Willingness to carbon offset: value of malaysian air travellers’ experience, general and specific environmental knowledge

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Abstract. Greenhouse gas emissions from the aviation sector contribute significantly to global warming. Air transportation contributed 4% to 9% of total CO2 emissions in Malaysia. Several approach have been done by aviation industries in Malaysia to reduce carbon emissions from airlines, but still unsuccessful to implement carbon offset program. This study investigated experience, understanding of carbon offsets and the information passengers have concerning environmental issues and the ability to evaluate and understand impact on society and the environment among Malaysian airlines passengers. A descriptive statistics is reported as data collected from 407 Malaysian airlines passengers. The result shows only 1.5% of passengers experienced bought carbon offset schemes in past flight, more than 83% are knowledgeable with environment knowledge and more than 75.7% enlightened with understanding of carbon offsets. The finding obtained will help in providing insightful understanding about Malaysian airlines passengers’ acceptance on carbon offsets and willingness to contribute with carbon offsetting.

1. Introduction
There are many factors that contribute to the greenhouse gases and one of it is the released of carbon dioxide (CO2) emission to the atmosphere. According to [1], CO2 emission does not come from only one sector, but contributed by many other sectors such as industrial, residential, agriculture and also transport sector. As the data provided by [2], transportation sector showed an increasing rate of energy consumption starting from 2010 until 2016. In Malaysia, 24% of CO2 emissions contributed by the transportation sector; air transportation contributed 4% to 9% of total CO2 emissions. The impact of air transportation on the environment is receiving increasing attention.

As the aviation has been identified as a significant and rapidly growing contributor of emissions of greenhouse gases [3], many airlines around the world launched efforts to mitigate aviation emissions, including fuel-efficient usage, aircraft weight reduction and implementation of carbon offsetting [4]. Previously in 2008, Malaysia Airlines (MAS) has launched the voluntary carbon offsets program named “towards a greener future”, but the program is no longer continued. No supporting group, lack of exposure and advertising to promote the program causing it to be considered as failed. The effort
made by airlines is typically not apparent to passengers [5, 6]. As we know, there are much information on road transportation impact on the environment, but not from air transportation. Less information received from passengers may effect on their decision to reduce CO\textsubscript{2} emission from their travel.

A large and growing body of literature has investigated the purchasing of carbon offset depends on factor associated with socio-demographic profile [7, 8, 9, 10, 11, 24]. A considerable amount of literature has been published on psychological variables such as attitudes [4, 12, 9, 13] and emotions [14] as a factor determine purchasing of carbon offset. Few research [4, 10,11, 14] include variable knowledge and awareness of offsets as a measured factor, and only a small number of research investigating the effect of offsets experience and knowledge on carbon offsets in influencing offsetting decision. [10] reveal that, 6% of Taiwanese passengers knew the specifics of carbon offsetting schemes, and only 5% felt that offsetting schemes were successful in reducing carbon emissions. [7] found that only 36% among Malaysian airlines passengers knows about carbon offsets program, and only 1% have an experienced buying carbon offsets. [15] investigating the perception of carbon offsetting by Australian travellers and it found that less than 30% of respondents understood what carbon offsets were.

As mentioned previously, the information on carbon offsets launched by MAS is not clearly understood by air passengers, makes them unwilling to contribute to offset. [16] showed that low level of contribution among Asian travellers was due to their lack of awareness regarding the impact of aviation to the environment. As the value of willingness to pay for carbon offset among Putrajaya resident, calculated by [8] revealed, lack of awareness among Putrajaya residents is a prove of low level contribution on carbon offsetting. Besides, [10] also concluded knowledge on carbon offset schemes will effect on offsets decision.

As carbon offsets scheme/program still unfamiliar, and not many industries in Malaysia implemented carbon offsets, thus, this study will investigate experience, understanding of carbon offsets and environmental knowledge, or the information passengers have concerning environmental issues among Malaysian airlines passengers. The finding obtained will help in providing insightful understanding about Malaysian airlines passengers’ acceptance on carbon offsets and their willingness to contribute with carbon offsetting.

2. Methodology
A quantitative survey was carried to assess Malaysian air travellers’ knowledge on carbon offsets and general environmental knowledge. The survey were distributed at Kuala Lumpur International Airport (KLIA) and Kuala Lumpur International Airport 2 (KLIA2), which these two is the main hub in Malaysia for both international and domestic flight especially for Malaysia Airlines (MAS) and Air Asia Sdn Bhd. The survey was carried out for three months from February to April 2018, focusing on MAS and Air Asia passengers only. In total, 407 passengers willing to cooperate to answer the survey and they were explained in personal communication by enumerator. The enumerators explained and helped respondents to answer the questionnaire. It is important to ensure that respondents clearly understand the issues in the questionnaire. Questionnaires were provided in both Malay and English language. The data collected were then analyzed using statistical software IBM-SPSS (version 22).

2.1. Questionnaire design
The questionnaire comprises three sections; Section A asks about the demographic profile of the respondent; Section B contains questions about travel patterns and experience on carbon offset program; and last Section C is on the general environmental knowledge and carbon offset knowledge, and passengers were asked to answer regarding the statement given based on one-to-seven Likert scale (1: strongly disagree, 7: strongly agree). The questionnaire was adapted from [18, 19, 17, 16] and modified to suit the study. [20, 21] highlights that environmental knowledge refers to what people understand about the environment and the key relationship that leads to the environmental impacts. In
detail, environmental knowledge can be explained as a general knowledge of facts, concepts, and relationship regarding the natural environment and its major ecosystems [22]. Results and Discussion

A total of 450 questionnaires were distributed and 407 valid responses were retained for analysis. Intercept sampling was used as a sampling strategy to select potential respondents from KLIA and KLIA2. The response rate is 89.6%. The final sample comprised slightly more females (68.3%) than males (31.7%). The major proportion of the respondents (97.7%) was aged between 20 to 54, and 2.3% ages between 55 and above. The sample appeared to be well-educated passengers (94.6% held university level). In terms of profession, most of the respondents work with the private and government sector, representing 34.4% and 28.3% of all respondents respectively. Followed by students (13.8%), 18% of respondents reported that they have their own business or self-employed, 3.2% are housewives, and only 2.3% are retirees, as can be seen from Table 1.

| Table 1. Demographic profile. |
|-----------------------------|
| Variable         | Group   | Frequency | Percentage (%) |
| Gender           | Female  | 278       | 68.3%          |
|                 | Male    | 129       | 31.7%          |
| Race             | Malay   | 328       | 80.6%          |
|                 | Chinese | 41        | 10.1%          |
|                 | Indian  | 35        | 8.6%           |
|                 | Others  | 3         | 0.7%           |
| Marital status   | Married | 186       | 45.7%          |
|                 | Single  | 218       | 53.5%          |
|                 | Others  | 3         | 0.74           |
| Age              | 20 – 55 years | 398 | 97.7%          |
|                 | 55 years and above | 9 | 2.3%           |
| Education level  | Primary school | 6     | 1.5%          |
|                 | Secondary school | 16 | 3.9%          |
|                 | Professional certificate / diploma | 50 | 12.3% |
|                 | Bachelor degree | 147 | 36.1% |
|                 | Postgraduate | 188     | 46.2%          |
| Occupation       | Housewife | 13     | 3.2%          |
|                 | Student   | 56       | 13.8%          |
|                 | Retiree   | 10       | 2.3%           |
|                 | Self-employed | 45 | 11.1%          |
|                 | Own business | 73     | 18.0%          |
|                 | Private sector | 140 | 34.4%          |
|                 | Government | 115     | 28.3%          |

In reporting on travel patterns, passengers were asked to report on the number of flights made in past 12 months and the purposes of their trip. Table 2 shows the pattern on flying frequency among respondents which 38.6% flying in up to five trip per year, 43.2% experienced 3 to 4 trip per year and only 18.2% flying at least 1 to 2 times per year. As expected, most of the passengers choose to travel using airlines for leisure activities (50.6%) as it will shorten the time travelling (Figure 1) [14], especially when flying internationally. As can be seen from Table 3, more than half of all passengers flying for domestic destination (62.9%) and 37.1% international destination.

| Table 2. Number of flying trip. |
|-------------------------------|
| Flying Trip in past 12 months | Sample (%) |
| 1 - 2 times                   | 18.2       |
| 3 - 4 times                   | 43.2       |
| More than 5 times             | 38.6       |
Table 3. Passengers’ flight destination.

| Destination | Sample (%) |
|-------------|------------|
| Domestic    | 62.9       |
| International | 37.1      |

Table 4 provides the summary statistics for carbon offsets program, contain question on passengers’ experienced in contributing with carbon offsets. The overall response about carbon offsets experience is very low. Although almost half of passengers (42%) know about the emissions from airlines, more than half of passengers (53%) do not familiar with the notion of carbon offsets. Only 12.1% have an idea about carbon offsets and 34.9% might known about it. However, 89.9% of Malaysian passengers never had an experienced paying for carbon offsets and only a small number, 1.5% ever bought carbon offsets during their flight in past. Despite of Malaysia’s airlines (Malaysia Airlines Berhad, Air Asia, Malindo Air and Firefly) still did not implemented carbon offsets, some of the passengers experienced it while flying with other airlines.

Table 4. Passengers’ experience with carbon offsets.

| Statement | Sample (%) |
|-----------|------------|
| Do you know about the emissions from airlines? | |
| Yes       | 42.0       |
| No        | 38.8       |
| Maybe     | 19.2       |
| How familiar are you with the notion of carbon offsets? | |
| I do not know what carbon offsets are | 53.0 |
| I slightly know what carbon offsets are | 34.9 |
| I know what carbon offsets are | 12.1 |
| Have you ever bought carbon offsets for any flight in the past? | |
| Yes       | 1.5        |
| No        | 89.9       |
| I am not sure | 8.6      |
The last section of questionnaire focused on air traveller’s knowledge on carbon offsets and a question on environmental knowledge. This section provide an insight about awareness among Malaysian airlines passengers towards environmental issues and problems. Knowledge is believed to be an important factor for an individual as it somehow will influence someone’s decision. Table 5 presents a descriptive on passengers’ understanding of carbon offsets. Based on five statement adopted from [14, 23, 19], it is apparent that Malaysian passengers do have a knowledge about carbon offsets, as the result shows passengers’ agree and strongly agree with the statement asked (75.7% - 94.8%), and less than 12% are undecided on the statement asked. The answer given by passengers in Table 5 linked with passengers’ experience with carbon offsets, as in Table 4, 12.1% passengers have a knowledge about carbon offsets and 34.9% of passengers slightly know about carbon offsets.

Table 5. Passengers’ understanding of carbon offsets.

| Statement                                                                 | Sample (%)                        |
|--------------------------------------------------------------------------|-----------------------------------|
| Carbon offsets involve firms/transportation reducing their pollution      | 75.7% agree – strongly agree      |
| Firms that offer carbon offsets are environmentally responsible          | 94.8 % agree – strongly agree      |
| All carbon offsets program are government regulated/approved             | 88.7% agree – strongly agree      |
| Carbon offsets are priced as a percentage of the overall price of the good/service | 88.0% agree – strongly agree    |
| Carbon offsets may invest in activities that only reduce carbon in future | 91.1% agree – strongly agree      |

Table 6. Passengers’ general environment knowledge.

| Statement                                                                 | Sample (%)                        |
|--------------------------------------------------------------------------|-----------------------------------|
| Most smog in our big cities comes from industrial plants (i.e. factories) | 96.1% agree – strongly agree      |
| Air transport contributes 20% of global man-made CO₂ emissions            | 83.0 % agree – strongly agree      |
| Diesel fuel pollutes less than unleaded fuel                             | 85.3% agree – strongly agree      |
| Ecology assumes that man is an integral part of nature                    | 90.2% agree – strongly agree      |
| Carbon dioxide (CO₂), methane (CH₄) and water vapour are some examples of greenhouse gases | 91.4% agree – strongly agree |
| Increased amount of CO₂ in the atmosphere which traps the heat radiated    | 92.9% agree – strongly agree      |
| Global warming is an international environmental problem                  | 98.3% agree – strongly agree      |
| Ozone protects us from harmful, cancer-causing sunlight                   | 8.0% agree – strongly agree       |
| Oil is a renewable resource                                               | 84.8% agree – strongly agree      |
Environmental knowledge, or general environmental knowledge needs to be refreshed now and again, follow the updated information [23]. Based on Table 6, the descriptive reported that only a small number among passengers were between disagree to totally disagree (0.2% - 1.5%) with the statement on general environmental knowledge, 0.7% - 13.8% of passengers undecided or unsure with the statement, and 83% - 98.3% agree to strongly agree with the statement on environment knowledge. This proves that Malaysian passengers have been exposed and aware about the environmental knowledge. This result also in line with study by [25]. However, not all statement in Table 6 understood by respondents. The last statement “oil is a renewable resource” shown a reversed result where 84.8% agree to strongly agree with the statement whereas the answer should be non-renewable resource.

Other than asking passengers about their experience and knowledge, questionnaire also provide one question on the willingness to contribute with the carbon offsets, which passengers need to give answer either “yes” or “no”. Based on the data collected, response on the willingness is almost balances, as 50.4% among passengers are willing to contribute and 49.6% are not willing to contribute with carbon offsets. Based on [7], 64.5% of Malaysian passengers willing to pay for carbon offset program in aviation industry, but 77% of passengers think airlines industry should responsible and take action to reduce the emission, not by transfer the burden to the passengers. This result in line with studies that have been done by [14]. The value that passengers are willing to contribute in reducing airlines emissions become the leap to the airlines industry in preparing to reduce global warming problems.

3. Conclusion
This study have proved Malaysian passengers interviewed conscious and knowledgeable on general and specific environmental knowledge and half of the passengers are willing to contribute with carbon offsets in future. However, it would be better if the government, together with the airlines industry take an action to implement and promote carbon offsets as one of the method in reducing carbon emission. Taken together, these result provide an insightfull understanding about Malaysian passengers’ knowledge but their attitude towards intention to offsets have not been yet discovered.

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