



‘Each flight is different’: Carbon emissions of selected flights in three geographical markets



Stefan Baumeister*

University of Jyväskylä, School of Business and Economics, P.O. Box 35, 40014 University of Jyväskylä, Finland
 University of California, Los Angeles, Institute of the Environment and Sustainability, P.O. Box 951496, Los Angeles, CA 90095, USA

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ABSTRACT

Air travel is considered the biggest individual climate sin. Avoiding flying, however, seems impossible. In this paper we argue that the flight a passenger chooses can be significant. For this purpose we compared the carbon emissions of selected flights in three geographical markets. We found tremendous differences in the environmental performance of individual flights. Furthermore, we also found that flying with the most modern aircraft or flying non-stop represents, in many cases, the least polluting option. Nevertheless, we were able to show that there are exceptions to this rule. Based on our results, we provide recommendations to the industry and for further research.

1. Introduction

According to an article in the New York Times, air travel is considered the biggest individual climate sin (Rosenthal, 2013). Ironically, it is the middle-class that is the most environmentally aware (Alibeli and Johnson, 2009) but also the group who flies the most (Randles and Mander, 2009). Even though several studies found that consumers do identify air traveling as a cause of climate change (Bonini and Oppenheim, 2008; Brouwer et al., 2008) still there is little willingness to change the flying behavior or to sacrifice vacations for the environment’s sake (Cohen and Higham, 2011; Lassen, 2010). For many, such changes would be considered a restriction of the personal freedom to travel (Becken, 2007). As Rosenthal (2010) argues, air passengers are caught in a “flying dilemma” where one’s individual self-concept as an environmentally responsible consumer conflicts with the environmental impacts of frequent air travel. Though some consumers might act in environmentally conscious ways in everyday situations (e.g. by using public transport, recycling or going paperless), transferring these values to their flying behavior is considered to be difficult (Barr et al., 2009). Davison et al. (2014) clearly see a value-action gap when it comes to consumers’ knowledge about the environmental impacts of air travel and their actual behavior. However, when looking at the barriers that prevent consumers from changing their behavior, as presented by Hares et al. (2010), it becomes obvious why the gap still exists: There is (a) a lack of alternatives to flying, (b) an unwillingness to change travel behavior and, (c) the contribution of one individual to climate change through air travel is seen as being insignificant.

While not to fly does not seem to be a feasible option, the question becomes whether there is a possibility to mitigate the environmental impacts by the way in which we fly. Miyoshi and Mason (2009) indicate that there is a difference between the environmental performances of individual airlines. Based on that, we argue that choosing the right flight could have an impact on the environmental outcome of our flying behavior. In order to support this argument we have conducted carbon dioxide emissions calculations for selected flights in three geographic markets. We then compared these figures with the often stated goal of keeping

* Address: University of Jyväskylä, School of Business and Economics, P.O. Box 35, 40014 University of Jyväskylä, Finland.
 E-mail address: stefan.c.baumeister@jyu.fi.

global warming below 2 degrees Celsius, based on pre-industrial levels. According to the [German Advisory Council on Global Change \(2009\)](#), to achieve the climate goal, each human would only be allowed an annual climate budget of 2300 kg CO₂. Nevertheless, only one-fourth (575 kg CO₂) could be spent on mobility. The first objective of this paper is to show that there are differences between flight options and that, from an environmental point of view, these differences are indeed significant. Making those differences visible to the consumer could have great potential for mitigating the environmental impacts of flying, because the consumer could actively choose flights that are less polluting. Although a fair amount of air passengers are able to differentiate between the environmental friendliness of airlines ([Mayer et al., 2012](#)), [Gössling et al. \(2009\)](#) also found that it would require expert knowledge in order to be able to compare the environmental performance of airlines or individual flights. All that an average air passenger can currently rely on are some general environmental measures, such as flying on modern and fuel-efficient aircraft or flying non-stop. The second objective of this paper is therefore to analyze the effectiveness of these environmental measures, with the help of carbon emissions calculations. This paper is structured as follows. We first discuss environmental measures in more detail. Next, we examine emissions calculations by discussing different approaches and the limitations of existing methods. We then present our calculation method. After that we proceed with the results of our study, followed by a conclusion with recommendations to the industry as well as for further research.

2. Environmental measures for air passengers

Previous literature investigating the mitigation of environmental impacts of air travel through behavioral change has mainly examined air passengers' motivation and willingness to pay for carbon offset (e.g. [Mair, 2011](#); [van Birgelen et al., 2011](#); [Gössling et al., 2009](#)) or discussed changes of travel behavior in terms of using alternative transportation modes or avoiding holidays overseas (e.g. [Davison et al., 2014](#); [Sgouridis et al., 2011](#); [Higham and Cohen, 2011](#)). Only a few studies have discussed the issue of mitigating environmental impacts through behavioral change by air passengers actively selecting airlines or flights that are less polluting ([Mayer et al., 2012](#); [Wittmer and Wegelin, 2012](#)). However, those studies have mainly focused on the environmental image of airlines and how this might affect an air passenger's booking decision. Concrete environmental measures and their effectiveness in reducing carbon dioxide emissions have not yet been investigated. Because the current literature lacks examples of environmental measures, we turned our attention to commonly shared knowledge and recommendations on how to choose an airline or flight that is less polluting. [Table 1](#) illustrates recommendations provided by various environmental organizations for how the general public can reduce the environmental impacts of air transport. These recommendations range from choosing eco-friendly airlines all the way to the total avoidance of flights in general. When focusing on the measures relevant for air passengers in terms of choosing a flight that has fewer environmental impacts, two measures were mentioned the most often and by almost all the environmental organizations: flying on a modern and fuel-efficient aircraft and flying non-stop. Because these two environmental measures are seen as the most crucial for making environmentally conscious flight choices, we will focus our further investigation on them.

3. Carbon calculators

In recent years, a number of carbon calculators have become available, which made the environmental impact of flying more easily measurable. Unfortunately, there is a lack of consistency and different calculators produce different outcomes for the same journey ([Miyoshi and Mason, 2009](#)) as is shown in [Table 2](#). So far no consensus exists on how to calculate the carbon emissions produced from air transportation. Nevertheless, as [Jardine \(2009\)](#) found, all aviation carbon calculators broadly utilize the same methodology.

However, while the methodologies applied in the carbon calculators are similar, there are huge differences in the data they use.

Table 1
Environmental measures provided by environmental organization regarding less polluting flights.
Source: Environmental organization websites (accessed January 2015).

Environmental organization	Environmental measures
Brighter Planet	Fly direct , avoid business or first class, fly on modern aircraft with high load factor and freight share, pack light, find alternatives to flying
Union of Concerned Scientists	Fly economy class, use aircraft with economy class seating only, fly non-stop , choose fuel-efficient airplanes , avoid airports with long delays
Treehugger	Use modern aircraft , choose flights with very few or no premium seats and high load factors, avoid low cost carriers, use turbo prop aircraft
WWF	Choose flights with high load factors, fly on more efficient aircraft , buy carbon offset, avoid short-haul flights, take vacations closer to home
Smart Travel	Fly non-stop , choose efficient airplanes , choose airports with fewer delays, buy carbon offset, use airlines testing biofuels
Friends of the Earth	Fly less frequently, avoid short-haul flights, search for alternative transportation modes, spend vacations closer to your home
Ecolife	Avoid business or first class, fly non-stop , use e-ticketing, reduce baggage weight, recycle onboard waste in the airport, use restroom before boarding, pay for carbon offset
Greenpeace	Avoid flying, search for alternative transportation options, don't use short-haul flights
Ecology Center	Fly non-stop , avoid short-haul flights, search for alternatives transportation, spend vacations closer to home
Sustainable Travel	Avoid stopovers , look for alternative travel modes, pack lightly, use restroom before getting on board, purchase carbon offset, recycle during the flight, avoid long-haul short-stay trips

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