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An investigation of UK passenger attitudes towards the carbon offsetting of both flight and airport emissions

By

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Declarations

This work is original and has not been previously submitted in support of a degree or other qualification.

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Abstract

Airlines and airports have to meet strict carbon emission reduction targets by 2050. Technological improvements and operational efficiencies can only go so far, in an industry that relies on hydrocarbons. To help the industry meet its targets, carbon offset schemes are a viable tool. These schemes are voluntary to passengers and so to become successful passengers in large numbers need to engage with them. At present less than 9% of passengers have ever donated to a carbon offset scheme. The industry has failed to promote such schemes with 60% of passengers unaware that they exist. Despite this, 82% would offset in the future, women and under 40's in particular. Factors such as gender and a passenger's belief in the existence of climate change play a key role in affecting a passenger's likelihood of donating to a scheme. The airport offset scheme is a viable one, however there is mixed reaction from passengers.

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1.0 ***Introduction***

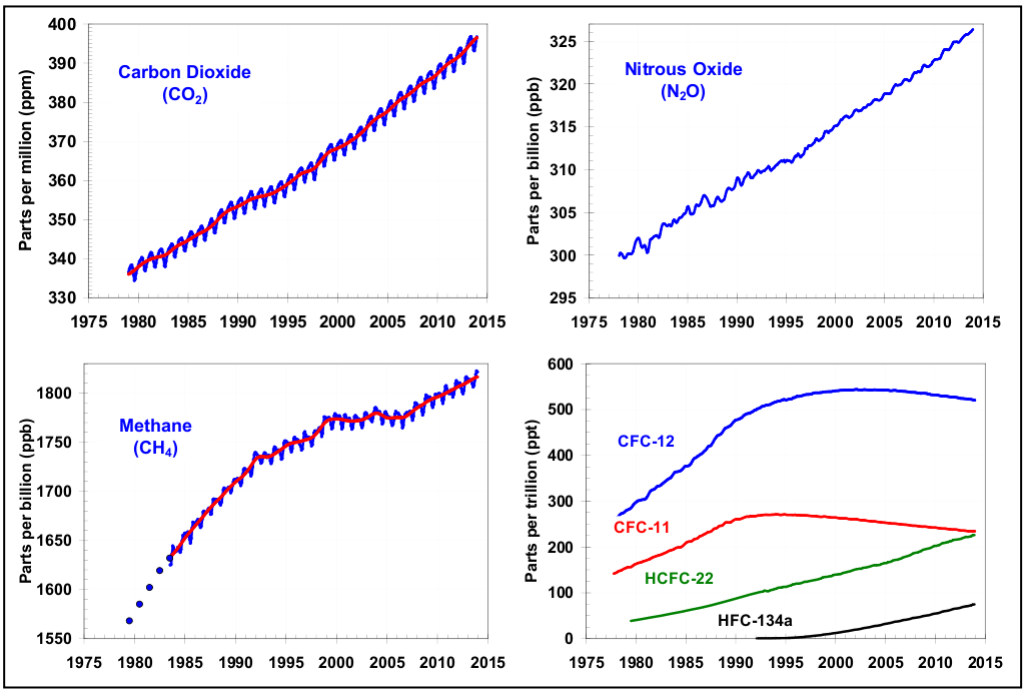
1.1 Introduction

Global warming and climate change has been the subject of academic debate for over a hundred years (Cameron, 2013). Evidence in recent years has supported a link between accelerated human activities since the industrial revolution and an increase in global warming (Intergovenmental Panel on Climate Change, 2013). Despite this, there are still academics and those of the general public who deny that such a phenomenon exists (Adger & Dessai, 2009). The failure of nation states and its people to commonly acknowledge its existence has hindered the progress to reduce global greenhouse gas emissions, the main cause of global warming (Adger, 2010).

Global warming and climate change are two phrases most often used interchangeably, however they are significantly different. Global warming is the process of a gradual increase in global temperatures of the Earth's atmosphere over time (International Energy Agency, 2009). This is often associated with the increase of greenhouse gases (GHG), such as Carbon Dioxide, Methane, CFC's and other pollutants (Montzka & Dlugokencky, 2012).

Global warming has increased in recent years (Figure 1), due to the increase of Greenhouse gases from human activity (Cameron, 2013).

Fig. 1: Rapid Increase of GHG's since 1980 (NOAA, 2013)



Climate change is the change in global climatic patterns caused due to global warming (IPCC, 2001). As such, climate change has become a key driver in government policies such as the Kyoto Protocol and has become the subject of debate for policy makers at the recent G8, Rio and Copenhagen summits (Whitmarsh, 2011).

Global warming and the increase of global temperatures is important to mitigate, due to the effect of climate change on the planet, leading to more extreme weather events and the likelihood of areas becoming uninhabitable (Fankhauser, 2013). Climate change has already produced more frequent and more serve weather events in the last 30 years, with a total of $3.8 trillion of reported losses from natural disasters from 1980 to 2012, with 74% of that accountable to extreme weather events (World Bank, 2013). Climate change and its affects are not limited to just the aftermath of severe weather events. Mitigation, infrastructural improvements, crop prices, available farm land and availability of resources such as fresh water are becoming a major economic factor for governments to contend with (Coninck, Fischer, & Newell, 2008).

In order to reduce such impacts of climate change, the reduction of global warming must be achieved. As the rise in GHG's is the main cause of global warming, governments, specifically in Europe have placed strict carbon reduction targets, to reduce their GHG, specifically Carbon Dioxide emissions by 80% by 2050 from their 1990 baseline figures (European Commision, 2012).

One such industry that is responsible for 2% of global GHG emissions is the aviation sector (Randles & Bows, 2009). Technology, operational efficiencies in new aircraft manufacturing and airport operations have continued to reduce the aviation industries GHG emissions by 25% over the past twenty years (FAA, 2013). Nevertheless, with the industry relying so heavily on fossil fuels, such reduction in GHG emissions is not achievable at present through technology and operational efficiencies alone (Lawrence, 2009). Carbon offsetting schemes however, do provide the industry with a tool to help them reach their carbon reduction targets (Macintosh & Wallace, 2010).

Carbon offsetting, particularly in aviation is a concept that has received mixed success in the airline industry. Carbon offsetting does have great potential to help airlines reduce their emissions if the schemes are executed correctly (Eijgelaar, 2009). To date, limited research has focused on the engagement of passengers with such schemes, to better understand how to make the schemes more successful. This research has

predominately been focused on Asian and Australasian passengers, with very few being European specific case studies with little to non UK based. This dissertation will aim to assess UK passenger engagement and their attitudes towards engagement in such a scheme. This will further support evidence about carbon offset schemes and their engagement, while addressing the gap in UK specific case studies. To date there is currently no research into a new carbon offset scheme, which is for airports only. This dissertation will address this gap in the literature by investigating the viability and implementation of such a scheme.

1.2 Research Objectives

In order to support and further enhance current research and to address the gap in the literature this research will answer the following objectives:

1. To investigate and understand the attitudes of passengers towards the carbon offsetting of both flight and airport emissions
2. To evaluate the viability of an airport carbon offset scheme
3. To explore different mechanisms of implementation for the airport carbon offset scheme
4. To evaluate all of the above in relation to both airlines and airports ability to meet their carbon emission targets

1.3 Structure

Preceding this introduction, Chapter 2 will provide a critical review of current research undertaken around carbon offsetting of aviation emissions. The chapter will begin with an overview of the aviation sector and its carbon emissions and the developments within the sector to reduce its GHG emissions. Following on from this an explanation of carbon offset schemes and Offset schemes in the aviation sector will be outlined before a comprehensive review of current literature is conducted. This review of the literature is to understand what research has been done to date and to discover trends between passenger attitudes towards carbon offsetting, while identifying gaps in the literature. The chapter will then finish outlining the challenges of implementing such a scheme in the aviation sector.

Chapter 3, the methodology will outline the approach and research methods implemented in this dissertation. Justifications, philosophy and ethical dimensions of the

research will also be outlined in this section. This research is primarily focused around internet based questionnaires for data collection along with supporting secondary data.

Chapter 4, the results and analysis section is split into two parts. Part one is an in-depth analysis, discussion and key findings in relation to Objective one, specifically passenger attitudes and engagement with carbon offsetting schemes. Part two, will focus on Objectives 2 to 4 with an in-depth analysis and discussion of the airport carbon offset scheme.

The final chapter, Chapter 5, will summarise the key points brought up in Chapter 4 and offer recommendations for both airline and airport regarding carbon offset schemes. A further critique and recommendations for further study will be presented in this chapter.

2.0 ***Literature Review***

2.1 Introduction

This chapter is an in-depth review of current literature and the issues surrounding carbon offsetting of airline and airport emissions. The problems associated with the aviation sector and carbon emissions will be discussed first, followed by what the industry is doing to combat such high emissions. This leads onto a critical review of carbon offset schemes and their implementation into the aviation industry before finishing with a review of current literature around passenger engagement with carbon offset schemes.

2.2 Problems linked to the aviation sector and CO_2 emissions

In the United Kingdom in 2012, the transport sector including international travel from the UK produced 158.9 million tons of CO_2 equivalent ($MtCO_2e$), with domestic transport greenhouse gas emissions equating to 118.0 $MtCO_2e$ of the total output (Department for Transport, 2012). Greenhouse gas emissions have continued to rapidly rise, government and businesses in the UK face a difficult challenge of trying to meet tough UN and European Union targets of reducing emissions by up to 80% by 2050 from 1990 baseline figures due to the 2008 Climate Change act (Legislation, 2008).

The aviation sector has been identified as a key driver in climate change due the significant and rapidly growing expansion of the industry (Sausen, 2005). Other transport systems such as motor vehicles produce far more global CO_2 per year than aircraft due to there being around 95,000 flights per day, compared to around 1 billion car journeys (Lacey, 2011). However the release of CO_2 per passenger mile is greater for aircraft. For example, a passenger who flies a return trip from London to New York produces as much carbon emissions as one European person who heats their home for a whole year (European Commision, 2014). Thus, such large carbon outputs from a relatively small number of aircraft have the greatest potential to reduce CO_2 emissions to help countries reach their 80% reductions in CO_2 emissions (IATA, 2013). Globally, the aviation industry represents around 2% of all human CO_2 emission outputs (Air Transport Action Group, 2013).

Aviation includes the transportation of freight, passengers and military flights. This dissertation will solely focus on passenger transportation in aviation which has the largest share of overall emissions from aviation at 68% (Anderson, 2008).

The act of consuming large quantities of fossil fuels in the aviation sector is a concern and a barrier to achieving carbon neutrality for the industry and is a barrier to government reductions (Frankhause & Kennedy, 2010). Despite such increase in efficiencies of aircraft technologies today compared to their counterparts of just 10 years ago (Lawrence, 2009), the rapid increase in the number of flights per year could be argued to make new efficiencies in CO_2 reduction less effective, due to increased flights (Budd, Griggs, & Howarth, 2013). Aviation is one of the fastest growing industries, not only in terms of manufacturing output but that of technological advancements (Humphreys, 2003). In as little as one hundred years ago, the industry has gone from its first flight which lasted no longer than the wingspan of today's largest aircraft, to being an industry which can be argued was a potential catalyst for globalisation, giving those with the opportunity, to travel to all corners of the world (Upham, 2003).

Such expansion has many benefits for today's society but it has come at a great cost to the environment (Bishop, 2011). An example is that a flight from Europe to Australia produces emissions of around 4.5 tonnes of CO_2. Arguably, there is no other form of human activity per capita which produces quite so much carbon emissions in such a relatively short space of time (Gossling & Haglund, 2009). This is compounded furthermore by passenger flights being restricted to the global wealthy. At present, around only 2% of the world's population participates in international flights annually (Anderson, 2008). Therefore such carbon intensive activity from the minority of humanity is of vital importance to address and reduce (Upham, 2003). With aviation in Europe expected to increase by up to 10% in the next 20 years, with an increase in pressure from finite resources, rising fuel prices and external governmental pressures, the aviation industry is beginning to adapt (Graham, 2013). Although large gains have been made in aircraft design and operational efficiencies of airports, a lot more is still to be achieved (Abeyratne, 2009).

2.3 Development in the aviation sector

The aviation industry, despite its large carbon output, is a vital global sector providing around 57 million jobs and a GDP revenue of around $2.2 Trillion (IATA, 2013). The

industry nevertheless has recognised its high carbon outputs and has made large strides towards carbon efficiency through fuel efficiency gains due to designs of new engines and aircraft manufacturing processes (Krien, 2011). In 2010, the industry collectively agreed to pursue some tough carbon goals such as (ATAG, 2013):

- To improve aircraft fuel efficiency by 1.5% each year until 2020
- To stabilise net emissions from 2020 through Carbon-Neutral growth
- By 2050 net carbon emissions to be half of what they were in 2005

Today's largest passenger aircraft the Airbus A380, impressively produces a Carbon per passenger mile that is the same as today's family sized cars (Air Transport Department, 2013). The aviation industry is producing a new set of aircraft aimed at being more environmentally friendly and fuel efficient through the use of more composite lightweight materials and fuel efficient engine design (Aerospace Innovation, 2012). Aircraft such as the Boeings 787 and the Airbus A350XWB are changing how the industry manufactures and designs aircraft, with these new long haul aircraft being around 20% more efficient than their predecessors (Air Transport Department, 2013). Such gains in efficiency will continue to increase as older generation aircraft are phased out of service and newer, more efficient air frames replace them (International Airline Association, 2013).

Despite this, the aviation industry faces a difficult challenge of finding an alternative to liquid hydrocarbons as its fuel source (Blakey, Rye, & Wilson, 2011). The motoring industry which also uses liquid hydrocarbons is perfecting the technology of hybrid and electric propulsion systems as an alternative fuel source for cars (Zapata & Nieuwenhuis, 2010). Although this technology is yet to be fully established and some uncertainties remain, particularly on how the electricity for electric cars is produced, it is a step in the right direction and offers the motoring industry a viable alternative to liquid hydrocarbons (Emadi & Lee, 2008). For aircraft however, such electric or alternative methods of fuel are not powerful enough for commercial flight. Installing an electric engine in a small transport vessel such as a car, for short distances, is viable. For aviation, the technology is primitive and impractical and does not offer the same performance as today's aviation fuel (Czerski, 2014). The aviation industry is continuing to develop and understand new ways of alternative fuels for aircraft. The industry is aware of the heavy reliance on hydrocarbons but, to date, there have been no significant technological advancements in alternatives (Coppell, 2014).

There have been technological advancements such as the 'Solar Impulse' aircraft, the first round the world nonstop flight by solar generation was successful, the implementation of such a design onto today's passenger jets is impractical to flight as we know it (Czerski, 2014). Aircraft manufacturers like Airbus have set out a long term plan of how sustainable aviation will look in 2050. Extensive work has been placed into the Airbus 2050 concept aircraft, with details about designs and efficiencies but very little development on a new way to fuel the aircraft (Airbus, 2013).

One potential way to combat this is the use of biofuel blends in aviation fuel. Airlines such as Virgin and Lufthansa have begun flight trials in using such a blend which not only reduces fuel consumption but also CO_2 emissions by up to 80% (Sugeoner, 2014). This is a positive step for the industry but it still relies on liquid hydrocarbons, no matter how it is blended or used. Biofuel blends have also been questioned over their sustainable credentials. There is debate that once the emissions of production of the crops needed for biofuels and the process of creating the fuel is taken into consideration, the biofuel blends become less carbon efficient as first thought (Elbehri, Segerstedt, & Lui, 2013). Creating biofuels through the use of crops also leads to further environmental issues such as the food vs fuel debate. In a world where the population in 2012 surpassed 7 billion, food security has become a major issue (Godfray & Garnett, 2014). The debate around biofuels and food is to what percentage of farm land is to be used for biofuel production versus food production (Babcock, 2011). Some believe that government subsidies for farmers to switch to biofuel crop production can lead to agricultural price shocks of staple crops such as corn (Zhang, 2010). Water, which is also a finite resource, can be affected by biofuel production. The vast amount of water needed for irrigation of biofuel crops and water used in the process of creating the fuel through boiling and cooling needs to be taken into account, as on average around 860 litres of water is needed to produce one litre of ethanol (Ring, 2012). The aviation industry therefore faces a difficult task in changing from liquid hydrocarbons as for the foreseeable future; hydrocarbons are the only fuel source for the industry (IATA, 2014).

With this acknowledged by the industry, there is a drive to implement carbon offset schemes of such emissions from aircraft. Carbon offset schemes therefore in the aviation industry, make it much easier to justify their use in both an ethical and commercial sense compared to the introduction of such schemes in other sectors (Brouwer & Brander, 2008).

2.4 What is Carbon Offsetting?

Carbon offsetting is the act of paying a provider to neutralise the consumption of emissions generated (for example your flight) by compensating another sector. Often this compensation is in the form of investment in renewable energy or forestry projects (Gössling, Broderick, & Upham, 2007). Although most schemes are global, Carbon Pure in the UK who deal with British Airways carbon offsets solely, focuses on UK based low carbon community projects (Pure, 2013).

2.4.1 Carbon Offsetting of Flights

Passengers, when booking their flight with British Airways have the option to carbon offset their flight at checkout when booking. Usually, depending on the duration and distance of the flight, the passenger will be presented with three potential donation amounts usually ranging from £5 to £25 (British Airways, 2014).

Most companies and airlines differ in their calculations on how this is derived. All airlines participating in the International Air Transport Association offset program use a methodology based on that developed by the UN's International Civil Aviation Organization's calculation. Which stipulates for every 1 kilogram of aviation fuel burnt, it equates to 3.15 kilograms of CO_2 (Jardine, 2009). Yet this formula is basic in the sense that distance, passenger numbers, cargo loadings and altitude play an important factor in aircraft emissions (Arunachalam & Woody, 2014). As such, the ICAO derived a more complex system which allows airlines to input aircraft data, fuel burn and passenger data for more accurate measurement of CO_2 for any given flight, these data inputs include (IATA, 2014):

- Distance per flight leg
- Number of seats – This is to calculate a flight's load factor
- Number of passengers transported – i.e. how many passengers fill up the number of seats equates to the load factor number
- Average fuel used per flight distance
- Passenger Weight – Using the ICAO standard average of 90Kg
- Travel Class – For business and first class the carbon emissions per flight is doubled
- Carbon Emissions Factor – 1kg of fuel equates to 3.15 Kg of CO_2

Once the carbon emissions for a particular flight has been defined and a monetary value attached to it, the money is collected and then invested in either carbon capture schemes such as forests, or carbon prevention schemes such as renewable energy (Lovell & Liverman, 2010). Carbon Pure invest this capital in UK low carbon community projects, for which they chose through a 'Dragons Den' style review. Often, a low carbon community project will require capital for the investment in a renewable energy source, such as the securing of a wind turbine, a hydroelectric dam system or funding for solar panels on the local parish hall roof. Carbon Pure provides this capital, along with advice for the projects on how to buy and maintain such equipment (Pure, 2013).

In turn, the capital used to secure renewable energy for the community makes that community carbon neutral and therefore has prevented a set amount of carbon emissions being produced over a number of years. Other carbon emission companies will invest in more direct schemes such as the securing and planting of trees and forests, with trees capturing such carbon produced by the flight (Lovell & Liverman, 2010).

To date there are only around 35 airlines which offer their own carbon offset schemes in some form to their passengers (IATA, 2013). Globally there are 2397 airlines active today, with only 35 carbon offsetting, representing just 1.5% of all airlines (Jenson, 2014).

2.4.2 Carbon Offsetting of Airports

Airport carbon offsetting although similar to that of flights is slightly different. Firstly, to carbon offset airport emissions is substantially cheaper per passenger than it is for the carbon offsetting of a passenger's flight. It has been mentioned already why carbon offsetting is important for the aviation industry due to the no alternative in hydrocarbon fuels. Airports however are similary locked into making the best out of a potentially bad infrastructural problem. Many airports, particularly in the UK, have older designed terminal buildings and airport infrastructure (Bishop, 2011). Although these are regulary updated to include more green infrastructure such as insulation, energy efficient lighting and improved technologies, they can only do so much with what they have. When a new terminal is built, such green considerations can be implemented from the outset of design, improving energy and operational efficiency. It is much easier for example to design and implement an onsite biomass generator and solar panels along the large

expanse of the terminal roof for a new terminal being built, than it is to add that on to an already existing building (Graham, 2013).

Airports are a buisness and to become more environmentally efficient is costly. Historically, capital generated by airports has not always had a green agenda attached to it, as to be green and energy secure was never a critical factor in the day to day running of the aiport and therefore was never a real threat to the longevity of the buisness (Doganis, 2005). Times have drastically changed, with an increase in fuel prices, increased operational costs and airlines placing pressure on airports for greater operational efficiency and green credentials due to EU policies, airports have to adapt (Carlisle, 2013). Not every airport has the capital generated to build new infrastructure which can be designed to be highly efficient both in terms of energy usage and operationally efficient. Therefore airports need a way of generating capital for which they can invest in newer energy efficient measures. This can be acheived through the instilation of photovoltaic energy generation systems on the roof of the terminal building, to investing in electric airside vehicles and driver behaviour changes (Ashford, Coutu, & Beasley, 2013).

One potential way of securing such money is through the introduction of a voluntary donation by passengers to offset their airport emissions. This includes the carbon produced from ground and air side veichles, air side operations and energy used to power the terminal and all computer and baggage systems. Airports need to do this to help them meet their scope 1 and scope 2 targets.

- Scope 1 are direct GHG emissions from sources that are owned or controlled by the airport. This is often equated to the fossil fuels burned on site and by airport owned or leased vehicles.
- Scope 2 emissions are indirect GHG emissions resulting from the generation of electricty, heating and cooling and the provision of purchased utlities on site.

(Environmental Protection Agency, 2013)

If the airport can generate a carbon offset to secure their scope 1 and 2 emissions, then extra capital can be spent on other green improvements and operational efficiencies.To date there is yet to be an airport that has fully embraced a succesful airport carbon offset scheme.

2.5 Challenges of implementation in the aviation industry

Carbon offsetting although a viable tool to combat aircraft and airport emissions, such a small percentage of airlines up taking such schemes needs to be addressed if it is to become successful. One potential reason why more airlines have not taken up such a scheme is due to the debate over how affective the schemes are at reducing CO_2.

Carbon offset schemes are beneficial by neutralising CO_2, yet it does not deter a passenger from consuming and producing the CO_2 to begin with (Davidson, 2008). Furthermore, such carbon offsetting of flights has the potential to encourage a person to take more flights, if they feel as if there is no carbon penalty attached to their flight (Choi & Ritchie, 2014). In relation to carbon offsetting investment in forestry projects, due to the nature of the forest, it may take up to 100 years for that flight to be offset (Knoblauch , 2010).

The carbon offset industry is often unregulated and has a wide variety of different certification standards which can be confusing for a passenger to understand (Gossling & Haglund, 2009). Without such a national and international regulatory body, scepticism and damaging reports in the media in recent years have introduced an air of caution from passengers with regards to carbon offsetting their flights (Frunza, 2013). Carbon offsetting in practical terms can only be offered through voluntary uptake from passengers. It cannot be forced onto airlines or governments to offset emissions from flights due to the complexities in measuring just what emissions are which countries when aircraft cross borders, not to mention who is responsible for emissions of international airspace (Abeyratne, 2009).

The lack of regulation with regards to carbon offsetting is a real concern for airlines as well as passengers. Carbon offsetting for airlines can play a huge role in carbon trading. This involves companies, in this case airlines, purchasing contracts that one party pays to another in return for reducing emissions or has purchased the right to release emissions (Brand Strategy, 2007). This in theory would help airlines to meet their carbon targets. Simply put a carbon offset is an emission reduction credit from another organisations project that has resulted in less CO_2 than would otherwise have occurred (Foster, 2010). However carbon trading for companies, such as airlines are often very tightly regulated and capped, therefore to help achieve carbon targets it is the volunteering of carbon

offsetting from passengers which is the most viable to airlines (Wallace & Macintosh, 2009).

In the UK, the government has tried to enforce an example of carbon offsetting by introducing the Air Passenger Duty tax (Truby, 2010). Although this is an attempt to combat carbon emissions from aircraft, research suggests that such a controversial involuntary taxation to passengers is both negative for voluntary carbon offsetting and has a negative effect on airlines profits and the national economy (Thomas, 2013).

2.6 Research on Carbon Offsetting and passenger attitudes

Research with regards to carbon offsetting has been around since 1980 but in terms of carbon offsetting of flights, it has become more prominent in the early 2000's. Research to date has often looked at the legality and potential claims of untrustworthiness in the carbon offset industry such as the Frunza (2013) study. Frunza stated that the transparency of carbon offsetting companies is problematic. Even the most trusted of companies often fail to display their true calculations or due to the vast distances that their projects operate in, often the control of finances are difficult to account for. Research by Singh (2007) suggests that such complexity and lack of transparency surrounding carbon offsets has led to alienation of some passengers and helps explain why studies by Gössling, Broderick, & Upham (2007); Smith & Rodger (2009); and Mair (2011) show that passengers have such a low uptake of carbon offset schemes.

Further research by Johnston (2009) has investigated to what extent carbon offsetting is a way forward in tackling climate change issues. Johnson shows as high as 40% of the European public would be willing to carbon offset their yearly emissions. This, although not solving the carbon issues, would go some way, along with other solutions to keep the European Union on target to reduce their emissions by 2020. Keen, Parry, & Strand (2013) contradict the findings and optimism of Johnson by declaring that carbon offsetting is too complex, corrupt and at best would equate to less than 1% of all carbon emissions.

Though general research into the implementation of carbon offsetting is relatively abundant, there is a large gap in academic research exploring passengers' attitudes and potential barriers to carbon offset schemes of flights. The limited research in this area is predominately based on case studies in Australia, China and Taiwan, with little to no European case studies. This dissertation therefore will be UK based. This is important as

the limited research done to date, although having similar themes emerging, also have some quite stark differences. Some of these differences can be attributed to the culture of the country and, therefore, to take their recommendations may not be UK relevant. As such, this research will seek clarification on their findings to assess whether such attitudes and barriers are globally present or if they are country specific.

Research by Gossling & Haglund (2009) investigated passengers' attitudes and barriers to carbon offsetting flights in Sweden's second largest airport, Gothenburg Landvetter Airport. They conducted face to face questionnaires with passengers at the departure lounge, citing that such an area had a higher rate of engagement due to passengers 'killing time' waiting for their flights. The questionnaire attempted to answer the following, which were similar to questions asked in other studies by Gössling, Broderick, & Upham (2007); Smith & Rodger(2009); and Mair (2011):

- Travel motives (business/pleasure) and how many flights the individual takes per year.
- Passengers' attitudes towards global warming and their attitudes towards aviation as a key factor in this.
- Their attitudes and existing knowledge of voluntary carbon offset schemes.
- Their attitudes to participating in carbon offsetting their flights.

In relation to this questionnaire which was conducted in April over one week, 300 passengers took part. The researchers chose to survey every third traveller. Interviews were also conducted with Scandinavian Airlines Sustainability and Environmental Manager.

Gossling & Haglund stated that 49% of those surveyed take over 15 flights a year, with one participant travelling over 300 flights a year for business. Only 24% of passengers were aware of carbon offsetting schemes, with only 2% having actually offset their flight. It seemed that the more the passengers flew, the more they understood carbon offsetting however many stated that although they would like to carbon offset their flight. Their reasons for flying were often due to being on business and therefore it was the company who were often against spending extra capital on carbon offsetting. Similar levels of awareness and uptake of carbon offsetting was also reported in research by Gössling, Broderick, & Upham (2007); Smith & Rodger (2009) and Mair (2011).

Gossling & Haglund stated that once passengers who were not aware of Carbon Offset schemes were told a definition, 64% stated that they would think about carbon offsetting. A lower figure of 45% was found by Gössling, Broderick, & Upham (2007) but both stated that passengers were motivated and surprised by the relative cheapness of buying a carbon offset for their flights.

Research by Mair & Wong (2010) and Mair (2011) looked futher into the barriers towards carbon offsetting. Mair (2011) conducted a larger study of 1000 passengers in Taiwan international airport. Along with the above questions, Mair aimed to find out if demographics such as age, gender, educational background and existing views on green policies all had an effect on the uptake of offsets.

Mair stated that there was indeed a link between age, stating that over 50s and in particular women, were more likely to carbon offset their flights. This contradicted a smaller study in Australia by Smith & Rodger (2009) which stated that there was no link between gender and uptake, however the younger generation below 30, were more likely to state they would or have carbon offset their flights than over 30s. Such a difference could prehaps be explained through the different cultures present, or as argued by Hart (2013), that today's generation in Western Society views environmental concerns as a high priority compared to their parents' generation.

Mair & Wong (2010) through the use of double dichotomous choice answers, sought to understand at what price passengers would be willing to pay for the carbon offsetting of their flights. Of those who were willing to carbon offset their flights, 59% would pay no more than 10% of the cost of their flight. Two percent stated they would spend up to 50%.

In terms of barriers, all studies concluded that passengers are often unaware of carbon offset schemes and once told are often more positive towards them. Although there is a challenge in convincing around 5% who do not believe in climate change and the futher 2% who believe carbon offsetting schemes are corrupt. Smith & Rodger (2009) and Gossling & Haglund (2009) stated that 80% of passengers believed that the airlines and government should be responsible for the reduction in carbon emissions from aviation, with little over 10% stating the passenger should carry the cost.

This dissertation will seek to further broaden the findings about the attitudes of passengers towards carbon offsetting. This dissertation will also be a pioneering one, as

part of this study is to further investigate passengers attitudes to carbon offsetting airport emissions. This research will attempt to understand if there is a link between airport and flight offsetting by passengers or whether their reasoning and barriers differ between the two and if they understand the difference between two differing schemes. This project will go beyond the research to date by investigating potential ways of improving and implementing a carbon offset scheme for airports. To date, academic research into voluntary airport carbon offsetting schemes is non-existent.

3.0 ***Methodology***

3.1 Introduction

This chapter will begin by outlining and justifying the approach taken in this study. The method of data collection and its limitations is outlined before moving onto the questionnaire design, based on previous studies. Following on from that, the chapter concludes with the exploration of methods of analysis and ethical considerations taken in the completion of the research.

3.2 Approach taken

In order to investigate the aims and objectives of this study a positivistic approach through online questionnaires was implemented. A positivistic approach is a philosophy of natural and social science that states there is only valid truth in scientific knowledge (Maconinis, 2010). Positivism is empirical in focus, which is the "method of obtaining data through the use of observations and experiments" (Ashley & Orenstien, 2005, p. 95) and through the use of positivism it allows the researcher to be scientifically objective. This approach, allows the researcher to examine in depth the relationship between cause and effect between variables (Coheen & Maldonado, 2007). Positivism and the link between the cause and effect of variables is important to this study as it is investigating passenger attitudes towards carbon offsetting and the many variables which may affect their attitudes.

To collect such data, the primary method of data collection was through the use of an online questionnaire, distributed through social media to gain exposure to a wider sample participation. At the time of the study, the researcher was unable to gain access to a major UK international airport to conduct a questionnaire with the passengers inside the terminal building. Due to this, the researcher elected to continue with questionnaires but through the use of social media.

Positivistic questionnaires allow the researcher to gain a representative sample size of the population and thus can make statistically viable assumptions and recommendations in their research (Brunsdon, 2007). Questionnaires are one of the most reliable forms of research methods due to every respondent being asked the same question in the same way, thus reducing bias (Miller , 2013). With the questionnaire asking closed questions, the chances of the researcher misinterpreting the meaning of the answers are very

unlikely, unlike in humanistic methods where the researcher cannot remove his or herself from the data collection (Flowerdrew, 2005).

3.2.1 Method of delivery through social media

Previous studies on the attitudes of passengers towards carbon offsetting have often been conducted through face to face questionnaires inside the airport terminal. For this study a face to face questionnaire was unfeasible once access to the terminal building was not gained. In light of this the researcher decided to place the face to face questionnaire, with minor amendments to the questions and place the questionnaire on Social media. The questionnaire was conducted online through the social media sites, Facebook and Twitter.

Using social media as a vessel for data collection is a relatively new concept in social science studies (Carrington & Scott , 2010). Nevertheless data collection in medical studies in the past number of years have employed such a method of data collection due to being able to access a wide range of participants of all ages and backgrounds without the need to visit the sample, particularly useful if investigating diseases (Freeman, 2010).

The questionnaire was distributed through two major social media platforms, each with their own benefits to gaining access to a wide and diverse audience (Haythornthwaite, 2005). Facebook allowed the researcher to place a link to the questionnaire, along with a lengthy explanation about the study on a status. This in turn was shared to increase the number of potential participants. For further explanation and an example of Facebook and the sharing method used in this study please see Appendix 1.

The use of Twitter and the digital word of mouth was also employed for this study. Although similar to Facebook, Twitter is limited to a status of 140 characters, including the link to the study. For this the researcher was limited in their explanation of the study to attract potential participants. However, Twitter allows the researcher to gain access to a far wider audience by targeting specific, large followed Twitter accounts through hashtags and the Retweet tool. For further examples and explanations of the use of retweeting to gain a larger sample size, see Appendix 2.

By using the Facebook share option and the Twitter retweet service, the studies potential reach to a wide sample size dramatically increased. If the researcher did not

encourage sharing and retweeting of the link to their study, the potential sample size was less than 300 people. By gaining retweets and shares the potential number of those who saw the link to the study was over 35,000. Providing the researcher with a wide variety of ages, locations and backgrounds, much like the researchers who would conduct a face to face questionnaire in an airport would face. Arguably, by using Social media, such exposure and vast numbers of potential respondents could not have been achieved any other way.

3.3 Limitations

In order to gain such a wide potential sample, the method of distribution through social media requires engagement and for the goodwill of participants to share (Sedghi, 2014). If the method of sharing is not achieved the survey would never go beyond the researcher's first degree of separation and thus the potential sample size of the population is reduced. No matter how successful the researcher is in distributing their survey through social media, there remains a challenge to get a high engagement rate of participation. Online questionnaires tend to have less than 10% of all who see it, complete it (Nulty, 2008). Often through social media and online, it is impractical to offer a reward to take part in research due to expense to the researcher. Therefore the researcher relies on the goodwill of his or her network and their participants to engage with the study (Wright, 2005).

Social media is now one of the most populous forms of communication with over 1.74 billion active users worldwide every month (Sedghi, 2014). Although that is a lot of potential candidates there is still a significant number of the older generation who are not on social media and therefore unreached by this research. In 2013, 42% of over 65's in the UK had access to the internet, an estimated less than 5% have an active Facebook (Ofcom, 2014). Such a small number of over 65's reflects the smaller number of over 60's who participated in this study.

3.4 Questionnaire Design and Justification

3.4.1 Justification

Social media questionnaires offer the researcher the chance to have unbiased and truthful answers to his or her questions. When the researcher is face to face conducting paper questionnaires, such as the previous studies of this nature, it is noted that some

participants may lie or say what they believe the researcher wants them to say (Borgatti & Foster, 2003).The researcher in such cases must always be aware of the potential for respondents to answer untruthfully due to the presence of the researcher and therefore their results may be affected (Sincero, 2013).Through social media, this is removed and allows the participant to feel completely anonymous and therefore creates a safe environment for the participant to express their views truthfully and comfortably (Kadushin, 2005).

Online surveys have many beneficial factors over traditional survey methods. To begin, online questionnaires are on average two-thirds quicker than traditional methods due to the data being gathered automatically, producing results that are almost instant (Evans & Mathur, 2005). This also reduces the error rate, as the participant in the study is directly inputting the data, unlike traditional paper copied surveys which the researcher must input into the system, allowing for human error (Duffy, Smith, & Bremer, 2005).

Online questionnaires are also much cheaper and more environmentally friendly. The researcher does not have to spend money on materials such as ink or vast amounts of paper and in the use of postal questionnaires, eliminates the extra cost of envelopes and return stamps (Van Selm & Jankowski, 2006).

The participant also finds online questionnaires much easier and quicker to complete compared to traditional paper questionnaires. The participant can also complete the survey at a time that suits them and can take as much time as they require with no external pressures, which may occur when the researcher is conducting the questionnaire to the participant (Lefever & Matthiasdottir, 2007).

The online questionnaires also benefit the researcher by reducing the time having to wait for the results to be collected and analysed. Online questionnaires can be analysed almost instantly, producing graphs and charts are both visually appealing and easy to understand (McDonald & Adam, 2006). Some more sophisticated systems allow a direct input into IMB's Statistical Package for the Social Sciences (SPSS) to conduct further, more detailed analysis of the data (Vaske, 2011).

3.4.2 Questionnaire Design

To be successful, the questionnaire must be designed in way that is relatively quick (no more than 3 pages long, or in online terms no more than 4 minutes to complete), and

must not ask any potentially sensitive or offensive questions and must not introduce bias (Torgerson, 2002). A series of closed and open questions were used and followed a similar pattern of questions already outlined in 2.6. The questionnaire was split into three sections for the researcher: A blank copy of the questionnaire and questions asked can be found in Appendix 3.

Part One: The researcher wanted to understand

- Baseline information such as number of flights, type of flight and airline
- Assessment of passengers knowledge of carbon offsetting
- Assessment of their barriers and attitudes towards carbon offsetting schemes
- How much passengers were willing to pay to carbon offset their flights
- Assessment of a passengers attitudes towards carbon offsetting and their engagement rates

Part Two: The researcher wanted to understand

- Attitudes and barriers towards carbon offsetting airport emissions
- How much passengers would be willing to pay for carbon offsetting their airport emissions
- Potential ways of implementing such a scheme to passengers
- Assessment of engagement rates for the scheme

Part Three: Respondent data

- Demographics of the participants, including Gender, Age and Educational levels, all potential variables in affecting passenger attitudes towards carbon offsetting.

3.5 Analysis

To analyse the results, two methods where used in this study. To begin, basic data analysis such as descriptive and text analysis was done through the use of the online facility on Survey Monkey (SurveyMonkey, 2014). In order to analyse the data in more depth, to understand relationships and significance of such relationships between variables, SPSS was used. SPSS facilitates the accurate use of statistical tests such as Chi-Squared to discover relationships and trends in the data (Morgan & Leech, 2012). In order to use SPSS, a coding frame was created by the researcher and inputted into SPSS (Appendix 4).

3.6 Secondary Data

Secondary Data was also used in this research, including databases and reference to findings from previous research, along with reports from governments and international organisations such as the International Airline Association who deal with carbon offsetting of flights and the Civil Aviation Authority.

3.7 Ethics and Risk

Ethics and risk are two important factors a researcher must consider for the safety of themselves and the subjects of their research (Lee-Treweek & Linkogle, 2000). To mitigate such risks and for the research to be deemed ethical, the following methods where used.

3.7.1 Informed consent/ Permissions

Each individual participant at the start of the survey had access to a small statement explaining the study. The participant had the right at all times to end the questionnaire or to refuse to complete the questionnaire for the researcher.

3.7.2 Confidentiality and Anonymity:

All questionnaires are anonymous and this is clearly stated by the researcher in the statement provided at the start of the survey. This increases the likelihood of participant engagement and ensures that the participant feels safe enough to express their views truthfully (Evans, Robling, Rapport , & Houston, 2002). Only the participants i.p adress will be recorded by the Surveymonkey website to understand locations of the participants, however this is not pertinent to this research and therefore will not be used.

3.7.3 Risk

There were no risks to the researcher or the participants during this study. As this research was conducted online there was no personal interaction between researcher and participant. All data collected through Survey Monkey is protected by their Data Protection act and is Norton secure. Therefore a risk assessment for this study was not required.

4.0 ***Results & Analysis***

4.1 Introduction

This chapter is divided into two parts. Part one, from 4.2 to 4.8, is the discussion and analysis of results associated with Objective One of this study. The first part of this discussion focuses on the attitudes of passengers towards climate change before moving onto their attitudes and engagement surrounding carbon offsetting of flight emissions. Part two, 4.8 to 4.10, investigates and discusses passenger attitudes towards airport offset schemes and their viability. All the results for this study can be found in Appendix 5.

4.2 Data Description

The sample consisted of respondents who resided in the United Kingdom and had flown at least once in the past 12 months. This helped to gain a UK specific case study of passenger attitudes, compared to other studies which have looked at international travellers. Overall there were a 154 respondents for this survey, ***65 males (42.5%)*** and ***88 Females (57.8%)***. All age ranges from 18 and above are represented, with the 18-30 years old category the most populous at ***49%***. Overall, ***69%*** of the sample is under 45 years old, with the over 60 population least represented at ***7.24%*** (Figure 2). This can be attributed the nature of the collection process of this study, less than 5% of over 60's maintain an active Facebook or Social Network profile, meaning the exposure of this study to such an age range was limited (Ofcom, 2014).

On the whole the sample size was highly educated with ***53%*** of respondents having been educated to Degree or Post Graduate level. In the UK, educational attainment at level 4 (Degree and Post Graduate level) is the most populous at 27% (Office for National Stastics, 2014). Just under half (***45%***) of respondents were educated to level 2 and 3 (GCSE and A Levels) with only ***1.33%*** of respondents having no qualifications at all (Figure 3).

Fig. 2: Age range of the survey participants

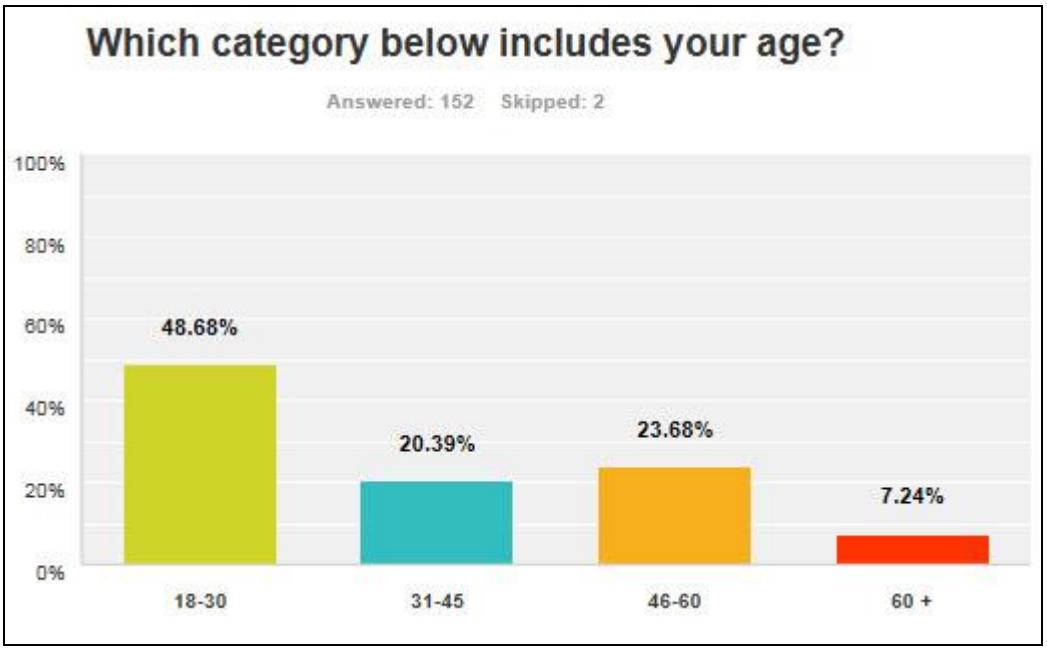
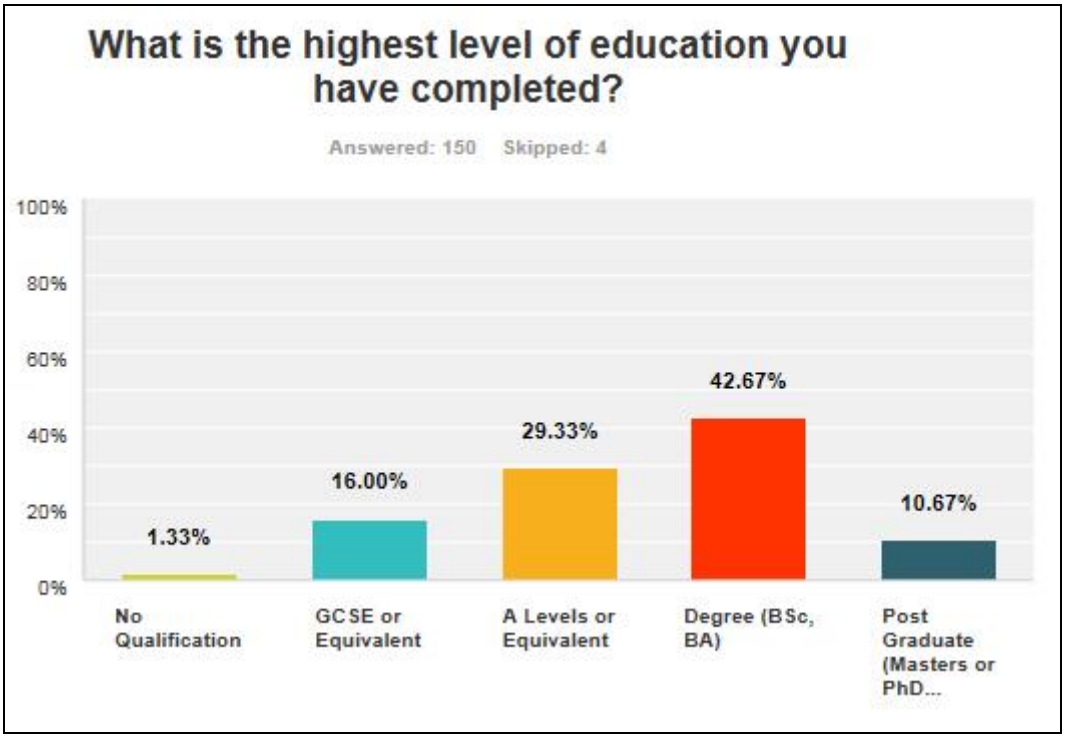


Fig. 3: Levels of education within the sample



4.3 Passenger Travel Habits

The respondents were asked about the destination of their last flight. For the purpose of this study, the criteria for placing destinations from the UK into categories are as follows:

- ***Short Haul:*** A flight that is less than 3 hours in duration or less than 2,500Nm.
- ***Medium Haul:*** A flight that is above 2,500Nm and between 3-6 hours in duration.
- ***Long Haul:*** A flight that is between 6-12 hours in duration.

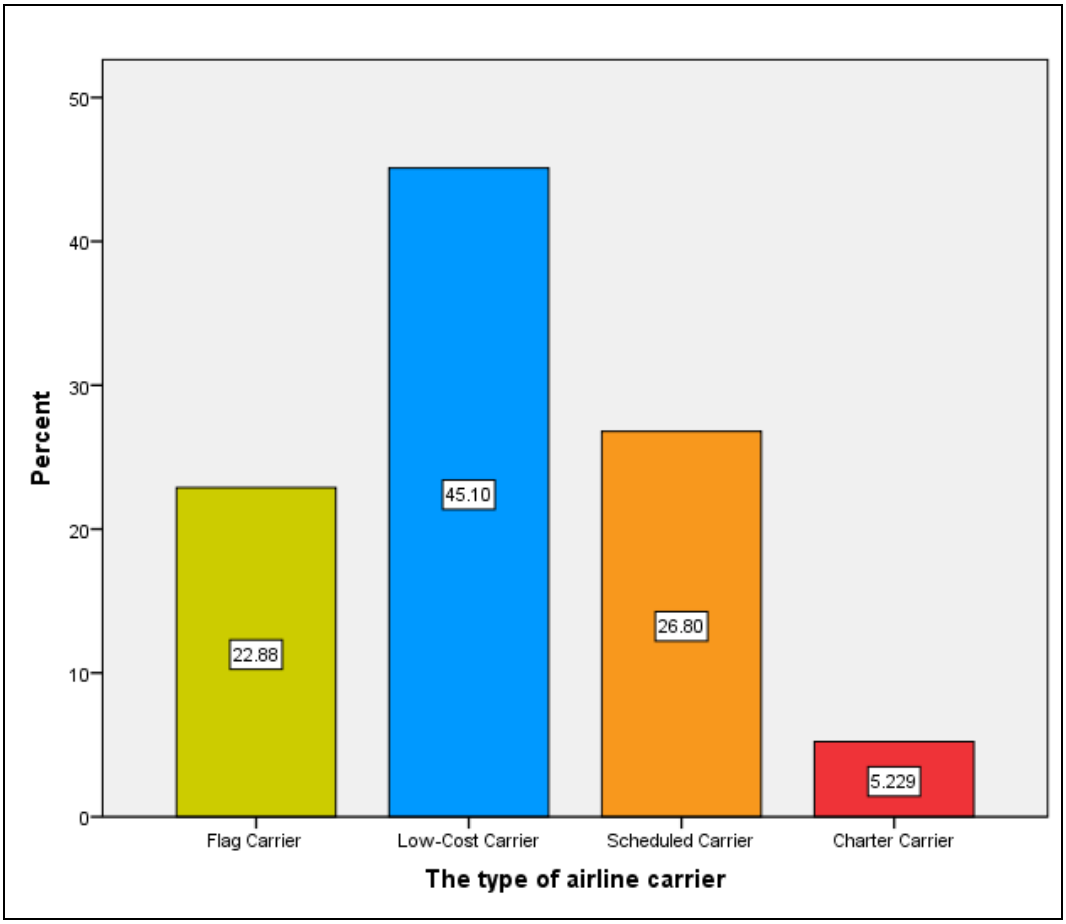
(Scheelhaase & Grimme, 2010)

Two thirds of respondents (***66%***) had flown to short haul destinations in the past 12 months, slightly above the UK average of 52.4% of all passengers travelling between the UK and the European Union in 2013, a total of 137 million passengers (Civil Aviation Authority, 2014). This was also reflected in the top three most used airlines by the respondents for their last flight. 1st Easyjet (21.6% passenger share), 2nd Ryanair (14.4% passenger share) and 3rd Thompson (7.8% passenger share). Easyjet and Ryanair are two of Europe's largest Low-Cost carriers representing 52% of the market and with the UK having the most Low-Cost flight departures per week than any other country in Europe, as expected most of this sample travelled by such airlines to short haul destinations (Weiss, 2014).

Forty Five percent of passengers for this survey flew on Low-Cost carriers to their most recent destination, ***26.8%*** flew on scheduled carriers, ***22.9%*** on Flag Carriers and only ***5.2%*** flying on charter carriers (Figure 4). These figures represent a growing trend in the UK for passenger share to be dominated by Low-Cost airlines and less on legacy/flag carriers (OAG, 2013). Market volume for flag carriers had increased by 2.8 million seats between May 2004 and May 2013, compared to low cost carriers increasing their share by 20 million seats in the same 10 years (Turner, 2013).

Passengers were asked what airline they had flown with last to help understand if those airlines that had well developed carbon offset schemes, specifically on their booking page, had a higher engagement rate with passengers buying carbon offset schemes than those who did not.

Fig. 4: Type of airlines used by the passengers for their most recent flight



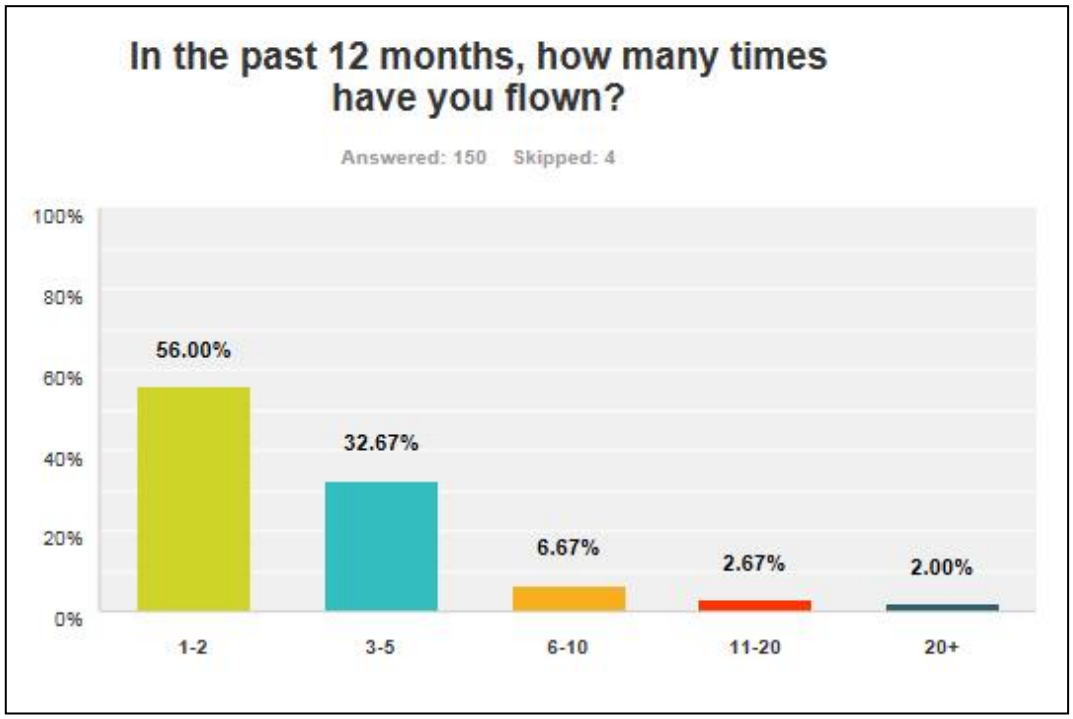
Based on the survey respondents and a review of airline online booking systems (Appendix 6), it can be seen that only ***13%*** of airlines used by the passengers had a carbon offset program available to passengers on their booking page. Although ***49%*** of airlines used by the respondents did have carbon offsetting schemes; they were often near the bottom of the main airline page, or found through various sub links. The researcher had to actively look for carbon offsetting schemes on their website and often had to input their own data into the supplied carbon calculator to see how much would be needed to offset their emissions. This process was time consuming and cumbersome and relies on the passenger actively seeking out the calculator and scheme to donate. There were a large percentage of airlines, ***38%***, who did not offer any carbon offsetting schemes to passengers. Airlines such as Ryanair, who have a 14.4% share of passengers for this study, do not have a carbon offset scheme. The potential implications of this for carbon offset engagement by passengers will be discussed in section 4.9.

4.3.1 Purpose of the passenger's trip

To better understand passenger motivations for their trips, passengers were asked about the purpose of their last trip. ***Eighty Four*** percent of passengers stated that they travelled for leisure purposes, with 5% stating that they flew for both leisure and business. Passengers in this survey typically travelled for leisure ***(91%)*** while ***9%*** predominantly flew for business purposes. Business travel by passengers in this sample is significantly lower than previous studies by Gossling & Hanglund (2009). There are two reasons why this may be the case. Firstly, previous studies have had access to the passenger terminal and times of day that they have conducted their research, coincides with business flights (typically early morning). Another explanation is that more and more businesses are now using conference calls and face to face communication over the internet to conduct business (Martinez-Garcia & Coenders, 2012). Such a cost saving measure, in still tough economic climates, may equate to the smaller number of business passengers in this sample (Dresner, 2006).

Just over half of passengers in this study ***(56%)***, had only flown once or twice in the past year, with less than ***5%*** flying more than ten times a year (Figure 5). With over ***89%*** of passengers having flown less than 5 times in the past year, there is a significant scope for airlines to engage with these passengers on carbon offsetting schemes. At first, this may seem contradictory, however if a passenger is only partaking in a flight once a year there is a greater chance that they may feel obliged to donate as it's a one off for the year compared to a frequent flier having to donate every time they fly (Mair, 2011).

Fig. 5: The number of times the passengers had flown in the previous 12 months



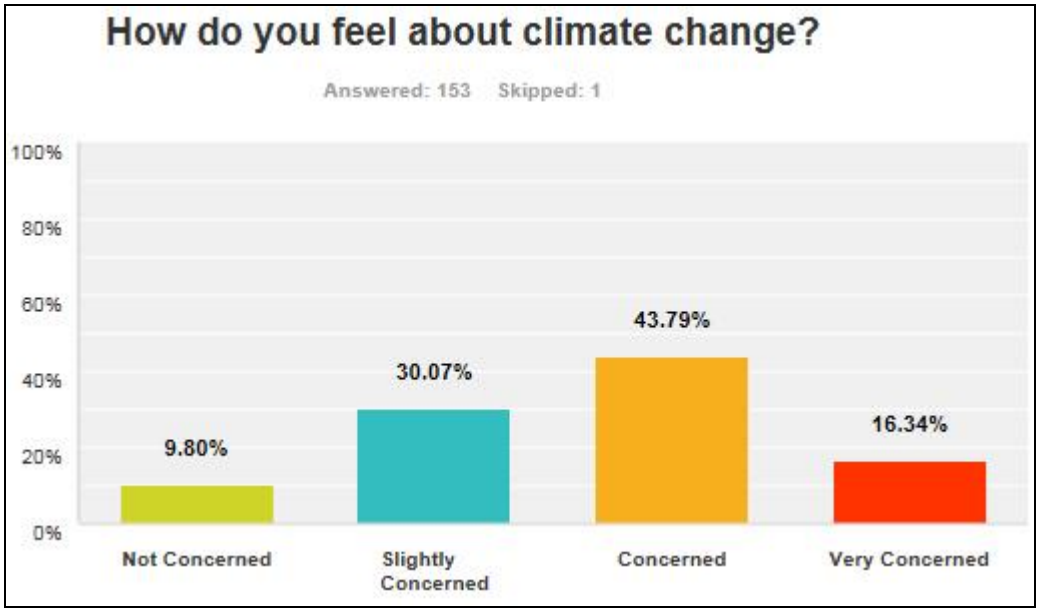
4.4 Passenger feelings on Climate Change

Passenger's feelings and attitudes towards climate change are likely to affect engagement with a carbon offset scheme. There were ***60%*** of passengers who stated that they were concerned or very concerned by the notion of climate change with less than ***10%*** dismissing the issue (Figure 6). Studies by Mair & Wong (2010) and Brouwer & Brander (2008) who interviewed international passengers stated that those from Western Europe and specifically the UK were more concerned by climate change than of any other location, such a high percentage is evident in this study.

In the United Kingdom since 2000, emphasis has been placed on climate change and global warming in the media and through Government policy (Shove, 2010). Such issues as climate change are in the public eye on a regular basis, much more than Asian and North American countries. This can possibly explain why UK passengers have a greater concern for climate change (Boykoff, 2011).

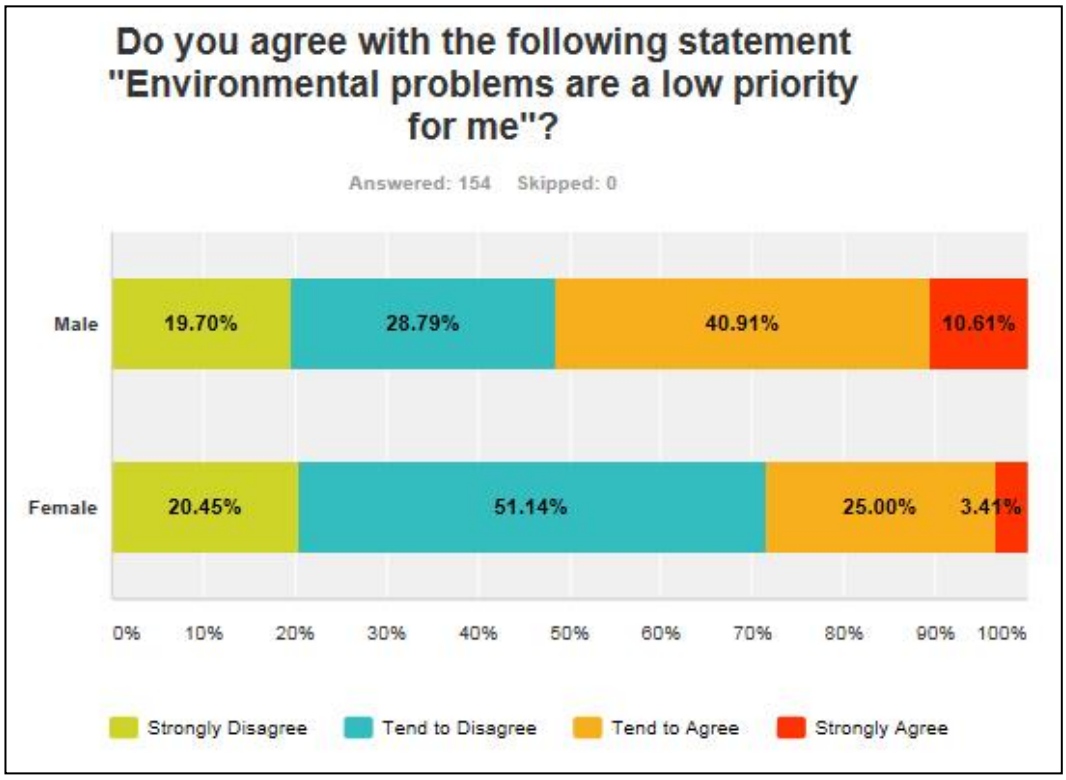
Gender and educational levels of passengers affected how much they were concerned by climate change. The Chi-Squared statistical test showed that females were significantly more concerned by climate change than males (***p 0.022***) and passengers who were educated to Degree level or higher were also significantly more concerned by climate change, than those who had been educated to a lower level (***p 0.033***). (For workings, please see Appendix 7 & 8).

Fig. 6: UK passenger attitudes towards carbon offsetting



Passengers were asked to rate how much they agreed with the following statement *"Environmental problems are a low priority for me".* This question was asked to understand if environmental problems as a whole were important to the passenger and not just climate change. As expected those who were concerned by climate change were also significantly more likely to disagree or strongly disagree to the statement above (***p 0.000*** Appendix 9)**.** Over ***60%*** of passengers stated that the environment was a high to very high priority for them, with women placing environmental issues as a higher priority in their lives than men (***p 0.018*** Figure 7 and Appendix 10).

Fig. 7: A comparison of the attitudes of male and female passengers towards environmental problems



There have been numerous reports in recent years which support the idea that women are more accepting of, and concerned about, climate change than men. A report published in early 2014 by the World Economic Forum stated that females and those under 30, were significantly more concerned by climate change and environmental issues than older males, a trend evident in the passengers sampled in this study (World Economic Forum, 2014). McCright (2010) believes such a gender divide is down to historical gender ideologies and roles within Western Society. There is a notion that females from a young age are taught to be more compassionate towards others and their surroundings, where males seem to be less likely to express their concerns over emotive topics. Hamilton (2011) however, states that males are not completely

unsympathetic to environmental problems. Hamilton comments that women tend to look at the impact of climate change in the form of increased weather events, persons displaced and loss of habitats whereas males tend to look at the long term economic impacts of climate change.

Whitmash's study (2011) also shows that those educated to a higher level in the UK are more likely to be concerned by climate change and environmental issues, which is evident in this sample. Passengers who are educated to level four or above are significantly more aware of global issues and events in day to day life and therefore are more inclined to be aware of climate change issues (Cohen, Higham, & Cavalirere, 2011).

4.5 Flight emissions and Climate Change

Aircraft emissions equate to 2% of all global emissions (Air Transport Action Group, 2013), however if a passenger does not believe that aircraft contribute to global emissions then their likelihood of investing in a carbon offset scheme is reduced (Whitmarsh & O'Neil, 2010). This poses another barrier to engagement in a carbon offset scheme. Most passengers (***88%***) believed that flight emissions contributed to climate change with ***12%*** stating it did not. There was no statistical difference between Age and Gender, although as seen in Figure 8, more males than females stated that flight emissions did not contribute to climate change. Twenty percent of over 60's did not believe that flights contribute to climate change, higher than any other age category (Figure 9).

Fig. 8: Difference in gender attitudes towards the contribution of aircraft emissions and climate change

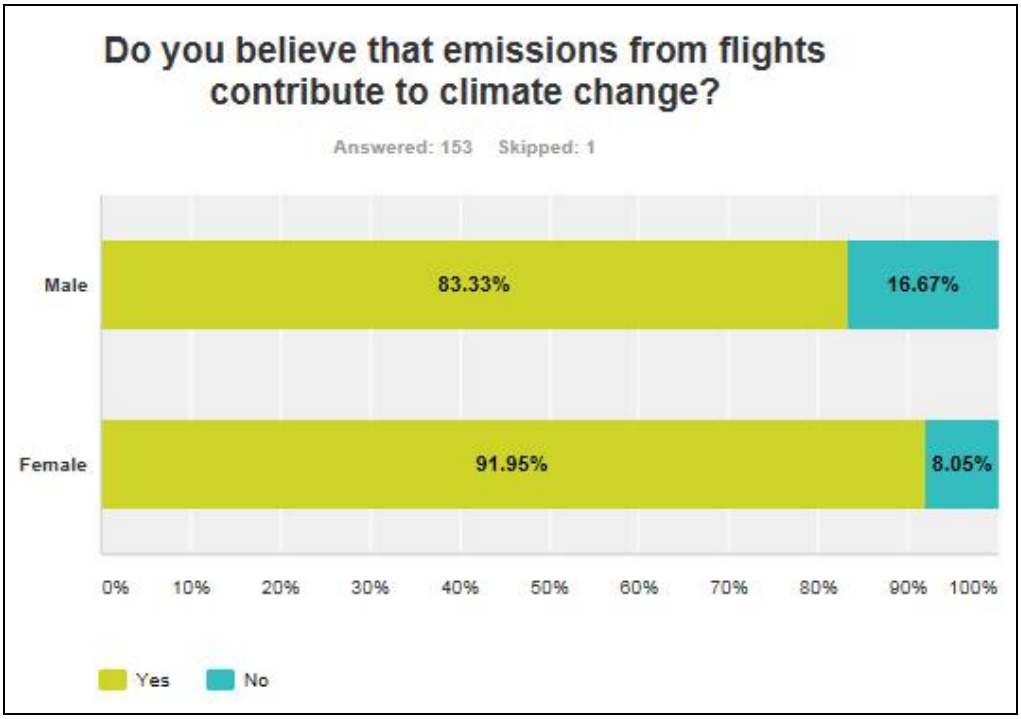
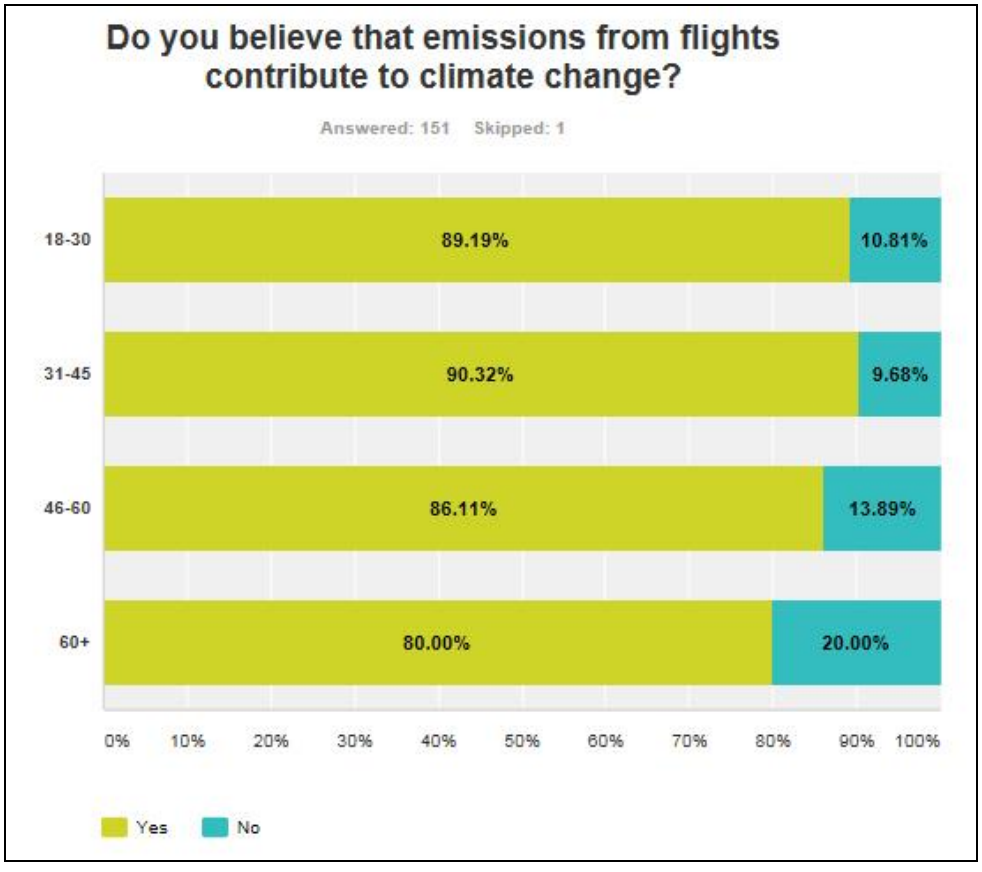


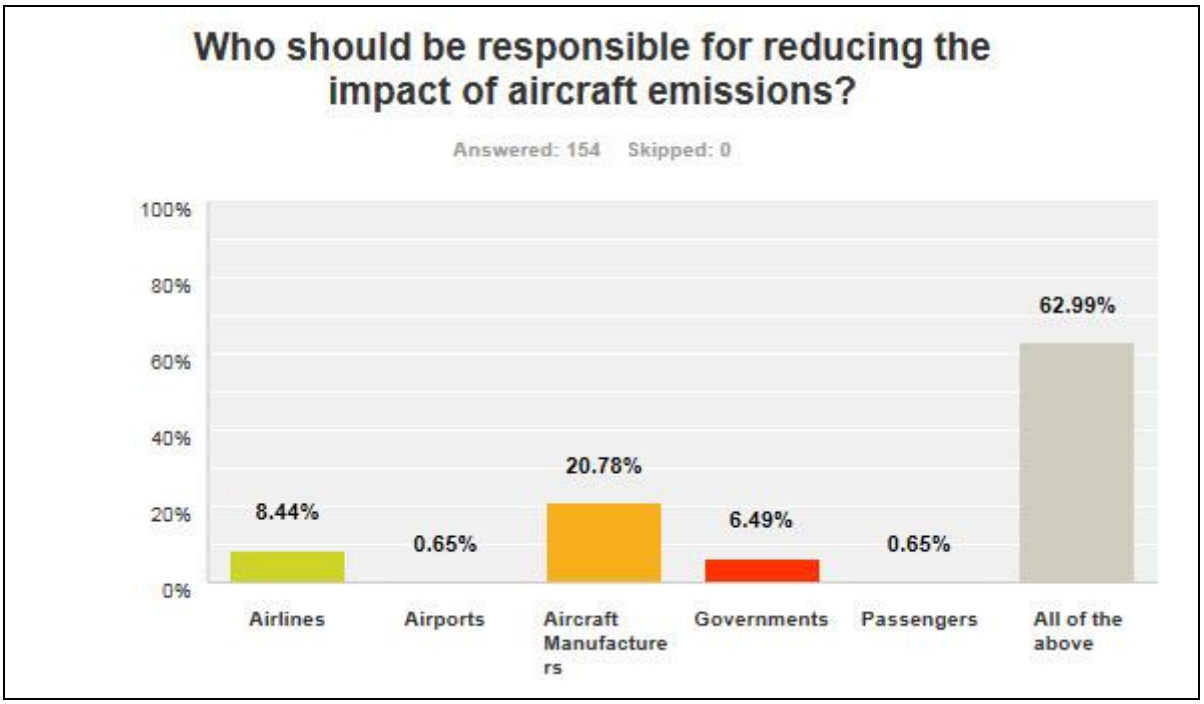
Fig. 9: Difference in passenger's age and their attitude towards the contribution of aircraft emissions and climate change



4.5.1 Passenger responsibility for the impact of aviation emissions

Just fewer than 90% of passengers recognised that flight emissions contributed to climate change. Nevertheless only ***1%*** solely placed passengers as having the responsibility to reduce aircraft emissions (Figure 10). A similar trend is evident in research that although passengers recognise that they are part of the problem, they are less likely to place themselves as part of the solution (McKercher, Prideaux, Cheung, & Law, 2010). When passengers were asked if they would reduce their flights to save carbon emissions, ***67%*** of passengers stated that they were unlikely or very unlikely to do so; further supporting the argument that passengers believe it is another stakeholder's responsibility. This is clearer when passengers who stated that environmental problems and climate change was a concern to them, only ***41%*** stated that they would be willing to reduce their number of flights. The majority who are concerned by climate change would not, highlighting a major issue with tackling climate change and getting individuals to act.

Fig. 10: Who should be responsible for reducing the impact of aircraft emissions according to passengers



Despite this, ***63%*** stated that a holistic view on tackling aircraft emissions should be employed by all parties working together; these include Airlines, Airports, Aircraft Manufacturers, Governments and Passengers. Although, due to such a large volume of passengers unwilling to reduce their flights to help reduce climate change, it is unclear

how balanced such a holistic view would be in practice. If a passenger is unwilling to reduce the frequency of their flights, yet feels strongly about climate change, the option of carbon offsetting is a key alternative tool in engaging passengers to help reduce the impact of aircraft emissions.

Just under a third of passengers (***29%***) stated that aircraft manufacturers and airlines should be solely responsible for the reduction in aircraft emissions. This is somewhat expected as some passengers stated that the aircraft are the cause of the emissions and therefore those who manufacture and fly them have the greatest responsibility. Aircraft manufacturers are already acting upon this with a 25% reduction in the past twenty years, with a further 1.5% reduction in emissions per year (Federal Aviation Administration Office of Environment and Energy, 2012). Less than ***6%*** placed Government and policy as a key driver in reducing emissions. Of the 12% who stated that aircraft emissions did not contribute to climate change, ***44%*** nevertheless placed Aircraft Manufacturers as the key driver in reducing aircraft emissions. To a certain extent, this counters their belief that aircraft do not contribute to climate change.

4.6 Passenger awareness and barriers of Carbon Offsetting schemes

For a passenger to engage with a carbon offset scheme, they first must be made aware of it. Most studies conducted have revealed less than 20% of all passengers are aware of carbon offsetting schemes (Anderson, 2012). Despite UK passengers being more concerned by climate change, ***60%*** of passengers in this study were unaware of carbon offset schemes for flights. It is to be noted that 40***%*** of passengers in this study being aware of carbon offset schemes, is far higher than previous studies by Gossling & Haglund (2009); Mair (2011); Lu & Shon (2012); Chen (2013) and Choi & Ritchie (2014). Perhaps this reflects the UK being more knowledgeable about climate change than international passengers. However the majority are unaware, showing that airlines, governments and carbon offset companies must do much more to help promote and engage passengers for carbon offset schemes.

To do this, airlines that have carbon offset schemes must target women as they were significantly less likely to be aware of carbon offset schemes than men (***p 0.013*** Appendix 11). There was also a disparity between ages, despite MacKerron (2009) stating that under 30's are more concerned by climate change; in this sample they were

the least likely age to be aware of carbon offsetting schemes. Instead, passengers who were between the ages of 31-45 were most aware and those who had a higher educational level were more aware of carbon offset schemes than those who were not.

It can be argued that those who place environmental issues as a high importance in their lives and who are concerned by climate change are the group that airlines must target, as they are most likely to offset their flights (Dodds, Leung, & Smith, 2008). Yet in this sample there was no statistical likelihood of environmental issues or concern for climate change being a major factor in a passenger's awareness of carbon offsetting schemes. Despite this, passengers who stated they were not concerned by climate change or environmental issues were ***3%*** more aware of carbon offset schemes than those who were concerned or very concerned.

4.6.1 Carbon Offsets and Price

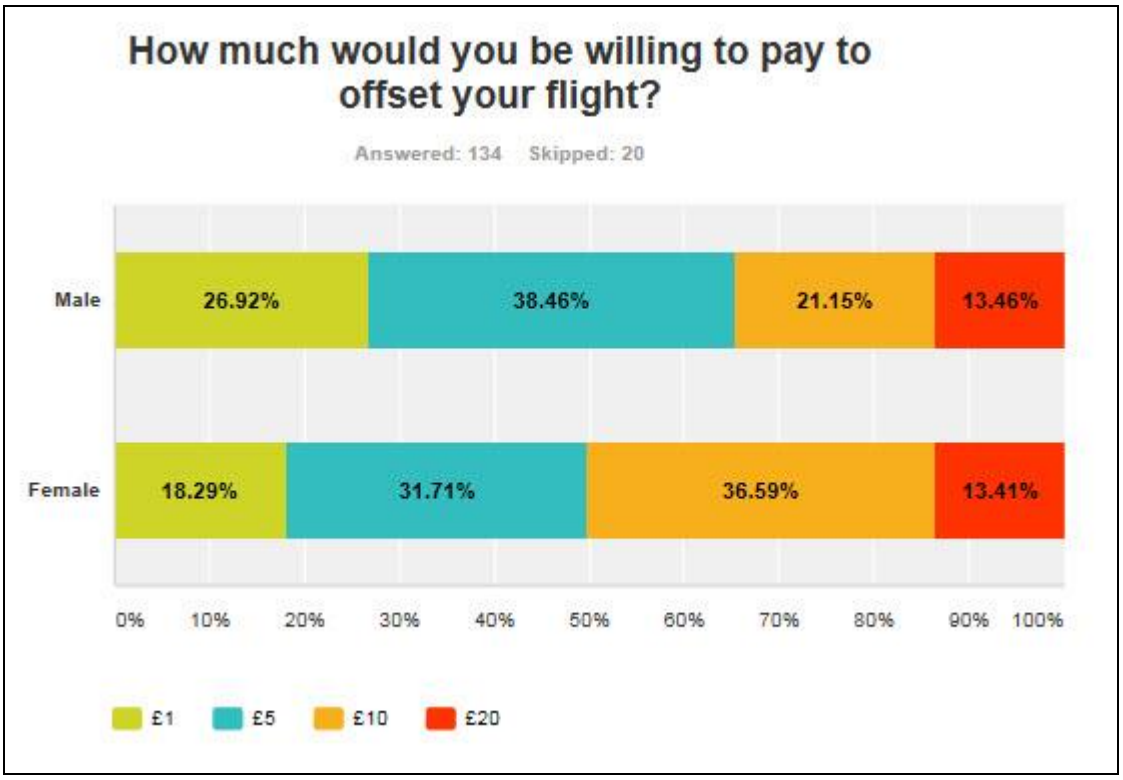
In order for airlines to meet their carbon targets through offsetting, a passenger must pay a monetary value. Price and investment in a carbon offset scheme is another potential barrier for a passenger to overcome before they can donate. If the price is too high or investment in a project is not what the passenger believes in, they may refuse to donate (Whitmarsh, Seyfang, & O'Neill, 2011). Carbon offsetting prices vary wildly between companies and airlines. With no regulation in the voluntary market it is difficult to estimate a standard carbon offset fare (Corbra, Estrada, & Brown, 2013). Airlines such as Easyjet use a carbon offset calculator which prices up the total cost of the routes emissions and gives the passenger a price to offset (easyJet, 2014), compared to British Airways who offer passengers the choice of three set amounts, regardless of their destination (British Airways, 2014).

Passengers in this study were asked how much they would be willing to pay to offset their flights, so that recommendations could be made to the airlines on what best price, the most passengers would pay. The passengers had the following choice of monetary values:

- £1
- £5
- £10
- £20

All values were selected by the passengers, with £5 being the most selected with ***34%*** and £10 being the second highest at ***31%***. Therefore airlines who offer carbon offset schemes should aim to price their schemes between £5 and £10 to gain the most donations to meet their targets. Age was not a deciding factor in how much the passengers would donate, though women were significantly more likely to pay more than males (***p 0.012***, Figure 11 & Appendix 12).

Fig. 11: Breakdown of gender and amount the passenger would pay to offset their flight



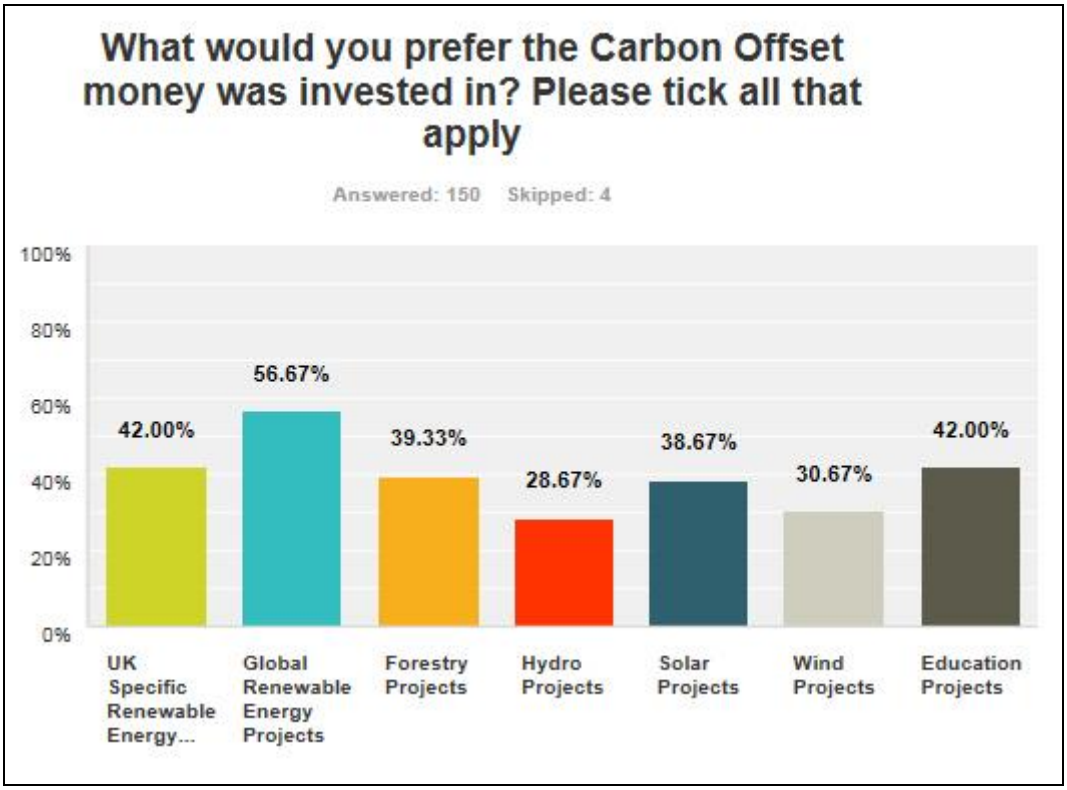
Some passengers at this point who skipped this question stated that they would not pay at all. Some women mentioned that they would prefer a percentage of the fare to be how much a passenger has to pay. One male stated that they would pay up to £50 for a transatlantic flight and a similar sentiment was brought up by a female passenger who stated that *"It depends on my destination-Obviously more for long haul flights"*. Therefore it would be prudent for airlines to offer set value monetary choices that cater for both short and long haul destinations.

4.6.2 Preference for Carbon Offset investment

Deciding on what amount to pay for a carbon offset scheme according to Mair (2011) affects engagement rates. Akter et al (2009) states that the investment of a passenger's money in a carbon offset scheme is perhaps one of the key drivers in getting a passenger

to offset. This is because the passenger actively can envisage their donation being put to work, making them feel good about themselves. Carbon offset schemes often lack any choice for a passenger to choose how and where their money is invested. Often the company who runs the carbon offset scheme will already have a project in mind. This research, in figure 12, shows that passengers have no real preference for one specific type of investment; instead passengers chose a whole range of different projects. However, when gender and age was taken into account, some projects were more likely to be selected by certain groups than others.

Fig. 12: Passenger preference for investment of their carbon offset money



Global renewable projects were the most popular choice with ***57%*** of passengers stating they would like to invest in such a scheme. This can be attributed to passengers recognising the global impact of air travel and flight emissions. As the passenger is flying from one country to the next, there is a realisation that aircraft emissions are not country specific and this is why they prefer to invest in more holistic global renewable projects (Hares, 2013). This holistic view is also seen by those who are concerned by climate change with them most likely to offset in such a scheme (***p 0.000*** Appendix 13).

Gender and Age influenced what passengers were most likely to invest in. Women were significantly more likely to invest in educational projects than males were (***p 0.009***

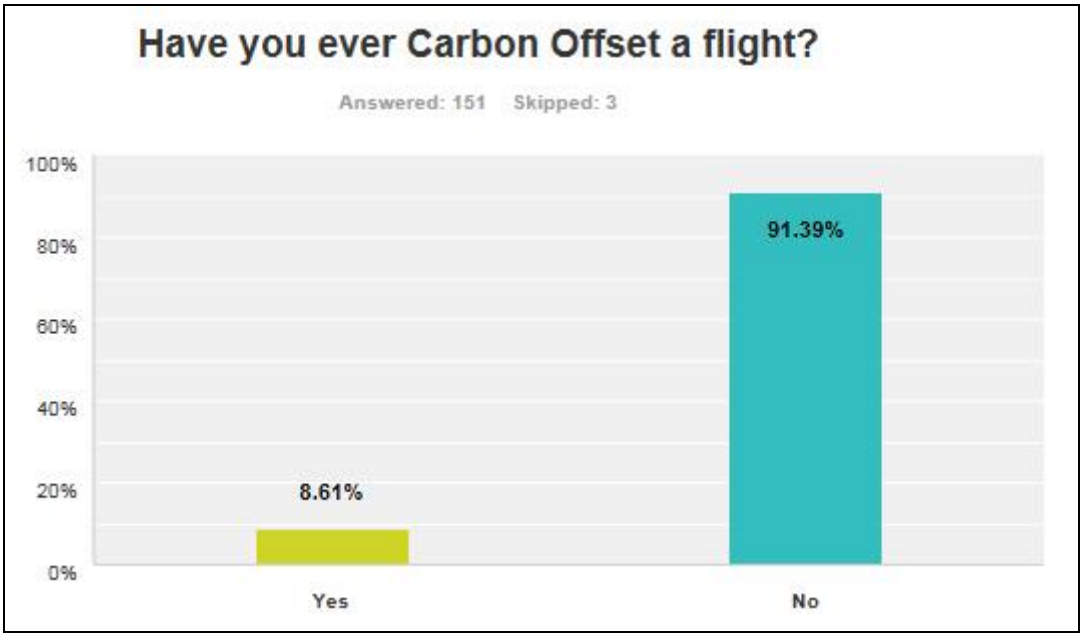
Appendix 14). Conceivably, this may be linked to Females taking a more wider and interpersonal look at climate change, whereas males prefer to look at the harder more technological solutions such as renewable projects (Hamilton, 2011).

4.7 Passenger engagement rates in Carbon Offsets for flights

So far potential barriers and their effect on engagement rates for carbon offsetting have been discussed. Research by Gossling (2009); Mair & Wong (2010) and Lu & Shon (2012), have shown less than 10% of passengers have ever carbon offset their flights. Highlighting a major problem in carbon offsetting and how the industry really must tackle the problem of engagement.

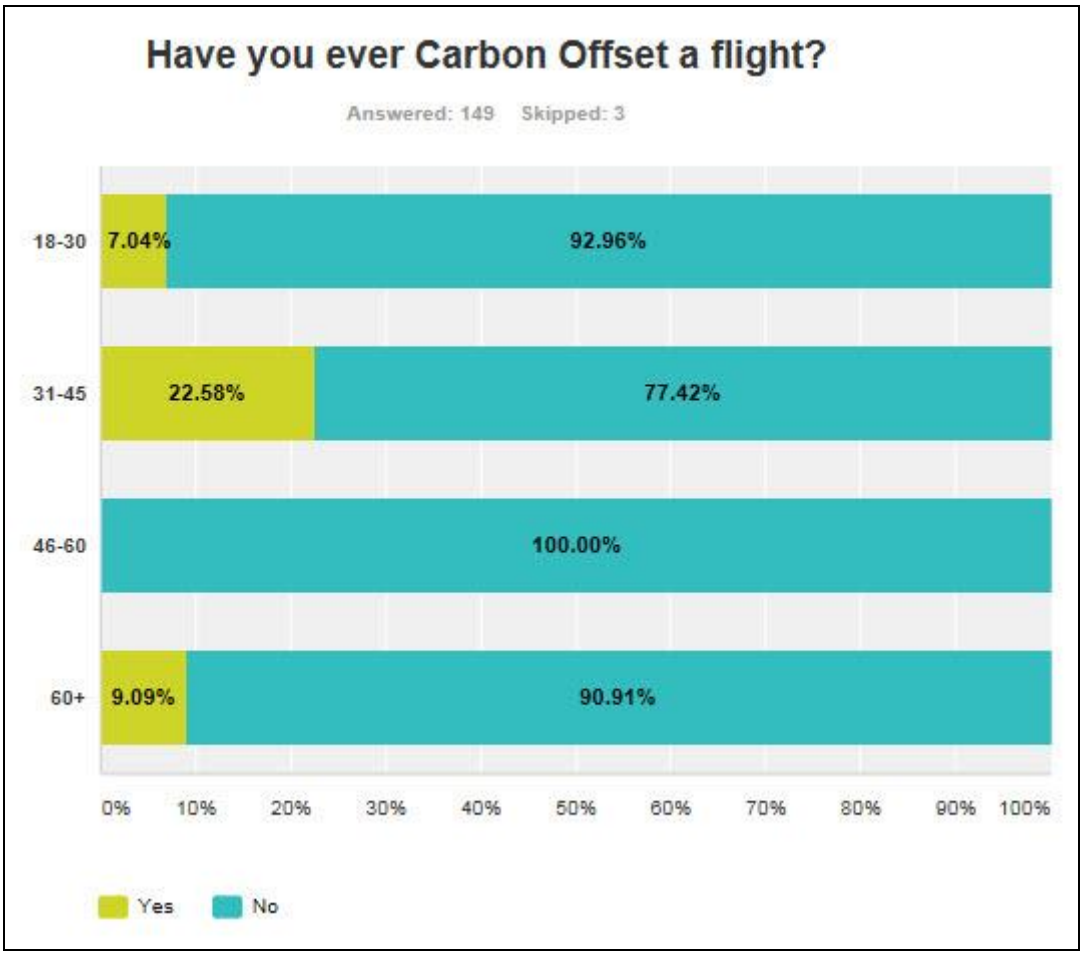
This phenomenon is evident in this research with ***91%*** of passengers stating they have never carbon offset a flight (Figure 13).

Fig. 13: Passenger engagement with carbon offsetting of flights in the past



Despite Gender and Age being a major factor in whether a passenger is aware of carbon offset schemes and their concern over climate change; they had no impact on a passenger actually donating. However as observed in figure 14, the 31-45 years bracket have offset the most in the past with the 46-60 age range having never donated to a carbon offset scheme before. There is a link between passengers' awareness of carbon offsetting schemes and them actually donating. The 31-45 year olds were the most aware age group when it came to carbon offsetting and they are the ages who have donated the most at **23%.**

Fig. 14: Age and engagement rates of carbon offset schemes in the past



4.7.1 Reasons and barriers to low engagement rates

The industry is clearly facing a problem in getting people to engage in carbon offsetting schemes. In the UK at least, with high educational levels and awareness of environmental issues, engagement rates should be far higher than they are at present. Passengers who would not donate to a carbon offset scheme where asked why they would not or have not in the past. Below, in Figure 15 are the six main reasons that the passengers stated why they would not donate.

Fig.15: The six main reasons stated by passengers in this survey, why they would not engage with carbon offsetting of flights

- Passenger states that flights cost enough already and that as UK passengers they are taxed far too much already and therefore refuse to pay more. (*Most popular reason)*

- Passenger shows a lack of trust in Carbon Offsetting schemes. They believe their money does not go to the projects stated and therefore don't believe they help. *(2nd most popular)*
- Passenger does not believe aircraft emissions contribute to global warming, or does not believe global warming/climate change exists. *(3rd most popular)*
- Passenger believes a Carbon Offset should be as part of the ticket and therefore compulsory.
- Passenger does not believe it should be the passenger's responsibility.
- Passenger would only consider it, if more people did it.

Passengers in the UK are subjected to high air passenger duty and fuel taxes compared to other nations (Ryley & Davidson, 2012). For example, a flight from London to New York is subjected to £241.46 in taxes and fees (Shiel, 2014). Some passengers state that with such a high taxation they would prefer a percentage of the tax to go into carbon offset schemes and for them to see the benefit. Passengers complained at the lack of transparency in the high taxes, specifically the Air Passenger Duty tax, with a lack of explanation to where their money goes. The industry and the government must work more closely with passengers to alleviate such uncertainties. Although, if a passenger is already angry at paying higher taxes, then despite more clear information it is unlikely they may offset (Truby, 2010).

Passengers who showed a lack of trust in carbon offset schemes links into research by Frunza (2013). Frunza stated that the transparency of carbon offset companies is problematic. Even the most trusted of companies often fail to display their true calculations. He continues to state that recent negative portrayal of carbon offsetting schemes in the media has had a negative impact on passengers. This is further supported by Singh (2007) who suggests that such complexity and lack of transparency surrounding carbon offsets makes it difficult for the general public to understand and therefore has led to alienation of significant number of passengers. This is evident in this study.

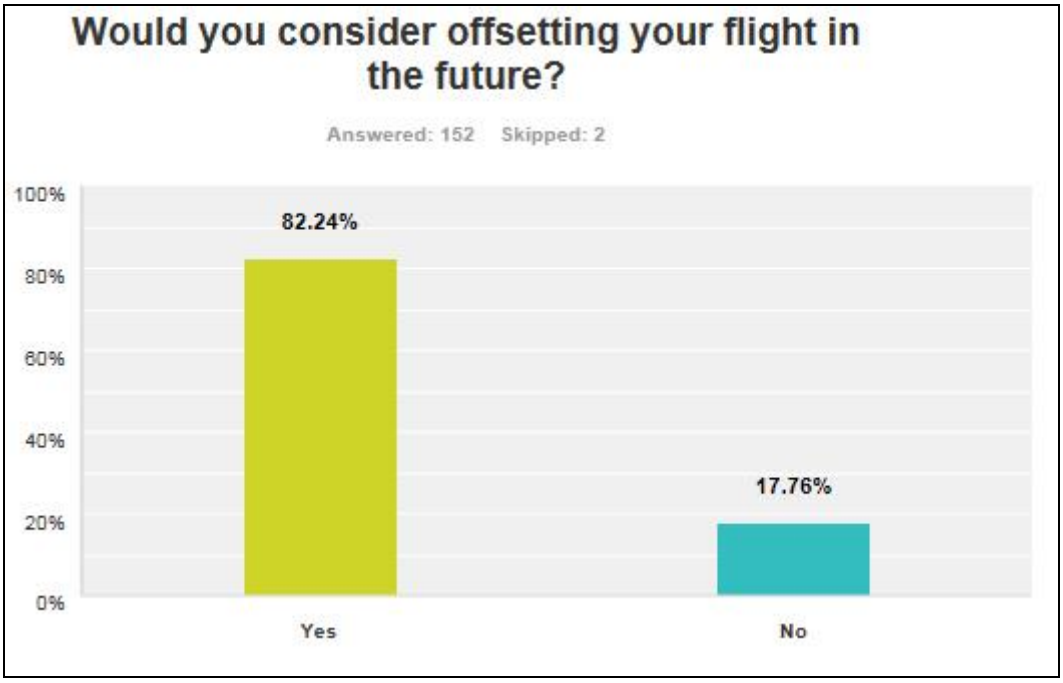
To overcome this, perhaps setting up a regulatory body to give carbon offset schemes more credibility and regulation will go some way to gaining passengers trust. Media plays an important part in everyday life; positive news coverage of carbon offset schemes may go some way to reversing the negativity in some passengers' minds. Yet,

as identified by Kepplinger (2007), sometimes harmful news coverage can have lasting negative connotations to a business or object for many years.

4.7.2 Passenger willingness to offset. A challenge from considering, to doing.

Despite the above barriers to engagement in carbon offset schemes, there is no shortage of willingness from passengers to donate in the future. Over three quarters (***82%***) of passengers stated that they would consider offsetting their flights in the future (Figure 16), higher than 64% as discovered in Gossling & Haglund's (2009) study, yet this still shows a high percentage of passengers who are willing to offset in the future.

Fig. 16 – Willingness of passengers to offset their flights in the future

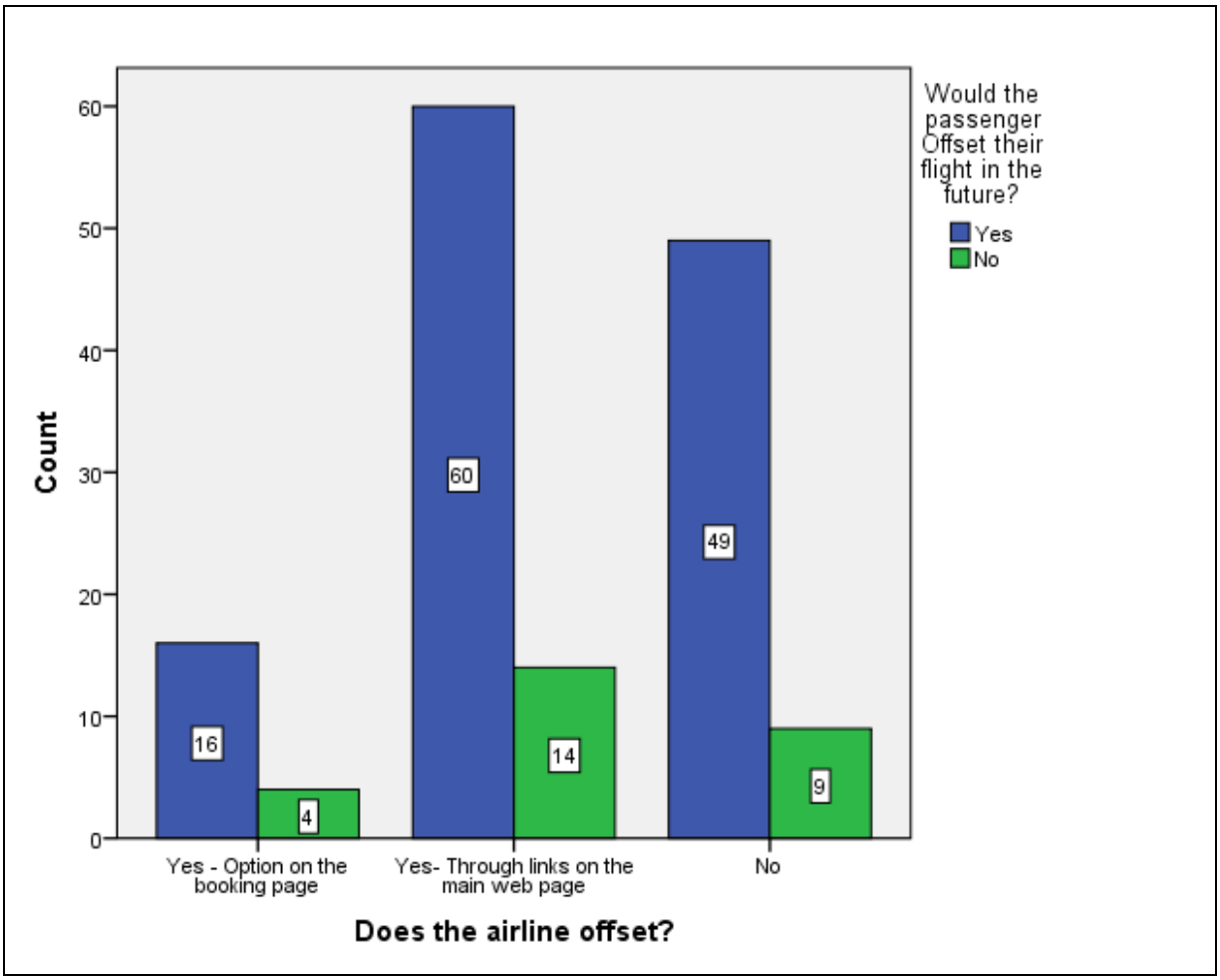


Once again, females were significantly more likely to offset their flights in the future over men (***p 0.006*** Appendix 15). The link between awareness and donating is evident once again here, as it was with the 31-45 year olds. Women were significantly less likely to be aware of carbon offsetting schemes, yet once the scheme was explained to them, they were significantly more likely to state they would offset in the future. This phenomena was also encountered by Mair (2011), who concluded that Women and passengers over 50, where significantly more likely to Offset in the future than males and under 50's.

One common theme appearing is that the Industry and carbon offset providers must do far more to raise awareness and educate passengers about carbon offsetting. As 60% of passengers were unaware of carbon offsetting schemes, perhaps if they were made aware and educated on such a topic, engagement rates of carbon offsetting would be far higher. This is evident with over 80% of passengers showing an active interest in carbon offsetting in the future.

Airlines who offer carbon offset schemes to their passengers must be more proactive to promote carbon offsetting than they currently do so. Figure 17, indicates that airlines that do not currently offset are missing out on a large number of passengers who would consider donating in the future. If such airlines were to enter the carbon offset schemes then undoubtedly, the rates of engagement in carbon offset schemes would increase. There is a clear market for carbon offsetting.

Fig. 17: Passenger willingness to offset their flights with airlines who offer carbon offset schemes



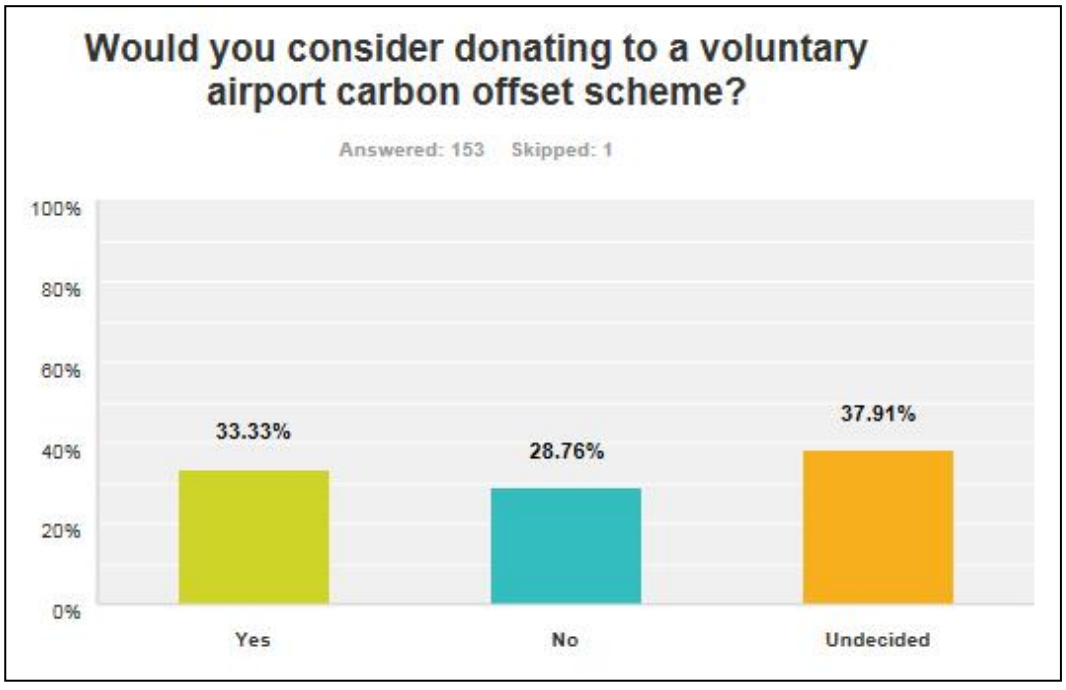
4.8 Airport Offset Scheme

Section one, 4.3 to 4.7, so far has discussed passenger attitudes and potential barriers to the carbon offsetting of flights. For the second part of this study, passengers were asked about their attitudes towards a new concept of offsetting. That is the airport carbon offset. This new concept is in its infancy and little to no research on the topic to date has been published. Airline carbon offsets only offset what emissions the aircraft produces once in the air until their destination. Airports like airlines are facing strict EU and UK government policies to reduce their carbon emission outputs by half by 2050. In order to achieve this, like airlines, carbon offset schemes are an attractive way to help airports reduce their emissions. This part of the study was to assess the viability of such a scheme in the form of passenger engagement and to understand if implemented, how much the passenger would be willing to donate. This could then be equated to how much revenue could be generated and through what mechanism of collection should be used to make the scheme most effective.

4.8.1 Engagement rate of Airport Offset scheme

In order to investigate the potential of an airport carbon offset scheme, passengers were asked if they would be willing to donate. On the online survey a short paragraph explaining what an airport offset scheme was given (Appendix 16). A third of passengers (***33%***) said that they would be willing to donate to such a scheme, with ***29%*** declining and ***38%*** being undecided (Figure 18).

Fig. 18 – Passenger engagement in an airport carbon offset scheme



Thirty Eight percent of passengers being undecided is a significant portion of passengers; however this can be attributed to the researcher not being present to explain to the passengers the scheme in more detail. Alternatively such indecision may be due to the scheme being completely new to the passengers. Often new schemes are met with indecision and take time for people to understand and engage with (Moll, Krueger, & Zahn, 2006). Passengers therefore may wait to be more informed over the project before committing to an answer. If such a high proportion is representative of passenger engagement in an airport offset scheme then it indicates that airports must do everything they can to engage the undecided to contribute to their scheme.

Gender and educational levels did not affect passenger engagement with the scheme, though under 45's were significantly more likely to say they would participate than over 45's (***p 0.046*** Appendix 17). A similar trend was evident in what age would carbon offset their flights, with under 45's more likely to offset. Those who were concerned by climate change and environmental issues where significantly more likely to donate than those who were not (***p 0.000*** Appendix 18).

Passengers who stated that they have offset their flight in the past, just over half (***54%***) would donate to an airport offset scheme (Figure 19). Passengers who stated that they would not offset their flight in the future, ***70%*** would not donate to an airport offset scheme in the future either (Figure 20).

Fig. 19: Passengers who have offset a flight in the past and their engagement with an Airport Offset scheme

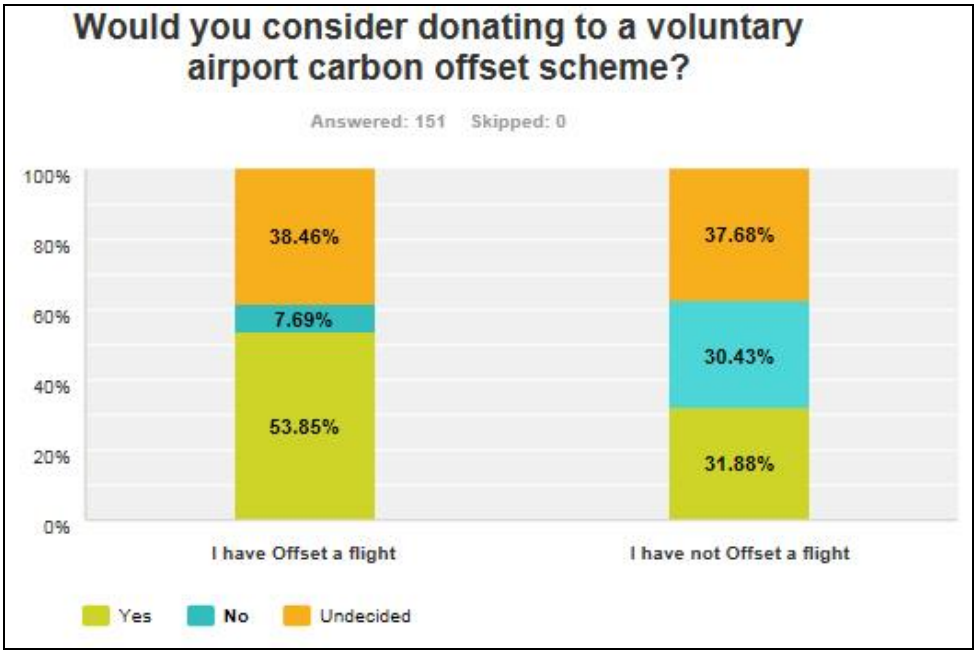
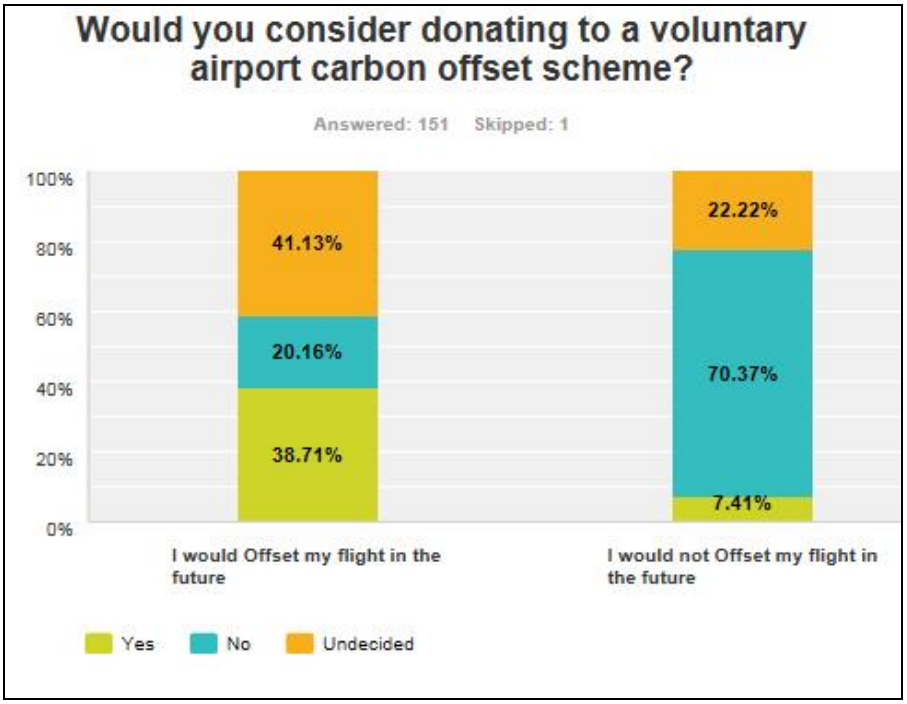


Fig. 20: Passengers willingness to offset their flight in the future and their engagement with an airport offset scheme



4.8.2 How much is a passenger willing to pay and how much could be generated?

Airports generate far less CO_2 emissions than airlines over the course of a year and therefore it was expected that passengers would recognise this and on the whole donate less to an airport offset scheme. This is due to the smaller emissions needing to be offset from the airport compared to airlines. Airports need to offset their scope 1 and scope 2 emissions.

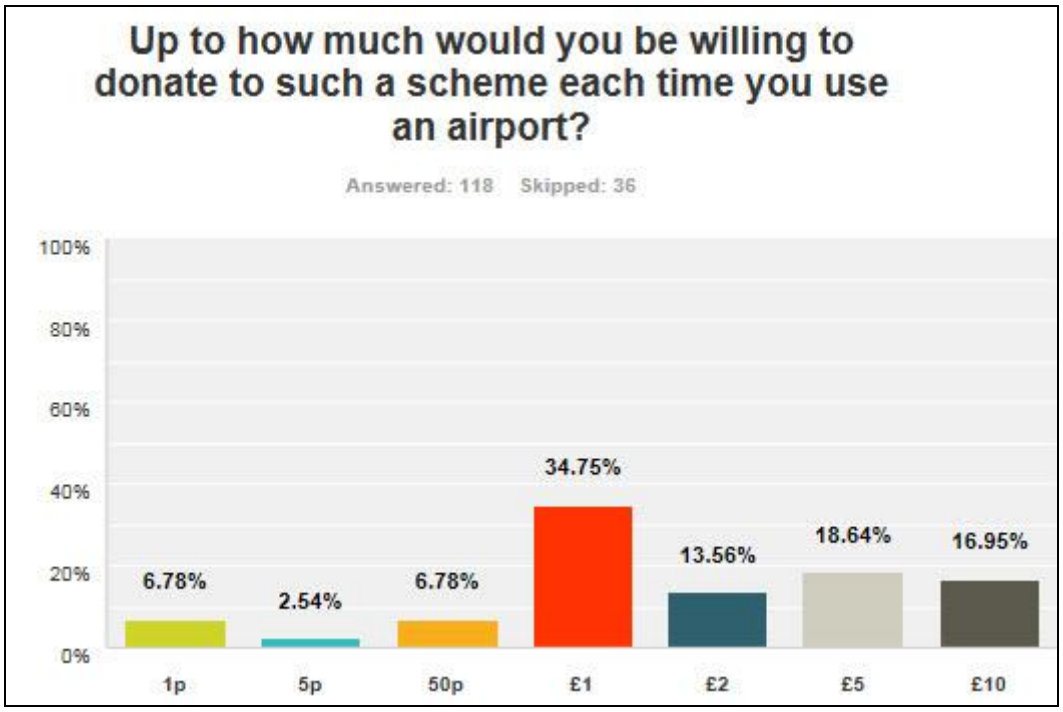
- Scope 1 are direct GHG emissions from sources that are owned or controlled by the airport. This is often equated to the fossil fuels burned on site and by airport owned or leased vehicles.
- Scope 2 emissions are indirect GHG emissions resulting from the generation of electricty, heating and cooling and the provision of purchased utlities on site.

(Environmental Protection Agency, 2013)

The airport offset scheme differs to that of an airline offset in the sense that although still voluntary, there is no set amount that a passenger should donate; it is of total

freewill of the passenger. Figure 21, is a breakdown of how much the passengers would be willing to donate to an airport offset scheme.

Fig. 21: Passenger preference for how much they would donate to an airport carbon offset scheme



The most prevalent amount a passenger would donate is ***£1***; however the majority of passengers ***61%*** would donate between **£1-£5**. A significant proportion would donate £10; these passengers are the passengers who are very concerned by climate change and environmental problems. Females are most likely to donate between £1- £5 with males most likely to donate **£**1, despite this **23%** of males stated that they would pay **£10** compared to just **14%** of females.

Below in figure 16 shows in theory, based on the figures obtained in this study, how much could potentially be generated for the whole UK airport industry if the scheme was successful.

Fig. 22 – Estimations of how much could be generated for all airports in the UK

Example: In 2013, there were 228 million passengers travelling through UK airports (Civil Aviation Authority, 2014). Based on this and the figures obtained on passenger engagement in an airport offset scheme below are expected revenue generation for the UK industry. The figure 228 million is halved here, with the assumption that the 228 million is split evenly between departing and arriving passengers. In reality this figure may well be higher, with passengers using one way trips. Due to this scheme being

mainly for passengers departing the airport (although not exclusive to departing passengers), the figure of 114 million is used in these calculation.

- **Conservative Estimate:** 61% of the 33% who would donate stated they would donate between £1 and £5.Therefore this price range is used in this example as the most popular. If only half of those who said they would donate to an airport offset scheme (15%) donated at the lower end of the average monetary value of £1.

  Number of passengers who would donate = 17.1 million

  Revenue Generated = £17.1 million

- **Actual Estimate:**

  Based on the figures in this study, if 33% of all UK passengers donated in relation to the percentages in Fig.15.

  37.620 million departing passengers would donate:

  6% would donate 1p = £22,572

  2.5% would donate 5p = £47,025

  6% would donate 50p = £1,128,600

  35% would donate £1 = £13,167,000

  13% would donate £2 = £9,781,200

  18% would donate £5 = £33,858,000

  17% would donate £10 = £63,954,000

  Total revenue generated from 33% of UK departing passengers = £121.958 million

At the values presented in this survey, a significant proportion of revenue can be generated for the airport community to offset their emissions. The scheme however would most likely be airport specific, due to the challenges of creating a committee and pooling of money for all airports, these challenges of implementation are discussed in section 4.9.

This scheme would be designed to generate revenue for a specific airport to carbon offset their own emissions and invest in greener technology for future operations. To place the airport offset scheme in a more location specific context an example in figure 17 is below. Here the example of London Gatwick is used. London Gatwick is the second busiest UK airport and busiest single runway airport in the world, in 2012 Gatwick operated 242,498 air transport movements, double that of the next busiest single

runway airport (Gatwick, 2014). Gatwick has also invested heavily in recent years in infrastructural improvements and operational efficiencies. Gatwick has set out an ambitious and industry leading target to reduce their emissions by 50% by 2020, with 40% already achieved (Gatwick Airport LTD, 2013). Therefore such a scheme would be beneficial to such an airport. Below are estimates, based on the figures of this study, how much revenue could be generated.

Fig. 23 – Estimations of how much could be generated by an airport offset scheme for London Gatwick

Example two: Airport specific - In 2013 there were 34.2 million passengers travelling through London Gatwick airport (CAA, 2014). Based on this and the figures obtained on passenger engagement in an airport offset scheme below are expected revenue generation for the airport. For a more accurate account of revenue, the figure of 34.2 million is halved. This is of the assumption that at least half depart the airport. In reality this would higher, with passengers operating one way trips from the airport.

Estimate:

Based on the figures in this study, if 33% of all departing passengers from Gatwick donated in relation to the percentages in Fig.15.

5.64 million Passengers would donate:

6% would donate 1p = £3,386
2.5% would donate 5p = £7,054
6% would donate 50p = £169,290
35% would donate £1 = £1,975,050
13% would donate £2 = £1,467,180
18% would donate £5 = £5,078,700
17% would donate £10 = £9,593,100

Total income generated = £18.293 million

Conservative Estimate:

Assuming half of the estimated 33% actually donate (15%)

Total Income Generated = £9.147 million

With a potential of £9 million to £18 million of income generated for carbon offsetting, this scheme is viable. In reality, this figure may well be higher once the inclusion of

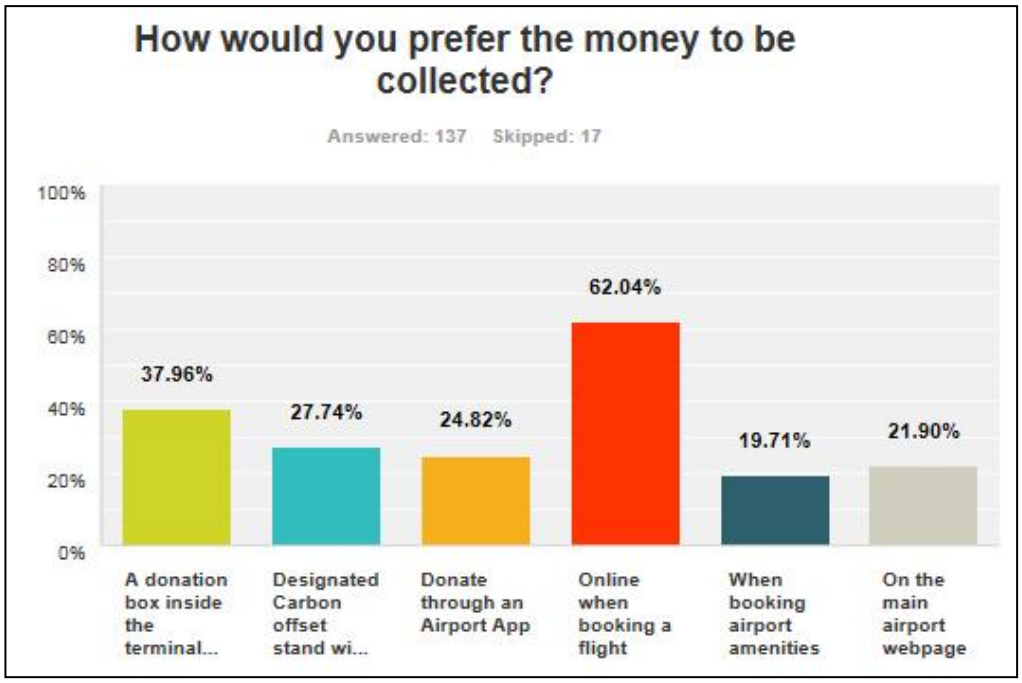
arriving passengers is included. It is envisaged that to begin with, the scheme should focus on departing passengers as they tend to spend longer in the airport, using their amenities etc. Arriving passengers should be targeted once the scheme is running, or at least, have provisions for arriving passengers to donate if they so wish.

4.8.3 Method of collection

In order to gain maximum engagement and therefore revenue for such a scheme, an airport must execute the scheme in a specific way. As shown in the case of an airline offset, there is a high potential for people to offset, yet the numbers who do are significantly smaller. Awareness is a key barrier to passengers not offsetting their flights due to not knowing such a scheme existed. Therefore it is imperative that airport management works with airlines and in-house design teams to effectively convey the message, the principle and process of an airport offset.

Due to the scheme being entirely voluntary with no set amounts, a passenger should be made aware and informed in sufficient depth so that they can be made aware of the scheme and where their potential donation is going. Once a passenger is aware of the offset scheme, there still remains the problem of collection of such money. Passengers were asked to select what methods of money collection they would prefer, which in turn should increase engagement with passengers. Figure 18 shows what method of collection the passengers preferred, however certain age groups were more likely to state a particular method than another, showing that the airport must take a multi-method approach for best engagement in a scheme.

Fig. 24 – Passenger preference for collection of an airport offset



Passengers most preferred the option to donate online through the airline when booking their flights. Research by Hodgkindon & Coram (2012) shows those airlines that have carbon offset schemes on their booking page have a higher engagement rate than those who do not. This would be beneficial for the airport as it is quick, easy and simple and can be integrated into an already established system. However, as outlined in section 4.9 there are significant challenges to successfully integrate an online scheme with an airline.

Although donating online is the most preferred method, under 45's and specifically the 18-30 age group were most likely to donate using an airport app (***p 0.006*** Appendix 19). This can be potentially explained due to the 18-30 generation having grown up with mobile technology, apps and mobiles phones are now an integrated way of life (Sackmann & Winkler, 2013). With sophisticated Apps now making money transfers and information instant in the hands of the passenger, the app method of collection is a very important method an airport should pursue.

By using QR codes on posters throughout the airport, the passenger can have in-depth access to the scheme and information through their mobile phone devices, for an example and explanation of a QR code see Appendix 20. With instant money transfer already established through the use of Google Wallet, Play and PayPal money can instantly and easily be donated to the scheme (Watson, McCarthey, & Rowley, 2013). If such a donation is integrated into an airport app which already provides flight information for a passenger, an airport can develop a well-used and integrated app which increases passenger satisfaction and has endless potential for promotion for the airport.

Although most passengers preferred the use of online donations and apps, ***40%*** of passengers stated that a donation box inside the terminal, with a promotional display explaining the scheme, would be a preferred method of collection. This method is also an important method for an airport to implement due to the many benefits it possesses. One main method of increasing engagement is for passengers to feel as If they are 'doing good'. The act of physically donating money has been shown to increase mood and participation (Cryder, Loewenstein, & Seltman, 2013). The act of one person donating in front of other passengers, will make other passengers curious and the sense of feeling obliged to do so, so they are not left out, increases engagement with a scheme (Winterich, Mittal, & Aquino, 2013).

One passenger stated that they would prefer such a method of donation, due to the following reason.

"When I'm travelling home from a country with a different currency, I've often got spare change left over. There is little point in exchanging it back home for such a small amount, so it would be perfect to donate such a left over currency. Saves me the hassle and helps the environment"

The above is a real problem for travellers and through such a method of donation can be a very successful for gaining revenue and engagement. Foreign passengers may feel this way when departing UK airports and may well donate their left over Sterling. Feasibly this can be implemented in the baggage hall of arrivals for UK passengers to donate their foreign currency due to the reason above.

4.8.4 Passenger preference in investment in an airport offset scheme

Once the money has been collected by the airport, they must invest in a carbon offset scheme or project. Passengers were asked about their preference for what they would prefer their money to be invested in. Just under half (***47%***) of passengers would prefer their money to be invested in on-site renewable technologies or UK based projects. On-site renewable technologies will help to further reduce and offset future emissions from the airport and passengers can actively see their donation being put into practice.

Forty Four percent of passengers prefer if the airport used the money in replacing all airside vehicles to electric ones. Those passengers who are concerned by climate change and environmental issues are the most likely to prefer this method (***p 0.010*** Appendix 21). This again, reduces the impact of emissions on the airport and shows the passengers how their donation is helping the airport. There is a lot of potential when it comes to offsetting airside vehicles. Although airside vehicles such as Aircraft tugs and Emergency service vehicles may be difficult to be fully electric, there is the technology available today for these vehicles to be hybrid. For example, an aircraft pushback tug, needs a large amount of torque to push an aircraft back, which can currently only be generated by a combustion engine. However, while driving from one aircraft to another, it can run on electrical motors instead. Airside buses, baggage carts and even service vehicles can all be electric. It is important also that the airport shows on the side of the vehicles that they are electric and funded by donations from passengers (Fontela &

Soria, 2007). This is another visual link for passengers to see where their donations are going, which is hoped would increase passenger engagement once they see the scheme in action (Oppenheimer & Olivola, 2011).

Airport Offset schemes and their investment is very different to the broader and generalised global invest of the airline offset. Airport offsetting investment is much more localised and airport specific and therefore investment should be placed into onsite and electric vehicles than more broader projects seen in the airline offsetting schemes.

4.9 Challenges of implementation

Due to this scheme being new much like the airline carbon offset schemes, regulation should be used when setting up such a scheme. An independent commission should be set up to make sure all money generated by the airport for an offset scheme is placed directly into carbon offset projects and not for other purposes. Airline Offsetting has low engagement in part due to public uncertainties over the lack of regulation of such schemes and therefore have a lack of trust. If an airport offset scheme can be regulated and trusted then passengers will feel trusting in donating, which in turn will increase engagement.

The major challenge that an airport offset scheme would face would be whether money generated by an airport is kept within the airport or is pooled for other airports to use for carbon offsetting the industry. The latter poses more challenges than the first. It would be difficult to set up and regulate a large pool of revenue with potential conflict over the division of such funds. Would the airport that generates the biggest percentage, get the largest percentage back or will each airport get the same percentage, regardless of how much they pay into a scheme? Further discussion and research needs to be done to answer such questions.

Engagement remains the biggest challenge in how successful an airport offset will be. This is a determining factor in the success of all carbon offset programs (Char-lee, Becken, & Battye, 2014). To alleviate this, the airport should have a donation box inside the terminal, integration into a well-developed airport app and finally to work with airlines to place a donation option on their booking page.

The latter remains a very difficult challenge but one that ultimately may prove successful. With only 13% of airlines in this study already having the option to donate to their carbon offset schemes on their booking pages; it may prove more difficult for this to happen with an airline who does not offer this already. However, many airlines today offer add on options such as baggage, food and seat selections on their booking pages. There is opportunity for an airport offset to be added within this system, allowing passengers to add payment for such a scheme while selecting other add on option within their ticket. The challenge the industry would face with this is how the division of money is collected and distributed back to the airport.

With that in mind, the airport may wish to choose one airline to use such an online scheme with first. For instance, Gatwick could partner with British Airways, who use the airport already and have their own airline carbon offset scheme on their booking pages. It would be feasible for Gatwick to have an airport offset included in such an airline offset from British Airways flights departing from Gatwick. If this were to be achieved British Airways and the Airport could in effect have a carbon neutral flight. This reduces emissions, which helps both airline and airport to reach their targets, while proving positive media coverage for both airline and airport.

4.10 Airport Offset placed into a wider integrated context

Airline and airport offset schemes, if successful are an important tool, along with other methods in helping to reduce the industries carbon reduction targets by 2020 and 2050. Although the offset schemes are good for individual stakeholders, if a successful integration of both airline and airport offset scheme is achieved then there is scope for a large carbon neutral network.

For example, if a successful scheme was introduced, in theory a passenger in the future, based in London, flying from London Gatwick to New York could participate in what is in effect a carbon neutral flight. The passenger if flying with British Airways elects to donate to their carbon offset scheme, making his or her flight carbon neutral. Due to the success of the airport offset scheme, Gatwick has introduced a green ticket on their Gatwick express train service. Under this ticket, for a small extra cost the passenger has successfully offset his or her journey to the airport and offset the use of the airport in one integrated ticket. In effect the passenger has now participated in a carbon neutral flight, with travel and airport offsets included. This helps reduce all parties' carbon

emissions and helps all three work towards carbon reduction. The marketing potential for such a pioneering integrated carbon neutral scheme is large. If over time this can become the norm, then the industry and passengers can participate in carbon neutral flights, helping all sectors to reduce emissions, providing that they continue to reduce emissions through operational efficiencies and technological improvements. This can be integrated today, providing all stakeholders, including airlines, airports, business, passengers and governments engage with it. To have such an integrated and successful network and airport scheme will take time. The airport offset is not a scheme which can be implemented and gain results instantly, it is a process of time and engagement for an airport. It is a valuable tool in helping airlines and airports to reach their carbon reduction targets. However such schemes need to be implemented sooner rather than later, allowing time for them to flourish and become successful before they become imperative as time runs out for airlines and airports to reach their targets. A by-product of such a scheme and investment in onsite renewable energy means the airport becomes more resilient and less affected by price shocks of oil and gas, which helps secure the future revenue of the airport for many years to come.

5.0 ***Conclusion***

5.1 Passenger attitudes towards the Carbon Offsetting of both flights and airport emissions

Previous studies have most often been located in Asian and Australasian countries with little European case studies. Despite this, one common theme present from all research, including this research is the low engagement rates of passengers in carbon offsetting of flights. Despite this sample being more educated and more concerned by climate change and environmental issues than any other study, the engagement rate was similar to previous studies with only ***9%*** having ever offset a flight. Engagement and awareness is a key issue airline and airports must face if they are to tackle their carbon reduction targets. Over ***60%*** of passengers were unaware such schemes existed. Despite a lack of awareness from passengers over carbon offsetting schemes they have shown a substantial interest and willingness to offset their flights in the future with ***82%*** stating they would. Therefore airlines have a large potential of donators to make their offset schemes viable, however this potential is untapped by airlines and their approach to marketing and promotion of such schemes must be addressed.

The airport offset scheme is in a unique position to learn from the failures of the airline carbon offset schemes when it comes to engagement. With ***33%*** of passengers willing to donate to an airport offset scheme, the scheme is viable and an attractive source of revenue can be generated if implemented correctly. With ***38%*** of passengers undecided, it is important that such a large proportion of passengers is targeted and engaged in the airport scheme to further increase its potential success. In order to achieve this, the methods of implementation that should be used are outlined in the airport recommendation section, 5.4.

This research has shown that there are a number of factors and attitudes which affect a passengers' likelihood of donating to a carbon offset scheme.

5.1.1 Gender

Gender is a clear differentiating factor in affecting passenger attitudes towards carbon offsetting. Men are significantly more aware of carbon offset schemes than women; however there is a disparity between being aware and actually donating. Men are less

likely to donate higher amounts to a carbon offset scheme and a significant portion would not donate at all. Women on the whole, despite their lack of awareness of carbon offset schemes, once the scheme was explained, they were more willing to engage in a scheme in the future for both their aircraft and airport emissions than men. Females in this study have shown a greater concern for climate change and placed environmental problems as a higher importance in their lives than males. Perhaps such a divide in gender has arisen through the gender dynamics of society and is one which the industry perhaps may struggle to change.

5.1.2 Age

The age of a passenger is also a factor in affecting passenger attitudes towards carbon offsetting. The 31 to 45 age range is a key target for airlines and airports. Those in this age range show significant more awareness of such schemes and are significantly more likely to donate to a scheme than any other age range. Over 45's in general are less likely to engage in the process than under 45's, a similar trend discovered by (Smith & Rodger, 2009). Perhaps this is due to the under 45's being the generations that have started to live with and be taught through education about the issues of climate change (Evans & Honeyford, 2012). Despite under 45's being more likely to offset their flights, those under 30 were least aware of carbon offset schemes. Therefore, such potential needs to be exploited by employing marketing strategies that will engage and promote carbon offsetting to this age range.

Age played an important role in how a passenger envisaged their donations being spent. The older the passenger tended to focus on UK specific projects compared to the more holistic and global view of the under 45's.

5.1.3 Education

Despite UK passengers in this study having a high educational level, a passenger's level of education did not play a significant factor in a passenger's engagement towards carbon offsetting. Passengers who had been educated to Degree level or higher were significantly more concerned by climate change and were significantly more aware of carbon offsetting schemes. Despite this, there was no significant influences of educational levels between higher and lower educated passengers having engaged in the past or willing to engage in the future. Personal beliefs such as believing in climate change and how high of a priority environmental problems are placed in the passengers

lives is a far greater driver to offsetting their emissions than their educational levels. Educational levels do, however, help to inform such beliefs, with those educated to a higher level being more concerned by climate change.

5.1.4 Passenger views on Climate Change and environmental issues

Passenger's views on climate change and environmental issues where perhaps, the biggest driver in affecting if a passenger would donate or not. Passengers who were concerned or very concerned by climate change and those who stated that environmental problems were of a high priority for them were significantly more likely to engage and donate to both offsetting schemes in the future. Those who held this attitude were on the whole the most engaging with the schemes and were most likely to donate higher amounts than those who held opposing views. If a passenger did not feel strongly about climate change or environmental issues, they tended to be disengaged with the subject of carbon offsetting and were the group that were most likely to not donate at all.

Passengers who are unconcerned by climate change can be targeted by promotion and education to possibly change their attitudes. A person's attitude towards green issues as noted by Zimmer & Stafford (1994) falls into split two categories, hard or soft. Those who have hard attitudes are most unwilling to be swayed on their beliefs surrounding green issues. These people feel very strongly for or against environmental issues and are often on the extremes of the scale, such as activists. Most people vary along the soft scale of attitudes. People often pick and choose their stance regarding different aspects of environmental issues and therefore can be targeted in green promotion and marketing. For example a person may feel very strongly about a local environmental issue, yet disengage with a similar global issue. There is potential to engage these changing attitudes, through promotion and education in order to get passengers to donate as their priority of environmental issues is a key driver to donating in an offset scheme. Some passengers who hold the view of climate change not being caused by human activity and therefore do not see carbon offsetting as needed are unlikely, regardless of promotion to change their minds and donate.

5.2 Recommendations for both

i. Both airline and airport must make women more aware of their carbon offsetting schemes. Females are most likely to engage more and donate higher amounts than males. To do this marketing strategies should be developed to appeal to women. Ottman, Stafford & Hartman (2006) states that when it comes to green issues, it is often male dominated from the technology side to the marketing. This has led to a distancing of some females and their engagement with such schemes. In order to engage women airlines and airports should have and promote female green ambassadors. Setting an example and having a green ambassador has shown to increase engagement and popularity with the public from events, to donating (Ambec & Lanoie, 2008). A green ambassador is important not only for marketing purposes but also is beneficial to staff. Having an ambassador who can drive more sustainable issues in the airline and airport industry and to provide an outlet for green ideas to be heard is important (Kantabutra, 2013). Appealing to one gender over another however has its risks. Although women should be targeted to increase engagement, the process for which an airline or airport goes about this issue should be done in a way that is to not offend or alienate females or males alike (Ottman, 2011).

ii. Age is an important aspect of passenger engagement. The 31 to 45 year olds are most likely to donate; therefore both airline and airport can work on such an age group to maximise such donation potential. Marketing teams should however employ different marketing strategies at all age ranges especially 18-30 year olds who have shown, despite a lack of awareness of offsetting schemes, they possess a significant awareness and concern over climate change issues and have the potential to turn a lack of awareness of carbon offsetting schemes into high engagement rates.

5.3 Recommendations for Airline Offsetting

i. Airlines should place their carbon offsetting schemes on their booking pages to gain maximum engagement potential. Airlines that have schemes or are affiliated with schemes need to promote such schemes more to passengers. Research by Hodgkinson & Coram (2012) has shown that those airlines that have carbon offset schemes at checkout on their booking page have a far higher engagement rate than those who do not. Airlines that have placed effort in their

CSR policies to have a carbon offset scheme are undermining such effort by not displaying their schemes to passengers. The process must be simplified for these airlines as often to find such schemes through their websites is difficult and cumbersome. As engagement in offsetting schemes is low due to awareness, once the passenger is engaged they must not them be alienated by a complex carbon calculator and information. To overcome this, airlines should either offer three set amounts at £5, £10, £20. Or have an inbuilt system which, based on the booking and their destination a set amount is worked out for the passenger, with the final sum presented to them with the option to donate at checkout.

ii. Passengers would most likely donate between £5 and £10. This would provide sufficient funds to offset the flight emissions; however £5 may be insufficient to cover the more extensive long haul routes on older generation aircraft. To compensate the £20 option should remain.

iii. Investment should be placed into Global Renewable projects due to the passenger's awareness of the global impact of aviation emissions.

iv. Airlines should lobby for more regulation in the carbon offsetting market, this ensures credibility of their schemes and trust between passengers is secured.

v. Carbon offsetting is a vital tool in helping an airline meet their targets and should be a key part of their CSR policies. Affective management, engagement and implementation of a carbon offset scheme should be employed to gain the most reward from a scheme, in order to reduce their carbon targets.

5.4 Recommendations for Airport Offsetting

i. A carbon offsetting scheme is viable and should be implemented.

ii. Engagement of women and under 45's most likely to yield best results. To engage women, as above the airport should have female green ambassadors to increase engagement and marketing potential. The 18-30 age range has shown considerable interest in offsetting through an airport App. Such technology is used in everyday life and with the ease of internet transfers of money from a user's phone or tablet is now common place (Sackmann & Winkler, 2013). An airport App is useful for flight information for a passenger and within that app information and the means to donate should be included. With the use of QR codes on posters, there is a large scope for airports to offer passengers with a wide range of information and ease of donation through portable devices. Such

information can be about the scheme, it can be placed on donation boxes, it can even be placed around various locations and amenities showing how much carbon is produced by that activity. As passengers often have to wait in the departure lounge for their flights, such information may be an attractive thing to read to pass the time. There is significant scope for airports to engage with passengers, especially through an integrated airport app with QR reader installed.

iii. Donations should be entirely voluntary. However between £1 and £5 passengers are most likely to donate.

iv. Multi-method approach to collection should be employed. Airports should work with airlines to have their carbon offset scheme located on the booking pages of airlines as this is the most preferred method of collection by passengers. In order to gain maximum engagement an airport should place a donation box inside the terminal. The act of donating in front of other passengers often increases other passenger engagement (Winterich, Mittal, & Aquino, 2013). As outlined in chapter 4.8.3, the donation box can also be used for passengers to place left over currency before departing or arriving in the airport.

v. Investment of the money collected should be placed into onsite renewable technologies and electric airside vehicles. This ensures the passengers can see their donations at work while actively reducing future emissions of the airport. In order to further enhance engagement, schemes often do better when those who donate can actively see a link from their money to outcome of a project (Oppenheimer & Olivola, 2011). Therefore if all airside vehicles which can be electric are made electric, promotional messages about them being funded by passengers through the scheme should be used. This is especially important for passenger buses and airside vehicles which have the greatest exposure to passengers.

vi. There is a significant opportunity for airport management to work with airlines and other transport systems on an integrated carbon neutral network in the future.

5.5 Further Study & Critique

Despite this research limiting the "researcher effect" by conducting the surveys online, it is to be noted that the "researcher effect" may well still be influential in some passengers answers. The researcher effect is when those surveyed state what they believe the researcher wants to hear and not view points of their own (Borgatti & Foster, 2003). Although rare, this cannot be ruled out in this study. As most of the study was conducted by passengers outside of the first degree of separation from the researcher due to the distribution methods of the survey, those inside the first degree of separation had the potential be affected by the researcher effect.

It is to be acknowledged that this research presents only the perspective of the passenger. After being unable to gain interviews from other stakeholders such as airline and airport management, their views could not be presented in this research.

The method of data collection for this research, if done again could be refined. Although Social media was an appropriate alternative of data collection once access to the terminal was unavailable, it has its limitations. This was evident in the low percentage of over 60's in this study, who do not have access to such social media outlets. If this research was to be recreated, access to the terminal building is important. This way, particularly in relation to the airport offsetting scheme, research can be location specific. A cross section of passengers who use the airports and their thoughts and feelings can be investigated. A larger data set would help to make more informed decisions on passenger attitudes and preferences. To gain a better cross section of passengers, the survey should be conducted over a number of weeks, at different times of day to get a wide range of ages, business and leisure travellers along with long and short haul passengers.

Interviews with airline representatives and airport management would have enhanced the study to understand the operational limitations such as budget; staffing and time it would take to implement a carbon offset scheme, particularly for airports. It would be beneficial to for a further study to investigate why some airlines do not offset their emissions and why some have no placed carbon offset schemes on their booking pages.

This study is one of the first to investigate the idea of an airport carbon offset scheme and therefore much more study into such a scheme is needed. This can take many

forms, from the in-depth economics of a scheme, to passenger behaviour and habits to gain better engagement rates, to research into regulation and implementation.

5.6 Concluding thoughts

The airport and airline offsetting scheme is a clear and effective tool, if implemented correctly, in helping the industry meet the strict EU and UK Carbon reduction targets. Carbon offsetting schemes however are not a 'silver bullet' for the industry, in the sense that even the most successful scheme would not solve all the problems associated with hitting industry carbon reduction targets. It is an effective and valuable tool in helping an airport or airline to meet its targets, if used with other methods of Carbon reduction such as operational efficiencies and new infrastructural improvements.

Carbon offsetting is yet to be represented in sufficient depth through policy and research as much as the changes in infrastructure and renewable energy are in making an airline or airport more sustainable. Carbon offset schemes for airlines is underutilised with less than 2% of global airlines actively offering such schemes to their passengers. With carbon offsetting a viable tool in helping airlines to reach their targets, such low engagement must be addressed by the industry.

Those airlines who do offer carbon offsetting schemes have often failed to engage passengers in sufficient numbers, a trend seen throughout current research. There are a large proportion of passengers who would donate and donate significant amounts to offset their flights, if they were aware of such schemes. Awareness is the single most important barrier a scheme must overcome to be successful. Carbon offset schemes will find that to be successful, education, transparency and trust must be well developed between scheme and passenger before they will engage in the process. Therefore this process of carbon offsetting will be built up over a number of years, which will require constant engagement with passengers. However, such perseverance will pay off with high engagement rates and therefore enough capital will be generated to allow airlines and airports to offset their emissions to reach their targets.

Some airlines have stopped their carbon offset schemes after poor engagement from passengers. These airlines stopped due to the belief that carbon offsetting for airlines is ineffective. This research would disagree with that assumption; perhaps it is the poor implementation of the scheme by the individual airlines and the industry as a whole which has caused such ineffective engagement. Airlines that have such schemes and

promote them well through online booking systems have seen the benefits of having such a system, even though as presented in this research more can be done to engage more passengers for such a scheme.

Airport offsetting is a new concept and one that requires much more research. Questions over regulation and implementation for the wider airport industry remain. Nevertheless, this research has shown that there is a viable market for such a scheme which can yield very positive revenues for an airport to utilise to invest in carbon offsetting schemes. The marketing potential for an airport and the expansion of such integrated carbon offsetting networks as outlined Chapter 4.10 is important for an airport to attract business and passengers by using their carbon friendly initiatives as a competitive advantage over their rivals in the future.

Airlines and Airports should see carbon offsetting as a viable and attractive tool in helping them to reach their targets. Carbon offsetting is a challenge, especially as a successful scheme will take time to become established and requires constant engagement with passengers. However, airlines and airports should act now, to imbed such schemes while the carbon reduction targets are not business critical. By time the industry is a point where technology can no longer reduce their carbon outputs further, those without carbon offset schemes will find it difficult to implement and see a result right away. Those who have a well-integrated and successful carbon offset scheme which has been built up over years will be more resilient.

References

Abeyratne, R. (2009). Carbon trading in commercial aviation. *Journal of World Trade, 43(3)*, 641-655.

Adger, W., & Dessai, S. (2009). Are there social limits to adaptation to climate change? *Climatic change, 93(3-4)*, 335-354.

Adger, W. (2010). Social capital, collective action, and adaptation to climate change. *Der Klimawandel*, 327-345.

Aerospace Innovation. (2012). *Innovation in a sustainable supply chain: A global Challenge.* Retrieved March 1, 2014, from Aerospace Innovation: Report and White Paper: http://www.aeromontreal.ca/content/uploads/files/23042012/AeroEN_HR.pdf

Air Transport Action Group. (2013). *Beginners Guide to Aviation Biofuel.* http://www.cphcleantech.com/media/2450696/beginnersguide.pdf.

Air Transport Department. (2013). *Fuel and air transport: A Report for the European Commission.* Cranfield University: Air Transport Department.

Airbus. (2013). *Future Concepts.* Retrieved May 29, 2014, from Airbus Industries: http://www.airbus.com/innovation/eco-efficiency/design/future-concepts/

Akter, S., Brouwer, R., Brander, L., & Van Beukering, P. (2009). Respondent uncertainty in a contingent market for carbon offsets. *Ecological Economics, 68(6)*, 1858-1863.

Ambec, S., & Lanoie, P. (2008). Does it pay to be green? *A systematic overview. The Academy of Management Perspectives, 22(4)*, 45-62.

Anderson, K. (2012). The inconvenient truth of carbon offsets. *Nature, 484(7)*, 1121-1123.

Anderson, P. (2008). Climate change and tourism: Responding to global challenges. *United Nations World Tourism Organisation.* Madrid: UNWTO-UNEP-WMO.

Arunachalam, S., & Woody, M. (2014). Future Year Air Quality Change Due to Growth in Aircraft Emissions and Changes in Climate. *Air Pollution Modelling and its Application XXIII*, 73-78.

Ashford, N., Coutu, P., & Beasley, J. (2013). *Airport operations, 3rd edition.* Whitby: McGraw- Hill Ryerson Ltd.

Ashley, D., & Orenstien, D. (2005). *Sociological theory: Classical statements (6th ed.).* Boston: Pearson Education.

ATAG. (2013). *ATAG paper on Carbon Emissions in 2020*. Retrieved May 29, 2014, from Air Transport Action Group: https://www.iata.org/policy/environment/Documents/atag-paper-on-cng2020-july2013.pdf

Babcock, B. (2011). *The Impact of US Biofuel Policies on Agricultural Price Levels and Volatility, for ICTSD, Issue Paper No. 35.* Iowa: Centre for Agricultural and Rural Development, Iowa State University.

Bishop, J. (2011). Airport Operations and Future Growth Present Environmental Challenges. *Journal of Air Transport, Vol 25:2*, 32-41.

Blakey, S., Rye, L., & Wilson, C. (2011). Aviation gas turbine alternative fuels: A review. *Proceedings of the combustion institute, 33(2)*, 2863-2885.

Borgatti, S., & Foster, P. (2003). The network paradigm in organizational research: A review and typology. *Journal of management 29(6)*, 991-1013.

Boykoff, M. (2011). *Who speaks for the climate?: Making sense of media reporting on climate change.* Cambridge: Cambridge University Press.

Brand Strategy. (2007). *CARBON OFFSETTING: Carbon offsetting options to date.* London: Centaur Communications Ltd.

British Airways. (2014). *One Destination Carbon Fund*. Retrieved August 31, 2014, from British Airways, Responsible Flying: http://responsibleflying.ba.com/environment/climate-change/one-destination-carbon-fund/

Brouwer, R., & Brander, L. (2008). "A convenient truth": air travel passengers' willingness to pay to offset their CO2 emissions. *Climatic Change, 90(3)*, 299-313.

Brunsdon, C. (2007). *Quantitive Geography.* London: SAGE Publications.

Budd, L., Griggs, S., & Howarth, D. (2013). *Sustainable Aviation Futures.* Bingley: Emerald Publishing Limited Group.

CAA. (2014). *UK Airport Statistics: 2013 - Annual.* Retrieved September 1, 2014, from Civil Aviation Authority Statistics: http://www.caa.co.uk/default.aspx?catid=80&pagetype=88&sglid=3&fld=2013Annual

Cameron, F. (2013). *Climate change as a complex phenomenon.* Sydney: University of Western Sydney Press.

Carlisle, A. (2013). The outlook for airport finance: How forecasting techniques can adapt to reflect changeable market conditions. *Journal of Airport Management, 7(3)*, 237-254.

Carrington, P., & Scott, S. (2010). *Models and Methods in Social Network Analysis (structural Analysis in Social Sciences).* Cambridge: Cambridge University Press.

Char-lee, J., Becken, S., & Battye, R. (2014). Voluntary carbon offsetting: Who does it?. *Tourism Management, 45(194)*, 198-200.

Chen, F. (2013). The intention and determining factors for airline passengers' participation in carbon offset schemes. *Journal of Air Transport Management, 19*, 17-22.

Choi, A., & Ritchie, B. (2014). Willingness to pay for flying carbon neutral in Australia: an exploratory study of offsetter profiles. *Journal of Sustainable Tourism*, 1-21.

Civil Aviation Authority. (2014). *Passenger numbers at UK airports increase for the third year in a row.* Retrieved August 19, 2014, from Civil Aviation Authority: http://www.caa.co.uk/application.aspx?appid=7&mode=detail&nid=2342

Coheen, L., & Maldonado, A. (2007). Research Methods in Education. *British Journal of Educational Studies, 55*, 9-15.

Cohen, S., Higham, J., & Cavalirere, C. (2011). Binge Flying: Behavioural addiction and climate change. *Annals of Tourism Research, 38(3)*, 1070-1089.

Coninck, D., Fischer, H., & Newell, R. (2008). International technology-oriented agreements to address climate change. *Energy Policy, 36(1)*, 335-356.

Coppell, E. (2014). *Development of sustainable jet fuels moves towards next phase of new technology pathways and ramping up supply.* Retrieved May 29, 2014, from Green Air Online: http://www.greenaironline.com/news.php?viewStory=1916

Corbra, E., Estrada, M., & Brown, K. (2013). How do regulated and voluntary carbon-offset schemes compare? *Journal of Integrative Environmental Sciences, 6(1)*, 25-50.

Cryder, C., Loewenstein, G., & Seltman, H. (2013). Goal gradient in helping behaviour. *Journal of Experimental Social Psychology, 49(6)*, 1078-1083.

Czerski, H. (2014). *Is Jet Travel Becoming the Dirtiest Way to Cross the Planet?* Retrieved May 29, 2014, from British Broadcasting Corporation: http://www.bbc.co.uk/guides/z2h66sg#z2fnn39

Davidson, S. (2008). Voluntary carbon offsetting: An overview. *Business Law Review, 29(11)*, 253-258.

Department for Transport. (2012). *Total Greenhouse Gas Emissions from Transport.* Retrieved April 15, 2014, from Gov.UK: https://www.gov.uk/government/publications/total-greenhouse-gas-emissions-from-transport

Dodds, R., Leung, M., & Smith, W. (2008). Assessing awareness of carbon offsetting by travellers and travel agents. *Anatolia, 19(1)*, 135-148.

Doganis, R. (2005). *The airport business.* Routledge: Oxford.

Dresner, M. (2006). Leisure versus business passengers: Similarities, difference and implications. *Journal of Air Transport Management, 12*, 28-32.

Duffy, B., Smith, K., & Bremer, J. (2005). Comparing data from online and face to face surveys. *International Journal of Market Research, 47(6)*, 615.

EasyJet. (2014). *Carbon Calculator*. Retrieved August 31, 2014, from easyJet PLC: https://www.easyjet.com/EN/environment/carbon_emissions_calculator.asp

Eccersal, R. (2014). *QR-Code.* Retrieved September 14, 2014, from Gadget Ultra: http://gadgetultra.com/wp-content/uploads/2013/03/QR-CODE.png

Eijgelaar, E. (2009). Voluntary carbon offsets a solution for reducing tourism emissions? Assessment of communication aspects and mitigation potential. *Transport and tourism: Challenges, issues and conflicts special edition*, 46-64.

Elbehri, A., Segerstedt, A., & Lui, P. (2013). *Biofuels and the Sustainability Challenge: A global assesment of sustainability issues, trends and policies for biofuels and related feedstocks.* Rome: Food and Agriculture Organisation of the United Nations.

Emadi, A., & Lee, Y. (2008). Power electronics and motor drives in electric, hybrid electric and plug-in hybrid electric vehicles. *Industrial Electronics, IEEE Transactions on, 55(6)*, 2237-2245.

Environmental Protection Agency. (2013). *EPA's Greenhouse Gas Reductions*. Retrieved May 31, 2014, from Environmental Protection Agency: http://www.epa.gov/greeningepa/ghg/

European Commission. (2012). *Global CO2 emissions continue to increase in 2011.* Retrieved April 15, 2014, from European Commission JRC News Release: http://ec.europa.eu/dgs/jrc/downloads/jrc_20120618_newsrelease_trends_in_global_co2_emissions.pdf

European Commission. (2014). *Reducing emissions from aviation*. Retrieved May 29, 2014, from European Commission Climate Action: http://ec.europa.eu/clima/policies/transport/aviation/index_en.htm

Evans, B., & Honeyford, E. (2012). 'Brighter Futures, greener lives': Children and young people in UK Sustainable development policy. *Critical Geographies of Children and Youth*, 61-77.

Evans, J., & Mathur, A. (2005). The value of online surveys. *Journal of Internet Research, 15(2)*, 195-219.

Evans, M., Robling, M., Rapport , M., & Houston, H. (2002). It doesn't cost anything just to ask, does it? The ethics of questionnaire-based research. *Journal of Research Ethics, 28(1)*, 41-44.

Fankhauser, S. (2013). *Valuing climate change: the economics of the greenhouse.* Routledge.

Federal Aviation Administration Office of Environment and Energy. (2012). *Aviation and Emissions.* Washington: FAA.

Flowerdrew, R. (2005). *Methods in Human Geography; A guide to students doing a research project.* Harlow: Prentice Hall.

Fontela, P., & Soria, A. (2007). Airport electric vehicle powered by fuel cell. *Journal of power sources, 169(1)*, 184-193.

Foster, C. (2010). Guide to carbon offsetting. *Business and the Environment, 18(5)*, 16.

Frankhause, S., & Kennedy, D. (2010). *The UK's carbon targets for 2020 and the role of the committee on Climate Change.* Retrieved January 15, 2014, from Grantham Institute: http://www.lse.ac.uk/GranthamInstitute/publications/research-articles/Docs/uk-carbon-targets-2020.pdf

Freeman, L. (2010).*The development of social network analysis: A study in the sociology of science (Vol. 1).* Vancouver: Empirical Press.

Frunza, M. (2013). *Environmental market insights: Fraud and carbon markets.* London: Taylor and Francis.

Gatwick. (2014). *Facts & Stats.* Retrieved September 1, 2014, from About Gatwick - Your London Airport: http://www.gatwickairport.com/business-community/about-gatwick/at-a-glance/facts-stats/

Gatwick Airport LTD. (2013). *Response to discussion paper 03 on aviation and climate change.* Retrieved September 1, 2014, from Gatwick Airport Publications: http://www.gatwickairport.com/PublicationFiles/business_and_community/all_public_publications/transforming_gatwick/Gatwick_Airport-Aviation_and_Climate_Change_paper-16_May_13.pdf

Godfray, H., & Garnett, T. (2014). Food security and sustainable intensification. *Philosophical Transactions of the Royal Society B: Biological Sciences, 369(1639)*.

Gossling, S., & Haglund, L. (2009). Swedish air travellers and voluntary carbon offsets: Towards the co-creation of environmental value?. *Current Issues in Tourism, 12(1)*, 1-19.

Gössling, S., Broderick, J., & Upham, P. (2007). Voluntary carbon offsetting schemes for aviation: Efficiency, credibility and sustainable tourism. *Journal of Sustainable Tourism, 15(3)*, 223-248.

Graham, A. (2013). *Managing Airports: An international Perspective.* Oxford: Butterworth-Heinemann.

Hamilton, L. (2011). Education, politics and opinions about climate change evidence for interaction effects. *Climate Change, 104(2)*, 231-242.

Hares, A. (2013). *Tourist understanding of and engagement with the climate change impacts of holidays.* Bournemouth: Bournemouth University.

Hart, R. (2013). *Children's participation: The theory and practice of involving young citizens in community development and environmental care.* Routledge.

Haythornthwaite, C. (2005). Social network analysis: An approach and technique for the study of information exchange. *Library Information Science Research, 18(4)*, 323-342.

Hodgkinson, D., & Coram, A. (2012). *Management and Mitigation of airline exposure to climate change risks: Why an airline default (Or opt-out) passenger offset scheme makes sense: Working paper No. 1.* Retrieved September 1, 2014, from The Hodgkinson Group Aviation Advisors: http://hodgkinsongroup.com/documents/Management_and_Mitigation.pdf

Humphreys, I. (2003). Organizational and growth trends in air transport. In P. Upham, J. Maughan, D. Raper, & C. Thomas, *Towards sustainable aviation* (pp. 19-35). Wales: Creative Print and design.

IATA. (2013). *Carbon offset factsheet*. Retrieved July 08, 2014, from IATA Offset: http://www.iata.org/pressroom/facts_figures/fact_sheets/pages/carbon-offsets.aspx

IATA. (2013). *Reducing Emissions from Aviation through Carbon Neutral Growth by 2020.* IATA Press.

IATA. (2014). *Facts & Figures: Alternative Fuels*. Retrieved May 31, 2014, from IATA: http://www.iata.org/pressroom/facts_figures/fact_sheets/pages/alt-fuels.aspx

IATA. (2014). *IATA Carbon Offset Program*. Retrieved May 31, 2014, from International Airline Transport Association: https://www.iata.org/whatwedo/environment/Documents/carbon-offset-program-faq-airline-participants.pdf

Intergovernmental Panel on Climate Change. (2013). *Climate Change 2013: The Physical Science Basis.* IPCC.

International Airline Association. (2013). *2013 Report of Energy Usage and Efficiency.* Hamburg: IAA.

International Energy Agency. (2009). *World Energy Outlook.* Paris: IEA Press.

IPCC. (2001). *Special Report on Climate Change - Complete online version.* http://www.grida.no/publications/other/ipcc_sr/?src=/climate/ipcc/aviation/index.htm: IPCC.

Jackson, D. (2012). Jackson, D. W. (2011). StandarBar Codes Beware-Smartphone Users May Prefer QR Codes. *Law Library Journal, 103(1)*, 153.

Jardine, C. (2009). *Calculating the carbon dioxide emissions of flights. Final report by the Environmental Change Institute.* Environmental Change Institute.

Jenson, C. (2014). *Active Airlines*. Retrieved July 08, 2014, from Airline History, Past, Present and Future: http://www.airlinehistory.co.uk/

Johnston, B. (2009). Carbon offsetting - the future. *Consumer Policy Review, 18(4)*, 90.

Kadushin, C. (2005). Who benefits from network analysis: ethics of social network research. *Social Networks, 27(2)*, 139-153.

Kantabutra, S. (2013). Sustainable leadership: honeybee practices. *International Journal of Educational Management,(27)4*, 356 - 376.

Keen, M., Parry, I., & Strand, J. (2013). Planes, ships and taxes: Charging for international aviation and maritime emissions. *Economic Policy, 28(76)*, 701-749.

Kepplinger, H. (2007). Reciprocal effects: Toward a theory of mass media effects on decision makers. *The Harvard International Journal of Press/Politics, 12(2)*, 3-23.

Knoblauch, J. (2010). *Carbon cowboys.* Norwalk: Earth Action Network.

Krien, A. (2011). *FlightPath 2050.* Retrieved February 28, 2014, from Europe's Vision of Future Air traffic: http://www.cdti.es/recursos/doc/eventosCDTI/Aerodays2011/3H3.pdf

Kuhn, M. (2013). *How do QR codes work?* Retrieved September 14, 2014, from Create QR codes: http://www.createqrcodes.org/

Lacey, S. (2011). *One Billion Cars Now on World's Roads, Driven by Exploding Demand from China*. Retrieved May 28, 2014, from Climate Progress: http://thinkprogress.org/climate/2011/08/22/300530/one-billion-cars-china/

Lawrence, P. (2009). Meeting the challenge of aviation emissions: An aircraft industry perspective. *Technology Analysis & Strategic Management, 21(1)*, 79-92.

Lee-Treweek, G., & Linkogle, S. (2000). *Danger in the field: Risk and ethics in social research.* Psychology Press.

Lefever, S., & Matthiasdottir, A. (2007). Online data collection in academic research: advantages and limitations. *British Journal of Educational Technology, 38(4)*, 574-582.

Legislation. (2008). *Climate Change Act 2008.* Retrieved April 15, 2014, from United Kingdom Parliament Legislation: http://www.legislation.gov.uk/ukpga/2008/27/contents

Lovell, H., & Liverman, D. (2010). Understanding carbon offset technologies. *New Political Economy, 15(2)*, 255-273.

Lu, J., & Shon, Z. (2012). Exploring airline passengers' willingness to pay for carbon offsets. *Transportation Research Part D: Transport and Environment, 17(2)*, 124-128.

Macintosh, A., & Wallace, L. (2010). International aviation emissions to 2025: Can emissions be stabilised without restricting demand? *Energy Policy, 37(1)*, 264-273.

MacKerron, G., Egerton, C., & Gaskell, C. (2009). Willingness to pay for carbon offset certification and co-benefits among (high-) flying young adults in the UK. *Energy Policy, 37(4)*, 1372-1381.

Maconinis, J. (2010). *Sociology - The Seventh Canadian Edition.* Toronto: Pearson Canada.

Mair, J. (2011). Exploring Air Travellers Voluntary Carbon-Offsetting Behaviour. *Journal of Sustainable Tourism, 19(2)*, 215-230.

Mair, J., & Wong, E. (2010). An elicitation study to explore attitudes towards purchasing carbon offsets for flights. *CAUTHE 2010: Tourism and Hospitality: Challenge the Limits*, 925.

Martinez-Garcia, E., & Coenders, G. (2012). Profile of Business and leisure travellers on low cost carriers in Europe. *Journal of Air Transport Management, 20*, 12-14.

McCright, A. (2010). The effects of gender on climate change knowledge and concern. *Journal of Population and Environment, 32(1)*, 66-87.

McDonald, H., & Adam, S. (2006). A comparison of online and postal data collection methods in marketing research. *Marketing Intelligence & Planning, 21(2)*, 85-95.

McKercher, B., Prideaux, B., Cheung, C., & Law, R. (2010). Achieving voluntary reductions in the carbon footprint of tourism and climate change. *Journal of sustainable tourism, 18(3)*, 297-317.

Miller, M. (2013). *Reliability and Validity of Graduate Research Methods.* Western International University: Westerns International University Press.

Moll, J., Krueger, F., & Zahn, R. (2006). Human fronto–mesolimbic networks guide decisions about charitable donation. *Proceedings of the National Academy of Sciences, 103(42)*, 15623-15628.

Montzka, S., & Dlugokencky, E. (2012). Non-CO2 greenhouse gases and climate change. *Nature, 476(7358)*, 43-50.

Morgan, G., & Leech, N. (2012). *IMB SPSS: For introductory statistics 5th Ed.* Abington: Routledge.

NOAA. (2013). *NOAA's Annual Greenhouse Gas Index.* Retrieved September 3, 2014, from NOAA: Earth System Research Laboratory: http://www.esrl.noaa.gov/gmd/aggi/

Nulty, D. (2008). The adequacy of response rates to online and paper surveys: What can be one? *Journal of Assessment & Evaluation in Higher Education, 33(3)*, 301-314.

OAG. (2013). *May Aviation Facts.* http://www.oag.com/sites/default/files/May%20FACTS.pdf: OAG Press.

Ofcom. (2014). *Tablets help drive increase in older people going online*. Retrieved August 18, 2014, from Ofcom: http://media.ofcom.org.uk/news/2014/tablets-help-drive-increase-in-older-people-going-online/

Office for National Statistics. (2014). *2011 Census: Key Statistics for England and Wales, March 2011.* Retrieved August 19, 2014, from Office for National Statistics: http://www.ons.gov.uk/ons/dcp171778_290685.pdf

Oppenheimer, D., & Olivola, C. (2011). *The science of giving: Experimental approaches to the study of charity.* Psychology Press.

Ottman, J. (2011). *The new rules of green marketing: Strategies, tools, and inspiration for sustainable branding.* Berrett-Koehler Publishers.

Ottman, J., Stafford, E., & Hartman, C. (2006). Avoiding green marketing myopia: ways to improve consumer appeal for environmentally preferable products. *Environment: Science and Policy for Sustainable Development, 48(5)*, 22-36.

Pure. (2013). *About the One Destination Carbon Fund*. Retrieved April 22, 2014, from Pure Leapfrog: http://www.puretrust.org.uk/one-destination-donate.jsp

Randles, S., & Bows, A. (2009). Aviation, emissions and the climate change debate. *Technology Analysis & Strategic Management, 21(1)*, 1-16.

Ring, E. (2012). *Is Biofuel water positive*. Retrieved July 07, 2014, from Ecoworld, Sustainability and energy: http://www.ecoworld.com/sustainability/energy-sustainability/corn-ethanol-water.html

Ryley, T., & Davidson, L. (2012). Public engagement on aviation taxes in the United Kingdom. *International Journal of Sustainable Transportation, 4(2)*, 112-128.

Sackmann, R., & Winkler, O. (2013). Technology generations revisited: The internet generation. *Gerontechnology, 11(4)*, 493-503.

Sausen, R. (2005). Aviation radiative forcing in 2000: An update on IPCC (1999). *Meteorologische Zeitschrift, 14(4)*, 555–561.

Scheelhaase, J., & Grimme, W. (2010). The inclusion of aviation into the EU emission trading scheme–impacts on competition between European and non-European network airlines. *Transportation Research Part D: Transport and Environment, 15(1)*, 14-25.

Sedghi, A. (2014). Facebook: 10 years of social networking, in numbers. *The Gaurdian*, pp. [Online] http://www.theguardian.com/news/datablog/2014/feb/04/facebook-in-numbers-statistics.

Shiel, O. (2014). *Air Passenger Duty - How to avoid the flight tax*. Retrieved August 31, 2014, from Travel Tips: Cheap Flights.co.uk: http://www.cheapflights.co.uk/news/air-passenger-duty-how-to-avoid-the-flight-tax/

Shove, E. (2010). Beyond the ABC: climate change policy and theories of social change. *Environment and planning. A, 42(6)*, 1273-1278.

Sincero, S. (2013). *The Advantages and Disadvantages of Surveys*. Retrieved April 22, 2014, from The Survey Guide: https://explorable.com/advantages-and-disadvantages-of-surveys

Singh, R. (2007). *Offsetting is off message.* London: Incisive Media Plc.

Smith, I., & Rodger, C. (2009). Carbon emission offsets for aviation-generated emissions due to international travel to and from New Zealand. *Energy Policy, 37(9)*, 3438-3447.

Sugeoner, C. (2014). *Avianca and Lufthansa team up with US next-gen biofuel companies to support alcohol-to-jet fuel approval.* Retrieved May 29, 2014, from GreenAir Online: http://www.greenaironline.com/news.php?viewStory=1922

SurveyMonkey. (2014). *How to Analyse Survey Results*. Retrieved September 22, 2014, from Survey Monkey Help Centre: http://help.surveymonkey.com/articles/en_US/kb/How-to-analyze-results

Thomas, N. (2013). Abolish air passenger tax, airlines urge Osborne: Economy 'would be pounds 16bn better off by 2015' if duty were scrapped. *The Daily Telegraph*, p. 3.

Torgerson, D. (2002). *Increasing Response Rates to Postal Questionnaires.* York: University of York Department of Health Sciences.

Truby, J. (2010). Reforming the air passenger duty as an environmental tax. *Environmental Law Review, 12(3)*, 200-210.

Turner, A. (2013). *Europe low cost carrier growth outstrips legacy airline rivals.* Retrieved August 20, 2014, from Air Traffic Management: http://www.airtrafficmanagement.net/2013/05/europe-lcc-growth-outstrips-legacy-rivals/

Upham, P. (2003). *Towards sustainable aviation.* London: Earthscan Publications. .

Van Selm, M., & Jankowski, N. (2006). Conducting online surveys. *Quality and Quantity, 40(3)*, 435-456.

Vaske, J. (2011). Advantages and disadvantages of internet surveys. *Human Dimensions of Wildlife, 16(3)*, 149-153.

Wallace, L., & Macintosh, A. (2009). International aviation emissions to 2025: Can emissions be stabilised without restricting demand? . *Energy Policy, 37(1)*, 264-273.

Watson, C., McCarthey, J., & Rowley, J. (2013). Consumer attitudes towards mobile marketing in the smart phone era. *International Journal of Information Management, 33(5)*, 840-849.

Weiss, R. (2014). *Low-Cost Carrier Battle in Europe Grows as Ryanair Rivals Gain Strength*. Retrieved August 20, 2014, from Transport>Airlines: http://skift.com/2014/04/25/low-cost-carrier-battle-in-europe-grows-as-ryanair-rivals-gain-strength/

Whitmarsh, L. (2011). Scepticism and uncertainty about climate change: dimensions, determinants and change over time. *Global Environmental Change, 21(2)*, 690-700.

Whitmarsh, L., & O'Neil, S. (2010). Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology, 30(3)*, 305-314.

Whitmarsh, L., Seyfang, G., & O'Neill, S. (2011). Public engagement with carbon and climate change: To what extent is the public 'carbon capable'? *Global Environmental Change, 21(1)*, 56-65.

Winterich, K., Mittal, V., & Aquino, K. (2013). When does recognition increase charitable behaviour? Toward a moral identity-based model. *Journal of Marketing, 77(3)*, 121-134.

World Bank. (2013). *Damages from Extreme Weather Mount As Climate Warms.* Retrieved September 3, 2014, from The World Bank: http://www.worldbank.org/en/news/press-release/2013/11/18/damages-extreme-weather-mount-climate-warms

World Economic Forum. (2014). *Insight Report: Global Risk 2014 Ninth Edition.* Geneva: World Economic Forum Press.

Wright, B. (2005). Researching Internet Based Populations: Advantages and Disadvantages of Online Survey Research. *Journal of Computer Mediated Communication, 10(3)*, 101-106.

Zapata, C., & Nieuwenhuis, P. (2010). Exploring innovation in the automotive industry: new technologies for cleaner cars. *Journal of Cleaner Production, 18(1)*, 14-20.

Zhang, L. (2010). Food versus fuel: What do prices tell us? *Energy Policy, 38(1)*, 445-451.

Zimmer, M., & Stafford, T. (1994). Green issues: dimensions of environmental concern. *Journal of business research, 30(1)*, 63-74.

Appendix One: The use of Facebook as a vessel of data collection

Below is a screen grab of the first status posted on Facebook regarding the dissertation survey.

A. The link highlighted is the link that took the recipient straight to the online survey page. The respondent could copy and paste such link into the web browser. By placing the link in the status, Facebook embeds the link into the message as seen in **C.**

B. Here, the first message to the researcher's network was made. The tone of the message is informal and is written in such a way to engage the goodwill of their network. It was important to state the research title so that the respondents understood what the research was about and the criteria needed to take part. Time for completion was an important point to convey, surveys with less than four minutes completion time were the most successful with engagement.

C. Facebook embeds the link of the survey into the core of the status. All the respondent has to do is click on the box, which takes them straight to the online survey page.

Appendix One: The use of Facebook as a vessel of data collection (Continued)

Below is an example of how the message is viewed by the researcher's network. This was the second message the researcher placed on Facebook, five days after the first message above was sent.

A. The link is embedded in the status, this means the respondent could copy and paste the link if they wished, however it is a hyperlink which once clicked takes the respondents directly to the online survey page.

B. The message to the researcher's network is a variation on the first status

C. The embedded link appears as a clickable box to the researcher's network. All the respondent has to do is click the box, which takes them directly to the online page.

D. Here shows the function of the like, comment and share options. Here, two of the researchers network have 'liked' the survey, a further ten have 'commented' and eight have 'shared'. The method of 'liking' on Facebook, for the purpose of this study is to let the researcher know they have completed the research without explicitly telling the researcher they have. This is common practice on social media where the like function is used as an acknowledgement. The ten comments where by those who stated they had completed the survey for the researcher. The share function is the most important function for this study. In order to gain a wide sample size, the research had to go beyond the researcher's first degree of separation. As the original message could only

be seen by the researchers network, once one of the respondents 'shared' the message, their network, to which was unreachable from the researcher's network, now can see the message. If someone from that extended network shares it, it is then viewable to their network and so on. This means that the original message had a potential view of 300 people, (the size of the researcher's network). However, once it was shared the message was viable to over 5,000 people. Due to the nature of Facebook and Social media, people's networks are often over great distances and varying places both in the UK and overseas. Therefore, with the sharing method, the researcher has access to a very wide and differing sample size of ages, social classes, backgrounds, locations and educational levels than would be the case if it remained within the researchers own network.

Appendix Two: Using Twitter as a vessel of data collection using the Retweet function

Twitter, unlike Facebook is limited to a message of 140 characters. Therefore it was difficult for the researcher to explain in depth about the research. The researcher however relied on the goodwill of the network to be enticed by the dissertation title and the effective use of 'Hashtags'. In order to gain a wide audience, the researcher asked specific accounts to 'Retweet' the message. This is in principle Twitters version of the Facebook share.

A. This is a snapshot of a tweet sent by the researcher to the National Air Traffic Service Press Office on the 9th of July. On this day, NATs retweeted the message, along with five other people. A name of a respondent who is not a company has been redacted above to preserve their anonymity.

B. This was the message sent to NATs. NATs have over 10,000 followers compared to just 120 on the researcher's network. NATS is the largest company dealing with UK airspace and airport operations, many airlines, airports and passengers follow their account. Therefore gaining a retweet from NATS was important high profile exposure for the survey. 'RT' is short hand twitter speak for a retweet. Fortunately NATS press office was kind enough to retweet this message to their followers. Therefore, the message had gone from a potential of 120 participants, to 10,000 in one tweet. From this message, three of NATS associated companies retweeted the message (each with a further 5,000 followers each) and three people saw the message from the NATS retweet and retweeted it to their followers. This increases the potential sample size greatly, with all the benefits as outlined by Appendix One.

Appendix Three: A blank version of the questionnaire used online for this study

Thank you for taking the time to complete this short survey for a masters dissertation investigating passenger attitudes towards the carbon offsetting of flights and airport emissions. This survey is anonymous and if you have any questions please email me at 1007723@chester.ac.uk

The following is a short survey investigating passenger attitudes towards carbon offsetting of flights and airport emissions for my Masters dissertation in sustainability. I'd like to thank you for your time.

***1. What destination did you last fly to?**

***2. What airline did you fly with?**

3. Was the trip for Business, Leisure or Both?

- ◯ Business
- ◯ Leisure
- ◯ Both

4. Do you typically fly for business, leisure, or some other reason?

- ◯ Business
- ◯ Leisure

Other (please specify)

5. In the past 12 months, how many times have you flown?

- ◯ 1-2
- ◯ 3-5
- ◯ 6-10
- ◯ 11-20
- ◯ 20+

6. How do you feel about climate change?

◯ Not Concerned ◯ Slightly Concerned ◯ Concerned ◯ Very Concerned

7. Do you agree with the following statement "Environmental problems are a low priority for me"?

◯ Strongly Disagree ◯ Tend to Disagree ◯ Tend to Agree ◯ Strongly Agree

8. Do you agree with the following statement: "Humans and not technology are capable of finding ways to overcome the world's environmental problems"?

◯ Strongly Disagree ◯ Tend to Disagree ◯ Tend to Agree ◯ Agree

9. Do you believe that emissions from flights contribute to climate change?

- ◯ Yes
- ◯ No

10. Who should be responsible for reducing the impact of aircraft emissions?

- ◯ Airlines
- ◯ Airports
- ◯ Aircraft Manufacturers
- ◯ Governments
- ◯ Passengers
- ◯ All of the above

11. Would you consider flying less to save Carbon?

◯ Very Unlikely ◯ Unlikely ◯ Likely ◯ Very Likely

12. Are you aware of Carbon Offsetting Schemes for flights?

- ◯ Yes
- ◯ No

Definition: Voluntary carbon offsetting means paying an additional amount of money on top of the ticket price to offset the amount of carbon dioxide emissions caused by the flight. This money is spent on environmental projects elsewhere, such as investing in renewable energy or tree planting.

13. How much would you be willing to pay to offset your flight?

◯ £1 ◯ £5 ◯ £10 ◯ £20

Other (please specify)

14. What would you prefer the Carbon Offset money was invested in? Please tick all that apply

- ☐ UK Specific Renewable Energy Projects
- ☐ Global Renewable Energy Projects
- ☐ Forestry Projects
- ☐ Hydroelectric Projects
- ☐ Solar Projects
- ☐ Wind Projects
- ☐ Educational Projects

15. Have you ever Carbon Offset a flight?

- ◯ Yes
- ◯ No

16. Did you Carbon Offset your last flight?

- ◯ Yes
- ◯ No

17. Would you consider offsetting your flight in the future?

- ◯ Yes
- ◯ No

18. If your answer to the above question is NO, please state why you would not Carbon Offset future flights

Carbon Offset schemes for flights only cover emissions generated by aircraft once they've departed the airport. A Voluntary Airport Carbon Offset scheme aims reduce the amount of carbon dioxide emissions caused by airport operations, such as airside vehicles and lighting of the terminal.

19. Would you consider donating to a voluntary airport carbon offset scheme?

◯ Yes ◯ No ◯ Undecided

20. Up to how much would you be willing to donate to such a scheme each time you use an airport?

◯ 1p ◯ 5p ◯ 50p ◯ £1 ◯ £2 ◯ £5 ◯ £10

Other (please specify)

21. How would you prefer the money to be collected?

☐ A donation box inside the terminal with a display explaining the scheme.

☐ Option to donate online through the airline when booking a flight.

☐ Designated Carbon offset stand with a reward for donating. I.e Coupons.

☐ Option when booking Airport amenities such as Car parking, Lounges and Fast Track security.

☐ Option to donate your own amount via an online App in the airport terminal.

☐ Option of donating clearly stated on the main airport webpage.

Other (please specify)

22. How would you prefer this money to be invested?

☐ Making airside vehicles more carbon efficient. I.e. All electric

☐ Investment in behavioural changes and educational projects

☐ Investment in renewable technology either onsite or UK projects

☐ Investment in forestry projects both UK and Global

Other (please specify)

23. Gender:

◯ Male ◯ Female

24. Which category below includes your age?

◯ 18-30 ◯ 31-45 ◯ 46-60 ◯ 60 +

25. What is the highest level of education you have completed?

◯ Did not attend school ◯ GCSE or Equivalent ◯ A Levels or Equivalent ◯ Degree (BSc, BA) ◯ Post Graduate (Masters or PhD Doctorate)

Other (please specify)

26. Do you have any other comments?

Appendix Four: Coding Frame used to input the research data into SPSS so that statistical tests could be run against the data.

Question Number	Answer	Code
Q1	Short Haul	1
	Medium Haul	2
	Long Haul	3
Q2	Ryanair	1
	Easyjet	2
	Lufthansa	3
	British Airways	4
	Delta	5
	Monarch	6
	Southwest	7
	Singapore Airlines	8
	Jet 2	9
	Thompson	10
	Thomas Cook	11
	Whizz air	12
	Emirates	13
	Etihad	14
	Flybe	15
	Alaska Airlines	16
	North-western	17
	Spirit	18
	Virgin Atlantic	19
	US Airways	20
	Air France	21
	American Airlines	22
	TUIfly	23
	Jet Blue	24

	Virgin Australia	**25**
	KLM	**26**
	Air New Zealand	**27**
	Air Canada	**28**
	Alitalia	**29**
	Germanwings	**30**
	United	**31**
	Swiss International	**32**
	Qatar Air	**33**
	Aer Lingus	**34**
	Croatia Airlines	**35**
	Iberia	**36**
	Royal Air Force (Charter)	**37**
Type of Carrier	**Flag Carrier**	**1**
	Low-Cost Carrier	**2**
	Scheduled Carrier	**3**
	Charter Carrier	**4**
Does airline offset?	**Yes online booking**	**1**
	Yes but through links to calculator	**2**
	No	**3**
Q3	**Business**	**1**
	Leisure	**2**
	Both	**3**
Q4	**Business**	**1**
	Leisure	**2**
	Other	**3**
Q5	**1 to 2**	**1**
	3 to 5	**2**

	6 to 10	**3**
	11 to 20	**4**
	20 plus	**5**
Q6	**NC**	**1**
	SC	**2**
	C	**3**
	VC	**4**
Q7	**SD**	**1**
	TD	**2**
	TA	**3**
	A	**4**
Q8	**SD**	**1**
	TD	**2**
	TA	**3**
	A	**4**
Q9	**Yes**	**1**
	No	**2**
Q10	**Airlines**	**1**
	Airports	**2**
	Aircraft Manufacturers	**3**
	Governments	**4**
	Passengers	**5**
	All of the above	**6**
Q11	**VU**	**1**
	U	**2**
	L	**3**
	VL	**4**

Q12	**Yes**	**1**
	No	**2**
Q13	**£1**	**1**
	£5	**2**
	£10	**3**
	£20	**4**
	Other	**5**
Q14	**UK specific projects Renew Projects**	**1 for yes 2 for no**
	Global Renew Projects	
	Forestry Projects	
	Hydroelectric Projects	
	Solar Projects	
	Wind Projects	
	Educational Projects	
Q15	**Yes**	**1**
	No	**2**
Q16	**Yes**	**1**
	No	**2**
Q17	**Yes**	**1**
	No	**2**
Q19	**Yes**	**1**
	No	**2**
	Undecided	**3**
Q20	**1p**	**1**
	5p	**2**
	£1	**3**

	£2	**4**
	£5	**5**
	£10	**6**
	Other	**7**
Q21	**Donation box in terminal**	**1 for yes 2 for no**
	Carbon offset stand	
	Online App	
	Airline booking	
	Airport amenities	
	Airport website	
	Other	
Q22	**Efficient airside vehicles**	**1 for yes 2 for no**
	Investment in behaviour	
	Renewable UK	
	Renewable UK and global	
	Other	
Q23	**Male**	**1**
	Female	**2**
Q24	**18-30**	**1**
	31-45	**2**
	46-60	**3**
	60+	**4**
Q25	**No school**	**1**
	GCSE	**2**
	A Level	**3**
	Degree	**4**
	Post grad	**5**

Other	**6**

Appendix Five All results from Excel

What destination did you last fly to?		
Answer Options		**Response Count**
		154
	answered question	**154**
	skipped question	**0**
Number		**Response Text**
1		Kenya
2		Kenya
3		Tenerife
4		Ibiza
5		Spain
6		Madrid
7		Dubai
8		Alicante, Spain
9		Menorca
10		Tenerife
11		Barbados
12		Lanzarote
13		Jamaica
14		Spain
15		Tenerife
16		Mexico
17		Germany
18		Menorca
19		Toronto passing through Chicago
20		Italy
21		Benidorm
22		Toronto
23		Belfast
24		Ibiza
25		Tenerife
26		Crete
27		Ireland
28		Las Vegas
29		DUBLIN
30		LIVERPOOL
31		COPENHAGAN
32		MILAN
33		PORTUGAL
34		Berlin
35		Amsterdam
36		Ireland
37		Spain
38		Valencia (Spain)
39		los Angeles usa
40		England
41		Alicante
42		East
43		Arizona
44		Turkey

45		Spain
46		Rome
47		Australia
48		Pathos, Cyprus
49		New York
50		Egypt
51		Crete
52		Spain
53		Gran canary
54		San Diego, CA
55		France
56		Colorado Springs, CO, USA
57		Spain
58		Las Vegas
59		Iceland
60		Amsterdam
61		Amsterdam
62		Croatia
63		New York
64		Alicante
65		Bratislava
66		Rome
67		Rome
68		San Francisco
69		Malta
70		Menorca
71		Zurich
72		France
73		Dubai
74		Alicante
75		Crete
76		Menorca
77		Munich
78		Canada
79		Amsterdam
80		Southampton
81		Barcelona
82		Geneva
83		Copenhagen
84		Cologne
85		Almeria
86		Spain
87		Minneapolis
88		Funchal
89		Barcelona
90		New York
91		Belfast
92		Ft. Lauderdale, Florida, USA
93		China
94		Mallorca
95		Amsterdam
96		Paris
97		Zakynthos
98		Spain
99		Dalaman, Turkey
100		Costa Del Sol

101		Venice
102		Poland
103		Amsterdam
104		Malaga
105		Amsterdam
106		Bangkok
107		Rhodes
108		Abu Dhabi
109		Majorca
110		Amsterdam
111		London
112		Alicante
113		Italy
114		Hawaii
115		Detroit, Michigan
116		Sweden
117		Italy
118		Minnesota
119		Orlando, Florida, USA
120		Cleveland
121		USA
122		Portugal
123		Faro
124		New York
125		DUI
126		Dublin, Ireland
127		Toulouse, France
128		Amsterdam
129		Minorca
130		Orlando, Florida. USA
131		Paris
132		Denver
133		Murcia Airport
134		Antalya
135		Montreal, Canada
136		New York City (JFK airport)
137		Mareeba
138		Greece
139		Mississippi, USA
140		New Zealand
141		Italy
142		Berlin
143		Alicante
144		Spain
145		Zante
146		Canada
147		London
148		Capri
149		Miami
150		Corfu
151		San Francisco
152		Tenerife
153		Madrid
154		Alicante

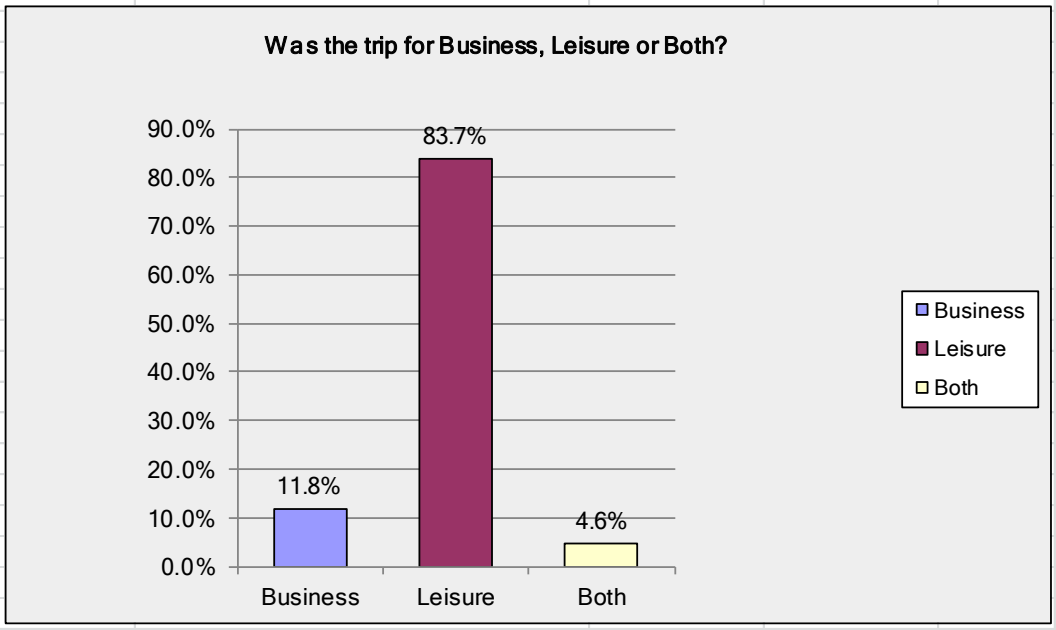
What airline did you fly with?		
Answer Options	**Response Count**	
	154	
answered question	**154**	
skipped question	**0**	

Number	Airline used
1	Royal Air Force
2	Royal Air Force
3	Easyjet
4	Ryanair
5	Easyjet
6	Iberia
7	Qatar
8	Jet 2
9	Thomas Cook
10	Monarch
11	Thomas Cook
12	British Airways
13	Thompson
14	Ryanair
15	Monarch
16	Thompson
17	Lufthansa
18	Thomson
19	American Airlines/ American eagle
20	Jet2
21	Ryan aur
22	Air Canada
23	Ryan air
24	Ryanair
25	Easy jet
26	Thomson
27	Ryanair
28	Virgin
29	AER LINGUS
30	RYANAIR
31	KLM
32	AER LINGUS
33	AER LIGUS
34	Klm
35	Easy jet
36	Aer Lingus
37	EasyJet
38	Easy Jet
39	virgin
40	easy jet
41	Jet2
42	Us Airways
43	Delta
44	Thompson

45		Easyjet		
46		jet2		
47		Emirates		
48		Thomson Airlines		
49		British Airways		
50		Monarch		
51		Jet 2		
52		Easy jet		
53		Thomas cook		
54		Delta		
55		Ryanair		
56		Southwest		
57		Easyjet		
58		BA		
59		Easy Jet		
60		Easyjet		
61		KLM		
62		Croatia airlines		
63		American Airlines		
64		Easy jet		
65		Ryanair		
66		Ryanair		
67		Monarch		
68		United		
69		Easyjet		
70		Thomson		
71		Swiss International Air Lines		
72		Ryanair		
73		Qatar air		
74		EasyJet		
75		Thompson		
76		Thomson		
77		Easy jet		
78		Aer Lingus		
79		EasyJet		
80		Flybe		
81		Ryanair		
82		Easyjet		
83		Easyjet		
84		Lufthansa		
85		British Airways		
86		Easy jet		
87		Delta		
88		Monarch		
89		EasyJet		
90		British airways		
91		Easy Jet		
92		Southwest		
93		Singapore Airlines		
94		Ryanair		
95		Easyjet		
96		Jet 2		
97		Thompson		
98		EasyJet		
99		Thomas Cook Airlines		
100		Thompson		

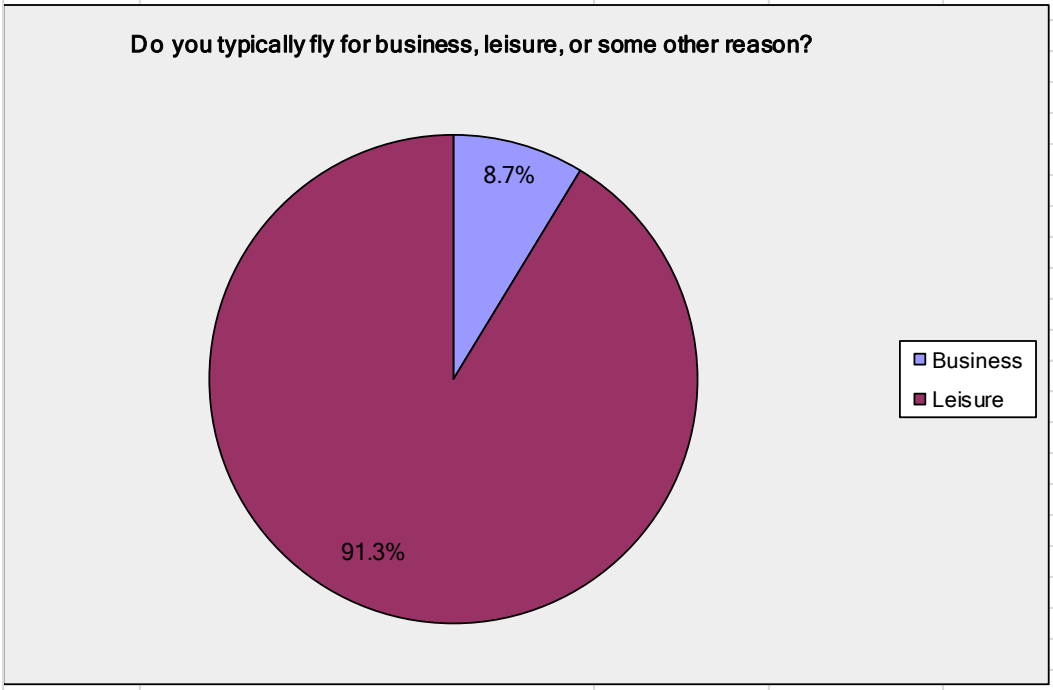
101		Ryan Air		
102		Whizz air		
103		EasyJet		
104		Ryanair		
105		Easy jet		
106		Emirates		
107		Thomas Cook		
108		Etihad		
109		Ryanair		
110		EasyJet		
111		BA		
112		Easyjet		
113		Flybe		
114		Alaska Airlines		
115		North-western		
116		Ryan Air		
117		British Airways		
118		Spirit		
119		Virgin Atlantic		
120		Delta		
121		Virgin Atlantic		
122		Ryan Air		
123		Easyjet		
124		British Airways		
125		Ryan air.		
126		US Airways		
127		Air France		
128		Flybe		
129		Thomas Cook		
130		American Airlines		
131		Easyjet		
132		British Airways		
133		Ryanair		
134		TUIfly		
135		US Airways		
136		Jet Blue		
137		Virgin Australia		
138		EasyJet		
139		Delta		
140		Air New Zealand		
141		Klm		
142		Lufthansa		
143		Jet2		
144		Easy jet		
145		Monarch		
146		air Canada		
147		Germanwings		
148		Alitalia		
149		Virgin Atlantic		
150		Ryanair		
151		Virgin Atlantic		
152		Ryanair		
153		British Airways		
154		easy jet		

Was the trip for Business, Leisure or Both?		
Answer Options	**Response Percent**	**Response Count**
Business	11.8%	18
Leisure	83.7%	128
Both	4.6%	7
	answered question	**153**
	skipped question	**1**

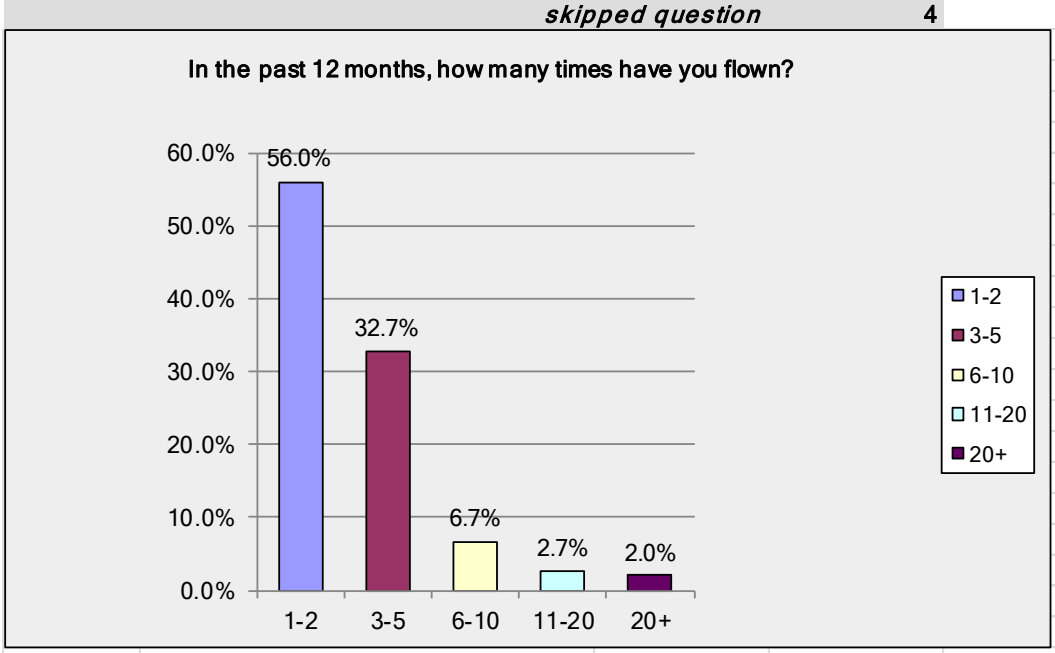


Do you typically fly for business, leisure, or some other reason?		
Answer Options	**Response Percent**	**Response Count**
Business	8.7%	13
Leisure	91.3%	137
Other (please specify)		2
answered question		**150**
skipped question		**4**

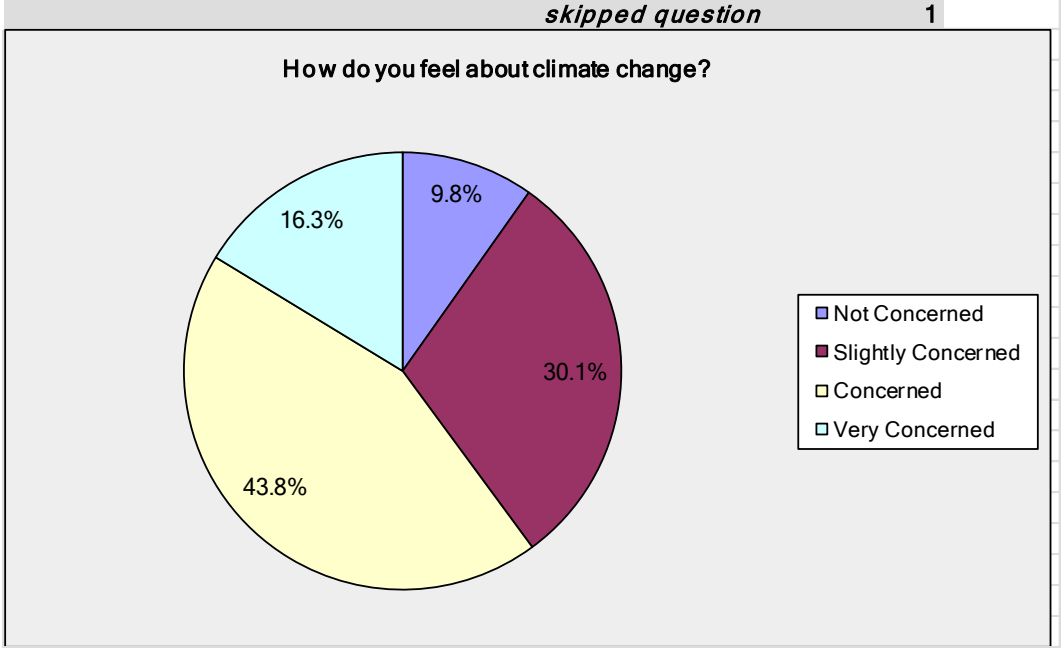
Number	Response Date	Other (please specify)	Categories
1	Jul 26, 2014 2:17 PM	Educational trips	
2	Jul 15, 2014 2:05 PM	Both almost equally.	



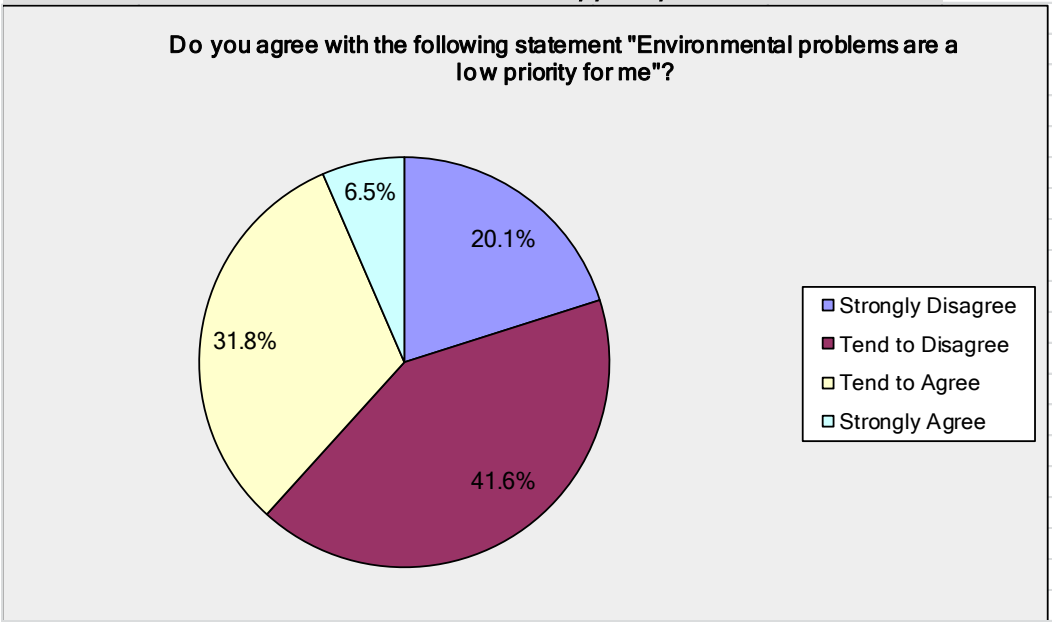
In the past 12 months, how many times have you flown?		
Answer Options	**Response Percent**	**Response Count**
1-2	56.0%	84
3-5	32.7%	49
6-10	6.7%	10
11-20	2.7%	4
20+	2.0%	3
answered question		**150**
skipped question		**4**



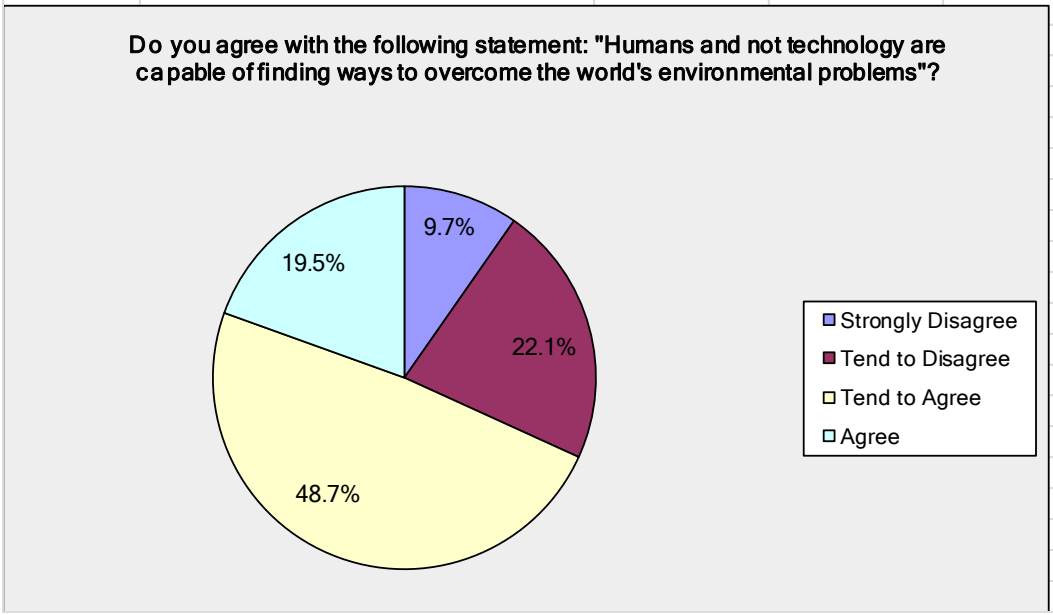
How do you feel about climate change?		
Answer Options	**Response Percent**	**Response Count**
Not Concerned	9.8%	15
Slightly Concerned	30.1%	46
Concerned	43.8%	67
Very Concerned	16.3%	25
answered question		153
skipped question		1



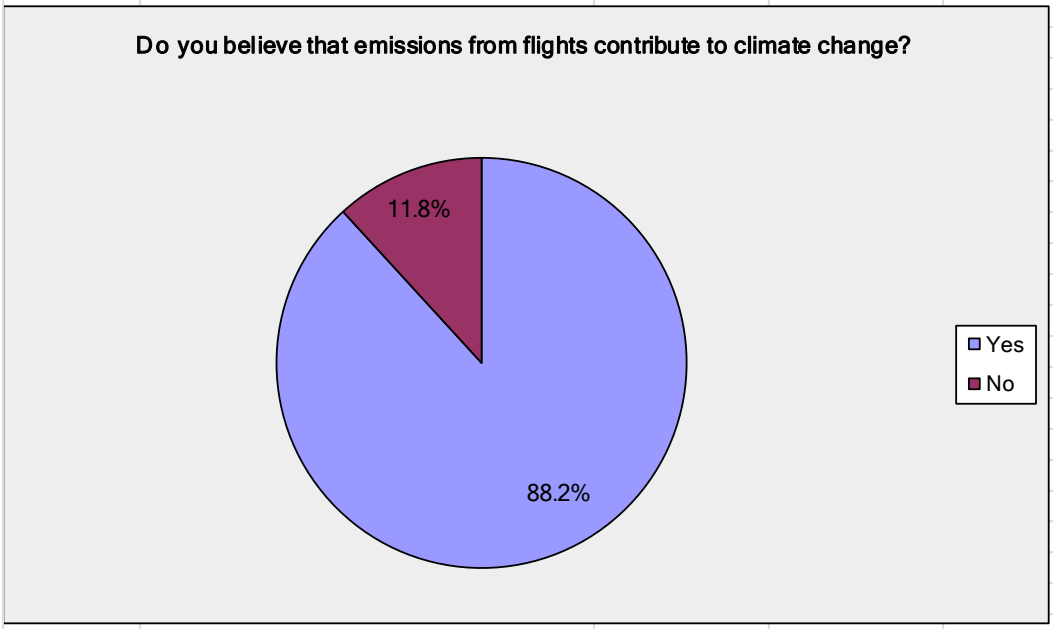
Do you agree with the following statement "Environmental problems are a low priority for me"?		
Answer Options	**Response Percent**	**Response Count**
Strongly Disagree	20.1%	31
Tend to Disagree	41.6%	64
Tend to Agree	31.8%	49
Strongly Agree	6.5%	10
answered question		**154**
skipped question		**0**



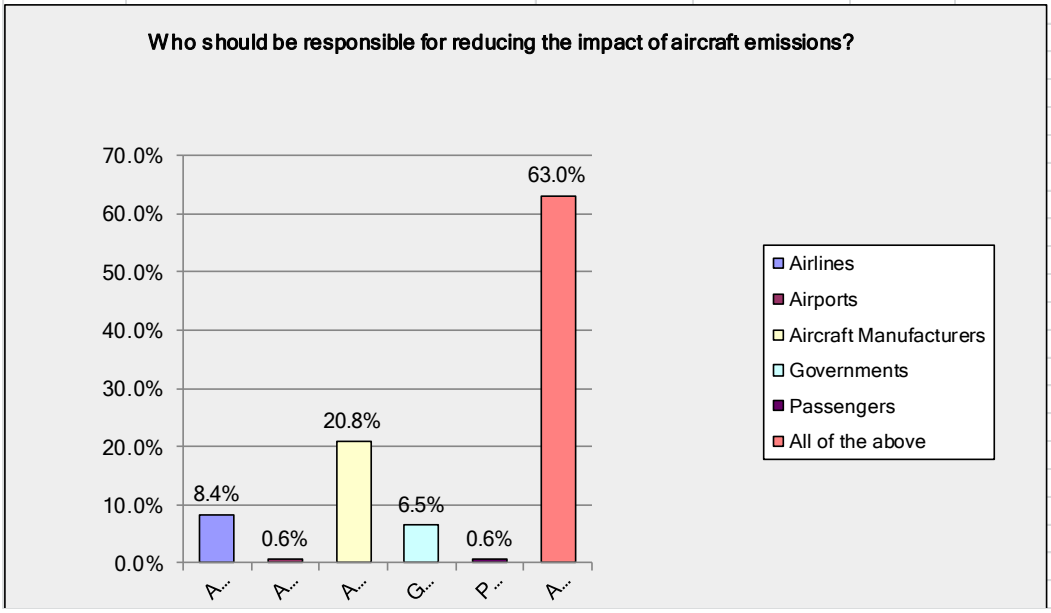
Do you agree with the following statement: "Humans and not technology are capable of finding ways to overcome the world's environmental		
Answer Options	**Response Percent**	**Response Count**
Strongly Disagree	9.7%	15
Tend to Disagree	22.1%	34
Tend to Agree	48.7%	75
Agree	19.5%	30
answered question		**154**
skipped question		**0**



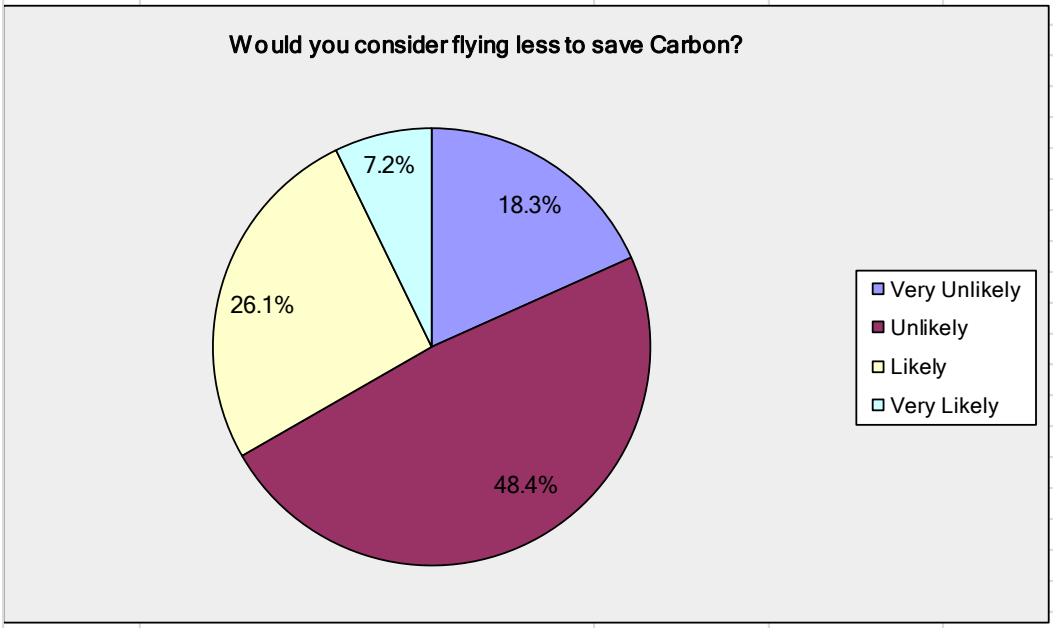
Do you believe that emissions from flights contribute to climate change?		
Answer Options	**Response Percent**	**Response Count**
Yes	88.2%	135
No	11.8%	18
answered question		153
skipped question		1



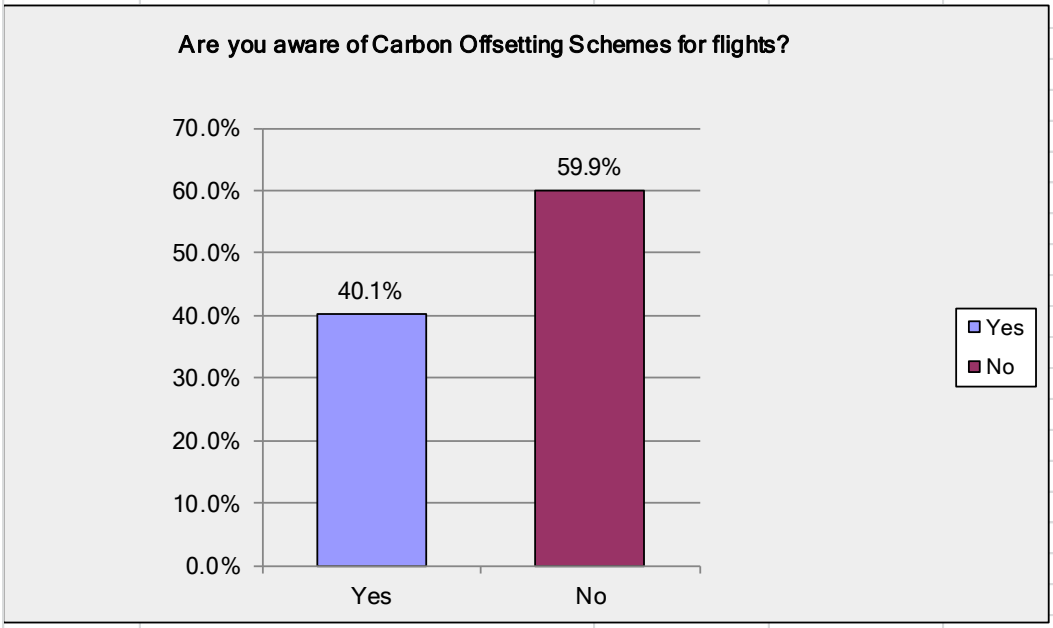
Who should be responsible for reducing the impact of aircraft emissions?		
Answer Options	**Response Percent**	**Response Count**
Airlines	8.4%	13
Airports	0.6%	1
Aircraft Manufacturers	20.8%	32
Governments	6.5%	10
Passengers	0.6%	1
All of the above	63.0%	97
answered question		**154**
skipped question		**0**



Would you consider flying less to save Carbon?		
Answer Options	**Response Percent**	**Response Count**
Very Unlikely	18.3%	28
Unlikely	48.4%	74
Likely	26.1%	40
Very Likely	7.2%	11
answered question		153
skipped question		1

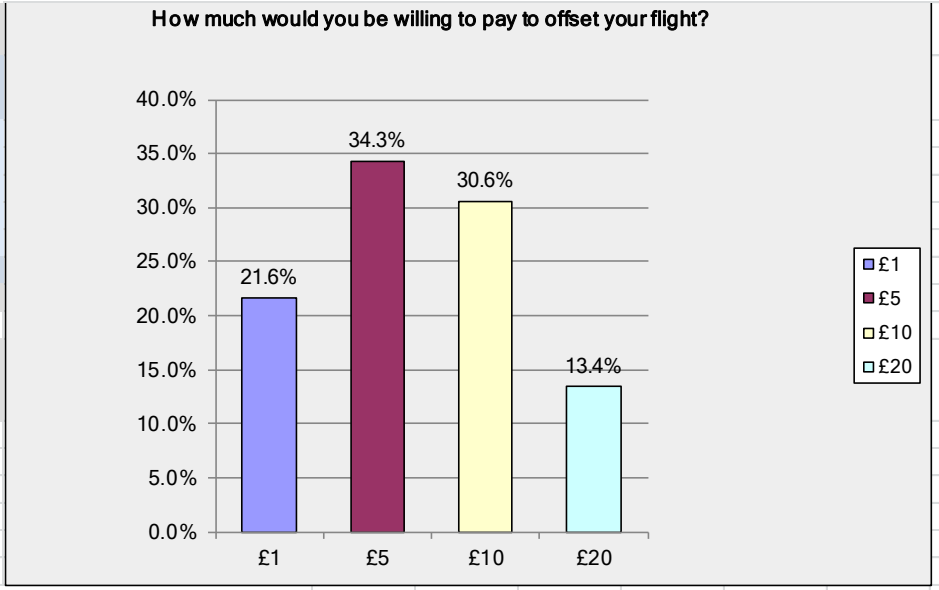


Are you aware of Carbon Offsetting Schemes for flights?		
Answer Options	**Response Percent**	**Response Count**
Yes	40.1%	61
No	59.9%	91
	answered question	**152**
	skipped question	**2**



How much would you be willing to pay to offset your flight?

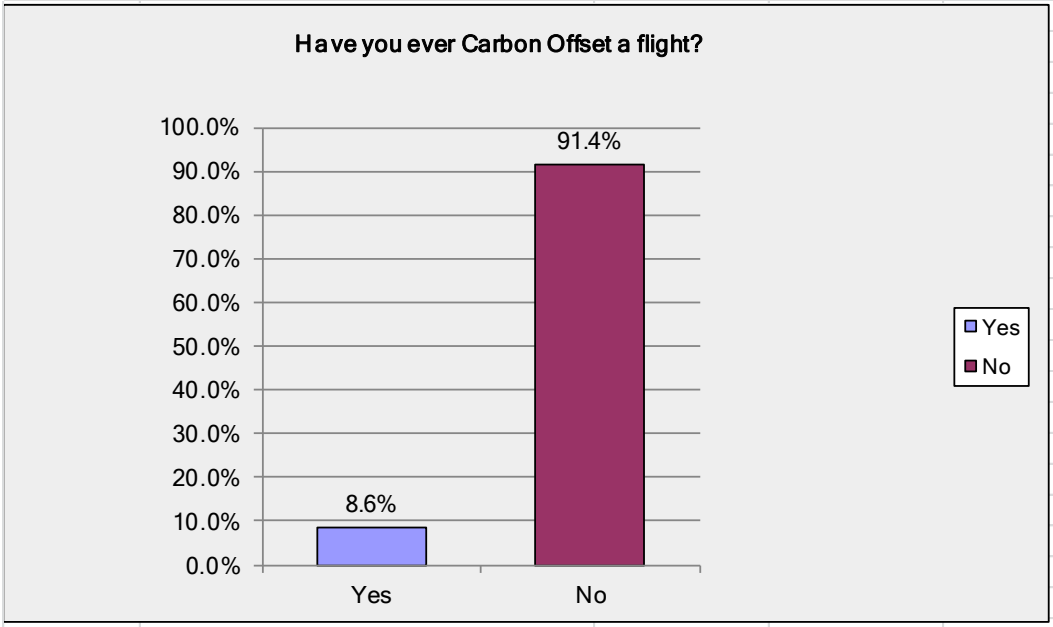
Answer Options	Response Percent	Response Count
£1	21.6%	29
£5	34.3%	46
£10	30.6%	41
£20	13.4%	18
Other (please specify)		22
answered question		134
skipped question		20



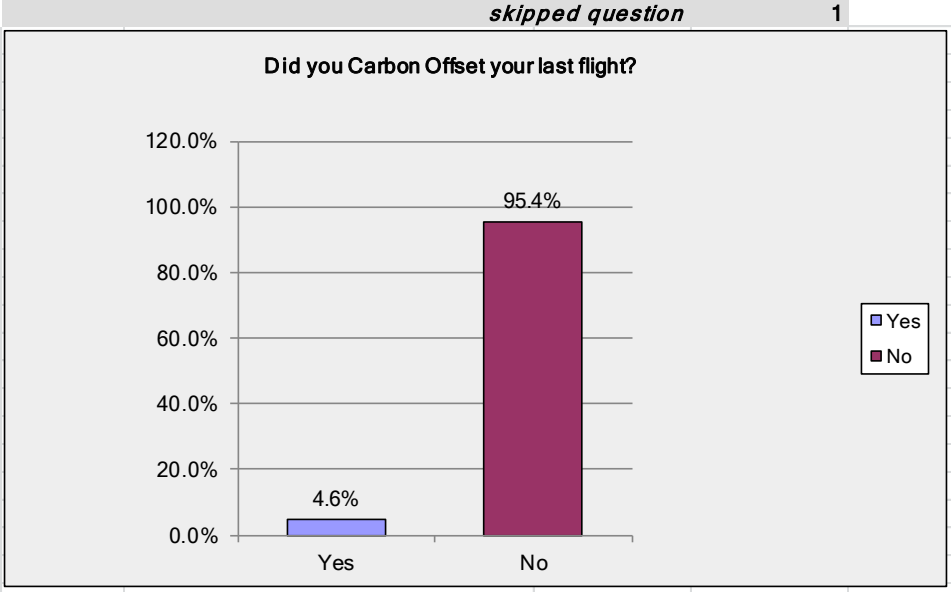
Number	Response Date	Other (please specify)	Categories
1	Aug 4, 2014 11:29 AM	0	
2	Aug 2, 2014 2:10 PM	0	
3	Jul 28, 2014 2:08 PM	Nothing	
4	Jul 28, 2014 2:07 PM	None	
5	Jul 28, 2014 2:05 PM	I believe airlines should do this	
6	Jul 26, 2014 2:17 PM	percentage of the flight cost	
7	Jul 15, 2014 7:31 AM	Enough to contribute to creating a sink for my marginal emission.	
8	Jul 11, 2014 7:50 AM	0	
9	Jul 11, 2014 12:06 AM	0£	
10	Jul 10, 2014 7:20 PM	None	
11	Jul 10, 2014 12:37 PM	£0	
12	Jul 9, 2014 9:17 PM	£0	
13	Jul 9, 2014 9:07 PM	£50	
14	Jul 9, 2014 7:23 PM	A percentage of ticket cost, I.E. 1%..	
15	Jul 9, 2014 3:42 PM	Depends on the destination - obviously more for long haul flights.	
16	Jul 9, 2014 3:09 PM	a percentage of cost of flight	
17	Jul 9, 2014 3:05 PM	£0	
18	Jul 9, 2014 2:43 PM	0	
19	Jul 9, 2014 2:17 PM	nothing, flights are costly enough and I doubt my £2 will make a massive difference to the other 380 people on the plane not paying	it
20	Jul 9, 2014 2:13 PM	0	
21	Jul 9, 2014 1:55 PM	Potentially more. Environmental projects are important, and small donations like this would be extremely beneficial.	
22	Jul 9, 2014 1:50 PM	nothing	

What would you prefer the Carbon Offset money was invested in? Please tick all that apply		
Answer Options	**Response Percent**	**Response Count**
UK Specific Renewable Energy Projects	42.0%	63
Global Renewable Energy Projects	56.7%	85
Forestry Projects	39.3%	59
Hydroelectric Projects	28.7%	43
Solar Projects	38.7%	58
Wind Projects	30.7%	46
Educational Projects	42.0%	63
	answered question	**150**
	skipped question	**4**

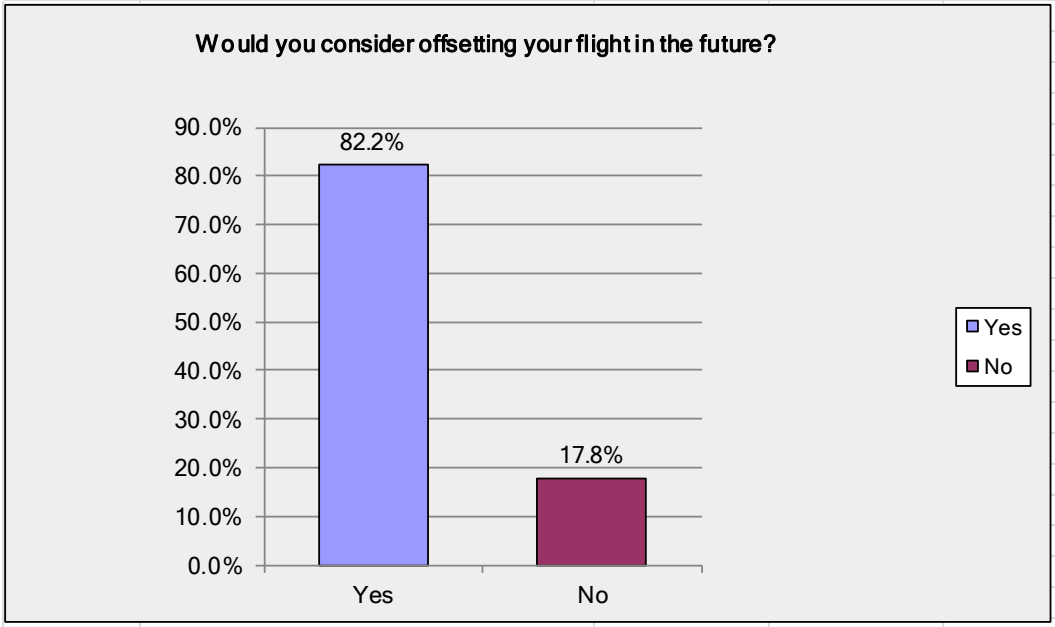
Have you ever Carbon Offset a flight?		
Answer Options	**Response Percent**	**Response Count**
Yes	8.6%	13
No	91.4%	138
answered question		**151**
skipped question		**3**



Did you Carbon Offset your last flight?		
Answer Options	**Response Percent**	**Response Count**
Yes	4.6%	7
No	95.4%	146
answered question		**153**
skipped question		**1**



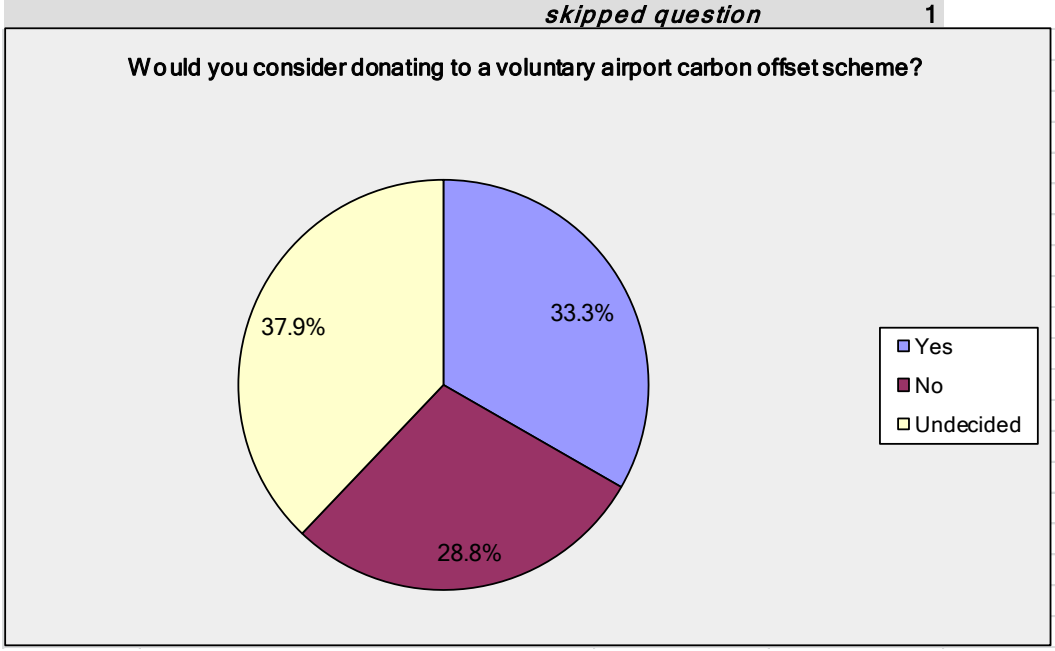
Would you consider offsetting your flight in the future?		
Answer Options	**Response Percent**	**Response Count**
Yes	82.2%	125
No	17.8%	27
answered question		**152**
skipped question		**2**



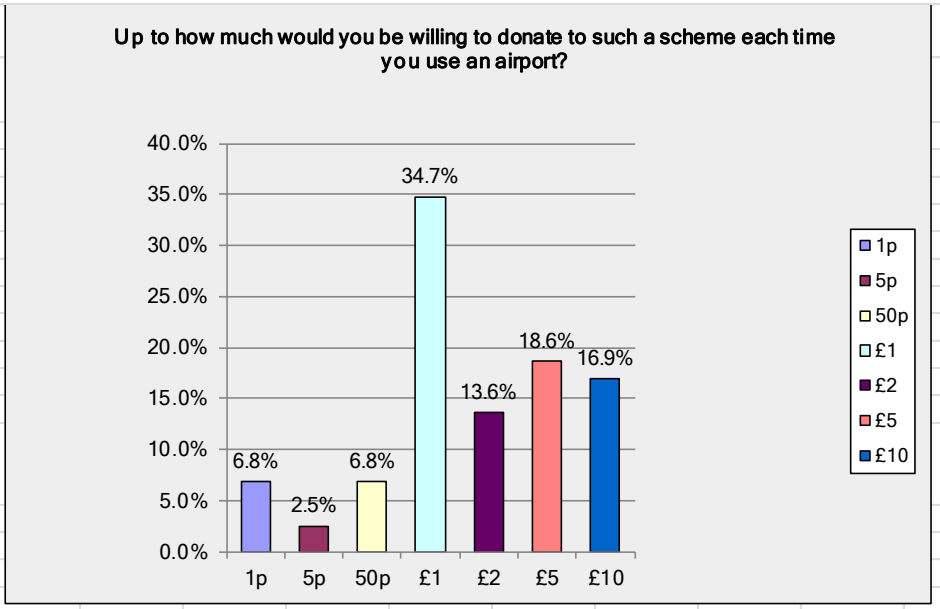
If your answer to the above question is NO, please state why you would not Carbon Offset future flights	
Answer Options	**Response Count**
	26
answered question	**26**
skipped question	**128**

Number	Response Text
1	Don't believe it is the passengers responsibility
2	Cost, should be included in the flight price as then it is compulsory
3	I do not believe it helps
4	Don't trust the carbon offsetting. Don't think it stops the effects of emmisions
5	Can't see it going to the projects
6	Although I would consider it I would be more likely to if it was a common mainstream thing
7	Flights cost enough as it is!
8	I believe that the money would not be spent on offsetting but instead would be used for other purposes
9	Not convinced the money would go anywhere useful. Need better audit trails.
10	Flights are expensive enough as it is, I don't see it as my responsibility to pay extra to offset
11	I don't think aircraft emissions add much to global warming
12	Flights are expensive enough. Carbon offsetting isn't promoted well. Maybe if it was promoted more widely and the benefits that have subsequently been incurred from carbon offsetting made more obvious then people such a
13	It needs countries like China, USA and India to do their bit for saving the planet so my £1 will not make a difference
14	I do not accept that global warming is a problem
15	I am already subject to taxes and vat in addition to costs and profits of the organisations. I doubt the carob offset is efficiently spent.
16	Flights are expensive enough and I pay enough taxes
17	Flights are already paying enough. Government should make the flight companies actually pay fair taxes, and use these for carbon offset.
18	Don't see why I should have additional expenses to my journey, I don't do it for other modes of transport
19	No such thing as global warming caused by man, it's a natural event which has occurred many times before.
20	Air Passenger Duty should be structured and spent in such a way that it accounts for carbon offsetting and the impact of flying on the environment rather than being used as a general revenue raising scheme.
21	It should be compulsory in the cost of the ticket
22	False economy. The impact of anthropogenically-induced climate change is negligible in comparison to the natural climate change cycle.
23	Money is tight at the moment, and not sure if carbon offsetting is the correct route of action
24	Scheduled business fights are ridiculously pricey as is for the service provided. At the amount charged you'd this a 5 pound offset would be included. I'd be more than happy to forego the inedible inflight meals for this.
25	Insufficient funds
26	No point, already get charged enough tax on the fuel that should be used to sort this issue out

Would you consider donating to a voluntary airport carbon offset scheme?		
Answer Options	**Response Percent**	**Response Count**
Yes	33.3%	51
No	28.8%	44
Undecided	37.9%	58
answered question		153
skipped question		1



Up to how much would you be willing to donate to such a scheme each time you use an airport?		
Answer Options	**Response Percent**	**Response Count**
1p	6.8%	8
5p	2.5%	3
50p	6.8%	8
£1	34.7%	41
£2	13.6%	16
£5	18.6%	22
£10	16.9%	20
Other (please specify)		21
answered question		**118**
skipped question		**36**



Number	Other (please specify)	Categories
1	0	
2	Nothing	
3	Nothing	
4	Still think they make enough profit	
5	the airport operations are only similar to other companies operatioms and they should therefore as a company be responsible for this.	
6	DONT BELIEVE MONEY WILL GO TO PROJECTS	
7	NOTHING	
8	As above; the cost of my marginal impact.	
9	0	
10	0p	
11	£0	
12	0	
13	£0	
14	none	
15	nothing	
16	depends on where the money was going	
17	£0	
18	Should be compulsory	
19	0	
20	Potentially more, as mentioned above.	
21	nothing	

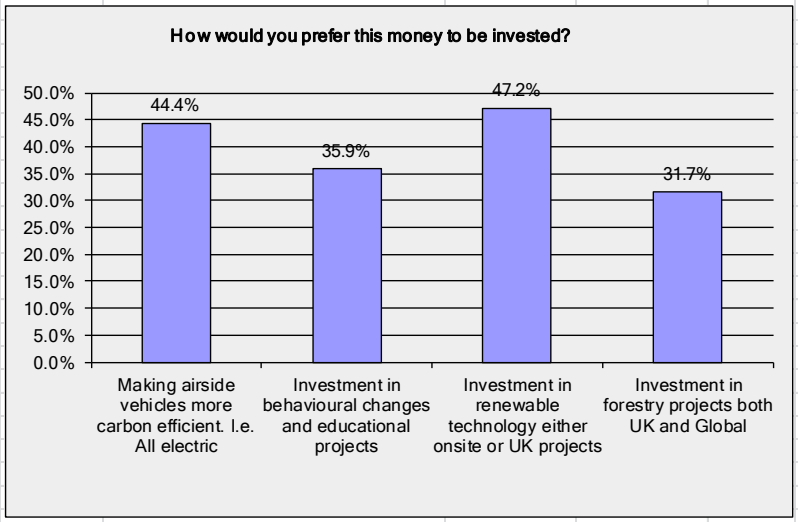
How would you prefer the money to be collected?		
Answer Options	**Response Percent**	**Response Count**
A donation box inside the terminal with a display	38.0%	52
Designated Carbon offset stand with a reward for	27.7%	38
Option to donate your own amount via an online App in	24.8%	34
Option to donate online through the airline when	62.0%	85
Option when booking Airport amenities such as Car	19.7%	27
Option of donating clearly stated on the main airport	21.9%	30
Other (please specify)		11
answered question		137
skipped question		17

Number	**Response Date**	**Other (please specify)**	**Categories**

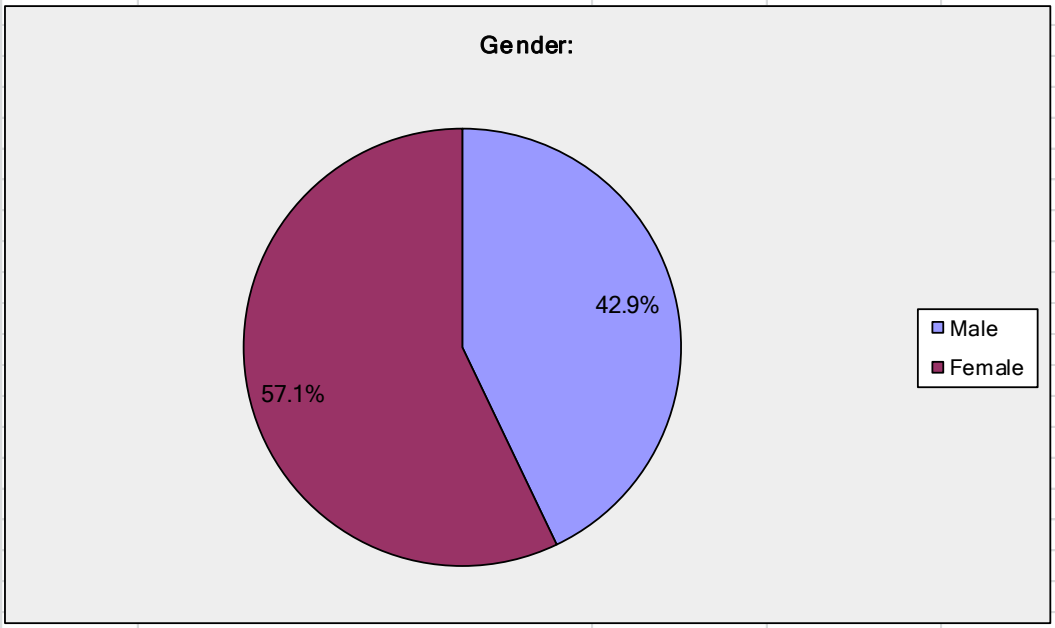
How would you prefer this money to be invested?

Answer Options	Response Percent	Response Count
Making airside vehicles more carbon efficient. I.e. All	44.4%	63
Investment in behavioural changes and educational	35.9%	51
Investment in renewable technology either onsite or	47.2%	67
Investment in forestry projects both UK and Global	31.7%	45
Other (please specify)		4
answered question		142
skipped question		12

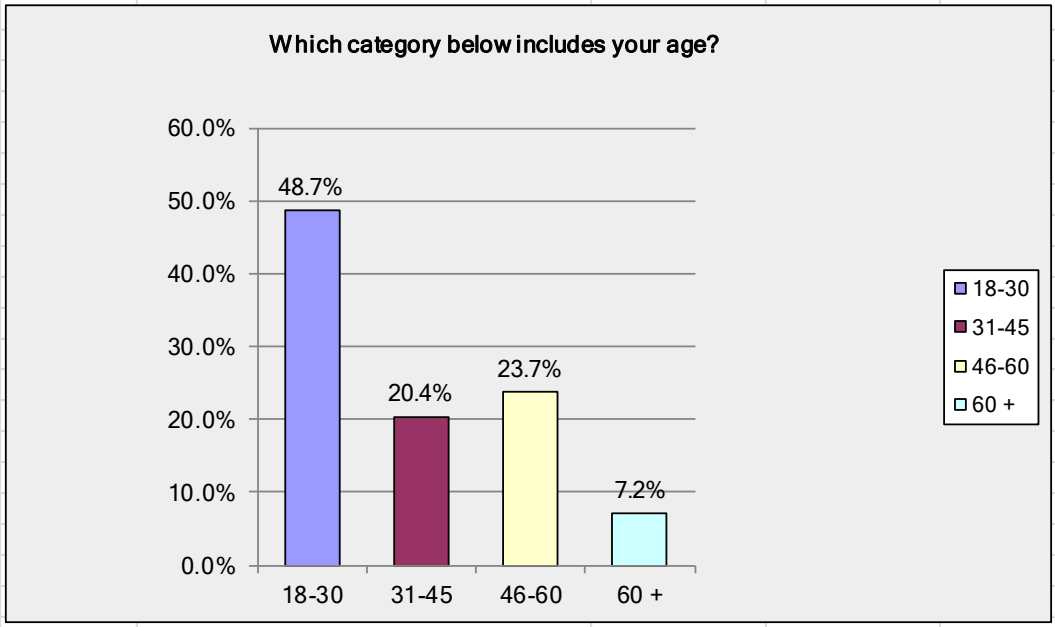
Number	Response Date	Other (please specify)	Categories
1	Jul 26, 2014 2:17 PM	airport specific donatioms should be beneficial to that specific airport	
2	Jul 11, 2014 7:50 AM	N/A	
3	Jul 11, 2014 12:06 AM	No pereference	
4	Jul 9, 2014 2:43 PM	investment in developing more environmentally friendly aircraft	



Gender:		
Answer Options	**Response Percent**	**Response Count**
Male	42.9%	66
Female	57.1%	88
answered question		**154**
skipped question		**0**

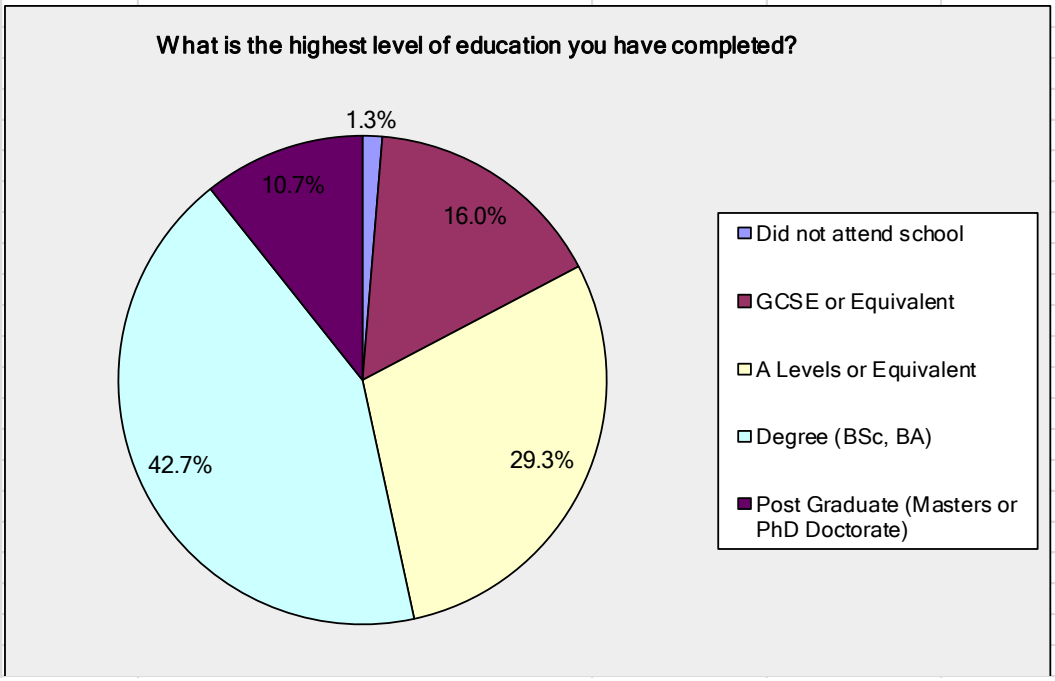


Which category below includes your age?		
Answer Options	**Response Percent**	**Response Count**
18-30	48.7%	74
31-45	20.4%	31
46-60	23.7%	36
60 +	7.2%	11
answered question		**152**
skipped question		**2**



What is the highest level of education you have completed?		
Answer Options	**Response Percent**	**Response Count**
Did not attend school	1.3%	2
GCSE or Equivalent	16.0%	24
A Levels or Equivalent	29.3%	44
Degree (BSc, BA)	42.7%	64
Post Graduate (Masters or PhD Doctorate)	10.7%	16
Other (please specify)		5
answered question		**150**
skipped question		**4**

Number	**Other (please specify)**	**Categories**
1	Deploma	
2	PGCE	
3	Pgce	
4	Aircraft apprenticeship	
5	GCE	



Appendix Six: Research looking at if the airlines have Carbon Offset schemes for passengers

The researcher went through the booking process of all the airlines within this study to investigate whether there was an option when booking to offset their flight. If an airline did not have such an option on the booking page, the researcher searched for one on the main welcome page. Airlines, who offered Carbon Offset programs to passengers but not through their booking page varied greatly in accessibility, ease of use and explanation. Some airlines made it extremely difficult to locate, often through various sub links and searches. Some airlines simply offered a Carbon Calculator for which the passenger had to input his or her own data and then pay following a link to a Carbon Offsetting website. This was time consuming and cumbersome for the passenger. Some airlines did not offer a Carbon Offset scheme to passengers at all. Some, particularly the Low-Cost carriers make no mention of Carbon targets or Offsets. Some airlines, state the age of their fleet and cite how as they are new aircraft they are efficient and therefore do not need a Carbon Offset. Some airlines, particularly Emirates and Etihad, stress that they do not offer the Passenger the option to donate because they feel it is not the passenger's responsibility. Such airlines feel it is their challenge to offset, through operational efficiencies and newer aircraft. Below is a table outlining the results.

Airlines that have the option to Offset on their booking pages	Airlines that do not have their own Carbon Offset program but offer one through sub links or online calculator	Airlines that have no Carbon Offset programme for passengers
British Airways	Easyjet	Ryanair
Virgin Australia	Lufthansa	Southwest
Thompson	Delta	Singapore Airlines
Air New Zealand	Monarch	Jet 2
	Virgin Atlantic	Thomas Cook
	US Airways	Whizz Air
	Air France	Emirates
	American Airlines	Etihad
	Jet Blue	Flybe
	KLM	Spirit
	Air Canada	TUIFly
	United	Alitalia
	Iberia	German Wings
		Swiss International

	Qatar Air
	Aer Lingus

Appendix Seven: Chi-Squared test – Females significantly more concerned by Climate Change than males

Null Hypothesis: There is no relationship between gender and concern

Gender * Passengers feelings on the issue of Climate Change Crosstabulation

			Passengers feelings on the issue of Climate Change				Total
			Not Concerned	Slightly Concerned	Concerned	Very Concerned	
Gender	Male	Count	12	17	26	10	65
		Expected Count	6.4	19.1	28.5	11.0	65.0
		% within Gender	18.5%	26.2%	40.0%	15.4%	100.0%
		% of Total	7.8%	11.1%	17.0%	6.5%	42.5%
	Female	Count	3	28	41	16	88
		Expected Count	8.6	25.9	38.5	15.0	88.0
		% within Gender	3.4%	31.8%	46.6%	18.2%	100.0%
		% of Total	2.0%	18.3%	26.8%	10.5%	57.5%
Total		Count	15	45	67	26	153
		Expected Count	15.0	45.0	67.0	26.0	153.0
		% within Gender	9.8%	29.4%	43.8%	17.0%	100.0%
		% of Total	9.8%	29.4%	43.8%	17.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.591[a]	3	.022
Likelihood Ratio	9.812	3	.020
Linear-by-Linear Association	3.656	1	.056
N of Valid Cases	153		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.37.

Significance level of 0.022, therefore the Null Hypothesis can be rejected. Females are significantly more likely to be concerned by Climate Change than males.

Appendix Eight: Chi-Squared test – Passengers educated to Degree level or higher are more concerned by Climate Change

Null Hypothesis: There is no relationship between educational attainment and concern for Climate Change.

Educational Levels * Passengers feelings on the issue of Climate Change Crosstabulation

			Passengers feelings on the issue of Climate Change				Total
			Not Concerned	Slightly Concerned	Concerned	Very Concerned	
Educational Levels	A Levels and below	Count	11	21	34	7	73
		Expected Count	7.2	21.5	32.0	12.4	73.0
		% within Educational Levels	15.1%	28.8%	46.6%	9.6%	100.0%
		% of Total	7.2%	13.7%	22.2%	4.6%	47.7%
	Degree and Higher	Count	4	24	33	19	80
		Expected Count	7.8	23.5	35.0	13.6	80.0
		% within Educational Levels	5.0%	30.0%	41.3%	23.8%	100.0%
		% of Total	2.6%	15.7%	21.6%	12.4%	52.3%
Total		Count	15	45	67	26	153
		Expected Count	15.0	45.0	67.0	26.0	153.0
		% within Educational Levels	9.8%	29.4%	43.8%	17.0%	100.0%
		% of Total	9.8%	29.4%	43.8%	17.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.718[a]	3	.033
Likelihood Ratio	9.046	3	.029
Linear-by-Linear Association	5.501	1	.019
N of Valid Cases	153		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.16.

Significance level of 0.033 means the null hypothesis can be rejected. More educated passengers are more concerned by climate change.

Appendix Nine: Chi-Squared test – Passengers who are concerned by climate change are significantly more likely to have environmental problems as a high priority in their life.

Null Hypothesis: there is no relationship between concern for climate change and priority of environmental problems.

Passenger feelings on climate change (2 groups) * feel about environment Crosstabulation

			feel about environment		Total
			Disagree or Tend to Disagree	Tend to Agree or Agree	
Passenger feelings on climate change (2 groups)	Not Concerned or Slightly Concerned	Count	18	41	59
		Expected Count	36.9	22.1	59.0
		% within Passenger feelings on climate change (2 groups)	30.5%	69.5%	100.0%
		% of Total	11.8%	27.0%	38.8%
	Concerned or Very Concerned	Count	77	16	93
		Expected Count	58.1	34.9	93.0
		% within Passenger feelings on climate change (2 groups)	82.8%	17.2%	100.0%
		% of Total	50.7%	10.5%	61.2%
Total		Count	95	57	152
		Expected Count	95.0	57.0	152.0
		% within Passenger feelings on climate change (2 groups)	62.5%	37.5%	100.0%
		% of Total	62.5%	37.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	42.109[a]	1	.000		
Continuity Correction[b]	39.907	1	.000		
Likelihood Ratio	43.137	1	.000		
Fisher's Exact Test				.000	.000

Linear-by-Linear Association	41.832	1	.000		
N of Valid Cases	152				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 22.13.

Significance level of 0.000 therefore the null hypothesis can be rejected. Passengers who show concern for climate change also have a high priority for environmental problems.

Appendix Ten: Chi-Squared test – Women significantly more likely to state environmental issues as a higher priority in their lives than males.

Null Hypothesis: There is no relationship between gender and environmental issue priority

Gender * feel about environment Crosstabulation

			feel about environment		Total
			Disagree or Tend to Disagree	Tend to Agree or Agree	
Gender	Male	Count	33	31	64
		Expected Count	40.0	24.0	64.0
		% within Gender	51.6%	48.4%	100.0%
		% of Total	21.7%	20.4%	42.1%
	Female	Count	62	26	88
		Expected Count	55.0	33.0	88.0
		% within Gender	70.5%	29.5%	100.0%
		% of Total	40.8%	17.1%	57.9%
Total		Count	95	57	152
		Expected Count	95.0	57.0	152.0
		% within Gender	62.5%	37.5%	100.0%
		% of Total	62.5%	37.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.642[a]	1	.018		
Continuity Correction[b]	4.865	1	.027		
Likelihood Ratio	5.629	1	.018		
Fisher's Exact Test				.027	.014
Linear-by-Linear Association	5.605	1	.018		
N of Valid Cases	152				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 24.00.

b. Computed only for a 2x2 table

Significance level of 0.018 means the null hypothesis can be rejected. Women place environmental issues significantly higher in priority in their lives than males.

Appendix Eleven: Chi-Squared test – Women were significantly less likely to aware of Carbon Offset schemes

Null Hypothesis: There is no link between Gender and awareness of Carbon Offset schemes

Gender * Is the passenger aware of carbon offsetting schemes? Crosstabulation

			Is the passenger aware of carbon offsetting schemes?		Total
			Yes	No	
Gender	Male	Count	34	31	65
		Expected Count	26.5	38.5	65.0
		% within Gender	52.3%	47.7%	100.0%
		% of Total	22.4%	20.4%	42.8%
	Female	Count	28	59	87
		Expected Count	35.5	51.5	87.0
		% within Gender	32.2%	67.8%	100.0%
		% of Total	18.4%	38.8%	57.2%
Total		Count	62	90	152
		Expected Count	62.0	90.0	152.0
		% within Gender	40.8%	59.2%	100.0%
		% of Total	40.8%	59.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.238[a]	1	.013		
Continuity Correction[b]	5.433	1	.020		
Likelihood Ratio	6.244	1	.012		
Fisher's Exact Test				.019	.010
Linear-by-Linear Association	6.197	1	.013		
N of Valid Cases	152				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 26.51.

b. Computed only for a 2x2 table

Significance level of 0.013 means the Null Hypothesis can be rejected. There is a significant relationship between Gender and awareness, with males being significantly more aware.

Appendix Twelve: Chi-Squared test – Females significantly more likely to pay more towards Carbon Offsetting of flights

Null Hypothesis: There is no relationship between Gender and the amount a passenger would pay to offset their flight

Gender * How much is a passenger willing to pay to offset their flight (other category now included) Crosstabulation

			How much is a passenger willing to pay to offset their flight (other category now included)		Total
			Less than £10	More than £10	
Gender	Male	Count	47	18	65
		Expected Count	39.5	25.5	65.0
		% within Gender	72.3%	27.7%	100.0%
		% of Total	30.7%	11.8%	42.5%
	Female	Count	46	42	88
		Expected Count	53.5	34.5	88.0
		% within Gender	52.3%	47.7%	100.0%
		% of Total	30.1%	27.5%	57.5%
Total		Count	93	60	153
		Expected Count	93.0	60.0	153.0
		% within Gender	60.8%	39.2%	100.0%
		% of Total	60.8%	39.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.296[a]	1	.012		
Continuity Correction[b]	5.483	1	.019		
Likelihood Ratio	6.414	1	.011		
Fisher's Exact Test				.013	.009
Linear-by-Linear Association	6.254	1	.012		
N of Valid Cases	153				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.49.

b. Computed only for a 2x2 table

Significance level of 0.012 means the Null Hypothesis can be rejected. There is a significant relationship between Gender and the amount the passenger would pay to offset their flights. Women are significantly more likely to donate £10 or more.

Appendix Thirteen: Chi-Squared test – Those concerned by climate change most likely to invest in Global Renewable energy projects

Null Hypothesis: There is no relationship between concern for Climate Change and investment

Passenger feelings on climate change (2 groups) * Preference for Carbon Offset money of flights to be invested in - Global Energy Projects Crosstabulation

			Preference for Carbon Offset money of flights to be invested in - Global Energy Projects		Total
			Yes	No	
Passenger feelings on climate change (2 groups)	Not Concerned or Slightly Concerned	Count	20	36	56
		Expected Count	31.6	24.4	56.0
		% within Passenger feelings on climate change (2 groups)	35.7%	64.3%	100.0%
		% of Total	13.4%	24.2%	37.6%
	Concerned or Very Concerned	Count	64	29	93
		Expected Count	52.4	40.6	93.0
		% within Passenger feelings on climate change (2 groups)	68.8%	31.2%	100.0%
		% of Total	43.0%	19.5%	62.4%
Total		Count	84	65	149
		Expected Count	84.0	65.0	149.0
		% within Passenger feelings on climate change (2 groups)	56.4%	43.6%	100.0%
		% of Total	56.4%	43.6%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	15.574[a]	1	.000		
Continuity Correction[b]	14.257	1	.000		
Likelihood Ratio	15.708	1	.000		
Fisher's Exact Test				.000	.000

Linear-by-Linear Association	15.469	1	.000		
N of Valid Cases	149				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 24.43.

b. Computed only for a 2x2 table

Significance level of 0.000, the Null Hypothesis can be rejected. Those who are concerned or very concerned by Climate Change are most likely to invest their Carbon Offset money in Global Renewable Energy projects.

Appendix Fourteen: Chi-Squared test – Females more likely to invest in Educational projects than males

Null Hypothesis: There is no relationship between gender and investment in educational projects

Gender * Preference for Carbon Offset money of flights to be invested in - Educational Projects Crosstabulation

			Preference for Carbon Offset money of flights to be invested in - Educational Projects		Total
			Yes	No	
Gender	Male	Count	18	45	63
		Expected Count	25.8	37.2	63.0
		% within Gender	28.6%	71.4%	100.0%
		% of Total	12.1%	30.2%	42.3%
	Female	Count	43	43	86
		Expected Count	35.2	50.8	86.0
		% within Gender	50.0%	50.0%	100.0%
		% of Total	28.9%	28.9%	57.7%
Total		Count	61	88	149
		Expected Count	61.0	88.0	149.0
		% within Gender	40.9%	59.1%	100.0%
		% of Total	40.9%	59.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.906[a]	1	.009		
Continuity Correction[b]	6.048	1	.014		
Likelihood Ratio	7.035	1	.008		
Fisher's Exact Test				.011	.007
Linear-by-Linear Association	6.859	1	.009		
N of Valid Cases	149				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.79.

b. Computed only for a 2x2 table

Significance level of 0.009 therefore the Null Hypothesis can be rejected. Women are significantly more likely to invest in Educational projects than males are.

Appendix Fifteen: Chi-Squared test – Women more likely to offset their flights in the future

Null Hypothesis: There is no relationship between gender and future engagement in Carbon Offsetting of flights

Gender * Would the passenger Offset their flight in the future? Crosstabulation

			Would the passenger Offset their flight in the future?		Total
			Yes	No	
Gender	Male	Count	47	18	65
		Expected Count	53.5	11.5	65.0
		% within Gender	72.3%	27.7%	100.0%
		% of Total	30.9%	11.8%	42.8%
	Female	Count	78	9	87
		Expected Count	71.5	15.5	87.0
		% within Gender	89.7%	10.3%	100.0%
		% of Total	51.3%	5.9%	57.2%
Total		Count	125	27	152
		Expected Count	125.0	27.0	152.0
		% within Gender	82.2%	17.8%	100.0%
		% of Total	82.2%	17.8%	100.0%

Chi-Square Tests

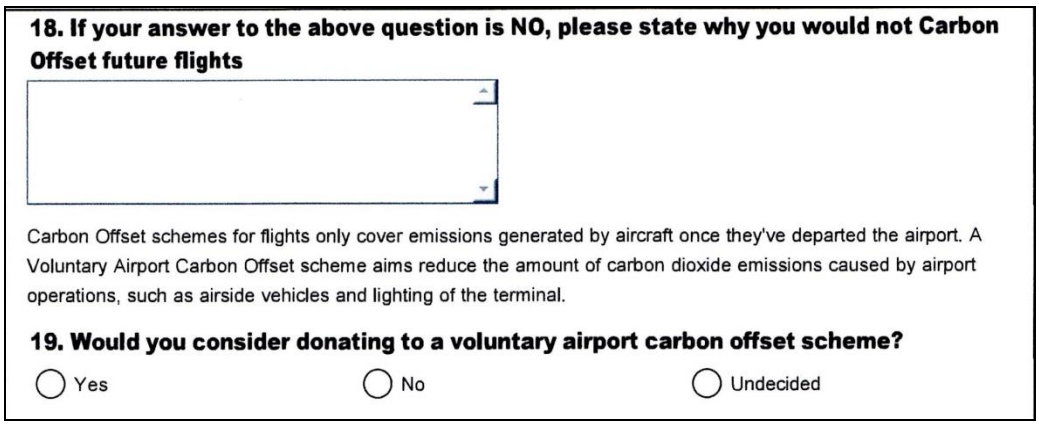
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.664[a]	1	.006		
Continuity Correction[b]	6.523	1	.011		
Likelihood Ratio	7.632	1	.006		
Fisher's Exact Test				.009	.005
Linear-by-Linear Association	7.614	1	.006		
N of Valid Cases	152				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.55.

b. Computed only for a 2x2 table

Significance level of 0.006 means the null hypothesis can be rejected. Women are significantly more likely to offset their flights in the future than males.

Appendix Sixteen: An extract from the online survey, explaining what an airport offset is



18. If your answer to the above question is NO, please state why you would not Carbon Offset future flights

Carbon Offset schemes for flights only cover emissions generated by aircraft once they've departed the airport. A Voluntary Airport Carbon Offset scheme aims reduce the amount of carbon dioxide emissions caused by airport operations, such as airside vehicles and lighting of the terminal.

19. Would you consider donating to a voluntary airport carbon offset scheme?

◯ Yes ◯ No ◯ Undecided

Appendix Seventeen: Chi-Squared test – Under 45's were significantly more likely to donate to an airport offset scheme

Null Hypothesis: There is no relationship between age and engagement in an airport offset scheme

Age Collapsed * Would the passenger donate to the airport Carbon Offset scheme? Crosstabulation

			Would the passenger donate to the airport Carbon Offset scheme?		Total
			Yes	No	
Age Collapsed	18-45	Count	37	22	59
		Expected Count	32.3	26.7	59.0
		% within Age Collapsed	62.7%	37.3%	100.0%
		% of Total	38.9%	23.2%	62.1%
	46+	Count	15	21	36
		Expected Count	19.7	16.3	36.0
		% within Age Collapsed	41.7%	58.3%	100.0%
		% of Total	15.8%	22.1%	37.9%
Total		Count	52	43	95
		Expected Count	52.0	43.0	95.0
		% within Age Collapsed	54.7%	45.3%	100.0%
		% of Total	54.7%	45.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.997[a]	1	.046		
Continuity Correction[b]	3.192	1	.074		
Likelihood Ratio	4.007	1	.045		
Fisher's Exact Test				.057	.037
Linear-by-Linear Association	3.955	1	.047		
N of Valid Cases	95				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.29.

b. Computed only for a 2x2 table

Significance level of 0.046 means the null hypothesis can be rejected. Under 45's are significantly more likely to engage in an airport Carbon Offset scheme than over 45's.

Appendix Eighteen: Chi-Squared test – Those concerned by Climate Change are more likely to donate to a Carbon Offset scheme for Airports

Null Hypothesis: There is no relationship between concern for climate change and engagement in a carbon offset scheme for airports

Passenger feelings on climate change (2 groups) * Would the passenger donate to the airport Carbon Offset scheme? Crosstabulation

			Would the passenger donate to the airport Carbon Offset scheme?			Total
			Yes	No	Undecided	
Passenger feelings on climate change (2 groups)	Not Concerned or Slightly Concerned	Count	10	27	23	60
		Expected Count	20.4	16.9	22.7	60.0
		% within Passenger feelings on climate change (2 groups)	16.7%	45.0%	38.3%	100.0%
		% of Total	6.5%	17.6%	15.0%	39.2%
	Concerned or Very Concerned	Count	42	16	35	93
		Expected Count	31.6	26.1	35.3	93.0
		% within Passenger feelings on climate change (2 groups)	45.2%	17.2%	37.6%	100.0%
		% of Total	27.5%	10.5%	22.9%	60.8%
Total		Count	52	43	58	153
		Expected Count	52.0	43.0	58.0	153.0
		% within Passenger feelings on climate change (2 groups)	34.0%	28.1%	37.9%	100.0%
		% of Total	34.0%	28.1%	37.9%	100.0%

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.743[a]	2	.000
Likelihood Ratio	19.346	2	.000
Linear-by-Linear Association	4.304	1	.038
N of Valid Cases	153		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.86.

Significance level of 0.000 means the null hypothesis can be rejected. There is a significant relationship between concern for climate change and engagement in an airport carbon offset scheme.

Appendix Nineteen: Chi-Squared test – Under45's most likely to donate through the airport app

Null Hypothesis: There is no relationship between age and those likely to offset through an airport app

Age Collapsed * Money to be collected for the scheme by- Own donation through an online App in the airport terminal Crosstabulation

			Money to be collected for the scheme by- Own donation through an online App in the airport terminal		Total
			Yes	No	
Age Collapsed	18-45	Count	29	73	102
		Expected Count	22.8	79.2	102.0
		% within Age Collapsed	28.4%	71.6%	100.0%
		% of Total	20.3%	51.0%	71.3%
	46+	Count	3	38	41
		Expected Count	9.2	31.8	41.0
		% within Age Collapsed	7.3%	92.7%	100.0%
		% of Total	2.1%	26.6%	28.7%
Total		Count	32	111	143
		Expected Count	32.0	111.0	143.0
		% within Age Collapsed	22.4%	77.6%	100.0%
		% of Total	22.4%	77.6%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.506[a]	1	.006		
Continuity Correction[b]	6.340	1	.012		
Likelihood Ratio	8.802	1	.003		
Fisher's Exact Test				.007	.004
Linear-by-Linear Association	7.453	1	.006		
N of Valid Cases	143				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.17.

b. Computed only for a 2x2 table

Significance level of 0.006 means the null hypothesis can be rejected. Under 45's are significantly more likely to opt to donate via an airport app than over 45's.

Appendix Twenty: An example and explanation of how QR codes work

Below is an example of a QR code (Eccersal, 2014):

QR codes are in essence a barcode which holds around 350 times more information than a standard barcode. QR stands for Quick Response and their codes are often placed on posters or objects by a company. A customer takes out their smartphone and with the built in QR reader simply scans the barcode. In an instant they are taken to a page on a website where the company has more information etc. about their product (Kuhn, 2013).

QR codes are a very important piece of marketing as it entices the customer in, especially with QR codes being interactive. For example, a passenger could scan the QR code and be taken to a video explaining the scheme, followed by the option to donate online which increases the engagement rates.

QR code use is still relatively new, however they have shown great potential. Research in 2012 showed that the most populous demographic who scanned QR codes were the 18-34 age range. This fits in with this research with the 18-30 category most likely to donate through an APP (Jackson, 2012). Therefore it is essential that an app and a QR code for the airport offset scheme are developed.

Appendix Twenty One: Chi-Squared test – Passengers concerned by climate change would prefer money to be offset by electric airside vehicles

Null Hypothesis: There is no relationship between a passengers concern for climate change and their preference of investment in electric vehicles

Passenger feelings on climate change (2 groups) * Passenger preference for Airport offset money to be invested in- Making airside vehicles more efficient. I.e. All electric Crosstabulation

			Passenger preference for Airport offset money to be invested in- Making airside vehicles more efficient. I.e. All electric		Total
			Yes	No	
Passenger feelings on climate change (2 groups)	Not Concerned or Slightly Concerned	Count	16	37	53
		Expected Count	23.4	29.6	53.0
		% within Passenger feelings on climate change (2 groups)	30.2%	69.8%	100.0%
		% of Total	11.0%	25.5%	36.6%
	Concerned or Very Concerned	Count	48	44	92
		Expected Count	40.6	51.4	92.0
		% within Passenger feelings on climate change (2 groups)	52.2%	47.8%	100.0%
		% of Total	33.1%	30.3%	63.4%
Total		Count	64	81	145
		Expected Count	64.0	81.0	145.0
		% within Passenger feelings on climate change (2 groups)	44.1%	55.9%	100.0%
		% of Total	44.1%	55.9%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.592[a]	1	.010		
Continuity Correction[b]	5.731	1	.017		
Likelihood Ratio	6.730	1	.009		
Fisher's Exact Test				.015	.008
Linear-by-Linear Association	6.547	1	.011		
N of Valid Cases	145				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.39.

b. Computed only for a 2x2 table

Significance level of 0.010 means the null hypothesis can be rejected. Those passengers concerned or very concerned by climate change are more likely to want the money invested in electric airside vehicles.