Emissions allocation from international aviation to the UK inventory

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Introduction

The Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1997 by 160 countries and ratified by the European Union (EU) on 31st May 2002. Greenhouse gas (GHG) emissions from international aviation are not included in national GHG inventory totals and are therefore not reflected in Kyoto targets for the first commitment period (2008-2012) and so there is no incentive beyond the normal commercial incentive to reduce these emissions.

In 1996 the UNFCCC identified 8 options for the allocation and control of GHG emissions from international bunker fuels. In the first option international emissions are not allocated to individual countries but remain in the international sphere. In the other seven options variety of criteria are employed for allocating international emissions to individual Annex I countries. The 8 allocation options are described as follows:

1. No allocation
2. *Allocation of global emissions from bunker fuels in proportion to national emissions of Parties*
3. Allocation to Parties according to the country where the bunker fuel is sold
4. Allocation to Parties according to the nationality of the transporting company, the country where the aircraft is registered, or the country of the operator
5. Allocation to Parties according to the country of destination or departure of aircraft. Alternatively, the emissions related to the journey of an aircraft could be shared by the country of departure and the country of arrival
6. Allocation to Parties according to the country of departure or destination of passenger or cargo. Alternatively, the emissions related to the journey of passengers or cargo could be shared by the country of departure and the country of arrival
7. *Allocation to Parties according to the country of origin of passengers or owner of cargo*
8. *Allocation of emissions generated within each Party's national space*

Options 2, 7 and 8 (in italics) were subsequently considered by the UNFCCC to be less attractive options on the basis of equity, tractability and efficiency respectively.

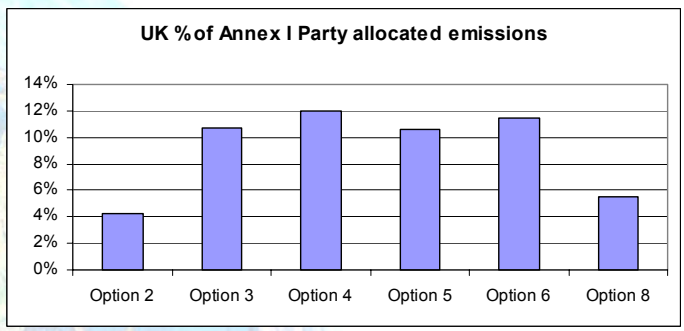
Description

The aim of this study is to provide quantitative insight into how each of the allocation options for national allocation of international aviation emissions of GHGs translate into assigned amounts accruing to the UK. Analysis of the data sources available and an initial assessment of the tractability of the allocation options has been undertaken.

It is possible to calculate allocations according to Options 2, 3 and 4 using some available data sources although these sources are not always complete or consistent. Allocation using these data has been undertaken where possible and compared with the values derived from the FAST model described in the following section. Allocation according to the country of origin of the passenger/freight (Option 7) is not possible as these data are not available on a wide enough basis. For the remaining options, calculations from actual aircraft movements are required and the allocation calculations are thus reliant on modelling. Throughout the project the uncertainties associated with the data and the calculation procedures have been assessed.

The FAST model

The FAST model (Lee et al., 2003) has been used as the principal tool in this study. FAST has been used to calculate a global total for international aviation emissions and then to evaluate each of the proposed emission allocation options. The use of the same tool for evaluation of all the allocation options allows a consistent basis for comparison. The allocation methods are applied to GHG emissions international aviation where possible. However, the uncertainty surrounding GHGs other than CO_2 is large and the data available do not always provide a sufficient basis for the calculation of other emissions and effects. The FAST model was constructed for the UK Department for Trade and Industry and follows the same approach as the peer-reviewed global aviation emissions model ANCAT/EC2 (Gardner et al., 1997; 1998). The FAST model works by combining a global aircraft movements database with data on fuel flow provided by a separate commercial model PIANO, which is an aircraft performance model. These data with knowledge or aircraft and engine types, allow calculation of emissions via a recognized and validated algorithm that corrects certification (ICAO databank) data for altitude. Baseline calculations have used the years1990 and 2000. These calculations have been undertaking using the OAG global aircraft movement database. Future scenarios up to 2050 have been studied and future aircraft movements have been calculated using the ICAO (CAEP) forecasts in conjunction with the IPCC Emission Scenarios (2000) GDP growth assumptions. Future fleet predictions are made using the FAST model. The project is ongoing and the final results are not yet available. An indication of the likely pattern of allocated emissions is given in the figure below (from van Velzen and Witt, 2000). Option 4 here is based on airline nationality (therefore reflects the fact that the UK services relatively more flight stages to and from overseas airports), potentially different outcome if use country of operation or aircraft registration.



Discussion

The policy implications of each of the allocation options are beyond the remit of this study. However, the importance of accurate and consistent calculations on which to compare the outcomes of the various allocation options for the UK is clear. The results of this project will allow the policy discussions surrounding the allocation debate to be conducted on clearly determined emission calculations.

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