

Does taxing aviation really reduce emissions?

Headlines such as “Airlines have enjoyed a free ride for too long – it’s time they paid the price for their role in climate destruction”¹ are increasingly common in the media, and there is growing consensus on the need to tax aviation more in order to reduce emissions to achieve the goal of zero emissions by 2050.

This “Think paper” is to help in the debate, takes a careful look at how best aviation emissions could be reduced, and aims to find answers to the following questions:

- Do taxes on aviation fuel or air tickets, or equivalent measures to compensate for the environmental impact of the emissions generated by aircraft movements, which are already being applied by many states, effectively contribute to reducing aviation emissions?
- Could aviation taxes help reduce the aviation sector’s CO₂ emissions in the current COVID context, given the slow economic recovery?
- To what extent could CO₂ goals be met by decarbonising the aviation sector?

We seek to find answers to these questions by looking at the impact of factors such as travel restrictions, GDP, passenger demand, fuel prices and airfares. The paper analyses some of the instruments already in place that are designed to help reduce CO₂ emissions, as well as the impact that using aviation taxes to decarbonise the aviation sector could have.

Main findings

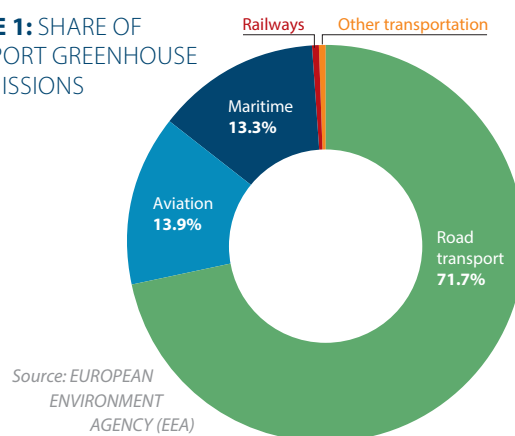
1. While passenger numbers increased by 40% between 2009 and 2017, CO₂ emissions only increased by 15%, and noise levels remained stable.
2. There is little evidence that taxing aviation per se leads to lower CO₂ emissions; nor do raising fuel prices or ticket prices reduce CO₂ emissions.
3. Economic output is the main factor influencing demand, and hence higher or lower CO₂ emissions.
4. Long-distance air traffic dominates aviation emissions, drives their evolution, and hence must be targeted if a reduction in CO₂ emissions is to be achieved.
5. Decarbonisation measures should be strongly supported with substantial funding over the next 30 years, especially in relation to long-distance flying.
6. If a European tax to reduce aviation’s CO₂ emissions were to be introduced, it should be ring-fenced to support decarbonisation measures for aviation.
7. To ensure long-term competitiveness in aviation, Europe should encourage the delivery of global aviation decarbonisation solutions.

EU CO₂ emissions in the aviation sector - Setting the scene

One of the key objectives of the **EU Green Deal** is to allow economic growth while reducing net EU carbon emissions to zero by 2050, including a 90% reduction in transport emissions² compared with 1990. In 2016, aviation produced 3.6%³ of total EU28 greenhouse gas emissions and, as Figure 1 shows, 13.9% of emissions from transport⁴.

THINK PAPERS are produced to stimulate debate and look at alternatives. They do not represent the official views of the Agency or its Member States.

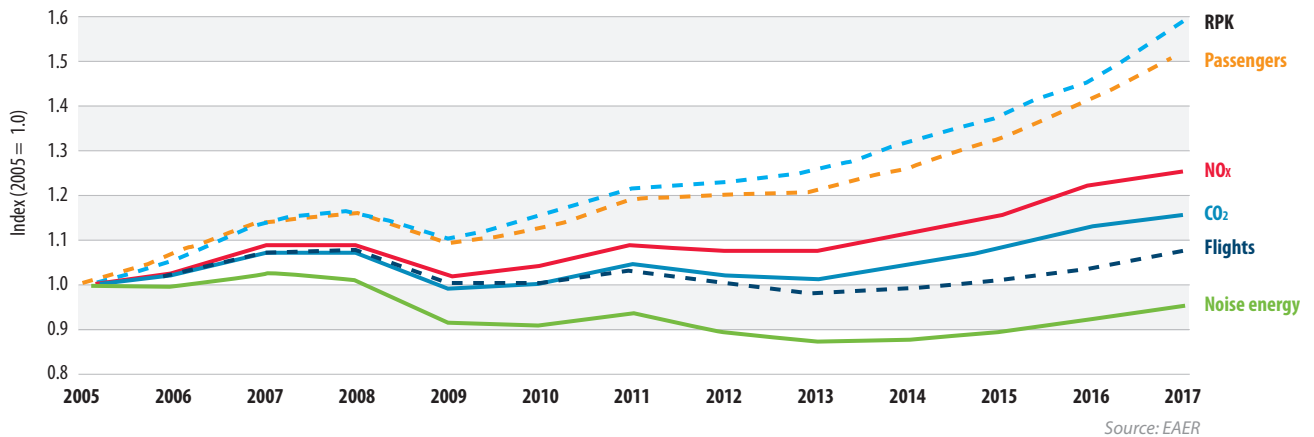
FIGURE 1: SHARE OF TRANSPORT GREENHOUSE GAS EMISSIONS



From 2009 to 2017, air transport underwent significant and steady growth, greatly contributing to economic development in Europe and globally, and providing European citizens with greater connectivity and mobility. As can be seen in Figure 2, the **number of passengers increased by 40%** and the number of revenue passenger kilometres (RPK) by 45%. Fortunately, **thanks to fleet renewal with**

cleaner and more fuel-efficient aircraft, improved operations and higher load factors, CO₂ emissions have risen much more slowly, by only 15%, while noise impact has stabilised (+4.0%). Although significant, the growth in CO₂ emissions from aviation is therefore being contained thanks to the efforts of all its stakeholders.

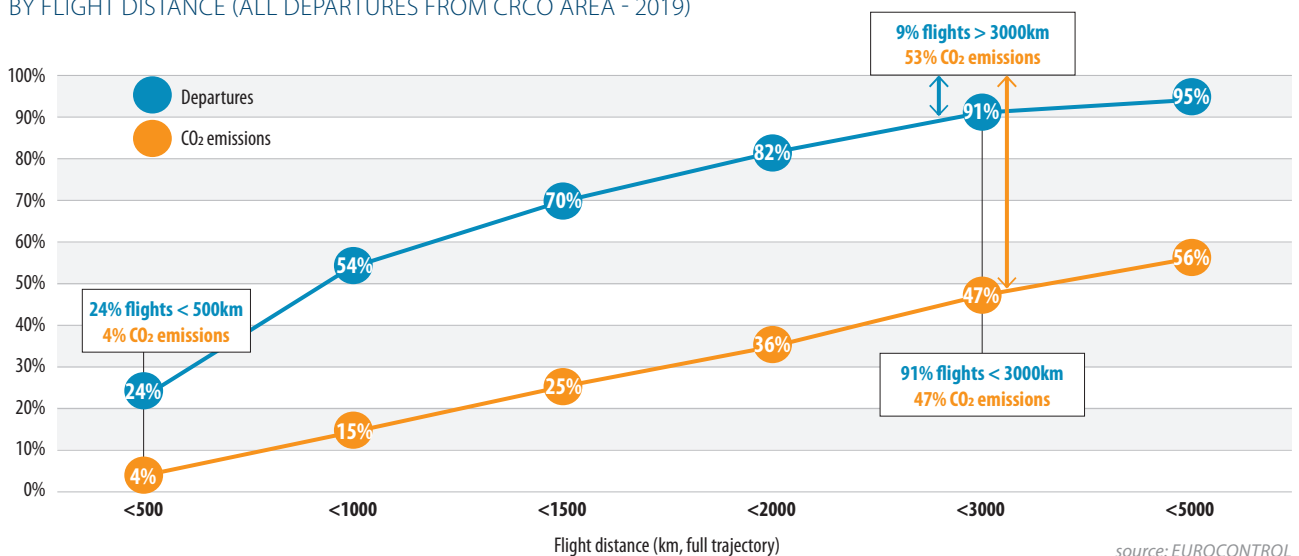
FIGURE 2: KEY INDICATORS IN THE EUROPEAN AVIATION ENVIRONMENTAL REPORT (EAER) 2019



To keep pace with economic growth due to globalisation, aviation has had to adapt profoundly, in particular by increasing the frequency of direct connections between the world's major cities. In doing so, and despite the efforts made by our industry, this has resulted in an increase in CO₂ emissions. Figure 3 provides a better understanding of this phenomenon. As can be seen, flights of less than 500 km account for 24% of flights departing from the CRCO area (all EUROCONTROL Member States except Monaco and

Ukraine), but are responsible for only 4% of CO₂ emissions. Conversely, **flights of more than 3,000 km make up only 9% of departing flights, but produce 53% of CO₂ emissions. Decarbonising medium-to-long-distance flights is therefore paramount to achieving significant CO₂ emission reductions in the aviation sector.** For this reason, the use of sustainable aviation fuels (SAF) and other decarbonisation solutions for aviation must be accelerated, especially for these longer sectors.

FIGURE 3: FLIGHTS AND CO₂ EMISSIONS - CUMULATIVE DISTRIBUTIONS BY FLIGHT DISTANCE (ALL DEPARTURES FROM CRCO AREA - 2019)



“Decarbonising medium-to-long-distance flights is therefore paramount to achieving significant CO₂ emission reductions in the aviation sector.”

Travel restrictions, GDP and air traffic demand have a stronger influence on the number of flights than higher fuel or ticket prices

To regulate/constrain demand, some states have increased the price of flight tickets through taxes or excise duties on fuel. However, to what extent is this really effective in the aviation sector? What are the main factors influencing traffic demand and the number of flights?

Flights vs. Ticket and Fuel prices

Figure 4 shows the evolution of the number of flights, and fuel and ticket prices between 2005 and 2019. A strong seasonal variation ($\pm 20\%$) can be seen in real ticket prices and the number of flights, with peaks in the summer, when demand is at its highest. Variation in opposite directions would be expected if an increase in ticket prices had a strong influence on demand and led to its decreasing. In fact, in the highly competitive European air transport market, **higher demand clearly leads to an increase in the number of flights, despite higher ticket prices.**

Another surprising fact is the remarkable insensitivity of the number of flights to the strong variation in fuel price over the last 15 years, including during the oil crisis that peaked in May 2008 (+70% in 12 months).

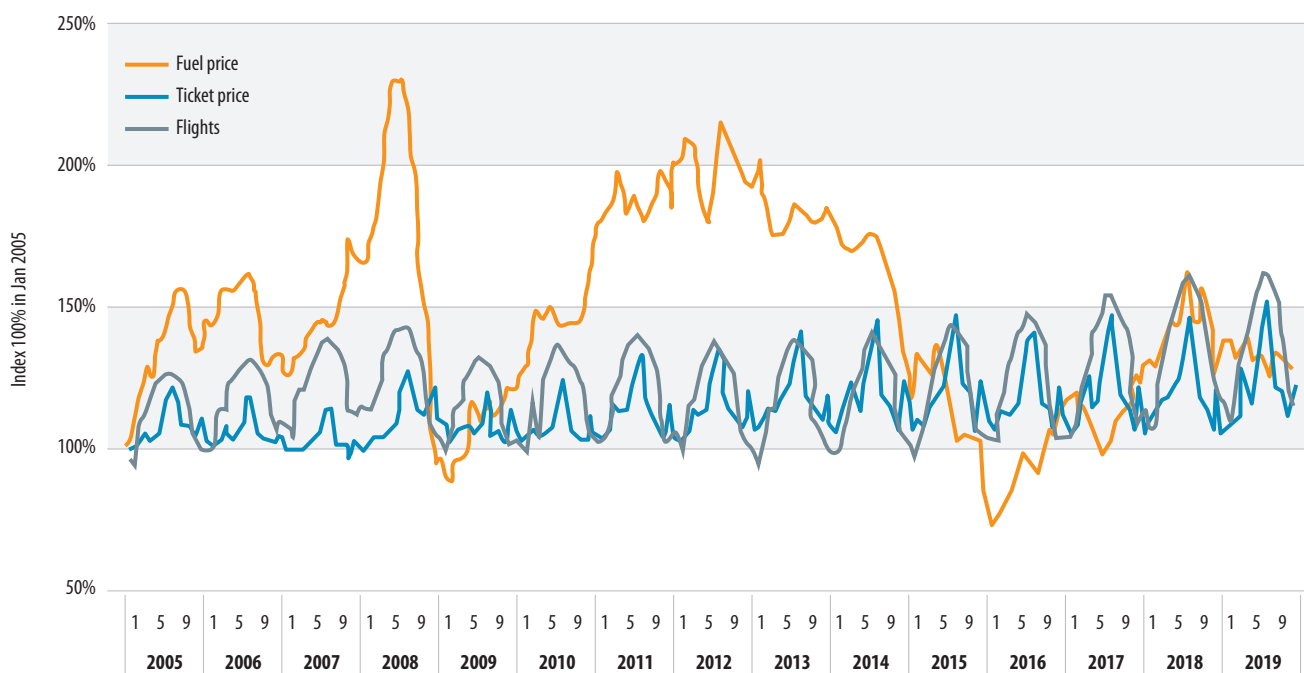
In the long run, **economic growth remains the most important factor that influences the growth in demand for air travel.** Air traffic and the number of flights are strongly influenced by Gross Domestic Product (GDP). Data shows that year-on-year demand for air travel tends to follow economic growth, with a **1% change in GDP generally resulting in a 1.5%-2% change in the number of flights.**

For example, during the 2009 economic crisis, EU GDP fell by 4.3% and the number of flights fell by 6.6%.

Finally, air traffic fell by 77.2% between April and July 2020 compared to the same period in 2019 following the travel and air traffic restrictions in response to the COVID-19 pandemic, reducing CO₂ emissions by 77.7% for the same period.

“Factors such as travel restrictions, GDP and air traffic demand have therefore a much stronger influence on the number of flights than any increases in fuel or ticket prices.”

FIGURE 4: EVOLUTION OF FLIGHTS, TICKET AND FUEL PRICES



Sources: Eurostat, IATA, EUROCONTROL

“Higher demand clearly leads to an increase in the number of flights, despite higher ticket prices.”

Influence of taxes on aviation CO₂ emissions

The European Commission recently published a study conducted by the University of Delft on *"Taxes in the Field of Aviation and Their Impact"*. Figure 6 taken from this June 2019 study shows that some European states already levy taxes on aviation, with the highest tax burden per passenger being in the UK.

One way to identify the influence of taxes on aviation emissions is to observe changes in the amount of CO₂ emitted following their introduction.

The UK's ticket tax is called the "UK Air-Passenger Duty" (APD), which was introduced in 1994 and is charged to all passengers departing from UK airports on aircraft with a maximum take-off weight (MTOW) of more than 5.7 tonnes⁶. The following table gives the APD rates from 1 April 2020⁷:

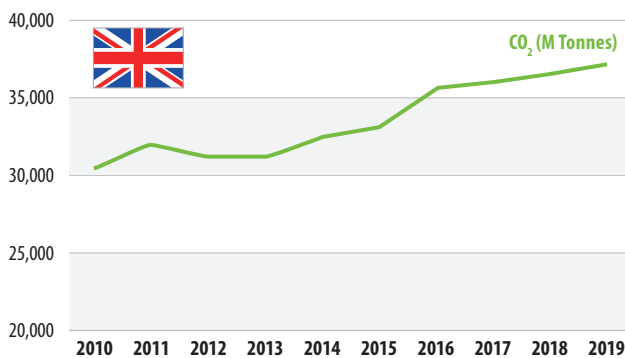
TABLE 1: UK APD RATES FROM 1 APRIL 2020

Destination bands	Reduced rate	Standard rate	Higher rate
Band A	£13	£26	£78
Band B	£80	£176	£528

Source: <https://www.gov.uk/>

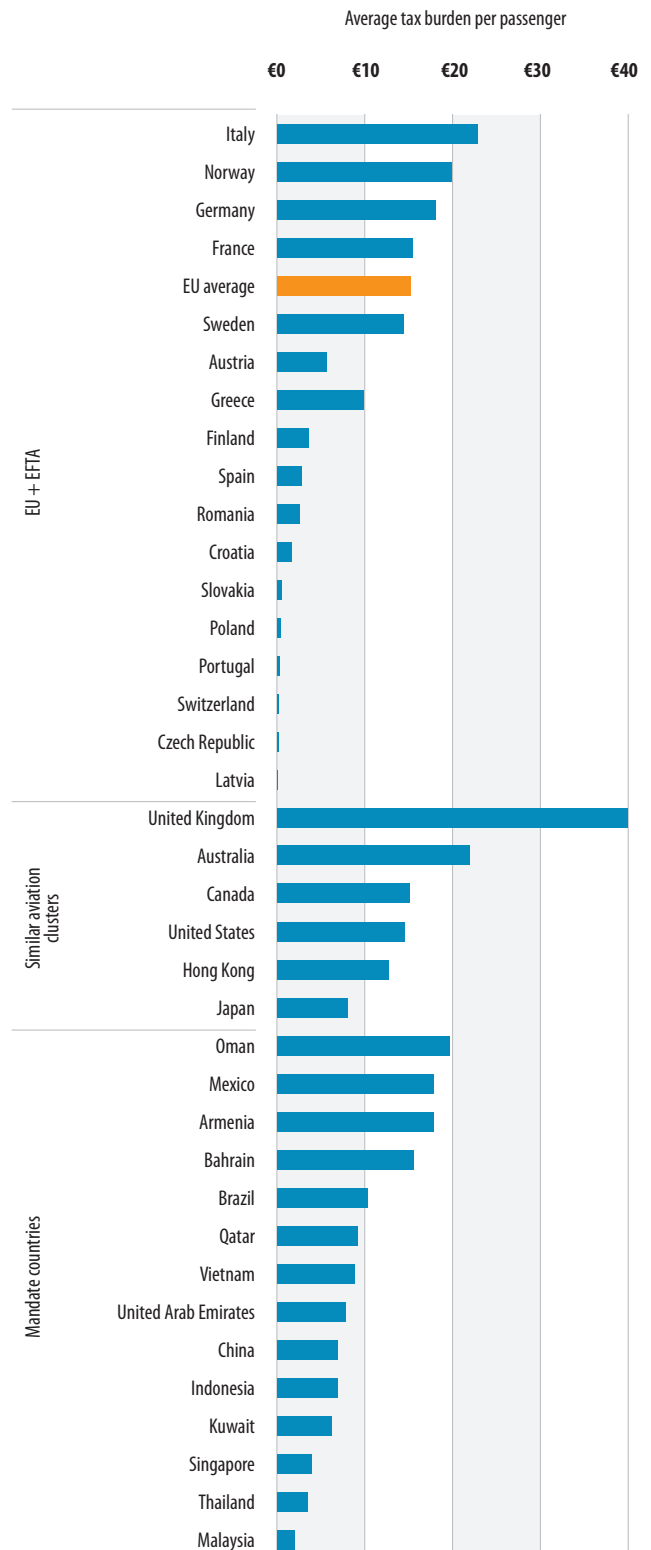
"Despite having the highest rate of taxation on air travel in Europe, CO₂ emissions continue to increase in the UK, despite a slight reduction in the number of flights that can be seen in 2018 and 2019, as Figure 5 shows".

FIGURE 5: AVIATION CO₂ EMISSIONS IN MILLION TONNES FROM UK DEPARTURES



Source: EUROCONTROL

FIGURE 6: AIR TRAVEL TAXES

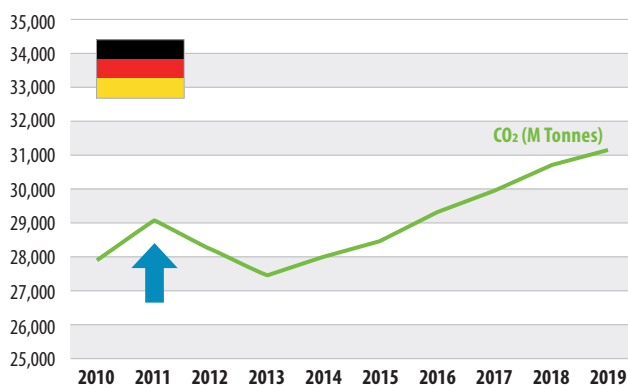


Source: Delft Study

"Despite having the highest rate of taxation on air travel in Europe, CO₂ emissions continue to increase in the UK."

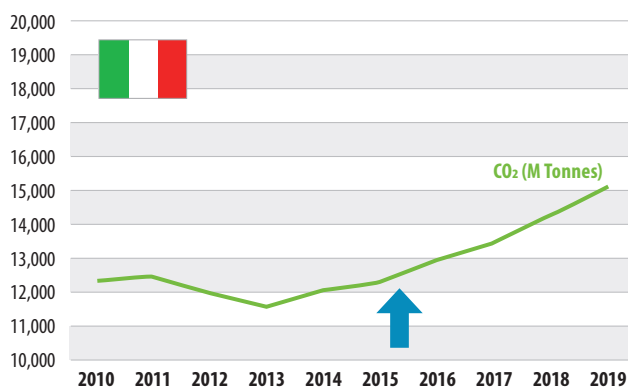
As another example: despite the introduction of a departure tax on 1 January 2011 in Germany, CO₂ emissions increased by 4.2% that year, as shown in Figure 7. Similarly in Figure 8, although Italy increased departure taxes by almost 40% on 1 January 2016⁸, its CO₂ emissions increased by 5.2% that year, while traffic from Italy fell by just 1.4%.

FIGURE 7: AVIATION CO₂ EMISSIONS IN MILLION TONNES FROM GERMANY DEPARTURES



Source: EUROCONTROL

FIGURE 8: AVIATION CO₂ EMISSIONS IN MILLION TONNES FROM ITALY DEPARTURES



Source: EUROCONTROL

These examples show that the **influence of fuel or ticket taxes has so far had only a limited effect on the growth of air traffic, and thus on its emissions.**

Nevertheless, there is now an emerging consensus on the need to use aviation taxes to reduce emissions – so the question is how best to achieve the desired effect, namely to achieve a real reduction in the aviation sector's CO₂ emissions.

Aviation decarbonisation is the answer – but it requires huge investments

Decarbonisation will allow economic growth and has the potential to reduce net EU carbon emissions to zero by 2050, including a 90% reduction in transport emissions. **It can be achieved by implementing the four ICAO pillars of market-based measures, disruptive technology, improved infrastructure and operations, and the uptake of Sustainable Aviation Fuels (SAF).** These pillars are global aviation solutions for a global problem which will help ensure European competitiveness in the global aviation market.

Moving short-haul passengers to another mode of transport is not a solution for achieving this 90% CO₂ reduction, as it will only affect 4% of aviation's CO₂ emissions (see Figure 3) – and will have a significant negative impact on connectivity where no alternative transport solutions are available.

Market-based measures such as **ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) and the EU Emission Trading Scheme (ETS)** can compensate for or reduce aviation emissions, but offsetting will not be enough to achieve the 'Green Deal' objective.

The aircraft manufacturing industry is confident that it can develop the technology to reach carbon neutrality by 2050, but it needs massive investments in disruptive aircraft technology and SAF.

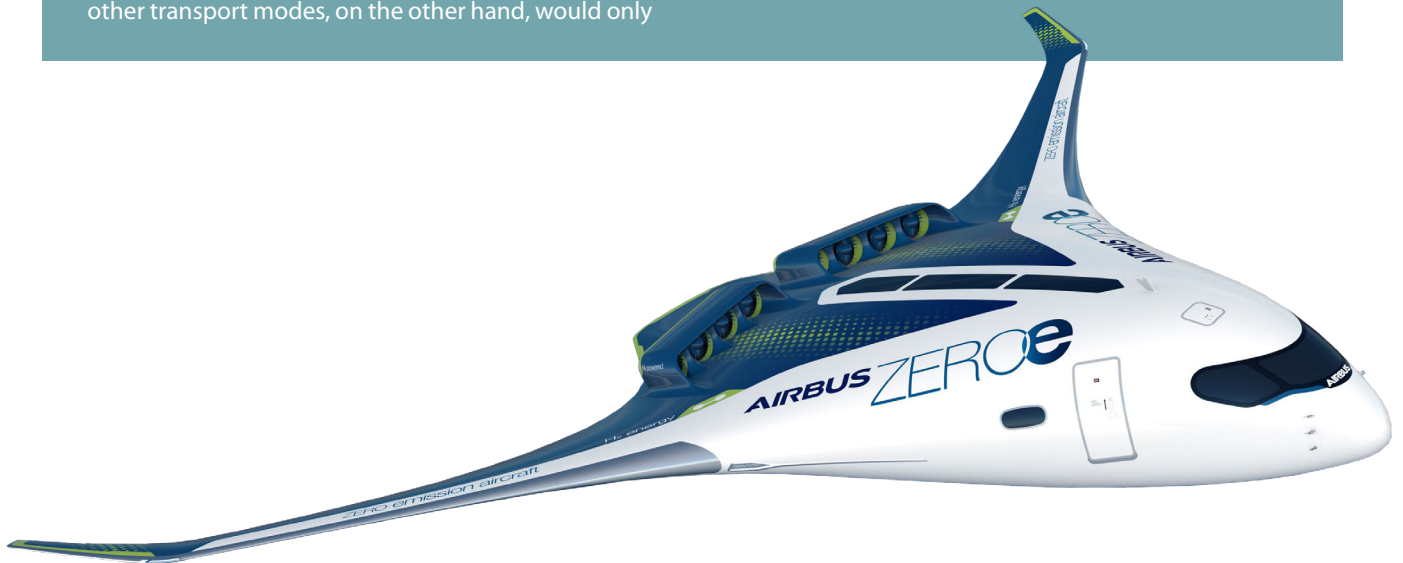
Electric, hydrogen or hybrid aircraft need further research and investment for their industrialisation and commercialisation. Initiatives such as Airbus Zero or IMOTHEP⁹ (Investigation and Maturation Of Technologies for Hybrid Electric Propulsion), carried out by a multidisciplinary consortium of 33 European and international partners including R&D institutes, universities and industrial partners, must be developed further.

The use of currently available **SAFs** can provide a net carbon emission saving of up to 80%, and advanced bio-fuels or synthetic fuels are reported to be able to save even more. Of course, this requires huge investment that can enable large-scale production of SAFs and thus significantly reduce their cost. Initiatives such as the RefuelEU initiative, which aims to boost supply and demand of SAF, are essential and could greatly benefit from aviation tax revenues if these were to be kept within the aviation sector.

"The influence of fuel or ticket taxes has so far had only a limited effect on the growth of air traffic, and thus on its emissions."

Key conclusions

1. While passenger numbers increased by 40% between 2009 and 2017, CO₂ emissions only increased by 15%, and noise levels remained stable.
2. There is little evidence that taxing aviation per se leads to lower CO₂ emissions; nor do raising fuel prices or ticket prices reduce CO₂ emissions.
3. Economic output is the main factor influencing demand, and hence higher or lower CO₂ emissions, as GDP drives air traffic and the number of flights.
4. Long-distance air traffic dominates aviation emissions, drives their evolution, and hence must be targeted if a reduction in CO₂ emissions is to be achieved. It is difficult to substitute these flights by other modes of transport, and they are less sensitive to ticket price variation. Encouraging short-haul air traffic to shift to other transport modes, on the other hand, would only have a limited impact on CO₂ emissions, but a significant negative impact on connectivity.
5. Decarbonisation measures like greater use of market-based measures, disruptive technology, improved infrastructure and operations, and the uptake of Sustainable Aviation Fuels (SAF), as outlined in EUROCONTROL Think Paper No. 4 on decarbonisation issues¹⁰, should be strongly supported with substantial funding over the next 30 years, specially in relation to long-distance flying.
6. If a European tax to reduce aviation's CO₂ emissions were to be introduced, it should be ring-fenced to support decarbonisation measures for aviation.
7. To ensure long-term competitiveness in aviation, Europe should encourage the delivery of global aviation decarbonisation solutions.



Footnotes

- 1 <https://www.independent.co.uk/voices/airline-industry-travel-aviation-fuel-tax-carbon-emissions-climate-emergency-a9631921.html> (22 July 2020)
- 2 See §2.1.5 of EC communication COM(2019) 640 final
- 3 Source: European Aviation Environmental Report 2019 (EAER 2019 by EASA, EEA and EUROCONTROL)
- 4 Source: European Environmental Agency (EEA)
- 5 Source: EUROCONTROL based on CRCO departure flights, including Iceland
- 6 <https://www.gov.uk/guidance/rates-and-allowances-for-air-passenger-duty#rate-bands>
- 7 Band 'A' is used if the distance from London to the destination country's capital city is less than 2,000 miles; band 'B' is used if it exceeds 2,000 miles. Reduced rate is used if the passenger's seat pitch is less than 40 inches.
- 8 https://www.europarl.europa.eu/doceo/document/E-8-2016-001098_EN.html
- 9 <https://www.imothep-project.eu/>
- 10 EUROCONTROL Think Paper #4, 'The Aviation Network - Decarbonisation Issues', September 2019, <https://www.eurocontrol.int/sites/default/files/2020-01/eurocontrol-think-paper-4-decarbonisation-en.pdf>



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