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PUBLIC ATTITUDE TOWARDS AVIATION BIO-FUELS: A PILOT STUDY FINDINGS

Salman Ahmad[1*], Bing Xu[2], Phil Greening[3], Jamal Ouenniche[4]
1 School of Social Science, Heriot-Watt University, Edinburgh, UK (Corresponding Author)
2 School of Social Science, Heriot-Watt University, Edinburgh, UK
3 Centre for Sustainable Road Freight, Heriot-Watt University, Edinburgh, UK
4 Business School, University of Edinburgh, Edinburgh, United Kingdom

ABSTRACT

Aviation industry has a substantial carbon footprint, which is likely to increase due to a continuous rise in air-travel demand. Use of bio-fuels present a prospective carbon mitigation measure. Success of any technological innovation depends on public's awareness and perception of that technology. Little is known about the social acceptance of aviation bio-fuels. Public's awareness and opinion can contribute to social acceptance resulting in higher uptake of this type of fuel by the aviation sector. In this study, we examine public acceptance by designing a multiple-choice questionnaire based upon public's knowledge, perception and attitude. Convenience randomly sampling is used to select the respondents. Along with demographic questions, 4 questions are related to knowledge; 3 questions explore the social trust; 10 questions try to judge respondents' perception while 5 relate to attitude. For recording the responses, five point Likert Scale is used. A model questionnaire is presented for discussion. Preliminary results of pilot study are also presented.

Keywords: sustainable aviation biofuel, public perception, attitude, climate change, social acceptance,

1. INTRODUCTION

Biofuels are categorised as first, second, third and fourth generation, depending upon the type of biomass they are derived from [1]. In terms of end product, biofuels are classified into: bio-solid; bio-diesel; bio-gas, syngas, and bio-alcohols [2]. In transportation sector biofuels have been widely used in land, marine and aviation. Biofuels are not new. In fact, earlier internal combustion engines used ethanol and peanut oil as fuel. Overtime, biofuels in road transportation lost their share to cost, availability and ease of use to fossil fuels. However, recently there has been a renewed interest in biofuels for road transportation sector emanating from desire in reducing fossil fuels reliance as well as environmental concerns. Within transportation, aviation counts for approximately 2.6% of annual carbon dioxide (CO2) emissions [3]. Annual average aviation activity is expected to grow by approximately 4.5–4.8% which can result in global fossil fuel CO2 emissions of 4.6–20.2% by 2050[4]. This is an alarming development as environmental effects of aviation are getting noticed.

Aviation biofuels have the potential to play a significant role in reducing GHG emissions from aviation. These biofuel are not only technical feasible [5], but have a substantial potential to decarbonise the sector [6]. However, there are few challenges: high production cost, low availability of fuel, public acceptance-'food versus fuel' dilemma, to name a few [5,7–9].

A plethora of studies have looked into social or public acceptance of biofuels. To judge the willingness to use biofuels a number of well-established behavioural approaches have been used. The prominent one being; Fishbein and Azjen's Theory of Reasoned Action, forwarded and 1975 and updated in 1980 by Azjen as Theory of Planned Behaviour; Triangular Model of Acceptance, and Grounded Theory Approach to name a few. However, these studies confide to road transport sector only. Aviation sector has greatly been ignored.

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Since sustainable aviation bio-fuels (SAF) are promoted as the most viable option at the moment for reducing GHG emission from aviation, it is therefore very important to find social acceptance of SAFs.

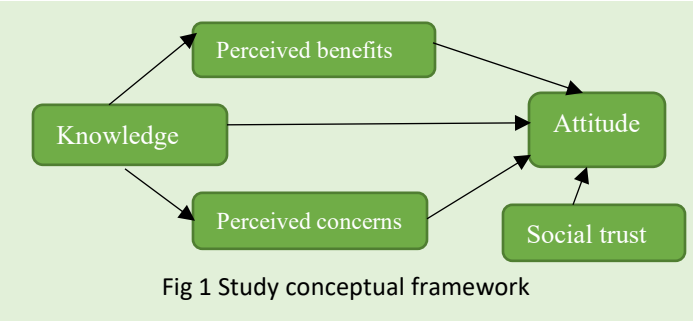

Fig 1 Study conceptual framework

Based on the unique nature of SAF, in contrast to the biofuels in road transportation sector, our study aims to find how general public's knowledge, social trust and perceptions develop their attitude towards SAF use.

2. MATERIALS AND METHOD

In order to determine the social acceptance of SAF, a multi-dimensional instrument measuring attitude towards SAF is suggested. The proposed framework, based on extensive literature review, incorporates five constructs along with demographics. The five constructs are: knowledge; social trust; perceived benefits; perceived concerns and attitude. The Fig 1 summaries the theoretical framework for this study. All the items are measure on a 5-point Likert scale.

2.1 Knowledge

In this section issues regarding public knowledge of SAF is evaluated. The questions are structured around (1) aviation being a major contributor of greenhouse gas (GHG) emissions; (2) GHG emission worries from aviation; (3) awareness of SAF use in aviation; (4) self-assessment of SAF information.

2.2 Social trust

Social trust in major stakeholders is assessed by the following three items: (1) contribution of scientific community in developing SAF; (2) SAF producers helping the society; (3) contribution of policy-makers.

2.3 Perceived benefits

Perceived benefits are measured by the following item: (1) SAF can reduce conventional jet fuel dependence; (2) Using SAF will reduce country's dependence on foreign oil; (3) SAF use can greatly help in safeguarding the environment; (4) The benefits of using SAF exceed other GHG emissions reduction measures in aviation, and (5) Investments in SAF will benefit both the economy and society.

2.4 Perceived concerns

Perceived concerns comprises of the following item: (1) Sustainable aviation bio-fuel pose a safety concern; (2) Higher SAF production leads to an increased competition for agricultural land; (3) SAF would harm the ecosystem; (4) SAF take more energy to make than it is worth, and (5) There is not enough SAF to meet the demand.

2.5 Attitude

Attitude towards SAF is measured by the following items: (1) I believe it is a good idea to use SAF for flights; (2) I dislike the idea of using SAF for flights; (3) I would be nervous on a flight using sustainable aviation bio-fuels;(4) I would prefer flying with airlines using SAF, and (5) I would encourage others to fly on flights using sustainable aviation bio-fuels.

The survey instrument is administered through an online data gathering software Qualtrics® (www.qualtrics.com). Personal and social contacts are use to access the respondents for conducting this pilot study.

3. ANALYSIS AND DISCUSSION

3.1 Knowledge

The study found that the majority of respondents (74%) recognised aviation as a main source of GHG emission as opposed to only 10% who oppose the notion. This is further strengthened by more than half the number of respondents classifying emission worries as real and pose a great challenge to the environmental wellbeing of the atmosphere. A moderate level of awareness of SAF use in aviation is observed. 55% of the respondents are aware of SAF being used in aviation. However, a substantial proportion (23%) are still needed to be informed about alternative aviation biofuels. Finally, in the knowledge category, a self-assessment of SAF information reveals a shocking discovery. Around 60% of participants are not having enough information on the subject.

3.2 *Social trust*

Survey participant shows a clear distinction in entities relating to SAF development. SAF producers contribution is regarded the most followed by the scientific community. For these two survey items, 76% agree to producers' contribution while around 40% recognise the scientific community's efforts. 30% of participants are not sure of the scientific community's contributions. This is not unusual as the scientific community tend to focus less on disseminating their work through public engagement and outreach. Least amount of trust is shown in the contribution of policy-makers. 40% of the survey participant are undecided and 35% disagree. This show trust in policymakers needs to be improved. Fig2 shows the distribution participants responses for three question items.

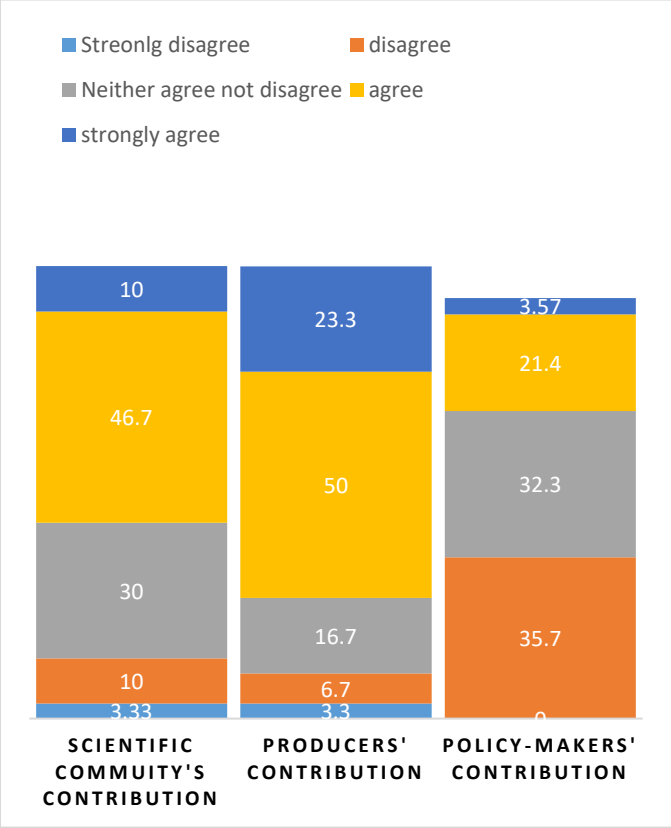

Fig 2 Respondents' social trust

3.3 *Perceived benefits*

Participants perceived SAF can reduce conventional jet fuel dependence as well as using SAF will reduce a country's dependence on foreign oil. Within the sample, more than 70% agreed to both the items. On the environmental side, 74% of participants agree that SAF use can greatly help in safeguarding. However, when comparing SAF as GHG emissions 54% of the participants are undecided. Finally, in this category, there is unanimous agreement that investments in SAF will benefit both the economy and society.

3.4 *Perceived concerns*

Only 4.7% of participants perceive sustainable aviation bio-fuel pose a safety concern. This shows a high level of trust in innovation. However, higher SAF production leading to increased competition for agricultural land concern is high (52%). This shows that food versus fuel predicament is still a major concern the general public. Taking a wider view of the environment, a mix response is observed regarding SAF having a detrimental effect on the ecosystem-44% disagree while 30% agree, however, 26% are undecided. SAF takes more energy to make than it is worth is perceived as risk (~31%) while only ~22.73% consider it not to be the case. Finally, on the supply risk of SAF more than half (~60%) consider that there is not enough SAF to meet the demand.

3.5 *Attitude*

Survey participants show a positive attitude towards SAF use. A good 71% believe it to be a good idea to use SAF for flights. Similarly, 91% did not agree that using SAF is not a good idea. 71% show their preference for flying with airlines using SAF, rest (29%) undecided. Last but not least, a unanimous agreement is among the participants to encourage others to fly on flights using sustainable aviation biofuels.

4. CONCLUSIOSN

The aviation sector is an important contributor to GHG emissions. To facilitate sector towards environmental sustainability effective de-carbonization is required. SAF provides an effective and feasible option. However, it is crucial to ensure that SAF benefits are understood and accepted by the general public. Little is known about public attitudes to SAF use in aviation, particularly from the standpoint of its environmental benefits and safety. This study contributed by analyzing public opinion on the role, benefits and limitations of SAF use in aviation. The study showed that respondents possess some knowledge of the environmental issues attributed to aviation. The relationship between aviation and emissions is found to be well established. The public

has information on SAF yet it needs to be further be reinforced. The national policy-makers are least trusted in their efforts to promote SAF. The study demonstrated public perceives the environmental benefits attached to the use of biofuels in general, and their potential as a safe alternative to conventional aviation fuels. Unlike the generally negative perception of SAF safety in aviation, this study finds that participants find SAF to be risk-free. However, food versus fuel seems to be an existing risk. This highlights the area for potential policy-making interventions for public awareness of SAF. Lastly, this study finds that overall participants have a positive attitude to SAF.

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