# AVIATION FIT FOR 55

## TICKET PRICES, DEMAND AND CARBON LEAKAGE

EXECUTIVE SUMMARY

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# Executive Summary: Aviation Fit For 55

The costs associated with Fit for 55 policies make European air travel more expensive. Higher costs reduce the demand for air travel to, from and within the European Economic Area (EEA) and cause a shift in demand to competing non-EEA hub airports and routes. Fit for 55 policies reduce aviation $CO_2$ emissions, but carbon leakage due to the demand shift reduces these emission savings.

In this study, SEO Amsterdam Economics (SEO) and Royal Netherlands Aerospace Centre (NLR) estimate Fit for 55 impacts on ticket prices, demand, $CO_2$ emissions and carbon leakage, based on a global passenger choice model.[1,2]

The report focuses on air travel to, from and within the EEA. This approximates the EU scope of the Fit for 55 policies:

- **EU-ETS** (EU Emissions Trading System), and **CORSIA** (Carbon Offsetting & Reduction Scheme for International Aviation)
- **ETD** (Energy Taxation Directive, i.e., kerosene tax)
- **ReFuelEU** Aviation (Sustainable Aviation Fuel blending mandate)

The **costs** of air travel increase due to these policies. Within the EEA, Fit for 55 increases the cost of a return flight of 3000 km within the EEA by about €45 per passenger in 2030 and €65 per passenger in 2035 compared to a no-policy scenario in those years. For flights to non-EEA destinations, costs increase for a return flight of 19,000 km (e.g. Frankfurt-Tokyo) around €50 per passenger in 2030 and by €105 in 2035.[3] While costs are an almost linear function of flight distance, both within and outside the EEA, there is variation because the average additional cost per airport may differ. Since longer distances within the EEA imply higher costs, airports closer to EEA borders (e.g. Helsinki, Madrid, Cyprus) have a relative cost disadvantage in comparison to airports located more towards the centre of Europe. Airports just outside the EEA area have a competitive cost advantage as an onward hub for indirect flights from the EEA. Depending on the pass-through rate to the consumers, ticket prices are expected to increase.[4]

The **demand** for air travel decreases due to the additional cost and resulting ticket price increases from Fit for 55 policies. In case the complete cost increase would be passed on to consumers in its entirety, overall passenger volumes in 2030 decrease by 8.4 percent compared to the no-policy scenario of the same year. This implies a decrease of around 75 million passengers (summary Table S.1). In 2035, the overall passenger volumes decrease by 11.6 percent compared the reference scenario, adding up to a total reduction of 119 million passengers. The number of passengers traveling to a non-EEA destination, either directly or via an EEA hub, decreases by 6 percent in

[1] This independent assessment is commissioned by Air France-KLM Group, Groupe ADP, Lufthansa Group and Royal Schiphol Group.
[2] This model was also used in *'Destination 2050: A Route To Net Zero European Aviation'* by NLR and SEO (2021).
[3] Due to the remaining uncertainty around sustainable aviation fuel prices, price forecasts are conservative and therefore could be an underestimate. Larger SAF price forecasts used in industry estimates suggest even higher cost increases. Similarly, there are uncertainties related to other policies, such as RefuelEU applicability and carbon abatement cost.
[4] The assumed pass through rate is 100%. This is a strong assumption usually only applicable to markets with perfect competition. A 100% pass-through rate results in an upper bound on demand impacts, $CO_2$ savings and carbon leakage. Actual pass through will vary according to competition on the route, airport congestion and airline operating profits. The demand and carbon leakage impacts scale linearly with the pass-through, so that a 50 percent pass through would yield half the demand impact and carbon leakage shown here.

2035 (minus 10 million passengers). On the other hand, the number of intercontinental passengers travelling through non-EEA hubs increases by 2 percent (plus 1.4 million passengers).

Table S.1 Overview of impacts on demand and $CO_2$ emissions

| | Intra-EEA | | | EEA → non-EEA | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2018 | 2030 | 2035 | 2018 | 2030 | | | 2035 | | |
| | Total | Total | Total | Total | EEA hubs or direct | non-EEA hubs | Total | EEA hubs or direct | non-EEA hubs | Total |
| **Passenger demand** [a] | | | | | | | | | | |
| Baseline traffic (x mln pax) (without FF55 measures) | 578 | 702 | 792 | 152 | 141 | 53 | 194 | 167 | 63 | 230 |
| Absolute change (x mln pax) (due to FF55 measures) | | -72 | -110 | | -3.8 | 1.0 | -2.8 | -10.0 | 1.4 | -8.6 |
| Relative change (%) | | -10% | -14% | | -2.7% | 1.9% | -1.4% | -6.0% | 2.2% | -3.8% |
| **$CO_2$ emissions** [b] | | | | | | | | | | |
| Baseline emissions (x Mton) | 60 | 64 | 71 | 93 | 62 | 39 | 101 | 71 | 46 | 118 |
| Absolute change (x Mton) | | -9.1 | -19.3 | | -4.6 | -0.2 | -4.8 | -15.7 | -3.3 | -19.1 |
| Relative change (%) | | -14% | -27% | | -7.4% | -0.5% | -4.7% | -22% | -7% | -16% |
| Carbon leakage (x Mton) [c] | | 0.0 | 0.1 | | | | 0.7 | | | 1.1 |

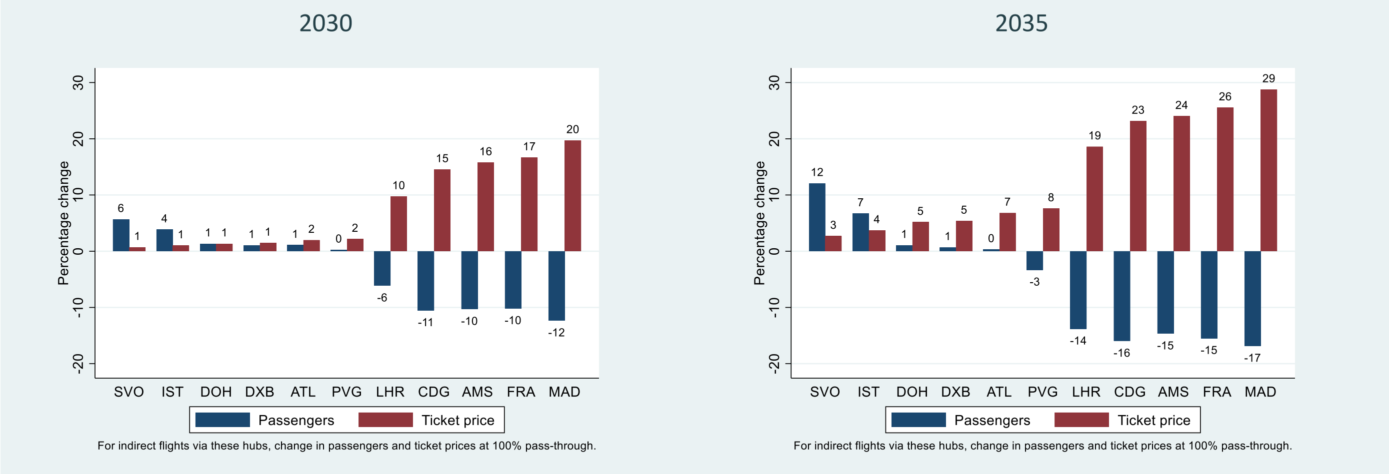
Notes: [a]: Total number of departing Origin & Destination (O&D) passengers from EEA airports.
[b]: Total estimated $CO_2$ emissions of all departing O&D passengers from EEA airports. Baseline emissions are without Ff55 measures, but include reduced $CO_2$ emissions as a result of technological and operational improvements, based on developments according to Destination 2050.
[c]: Sum of all additional emissions due to a shift of demand to non-EEA hubs.
Source: SEO & NLR (2022)

The figures on the next page show the relative impact of Fit for 55 fare increases on average passenger volumes for a selection of EEA and non-EEA hubs, compared to a reference scenario in the same year with no Fit for 55 policies. Competitiveness of European airlines and hubs is expected to diminish in comparison to non-European airlines and hubs. Hubs close to the EEA such as Istanbul (IST) and Moscow Sheremetyevo (SVO) respectively gain 7 and 12 percent of traffic from EEA hubs in 2035 (0.8 and 0.5 million passengers per year). High volume EEA hubs have more to both gain or lose. Since airports at EEA border have a cost disadvantage from Fit for 55, the negative demand impacts are slightly larger (minus 17 percent for Madrid) than for airports located at the centre of Europe, such as Amsterdam or Frankfurt (minus 15 percent, equal to 1.2 and 1.7 million passengers, respectively).

For the purpose of this study, it is assumed that ETD does not apply for the UK, whereas all other measures are in full alignment with the EEA. As a result of the combined impacts, ticket prices for flights via London Heathrow are expected to increase by 19 percent, leading to a 14 percent demand decrease in travel via Heathrow (minus 1.1 million passengers).

Figure S. 1 Ticket price and demand impacts of the Fit for 55 measures

**Average Fit for 55 change in ticket price relative to ticket price (red) versus passenger volume impact (blue) by hub**




Source: SEO & NLR (2022)

A reduction of demand and a relative loss in competitiveness of EU airlines and hubs – in particular on long-haul routes – could jeopardize the further development of EU air connectivity. Although a causal relationship can run both ways, various studies acknowledge that there is a positive relationship between air connectivity and economic growth. From that perspective, a reduction of demand reduces economic growth and aviation employment in the EU compared to the no-policy reference scenario.

The **$CO_2$ savings and carbon leakage** depend directly on the demand impacts of Fit for 55. The higher cost per ticket reduces demand for air travel and the SAF uptake with lower $CO_2$ emissions, in combination result in substantial $CO_2$ savings. For travel from the EEA to a destination outside the EEA, Fit for 55 costs are lower, and demand for air travel via non-EEA hubs increases, thereby reducing overall $CO_2$ savings, i.e., causing carbon leakage.

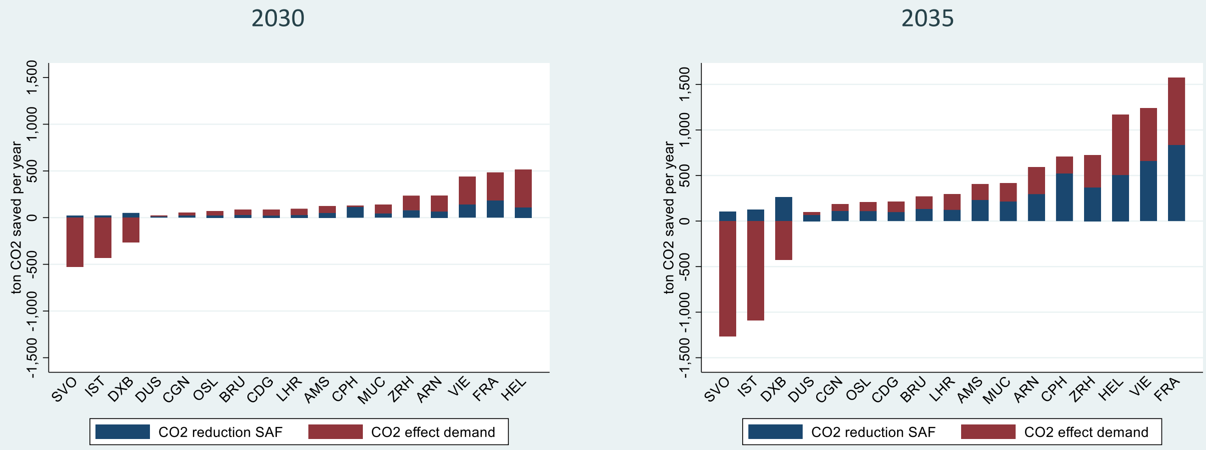
Carbon leakage, the increase of emissions in one country due to the reduction efforts in another, mainly occurs on non-EEA routes. In 2035, the Fit for 55 policy leads to a net $CO_2$ reduction of 19 megatons per year (roughly the emissions of all passenger flights departing from France in one year), whilst carbon leakage leads to an increase of 1.1 megatons of $CO_2$ (equivalent to about 7,000 flights between Frankfurt and New York JFK). Carbon leakage mainly occurs on long-haul markets, particularly on routes with high competition from non-EEA hubs and airlines. On such routes, carbon leakage can be substantially higher, for example on routes towards Asia (e.g. 46 percent on the route Nice to Seoul and 35 percent for Hamburg to Bangkok. Conversely, there are routes with little or no carbon leakage. Taking into account all non-EEA routes, carbon leakage is estimated to be at least 6 percent of total $CO_2$ savings associated with the Fit for 55 policy. Competitive distortion and the resulting carbon leakage are unintended consequences of the Fit for 55 policy.

For intra-EEA routes, there is a limited risk of $CO_2$ leakage. Two sources for carbon leakage within the EEA are that indirect flights within the EEA use a non-EEA hub or that travellers substitute for non-EEA destinations. The former occurs for 0.2 percent of all within EEA travel in 2035. The latter requires analysing travellers' destination choices, which was beyond the scope of the current research.

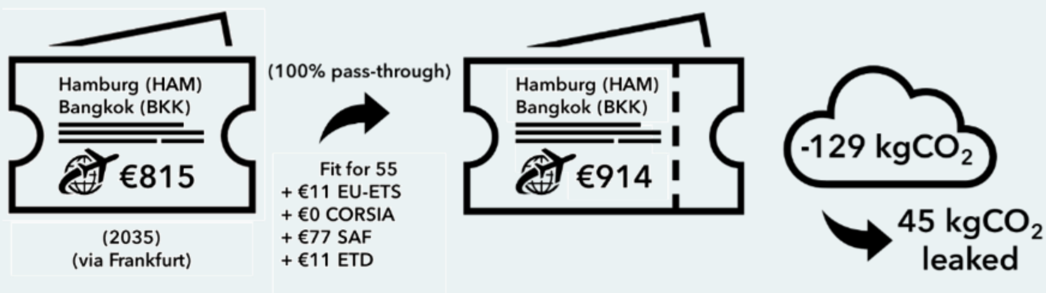
**Case study: Impact in 2035 on a selected route (Hamburg – Bangkok)**

On the Hamburg – Bangkok route, $CO_2$ savings occur for EEA hubs such as Frankfurt, Paris and Amsterdam, but $CO_2$ leakage takes place for routes through non-EEA hubs such as Dubai and Istanbul. The figure below shows the total $CO_2$ savings per hub airport for this particular route. Total $CO_2$ savings via Frankfurt are highest, as this alternative has the highest passenger volume. Demand reductions from EU-ETS and Energy Taxation Directive add to the $CO_2$ savings from ReFuelEU, the Sustainable Aviation Fuel blending mandate. An increase in demand at non-EEA hubs due to lower prices add carbon emissions and therefore reduces the overall $CO_2$ savings. The net (overall) $CO_2$ savings for this example are positive in comparison with a no policy reference case.

**Breakdown of $CO_2$ savings by SAF uptake and demand reduction, by hub**
Hamburg (HAM) ↔ Bangkok (BKK) (assuming 100 percent pass-through rate)




The price, demand and $CO_2$ emission changes can be compared for the two-way travel from Hamburg (HAM) to Bangkok (BKK) via Frankfurt (FRA) and back. In 2035, Fit for 55 policies add € 99 to the return ticket price. This price increase reduces passengers via Frankfurt by 17 percent (approximately 970 passengers annually) in comparison to the reference case of no Fit for 55 cost. Non-EEA hubs gain a competitive advantage over EEA hubs: demand via non-EEA increases by 24 percent whereas traffic via EEA hubs decreases by 15 percent. The SAF mandate and the demand reduction lead to an annual net saving of around 6430 $tCO_2$ for all air travel between Hamburg and Bangkok, which translates to 129 kg per remaining passenger. The amount of $CO_2$ reduction achieved is reduced because some passengers reroute through non-EEA hubs. Without leakage of passengers and emission to non-EEA airports, the $CO_2$ savings could have been 45 kg higher per passenger traveling under the assumed price conditions, implying carbon leakage of 35 percent.




Source: SEO & NLR (2022)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