



and the infrastructure required for manufacturing new designs (~30 years each) seriously curtails the rate of technical and operational mitigation available to the industry. Against this backdrop of severe limitations in early efficiency gains, there are limits to aviation growth if it is to remain within the boundaries of the EU-ETS.

The impact of the EU-ETS on aviation growth

The EU-ETS is a cap-and-trade system – as such there are limits on the quantity of permits that can be purchased. The price of the available permits is a product of both the size of the cap and the success of sectors' mitigation efforts in reducing their absolute emissions. Current discussion on airport expansion assumes that all future emissions growth can be offset through the purchase of EU-ETS permits. Whereas this assumption may hold for phase three, 2013–2020, it does not take into account the future direction of the EU-ETS. New infrastructure decisions made today will have both a long lead time and lifetime; with new runway capacity unlikely before 2020.

“ As an island, the UK has become disproportionately reliant on aviation compared with other EU nations. ”

If the ETS is considered in the context of the EU's 2050 Roadmap, a significant reduction in the cap and corresponding increase in carbon price can be expected post-2020 [7]. The Roadmap sets out how the EU could achieve its objective of an 80–95% GHG reduction on a 1990 baseline by 2050, with 80% of the reduction being achieved through domestic action alone; in other words, excluding offsetting or carbon trading with other countries. These reductions include emissions from domestic and international aviation. The transport sector is expected to contribute emissions reductions of 54–67%, a target range that aviation will struggle to reconcile with anticipated growth between now and 2050 [7]. The sector will be competing for carbon permits with the industrial and power sectors, with their own reduction targets of 83–87% and 93–99%, respectively [7]. The ability of aviation to continue purchasing carbon allowances requires these and other sectors to go beyond their already challenging reduction targets. Given that the Roadmap and cap are to be reviewed with an eye to them being further tightened, it would be prudent to assess how much (or whether) the sector could grow while remaining within the tightening constraints of the EU-ETS.

Advice to the UK Government from its independent Committee on Climate Change (CCC) recommends that UK aviation emissions return to 2005 levels by 2050,

a level consistent with the Committee's wider strategy but still not yet aligned with what is necessary under the UK's international commitments [5]. Recognizing the technical and operational limitations of mitigation, the CCC advised that growth be limited to a maximum increase in air traffic movements of approximately 55% between 2005 and 2050, and a maximum of 60% increase in passenger demand, equating to 140 million extra passengers arriving or departing UK airports per annum [5]. The consultation on the retention of the UK's hub status in the south east of England follows the UK Government's previous and high profile rejection of new runways in the area, proposing instead any new capacity be met by regional airports [104]. Announcements to date suggest the consultation will seek views on a range of potential options including additional runways, improved utilization of existing capacity and the construction of a new hub airport [2]. Policy regarding the expansion of regional airports remains unchanged [8]. However, any expansion in the south east of the UK through an additional runway at Heathrow or a new hub airport, coupled with existing regional expansion plans, would facilitate passenger growth over and above that recommended by the CCC and be incommensurate with the emission constraints imposed by the EU-ETS.

Aviation as an economic growth provider

Part of the rationale for the renewed examination of aviation expansion in the UK is that in times of economic hardship aviation services can stimulate growth, particularly by providing hub services to new markets. The economic contributions from aviation are direct, indirect and catalytic. It is principally the catalytic effects that are sought from capacity expansion; the economic contribution presumed to arise by enhancing the productivity of the country by increasing connectivity and thus trade and inward investment. However, the current evidence base upon which the catalytic impacts can be assessed is limited and there is no consensus in the literature as to their size [9–11]. That said, whatever the catalytic impacts, they relate primarily to passengers flying for business purposes; passengers who represent just 30% of those using Heathrow, and typically lower proportions for regional airports [12]. Any catalytic effects are thus associated with a small proportion of the passengers currently using UK aviation services. An additional economic benefit is claimed to come from overseas tourists to the UK; however, their expenditure in the UK is offset by UK resident's expenditure overseas. For 2011 there was a net deficit of £13.7 million [105].



As an island, the UK has become disproportionately reliant on aviation compared with other EU nations. The emissions from flights serving the UK represent 28% of the aviation sector's emission baseline in the EU-ETS – a baseline that encompasses the aviation emissions from services in 29 other countries [13,14]. The evidence base for future aviation policy requires a fundamental re-examination of the role of aviation within a country's economy. This requires research to identify how and why connectivity begets inward investment and productivity and whether provision of aviation services can be focussed to maximize this within a boundary that recognizes the sector's significant and growing climate impacts. Any investment in high-carbon activities now effectively locks all sectors included within the EU-ETS into a future with high carbon prices.

The evidence base to support future investment decisions on aviation expansion would include comparisons with anticipated returns from similar levels of investment in other areas of UK activity; reducing congestion for commuters, improved freight routes or high-speed data transfer, for example. Understanding the opportunity cost of airport expansion may well highlight alternative and much more strategic investment opportunities. This presents an important and timely research agenda for academics in the field.

Ultimately, however, sustainable economic growth is about more than short-term financial gains; climate change is real and the UK has, thus far, played an important leadership role in acknowledging its economic, social and environmental repercussions. Disturbingly then, as the trend in global emissions is locking the international community into a future of 'dangerous climate change', the self avowed 'greenest government' is considering the expansion of the most carbon-intensive activity humankind has thus far developed. This is a real test of both leadership and the future of evidence-based policymaking.

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