottingham. A quota was set for sampling both the local authority and sub-areas. The criteria for the local authority was to sample at a range of distances from East Midlands airport, the most central airport in the region; to get a mixture of urban and rural districts; and not to select adjacent authorities. The sub-areas were selected to include a range of different socio-economic characteristics, reflecting England and Wales (given the lack of data for the East Midlands); again adjacent areas were rejected. The sampling frame was the Electoral Register, a record of everyone living within the Council area eligible to vote.

Of the 5000 questionnaires posted out in autumn 2007, 517 usable questionnaires were returned. This represents an overall response rate of 10%, lower than expected. Postal survey questionnaires tend

to have response rates of between 10% and 20% (Ryley & Davison, 2009). To overcome the bias of low response by sub-area, further surveys were sent to those with less than 50 responses. In total, 1300 further surveys were posted during spring 2008, of these 88 (7% response rate for the boost) were returned, resulting in 605 overall returns (10% response rate).

2.2. East Coast US Air Travel Survey (ECUSATS)

The primary goal of the East Coast US Air Travel Survey (ECUSATS) was to examine airport travel preferences, with a focus on airport choice, and how these vary across population segments. ECUSATS was conducted in Summer 2008 and follows a series of four bi-annual US internet-based air travel survey undertaken by Resource Systems Group Inc. since 2000 (see Adler, Falzarano, & Spitz, 2005; Bhat, Adler, & Warburg, 2006; Hess, Adler, & Polak, 2007; Theis, Ben-Akiva, Adler, & Clarke, 2006). The Loughborough University team was able to insert five attitudinal statements into ECUSATS in order to compare findings between the UK and the US samples. A web-based survey method was adopted, a cost effective and efficient way to get information from a range of individuals, across a diverse geographical area. The survey design offered respondents the flexibility to complete the questionnaire at a time or times convenient to them. Disadvantages of internet surveys include that respondents have to have internet access, and that individuals can be 'professional survey fillers', which can cause bias (Ryley & Davison, 2009). The final sample, of 504 individuals, lived primarily in the following American states: New York 147 (29.2%), Pennsylvania 110 (21.8%), and New Jersey 73 (14.5%). The three states of New York, Pennsylvania and New Jersey (65% of the ECUSATS area) cover 256,408 km^2 and have a population of 40,621,237 (U.S. Census Bureau, 2009). The ECUSATS area, therefore, covers a much larger area and target sample population than the EMATS area. Given the large size of the ECUSATS area it is acknowledged that there are variations within the sample both in terms of socio-demographic characteristics of respondents and their access to airports.

2.3. Survey content and analysis

There are five attitudinal statements regarding air travel and sustainability common to both surveys, which are analysed in this paper. The attitudinal statements were carefully designed so as not to cause confusion or bias amongst respondents, and that they would enable opinions across different socio-economic groups within the population to be determined. The five statements are:

1. Air travel is essential to the UK/US economy and the country's continuing prosperity.
2. The nearest/previous airport should be expanded to offer more air travel opportunities.
3. Air travel is a significant contributor to climate change.
4. Air passengers should pay more to fly to offset any negative environmental effects of aviation.
5. I am trying to fly less for environmental reasons.

Statements 1 to 5 were presented as a 5-point Likert scale: Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree and Strongly Agree. Note that in ECUSATS 'Disagree' and 'Agree' were 'Somewhat Disagree' and 'Somewhat Agree'. Also note that Statement 5, referring directly to the respondent, had a Yes/No response in the EMATS, as opposed to the 5-point Likert scale in ECUSATS; there is also a difference in Statement 2, referring to the nearest airport in EMATS and previous airport used in ECUSATS.

The socio-economic characteristics of respondents analysed across both surveys are gender, age, income, current status, frequency of flying and trip purpose. The variable of children present within the household is also in EMATS and included in the analysis.

The Chi-square technique has been applied to test the independence between the socio-economic characteristics and attitudinal statement responses to the two air travel surveys. Chi-square tests are used with categorical and nominal data; calculations are based upon the difference in observed and expected frequencies. The test determines whether the observed frequencies are significantly different from the expected frequencies; critical values mean the level of statistical significance can be assessed, indicating the likelihood they occurred by chance (Urdan, 2005). Statistically significant relationships are considered at the 90%, 95% and 99% confidence levels.

3. Findings and discussion

3.1. Socio-economic characteristics of the survey samples

Before analysing the attitudinal statements, discrepancies between the two surveys relating to the socio-economic variables are considered. In terms of gender, both surveys have a higher response rate amongst female respondents (EMATS 63% female, ECUSATS 74% female). This is particularly pronounced for the ECUSATS; internet surveys can be dominated by female respondents (also evidenced from other surveys conducted by the authors).

EMATS and ECUSATS are a series of air travel surveys that were established separately and so category bands for variables such as age and income are different. There are a greater proportion of elderly respondents (over 60) in EMATS (33%) than in ECUSATS (6%), presumably due to the nature of the survey, postal-based rather than internet-based. To counter these differences, for some analysis those aged over 60 have been taken out. In addition, as the age category boundaries differ between the surveys, age has been grouped into the categories of 'young', 'middle aged' and 'older' (EMATS 18–34, 35–59 and 60+; ECUSATS 18–29, 30–59 and 60+).

Income was recorded differently between the two surveys, income in EMATS is personal income whereas income in ECUSATS is household income. Given also the currency differences in which the incomes are measured, income has also been analysed in relative terms: re-categorizing income brackets into groups as 'low', 'middle' and 'high' earners. There is a much higher percentage of respondents in the higher income brackets from ECUSATS (72% in the top 4 income categories) in comparison to EMATS (20% in the top 4 brackets). In EMATS, the most frequent 'current status' categories amongst respondents are employed full-time (36%) and permanently retired from work (29%). Of the households in the sample, 32% contain children. In ECUSATS, by far the most frequent 'current status' category amongst the respondents is as a full-time worker (56%). As expected, given the ECUSATS respondent criteria (had flown over the previous 12 months), respondents from EMATS fly less frequently than ECUSATS respondents.

For EMATS, many of the socio-economic variables correlated significantly (at a 99% significance level). Older respondents are more likely to have children living at their house (−0.443), have a lower income (−0.439) and be male (−0.154). The gender of the respondent is also correlated significantly with three other variables. Females are more likely to have a higher number of children at the address they live at (0.145), fly less frequently in comparison to males (−0.139) and have a lower personal income (−0.167). The number of children that lived at the respondent's household correlated positively with personal income (0.194). Within ECUSATS, household income correlated significantly with three variables: a greater frequency of domestic flying (0.206) and a higher proportion of business trip (0.268); both significant to the 99% level. At a significance level of 95%, a higher household income correlated with older respondents (0.105). Gender was not correlated with the other socio-economic variables.

In summary, the survey datasets used different data collection methods (postal vs. internal panel) and target samples (general public

vs. air travellers). Although both were similar in comprising a majority of female respondents, the ECUSATS sample is younger, with higher incomes, and a higher proportion in full-time work. As such, the surveys have different underlying correlation structures.

3.2. Attitudinal statement analysis

Table 1 shows responses to the first four attitudinal statements. The statements are analysed in turn relating to economic (Statement 1), social (Statement 2), and environmental sustainability (Statements 3–5). The environmental sustainability statements can be split further according to attitudes towards climate change (Statement 3), action in terms of all passengers paying more to fly (Statement 4) and action in terms of the respondent flying less (Statement 5).

The majority of respondents from both surveys are in agreement that air travel is essential to the economy: 69% (EMATS) and 75% (ECUSATS). Only 4% of respondents disagree with the statement from each survey. Respondents in ECUSATS (60%) are slightly more in agreement about airport expansion in comparison to the respondents in EMATS (52%), although many are undecided (EMATS, 33%, ECUSATS, 30%).

A greater proportion of EMATS respondents (52%) agree with the statement 'Air travel is a significant contributor to climate change' than respondents to ECUSATS (33%). A similar number for both surveys, around 40%, did not agree or disagree with this statement. The reason for a large proportion of respondents neither agreeing nor disagreeing with the statement may be because of lack of knowledge or interest into how much the aviation industry pollutes.

The statement with the highest disagreement was 'paying more to fly for environmental reasons'. Both surveys share almost identical views on this statement, with less than one in five respondents (18%) considering passengers should have to pay more to offset any negative environmental impact. For both surveys, more than half of the respondents therefore consider that it is not the consumer's responsibility and that they should not have to pay more to offset the negative costs to the environment. Around 30% of respondents to both surveys are undecided as to whether it is the consumer responsibility to pay to offset any negative impacts of air transportation.

For the final statement a higher proportion of respondents from ECUSATS (19%) agree that they are trying to fly less for environmental reasons in comparison to the respondents for EMATS (8%). On the surface this shows that respondents to the ECUSATS survey are more environmentally friendly, although ECUSATS respondents fly more frequently and by being willing to reduce the number of flights from an existing greater number is not necessarily being more environmentally friendly. Although EMATS respondents are more likely to agree that the aviation industry is a major contributor to climate change, they are less likely to reduce the amount they fly for environmental reasons (i.e. change their personal travel behaviour).

3.3. Analysis of attitudinal responses by different socio-economic characteristics

Chi-square analysis was applied to determine significant relationships between socio-economic variables (gender, age, income, status, air travel frequency, trip purpose and children present) and the air travel and environmental sustainability attitudinal statements. Those that generated statistically significant relationships are shown in Table 2, determined from the socio-economic variables of frequency of flying, gender and income.

Flight frequency has an influence over the response of respondents to the environmental attitudinal statements in both surveys. It is statistically significant (at a 90% level or greater) for all statements with the exception of 'air travel is significant to climate change' in ECUSATS. This can be interpreted as the more an individual flies the less likely they are to agree with the environmental attitudinal statements.

Gender is also significant, with a strong link in both surveys to 'air travel is a significant contributor to climate change' and 'passengers should pay more to offset any negative environmental effects of climate change'. This outlines the likelihood of females to be more in agreement with these two environmental attitudinal statements, although interestingly not in the personal action of flying less for environmental reasons.

The final significant relationship is that those with higher incomes are 'trying to fly less for environmental reasons' (Chi-square test at 95%, ECUSATS sample).

3.4. Further analysis of gender and the statement that 'air travel is a significant contributor to climate change'

Females are more likely to agree with the attitudinal statement 'air travel is a significant contributor to climate change' in both surveys. Within the EMATS, unlike ECUSATS, gender is correlated significantly with children present, frequency of flying and incomes (Section 3.1). Females are more likely than males to have a higher number of children at the address they live at, fly less frequently and have a lower personal income.

Table 1
Responses to the first four attitudinal statements within EMATS and ECUSATS.

Statement	EMATS						ECUSATS					
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Number of respondents	Strongly agree	(Somewhat) agree	Neither agree nor disagree	(Somewhat) disagree	Strongly disagree	Number of respondents
Air travel is essential to the UK/US economy and the country's continuing prosperity	24.8%	43.8%	27.1%	3.6%	0.7%	576	33.5%	41.7%	20.0%	3.8%	1.0%	504
Nearest/previous airport should be expanded to offer more air travel opportunities	21.9%	29.8%	33.1%	12.2%	2.9%	580	26.4%	34.1%	29.6%	8.1%	1.8%	504
Air travel is a significant contributor to climate change	14.7%	36.9%	36.2%	10.5%	1.7%	572	6.9%	26.2%	42.5%	15.1%	9.3%	504
Air passengers should pay more to fly to offset any negative environmental effects of aviation	5.4%	13.4%	29.2%	35.7%	16.3%	575	5.4%	12.9%	30.4%	24.2%	27.2%	504

Table 2
Chi-square tests for the environmental sustainability attitudinal statements by socio-economic variables for EMATS and ECUSATS.

EMATS	Trying to fly less for environmental reasons			Air travel is a significant contributor to climate change			Passengers should pay more to fly to offset any negative environmental effects of aviation		
	Number	Pearson Chi-square value	Significance level	Number	Pearson Chi-square value	Significance level	Number	Pearson Chi-square value	Significance level
Frequency of flying	527	19.287	0.037[b]	539	31.675	0.047[b]	542	37.530	0.10[c]
Gender	526	3.037	0.219	568	22.733	0.000[a]	570	17.566	0.002[a]
Income	485	12.817	0.541	526	37.692	0.104	530	19.192	0.892
ECUSATS	**Trying to fly less for environmental reasons**			**Air travel is a significant contributor to climate change**			**Passengers should pay more to fly to offset any negative environmental effects of aviation**		
	Number	Pearson Chi-square value	Significance level	Number	Pearson Chi-square value	Significance level	Number	Pearson Chi-square value	Significance level
Frequency of flying	504	39.563	0.001[a]	504	7.754	0.956	504	27.042	0.041[b]
Gender	504	2.291	0.682	504	11.389	0.023[b]	504	17.254	0.002[a]
Income	504	48.483	0.031[b]	504	34.720	0.340	504	30.950	0.520

[a] 99% significant.
[b] 95% significant.
[c] 90% significant.

Table 3 shows the overall gender attitudes for 'air travel is a significant contributor to climate change' across both surveys, and then EMATS split further by sub-groups (of at least 30 members) based on children present, income, age and children. The female sub-groups that have stronger agreement than the 54% of the overall female EMATS group are: females with children (57%), younger (18–34) females with children (60%), younger (18–34) females (63%), and middle income (£20,001–£50,000 personal income per year) females (70%).

Given that agreement is higher for women who are younger and/or have children, there is a sense that females have more of a focus on the future ahead of them, either because they are young and/or because they partly view the world from the perspective of their children.

4. Implications for managerial practice

There are a range of air transportation stakeholders, including airports, airlines, national policy-makers and ground access operators, which have a shared goal of developing aviation in a sustainable manner. The aviation industry needs to be aware of general public attitudes, as they can influence transport planning (e.g. through consultation) and governing bodies (e.g. through elections). In addition, air transportation managers need to be tuned into the way that public attitudes are influenced (e.g. by the various media channels) which in turn affects how individuals value sustainability.

The paper has demonstrated that individuals value highly the economic and social sustainability elements of air transportation but are not so convinced by the environmental arguments. Analysis has identified sub-groups within the population that respond more positively to messages surrounding air travel and environment issues. This is particularly the case for female population segments, and more so for those who are also younger and/or have children. Stakeholders could promote policy messages relating to air travel and environmental sustainability to such sub-groups. Any fiscal measures implemented as part of managerial practice to improve the environmental sustainability of aviation are likely to be met with resistance from the general public, who do not think that individuals should pay more to fly to offset the negative environmental effects of aviation.

5. Contribution to scholarly knowledge

Although the two surveys had different data collection methods (postal vs. internet panel) and target samples (general public vs. air travellers), they have provided insights into the public response to air travel and sustainability aspects in two developed countries. Although respondents tend to value highly the economic and social sustainability arguments for air transportation, and acknowledge aviation's contribution to climate change, they tend not to agree with the environmental responses. Most respondents showed an unwillingness to pay more to fly to offset the negative environmental

Table 3
'Air travel is a significant contributor to climate change' attitude statement split by gender.

	Strongly agree	(Somewhat) agree	Neither agree nor disagree	(Somewhat) disagree	Strongly disagree	Frequency	Percentage
ECUSATS Overall	*6.9%*	*26.2%*	*42.5%*	*15.1%*	*9.3%*	*504*	*100.0%*
ECUSATS Male	7.8%	23.3%	34.1%	21.7%	13.2%	129	25.6%
ECUSATS Female	6.7%	27.2%	45.3%	12.8%	8.0%	375	74.4%
EMATS Overall	*14.7%*	*36.9%*	*36.2%*	*10.5%*	*1.7%*	*572*	*100.0%*
EMATS Male	13.0%	34.1%	32.2%	17.3%	3.4%	208	36.5%
EMATS Female	15.6%	38.6%	38.6%	6.4%	0.8%	360	63.5%
EMATS Female: no children	14.8%	37.5%	37.0%	9.3%	1.4%	216	63.5%
EMATS Female: children	17.8%	39.3%	40.7%	2.2%	0.0%	135	36.5%
EMATS Female: lower income	16.5%	30.9%	42.6%	8.7%	1.3%	230	70.2%
EMATS Female: middle income	17.0%	53.4%	27.3%	2.3%	0.0%	88	26.0%
EMATS Female: age 18–34	22.8%	40.5%	31.6%	3.8%	1.3%	79	21.4%
EMATS Female: age 35–59	13.0%	37.0%	44.6%	5.4%	0.0%	184	50.1%
EMATS Female: age 60+	14.6%	39.6%	33.3%	10.4%	1.9%	96	28.5%
EMATS Female: age 18–34 & children	20.0%	40.0%	38.0%	2.0%	0.0%	50	8.7%

effects of aviation and only a small minority were trying to fly less for environmental reasons. This aligns with the literature in that individuals are prepared to think environmentally but not act in such a manner, particularly for air transportation applications. There is a research challenge to further examine the differences between attitudes and behaviour of population sub-groups, particularly those such as females who tend to value environmental sustainability more highly. Further application of a sustainability framework split by economic, social and environmental dimensions would be worthwhile.

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