CHAPTER II

LITERATURE REVIEW

This study focused on the perceptions and attitudes of Lufthansa Airlines passengers towards the impact of air travel on global warming. The review raised three important issues to meet the objectives. First, the description of global warming should be defined to understand the cause-and-effect chain on the impact side of climate change. Second, it should be defined in order to be able to help protect the earth from the effects of global warming. Companies involved in greenhouse gas emissions should enact policies and planning to preserve our environment for the benefit of the present as well as future generations. Despite the consensus within Lufthansa's management on **the need to act now**, it remains to be seen whether the airline management and the passengers are truly willing to take this action to avoid further threats of climate change and the economic impact on the airline's business.

Global warming

Global warming is becoming a serious issue throughout the entire world. Many scientific evidences for anthropogenic global warming have been emerging continuously. The world is undoubtedly warming; the main cause of global warming is an intensified greenhouse effect, which comes from the increased emission of carbon dioxide and other greenhouse gases from human activities including the airline industry. In terms of climate change, it refers to any change in climate over time, whether due to natural variability or as a result of human activity (IPCC, 1999). Therefore, climate change is the main influence of the global warming phenomenon.

1. Greenhouse effect

Energy from the sun does not get absorbed into the atmosphere directly. It reaches the earth's surface and is absorbed as heat. This heat is then re-emitted back out into space, though at a greatly reduced rate because of the presence of so called greenhouse gases in the atmosphere. The Pew Centre on Global Climate Change website (n.d.) described the greenhouse effect as a natural warming process to keep

the earth warm and habitable. It helps to control the temperature on the earth's surface. Without it, the temperature would drop to about 60 degrees Fahrenheit (15.55° C) or colder on average. For many centuries before the industrial revolution, the greenhouse gases were relatively constant. However, due to the increasing world population and continuous development in industry, the level of greenhouse gases has risen considerably. The cumulative effect of these greenhouse gases has resulted in an increase in the average global temperature, which alters the associated atmospheric circulation and wind patterns. The biggest single contributor is carbon dioxide, but other gases such as chlorofluorocarbons, methane, ozone and nitrous oxides are included (IPCC, 1999). According to the Environmental Unit of the International Civil Aviation Organization's website (February, 2004), during the last century, the average global temperature rose by 0.74°C, and current projections show that it will continue to increase in the future.

Carbon dioxide is the main component of the greenhouse gases that are the leading contributors to global warming (Houghton, 2004). Emissions have reached levels that concern the scientific community principally as a result of energy use by rich countries. Today, fossil energy sources provide some 80 per cent of total energy needs. Globally, forest ecosystems contained 638 billion tons of carbon in 2005, with half of that amount (321 Gt.) in forest biomass and deadwood. The estimated average global rate of forest carbon depletion per year is 1.6 Gt., or about 0.25 per cent of total forest carbon. Deforestation and forest degradation are the primary sources of carbon emissions from some developing countries. In 2004, the forest sector accounted for the release of approximately 8.5 Gt. of carbon dioxide equivalent (GtCO2e), mostly from deforestation, which contributes 17.4 per cent of all human-generated CO2 emissions, (World Economic and Social Survey, 2009).

Today, human activities have overwhelmed the earth's natural feedback mechanism as global warming is mainly caused by human activities. The burning of wood and all sorts of fuels, including cow dung and whale oil, has greatly increased the amount of carbon dioxide produced. At the same time, increasing energy consumption has also had an effect on global warming, and the clearing of forests has reduced the earth's capacity to absorb those effects. The industrial revolution and all its discoveries, especially the use of fossil fuels, have enormously exacerbated the

problem. For every gallon of gasoline burned, 26 pounds of carbon dioxide is put into the air, and greenhouse gas emission from air travel will grow considerably in the future.

2. The airline industry and greenhouse gas emissions

The airline industry has been increasing rapidly over the past 40 years in both local and international routes (Brouwer, Brander and Van Beukering, 2008, p. 301). Indeed, air traffic has been expanding at nearly two and half times the average economic growth rate since 1960. It is expected the number of people flying will virtually double over the next 15 years. This means increasing airport capacity, more flights, more pollution and increasingly crowded airspace (Lufthansa, 2009). Air travel accounts for approximately 46 percent of international tourist arrivals, and costs more than the road-based and water-based transport (Chenoweth, 2009, p. 275). Concerns about greenhouse gas emissions, especially carbon dioxide, from the airline industry are important; the aviation sector was not included in the Kyoto Protocol owing to its international nature and also because of the practical difficulty in assigning emissions to a particular country. According to IPCC (1999), carbon dioxide emissions from civil aviation have risen between 60 percent and over 100 percent between 1992 and 2050. Moreover, the carbon dioxide concentration in the earth's atmosphere has gone up by 100 ppmv, or 35 percent between 1832 (284 ppmv) and 2007 (384 ppmv) (Clayton, 2009, p. 219). Macintosh and Wallace (2009) have suggested that as the global economy continues to grow, aviation carbon dioxide emissions are likely to experience a greater than three-fold increase between 2000 and 2050.

In terms of the impact side, there are three possible ways that air transport can impact the environment: (i) gaseous emissions from aircraft engines (ii) noise pollution and (iii) air craft maintenance operations which contaminate soil and underground water. Moreover, some officials and ground service activities also contribute to the greenhouse gases emissions. Global emissions by international aviation of carbon dioxide and other greenhouse gases, including methane and nitrous oxides from fossil fuels, cost only 1-3 percent of total anthropogenic emissions (Olsthoorn, 2001, p. 87; Brouwer, Brander and Van Beukering, 2008, p. 301). The list of important greenhouse gases and their descriptions are indicated in Table 1 below.

However, air travel for tourism will have greatly significant climate change implications that we should not overlook.

Air travel is an important contributor to global climate changes via fossil fuel consumption, which creates greenhouse gas emission. Therefore, the impacts on the global atmosphere from air travel will be concentrated over Europe and the USA, where 70-80% of all flights occur. Hence the regional climatic impacts of aircraft emissions over these areas are likely to be greater than predicted. Aircraft greenhouse emissions will continue to rise and could contribute up to 15% of global warming from all human activities within 50 years. Improvements in airline and engine technology and in air traffic management are expected to offset the projected growth in aircraft emissions, yet people need to slow the growth in air travel in order to reduce their contribution to aircraft greenhouse gas emissions.

Table 1 Descriptions of important greenhouse gases

Chemical compound	**Description**
Carbon dioxide (CO_2)	The most important greenhouse gas because of the large quantities released and its long residence time in the atmosphere.
Nitrogen oxides (NO_x) Ozone (O_3) Methane (CH_4)	NO_x have two indirect effects on the climate. Nitrogen oxides produce ozone under the influence of sunlight, but they also reduce the atmospheric concentration of methane (these reduction of methane tend to cool the surface of the earth). Both ozone and methane are strong greenhouses gases. They have opposite effects but the net result is that the ozone dominates the methane effect, thus warming the earth.

Table 1 (Cont.)

Chemical compound	Description
Water vapour	Water vapour emitted at high altitude often triggers the formation of condensation trails, or "contrails", (i.e. white-line clouds often visible behind aircraft). These contrails can have a warming effect on the earth's surface. Moreover, contrails may develop into cirrus clouds (i.e. thin, wispy high clouds), which also tend to warm the earth's surface.
Sulphate (SO_x)	SO_x emissions lead to the formation of sulphur aerosols, which reflect solar radiation and thereby cool the atmosphere. They can also have indirect effects by altering cloud formation.
Soot	Soot can act as a warming agent by trapping and radiating heat. It can also have indirect warming effects by altering the albedo (reflectivity) of the earth's surface.

Source: Environmental Unit, 2007

Lufthansa Airlines

Lufthansa Airlines was established in 1926 in Berlin and then it was recreated in 1953. Deutsche Lufthansa AG is its official name, an aviation company with operations worldwide, totalling 107,800 employees at the end of 2008. The group operates in five business segments: (i) passenger transportation (ii) logistics (iii) maintenance, repair and overhaul (iv) IT services and (v) catering.

The business segment passenger transportation includes Lufthansa Passenger Airlines, SWISS and Germanwings, as well as the equity investments in British Midland (BMI), JetBlue and SunExpress. At the end of 2008, the fleet of this business segment was comprised of 515 aircraft (Lufthansa, 2009).

Lufthansa Services (Thailand) Limited was founded in 1993 at Don Muang International Airport. Presently, there are two handling service centres, one at Suvarnabhumi International Airport and the other at Phuket International Airport. The company provides passenger handling, load control services, flight operations and cargo handling supervisions. Its passenger handling department provides check-in services, ticket sales and reservations, baggage services and tracing, including VIP escorts. In addition, Lufthansa Airlines is one of the world's leading international airlines known for its good flight connections, on time performance and the in-flight service responsible for maintaining its image and campaign slogan “There is no better way to fly”. Therefore Lufthansa Services (Thailand) Limited must both maintain the airline’s good reputation and meet the passengers’ expectations. Hence, it emphasizes enhancements in ground staff management, knowledge and technology. Employees are trained both locally and overseas to the highest standards in order to ensure service quality, as well as safety and security. Lufthansa flies daily from Bangkok to Frankfurt.

1. Environmental data

Ralf Wunderlich, Head of Environmental Management at Lufthansa Technik said; “Our customers expect that we offer the same quality and environmental standards worldwide” (Lufthansa, 2009, p. 59). At Lufthansa, in particular, environmental care has been an established part of corporate culture for many years with numerous options for making a contribution to climate protection. Lufthansa’s goal is to reduce their specific CO_2 emissions from its group fleet by 25 percent by 2020, ideally below their recorded level of emissions in 2006. Environmental data from the years 2007 and 2008 are shown below in Table 2. The data indicates that greenhouse gas emissions increased more than 10% in all parameters between 2007 and 2008.

2. Environmental management at Lufthansa

Numerous options are open to the aviation industry for making a contribution to climate protection. At the beginning of 2008, Lufthansa set a long-term perspective environmental program for climate protection. The program was guided by the internationally accepted Four-Pillar Strategy for air transport, which included the

entire range of practicable measures for climate protection in aviation (Lufthansa, 2009, p. 64). The Four- Pillar Strategy on Climate Change is as follows:

2.1 Investments in technology

2.2 Effective operations

2.3 Efficient infrastructures

2.4 Positive economic measures

The first pillar is based on the technological progress, including all opportunities that open up as a result of advanced aircraft and engine technology. The second pillar is related to the improved infrastructure that also offers an enormous potential to reduce CO_2 emissions. The third pillar is the enhanced strategy of measuring and optimising all procedures of airline operations, such as using efficiently sized aircraft, adopting more efficient maintenance processes, and reducing on-board weight. Over the past years, Lufthansa Technik has developed a number of innovative maintenance procedures that reduce the environmental effects caused by aircraft operations. Ralf Wunderlich, Head of Environmental Management at Lufthansa Technik said; “this includes measures to improve engine performance, for example by means of modern engine wash procedures and optimized repair methods” (Lufthansa, 2009, pp. 59-60). And the fourth pillar focuses on economic measures requiring the oversight of a regulatory force, including a global emissions trading system for airlines (Lufthansa, 2009, p. 69).

In addition, Lufthansa has enacted over 120 individual measures in order to reach its environmental goal. Improvements are added continuously every year.

Table 2 The environmental data of Lufthansa Airline

Resource consumption	**Unit**	**2008**	**2007**	**Change**
Fuel consumption	Tones	7,673,141	6,781,412	+13.1%
Fuel consumption, specific, passenger transportation	l/100 pkm	4.34	4.32	+0.5%
Fuel consumption, specific, freight transport	g/tkm	236	228	+3.7%
Emissions				
Carbon dioxide emissions	Tones	24,170,394	21,361,449	+13.1%
Carbon dioxide emissions, specific, passenger transportation	kg/100 pkm	10.93	10.88	+0.5%
Nitrogen oxide emissions	Tones	112,820	98,584	+14.4%
Nitrogen oxide emissions, specific, passenger transportation	kg/100 pkm	50.6	49.8	+1.5%
Carbon monoxide emissions	Tones	17,095	15,313	+11.6%
Carbon monoxide emissions, specific, passenger transportation	kg/100 pkm	8.5	8.6	-1.4%
Unburned hydrocarbons	Tones	2,066	1,901	+8.7%
Unburned hydrocarbons, specific, passenger transportation	kg/100 pkm	1.0	1.0	-3.4%

Source: Lufthansa, 2009

3. Research at Lufthansa

There have been several scientific studies conducted to assess the environmental impact of air transport, including studies specifically related to Lufthansa's impact on global warming. For example, the projects network for the coordination of European research on aviation issues (AERONET) was established to facilitate the exchange of experience and knowledge and to smooth the way for competitive and environmental compatibility in the development of Europe's aerospace industry. The network's many research endeavours can help reduce emissions of CO_2 and other pollutants from air transport particularly by advancing aircraft and engine technology. This approach comprises aircraft flight routing and airport operations alike. Furthermore, Lufthansa completed a feasibility study in Hamburg to reduce its greenhouse gas emissions in the areas of infrastructure and production by at least 30 percent by 2012 (Lufthansa, 2009, pp.63-64, 83).

Concepts of perception and attitude

1. Passenger's perception

1.1 Definition of perception

Kotler, et al. (2003) defined perception as the process whereby individuals gather what they see, hear, and feel from their environment, order these sensations, and attribute meaning to them to gain understanding and knowledge. Klapper (1967) concurs that perception is a process in which people select information from among their varying sensations and synthesize it into a cohesive narrative. Employing these understandings of perception, it is clear that each individual interprets sensations and stimuli differently.

Consumers perceive marketing stimuli selectively because each individual is unique in the combination of his or her needs, attitudes, experiences, and personal characteristics. Selective perception means that a single advertisement, package, or product may be perceived very differently by two different consumers (Assael, 1987). Selective perception ensures that consumers will receive information most relevant to their needs and to brand evaluation. This process is referred to as perceptual vigilance (Assael, 1987).

Chuangchote and Associates (1983) identify two types of factors influencing perceptions: the nature of the stimulus itself and factors relating to the observer. As for the former, a constantly changing stimulus, for example, might rapidly stimulate perception. The latter, on the other hand, may include physical factors such as a hearing impairment, as well as psychological factors, including an individual's culture, experiences, memories, emotional state, needs, and attitudes.

1.2 Identifying customer perceptions

Perception is a process in which the brain interprets and translates individual knowledge and past experiences in order to measure past experience about the service quality, passengers' satisfaction and their expectations. Therefore, it is necessary to measure passengers' past experiences with environmentally-friendly programs. The important point here is the involvement of feelings, emotions and perceptions. In today's competitive marketplace, these perceptions are becoming much more important for gaining sustainable competitive advantages. Customer perceptions are influenced by a variety of factors, not only the actual outcome, but also whether the product or service delivered the expected function and fulfilled the customer's need. Therefore, the whole process of consumption and all interactions involved are of crucial importance (Recklies, 2006).

Customer perceptions are dynamic. First of all, with the developing relationship between customer and company, customers' perceptions of the company and its products or services will change. The more experience customers accumulate, the more their perceptions will shift from fact-based judgements to more general assessments of what the whole relationship gains for them.

Moreover, if the customers' circumstances change, their needs and preferences often change too. In the external environment, the offerings of competitors, to which customers compare a product or service, will alter their perceptions in their search for the best offer around. Another point is that the public opinion towards certain issues can change. This effect can reach from fashion trends to the public expectation of good corporate citizenship.

The concept of customer perception does not only relate to individual customers in consumer markets. It is also valid in business to business situations. Companies have done a lot to improve customer satisfaction and customer relationships in the past. As discussed above, this will not be enough anymore.

Any serious effort to manage customer perceptions starts with a good measurement system. Companies must be truly willing to look at the whole process of interaction through the customers' eyes. The backbone of any customer perception management and measurement system are thorough market research and surveys. There are several aspects of measuring customer perceptions.

First of all, the company has to find out how its offerings and the company itself are perceived by the customers. It is essential to identify what the customers are actually buying and which features are most important to them. Only in this way is it possible to align the internal focus and resources to the customers' expectations. This information is of greater value if it can be compared to the customers' perception of competitive offerings. Not only will this reveal relative strengths and weaknesses, but it is also a valuable source of ideas for improvement. Furthermore, surveys should also identify the relative importance of several influencing variables in the eyes of the customers. To know what matters most to the customer helps to set priorities for projects. Besides, information should be based on careful customer segmentation. Customer groups that differ by frequency of use, social status, geographical region or other criteria, are likely to have different expectations and preferences. Hence, they will probably perceive an offering in different ways.

In meeting customers' requirements and measuring customers' satisfaction indexes, customer perceptions definitely should be a key consideration. Qualified services in the operations execution layer, technical management layer and business development layer are necessary. However, it is even more important to efficiently understand customer expectations and make efforts to exceed what they perceived to be the best value for their money. Therefore, customer perception management becomes a central topic. The biggest challenge is customer perception management, or customer perception satisfaction.

As a matter of fact, one of the major characteristics of service is its intangibility. Since the core value of service is incapable of being perceived by the physical senses, it is an experience and perception that varies with each customer. The final aim and ideal effect of service provisioning is to have customers perceive and enjoy the service. Such perceptions are both at psychological and behavioural levels, and they are the contents of high-quality life in the modern, service-oriented society. Customers are seeking material deliverables as well as perceptive enjoyment when purchasing a service product. Since perceptive enjoyment is a vital service objective, one of the key service management objectives must be meeting customers' perceptive enjoyment.

For instance, in selecting an airline service, beyond all doubt a passenger will consider its service price, delivery quality, service features, service stability, service convenience, and even environmental management, which passengers may recognise as a great issue nowadays. However, many of the considerations are actually intangible concerns, such as service convenience, maturity of the service delivery engagement model, service effect and customer loyalty. Involuntarily, indexes concerning service product functions and delivery quality are all shifted to intangible perception.

1.3 Perception towards global warming and environment

As covered already, perception is a process in which physical sensations are selected, arranged, and interpreted into a meaningful narrative. Individual consumers' perceptions of a company's treatment of environmental issues can begin to establish a wider reputation of the company as "green"--or "not green" (D'Souza, et al., 2007; Olson, 2008). Specifically, in the context of demographics and consumer perception of environmental issues, females showed more interest in promoting "green" activity than males (Andereck, 2009). Stern and Dietz (1994) indicated that women expressed more anxiety due to environmental degradation than men did. According to Mohai (1992), younger tourists derived greater pleasure in engaging in environmentally- friendly activities. Most of the younger group in Shim's study (1995), for example, showed a sense of environmental concern by donating clothes for charity rather than discarding them.

A company's environmental policies manifest its commitment to maintain social responsibility and to respond to environmental concerns. Most high-profile corporations recognise environmentally-friendly policies as an integral component of their strategy, rather than a controversial issue (D'Souza, et al., 2006). Indeed, with customers continuing to demand practices that protect the environment, deliberate attention to environmental concerns has become an indispensable part of many corporate strategies. Yet, firms are often hard-pressed strike a workable balance between their customers' environmental demands and their own bottom line (Berry and Rondinelli, 1998).

Increasingly, customers' changing attitudes are applying pressure on firms to adapt by restructuring their business model and product offerings to make efficient use of their resources and to limit their environmental footprint. Forte and Lamont contend that "consumers increasingly make purchases on the basis of a firm's role in society" (Forte and Lamont, 1998, pp.89-90). Observing the public's increasing demand for environmental responsibility, shareholders also work to emphasize the importance of maintaining a "green" reputation. Given the current social climate, one can see the value in exploring a corporation's perception in light of their consumers' mindfulness of environmental issues (Atkin, 1973).

Global warming has given rise to a new niche in tourism: 'climate tourists'. As icecaps are melting and coral reefs are vanishing, people are rushing to see the natural wonders of the world in increasing numbers, afraid to miss out on the disappearing beauty of towering glaciers, rugged snow-covered mountains, and icebergs. The newfound eco-consciousness has caused a surge in eco-tourism, particularly to the Antarctic. Ecologists are concerned about growing visitor numbers and the impact on the environment. But contrary to popular belief, local researchers are not opposed to tourism (Thoeng, 2009).

It is generally acknowledged that weather and climate play an important role in tourism. Travellers largely base their travel decision on images of sunny beaches or snowy peaks, which is to say, on their perception of climate factors such as temperature, rain, and humidity (e.g. De Freitas, 2001; Smith, 1993). Thus, as climate changes, one can expect travel behaviour to adapt accordingly, both because of evolving conditions that affect what activities are available in a given destination (such

as skiing), and because of perceived changes in comfort level due to the changing climate there. With this change potentially on the horizon, there is an emerging need for more detailed information on tourists' perception of climate if there is to be any trustworthy prediction of how global climate change will affect global travel patterns, especially in warmer tourism hotspots.

Temperature differences tend to influence tourists' perception of comfort. Mansfeld, et al. (2007), states that perceptions might be very different under summer conditions, when both wind conditions and cloudiness might be perceived as rather positive. The study goes on to reveal that domestic tourists, more than foreign tourists, show sensitivity to perceived unfavourable weather conditions, which suggests the importance of other aspects, such as what sort of climate a given tourist calls home. Mansfeld, et al. (2007) concludes that any given weather variable can influence tourists' perception of comfort level, depending on the current weather conditions relative to the destination's usual conditions and the conditions at the tourist's home.

The different aspects of a tourist's internal factors and their inter-relationships as expressed by tourists in this research are visualized in Figure 2. A scientific understanding of climate change and other environmental impacts plays an important role in tourists' perception of climate change, as well as how they assess their individual responsibility. Recognizing knowledge gaps or lack of awareness, tourists expressed the need for more information. Responsibility seems to differ for the individual as a 'tourist' or a general member of society. The latter seemed to be influenced by societal norms, while the responsibility as a tourist was mainly discussed in relation to the barriers that limit tourists' behaviour (Becken, 2007).

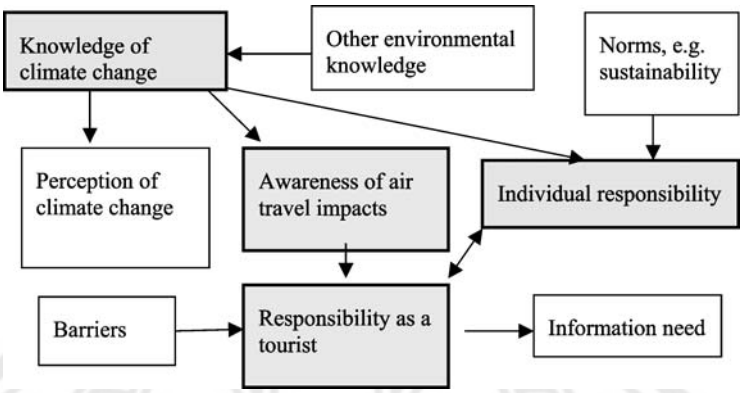

Figure 2 Internal factors: knowledge, perception and awareness of climate change and how they relate to the tourists' perception of responsibility (key factors are highlighted)

Source: Becken, 2007

Despite the lack of specific knowledge relating to tourists' travel, some people perceived that climate change is a massive and immediate problem. Becken (2007) mentions that some people saw climate change in terms of global problems, whereas some noted that other social or environmental problems might be more pressing, for example, alleviating poverty in third world countries. No research participant made a link between those global problems or argued that mitigating climate change could be an important part of decreasing poverty.

Awareness of air travel's climate change impacts relates to knowledge and perception but refers specifically to the individual consciousness about specific facts, (Becken, 2007). Tourists also indicated that increased airfares would not prevent them from travelling and that all people would fly anyway even if tickets were more expensive. This was somewhat contradictory to statements made about their preference for cheap flights. On the other hand, some people care greatly about how to make less impact while they are travelling.

The main elements in the tourist's external environment and relationships are shown in Figure 3. Governments informed by scientists are charged

with implementing and monitoring climate policies and overcoming barriers. Airlines, particularly low-cost airlines, and the tourism industry were mainly seen as being economically affected by climate change policies. Tourists saw themselves affected by the three suggested policy scenarios, which were also seen to impact on global economic growth and the distribution of wealth (i.e. equity). Tourists see themselves in the context of wider societal trends, and the totality of influencing factors has to be seen as an interaction between those displayed in Figures 2 and 3 (Becken, 2007).

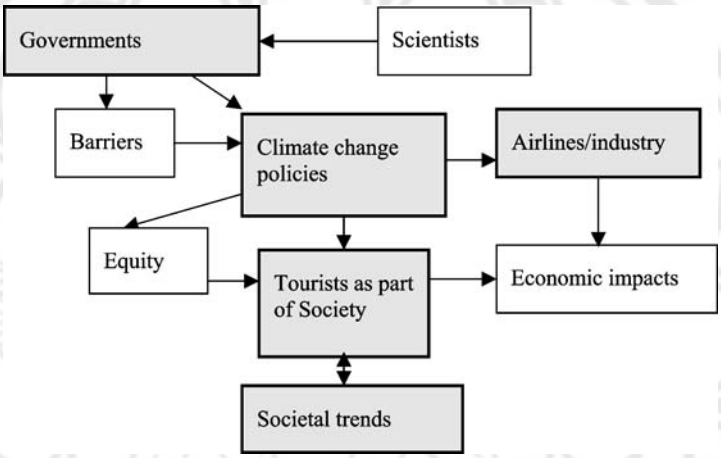

Figure 3 Main aspects of the external environment relating to climate change policies for air travel (key factors are highlighted)

Source: Becken, 2007

Tourists concerned over environmental degradation can be described as green tourists. Swarbrooke and Horner (2007) claimed that green tourists may extend their anxiety over 8 areas (detailed below in Figure 4): wildlife, transport, sporting activities, new building, organisational practices of tourism organisations, pollution, resource use and conservation. They look for ways to protect their home and their lifestyle (Bergin-Seers and Mair, 2008), ways which may include patronizing green companies and refusing to purchase products containing or produced with environmentally hazardous materials (Ottman, 1999; Spence, 2005).

A key issue for the tourism industry is how the green concerns of consumers correlate to tourists and how the concerns convert to travel or holiday-related action. (Goessling, 2002b; Peeters, 2003). Although many in the tourism industry question whether the environmental concerns of tourists influence decision making there is evidence that some tourists may choose an airline based on their environmental management practices. They may also boycott events involving animal cruelty (for example bull-fights) or campaign against tourism development that destroys wildlife habitats. Very 'green' consumers may convert their beliefs into action by not taking holidays away from home so as to prevent harm to the environment, and in so doing, avoid becoming tourists. On the other hand the 'not green at all' tourist is likely to show only a passing interest by reading about the environmental issues caused by tourism. Green behaviour is determined by a number of factors: information obtained from the media and pressure groups, the amount of disposable income and employment (Swarbrooke and Horner, 2007). Green tourists can be concerned about a range of issues, which are summarised in the model shown in Figure 4.

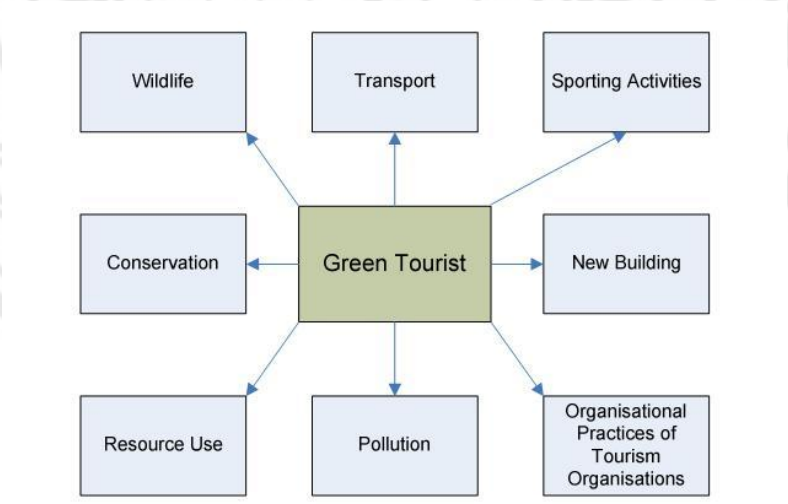

Figure 4 Issues that may concern a green tourist

Source: Swarbrooke, J. and Horner, S., 2007

Tourists' perception of the benefits of these activities may illustrate their attitudes and beliefs toward environmental protection. These varying perceptions influence the behaviour of people in different ways. According to Turner (1997), the positive perception toward the benefits of environmental protection in the context of health, quality of life and economy can lead to the growth of environmental actions.

Passenger perceptions of global warming can be classified into Assael's (1987) three major stages of perception: attention, comprehension and retention.

Attention is the act of noticing a stimulus or certain portions of it. It is selective since people are more likely to notice the portion of a stimulus that relates to their needs and conforms to their experience.

With regard to global warming, many people have heard about it already. However, with all the knowledge that has been fighting for the public's attention, there is still little that people in general do to alleviate the crisis. Yet many people are likely to be more concerned about it and to feel a sense of responsibility for doing something to help reduce carbon dioxide emissions. Accordingly, there have been attempts to understand the effects of increasing temperatures and related parameters (such as rain) on tourist choices of a destination and time of departure. Maddison (2001), for instance, analysed the travel patterns of British tourists to discover that their ideal daytime temperature is 30°C. Tourism numbers drop significantly with even minor temperature increases above this level. He also reported an inverse relationship between rainfall and the rate of tourism.

In a parallel study, Lise and Tol (2002) analysed the travel patterns of tourists from countries in the Organisation of Economic Co-operation and Development (OECD). OECD tourists were found to prefer destinations with temperatures averaging around 21°C during the hottest month. Both studies warned that climate change may lead tourists to alter their travel habits to favour other destinations or seasons of the year. Such changes could have dramatic economic consequences for economies heavily dependent on tourism. "Although very responsive, tourists probably do not care much about climate change. They substitute one destination to another or one travel date to another" (Lise and Tol, 2002, p. 447). Such findings help in assessing travellers' attention to climate variations.

Comprehension is a selective process since people are more likely to interpret a message to agree with their beliefs. Two people may interpret the same information differently because of differences in beliefs, attitudes, and experiences regarding the information being shown (Assael, 1981).

As discussed by Drost (1996), people responded to environmental impacts differently. Specifically, in the context of air travel and global climate change, there are several factors that influence tourists' perception towards airlines' impact on global warming. Some countries are very concerned about environmental issues, with their governments announcing climate change policies to show their responsibility to our planet (Jackson, 2005 as cited in Becken, 2007). Hence, people recognize themselves as world citizens and members of a global society. They expressed their comprehension and willingness to act in accordance with societal trends (O'Connor, et al., 1999; Ryden, 2003; Wei and Ruys, 1997). Individual socio-economic background is also a factor that influences whether people participate in environmentally-friendly programs (Carlsson-Kanyama and Linden, 1999; Rovira, 2000).

Becken (2007) points out in her study that some tourists consider the price of an airplane ticket the primary deciding factor in which airline to choose, much more than any environmental issue. They may choose airlines based on travel cost because of factors including their limited budget. Tourists also tend to be less aware and concerned about airlines' impact on global warming than they are about their own everyday impact on the local environment (Goessling and Peeters, 2007; Spaargaren, 2003).

Retention is the conscious or subconscious internalisation of a message that would otherwise be noticed, interpreted, and quickly forgotten. Messages that are most relevant to people needs are more likely to be remembered.

Global warming is the phrase on everyone's lips these days, and it is practically a daily item in the news. Over the last few years, public interest in the subject has soared to the point where it is now a major issue in political campaigns as well as a hot topic in public and private conversations worldwide (Becken, 2007; Swarbrooke and Horner, 2007). Many believe the phenomenon is permanently changing the earth's climate (Becken and Patterson, 2006).

In summary, perception is a process where physical sensations from the environment are interpreted into understanding using existing knowledge and experience. The subject of airline passengers' perceptions and attitudes must be studied with regard to their awareness of airlines' impact on global warming.

1.4 Perception towards airline-induced global warming

Sixty years ago, the airline's business was a newborn industry responsible for a very small fraction of total transportation. Nowadays, it is an integral part of the global economy, and it carries more than two billion passengers and 41 million tonnes of freight and mail each year. It also shows an approximate accounting for nine percent of global GDP (Airbus, 2007a; ICAO, 2007; UNSD, 2008).

Continuing rapid growth in aviation would promote economic benefits and allow greater mobility among the global population. However, these benefits would come at a cost, most remarkably a significant rise in aviation greenhouse gas emissions. While aviation is not currently one of the main drivers of global warming, the growth of flight paths could make it a more important factor over the coming decades (Macintosh and Wallace, 2009).

As the request of the International Civil Aviation Organization (ICAO) to the Intergovernmental Panel on Climate Change (IPCC, 1999), it demonstrated that civil aviation carbon dioxide emissions could rise by between 60 percent and over 1000 percent between 1992 and 2050. More current research suggests that if strong global economic growth continues, aviation CO2 emissions will most likely experience a higher than three-fold increase between 2000 and 2050 (Horton, 2006; Lee, et al., 2009).

The new reality is that the public must understand tourism and climate change as being in an intertwined relationship (WTO, 2003). As climate change affects tourism patterns, so tourism itself is adding to global climate change, as travel, guest accommodation, and tourist activities all require the burning of large volumes of hydrocarbons (Becken, et al., 2003; Ceron, 2003; Goessling, 2002; Goessling, et al., 2002; Høyer, 2000; Peeters, 2003). Air travel, which is responsible for rendering tourism feasible to so many, has an especially strong impact, as the exhaust is released directly into the upper troposphere and lower stratosphere, affecting ozone and

cloudiness significantly more than similar exhaust released around sea level (IPCC, 1999; Schumann, 2004).

Tourism's increasing contribution to climate change, especially through the use of air travel is now acknowledged. The effects of aircraft emissions on the current and projected climate of our planet may be the most serious long-term environmental issue facing the aviation industry (IPCC, 1999; Aviation and the Environment–Report to the United States Congress, 2004). However, there are large uncertainties in the present understanding of the magnitude of climate impacts due to aviation emissions. With extensive growth in demand expected in aviation over the next few decades, it is imperative that timely action is taken to understand and quantify the potential impacts of aviation emissions to help policymakers address climate and other potential environmental impacts associated with aviation (International Civil Aviation Organization, 2004).

In the 2003 Djerba Declaration, the World Tourism Organisation acknowledged the two-way relationship between tourism and climate change. Climatic changes will have impacts on a number of tourist destinations and tourist flows. In turn, tourism is a major contributor to climate change by its use of fossil fuels and emission of greenhouse gases. Mitigation is therefore an important responsibility for the tourism sector. To date, however, tourism has rarely been recognized as a sector in its own right, despite its increasing economic significance globally. International tourism is growing at a rate of about 4% annually worldwide with an estimated 763 million international arrivals in 2004 (WTO, 2005).

Tourism has only recently attracted attention as both an important contributor to climate change through its greenhouse gas emissions (Goessling, et al., 2002), and an industry that is potentially at high risk given predicted changes in the global climate. Nevertheless, international aviation is an important contributor to global climate change via its fossil fuel consumption and resulting greenhouse gas emissions.

Emissions of nitrogen oxides (NOx), carbon monoxide (CO), unburned hydrocarbons (UHC) and particulate matter (PM) from a variety of airport sources contribute to local air quality deterioration, resulting in human health and welfare impacts. In the United States, local air quality has steadily improved as a result

of the Clean Air Act, which has led to reductions in pollution from most sources (EPA 1999a; EPA 2001). However, many of the technologies employed for land-based sources are not applicable to aircraft because of the more severe weight, volume and safety constraints. Thus, although aviation is a small overall contributor to local air quality impacts, some aircraft emissions are growing against a background of generally decreasing emissions from other sources. Historically, the most difficult of the pollutants to control for aviation has been NOx. Aviation operations below 3000 feet contribute 0.4% to the total national NOx inventory. Forty-one of the 50 largest airports are in ozone non-attainment or maintenance areas.

There are physical and chemical phenomena that make it more challenging to reduce NOx emissions from aircraft engines that employ high temperatures and pressures to reduce fuel consumption. However, there are alternatives for reducing NOx that do not require trade-offs with fuel efficiency; improvements in combustor technology and airframe aerodynamics and weight have led to reductions in NOx emissions without negative effects on fuel efficiency. Over the last 35 years fuel burn per passenger-mile has been reduced by 60%. Two-thirds of this reduction has been due to improvement in engine technology with the rest due to improvements in aerodynamics, weight and operations (Lee, 2000). Continuation of ongoing technology research is expected to reduce fuel consumption at a slower rate about 1% per year over the next 15 to 20 years, with more opportunities for improvement in airframes than engines (IPCC, 1999; Lee, 2001).

The International Air Transport Association (IATA) set a goal of creating a zero-emissions airplane within 50 years. The European Union plans to implement an emissions cap and trading system for airlines by 2012. There are some eco-friendly airlines such as Lufthansa, Qantas, Air New Zealand, Continental, JetBlue and Virgin Atlantic, all with plans for emissions improvement.

Leading the way in alternative energy for aviation is Virgin Atlantic. They just completed the world's first flight using a bio fuel-powered commercial aircraft. Virgin flew its Boeing 747-400 aircraft using 20 percent bio fuel (a mixture of coconut and babassu oil) and 80 percent conventional jet fuel. Clearly dedicated to finding a cleaner and more sustainable form of fuel, Virgin has used all of its profits since 2006 for the research and development of alternative fuels.

In the past decade, Continental Airlines has replaced most of the aircraft in its fleet with more energy-efficient planes. By installing winglets on most of its Boeing 737s and 757s, Continental has saved fuel and reduced emissions by nearly 5 percent. Also, the Houston-based airline has reduced emissions from the ground equipment at its hub by more than 75 percent since 2000. An environmental leader among the legacy carriers, Continental received an award from the U.S. Environmental Protection Agency (EPA) in April 2008 for being the first carrier to use an environmentally friendly pre-treatment on its aircraft.

Emissions trading schemes are in development in three of the main jurisdictions in which Qantas operates: Australia (2010), New Zealand (2011) and the European Union (2012). These schemes could introduce material compliance costs for the group. Qantas continues to press for harmonised schemes that create a level playing field for all participants and 'time to adapt' given the broad benefits aviation brings relative to the size of its carbon footprint. To reduce greenhouse gas emissions and fuel costs, the Qantas is targeting a greater than 25 per cent improvement in emissions intensity by 2020 and has set an inspirational target of zero carbon emissions within 50 years. This estimate is based on the planned arrivals of new technology aircraft, further operational efficiencies, the introduction of cleaner jet fuels and improvements in government controlled air traffic management systems. In 2007, the Qantas Group set a challenging environmental improvement target of a two million tonnes efficiency saving of carbon dioxide emissions and a 7.5 per cent improvement in fuel efficiency by 2011.

1.5 The effect of perception on attitude

Perception is defined as a process by which individuals organize and interpret their sensory impressions in order to give meaning to their environment (Robbins, 2004). For example, there is often disagreement among employees in any organization over pay allowances, administrative back up, policies and procedures and the place of work itself. An individual who displays a positive attitude may perceive the above factors as good and conducive to the work environment while others may consider them inadequate.

Perception is a matter of attitude, whether positive or negative. Some passengers feel and perceive that the prevailing global warming issue is affecting the world. This is indicative of both positive and negative attitude patterns.

Attitude is a predisposition to respond and exerts an influence on a person's response to a person, a thing, an idea, or a situation. Attitudes are an important part of consumer behaviour, because they are linked with perception, learning, emotions, and motivation. For example, a passenger's attitudes toward global warming and the airline service influences his or her perception of how much the airline helps to prevent global warming.

2. Passengers' attitudes

2.1 Definition of attitude

Numerous researchers mention that one's attitude is a factor affecting performance and behaviour. However, a specific definition of attitude is complicated to identify, since an attitude is a predisposition to react favourably or unfavourably toward someone or something. As stated by Fishbien and Ajzen (1975), attitude toward an object is viewed as related to the person's intention to perform a variety of behaviours with respect to an objective. However, it could be said that an attitude is an option stimulated by emotion, which encourages an individual into some specific behaviour. Moreover, attitude plays a significant role in helping people to improve and protect themselves, in order to be able to express the various values, from aiding individuals to understanding the world surrounding them.

Attitude refers to a learned predisposition to respond consistently favourably or unfavourably to an object. Since attitudes are learned, they are affected by information and experiences (Wilkie, 1994). On the other hand, attitudes are predispositions to respond, and lead to their relationship with actual consumer behaviour.

Attitude is defined as a mental, emotional or rational predisposition with regard to a fact, state, person or an object. In the context of consumer behaviour we are studying the attitude of buyer towards all the relevant attributes of a product or service as well as the marketer and market. For this research, attitude means the airline passengers' beliefs, evaluations and behavioural intentions towards airlines' impact on global warming resulting from their perception.

Fishbein and Ajzen (1975) present a conceptual framework of the relationship between belief, attitude and behavioural intention. The major concern of the conceptual framework is the relations between these variables.

Beliefs are the fundamental building blocks in conceptual structure. By reason of direct observation or information received from outside sources or by way of various conclusion processes, a person learns or forms a number of beliefs about some object. The totality of a person's beliefs serves as the informational base that determines his or her attitudes, intentions and behaviours.

Attitude is viewed as effective or evaluative in nature, being determined by a person's beliefs about the object of the attitude. In general, people hold both positive and negative beliefs, and attitude is viewed as corresponding to the total effect associated with their beliefs. Ordinarily, attitude to an object is viewed as related to the person's intentions to perform a variety of behaviours with respect to that object.

2.2 Characteristics of Attitude

The attitudes that have significant influence on an individual's behaviour and personality have certain characteristics. Attitude is formed on the basis of learning, knowledge, information, education, upbringing, thinking, lifestyle, experience, predisposition, belief, faith, outlook, communication, and observation (Ajzen, 1993). It can be good or bad, optimistic or pessimistic, positive or negative, broad or narrow, friendly or unfriendly and so on (Ajzen and Fishbein, 1973). It may be consistent; it may change with several external factors like time or environment; it may even influence or be influenced by other attitudes.

2.3 Functional theory of attitude

From the marketing point of view, this is based on the need fulfilment of buying behaviour. The functions that attitude performs are: 1.Utilitarian– Consumers buy products to fulfil their need, enjoy some benefit, get some extra features and receive after-sales service (Knox and Chernatony, 1989). If they get it according to their expectations, they develop a positive attitude towards that product. If not, then a negative attitude is developed (D'Souza, et al., 2007). Marketers usually stress and highlight the positive aspects of their products to form a positive attitude. 2. Value-expression–The importance of values in our life cannot be overemphasized.

We learn them as we grow up in teaching and training (Miniard and Cohen, 1983). This value system prevents or encourages buyers to buy certain products related to, for example, smoking, drugs, environment, health, ethics, and wildlife.

2.3.1 Ego-defensive–All people are concerned about their self-esteem and ego, always trying to safeguard them. Products intended to boost the ego and self-esteem are the targets of such attitudes.

2.3.2 Knowledge-function–Man is ever inquisitive, curious and seeking knowledge all the time. Information and understanding about products and services help in creating, modifying and changing attitudes towards them.

2.3.3 Combination-function–More often than not, individuals develop an attitude to a product which is the effect of a combination of all these functions.

2.4 Formation of attitude

According to Ajzen (1988), People are not born with attitudes. Rather, they are developed throughout the growing and learning period of life. Below are some of many ways attitudes can be formed:

2.4.1 Classical conditioning–Attitudes about the product are formed over the years by continuous tutoring and exposing the consumer to the product's attributes. Thus, slowly, the consumer's attitude emerges and is reinforced.

2.4.2 Instrumental conditioning–Sometimes attitudes are formed out of an incidence. This is not intentional, but if, for some reason, the consumer tries some new product and develops a favourable or unfavourable attitude, it lays the foundation for future strengthening of the attitude.

2.4.3 Cognitive learning theory–This is similar to classical conditioning, with the difference being that it is associated with learning through mental processing and evaluation as well as the experience of using the product over a period of time.

2.5 Attitude change

Attitudes can be formed, but they can be changed, as well. They can be formed and changed slowly or quickly, and the change could come easy or with much difficulty (Marsh and Matheson, 1983). This phenomenon is very important, and creates a big opportunity for the marketers to influence the consumer's attitude favourably for them and their products (East, 1997). The following are the best possible ways to change a consumer's attitude:

2.5.1 By changing the functional utility–here the functional theory of the attitude is used by the marketers in trying to change the functions of the products by adding or improving them. Such a move can bring about change in attitude to a particular product.

2.5.2 By associating it with a famous personality–marketers often try to change or influence attitude by associating themselves or their products to a famous personality or an established or reputable firm. These can change the attitudes of consumers with already favourable attitudes toward the associated personality.

2.5.3 By changing the features and presenting the product in a new way–marketers sometimes break the monotony and present the products in a new way, as if they are newly launched, by adding some extra features or changing the appearance. This may change the attitudes of consumers looking for a new, fresh look or new features.

2.5.4 By changing the consumer's beliefs about a product–consumers have beliefs and notions about products. Marketers try to change and enhance that belief by giving additional facts and figures about the product to enhance its image.

2.5.5 By changing the consumer's perception of a competitor's products–marketers try to change that perception in such a way that their product looks better. They do not directly assert that the competitor's products are bad, but rather devise certain methods to send the message to the consumers so they can compare and test to see the difference.

The overall meaning, concept, theory and characteristics of attitude can be defined as the passenger's attitude, behaviour and personality that have certain characteristics. As discussed by Ajzen (1993), attitude is formed on the basis of learning, knowledge, information, education, upbringing, thinking, lifestyle, experience, predisposition, belief, faith, outlook, communication, and observation. It may change with several external factors like time or environment, and may influence or even be influenced by other attitudes.

2.6 Attitude towards global warming and environment

Global warming is hardly a new issue. Everyone has surely heard about it. In recent years, information available to the mass public about the causes and consequences of global warming and climate change has increased significantly. This

information increase is reflected in longitudinal data on the number of scientific manuscripts, newspaper articles, and congressional hearings devoted to the issue.

Ronald (2007) noticed that among those who truly believe global warming is an important and urgent issue, only a small fraction is actually putting it in their daily-life agenda. This is not surprising, as it is hard to maintain as part of one's lifestyle an activity the effects of which are not apparent or immediate.

Having focused on national and community environmental problems, the world-wide problems of air, water, and soil degradation, loss of plant and animal species, loss of rain-forests, global warming, and ozone depletion must be considered. Impacts of such truly global problems are expected to be felt worldwide (Dunlap, 1994). In most countries, nearly all of the global problems examined are rated as 'very serious' by majorities of the respondents, although in Japan, Korea, the Philippines, Hungary, Nigeria, and the Netherlands most of the world problems are given that rating by 'only' one-third to one-half of the citizens. Countries whose residents are especially likely to see these seven world problems as very serious include Chile, Brazil, Germany, Portugal, Poland, Uruguay, and Mexico. Thus, it is apparent that citizen concern for worldwide environmental problems is distributed fairly evenly across the nations (although citizens in Nigeria, India, and the Philippines tend to rate most of them less seriously than is the case for other nations). Whereas residents of the poorer nations are much more concerned about local environmental problems than are their counterparts in the wealthy nations, the converse does not hold for the world level: those in the wealthy nations are not substantially more likely than those in the poorer nations to see world problems as very serious.

Turning to the specific global problems examined, water pollution and loss of rain-forests are the most likely to be seen as very serious, followed by ozone depletion, air pollution, loss of species, global warming, and contaminated soil. It is notable that in every country except the Philippines, loss of ozone is seen as more serious than is the related problem of global warming. More importantly, in eighteen of the twenty-four countries, loss of plant and animal species is more likely to be rated 'very serious' than contaminated soil, and in fifteen countries more so is global warming (with which it is interrelated). This suggests that, despite the growing recognition of the threat to human health and welfare posed by environmental

degradation, concern for environmental quality encompasses far more than a narrow concern with human welfare (Dunlap, 1994).

2.7 Attitude towards airline-induced global warming

Aviation is one of the world's fastest growing sources of greenhouse gases. Consequently, some believe that it is essential that growth of the sector be regulated, and that stringent controls be placed on emissions from aircraft. The website Woodland maintains that large-scale expansion would jeopardize the chances of the UK meeting its commitments to reduce greenhouse gas emissions in line with international agreements such as the Kyoto Protocol. Although aviation is not included in the Protocol, it is self-defeating to encourage expansion of an industry that is one of the major contributors to CO2 emissions while attempting to achieve cuts in emissions in other sectors. Targets for reduction of emissions from aircraft should be imposed nationally and internationally. This will require negotiation between the UK and other countries, and we would like to see the UK take the lead in this area, ensuring that emissions from aviation are limited as far as possible. Regulation should be undertaken alongside incentives for airlines to take a more environmentally responsible attitude towards the environment. It is also important that a way is found of internalising the environmental cost that is acceptable to consumers, so that the true cost of flying is recognized.

Belief refers to a person's favourable or unfavourable evaluation of an object, belief represents the information he has about the object. Specifically, a belief links an object to some attribute (Fishbein and Ajzen, 1975). Belief is also subjective judgments about the relationship between two or more things. Ideally, after you finish this chapter, you will believe that it was informative. You may also form a belief about whether the chapter was interesting (versus boring) and easy (versus difficult to understand). For example, beliefs in the aviation industry about conserving kerosene are the key to reducing the environmental effects of flying. Apart from the ecological necessity, this also becomes a purely economic requirement against the background of highly volatile fuel prices. However, airlines in the industry need to collaborate in order to face global warming issues and to undertake actions to reduce greenhouse gas emissions, which will involve saving fuel to limit CO_2 emissions, as the aviation industry's share of CO_2 emissions stands at 2 percent of the atmosphere's total. There

are three ways in which emissions from aircraft could be reduced without affecting the number of flights taken. They include improvements in air traffic management, other improvement in operational efficiency and improvement in technological efficiency (Lufthansa, 2009). Other improvements in operational procedures are often included within discussions about improving technological efficiency. The IPCC (1999, p. 11) clarifies that these operational measures include increasing load factors (carrying more passengers per aircraft), eliminating non-essential weight, optimising aircraft speed, limiting the use of auxiliary power (e.g. for heating and ventilation) and reducing taxiing. Notably, the IPCC dealt with these 'operational procedures' as a self-contained topic and estimated that the potential scale of emissions reductions from such measures was relatively small (2–6 percent). Technology options are defined as improvements in airframe and engine design, and the possible use of alternative fuels. Meanwhile, the International Civil Aviation Organisation has produced guidance entitled 'Operational Opportunities to Minimise Fuel Use and Reduce Emissions' which looks at the possibilities for reducing emissions from existing aircraft by air traffic management and other improvements in operational efficiency (ICAO, 2004).

The chairman of British Airways suggested the use of new economic instruments to reduce the greenhouse gas emissions. The absence of a fuel tax or an emissions-based levy allows airlines to charge artificially low ticket prices, with the cost of pollution being passed on to society and not the passenger.

Fuel taxes–an aviation fuel tax would encourage more efficient airplane by taxing fuel consumption. According to the International Air Transport Association, fuel makes up less than 15 percent of the cost of flying, thus there is little incentive for aviation industry to invest in more efficient airplane. Unlike an emissions trading scheme, which will take years to improve, an aviation fuel tax could be implemented relatively quickly by removing the fuel tax exemption from existing bilateral air service agreements. This should happen at a global level but it could begin at a European Union-wide level if a global agreement could not be reached quickly enough.

Emissions levy–an alternative way to make an aviation industry pay for their pollution is through a charge or tax on airplane emissions. The European Union has suggested an environmental charge or levy for airplane emissions, which

could be implemented on a European-wide basis if no action is taken internationally to reduce aircraft emissions (EU Communication on Air Transport and the Environment IP/99/925). The emissions levy has pros over a fuel tax in that it would directly tax emissions and not just fuel consumption. Moreover, it would be easier to introduce a levy as bilateral air service agreements do not prevent levies on emissions, unlike fuel taxes.

For many years, Lufthansa Technik has used low-emissions paint systems and replaced hazardous substances, such as chlorate solvents and corrosive agents, with substances that are biologically degradable. In addition, the aviation technology company has compiled a "gray list" of hazardous substances that may no longer be used as they harm the environment and the process chain. To reduce greenhouse-gas emissions in the areas of infrastructure and production by at least 30 percent by 2012, Lufthansa Technik completed a feasibility study for its Hamburg location in 2008, revealing a range of concrete implementation opportunities. In addition, the company counts on advanced technologies whenever production venues are rebuilt or remodelled, such as in the area of lighting management.

On the other hand, people can help with global warming issues by making small changes in their routine like using less convenient products and services. There are things people can do with the cars they drive now to conserve energy and be more fuel-efficient, like driving only when necessary, slowing down, not racing the engine and turning off the engine while waiting. Telecommuting and public transportation are other great options, as well as not driving once a week, and walking instead of driving (which is also good exercise). These alternatives to standard driving patterns can save a ton of carbon dioxide emissions every year.

Evaluation is systematic determination of merit, worth, and significance of something or someone using criteria against a set of standards. Evaluation often is used to characterize and appraise subjects of interest in a wide range of human enterprises, including the arts, criminal justice, foundations and non-profit organizations, government, health care, and other human services.

The evaluation could help airlines improve their environmental management system in order to reduce their impact on global warming. As the world's leading provider of technical services for civil aviation, Lufthansa Airlines has

developed numerous new procedures and processes that help aircraft to consume less fuel and thus produce lighter environmental burdens.

In 1996, the Lufthansa subsidiary was the first aircraft maintenance provider worldwide to introduce an environmental management system. This includes measures to improve engine performance, for example, by using a modern engine wash procedure and optimised repair methods. As the engine must continue to produce the same performance, it is exposed to greater stress and wears out sooner. It consumes more kerosene and its exhaust gases are also hotter. After cleaning, an engine runs better again. With the Cyclean Engine Wash, Lufthansa German Airlines can cut back their kerosene requirements by about 0.5 percent and reduce their CO_2 emissions proportionally. This new technology gives Lufthansa the potential to cut its kerosene consumption by up to 25,000 tonnes a year, depending on the fleet. This is equal to avoiding 75,000 tonnes of CO2 emissions. With this new cleaning procedure, aircraft engines are exposed to less thermal stress, which increases their life span considerably, while maintenance costs decline. Furthermore, engines cleaned this way function more efficiently from a thermodynamic point of view.

Given the growth forecasts for air transport, policymakers and public opinion leaders have exerted increasing pressure on airlines and engine manufacturers to lower CO2 emissions and to achieve traffic growth in climate-neutral ways.

The maintenance, repair and overhauling of aircraft can save kerosene. According to the Environmental Program of Lufthansa with Optimized Aircraft Load Planning, optimizing flight routes, flying at variable speeds, these can help to decrease CO_2 emissions. However, Lufthansa Technik does more than just develop environmentally compatible solutions for its customers; they also keep a watchful eye on protecting the environment in its own work processes. This approach is especially evident in three areas: the use of hazardous substances, the sustainable use of natural resources and the reduction of greenhouse-gas emissions in infrastructure and production. With the sustainable use of natural resources, Lufthansa’s environmental program can help to reduce the impact on global warming.

Behavioural intention refers to a person's assumption of holding a specific behavioural intention that influences his subsequent overt behaviour. The intention in the present theory refers to performance of a given action in a given situation; it is the intention to perform the particular overt response that is to be predicted (Fishbein, 1967). In the behavioural intention model described below, Fishbein proposed that behavioural intention (BI) leads to behaviour (B), and that behavioural intention (BI) is determined by the consumer's attitudes toward purchasing or using a brand (Aact) and by a normative value or subjective norm (SN) (Fishbein and Ajzen, 1975).

$$B \sim BI = (Aact)w1 + (SN)u2$$

Where,

$$Aact = \sum_{i=1}^{n} B_i E_i \text{ and } SN = \sum_{j=1}^{k} NB_j MC_j$$

The personal attitudes toward the behaviour refer to whether the person is in favour of or against performing the behaviour in question. The subjective norm is the person's perception of the social pressures for or against performing the behaviour. The w1 and w2 components represent empirically determined regression coefficients.

The attitudes toward purchasing or using a brand are, in turn, a function of the cognitive belief structure ($\Sigma^{n}_{i=1} B_i E_i$). The cognitive belief structure is a belief-evaluation composite where B_i is the belief that performance of the behaviour will lead to a specific outcome, i, and E_i is the evaluation of each consequence, and n is the number of salient outcomes. The subjective norm (SN) is represented as a function of a normative structure ($\Sigma^{n}_{i=1}$ =1 NBjMCj), where NB_j is the perceived expectation that referent j thinks the individual should or should not perform the behaviour. MC_j is the consumer's motivation to comply with referent j, and k is the number of salient referents. Support for the Fishbein model has been extensive in the consumer behaviour literature (Farley, et al., 1981; Ryan and Bonfield, 1980; Sheppard, et al., 1988). Its strong

predictive power for Western consumers has been demonstrated with a variety of consumer products, such as dress (Miniard and Cohen, 1983), toothpaste (Ryan, 1982), dog food and beer (Miniard and Cohen, 1983), mineral water (Knox and Chernatony, 1989) and facial tissue (Mitchell and Olson, 1981).

Many airlines' behavioural intention towards global warming have manifested themselves in the launching of projects for developing efficient aircraft engines that run on biofuel power instead of traditional fossil fuels, since biofuels release less carbon dioxide than fossil fuels. Airlines Management Teams are discussing the impacts of aviation's other emissions and examine the likely scale of emission reductions possible through such improvements in technology and operations, including changes in air traffic management.

The last UK airports policy, which was published over 15 years ago, focused largely on airport capacity while virtually ignoring the impacts of air travel. In 1998 the Government promised to publish a new airports policy, looking 30 years ahead, that would consider the environmental and social impacts of flying. However a new airports policy is unlikely to be published until after the next General Election. According to Friends of the Earth's website (n.d.), the British Government is allowing a massive expansion of UK's airports that is undermining the development of an environmentally-sustainable aviation industry. It is vital that the new airports policy specifically addresses how harmful greenhouse gases from aircraft will be reduced and that adequate resources are put into encouraging alternatives to flying, such as high-speed rail.

Nevertheless, Lufthansa Airlines provides an environmentally-friendly programs in order to reduce CO_2 emissions and help aircraft to consume less fuel, thus producing lighter environmental burdens. Moreover, an airline's environmental development could motivate passengers willing to choose a green airline with a sense of responsibility to global warming, including emission reduction policy and precise, environmentally-friendly operations. Once the customer can notice the numerous developments in environmentally-friendly programs, they may convince friends and relatives to choose the airlines that have environmentally-friendly programs.

2.8 Attitudes on environmentally-friendly airlines (Related/Previous Research)

Another survey of British air travellers shows a familiar pattern of concern by the public over green issues such as climate change and aircraft noise and air pollution, but an unwillingness to let it alter their flying habits. The study, commissioned by Camcon Technology and carried out by international research agency YouGov, reveals that almost three-quarters (74 percent) were worried about the effects, yet only 22 percent admitted the issue had affected the number of flights they took. According to the study, a small majority (54 percent) of the 2,023 adults sampled in September were unconcerned by the proposed expansions at Heathrow and other UK airports. In fact, 41 percent felt that more capacity was required to meet demand. Of the 46 percent who expressed apprehension about the development plans, the key causes for concern were: noise pollution (67 percent), climate change (65 percent), air quality (60 percent), and effect on house prices in the surrounding area (30 percent).

Interestingly, it appears the public expect airlines and aircraft manufacturers to do more to protect the environment. Of those who were concerned over the expansion plans, more than three-quarters (77 percent) said they would feel more comfortable if they knew that airlines and aircraft manufacturers were spending money on developing environmentally friendly planes that burn less fuel and emit less noise.

To protect the environment, the aviation industry needs to examine the technologies that are now available to reduce carbon emissions and help decrease the noise from engine jets, fans and landing gear," said Danny Chapchal, CEO of Camcon. "With European Union regulations placing pressure on airlines to cut emissions by 3 percent in 2012 and airport expansions set to be rolled out across the UK, it is time that a new generation of quieter and more environmentally-friendly planes is developed."

Behind Chapchal's comments is a vested interest. Camcon is a participant in the Aircraft Noise Disturbance Alleviation by Novel Technology (ANDANTE) consortium, which aims to develop noise reduction concepts for engine and airframe component design.

Cambridge-based Camcon has developed binary actuation technology that has been used in work with other consortium members to investigate active jet noise reduction using micro-jet technology. Tests conducted in January on a 1/10th scale model of a large engine exhaust nozzle in the presence of a flight simulation flow and static running resulted in jet noise reductions of approximately 1.5dB.

Conclusion

In conclusion, the study focused on the perceptions and attitudes of Lufthansa Airlines passengers towards airlines' impact on global warming. Global warming is becoming a serious issue throughout the world, and very complex to resolve. The main cause of global warming is the greenhouse effect, which comes from the emission of carbon dioxide and other greenhouse gases from human activities. Moreover, tourism is increasing its contribution to climate change, especially through the use of air travel. The effects of aircraft emissions on the planet may be the most serious long-term environmental issue facing the aviation industry. Therefore, Lufthansa Airlines has set a long-term perspective environmental program for climate protection (Lufthansa, 2009).

Green tourists have tried to find solutions to protect quality of life, such as supporting companies that strive for environmental protection and avoiding using materials that contain hazardous chemicals. Perception is a process where physical sensations from the environment are interpreted into a coherent understanding using existing knowledge and experience. Airline passengers' perception and attitudes result from their consciousness towards airlines' impact on global warming. These consisted of attention, comprehension and retention of the concept related to the ability to protect the environment. The continuing rapid growth of air travel provides economic benefits at the cost of a significant increase in aviation greenhouse gas emissions.

The International Air Transport Association (IATA) has set a goal of creating a zero-emissions airplane within 50 years. There are some eco-friendly airlines such as Lufthansa, Qantas, Air New Zealand, Continental, JetBlue and Virgin Atlantic, all with plans for emissions improvements in order to reduce greenhouse gas emissions and fuel costs by 2020. This estimate is based on the planned arrivals of new technology in aircraft, further operational efficiencies, the introduction of cleaner jet fuels and improvements in government controlled air traffic management systems.

Fishbein and Ajzen (1975) explain that attitudes are formed from a person's beliefs and favourable or unfavourable evaluations of an object. Belief links an object to some attribute and behavioural intention. The aviation industry's belief in the importance of conserving kerosene is the key to reducing the environmental effects of flying. Lufthansa Technik has used low-emissions paint systems, replaced hazardous substances and remodelled in the area of lighting management. Evaluation is often used to characterize subjects of interest in a wide range of human enterprises, and other human services. Evaluations could help airlines to improve their environmental management system in order to reduce their impact on global warming. As the world's leading provider of technical services for civil aviation, Lufthansa Airlines has developed numerous new procedures and processes that help aircraft to consume less fuel, and thus produce lighter environmental burdens.