

Voluntary Carbon Offsets a Solution for Reducing Tourism Emissions? Assessment of Communication Aspects and Mitigation Potential

Eke Eijgelaar¹

Centre for Sustainable Tourism & Transport, NHTV Breda University of Applied Sciences

Contrary to most sectors, to date the tourism and aviation industries have not managed to level off greenhouse gas emissions. Moreover, effective mitigation through technological innovation or structural and behavioural change cannot be expected shortly. Airlines and tourism companies appear to use carbon offsetting as a last resort. However, offsetting is generally acknowledged as a second-best solution for mitigating emissions, after reducing energy use. This paper seeks to determine the mitigation potential of voluntary carbon offsetting by comparing public and industry awareness of climate change and aviation emissions, and attitudes to various mitigation measures with relevant online communication by 64 offset providers. Methods were a literature review and online content analyses. Overall, the gaps that were identified between awareness, attitude and actual behaviour are not bridged by provider communication. From this perspective, the mitigation potential of voluntary carbon offsetting for achieving reductions of tourism transport emissions is estimated as low. The same conclusion is reached by comparing carbon dioxide volumes of flight offsets with actual air travel emissions. Current sales of flight offsets compensate less than 1% of all aviation emissions.

Keywords: tourism emissions, carbon offset, environmental behaviour, mitigation, online communication, content analysis

1. Tourism and aviation emissions

The tourism impact from energy use is one of the most pressing issues regarding the future sustainability of tourism (Gössling et al., 2008). In 2005, total carbon dioxide (CO₂) emissions from worldwide international and domestic tourism were estimated at 1,302 Mt, representing 4.9% of all global emissions. Three quarters of these are transport related; 40% are caused by air travel (UNWTO/UNEP/WMO, 2008). Aviation's share of global CO₂ emissions is just over 2%, but this figure is significant when related to the small share (2-3%) of the world population that uses international aviation on an annual basis (Peeters et al., 2006). In contrast to other sectors, tourism and aviation emissions are growing fast and will continue to increase (Bows et al., 2005; Kahn Ribeiro et al., 2007; Macintosh and Wallace, 2009; IATA, 2008a). The share of aviation in tourism emissions is expected to increase to 52% in 2035 (UNWTO/UNEP/WMO, 2008). These

¹ CSTT, NHTV, PO Box 3917, 4800 DX Breda, The Netherlands, T: +31765332575, E: eijgelaar.e@nhtv.nl

growth scenarios clearly interfere with global emissions reduction efforts of up to 80% by 2050 (Parry et al., 2008; IPCC, 2007). In relation to emission contraction profiles, aviation could represent a very large proportion of national carbon budgets by mid century (Bows et al., 2005). The 2008/2009 recession will merely delay further growth, as past downturns have always seen air traffic recovering (IATA, 2008c). In the above, strong technological improvements have already been accounted for (see Bows et al., 2005; Kahn Ribeiro et al., 2007; Peeters, 2007).

Aviation does not have short- or medium-term alternatives to kerosene or fuel efficiency improvement (Bows and Anderson, 2007). As industry representatives acknowledge: “complete solutions do not exist today” (IATA, 2008a, p. 32). Consequently, global policy interventions and structural changes are needed, but these have long adoption processes. Some recent measures, like the Open Skies agreement and the UK aviation tax, may even lead to a slight rise in emissions (Mayor and Tol, 2008; Mayor and Tol, 2007). The inclusion of aviation in the EU Emissions Trading Scheme (ETS) starting 2012 (cf. EC, 2009), is not expected to lead to significant emissions reductions (Heffernan, 2008; FitzGerald and Tol, 2007). Instead, it may lead to problems for other industries due to rising EU Allowance prices (House of Lords EU Committee, 2006; Bows and Anderson, 2007). It appears very unlikely that aviation emissions can be stabilised at a level consistent with international emission reduction targets without reducing air traffic volumes (Macintosh and Wallace, 2009; Peeters, 2007). A change in transport and tourism behaviour, away from aviation, is needed most. Consumers need clear, consistent and reliable information about the impact of tourism on climate change and positive messages about what mitigating action they can take (Burns and Bibbings, 2007). Unlike airlines, tour operators and destinations have several low-carbon tourism options and sustainable transportation guidelines at their disposal (e.g. de-marketing, carbon labelling and changes in the destination portfolio; see Peeters et al., 2009; Strasdas, 2009). Tourism stakeholders have recently acknowledged the need for mitigation measures (UNWTO/UNEP/WMO, 2008; WTTC, 2009).

In the short-term, voluntary carbon offsetting can be one way of mitigating the impact from aviation on climate change (Gössling et al., 2007). The fact that, until recently, aviation emissions were hardly covered by policy instruments made them very suitable for carbon offsetting (Sterk and Bunse, 2004). Over the last few years, the market in voluntary carbon offsets has experienced rapid growth, yet offsetting is still heavily debated (see section 2.2) and several issues have hardly been researched. One of these is provider communication related to climate change. This paper aims to contribute to the discussion on ways to mitigate tourism emissions by analysing the voluntary carbon offset market from a communication perspective. The objective is to demonstrate the limited mitigation potential of offsets. The next section provides an overview of the voluntary carbon offset market. In section 3 the communicative aspects of offset schemes are assessed and compared to public and industry awareness on climate change, air travel impacts and offsetting. Section 4 shows the actual mitigation share of flight offsets. Finally, outcomes are discussed and concluded upon. The paper is based on an assessment conducted in 2007 (Eijgelaar, 2007) and updated with more recent findings.

2. The voluntary carbon offset market

2.1 Introduction

The UK Department of Energy and Climate Change (DECC) describes carbon offsetting as the compensation of “unavoidable emissions by paying someone to make an equivalent greenhouse gas saving” (DECC, 2009, p. 1). Carbon credits are generated via projects that reduce or absorb emissions, and are sold by offset providers to compensate for any activity, ranging from household energy use and air travel to sport events and business operations. A 2008 analysis of 97 providers and 328 projects found carbon sequestration through reforestation to be the most

frequently used project type (33%), followed by renewable energy and methane abatement with 26% each. Energy efficiency projects were used much less frequently (Kotchen, 2009). The voluntary market tries to fill the gap left by ineffective government action and the fact that climate policy does not sufficiently address private individuals and (smaller) businesses, its main advantage being the immediate availability of offsets (Capoor and Ambrosi, 2007; Boon et al., 2007; Sterk and Bunse, 2004). Voluntary carbon offset providers sell credits to anyone or any organisation that does not need to comply with regulatory caps and can work within or outside the Kyoto Protocol initiatives Clean Development Mechanism (CDM) and Joint Implementation (JI) (Braun and Stute, 2004; Kollmuss and Bowell, 2007).

2.2 Issues

Previous assessments have revealed great differences in the project standards, calculation methods, transparency and project verification of offset schemes (Boon et al., 2007; Clean Air-Cool Planet, 2006; Gössling et al., 2007; Kollmuss and Bowell, 2007; Hooper et al., 2008). Besides these, the additionality, double counting, permanence, leakage and sustainability benefits of offsets are some of the main issues facing criticism. Consequently, the credibility of offset providers is questioned and consumers are discouraged from using offsets (Elgin, 2007; Hammond, 2007; Traufetter, 2006; Davies, 2007; Revkin, 2007). Part of this can be attributed to the young age of the trade (Clean Air-Cool Planet, 2006; Kollmuss and Bowell, 2007), but even market experts regard the voluntary market as non-transparent and few believe it produces real emission reductions (Røine et al., 2008). The lack of standards and credibility may even result in a collapse of the voluntary market (Hooper et al., 2008; Gillenwater et al., 2007). In response to the above, at least a dozen standards have been developed (see Hamilton et al., 2008; Kollmuss et al., 2008). Additionally, the UK government has introduced a Quality Assurance Scheme for Carbon Offsetting in an effort to secure that consumers receive credible information about their impacts, offset projects and sustainable alternatives (DECC, 2009).

Issues aside and provided that all emissions are accurately calculated and compensated, an emissions reduction achieved through offsets could be regarded as equal to a direct reduction (Gillenwater et al., 2007). This is not entirely realistic as the long-term impact of various reductions, for example technological innovation versus modal shift, varies considerably (cf. Kollmuss et al., 2008). The availability of offsetting has some potential to increase public awareness of climate change (Gössling et al., 2007) and foster technological innovation (Gillenwater et al., 2007; Harris, 2007). However, there is much concern about a negative effect on the transition of participating industries and individuals towards low-carbon technologies and practices, including the support of unsustainable travel (Hooper et al., 2008; Gössling et al., 2007). This concern is certainly applicable to aviation, where a business-as-usual scenario combined with offsetting as a main mitigation strategy would lead to a substantial growth of emissions (Bows et al., 2005).

2.3 The market

Despite these issues, the voluntary carbon market has grown rapidly over the last years (see figure 1): from 6 schemes in 1999 to at least 170 in 2008 (ENDS, 2008). At least 64 anglophone providers of flight offsets were counted in September 2007, of which 56% were non-profit schemes (Eijgelaar, 2007). There appears to be a shift from non-profit to for-profit: December 2008, two thirds of 97 providers were for-profit (Kotchen, 2009). Of these providers, 43% were based in Europe, 40% in the USA/Canada and 17% in Australia/New Zealand. The majority (56%) of projects were located in developing countries (ibid.).

The voluntary carbon market consists of two segments: the Over-the-counter (OTC) market, and allowance-based markets such as the Chicago Climate Exchange (CCX). On the CCX, firms trade allowances after having committed themselves to emission limits on a voluntary base (a cap-and-

trade system). The very diverse and unregulated OTC market caters both to companies and individuals that want to offset their emissions. The OTC market is where most, if not all flight offsets are traded. The combined voluntary transactions for the OTC and CCX markets have increased rapidly from 11 Mt CO₂-equivalents (CO₂e) in 2005 to 123 Mt CO₂e in 2008 (Hamilton et al., 2009). However, these figures are for transactions, meaning the credits have not necessarily been retired yet, which would result in an actual emission reduction. For example, only 12 Mt of the 54 Mt CO₂e sold on the OTC market in 2008 have already been retired. Overall, the voluntary market is a small player compared to the 4,090 Mt CO₂e traded on the regulated carbon market in 2008 (ibid.). Figures on the extent to which offsets are offered by the tourism industry and its sectors are unavailable, but a rapid increase in use is evident from the constant flow of new partnership announcements with tour operators or airlines by offset providers. For aviation, IATA (2009) reported that over 30 international airlines ran offset programs and 15 airlines had signed up to IATA's own offset program by December 2009.

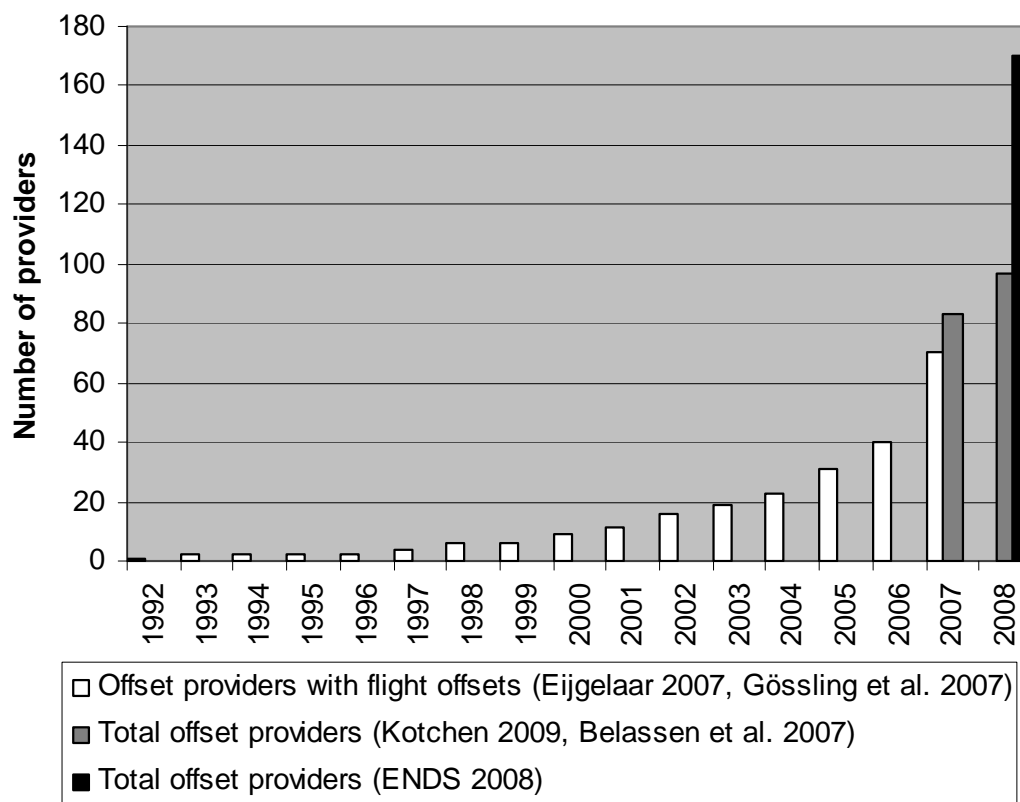


Figure 1. Number of voluntary carbon offset providers

3. Assessment of communication aspects

3.1 Introduction

Although it is widely acknowledged that reduction should always precede offsetting, this strategy is not always effectively communicated. Voluntary compensation schemes can help raising public awareness of climate change and the need to act (Boon et al., 2007; Hooper et al., 2008), but only if consumers are well-informed about their impact on climate change (see Burns and Bibbings, 2007). Otherwise they may conclude that compensation allows a continuation of energy-intensive travel lifestyles (Boon et al., 2007; Gössling et al., 2007). Taiyab (2006) sees raising public awareness of climate change and carbon offsetting as a key factor for the success of

the voluntary market. However, raised awareness and changed attitudes do not often result in a change of behaviour (see Kollmuss and Agyeman, 2002).

There is little scientific understanding of the reasons for growth in air travel in terms of people's motivations and decision-making process to use air travel, as well as of the public knowledge of air travel impacts on climate change (Anable et al., 2006). Neither has the willingness of consumers to change travel behaviour or mitigate their impacts in other ways been researched in much detail (Becken, 2004). Such understanding is critical for motivating public support for mitigating action. Air travellers that know little about aviation impacts do express the need for information on the subject (Becken, 2007). Thus it is essential for offset providers to educate their customers about climate change and aviation impacts, and more importantly, to provide options for reducing emissions. The latter should be given priority over offsetting (Gössling et al., 2007; Sterk and Bunse, 2004). These aspects were included in the UK Government Quality Assurance Scheme for Carbon Offsetting (DECC, 2009). The scheme requires providers to give information on climate change, the importance of reducing emissions, advice on how to do this, and on the role of offsetting in tackling climate change.

Communication or consumer education by voluntary carbon offset schemes has received limited attention. Providing sufficient transparency is already a problem for many offset providers (Clean Air-Cool Planet, 2006; Taiyab, 2006). An evaluation of 30 providers revealed a general poor performance of consumer education on global warming; most providers did not feel responsible (Clean Air-Cool Planet, 2006). Ribón and Scott (2007) found only a few Australian providers who communicated offsetting as being only one element for mitigating impacts on climate change and some encouraging consumers to reduce first and then offset. Hooper et al. (2008) analysed the educational information of 42 providers: 17 schemes provided comprehensive information on climate change, offsetting and ways to reduce emissions; 18 schemes provided adequate information on two of these three issues; the informative content of seven schemes was described as poor. Teiwes (2008) evaluated 17 North American providers on several criteria, of which customer education on issues related to climate change and offsetting was one. On this criterion, six were evaluated as 'excellent', four as 'good', and seven as 'poor'.

In order to close some of these research gaps, this paper compares online communication of voluntary offset schemes on climate change, air travel impacts, offsetting and reduction advice with public and industry awareness of and attitudes to the same issues. The result is used to evaluate the potential of voluntary carbon offsetting to induce sustainable lifestyles and its contribution to climate change mitigation from tourism emissions.

3.2 Methods

The overview of global public and industry perceptions of and attitudes to climate change and air travel behaviour is based on a literature review. Some of the most comprehensive reports were published in the UK (e.g. Anable et al., 2006). Research on the perceptions of tourism stakeholders on climate change and travel emissions has only just started (Becken, 2004; Becken, 2007; Lund-Durlacher et al., 2007; Driscoll et al., 2007; Shaw and Thomas, 2006; Gössling et al., 2009).

Provider communication was analysed online. Publications and websites on voluntary carbon offsetting (Gössling et al., 2007; Kollmuss and Bowell, 2007; Ribón and Scott, 2007; Clean Air-Cool Planet, 2006; Taiyab, 2006; Boon et al., 2007; Sterk and Bunse, 2004) were consulted for the selection of applicable schemes. Only schemes that offered flight offsets and provided English content were included. Automated and conventional online content analyses were used for evaluating textual content of selected websites. The conventional analysis assessed if providers communicate the importance of reducing emissions before offsetting, and if advice is given on how to reduce air travel emissions. From a mitigation point-of-view, these are the most essential,

but from a marketing perspective the most controversial educative elements providers need to communicate. Website material was analysed systematically through inductive category development (Mayring, 2000). Categories were described and defined in a coding agenda with which all websites were analysed. In order to assess information depth on climate change, carbon offsetting and advice on reducing emissions, an automated frequency analysis matched a list of pre-defined terms with the online content of carbon offset providers. The terms were written as Regular Expressions (REs) to match the website content (see Kuchling, Undated). The analysis was performed by a custom Linux script. The textual content of each website was downloaded to create a mirror sample. A loop based on the 'egrep' Linux command matched the REs in all webpages. Initially, an excel sheet with total frequency counts per expression was produced. Some REs were then altered or deleted for being too ambiguous or to exclude irrelevant content. Finally, matches were manually cleaned, resulting in 165 REs with 29,000 matches. All content analyses were conducted from September to October 2007.

3.3 Review of public and industry attitudes

The literature review revealed a generally high level of awareness of climate change in industrialised countries, whereas levels of concern vary. Both public and industry are not always well-informed about exact causes. Some 30 to 40% of the public and tourism industry representatives recognise air travel as a contributor to climate change. Only few citizens and tourism professionals can identify relevant measures for reducing (air travel) emissions. Evidence shows that tourism companies and airlines are gradually adopting carbon offsetting as an environmental strategy; tour operators refrain from measures that would increase the price of their products. A growing number of people seem to be willing to pay for mitigating climate change, though there are differences between countries and target groups (see e.g. Anable et al., 2006; Brouwer et al., 2008; Hooper et al., 2008). Support for policy measures like air tax is limited. On average, some 2 to 5% of the public uses offsets. Despite the public's greater confidence in governments and industries to solve climate change, personal environmentally friendly behaviour appears to have increased. However, people are less willing to change travel behaviour than other consumptive behaviours (Anable et al., 2006). Willingness to reduce flying ranges between 7 and 17%. There is very little evidence on willingness to shift transport modes, and even if there was, tourism professionals do not seem keen to introduce modal changes to their products.

Overall, large information deficits were found. Figure 2 illustrates the present gaps between awareness, attitudes and behaviour related to air travel and climate change. The results from this assessment (Eijgelaar, 2007) are for the UK only, because the evidence from this country is most comprehensive. Recent surveys of air travellers by Hooper et al. (2008) and Gössling et al. (2009) signal that awareness of air travel impacts and willingness to pay for offsets is high among air travellers, though travel and offset behaviour remains the same, making the attitude-behaviour gap only seem bigger. A Dutch airport survey suggests that higher levels of awareness of aviation impacts and/or a higher sense of personal responsibility for climate change have a positive impact on the willingness to pay for a carbon tax (Brouwer et al., 2008). However, if on a voluntary basis, only 10% of the original 75% who were willing to pay were very sure they would actually pay the tax (Akter et al., 2009).

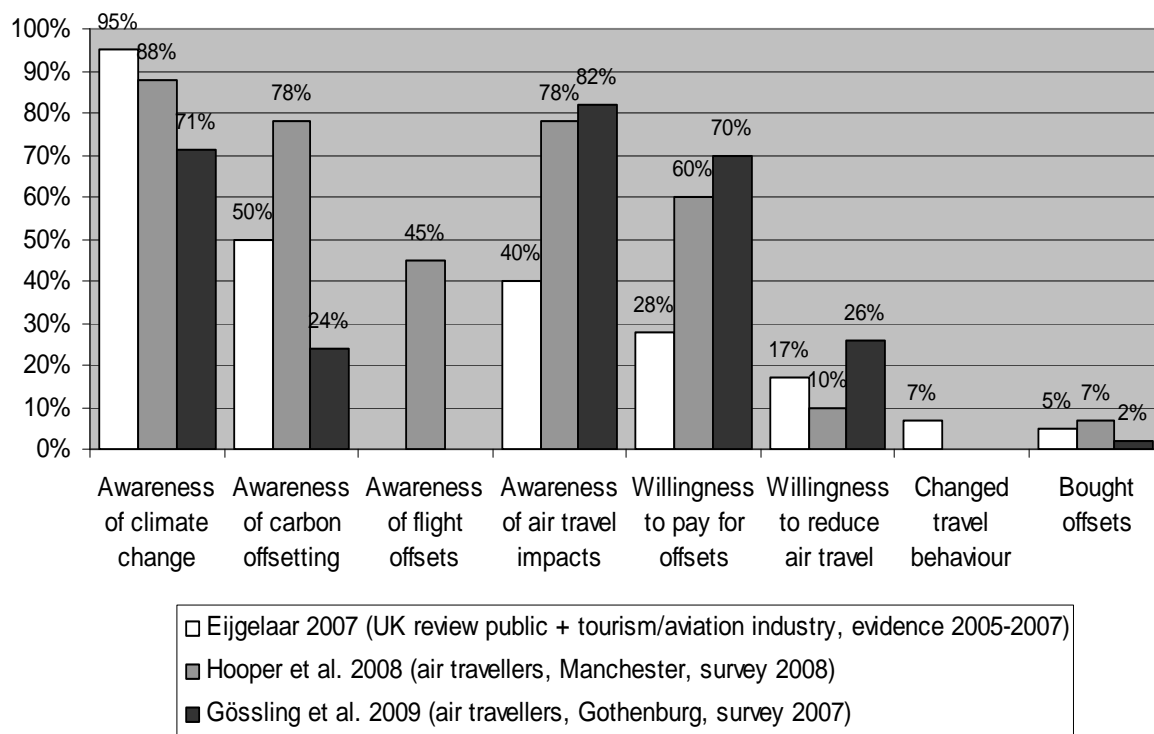


Figure 2. Levels of awareness, attitude and behaviour regarding climate change, air travel and offsets

3.4 Results content analyses

The websites of 64 voluntary carbon offset schemes were selected for analysis. Two thirds of these schemes were based in the UK (23) and North America (21); twelve were based in Australia and New Zealand, and eight in the rest of Europe. 36 schemes were operating non-profit and 28 for-profit. Two thirds (42) featured origin-destination calculators for measuring air travel emissions. Another five sites provided such calculators via external links, while seven required the user to estimate miles flown and ten offered far less accurate 'packages' for offsetting air travel emissions. A slight majority (58%) of voluntary carbon offset providers emphasised the importance of reducing energy use and emissions before using carbon offsets, but only 14 (22%) did so on their homepage. Many clearly prioritised offsetting and eleven sites (17%) did not contain any content on the need to reduce. 48 sites (75%) provided general advice on reducing energy consumption and 21 sites (33%) did so for air travel. The amount of advice varied greatly and relevant content was often hard to find. Few schemes provided appropriate information on how to reduce air travel emissions: video conferences, train travel and holidaying locally were most frequently mentioned (only seven sites provided three or more alternatives for air travel). More innovative sustainable transportation alternatives and external links to sustainable tourism and transportation companies were largely absent. Advice was often supported with personal or corporate economic and responsibility-oriented arguments.

Climate change and its causes were explained by nearly all providers, but often very superficial or left to other organisations via links. The variety of terms used for describing the impacts was larger than for explaining the science and causes of climate change (26 vs. 20 terms). Only three schemes provided scientifically based information on air travel impacts of some depth (i.e. used at least 5 different terms). Carbon offsetting was explained sufficiently (51 terms in total), but general and project type-related terms were used much more than project standards. Many schemes were inconsistent as they did not combine the information on various topics, for example 12 of the 19 schemes that provided content on air travel impacts did not provide advice

on reducing air travel. Only one site (Carbon Fund) reached the highest category for four concepts (importance of reducing energy use, reduction advice, climate change science, climate change impacts), but failed to provide information on the impacts from air travel.

3.5 Comparison

The results of the previous two sections are compared to determine the mitigation potential of voluntary carbon offsetting. The validity of this comparison is limited by a number of factors, such as the many other influences of environmental behaviour that were not considered (cf. Anable et al., 2006), the low evidence base for some topics and the limitations of the content analyses due to rapidly changing Web content. Despite these constraints, a distinct trend is revealed: overall, online consumer education does not fill the knowledge gaps identified in the attitude review (see figure 3). Those topics that require urgent public and industry attention and for which awareness is low – causes of climate change, impacts from and reduction advice for air travel – are also communicated least sufficient by offset providers. Vice versa, topics that are better-known are also more often mentioned by providers. The information deficits seem equal among all stakeholders: the public, tourism companies, airlines, and offset providers. Nevertheless, the overall performance of consumer education on climate change and reduction advice by offset providers appears to have improved since the evaluation by Clean Air-Cool Planet (2006), which can also be concluded by the results of Hooper et al. (2008) and Teiwes (2008).

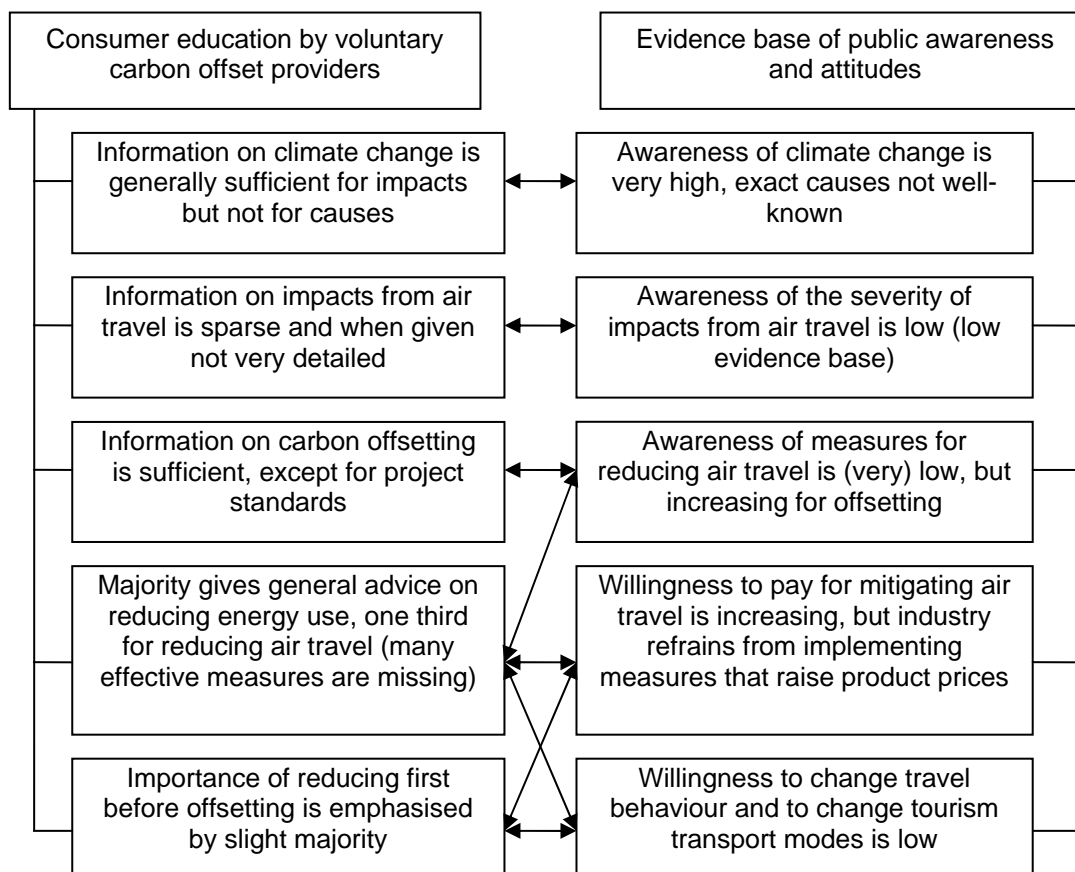


Figure 3. Comparison of results of attitude review and provider analysis

4. Mitigation share of flight offsets

A more direct way of evaluating the mitigation potential of voluntary carbon offsetting is to look at the actual share of offset volume of emissions. In this case the sales volume of flight offsets is compared with aviation emissions. Total CO₂ emissions from air travel were estimated at 705 Mt in 2004 and tourism air travel emissions at 515 Mt in 2005 ((IATA, 2008b; UNWTO/UNEP/WMO, 2008). There are no figures known for the global sale of flight offsets. Evidence of offset take-up by tour operators or airlines is limited to some individual reports. For airlines, IATA (2008a) reports passenger use of offsets as low. Take-up was virtually zero percent with trips offered by Fritidsreseguppen/TUI Nordic (Gössling et al., 2009). On the other hand, both TUIfly and Dutch online ticket seller Cheaptickets report an offset take-up of at least 8% (TUIfly, 2008; CNG, 2009). Because offset schemes tend to provide a better overview of their market, this paper's estimates are based on their data.

For this paper, flight offset CO₂ volumes are compared with national aviation CO₂ emissions, despite the international character of this largely online market. Table 1 shows the comparison for three providers in Germany and the Netherlands; two countries with few other flight offset schemes. In these countries, the mitigation share of flight offsets is limited to 0.35-0.39% of annual national aviation emissions. Other providers do not specify flight offset sales, and are therefore unsuitable for comparison. In the UK, Daviss (2007) estimated that 1.5 million people bought flight offsets in 2006. Compared to 235 million terminal passengers in all UK airports (CAA, 2007), the share of compensated flights is equally low. Even in the unlikely event of 100 schemes selling the same amount of flight offsets as atmosfair, the total volume would just exceed 1% of global aviation emissions.

Table 1. Comparison of flight offset volumes with national aviation emissions

Country	Aviation emissions (int. & dom.)	Provider	Flight offset sales	Share of national aviation emissions
Germany	25 Mt CO ₂ (2005)	atmosfair	88,600 t CO ₂ (2008)	0.35%
Netherlands	11 Mt CO ₂ (2005)	GreenSeat	18,000 t CO ₂ * (2007)	0.16%
		Trees for Travel	25,000 t CO ₂ (2007)	0.23%

*CO₂ calculated by assuming an annual offset sale of 60,000 flight stretches and using a global emission factor for passenger air transport of 0.129 kg CO₂/pkm and an average return distance of 4,580 km (UNWTO/UNEP/WMO, 2008)

Sources: atmosfair, 2009; CNG, 2007; OECD/ITF, 2008; Trees for Travel, 2008

Another estimate can be made by using offset retailer survey results. Individuals and businesses offsetting travel emissions each occupied an 11% share of the customer group base of 24 retailers surveyed in 2006 (Harris, 2007). Comparing these percentages to the total market volume of 2006 as used by the same author (10 Mt CO₂e), would mean flight offsets equalled around 2.2 Mt CO₂e. Respondents in a 2009 survey of brokers, developers, retailers and wholesalers by Hamilton et al. (2009) claimed that individuals bought 2% of the transaction volume of the OTC market in 2008, down from 5% in 2007. In 2007, another 6% was used for offsetting business flights (Hamilton et al., 2008; no figure for 2008). Thus, a combined volume of less than 4 Mt CO₂e used for compensating air travel would be a high estimate. Comparing these CO₂e offset estimates with air travel CO₂ emissions would imply that around 0.5% of aviation emissions were compensated for by voluntary carbon offsets. However, this offset share will actually be much lower, as air travel emissions are CO₂ only, and therefore significantly underestimated considering all greenhouse gas emissions and effects. The non-carbon impacts of aviation on radiative forcing (RF) may be up to five times the RF of all cumulated aviation CO₂ emissions since 1940 (see Lee et al., 2009). In conclusion, the total volume of annual flight offsets is

estimated to compensate less than 1% of global annual air travel emissions, thereby confirming a previous estimate by Boon et al. (2007).

5. Discussion

The results in the previous sections show that voluntary carbon offsetting does not contribute significantly to climate change mitigation from tourism. On the basis of these results, its future potential to do so is also estimated as low. Many stakeholders seem to agree on this and regard offsetting as a second-best solution for mitigating climate change, after reducing energy use: for example governments (DECC, 2009), offset retailers (Harris, 2007) and aviation representatives (ICAO, 2007). Offsetting should be seen as a transitional alternative for policy and technological solutions that are currently missing and which should bring the structural changes and government-mandated schemes needed (Sterk and Bunse, 2004; Braun and Stute, 2004; Gillenwater et al., 2007; Taiyab, 2006). In this context, tourism companies and airlines will most certainly keep using carbon offsets to justify further growth (Broderick, 2009), as was feared by Gössling et al. (2007). After all, other industry reduction efforts, like more structural changes in tourism management, are perceived to raise product prices and deter customers (Driscoll et al., 2007). Confirming this worrying trend, market experts identified the option 'offset purchases are easier than direct emissions reduction' as the third greatest motivation for buyers, after CSR and PR (Hamilton et al., 2009). Most likely, tourism companies still need considerable persuasion about the positive impacts of adaptation to climate change on their (economic) survival, before they will act more structurally (see Hall, 2009). Both the state of 'collective denial' described by Becken (2007) and the 'clear conscience' perspective of Downing and Ballantyne (2007) apply here: everyone is showing a green image while waiting for others to take effective action. This trend does establish carbon offset schemes on a broader basis, but may also lead to an 'offset and keep flying' instead of the required 'reduce or stop flying' behaviour (cf. Boon et al., 2007). Consumers thus maintain their energy-intensive, mobile lifestyles (Gössling et al., 2007; Sterk and Bunse, 2004).

As the gap between the willingness to offset or change travel behaviour and actual behaviour is likely to remain substantial, the huge offset market potential identified in willingness to pay studies (e.g. Brouwer et al., 2008; MacKerron et al., 2009) is equally likely to remain untouched. As long as consumers on the main market remain largely uninvolved, substantial mitigation of tourism and aviation emissions cannot be expected from voluntary carbon offsetting. This is confirmed by the comparison between flight offset sales and aviation emissions in the previous section. However, its short-term use for individuals and businesses wanting to take action should not be neglected. Hence, Daley et al. (2009, p. 362) see offsetting as "part of an overall, integrated aviation and climate policy that is focused primarily on reducing greenhouse gas emissions and that contributes to the overall transition to a low-carbon economy, rather than being simply mechanisms for raising revenue." Meanwhile, the noted decrease in the amount of offsets bought by individuals may already signal reduced interest in offsetting (Hamilton et al., 2009).

The content analysis has shown that clear and appropriate information was not always available on the websites of voluntary carbon offset schemes. Not a single scheme offered sufficient information on all topics analysed. The question is whether improving consumer education by carbon offset schemes will bridge the identified gaps. Along with increasing exposure to carbon offset schemes via tourism and airline websites this may increase awareness of travel impacts and willingness to pay for offsets, but not behavioural change (see Kollmuss and Agyeman, 2002). An uncontrolled increase in offset schemes and standards could also confuse and deter the average consumer, much like what happened with many tourism ecolabels (Hart et al., 2004).

By offering and using carbon offsets, more individuals and businesses have at least started thinking about the sustainability of their travel behaviour and business strategies. After all, the

very concept of 'voluntary' carbon offsetting implies a commitment to climate protection (Sterk and Bunse, 2004). But due to its similarities with other ethical market approaches, voluntary offsetting could remain a niche market for responsible individuals and businesses (Bellassen and Leguet, 2007). There would be no harm in targeting information more towards 'willing' consumers: the stronger the belief about the relationship between air travel, climate change and offsetting, and about the ability of individuals to limit their air travel impacts, the higher the willingness to pay and the higher the likeliness to offset (Hooper et al., 2008). The problem is that the majority of air passengers hold airlines and governments far more responsible for mitigating aviation emissions than themselves. Meanwhile, there are other ways to increase offset uptake: some positive results have been reported with small 'opt-out' donations and mandatory offsets (see Hooper et al., 2008; Gössling et al., 2009). These cases may provide valuable lessons to offset providers and policy makers.

6. Conclusion and recommendations

The evidence in this assessment points to a low potential of voluntary carbon offsetting for mitigating tourism transport emissions and for inducing sustainable lifestyles, particularly concerning air travel. This starts with the generally low public and industry awareness of the severity of air travel impacts, and of measures for reducing air travel emissions. Also, raised awareness of other issues, like climate change, has not increased offset sales or changed travel behaviour. On top of that, online communication by offset providers does not close the identified knowledge gaps. And finally, current sales of flight offsets compensate less than 1% of tourism aviation respectively all aviation emissions. There appears to be consensus about the limited use of carbon offsetting for mitigating climate change among many important stakeholders. Nevertheless it will likely remain a frequently used tool until policy and technology have come to terms with the present situation and more structural changes have been achieved.

Consequently, the voluntary carbon offset market remains an interesting research topic. There is still little evidence on how travellers who offset compare to travellers who do not use offsets, in respect to their environmental awareness, attitudes and behaviour. Understanding attitudes to air travel and to alternatives for air travel remains essential for finding ways to effectively close attitude-behaviour gaps. At least as important would be to investigate whether offsetting limits the willingness of individuals, businesses, tourism companies and airlines to engage in structural, technological and behavioural change. The tourism and aviation sectors should engage in developing innovative low-carbon products and take leadership in emissions reduction by adopting more structural changes, instead of focusing on offsets. Raising awareness among customers and staff, and engaging them in response processes, remains necessary. Unfortunately, figures on the offset market are limited. In this respect it will be most helpful that the UK government is planning to include such figures in an annual report on the providers that join its Quality Assurance Scheme (DECC, 2009). Providers should also pay attention to DECC's criteria for consumer information and rewrite their websites accordingly. Links between information on climate change science, impacts, causes, and mitigation measures need to improve. Ideally, a user would have to start with information on climate change and its causes, followed by emissions calculation, reduction advice, and finally offset options.

This paper has attempted to follow a multidisciplinary approach, combining results from tourism, transport and environmental behaviour research. Consequently, some theories have only been touched upon. The analyses have had a strong focus on the role of information and left out other factors influencing travel behaviour. A distinct link between information levels of public and industry and offset website content was found after all.

References

- Akter, S., Brouwer, R., Brander, L. and Van Beukering, P. (2009). Respondent uncertainty in a contingent market for carbon offsets. *Ecological Economics*, vol. 68, no. 6, pp. 1858-63.
- Anable, J., Lane, B. and Kelay, T. (2006). *An evidence base review of public attitudes to climate change and transport*. London, UK, The Department for Transport.
- atmosfair (2009). *Jahresbericht 2008*. Bonn, Germany, atmosfair gGmbH.
- Becken, S. (2004). How tourists and tourism experts perceive climate change and carbon-offsetting schemes. *Journal of Sustainable Tourism*, vol. 12, no. 4, pp. 332-45.
- Becken, S. (2007). Tourists' perception of international air travel's impact on the global climate and potential climate change policies. *Journal of Sustainable Tourism*, vol. 15, no. 4, pp. 351-68.
- Bellassen, V. and Leguet, B. (2007). *The emergence of voluntary carbon offsetting*. Paris, France, Mission climat de la Caisse des Dépôts.
- Boon, B.H., Schroten, A. and Kapman, B. (2007). Compensation schemes for air transport. In Peeters, P. (ed) *Tourism and climate change mitigation: methods, greenhouse gas reductions and policies*. Breda, Netherlands, NHTV Academic Studies, pp. 77-90.
- Bows, A. and Anderson, K.L. (2007). Policy clash: Can projected aviation growth be reconciled with the UK Government's 60% carbon-reduction target? *Transport Policy*, vol. 14, no. 2, pp. 103-110.
- Bows, A., Upham, P. and Anderson, K. (2005). Growth Scenarios for EU & UK Aviation: contradictions with climate policy. Manchester, UK, Report for Friends of the Earth Trust Ltd. Tyndall Centre for Climate Change.
- Braun, M. and Stute, E. (2004). Anbieter von Dienstleistungen für den Ausgleich von Treibhausgasemissionen. Bonn, Germany, Germanwatch.
- Broderick, J. (2009). Voluntary carbon offsets: a contribution to sustainable tourism? In Gössling, S., Hall, C.M. and Weaver, D.B. (eds) *Sustainable Tourism Futures: Perspectives on systems, restructuring and innovations*. New York, USA; Abingdon, UK, Routledge, pp. 169-199.
- Brouwer, R., Brander, L. and Van Beukering, P. (2008). "A convenient truth": air travel passengers' willingness to pay to offset their CO₂ emissions. *Climatic Change*, vol. 90, no. 3, pp. 299-313.
- Burns, P. and Bibbings, L. (2007). Mitigation: potential for emission reduction through behavioural change. In eCLAT (ed) *eCLAT Technical seminar "Policy dialogue on tourism, transport and climate change: stakeholders meet researchers"*. Paris, France.
- CAA (2007). *UK airport statistics: 2006 - annual*. Civil Aviation Authority. Online documents at URL <http://www.caa.co.uk> (Last access 18-03-2009).
- Capoor, K. and Ambrosi, P. (2007). *State and trends of the carbon market 2007*. Washington, D.C., World Bank.
- Clean Air-Cool Planet (2006). *A consumers' guide to retail offset providers*. Portsmouth, NH, USA, Clean Air-Cool Planet.
- CNG (2007). *Transparency Report June 2007*. Arnhem, Netherlands, Climate Neutral Group.
- CNG (2009). *Jaarverslag Climate Neutral Group 2008*. Utrecht, Netherlands, Climate Neutral Group.

Daley, B. and Preston, H. (2009). Aviation and climate change: assessment of policy options. In Gössling, S. and Upham, P. (eds) *Climate change and aviation: Issues, challenges and solutions*. London, UK, Earthscan, pp. 347-72.

Davies, N. (2007). The inconvenient truth about the carbon offset industry. *Guardian*, 16 June 2007.

Daviss, B. (2007). Green sky thinking: Eight ways to a cleaner flying future. *The New Scientist*, vol. 193, no. 2592, pp. 32-38.

DECC (2009). *The Government's Quality Assurance Scheme for Carbon Offsetting: Approval requirements and procedures for offset providers*. UK Department of Energy and Climate.

Downing, P. and Ballantyne, J. (2007) Tipping point or turning point? Social marketing & climate change. London, UK, Ipsos MORI.

Driscoll, L., Mansfield, C. and Strasdas, W. (2007). Nature Tour Operators' Attitudes and Actions Concerning Travel Related Greenhouse Gas Emissions. Website analysis and survey of members of The International Ecotourism Society, Sustainable Travel International, Adventure Travel Trade Association. Stanford, USA.

EC (2009). Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community. *Official Journal of the European Union*, 13.1.2009.

Eijgelaar, E. (2007). *Voluntary carbon offset schemes and tourism emissions: Assessment of mitigation potential through analysis of online provider communication on and review of public and industry attitudes to climate change and air travel*. Eberswalde, Germany, Eberswalde University of Applied Sciences.

Elgin, B. (2007). Another inconvenient truth: behind the feel-good hype of carbon offsets, some of the deals don't deliver. *BusinessWeek Online*, 26 March 2007.

ENDS (2008). The ENDS guide to carbon offsets. London, UK, Environmental Data Services.

Fitzgerald, J. and Tol, R. S. J. (2007). Airline emissions of carbon dioxide in the European Trading System. *CESifo Forum*, vol. 8, no. 1, pp. 51-54.

Gillenwater, M., Broekhoff, D., Trexler, M., Hyman, J. and Fowler, R. (2007). Policing the voluntary carbon market. *Nature Reports Climate Change*, vol. 6, pp. 85-87.

Gössling, S., Broderick, J., Upham, P., Peeters, P., Strasdas, W., Ceron, J.-P. and Dubois, G. (2007). Voluntary carbon offsetting schemes for aviation: efficiency, credibility and sustainable tourism. *Journal of Sustainable Tourism*, vol. 15, no. 3, pp. 223-48.

Gössling, S., Haglund, L., Kallgren, H., Revahl, M. and Hultman, J. (2009). Swedish air travellers and voluntary carbon offsets: towards the co-creation of environmental value? *Current Issues in Tourism*, vol. 12, no. 1, pp. 1-19.

Gössling, S., Hall, M., Lane, B. and Weaver, D. (2008). The Helsingborg Statement on Sustainable Tourism. *Journal of Sustainable Tourism*, vol. 16, no. 1, pp. 122-24.

Hall, C.M. (2009). Tourism firm innovation and sustainability. In Gössling, S., Hall, C.M. and Weaver, D.B. (eds) *Sustainable Tourism Futures: Perspectives on systems, restructuring and innovations*. New York, USA; Abingdon, UK, Routledge, pp. 282-98.

Hamilton, K., Sjardin, M., Marcello, T. and Xu, G. (2008). Forging a frontier: State of the voluntary carbon markets 2008. New York, USA, New Carbon Finance, Ecosystem Marketplace.

Hamilton, K., Sjardin, M., Shapiro, A. and Marcello, T. (2009). *Fortifying the Foundation: State of the Voluntary Carbon Markets 2009*. Washington, D.C.; New York, USA, Ecosystem Marketplace & New Carbon Finance.

Hammond, R. (2007). Carbon offsetting: who to trust? *Times Online*, 23 February 2007.

Harris, E. (2007). The voluntary carbon offsets market: An analysis of market characteristics and opportunities for sustainable development. *Markets for Environmental Services*. London, UK, International Institute for Environment and Development.

Hart, P., Becken, S. and Turney, I. (2004). Offsetting carbon dioxide emissions from tourism. In Matzarakis, A., De Freitas, C.R. and Scott, D. (eds) *Advances in Tourism Climatology*. Freiburg, Germany, Meteorologisches Institut der Universität Freiburg, pp. 97-104.

Heffernan, O. (2008). Time to buckle up on aviation emissions. *Nature Reports Climate Change*, vol. 2, Feb 08, p. 15.

Hooper, P., Daley, B., Preston, H. and Thomas, C. (2008). *An assessment of the potential of carbon offset schemes to mitigate the climate change implications of future growth of UK aviation*. Manchester, UK, Manchester Metropolitan University.

House of Lords EU Committee (2006). Including the Aviation Sector in the European Union Emissions Trading Scheme. Report with evidence. 21st Report of Session 2005-06. London, UK, House of Lords.

IATA (2008a). *Annual report 2008*. Istanbul, Turkey, International Air Transport Association.

IATA (2008b). *Building a greener future*. International Air Transport Association.

IATA (2008c). *IATA economic briefing December 2008: The impact of recession on air traffic volumes*. International Air Transport Association.

IATA (2009). *Fact sheet: Carbon offsets*. Updated: December 2009. International Air Transport Association. Online documents at URL <http://www.iata.org> (Last access 20-01-2010).

ICAO (2007). *ICAO Environmental Report 2007*. Montreal, Canada, International Civil Aviation Organisation.

IPCC (2007). Summary for Policymakers. In Metz, B., Davidson, O.R., Bosch, P.R., Dave, R. and Meyer, L.A. (eds) *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change Fourth Assessment Report*. Cambridge, UK, Cambridge University Press.

Kahn Ribeiro, S., Konayashi, S., Beuthe, M., Gasca, J., Greene, D., Lee, D.S., Muromachi, Y., Newton, P.J., Plotkin, S., Sperling, D., Wit, R. and Zhou, P.J. (2007). Transport and its infrastructure. In Metz, B., Davidson, O.R., Bosch, P.R., Dave, R. and Meyer, L.A. (eds) *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, UK, Cambridge University Press, pp. 323-85.

Kollmuss, A. and Agyeman, J. (2002). Mind the Gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, vol. 8, no. 3, pp. 239-60.

Kollmuss, A. and Bowell, B. (2007). *Voluntary offsets for air-travel carbon emissions: Evaluation and recommendations of voluntary offset companies*. Medford, MA, USA, Tufts Climate Initiative.

Kollmuss, A., Zink, H. and Polycarp, C. (2008). Making Sense of the Voluntary Carbon Market: A Comparison of Carbon Offset Standards. WWF Germany.

Kotchen, M. J. (2009). Offsetting green guilt. *Stanford Social Innovation Review*, Spring 2009, pp. 26-31.

Kuchling, A.M. (Undated) Regular Expression HOWTO. Online documents at URL <http://www.amk.ca/python/howto/regex/> (Last access 25-3-2009).

Lee, D.S., Fahey, D.W., Forster, P.M., Newton, P.J., Wit, R.C.N., Lim, L.L., Owen, B. and Sausen, R. (2009). Aviation and global climate change in the 21st century. *Atmospheric Environment*, vol. 43, pp. 3520-3537.

Lund-Durlacher, D., Strasdas, W. and Seltmann, R. (2007). Klimawandel und Tourismus: Problemwahrnehmung und Lösungsvorschläge aus Sicht der Touristiker. Ergebnisse einer Blitzumfrage unter Ausstellern auf der ITB Berlin 2007. *Oikos*. Eberswalde, Germany, Eberswalde University of Applied Sciences.

Macintosh, A. and Wallace, L. (2009). International aviation emissions to 2025: Can emissions be stabilised without restricting demand? *Energy Policy*, vol. 37, no. 1, pp. 264-73.

MacKerron, G.J., Egerton, C., Gaskell, C., Parpia, A. and Mourato, S. (2009). Willingness to pay for carbon offset certification and co-benefits among (high-)flying young adults in the UK. *Energy Policy*, vol. 37, no. 4, pp. 1372-81.

Mayor, K. and Tol, R.S.J. (2007). The impact of the UK aviation tax on carbon dioxide emissions and visitor numbers. *Transport Policy*, vol. 14, no. 6, pp. 507-13.

Mayor, K. and Tol, R.S.J. (2008). The impact of the EU-US Open Skies agreement on international travel and carbon dioxide emissions. *Journal of Air Transport Management*, vol. 14, no. 1, pp. 1-7.

Mayring, P. (2000). Qualitative content analysis. *Forum: Qualitative Social Research*, vol. 1, no. 2, art. 20.

OECD/ITF (2008). *Greenhouse gas reduction strategies in the transport sector: Preliminary report*. Paris, France, International Transport Forum.

Parry, M., Palutikof, J., Hanson, C. and Lowe, J. (2008). Squaring up to reality. *Nature Reports Climate Change*, vol. 2, Jun 08, pp. 68-70.

Peeters, P. (2007). Mitigating tourism's contribution to climate change: an introduction. In Peeters, P. (ed) *Tourism and climate change mitigation: methods, greenhouse gas reductions and policies*. Breda, Netherlands, Stichting NHTV Breda, pp. 11-26.

Peeters, P., Gössling, S. and Becken, S. (2006). Innovation towards tourism sustainability: climate change and aviation. *International Journal of Innovation and Sustainable Development*, vol. 1, no. 3, pp. 184-200.

Peeters, P., Gössling, S. and Lane, B. (2009). Moving towards low-carbon tourism. In Gössling, S., Hall, C.M. and Weaver, D.B. (eds) *Sustainable Tourism Futures: Perspectives on systems, restructuring and innovations*. New York, USA; Abingdon, UK, Routledge, pp. 240-57.

Revkin, A.C. (2007). Carbon-Neutral Is Hip, but Is It Green? *New York Times*, 29 April 2007.

Ribón, L. and Scott, H. (2007). *Carbon Offset Providers in Australia 2007*. Melbourne, Australia, Global Sustainability at RMIT University.

Røine, K., Tvinnereim, E. and Hasselknippe, H. (eds) (2008). *Carbon 2008: Post-2012 is now*, Oslo, Norway, Point Carbon.

Shaw, S. and Thomas, C. (2006). Social and cultural dimensions of air travel demand: hyper-mobility in the UK? *Journal of Sustainable Tourism*, vol. 14, no. 2, pp. 209-15.

Sterk, W. and Bunse, M. (2004). Voluntary compensation of greenhouse gas emissions. *Policy Paper*. Wuppertal, Germany, Wuppertal Institute.

Strasdas, W. (2009). Sustainable transportation guidelines for nature-based tour operators. In Gössling, S., Hall, C.M. and Weaver, D.B. (eds) *Sustainable Tourism Futures: Perspectives on systems, restructuring and innovations*. New York, USA; Abingdon, UK, Routledge, pp. 258-81.

Taiyab, N. (2006). Exploring the Market for Voluntary Carbon Offsets. London, UK, International Institute for Environment and Development.

Teiwes, I. (2008). COPEM - Carbon Offset Provider Evaluation Matrix: Carbon Concierge.

Traufetter, G. (2006). The climate indulgence market: planting trees to atone for our environmental sins. *Spiegel Online*, no. 44.

Trees for Travel (2008). Jaarverslag 2007. Arnhem, Netherlands, Trees for Travel Stichting.

TUIFLY (2008). TUIfly und myclimate: Partner ziehen nach einem Jahr positive CO2-Bilanz. TUIfly. Online documents at URL <http://www.tuifly.com> (Last access 23-03-2009).

UNWTO/UNEP/WMO (2008). *Climate Change and Tourism – Responding to Global Challenges*, Madrid, Spain, World Tourism Organization and United Nations Environment Programme.

WTTC (2009). *Leading the challenge on climate change*. London, UK, World Travel & Tourism Council.