Creating a world fit for the future

Study on the taxation of the air transport sector

Final Report

Report for European Commission (DG TAXUD)

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under framework contract CLIMA.A4/FRA/2019/0011

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Contact:

Gareth Horton, 30 Eastbourne Terrace, London, W2 6LA, UK

T: +44 (0) 1235 753 050

E: gareth.horton@ricardo.com

Author:

Rui Neiva, Aleix Pons, Gareth Horton (Ricardo), Christian Lutz, Martin Distelkamp (GWS), Raquel de Luis Iglesias, Olivia Brajterman (Ipsos), Andre van Velzen Alice Pirlot

Approved by:

Lorenzo Casullo

Signed

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Abstract

This study on the taxation of the aviation sector in the European Union supports the impact assessment of the Energy Taxation Directive (ETD) to address the problem of insufficient internalisation of climate-related externalities in this sector and to preserve the capacity to generate revenues for the budgets of the Member States. The study assessed the potential impacts of introducing a fuel tax, a ticket tax and a combined tax (fuel tax on intra-EEA flights and ticket tax on extra-EEA flights). The options were assessed against two baseline scenarios, reflecting the uncertainty around the recovery of aviation activity following the COVID-19 pandemic.

The policy options for a fuel tax on intra-EEA flights would amend the current tax exemption of aircraft fuel. Possible tax rates were based on the tax levels for kerosene as defined in the current version of the ETD.

The ticket tax options included a 'flat rate', a 'stepped rate' (with higher tax rates for longer distances, reflecting higher environmental impacts) and an 'inverse stepped rate' (with higher tax rates for shorter flights, as an incentive to use alternative transport options where available).

The analysis assessed both impacts on the aviation sector (travel demand, environmental emissions, sector revenues), and wider socio-economic impacts (employment, GDP) providing a comparison across policy tools to guide decision-making. A case study was also performed on the potential impacts on selected island regions (the Canary Islands, Crete, Ireland and Malta) in the European Union.

Executive summary

Purpose and scope of the study

The aviation sector contributes to global CO_2 emissions from fossil fuel combustion , and its contribution is expected to grow significantly in the future. The aviation sector will be required to contribute to the 90% reduction in emissions from transport targeted for 2050 under the European Green Deal (European Commission, 2019a).

This study on the taxation of the air transport sector in the European Union supports the impact assessment to be performed by the European Commission as part of the review of Directive 2003/96/EC (the 'Energy Taxation Directive', ETD). The study considers the possibility of modifying the current tax regime applicable to the commercial aviation sector to address the problem of insufficient internalisation of climate-related externalities in this sector, and assesses the environmental and socio-economic impacts of different policy options that would strengthen the sector's contribution to the EU's climate goals.

The study covers the whole of the European Economic Area (EEA), namely the EU27 plus Norway, and Iceland. It assumes that potential policy options would enter into force in 2023, with the impacts being assessed for the period up to 2050.

Approach and methodology

The analysis assesses the impacts of the proposed policy options against two baseline scenarios. The use of two baselines was motivated by the severe impacts on the aviation sector, and society more widely, from the global COVID-19 pandemic. The health and economic crises generated by the pandemic have affected and will continue to impact demand for travel, potentially inducing long-term changes to businesses and people's habits, making any forecast of aviation demand very uncertain. Therefore, a main baseline scenario reflecting developments under current trends and adopted policies is used. It builds on the baseline scenario underpinning the impact assessment accompanying the 2030 Climate Target Plan and the staff working document accompanying the Sustainable and Smart Mobility Strategy, but it additionally considers the impacts of the COVID-19 pandemic and the National Energy and Climate Plans. In this scenario, air passenger traffic recovers by 2025, with a return to growth rates akin to historic rates in subsequent years. A sensitivity baseline with lower future growth is also used, based on EUROCONTROL's scenarios for the post-COVID recovery for the aviation sector.

The following tools are used to assess the impacts:

- A model, AERO-MS, focussed on the aviation sector, with detailed data at an airport pair level. This model is used to quantify impacts on the aviation sector of the various policy options.
- Results from the AERO-MS are transferred to a macro-economic model, GINFORS-E. This model, which includes bilateral world trade data, is used to quantify wider economic impacts on other transport modes and other economic sectors for the different policy options.
- The use of both models provides a comprehensive overview of impacts in comparison with each of the baselines included in the study, with results produced for short-term (2025), mid-term (2030) and long-term (2050) impacts.
- The study also includes a thorough legal analysis of the EU and international legal framework currently in place, in order not only to ensure the effectiveness of the different policy options under current legislation, but also to assess the potential legal consequences of the interventions.
- A focused field research programme is also part of the study, with conversations held with experts in the competent ministries of Austria, Germany, Sweden and the Netherlands. All of these are Member States with experience in levying national air ticket taxes.
- A case study on peripheral and island regions is also conducted, to investigate and quantify possible negative socio-economic impacts that could take place on those regions, given their reliance on aviation for their economic activities, if taxation on the aviation sector is

implemented in the EU. The regions and Member States under analysis were the Canary Islands (Spain), Crete (Greece), Ireland and Malta.

Assessment of policy options

Fuel tax

Overview of policy options

The policy options implementing a fuel tax for intra-EEA aviation activity would amend the current exemption from excise duty of aircraft fuel in Article 14(1) of the ETD. This responds to the need for a harmonised approach, since the capacity to waive current exemptions for domestic flights or intra-community flights via bilateral agreements between Member States under Article 14(2) has not been used so far. The current minimum excise duty rate for kerosene, according to the Energy Taxation Directive, is € 330/1,000 L (or 33 cents/L). The sub-options consider variations around (above and below) the minimum kerosene tax rate that would be applicable to commercial aviation, as well as a number of exemptions. This is summarised in the table below.

Summary of policy options for the implementation of a fuel tax

Policy package	Tax rate	Other considerations
Harmonised fuel tax for intra-EEA aviation under the revised ETD	€0.17, €0.33 and €0.50/litre[1] (equivalent to approximately €4.82, €9.35 and €14.17 per GJ, respectively) Tax applies to passenger flights but not to cargo-only flights[2] Tax is either implemented at once or over a ten-year period (increments of 10% of the full value in each year) Sustainable aviation fuels are exempt from fuel tax	Exemptions for flights operated under public service obligations Exemptions for flights to and from EU outermost regions No earmarking of revenues

The tax rates shown in the table above can also be related to the CO_2 emissions produced from the combustion of the fuel. The three rates shown are equivalent to approximately €67, €131 and €198 per tonne CO_2, respectively.

A tax on the fuel loaded for a flight can help towards internalising the external costs of greenhouse gases and air pollutants emissions, related to the quantity of fuel consumed. The airline is expected to pass through the cost to consumers by raising ticket prices, leading to a reduction in passenger demand and hence fuel consumption. To a more limited extent, airlines are also incentivised to choose more efficient aircraft for their operations to reduce the fuel consumed. The effectiveness of the fuel tax in achieving those goals could be reduced if the airlines use the practice of 'tankering' to reduce their tax burden (i.e. filling up the aircraft in destinations where there is no fuel tax and then using the same aircraft to fly intra-EEA flights where fuel would be taxed) or if they shift some of their intra-EEA flights to destinations in third countries.

From an efficiency perspective, the collection of a fuel tax is not expected to be problematic. Member States already have experience in collecting fuel taxes in other modes, namely on road transport. It is expected that an aviation fuel tax would be collected in a similar manner, with the fuel suppliers

[1] Prices are modelled, and presented in this report, in constant 2019 Euros. The central tax rate used in this study was selected prior to the finalisation of the value used in the Commission's impact assessment, so there is a small difference between the values in the two studies.
[2] Due to modelling limitations, the impact results presented include the application of the fuel tax to cargo-only flights. The contribution of such flights to the overall emissions is small, so the effects of including the tax on them is also considered to be small.

collecting the tax when they supply kerosene at airports, then transferring those funds to the relevant tax authorities. The analysis indicates administrative costs of €45 million across the EEA by 2050.

From a legal perspective, no issues are identified for the implementation of a tax on fuel loaded for intra-EU flights by EEA carriers. Furthermore, many air services agreements (horizontal agreements, HAs, and comprehensive air transport agreements, CATAs) between the EU and third countries also allow the taxation of fuel used by their carriers on intra-EU flights. Updates to these agreements might be needed to allow the taxation of fuel used by their carriers on flights between the EU and the other EEA countries.

Assessment of impacts

Overall, the options implementing a tax on fuel loaded for intra-EEA flights all have noticeable impacts on CO_2 emissions in the long-term, with reductions of between 6% and 15% for intra-EEA flights, relative to the baseline, for tax rates from €0.17 to €0.50 per litre (the short-term impacts depend on whether a transition period is included). This result corresponds closely to the level of the reduction in passenger demand – while the fuel tax leads to a small improvement in aircraft fuel efficiency, the large majority of the reduction in emissions is due to a reduction in demand due to increased ticket prices. These results are only marginally affected when considering them against a lower baseline demand (representing a slower recovery following the COVID-19 pandemic).

The impacts of the fuel tax and the consequent changes in demand reduce total GDP in the EU27 by approximately €9 billion (about 0.05%) by 2050, under the assumption that revenues collected are used for deficit reduction purposes. Should the revenues be recycled, for example to fund reduction in other taxes, the negative impact on GDP would be smaller. In terms of tax revenue, the existing national ticket taxes contribute €2.6 billion of revenue from intra-EEA flights in 2025 and €3.8 billion in 2050; under the €0.33 per litre option, the tax on fuel raises about €7.0 billion per annum in 2050. However, the reduction in demand also reduces the revenue from the existing ticket taxes, so the total increase in tax revenue from aviation is about €6.7 billion per annum in 2050. The wider impacts on the economy from the reduction in aviation demand then reduce the rise in total tax revenue over the baseline to €5.4 billion per annum.

Regarding the impact on connectivity, the lower demand resulting from the introduction of a fuel tax would be expected to reduce flight frequencies across all routes. In principle, this could potentially lead to the loss of air transport on some routes, should these cease to be financially viable for air carriers to operate. However, this negative effect may be limited. This is because the expected number of intra EEA flights in the baseline for 2025 is 21% higher compared to base year 2016. By 2025, the introduction of a fuel tax of €0.33/litre (with no transition period) would lead to a reduction of 10% in the number of flights when compared to the baseline. Given this, it is expected that, overall, the flight frequency on most routes would be still higher than it was in 2016, although some variations are expected and specific regions could indeed see their connectivity reduced.

In terms of competitiveness of EEA carriers in relation to third country carriers (and between different EEA carriers) there could negative impacts on the former. This is because non-EEA carriers might be subject to a more lenient tax regime in their 'home' market, allowing them to be more profitable overall and be in a better position to compete with the EEA carriers on the routes on which the two sets of carriers compete.

The implementation of a fuel tax on intra-EEA flights could give rise to concerns regarding 'hub switching', as carriers change the connection airport on an indirect flight (between an EEA departure and a non-EEA destination) from an EEA airport to a non-EEA airport, to take advantage of the lack of fuel tax on the initial leg. This is more likely to impact traditional network carriers than low-cost carriers, as the latter tend to fly mainly direct flights. However, the extent to which hub switching may occur depends on a number of factors, including slot availability at airports and passenger preferences, so it is not possible to quantify the likely impact at this stage.

Sensitivity analyses

The impacts of the fuel tax (as percentage changes in demand and emissions) are not significantly affected when considering them against a lower baseline demand (representing a slower recovery following the COVID-19 pandemic).

A scenario in which there is a significantly higher uptake of sustainable aviation fuels (through a blending mandate, as investigated by the ReFuelEU Aviation initiative) increases the reduction in demand on intra-EEA flights in 2030 under the €0.33 per litre fuel tax from 9.2% (under the case with the baseline use of sustainable aviation fuel) to 9.9%. By 2050, the reduction in demand on intra-EEA flights is 9.7% (with the baseline sustainable aviation fuel use) and 15.4% (under the blending mandate). The reduction in CO_2 emissions (relative to the baseline) in 2050 rises from 10.3% (for just the fuel tax) to 66.5% (for the blending mandate and fuel tax combined), under the assumption that sustainable fuels cause zero net emissions on a life cycle basis and are rated at 50% of the full tax rate under the fuel tax (i.e. €0.165 per litre). The revenue from the fuel tax is reduced by 34% under such a scenario, compared to the case without the blending mandate.

The primary analysis assumes that the additional costs due to the fuel tax are passed through to passengers, as increased ticket prices, in full. Under a scenario in which only 50% of the costs are passed through (with the remainder being absorbed by the airlines), the impacts on demand and emissions are approximately half those under the full cost pass-through case. Due to the smaller impact on demand, the tax revenue from the fuel tax is about 5% higher than under the full cost pass-through assumption.

Under a scenario in which existing national ticket taxes are withdrawn when the fuel tax is implemented (rather than being retained as in the primary analysis), demand for intra-EEA flights is reduced by 5.6% (relative to the baseline) compared to 9.7% in the primary analysis. The reduction in emissions (in 2050) is similarly lower. Although the demand is higher than under the primary analysis, the withdrawal of the national ticket taxes results in a reduction in the total tax revenue.

A scenario in which the fuel tax is applied to fuel supplied for flights from the EEA to Morocco and the UK (as allowed for by the aviation agreements with those countries), but assuming that those two countries do not impose the same fuel tax on flights to the EEA, raises the reduction in demand by 13% more than in the case that the fuel tax is applied only to intra-EEA flights (noting that this additional reduction in demand occurs on extra-EEA flights). The large majority of this extra reduction occurs on low-cost carrier flights, reflecting the close proximity of these two countries to the EEA. The increased reduction in demand leads to a similar increased reduction in emissions and an approximately 11% increase in tax revenue.

A scenario in which EU ETS allowances are fully auctioned (i.e. removal of free allowances) under the assumption of the baseline carbon price projections (i.e. not taking into account the impacts on carbon prices of the revisions of the ETD and the ETS, and the ReFuelEU Aviation initiative), shows a slightly greater reduction in demand, fuel consumption and emissions, but a slightly lower increase in tax revenues, compared to a scenario where a fuel tax is implemented but a proportion of EU ETS allowances continues to be granted for free to airlines.

Ticket tax

Overview of policy options

The policy options implementing a fuel tax define a minimum, EU-wide ticket tax applicable to passenger services and, potentially, to air freight services. A number of EU Member States and their neighbours (Austria, France, Germany, Italy, Netherlands, Portugal and Sweden, together with Norway and the UK) already implement a ticket tax – in some jurisdictions better defined as a levy or charge – on all departing air passengers. While the applicable rates of existing national ticket taxes vary significantly, most of them share some common features: exemptions for transit and transfer passengers; differentiation between short haul and long haul flights, based on different criteria; and no earmarking of revenues to a dedicated fund. Air freight services are typically not affected by national taxes on the ground of international competitiveness. Many of these features also characterise the ticket tax policy option, as summarised in the table below.

Summary of policy options for the implementation of a ticket tax

Policy package	Tax rate	Other considerations

Harmonised ticket tax across the EU	Different types of passenger taxes considered:
	• Flat tax
	  ○ €10.43 for all passengers
	• Tax increasing with the distance flown
	  ○ €10.12 for intra-EEA flights
	  ○ €25.30 for extra-EEA flights of up to 6,000km
	  ○ €45.54 for extra-EEA flights over 6,000km
	• Tax decreasing with the distance flown
	  ○ €25.30 for flights of up to 350km
	  ○ €10.12 for flights over 350km
	Tax could be the same for all passengers in a flight, or be differentiated depending on the class of travel (non-premium/premium tickets).
		Exemptions for flights operated under public service obligations
		Exemptions for flights to and from EU outermost regions
		No earmarking of revenues

In terms of efficiency, conversations with Member States government officials indicate that the administrative burden of implementing and managing a ticket tax is relatively low both for public administrations and airlines. Overall administrative costs are expected to be lower than equivalent costs for implementing a fuel tax. Analysis indicates administrative costs of €465 thousand to €1 million per Member State per year (€12.6 million to €27.6 million across the EU).

From an effectiveness perspective, unlike a fuel tax, ticket taxes can at most have an indirect relationship with fuel consumption (e.g. if they increase with distance). They do not provide direct incentives for increased fuel efficiency (passengers on two different aircraft with different fuel efficiencies would pay the same ticket tax) but are essentially a demand management measure, as they essentially increase the price of air tickets. This gives a small disadvantage of ticket taxes compared to fuel taxes. An advantage of a ticket tax is that it can be more easily applied (from a legal perspective) to an increased scope (intra-EEA, extra-EEA flights or both), which increases the potential demand effects of such a measure and reduces the need for renegotiating some international air transport agreements.

Assessment of impacts

The impacts of the different types of ticket tax considered were as follows:

- For the flat ticket tax, where a single tax rate applies to all flights, the reduction in demand is 9% on intra-EEA flights and 1.5% on extra-EEA flights. The total tax revenue is about €6.7 billion in 2025, rising to €9.9 billion in 2050, representing increases of €4.1 billion to €6.2 billion above the baseline values.
- The stepped rate option, with a higher tax rate applying to longer flights (over 6,000 km), has a slightly lower impact on intra-EEA demand, but a significantly greater impact on extra-EEA demand (about 4.5% reduction in demand), compared to the flat rate option. The tax revenue from this option in 2050 is €6 billion over the baseline.
- The inverse stepped rate, with a higher rate applying to short flights (below 350 km), has a slightly higher impact on intra-EEA demand, and a very similar impact on extra-EEA demand, compared to the flat rate option. The tax revenue from this option in 2050 is €7 billion over the baseline.

In terms of CO_2 emissions, the different ticket tax options lead to reductions of between 8% and 10% on intra-EEA flights and between 3% and 5.5% on extra-EEA flights.

Regarding other potential sub-options, the application of tax multipliers of 3.0 and 7.5 for premium seats has only a small effect on the demand impacts of the tax options as they target passengers with more inelastic demand. Multipliers have a more significant effect on the tax revenue, increasing revenue to about €13 billion in 2050 under the flat rate tax with a 7.5 premium multiplier. The relative impacts of the ticket tax (as percentage changes) do not change when considering them against a lower baseline demand (representing a slower recovery following the COVID-19 pandemic).

With respect to the impact on connectivity, and not unlike the options introducing a fuel tax, the lower demand resulting from the ticket tax would be expected to reduce flight frequencies across all routes. However, under the different policy options that introduce a ticket tax, by 2025 demand is expected to be above 2016 levels – e.g., under a stepped ticket tax with no reduction in national ticket taxes, by 2025 number of flights by legacy carriers is expected to be 12% higher than in 2016, and for low-cost carriers 9% higher. That is, the introduction of a ticket tax, while reducing the expected growth in demand, is not expected to reduce demand when compared to 2016 levels and thus the impacts on connectivity are expected to be limited.

The implementation of a ticket tax, covering both intra-EEA and extra-EEA flights, might also raise concerns on the potential for hub switching. The ticket tax options considered in this study all exempt passengers travelling from a non-EEA origin to a non-EEA destination, connecting via an EEA airport; this exemption is expected to reduce the risk of airlines deciding to move their hubs away from EEA airports. The risk of passengers electing to travel from the EEA to a non-EEA destination, with a connection at a non-EEA airport (rather than connecting at an EEA airport) will depend on the exact design of the tax (e.g. whether the tax is calculated on the ‘ticket’ for the full journey or individual legs). Overall, the impact of hub switching on the competitiveness of EEA carriers and airports is expected to be limited.

Sensitivity analyses

The impacts of the ticket taxes (expressed as percentage changes) do not vary when considering them against a lower baseline demand (representing a slower recovery following the COVID-19 pandemic).

Under a scenario in which existing national ticket taxes that are already higher than the harmonised minimum value are set to this value, the impacts on demand, emissions and tax revenues change only very slightly compared to the case in which existing national ticket taxes that are higher than the harmonised minimum are retained at their existing values.

Combined tax options

Overview of policy options

Different combinations of the two types of taxes were developed to identify whether there are advantages in having such combinations. Sub-options include the case where the ticket tax is applied to all flights (intra-EEA and extra-EEA), to intra-EEA flights only and to extra-EEA flights only. Otherwise, the combined tax options have the same considerations in terms of efficiency, effectiveness and legal issues as the fuel and ticket taxes considered individually.

Assessment of impacts

All the combined tax options considered in this study include a tax on the fuel supplied for intra-EEA flights and a ticket tax on extra-EEA flights. The cases considered have combined a €0.33 per litre fuel tax on intra-EEA flights and a ticket tax (flat, stepped or inverse stepped) on extra-EEA flights.

All tax options analysed have significant impacts on CO_2 emissions in the long-term, with reductions of about 10% on intra-EEA flights and up to almost 5% on extra-EEA flights. The option with the stepped ticket tax on extra-EEA flights has a greater impact than the other two combined tax options considered. The impacts on demand are very similar to those on emissions, with slightly lower magnitudes of change (up to 9.7% on intra-EEA flights and 4.0% on extra-EEA flights).

The additional tax revenue from aviation under the combined tax options ranges from €14 billion to €16 billion per annum by 2050. The impacts on the economy from the reduction in aviation demand reduce the rise in total tax revenue from the transport sector to about €12 billion per annum. A similar reduction in GDP is also expected by 2050 in the EU27 Member States.

Sensitivity analyses

The relative impacts of the combined tax (as percentage changes) are unaffected when considering them against a lower baseline demand (representing a slower recovery following the COVID-19 pandemic).

In a scenario under the combined tax option in which flights from the EEA to Morocco and to the UK[3] are subject to the fuel tax element instead of the ticket tax element (otherwise applied to all 'extra-EEA' flights) the impact on demand, fuel consumption or revenue is negligible compared to the case in which these flights are subject to the ticket tax element of the combined tax.

Comparison of options

The table below presents a quantitative comparison of the impacts of the main indicators for the 'main' sub-option of each policy option – the heading of the table provides the details of the sub-option under consideration. All impacts are presented for the year 2030. To simplify the table, all increases in parameters (demand, tax revenue, etc.) are marked as '+', while all reductions are marked as '-'.

Comparison of main policy options

	Policy option 1: €330 per 1,000 litres fuel tax on fuel loaded for intra-EEA flights	Policy option 2: Stepped rate ticket tax (€10.12 per ticket on intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km)	Policy option 3: €330 per 1,000 litres fuel tax on fuel loaded for intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km
Economic impacts			
Total flights	-9.1% intra-EEA; 0.0% extra-EEA	-8.1% intra-EEA; -8.9% extra-EEA	-9.1% intra-EEA; -5.9% extra-EEA[4]
Total aviation passenger demand (p-km)	-9.2% intra-EEA; 0.0% extra-EEA	-8.3% intra-EEA; -4.6% extra-EEA	-9.2% intra-EEA; -2.7% extra-EEA
Total rail + aviation passenger demand (p-km)	-5.6% (1,078.8 billion p-km)	-5.0% (1,097.0 billion p-km)	-5.6% (1,090.3 billion p-km)
Revenues in aviation sector[5]	-0.5% intra-EEA; 0.0% extra-EEA; -3.2% total net revenue	-0.7% intra-EEA; +0.8% extra-EEA; -8.5% total net revenue	-0.5% intra-EEA; +0.5% extra-EEA; -6.5% net revenue
Revenues from taxation (aviation), including existing ticket taxes	€7.44 billion intra-EEA; €10.36 billion total	€7.44 billion intra-EEA; €19.14 billion total	€7.43 billion intra-EEA; €15.87 billion total
GDP	-0.04%	-0.06%	-0.04%
Environmental impacts			
CO_2 emissions (aviation sector)	-9.9% intra-EEA; 0.0% extra-EEA; -3.7% total	-7.8% intra-EEA; -5.2% extra-EEA; -6.2% total	-9.9% intra-EEA; -3.6% extra-EEA; -6.0% total

[3] As allowed for by the air transport agreements between the EU and those countries

[4] Although the ticket tax rates on extra-EEA flights are the same under policy options 1 and 2, the impacts of policy option 3 are lower in 2030 as the tax (including both fuel tax and ticket tax elements) is implemented with a 10-year transition period starting in 2024, whereas under policy option 2 the tax is implemented in full from 2024.

[5] The aviation sector revenues are the incomes to the airlines from passenger tickets and freight charges. The gross impacts (presented for intra-EEA and extra-EEA flights) include additional incomes from passing through the ticket taxes to passengers (and cargo taxes to freight companies), while the impact on net revenues includes the payment of the ticket and cargo taxes collected, and fuel taxes, to the tax authorities.

	Policy option 1: €330 per 1,000 litres fuel tax on fuel loaded for intra-EEA flights	Policy option 2: Stepped rate ticket tax (€10.12 per ticket on intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km)	Policy option 3: €330 per 1,000 litres fuel tax on fuel loaded for intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km
Social impacts – number of persons employed			
Air transport services	-1.0%	-1.8%	-1.3%
Total transport services	+0.02%	+0.04%	+0.02%

All three policy options are found to have similar impacts on intra-EEA flights: introducing a tax (either fuel tax or ticket tax) on commercial aviation increases ticket prices and reduces demand. Options 2 and 3 add in the extra impacts of including extra-EEA flights in their scope and, therefore, give greater total reductions in emissions and total tax revenues. Although options 2 and 3 include the same ticket tax rates on extra-EEA flights, the impacts are slightly greater in the table for option 2 as the taxes are assumed to be implemented immediately (in 2024) under that option, while option 3 assumes a 10-year transition period (in line with that used for the fuel tax on intra-EEA flights).

Résumé

Objectif et portée de l'étude

Le secteur de l'aviation est l'un des principaux responsables des émissions de CO_2 mondiales dues à la combustion de combustibles fossiles, la plus grande source d'émissions de gaz à effet de serre (GES) provenant d'activités humaines. Bien que l'aviation soit l'un des émetteurs de GES les plus importants, et que sa contribution doive augmenter considérablement à l'avenir, elle reste largement non taxée. Dans le cadre du "contrat vert" européen, le secteur de l'aviation devra contribuer à l'objectif de 90% de réduction des émissions du secteur des transports prévue pour 2050 (European Commission, 2019a).

Cette étude sur la taxation du secteur du transport aérien dans l'Union européenne assiste l'analyse d'impact que la Commission européenne doit réaliser dans le cadre de la révision de la directive 2003/96/CE (la "directive sur la taxation de l'énergie", DTE). L'étude examine la possibilité de modifier le régime fiscal qui s'applique actuellement au secteur de l'aviation commerciale, afin de résoudre le problème de l'internalisation insuffisante des externalités liées au climat dans ce secteur, et évalue les impacts environnementaux et socio-économiques de différentes options politiques qui renforceraient la contribution du secteur aux objectifs climatiques de l'UE.

L'étude couvre l'ensemble de l'Espace économique européen (EEE), à savoir l'UE-27 plus la Norvège et l'Islande. Elle part de l'hypothèse que les options politiques potentielles entreraient en vigueur en 2023, les impacts étant évalués pour la période allant jusqu'à 2050.

Approche et méthodologie

L'analyse évalue l'impact des options stratégiques proposées par rapport à deux scénarios de référence. L'utilisation de deux scénarios de référence a été justifiée par les graves répercussions de la pandémie mondiale du COVID-19 sur le secteur de l'aviation, et plus largement sur la société. Les crises sanitaires et économiques engendrées par la pandémie ont eu et continueront d'avoir un impact sur la demande de voyages, pouvant induire des changements à long terme dans les entreprises et les habitudes des personnes, rendant toute prévision de la demande d'aviation très incertaine. Par conséquent, l'analyse utilise un scénario de référence principal reflétant les développements dans le cadre des tendances actuelles et des politiques adoptées. Il s'appuie sur le même scénario de référence utilisé pour l'analyse d'impact accompagnant le Plan climat 2030 et le document de travail des services de la Commission accompagnant la stratégie de mobilité durable et intelligente, mais il prend également en compte les effets de la pandémie COVID-19 et des plans nationaux pour l'énergie et le climat. Dans ce scénario, le trafic aérien de passagers est rétablit d'ici à 2025, et les taux de croissance redeviennent proches des taux historiques les années suivantes. Une autre base de référence est également utilisée, avec une croissance future plus faible, basée sur les scénarios d'EUROCONTROL pour la reprise du secteur de l'aviation après le COVID.

Les outils suivants sont utilisés pour évaluer les impacts:

- Un modèle, AERO-MS, axé sur le secteur de l'aviation, avec des données détaillées au niveau de paire d'aéroports. Ce modèle est utilisé pour quantifier les impacts des différentes options politiques sur le secteur de l'aviation.
- Les résultats de l'AERO-MS sont transférés à un modèle macro-économique, GINFORS-E. Ce modèle, qui comprend des données sur le commerce mondial bilatéral, est utilisé pour quantifier les impacts économiques plus larges sur les autres modes de transport et les autres secteurs économiques pour les différentes options politiques.
- L'utilisation des deux modèles permet d'obtenir une vue d'ensemble des impacts par rapport à chaque scénario de référence inclus dans l'étude, avec des résultats produits pour les impacts à court terme (2025), à moyen terme (2030) et à long terme (2050).
- L'étude comprend également une analyse approfondie du cadre juridique européen et international actuellement en place, afin non seulement de garantir l'efficacité des différentes options politiques dans le cadre de la législation actuelle, mais aussi d'évaluer les conséquences juridiques potentielles des interventions.

- L'étude comprend également un programme de recherche sur le terrain, y compris des entretiens avec des experts provenant des ministères compétents d'Autriche, d'Allemagne, de Suède et des Pays-Bas. Tous ces pays sont des États membres qui ont de l'expérience dans le prélèvement de taxes nationales sur les billets d'avion.
- Une étude de cas sur les régions périphériques et insulaires est également menée, afin d'examiner et de quantifier d'éventuels impacts socio-économiques qui pourraient nuire à ces régions si la taxation du secteur de l'aviation est mise place dans l'UE, étant donné leur dépendance à l'égard de l'aviation pour leurs activités économiques. Les régions et les États membres analysés sont les îles Canaries (Espagne), la Crète (Grèce), l'Irlande et Malte.

Évaluation des options politiques

Taxe sur les carburants

Aperçu des options politiques

Les options politiques pour mettre en œuvre une taxe sur le carburant pour l'activité aérienne intra-EEE modifieraient l'actuelle exonération de droits d'accise sur le carburant d'aviation prévue à l'article 14, paragraphe 1, de la directive sur le transport aérien. Cela répond à la nécessité d'une approche harmonisée, puisque la possibilité de renoncer aux exonérations actuelles sur les vols intérieurs ou intracommunautaires par le biais d'accords bilatéraux entre les États membres en vertu de l'article 14, paragraphe 2 n'a pas été utilisée jusqu'à présent. Le taux d'accise minimal actuel pour le kérosène, conformément à la directive sur la taxation de l'énergie, est de 330 €/1 000 L (ou 33 cents/L). Les sous-options envisagent des variations autour (au-dessus et en dessous) du taux minimal de taxation du kérosène qui serait applicable à l'aviation commerciale, sauf un certain nombre d'exemptions. Ceci est résumé dans le tableau ci-dessous.

Résumé des options politiques pour la mise en œuvre d'une taxe sur les carburants

Policy package	Tax rate	Other considerations
Taxe harmonisée sur le carburant pour l'aviation intra-EEE dans le cadre de la DTE révisée	€0.17, €0.33 et €0.50/litre[6] (équivalant respectivement à environ €4.82, €9.35 et €14.17 par GJ) La taxe s'applique aux vols de passagers, mais pas aux vols de fret[7] La taxe est mise en œuvre soit en une fois, soit sur une période de dix ans (par tranches de 10 % de la valeur totale chaque année) Les carburants d'aviation durables sont exonérés de la taxe sur les carburants	Exemptions pour les vols effectués dans le cadre d'obligations du service public Exemptions pour les vols à destination et en provenance des régions ultrapériphériques de l'UE Pas d'affectation des recettes

Les taux d'imposition indiqués dans le tableau ci-dessus peuvent également être liés aux émissions de CO_2 produites par la combustion du carburant. Les trois taux indiqués équivalent à environ €67, €131 et €198 par tonne de CO_2, respectivement.

Une taxe sur le carburant chargé sur un vol peut contribuer à internaliser les coûts externes des émissions de gaz à effet de serre et de polluants atmosphériques, liés à la quantité de carburant consommée. Il est attendu que la compagnie aérienne répercute ce coût sur les consommateurs en

[6] Les prix sont modélisés, et présentés dans ce rapport, en euros constants de 2019.
[7] En raison des limites de la modélisation, les résultats de l'impact présentés incluent l'application de la taxe sur le carburant aux vols de fret uniquement. La contribution de ces vols aux émissions globales étant faible, les effets de l'inclusion de la taxe sur ces vols sont également considérés comme faibles.

augmentant le prix des billets, entrainant une réduction de la demande des passagers et donc de la consommation de carburant. Dans une mesure plus limitée, les compagnies aériennes sont également incitées à choisir des avions plus efficaces pour leurs opérations afin de réduire la consommation de carburant. L'efficacité de la taxe sur le carburant pour atteindre ces objectifs pourrait être réduite si les compagnies aériennes recourent à la pratique du "ravitaillement en carburant" pour réduire leur charge fiscale (c'est-à-dire en faisant le plein de carburant dans des destinations où il n'y a pas de taxe sur le carburant et en utilisant ensuite le même avion pour effectuer des vols intra-EEE où le carburant serait taxé) ou si elles déplacent certains de leurs vols intra-EEE vers des destinations dans des pays tiers.

Du point de vue de l'efficacité, la récolte d'une taxe sur les carburants ne devrait pas poser de problème. Les États membres ont déjà l'expérience de récolter des taxes sur le carburant sur d'autres modes de transport, notamment le transport routier. On s'attend à ce qu'une taxe sur le carburant d'aviation soit perçue de manière similaire, les fournisseurs de carburant percevant la taxe lorsqu'ils fournissent du kérosène aux aéroports, puis transférant ces fonds aux autorités fiscales compétentes. L'analyse indique des coûts administratifs de 45 millions d'euros dans l'EEE d'ici 2050.

D'un point de vue juridique, aucun problème n'est identifié lié à la mise en place d'une taxe sur le carburant chargé pour les vols intra-UE par les transporteurs de l'EEE. En outre, la plupart des accords de services aériens (accords horizontaux, AP, et accords globaux de transport aérien, ACTA) entre l'UE et les pays tiers autorisent également la taxation du carburant utilisé par leurs transporteurs sur les vols intra-UE. Des mises à jour de ces accords pourraient être nécessaires pour permettre la taxation du carburant utilisé par leurs transporteurs sur les vols entre l'UE et les autres pays de l'EEE.

Évaluation des impacts

Globalement, les options politiques mettant en œuvre une taxe sur le carburant chargé pour les vols intra-EEE ont toutes un impact notable sur les émissions de CO_2 à long terme, avec des réductions comprises entre 6 % et 15 % pour les vols intra-EEE, par rapport au scénario de référence, pour des taux de taxation allant de 0,17 € à 0,50 € par litre (les impacts à court terme dépendent de l'inclusion ou non d'une période de transition). Ce résultat correspond étroitement au niveau de la réduction de la demande des passagers - si la taxe sur le carburant entraîne une légère amélioration du rendement énergétique des avions, la grande majorité de la réduction des émissions est due à une réduction de la demande en raison de l'augmentation du prix des billets. Ces résultats ne changent que marginalement si l'on considère une demande de base plus faible (représentant une reprise plus lente après la pandémie de COVID-19).

L'impact économique de la taxe sur les carburants et les modifications de la demande qui en découlent réduisent le PIB total de l'UE27 d'environ 9 milliards d'euros (environ 0,05 %) d'ici 2050, dans l'hypothèse où les recettes collectées sont utilisées à des fins de réduction du déficit. Si les recettes étaient recyclées, par exemple pour financer la réduction d'autres taxes, l'impact négatif sur le PIB serait moindre. En termes de recettes fiscales, les taxes nationales existantes sur les billets d'avion représentent 2,6 milliards d'euros de recettes provenant des vols intra-EEE en 2025 et 3,8 milliards d'euros en 2050; dans le cadre de l'option 0,33 € par litre, la taxe sur le carburant rapporte environ 7 milliards d'euros par an en 2050. Toutefois, la réduction de la demande entraîne également une diminution des recettes provenant des taxes existantes sur les billets, de sorte que l'augmentation totale des recettes fiscales provenant de l'aviation est d'environ 6,7 milliards d'euros par an en 2050. Les effets globaux de la réduction de la demande d'aviation sur l'économie réduisent alors l'augmentation des recettes fiscales totales par rapport au scénario de référence à 5,4 milliards d'euros par an.

En ce qui concerne l'impact sur la connectivité, la baisse de la demande suite à l'introduction d'une taxe sur le carburant devrait réduire la fréquence des vols sur toutes les liaisons. En principe, cela pourrait conduire à la perte de certaines liaisons pour le transport aérien, si celles-ci ne sont plus financièrement viables pour les transporteurs aériens. Toutefois, cet effet négatif pourrait être limité. En effet, le nombre prévu de vols intra-EEE dans le scénario de référence pour 2025 est supérieur de 21 % à celui de l'année de référence 2016. En 2025, l'introduction d'une taxe sur le carburant de 0,33 €/litre (sans période de transition) entraînerait une réduction de 10 % du nombre de vols par rapport à l'année de référence. Dans ces conditions, on s'attend à ce que, globalement, la fréquence des vols sur la plupart des liaisons reste supérieure à ce qu'elle était en 2016, bien que certaines variations soient attendues et que des régions spécifiques puissent effectivement voir leur connectivité réduite.

Concernant la compétitivité des transporteurs de l'EEE par rapport aux transporteurs de pays tiers (et entre différents transporteurs de l'EEE), il pourrait y avoir des impacts négatifs sur ces premiers. En effet, les transporteurs de pays tiers à l'EEE pourraient être soumis à un régime fiscal plus clément sur leur marché "national", ce qui leur permettrait d'être globalement plus rentables et d'être mieux placés pour concurrencer les transporteurs de l'EEE sur les liaisons sur lesquelles les deux groupes de transporteurs sont en concurrence.

La mise en place d'une taxe sur le carburant pour les vols intra-EEE pourrait susciter des inquiétudes quant au "changement de hub". Les transporteurs pourraient changer l'aéroport de correspondance habituel sur un vol indirect (entre un départ de l'EEE et une destination hors EEE), afin de profiter de l'absence de taxe sur le carburant sur le segment initial. Ce phénomène est plus susceptible d'affecter les transporteurs de réseau traditionnels que les transporteurs à bas prix, car ces derniers ont tendance à effectuer principalement des vols directs. Toutefois, l'ampleur du changement de plate-forme dépend d'un certain nombre de facteurs, notamment la disponibilité des créneaux horaires dans les aéroports et les préférences des passagers. Ainsi, il n'est pas possible de quantifier l'impact probable à ce stade.

Analyses de sensibilité

Les impacts de la taxe sur les carburants (variations en pourcentage de la demande et des émissions) ne sont pas significatifs par rapport au scénario ou la demande de base est plus faible (représentant une reprise plus lente après la pandémie de COVID-19).

Dans un scénario ou l'adoption de carburants d'aviation durables est sensiblement plus élevée (grâce à un mandat de mélange, comme l'étudie l'initiative ReFuelEU Aviation), la réduction de la demande sur les vols intra-EEE en 2030 dans le cadre de la taxe sur le carburant de 0,33 € par litre passe de 9,2 % (dans le cas du scénario de référence pour le carburant d'aviation durable) à 9,9 % (dans le cas du mandat de mélange). En 2050, la réduction de la demande sur les vols intra-EEE serait de 9,7 % (dans le cas de l'utilisation durable de carburant d'aviation de référence) et de 15,4 % (dans le cas du mandat de mélange). La réduction des émissions de CO_2 (par rapport au scénario de référence) en 2050 passe de 10,3 % (pour la seule taxe sur les carburants) à 66,5 % (pour le mandat de mélange et la taxe sur les carburants combinés), dans l'hypothèse où les carburants durables n'entraînent aucune émission nette sur l'ensemble du cycle de vie et sont taxés à 50 % du taux plein de la taxe sur les carburants (c'est-à-dire 0,165 € par litre). Les recettes de la taxe sur les carburants sont réduites de 34 % dans un tel scénario, par rapport au cas sans mandat de mélange.

L'analyse de base suppose que les coûts supplémentaires dus à la taxe sur le carburant sont intégralement répercutés sur les passagers, sous la forme d'une augmentation du prix des billets. Dans un scénario où seulement 50 % des coûts sont répercutés (le reste étant absorbé par les compagnies aériennes), les effets sur la demande et les émissions sont environ deux fois moins importants que dans le cas d'une répercussion totale des coûts. En raison de l'impact plus faible sur la demande, les recettes fiscales provenant de la taxe sur le carburant sont environ 5 % plus élevées que dans l'hypothèse d'une répercussion intégrale des coûts.

Dans un scénario où les taxes nationales existantes sur les billets sont supprimées lors de la mise en œuvre de la taxe sur le carburant (au lieu d'être maintenues comme dans l'analyse de base), la demande de vols intra-EEE est réduite de 5,6 % (par rapport au scénario de base), contre 9,7 % dans l'analyse de base. La réduction des émissions (en 2050) est également plus faible. Bien que la demande soit plus élevée que dans l'analyse de base, la suppression des taxes nationales sur les billets entraîne une réduction des recettes fiscales totales.

Un scénario dans lequel la taxe sur le carburant est appliquée au carburant fourni pour les vols de l'EEE vers le Maroc et le Royaume-Uni (comme le permettent les accords aériens avec ces pays), mais en supposant que ces deux pays n'imposent pas la même taxe sur le carburant pour les vols à destination de l'EEE, augmente la réduction de la demande de 13 % de plus que dans le cas où la taxe sur le carburant est appliquée uniquement aux vols intra-EEE (à noter que cette réduction supplémentaire de la demande se produit sur les vols extra-EEE). La grande majorité de cette réduction supplémentaire se produit sur les vols des transporteurs à bas prix, dû à la proximité géographique de ces deux pays avec l'EEE. La réduction accrue de la demande entraîne une réduction similaire des émissions et une augmentation d'environ 11 % des recettes fiscales.

Un scénario dans lequel les quotas du système d'échange de quotas d'émission (SCEQE) sont entièrement mis aux enchères (c'est-à-dire la suppression des quotas gratuits) montre une réduction légèrement supérieure de la consommation de carburant (et des émissions) et une augmentation légèrement inférieure des recettes fiscales, par rapport à un scénario dans lequel une taxe sur le carburant est mise en œuvre mais une partie des quotas du SCEQE continue d'être accordée gratuitement aux compagnies aériennes.

Taxe sur les billets

Aperçu des options politiques

Les options politiques mettant en œuvre une taxe sur le carburant définissent une taxe minimale sur les billets à l'échelle de l'UE, applicable aux services de transport de passagers et, éventuellement, aux services de fret aérien. Un certain nombre d'États membres de l'UE et leurs voisins (l'Autriche, la France, l'Allemagne, l'Italie, les Pays-Bas, le Portugal et la Suède, ainsi que la Norvège et le Royaume-Uni) appliquent déjà une taxe sur les billets - définie dans certaines juridictions comme un prélèvement ou une redevance - à tous les passagers aériens en partance. Si les taux applicables des taxes nationales existantes sur les billets varient considérablement, la plupart d'entre elles présentent des caractéristiques communes : exemptions pour les passagers en transit et en transfert ; différenciation entre les vols courts et les long-courriers, sur la base de différents critères ; et aucune affectation des recettes à un fond particulier. Les services de fret aérien ne sont généralement pas affectés par les taxes nationales pour des raisons de compétitivité internationale. Nombre de ces caractéristiques s'appliquent également à l'option de politique de taxation des billets, comme le résume le tableau ci-dessous.

Résumé des options politiques pour la mise en œuvre d'une taxe sur les billets d'avion

Option politique	Taux de taxation	Autres considérations

Une taxe sur les billets harmonisée dans toute l'UE	Différents types de taxes sur les passagers envisagées:
	• Taxe forfaitaire
	  ○ €10.43 pour tous les passagers
	• Taxe augmentant avec la distance parcourue
	  ○ €10.12 pour les vols intra-EEE
	  ○ €25.30 pour les vols extra-EEE jusqu'à 6.000km
	  ○ €45.54 pour les vols extra-EEE de plus de 6 000 km
	• Taxe décroissante en fonction de la distance parcourue
	  ○ €25.30 pour les vols jusqu'à 350 km
	  ○ €10.12 pour les vols de plus de 350 km
	La taxe peut être la même pour tous les passagers d'un vol, ou être différenciée en
		Exemptions pour les vols effectués dans le cadre d'obligations de service public
		Exemptions pour les vols à destination et en provenance des régions ultrapériphériques de l'UE
		Pas d'affectation des recettes

Option politique	Taux de taxation	Autres considérations
	fonction de la classe de voyage (billets non premium/premium).	

En termes d'efficacité, les conversations avec les responsables gouvernementaux des États membres indiquent que la charge administrative liée à la mise en œuvre et à la gestion d'une taxe sur les billets est relativement faible, tant pour les administrations publiques que pour les compagnies aériennes. Les coûts administratifs globaux devraient être inférieurs aux coûts équivalents pour la mise en œuvre d'une taxe sur le carburant. L'analyse indique des coûts administratifs de 465 000 à 1 million d'euros par État membre et par an (12,6 à 27,6 millions d'euros pour l'ensemble de l'UE).

Du point de vue de l'efficacité, contrairement à une taxe sur le carburant, les taxes sur les billets peuvent tout au plus avoir une relation indirecte avec la consommation de carburant (par exemple, si elles augmentent avec la distance). Elles ne fournissent pas d'incitations directes à l'amélioration de l'efficacité énergétique (les passagers de deux avions différents ayant des efficacités énergétiques différentes paieraient la même taxe sur les billets), mais constituent essentiellement une mesure de gestion de la demande, car elles augmentent le prix des billets d'avion. Cela donne un léger désavantage aux taxes sur les billets par rapport aux taxes sur le carburant. Un avantage de la taxe sur les billets est qu'elle peut être plus facilement appliquée (d'un point de vue juridique) à un champ d'application plus large (vols intra-EEE, extra-EEE ou les deux), ce qui augmente les effets potentiels d'une telle mesure sur la demande et réduit la nécessité de renégocier certains accords internationaux sur le transport aérien.

Évaluation des impacts

Les impacts des différents types de taxe sur les billets envisagés sont les suivants:

- Pour la taxe forfaitaire sur les billets, où un taux de taxation unique s'applique à tous les vols, la réduction de la demande est de 9 % sur les vols intra-EEE et de 1,5 % sur les vols extra-EEE. Les recettes fiscales totales sont d'environ 6,7 milliards d'euros en 2025 et atteignent 9,9 milliards d'euros en 2050, soit une augmentation de 4,1 à 6,2 milliards d'euros par rapport aux valeurs de référence.
- L'option de taux progressifs, avec un taux de taxation plus élevé s'appliquant aux vols plus longs (plus de 6 000 km), a un impact légèrement plus faible sur la demande intra-EEE, mais un impact nettement plus important sur la demande extra-EEE (environ 4,5 % de réduction de la demande), par rapport à l'option de taux fixe. Les recettes fiscales de cette option en 2050 sont de 6 milliards d'euros par rapport au scénario de base.
- Le taux progressif inverse, avec un taux plus élevé appliqué aux vols courts (inférieurs à 350 km), a un impact légèrement plus élevé sur la demande intra-EEE, et un impact très similaire sur la demande extra-EEE, par rapport à l'option du taux fixe. Les recettes fiscales de cette option en 2050 sont supérieures de 7 milliards d'euros à celles du scénario de base.

En termes d'émissions de CO_2, les différentes options de taxation des billets entraînent des réductions comprises entre 8 et 10 % sur les vols intra-EEE et entre 3 et 5,5 % sur les vols extra-EEE.

En ce qui concerne les autres sous-options potentielles, l'application de multiplicateurs de taxe de 3.0 et 7.5 pour les sièges premium n'a qu'un faible effet sur l'impact des options politiques sur la demande, car elle vise les passagers dont la demande est plus inélastique. Les multiplicateurs ont un effet plus important sur les recettes fiscales, les faisant passer à environ 13 milliards d'euros en 2050 dans le cadre de la taxe forfaitaire avec un multiplicateur de 7,5 pour les sièges premium. Les impacts relatifs de la taxe sur les billets (en pourcentage) ne changent pas lorsqu'on les considère par rapport à une demande de base plus faible (représentant une reprise plus lente après la pandémie de COVID-19).

En ce qui concerne l'impact sur la connectivité, et à l'instar des options introduisant une taxe sur le carburant, la baisse de la demande résultant de la taxe sur le billet devrait réduire la fréquence des vols sur toutes les liaisons. Toutefois, dans le cadre des différentes options stratégiques introduisant une taxe sur les billets, la demande devrait être supérieure aux niveaux de 2016 d'ici 2025 - par exemple, dans le cadre d'une taxe progressive sur les billets sans réduction des taxes nationales sur les billets, le nombre de vols effectués par les transporteurs traditionnels devrait être supérieur à celui de 2016 de 12 %, et celui des transporteurs à bas coûts de 9 %. En d'autres termes, l'introduction d'une taxe sur les billets, tout en réduisant la croissance attendue de la demande, ne devrait pas réduire la demande par rapport aux niveaux de 2016, et les répercussions sur la connectivité devraient donc être limitées.

La mise en œuvre d'une taxe sur les billets, couvrant à la fois les vols intra-EEE et extra-EEE, pourrait également susciter des inquiétudes quant au potentiel changement de plate-forme. Les options de taxation des billets envisagées dans cette étude exonèrent tous les passagers voyageant d'une origine hors EEE vers une destination hors EEE, avec une correspondance via un aéroport de l'EEE ; cette exonération devrait réduire le risque que les compagnies aériennes décident de déplacer leurs plates-formes de correspondance hors des aéroports de l'EEE. Le risque que les passagers choisissent de voyager de l'EEE vers une destination hors EEE, avec une correspondance dans un aéroport hors EEE (plutôt qu'une correspondance dans un aéroport de l'EEE) dépendra de la conception exacte de la taxe (par exemple, si la taxe est calculée sur le "billet" pour le voyage complet ou pour des étapes individuelles). Globalement, l'impact du changement de plate-forme sur la compétitivité des transporteurs et des aéroports de l'EEE devrait être limité.

Analyses de sensibilité

L'impact des taxes sur les billets (en pourcentage) n'est pas affecté lorsqu'on les considère par rapport à une demande de base plus faible (représentant une reprise plus lente après la pandémie de COVID-19).

Dans un scénario où toutes les taxes nationales existantes sur les billets qui sont supérieures au minimum harmonisé sont baissées au minimum harmonisé, les incidences sur la demande, les émissions et les recettes fiscales ne sont que très légèrement modifiées par rapport au cas où les taxes nationales existantes sur les billets qui sont supérieures au minimum harmonisé sont maintenues à leur valeur actuelle.

Options fiscales combinées

Aperçu des options politiques

Différentes combinaisons des deux types de taxes ont été élaborées afin de déterminer si ces combinaisons présentent des avantages. Les sous-options comprennent le cas où la taxe sur les billets est appliquée à tous les vols (intra-EEE et extra-EEE), aux vols intra-EEE uniquement et aux vols extra-EEE uniquement. Autrement, les options de taxes combinées ont les mêmes considérations en termes d'efficience, d'efficacité et de questions juridiques que les taxes sur le carburant et les billets considérées individuellement.

Évaluation des impacts

Toutes les options fiscales combinées envisagées dans cette étude comprennent une taxe sur le carburant fourni pour les vols intra-EEE et une taxe sur les billets pour les vols extra-EEE. Les cas envisagés combinent une taxe sur le carburant de 0,33 € par litre pour les vols intra-EEE et une taxe sur les billets (forfaitaire, progressive ou progressive inverse) pour les vols extra-EEE.

Toutes les options fiscales analysées ont un impact significatif sur les émissions de CO_2 à long terme, avec des réductions d'environ 10% sur les vols intra-EEE et jusqu'à près de 5% sur les vols extra-EEE. L'option prévoyant une taxe progressive sur les billets pour les vols extra-EEE a un impact plus important que les deux autres options fiscales combinées envisagées. L'impact sur la demande est très similaire à celui sur les émissions, avec des changements légèrement moins importants (jusqu'à 9,7% sur les vols intra-EEE et 4,0% sur les vols extra-EEE).

Les recettes fiscales supplémentaires provenant de l'aviation dans le cadre des options fiscales combinées se situent entre 14 et 16 milliards d'euros par an d'ici à 2050. Les effets sur l'économie de la réduction de la demande de transport aérien ramènent l'augmentation des recettes fiscales totales du secteur des transports à environ 12 milliards d'euros par an. Une réduction similaire du PIB est également attendue d'ici 2050 dans les États membres de l'UE27.

Analyses de sensibilité

Les impacts relatifs de la taxe combinée (en pourcentage) ne sont pas affectés lorsqu'on les considère par rapport à une demande de base plus faible (représentant une reprise plus lente après la pandémie de COVID-19).

Dans le cadre de l'option de la taxe combinée, un scénario dans lequel les vols de l'EEE vers le Maroc et vers le Royaume-Uni sont soumis à la taxe sur le carburant (comme le prévoient les accords aériens avec ces pays) au lieu de la taxe sur les billets (autrement appliquée à tous les vols "extra-EEE") a un impact presque négligeable sur la demande, la consommation de carburant ou les recettes par rapport au cas où ils sont soumis à la taxe sur les billets prévue dans la taxe combinée.

Comparaison des options

Le tableau ci-dessous présente une comparaison quantitative des impacts des principaux indicateurs pour la sous-option "principale" de chaque option politique - le titre de chaque colonne fournit les détails de la sous-option considérée. Tous les impacts sont présentés pour l'année 2030. Pour simplifier le tableau, toutes les augmentations des paramètres (demande, recettes fiscales, etc.) sont marquées d'un "+", tandis que toutes les réductions sont marquées d'un "-".

Comparaison des principales options politiques

	Option politique 1: €330 par 1 000 litres de carburant sur le carburant chargé pour les vols intra-EEE	Option politique 2: Taxe sur les billets à taux progressif (€10.12 par billet sur les vols intra-EEE, €25.30 par billet sur les vols extra-EEE jusqu'à 6.000km, €45.54 par billet sur les vols extra-EEE de plus de 6 000 km)	Option politique 3: €330 par 1 000 litres de carburant sur le carburant chargé pour les vols intra-EEE, €25.30 par billet sur les vols extra-EEE jusqu'à 6.000km, €45.54 par billet sur les vols extra-EEE de plus de 6 000 km
Impacts économiques			
Total des vols	-9,1% intra-EEE; 0,0% extra-EEE	-8,1% intra-EEE; -8,9% extra-EEE	-9,1% intra-EEE; -5,9% extra-EEE[8]
Demande totale de passagers de l'aviation (p-km)	-9,2% intra-EEE; 0,0% extra-EEE	-8,3% intra-EEE; -4,6% extra-EEE	-9,2% intra-EEE; -2,7% extra-EEE
Demande totale de passagers par rail + aviation (p-km)	-5,6% (1 078,8 milliards p-km)	-5,0% (1 097,0 milliards p-km)	-5,6% (1 090,3 milliards p-km)
Revenus dans le secteur de l'aviation[9]	-0,5% intra-EEE; 0,0% extra-EEE; -3,2% total des revenus nets	-0,7% intra-EEE; +0,8% extra-EEE; -8,5% total des revenus nets	-0,5% intra-EEE; +0,5% extra-EEE; -6,5% total des revenus nets
Revenus de la fiscalité (aviation), y compris les taxes existantes sur les billets d'avion	€7,44 milliards intra-EEE; €10,36 billion total	€7,44 milliards intra-EEE; €19,14 milliards total	€7,43 milliards intra-EEE; €15,87 milliards total
PIB	-0,04%	-0,06%	-0,04%
Impacts sur l'environnement			

[8] Bien que les taux de la taxe sur les billets d'avion pour les vols extra-EEE soient les mêmes dans le cadre des options 1 et 2, l'impact de l'option 3 est plus faible en 2030 car la taxe (y compris la taxe sur le carburant et la taxe sur les billets d'avion) est mise en œuvre avec une période de transition de 10 ans à partir de 2024, alors que dans le cadre de l'option 2, la taxe est mise en œuvre intégralement à partir de 2024.
[9] Les recettes du secteur de l'aviation sont les revenus des compagnies aériennes provenant des billets des passagers et des frais de fret. L'impact brut (présenté pour les vols intra-EEE et extra-EEE) comprend les revenus supplémentaires provenant de la répercussion des taxes sur les billets aux passagers (et des taxes sur le fret aux compagnies de fret), tandis que l'impact sur les recettes nettes comprend le paiement des taxes perçues sur les billets et le fret, ainsi que des taxes sur le carburant, aux autorités fiscales.

	Option politique 1: €330 par 1 000 litres de carburant sur le carburant chargé pour les vols intra-EEE	Option politique 2: Taxe sur les billets à taux progressif (€10.12 par billet sur les vols intra-EEE, €25.30 par billet sur les vols extra-EEE jusqu'à 6.000km, €45.54 par billet sur les vols extra-EEE de plus de 6 000 km)	Option politique 3: €330 par 1 000 litres de carburant sur le carburant chargé pour les vols intra-EEE, €25.30 par billet sur les vols extra-EEE jusqu'à 6.000km, €45.54 par billet sur les vols extra-EEE de plus de 6 000 km
CO_2 émissions (l'aviation)	-9,9% intra-EEE; 0,0% extra-EEE; -3,7% total	-7,8% intra-EEE; -5,2% extra-EEE; -6,2% total	-9,9% intra-EEE; -3,6% extra-EEE; -6,0% total
Impacts sociaux – nombre de personnes employées			
Services de transport aérien	-1,0%	-1,8%	-1,3%
Total des services de transport	+0,02%	+0,04%	+0,02%

Les trois options stratégiques ont un impact similaire sur les vols intra-EEE, la taxe (taxe sur le carburant ou sur les billets) augmentant le prix des billets et réduisant la demande. Les options 2 et 3 tiennent compte de l'impact supplémentaire de l'inclusion des vols extra-EEE dans leur champ d'application et, par conséquent, donnent lieu à des réductions totales plus importantes des émissions et des recettes fiscales totales. Bien que les options 2 et 3 prévoient les mêmes taux de taxe sur les billets pour les vols extra-EEE, les impacts sont légèrement plus importants dans le tableau de l'option 2, car les taxes sont supposées être mises en œuvre immédiatement (en 2024) dans le cadre de cette option, tandis que l'option 3 prévoit une période de transition de 10 ans (conformément à celle utilisée pour la taxe sur le carburant pour les vols intra-EEE).

Table of Contents

1 Introduction

Ricardo, together with our partners GWS, Ipsos NV, André van Velzen (TAKS/Vital Link) and Alice Pirlot, have been commissioned to deliver a study on the taxation of the air transport sector in Europe, in support of an impact assessment to be performed by DG TAXUD as part of the review of Directive 2003/96/EC[10] (the 'Energy Taxation Directive'). This report forms the Final Report on the study. It presents the results of all the analyses performed under the study and the conclusions derived from them.

2 Policy objectives

2.1 Problem definition

The initial step in defining the objectives of the new, or updated, policy is to consider the problem that is leading to the need to take action.

The approach to this task follows the Better Regulation Guidelines (Tool #14) and answers the following questions:

1. What is the nature of the problem(s)?
2. What is the scale of the problem(s)?
3. Who is affected by the problem(s)?
4. What are the drivers and root causes of the problem(s)?
5. How has the problem developed over time and how is it likely to develop without action?
6. Why does the problem need action at EU level?

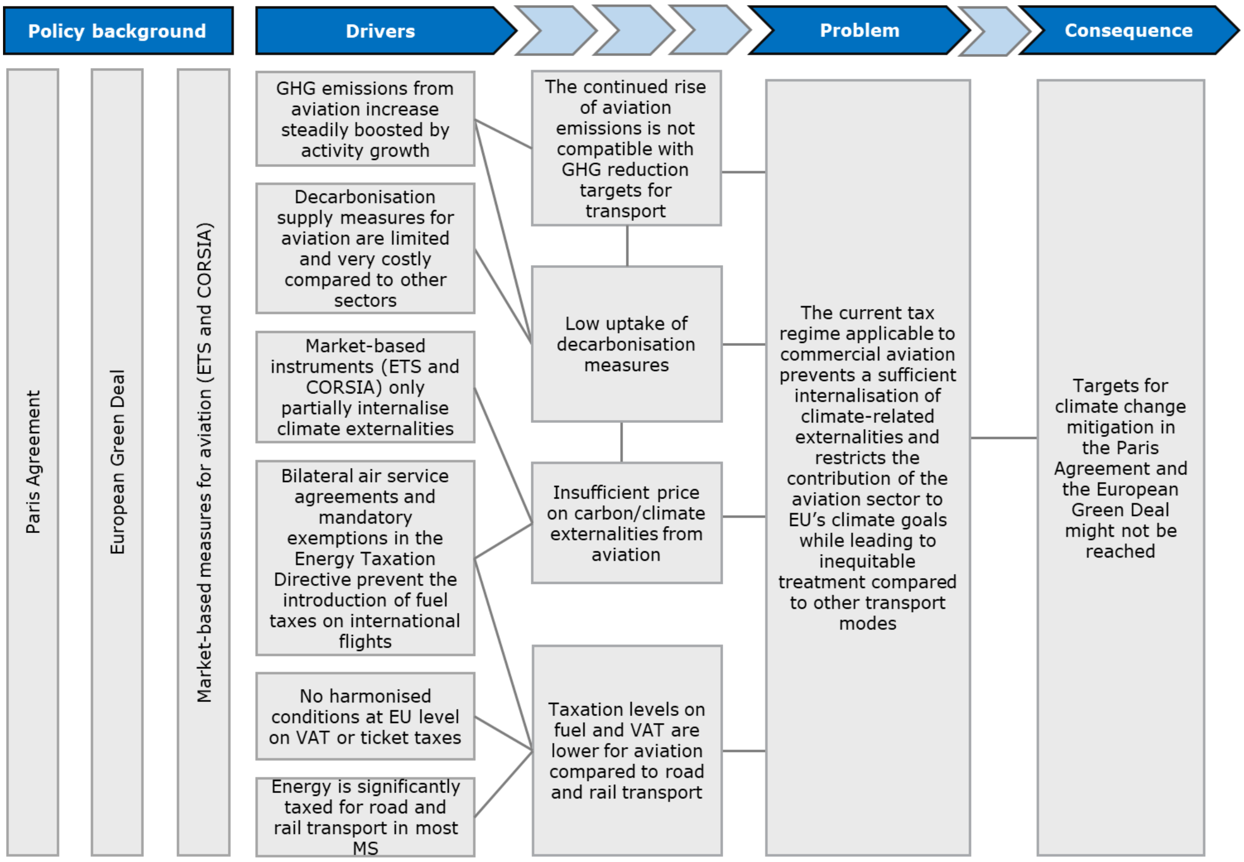
The problem identified is:

The current tax regime applicable to commercial aviation prevents a sufficient internalisation of climate-related externalities and restricts the contribution of the aviation sector to the EU's climate goals while leading to inequitable treatment compared to other transport modes

A detailed description of this problem, and their drivers, is further discussed in the sections below. We have also developed a problem tree, which is shown in Figure 2-1.

[10] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32003L0096:en:HTML

Figure 2-1: Problem tree



2.1.1 Policy background

Paris Agreement and European Green Deal

The Paris Agreement's central aim is to keep a global temperature rise this century to well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. With this aim, the European Green Deal (European Commission, 2019a) foresee the achievement of an economy-wide carbon neutrality by 2050, which has been already included in the European Commission's legislative proposal for a European climate law. Recently, the Commission has presented an EU-wide, economy-wide greenhouse gas emissions reduction target by 2030 compared to 1990 of at least 55% including emissions and removals, as part of a balanced, realistic, and prudent pathway to climate neutrality by 2050 (European Commission, 2020d).[11]

As recognised in the European Green Deal, 'current policies will only reduce GHG emissions by 60% by 2050' and, hence, there is a need to transform all sectors of the economy. In particular, the European Green Deal states that 'to achieve climate neutrality, a 90% reduction in transport emissions is needed by 2050' (compared to 1990 levels). This objective goes well beyond the previous target set in the 2011 Transport White Paper (European Commission, 2011) of a 60% reduction by 2050. This increased ambition means that all transport modes (i.e. road, rail, aviation and waterborne transport) will have to contribute to this reduction, although not necessarily at the same rate. In particular, given that it represents 13.4% of all transport CO_2 emissions in the EU, aviation needs to pursue a basket of measures to reduce its GHG emissions and contribute to the overall 90% GHG reduction target for transport. The Mobility Strategy (European Commission, 2020e)

[11] The European Parliament the 6/10/2020 voted to increase the EU's climate ambitions for 2030 to a 60% reduction in GHG emissions compared to 1990 levels. The text still needs to be approved by the EU Council of Ministers

foresees that the contribution of aviation is expected to be lower than that of road transport, where more technological options are available.

Market-based measures (EU ETS and CORSIA)

The EU took the lead in introducing market-based measure for aviation, with the inclusion of aviation in its Emission Trading System (EU ETS) in 2008, with the scheme taking effect in 2012.

However, the integration of aviation into the EU ETS faced significant international opposition from airlines and other States as regards its application to routes between an EU airport and a non-EU airport. Following positive steps made at the ICAO meeting in November 2012, the EU adopted a 'Stop the Clock' derogation, which deferred enforcement of the obligations on incoming and outgoing flights to the EU. Eventually, the ICAO Assembly in September 2016 adopted Resolution A39-3, agreeing to implement the 'Carbon Offsetting and Reduction Scheme for International Aviation' (CORSIA), with the aim of keeping net emissions from aviation at 2019/2020[12] levels in future years.

Under the EU ETS Directive (Article 28a) the current situation is that only requirements for flights within the EU and the European Free Trade Association (EFTA) countries apply. However, in case no amendment to the EU ETS Directive is adopted by the European Parliament and Council by December 2023, the EU ETS for aviation would automatically revert back to its initial scope i.e. be effectively extended to routes between an EU airport and a non-EU airport.

The requirements for operators are different under CORSIA and the EU ETS. Under the EU ETS, operators are required to surrender allowances for all their emissions on intra-EEA flights (domestic and international); EU aviation allowances (EUAAs) and EU allowances (EUAs) are acceptable, as are a limited percentage of international credits until 2020. Under CORSIA, air carriers (operating in all states that participate – it is voluntary for states to opt in from 2021 to 2026, thereafter it is mandatory unless the state has been exempted) will need to purchase (and cancel) offsets in proportion to the emissions above 2019[13] levels on international flights between participating states. Under the EU ETS, airlines also receive a share of free allowances as a proportion of the cap set for aviation, which varies from one operator to the other based on an efficiency benchmark.

The EU ETS Directive concerning aviation is currently under review. This will serve to implement CORSIA in the EU in a way that is consistent with the EU's 2030 climate objectives. The initiative will also propose to increase the number of allowances being auctioned under the system as far as aircraft operators are concerned (European Commission, 2020b) to increase the contribution of aircraft operators to reducing greenhouse gas emissions. This may result in the internalisation of a significant share of external CO_2 costs for operators that to date receive a large share of their allowances for free.

2.1.2 Drivers of the problem

GHG emissions from aviation increase steadily boosted by activity growth

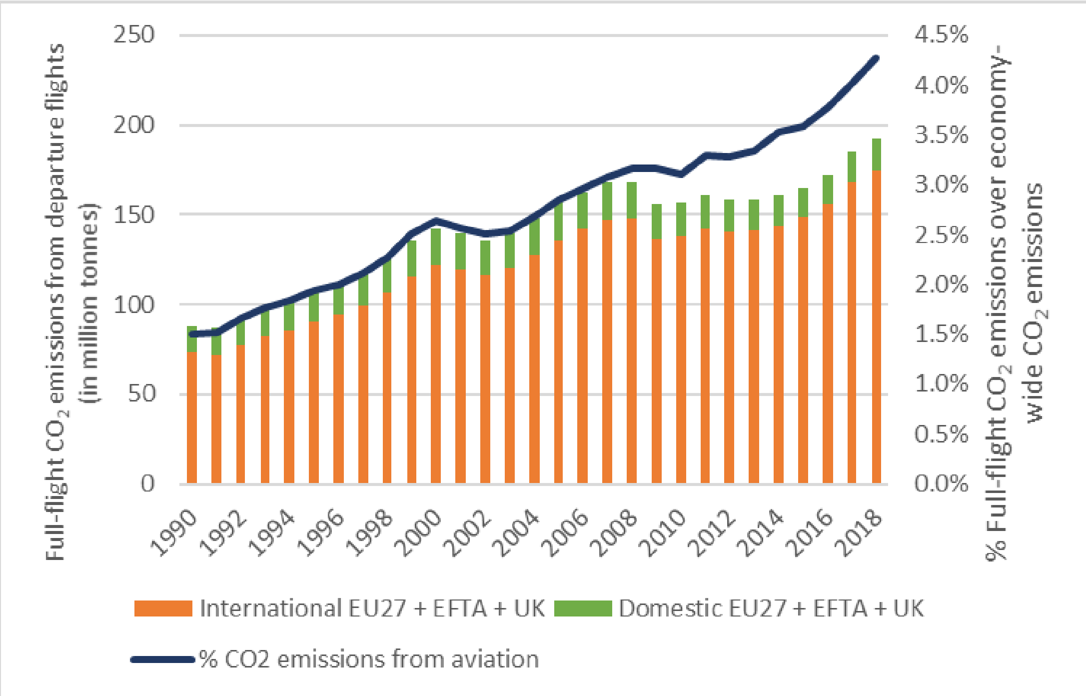
According to the data reported by Member States to the United Nations Framework Convention on Climate Change (UNFCCC), the GHG emissions (in CO_2e) of all flights departing from EU27, EFTA and the UK in 2018 was 192.5 million tonnes, of which 99% are CO_2 emissions[14]. This represents an increase of 119% on 1990 levels and of 23% on 2005 levels (see Figure 2-2).

In 2018, GHG emissions of all flights departing from EU27, EFTA and the UK represented 4.3% of total GHG emissions from these countries. This share has increased from a value of 1.5% in 1990 as other sectors of the economy reduce their GHG emissions or have a slower growth compared to aviation (see Figure 2-2).

[12] Even though the initial base emissions were set at an average of 2019 and 2020 levels, the ICAO Council decided on 30 June 2020, for the purpose of calculating obligations during the 2021-2023 pilot phase, to disregard data from 2020 when calculating the baseline emissions for CORSIA, in light of the coronavirus pandemic. Instead, for the pilot phase, the baseline will be calculated using only 2019 emissions data
[13] See previous footnote.
[14] https://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer

There are significant scientific uncertainties remaining in quantifying aviation's non-CO_2 impacts on climate. The non-CO_2 impacts arise from emissions of oxides of nitrogen (NOx), soot particles, oxidised sulphur species, and water vapour. These emissions result in changes in the chemical composition of the global atmosphere and cloudiness, perturbing the earth-atmosphere radiation budget. The net impact of aviation non-CO_2 emissions is a positive radiative forcing (warming), although there are a number of individual positive (warming) and negative (cooling) forcing arising from respective aviation non-CO_2 emissions, for which large uncertainties remain. A stream of EU-funded projects (e.g. FP7-REACT4C) as well as the German-funded project WeCare have shown that although there are still significant uncertainties in non-CO_2 emissions, more than 50% of the climate impact from aviation is due to non-CO_2 effects and that climate-sensitive areas could substantially reduce the climate impact of aviation at low cost increase.[15]

Figure 2-2: Evolution of CO_2 emissions from aviation



Source: European Environmental Agency greenhouse gas - data viewer

Due to recent improvements in aircraft energy efficiency, the average fuel burn per passenger kilometre flown for passenger aircraft, excluding business aviation, has decreased by 2.8% per annum between 2014 and 2017 (EASA, EEA, EUROCONTROL, 2019). This reduction is more significant than the historic average of 1% to 1.5% per annum.[16] However, this efficiency gain was not sufficient to counterbalance the increase in CO_2 emitted due to the growth in air traffic activity.

According to a long-term traffic forecast from EUROCONTROL in 2017 (EUROCONTROL, 2017) for Europe as a whole[17], the most likely scenario has an 1.9% average annual growth per year over the 2017-2040 period in the number of flights, leading to a 53% accumulated growth by 2040 on 2017 levels. Most recently, the November 2020 version of the Five-Year Forecast (EUROCONTROL, 2020) lowered growth expectations by taking into account the effects of COVID-19 on air traffic and

[15] The Commission has published a report on non-CO_2 emissions based on the mandate in Article 30 of the EU ETS [COM(2020)] 747 final]
https://www.easa.europa.eu/sites/default/files/dfu/201119_report_com_ep_council_updated_analysis_non_co2_climate_impacts_aviation.pdf. In addition, in the proposed Horizon Europe aviation programme, research topics aim to reduce uncertainties around non-CO_2 emissions

[16] https://aviationbenefits.org/media/166506/fact-sheet_3_tracking-aviation-efficiency.pdf

[17] As well as the EU Member States, members of EUROCONTROL include the UK, Turkey, Switzerland, Norway, Monaco, North Macedonia, Moldova, Albania, Bosnia and Herzegovina, Ukraine, Serbia, Armenia, Montenegro and Georgia.

economic growth for different recovery scenarios. The most optimistic scenario (vaccine available by 2021) considers a full recovery of 2019 daily flights (in IFR movements) by 2024, while the most pessimistic scenario (vaccine not effective) forecasts that that 2024 traffic levels will still be 75% of that in 2019, with full recovery of 2019 flights by 2029.

The effects of the pandemic generate high uncertainty in traffic growth prospects but are not expected to prevent long-term growth in air transport. This means that the steady increase in GHG emissions boosted by increased air travel activity is expected to hold in the long-term.

According to baseline scenario presented in section 5.1, after the drop in 2020 and successive years, CO_2 emissions will continue to increase by 24% by 2030 and by 27% by 2050 on 2005 levels.

Decarbonisation supply measures for aviation are limited and very costly compared to other sectors

At its 37th Session in 2010, the International Civil Aviation Organisation (ICAO) Assembly adopted the two global aspirational goals for the international aviation sector of 2% annual fuel efficiency improvement through to 2050 and carbon neutral growth from 2020 onwards. ICAO expects to achieve this with aircraft technology improvements, operational improvements, sustainable aviation fuels, and market-based measures. The two goals were reiterated by the ICAO Assembly in 2019 (ICAO, 2019), which also initiated the investigation of possible long-term global aspirational goals for the aviation sector. The progress of this work is be presented to the 41st Session of the ICAO Assembly in 2022.

Reductions in carbon intensity have been driven historically by demands to make aircraft more fuel-efficient, since fuel costs are a major fraction of airlines' operating costs. CO_2 standards were adopted by ICAO in 2017, which provide an additional requirement into the design process that increases the priority of fuel efficiency in the overall aeroplane design, although there have been suggestions that the impacts of the standards will be small [18]. These are supported by EASA and apply to new type designs from 2020, new derivatives of in-production types from 2023 and to all newly manufactured aircraft from 2028. Recently, the entry into service in recent years of several new types and improved derivatives (e.g. Airbus A350, Airbus A320neo family, Bombardier C-Series (now Airbus A220)) has increased the energy efficiency improvement rate to over 2%. However, significant improvements are becoming harder to achieve, as aircraft and engine technology approach the limits of what is achievable with 'conventional' configurations and the introduction of 'unconventional' configurations (such as blended wing-bodies or open rotor engines) remains some way off (although the overall fleet fuel efficiency will continue to improve over several years as the recent new types achieve a greater fleet penetration).

Given the low energy density per unit volume of hydrogen and battery storage compared to kerosene, the adoption of alternative power options for civil aviation purposes is extremely challenging. Even though a number of ongoing projects[19] are exploring electric or hybrid-electric aircraft technology or liquid hydrogen propulsion, and the recent European strategic research and innovation agenda on clean aviation also identifies hydrogen as a potential key future fuel[20], new clean aircraft technologies such as electric or hydrogen-powered aircraft are not expected to be mature enough to play a significant role in commercial aviation in the next decades (European Commission, 2020a).

Another abatement measure available for aircraft operators are operational measures or Air Traffic Management (ATM) improvement strategies such as the Single European Sky SESAR project (Europe), NextGen (US) and CARATS (Japan). These programs are aligned at the ICAO level under the Aviation System Block Upgrades (ASBU) framework. It has been estimated that improvements in ATM could potentially reduce aircraft emissions between 6% to 10% (ICAO, 2019). Reductions in CO_2 emissions of 1.5% to 2.9% in 2025 relative to 2015 can be attributed to Block 0/1 implementation of the ASBU (ICAO, 2019). These improvements require large investments, which are essential to

[18] Although there have been suggestions that the impacts of the standards will be small (e.g. https://theicct.org/sites/default/files/publications/Aircraft_CO2_Standard_US_20181002.pdf)
[19] See for example recent European projects from the FCH (link) and Airbus (link)
[20] http://clean-aviation.eu/files/Clean_Aviation_SRIA_R1_for_public__consultation.pdf

improve performance and safety of air transport. The European Green Deal (European Commission, 2019a) states that the Commission's renewed proposal on a truly Single European Sky will need to restart, as this will help achieve significant reductions in aviation emissions'. The Commission has recently proposed upgrades to the Single European Sky regulatory framework to contribute to this[21].

There is the potential for producing drop-in power-to-liquids (or e-fuels) as well as advanced sustainable biofuels for aviation known as sustainable aviation fuels (SAF), which are technologically compatible with existing aircraft engines and can deliver significant GHG reductions. However, the use of sustainable aviation fuel is currently minimal and is likely to remain limited in the short term without additional EU level policies (EASA, EEA, EUROCONTROL, 2019). Production costs of advanced biofuels and e-fuels in the short and medium term will remain high as their production requires the use of feedstock, raw materials and resources (e.g. hydrogen, renewable energy), for which supply chains are not organised, and also comes with high capital expenditure costs to develop new production infrastructure. On the demand side, while airlines are increasingly asking for SAF to be available in large quantities in order to decarbonise their operations, actual demand is low under the current conditions of the SAF market, since current prices are significantly higher compared to conventional fossil fuels.

While a typical price for fossil-based aviation fuel would be around €600/tonne, the price of biokerosene produced from used cooking oil with a Hydroprocessed Esters and Fatty Acids (HEFA) production route can be in the range of €950-€1,015/tonne (EASA, EEA, EUROCONTROL, 2019) [22]. While the cost of HEFA biokerosene is expected to remain approximately stable, the price difference with fossil kerosene may be reduced as the price for fossil kerosene increases in the next decades. Other production routes for advanced biofuels such as the Alcohol to Jet (ATJ) route have a higher production costs, currently estimated at around €1,900/tonne to €3,900/tonne. Synthetic kerosene produced from green hydrogen is estimated to be approximately 40% more expensive than the ATJ biokerosene price in 2030, but the price is expected to converge to that of biokerosene towards 2050 (European Commission, 2021).

Feedstock that comply with sustainability requirements to be considered as SAF are in demand by the other sectors, like road transport. Despite these challenges, ICAO expects that a significant proportion of the carbon neutral growth roadmap will come from the use of SAF (ICAO, 2019). According to the International Energy Agency (IEA), 10% of the aviation fuel demand would need to be met by SAF in 2030 but only 5% might be realistically achieved according to Lufthansa (European Commission, 2020c). The European Commission has recently launched the ReFuelEU Aviation initiative, which aims to boost the supply and demand for sustainable aviation fuels in the EU (European Commission, 2020a). This initiative is expected to result in a legislative proposal in the course of 2021.

Considering these production costs for SAF, the cost-effectiveness of using HEFA biokerosene is currently around €148/tonne of CO_2, while other SAF production routes with higher scalability and decarbonisation potential needed to meet the overall demand would be less cost-effective. For example, the cost-effectiveness of an ATJ biokerosene is estimated at around €475/tonne of CO_2, while synthetic kerosene would represent a cost of €740/tonne of CO_2. However, the cost-effectiveness of all SAF production routes is expected to improve significantly over time as SAF production costs decrease as a result of the ReFuelEU initiative. These abatement costs compare to the economy-wide carbon avoidance value of €100/tonne of CO_2 by 2030 and 269/tonne of CO_2 by 2060 (CE Delft et al, 2019b).

Market-based instruments (EU ETS and CORSIA) only partially internalise climate externalities

Under the EU ETS regulation for aviation, 82% of aviation allowances based on a historical 'grandfathering' cap are granted for free to aircraft operators, 15% are auctioned and 3% are in a special reserve for distribution to fast-growing aircraft operators and new entrants. The share of aviation allowances over the total verified emissions for the aviation sector decreases as CO_2

[21] https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1708
[22] HEFA pathway is currently the only mature one that can be used for aviation, however it competes with the use in road and has high feedstock limitations

emissions keep growing (see Table 2-1). From 2021 onwards, the same linear reduction factor that applies to stationary installations, 2.2% annually, will start applying to these allocations to aircraft operators. This means that air carriers increasingly need to purchase allowances from other sectors.

In 2019, around 5.5 million aviation allowances were auctioned and 30.2 million aviation allowances were allocated for free to air carriers. These 35.7 million allowances represent 52% of the 68.2 million verified emissions from the aviation sector. The remaining units had to be acquired from other sectors. This means that from the total verified emissions in 2019, 44% were allocated for free to air carriers and 56% were covered by allowances acquired from auctions or other sectors.

Table 2-1: Allocation of allowances for aviation within the ETS in the EEA (EU-2, UK, IS, NO)

	2016	2017	2018	2019
Total allocated allowances	37,584,901	37,389,280	36,195,655	35,692,202
Freely allocated allowances (both existing entities and new entrants reserve)	31,587,401	32,658,780	30,594,155	30,189,702
Allowances auctioned	5,997,500	4,730,500	5,601,500	5,502,500
Verified emissions	61,473,762	64,416,501	67,494,005	68,172,091
Allocated allowances over total verified emissions	61%	58%	54%	52%
Freely allocated allowances over total verified emissions	51%	51%	45%	44%

Source: EEA, ETS_Database_v38 (link)

In 2019, the EU ETS allowance price varied from €20 to €30[23]. Considering an average allowance price of €23, the aviation sector paid in 2019 around €874 million in EU ETS allowances.

The allocation of free allowances within the EU ETS generally aims to mitigate carbon leakage, but it is often subject to debate.[24] Theoretically, regulated entities within an ETS consider the opportunity cost of free allowances, equal to the revenue that would be earned if the corresponding emissions were avoided and the allowances were sold.[25] However, in practice, a higher auctioning share may better reflect the carbon price in the final price perceived by consumers and it effectively contributes to internalise climate externalities. This issue is especially relevant when comparing different levels of internalisation across transport modes. In addition, auctioning revenues could be used to fund decarbonisation policies. Overall across ETS sectors, around 80% of auctioning revenues in 2013-2018 were used for climate- and energy-related purposes (Europen Commission, 2019f).

Against this background, the recent Communication on a European Green Deal states that 'the Commission will propose to reduce the EU Emissions Trading System allowances allocated for free to airlines'. This matter is currently being reviewed by the Commission (European Commission, 2020b). This Impact Assessment on aviation EU ETS will look at several options to increase the level of auctioned allowances, including full auctioning already in 2023 or a linear increase to 55-100% auctioning by 2030. This Impact Assessment study also aims to study different ways to implement CORSIA in Union law through a revision of the EU ETS Directive, including the potential future interaction between the two measures, in a way that is consistent with the EU's 2030 climate objectives.

Considering an increase in the share of EU ETS being auctioned to 100% in 2030, a price of an EU ETS allowance ranging from 20 to 43 €[26] and the effects of the COVID-19 pandemic on the demand for allowances, the cost of allowances (EUAA and EUA) in 2030 for intra-EEA flights would be between €1,627 and €3,292 million (TAKS, 2019) (TAKS, 2020).

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[23] This would be equivalent to a fuel tax of €0.05-0.08 per litre of kerosene

[24] For example, a recent report by the European Court of Auditors makes recommendations aimed at better targeting the allocation of free allowances (European Court of Auditors, 2020)

[25] This is the basic assumption of the independence property (Hahn, 2011), which ensures that overall emission target is achieved at minimum cost irrespective of how the allowances are initially distributed.

[26] The carbon price considered in the Climate Target Plan Impact Assessment {SWD/2020/176 final} for the baseline scenario in 2030 is 32 €/tonne of CO_2, which would fall within this range

Costs associated to CORSIA in 2030 are estimated to range between €151 million and €236 million, with an offsetting price in 2030 ranging from €9-13/tCO_2 in 2030[27] and depending on whether the scheme applies to extra-EEA flights only or to both intra-EEA and extra-EEA flights (TAKS, 2019) (TAKS, 2020).

In summary, for intra-EEA flights, climate change impacts are currently not fully internalised through the EU ETS as a significant proportion (44% in 2019) of total verified emissions are allocated for free to aircraft operators. The situation would change if, as a result of the ongoing EU ETS revision, the level of auctioned allowances increases significantly, leading to an increased level of internalisation of climate externalities in line with the overall carbon price for EU ETS sectors. It is worth noting, however, that the price for EU ETS allowances is expected to be significantly lower than marginal abatement costs in the aviation sector in any case. This means that the effect of EU ETS on emission reductions within the aviation sector itself may still be limited, since reduction would take place where it is cheaper. As for extra-EEA flights, the price signal, if any, provided by CORSIA would clearly fall below the EU ETS carbon price and would only very partially reflect the climate external costs generated by extra-EEA flights.

Provisions contained in bilateral air service agreements and mandatory exemptions in the Energy Taxation Directive prevent the introduction of fuel taxes on international flights

Aviation fuel has traditionally had a privileged tax regime compared to other modes of transport. This tradition dates back to the 1944 Convention on International Civil Aviation, generally known as the *Chicago Convention*[28]. While it bans the taxing of fuel on board an aircraft when it arrives in the country, the Chicago Convention does not include any restrictions on taxing the fuel loaded onto the aircraft in that country.

It should be noted, however, that ICAO explicitly supports the non-charging of fuel levies on international transport, resolving in its non-binding resolution on 'Policies on User Charges & Taxation' that 'when an aircraft registered in one Contracting State, or leased or chartered by an operator of that State, is engaged in international air transport to, from or through a customs territory of another Contracting State its fuel […] shall be exempt from customs or other duties on a reciprocal basis […], when:

i. the fuel etc. is contained in the tanks or other receptacles on the aircraft on its arrival in the territory of the other State […];
ii. the fuel etc. is taken on board for consumption during the flight when the aircraft departs from an international airport of that other State either for another customs territory of that State or for the territory of any other State […]; or
iii. the fuel etc. is taken on board the aircraft at an international airport in one customs territory of another State and the aircraft makes successive stops at two or more international airports in that customs territory on its way to another customs territory of that State or to the territory of any other State;' (ICAO, 2000).

Following this common practice, most bilateral Air Service Agreements that are in place between EU Member States and third countries include provisions explicitly prohibiting taxation of aviation fuel for international flights. However, the EU has been attempting to remove such language in the horizontal and comprehensive agreements (which respectively amend and replace the bilateral agreements mentioned above) with third countries it has signed since 2002. There are now examples of agreements that do not prevent the EU taxing even extra-EU flights (the agreements with Morocco and the UK).

In the EU, the Energy Taxation Directive 2003/96/EC only allows Member States to tax fuel used in domestic aviation or, if a bilateral agreement is in place between two Member States, to tax fuel for flights between those two Member States (article 14(2)). However, no such bilateral agreements are in place, and the Netherlands is the only EU Member State with a tax on kerosene for commercial

[27] Based on (TAKS, 2019) and exchange rate of 1€=1.136$. It should be noted that the offsetting price does not consider the effects of the Covid-19 pandemic
[28] https://www.icao.int/publications/pages/doc7300.aspx

domestic flights – this tax is not applicable at the present, as currently there are no scheduled domestic flights in the Netherlands. In the EEA, Norway does apply a fuel tax on its domestic flights. Outside the EEA, there are also excise duties levied on fuel used for domestic commercial aviation in countries like the USA or Japan[29] (see Box 2-1).

Box 2-1: Duties charges on domestic commercial aviation in the USA and Japan

The USA and Japan are two examples of countries with a large domestic commercial aviation industry (the USA being the largest domestic aviation market in terms of seats flown in 2019, and Japan being the fifth biggest (CAPA, 2020)) where excise duties are levied on kerosene used in domestic flights. Besides excise duties on kerosene in both countries there are also duties levied on passengers. This box explores the duties levied in both countries.

In the USA, there are a multitude of levies charged to operators and passengers on domestic flights that are used to fund the aviation system (via the Airport and Airway Trust Fund, AATF). These include (Congressional Research Service, 2021):

- Passenger ticket tax: 7.5% of the value of the ticket.
- Flight segment tax: $4.30 (€3.55), paid on all flight segments (so a connecting flight via a hub would pay twice this amount).
- Excise duty on commercial jet fuel (kerosene): $0.043/US gallon (€0.01/litre).

Passengers on international flights pay an ‘international arrival and departure tax’ of $19.10 (€15.80), as of 2021. These passengers do not pay the 7.5% tax on the value of the ticket (Congressional Research Service, 2021).

In fiscal year 2019, the revenues derived from the excise duty on fuel totalled $428 million (€354 million). The revenues for the levies on passengers are much higher: for domestic passengers these totalled $10.4 billion (€8.6 billion), and for international passengers $4.3 billion (€3.6 billion) (Federal Aviation Administration, 2020).

The AATF is used to fund capital and operational expenditures of the air traffic control system (taking 75% of the $19.2 billion (€15.9 billion) of the AATF’s budget for 2021), capital investments in airports (18%), with the remaining being investment in research and development in aviation technologies. While the tax and levies mentioned above provide the majority of funding for the AATF, funding is also provided by the federal government overall budget (Congressional Research Service, 2021). (For a like-for-like comparison with European taxation and charging systems on aviation, the differences in how ATM systems are funded should be accounted for. In Europe, unlike in the US, there is a performance and charging scheme for Air Navigation service providers which is laid by the European Commission).

(Besides these taxes that fund the AATF, domestic and international passengers in the USA also pay a ’September 11th fee’ of $5.60 (€4.60) that is used to fund airport security and arriving international passengers pay a total of $12.99 (€10.75) in customs and immigration fees.)

In Japan, there is an excise duty of JPY18 per litre of kerosene (around €0.14/litre). In fiscal year 2014, revenues from this duty totalled JPY66 billion (around €500 million). This duty is earmarked for the maintenance of aviation facilities in the country, with two-ninths of revenue being allocated to cities and states (Naito & Motoki, 2015). Besides this excise duty on fuel, there is also an 10% ’consumption tax’ charged to passengers (CE Delft, 2019).

Taken together, while these provisions make it possible to apply taxes to the fuel supplied to EU-air carriers for intra-EU flights (if Member States sign between them appropriate bilateral agreements), there are legal limits, under international agreements, to the possibility to tax fuel supplied to non-EU carriers when they operate intra-EU flights. This issue is further discussed in Section 4.2 and in Annex A1 (Legal analysis).

No harmonised conditions at EU level on VAT or ticket taxes

[29] Other countries with excise duties on jet fuel used for commercial aviation and the respective rates (€/litre) are: Armenia (€0.05/l), Australia (€0.02/l), Canada (€0.08/l), Hong Kong (€0.70/l), Philippines (€0.07/l), Saudi Arabia (€0.02/l), Thailand (€0.10/l) and Vietnam (€0.11/l) (CE Delft, 2019).

As for the taxation of aviation services, namely ticket taxes, the VAT Directive (2006/112/EC) allows Member States, under certain conditions, to exempt passenger transport from value added tax (VAT), apply reduced rates or a zero VAT rate[30]. All Member States apply a zero rate to international air transport, while 17 Member States charge VAT on domestic air tickets, either at a reduced rate or at the standard rate of VAT. Six Member States levy specific departures taxes on international flights, in the form of ticket taxes for passengers departing from an airport in that Member State. On average, a passenger departing an EU airport pays around €11 per ticket in taxes (CE Delft, 2019); these include ticket taxes and VAT[31].

Table 2-2 below shows the high variability of ticket taxes and VAT schemes applied in the EEA.

Table 2-2: Airport taxes, ticket taxes and VAT applied in the EEA, Switzerland and the United Kingdom (as of December 2020)

Country	Tax name	Domestic flights	International flights	VAT on domestic aviation
Austria	Austria air transport levy	€30 for very short flights (less than 350 km measures in great-circle distance (GCD) terms) €12 for all other flights VAT may be payable on domestic flights; in which case it can be subtracted from the levy (giving € 26.10 and € 10.44) Before 01 September 2020: €3.50 for short-haul €7.50 for medium-haul	From 01 September 2020: €30 for very short flights (less than 350 km GCD) €12 for all other flights Before 01 September 2020: €3.50 for short-haul €7.50 for medium-haul €17.50 for long-haul Short-haul and Medium-haul defined by lists of countries (all EU in short-haul)	13%
France	France civil aviation tax	€4.63 for flights to EEA airports (including France domestic)	€4.63 for flights to EEA airports €8.32 for flights to other destinations	10%
France	Air passenger solidarity tax	€2.63 for economy passengers on flights to EEA airports (including France domestic) and Switzerland €20.27 for premium passengers on flights to EEA airports (including France domestic) and Switzerland	€2.63 for economy passengers on flights to EEA airports and Switzerland €20.27 for premium passengers on flights to EEA airports and Switzerland €7.51 for economy passengers on flights to other destinations €63.07 for premium passengers on flights to other destinations	
France	'Fiscal tax' (Corsica)	€4.57 (single) €9.15 (return)		

[30] As included in Annex III and X of COUNCIL DIRECTIVE 2006/112/EC of 28 November 2006 on the common system of value added tax
[31] The study focuses on taxes and charges that are used for general public purposes. Revenues from environmental charges (emissions, noise) accrue to the airport and, hence, are excluded from the study.

Country	Tax name	Domestic flights	International flights	VAT on domestic aviation
	Airport tax	€10.80 for Class 1 airports (Paris Charles de Gaulle, Paris Orly, Paris Le Bourget) Between € 3.50 and €9.50 for Class 2 airports (Lyon, Marseille, Nice, Toulouse, etc.) Up to €14.00 for other airports		
Germany	German air transport tax	€12.90	€12.90 for domestic and Europe and other short haul flights €32.67 up to a distance of 6,000 kilometres €58.82 for long-haul	19%
Italy	Italy city council tax	€ 7.07	€7.07	
	Italy luxury tax	€10 (distance < 100 km) €100 (distance < 1,500 km) for passengers travelling on executive air charter flights	€10 (distance < 100 km) € 100 (distance < 1,500 km) for passengers travelling on executive air charter flights	
Netherlands	Dutch aviation tax	€7.85	€7.85	21%
Portugal	Carbon tax	€2 per passenger (expected to start in July 2021) Exemptions: children under 2-years old; PSO flights; residents of Azores and Madeira in flights between those archipelagos and the mainland and between any islands in those archipelagos	€2 per passenger (expected to start in July 2021) Exemptions: children under 2-years old; PSO flights	6% (flights between mainland airports only)
Spain	-	Spanish government is considering implementing a ticket tax aiming to internalise the environmental costs of air transport; no further details (rates, implementation date, etc.) are available at this point	Same as domestic flights	10% (except flights to/from Canary Islands, Ceuta and Melilla)
Sweden	Air travel tax	62 SEK	62 SEK for Appendix 1 destinations (includes all EU MS) 260 SEK for other destinations	6%
Switzerland	-	30-120 CHF for commercial flights 500 CHF for private flights	Same as domestic flights	8%

Country	Tax name	Domestic flights	International flights	VAT on domestic aviation
		(expected to start in January 2022) Levy for commercial flights will vary with distance and class of travel (details to be defined) Exemptions: transit passenger, children under 2-years old; passengers in aircraft with zero CO_2 emissions		
United Kingdom	Air passenger duty	£13 for economy class (if seat pitch is less than 1016mm) £26 for premium class (or if seat pitch is greater than 1016mm)	£13 for economy class (if seat pitch is less than 1016mm) flights less than 3,219 km £26 for premium class (or if seat pitch is greater than 1016mm) flights less than 3,219 km £80 for economy class (if seat pitch is less than 1016mm) flights over 3,219 km £176 for premium class (or if seat pitch is greater 1016mm) flights over 3,219 km	0%
Norway	Air passenger duty	76.50 NOK for flights to European airports	76.50 NOK for flights to European airports 204.00 NOK for flights to destinations beyond Europe	

Source: Based on (CE Delft, 2019) *with updates to December 2020. All taxes listed here are already applied or will be applied in the future; the exception are the Spanish taxes, which are still under discussion.*

Energy for road and rail transport is significantly taxed in the majority of Member States

A 2019 study commissioned by DG MOVE (CE Delft, 2019) analysed in detail the taxes and charges imposed on the different modes of transport. For road transport, the fuel levies varied between €0.36 and €0.78 per litre of petrol and €0.33[32] and €0.70 per litre of diesel, with all Member States also levying VAT on fuel in addition to those excise duties; likewise, taxes and VAT are levied on electricity used as a fuel across all EU27 countries. Additionally, road transport is also subjected to a number of other taxes and charges, such as purchase and registration taxes or road tolls and vignettes, with the total revenue collected across the EU in 2016 varying between €30 and €105[33] per 1,000km for passenger cars. For rail, the picture is more varied, with some countries exempting the sector from any fuel duties (be it on diesel or electricity). For diesel, three Member States (Belgium, Hungary, Sweden) and Norway exempt the sector from fuel duty, with the maximum value of €0.83 per litre being levied in Romania. For electricity, 11 Member States and Norway either do not levy any taxes at

[32] €0.36 and €0.33 per litre are in fact the minimum levels set in Directive 2003/96/EC for petrol and diesel, respectively.
[33] Values adjusted for purchasing power parity.

all or have regimes of exemption for the sector. Rail tickets are also usually subject to VAT across the EU, either on standard or reduced rates (CE Delft, 2019).

The maritime sector has not been subjected to fuel taxes, with Article 14 c) of the Energy Taxation Directive explicitly exempting from taxation fuel used for navigation within Community waters.

As already mentioned above, Article 14 of the current Energy Taxation Directive (ETD) has a mandatory tax exemption for the fuel used in air navigation other than private pleasure transport. The Directive allows EU Member States to tax kerosene used for aviation in domestic flights, or intra-EU flights provided there is a bilateral agreement between the departing and the arriving countries. Aviation is subject though to some other taxes – such as ticket taxes, VAT (for domestic flights only), environmental taxes and charges for air cargo – with varied practice and rate across MS – apart from charges for infrastructure use (airport, air navigation).

In addition, market-based measures (EU ETS and CORSIA) apply to the aviation sector and the maritime sector is likely to be included in the EU ETS soon, whereas emissions from fossil fuel consumption in road and rail transport are not integrated into the EU ETS. However, the generation of electricity used for railways and road electric vehicles is part of the EU ETS. This is currently much more significant for railways with 60% of main lines within the European rail network being electrified and 80% of traffic running on these lines. Especially in cities, rail almost exclusively runs on electricity already today (European Commission, 2017a). For road, while currently battery electric vehicles are less than 1% of the passenger cars fleet[34], the new targets in the Climate target plan for 2030, together with suggestions for banning the sales of internal combustion engines vehicles completely, will demand a significant uptake of electric vehicles.

2.1.3 Nature and scale of the problem

Problem: The current tax regime applicable to commercial aviation prevents a sufficient internalisation of climate-related externalities and restricts the contribution of the aviation sector to EU's climate goals while leading to inequitable treatment compared to other transport modes

The current tax regime is a problem insofar as it results in only a limited capacity of the EU aviation sector to deliver its climate goals, notably due to an insufficient internalisation of carbon externalities that could incentivise decarbonisation.

The continued rise of aviation GHG emissions (pre-COVID-19 levels) represents an increasing challenge in terms of reaching the EU's economy-wide climate neutrality target and commitments under the Paris Agreement and European Green Deal. GHG emissions (in CO_2e) of all flights departing from EU27, EFTA and the UK increased by 119% over the period 1990-2018 and by 23% between 2005 and 2018. The baseline scenario (which does not take into account ReFuelEU Aviation initiative and revision of EU ETS) presented in section 5.1 estimates that CO_2 emissions will increase by 24% by 2030 and by 27% by 2050 on 2005 levels.

In line with the Sustainable and Smart Mobility Strategy (European Commission, 2020e), there is no single measure to decarbonise aviation and it will need to rely on a basket of measures. The potential for emissions reduction from new disruptive technologies and operational practices is limited in the mid-term and costly in the aviation sector (European Commission, 2017b). Operational improvements are supported by the EU through Clean Sky Joint Undertaking and its successor Clean Aviation Joint Undertaking, and Single European Sky. Scaling up the supply and uptake of sustainable aviation fuels will provide an important contribution to the decarbonisation of the aviation and will be promoted by the EU through the ReFuelEU Aviation initiative. In this sense, a significant reduction of emissions within the aviation sector itself is needed through a basket of measures to contribute to the overall 90% reduction of transport emissions by 2050.

ICAO has identified that market-based measures, as part of the basket of measures, are necessary for air transport to contribute to emission reductions as they allow the sector to offset its strong

[34] https://www.eafo.eu/vehicles-and-fleet/m1

emission growth from increased activity through acquiring emission units from other sectors at lower abatement costs. A strong price signal may provide incentives to the aviation industry to invest in decarbonisation measures and to increase demand in favour of more sustainable modes, for the trips where those are available.

According to T&E (Transport & Environment, 2018), a carbon price equivalent to €150/tCO_2 can moderate fuel demand growth from the sector through incentivising a combination of design and operational efficiency improvements and modal shift. The use of SAF, which is the most promising decarbonisation option for aviation, would imply a cost of around €150 per tonne of avoided CO_2 for the cheaper production routes. This is significantly higher than the expected EU ETS price of around €44/tCO_2[35] in 2030 for intra-EEA flights and the CORSIA offsetting price of around €9-13/tCO_2 in 2030[36] for extra-EEA flights, which means that these price signals will be insufficient to incentivise significant abatement actions within the aviation sector, at least in the mid-term. It should be noted, however, that there is a significant difference in the level of internalisation between intra-EEA flights (higher degree of internalisation) and extra-EEA flights (lower). A potential increase in the level of auctioning for aviation EU ETS allowances[37] would deliver a higher level of internalisation for intra-EEA flights reflecting the carbon price across EU ETS sectors. In contrast, the carbon price introduced through CORSIA (assuming that the expected prices identified above are realised) would only partially reflect the climate external costs generated by extra-EEA flights (and the requirements for offsets applies only to emissions growth above 2019 levels, not the full emissions).

A recent, pre-COVID pandemic study for Sweden estimated that direct emissions from aviation will continue to increase under the EU ETS and CORSIA, assuming that the current allocation of free allowances for aviation in EU ETS is maintained. When indirect emission reductions (as a result of the aviation sector's purchases of emission allowances or offsets from other sectors) are included, net carbon reductions are expected to be rather modest, around 0.8% per year (Larsson, Elofsson, Sterner, & Akerman, 2019).

In this sense, given the expected limited incentives from the EU ETS and CORSIA for the reduction of GHG emissions within the aviation sector itself, the adoption of economic instruments such as fuel tax or ticket taxes can create compatible mechanisms with current market-based instruments and increase the contribution of aviation to climate goals (Larsson, Elofsson, Sterner, & Akerman, 2019) (Fukui & Miyoshi, 2017). This aligns with the Green Deal goal 'to ensure effective carbon pricing throughout the economy' where 'different pricing instruments must complement each other and jointly provide a coherent policy framework'. On this point, the evaluation of the Energy Tax Directive[38] points out that 'some of the preferential tax treatments [to aviation] may restrict the potential contribution of the transport sector to the EU's climate policies'.

Recently, taxation of aviation services and/or aviation fuel (kerosene) has been under public scrutiny, with Ministers of Finance of nine EU Member States calling on the Commission[39] to start debating the issue and a citizen's initiative asking for an aviation fuel tax to be introduced for intra-EU flights receiving more than 70,000 signatures[40]. The European Commission also indicated in the European Green Deal that it has a goal of ending subsidies for fossil fuels and ensuring that any loopholes that allow the price of transport not to fully take into account its environmental externalities should be removed.

This analysis suggests that aviation externalities, and climate-related external costs in particular, are not sufficiently internalised through the current tax regime and market-based measures applied to air

[35] This is the price for the MIX scenario in the Climate Targets Plan Impact Assessment, which could be fully internalised if 100% of allowances are auctioned in 2030. The price in the most ambitious scenarios could raise up to €60/tCO_2. The carbon price in the period 2030-2040 is estimated to increase substantially to more than €100/tCO_2 in all the scenarios considered, which may be closer to the current marginal abatement costs in the aviation sector

[36] Based on (TAKS, 2019) and exchange rate of 1€=1.136$

[37] This matter is currently being considered by the Commission (European Commission, 2020b)

[38] SWD(2019) 332 final, page 64

[39] https://www.rijksoverheid.nl/documenten/publicaties/2019/11/15/joint-statement-aviation-pricing

[40] https://eci.ec.europa.eu/008/public/#/initiative

transport in the EU, at least with the carbon prices expected for 2030. Since strong price signals are required to revert the current trend in carbon emissions generated by air transport, this insufficient level of internalisation may represent an obstacle for the aviation sector to contribute to the 90% reduction goal by 2050 set for the transport sector.

The current tax regime offers more privileged tax treatment than for other means of transport that commercial aviation competes with. On routes where alternatives to flying are available to passengers and freight shippers, uneven levels of taxation for what concerns environmental externalities can result in marginal cost differences which may, in turn, affect consumer choices by directing them towards options with higher emissions. This problem was identified in the evaluation of the Energy Taxation Directive[41]. The evaluation study noted that mandatory tax exemptions for international commercial aviation[42] and maritime transport – as well as optional exemptions and reductions for other modes of transport – may distort equal treatment in the transport sector. While the evaluation presented information for tankering in case of road transport between the MS, further analysis is needed to demonstrate the impacts of the mandatory exemptions for aviation and maritime on competition with other transport modes.

For the competition between air transport, rail transport and road transport to be affected by uneven taxation levels, three conditions need to be met:

1. There needs to be a viable alternative to air travel, typically by road or rail.
2. On those routes subject to competition, the difference in tax regimes (net of fiscal benefits such as operational subsidies) affects the relative cost of different modes of transport, namely giving a cost advantage to the sector that is not subject to taxes on their environmental externalities – especially when those would represent a high proportion of total variable costs.
3. Higher taxes in the sectors for which environmental fiscal regimes are in place (after taking account of fiscal benefits such as operational subsidies) translate into higher prices for consumers (assuming non-zero levels of cost pass-through), potentially favouring the options with favourable tax regimes.

For passenger transport, the first condition on the availability of transport alternatives will typically be met for a limited range of distances and travel times, for which road and rail can compete with air transport. High-speed rail is widely acknowledged as a (partial) substitute to air transport on short-haul routes, this is, distances up to 800 km (European Commission, 2006) and total journey time under around 200 minutes (Behrens & Pels, 2012). A number of studies have found significant supply effects as a result of this competition, with lower frequency and/or seats offered by air services when a high-speed line is introduced (Albalate, Bel, & Fageda, 2015) (Dobruszkes, 2011). For routes where a competitive high-speed alternative is available, the market share for the high-speed rail can grow to capture more than half of all passengers on the route[43]. Similarly, road transport or conventional rail alternatives will only be able to compete with air transport on routes with even shorter distances, as travel speeds are lower compared to high-speed rail.[44]

For freight transport, air travel is preferred to alternative modes in market segments which are either characterised by high-value or time-sensitive shipments. It is unlikely that other modes can compete in those segments.

[41] SWD(2019) 332 final, page 73
[42] While acknowledging that aviation is part of the EU ETS
[43] For example, the high speed rail share on the London-Paris market is 70% (D'Alfonso, Jiang, & Bracaglia, 2016) and 50% on the Barcelona-Madrid route (Albalate, Bel, & Fageda, 2015). Some of this demand is abstracted from air routes, while the rest is generated by attracting new travellers.
[44] Night trains could also be an alternative to short-haul and medium-haul flights. Although the European night train network shrank steadily from 2010 to 2017 (European Parliament, 2017), there has been a renaissance in the last years with new planned services operated by Austrian Federal Railways (ÖBB) and other rail operators. Recent research in the Netherlands finds an increased willingness to travel by night trains as an alternative to flying for leisure trips (Kantelaar, 2019).

As for the second condition, when competing transport modes have different environmental impacts, and taxes are levied unevenly across modes (net of fiscal benefits such as operational subsidies), cost advantages can materialise in favour of the modes subject to lower taxation.

The nature and level of taxes and charges applied along with their coverage of existing external costs varies significantly across transport modes (CE Delft et al, 2019c).

Table 2-3 presents the results of the comparison of average variable external and average variable infrastructure costs vis-à-vis average variable taxes and charges[45]. External costs of climate change are significantly higher for aviation (2.1 €-ct/pkm) compared to other modes (1.2 €-ct/pkm for road and no tailpipe emissions from electric railways). In contrast, road vehicles and railways have an average tax and charge levels of 3.2-3.9 €-ct/pkm[46] compared to 1.52 €-ct/pkm for commercial aviation. This leads to differences in the extent to which variable external costs are covered by sector-specific taxes and charges. The cost coverage of the aviation sector is 41% compared to 48% within the road sector and 258% for high speed trains.[47,48,49]

The study on internalisation did not include the price of EU ETS allowances. However, our own calculations based on a carbon price around €44/tCO_2 suggest that the price per passenger-km related to EU ETS would be lower than 0.4 €-ct/pkm even with full auctioning. Therefore, this would not affect significantly results presented in Table 2-3.

Table 2-3: Average variable external and average variable infrastructure costs vs. average variable taxes and charges (€-ct/pkm) across passenger transport modes

Cost category/taxes	Passenger road vehicle	Coach	High speed rail	Electric passenger train	Diesel passenger train	Aircraft
Average variable cost categories						
Accidents	4.45	0.98	0.06	0.47	0.47	0.01
Air pollution	0.71	0.73	0.00	0.01	0.80	0.14
Climate change	1.18	0.44	0.00	0.00	0.34	2.10
Noise	0.55	0.24	0.33	0.80	1.38	0.13
Congestion	0.71	0.14	0.00	0.00	0.00	0.00
WTT	0.38	0.15	0.30	0.80	0.11	0.80
Infrastructure	0.13	1.79	0.8	1.6	3.5	0.54
Total	8.1	4.5	1.5	3.7	6.6	3.7
Average variable taxes and charges						
Total	3.9	1.0	3.7	3.2	7.3	1.52
Cost coverage ratio						
Taxes over costs	0.48	0.23	2.58	0.86	1.10	0.41

Source: (CE Delft et al, 2019c)

[45] This excludes significant fixed taxes and external costs for road and rail transport. The 'Overall cost coverage excluding fixed infrastructure costs' indicator including fixed taxes and external costs could be used as an alternative indicator.
[46] Including fixed taxes, the level of road taxes and charges would increase to 5.5 €-ct/pkm.
[47] When considering fixed taxes and external costs, the cost coverage of road transport would increase to 63%, while the coverage ratio of high-speed rail would decrease to 181%.
[48] The high coverage ratio of high-speed rail is explained by infrastructure access charges applied to high speed rail are generally set to at least partially recover the high fixed infrastructure costs, which are excluded from this analysis based on variable costs.
[49] It should be noted that the analysis of the internalisation study (CE Delft et al, 2019c) did not include subsidies as these are generally very location specific and difficult to generalise across the EU. As for high speed rail, infrastructure capital costs are largely funded by national or European grants. However, subsidies are seldom applied to high speed operating costs and, therefore, from a variable cost perspective, subsidies have a limited effect on the cost coverage ratio presented for high speed rail.

Finally, meeting the third condition (i.e. the cost disadvantage of competing modes on certain routes affecting passenger choices in favour of flying) depends on the extent to which costs are passed through to transport users and the pricing strategy of operators.

For passenger cars and heavy-duty vehicles, fuel taxes (as well as other taxes and charges) are directly reflected into the price that users perceive when making choices about travelling on the road. The impact of fuel taxes on the final ticket price of passenger rail and coach transport is more uncertain and depends on revenue optimisation and cost minimisation strategies, besides the degree of intermodal competition. Taxes may also affect service provision by influencing frequency and vehicle sizes (Adler, Pels, & Nash, 2010). Economic theory as well as recent empirical studies (Koopmans & Rogier, 2016) maintain that pass-through is higher in markets where competition is more intense. This would indicate that on contestable routes (such as those routes described above on which either high-speed rail and aviation compete, or conventional rail, coaches and aviation compete), taxes can result in relatively higher pass-through and be perceived by passengers when making their choices[50]. With respect to freight services, it is common for air cargo and rail cargo operators to apply a 'fuel surcharge' or adjust their shipping contracts in response to increases in the price of fuel (European Parliament, 2009). Despite limited intermodal competition in freight margins, it is reasonable to assume a slight competitive advantage for air cargo in the absence of fuel taxes applying to the aviation sector.

All in all, price differentials between aviation and other modes on competing routes can therefore affect consumer choices at the margin on some routes, directing them towards travel options with higher emissions. This may exacerbate the problem of the lack of internalisation of external costs for the aviation sector by resulting in higher demand for flying than would be the case under a more harmonised tax regime. However, specific analysis per corridor or route would be needed to demonstrate the final effects on modal share from the different pricing and taxation levels between transport modes.

2.1.4 Evolution of the problem

Under the baseline (no policy change) scenario we expect the drivers of the problem to evolve as follows:

Driver	Expected evolution under baseline/assumptions
GHG emissions from aviation increase steadily boosted by activity growth	• Even though the effects of the COVID-19 pandemic on economic activity and personal mobility are resulting in a significant drop in passenger demand in the short term, air transport activity is expected to continue to grow in the long term
Uptake of decarbonisation measures on the supply-side in the aviation sector are currently limited due to low technological and commercial maturity	• Radical technological innovations like all-electric aircraft or hydrogen-fuelled aircraft are likely to roll-out only gradually due to low TRL levels and the high costs of implementation and therefore can only lead to limited emissions reductions in the coming decades • SAF offers promising avenues to decarbonise aviation, but currently has a low level of uptake (around 0.05%). The ReFuelEU Aviation initiative is expected to result in a mandate for the use of SAF, which will lead to a ramp up of production and uptake of SAF on the EU market, which will bring important emissions reductions.
Market-based instruments (EU ETS and CORSIA) only partially internalise climate externalities	• The share of free ETS allowances for aviation is likely to be reduced in future phases and this policy option will be analysed in the ongoing revision of the EU ETS, which would increase EU ETS effectiveness. Carbon price is expected to increase toward 2030 and 2050.

[50] However, evidence from the London-Paris route suggests that the level of competition between air transport and high-speed rail may decrease once the high-speed route consolidates a high market share, providing a dominant role to the high speed rail operator (Behrens & Pels, 2012).

	• At present 88 ICAO Member States have indicated an intention to join the CORSIA voluntary stages from the start in 2021. From 2027 onwards CORSIA will be mandatory for States that have a share in international aviation above 0.5% of total Revenue Tonne Kilometres (RTKs), which implies that Brazil, China, India, Russia and Vietnam will also join (TAKS, 2020) • The ambition level of CORSIA may evolve over time • The interaction between the ETS and CORSIA is still uncertain. One option is a 'clean cut' under which the EU ETS would continue to apply to the current intra-EU/EFTA scope and CORSIA would be introduced for extra-EU/EFTA flights. Another option would be a mixed approach under which ETS would apply up to each operator's emissions and CORSIA would apply to the growth above CORSIA baseline emissions[51]. • While it is expected that all aviation's emissions will be covered by one measure or the other, the current uncertainty in the future scope of the EU ETS and CORSIA, means that it is not clear which aviation emissions will be covered by which measure. This uncertainty is expected to be clarified in the forthcoming revision of the EU ETS Directive. However, it seems clear that all emissions will be covered.
Provisions contained in some of the applicable air services agreements between EU Member States and third countries, or between the EU and third countries or group of countries, limit the ability to introduce taxes on the fuel supplied to carriers operating intra-EU flights.	• Air services agreements are agreements establishing the conditions for providing air services between the agreeing parties. • Some of the existing agreements between Member States and third countries (i.e. bilateral air services agreements) as well as some of those between the EU and third countries or group of countries (i.e. comprehensive air transport agreements) pose legal obstacles to the adoption of indirect taxes on the aviation sector, especially in relation to taxes on fuel supplied to EU and non-EU carriers operating extra- and intra-EU flights. • The trend in more recently concluded and negotiated agreements is towards the inclusion of provisions allowing the taxation of fuel, though mainly on intra-EU flights only. The process of amending existing agreements might be lengthy and difficult as some partner countries might not be in favour of renegotiating existing terms. Where amendments can be adopted, the outcome is not the introduction of indirect taxes on aviation fuel, but it will set the prerequisites for their introduction.
No harmonised conditions at EU level on fuel taxes, VAT or ticket taxes for aviation	• MS are unilaterally introducing taxes and charged for aviation (taxes in 17 MS). • Without EU policy action and given the international and mobile nature of air transport, it is unlikely that unilateral measures by Member States would be effective at harmonising indirect taxes at the European level • Without EU harmonisation, it is unlikely that Member States will unilaterally adopt similar ticket taxes given the different economic incentives to do so across Member States. • To give Member States more leeway for levying a minimum tax on fuel supplied to aircraft operating intra-EU flights, the Energy Taxation Directive (article 14 in particular) would need to be modified.
Energy is significantly taxed for road and rail transport	• Fuel tax revenues are expected to decrease for road transport as a result of the uptake of alternative fuelled vehicles (e.g. battery electric vehicles or hydrogen-powered vehicles)

[51] During the pilot phase, 2019 emissions will be used for determining the CORSIA baseline.

	• However, alternative taxation schemes may be introduced to compensate for foregone revenues (e.g. mileage-based taxes or road use charges) • A similar behaviour is expected for railways but changes will be less significant as most rail services are already powered by electricity

2.1.5 Consequences of the problem

The current level of taxation in the aviation sector and market-based measures currently applied to air transport may provide insufficient price signals for the sector to adopt decarbonisation measures and for consumers to fully consider the carbon impacts of their travel decisions. This leads to an insufficient contribution of the aviation sector towards European and international climate mitigation goals, such as those specified under the European Green Deal. It should be noted, however, that the final contribution of the aviation sector towards climate goals will result from the combination of the basket of measures applied. This may include stronger price signals but also the SAF mandate to be proposed by the Commission (under the ReFuelEU Aviation initiative), which is expected to lead to a gradual uptake of SAF.

In addition, the current level of taxation in aviation provides for a preferential tax treatment of air transport, which does not reflect the decarbonisation agenda.

2.1.6 Need for action at EU level

There are different levels of aviation taxation among EU Member States with various levels of ticket taxes and VAT (on domestic flights only). In EU Member States, VAT or other taxes on domestic aviation are the most prevalent and exist in 17 Member States. Six Member States levy taxes on international aviation, invariably in the form of ticket taxes for passengers departing from airports in the Member State. In Europe, the highest average tax rates are in the UK followed by Italy, Norway, Germany and France. (see 2019 DG MOVE study on taxation in aviation)

Without EU harmonisation on taxes on aviation, Member States have followed the traditional ICAO stance of exempting kerosene from any taxation (except for some non-scheduled/not-for-remuneration flights, see section on drivers of the problem, above). This choice has also been outlined in their bilateral air services agreements, which traditionally have exempted kerosene from taxes.

The cross-border nature of the externalities linked to the aviation sector and its impact on climate change justifies the need and the relevance of action at the EU level. One of the measures can be the proposal to introduce a harmonised minimum tax on aviation fuels. A minimum degree of coordination is justified in the light of the practical obstacles that prevent Member States from unilaterally adopting energy taxes on the supply of aviation fuel, including the practice of fuel tankering by air carriers and risks related to the distorted competition between EU airports and the carriers operating there.

A proposal for a harmonised ticket tax would also, most likely, comply with the proportionality and subsidiarity principles but, potentially, on slightly different grounds. Clear added value would derive from EU action in comparison to action at the Member State level, as domestic action may lead to very different levels of air ticket taxes (e.g. by ticket class, in relation to transit and transfer journeys[52], etc.). Harmonisation at the EU level would contribute to achieving a minimum degree of coordination in line with overall EU decarbonisation goals and to minimise the risks of hub switching and destination switching (see section 6.5.1) associated with very different taxation levels across the EU.

[52] Transit and transfer passengers (or journeys) are those in which the passenger flies from their original destination to their ultimate destination with a stopover (of a limited time) at an intermediate airport. A transit journey is one on which both legs are flown on the same aircraft, while a transfer journey is one on which the two legs are flown on different aircraft.

2.2 Policy objectives

In this Task, the problem defined in Task 1 is used to develop, systematise and validate the general and specific objectives of the regulatory measures that may be the outcome from the impact assessment. The general and specific policy objectives are useful for setting the level of policy ambition and allowing the comparison of policy options.

The table below presents these objectives and their linkage to the problem definition (see problem tree in Figure 2-1: Problem tree).

Table 2-4: Policy objectives

Problem definition	Objective
The current tax regime applicable to commercial aviation prevents a sufficient internalisation of climate-related externalities and restricts the contribution of the aviation sector to EU's climate goals while leading to inequitable treatment compared to other transport modes	**General objectives** Establish a policy framework in the area of taxation of aviation fuel and aviation services that: a) Contributes to the EU's decarbonisation objectives, by mitigating the environmental impact of air transport. b) Contributes to the internationalisation of the external costs of aviation, by application of the 'polluter-pays' principle. c) Removes taxation preferential treatment for aviation vis-à-vis more environmentally friendly modes of transport when available. **Specific objective 1** Establish an EU-wide minimum level of taxation of aviation fuel and/or aviation services (e.g. departure taxes) that, in coherence and complementarity with other price mechanisms like the EU ETS and CORSIA, ensures climate-related externalities are adequately reflected in the price for air services and provides incentives for a reduction in GHG emissions in line with the EU's climate goals. **Specific objective 2** Any taxation measures resulting from this exercise are to be coherent with the sustainable growth objectives and GHG reduction targets of European Green Deal, including the related projections for transport in the Climate Target Plan 2030 and Mobility Strategy, ensuring that different policy instruments complement each other and jointly provide a coherent policy framework **Specific objective 3** Establish an EU-wide minimum level of taxation of aviation fuel and/or aviation services (e.g. departure taxes) that increase prices for aviation to encourage a shift to more environmental forms of transport when those are available. **Specific objective 4** The aviation tax regime should safeguard the connectivity, cohesion and regional development within the EU, particularly of remote and outermost regions.

During the inception period of the study we have reviewed the set of objectives and presented them to the Commission during the kick-off meeting. This revision aimed to ensure that:

- **The proposed specific objectives reflect the understanding of the problem and its underlying causes**:
    - The specific objectives reflect the definition of the problem and the underlying causes so that there is a clear logical link between the two.
- **The specific objectives link to the Commission's broader objectives**

  - The objectives were mapped vis-à-vis the relevant objectives set out in the recently adopted European Green Deal to ensure that they reflect its objectives.
- **Check that the objectives are consistent with other EU policies including:**
  - connectivity, cohesion and regional development
  - Competitiveness of industry and innovation policy.
  - Functioning of the single market.
  - Relations with third countries.

Given this, two new specific objectives (numbered 2 and 4 in the table above), not initially presented in the proposal, were added during the inception stage of the project.

The proposal submitted by Ricardo included the intention to review the objectives with stakeholders during the field research elements of the study. As explained in Section A4, the Commission indicated that extreme care should be exercised when approaching stakeholders and the interviews should be restricted. Therefore, these objectives were not reviewed with stakeholders during interviews.

3 Methodology

This section provides a summary of the different work streams that form the basis of the study. More details about each component are presented in the relevant subsequent sections.

3.1 Development of policy options

In the task, the different policy scenarios to be analysed were developed, analysed and short-listed. The characterisation and modelling of the 'no policy' scenario' (baseline scenario) was explored in a separate task (section 5).

The identification of policy options involved three main steps, in line with the Better Regulation Tool #17 on the identification of policy options:

- Step 1: Development of a full list of all possible measures, on the basis of desk research.
- Step 2: Initial screening of the long-list of measures by the project team and the Commission.
- Step 3: Short list of policy options.

3.1.1 Step 1: Development of a long list of policy measures

This sub-task was focussed on the development of a long list of potential sub-options building on the three main policy packages described in the ToR:

- **Policy package 1**: Introduction of a harmonised minimum rate of tax on the supply of fuel for aviation under the revised Energy Taxation Directive.
- **Policy package 2**: Introduction of harmonised minimum ticket tax across the EU.
- **Policy package 3**: Combination of a harmonised minimum tax on the supply of fuel and a harmonised minimum ticket tax.

The development and assessment of alternatives for each of the three main policy packages above was undertaken at two levels:

- **Measures level**: Independent variations around particular aspects (tax rate, level of differentiation, etc.), include measures aimed at minimising the risk of fuel tankering and traffic diversion.
- **Sub-option level**: Combinations of variations of measures across all aspects to conform fully defined taxation alternatives

The main characteristics for the three main policy packages along with the individual measures that are included in each package are analysed in further detail in section 4.1 and 4.2, respectively.

3.1.2 Step 2: Screening of policy measures

Given the large number of measures under consideration, with some having multiple variations around particular aspects (e.g. the tax rate level), the number of potential sub-options was very large (more than 200). Given this, different measures were first analysed separately to assess their and then combined in a set of sub-options that were to be analysed further (see Step 3).

This initial screening was performed based on the criteria outlined in Table 3-1. The objective was to narrow down the long list of policy options in a sensible manner so that less preferable measures are discarded. These criteria were adapted following the kick-off meeting with the Commission and the inception report. The assessment at this stage was qualitative (detailed quantitative assessment was performed for the short-listed policy options only, and is presented in section 1) based on the findings from the literature, judgement from the experts in our team and feedback from the Commission. Options that were considered infeasible were discarded.

Table 3-1: Criteria for screening of measures

Criterion	Description
Legal feasibility	Extent that options respect the principles of conferral, subsidiarity and proportionality and whether they may conflict with other EU legislation and international aviation legislation
Effectiveness	Contribution of the measure to addressing the specific problem and/or meeting the targeted objectives, including how effective the measure in on incentivising decarbonisation (incentivising lower CO_2 per passenger km)
Efficiency	Qualitative cost burden or savings that could be achieved
Technical feasibility	The presence of any technical barriers to the adoption and enforcement of a measure. This is particularly important for measures that require the new types of information for which standardised metrics do not yet exist and would require the development of legislation in other areas.
Subsidiarity and Proportionality	To ensure that the principles of subsidiarity and proportionality are respected
Risk of tax avoidance (and carbon leakage if ENV measure)	Assess to what extent the definition of the policy option reduces the risk of tankering and traffic diversion

In section 4.2 a list of all the measures considered is included, including a full analysis of the measures that were taken forward; measures that were discarded are presented in Annex A7.

3.1.3 Step 3: Short list of policy options

The final step was the packaging of the measures that were to be considered further into a set of suitable policy options. This packaging took into account the fact that only a sub-set of measures could be modelled quantitatively in the AERO-MS aviation model. These measures formed the basis of the sub-options. All other sub-measures were analysed qualitatively.

The final list of policy options that were considered is discussed in Section 4.2.3.

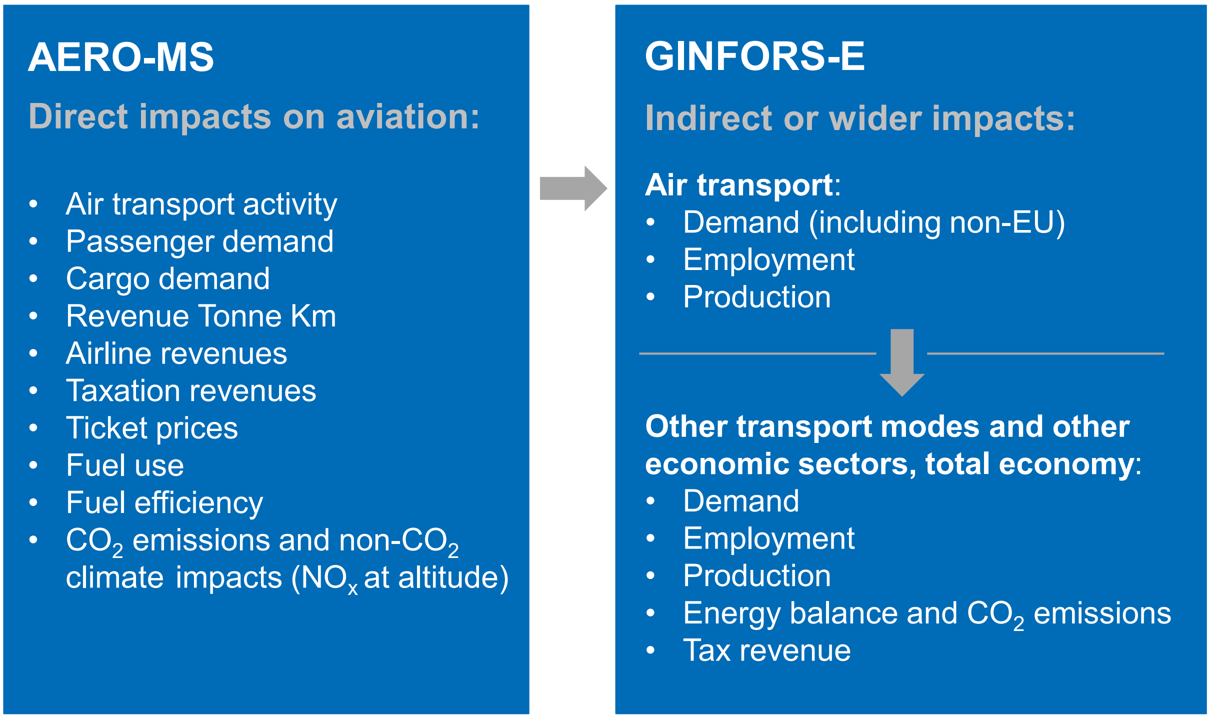
3.2 Assessment of impacts

In keeping with the need for proportionate and credible analysis, the study is focussing on providing quantitative analyses of the most significant impact categories. Environmental, economic and social impacts from increased taxation as per the different policy options and sub-options are quantified based on outputs from AERO-MS for the aviation sector and from GINFORS-E for wider impacts. The modelling framework used can capture the effects of different uses of taxation revenues, both on the aviation sector and on the whole economy.

The AERO-MS and GINFORS-E models, as applied in the impact analysis, are highly complementary. The AERO-MS models the global aviation industry with detailed data at an airport-pair level, whereby European flight data for the base year are based on EUROCONTROL data. GINFORS-E is a macro-economic model with bilateral world trade data from OECD. For the assessment of the various policy options, the AERO-MS model is run to quantify impacts on the aviation sector. Results of the AERO-MS are transferred to the classifications of the GINFORS-E macro model, which is then run to quantify wider economic impacts on other transport modes and other economic sectors for the different scenarios.

During the inception phase of the study, the required linkages between the two models were established. A procedure was developed whereby for each calculation, the AERO-MS produces an output report with a fixed format. This output report contains AERO-MS computational results by Member State regarding airline revenues, taxation revenues, passenger demand, cargo demand and energy demand. The AERO-MS outputs are then input to the GINFORS-E model. An overview of the modelling framework applied in this study is provided in Figure 3-1.

Figure 3-1: Modelling framework used in this study



The use of both models provides a comprehensive overview of impacts in comparison with each of the baselines included in the study, with results being produced for short-term (2025), mid-term (2030) and long-term (2050) impacts. The analysis includes calculations using AERO-MS for each of the policy options applied to each of the two baselines; the GINFORS-E model analyses the policy options against a single baseline (the primary baseline). The modelling uses the carbon price and fuel price assumptions provided as part of the primary baseline definition. Additional tax revenues (from either fuel taxes or ticket taxes) are assumed to flow into the general budget. No revenue recycling is assumed in the policy option analyses. GINFORS-E results include second round effects.

3.2.1 AERO-MS

The AERO-MS takes into account various responses to air transport taxation including:

- A demand side response whereby policy-induced cost increases are passed on to higher ticket prices, which results in a reduction in passenger and cargo demand.
- A supply side response whereby airlines shift towards the use of more fuel-efficient aircraft.

In relation to the first response the default assumption in the AERO-MS is that all policy-induced cost increases are passed on into higher ticket prices. The impact on demand which follows from these higher ticket prices is related to the price elasticities of demand in the model. The price elasticities of demand values in the AERO-MS are based on an IATA study[53]. The elasticities used for intra-EEA flights by different carrier types are shown in Table 3-2.

Table 3-2: Average price elasticities used for intra-EEA flights

Airline type	Price elasticity
Traditional scheduled carriers	-0.84
Low-cost carriers	-1.06
Cargo demand	-0.64

In relation to the supply side response, the AERO-MS takes into account that responses will be different for a fuel or ticket tax. In case of a fuel tax, there is a price incentive for the use of more fuel-efficient aircraft, whereas this is not the case for a ticket tax. This is a key difference between the two taxation alternatives and is captured in the quantification of impacts. The AERO-MS takes into account the following supply side responses:

- New aircraft technology shift: change in purchase behaviour of airlines towards (available) environmentally more efficient new aircraft and accelerated development of new aircraft technology.
- Accelerated fleet renewal: replacing the older part of the fleet earlier than in the situation without a fuel taxation, based on financial considerations of airlines.
- New aircraft capacity shift: adjustment of mission capabilities to allow for more efficient aircraft operation in view of anticipated fuel taxation impacts on transport flows.

In relation to the outputs from AERO-MS, the following remarks apply:

- Separate outputs are presented for all 29 EEA Member States (EU27, NO, IS [54]) plus Switzerland (as a member of the EFTA), including aggregated outputs for EEA29.
- The outputs per Member State (MS) are allocated based on country of departure of a flight
- A separate output table is provided for each MS for intra EEA traffic (including both domestic traffic and international intra EEA traffic) and extra EEA traffic (i.e., destination outside EEA).
- For a number of indicators there is distinction between impacts for traditional scheduled carriers and low-cost carriers. This show if different airline categories are affected differently by the taxation options.
- For calculations of the impacts of tax options, the results are presented as percentage changes relative to the baseline (Note: taxation revenues are presented in absolute terms).

3.2.2 GINFORS-E

GINFORS-E, as a global model, with inter-industry and bilateral trade relations endogenously modelled, can inform about indirect and total macroeconomic impacts. This includes indirect, induced and total effects on GDP and employment, and effects on industries with close links to aviation. Impacts on other modes of traffic (i.e. land and water transport) are also accounted for.

GINFORS-E takes input from AERO-MS in terms of air transport prices, air transport demand and energy demand under each scenario and quantifies various reactions to these inputs in the macro model. The following AERO-MS outputs are used as an input to the GINFORS-E model, whereby outputs of the AERO-MS have been provided in terms of differences relative to the baseline:

- Differences in airline revenues (passengers, cargo).
- Differences in demand (passenger km, cargo-km).

[53] https://www.iata.org/en/iata-repository/publications/economic-reports/estimating-air-travel-demand-elasticities---by-intervistas/

[54] Liechtenstein is also part of the EEA but has not been taken into account because it has no aviation sector

- Differences in air transport taxation revenues.
- Differences in air transport energy demand and CO_2 emissions.

As part of the initial setting up for this study, the GINFORS-E model has been recalibrated to ensure that it is consistent with the AERO-MS results for the aviation sector.

Results from AERO-MS for air ticket prices and air transport demand are the starting point for quantification of the tax scenarios in GINFORS-E (Figure 3-1). They are inputs for the GINFORS-E model.

A full description of the GINFORS-E model, including the different indicators used in the outputs, is given in Annex A3.2. Demand for land and water transport (indicators 1-3) depend on the total consumption expenditures by households at constant prices and on relative prices between the different transport modes. Thus, under a tax applied to aviation increasing the price of air transport, other modes (land, rail, water) become relatively cheaper and demand increases. The reaction depends on land or water transport being complements or substitutes for air transport. Econometric analysis helps at this point. Land transport (including private car, bus, etc.) demand depends on the ratio between the price of land transport services and the average transport service price. Respective econometric panel data analyses for price-deflated demand of the years 1990 to 2017 show in this regard an average price elasticity of -1.1 for demand by households and of -0.9 for land transport services as intermediate inputs of production. An increase in aviation prices will increase demand for land transport of persons and of freight. For water transport services, only the demand by households is significantly related to air transport services. Freight transport by water takes place domestically mainly with goods of low value density for which flights are too expensive. Econometric analyses show a direct positive correlation between price-deflated air transport consumption expenditures and price-deflated water transport consumption expenditures (elasticity of 0.5). The reason behind this finding (and modelling) might be that air transport is the usual mode of arrival for cruise holidays, the two travel modes in this case being complementary goods. One could also imagine some substitution between air and water transport, especially for short distances between the mainland and offshore islands. But the competition with flights is even in these cases limited, given the different transport times and the delay in ship boarding.

Changes in demand for different transport modes translate into adjustments of production, value added, labour demand, energy demand and emissions, and taxes. Employment effects on air transport (indicator 4) and total transport activities (indicator 5) mainly depend on changes in transport activities. But also different wage levels (relatively high in air transport, lower in land transport) have to be taken into account, when looking at employment effects in persons engaged.

As the decline in demand for air and water services for most countries exceeds the increase in demand for land transport services, there is a negative effect on the overall demand of private households.

Regarding price increases due to taxes full cost pass-through is assumed. During the current study, this assumption has been discussed and other sources consulted to check the validity of the assumption. A report for the European Commission (ICF Consulting, To be published) indicates that, for most cases, expected pass-through rates for additional airline costs are expected to be close to 100%. Therefore, it is considered that the assumption of full cost pass-through used here is valid.

The modelling of taxes without specific recycling of revenues leads to an increase in the overall price level with a slightly negative macroeconomic effect. Based on these initial changes, the model leads to further adjustments in other industries, on the labour market, and finally on GDP (indicator 11) and overall price level as GDP deflator (indicator 12). Employment as number of persons engaged is modelled on the sector level as a function of output and real wages. An increase in production leads to a less than proportional increase in employment. An increase in wages, measured in prices of the output good, reduces employment demand. Wage formation results at the macroeconomic level in a Phillips curve approach. Wages increase with labour productivity, price level and the (the lack of) availability of labour.

Among others, effects on tax revenues from income taxes and from taxes on products and on production and on energy use and CO_2 emissions are reported (beyond those already identified by AERO-MS for aviation).

Tax revenues from air transport stem from AERO-MS (indicator 6) and are just reported for completeness. Indicator 7 reports the sum of all taxes less subsidies on intermediate and final products except those on land, air and water transport. The taxes less subsidies on intermediate products are explained by the sum of all intermediate inputs at current prices plus the contribution of the respective sector to the revenues from ETS auctioning. The taxes less subsidies on final products that inter alia comprise VAT and energy taxes are modelled as constant relations to the respective final demand category. Current taxes on income, wealth etc. are reported as indicator 8. The revenues from this tax base are modelled as constant relation to the economy-wide gross value added at current prices. As revenues from these taxes are orders of magnitude higher than the revenues from the transport sector, even small percentage changes can have a significant impact on total tax revenue, for which taxes on transport and direct plus indirect taxes are added. (indicator 9).

Governments can use additional revenues differently. The recycling mechanism plays an important role for the macroeconomic effects. In this assessment it is assumed that additional revenues will accrue to general government budgets and will be used for debt reduction and not for consumptive or productive purposes, which is one of the reasons why the results tend to show negative growth impacts. Alternative revenue recycling via support programmes for airlines or airplane manufacturing, a reduction in labour costs or income taxes is expected to have more positive macroeconomic effects.

GINFORS-E calculates global energy related CO_2 emissions based on IEA energy balances for 64 countries plus rest of world, on an annual basis (2016-2050). This allows to calculate net CO_2 effects on the whole economy from taxation policies in the aviation sector. Energy use in transport (indicator 14) and related CO_2 emissions (indicator 16) cover all transport activity (in mobile engines) regardless of the economic sector to which it is contributing [ISIC Rev. 4 Divisions 49 to 51]. Total energy use (indicator 15) equals total energy supply. Indicator 17 represents all energy-related CO_2 emissions according to the IEA methodology. Indicators (14) to (17) do not include international aviation and marine bunkers. The IEA reports international aviation (indicator 18) and marine bunkers as memo, as they are not part of the national emission inventory.

More details on the assessment of impacts are presented in Section 6.1. A full description of the AERO-MS and GINFORS-E models is presented in Annex A6.

3.3 Legal and qualitative analysis

3.3.1 Approach and key sources

A thorough impact assessment needs to include an analysis of: the legal framework currently in place and how it contributes to: the problem analysis (section 2.1); the feasibility of the proposed policy options, sub-options and measures to ensure their effectiveness under current legislation[55] (section 4) and an assessment of the potential legal consequences of the interventions (section 6).

In summary, for the purpose of this report, we have analysed the following provisions, texts and legal frameworks to inform the analysis supporting this report:

- Convention on International Civil Aviation (‘Chicago Convention’).
- Relevant ICAO resolutions and policies.
- Relevant air services and air transport agreements between EU Member States and third countries (’Bilateral agreements’) and between the European Union and third countries (’Horizontal agreements’ and ’Comprehensive agreements’).
- EU legislation applicable to the aviation sector, legislative frameworks in the area of energy taxation, VAT and competition rules and the ongoing ’ReFuelEU Initiative’ (initiative to boost sustainable aviation fuels in the EU).

[55] When relevant, the legal analysis also draws attention to the provisions that would need to be modified in order to avoid inconsistencies or legal challenges.

- Regulations for carbon pricing or offsetting schemes (e.g. EU ETS, CORSIA).
- Some of the legislation at Member State level in the field of existing ticket and/or fuel taxes.

The detailed analysis is presented in Annex A1.

As part of this work, the study team has also engaged in conversations with experts at the European Commission and national tax administrations. Bilateral meetings with DG MOVE have shed light on the current and future coverage of third country agreements and their impact on the possibility of introducing taxes on intra-EU flights operated by third-country carriers. Conversations were also held with experts in the finance ministries of Austria, Germany, Sweden and the Netherlands. More details about field research for this study are shown in Annex A4.

3.3.2 Summary of legal considerations

The legal analysis has led to a number of considerations, summarised here. As noted, the detailed analysis is presented in Annex A1.

With respect to air ticket taxes, the legal analysis and the review of the experience of EU Member States shows that designing and implementing taxes on air passenger tickets does not pose fundamental legal issues. Legal objections have been raised in the past, in particular with regard to their compatibility with article 15 of the Chicago Convention. However, case-law in some Member States suggests that that ticket taxes do not violate this provision.[56] In theory, ticket taxes – if they can be assimilated to 'de facto' fuel taxes - could also be problematic under article 24 of the Chicago Convention and air services agreements (see the analysis below on the legal regime for fuel taxes).

With regard to EU law, the legality of ticket taxes has been questioned under EU State aid law, which highlights the need for Member States to design their taxes in compliance with article 107 of the TFEU.[57] Overall, the answer to the question of whether ticket taxes will or not be problematic under international and EU law largely depends on the design of the ticket tax regime. As long as it does not amount to a fuel tax and does not constitute state aid, the legal regime of ticket taxes should be relatively simple. Ticket taxes, which need to be included to the final price of air services available to the general public and specified along the final price of air services[58], are already a practical reality in various Member States. Also, article 23 of Regulation 1008/2008 (the Air Services Regulation) compels carriers to specify, in addition to the indication of the final price, at least a number of component parts of the final price. Taxes are one of the items to be specified, i.e. in the event they have been added to the air fare or air rate. This is more relevant for ticket taxes (as these are charged directly to the passenger); for the fuel taxes discussed in this report, the levies are charged to the airline, not the passenger (although a full cost pass through to passengers is expected as discussed above).

With respect to fuel taxes and aviation, the picture is more complex.

At the international level, the Chicago Convention on International Civil Aviation (1944) established the core principles permitting international transport by air. Article 24 prevents signatories of the Chicago Convention from taxing fuel onboard an aircraft on arrival and retained onboard - but does not prevent them from taxing fuel loaded into aircraft on their territory. This is an important clarification as article 24 may give rise to controversy if incorrectly interpreted as barring any form of fuel taxation.

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[56] See CE Delft, A study on aviation ticket taxes, November 2018. For a more detailed discussion of the legal arguments, see Uwe Erling, 'The German Air Transport Tax: A Treaty Override of International Law' (2015) 10(2) *FIU Law Review* 467-92; Brian F. Havel & Niels van Antwerpen, *Dutch Ticket Tax and Article 15 of the Chicago Convention* (2009) 34(2) Air and Space Law, pp. 141-146; Brian F. Havel & Niels van Antwerpen, *Dutch Ticket Tax and Article 15 of the Chicago Convention (Continued)* (2009) 34(6) Air and Space Law, pp. 447-451; Robert Lawson, *UK Air Passenger Duty held to be Consistent with the Chicago Convention* (2008) XXXIII(1) Air & Space Law, pp. 3-9.

[57] See CJEU, European Commission v. Aer Lingus, 21 December 2016, joined cases C-164/15 P and C-165/15 P; General Court, Aer Lingus v. Commission, 5 February 2015, T-473/12.

[58] See Article 23 of Regulation (EC) No 1008/2008 of the European Parliament and of the Council of 24 September 2008 on common rules for the operation of air services in the Community, OJ L 298, 31 October 2008, pp. 3-20.

At the European level, the ETD - Energy taxation directive (2003/96/EC) and the general arrangements for excise duty directive (2008/118/EC)[59] provide the regulatory framework for the adoption of excise duties on energy products and electricity. Directive 2003/96/EC specifically concerns the taxation of energy products and electricity. According to article 14, para. 1(b) of the ETD, 'energy products supplied for use as fuel for the purpose of air navigation other than in private pleasure-flying' shall be exempted from taxation by Member States. However, Article 14 para.1(b) also states that 'Member States may limit the scope of this exemption to supplies of jet fuel (CN code 2710 19 21)'. Moreover, Article 14, para. 2 indicates that 'Member States may limit the scope of the exemptions (….) to international and intra-Community transport. In addition, where a Member State has entered into a bilateral agreement with another Member State, it may also waive the exemptions (…). In such cases, Member States may apply a level of taxation below the minimum level set out in this Directive'.

Taken together, these provisions do not impede the application of taxes to the fuel supplied to EU-air carriers for intra-EU flights.

However, additional legal limits might apply to the taxation of fuel supplied to non-EU carriers when they operate intra-EU flights. Whether fuel supplied in the EU to non-EU carriers for intra-EU flights might be taxed or not will depend on the legal provisions to be found in (a) bilateral air services agreements concluded by Member States with third countries (and amended or not by horizontal agreements) or (b) comprehensive agreements.

A **bilateral air services agreement** concluded between a Member State and a third country might contain a provision requiring that fuel supplied for international air transport – which includes intra-EU flights - be exempt from taxation. Historically, such provisions have been very common. However, over the past years, the situation has evolved.

Since the early 2000s, the EU has negotiated, on behalf of the Union and of the Member States, **horizontal air services agreements (HAs)** and **comprehensive air transport agreements (CATAs)** with third countries. These negotiations have been justified by the need to align Member States' bilateral air services agreements with EU primary law, in particular the provision on the freedom of establishment.[60] However, many HAs and CATAs go beyond this initial objective and regulate other issues, including issues related to the taxation of aviation fuel.

The **HAs** allow the EU to amend a number of provisions in Member States' bilateral agreements. Increasingly, HAs include a provision allowing for the taxation of fuel supplied in Member States' territory for use in an aircraft that operates intra-EU flights.

The **CATAs** supersede the bilateral agreements that have been concluded by individual Member States with third countries. In many cases, CATAs include a provision allowing for the taxation of fuel supplied to an aircraft for intra-EU flights[61]. Moreover, the CATAs under negotiation and expected to be signed soon will usually include a provision allowing for the taxation of fuel supplied to an aircraft for intra-EU flights.

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[59] Council Directive 2008/118/EC of 16 December 2008 concerning the general arrangements for excise duty and repealing Directive 92/12/EEC

[60] See Commission of the European Communities, Communication from the Commission on the consequences of the Court judgements of 5 November 2002 for European air transport policy, 19 November 2002, COM(2002) 649 final; Regulation (EC) No 847/2004 of the European Parliament and of the Council of 29 April 2004 on the negotiation and implementation of air service agreements between Member States and third countries, OJ L 157, 30 April 2004, pp. 7-17. See also Frank Hoffmeister, 'Bilateral Air Transport Agreements between Several EU Member States and the United States (Open Skies) - Right to Establishment under European Law - External Competence of the European Community' (2004) 98 AM. J. INT'l L. 567-572.

[61] Note that the CATA concluded with the US does not include such a clause. Rather, article 11.6 of the EU-US Air Transport Agreement (OJ L 134, 25 May 2007, as amended) states as follows: 'Article 11.6. In the event that two or more Member States envisage applying to the fuel supplied to aircraft of US airlines in the territories of such Member States for flights between such Member States any waiver of the exemption contained in Article 14(b) of Council Directive 2003/96/EC of 27 October 2003, the Joint Committee shall consider that issue, in accordance with paragraph 4(e) of Article 18'.

What do these provisions mean in practice? The practical consequence of these agreements can be illustrated by means of two concrete examples:

(1) Situation 1:
In case a tax is introduced within the EU on fuel supplied on intra-EU flights, the fuel supplied in Member State 'A' to a non-EU carrier from third country 'X' operating intra-EU flights between Member State 'A' and Member State 'B' must benefit from an exemption if all the following conditions are met:

- There is no HA or CATA between the EU and country 'X' including a clause allowing for the taxation of the supply of fuel for intra-EU flights.

And

- The bilateral air services agreements between Member State 'A' and third country 'X' prevents the taxation of the supply of fuel for international air transport, including intra-EU flights. This can be explained by two main reasons: (a) there is no HA between the EU and country 'X' amending the bilateral agreement to allow for the taxation of the supply of fuel for intra-EU flights or (b) Member State 'A' has not negotiated, on an individual basis, a clause to allow for the taxation of the supply of fuel for intra-EU flights.

(2) Situation 2:
Conversely, the fuel supplied in Member State 'A' to a non-EU air carrier from third country 'X' operating intra-EU flights between Member State 'A' and Member State 'B' could be subject to taxation in the same way as the fuel supplied to EU air carriers for intra-EU flights if one of the following conditions is met:

- There is an HA or CATA between the EU and country 'X' including a clause allowing for the taxation of the supply of fuel for intra-EU flights.

Or

- The bilateral air services agreements between Member State 'A' and third country 'X' allows for the taxation of the supply of fuel for intra-EU flights, either because it has been amended by a HA negotiated between the EU and country 'X' or because Member State 'A' has, individually, negotiated the insertion of such a clause in its bilateral air services agreement with country 'X'.

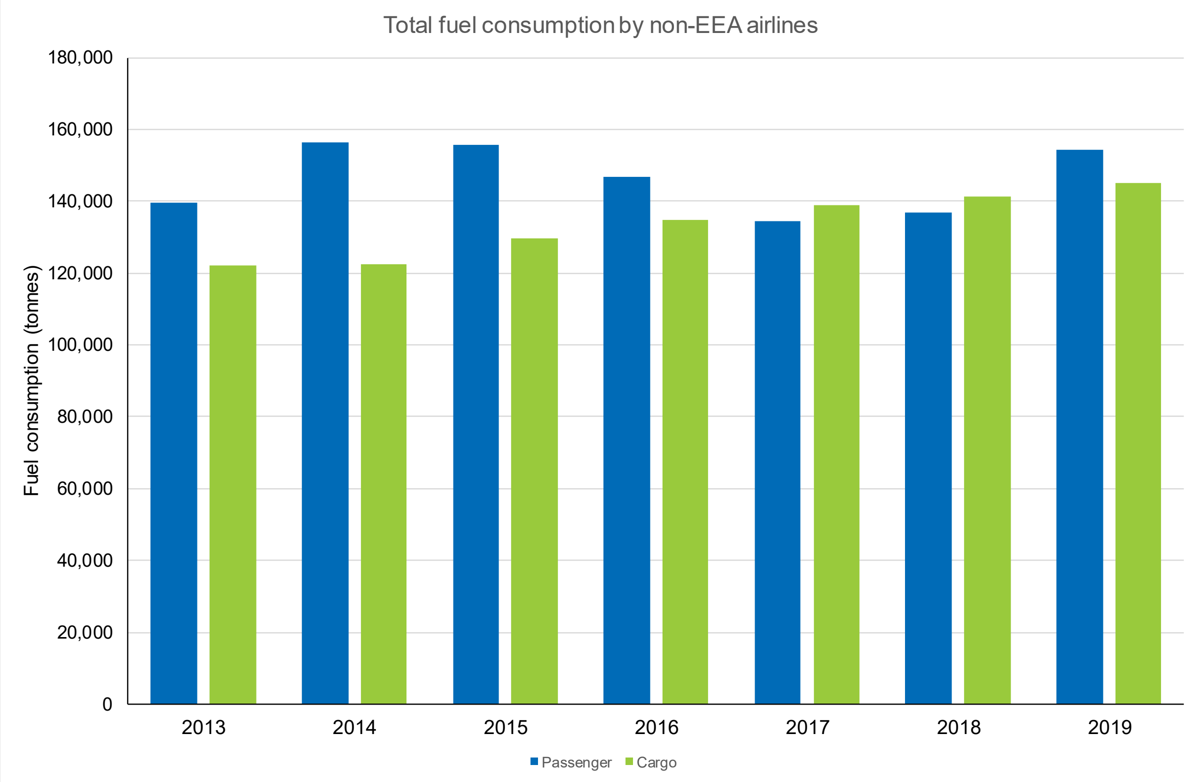
For the purpose of our analysis, we have mapped HAs concluded and all the CATAs concluded (or being finalised) between the EU and third countries. Following this mapping, we have analysed the extent to which those agreements allow the taxation of the supply of fuel for intra-EU flights (and, for the UK and Morocco, the taxation of fuel for flights from the EU to the UK and from the EU to Morocco). The full mapping is presented in Annex A1.

Due to the very large number of bilateral agreements existing between EU Member States and third countries, it is not possible to carry out an analysis of all the existing bilateral agreements that have not been modified by an HA. Nonetheless, our estimates show that the CATAs and HAs analysed cover most of all intra-EU passenger traffic by third-country carriers.

What does this tell us about the possibility that non-EU carriers who operate intra-EU flights may be able to operate without being subject to fuel taxes? The analysis below is useful to answer this question.

Data on the share of fuel burnt by third-party carriers operating intra-EU flights can be obtained from the EU ETS Transaction Log following a similar methodology to CE Delft (2019). This allows us to identify all the non-EEA aircraft operators that have submitted verified emissions under the EU ETS. Excluding non-commercial aircraft, we can focus on the commercial airlines that operate either (predominantly) passenger or cargo flights. Their fuel consumption is depicted in the figure below. It shows that the total fuel burnt by non-EEA carriers is relatively stable between 2013 and 2019 and that it is almost equally split between passenger and cargo operations.

Figure 3-2: Evolution of fuel consumption by non-EEA airlines for intra-EEA flights, by passenger and cargo flights



Source: Ricardo analysis of EU ETS Transaction Log

Besides looking at trends, we can estimate the share of total fuel burnt as a percentage of total fuel consumption, once again extracted from the EU ETS database. This reveals that the fuel consumed by non-EEA carriers for intra-EU flights is equivalent to 1.7% of the total fuel burnt. We can exclude cargo flights from this total as they would be out of scope from a potential fuel tax. This leaves us with a share of 0.9% attributable to intra-EU passenger flights by third country carriers.

Although the proportion is very small and stable over time, it is worth considering the countries of origin for those carriers and assess whether these countries have signed CATAs or HAs with the EU. Overall, the carriers with the highest fuel burn come from the USA and Switzerland. However, the American carriers are entirely cargo airlines.

Looking at passenger carriers, Switzerland, UAE, Korea, Ethiopia, Qatar and Chile come next. Except for Ethiopia, the EU has been able to conclude either CATAs or HAs with all of these countries.

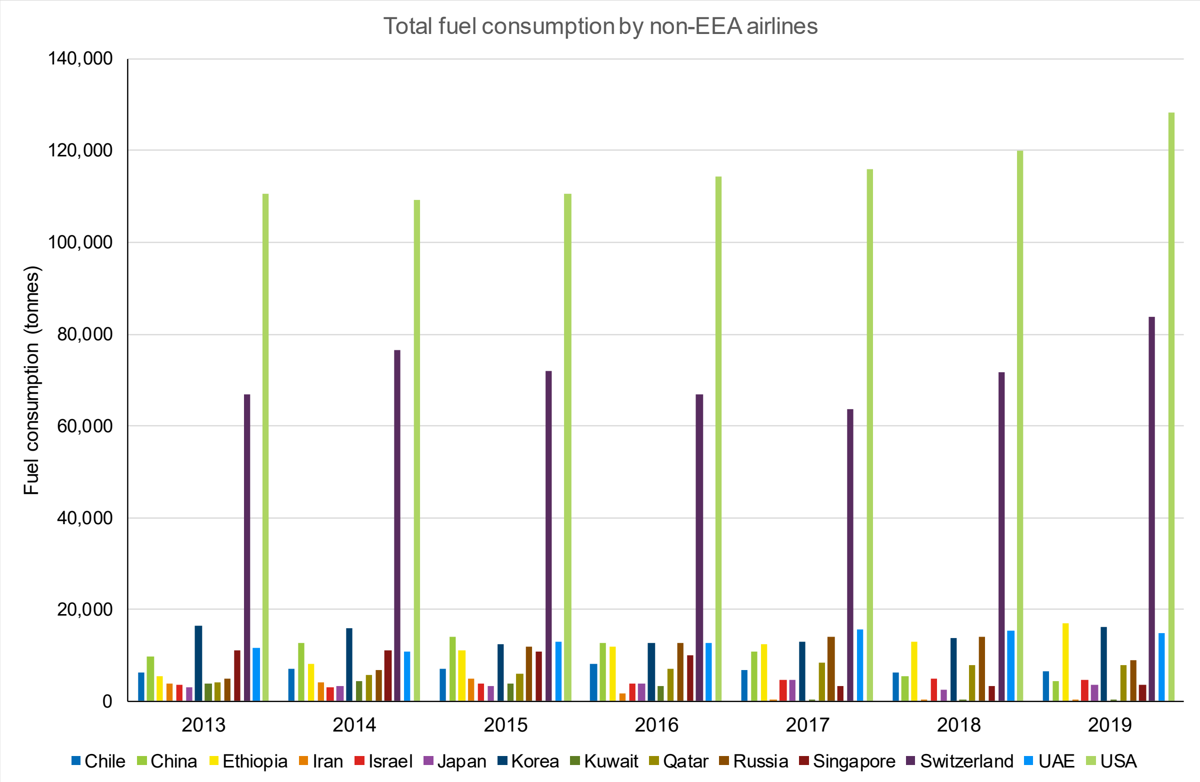
The agreement with Switzerland includes an explicit reference to article 14(1)(b) and Article 14(2) of Council Directive 2003/96/EC, which implies that the taxation of fuel supplied to Swiss air carriers for intra-EU flights should not be a problem.[62] Moreover, in the specific case of Switzerland, it is worth noting that the EU aviation acquis is regularly incorporated in the Swiss legal order by Decisions of the Joint Committee established under the EU-Swiss Air Transport Agreement. With rare exceptions and adaptations, aviation-related acquis is generally accepted by Switzerland and it would be safe to assume that harmonisation might take place should some form of taxation on fuel be introduced.

[62] See Annex, point 8 of the Agreement between the European Community and the Swiss Confederation on AIr Transport (OJ L 114, 30 April 2002, as later amended).

For UAE and Chile, a specific clause in the HA negotiated by the EU allows for the taxation of fuel supplied for intra-EU flights.[63]In the case of Korea and Qatar, agreements under negotiation are also expected to contain provisions addressing the potential for fuel to be taxed.

This would leave only Ethiopian carriers free from flying intra-EU flights without being subject to a potential fuel tax. The extent to which this is the case depends on the specific bilateral agreements between Ethiopia and each of the Member States (see Situation (1)).

Figure 3-3: Fuel consumed by non-EEA airlines for intra-EU flights, by country of origin



Source: Ricardo analysis of EU ETS Transaction Log

One important caveat of our conclusions is that today's analysis may not accurately describe tomorrow's situation, subject to some uncertainty. For example, assuming that EU air-carriers are subject to a new tax on the supply of fuel for intra-EU flights, some third-party carriers currently enjoying fifth-freedom rights but not actively pursuing intra-EU passenger routes may be incentivised to do so in the future - in case they benefit from a tax exemption due to the reasons explained above (see situation (1))

3.4 Peripheral and island regions case study

The purpose of the case study is to investigate and quantify possible negative socio-economic impacts that could take place in peripheral- and island regions if a taxation on the aviation sector is implemented in the EU. These areas are expected to be more affected than others by an aviation taxation, given their reliance on this mode of transport for their economic activities (e.g. tourism) and for the supply of consumable goods.

The case study is also focussed on the specific situation of outermost regions for the Canary Islands (ES), the situation of Crete (EL) and of Ireland and Malta – selected following a review of the relevant island and peripheral regions' connectivity and economic parameters, and discussions with

[63] See Article 4(2) of the Agreement between the European Community and the Republic of Chile on certain aspects of air services (OJ L 3000, 31 October 2006); article 4(2) of the Agreement between the European Community and the United Arab Emirates on certain aspects of ari services (OJ L 28, 1 February 2008).

Commission directorates (DG TAXUD, DG GROW and DG MOVE). Preliminary analysis on the case study, including the rationale for selecting the above specific situations as the focus of the case study, are presented in Section 8.

4 Policy options

This section presents an overview of the different policy options under consideration (section 4.1) and the measures that were taken forward for full analysis (section 4.2; measures that were discarded are presented in Annex A7), the policy options that were selected to be modelled (section 4.2.3). Finally, a legal analysis of the measures taken forward is presented in section 4.3.

4.1 Overview of the different policy packages

The main characteristics for the three main policy packages along with mechanisms to minimise the risks of tankering are described in this section. In the next section, the individual characteristics/measures that can go in each measure are analysed in further detail.

4.1.1 Policy package 1: Introduction of a harmonised fuel tax for aviation under the revised Energy Taxation Directive

Options under policy package 1 would amend the current exemption from excise duty of aircraft fuel in Article 14(1) of the Energy Tax Directive 2003/96/EC. This responds to the need for a harmonised approach, since the capacity to waive current exemptions for domestic flights or intra-community flights via bilateral agreements between Member States under Article 14(2) has not been used so far.[64] The current minimum excise duty rate for kerosene, according to the Energy Taxation Directive, is € 330/1,000 L (or 33 cents/L).

The sub-options considered variations around (above and below) the minimum kerosene tax rate that would be applicable to commercial aviation:

- €0.33/litre, the current minimum excise duty rate for kerosene in the ETD[65] (approximately €9.51/GJ).
- €0.17/litre, around 0.5 times the current minimum (approximately €4.90/GJ).
- €0.50/litre, 1.5 times the current minimum (approximately €14.41/GJ).

The definition of these different tax rates allows for sensitivity analysis of the impacts of a relatively wide range of tax rates. These tax rates can either be implemented to its full extent in one go, or they could be implemented over a period of time (e.g. over a ten-year period, with increments of 10% of the full value in each year; this possibility is further discussed in section 4.2.1).

From an administrative and implementation perspective, the collection of a fuel tax is not expected to be problematic. Member States already have experience in collecting fuel taxes in other modes, namely on road transport. It is expected that an aviation fuel tax would be collected in a similar manner, with the fuel suppliers collecting the tax when they supply kerosene at airports, then transferring those funds to the relevant tax authorities – some Member States could decide, however, to collect the tax from the flight operators instead (see Box 4-1 below for a discussion on the collection of current fuel taxes across the EU and in third countries).

In terms of efficiency, the costs of collecting the current motor fuel taxes can be used as a proxy for how much it would cost to collect an aviation fuel tax. A 2012 study for DG MOVE found that administrative costs for public authorities represented between 0.65% and 0.85% of the revenue of

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[64] The Netherlands have domestic aviation fuel taxes but domestic flights in the Netherlands have been phased out.
[65] The central tax rate used in this study was selected prior to the finalisation of the value used in the Commission's impact assessment, so there is a small difference between the values in the two studies

fuel tax (CE Delft et al., 2012)[66]. It is estimated that the collection of a kerosene fuel tax would be somewhat simpler, as the supply of kerosene is concentrated at airports, of which there are only a few in each Member State (compared with hundreds or thousands of petrol stations in each Member State). Given this, the lowest figure of 0.65% of revenue is considered as representing the upper bound for the administrative costs of collecting a fuel tax. Being defined as a percentage of revenue, this cost would vary depending on the tax rate considered, which is likely an unrealistic assumption – it is expected that would cost as much to collect the tax if the rate was €0.10/litre or €1.00/litre. As such, it was assumed that the administrative costs would represent 0.65% of the revenue associated with the 'base' tax rate of €0.33/litre, and the total administrative costs remain flat across all other variations of the fuel tax. By 2050, this would represent a cost of around €45 million (in 2019 euros) across EEA 29[67] for tax authorities.

For the airlines, the collection of the tax would also bring some costs, but no estimates were possible. The burden to pay the tax would depend on how the tax is collected. For example, if the tax was collected by the fuel supplier as part of the refuelling transaction, this is expected not to represent a great burden. If, on the other hand, the airline had to collect information on the fuel used on each intra-EEA flight and the pay the duty to the tax authority (a system similar to that in the United States; see Box 4-1), a greater burden would be likely. In any case, it should be noted that airlines already keep track of the fuel burn on their intra-EEA flights as part of the reporting requirement of the EU ETS[68]. As such, keeping track of such requirement is not a foreign concept for airlines. Additionally, in some Member States (e.g. Portugal, see Autoridade Tributária e Aduaneira (2019)), on each refuelling event airlines already have to state to the refueller that the fuel is exempt from any duties[69], so wider adoption of such procedures would allow for the collection of such a tax without significant burden for the airlines (or the tax authorities).

In general, the manner on how this fuel tax would be collected would depend on the Member State. Currently, Member States already collect fuel taxes on 'private pleasure' flights (as per Article 14 of the ETD), and these offer potential examples on how an eventual kerosene tax would be collected across the EU. Countries that collect fuel taxes on their commercial domestic flights could also provide examples for Member States to follow. These examples are explored in Box 4-1:

Box 4-1: Examples of how countries collect fuel taxes in aviation

As noted, Member States already collect fuel taxes on private pleasure flights. A few examples on how those taxes are collected follow:

- In Portugal, the tax is collected by the fuel supplier, who then transfer the monies to the tax authorities. If not wishing to pay the tax, the operator of the flight has to explicitly inform the fuel supplier that the flight will not be a private pleasure flight (Autoridade Tributária e Aduaneira, 2019).
- In Ireland, the fuel supplier also collects the tax. If an operator believes tax is not due on their flight (e.g. if they flight was for training purposes), it has to ask for a reimbursement (Irish Tax and Customs, 2021).
- In Malta, the fuel supplier, as an 'authorized warehouse keeper' also collects the tax (Legislation Malta, 1995). The fuel supplier is also responsible for collecting such taxes in Spain (Dirección General de Gobernanza Pública, 2020).
- In the UK, which was under the jurisdiction of the ETD until leaving the EU, the tax is paid directly by the operator of the flight, not the fuel supplier; payment must be made in the 30 days following the flight. Still, the fuel supplier is tasked to inform the operator that tax

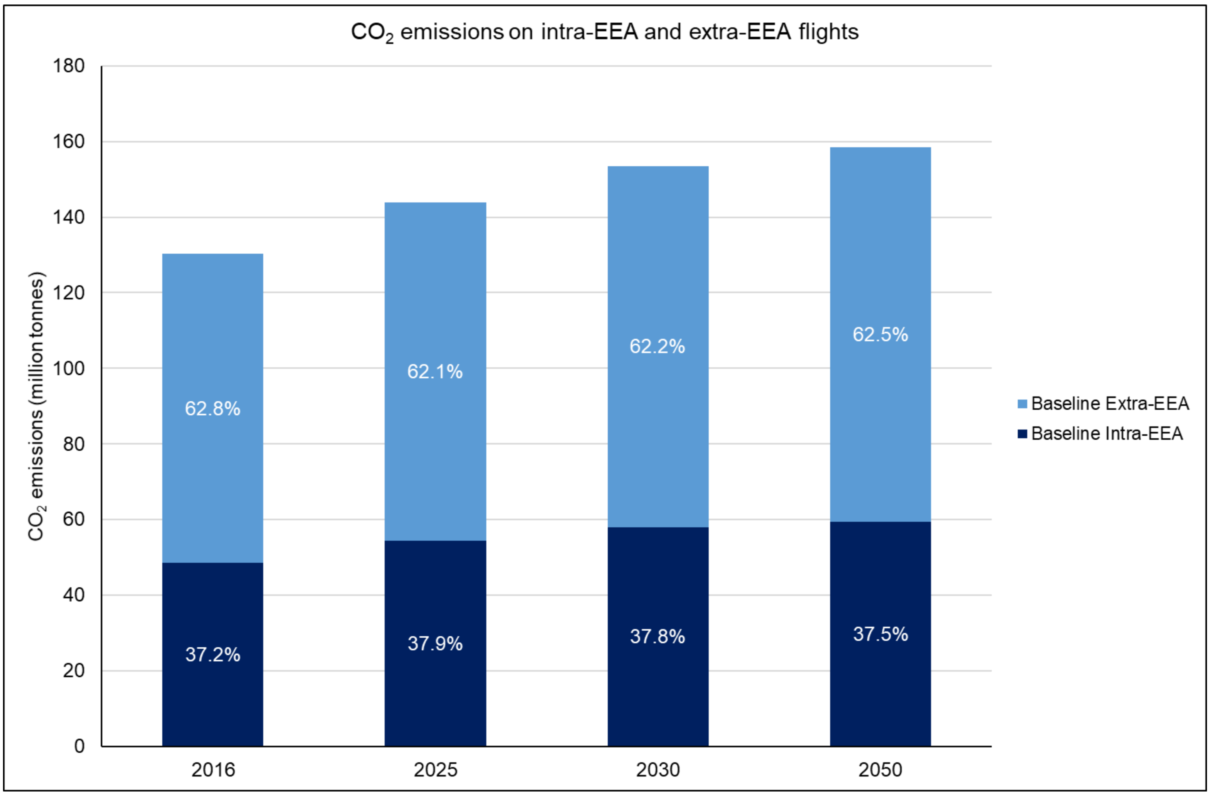
[66] These values are in line with what was found in the USA, with a study indicating that the collection of motor fuel taxes had administrative costs totalling 0.92% of revenue in the 2003-2007 periods (National Academies of Sciences, Engineering, and Medicine, 2011). The USA collects a kerosene tax for domestic flights, but it was not possible to identify any studies assessing the costs of collecting that tax.
[67] Policy option with a fuel tax of €0.33/litre in all intra-EEA flights and considering that existing ticket taxes are retained.
[68] Airlines with fewer flights can choose to use Eurocontrol's 'small emitters tool' which provides fuel burn estimates, instead of keeping track of their fuel usage.
[69] A similar system applies in the USA for international flights.

> might be due, and has to keep in its records whether the operator stated that the fuel was to be used for private pleasure flying or not (HM Revenue & Customs, 2008).
>
> These private pleasure flights represent, however, a very small number of flights compared to the number of flights that would be covered by an eventual fuel tax on all intra-EEA commercial flights. To assess how such a fuel could be collected, the experience of the USA (which, as noted in section 2.1, has the biggest domestic aviation market in the world) in collecting its excise duties for domestic flights (international flights are exempt) offer a potential example.
>
> The system used in the USA is similar to the one used in the UK for private pleasure flying, with the operator being responsible to pay directly the amount due to the tax authorities. The operators are also responsible for keeping track of the amount of fuel being used for domestic flights (which is taxed) and the fuel used for 'foreign trade' (i.e., international flights), which is not taxed; excise duty is paid twice a month. On each fuelling, a form is attached to the documents shared between the fuel supplier and the operator noting whether the kerosene is taxable or not; copies of these forms are kept by the fuel supplier for auditing purposes (Internal Revenue Service, 2020).

As a large majority of CATAs and HAs between the EU and third countries allow for fuel to be taxed for use on intra-EU flights (potentially intra-EEA), but not for flights between the EU and the third country (see Annex A1 on the legal analysis as well as section 4.3), it is considered that it would be significantly more difficult to implement a fuel tax on extra-EEA flights. In principle, the current agreements would allow a fuel tax to be implemented on flights from the EU to third countries, but only for EU carriers. This would introduce significant distortions to competition (between EU carriers and non-EU carriers flying the same route) and, therefore, has not been considered in this study. It is noted that the agreements between the EU and Morocco and between the EU and the UK do not disallow the taxation of fuel supplied in the EU for flights to those countries [70]. Therefore, the focus of the assessment of a harmonised minimum fuel tax is on potential fuel taxes for intra-EEA flights only. A sensitivity case (section 6.2.7.6 below) analyses the impact of a fuel tax for flights to the UK and to Morocco departing in the EEA, as the agreements between the EU and these two countries allow for the taxation of fuel supplied for flights to the third country. As intra-EEA flights only represent 37% of CO_2 emissions in the 2016-2050 period (Figure 4-1), this necessarily means that the impact of a fuel tax in reducing CO_2 emissions would be limited in nature. To address that concern, policy package 2 (presented in this sub-section) considers a ticket tax that would apply to all flights departing from EEA airports, regardless of their destination.

[70] As noted in those sections on the legal analysis, it is clear that a fuel tax on intra-EU flights only does not seem to raise specific legal issues as long as it is limited to intra-EU flights and EEA carriers. However, if the scope is extended, the EU would need to ensure that the agreements with third countries (BAs/HAs/CATAs) allow such extension. Of particular importance could be agreements between Norway and Iceland (the two EEA countries under consideration) and third countries that might allow flights between those EEA countries and the EU (i.e. intra-EEA flights). However, for the purposes of analysis of impacts in this study, it is assumed that taxation of fuel for all intra-EEA flights would be possible (after making sure all agreements were in place), and the analysis of impacts thus considers such a scenario with a fuel tax on all intra-EEA flights, but not extra-EEA flights.

Figure 4-1: CO_2 emissions on intra-EEA and extra-EEA flights (2016-2050) from the baseline scenario



Another key element to consider for this policy option is the level of differentiation that the harmonised fuel tax for aviation should meet as a minimum standard. A zero tax rate for Sustainable Aviation Fuels (SAF) is to be considered for all policy options.

Other sub-options for policy package 1 relate to potential lower rates or full exemptions applicable to certain categories of flights. These include flights to and from Outermost Regions[71] and their specific connectivity and socioeconomic issues. Potential exemptions for air services under Public Service Obligations (PSO)[72] were analysed, as these are generally applied to air links with thin demand and conspicuous public financial support; the same exemptions were analysed for flights to and from smaller airports (this latter measure was eventually discarded).

For cargo flights, it was decided that the fuel tax would not apply. As noted in section 3.3, some comprehensive agreements (notably the EU-USA comprehensive agreement) and Member States' bilateral agreements allow the operation of intra-EU flights by extra-EEA carriers (USA carriers in the case of the EU-USA agreement and, especially, MS's old bilateral air services agreements with the USA[73]), while at the same time exempting those extra-EU carriers from any eventual fuel taxes imposed by EU Member States. As a result, there is a bigger share of non-EEA carriers that operate

[71] Outermost regions are nine regions from France Portugal and Spain that are part of the EU but are very are distant from the European mainland. These regions are French Guiana, Guadeloupe, Martinique, Mayotte, Reunion Island and Saint-Martin (France), Azores and Madeira (Portugal) and the Canary Islands (Spain). In total they have less than 5 million inhabitants (European Commission, 2017).

[72] In order to maintain appropriate scheduled air services on air routes which are vital for the economic development of the region they serve, Member States may impose public service obligations (PSO) on some routes. In such routes, Member States can subsidise the operation of passenger and cargo flights, subjected to the rules imposed by the Air Services Regulation (1008/2008). As of as of 18 September 2019, there were 176 such routes. Full list is available at: https://ec.europa.eu/transport/modes/air/internal-market/pso_en

[73] In 2018, FedEx and UPS, two cargo-only USA carriers, operated more than 250 intra-EEA flights per week (Transport & Environment, 2020).

intra-EEA cargo-only flights (compared to intra-EEA passenger flights[74]) under air services agreements that include a clause preventing the taxation of the supply of fuel for international flights. Thus, EU cargo carriers could be at a competitive disadvantage compared to these non-EU carriers if they were required to pay a tax on fuel (and the non-EU carriers were not). To mitigate this risk, it was decided to exempt such flights from fuel taxes as long as these agreements are not renegotiated[75].

The possibility of earmarking revenues arising from aviation taxes was also considered but subsequently discarded on the basis of both economic and legal considerations, in line with the feedback received at the kick-off meeting with the Commission. The literature on environmental taxes including fuel taxes (e.g. (Carattini, Baranzini, Thalmann, Varone, & Vöhringer, 2017), (Beuermann & Santarius, 2006)) indicates that the public acceptability of those taxes may be enhanced once assurance is provided to taxpayers that at least some of the revenue collected is ringfenced and dedicated to a specific policy or investment area, as opposed to being allocated to the general budget. Examples of earmarking include both cases in which the government allocates revenue to address externalities or compensate losers in the same market where the tax is raised (e.g. providing subsidies for green fuels using the receipts of a petrol tax) or to channel extra funds into another sector of the economy which requires additional income (e.g. directing revenues from a tax on tobacco to funds for building new hospitals). Despite the greater public acceptability that may result from earmarking, a number of negative consequences can arise. First, the revenue raised from a specific tax may vary year-on-year thus resulting in budget instability and uncertainty. Second, the decision to allocate funding to a specific sector may tie the hands of legislators for years to come, reducing the room for re-evaluation and modifications of fiscal policy. Third, ensuring that the general public perceives the allocation of ringfenced funds as fair is a difficult exercise and, if 'leakage' then occurs due to changing circumstances, this may ultimately reduce public confidence.

In addition, legal provisions may render earmarking of tax revenues unlawful. In some Member States, constitutional and/or budget principles might forbid ringfencing and hypothecation and promote the principle of universality of all tax revenues instead.

Table 4-1 presents a summary of policy package 1.

Table 4-1: Summary of policy package 1

Policy package	Tax rate	Other considerations
Harmonised fuel tax for intra-EEA aviation under the revised ETD	€0.17, €0.33 and €0.50/litre Tax applies to passenger flights but not to cargo-only flights	Exemptions for PSO flights and flights to and from EU outermost regions No earmarking of revenues

[74] In 2016, using information from AERO-MS and the EU ETS Transaction Log, it was estimated that around 28% of fuel used in intra-EEA cargo flights was used by non-EEA carriers. For passenger flights, the comparable figure was 1.2%.

[75] While this exemption would improve the competitiveness of intra-EEA cargo-only operators vis-à-vis non-EEA cargo-only operators, it could impact the level playing field amongst intra-EEA carriers that carry both passengers and freight. This is because while cargo-only flights would be exempt from the fuel tax, passenger flights carrying cargo in the airplane cargo hold would not be exempt. Thus, cargo carried on a cargo-only flight would fly tax free, while the same cargo carried in a passenger flight would in practice be taxed. If the price differential is large, this could create an incentive for more cargo to travel in dedicated freight aircraft instead of using existing passenger flights. In our aviation model, it is assumed that around 20% of intra-EEA air cargo (measured in tonne-km) is transported on passenger flights - globally, around 40 to 50% of air cargo capacity is on passenger aircraft (FlightGlobal, 2020). For extra-EEA flights our model assumes around 55% of air cargo is transported on passenger flights. Given this, the impacts on how the industry operates could be significant. This could impact not only the competitiveness of passenger airlines but could also have negative impacts on emissions, as passenger aircraft would fly more empty (with unused cargo space) and more cargo aircraft would be needed to fly the same amount of cargo. This exemption would also impact the effectiveness of a fuel tax, as it diminishes the instances where such a tax applies. This reduced application of the tax would also have a negative impact in the level of emissions of the EEA aviation sector – it should be noted, however, the cargo-only flights represented a relatively small share of the total number of intra-EEA flights and, in 2016, fuel consumed by cargo-only flights represented only 3.4% of the total fuel consumed in intra-EEA flights.

Policy package	Tax rate	Other considerations
	Tax is either implemented at once or over a ten-year period (increments of 10% of the full value in each year) SAF are exempt from fuel tax	Administrative costs of €45 million in 2050 (combined figure for EEA29)

4.1.2 Policy package 2: Introduction of harmonised ticket tax across the EU

Options under policy package 2 define a minimum, EU-wide ticket tax applicable to passenger services and, potentially, to air freight services.

A number of EU Member States (Austria, France, Germany, Italy and Sweden, together with Norway and the UK) are already implementing a ticket tax – in some jurisdictions better defined as a levy or charge – on all departing air passengers (see Table 2-3). Others, like Portugal, are implementing such a tax starting in 2021. These ticket taxes vary significantly in terms of the tax rate[76], the type of exemptions, the level of differentiation (though it is common to differentiate short haul from long haul flights) and the use of revenues (though revenues are generally not earmarked[77]). In most cases, transit and transfer passengers are exempt, provided that their original departure point and ultimate destination are both outside the Member State. In the EU, a civil aviation tax is also levied on air freight in France (CE Delft, 2019). In some of these Member States there are also differentiate tax levels depending on the class of travel (with premium tickets paying higher taxes for the same trip); this possibility was also explored in this study.

In terms of efficiency, indication from conversations with Member States representatives indicate that the administrative burden of implementing and managing a ticket tax is relatively low both for public administrations and airlines. For public administrations, figures provided by two Member States to the study team ranged from 5 to 11 full time equivalents (FTE) dealing with the collection of existing ticket taxes. The lower figure was provided by a Member State with around six times less passenger traffic that the other Member State. Considering an average annual cost of €55,000 in wages per FTE in public administrations (Ricardo, 2020), collecting a ticket tax could incur expenditures between €275,000 and €605,000. Considering an overhead of 41% of an FTE in public administrations (Geurtsen & van Helden, 2014), this would represent an annual expenditure of €93,000 per FTE and the cost per Member State would be in the range of €465,000 to €1,023,000. Table 4-2 summarises these results, including the costs for the EU27 and EEA29. At the highest value of the range for the EEA29 (€29.7 million), these administrative costs would represent 0.22% of revenue in 2025 and 0.14% in 2050[78], comparing the ticket tax favourably with the estimated administrative costs of 0.65% of a fuel tax.

Table 4-2: Costs for public administrations of a passenger ticket tax

Scope	Annual costs (including overhead)
Member State	€465k – €1M
EU27	€12.6M – €27.6M
EEA29	€13.5M – €29.7M

[76] Ticket taxes across the EU vary from as low as €2 per departure (as will be implemented in Portugal) to more than €60 for some premium tickets (as is the case in France). For more details see Table 2-3.
[77] An exception is the new Portuguese ticket tax, whose revenues will be earmarked for that Member State's 'Environmental Fund', which support environmental policies related to climate change mitigation, water and waste management, and biodiversity.
[78] In the base scenario with a flat ticket tax of €10.43 for all passengers (regardless of class of travel) and cargo tax of €0.10 per tonne.km, both applied to all departures from EEA airports.

Note: these calculations assume that collecting a ticket tax would require between 5 and 11 FTE, at an annual cost of €93,000 (in current euros) each.

To allow the sub-options under this policy option to reflect similar levels of ambition to the fuel tax rates considered in policy package 1, an approach to defining an 'equivalent' ticket tax rate was investigated. For this, investigations of previous AERO-MS results for intra-EU flights in 2020 (based on a pre-COVID-19 traffic forecast) found an average fuel consumption of 0.0253 kg per passenger-km. Using a fuel density of 0.8 kg/litre converts this to 0.0316 litre/passenger-km. Applying a fuel tax of €0.33 per litre gives €0.0104 per passenger-km as the basis of a ticket tax with an equivalent impact.

This rate per passenger-km (or, indeed, rates calculated using either of the other fuel tax rates considered in policy package 1) could be used as is (applied to an individual flight based on the flight distance), or, more likely, multiplied by an overall average flight distance to give a single ticket tax value to apply to all flights. Alternatively, the full range of flight distances can be divided into bands, and the rate per passenger-km applied to average flight distances within each band. Both these latter two approaches have been included in the derivation of the tax rates included in this study; further details are given in Section 4.2.2). In addition, a tax was also considered for cargo transported on either cargo-only flights or on the cargo hold of passenger aircraft. This used the assumption (included in the AERO-MS model) of an average mass for a passenger (plus luggage) of 100 kg, leading to a cargo tax of €0.10 per tonne-km.

Unlike a fuel tax, ticket taxes can at most, and depending on how they are formulated, have an indirect relationship with fuel consumption (e.g. if they increase with distance). They do not provide direct incentives for increased fuel efficiency (passengers on two different aircraft with different fuel efficiencies would pay the same ticket tax) but are essentially a demand management measure, as they essentially increase the price of flights. This is a clear disadvantage of ticket taxes. An advantage of a ticket tax is that it can be more easily applied (from a legal perspective) to an increased scope (intra-EEA, extra-EEA flights or both), which increases the potential demand effects of such a measure. Additionally, tax rates could be differentiated according to the travelled distance to better match the air fare and environmental footprint of the flights – at the same time, longer flights, particularly transoceanic ones, do not have any realistic alternatives, while (some) shorter flights can be replaced by travel by land. As noted above, this can be introduced via distance zones. Given this, a set of measures were defined considering increased levels of differentiation, from a simple flat tax for all distances travelled to a stepped tax with the ticket tax increasing based on different distance 'bands' (flights of up to 6,000 km, and flights over 6,000 km; these bands were based on the current ticket taxes applied in Germany). A passenger ticket tax where the shortest flights (those up to 350 km) pay a higher tax rate was also included as the greatest impacts would be expected on flights for which alternative (and, potentially, lower emitting) modes, such as rail, may be available (the 350km threshold was based on a similar ticket tax now in place in Austria). It should be noted that all of these distances are the great-circle distances between airports, not actual distance flown on each flight.

A potential exemption or a differentiated (lower) tax rate applied to transit/transfer passengers whose origin and destination are both outside the EEA was also assessed to lower the risk of hub switching and competitiveness loss for EU airports. Existing national ticket taxes that exempt transit/transfer passengers do so for passengers whose origin and destination are outside the Member State; for an EU (or EEA) regulation for a harmonised minimum ticket tax rate, it is sensible to place the geographical limits for exemption at the EEA rather than the Member State. As with the fuel tax, exemptions for outermost regions, PSO flights and smaller airports were also considered (the latter being eventually discarded). Additionally, exemptions to flights to developing countries were also analysed (also discarded).

Table 4-3 presents a summary of policy package 2.

Table 4-3: Summary of policy package 2

Policy package	Tax rate	Other considerations
Harmonised ticket tax across the EU	Different types of passenger taxes considered: • Flat tax • Tax increasing with the distance flown • Tax decreasing with the distance flown Tax could be the same for all passengers in a flight, or be differentiated depending on the class of travel (non-premium/premium tickets) Cargo would also pay a tax, based on tonne-km	Exemptions for PSO flights and flights to and from EU outermost regions No earmarking of revenues Administrative costs of €465k – €1M per MS/year (€12.6M – €27.6M for the EU27/year)

4.1.3 Policy package 3: Combination of a harmonised fuel tax and a harmonised ticket tax

Different combinations of the two types of taxes were developed to identify whether there are advantages in having such combinations. Sub-options include the case where the ticket tax is applied to all flights (intra-EEA and extra-EEA), to intra-EEA flights only and to extra-EEA flights only. This last option aims to mitigate the issue of destination switching, an issue discussed below. Consistent with the approach in Policy package 1, the fuel tax is restricted to intra-EEA flights in all cases. A sensitivity case however presents the impacts of Policy package 3 in case flights from the EEA to Morocco and to the UK are subject to fuel tax (section 6.4.7.3).

4.1.4 Mechanisms to mitigate the risk of fuel tankering when applying a fuel tax

Fuel tankering is defined as the situation where more fuel is taken on board the aircraft than actually required for the execution of a flight, in order to use the extra fuel taken for the next flight. In the present situation, with no fuel taxation, tankering takes place because of differences in the (untaxed) fuel price between airports and countries, or because airlines want to reduce turn-around times.

Our analysis (see section 6.5.1.1) indicates that tankering resulting from the application of a fuel tax in all intra-EEA passenger flights can represent up to around 8% of total fuel consumption in intra-EEA passenger flights, leading to increased fuel consumption (and, consequently, GHG emissions) in incoming extra-EEA passenger flights of around 0.5%.

We did consider various options to discourage tankering including:

- Requirement for a maximum fuel reserve[79].
- Financial incentives to disincentive tankering.
- A minimum tax burden, equivalent to a minimum fuel take-up requirement, for intra-EEA flights.
- Gradual implementation of the fuel tax over a 10-year period.

These potential mechanisms are discussed in detail in the next section.

4.1.5 Mechanisms to reduce the risk of air traffic diversion

Another significant unintended effect to be considered is traffic diversion, which can be caused by:

- Destination switching.
- Hub switching.

[79] For safety reasons, there is a minimum fuel reserve which requires an aircraft to fly to an alternate airport and then be able to fly for 30 minutes at 450 metres (1,500 feet).

Destination switching may happen in case of a fuel tax for intra-EEA traffic only, in which destinations outside the EEA could become relatively more attractive as these destinations would not be subject to a policy-induced cost increase (with the degree to which they become more attractive depending on the tax rate and the customer's willingness to pay extra). This can be especially relevant for tourist destinations just outside the EEA (e.g. North Africa or the UK) which compete with tourist destinations (e.g. those in southern EU Member States that compete with North Africa). Not only would this lead to competitive distortion, but also the environmental benefits and taxation revenues would be reduced. The incentive for destination switching is addressed by the inclusion of policy options combining fuel tax with a ticket tax for extra-EEA flights (policy package 3).

Hub switching may happen in the case of a ticket tax and/or fuel tax for connecting flights departing from the EEA.

In the case of the ticket tax, transit and transfer passengers (with both the origin and destination of their travel outside the EEA) might choose to use a hub outside the EEA where in the current situation they use an EEA airport as the hub.

In the case of the fuel tax on intra-EEA flights, transit and transfer passengers (with either the origin or the destination outside the EEA) might choose to use a hub outside the EEA where in the current situation they use an EEA airport as the hub. This may lead to a loss of competitiveness of EEA hub airports and potentially EEA network carriers and a loss of air connectivity. In theory, hub switching might also occur in relation to intra-EEA indirect flights. For example, a passenger traveling on the route Lyon to Berlin via Paris could choose to travel on a journey Lyon-Berlin via Istanbul in order to avoid the ticket tax on the Istanbul-Berlin segment.

To minimise the risk of hub switching, a measure with an exemption of the ticket or fuel tax for transit and transfer passengers was considered.

With respect to ticket tax on flights, the mitigation measure would consist in exempting transit and transfer passengers whose origin and destination are both outside the EEA from paying a ticket tax on the segment starting in the EEA. For example, a passenger flying on the route New-York to Moscow via Paris would be subject, in theory, under policy package 2, to a ticket tax on the segment departing from the EEA, i.e. the Paris-Moscow segment. The mitigation measure would consist in exempting from ticket tax the segment Paris-Moscow, to avoid the passenger choosing to travel via (for example) Istanbul instead of Paris.

With respect to fuel tax on intra-EEA flights, the mitigation measure would consist in exempting transit/transfer passengers with origin or destination outside the EEA from 'paying' a fuel tax on the segment within the EEA. For example, a passenger flying on the route New-York to Lyon via Paris would be 'subject', in theory, under policy package 1, to a fuel tax on the intra-EEA flight (i.e. the Paris-Lyon segment). The mitigation measure would consist in exempting from fuel tax the segment Paris-Lyon, to avoid the passenger choosing to travel via (for example) Istanbul instead of Paris. Exempting transit/transfer passengers with both origin and destination in the EEA from 'paying' a fuel tax might lead to a distortion of competition between airlines operating direct services on a given route and airlines operating indirect services, as the latter would be exempt from fuel tax on this given route. However, as further explained in annexe A4 'Discarded Options', the likelihood of hub switching in the case of indirect flights within the EEA is limited by the lack of attractiveness of non-EEA hubs for these intra-EEA journeys.

4.2 Policy measures

As noted in the methodology section (section 3.1), given the large number of measures and their combinations, the number of potential sub-options is very large. Given this, different measures were first screened. Table 4-4 summarises which measures have been discarded and which ones were included in the short list of policy options. The final column also indicates on whether the measure in question was included in the AERO-MS aviation model or not. For the latter, a qualitative analysis was performed.

Table 4-4: Screening of measures

Policy package	Measure	Considered further/discarded	Included in AERO-MS model?
1	Tax on fuel supplied	Considered further	Yes
1	Exemptions for outermost regions/PSO flights	Considered further	No
1	Exemptions to transit/transfer passengers	Discarded	No
1	Exemptions for smaller airports	Discarded	No
1	Tankering mitigation: financial incentives	Discarded	No
1	Tankering mitigation: maximum fuel reserve requirement	Discarded	No
1	Tankering mitigation: minimum tax burden	Considered further	No
1	Tankering mitigation: gradual implementation of the tax	Considered further	Yes
2	Flat passenger ticket tax	Considered further	Yes
2	Stepped passenger ticket tax	Considered further	Yes
2	Passenger ticket tax inversely proportional to distance	Considered further	Yes
2	Tonne-km based cargo tax	Considered further	Yes
2	MTOW-based cargo tax	Discarded	No
2	Increased tax for premium passengers	Considered further	Yes
2	Exemptions for outermost regions/PSO flights	Considered further	No
2	Exemptions to transit/transfer passengers	Considered further	No
2	Exemptions for smaller airports	Discard	No
2	Exemptions for developing countries	Discard	No

The measures that were considered further are discussed in the next section. The measures that were discarded are discussed in more detail in Annex A7.

4.2.1 Measures for policy package 1

Tax on fuel supplied

This measure is the base measure for this policy package: a tax imposed on each litre of kerosene sold at EEA airports for intra-EEA flights.

As noted, several tax rates are under consideration:

- A base tax rate of €0.33/litre, a value based on the rate for kerosene in the current ETD (€330 per 1,000 litres), equivalent to €9.35 per GJ for aviation kerosene.
- A tax rate of €0.17/litre (equivalent to €4.82 per GJ), around half of the base tax rate, in order to assess the impacts that a lower tax rate would have on the level of demand and on the level of emissions.
- A higher tax rate of €0.50/litre (equivalent to €14.17 per GJ), around 1.5 times the base tax rate, to assess the impacts that a higher tax rate would have on the level of demand and on the level of emissions.

This tax is expected to be implemented at one specific point in time, i.e., on one day there would be no fuel tax, on the next day the fuel tax would be implemented across the EEA. The potential for a gradual implementation of the tax is discussed under the measures to mitigate tankering.

Although there are some concerns related to the competitiveness of EEA carriers vis-à-vis non-EEA carriers operating intra-EEA flights, a fuel tax imposed only on intra-EEA flights operated by EEA air carriers is not expected to present any legal issues (see Box 4-1 for a review of evidence of how airlines are expected to react when in the presence of structural changes in the cost base). Not imposing a fuel tax on extra-EEA flights or intra-EEA flights operated by non-EEA carriers might avoid having to re-negotiate agreements with third countries. More details on the legal aspects are discussed in the legal analysis in section 4.3). As noted in that section, it was concluded that it would be legal to implement a harmonised (minimum) fuel tax for intra-EEA flights. Given this, this policy option does impose a fuel tax on intra-EEA flights operated by EEA-registered air carriers.

Box 4-2: Case study: Airlines' adaptation to changes in their cost base

An important question arising from the implementation of a fuel tax for intra-EEA flights relates to how airlines would be expected to deal with such a permanent change in their cost structure – globally, fuel represents around 20% of an airline's operating costs (IATA, 2020). For that, this box presents an analysis of a few studies that have looked at the airlines' reaction (based on empirical evidence) to the large increase of the price of kerosene between 2004 and 2008 – between July 2004 and July 2008, the price of kerosene in dollar terms increased 224% (US Government Accountability Office, 2014).

In general, airlines focussed on cost cutting and efficiency improvement across their entire operations. These included, improvements in flight (e.g., flying slower) and ground operations (e.g., less use of engine power to taxi aircraft), improve aerodynamics (e.g. installation of winglets to reduce drag) and reduce onboard weight (e.g., slimmer seats). Airlines also reduced the number of staff employed (either by making some positions redundant or shifting to subcontractors), and reduce expenditures on sales and promotional events (Cranfield University, 2009), (European Parliament, 2009), (US Government Accountability Office, 2014). In the EU, these cost-cutting exercises led to airlines reporting per-seat reduction of costs of 6-13% in the years around 2008. However, given the limited scope to reduce those costs, eventually airlines resorted to price increases (including with a greater use of ancillary revenues, e.g., baggage and seat selection fees) and reductions of capacity (European Parliament, 2009). Given that most of these efficiencies are likely to already been achieved, the scope for further reduction of costs in the face of a fuel tax is likely to be limited. As such, these additional costs are likely to be passed to consumers via increased ticket prices.

A final thought relates to fleet renewal decisions of airlines as they face increasing cost pressures. Empirical evidence from the 2004-2008 period suggests that one of the ways that airlines coped in that period with increasing fuel prices was by delaying programmed fleet renewal initiatives, particularly for short and medium haul aircraft (for long haul aircraft, fuel costs represent a greater percentage of total lifecycle costs, and thus there is a greater incentive to quickly replace them) (Hansman, Hansen, Everett Peterson, & Trani, 2014). At the same time, rapid increases in the price of fuel in the 2004-2008 led to significant depreciation of less fuel efficient aircraft, while more fuel efficient aircraft increased in value (Cranfield University, 2009). While in the longer term, a large increase of fuel prices would still create an incentive for fleet renewal, short-term decisions on capital investments could lead to a situation where the introduction of climate policies (like a fuel tax on kerosene) could reduce investment in new aircraft (Hansman, Hansen, Everett Peterson, & Trani, 2014).

In terms of effectiveness on reducing emissions, this would depend on the level of tax. The impact on emissions could be the result of two distinct and parallel transmission mechanisms:

- Reduced demand due to higher ticket costs.
- Use of more efficient aircraft by the airlines.

In terms of efficiency, as indicated in the previous section, no significant costs are expected to implement the measure. No problems are also expected in terms of technical feasibility – Member States have experience in imposing fuel taxes for other modes.

The existence of a fuel tax creates risks of tankering and hub switching, which may lead to carbon leakage and reduced tax income, and hence the policy not delivering its objectives. Measures to mitigate these risks are explored in other measures.

Regarding subsidiarity and proportionality, a modification to the ETD requiring Member States to impose a minimum tax on fuel supplied to aircraft operating domestic and intra-EU flights would comply both with the subsidiarity and proportionality principles. The cross-border nature of the externalities linked to the aviation sector and its impact on climate change justifies the need and the relevance of action at the EU level, whereby taxation is one of the possible policy levers as part of the policy mix. A minimum degree of coordination is justified in the light of the practical obstacles that prevent Member States from unilaterally adopting energy taxes on the supply of aviation fuel for trans-national flights, including the practice of fuel tankering by air carriers and risks related to the distortion of competition between EU airports and the carriers operating there.

As noted in the previous section, this fuel tax would only apply to passenger flights with cargo-only flights being excluded because competitiveness issues of EEA carriers vis-à-vis non-EEA carriers with rights to operate intra-EEA cargo-only flights might arise under the current agreements.

Exemptions to flights to and from outermost regions and PSO flights

As noted in section 4.1, Member States may impose PSOs on some routes and subsidise these flights. Further attention is paid to the nine EU outermost regions which are very distant from the European mainland and where air connectivity is of great importance; some routes to and from these outermost regions are in facts subjected to PSOs.

For both the outermost regions and regions served by PSO flights, air connectivity can be an important factor in ensuring integration with the wider EU and the regions' economic development: as reported in the evaluation of the Air Services Regulation 1008/2008, a 10% increase of connectivity for remote EU regions and islands stimulates the GDP (per capita) by an additional 0.5%, the GDP growth rate by 1% and leads to an overall increase of labour productivity (European Commission, 2019). Considering the above, this measure exempts all PSO flights and flights to and from outermost regions from the fuel tax.

While such an exemption would reduce the effectiveness of a fuel tax, as fewer flights would be taxed, it is not expected that these flights would represent a large portion of intra-EEA flights or fuel consumed in intra-EEA flights. As such, the impact in overall emissions is likely to be relatively minimal and would be counter-balanced by the benefits for these regions in terms of minimising the costs of insularity (or, at least, not adding to those costs).

In legal terms, no issues are expected. The definition of the PSO routes and the outermost regions is defined at the EU level and is well established. Exempting such flights from existing taxes is also an established practice across the EU (albeit for ticket taxes, not fuel taxes): for example, PSO flights to the North Sea islands of Germany are exempted from the ticket tax as established by the 2011 Budgetary Law[80]. Similarly, the planned ticket tax to be introduced in Portugal in 2021 will exempt passengers of all PSO flights as well as residents of Madeira and Azores in flights to and from the archipelagos (both of which are EU outermost regions) and between their islands (PAN Grupo Parlamentar, 2020). Further analysis of legal aspects is presented in section 4.3.

In terms of efficiency, no problems are expected from the implementation of this measure.

From the technical side there is the risk that Member States would lobby for more of the routes serving their airports to be considered PSO routes in order to have such an exemption and for the route to be more competitive vis-à-vis similar routes across the EEA (e.g. routes serving tourism destinations).

Tankering mitigation: minimum tax burden

The aim of this measure is to disincentivise tankering by ensuring that the airline pays a representative tax related to the fuel used on the flight, whether they loaded the fuel for the flight at the departure airport or elsewhere. For each origin-destination pair, there would be a need to define

[80] On this measure, see State cases SA.32020 (2011/N) and SA.58188 (2020/N). The Commission decided not to raise objections to the aid in the form of reduction of air transport tax (European Commission, State aid SA.32020 (2011/N) – Germany, Tax reduction for flights to and from certain North Sea Islands, Brussels, 19 December 2012, C(2012) 9451 final; see also SA 58188).

the minimum fuel needed to fly that route (e.g. 1,000 litres). When operating that route, the airlines would then pay the tax based on the amount of fuel they put onboard (say, tax on 1,200 litres) or the tax based on that 'minimum fuel needed' for that route (the tax on 1,000 litres, in this example). Airlines would pay whichever value is higher (tax on actual fuel put onboard, in this case).

Depending on how it is implemented, the measure could be burdensome from an administrative perspective. Caution would also be needed to establish a minimum tax that would not be a disincentive to use more efficient aircraft (to avoid that, there might be a need to define the 'minimum fuel needed' for each route as a fraction of the most efficient aircraft for that distance).

In order to implement this measure, there would be a need to ensure that it is not interpreted as a tax on the fuel on board the aircraft when it landed in the first EU Member State, as that would be seen to violate Article 24 of the Chicago Convention (see Annex A1, section A1.3.1).

While acknowledging that this measure could ultimately be impractical to implement, the measure was not discarded in the initial screening as it is considered that it could help mitigate the issue of tankering (and does not have the problems of the financial incentives or the maximum fuel reserve requirement, two other measures to mitigate tankering that were eventually discarded – see Annex A7). If it was decided to implement such a measure, it is likely that careful consideration of the practical issues surrounding its implementation would be required, both in terms of the efficiency and practicality of the implementation, and in terms of potential legal issues.

Tankering mitigation: gradual implementation of the fuel tax over a 7 or 10-year period

A final potential way to mitigate tankering would be to implement the tax over a period of time. In this case, it was considered two transition periods of 7 or 10 years. This would be in contrast with the option of implementing the tax all at once, i.e., the 'base' option for this policy package. Under this option, and in the case of the 10-year transition period, 10% of the tax would be charged on year 1 (e.g. €0.033/litre under the 'base' tax rate of €0.33/litre), 20% on year 2 (€0.066/litre), etc., until 100% was reached on year 10 (€0.33/litre).

The potential impacts in terms of effectiveness of such a gradual implementation would be:

- Could mitigate the risk of tankering, especially in the short term when the tax would not introduce a great price differential to non-EEA airports. After the tax gradually introduces a relatively large price differential when compared to non-EEA airports (assuming they do not impose an equivalent level of taxation) the mitigation would be smaller, potentially non-existent[81].
- Reduce the upward pressure on air carriers' costs in the short term, thus diminishing the negative impacts on the level of demand. This would have a negative impact on the level of emissions, as they would not decrease as much as under a tax implemented all at once.
- A gradual implementation of a fuel tax would also allow more time for the air carriers to adapt to an increased level of taxation, giving them the possibility to prepare ahead for that higher level of taxation. Air carriers could then, for example, use that transition period to increase their use of more fuel-efficient aircraft and/or increase their use of SAF (assuming they would be subjected to a zero or lower tax rate than fossil kerosene) – see Box 4-1 above for a discussion of how airlines have reacted before to consistently higher fuel prices.

From an efficiency perspective, the same conclusions can be reached as with an implementation in one go and no significant costs are expected. No legal issues are expected.

From a political point of view, such a gradual implementation might make the introduction of a fuel tax more palatable to industry, consumers and Member States, especially in the aftermath of the COVID-19 crisis which has severely affected air passenger transport. Still, as noted, this would be at expense of higher level of emissions during the transition period of implementation.

[81] It should be noted that a recent paper by Eurocontrol experts concluded that airlines can decided to tanker fuel when the price differential leads to savings as low as €15 per flight (Tabernier, Calvo Fernández, Tautz, Deransy, & Martin, 2021), leading to the conclusion that perhaps the effectiveness in terms of tankering mitigation would not be high.

4.2.2 Measures for policy package 2

Flat passenger ticket tax (same tax for all distances)

Under this measure, a flat ticket tax will apply for all flights departing EEA airports (but not arrivals), regardless of the distance and destination (intra- or extra-EEA) of the flight.

As detailed in the previous section, the values for the ticket tax rate were based on an equivalent fuel tax rate for an average intra-EEA 1,000 km flight. These were calculated for the base fuel tax of €0.33/litre. This led to a ticket tax of €10.43 per passenger.

The effectiveness of this tax in incentivising cleaner modes of transport or the use of more efficient aircraft would depend on the tax rate: if this is too low, perhaps no impact would ensue. Given that the tax rate would be the same regardless of the flight in question, the impact would be lower for the most expensive flights and no differentiated impact would be expected for the routes in which air carriers compete with road and rail operators (as noted in section 2.1.3, land transport can be a substitute for trips of up to 800 km or under 200 minutes of total journey time).

In terms of efficiency and legal aspects, no specific problems are expected from the implementation of this measure[82]. It is possible that ticket taxes might be controversial under Articles 11 (discrimination against states) and 15 (implementation of taxes solely for the right to enter into or exit from a state) of the Chicago Convention (see Legal Annex under A1.3.1). However, ticket taxes have been implemented by several EEA Member States, so there is precedent for their use and air carriers are already used to collecting them following the administrative processes set up in different Member States. As noted, conversations with Member States representatives indicate that the administrative burden of implementing and managing a ticket tax is relatively low both for public administrations as well. Hub switching could be an issue, and a measure to address that is discussed in this section.

Regarding subsidiarity and proportionality, a proposal for a harmonised ticket tax would also, most likely, comply with the proportionality and subsidiarity principles but on different grounds. Added value would derive from EU action in comparison to action at the Member State level as national policies could lead to a fragmentation of the internal market. Harmonisation at the EU level would instead contribute to achieving a minimum degree of coordination. Still, it should be noted, that 17 Member States already impose some sort of tax on aviation, and while there is no coordination between all of these taxes it is not been proven that any negative impacts on the internal market have ensued.

Stepped passenger ticket tax (tax increases with distance)

In this measure the ticket tax paid by passengers would increase with the flight distance to take into account the fact that longer flights emit more GHG per passenger.

In order to set the values for this tax, two different distance zones/bands were considered: flights travelling 0-6,000 km (defined as the great circle distance between the two airports, i.e., the shortest distance between them) and flights of 6,001 km or more. These bands were based on the bands used in Germany.

There was further disaggregation for the shorter band between intra-EEA flights and extra-EEA flights, to take into account that the latter are, on average, longer than the former. Table 4-5 shows the tax rates considered for this measure.

Table 4-5: Tax rates for stepped passenger ticket taxes

	Flight distance		
	0-6,000 km (intra-EEA)	0-6,000 km (extra-EEA)	> 6,000 km
Tax rate	€10.12	€25.30	€45.54

[82] See, however, the legal criticisms expressed against the German ticket tax (Legal Annex, A.1.3.1).

Like with the flat passenger tax rate (and all other taxes, in fact), the effectiveness of this tax in incentivising other modes of transport (when these exist), or the use of more efficient aircraft, would depend on the existence of alternatives in the first place (the higher the distance the less available), the level of the tax being imposed, the extent of pass-through by operators to consumers, and the elasticity of demand in response to those changes in prices. As the tax impacts decisions by passengers on whether to fly, or how far to fly, higher taxes for longer distances would be expected to result in fewer long-distance journeys being undertaken. Disincentivising these journeys would lead to a relatively greater reduction in GHG than if shorter flights were discouraged. However, the lack of viable land-based transport alternatives for long-distance routes might render demand inelastic for this passenger segment.

In terms of efficiency and legal aspects, no specific problems are expected from the implementation of this measure – ticket taxes have been implemented by several EEA Member States (including stepped ticket taxes, see Table 2-3), so there is precedent for their use – that said, to be in compliance with EU State aid law careful design of the tax might be required; these issues are explored in Annex A1, section A.1.2.3. Hub switching could be an issue.

Passenger ticket tax inversely proportional to distance (tax decreases with distance)

In contrast to the stepped ticket tax, under this passenger ticket tax would decrease with distance. The rationale for this tax is to provide for a high internalisation of aviation's external costs on routes for which there is a likely alternative to flying, either by road or rail. Provided that intermodal competition is higher on these shorter-distance routes, it is reasonable to assume both a higher rate of pass-through and a higher elasticity of demand. The former would result in ticket prices signalling the higher cost of flying once external costs are internalised; the latter would mean that some passengers switch to land-based alternatives as a result.

To determine the values for this tax, the same 'equivalent' tax rate calculated before for the flat ticket tax was used. This would apply for the longer flights of 351 km or more. For shorter flights (up to 350 km) a higher tax would apply. The bands and value for this higher tax was based on the multiplier applied in Austria, the only EEA country with such a tax that is inversely proportional to distance since September 2020: in Austria, shorter flights (up to 350 km) pay a ticket tax that is 2.5 times higher than longer flights. The same multiplier was used here. Table 4-6 shows these rates, for all distances and both multipliers.

Table 4-6: Tax rates for the passenger ticket taxes inversely proportional to distance

	Flight distance	
	0-350km	> 350km
Tax rates	€25.30	€10.12

In terms of efficiency and legal aspects, no specific problems are expected from the implementation of this measure – ticket taxes have been implemented by several EEA Member States (including a passenger ticket tax inversely proportional to distance, in Austria), so there is precedent for their use as with the case of the stepped passenger tax, to be in compliance with EU State aid law careful design of the tax might be required; these issues are explored in Annex A1, section A.1.2.3.. Hub switching could be an issue.

Tax for cargo: based on tonne-km

This tax would apply to cargo carried both in passenger flights (in the aircraft's cargo hold or 'belly') and on cargo-only flights. Like with the passenger ticket tax, this tax would apply to all flights departing an EEA airport. The value of tax to be paid would be based on the weight of the cargo (a variable known for the airlines) and the distance travelled by the flight (defined as the great circle distance between the two airports).

Like with the passenger ticket taxes above, the definition of the taxes was initially based on the 'equivalent' fuel tax on a per-km basis, but this time applied to cargo[83]. This led to a tax rate of €0.10 per tonne-km, which is to be applied to all policy options with a ticket tax.

Like with other taxes, the effectiveness of this tax in incentivising other modes of transport or the use of more efficient aircraft would depend on the tax rate: if this is too low, perhaps no impact would ensue.

In terms of efficiency no problems are expected from the implementation of this measure. From the legal perspective, Section 3, there is some controversy on whether distance-based taxes can be considered *de facto* fuel taxes (with all the legal constraints that these entail) – see section 4.3. These potential legal constraints might require careful design of such a provision. Furthermore, we note that air freight transport serves relatively niche markets (e.g. high value, temperature-dependent) for which very few equivalent service alternatives exist.

Increased tax for premium passengers

Given the increased space that premium seats take onboard an aircraft and the resulting higher level of emissions resulting from a passenger travelling in those seats, this measure proposes to increase the ticket taxes paid by premium passengers. This increase level of taxation would be based on a 'premium multiplier' applied to the ticket taxes being considered under each policy option.

Two different multipliers for premium passengers were considered: 3.0 and 7.5. This leads to considering, in the example of the flat ticket tax, two additional sub-options (Table 4-7).

Table 4-7: Tax rates for flax ticket taxes, including multiplier for premium passengers

Premium multiplier	Tax rate
None	€10.43
3.0x	€31.29
7.5x	€78.23

The values of the multipliers were based on the existing ticket taxes that have such a premium multiplier: in France the air passenger solidarity tax has a multiplier of 7.5-8.4 times for business and first class passengers (it was decided to use a value of 7.5), and in the UK the air passenger duty has a multiplier of around 2 times for premium passengers (it was decided to use a value of 3 times to make it closer to highest multiplier).

One area where a clear definition would be needed is on what constitutes a 'premium passenger'. For this, the current taxes in the EEA and beyond offer some insights. In France, premium passengers are simply defined as travelling in business or first class (Ministère de la Transition Écologique, 2020). That is, 'premium economy' or 'economy plus' tickets seem to not be covered by the higher ticket taxes. In the UK, premium tickets are defined as being seats other than those the lowest class of travel available or having seat pitch (the distance between the back of two consecutive seats) greater than 1016mm. Class of travel is in itself defined as having 'different standards of comfort, service, privacy or amenities' (HM Revenue & Customs, 2020).

In terms of efficiency and legal aspects, no specific problems are expected from the implementation of this measure. By further increasing the price of some tickets this measure could further incentivise hub switching; measures to mitigate this unintended consequence are discussed below. Additionally, like with all ticket taxes, if transit/transfer passengers are exempt, this could provide an incentive for a passenger to fly connecting itineraries instead of direct flights (such as exemption is discussed below). Still, given than premium passengers are likely to be more time-sensitive than non-premium passengers, the existence of this multiplier for premium passengers could not further exacerbate the incentive to take a connecting flight.

[83] With the assumption that a passenger plus its luggage weighs an average of 100kg.

Exemptions to flights to and from outermost regions and PSO flights

Under this measure, and not unlike the similar measure for the fuel tax, flights on PSO routes and to and from the EU's outermost regions would be exempted from the ticket tax. This would support the goal of supporting the air connectivity of those regions.

As noted above, such exemptions in ticket taxes have already been implemented by EU Member States, so they are not expected to cause any specific legal or efficiency issues.

Exemptions to transit and transfer passengers

Transit and transfer passengers are passengers that, on a trip from A to C, stop at B airport. Transit passengers are passengers that travel on the same aircraft from A to B and them from B to C (for example, if the aircraft stops in B for refuelling). Transfer passengers are passengers that travel from A to B in one aircraft, leave the aircraft in B and board a different aircraft for the flight from B to C; this usually happens in a hub airport, with the passenger 'connecting' to a different flight to reach its final destination. This measure excludes both these types of passengers from a ticket tax.

There are two rationales for this exclusion. One relates to the issue of hub switching, and the measure will mitigate that problem for routes with origin and destination outside the EEA via an EEA hub. This is because on travels between two third-countries via an EEA hub, the ticket tax with the exemption to transit and transfer passengers will not function as an incentive to travel via a non-EEA hub to the passengers' final destination. However, the exemption should not apply to passengers with origin and/or destination in the EEA, because such an exemption could lead to competitive distortions. Such an exemption could function as an incentive for passengers to travel via a non-EEA hub. For example, a non-time sensitive passenger on the route Rome to New York City might decide to travel via an EEA hub such as Frankfurt (thus making the trip potentially longer and more polluting) instead of traveling on a direct flight. This passenger connecting via Frankfurt would not be subject to the ticket tax for the segment Frankfurt to New York City and potentially also for the segment Rome to Frankfurt (depending on how the exemption is applied). This exemption of transit and transfer passengers (with origin and/or destination in the EEA) could thus be seen as discriminatory by airlines that mostly/only fly point-to-point (notably low-cost carriers) in comparison to their competitors that have a hub-and-spoke system. On a given intra-EEA route, an airline operating an indirect service would have a competitive advantage compared to an airline operating direct services. To avoid competitive distortions in the internal market, these exemptions should apply only to transit and transfer passengers with both origin and destination outside the EEA.

The other rationale relates to practical aspects relating to tax collection. In the case where the exemption only applies to transit and transfer passengers with both origin and destination outside the EEA, the Member State collecting the ticket tax revenue would be as follows:

- In the case of a direct flight, it is clear who is the recipient of a ticket tax revenue: the Member State in which the travel initiates. For example, in a direct journey from Rome to New York, Italy would collect the ticket tax.
- If an indirect journey from Rome to New York via London, Italy would collect the ticket tax for the segment Rome to London.
- If a flight goes through a hub in a second Member State, this is less clear. For example, a passenger can fly from Rome to New York via Frankfurt. In this case both Italy and Germany have a flight departing in their Member State, so both could potentially tax the passenger.
- This could be further complicated if a stepped ticket tax is implemented: Italy could implement the tax in such a way that it considers that the passenger should be taxed based on their final destination. In this case, being a long-haul transatlantic flight, this would incur a higher ticket tax based on the longer distance between Rome and New York. But Germany could also decide that, since the passenger departs on a flight from one of its airports, it would also charge a ticket tax based for the long-haul flight. Such a scenario could lead to double taxation and this rationale has been used by, for example, Ireland, to exclude transfer passengers in their (now defunct) ticket tax (European Commission, 2018).

Naturally, instead of exempting any transit or transfer passengers, the alternative could be that the ticket tax is designed is such a way that it applies to each segment/flight of a trip. In this example, Italy would charge a ticket tax for the Rome to Frankfurt flight based solely on the distance travelled on that flight and Germany would charge a ticket tax for the Frankfurt to New York flight[84].

Still, in case the exemption also applies to transit and transfer passengers with origin and/or destination in the EEA via an EEA hub, this taxation by each segment flown would not address the issue of hub switching discussed in the previous paragraph. Dealing with transit passenger and flights would also constitute a greater administrative burden for air carriers, leading to potential errors and inaccuracies that would require more frequent inspection and appeals by public authorities.

From a legal perspective, it is worth noting that the potential incompatibility of an exemption regime for transit and transfer passengers with EU State aid law has been analysed by the Commission in the specific case of the Irish Air Travel Tax. The Commission concluded that the non-application to transit and transfer passengers of the Air Travel Tax did not constitute State aid[85].

Overall, this exemption would also have an impact in the tax revenue, depending on how many passengers connect in EEA airports. For that effect, we have analysed data for the year 2013, based on a paper by authors in the German Aerospace Centre, DLR (Maertens & Grimme, 2015). For 2013, the number of transfer passengers[86] in the EU27 airports was in the range of 10-15%[87]. As noted above, an exemption might increase the financial incentives for non-time sensitive/non-premium passengers to take connecting flights instead of direct ones. As such, for the analysis we consider that the share of transit and transfer passengers would be at the top end of the scale (15%), with an equivalent reduction of tax revenue.

In terms of efficiency and legal aspects, no specific problems are expected from the implementation of this measure. Such exemptions are already implemented in several Member States with existing ticket taxes, such as Germany and Austria, as well as the UK.

4.2.3 Policy packages analysed quantitatively

After detailing the measures that were to be further analysed, and in order to reduce the number of options to be modelled, we discussed with DG TAXUD a list of priority policy options that were analysed quantitatively. In total, 20 policy options were selected for analyses:

- Policy package 1: seven sub-options to be considered.
- Policy package 2: seven sub-options.
- Policy package 3: six sub-options.

To structure the detailed design of the sub-options in a robust and consistent way, each policy option was defined based on a standardised fiche template. Below, a fiche template is presented for the three 'base' options under each policy package.

Table 4-8: Fiches for the 'base' option under each policy package

Characteristic	Policy package 1	Policy package 2	Policy package 3
Fuel tax			
Tax rate	€0.33/litre	Not applicable (n/a)	€0.33/litre
Geographic applicability	Intra-EEA flights only	N/a	Intra-EEA flights only
Gradual introduction?	No	N/a	No

[84] This is what happens in the USA with its 'segment tax' that applies to all individuals flights (being a flat rate for domestic flights and another flat rate for international flights). So, if a trip is made of several flights the tax is paid for each of these flights.
[85] Commission Decision (EU) 2018/117 of 14 July 2017 on State aid case SA.29064 (2011/C) (ex 2011/NNN), OJ L 28, 31 January 2018, pp. 1-24. See also State aid SA.29064 (11/C) (ex 11/NN), Air Transport - Exemptions from air passenger tax, Invitation to submit comments pursuant to Article 108(2) of the TFEU, OJ C 306, 18 October 2011, pp. 10-16.
[86] It is not expected that the number of transit passengers is substantial.
[87] For EU28, which includes the major hub of London Heathrow, the figures are in the same range.

Exemptions	PSO flights, flights to and from outermost regions	N/a	PSO flights, flights to and from outermost regions
Measures to mitigate tankering	Minimum tax burden	N/a	Minimum tax burden
Measures to mitigate hub switching	None	N/a	None
Ticket tax			
Type of tax rate	N/a	Flat across all distances	Flat across all distances
Geographic applicability	N/a	All EEA departures	All EEA departures
Passenger tax rate	N/a	€10.43 per ticket	€10.43 per ticket
Multiplier for premium tickets	N/a	None	None
Multiplier for passenger ticket tax inversely proportional to distance	N/a	N/a	N/a
Cargo tax rate	N/a	€0.10 per tonne-km	€0.10 per tonne-km
Exemptions	N/a	PSO flights and flights to and from outermost regions	PSO flights and flights to and from outermost regions
Measures to mitigate hub switching	N/a	Exemptions to transit/transfer passengers with origin and destination outside the EEA	Exemptions to transit/transfer passengers with origin and destination outside the EEA

A further 14 runs of the model were also performed, including different levels of sensitivity:

- Seven runs with the lower demand sensitivity baseline (two runs for policy package 1, two for policy package 2, three for policy package 3).
- One run taking into account the minimum SAF blend mandate outlined in the 'ReFuelEU Aviation' study.
- Two runs with a lower cost pass-through of 50%, instead of the 100% used in all other runs (one run for policy package 1, one for policy package 2).
- One run considering withdrawing existing national ticket taxes rather than retaining them in the case of a fuel tax.
- One run setting existing national ticket taxes to harmonised minimum level rather than existing level in case of ticket tax
- Two runs considering fuel taxes also implemented in flights to select third countries (namely, UK and Morocco) (one run for policy package 1, one for policy package 3).

The Excel file attached to this report describes in detail the policy options that were prioritised, as well as the sensitivity cases that were modelled.

4.3 Legal review of policy measures

Table 4-9 gives an overview of the main legal questions raised by each of the policy options analysed in this report. A more detailed overview of the legal issues that might arise in relation to the adoption of policy measures on the aviation sector can be found in the description of each policy measure and in Annex A1.

Table 4-9: Overview of legal assessment of policy measures

Policy package	Measure	Legal analysis
Policy package 1: Harmonised minimum rate of a tax on the supply of fuel for intra-EU flights under the revised Energy Taxation Directive.		
1	Tax on the supply of fuel	- Requires a modification of the Energy Taxation Directive (See Legal Annex A1.2.4) - Does not seem to raise specific legal issues as long as it is limited to intra-EU flights and EEA carriers. If the scope is extended, the EU would need to ensure that the agreements with third countries (BAs/HAs/CATAs) allow such extension (See Legal Annex A.1.3.3.)
1	Exemptions for outermost regions/PSO flights	- Is in line with the EU's approach towards outermost regions. See, among others, articles 349 TFEU and 355 TFEU.[88] Similar measures have already been adopted by MS. See, for example, the German measure assessed by the Commission in SA.32020 under EU State aid rules (compatible aid under article 107(3)(c) TFEU); see also section 3.7 of the Commission's guidelines on State aid for environmental protection and energy 2014-2020. - For PSO flights, see articles 16 and 17 of Regulation (EC) No 1008/2008[89]
1	Tankering mitigation: minimum tax burden	- Could be inconsistent with Article 24 of the Chicago Convention if it is assimilated to a tax on fuel onboard an aircraft (See Legal Annex A.1.3.1)
1	Gradual implementation of the fuel tax	- Does not seem to raise specific legal issues.
Policy package 2: Introduction of harmonised minimum ticket tax across the EU		
2	Flat passenger ticket tax	- Does not seem to raise specific legal issues, although such taxes might be controversial under Articles 11 and 15 of the Chicago Convention (see Legal Annex under A.1.3.1).
	Stepped passenger ticket tax	- Does not seem to raise specific legal issues, although such taxes might be controversial under Articles 11 and 15 of the Chicago Convention (see Legal Annex under A.1.3.1). - Requires to be designed in compliance with EU State aid rules (See Legal Annex A.1.2.3)
2	Passenger ticket tax inversely proportional to distance	- Does not seem to raise specific legal issues, although such taxes might be controversial under Articles 11 and 15 of the Chicago Convention (see Legal Annex under A.1.3.1). - Requires to be designed in compliance with EU State aid rules (See Legal Annex A.1.2.3)

[88] See also article 51 of Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty, OJ L 187, 26 June 2014, pp. 1-78 (as amended). This provision concerns 'social aid for transport for residents of remote regions'.
[89] Regulation (EC) No 1008/2008 of the European Parliament and of the Council of 24 September 208 on common rules for the operation of air services in the Community, OJ L 293, 31 October 2008, pp. 3-20 (as amended).

Policy package	Measure	Legal analysis
2	Tonne-km based cargo tax	- Might raise legal issues if the tonne-km basis is seen as making the tax comparable to a tax on fuel onboard an aircraft, which would be inconsistent with Article 24 of the Chicago Convention
2	Increased tax for premium passengers	- Does not seem to raise specific legal issues
2	Exemptions for outermost regions/PSO flights	- Is in line with the EU's approach towards outermost regions and PSO flights (see above)
2	Exemptions to transit/transfer passengers with origin and destination outside the EEA	- Does not seem to raise specific legal issue. - Similar measures have been adopted by MS (see, for example, the Irish Air Travel Tax discussed in Commission Decision (EU) 2018/117 on SA.29064 (2011/C) (ex 2011/NN)).
Policy package 3: Combination of a harmonised minimum tax on the supply of fuel and a harmonised minimum ticket tax		
3	Tax on the supply of fuel (intra-EEA) + ticket tax (all flights)	- Does not seem to raise specific legal issues, although such taxes might be controversial under Articles 11 and 15 of the Chicago Convention (See Legal Annex under A.1.3.1.).
3	Tax on the supply of fuel (intra-EEA) + ticket tax (extra-EEA)	- Might raise legal issues under Article 11 of the Chicago Convention if such measure is considered discriminatory (as only extra-EEA flights pay the ticket tax). The ticket tax on extra-EEA flights could also be assimilated to a measure aimed at replicating the fuel tax at the domestic level: in that case it could be found contrary to Article 24 of the Chicago Convention and some BAs/HAs/CATAs (See Legal Annex A.1.3.1. and A.1.3.3.)

Overall, the legal review of these policy measures identified:

- There should be no legal problems associated with the introduction of a tax on fuel supplied for intra-EU flights. Agreements with some third countries may need to be renegotiated if the tax is to be applied to their carriers (to achieve maximum effectiveness of the tax);
- The exemptions identified are consistent with existing EU policy.
- The measure identified to mitigate potential carbon leakage through tankering may be seen as inconsistent with articles of the Chicago Convention;
- The concept of a ticket tax is not seen as raising specific legal issues; however, options in which the tax increases approximately in line with the fuel consumed could raise issues as being similar to a tax on that fuel, particularly when implemented as part of the combination of taxes;
- Increased taxes for premium passengers and exemptions for transit/transfer passengers should not raise issues.

5 Baseline scenarios

The baseline scenario forms a key component of an impact assessment. For this study, it is intended to provide a full description of the situation in the short-term (2025), mid-term (2030) and long-term (2050), in the absence of any changes to aviation taxation frameworks.

To be able to provide a thorough assessment of the policy options, it is important that the baseline includes the full range of factors that might influence any of the relevant parameters (economic, environmental and social indicators). The baseline needs to include a range of indicators consistent with those to be considered in the assessment of impacts (section 6.1).

This study has been performed against a backdrop of severe impacts on the aviation sector, and society more widely, from the global COVID-19 pandemic. The health and economic crises generated by the pandemic will continue to impact demand for travel, potentially inducing long-term changes to businesses and people's habits. This introduces significant uncertainty into any forecast of the development of aviation demand. Therefore, it was decided that the study should include multiple baseline scenarios to be able to capture the uncertainty in the impacts of the policy options.

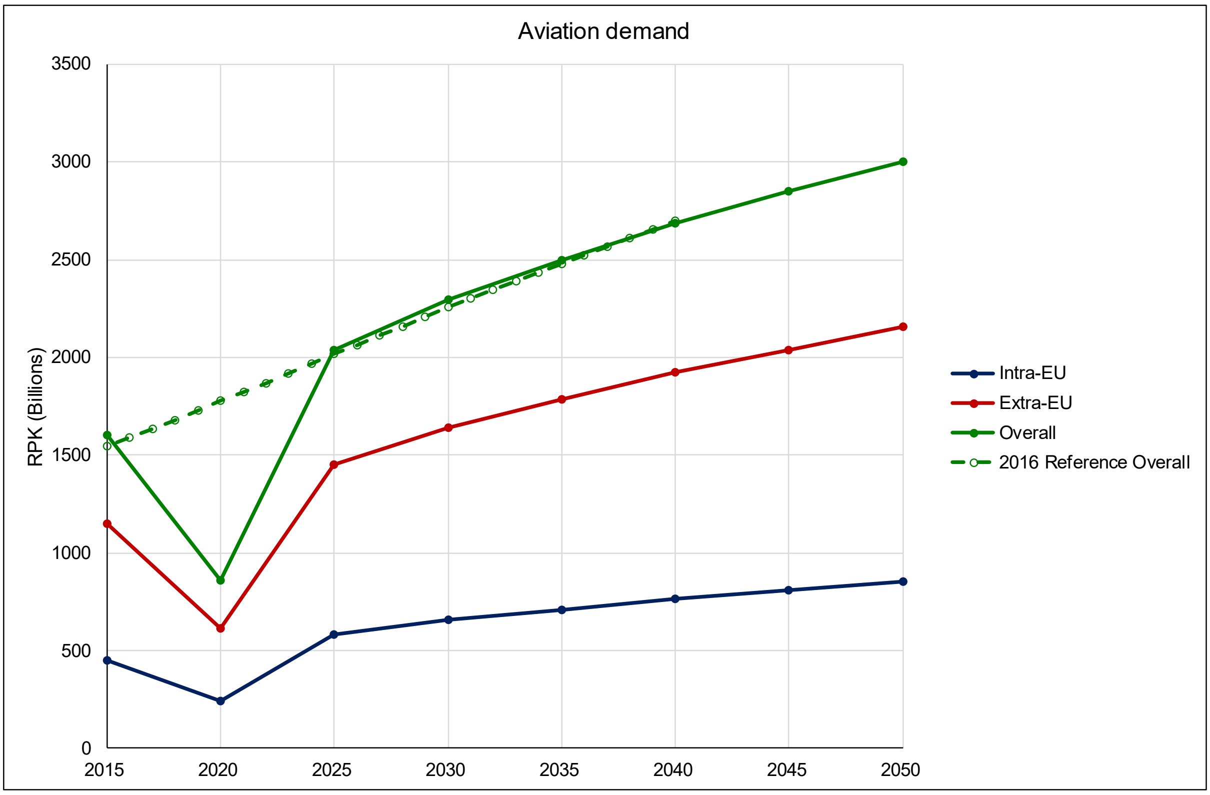
The main baseline scenario reflects developments under current trends and adopted policies. It builds on the baseline scenario underpinning the impact assessment accompanying the 2030 Climate Target Plan and the staff working document accompanying the Sustainable and Smart Mobility Strategy, but it additionally considers the impacts of the COVID-19 pandemic and the National Energy and Climate Plans

Analysis of the demand for the aviation sector (in revenue passenger-km, or RPK) defined by this primary baseline (using the data provided by DG CLIMA) identified that it included a recovery to similar levels of demand to that in the (pre-COVID-19) 2016 Reference Scenario by 2025. It was considered that it would be inappropriate to analyse the policy options against a baseline with a stronger recovery than this (i.e. showing a future demand greater than that expected prior to the COVID-19 pandemic); therefore, a single 'sensitivity baseline' was defined, with a slower recovery and a reduced growth rate beyond, This approach to the definition of the sensitivity baseline was agreed with DG TAXUD prior to its implementation in the aviation sector modelling.

5.1 Quantitative assessment of the aviation sector

The development of demand for aviation in the EU27, as defined by the primary baseline scenario, is shown in Figure 5-1 for intra-EU, extra-EU and total flights. For comparison with this baseline, Figure 5-1 also shows the overall demand values from the previous, 2016, Reference Scenario.

Figure 5-1: Evolution of aviation demand in EU27 under the primary baseline scenario



The definition of the primary baseline provides the demand for aviation, separately for intra-EU and extra-EU, as well as total, at five-yearly intervals from 2015 to 2050. In this context, intra-EU flights are those between two airports in the EU, whether in the same Member State (i.e. a domestic flight) or in different ones (an international flight). Extra-EU flights are international flights from EU Member States to third countries.

As can be seen in Figure 5-1, the primary scenario shows a large reduction in overall demand between 2015 and 2020 (mainly due to the dramatic reduction between 2019 and 2020, against continued growth between 2015 and 2019). It then shows a recovery by 2025, with a return to growth rates akin to historic rates in subsequent years. From 2025 to 2050, the average overall growth rate is 1.57% per annum (1.51% per annum intra-EEA, 1.60% per annum extra-EEA). Also included in Figure 5-1 is the projections from the 2016 EU Reference Scenario. As published, this scenario includes the UK as an EU Member State; therefore, to allow comparisons between the 2016 scenario and the new one, the total demand for just the EU27 Member States has been calculated. This is feasible for the total demand (as it includes all flights departing from EU27 airports); however, the data do not separate flights to the UK from flights to other Member States, so it is not possible to derive results for valid comparisons with the intra-EU and extra-EU demand curves in the new scenario. Nonetheless, it is clear that the overall demand in the new scenario from 2025 to 2040 is a close match to that from the 2016 Reference Scenario (the new scenario extends the projection out to 2050, beyond that given in the 2016 Reference Scenario).

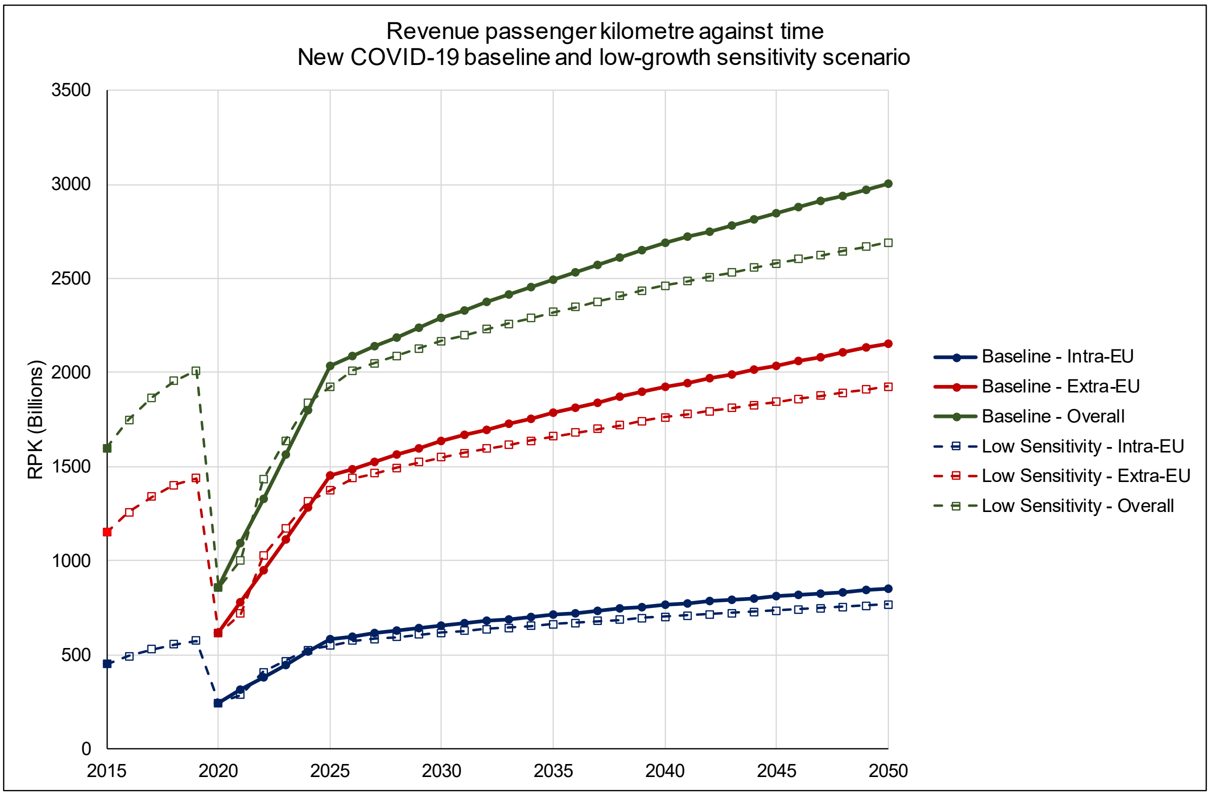
As noted above, given the recovery to the pre-COVID-19 forecast level of demand by 2025 in the primary baseline, it was not considered appropriate to model a sensitivity scenario that delivered a higher level of demand (a more rapid recovery would be feasible, but as the scenario definition, and the modelling, only includes every fifth year, the results would be indistinguishable from those shown in Figure 5-1). Therefore, a sensitivity baseline scenario with a slower recovery and a subsequent slower growth rate was considered.

In November 2020, EUROCONTROL published an updated five-year forecast[90]. This forecast included three traffic scenarios, reflecting different levels of optimism for the recovery of aviation traffic from the impacts of COVID-19:

- Scenario 1 – Vaccine Summer 2021
  - Vaccine widely made available for travellers (or end of pandemic) by Summer 2021, with traffic only returning to 2019 levels by 2024.
- Scenario 2 – Vaccine Summer 2022
  - Vaccine widely made available for travellers (or end of pandemic) by Summer 2022, with traffic only returning to 2019 levels by 2026.
- Scenario 3 – Vaccine not effective
  - Lingering infection and low passenger confidence, with traffic only returning to 2019 levels by 2029.

In May 2021, EUROCONTROL published a further update, with a slightly more optimistic 'most likely' scenario, giving recovery to 2019 levels of traffic by 2025[91]. However, the analyses presented here were performed using the November 2020 forecast. For these analyses, it was felt appropriate to use the EUROCONTROL scenario 2 assumptions to define the initial recovery from COVID-19, with the subsequent growth rate set at 80% of the annual growth rate represented by the primary baseline scenario, giving an average annual growth rate of 1.09% per annum post-2030, for the sensitivity baseline scenario. Figure 5-2 shows the resulting demand profiles for the sensitivity baseline in comparison with the primary baseline.

Figure 5-2: Comparisons of demand under sensitivity baseline scenario with primary baseline



In addition to the aviation demand profiles, the primary baseline scenario definition also includes projections for the population of the EU27 and the total gross domestic product (GDP), both of which are used as inputs to the macroeconomic modelling using the GINFORS-E model. These projections show the EU27 population remaining stable at between 444 million and 450 million, with GDP growing

90 https://www.eurocontrol.int/publication/eurocontrol-five-year-forecast-2020-2024#:~:text=In%20the%20most%20optimistic%20scenario,seen%20in%202019%20until%202029.
91 https://www.eurocontrol.int/publication/eurocontrol-forecast-update-2021-2024

from €12,653 billion in 2020 to €19,762 billion by 2050 (in the scenario, GDP shows annual average growth of 2.7% from 2020 to 2025, growth then slows to 1.1% per annum, before recovering to 1.4% per annum by 2050).

Other significant inputs to the modelling of the aviation sector, defined as part of the primary baseline scenario, include assumptions for fuel prices, carbon prices and the share of sustainable aviation fuel. These assumptions are presented in Table 5-1: Other assumptions in primary baseline scenario definition.

Table 5-1: Other assumptions in primary baseline scenario definition

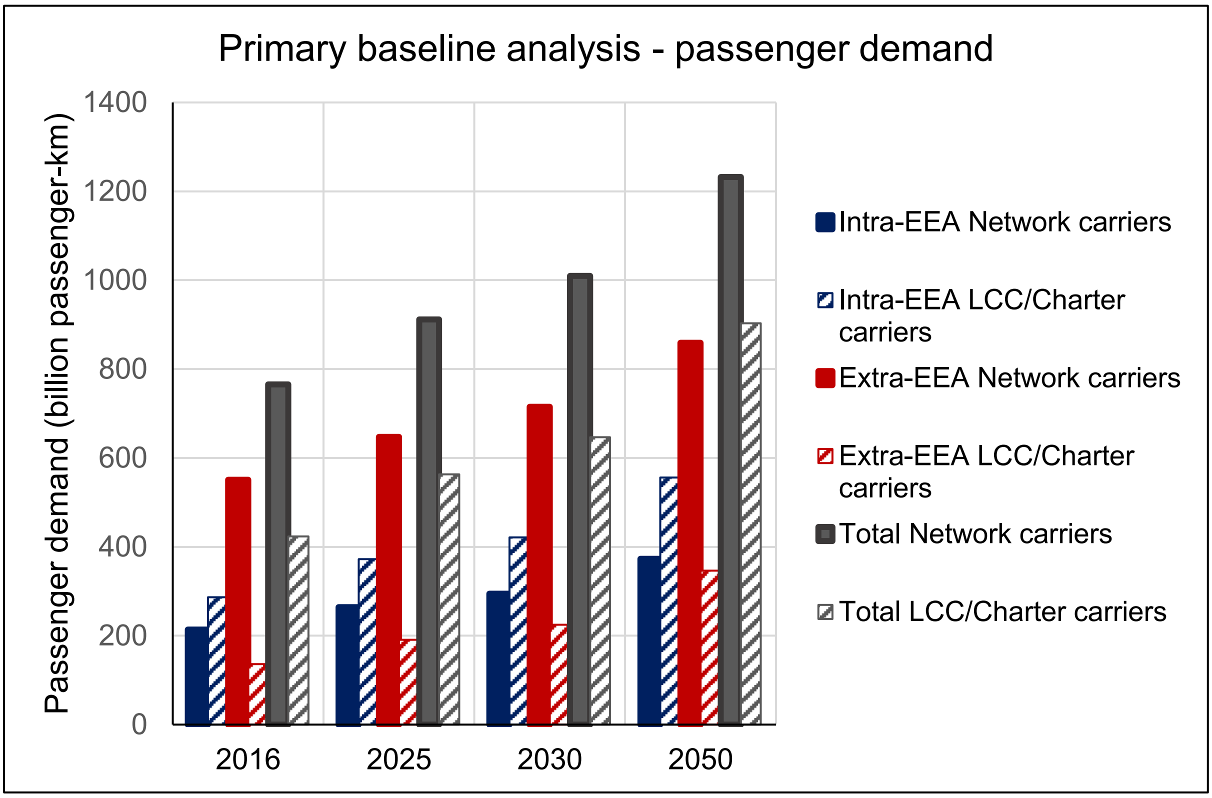
	2015	2020	2025	2030	2035	2040	2045	2050
Jet fuel price (EU27) (€/toe)	538	578	841	1,030	1,106	1,153	1,207	1,263
Carbon price ETS sectors (€/ tCO_2)	7.5	25.0	26.5	30.0	50.0	80.0		
SAF (EU27)	0.0%	0.0%	0.0%	0.2%	0.7%	1.2%	2.5%	2.9%

The other assumptions defining the baseline calculations by the two models (such as aircraft fuel efficiency, elasticities between prices and demand) are the standard values incorporated in the two models. Of particular note for this study is that the baseline calculations by the AERO model incorporated the existing ticket taxes implemented in Austria, Germany, France and Sweden, as described in Section 4.

Except for the projected level of aviation demand, these assumptions were not changed for the sensitivity baseline scenario.

Figure 5-3 shows the passenger demand (as passenger-km) output from AERO-MS for the years 2016 (the base year for the model), 2025, 2030 and 2050 under the primary baseline.

Figure 5-3: Passenger transport demand output from AERO-MS

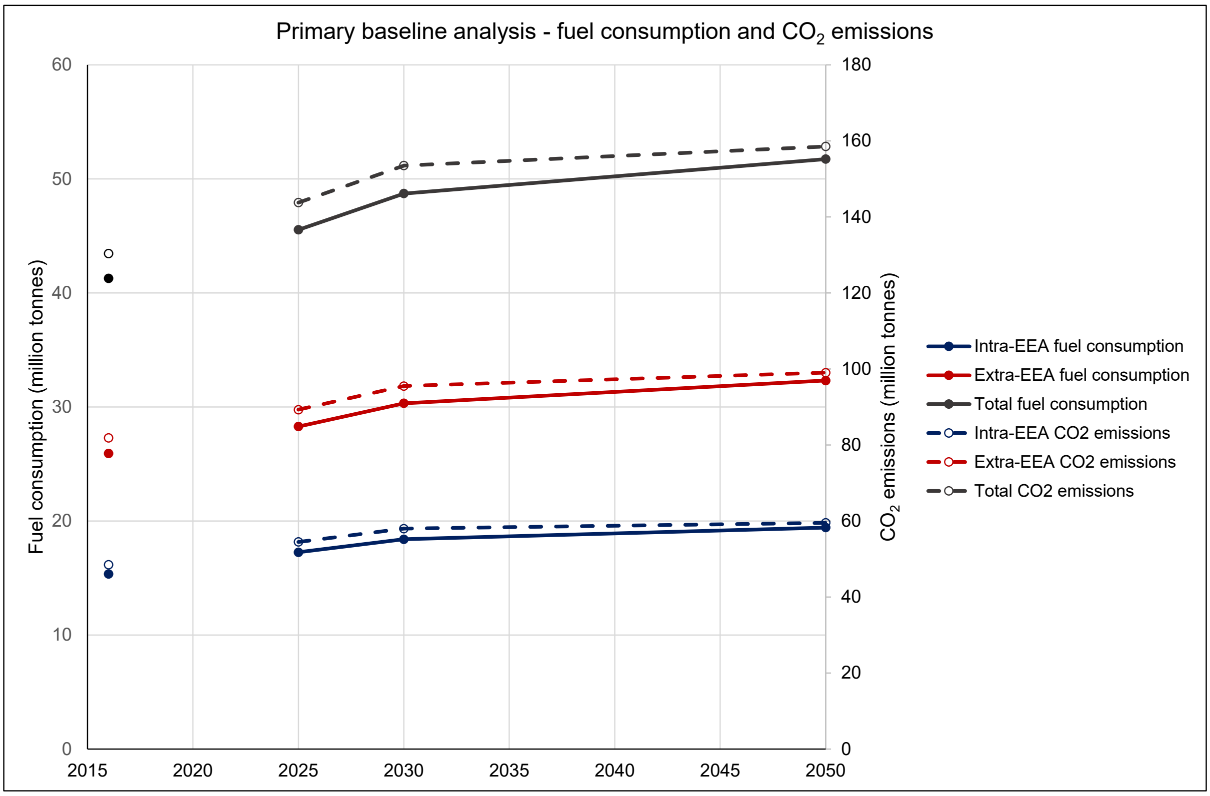


The levels of passenger demand output from AERO-MS are an accurate representation of the input demand data (as defined in the scenario supplied by the Commission), interpolated to the analysis years and presented for intra-EEA29 and extra-EEA29. The results are presented separately for traditional network carriers and LCC/charter carriers; it is notable that on intra-EEA routes the LCC/charter carriers have a slightly greater share of the market in 2016 than the network carriers (with the difference increasing over time), while they have a much smaller share of the market on extra-EEA routes. Between 2016 and 2025, the average annual growth rate for network carriers is 2.0%, between 2025 and 2030 the growth rate is 2.1%, while between 2030 and 2050 it reduces to 1.0%. The equivalent average annual growth rates for LCC/Charter carriers are rather higher at 3.2%, 2.8% and 1.7% for the three periods.

Some differences can be seen between the demand values shown in Figure 5-3 and those for the equivalent years in Figure 5-1. Partly, the differences relate to the presentation of results for EU27 Member States only in Figure 5-1 and the EEA29 in Figure 5-3; this particularly affects the intra-EEA (compared to intra-EU) results. Detailed investigations have shown that the differences in the total demand levels relate to the different allocation of demand on routes from EU countries to certain third countries between the two models. If levels of demand are derived from the AERO-MS results assuming similar allocation to that used in developing the scenario definition, a very close match is achieved between the two sets of results.

Figure 5-4 shows the fuel consumption and CO_2 emissions for the same primary baseline calculation.

Figure 5-4: Fuel consumption and CO_2 emissions for primary baseline



Note that, in Figure 5-4, the results for 2016 and 2025 are not connected by lines, as results have not been calculated for 2020 and the impacts of COVID-19 in that year would make any line joining the two years unrealistic. As expected, the fuel use and CO_2 emissions have very similar profiles. Between 2016 and 2025, they grow at the same rate, as the CO_2 emissions are calculated by applying a constant emissions index to the fuel consumption. However, after 2025, the CO_2 emissions grow at a slightly lower rate than the fuel consumption, reflecting the increased use of sustainable alternative fuel and the zero (net) emissions assumed for such fuels. Between 2016 and 2050, the total fuel consumption increases by 25.3%, while the total CO_2 emissions increase by 21.6%.

5.2 Wider impact areas and qualitative assessment

The modelling of the baseline for other modes of transport and wider economic sectors uses the GINFORS-E model, with the inputs for the aviation sector being taken from the outputs of AERO-MS (as shown above) and other inputs (such as gross domestic product) being taken from the scenario definition provided by the Commission. These inputs captured the policy measures already implemented or planned at the point that the analyses were performed. As such, they do not include any new measures included in the Commission's 'Fit for 55' initiative[92].

The values for key socio-economic indicators for the reference baseline are listed below. Land and water transport services (GINFORS-E indicators 1-3, see Annex A3.2) increase significantly in constant prices until 2050. Employment in air transport (indicator 4) remains largely constant because labour productivity continues to rise significantly. In the transport sector as a whole, employment falls across the EU (indicator 5). Due to the declining working-age population, total employment (indicator 12) and also employment in the manufacturing sector (indicator 13) will decrease by 2050 compared to 2016. In contrast, GDP at constant prices (based on year 2015 euros; indicator 10) will increase significantly with 1.2% on average until 2050. The macroeconomic price level (indicator 11) also increases by 1,7% p.a. on average. Tax revenues in current prices (indicators 7-9) grow even more strongly as they are closely related to GDP in current prices. The taxes on aviation (i.e. the existing national ticket taxes) are calculated in the AERO-MS model and, therefore, are not shown here for the baseline. Energy consumption and the corresponding CO_2 emissions (indicators 14-18) decrease until 2050, whereby the decline in transport is less pronounced than in other sectors.

Table 5-2: Main socio-economic indicators for the EU27 in the primary baseline scenario

EU27		Baseline			
Topic/Indicator	Unit	2016	2025	2030	2050
Demand effects on other modes of transport					
1. Land transport and transport via pipelines, output at constant prices	Billion €	559.8	639.3	666.2	853.3
2. Rail passengers transported	Billion pkm	386.6	413.5	427.2	546.9
3. Water transport, output at constant prices	Billion €	117.1	132.5	136.6	169.3
Effects on employment in the aviation and transport sector					
4. Air transport, number of persons engaged	Thousand	286.7	293.8	292.1	290.4
5. Transport, total, number of	Thousand	6,240.3	6,254.4	6,142.3	5,830.7

92 https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/package-fit-for-55

persons engaged					
Tax revenue effects					
6. Air transport, revenue from new taxes[93]	Billion €	-	-	-	-
7. Net indirect taxes	Billion €	1,254.4	1,580.9	1,764.5	3,355.7
8. Direct taxes.	Billion €	1,599.9	1,841.2	1,902.9	2,477.3
9. Tax revenues, total (incl. new aviation taxes)	Billion €	2,854.2	3,422.1	3,667.4	5,833.0
Other knock-on or spillover effects					
10. GDP at constant prices	Billion €	12,460	13,981	14,487	18,753
11. GDP deflator	2015=100	100.7	112.2	122.1	185.3
12. Employment, total, number of persons engaged	Thousand	193,156	189,054	184,662	175,990
13. Employment , manufacturing, number of persons engaged	Thousand	29,728	29,329	28,753	27,069
Energy use and CO_2 emissions					
14. Transport, total, energy use	Petajoule	13,222.2	13,021.0	12,644.3	10,618.8
15. Total energy use	Petajoule	61,005.7	57,481.2	55,277.5	48,116.2
16. Transport, total, CO_2 emissions	Megatonne	904.1	859.5	795.4	622.4
17. Total CO_2 emissions	Megatonne	2,936.6	2,571.1	2,314.6	1,741.2

[93] This indicator covers the taxes raised by the policy options under consideration in this study. It does not include the existing national ticket taxes. As a result, the baseline value in this table is zero.

6 Analysis of impacts

6.1 Assessment of impacts – overview

This section provides detailed analyses of the economic, environmental and social impacts of the short-listed policy options both at the micro and macro-economic level. The analysis highlights both the advantages and disadvantages of different options and offers a robust, quantitative assessment of the essential trade-off at stake.

The fuel tax options that have been analysed are based on fuel tax rates of €0.17, €0.33 and €0.50 per litre, applied to intra-EEA passenger flights – as noted in Section 4, cargo-only flights were excluded from the fuel tax for competitiveness reasons. All three of the fuel tax options were analysed with the assumption that existing national ticket taxes would remain in force when a harmonised minimum fuel tax was implemented. In addition, a sensitivity calculation was performed with the assumption that existing national ticket taxes would be withdrawn, in conjunction with the €0.33 per litre fuel tax.

The passenger ticket tax options that have been analysed include:

- flat rate of €10.43 per ticket on all flights;
- rates of €10.12 in intra-EEA flights, €25.30 on extra-EEA flights up to 6,000 km and €45.54 on extra-EEA flights over 6,000km;
- rates of €25.30 on flights of up to 350 km and €10.12 on all flights over 350 km.

These options also include a cargo tax of €0.10 per tonne-km, applied to both intra-EEA and extra-EEA flights.

The third policy option is that of a tax on fuel supplied for intra-EEA flights and a ticket tax on extra-EEA flights. This option has been analysed using the central fuel tax rate of €0.33 per litre and the extra-EEA elements of the ticket taxes described above.

In principle, a fuel tax increases the price for jet fuel which is a key component of the cost function of airlines. As such, it acts on the supply side of the aviation market and provides incentives for reducing jet fuel consumption (through energy efficiency measures). In addition, it may incentivise the use of sustainable fuels, depending on the level of the tax, whether it is applied to sustainable fuels (potentially at a lower rate than for conventional fuels) and the price difference between conventional and sustainable fuels. In addition, depending on the level of cost pass-through, higher fuel costs (due to a fuel tax) may lead to increased ticket prices and, in turn, reduced air transport demand for intra-EU flights and shift to other available transport modes (rail, car, bus).

A ticket tax can be expected to affect the demand side by increasing the final ticket price for passengers, again depending on the level of pass-through. Given its applicability to extra-EU flights too, a ticket tax has a wider impact on travel demand than a fuel tax.

The modelling framework used in this study models not only demand for air transport but also supply responses whereby airlines shift towards the use of more fuel-efficient aircraft. Currently, the modelling framework does not model any increased use of sustainable fuels as a result of taxes, as the percentage uptake of alternative fuels is an exogenous input. This aspect is analysed through a sensitivity analysis.

For the analyses performed, results are presented showing the impacts on ticket prices, demand (passenger-km and cargo tonne-km), fuel consumption and tax revenue. As well as results for the complete EEA-29, the distribution of tax revenue by Member State is also presented.

6.2 Impact assessment results – fuel tax

Policy option calculations have been performed for fuel taxes at three different tax rates, €0.17 per litre, €0.33 per litre, €0.50 per litre (as presented in Section 4.2.1), against the primary baseline. As noted previously, these fuel taxes are applied only to passenger aircraft and not to dedicated freighter aircraft and only to intra-EEA flights.

The 'default' analysis includes the application of these fuel taxes with a ten-year transitional phase, with 10% of the final tax rate being applied in 2024, ramping up linearly until the full rate is applied in 2033. This approach to introducing a new tax is considered to reduce the overall impacts arising from the initial shock of a sudden implementation, giving a more gradual increase in costs (for airlines and consumers). Analyses have also been performed to investigate the sensitivity of the results to this approach, using both a full implementation from 2024 onwards and a seven year transition phase (also starting in 2024, with the full rate implemented in 2030).

For the analyses reported here, all costs are calculated in constant year euros[94] (and the inputs, such as fuel prices and carbon prices, are also specified as constant year values). Therefore, although the Commission foresees the tax rates being indexed against inflation, they are implemented in the modelling as fixed values. The combination of constant year prices and fixed tax rates provides the same impacts as actual year prices (including inflation) and indexed tax rates. For completeness, and comparisons against other analyses, Table 6-1 shows how the fuel tax rates would vary over time if indexed against inflation (a constant inflation rate of 1.406% has been assumed for these calculations).

Table 6-1: Effective tax rates in future years if indexed against inflation

Year	Fuel tax €0.17 per litre	Fuel tax €0.33 per litre	Fuel tax €0.50 per litre
2025	€ 0.185	€ 0.359	€ 0.544
2030	€ 0.198	€ 0.385	€ 0.583
2050	€ 0.262	€ 0.509	€ 0.771

6.2.1 Impacts on ticket prices

The AERO-MS model assumes that all tax costs incurred by the airlines are passed through to their customers (i.e. 100% cost pass-through). This reflects the situation in the industry in which airlines' profit margins are low and so they have little ability to absorb additional costs. As a result, the implementation of a fuel tax leads to an increase in ticket prices. The impacts of the three different fuel tax rates on ticket prices compared to the baseline values, under the assumption that existing national ticket taxes are retained, are presented, separately for traditional scheduled carriers and low-cost and charter carriers, in Table 6-2.

Table 6-2: Impacts of different fuel tax rates on ticket prices for intra-EEA flights relative to the baseline, separated between traditional scheduled carriers and low-cost and charter carriers, using a ten-year transition period

Fuel tax rate	€0.17/litre		€0.33/litre		€0.50/litre	
Ticket price changes by year and carrier type	Traditional scheduled carriers	Low-cost carriers and charter flights	Traditional scheduled carriers	Low-cost carriers and charter flights	Traditional scheduled carriers	Low-cost carriers and charter flights
2025	0.9%	1.8%	1.7%	3.5%	2.6%	5.3%
2030	2.8%	5.7%	5.4%	10.9%	8.2%	16.4%
2050	3.1%	5.9%	6.0%	11.3%	9.0%	17.0%

[94] Because of model differences, the aviation sector modelling (including the impact of taxes on demand) used 2019 euros, while the socioeconomic modelling is based on 2015 euros. Inflation effects between the two years were applied when transferring values between models.

Under the central tax rate shown here of €0.33 per litre, ticket prices in 2025 increase by slightly under 2% for flights with traditional scheduled carriers, while those for low-cost carriers (LCCs) increase by approximately 3.5%, reflecting the higher proportion of operation costs related to fuel for such carriers. By 2030, ticket prices have risen to over 5% and almost 11%, respectively, as a greater proportion of the final tax rate (70%) is implemented. By 2050, the increase in ticket prices (as a percentage of the baseline) is now approximately 6% and 11% for the two carrier types. The impacts of the full application of the taxes from 2033 onwards is partially offset by an increase in ticket price in the baseline over time, and also by an increase in the fuel efficiency of aircraft, leading to reduced fuel consumption (and hence tax burden) per passenger-km. Under the reduced fuel tax rate of €0.17 per litre, the increase in ticket prices is considerably less, while under the higher tax rate, the increase is significantly greater, with a 5% increase in ticket prices for LCCs in 2025, rising further to about 17% increase over the baseline by 2050.

The implications for these changes on ticket prices paid is shown in Table 6-3. This shows calculated ticket prices for traditional scheduled carriers and LCC and LCC and charter carriers for an average intra-EEA flight distance of 1,000 km[95].

Table 6-3: Ticket prices for an average intra-EEA flight distance of 1,000 km for baseline and different fuel tax options

	Baseline		€0.17 per litre		€0.33 per litre		€0.50 per litre	
	Traditional scheduled carriers	Low-cost carriers and charter flights	Traditional scheduled carriers	Low-cost carriers and charter flights	Traditional scheduled carriers	Low-cost carriers and charter flights	Traditional scheduled carriers	Low-cost carriers and charter flights
2025	€ 154	€ 57	€ 155	€ 58	€ 157	€ 59	€ 158	€ 60
2030	€ 159	€ 60	€ 163	€ 64	€ 167	€ 67	€ 172	€ 70
2050	€ 165	€ 64	€ 170	€ 68	€ 175	€ 72	€ 180	€ 75

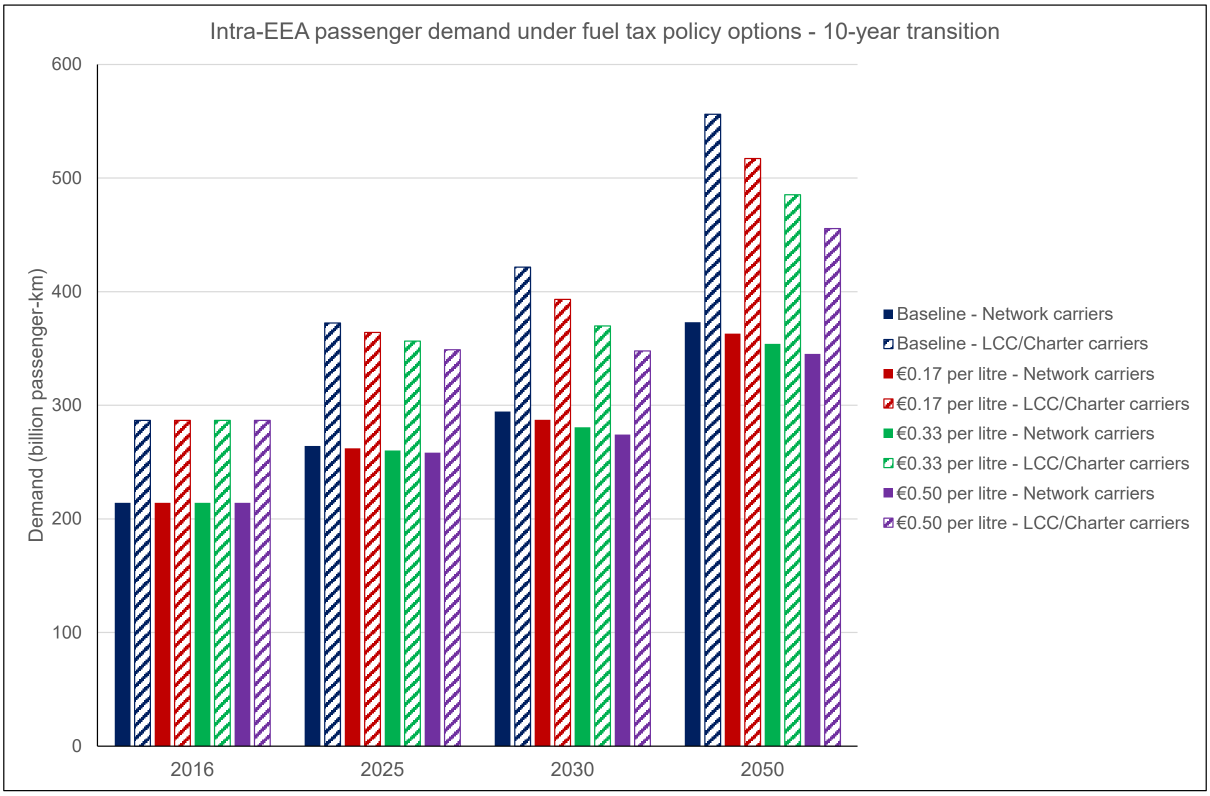
Additional analyses have also been performed to investigate the sensitivity of the results to the cost pass-through assumption. The results of these analyses are described in Section 6.2.7.4.

6.2.2 Impacts on demand

The increases in ticket prices in Table 6-3 lead to a reduction in demand (based on the values for price elasticity of demand implemented in the AERO-MS model[96]). Figure 6-1 shows the demand for intra-EEA passenger travel (in billions of passenger-km) under the baseline and policy option cases.

[95] Analyses of data in the AERO-MS model indicates an average flight distance for intra-EEA flights in 2016 of 970 km. this has been rounded up for a representative average distance of 1,000 km for the purpose of this analysis.
[96] The elasticities in the AERO-MS model are based on a report by the International Air Transport Association (IATA) (see https://www.iata.org/en/iata-repository/publications/economic-reports/air-travel-demand/). For intra-EEA flights, both a geographical and a short-haul multiplier are applied; the overall elasticity for intra-EEA flights is -0.924.

Figure 6-1: Impact on passenger demand for intra-EEA flights of the increased ticket prices following the implementation of a fuel tax



As shown in Figure 6-1, the demand in the baseline grows considerably (by about 74% for network carriers and about 94% for LCC/charter carriers) between 2016 and 2050. The increases in ticket prices under the fuel tax options then lead to reductions in demand relative to the baseline. The percentage reductions in demand, compared to the baseline scenario, are shown in Figure 6-2.

Figure 6-2: Percentage change in passenger demand for intra-EEA flights following the implementation of a fuel tax

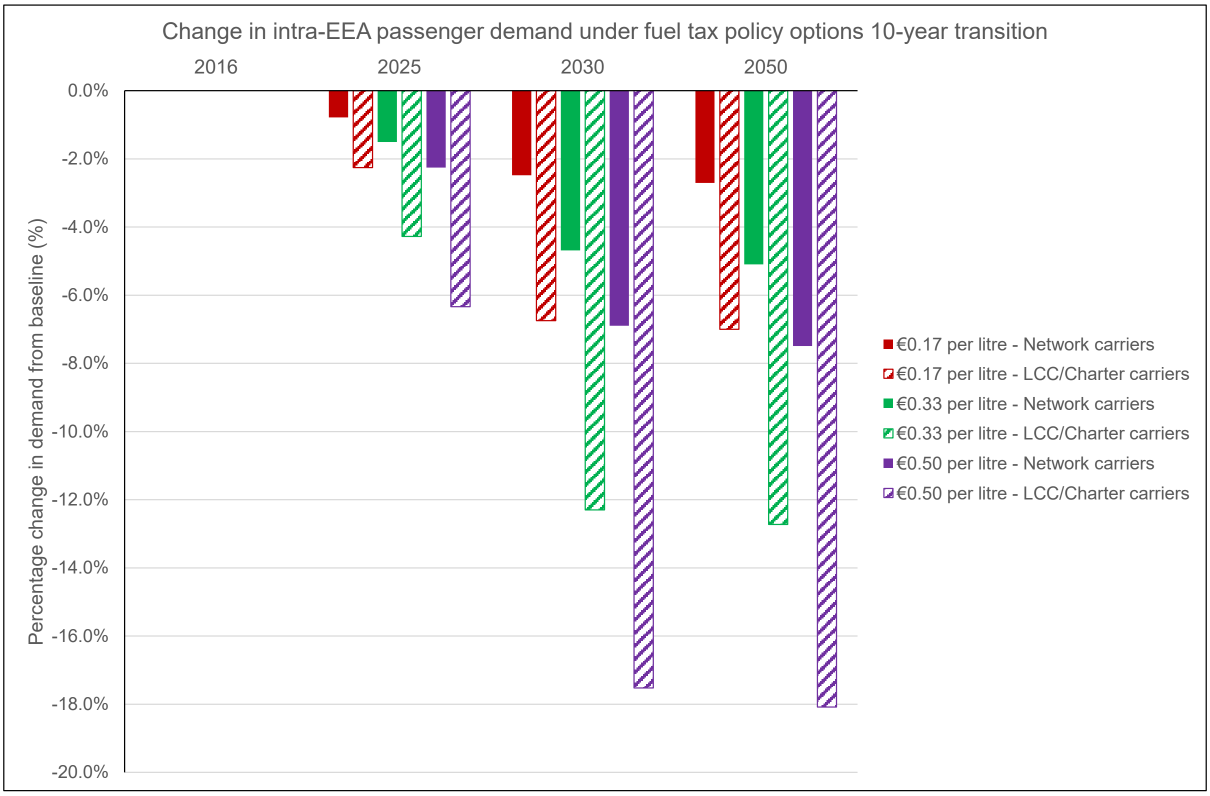


Table 6-4: Percentage change in passenger demand for intra-EEA flights following the implementation of a fuel tax

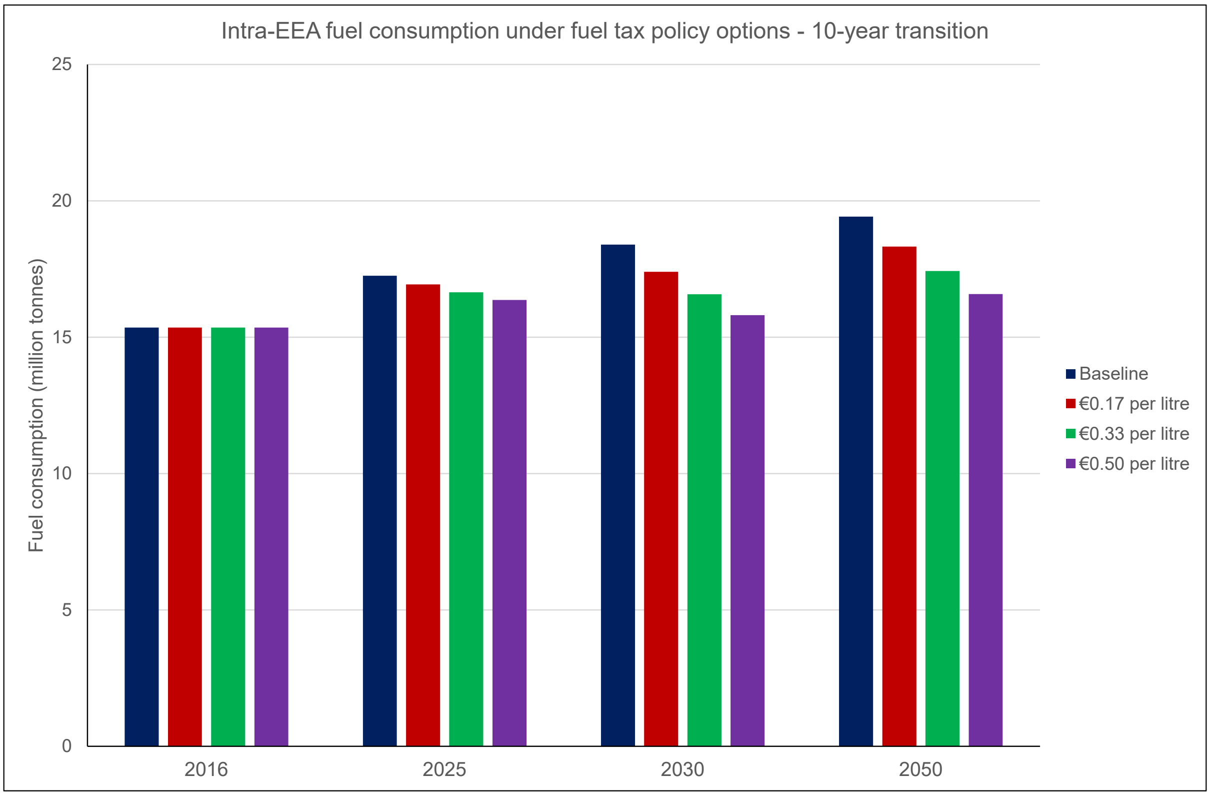
Fuel tax rate	€0.17/litre		€0.33/litre		€0.50/litre	
Percentage change in passenger demand	Traditional scheduled carriers	Low-cost carriers and charter flights	Traditional scheduled carriers	Low-cost carriers and charter flights	Traditional scheduled carriers	Low-cost carriers and charter flights
2025	-0.8%	-2.3%	-1.5%	-4.3%	-2.3%	-8.3%
2030	-2.5%	-6.7%	-4.7%	-12.3%	-6.9%	-17.5%
2050	-2.7%	-7.0%	-5.1%	-12.7%	-7.5%	-18.1%

Under the €0.33 per litre fuel tax option, total demand for intra-EEA air travel is reduced by about 3% in 2025, with the impact increasing to about a 10% reduction (relative to the baseline) by 2050. Under the lower tax rate, the reduction in demand is significantly less, varying between 1.5% in 2025 and 5% in 2050. Under the higher tax rate, on the other hand, the reduction in demand is significantly higher, between 5% in 2025 and 14% in 2050. In each case, the impact on demand for flights by low-cost carriers is significantly greater than for traditional scheduled carriers, as fuel costs form a greater percentage of their total costs and so the fuel tax leads to a proportionally greater increase in ticket price. In 2030, under the €0.33 per litre fuel tax option, the percentage reduction in demand for LCC flights is over 2.5 times that for traditional scheduled carriers.

6.2.3 Impacts on fuel burn and CO_2 emissions

As expected, the reduction in demand due to the different fuel tax options leads to a reduction in the fuel burn (and hence CO_2 emissions[97]). The variation in fuel consumption under the baseline and fuel tax policy cases is shown in Figure 6-3.

Figure 6-3: Fuel consumption on intra-EEA flights under different fuel tax options



The percentage reductions in fuel consumption corresponding to the total values shown in Figure 6-3 are shown in Table 6-5.

Table 6-5: Percentage reductions in fuel consumption on intra-EEA flights under different fuel tax options

Fuel tax rate	€0.17/litre	€0.33/litre	€0.50/litre
2025	-1.9%	-3.5%	-5.2%
2030	-5.4%	-9.9%	-14.1%
2050	-5.7%	-10.3%	-14.6%

In general, the changes in fuel consumption follow similar trends to those in demand. However, these changes are also affected by the increased fuel efficiency of the fleet (which occurs in the baseline but then accelerates further in response to the tax options), leading to greater percentage reductions in fuel consumption. There is a greater impact on demand and on incentives to airlines to improve the efficiency particularly in the early years (i.e. 2025), when the fuel efficiency in the baseline is not as good as in later years. For example, in 2025, although there is a 20% increase in demand relative to

[97] For conventional kerosene fuel, the CO_2 emissions are directly proportional to the fuel consumption (with a constant of proportionality of approximately 3.16, giving 2.53kg CO_2 emissions per litre of kerosene), The increased use of sustainable aviation fuel (SAF) over time in the baseline changes that relationship slightly. However, the proportion of SAF is assumed not to change in response to the fuel taxes; therefore, the changes in CO_2 emissions in response to the taxes follow an identical trend to that for fuel consumption.

2016 under the €0.50 per litre tax option, the fuel consumption increases by only 6.5%. The impacts of the fuel taxes on fuel efficiency are shown in Table 6-6.

Table 6-6: Percentage change in fuel efficiency on intra-EEA flights relative to the baseline for different fuel tax options[98]

Fuel tax rate	€0.17/litre	€0.33/litre	€0.50/litre
2025	-0.3%	-0.5%	-0.7%
2030	-0.6%	-1.0%	-1.4%
2050	-0.6%	-1.0%	-1.4%

6.2.4 Impacts on connectivity and competitiveness

With respect to the impact on connectivity, the lower demand resulting from the fuel tax would be expected to reduce flight frequencies across all routes. In principle, this could potentially lead to the loss of air transport on some routes, should these become not financially viable for air carriers to operate. However, this effect may be limited due to the following reasons:

- The expected number of intra EEA flights in the baseline for 2025 is 21% higher compared to the base year (2016), with the growth being larger for LCCs (24%) than for legacy carriers (19%). By 2025, the introduction of a fuel tax of €0.33/litre (with no transition period) would lead to a reduction of 9% in the number of flights by legacy carriers and of 19% by LCCs, when compared to the baseline (the greatest reduction in the number of flights by LCCs being a reflection on the fact that the taxes would represent a larger share of the ticket price in those carriers, when compared to legacy carriers). Given this, it is expected that, overall, the flight frequency on most routes would be still higher than it was in 2016. It should be noted, however, than under the €0.50/litre fuel tax with no transition period, by 2025 the number of flights operated by LCCs would be smaller than in 2016 (for legacy carriers it would be higher); by 2030 it would be higher for both types of carriers.
- For routes/peripheral regions where connectivity is a real issue, there is generally a PSO in place which ensures a minimum level of connectivity. The considered fuel tax foresees an exemption for routes covered by PSOs as well as for flights to and from outermost regions, as they are considered to be dependent on good levels of transport connectivity.
- For routes to smaller airports where no PSO is in place, there are risks that these would be the first to be cut: the experience in the US during the 2004-2008 period of high growth in fuel prices shows that smaller airports are more likely to lose service than bigger ones (Hansman, Hansen, Everett Peterson, & Trani, 2014). Particularly, many of those routes to smaller airports are served by LCCs, which the model predicts would be the most affected in terms of reductions in the number of flights (as compared to the baseline) Still, as noted in the first bullet point, in the central scenario with a fuel tax of €0.33/litre, it is expected that the number of flights will never fall below 2016 levels. As such, this risk of loss of connectivity on smaller airports for routes with no PSO is mitigated, and while the high levels of growth predicated under the baseline would not be achieved, overall no major loses in connectivity would be expected.
- For routes with high frequencies, a reduction in the number of flights may not be a major issue from a connectivity point of view, as a potential reduction of flights by 10% would have a marginal effect only on travellers' choice.

The taxes on the supply of fuel, as defined in this study, in principle apply to all carriers operating intra-EEA routes. As described in Section 3, the agreements (whether comprehensive air transport agreements or bilateral agreements) with some third countries include exemptions for their carriers from fuel taxes on intra-EU flights (and nearly all of them include exemptions for flights between the

[98] Fuel efficiency is expressed as fuel consumption per revenue tonne-km, with a passenger and luggage considered to have an average mass of 100kg, to enable passenger and freight transport to be combined

EU and EFTA/EEA States, considered as extra-EU under the agreements). The number of intra-EEA flights flown by such carriers (with the exception of cargo-only flights, which are excluded from the fuel tax) is very small – as noted in section 4.1.1, in 2016 around 1.2% of fuel used in intra-EEA passenger flights was used by non-EEA carriers. The main reasons for this situation are:

1. In fewer cases do international agreements grant intra-EU traffic rights for cargo than passengers;
2. typically, different aircraft are used for long haul and short haul operations, making it less economically beneficial for an airline to (for example) follow a transatlantic flight with an intra-EU connection under the 5th freedom rights granted to US carriers under the EU-US agreement.

Nevertheless, the situation may evolve if the introduction of taxes increases the difference in the cost base for EU and foreign (in this case US) operators; such an evolution could also be made easier by the market deployment of the new generation of single aisle aircraft (e.g. Airbus A321 XLR) capable of operating transatlantic flights. Therefore, it cannot be excluded that a tax on fuel supplied for intra-EEA flights would have a significant direct impact on competition between airlines, although this impact will probably be smaller than in the case of cargo, and would be limited to certain high-volume intra-EU routes and routes between the EU and EEA/EFTA States.

Overall, there may be some potential impacts on the competitiveness of EEA carriers with respect to (i) non-EEA carriers and (ii) other EEA carriers depending on the network of routes they serve. On a given route between the EEA and a third country, EEA carriers could be at a disadvantage *vis-à-vis* non-EEA carriers. Indeed, non-EEA carriers would also serve their 'home' market, on which they may bear a lower tax burden than EEA carriers would in their home market (intra-EEA flights). That might improve the overall profitability of non-EEA carriers, allowing them to offer lower fares on this route on which they competes with EEA carriers. This impact could be offset slightly by the EEA carriers adopting more fuel efficient aircraft (in the event that they fly the same types of aircraft on their intra-EEA routes and those on which they compete with the third country carriers), reducing their fuel consumption and, hence, their operating costs. On the other hand, EEA carriers are likely to have an advantage compared to non-EEA carriers in their EEA home market, notably thanks to their brand recognition, loyalty programs and intra-EEA connectivity. On a given intra-EEA route, EEA carriers that serve both intra-EEA and extra-EEA routes compared to those that serve only intra-EEA routes might have a better overall profitability than EEA carriers that serve only intra-EEA routes, assuming that the lack of tax on the extra-EEA routes would give an overall advantage in profitability to carriers that operate on both sets of routes.

Finally, in relation to fuel taxation of intra-EEA flights, there could be competitiveness concerns related to the issue of 'hub switching'[99], with (i) passengers travelling with origin in the EEA and destination outside the EEA with a connection in the EEA or (ii) passengers travelling with origin outside the EEA and destination in the EEA with a connection in the EEA. These passengers may choose to travel via non-EEA hubs to avoid the more expensive intra-EEA segment resulting from the fuel tax under discussion in this section. These would mostly affect indirect journeys between the EEA and a third-country, as for intra-EEA indirect travels, there are not many convenient non-EEA hubs that could compete effectively with EEA hubs on intra-EEA indirect travels – London Heathrow (and other London airports) being an exception where such intra-EEA travel via an non-EEA hub might be as convenient as using an EEA hub for many intra-EEA trips[100]. This could mean that, on a given route between an airport in the EEA and an airport outside the EEA, air carriers offering flights with a connection in the EEA (and therefore subjected to a fuel tax on the intra-EEA section of the journey) would be at a competitive disadvantage compared to air carriers offering flights via a non-EEA hub that are not subjected to a fuel tax. On indirect journeys between the EEA and a third country, the risk of hub switching would be likely to affect legacy air carriers more than LCCs, as legacy air carriers operate indirect flights via their EEA hub. By contrast, LCCs do not operate under the hub-and-spoke

[99] Hub switching is also a concern in relation to ticket taxes. This is further discussed in sections 6.3.4 and 6.5.1.3.
[100] For example, a trip from Stockholm to Lisbon would be shorter via Heathrow (3,030km) than via Frankfurt (3,101km).

model with indirect flights via an EEA hub, but operate direct flights between an EEA airport and a non-EEA airport. Policy package 1 does not foresee the taxation of extra-EEA flights (except for flights between the EEA and Morocco and between the EEA and the UK in the sensitivity case in section 6.2.7.6). Therefore, LCCs operating direct extra-EEA flights would not be subjected to fuel taxation. As a result, on a given route between an EEA airport and an extra-EEA airport, LCCs would not be at a competitive disadvantage compared to air carriers offering flights via a non-EEA hub.

It is not possible, however, to estimate the overall impacts and other factors such as capacity at extra-EEA hubs or passenger preferences would also play a role. For example, London airports have limited capacity available and airlines operating there might not have the possibility to expand their use as hubs to pull passengers away from EEA hubs. For long-haul travel, there is already a trend of traffic shift to non-EEA hubs (e.g. those in the Middle East[101]), and a fuel tax could be just another factor supporting that trend.

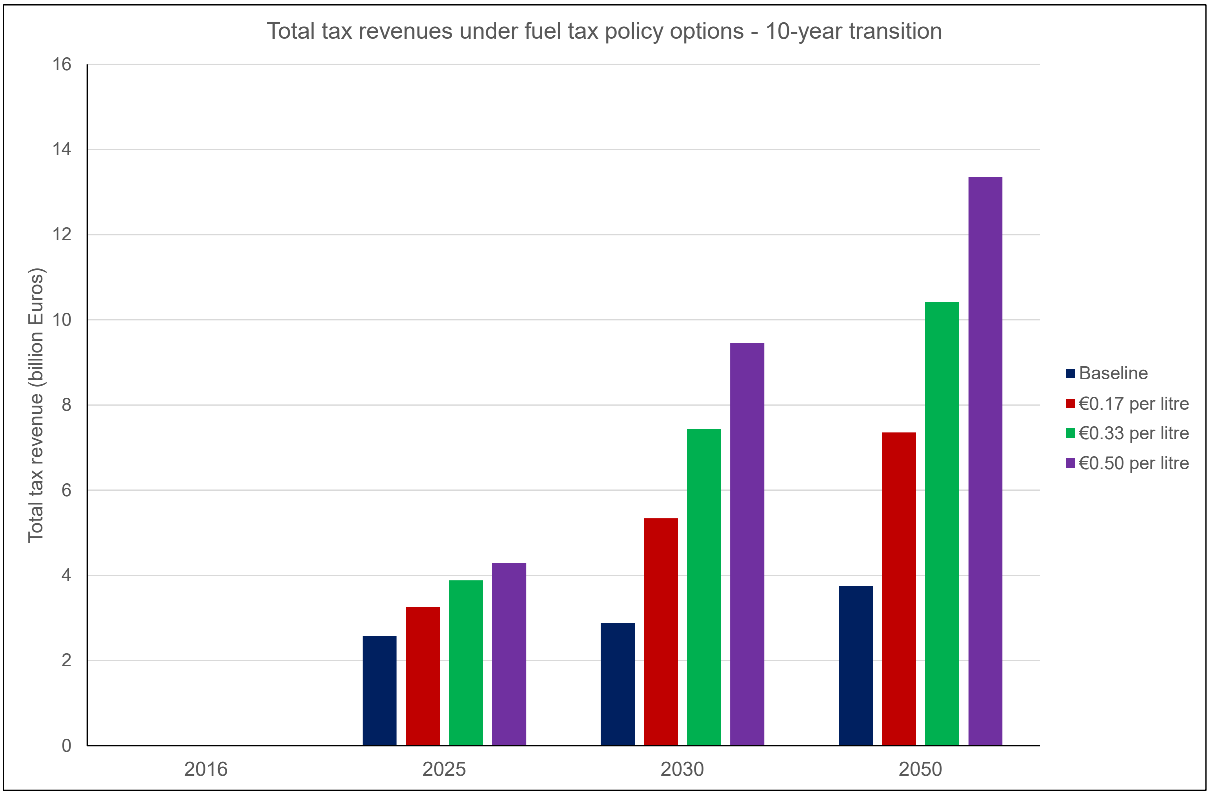
Clearly, there are many other commercial aspects that influence a carrier's profitability and competitiveness on a given route (related to the details of the routes it serves, home airports, etc.) and the overall impacts on competitiveness would be determined by the conjugation of those factors.

6.2.5 Impacts on revenues

Figure 6-4 shows the total revenues from the fuel and ticket taxes[102] collected by the Member States on intra-EEA flights for the different fuel tax policy options. As was noted above, these results have been calculated with the assumption that any ticket taxes existing at the national level and included in the baseline continue to apply upon the implementation of a fuel tax. However, the rate of the existing ticket taxes is held constant in future years, and Member States with no implemented ticket taxes as of 2020 are assumed not to introduce a national ticket tax in the future. Therefore, the tax revenues shown for the baseline are all from national ticket taxes, while the revenues from the fuel tax options are the combination of the national ticket taxes and the fuel taxes. It should be noted that the existing ticket taxes may apply to both intra-EEA and extra-EEA flights (with different rates based on flight distance, for example); the ticket tax revenues used to develop Figure 6-4 include only those from intra-EEA flights.

[101] For example, it has been estimated that between 2010 and 2015 20% of the passengers travelling between the EU and India started to use carriers from the Middle Eastern in detriment of EU carriers (de Vergnes, 2017).
[102] Note that there are other taxes and charges placed on aviation, such as airport charges, that are not included in the tax revenues shown here

Figure 6-4: Total tax revenues (ticket tax and fuel tax) under different fuel tax options for intra-EEA flights, with the national ticket taxes retained when the fuel tax is implemented



By 2050, the €0.17 per litre tax option approximately doubles the tax revenue compared to the baseline, while under the other two tax rates, the revenue collected increases to €10.4 billion and €13.4 billion for the €0.33 and €0.50 per litre tax rates, respectively.

The total tax revenue collected from the fuel tax under the three tax rates is presented, for individual years and the cumulative total to 2050 (derived by simple linear interpolation applied to the results for the three analysis years) in Table 6-7.

Table 6-7: Fuel tax revenues in 2025, 2030 and 2050, plus cumulative tax revenue raised to 2050 (€ billions)

	€0.17 per litre fuel tax	€0.33 per litre fuel tax	€0.50 per litre fuel tax
2025	€ 0.7	€ 1.4	€ 2.1
2030	€ 2.6	€ 4.8	€ 6.9
2050	€ 3.8	€ 7.0	€ 10.1
Cumulative to 2050	**€ 74.5**	**€ 137.8**	**€ 199.0**

The breakdown of the increase in tax revenue by Member State (i.e. the difference between the tax revenue under the policy case and the baseline case), plus Norway and Iceland (as the EEA countries with aviation activity) for 2030 and 2050 under the €0.33 per litre fuel tax option is shown in Table 6-8. It should be noted that as this shows the increase in tax revenue relative to the baseline, the total differs from that shown in Table 6-7 as it is affected by the reduction in ticket tax revenues due to the reduction in demand. Also shown in Table 6-8 are the percentages of the total increase in tax revenue by Member State; for example, in 2050, Spain collects an additional €1,302.6 in tax revenues, which is 19.5% of the total increase in tax revenues across the EEA.

Table 6-8: Changes in tax revenue from the baseline for the €0.33 per litre fuel tax on intra-EEA flights in 2050 (values show the increase in revenue for each MS relative to the baseline in millions of Euros)

Member State	Change in tax revenue relative to baseline (€ millions)		Percentage of total change in tax revenue	
	2030	2050	2030	2050
AT	84.1	124.5	1.8%	1.9%
BE	132.3	194.6	2.9%	2.9%
BG	43.2	69.0	0.9%	1.0%
CZ	37.8	53.8	0.8%	0.8%
CY	32.7	56.2	0.7%	0.8%
DE	628.5	957.0	13.8%	14.4%
DK	134.4	184.4	2.9%	2.8%
EE	13.1	20.5	0.3%	0.3%
ES	910.8	1,302.6	20.0%	19.5%
EL	203.7	308.3	4.5%	4.6%
FI	113.2	162.8	2.5%	2.4%
FR	410.5	591.3	9.0%	8.9%
HR	39.9	63.8	0.9%	1.0%
HU	43.3	67.6	0.9%	1.0%
IE	86.6	139.7	1.9%	2.1%
IT	563.4	826.9	12.4%	12.4%
LV	16.3	23.8	0.4%	0.4%
LT	14.8	21.4	0.3%	0.3%
LU	15.7	23.2	0.3%	0.3%
MT	33.2	48.1	0.7%	0.7%
NL	185.9	259.2	4.1%	3.9%
PL	119.4	174.4	2.6%	2.6%
PT	182.4	242.4	4.0%	3.6%
RO	83.4	128.6	1.8%	1.9%
SE	184.9	278.5	4.1%	4.2%
SI	3.7	6.0	0.1%	0.1%
SK	6.9	9.9	0.2%	0.1%
NO	195.4	275.5	4.3%	4.1%
IS	38.4	55.1	0.8%	0.8%
Total	**4,558.0**	**6,668.7**	**100%**	**100%**

In both years shown, the Member States with the greatest increases in tax revenues (relative to the baseline) are Spain, Germany and Italy. These same Member States also have the highest share of the fuel tax raised, (at 20%, 14% and 12%, respectively), as they have the highest share of the intra-EEA air traffic. Overall, combining both the fuel tax and the existing ticket taxes, Germany has the highest total revenue in 2050 at €5.5 billion, approximately 40% of all taxes raised.

6.2.6 Macroeconomic and other transport mode impacts

Because of the additional complexity associated with the macroeconomic modelling, the GINFORS-E model was applied to a smaller number of policy options and sub-options than the aviation sector AERO-MS model. For the fuel tax policy option, only the €0.33 per litre fuel tax option was analysed. The following results show the impacts on the EU-27 for this fuel tax option with a 10-year transition (Table 6-9) and with immediate implementation (Table 6-10). More details on the different indicators from the GINFORS-E model are given in Annex A3.2. Following the reduction in air transport demand due to the fuel tax, there are some increases in road and rail transport, while shipping transport also decreases slightly. With the lower air transport performance, employment in the sector also decreases. The fuel tax leads to an EU-wide revenue of € 5.5 billion in 2025, which increases to € 6.5 billion by 2050. However, due to the slightly lower economic output (GDP), the revenue from other taxes also decreases slightly in the long term. This is mainly due to the assumption of the use of tax revenues for debt reduction. The price level as expressed by the GDP deflator is slightly higher due to the fuel taxes. Energy consumption and CO_2 emissions decline somewhat due to the fuel tax and the change in transport volume. As the share of petroleum products in the total energy consumption decreases very slightly (as demand shifts to rail and land transport with, at least for rail, some level of electrification), CO_2 emissions react minimally stronger than energy consumption. The reduction in emissions from international flights (international aviation bunkers) is much higher. This percentage impact slightly reduces over time.

Table 6-9: Overview of macroeconomic results for EU27 for €0.33 fuel tax with 10-year transition period

EU27		€0.33 per litre fuel tax, 10-year transition		
Topic/Indicator	Unit	2025	2030	2050
Demand effects on other modes of transport				
Land transport and transport via pipelines, output at constant prices	% change	0.09%	0.24%	0.18%
Rail passengers transported (% change in pkm)	% change	0.08%	0.23%	0.17%
Water transport, output at constant prices	% change	-0.05%	-0.16%	-0.17%
Effects on employment in the aviation and transport sector				
Air transport, number of persons engaged	% change	-0.35%	-1.03%	-1.08%
Transport, total, number of persons engaged	% change	0.01%	0.02%	0.00%
Tax revenue effects				
Air transport, revenue from fuel tax	Billion €	1.2	4.3	6.3
Net indirect taxes	% change	0.00%	0.01%	-0.01%
Direct taxes	% change	-0.01%	-0.03%	-0.04%

Tax revenues, total (incl. new aviation taxes)	% change	0.03%	0.10%	0.09%
Second-order macroeconomic effects				
GDP at constant prices	% change	-0.01%	-0.03%	-0.03%
GDP deflator[103]	% change	0.01%	0.04%	0.03%
Employment, total, number of persons engaged	% change	0.00%	0.00%	0.00%
Employment , manufacturing, number of persons engaged	% change	0.00%	0.00%	0.00%
Energy use and CO_2 emissions				
Transport (non-aviation) energy use	% change	0.07%	0.21%	0.18%
Aviation energy use	% change	-3.50%	-9.88%	-10.29%
Transport (inc. aviation) energy use	% change	-0.15%	-0.50%	-0.76%
Transport (non-aviation) CO_2 emissions	Change (Mt)	0.5	1.3	0.9
	% change	0.07%	0.21%	0.19%
Aviation CO_2 emissions	Change (Mt)	-1.9	-5.7	-6.1
	% change	-3.50%	-9.88%	-10.29%
Total (all sectors) energy use	Change (PJ)	-18.3	-57.7	-73.9
	% change	-0.03%	-0.10%	-0.15%
Total (all sectors) CO_2 emissions	Change (Mt)	-1.4	-4.5	-5.3
	% change	-0.05%	-0.19%	-0.30%

Table 6-10: Overview of macroeconomic results for EU27 for €0.33 fuel tax with immediate implementation

EU27		€0.33 per litre fuel tax, immediate implementation		
Topic/Indicator	Unit	2025	2030	2050
Demand effects on other modes of transport				
Land transport and transport via pipelines, output at constant prices	% change	0.41%	0.33%	0.19%
Rail passengers transported (% change in pkm)	% change	0.38%	0.31%	0.17%
Water transport, output at constant prices	% change	-0.24%	-0.23%	-0.18%
Effects on employment in the aviation and transport sector				
Air transport, number of persons engaged	% change	-1.54%	-1.43%	-1.13%

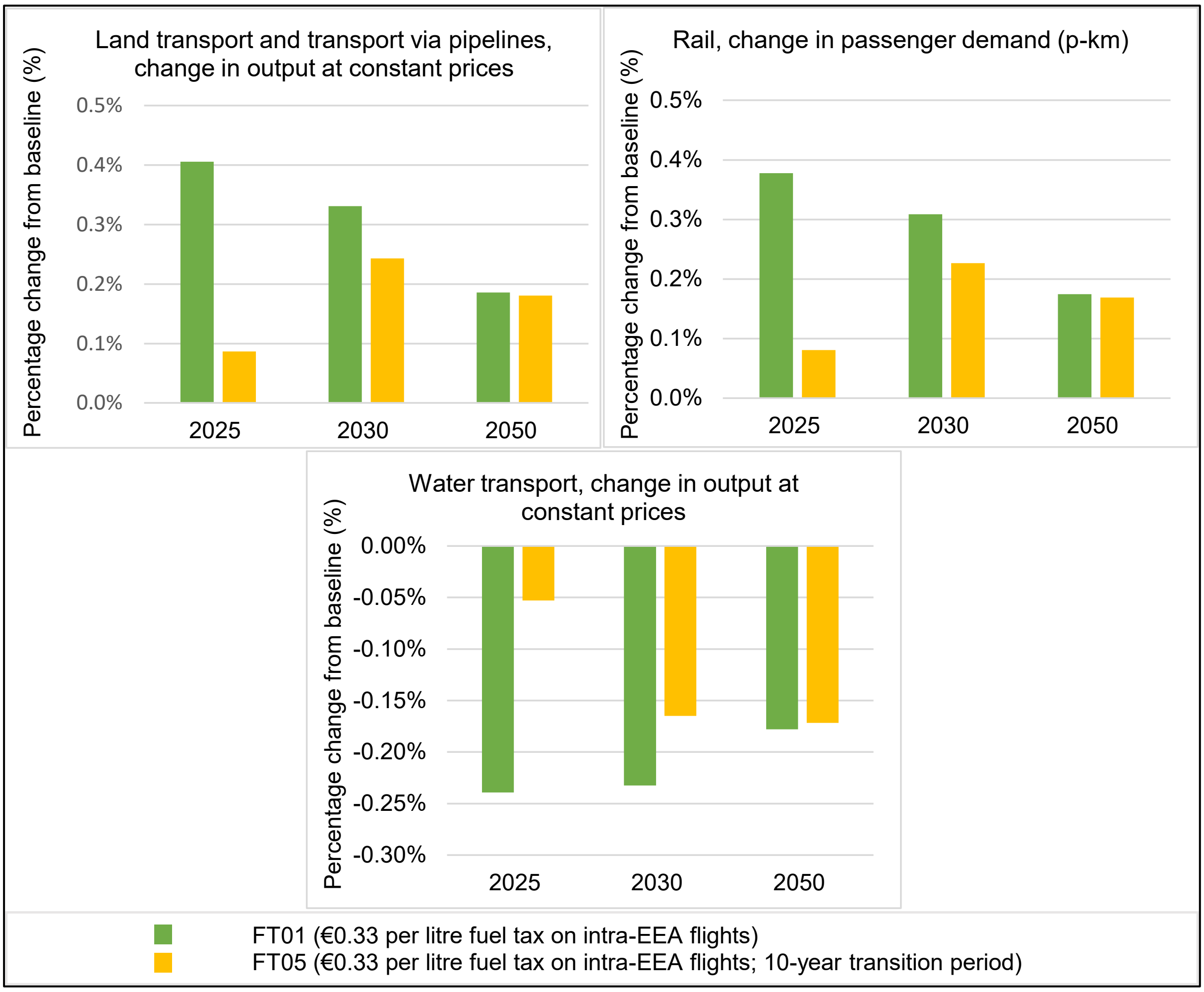
[103] The GDP deflator, or GDP price deflator, measures the changes in prices for all goods and services in an economy, relative to a reference year (2010 for this modelling).

Transport, total, number of persons engaged	% change	0.05%	0.03%	0.00%
Tax revenue effects				
Air transport, revenue from new taxes	Billion €	5.5	5.9	6.5
Other taxes, less subsidies on intermediate and final products	% change	0.03%	0.00%	-0.01%
Current taxes on income, wealth, etc.	% change	-0.04%	-0.05%	-0.04%
Tax revenues, total (incl. new aviation taxes)	% change	0.15%	0.13%	0.09%
Second-order macroeconomic effects				
GDP at constant prices	% change	-0.04%	-0.05%	-0.04%
GDP deflator	% change	0.05%	0.05%	0.03%
Employment, total, number of persons engaged	% change	0.01%	0.00%	0.00%
Employment , manufacturing, number of persons engaged	% change	0.01%	0.00%	0.00%
Energy use and CO_2 emissions				
Transport (non-aviation) energy use	% change	0.33%	0.28%	0.19%
Transport (non-aviation) CO_2 emissions	% change	0.33%	0.28%	0.19%
Aviation CO_2 emissions	% change	-14.86%	-13.41%	-10.29%

In addition to the transport-specific results, Table 6-9 includes the impacts on energy use and CO_2 emissions for all sectors. While the results for the transport modes (aviation and non-aviation) show very similar percentage changes in energy use and CO_2 emissions, the total for all sectors (while smaller as percentage changes) shows percentage changes in emissions approximately twice those for energy use (for example, in Table 6-9, for 2030, the total (all sectors) energy use reduces by 0.10%, while the CO_2 emissions reduce by 0.19%). This illustrates an effect whereby, as a result of the reduction in demand in the aviation sector, some demand switches to other modes (such as road and rail) in which there is a greater use of electricity and biofuels. This changes the relationship between emissions and energy demand, leading to the greater reduction in emissions.

The following figures show the impacts of the two fuel tax scenarios in greater detail. Demand for land transport will increase due to the fuel tax on intra-EEA aviation. This effect is apparent for rail transport. The results show only very minor differences in the impacts on road and rail transport. However, there are very significant differences between land transport (including rail), aviation and water transport. The activity in land transport is much higher than in air transport, so that percentage change is lower. The small decrease in water transport can be attributed to ship cruises that rely on feeder services through (in the tax cases more expensive) air transportation. Water transport output in the EU corresponds to around 20% of land transport output, with around 80% of water transport being freight transport, which is largely unaffected by the changes in demand for air transport. Although the impact on the number of passengers flying to the point of embarkation may be small, the value of the cruise (and hence the reduction in the output value of the sector) is slightly more significant. Conversely, it might be considered that the reduction in air transport in the EU could reduce the capacity for transporting freight on passenger flights and hence lead to an increase in demand for waterborne freight transport. There are two reasons why this effect may, in fact, be small. Firstly, the types of aircraft used for the majority of intra-EEA passenger services (regional jets and single-aisle airliners) have only a limited capacity for belly-hold freight. Secondly, the types of freight carried by air tend to be different (higher value, possibly perishable) than those carried by waterborne vessels, so the scope for transfer from one mode to the other is likely to be limited.

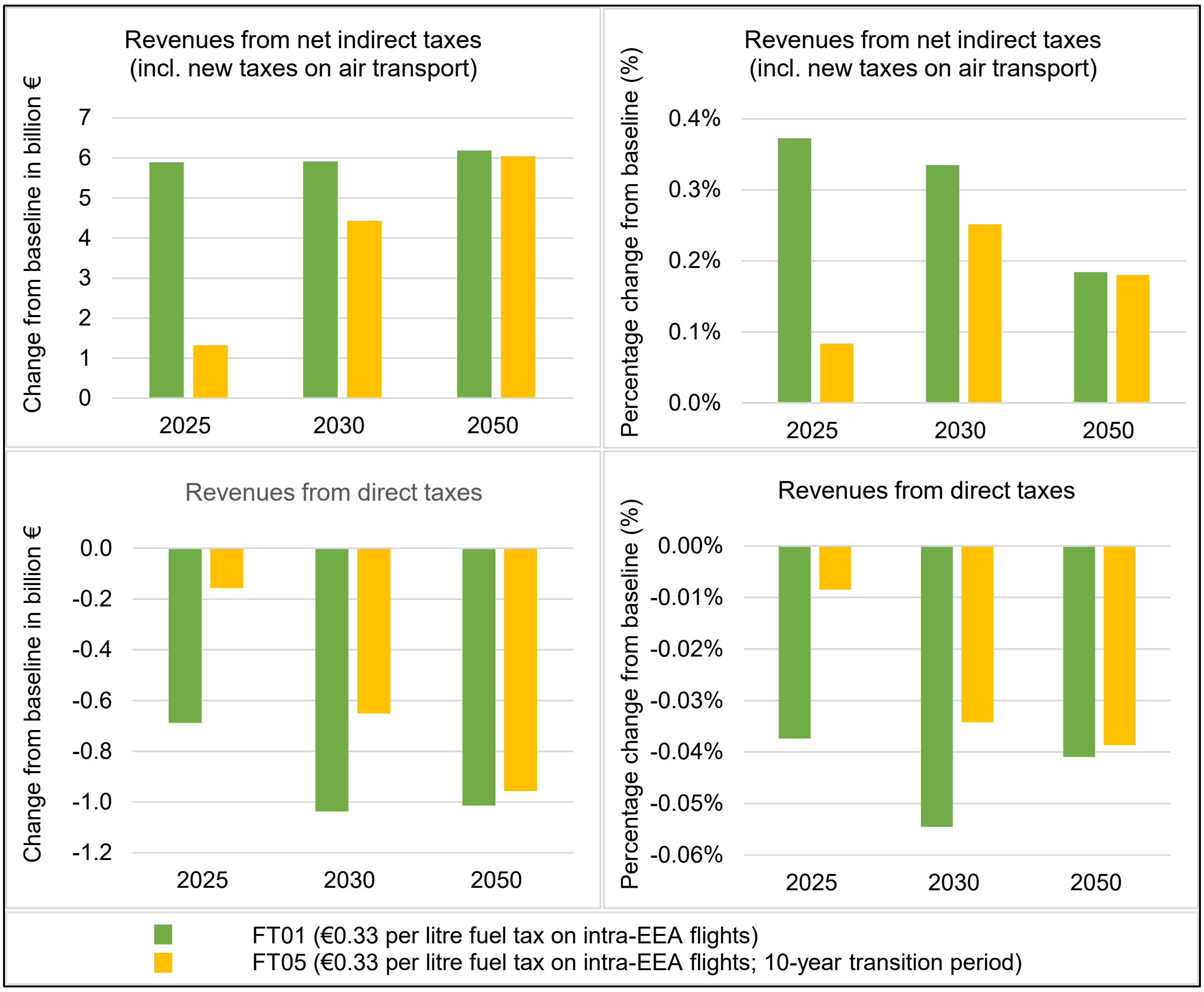
Figure 6-5: Fuel tax scenarios - demand effects on other modes of transport in the EU27



The effects on tax revenues are shown in Figure 6-6. Fuel tax revenues are taken directly from the AERO-MS results. The other variables are calculated in GINFORS-E. Indirect taxes, which include taxes on aviation, increase as a result of aviation taxation. In contrast, direct taxes (on income and wealth) decrease slightly because the economic output (GDP) decreases due to the assumption that the revenue from the fuel tax is used to reduce the national debt.

Over time, fuel tax revenues remain largely constant in the option with immediate implementation (FT01). Since ad valorem taxes, such as VAT, increase faster than the revenue from volume taxes such as the fuel tax, the percentage total effect becomes significantly smaller over time. Again, in the case of the 10-year transition option (FT05), the trend starts lower but increases over time.

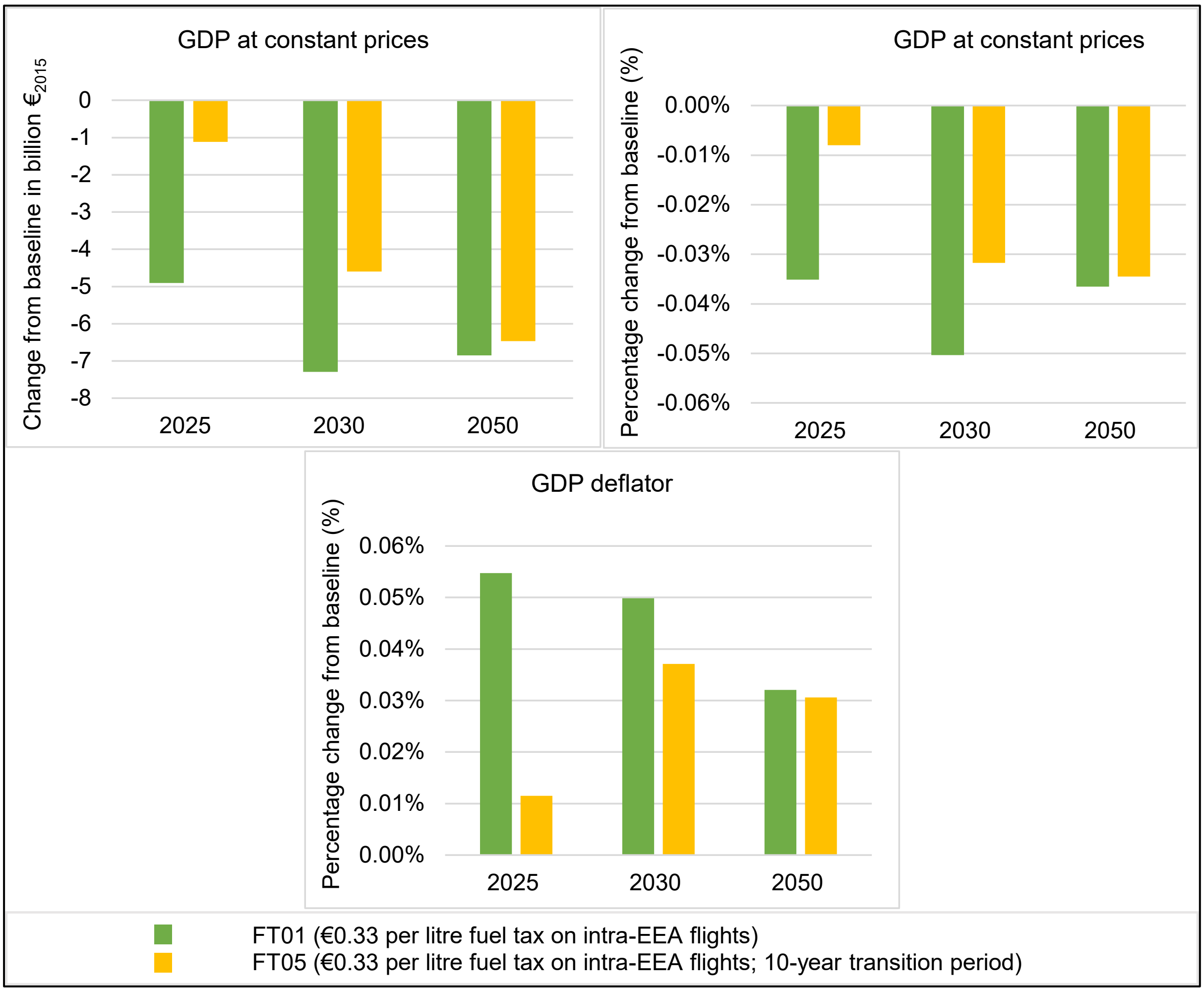
Figure 6-6: Fuel tax scenarios - effects on tax revenues in the EU27



The changes in tax revenue (from the baseline) in 2025 are a very close match to the similar tax revenue changes calculated by AERO-MS (Figure 6-4); in the subsequent years, the changes in revenue from the macroeconomic analysis become slightly lower than those in the aviation sector, as the changes in demand affect other industries, reducing the taxes collected from them.

At the macroeconomic level (Figure 6-7), the fuel tax on air transport leads to a slight increase in the price level (GDP deflator). It is assumed that 100% of the cost increases are added to the prices (full cost pass-through). As the additional tax revenues are not recycled to reduce prices through other tax cuts or subsidies, but remain in the budget for debt reduction, prices do not fall elsewhere in the economy. This assumed use of the tax revenues is also the main reason for the slight negative effect on GDP.

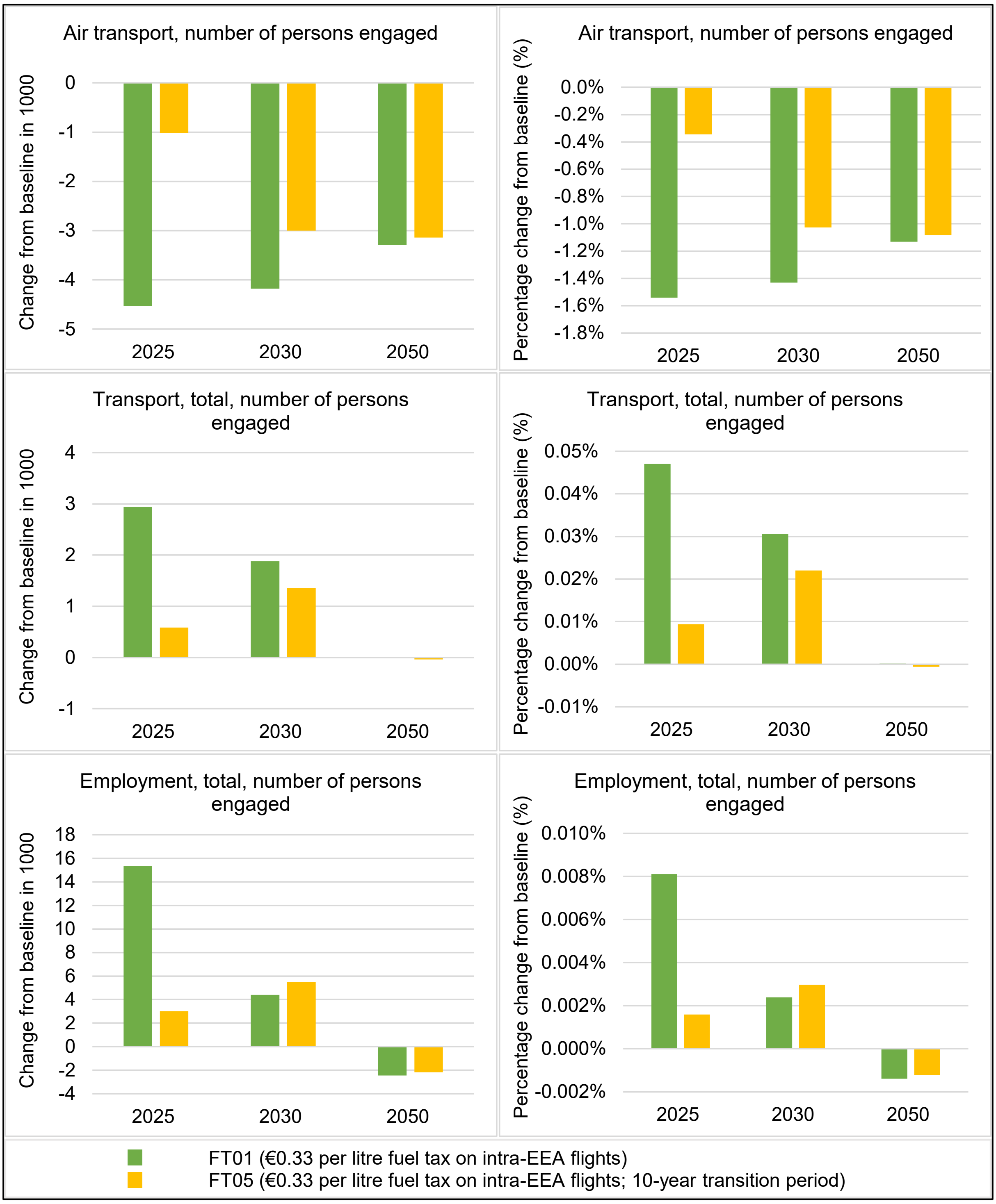
Figure 6-7: Fuel tax scenarios – macro-economic effects in EU27



The impact on employment in the air transport sector (Figure 6-8) is smaller compared to the impact on transported passengers and freight due to wage adjustments and labour demand elasticities of output smaller than 1. In the FT01 simulation (immediate implementation) for example, for the EU27 a decline of employment by 1.5% is projected for this sector in 2025, while the AERO-MS results for departing passenger kilometres show an impact of -5.3%.

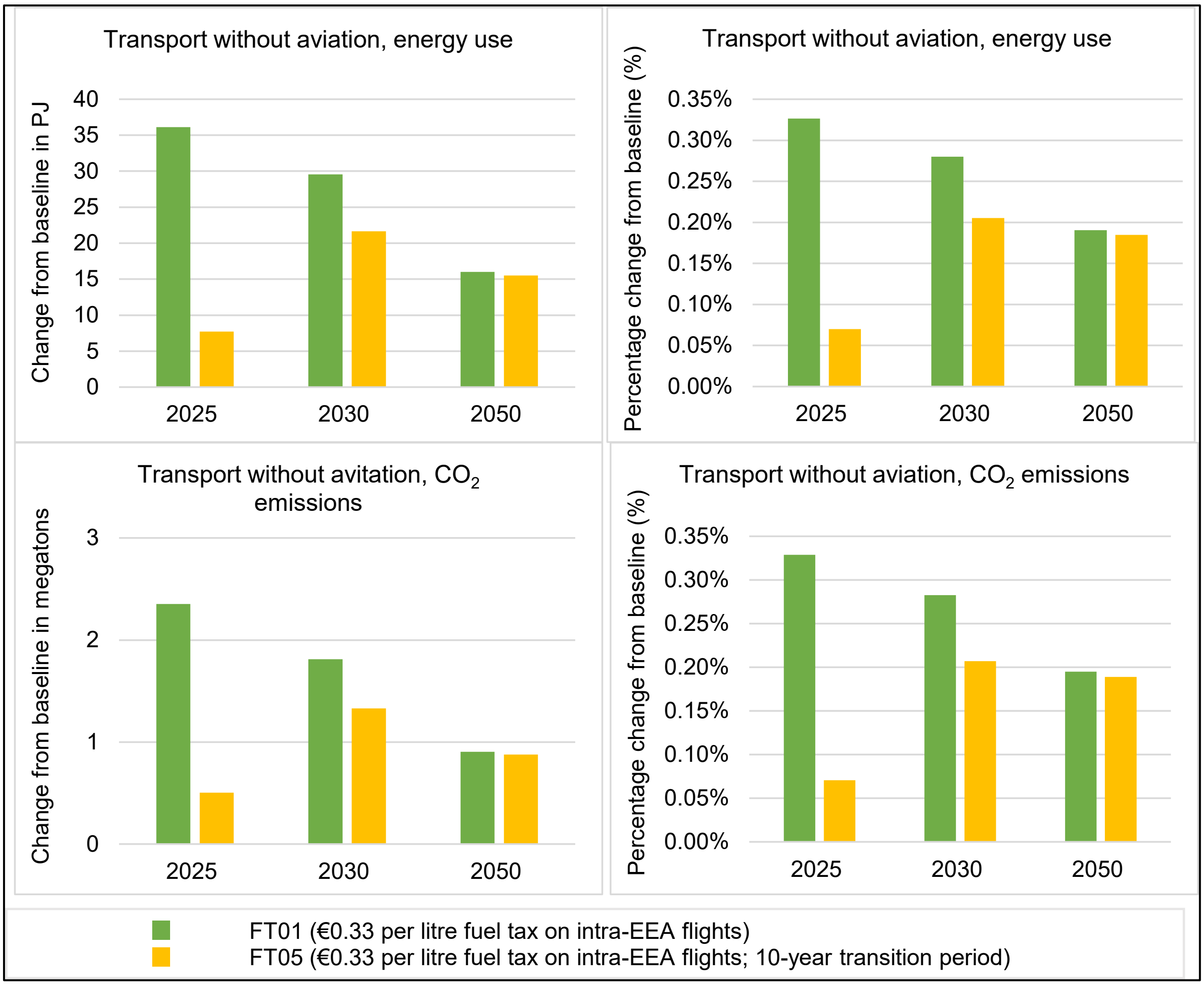
Under the immediate implementation option for the €0.33 per litre fuel tax, and the consequent reduced demand, employment in the air transport sector is in the order of 3 to 4.5 thousand, or 1% and 1.5%, lower than in the reference. Under the 10-year transition option (FT05), the effect is significantly smaller only in 2025, when the fuel tax is still low. The reductions in employment in the aviation sector are offset by increases in other transport sectors, leading to a small overall increase, at least in the early years, in total employment in the transport sector. When interpreting the effect on total employment, it should be borne in mind that wages in land transport and waterborne transport are lower than in air transport. The shift to road and rail transport is more likely to create additional jobs, which are, however, less well paid. This is offset slightly by the reduction in employment in waterborne transport resulting in the reduction in demand there. The effects on the overall total employment are greater than just in aviation; however, they remain very low in overall percentage terms. They are determined on the one hand by these substitution effects and on the other hand by the lower GDP.

Figure 6-8: Fuel tax scenarios – employment effects in EU27



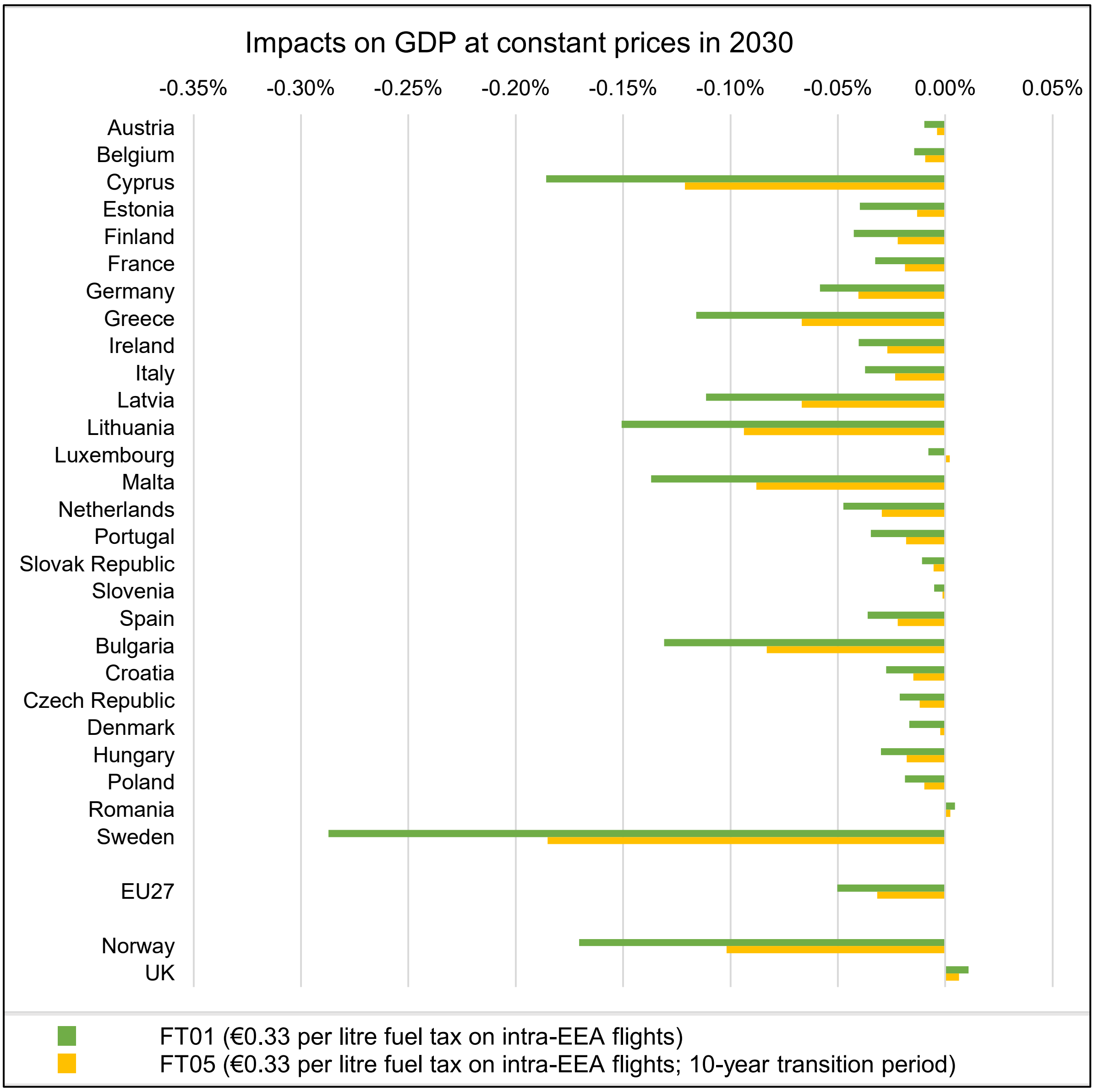
The increased demand for road and rail transport, resulting from the reduction in demand for aviation, leads to increases in the energy consumption and emissions from those other modes (Figure 6-9). Under an immediate implementation of the full tax rate, the increase in emissions from land-based transport in 2025 is approximately 2.3 million tonnes; this can be compared to the reduction in emissions from aviation of 8.0 million tonnes (derived by multiplying the difference in fuel consumption shown in Figure 6-3 by 3.16), giving an overall reduction in emissions of approximately 5.7 million tonnes CO_2. By 2050, the increase in emissions from other modes has reduced to approximately 1.0 million tonnes, while the reduction in emissions from aviation has reduced to 6.3 million tonnes, giving an overall saving of 5.3 million tonnes CO_2. Under the 10 year transition period for the fuel tax, the changes in emissions in 2025 are significantly smaller (giving an overall reduction in emissions of 0.1 million tonnes); by 2050, the results of the two options are the same.

Figure 6-9: Fuel tax scenarios – impacts on energy consumption and emissions in EU27



The individual EU member states are mostly slightly negatively affected. However, there are visible differences in the effects on GDP, which are shown in Figure 6-10 for the year 2030. In particular, some countries in Eastern Europe, the Mediterranean region and Scandinavia show above-average effects on GDP. Ultimately, the importance of air transport for the countries varies. Lower tax rates in the 10-year transition option (FT05) also lead to lower effects. The results for the UK are included in Figure 6-10; however, as the UK is outside the EEA, the implementation of a fuel tax for intra-EEA flights has a small positive impact on the UK GDP. It should be emphasised once again at this point that a fuel tax does not *per se* have to lead to negative macroeconomic effects.

Figure 6-10: Fuel tax scenarios – change in national GDP from baseline in constant prices



6.2.7 Sensitivity cases

As noted above, the previous results are all for the primary policy option, that of a fuel tax implemented for intra-EEA flights, with different tax rates. They also assume a 10-year transitional implementation, starting in 2024, and that existing national ticket taxes are retained when the fuel tax is implemented).

For this study, a number of different sensitivity studies have been performed, to investigate the effects of different assumptions (e.g. baseline scenario) or different tax options (alternative transition periods, national ticket taxes withdrawn when the fuel tax is implemented) on the impacts following the implementation of the fuel tax. This section describes the results of those sensitivity studies.

6.2.7.1 Low demand baseline

As noted in Section 5.1, there is considerable uncertainty regarding the future development of demand for air transport. Forecasts published in November 2020 by EUROCONTROL (EUROCONTROL, 2020) were used to develop an alternative baseline demand scenario with a delayed recovery to 2019 levels of demand (with that recovery being achieved by 2026) and a slower growth thereafter (as shown in Figure 5-2). This section presents the impacts of a fuel tax under this low demand sensitivity baseline and compares them to those under the primary baseline.

All results presented in this section are for a fuel tax of €0.33 per litre applied to fuel used on intra-EEA flights; results are presented for both an immediate implementation of the full tax rate in 2024 and for a transitional implementation over a 10-year period (starting in 2024)

Figure 6-11 shows the calculated passenger demand for intra-EEA flights under the fuel tax option (using both implementation approaches) under both the primary and sensitivity baselines, while Figure 6-12 shows the percentage change in demand (from the relevant baseline) due to the fuel tax options.

Figure 6-11: Passenger demand on intra-EEA flights under primary and sensitivity baselines, with €0.33 per litre fuel tax option

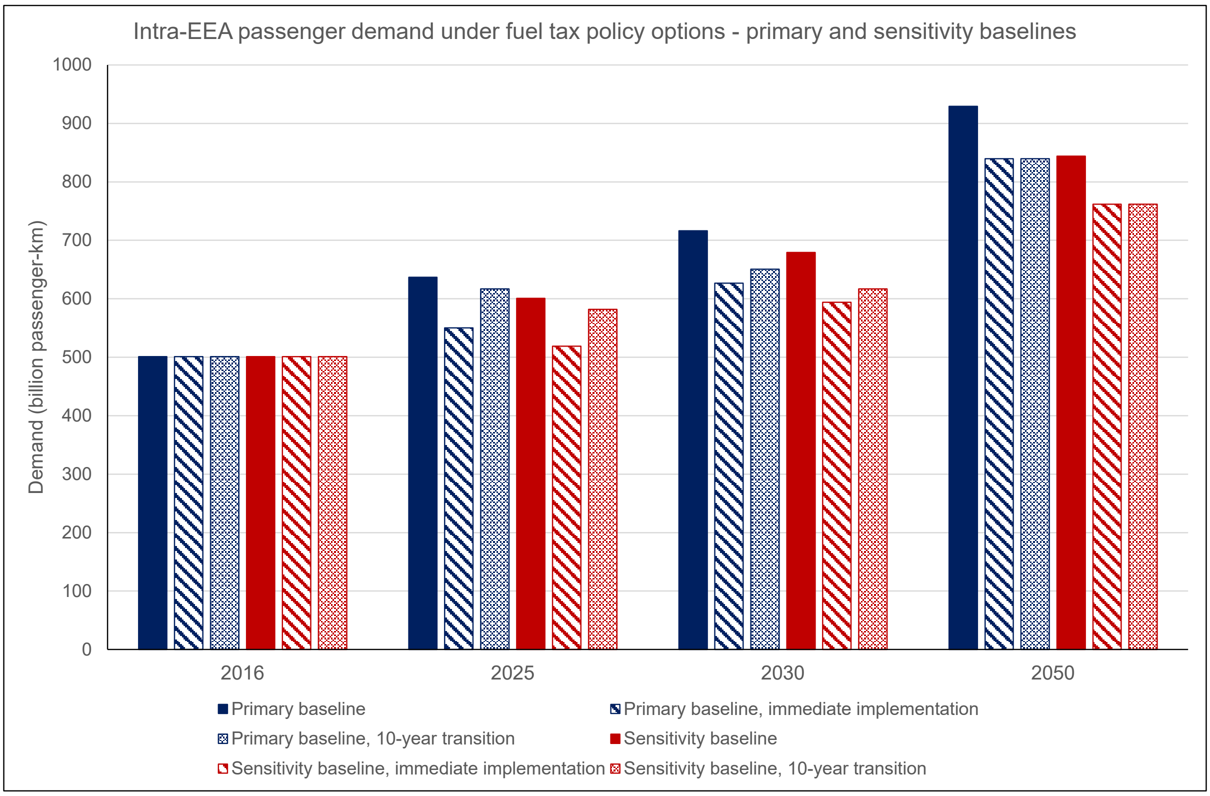
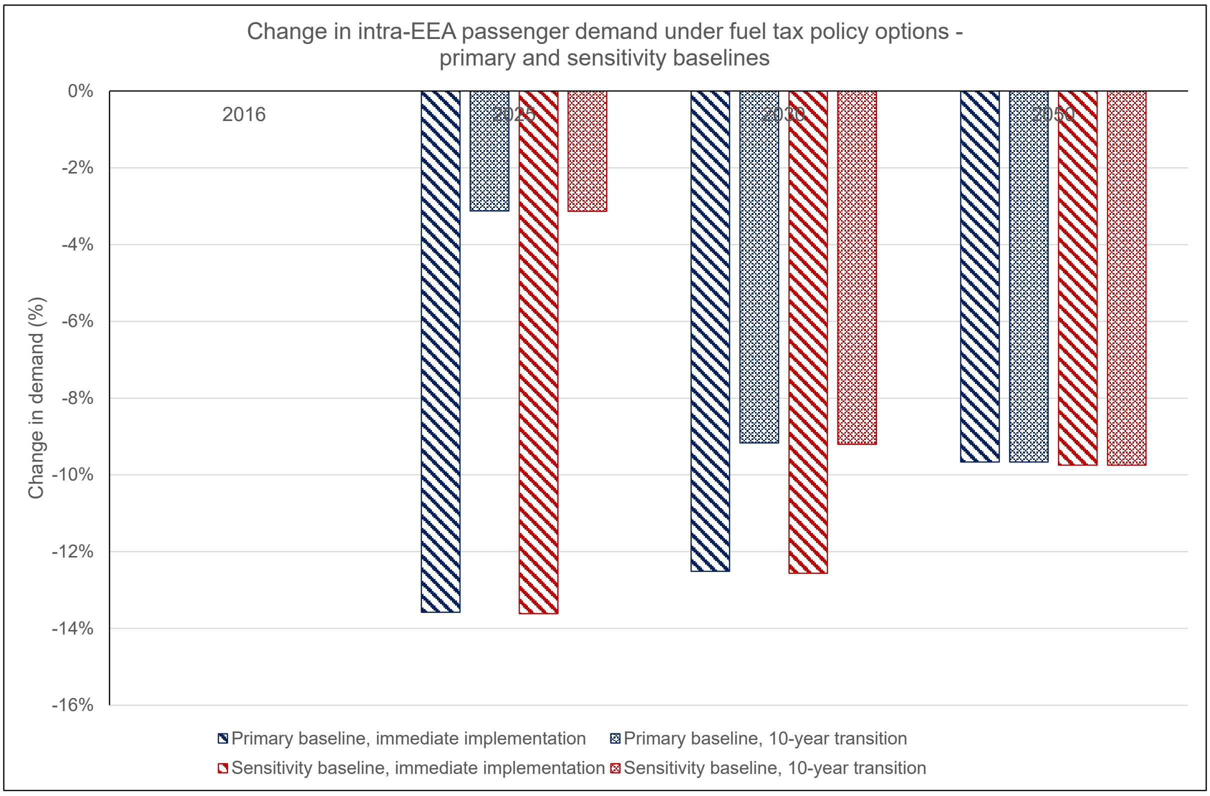


Figure 6-12: Change in passenger demand on intra-EEA flights (from baseline) under primary and sensitivity baselines, with €0.33 per litre fuel tax option



Under the sensitivity baseline, demand in 2050 is approximately 9% lower than under the primary baseline. The implementation of the fuel tax reduces demand under both baselines by very similar percentages, with the maximum percentage reduction being nearly 14% in 2025 when the full tax rate is implemented immediately. The impact of the tax is significantly less (in 2025) when it is implemented over a 10-year transition period, at about a 3% demand reduction. By 2050, the reduction in demand is approximately 10% relative to both baselines under each transition period.

The effects of the fuel tax on fuel consumption and tax revenue, under each baseline, are shown in Figure 6-13 and Figure 6-14.

Figure 6-13: Fuel consumption on intra-EEA flights under primary and sensitivity baselines, with €0.33 per litre fuel tax option

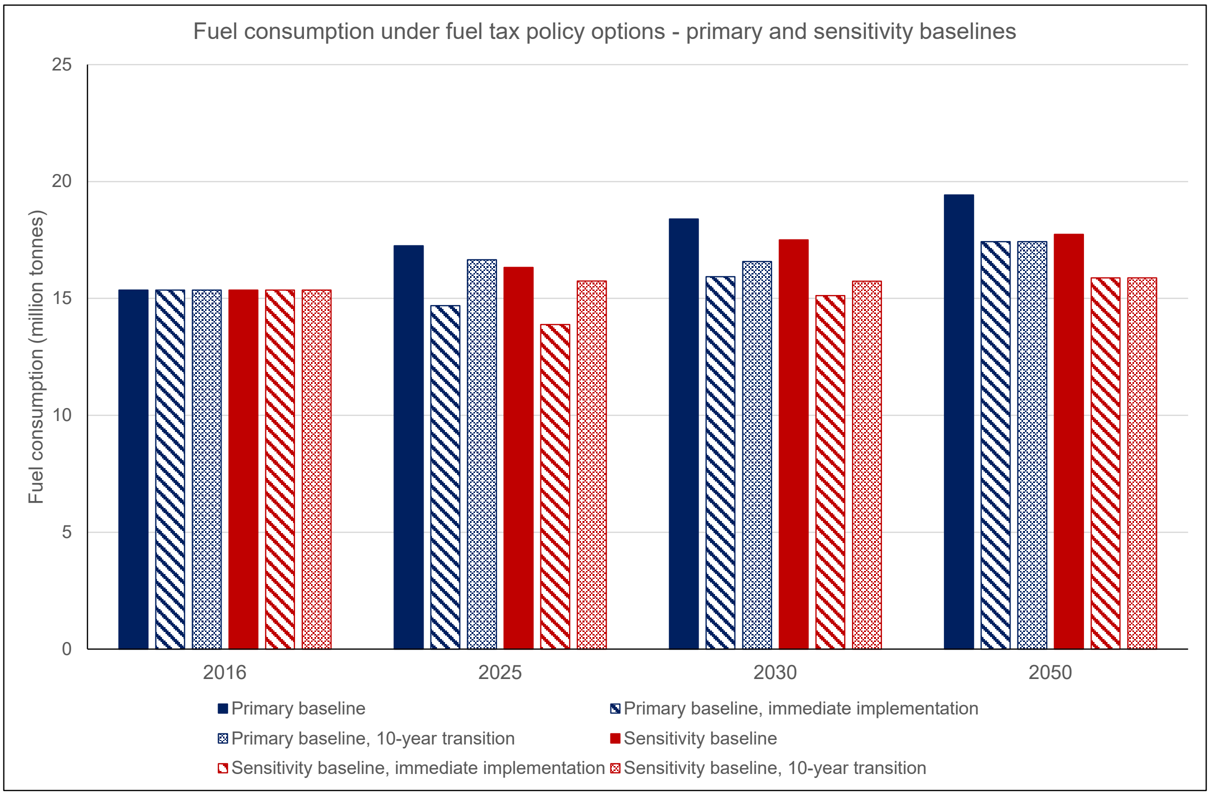
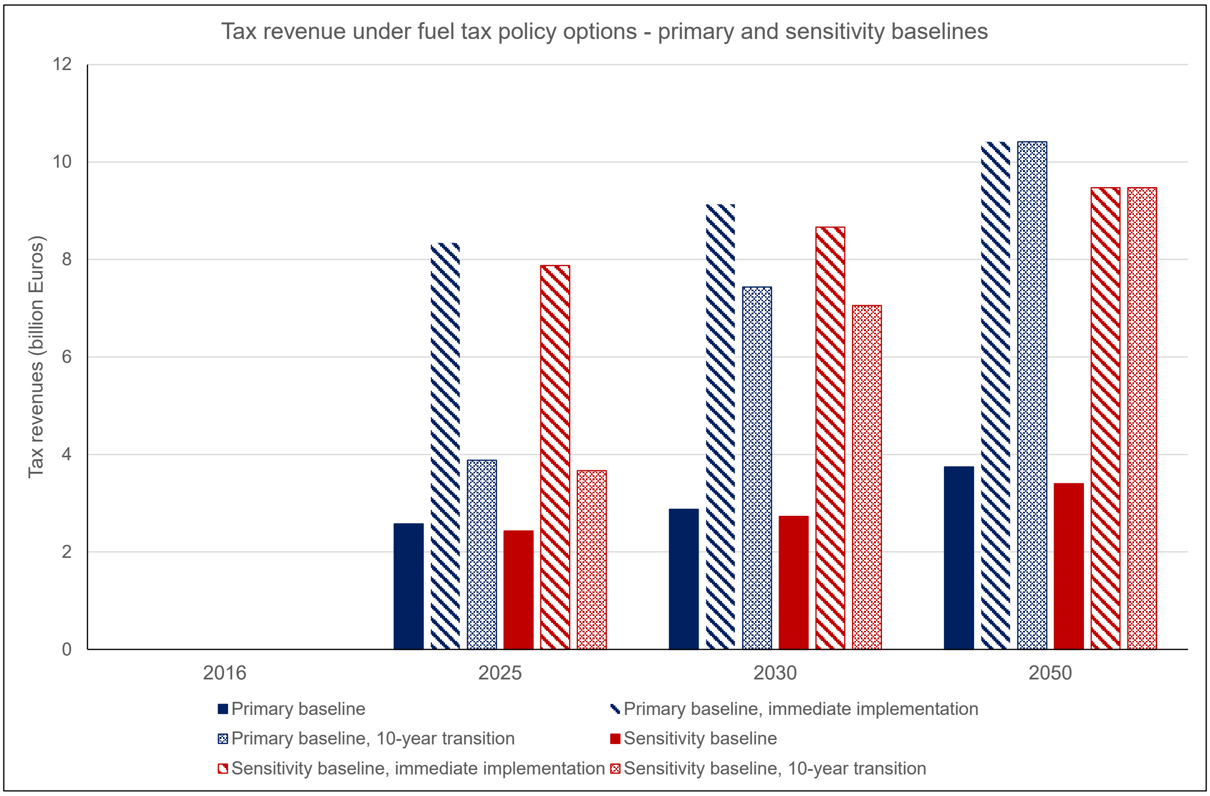


Figure 6-14: Total tax revenue under primary and sensitivity baselines, with €0.33 per litre fuel tax option



By 2050, the impact of the reduced demand under the sensitivity baseline on the fuel consumption is almost as great as the impact of the €0.33 per litre fuel tax. The fuel tax itself leads to very similar percentage reductions in fuel consumption relative to the respective baselines.

Under the sensitivity baseline, the tax revenues are about 5% lower in 2030 and about 9% lower in 2050 than they would be under the primary baseline.

6.2.7.2 Impact of blending obligation from ReFuelEU Aviation study alongside a fuel tax

In a parallel study, the European Commission has been considering policy options to encourage an increased production and consumption of sustainable aviation fuels (SAF) in the EU, known as the ReFuelEU Aviation study (European Commission, To be published). A sensitivity analysis has been performed to investigate the impact of a €0.33 per litre fuel tax alongside a blending mandate for SAF. The blending mandate definition was taken from one of the scenarios analysed by the ReFuelEU Aviation study, and was implemented in AERO-MS as an effective tax representing the price increase from the combination of the higher price for SAF and the fuel tax. Two options have been considered for the treatment of SAF under the fuel tax:

- SAF is zero-rated under the fuel tax;
- A fuel tax of 50% of that applied to conventional kerosene (giving a tax rate of €0.165 per litre) is applied to SAF.

The full fuel tax rate of €0.33 per litre is then applied to the conventional fuel portion of the blended fuel.

The assumed SAF uptake under the blending mandate, together with the effective prices, is shown in Table 6-11.

Table 6-11: Percentage SAF uptake under baseline and blending mandate and effective price increase over baseline fuel price

	2025	2030	2040	2050
Percentage SAF under baseline	0.0%	0.2%	1.2%	2.9%
Percentage SAF under blending mandate	2.0%	5.0%	32.0%	63.0%
Baseline fuel price (€/litre)[104]	€ 0.67	€ 0.82	€ 0.92	€ 1.00
Blend fuel price (€/litre)[105]	€ 0.69	€ 0.85	€ 1.12	€ 1.32
Effective price increase over baseline (including fuel tax) - biofuels zero-rated (€/litre)	€ 0.08	€ 0.25	€ 0.43	€ 0.45
Effective price increase over baseline (including fuel tax) - biofuels rated at 50% of conventional fuel (€/litre)	€ 0.08	€ 0.25	€ 0.48	€ 0.55

The price uplifts shown in Table 6-10 were applied to the calculation as effective tax rates, and the impacts on demand and fuel consumption calculated. Although the price of the SAF (biofuel or synthetic fuel) element of the blend is significantly higher than the price of conventional fuel, the reduced share of fossil fuel in the fuel mix (i.e. the taxed portion) results in a final price uplift of €0.45

[104] To ensure consistency, the baseline fuel price and the ReFuelEU Aviation policy option fuel price (i.e. that for the blended fuel) were both taken from the ReFuelEU Aviation study. Therefore, the baseline fuel price shown in the table may not exactly match that applied for the current study. The price uplift, representing the combined effects of the blending mandate and the fuel tax, was then added to the baseline fuel price for the current study as an effective tax rate.
[105] This represents the price of the blend of conventional kerosene and SAF, excluding taxes

per litre by 2050 when biofuels are zero-rated under the fuel tax (compared to the €0.33 uplift due to the fuel tax alone in the main analysis). When the biofuels are rated at 50% of the conventional kerosene rate, the uplift in 2050 becomes €0.55.

For the presentation of the results, it is assumed that the SAF would be zero-rated for tax (as explained above) and that it would contribute no CO_2 emissions on combustion (i.e. the net emissions from the SAF blend would be those related to the fossil fuel portion only).

Table 6-12 shows the impact of the combined SAF mandate and the €0.33 fuel tax on ticket prices, while Figure 6-15 shows the impact of the combined SAF mandate and the €0.33 fuel tax on demand for passenger travel, with the percentage changes from the baseline shown in Figure 6-16.

Table 6-12: Effect of combined SAF blend mandate and €0.33 per litre fuel tax on ticket prices

Fuel tax	€0.33/litre, default SAF		€0.33/litre with blending mandate (RefuelEU)		€0.33/litre (kerosene), €0.165/litre (SAF), with blending mandate (RefuelEU)	
Ticket price changes by year and carrier type	Traditional scheduled carriers	Low-cost carriers and charter flights	Traditional scheduled carriers	Low-cost carriers and charter flights	Traditional scheduled carriers	Low-cost carriers and charter flights
2025	1.7%	3.5%	2.0%	4.1%	2.0%	4.1%
2030	5.4%	10.9%	5.8%	11.6%	6.0%	11.9%
2050	6.0%	11.3%	8.3%	15.7%	10.2%	19.2%

Figure 6-15: Effect of combined SAF blend mandate and €0.33 per litre fuel tax on intra-EEA passenger demand

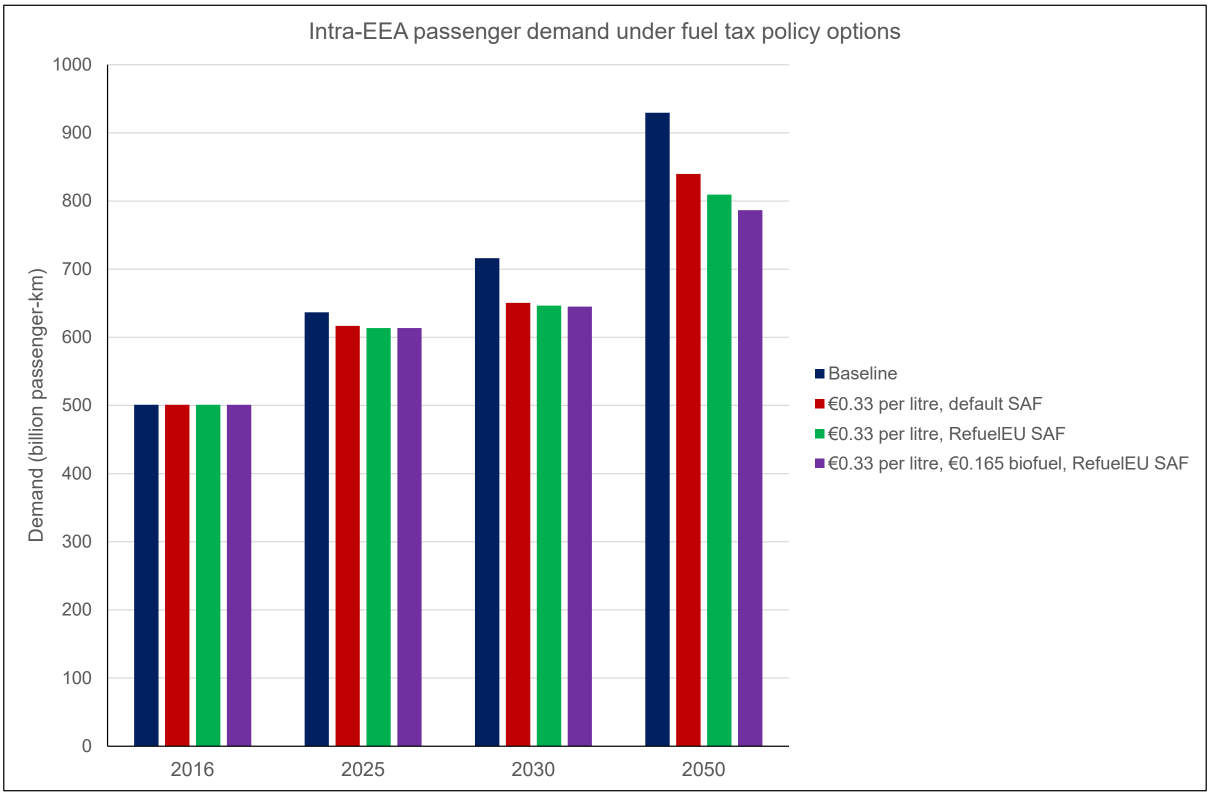
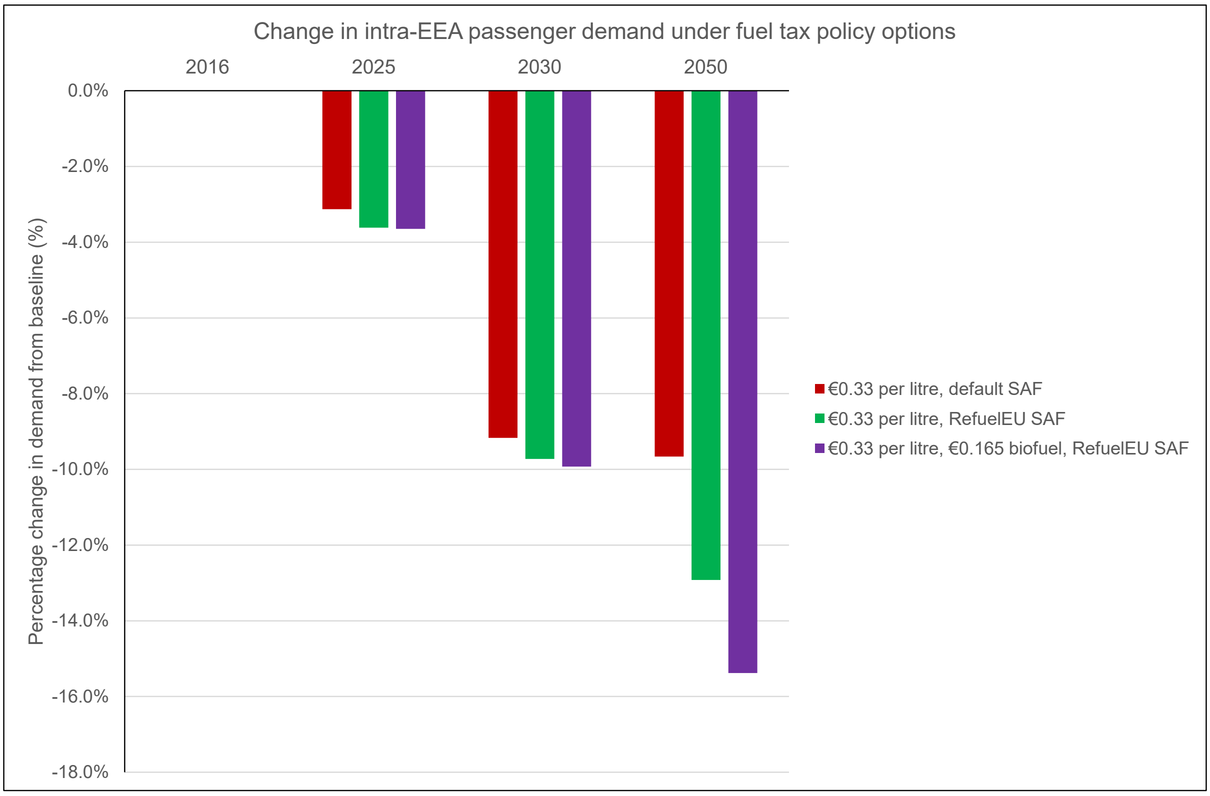


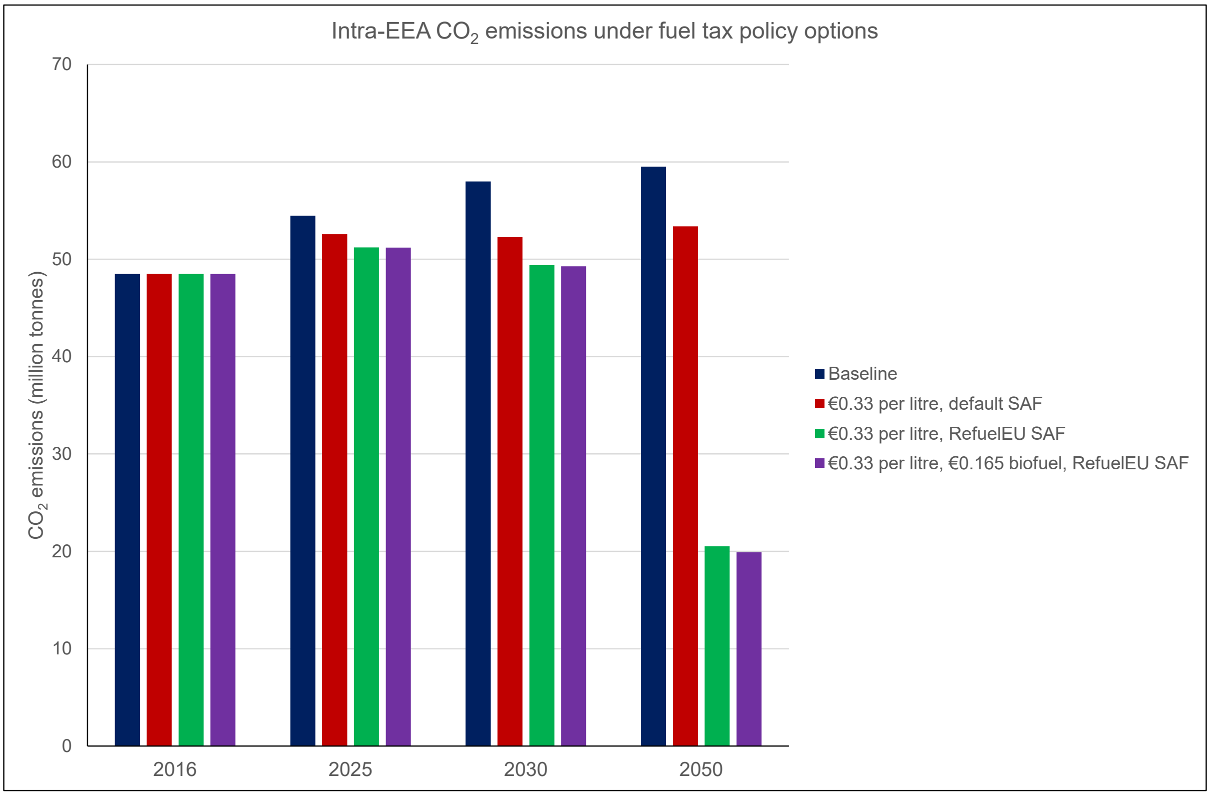
Figure 6-16: Percentage change in intra-EEA passenger demand due to combined SAF blend mandate and €0.33 per litre fuel tax



As the percentage of SAF in the fuel mix increases relatively slowly up to 2030, the results to that point are only slightly affected by the introduction of the blending mandate alongside the fuel tax. By 2050, however, there is a greater impact evident although, as noted above, the effect is limited by the zero-rating of the SAF portion under the fuel tax. Overall, the combination results in an increase in ticket prices in 2050 of 10% (for network carriers) and 19% for LCC/Charter carriers (compared to 6% and 11% under the fuel tax-only option) and a consequent reduction in demand (relative to the baseline) of about 13%, compared to nearly 10% under the fuel tax alone.

The combined blending mandate and fuel tax has a small impact on fuel consumption, as would be expected from the demand impacts shown in Figure 6-15. However, the impacts on CO_2 emissions are much greater, due to the assumption that SAF would be considered to have no emissions on a life cycle basis. Figure 6-17 shows the CO_2 emissions from intra-EEA flights under the baseline, fuel tax only and combined blending mandate and fuel tax cases.

Figure 6-17: Intra-EEA CO_2 emissions including impacts of combined blending mandate and fuel tax

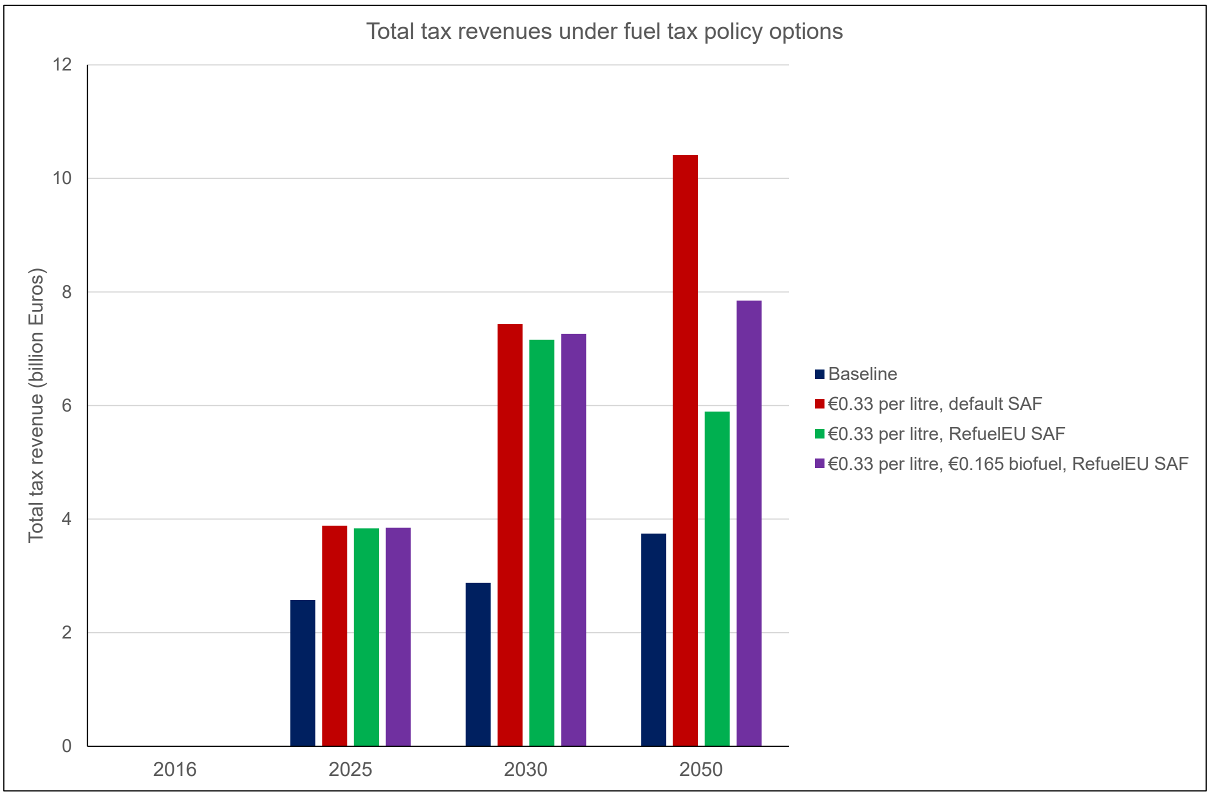


Up to 2030, there is a small additional reduction in emissions resulting from the implementation of the blending mandate alongside the fuel tax due to the low share of SAF in fuel mix. However, by 2050, the reduction in emissions (relative to the baseline) has increased to 66% compared to 10% under the fuel tax-only option.

The results presented here relate to the implementation of the blending mandate in combination with a fuel tax on intra-EEA flights. In practice, the implementation of a SAF blending mandate would also have significant impacts on emissions on extra-EEA flights (even without a fuel tax on those flights); however, that was not analysed as it is outside the scope of this study.

In addition to the significant increase in the CO_2 abatement, the combination of the blending mandate and fuel tax results is significantly lower tax revenue being collected than under the fuel tax-only option. Figure 6-18 compares both options to the baseline.

Figure 6-18: Tax revenues under cases with fuel tax alone and combined with blending mandate



The implementation of the blending mandate reduces the tax revenue by 43% compared to the option of the fuel tax alone when SAF are zero-rated, or by 25% if SAF are taxed at 50% of the full kerosene rate.

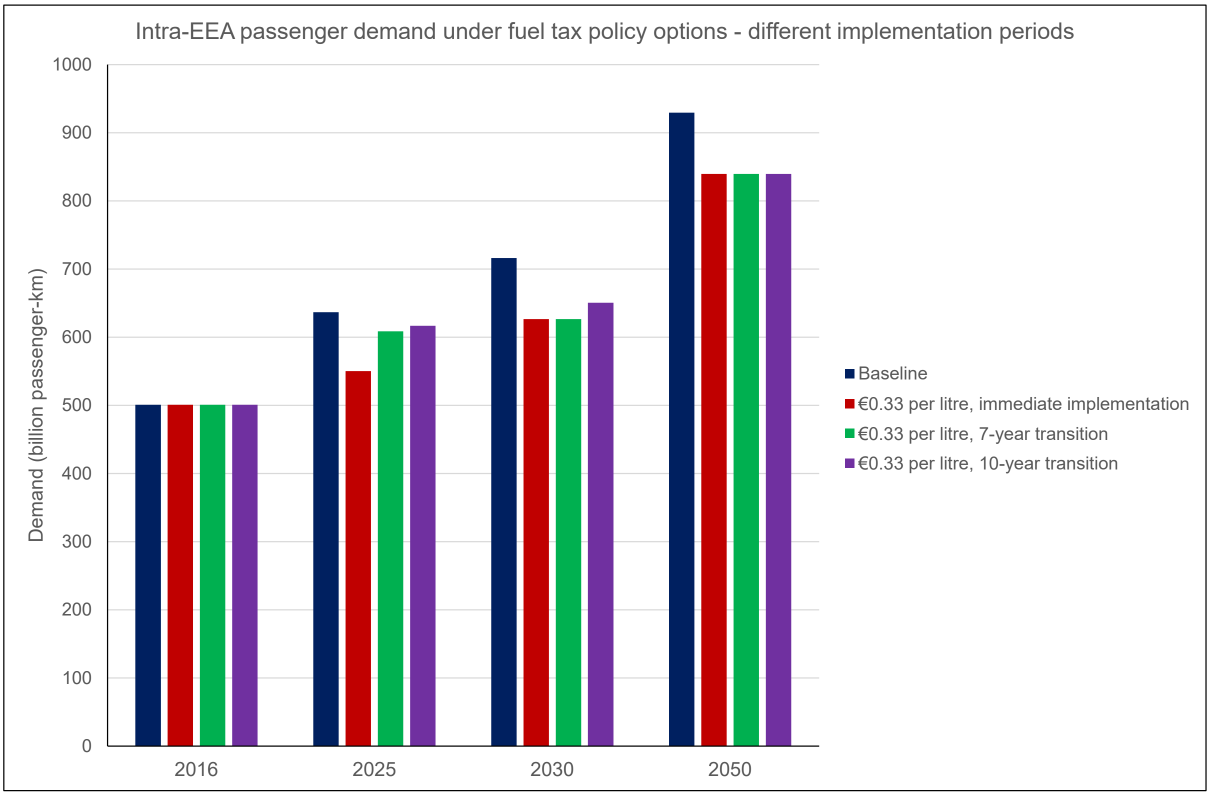
6.2.7.3 Immediate implementation and 7-year transition period vs. default 10-year transition

The main analysis of the fuel tax policy option has assumed a 10-year transition period, with 10% of the final tax rate being implemented in 2024, increasing steadily to the full tax rate being implemented from 2033 onwards. This is consistent with the Commission's approach for the impact assessment of revisions to the energy taxation directive. This sensitivity analysis considers the effects of that approach compared to either implementing the full tax rate from 2024 or a slightly more rapid ramp-up (7 years) to the full tax rate being implemented from 2030.

In considering the results of this analysis, it should be noted that the AERO-MS model does not consider the public (or business) perceptions of the rate of change of costs. Therefore, the impact of a tax in a given year is the same, whether the tax was just implemented in that year or had been in force for several years. Therefore, the model is not expected to show any differences between the three policy cases after the end of the longest transition phase (10 years). In practice, there would be small differences in the aircraft fleet transition as the higher tax rate in the immediate implementation case would drive the uptake of more fuel efficient aircraft slightly faster than in the 10-year transition case. This is not capture in the model as it assumes that the situation in the modelled year is sufficiently stable for the industry response to have caught up with the regulatory drivers.

Figure 6-19 compares the impacts on passenger demand between the three implementation periods (zero, 7 years and 10 years) and the baseline.

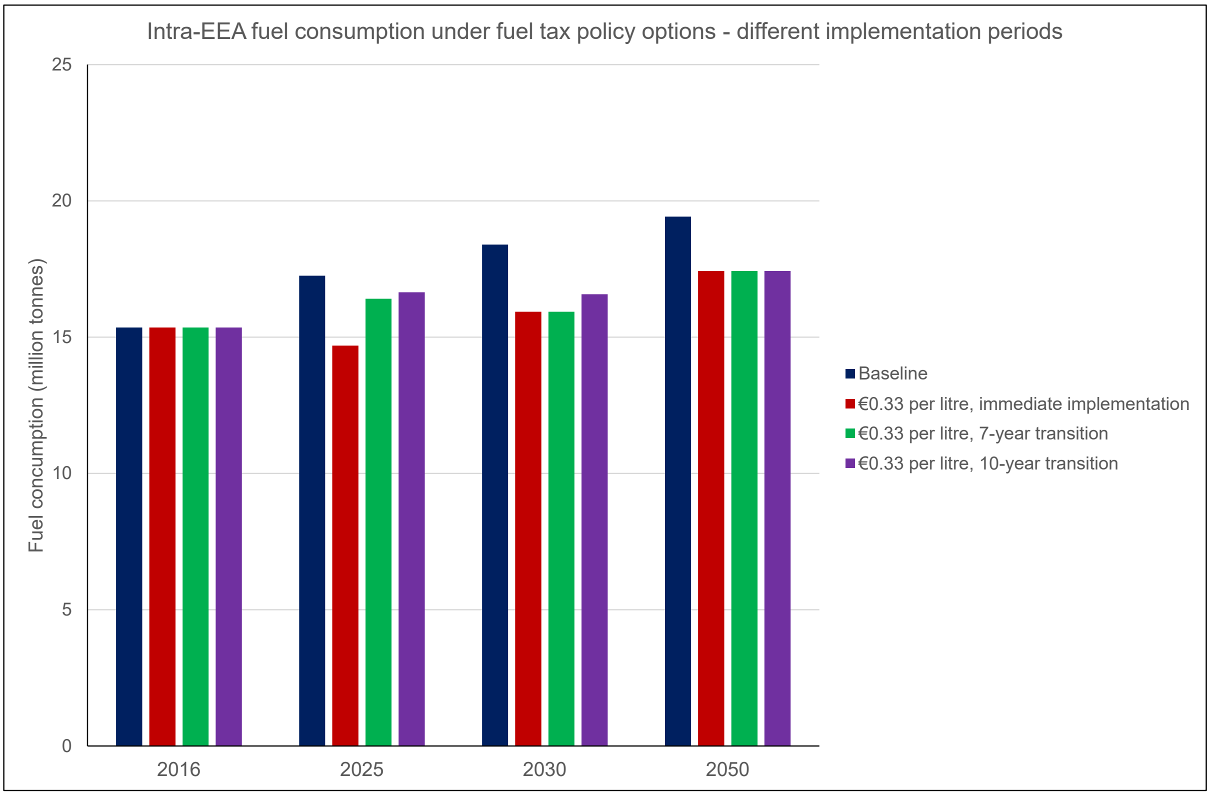
Figure 6-19: Passenger demand on intra-EEA flights under baseline and €0.33 per litre fuel tax, with three implementation periods



As expected, the immediate implementation of the fuel tax leads to a greater impact than the other two options in 2025, with the differences between the three policy cases reducing over time until there is no difference between them by 2050.

The impacts of the three policy cases on fuel consumption from intra-EEA flights is consistent with the impacts on demand, as can be seen in Figure 6-20.

Figure 6-20: Intra-EEA fuel consumption under baseline and €0.33 per litre fuel tax, with three implementation periods

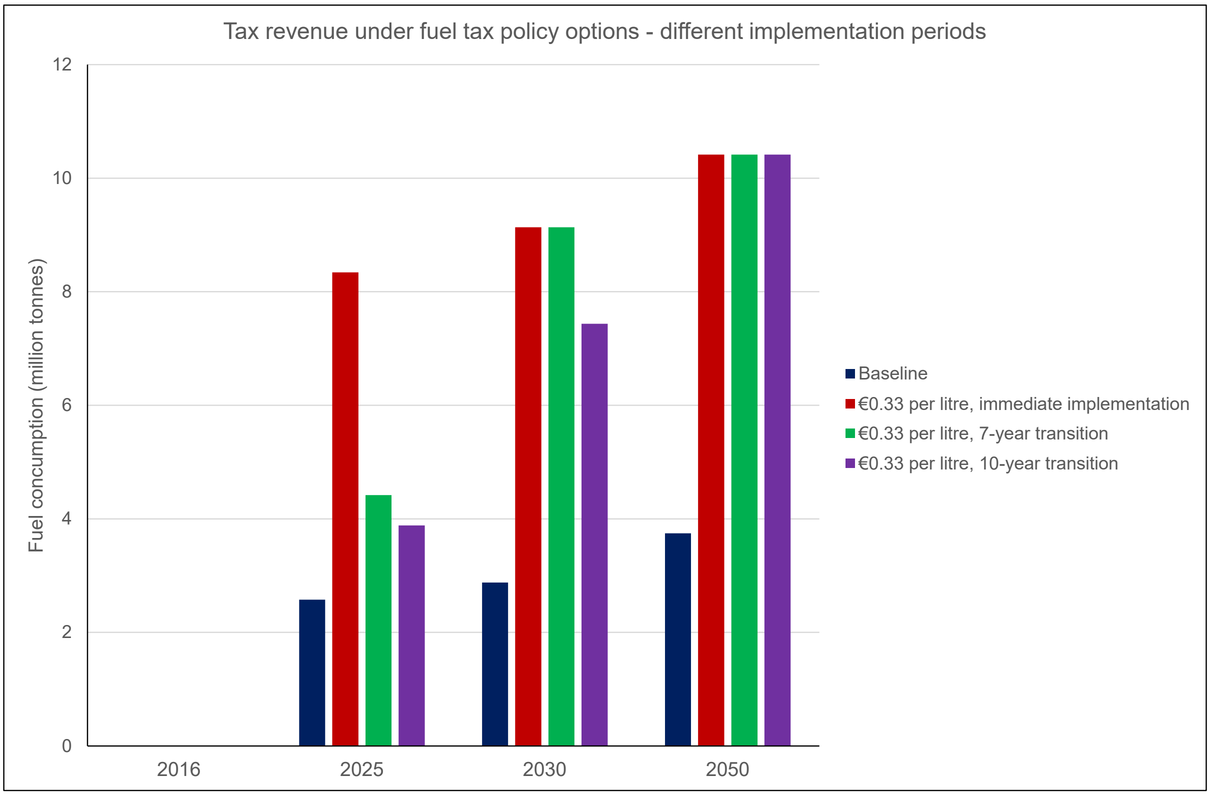


Although the analysis has considered only a limited number of years in detail, an estimate of total emissions savings can be obtained by using simple linear interpolation between the years analysed. Table 6-13 shows the total CO_2 saved to 2030 and to 2050 under each of the three cases.

Table 6-13: Cumulative savings in CO_2 emissions on intra-EEA flights to 2030 and 2050 under the three transition periods (million tonnes of CO_2 saved)

	Immediate implementation	7-year transition	10-year transition
2030	51.7	32.7	23.9
2050	189.8	170.8	142.6

Figure 6-21: Tax revenue under baseline and €0.33 per litre fuel tax, with three implementation periods

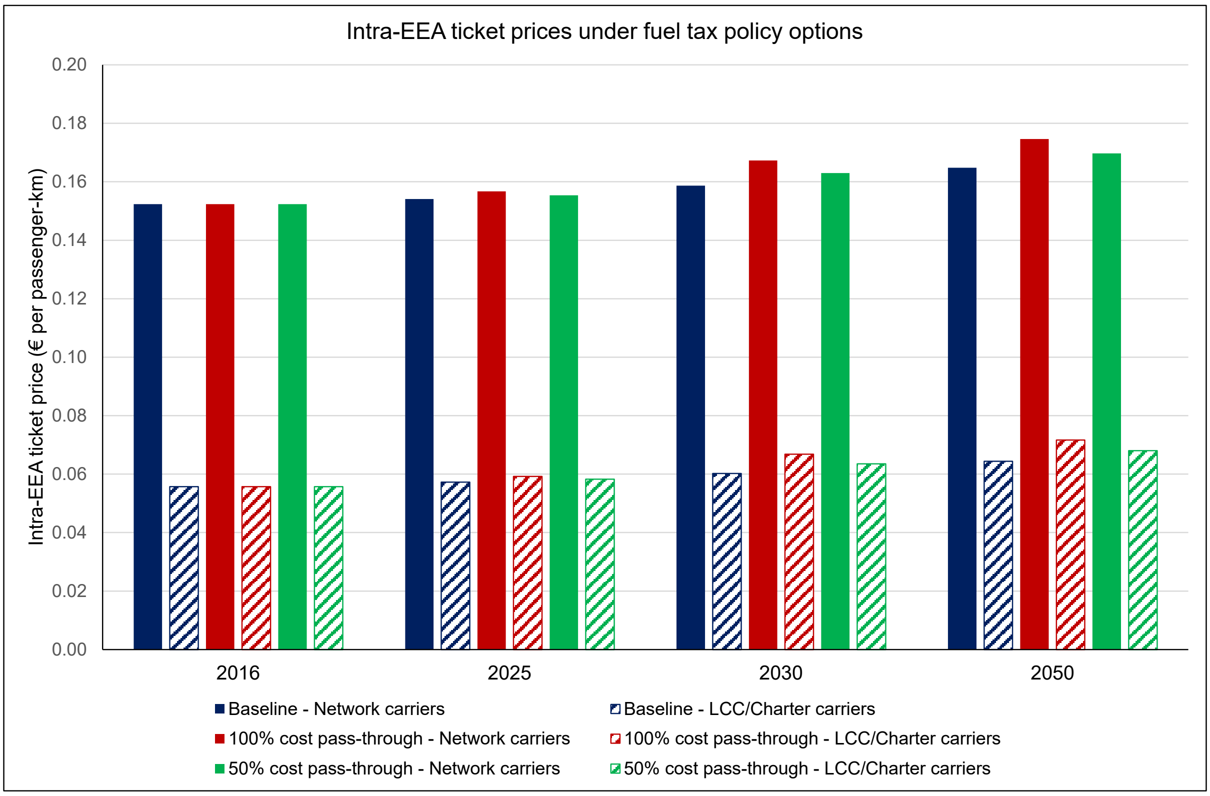


6.2.7.4 Cost pass-through

The default assumption in the AERO-MS model is that the full increase in costs arising from the implementation of a tax (including a fuel tax) is passed through to the passengers in higher fares. This assumption is consistent with an industry that is operating with low margins (so has no ability to absorb additional costs without impacting profitability). To understand the impacts of this assumption on the results of the analyses of the fuel tax options, an additional calculation has been performed for an assumption of 50% cost pass-through, i.e. the carrier absorbs 50% of the tax costs and passes 50% through to the consumer. This would be expected to reduce the increase in ticket prices and hence the impact on demand.

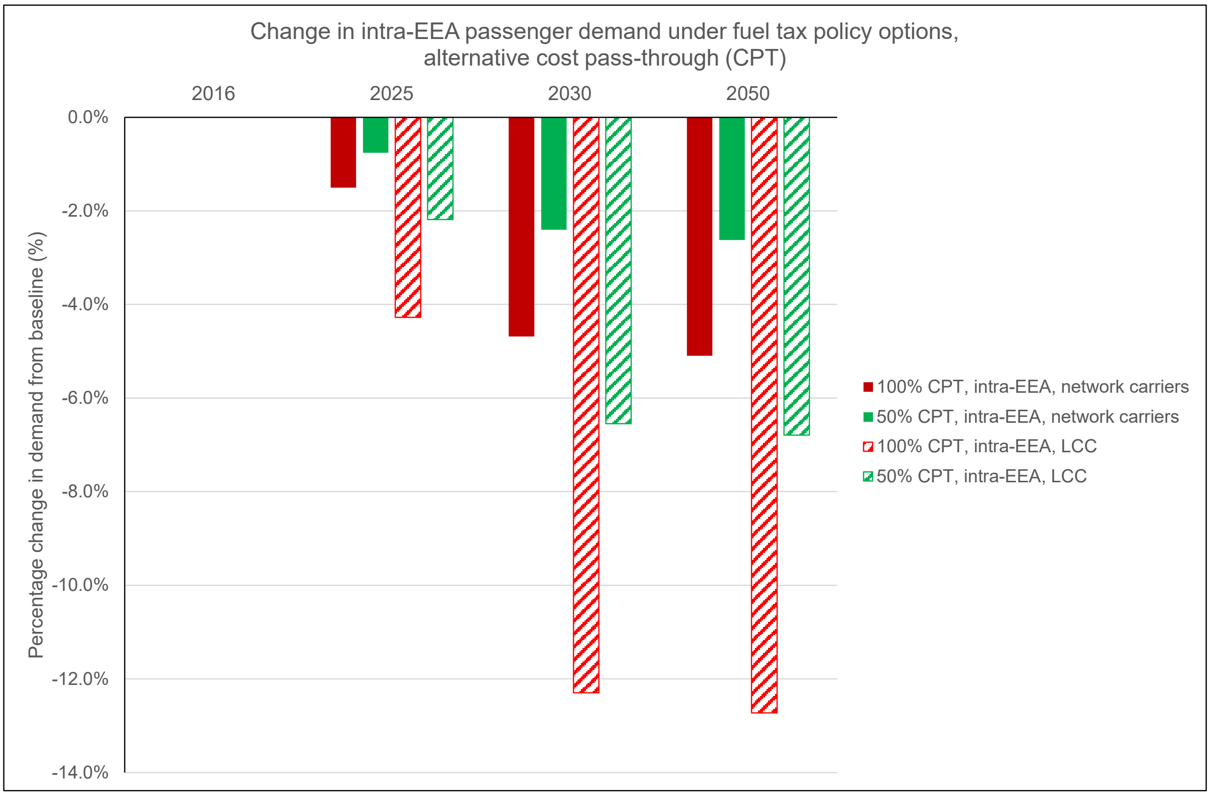
Figure 6-22 compares ticket prices under the €0.33 per litre fuel tax option with a 10 year transition period, for both 100% and 50% cost pass-through assumptions, together with the baseline. Ticket prices are shown per passenger-km and are shown separately for traditional network carriers, and LCC and charter carriers.

Figure 6-22: Ticket prices for intra-EEA flights for different cost pass-through assumptions



As expected, the increase in ticket price under a 50% cost pass-through assumption is approximately half that for the 100% pass-through assumption. Figure 6-23 shows how this changes the impact on passenger demand for intra-EEA flights.

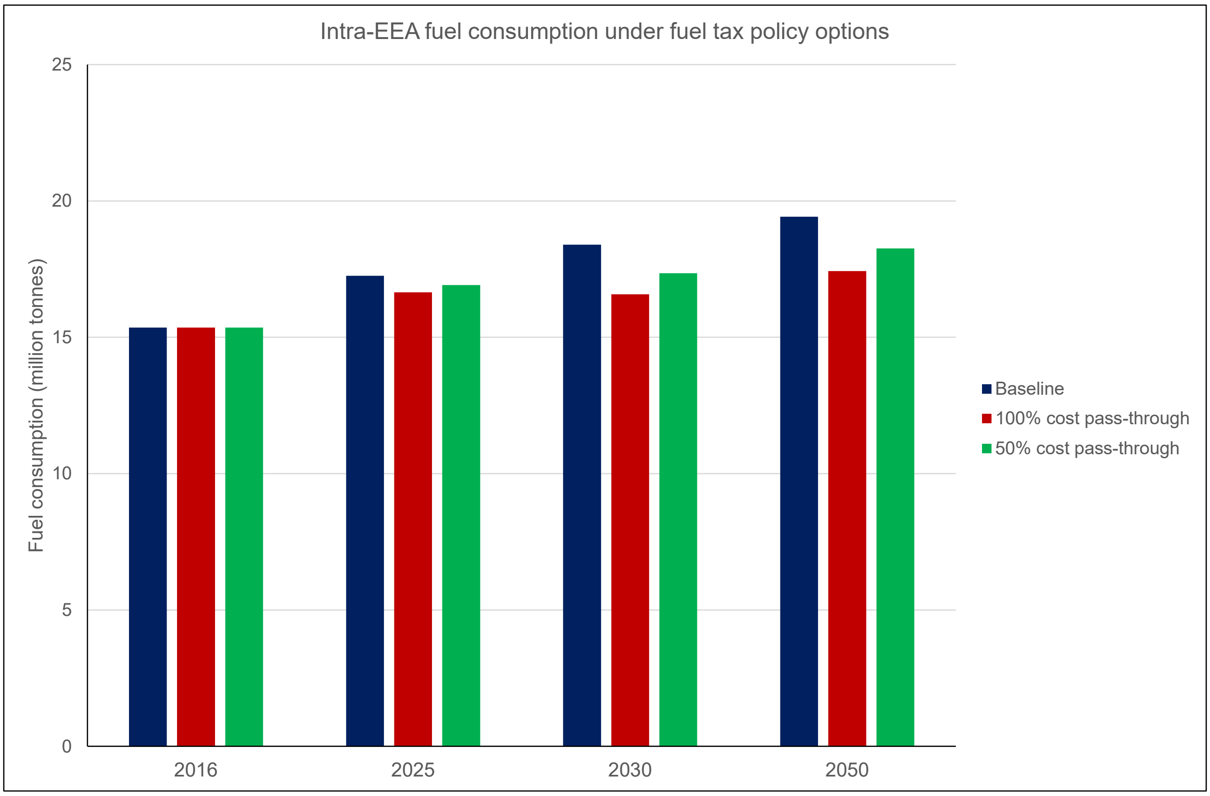
Figure 6-23: Percentage change in intra-EEA passenger demand for different cost pass-through assumptions



Again, the reduction in demand due to the fuel tax under the 50% pass-through assumption is about half of that for the 100% assumption. The impact of the fuel tax on demand for intra-EEA flights by low-cost carriers (LCC) is significantly greater than for network carriers, for both the 100% cost pass-through (e.g. 12.3% in 2030, compared to 4.7%) and the 50% cost pass-through (6.6% in 2030, compared to 2.4%) assumptions.

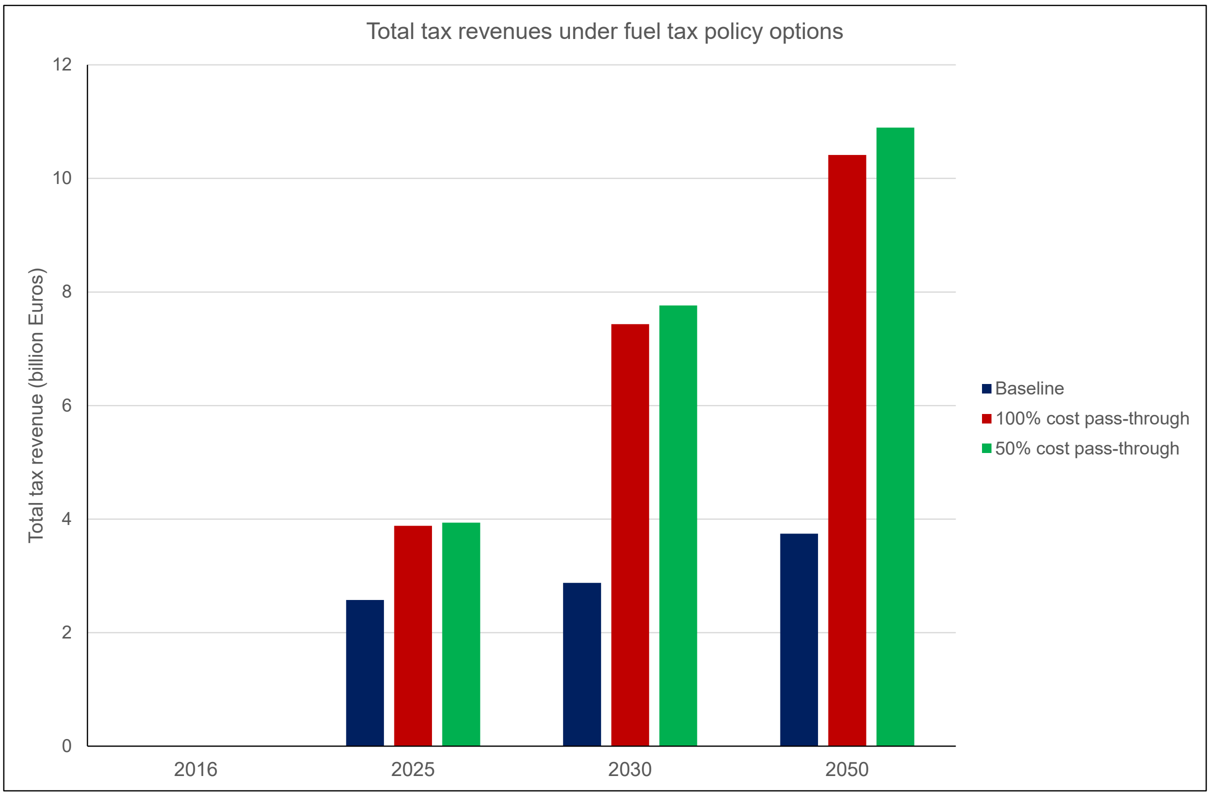
The different changes in demand under the two cost pass-through assumptions lead to different impacts on fuel consumption (Figure 6-24). As expected, the reduction in fuel consumption with the 50% pass-through assumption is less than that with the full pass-through assumption. However, as the carriers are absorbing a greater portion of the additional costs under the lower pass-through assumption, their incentives to improve fuel efficiency increase and the reduction in fuel consumption is over half of that under full pass-through; in fact, the reduction in fuel consumption is 58% of that with full pass-through.

Figure 6-24: Fuel consumption on intra-EEA flights for different cost pass-through assumptions



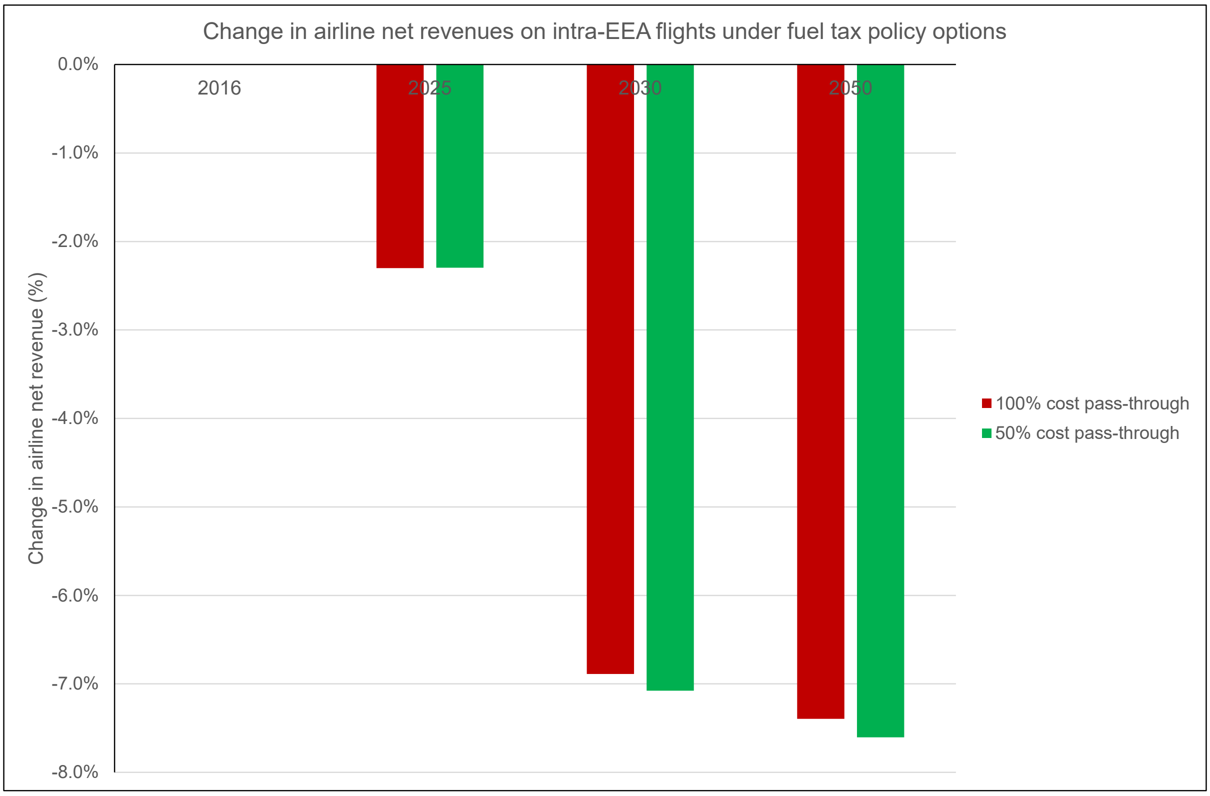
By absorbing 50% of the additional costs due to the tax on fuel, the carriers reduce the impact of the tax on demand. The full tax is still payable to the fiscal authorities, however, so, because of the higher demand, the total tax revenue is slightly higher under the 50% pass-through assumption than under 100% pass-through, as shown in Figure 6-25.

Figure 6-25: Tax revenue under different cost pass-through assumptions



In absorbing part of the additional costs due to the fuel tax, the airline net revenues are reduced, although this is largely offset by the increase in demand as a result of the lower ticket prices. Figure 6-26 compares the impact of the different cost pass-through assumptions on airline net revenues (gross revenue minus fuel tax).

Figure 6-26: Change in airline net revenues on intra-EEA flights from baseline under different cost pass-through assumptions



Although the impact of the fuel tax on airline net revenues is significant (over 7% reduction by 2050), the additional reduction due to the 50% cost pass-through assumption is small. It should be noted, however, that the airline costs (fuel, staff, maintenance, etc.) would also be higher due to the higher demand under this option, so the change in the impact on airline profits would be expected to be rather greater under the lower cost pass-through assumption.

6.2.7.5 Existing national ticket taxes withdrawn when fuel tax implemented

The main results presented above for the different fuel tax rates all assume that the existing national ticket taxes continue in force alongside the fuel tax. This sensitivity analysis considers the case when the existing national ticket taxes are withdrawn when the fuel taxes are implemented. The sensitivity has been calculated for a fuel tax rate of €0.33 per litre.

The main results for the €0.33 per litre fuel tax option assume a 10-year transition phase, with 10% of the final fuel tax being implemented in 2024, ramping up steadily to the full tax rate being implemented in 2033. However, the baseline analysis shows that the existing national ticket taxes contribute €2.6 billion of revenue from intra-EEA flights in 2025; under the €0.33 per litre fuel tax, with a 10-year transition, the fuel tax contributes only €1.4 billion in 2025. Therefore, it is clear that, if the national ticket taxes were withdrawn in 2024, when the fuel tax starts to be implemented, the overall cost of travel would reduce and demand (and emissions) would increase. Therefore, for this analysis, it has been assumed that the national ticket taxes would not be withdrawn until the fuel tax had reached a level at least equal to the national ticket taxes. In practice, the timing for this would be determined separately for each of the Member States that have existing ticket taxes; however, in most cases it is likely that this would occur some time between the two analysis years of 2025 and 2030[106] (i.e. with the in-year fuel tax being between 20% and 70% of its final value), so this sensitivity analysis

[106] Although detailed analyses of exactly when this timing would occur for each Member State were nor performed, assessments of the calculations showed that the fuel tax revenue would be substantially lower than the ticket tax revenue in 2025, but substantially greater in 2030.

has been performed with the national ticket taxes retained for 2025 and withdrawn in 2030 (and 2050).

Figure 6-27 compares the passenger demand under the baseline and the two policy options based on a €0.33 per litre fuel tax with a 10 year transition period, while Figure 6-28 compares the percentage changes from the baseline for the two policy cases.

Figure 6-27: Passenger demand for intra-EEA flights under €0.33 per litre fuel tax rate, with and without the withdrawal of the national ticket taxes

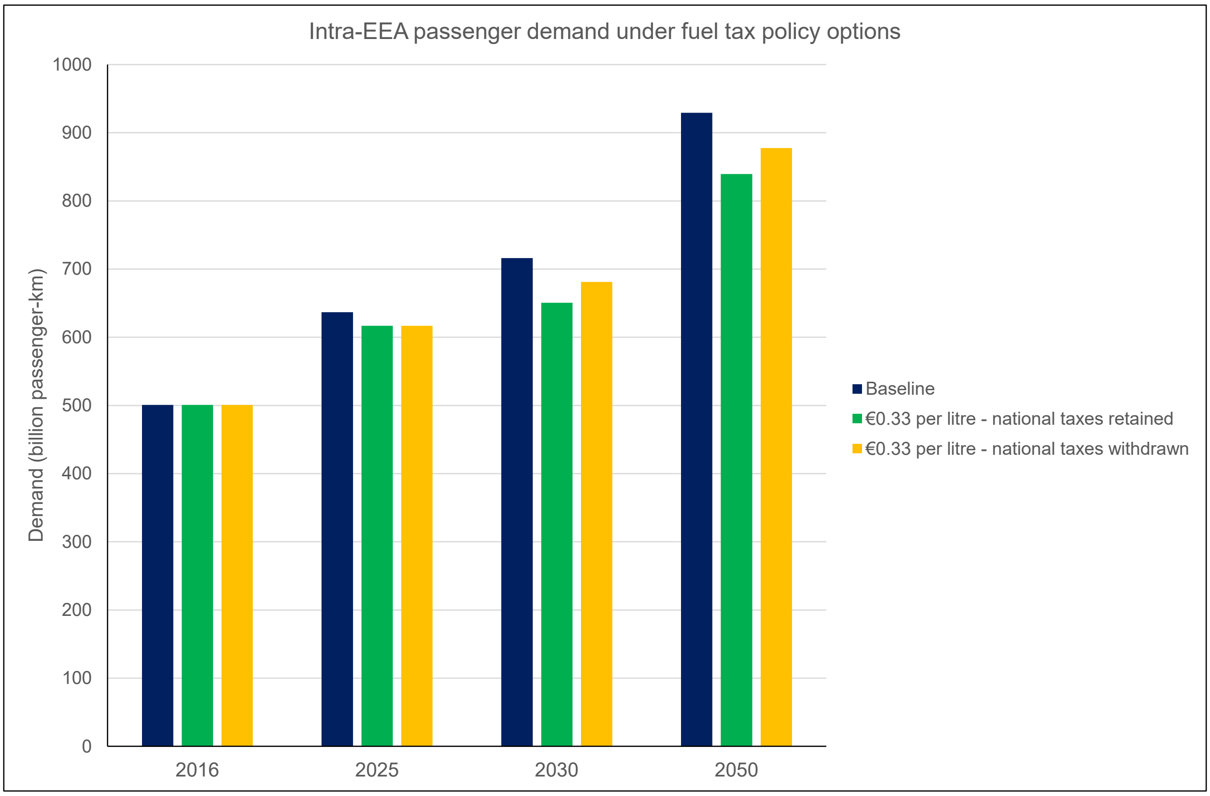


Figure 6-28: Percentage change in passenger demand for intra-EEA flights under €0.33 per litre fuel tax rate, with and without the withdrawal of the national ticket taxes

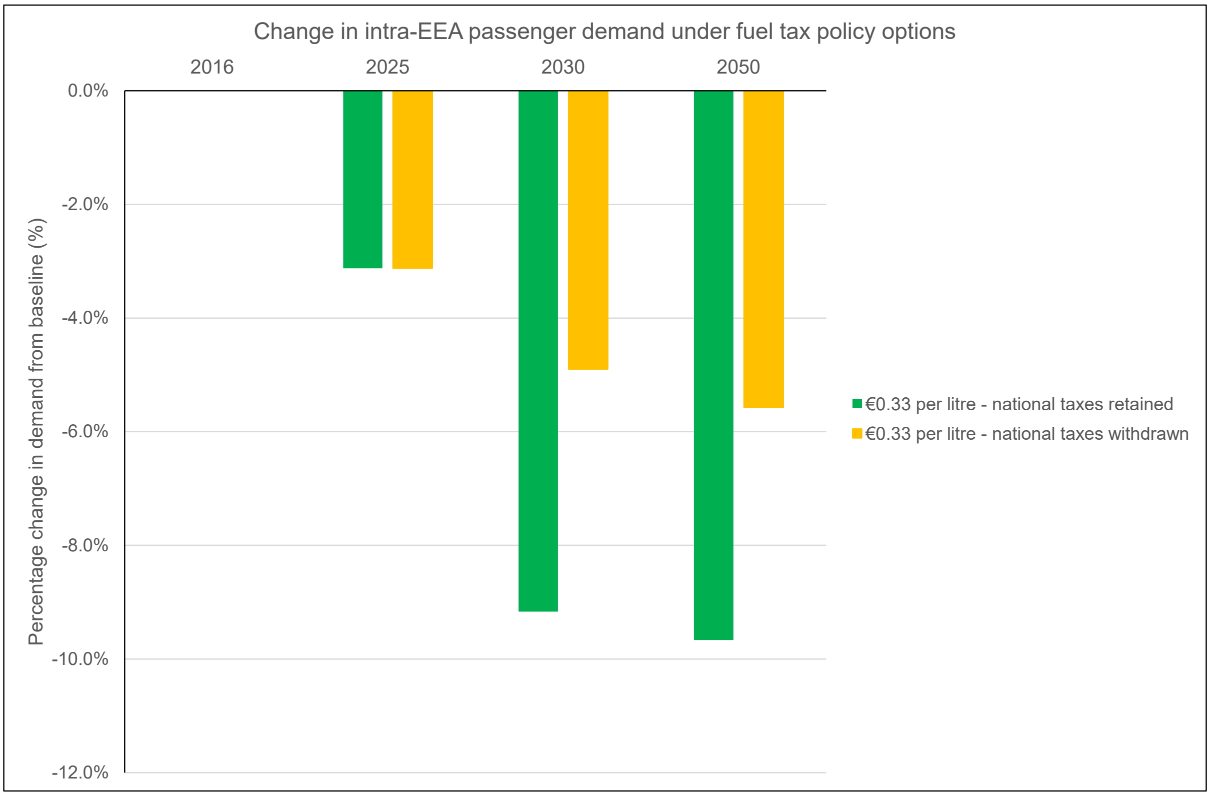


Table 6-14: Passenger demand and percentage change for intra-EEA flights under €0.33 per litre fuel tax rate, with and without the withdrawal of the national ticket taxes

	National taxes retained		National taxes withdrawn	
Passenger demand	Passenger demand (billion pkm)	Percentage change from baseline	Passenger demand (billion pkm)	Percentage change from baseline
2025	616.8	-3.1%	616.8	-3.1%
2030	650.6	-9.2%	681.1	-4.9%
2050	839.6	-9.7%	877.7	-5.6%

As expected, the withdrawal of the national ticket taxes after the implementation of the fuel tax leads to a lower total tax burden on the passengers (leading to reduced increases in ticket prices) and, hence, a lower reduction in demand. In the short-term, the difference between the two cases is negligible, but by 2050, the reduction in demand in the case with the existing national ticket taxes withdrawn is 5.6%, while under the case with the existing taxes retained, the reduction is 9.7%.

The impact of these reductions in demand on fuel consumption is shown in Figure 6-29, with the values provided in Table 6-15. The withdrawal of the national ticket taxes reduces the reduction in fuel consumption in 2050 from 10.3% (with national ticket taxes retained) to 6.4%.

Figure 6-29: Fuel consumption on intra-EEA flights under €0.33 per litre fuel tax rate, with and without the retention of the national ticket taxes

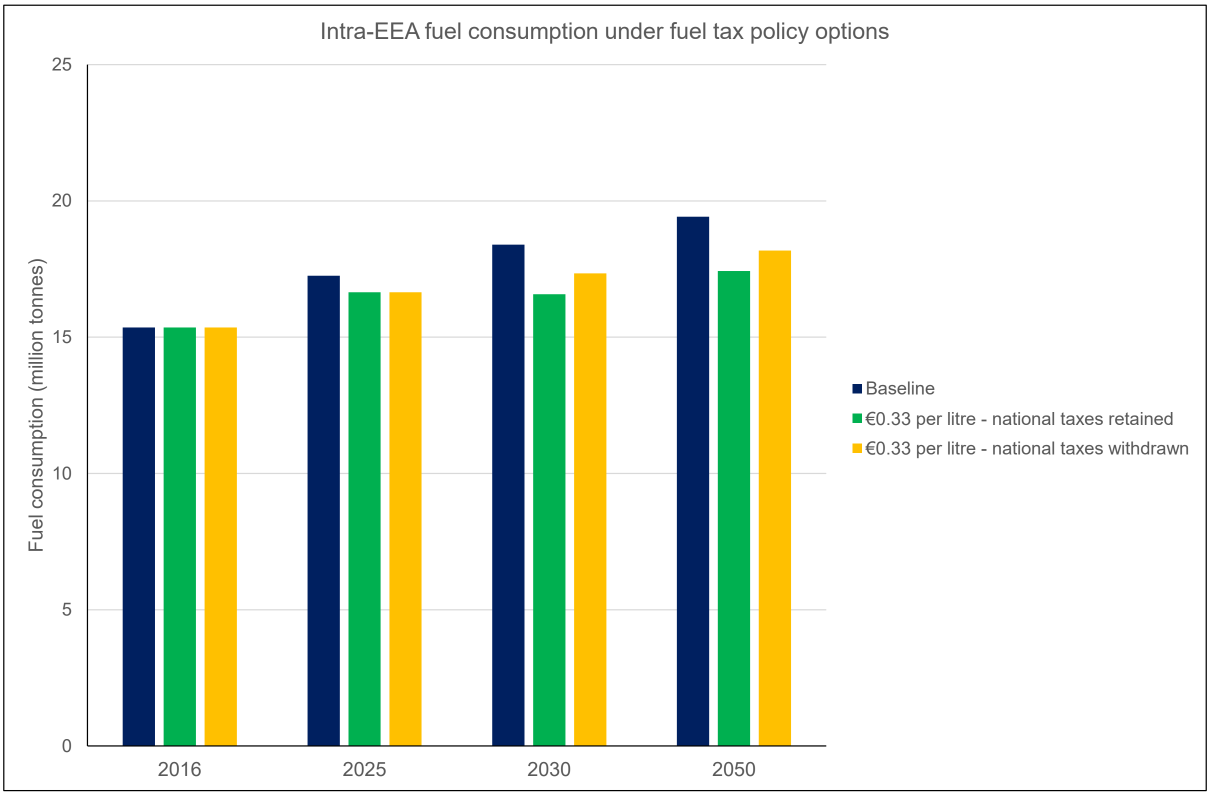


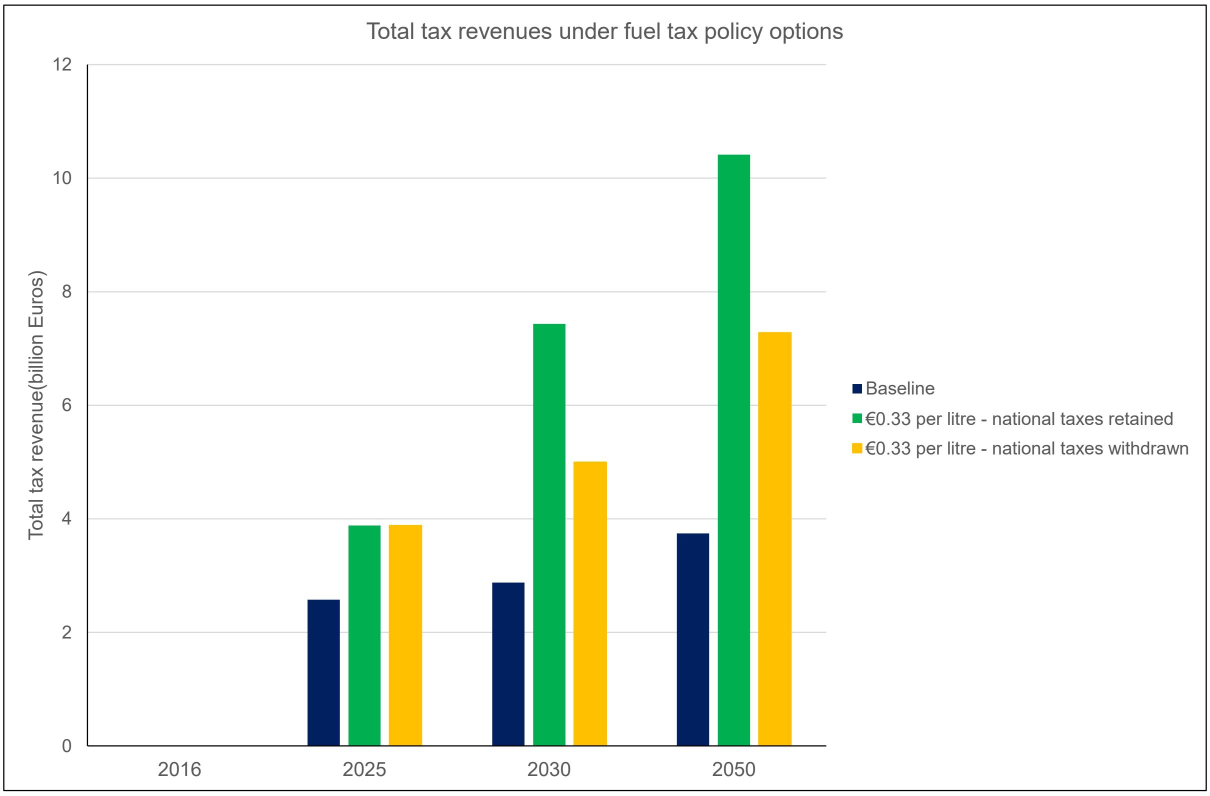
Table 6-15: Fuel consumption, and percentage change from baseline, on intra-EEA flights under the €0.33 per litre fuel tax rate, with and without the retention of the national ticket taxes

	National taxes retained			National taxes withdrawn		
Fuel consumption	Total fuel consumption (million tonnes)	Percentage change from baseline	Cumulative fuel saved (million tonnes)	Total fuel consumption (million tonnes)	Percentage change from baseline	Cumulative fuel saved (million tonnes)
2025	16.7	-3.5%	-0.9	16.7	-3.5%	-0.9
2030	16.6	-9.9%	-7.6	17.3	-5.7%	-5.3
2050	17.4	-10.3%	-45.8	18.2	-6.4%	-28.3

By 2050, the cumulative fuel saving (relative to the baseline) with the national taxes retained is 45.8 million tonnes, corresponding to 8.8% of the baseline fuel consumption (from 2023 to 2050); for the case with national taxes withdrawn, the cumulative fuel saving is 28.3 million tonnes, or 5.5% of the baseline cumulative fuel consumption.

The total tax revenues under the three scenarios are shown in Figure 6-30. Although the fuel tax collected is lower in the case with the national ticket taxes retained than when they are withdrawn, in line with the additional reduction in fuel consumption, the retention of those national ticket taxes leads to a higher total tax revenue in 2050, €10.4 billion, compared to €7.3 billion if they are withdrawn.

Figure 6-30: Tax revenue collected under €0.33 per litre fuel tax rate, with and without the retention of the national ticket taxes



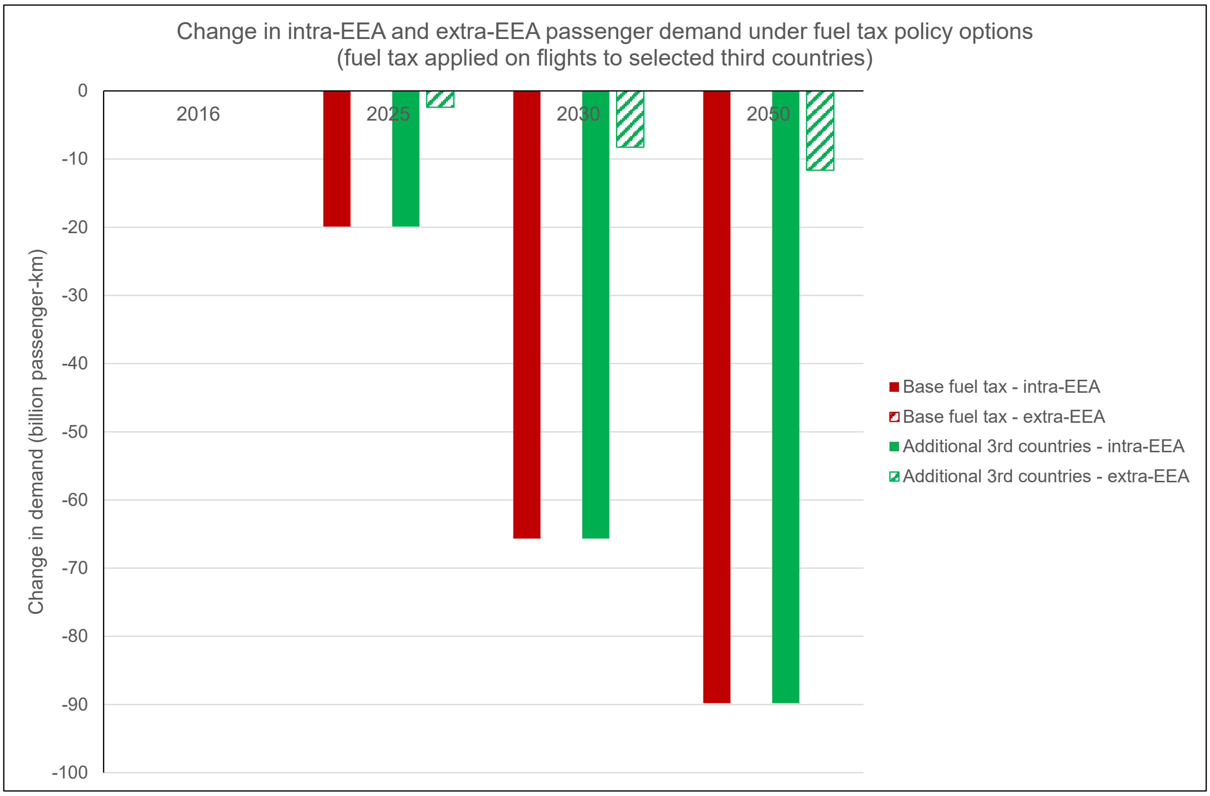
6.2.7.6 Fuel tax on flights to third countries (UK, Morocco)

As described in Section 3.3 and Annex A1, the majority of agreements between the EU (or its Member States) and third countries do not allow the taxation of fuel supplied for flights between the EU and the third country. However, two agreements, with Morocco and the UK, do allow for the taxation of fuel supplied for flights to the third country. This sensitivity analysis has considered the potential additional impacts of implementing a fuel tax for flights from the EU to these two third countries.

Although the agreements allow the third countries to also implement a tax on fuel supplied for flights to the EU, this has not been assumed for this analysis, which considers only the impacts of a fuel tax on flights from the EU (or, rather, the EEA, as all analyses described in this report have assumed that the EEA countries would also implement the same tax requirements as the EU). To ensure a complete effectiveness of the policy option, and to reduce the risk of fuel tankering, it would be necessary for the two third countries to incorporate similar tax rates in their tax regimes. The existing agreements with the EU allow them to introduce such a tax; therefore, if this option was adopted, it would be important for the EU to enter into negotiation with the two countries with the aim of ensuring a coordinated action on fuel tax.

Figure 6-31 shows the additional impact on passenger demand from implementing a €0.33 per litre fuel tax with a 10 year transition period on flights from the EEA to these two third countries, assuming that these third countries do not implement a fuel tax on flights to the EEA. As the two countries are outside the EEA, the impacts on demand for intra-EEA flights are the same as in the case where the tax is only applied to intra-EEA flights. Therefore, Figure 6-31 shows the change in extra-EEA passenger demand as well as that on intra-EEA demand compared to a scenario with a base fuel tax of €0.33 per litre fuel on intra-EEA flights only; to improve the comparison between the two routes, the changes are shown in billions of passenger-km, rather than percentages of the total.

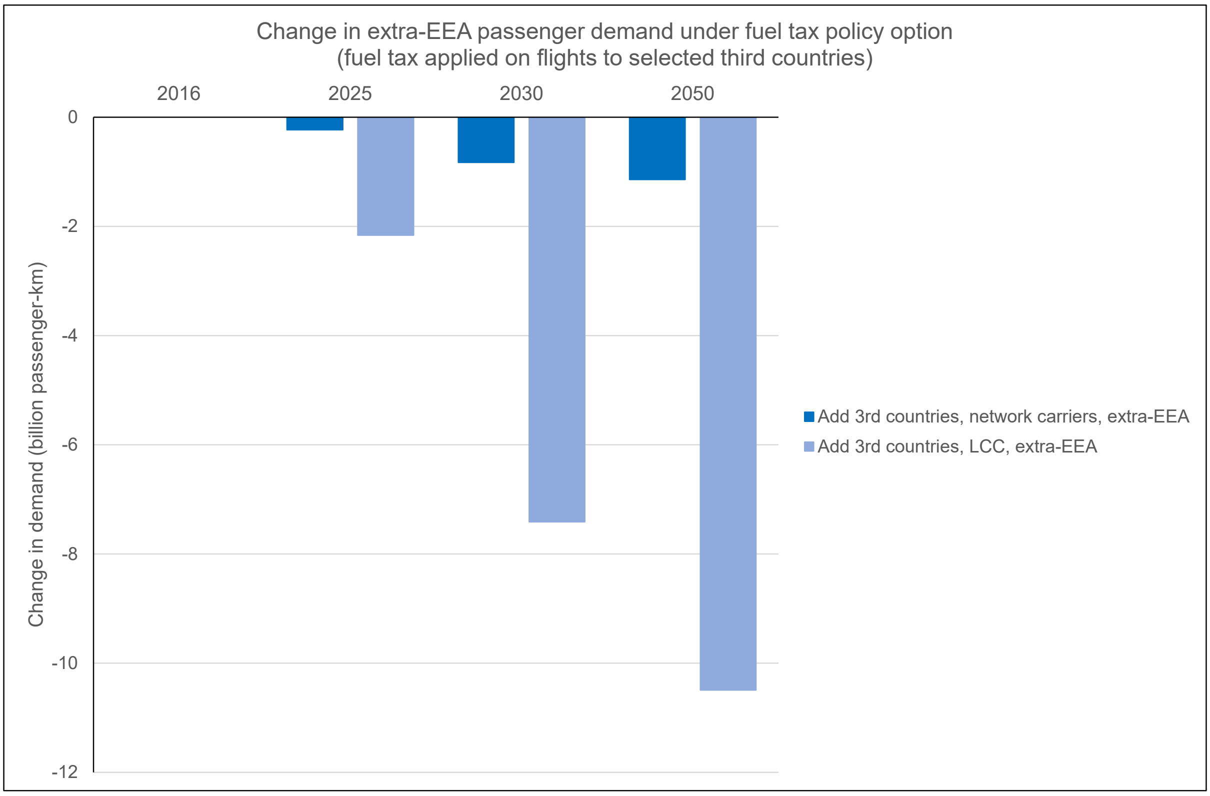
Figure 6-31: Change in passenger demand (intra-EEA and extra-EEA), including fuel tax applied to flights to UK and Morocco



The impact of a tax of €0.33 per litre on passenger demand for extra-EEA flights (i.e. to Morocco and the UK) is significantly smaller than the impact of a fuel tax of €0.33 per litre on intra-EEA demand (the decrease in passenger demand for extra-EEA flights in billion passenger-km represents approximately 13% of the decrease in passenger demand for intra-EEA flights). However, it should be noted that the large majority of flight bookings are for two-way (outbound and return) and that only one of the flights will be taxed, while both flights are taxed under this measure for intra-EEA routes. The application of the fuel tax only on the flight from the EEA to the third country significantly reduces the impact that it has on demand for extra-EEA flights compared to what would be expected if the third country also taxed the return flight (depending on the tax rate implemented by the third country).

The results for demand on extra-EEA flights under the option including the fuel tax on flights to the additional third countries, shown in Figure 6-31, can be broken down further by separating network carriers and LCCs. The results are shown in Figure 6-32.

Figure 6-32: Change in passenger demand (for extra-EEA flights), including fuel tax applied to flights to UK and Morocco, separating impacts on network carriers and low-cost carriers



About 90% of the total reduction in extra-EEA flight demand falls on LCCs, with only about 10% falling on the network carriers. This reflects the close location of the two additional countries (UK and Morocco) to the EEA, with air traffic being largely delivered by the LCCs, which operate direct flights (and several LCCs using the UK as a base, such as easyJet).

Figure 6-33 and Figure 6-34 show that the impacts on fuel consumption and CO_2 emissions (on intra-EEA and extra-EEA flights) follow a similar pattern to that on demand for intra-EEA and extra-EEA flights.

Figure 6-33: Change in fuel consumption (intra-EEA and extra-EEA), including fuel tax applied to flights to UK and Morocco

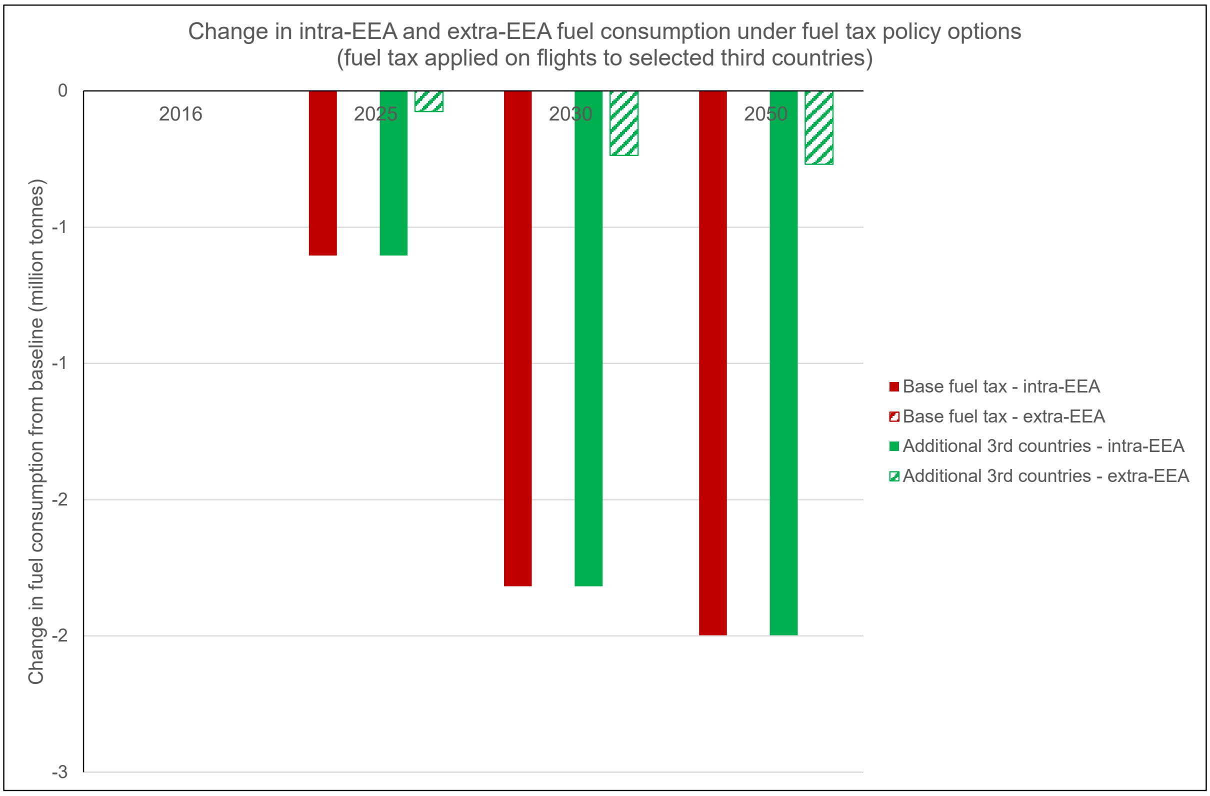
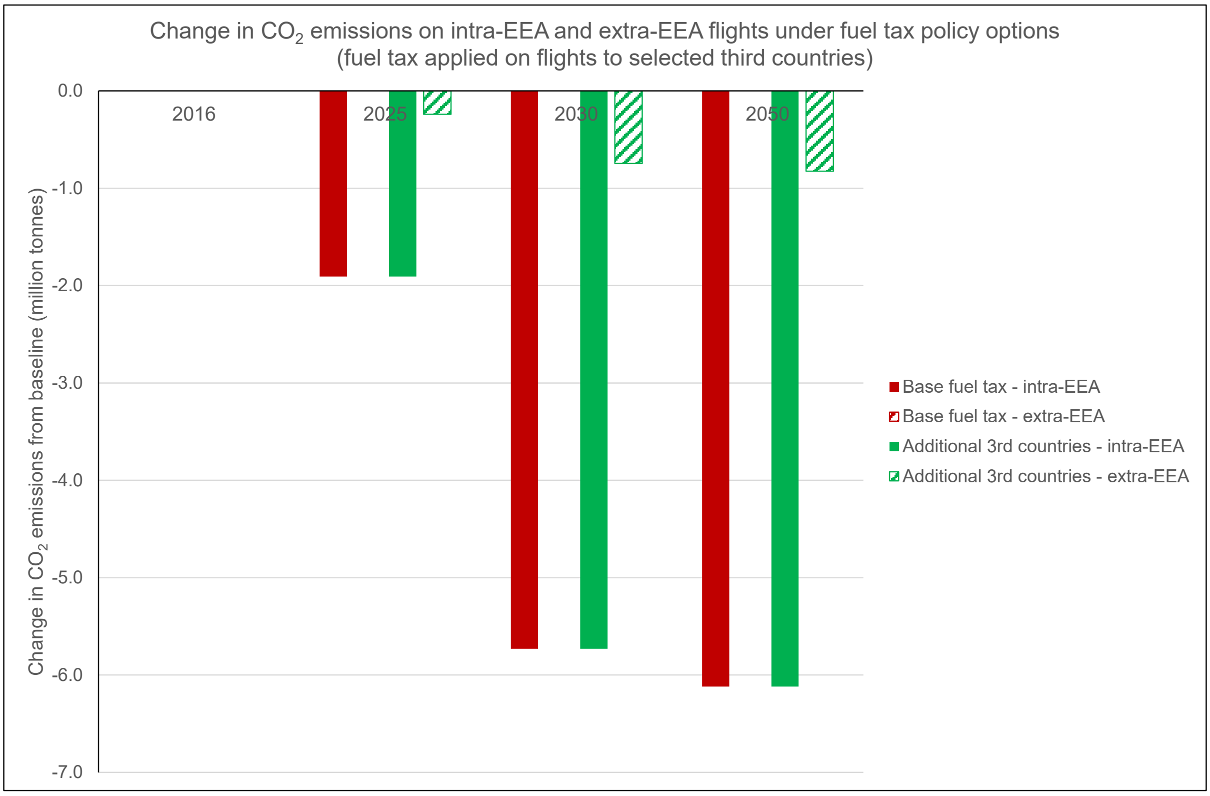
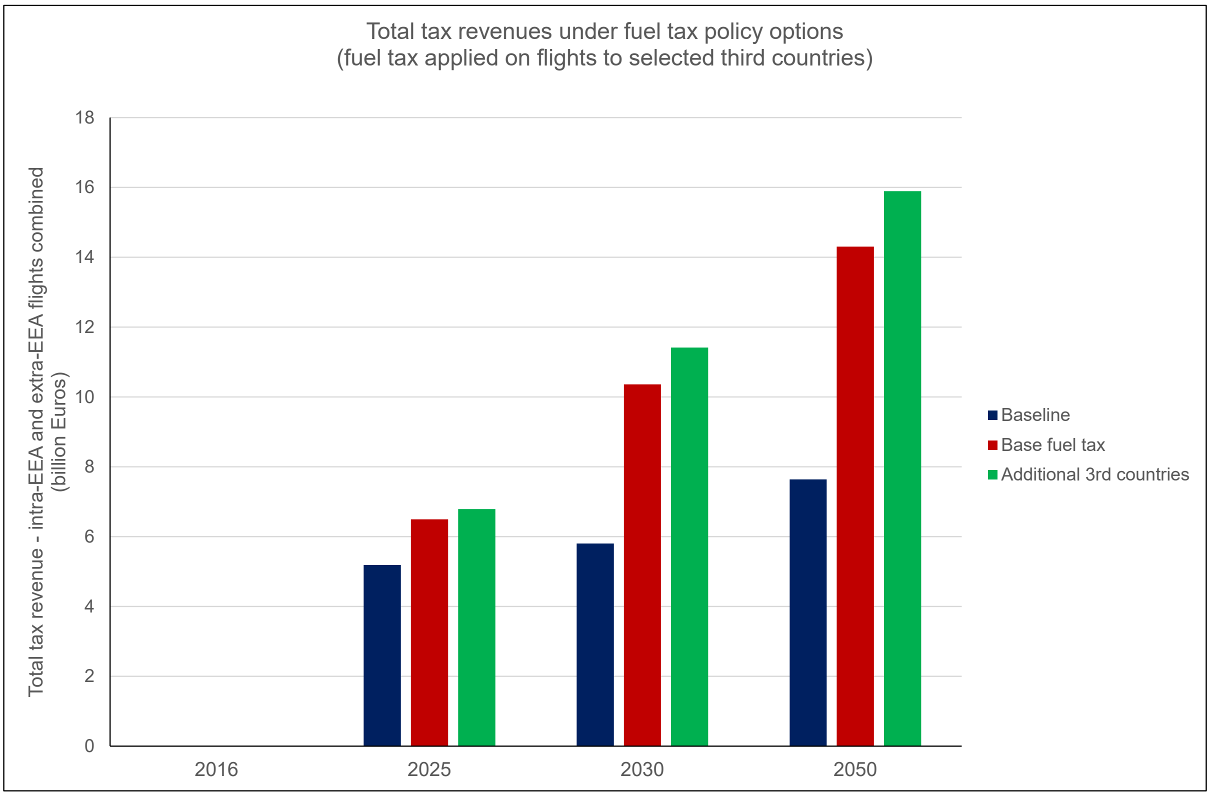


Figure 6-34: Change in CO_2 emissions (intra-EEA and extra-EEA), including fuel tax applied to flights to UK and Morocco



Overall, the inclusion of a tax on fuel supplied for flights from the EEA to the two third countries leads to a 11% increase in total tax revenue (compared to the case without them), as shown in Figure 6-35.

Figure 6-35: Tax revenues, including fuel tax applied to flights to UK and Morocco



By 2050, the additional tax revenue (relative to the baseline) from implementing the fuel tax increases from €6.7 billion to €8.3 billion due to the inclusion of flights to the two third countries.

It is important to note that the impacts of this policy option (i.e. fuel tax only on the journey originating from the EEA and arriving in Morocco or in the UK), as modelled, are subject to considerable uncertainty because of the significant risk of increased levels of tankering. Whilst, for the main policy option of a fuel tax applied to intra-EEA flights only, the risk of tankering concerns indirect tankering (loading of an increased quantity of fuel for a flight from outside the EEA to an EEA airport, to then use that additional fuel for a subsequent intra-EEA flight by the same aircraft, see Section 6.5.1.1), in the case of a tax being applied to fuel loaded for a flight from the EEA to (for example) the UK, but not for the return flight, there is a significant risk of direct tankering (additional fuel being loaded in the non-EEA country to be used on the return flight from the EEA). This could significantly reduce the impacts of this option on demand, fuel consumption (and emissions) and tax revenue if the tax is sufficiently high to have an impact on the differential between the EU and outside the EU. As the additional countries are located close to the EEA, in extremis, this option could lead to an increase in total emissions as nearly all aircraft would be able to tanker sufficient fuel for the return flight and the aircraft would be heavier on the inbound flights to the EEA. Measures to significantly reduce the risk of tankering should, therefore, be implemented; if the third country implemented a fuel tax on flights to the EEA, the risk of tankering would be very much reduced.

6.2.7.7 Changes to EU ETS allocation of free allowances

The primary calculations described in this report have assumed that the existing structure of the EU ETS would continue in their current form. In particular, the number of emissions allowances made available to airlines for free would continue as they are. However, the future of the ETS is currently being reviewed and there is interest in understanding how the fuel tax would operate if free allowances under the EU ETS were withdrawn and all allowances were purchased through auction. This sensitivity analysis has considered the results of implementing the €0.33 per litre fuel tax in conjunction with full auctioning of EU ETS allowances.

It should be noted that there are other elements of the EU ETS that are also being considered for update, such as the emissions cap. The changes to the cap and the free allocation of allowances may be expected to lead to changes in the future carbon prices (i.e. allowance prices) under the EU ETS. These carbon prices may also be expected to increase as a result of other initiatives being pursued by the Commission under the ‘Fit for 55’ package, such as the updates to the ETD and the ReFuelEU Aviation initiative. The baseline for the analyses for this study, as described in Section 5.1, is based on information provided by the Commission in relation to the development of a new reference scenario; this includes future carbon prices. The carbon prices assumed for this analysis are shown in Table 6-16.

Table 6-16: EU ETS carbon prices assumed for analysis[107]

	2020	2025	2030	2035	2040	2045	2050
€ (2015) per tonne CO_2e.	25	26.5	30	50	80	85	88

These assumptions were not changed for this sensitivity analysis; therefore, the results shown below may underestimate the total impacts of combining the fuel tax with the changes in the EU ETS regulation.

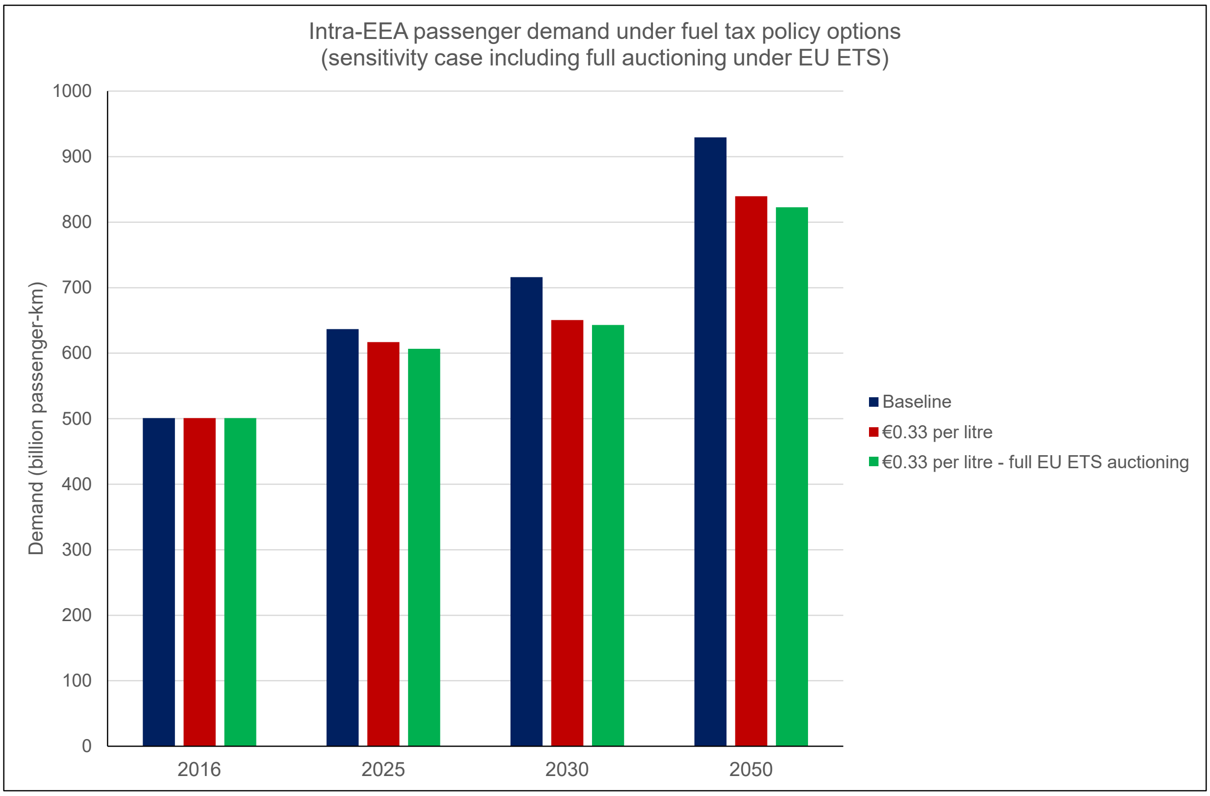
Table 6-17 shows the impact on ticket prices of the full auctioning of EU ETS allowances in combination with the €0.33 per litre fuel tax, while Figure 6-36 shows the resulting passenger demand on intra-EEA flights under this sensitivity analysis.

Table 6-17: Impacts on ticket prices for intra-EEA flights under €0.33 per litre fuel tax rate, including full auctioning of EU ETS allowances

Fuel tax	€0.33/litre		€0.33/litre with full auctioning	
Ticket price changes by year and carrier type	Traditional scheduled carriers	Low-cost carriers and charter flights	Traditional scheduled carriers	Low-cost carriers and charter flights
2025	1.7%	3.5%	2.6%	5.4%
2030	5.4%	10.9%	6.1%	12.3%
2050	6.0%	11.3%	7.2%	13.7%

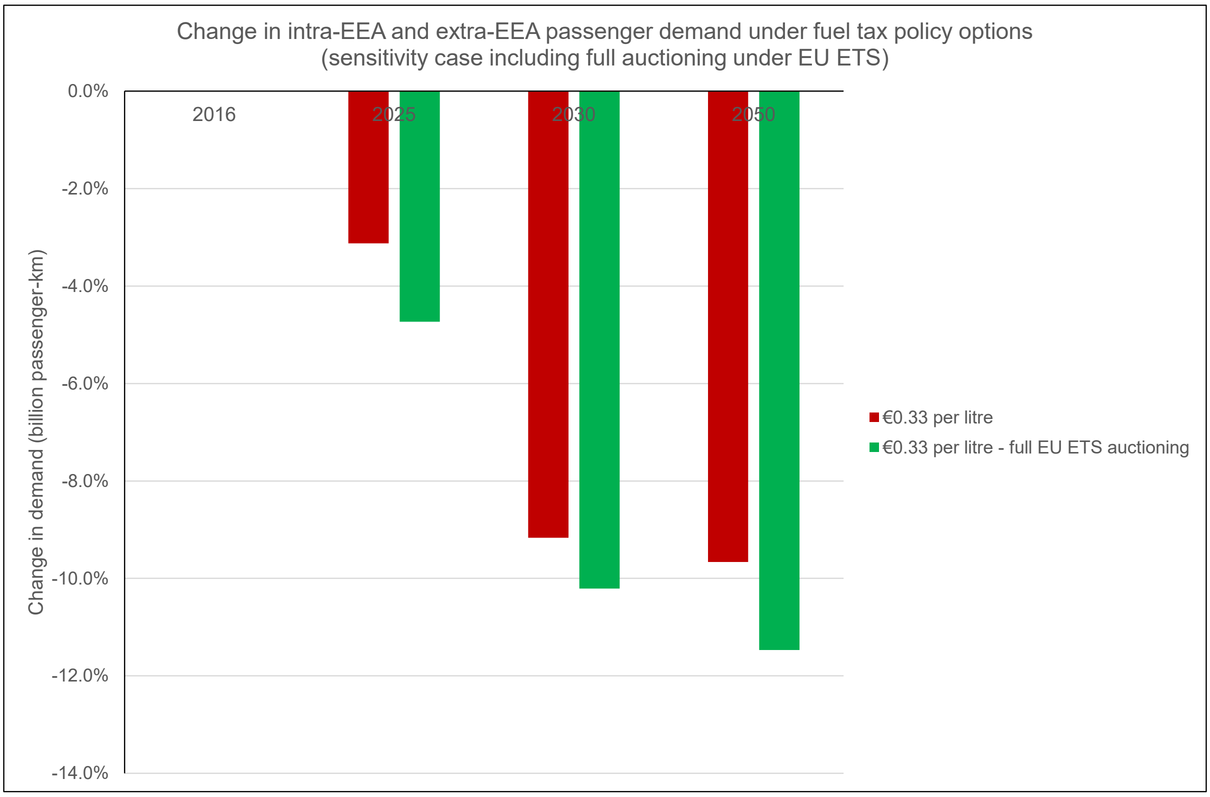
107 The specified carbon price values, which were given in €(2015) were inflated to €(2019) for consistency with other price assumptions before application in the model

Figure 6-36: Passenger demand for intra-EEA flights under €0.33 per litre fuel tax rate, including full auctioning of EU ETS allowances (using EU ETS carbon prices of €26.5 (2025), €30 (2030) and €88 (2050) (in 2015 euros))



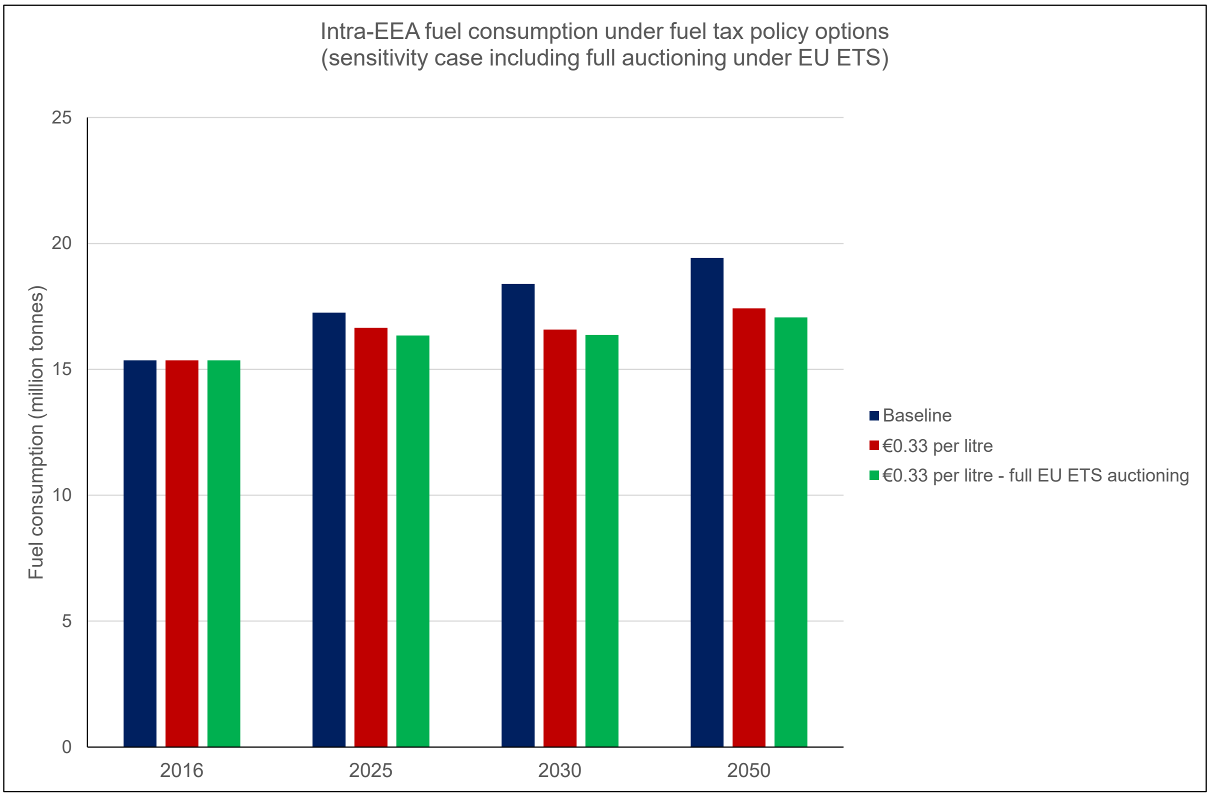
Under full auctioning of EU ETS allowances and the fuel tax, the demand for intra-EEA flights is slightly lower than with the existing free allowances. As shown in Figure 6-37, by 2050, the effect of the combination of full auctioning and the fuel tax is a reduction in demand of 11.5%, compared to 9.7% for the fuel tax in isolation.

Figure 6-37: Percentage change in passenger demand for intra-EEA flights under €0.33 per litre fuel tax rate, including full auctioning of EU ETS allowances (using EU ETS carbon prices of €26.5 (2025), €30 (2030) and €88 (2050) (in 2015 euros))



The effects of these reductions in demand on the fuel consumption on intra-EEA flights is shown in Figure 6-38.

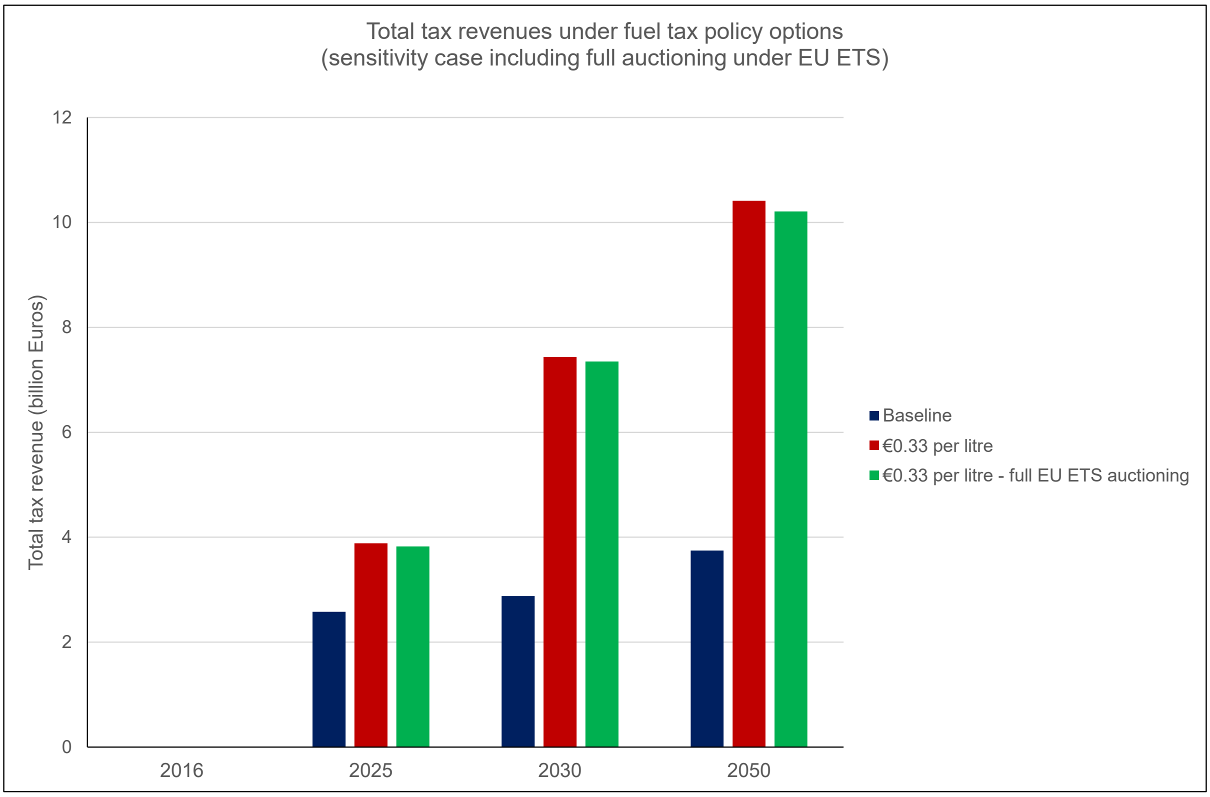
Figure 6-38: Fuel consumption on intra-EEA flights under €0.33 per litre fuel tax rate, including full auctioning of EU ETS allowances (using EU ETS carbon prices of €26.5 (2025), €30 (2030) and €88 (2050) (in 2015 euros))



The fuel consumption follows a very similar trend to passenger demand, with a slightly greater reduction in fuel consumption (and emissions) than under the case with just the fuel tax implemented. The reduction in fuel consumption relative to the baseline increases from 10.3% (under the fuel tax-only case) to 12.2% (under the case with full auctioning).

In this case, however, the greater reduction in fuel consumption is not due to an increased tax, but an impact of another mechanism leading to an increase in the effective fuel price. As a result, the revenue from the fuel tax in 2050 is reduced slightly from €10.4 billion to €10.2 billion by the effects of the change in the EU ETS allowance allocation, as shown in Figure 6-39.

Figure 6-39: Total tax revenue (fuel tax and ticket taxes combined) on intra-EEA flights under €0.33 per litre fuel tax rate, including full auctioning of EU ETS allowances (using EU ETS carbon prices of €26.5 (2025), €30 (2030) and €88 (2050) (in 2015 euros))



6.2.8 Summary of analysis of fuel tax options

- The fuel taxes analysed in this study have all been restricted to fuel supplied for intra-EEA flights, due to potential challenges under the Chicago Convention and air transport agreements with third countries if a tax was applied to fuel supplied for extra-EEA flights. However, the agreements with Morocco and the UK do allow for the taxation of fuel on flights between the EEA and these two countries. The impacts of fuel taxation on flights from the EEA to Morocco and the UK have been examined in a sensitivity case.
- The tax options analysed all have noticeable impacts on CO_2 emissions in the long-term, with reductions of between 6% and 15% for tax rates from €0.17 to €0.50 per litre for intra-EEA flights, which closely correspond to the level in the demand reduction,.
- Although the analysis shows that the fuel tax leads to a small improvement in aircraft fuel efficiency, the large majority of the reduction in emissions is due to a reduction in demand due to increased ticket prices. The €0.33 per litre tax option results in a 10% reduction in demand corresponding to 10% in CO_2 reduction, by 2050, with a spread from 5% to 14% for the lower to higher tax rates.
- The existing national ticket taxes contribute €2.6 billion of revenue from intra-EEA flights in 2025; under the €0.33 per litre fuel tax, with a 10-year transition, the fuel tax contributes only €1.4 billion in 2025. The additional tax revenue from aviation under the €0.33 per litre rate is about €6.7 billion per annum in 2050. The impacts on the economy from the reduction in aviation demand reduce the rise in total tax from the transport sector to €5.4 billion per annum.
- The impacts of the fuel tax and the consequent changes in demand reduce total GDP in the EU27 by approximately €9 billion (about 0.05%) by 2050, with strong variations between Member States as a function of the importance of aviation for their economy. This is however under the assumption that revenue is used for deficit reduction; if the revenue is recycled, the negative impact on GDP would be even smaller.

- The implementation of a fuel tax may have some impacts on connectivity. In general, the forecast growth in air transport more than offsets the reductions in demand (against the baseline) due to the fuel taxes. However, the reductions in profitability may make some marginal routes less commercially viable, but overall the effects are expected to be minor. Similarly, there may be some impacts on routes between the EEA and a third country on the competitiveness of EEA carriers as they compete with non-EEA carriers that are not impacted in the same way on the totality of their route network.
- The impacts of the fuel tax (as percentage changes) are not significantly affected when considering them against a lower baseline demand (representing a slower recovery following the COVID-19 pandemic).
- The primary analysis assumes that the existing national ticket taxes will be retained when the new fuel tax is implemented. A scenario in which these national ticket taxes are withdrawn when the fuel tax is implemented shows lower levels of impact, as the total tax burden is reduced. The impact on demand is reduced from 9.7% to 5.6, while the reduction in fuel consumption and CO_2 emissions is 6.4% instead of 10.3% (all calculations were based on the €0.33 per litre tax option).
- A scenario in which there is a significantly higher uptake of sustainable aviation fuels (through a blending mandate, as investigated by the ReFuelEU Aviation initiative) shows a small additional reduction in demand under a €0.33 fuel tax (compared to the same fuel tax with the baseline uptake of sustainable fuel). The reduction in CO_2 emissions (relative to the baseline) in 2050 rises from 10% (for just the fuel tax) to 66% (for the blending mandate and fuel tax combined), under the assumption that sustainable fuels cause zero net emissions on life cycle basis. The revenue from the fuel tax is reduced by 63% under such a scenario.
- A scenario in which EU ETS allowances are fully auctioned (i.e. removal of free allowances) shows a slightly greater reduction in fuel consumption (and emissions) and a slightly lower increase in tax revenues, compared to a scenario where a fuel tax is implemented but a proportion of EU ETS allowances continues to be granted for free to airlines.

6.3 Impact assessment results – ticket tax

This section describes the impacts of the different ticket tax options that have been investigated, with the taxes applying to both intra-EEA and extra-EEA flights in each case (though with, in some cases, different tax rates).

The three main ticket tax options that have been considered are a flat rate (the same tax value applied to all tickets sold), a stepped rate (with a higher tax for longer flights, reflecting the increased environmental impacts of such flights) and an inverse stepped tax rate (with a higher tax rate for short flights, reflecting the potential availability of alternative modes for such journeys). The tax rates included in these three cases are shown in Table 6-18. Each is for a one-way flight leg (i.e. the additional cost on a return ticket would be double the value shown). The rates shown were calculated based on average flight distances within each distance band, the average fuel consumption per passenger-km on such flights and an equivalence to the €0.33 per litre fuel tax. Additional details are given in Section 4.2.2.

Table 6-18: Harmonised minimum tax rates included in ticket tax options

Flat rate tax	Stepped rate tax	Inverse stepped rate tax
€10.43 per ticket on all flights Cargo tax €0.10 per tonne-km	€10.12 per ticket for all intra-EEA flights €25.30 per ticket for extra-EEA flights less than 6,000km €45.54 per ticket for extra-EEA flights over 6,000km Cargo tax €0.10 per tonne-km	€25.30 per ticket for flights less than 350km (intra-EEA and extra-EEA) €10.12 per ticket for flights over 350km (intra-EEA and extra-EEA) Cargo tax €0.10 per tonne-km

As described in Section 4.2, the ticket tax options include exemptions for transit/transfer passengers with origin and destination outside the EEA. Such passengers may represent up to 15% of all passengers on aircraft departing from EU airports, so the impacts of the policy measure are reduced because of the exemptions.

In addition to the tax applied to passenger tickets, the policy options also each include a tax rate of €0.10 per tonne-km applied to all cargo transported on intra-EEA and outbound extra-EEA flights. This tax is applied to the cargo, whether it is transported on dedicated freight aircraft or in the belly hold of passenger aircraft.

In addition to the analyses of the three primary ticket tax options described in Table 6-12 above, sensitivity analyses have also been performed on cases with alternative assumptions or tax rates, including:

- Low demand baseline
- Existing national ticket taxes set to the harmonised minimum

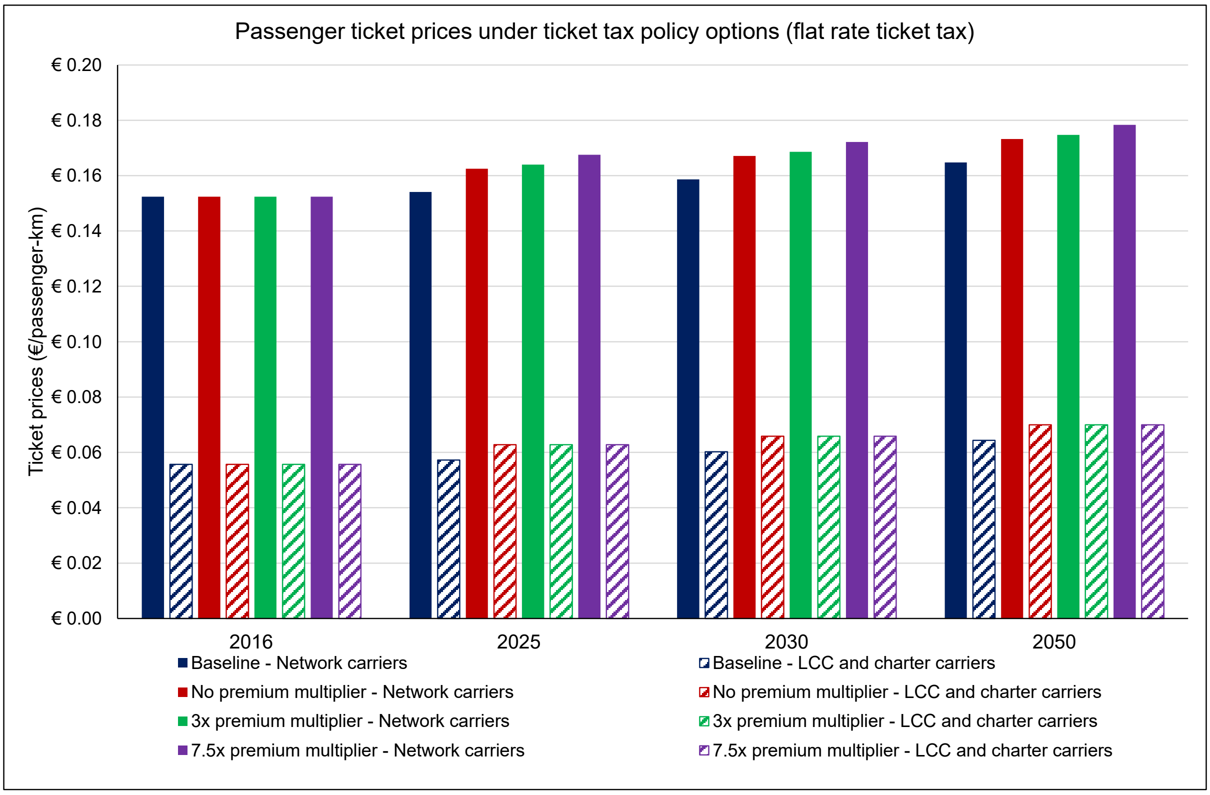
The results from these sensitivity analyses are described in Section 6.3.1.

6.3.1 Impacts on ticket prices

In modelling the impacts of the ticket tax option on ticket prices, the default assumption has been that, as the regulatory change being considered is a 'harmonised minimum' ticket tax, a Member State that has already implemented a ticket tax with a higher rate that the proposed minimum would maintain its existing tax rates, rather than reducing its rates to the harmonised minimum. A Member State that already has a ticket tax in place, but with rates lower than the harmonised minimum, is assumed to increase its rates to match the minimum values.

The impact of the introduction of the flat rate ticket tax on ticket prices is shown in Figure 6-40. In addition to the case in which the same tax rate is applied to all tickets, the figure also shows the effects of applying multipliers of 3 and 7.5 to the tax applied to premium seats (ticket prices are presented as an average per passenger-km across all seats).

Figure 6-40: Impact of flat rate ticket tax on ticket prices



The implementation of the tax leads to an increase of approximately €0.008 per passenger-km on traditional network carriers and €0.006 per passenger-km on LCC and charter carriers, representing increases of approximately 5.4% and 9.8%, respectively, in 2025. By 2050, due to the expected increase in ticket prices in the baseline, the percentage increases have reduced to 5.1% and 8.7% for the two carrier categories. The differences in the price increase for the different carrier types relate primarily to the different distributions of flight distances flown (network carriers are likely to have a greater proportion of longer flight distances in their route network).

The two premium multipliers raise the increase in average ticket prices in 2050 (relative to the baseline) to 6.0% (for a 3x multiplier) and 8.2% (for a 7.5x multiplier) for traditional scheduled carriers. As the number of premium seats on LCC and charter carriers is very low (or zero), the premium multiplier has no impact on the ticket prices on those carriers.

Figure 6-41 and Figure 6-42 show the equivalent increases in ticket prices for the stepped rate and inverse stepped rate ticket tax options (for the cases without a premium multiplier and with the 3x premium multiplier).

Figure 6-41: Impact of stepped rate ticket tax on ticket prices

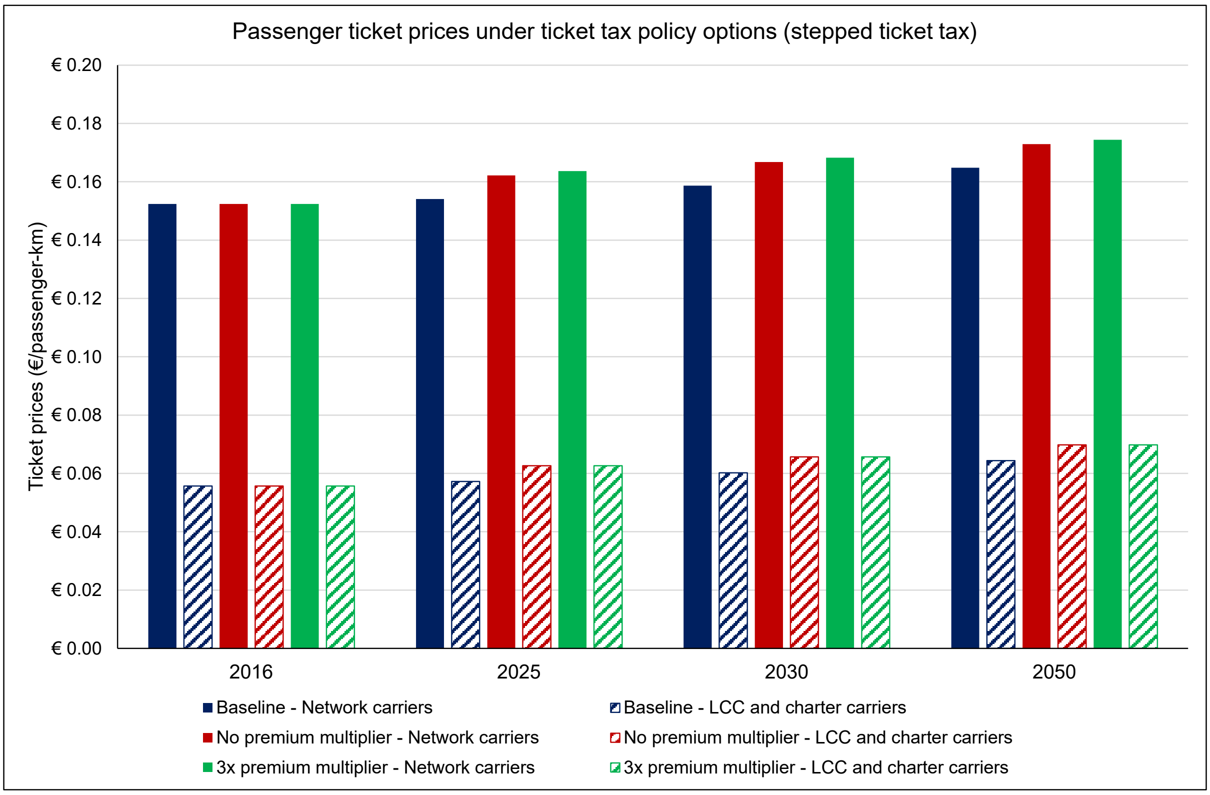
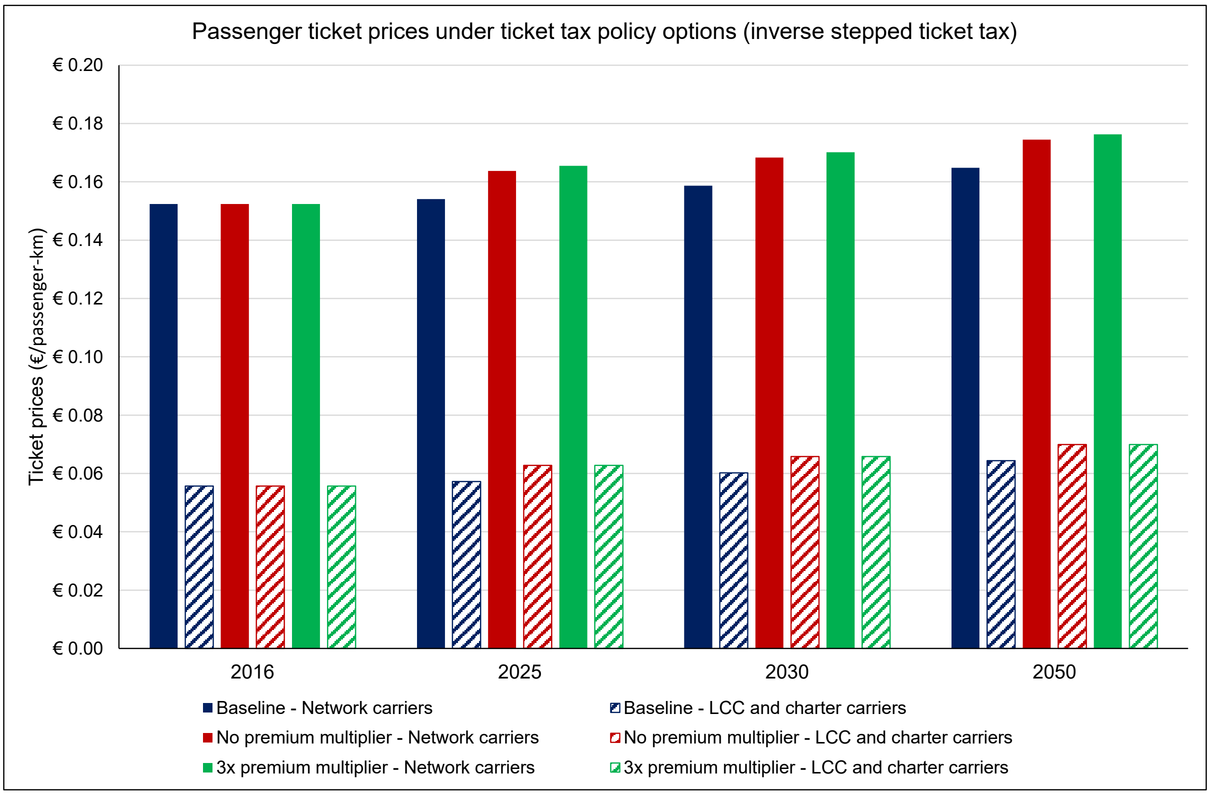


Figure 6-42: Impact of inverse stepped rate ticket tax on ticket prices



6.3.2 Impacts on demand

Figure 6-43 to Figure 6-46 show the impacts of the increased ticket prices on demand for each of the three ticket tax options, with results for intra-EEA and extra-EEA flights shown separately.

The flat rate ticket tax option leads to reductions in demand of about 9% on intra-EEA flights and about 1.5% on extra-EEA flights; in each case, the percentage reductions reduce over time as the baseline ticket price increases (and the price increase due to the ticket tax becomes relatively smaller). The greater percentage reduction in intra-EEA flights than extra-EEA reflects both the lower baseline prices (as there is a much higher proportion of flights flown by LCC and charter carriers on intra-EEA flights than extra-EEA) and the higher elasticity of demand on intra-EEA routes (which, itself, is partly influenced by the high number of flights by LCC), which also reflects that lack of realistic alternatives to aviation for long-haul extra-EEA flights.

The reduction in demand on intra-EEA flights in 2025 of 9% can be compared to the reduction in demand found for the €0.33 per litre fuel tax option of about 3% with a 10 year transition period and about 14% with no transition period (see Section 6.2.2).

For the stepped rate ticket tax, the reduction in demand on intra-EEA flights is slightly smaller than for the flat rate tax, but the reduction in demand on extra-EEA flights is significantly larger, at approximately 4.5%. This reflects the impact of the significantly higher tax on extra-EEA flights (both up to and over 6,000km distance) under this option.

For the inverse stepped rate ticket tax, the impact on demand for intra-EEA flights is greater, at slightly over 9%, while the impact on extra-EEA demand is very similar to that for the flat rate ticket tax. This latter result reflects the very limited number of extra-EEA flights of less than 350km, so the higher tax rate for such flight distances has very little impact on extra-EEA demand. Similarly, although the impact on intra-EEA flights is greater than under the flat rate ticket tax option, it is only by a small margin, as the majority of intra-EEA flights are over 350km.

Figure 6-43: Passenger demand on intra-EEA and extra-EEA flights under baseline and flat rate ticket tax policy option

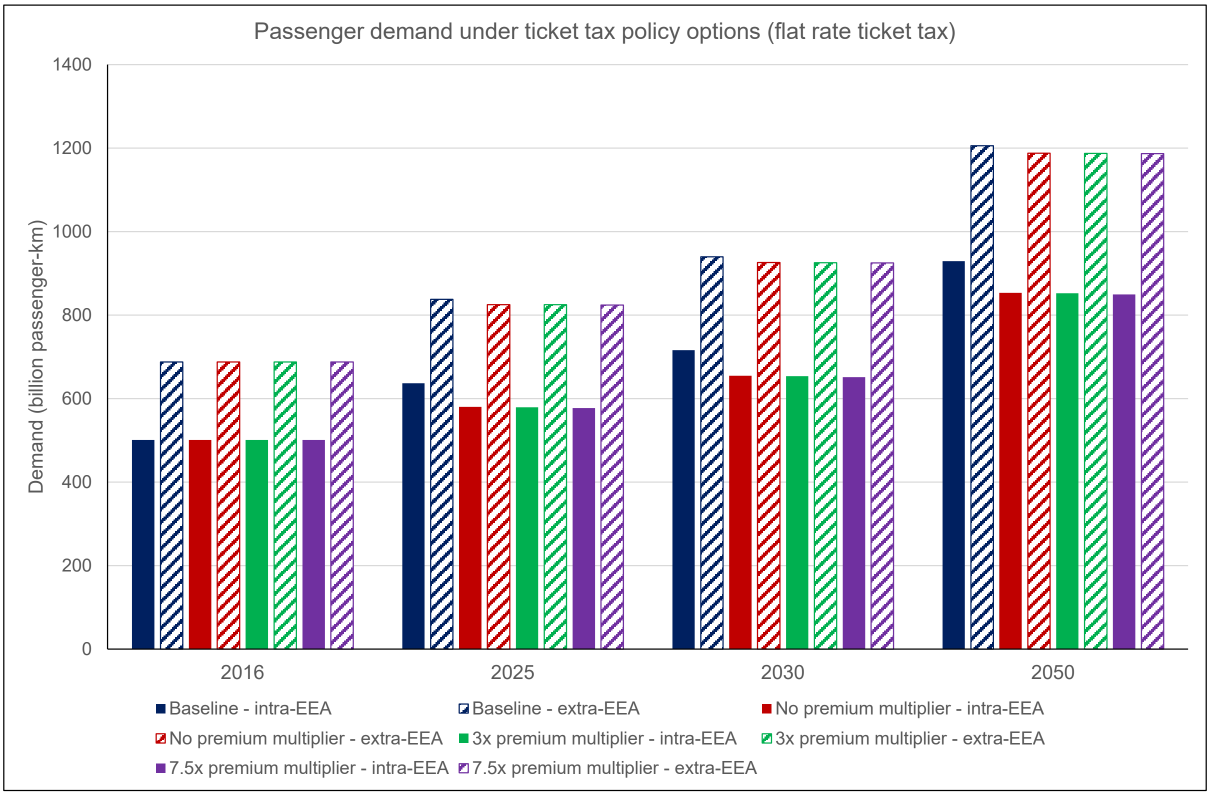


Figure 6-44: Change in passenger demand on intra-EEA and extra-EEA flights from flat rate ticket tax policy option

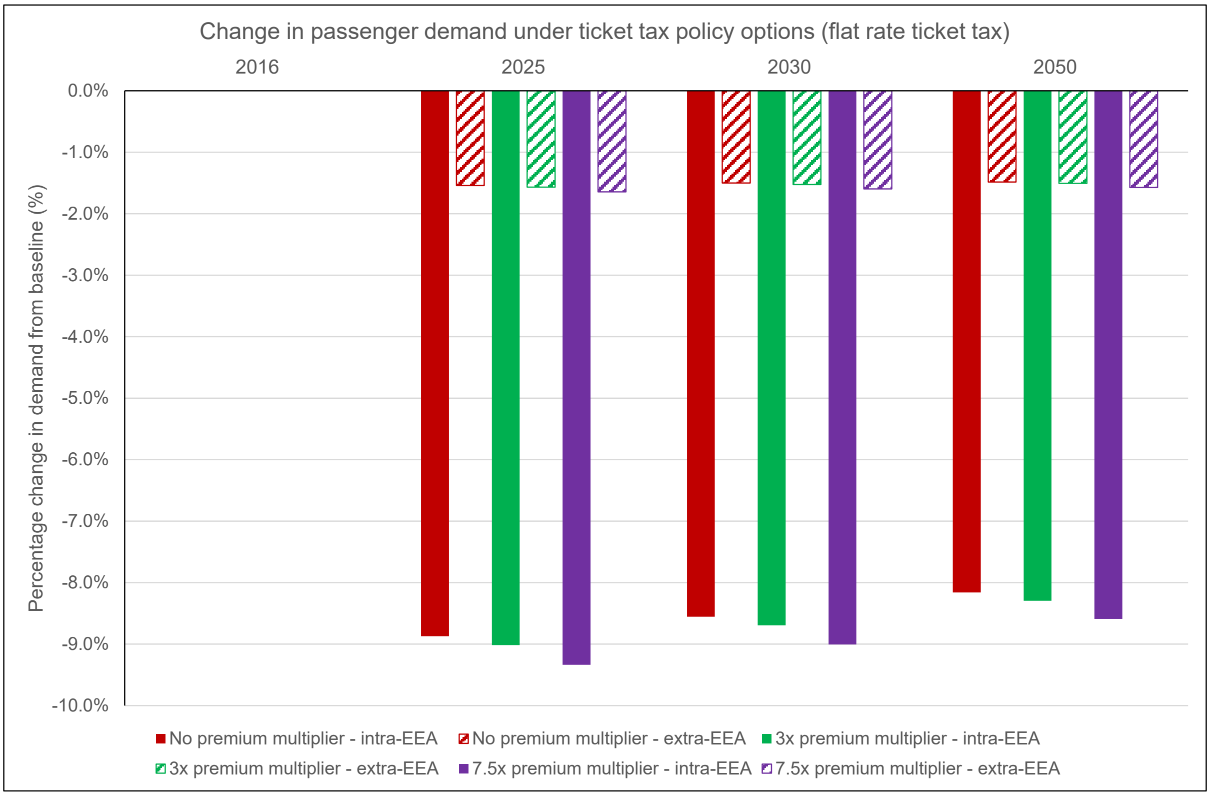


Figure 6-45: Change in passenger demand on intra-EEA and extra-EEA flights from stepped rate ticket tax policy option

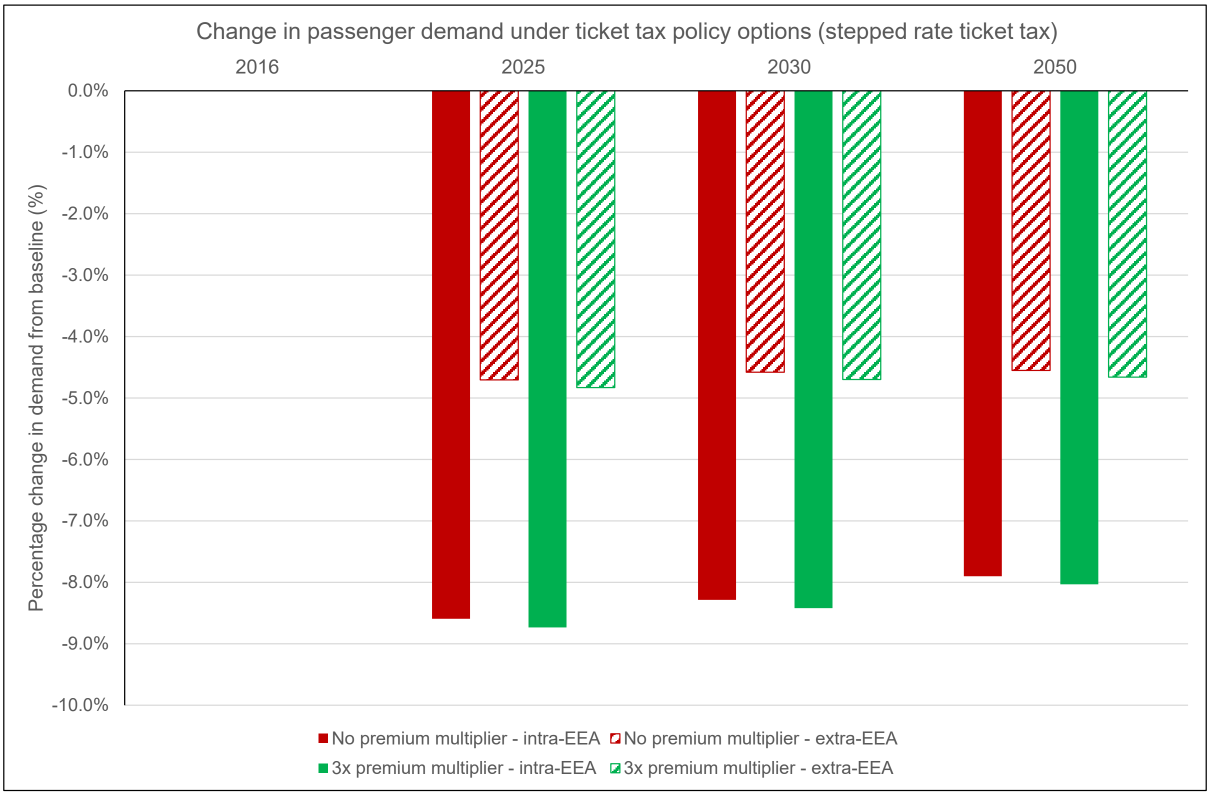
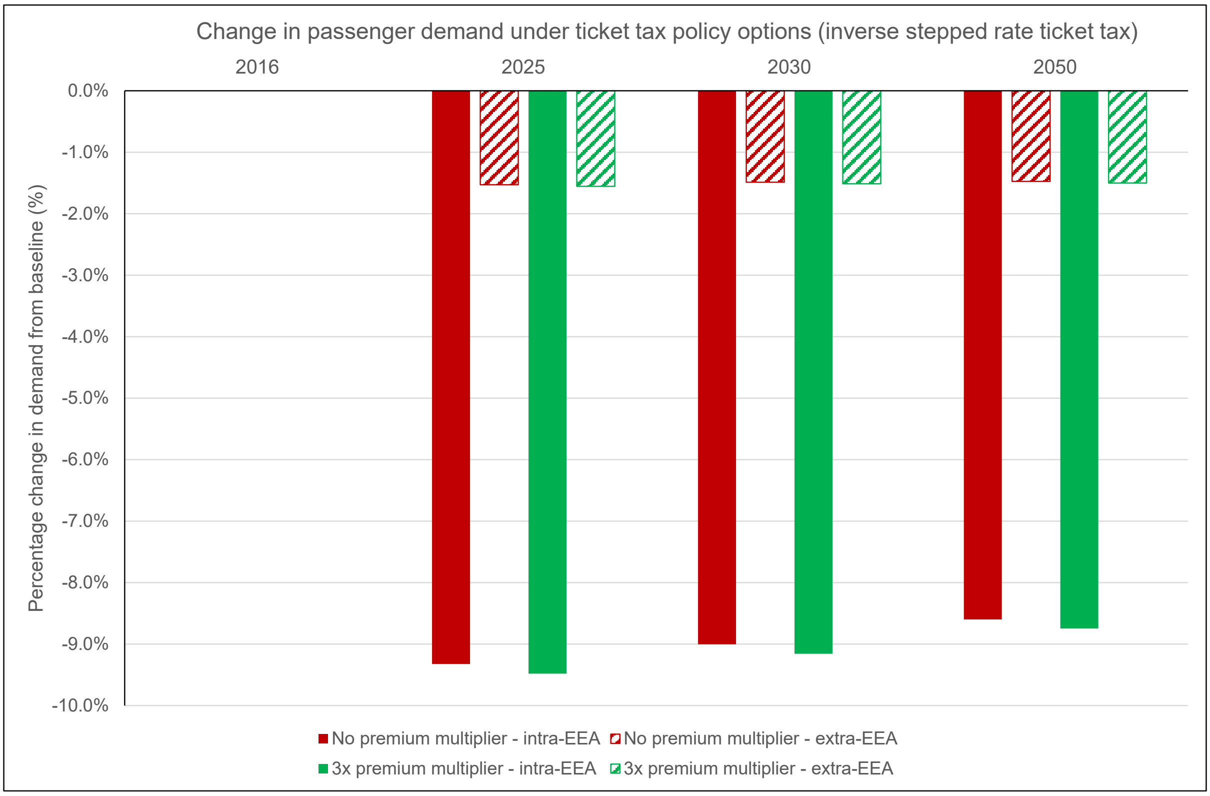


Figure 6-46: Change in passenger demand on intra-EEA and extra-EEA flights from inverse stepped rate ticket tax policy option



The percentage changes in passenger demand are presented in additional detail in Table 6-19, separating the impacts on network carriers and LCC/charter carriers, as well as intra-EEA and extra-EEA flights.

The 7.5x premium multiplier was only analysed in conjunction with the flat rate ticket tax; therefore, the results for the stepped rate and inverse stepped rate ticket taxes include just the 'no premium multiplier' and '3x premium multiplier' options.

Table 6-19: Percentage changes in demand for different ticket tax policy options

Case	2025	2030	2050
Flat rate ticket tax			
No premium multiplier			
Network carriers, intra-EEA	-5.0%	-4.9%	-4.7%
Network carriers, extra-EEA	-0.7%	-0.7%	-0.6%
LCC/charter carriers, intra-EEA	-11.6%	-11.1%	-10.5%
LCC/charter carriers, extra-EEA	-4.5%	-4.2%	-3.6%
3x premium multiplier			
Network carriers, intra-EEA	-5.4%	-5.2%	-5.1%
Network carriers, extra-EEA	-0.7%	-0.7%	-0.7%
LCC/charter carriers, intra-EEA	-11.6%	-11.1%	-10.5%
LCC/charter carriers, extra-EEA	-4.5%	-4.2%	-3.6%
7.5x premium multiplier			
Network carriers, intra-EEA	-6.1%	-6.0%	-5.8%
Network carriers, extra-EEA	-0.8%	-0.8%	-0.8%
LCC/charter carriers, intra-EEA	-11.6%	-11.1%	-10.5%
LCC/charter carriers, extra-EEA	-4.5%	-4.2%	-3.6%
Stepped rate ticket tax			
No premium multiplier			
Network carriers, intra-EEA	-4.8%	-4.7%	-4.6%
Network carriers, extra-EEA	-2.7%	-2.6%	-2.5%
LCC/charter carriers, intra-EEA	-11.3%	-10.8%	-10.2%
LCC/charter carriers, extra-EEA	-11.5%	-10.9%	-9.7%
3x premium multiplier			
Network carriers, intra-EEA	-5.2%	-5.1%	-4.9%
Network carriers, extra-EEA	-2.9%	-2.8%	-2.6%
LCC/charter carriers, intra-EEA	-11.3%	-10.8%	-10.2%
LCC/charter carriers, extra-EEA	-11.5%	-10.9%	-9.7%

Case	2025	2030	2050
Inverse stepped rate ticket tax			
No premium multiplier			
Network carriers, intra-EEA	-5.7%	-5.6%	-5.4%
Network carriers, extra-EEA	-0.7%	-0.7%	-0.6%
LCC/charter carriers, intra-EEA	-11.9%	-11.4%	-10.8%
LCC/charter carriers, extra-EEA	-4.4%	-4.1%	-3.6%
3x premium multiplier			
Network carriers, intra-EEA	-6.1%	-5.9%	-5.7%
Network carriers, extra-EEA	-0.7%	-0.7%	-0.7%
LCC/charter carriers, intra-EEA	-11.9%	-11.4%	-10.8%
LCC/charter carriers, extra-EEA	-4.4%	-4.1%	-3.6%

In general, the LCC/charter carrier category shows significantly higher impacts than the network carrier category (approximately double the percentage reduction in demand on intra-EEA flights). On extra-EEA flights, the different between the levels of impact is even greater, with the percentage changes for LCC/charter carriers being about six times those for network carriers for the flat rate and inverse stepped rate tax options and about four times for the stepped rate tax, although the overall demand level on extra-EEA flights is significantly higher for the network carrier category (approximately 860 billion pkm compared to 350 billion pkm for the LCC/charter carrier category in the), so the reductions in pkm are much closer between the two airline categories. The LCC/charter carrier category dos not, in general, include premium seats in their aircraft, so the premium multipliers do not have any impact on their demand; the multipliers do have an impact on the changes in demand for network carriers, but only a very small impact.

All three ticket tax options include the same option for a tax on cargo, at €0.10 per tonne-km. Figure 6-47 and Figure 6-48 show the impacts of the tax on cargo demand. The baseline demand is much higher for extra-EEA transport than intra-EEA, reflecting the reduced options for alternatives (the difference in speed between air and maritime transport is significantly greater than between air and road or rail transport) and the greater distances involved. The implementation of the cargo tax then leads to reductions in demand of about 8% and 11.5% for intra-EEA and extra-EEA transport in 2025. In a similar manner to the impacts on passenger transport, the reductions get smaller over time as the baseline freight charges increase and the tax becomes a smaller proportion of the total cost.

Figure 6-47: Cargo demand on intra-EEA and extra-EEA flights under baseline and ticket tax policy option

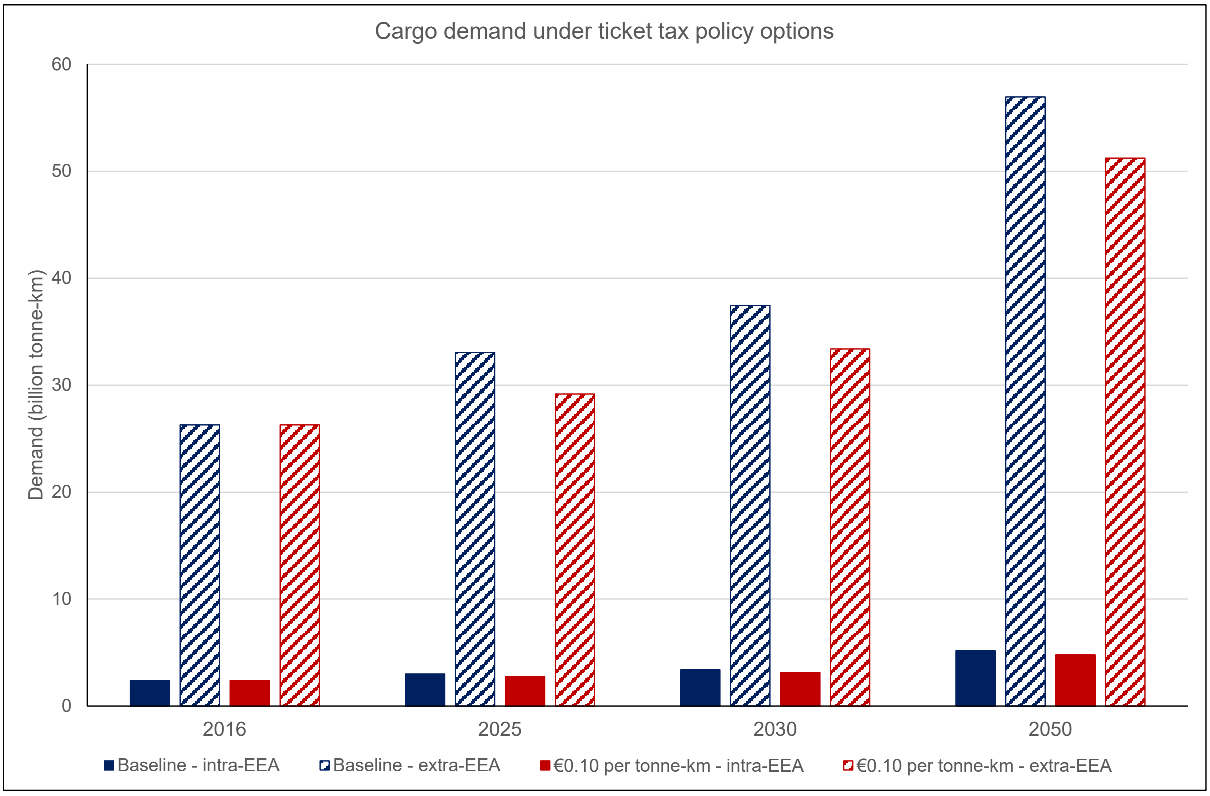
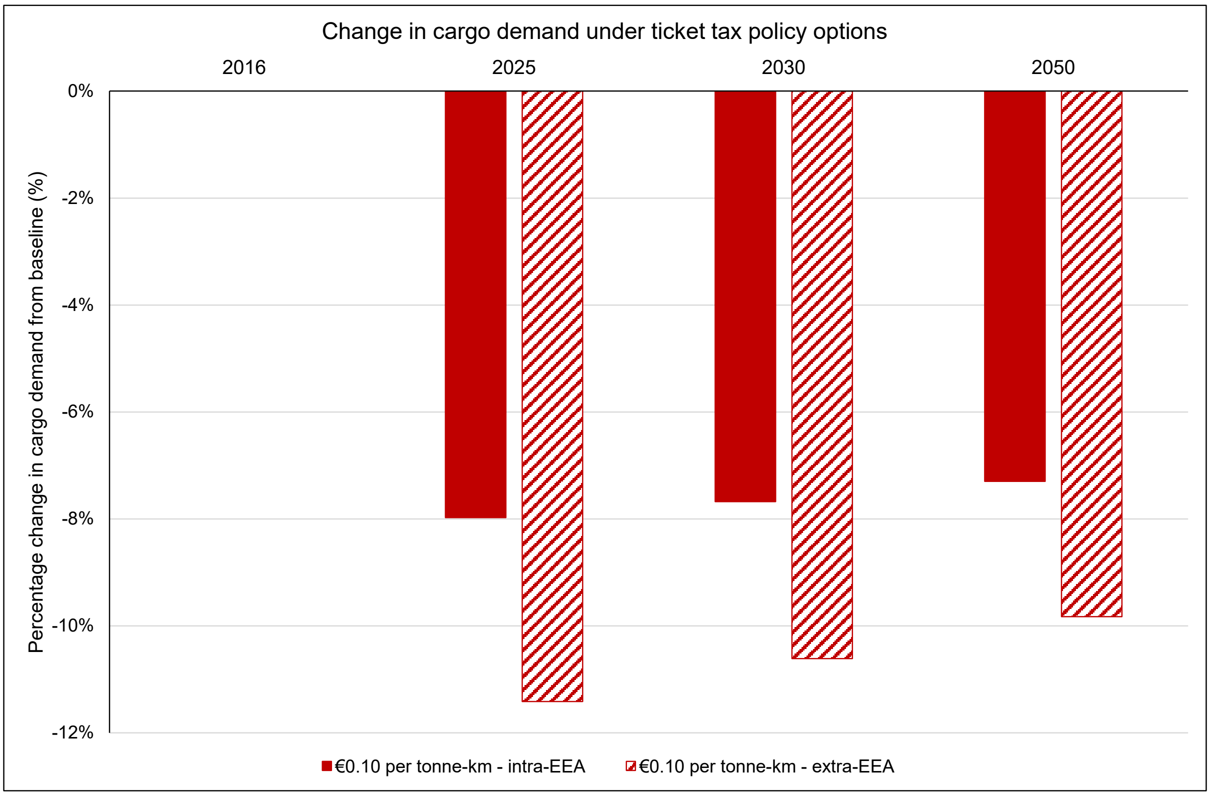


Figure 6-48: Effect on cargo demand on intra-EEA and extra-EEA flights of ticket tax policy option



6.3.3 Impacts on fuel burn and CO_2 emissions

As expected, the reductions in demand arising from the different ticket tax options lead to reductions in fuel consumption. As the ticket taxes apply to both intra-EEA and extra-EEA flights, the reduction in fuel consumption are also seen on both sets of flights. The fuel consumption under the baseline and flat rate ticket tax options (including the 3x and 7.5x premium multipliers) is shown in Figure 6-49, with the equivalent CO_2 emissions shown in Figure 6-50. The percentage changes in CO_2 emissions for the three ticket tax options are shown in Figure 6-51 to Figure 6-53.

Under the flat rate ticket tax option, fuel consumption is reduced (relative to the baseline) by 8.5% on intra-EEA flights and 2.8% on extra-EEA flights. The 3x and 7.5x multipliers on premium seats then provide small further reductions in fuel consumption as a result of their additional impact on overall demand. Between 2025 and 2050, the percentage impact on demand reduces (due to the increase in ticket prices in the baseline), so the percentage impact on fuel consumption also reduces slightly.

The results for the stepped rate ticket are also in line with the impacts on demand for this option, with the fuel consumption in 2025 being reduced by 8.3% and 5.5% on intra-EEA and extra-EEA flights, respectively. Similarly, the results for the inverse stepped ticket tax show results in line with demand, with reductions in fuel consumption of 9.6% and 2.8%.

As the emissions index for CO_2 is a fixed value, the reductions in CO_2 emissions are exactly in line with the reductions in fuel consumption described above.

Figure 6-49: Impact of flat rate ticket tax option on fuel consumption on intra-EEA and extra-EEA flights

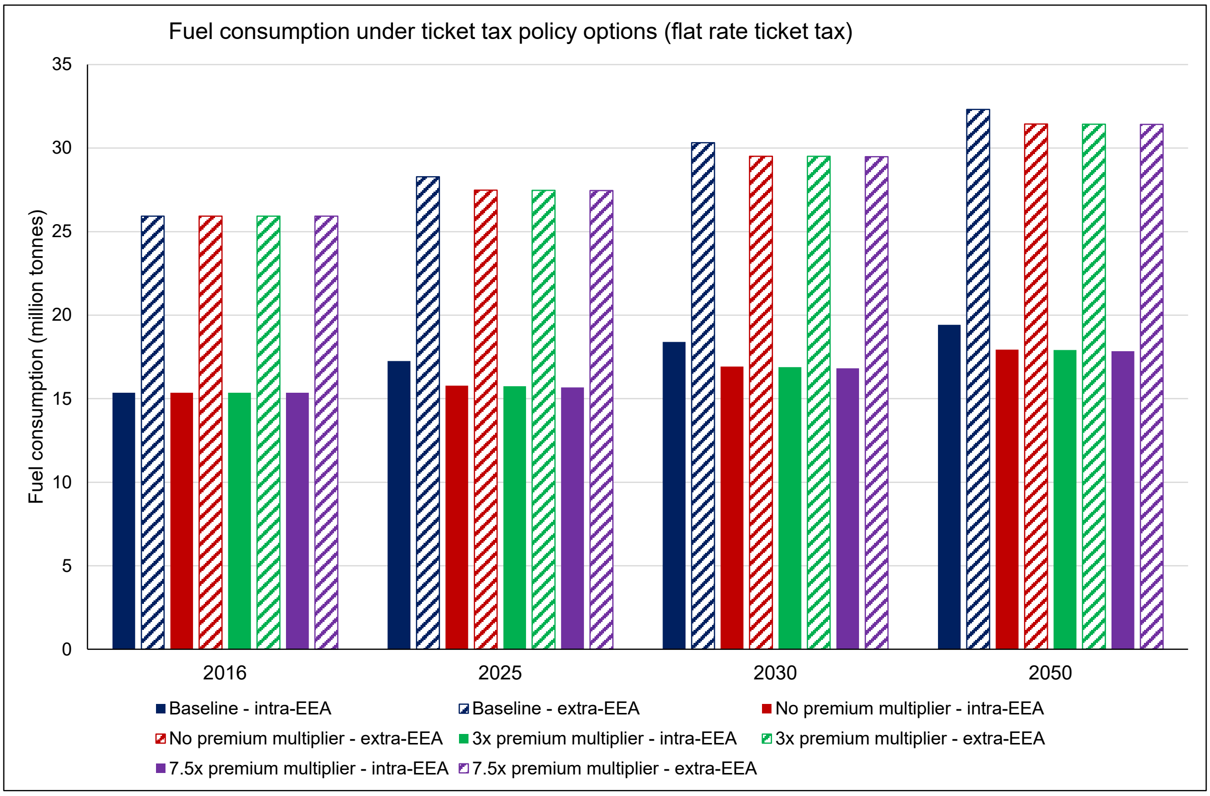


Figure 6-50: Impact of flat rate ticket tax option on CO_2 emissions on intra-EEA and extra-EEA flights

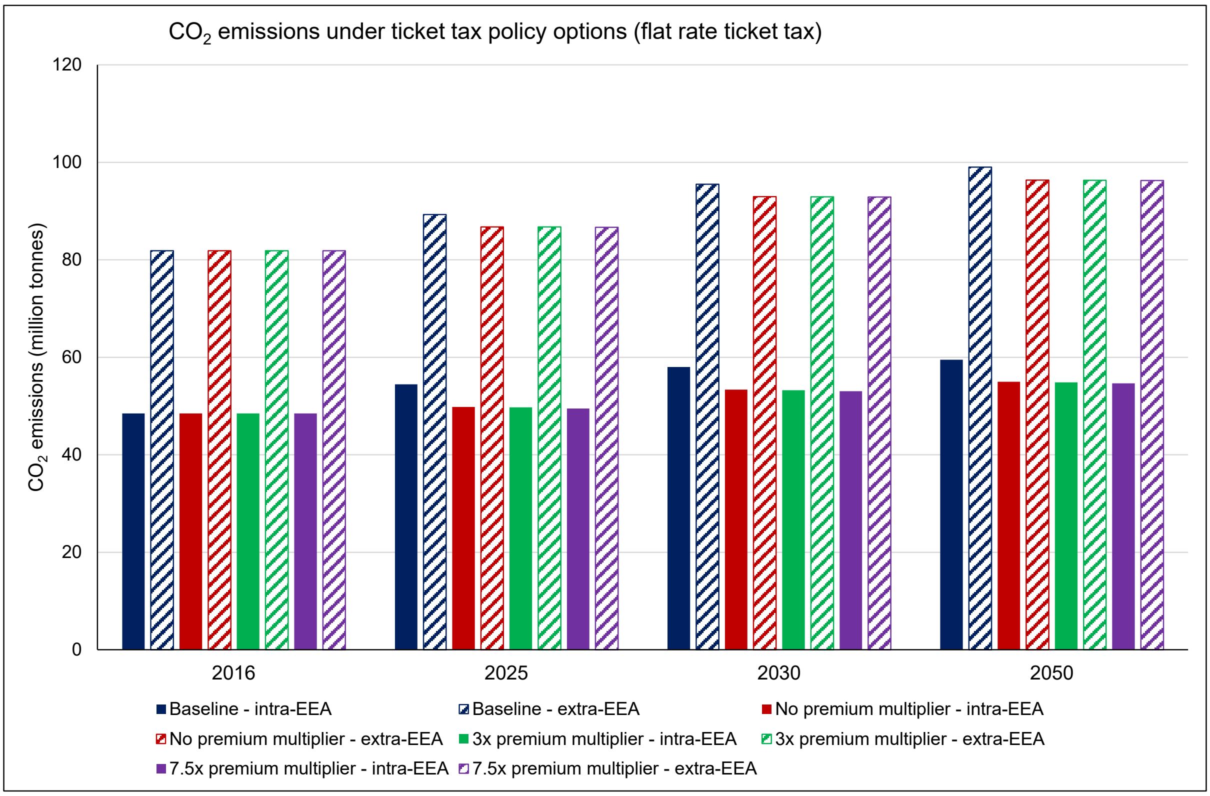


Figure 6-51: Change in CO_2 emissions from flat rate ticket tax on intra-EEA and extra-EEA flights

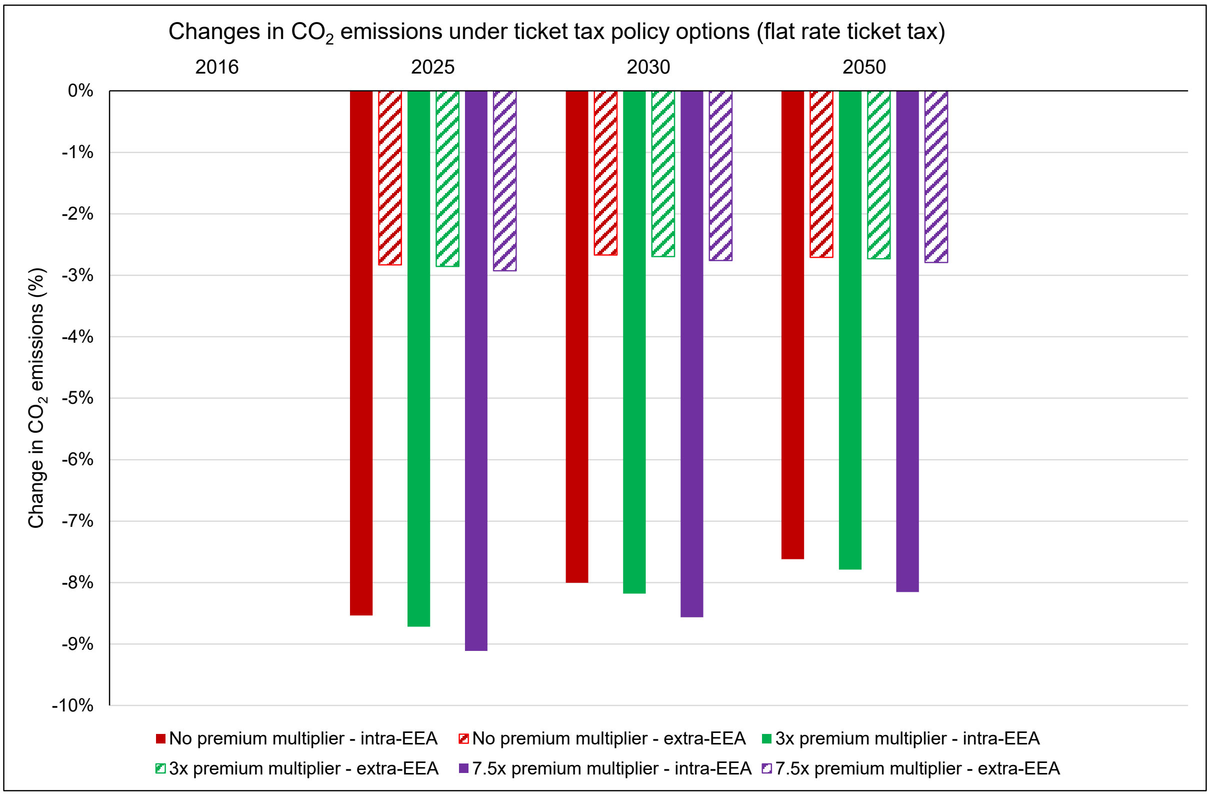


Figure 6-52: Change in CO_2 emissions from stepped rate ticket tax on intra-EEA and extra-EEA flights

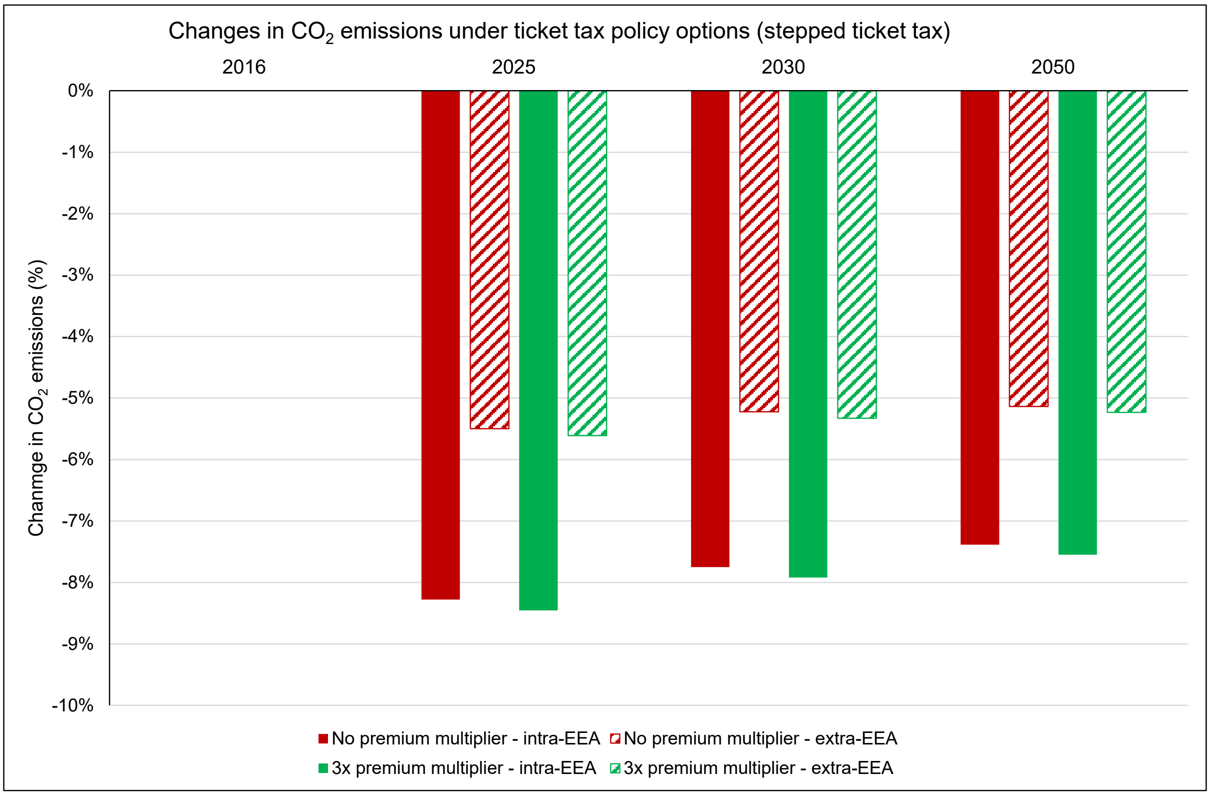


Figure 6-53: Change in CO_2 emissions from inverse stepped rate ticket tax on intra-EEA and extra-EEA flights

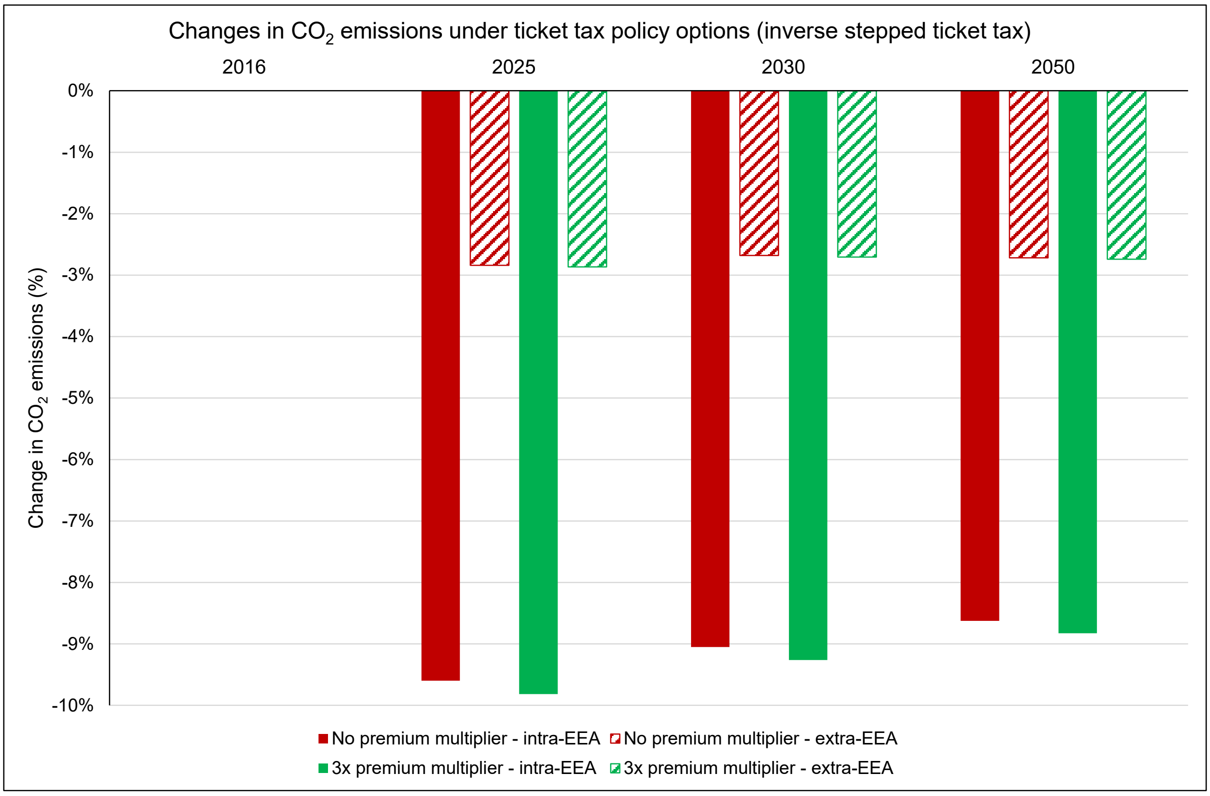
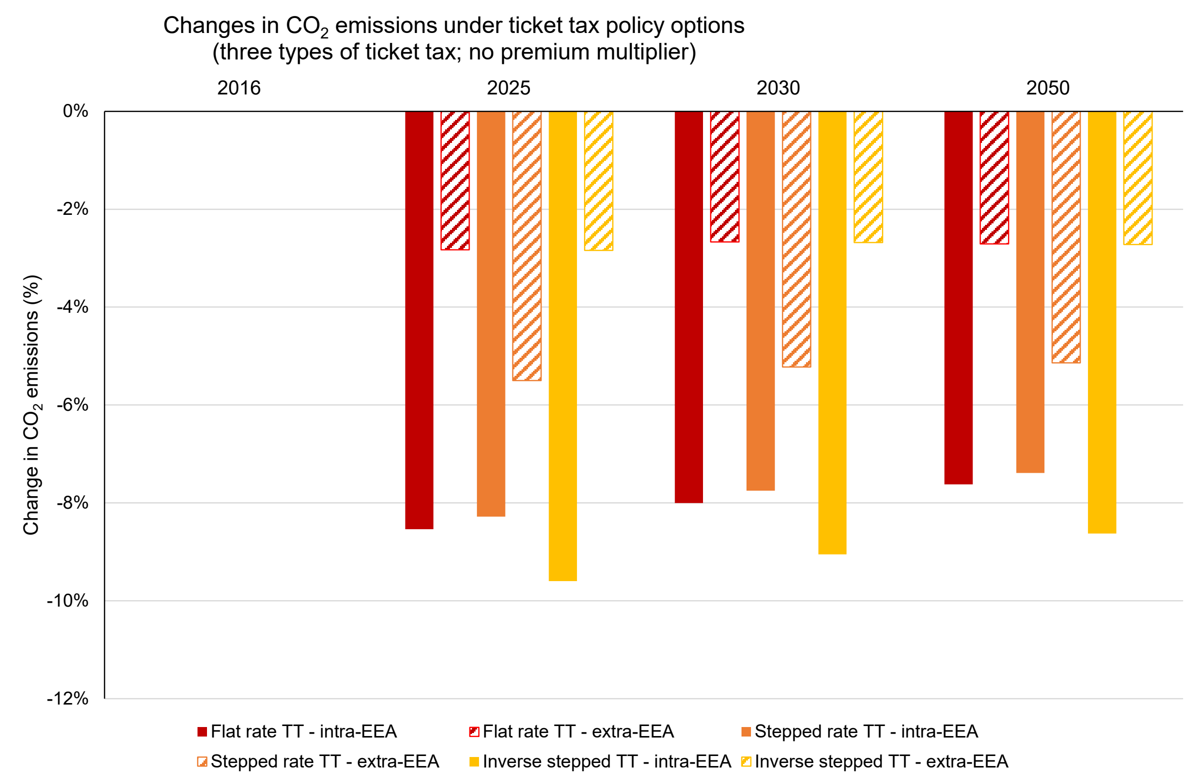


Figure 6-54 compares the changes in CO_2 emissions for the three different ticket tax options (without premium multipliers).

Figure 6-54: Changes in CO_2 emissions for the three ticket tax options on intra-EEA and extra-EEA flights (no premium multipliers)



The inverse stepped rate ticket tax gives the greatest reductions in emissions on intra-EEA flights, as expected (as it has a high tax rate on short flights). The other two ticket tax options have similar reductions (with the flat rate option having marginally greater reductions than the stepped rate option). On extra-EEA flights, the reductions in emissions for the flat rate and inverse stepped rate options are almost identical (and vary only little over time), while the stepped rate option gives significantly greater reductions in emissions (almost double the reductions from the other two options).

6.3.4 Impacts on connectivity and competitiveness

The impacts on connectivity and competitiveness derived from the implementation of a ticket tax are in line with the impacts discussed under the policy options were a fuel tax is introduced in intra-EEA flights – see section 6.2.4. This section presents a summary of the impacts that are expected to be similar, as well as a discussion of the more specific impacts of a ticket tax.

In general, for connectivity, the lower demand resulting from the ticket tax would be expected to reduce flight frequencies across all routes. As with the fuel tax, this could potentially lead to the loss of air transport on some routes, should these become not financially viable for air carriers to operate. However, as noted in section 6.2.4, the expected number of intra EEA flights in the baseline for 2025 are 21% higher compared to base year 2016, with the growth being larger for LCCs (24%) than for legacy carriers (19%). Under the different policy options that introduce a ticket tax, by 2025 demand is expected to still be above 2016 levels – e.g., under a stepped ticket tax with no reduction in national ticket taxes, by 2025 number of flights by legacy carriers is expected to be 12% higher than in 2016, and for LCCs 9% higher. That is, the introduction of a ticket tax, while reducing the expected growth in demand, is not expected to reduce demand when compared to 2016 levels. As such, in overall terms across the EU, the loss of connectivity is likely to be limited.

In terms of competitiveness, the major difference between implementing a fuel tax and a ticket tax is that a ticket tax applies to both intra-EEA and extra-EEA flights (unlike the fuel tax, which only applies to intra-EEA flights, except where international agreements would allow a fuel tax on extra-EEA flights). This distinction means that, e.g., even if the air services agreements allow non-EEA carriers to operate intra-EEA flights, they would have no intrinsic advantage over EEA carriers from a tax perspective. Still, the non-EEA carriers would have the potential advantage of not being subjected to this tax in their home markets, which might improve its overall profitability making it better suited to compete with EEA carriers. On the other hand, EEA carriers are likely to have an advantage compared to non-EEA carriers in their EEA home market, notably thanks to their brand recognition, loyalty programmes and intra-EEA connectivity. For more details see section 6.2.4**.**

Finally, the problem of 'hub switching', with passengers whose origin and destination are both outside the EEA choosing to travel via a non-EEA hub, instead of an EEA hub can also potentially impact the competitiveness of EEA carriers vis-à-vis carriers with hubs outside the EEA. However, the ticket tax policy options assessed in this study all include an exemption for connecting passengers, in line with existing ticket taxes in the EEA, which mostly exempt transit/transfer passengers. Given this, the risk of hub switching and its impact on the competitiveness of EEA carriers are expected to be limited. The issue of hub switching in general is discussed in more detail on section 6.5.1.3.

6.3.5 Impacts on revenues

The impacts of the three ticket tax options (including premium multipliers) on tax revenues are shown in Figure 6-55 to Figure 6-57. As noted in Section 6.3, these results are based on the assumption that any existing ticket taxes with rates that are above the harmonised minimum remain at their current level, while those below are brought up to the minimum level.

Figure 6-55: Impact of flat rate ticket tax option on tax revenue

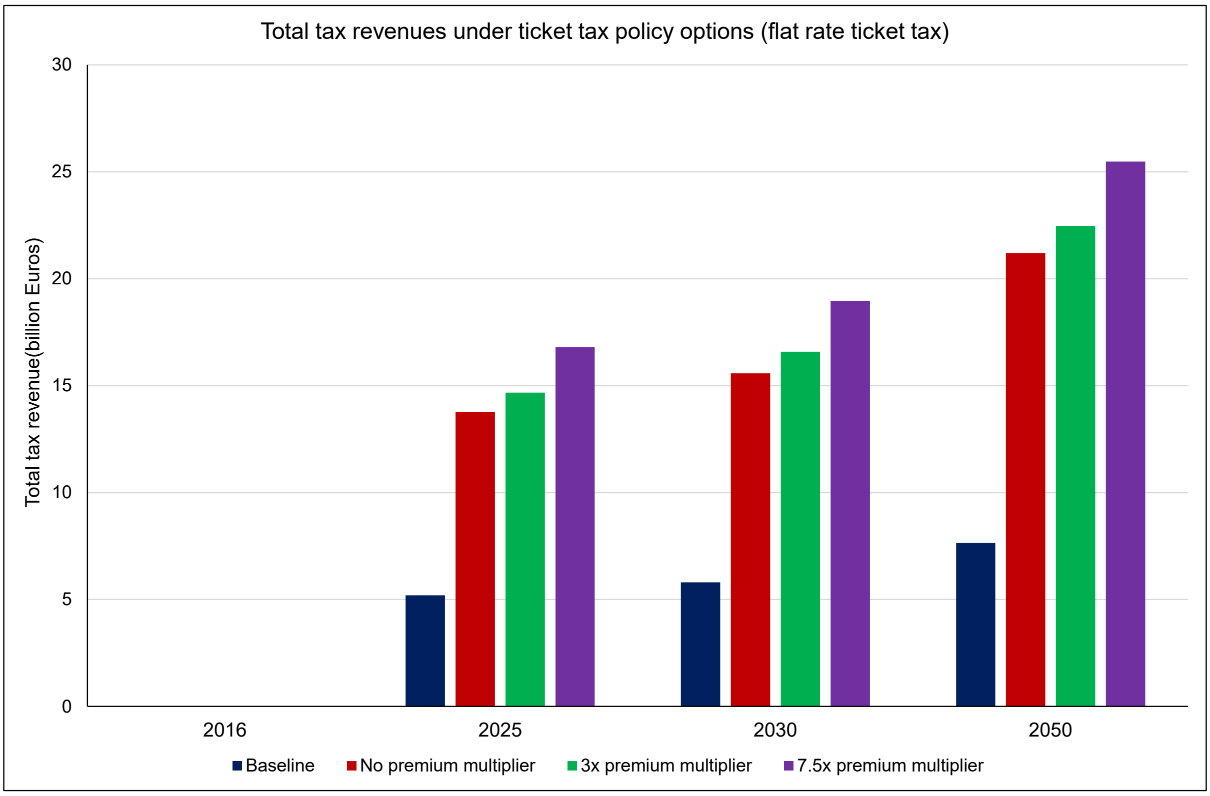


Figure 6-56: Impact of stepped rate ticket tax option on tax revenue

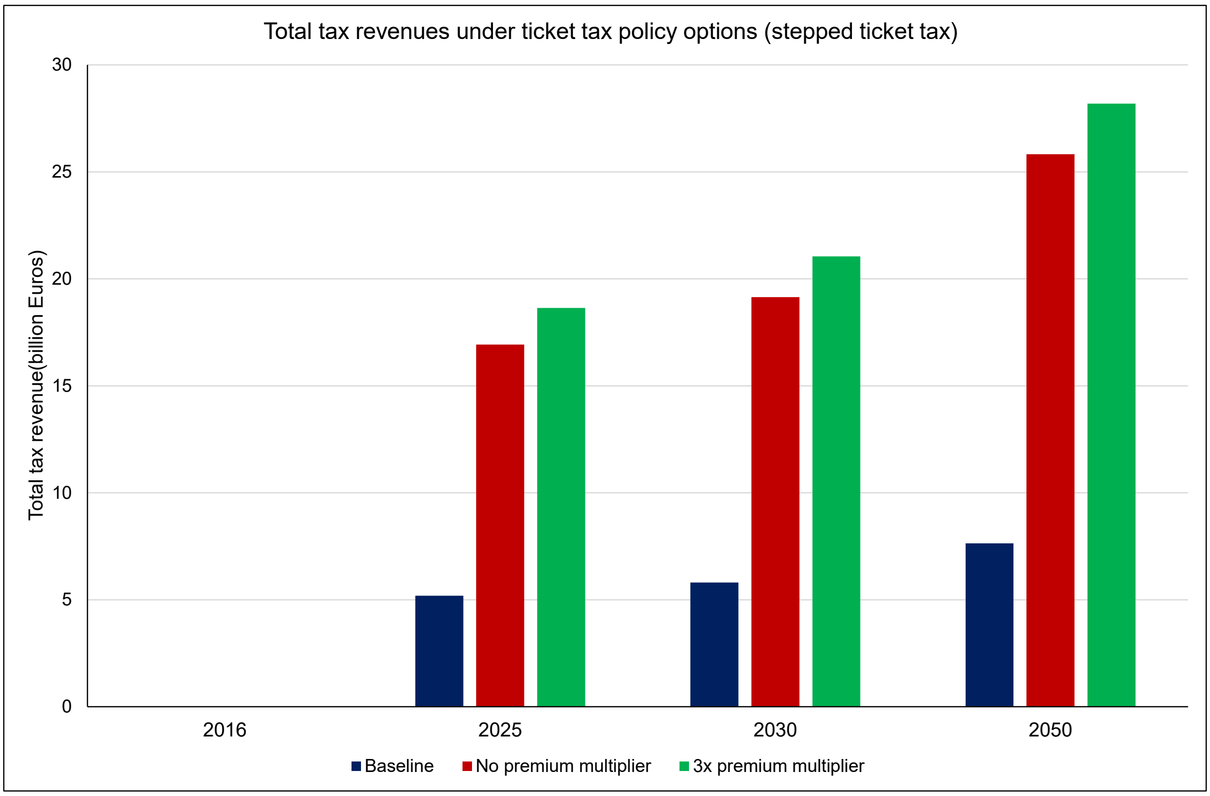
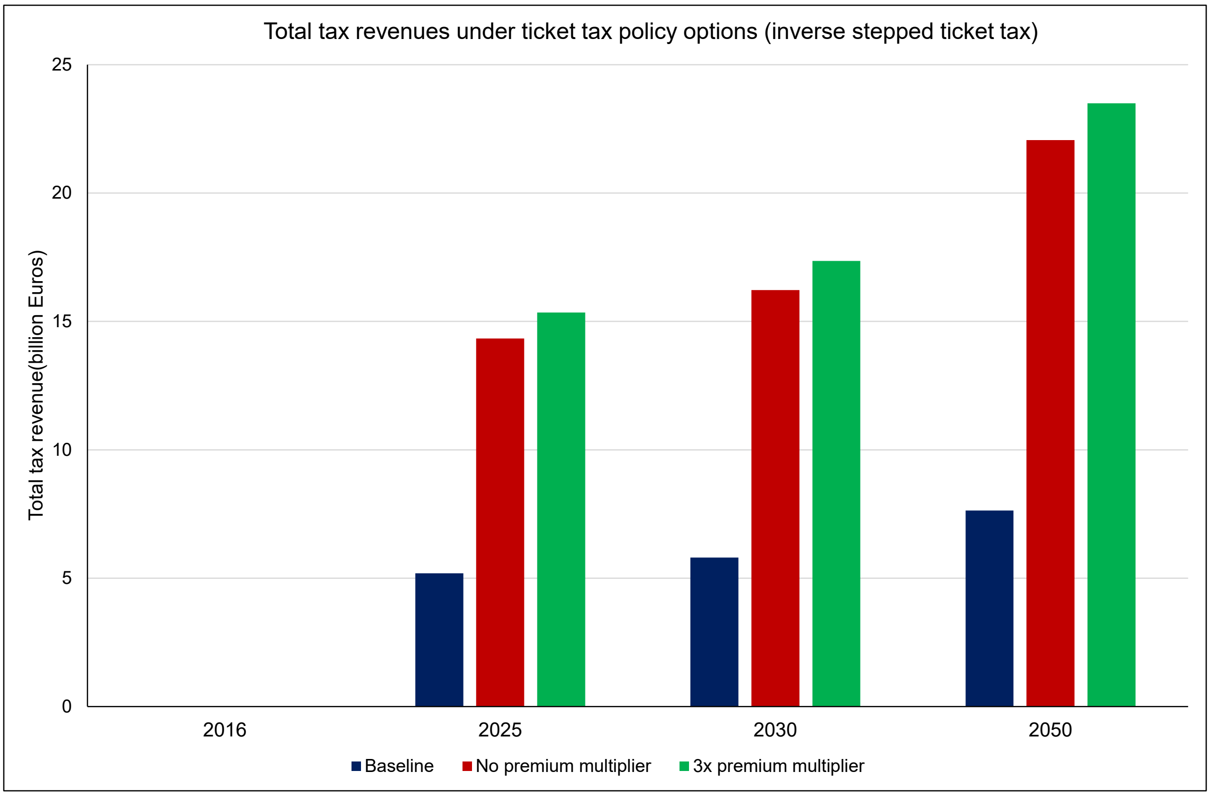


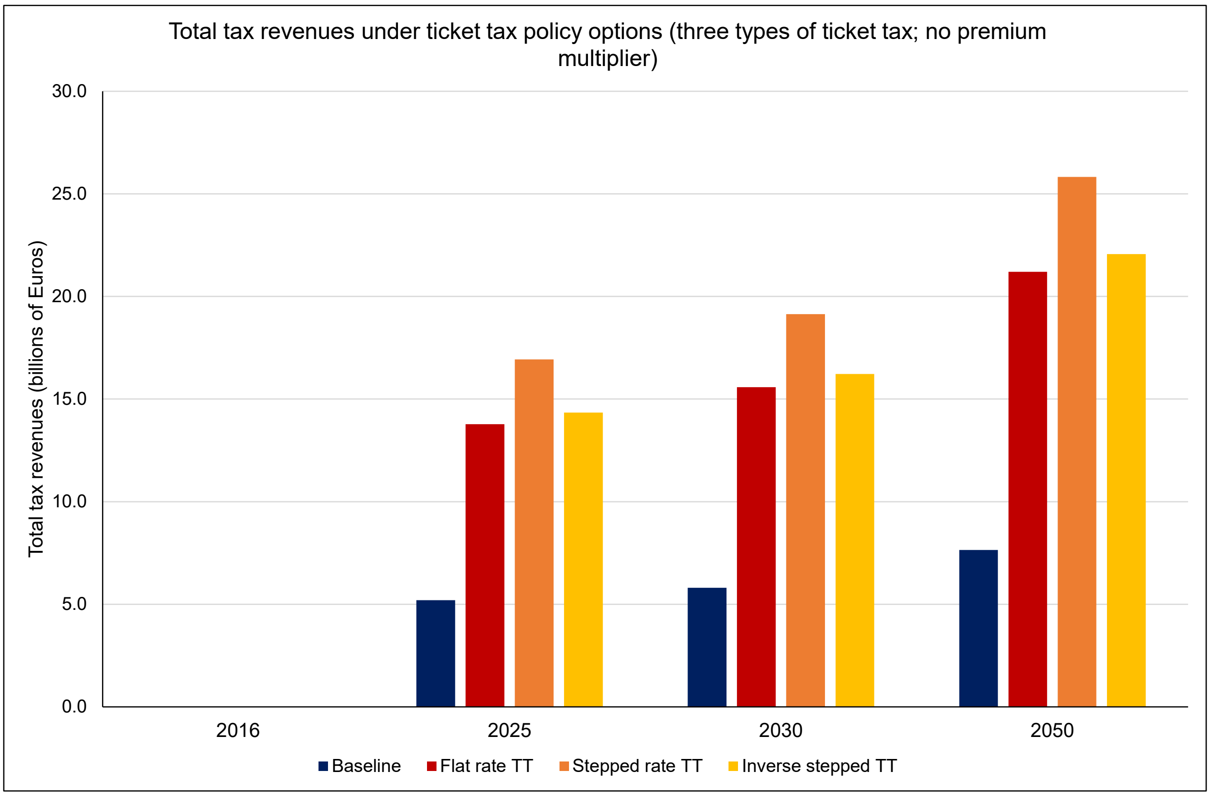
Figure 6-57: Impact of inverse stepped rate ticket tax option on tax revenue



Under the flat rate ticket tax (with no multiplier for premium seats), the total tax revenue is about €13.8 billion in 2025, rising to €21.2 billion in 2050, representing increases of €8.6 billion to €13.6 billion above the baseline values. Under the stepped and inverse stepped tax options, the increase over the baseline in 2050 increases to €18.2 billion and €14.4 billion, respectively. In each case, the premium multipliers have a greater impact on tax revenue (relative to the case with no premium multiplier) than they do on demand[108]. This is related to the relatively low elasticity for premium demand.

The total tax revenues raised under the three ticket tax options (for no premium multiplier) are shown in Figure 6-58.

Figure 6-58: Total tax revenues raised under three ticket tax options (no premium multiplier)



All three ticket tax options provide substantial increases in tax revenue relative to the baseline. The stepped rate option provides the greatest revenue; there is little variation between the other two options, with the flat rate option being slightly the smaller.

The distributions of tax revenue amongst the Member States in 2050 under the three ticket tax options (no premium multipliers) are shown in Table 6-20, together with the percentage of the total EU27 increase represented by each Member State's individual contribution.

Table 6-20: Changes in tax revenue from the baseline for ticket taxes in 2050 (values show the increase in revenue for each MS relative to the baseline in millions of Euros)

Member State	Flat rate ticket tax		Stepped ticket tax		Inverse stepped ticket tax	
	Change in tax revenue relative to baseline (€ millions)	Percentage of total change in tax revenue	Change in tax revenue relative to baseline (€ millions)	Percentage of total change in tax revenue	Change in tax revenue relative to baseline (€ millions)	Percentage of total change in tax revenue
AT	167.5	1.3%	294.7	1.6%	175.4	1.3%

[108] For example, the change in total demand for the 3x premium multiplier under the flat rate tax option in 2025 is 1.02 times that without a premium multiplier, while the total tax revenue with the same premium multiplier is 1.10 times that without.

BE	560.2	4.2%	657.7	3.7%	569.4	4.1%
BG	104.4	0.8%	142.2	0.8%	107.3	0.8%
CZ	129.4	1.0%	190.4	1.1%	131.7	0.9%
CY	129.7	1.0%	219.1	1.2%	133.3	1.0%
DE	1678.3	12.6%	2124.5	11.9%	1814.5	12.9%
DK	466.7	3.5%	587.0	3.3%	498.5	3.6%
EE	28.2	0.2%	31.8	0.2%	32.9	0.2%
ES	2300.5	17.3%	3152.6	17.6%	2401.6	17.1%
EL	544.5	4.1%	704.7	3.9%	645.6	4.6%
FI	261.1	2.0%	346.0	1.9%	332.3	2.4%
FR	1275.1	9.6%	1962.3	11.0%	1331.7	9.5%
HR	99.7	0.7%	126.3	0.7%	110.6	0.8%
HU	137.4	1.0%	181.5	1.0%	136.3	1.0%
IE	284.3	2.1%	446.2	2.5%	305.3	2.2%
IT	2029.2	15.2%	2635.2	14.7%	2057.7	14.7%
LV	51.5	0.4%	71.6	0.4%	53.5	0.4%
LT	38.5	0.3%	51.8	0.3%	39.5	0.3%
LU	301.2	2.3%	308.2	1.7%	312.4	2.2%
MT	70.1	0.5%	97.0	0.5%	71.2	0.5%
NL	1499.8	11.3%	2085.0	11.7%	1506.8	10.7%
PL	316.8	2.4%	418.3	2.3%	339.1	2.4%
PT	395.7	3.0%	540.2	3.0%	427.0	3.0%
RO	178.1	1.3%	214.3	1.2%	188.9	1.3%
SE	228.7	1.7%	242.6	1.4%	260.7	1.9%
SI	16.2	0.1%	25.7	0.1%	17.9	0.1%
SK	24.1	0.2%	33.3	0.2%	25.2	0.2%

Overall, there are only minor variations in the percentages of the total tax revenue collected by Member States between the three ticket tax options.

6.3.6 Macroeconomic and other transport mode impacts

As for the fuel tax option, the results from the aviation sector-specific analyses of the ticket tax options using the AERO-MS model have been used as inputs to the GINFORS-E model to investigate the macroeconomic impacts and those on other transport modes.

The tax options that were analysed using GINFORS-E were the three options described above with no premium multiplier.

Overviews of the results of the modelling for the three ticket tax options are given in Table 6-21 to Table 6-23.

Table 6-21: Overview of macroeconomic results in EU27 for flat rate ticket tax option

EU27		Flat rate ticket tax of €10.43 per ticket on all flights		
Topic/Indicator	Unit	2025	2030	2050
Demand effects on other modes of transport				
Land transport and transport via pipelines, output at constant prices	% change	0.33%	0.29%	0.19%
Rail passengers transported (% change in pkm)	% change	0.29%	0.25%	0.16%
Water transport, output at constant prices	% change	-0.18%	-0.19%	-0.18%
Effects on employment in the aviation and transport sector				
Air transport, number of persons engaged	% change	-1.41%	-1.37	-1.33%
Transport, total, number of persons engaged	% change	0.04%	0.02%	-0.01%
Tax revenue effects				
Air transport, revenue from ticket taxes	Billion €	8.4	9.6	13.3
Net indirect taxes	% change	0.01%	-0.01%	-0.03%
Direct taxes	% change	-0.03%	-0.04%	-0.04%
Tax revenues, total (incl. new aviation taxes)	% change	0.24%	0.24%	0.20%
Second-order macroeconomic effects				
GDP at constant prices	% change	-0.02%	-0.04%	-0.04%
GDP deflator	% change	0.03%	0.03%	0.02%
Employment, total, number of persons engaged	% change	0.01%	0.00%	0.00%
Employment , manufacturing, number of persons engaged	% change	0.00%	0.00%	-0.01%
Energy use and CO_2 emissions				
Transport (non-aviation) energy use	% change	0.27%	0.24%	0.20%
Total (non-aviation) energy use	% change	0.05%	0.04%	0.02%
Transport (non-aviation) CO_2 emissions	Change (Mt)	1.9	1.6	0.9
	% change	0.27%	0.25%	0.20%
Aviation CO_2 emissions (intra-EEA and extra-EEA flights)	Change (Mt)	-7.2	-7.2	-7.2
	% change	-4.99%	-4.69%	-4.55%
Total (all sectors) CO_2 emissions	Change (Mt)	-5.2	-5.8	-6.5
	% change	-0.20%	-0.25%	-0.37%

Table 6-22: Overview of macroeconomic results in EU27 for stepped rate ticket tax option

EU27		Stepped rate ticket tax of €10.12 per ticket on intra-EEA flights, €25.30 per ticket for extra-EEA flights less than 6,000km, €45.54 per ticket for extra-EEA flights over 6,000km		
Topic/Indicator	Unit	2025	2030	2050
Demand effects on other modes of transport				
Land transport and transport via pipelines, output at constant prices	% change	0.49%	0.43%	0.28%
Rail passengers transported (% change in pkm)	% change	0.44%	0.38%	0.25%
Water transport, output at constant prices	% change	-0.25%	-0.26%	-0.26%
Effects on employment in the aviation and transport sector				
Air transport, number of persons engaged	% change	-1.90%	-1.85%	-1.81%
Transport, total, number of persons engaged	% change	0.06%	0.04%	-0.01%
Tax revenue effects				
Air transport, revenue from ticket taxes	Billion €	11.5	13.1	17.9
Net indirect taxes	% change	0.02%	0.00%	-0.03%
Direct taxes	% change	-0.03%	-0.05%	-0.06%
Tax revenues, total (incl. new aviation taxes)	% change	0.33%	0.33%	0.26%
Second-order macroeconomic effects				
GDP at constant prices	% change	-0.03%	-0.05%	-0.06%
GDP deflator	% change	0.05%	0.05%	0.03%
Employment, total, number of persons engaged	% change	0.01%	0.00%	-0.01%
Employment , manufacturing, number of persons engaged	% change	0.01%	0.00%	-0.01%
Energy use and CO_2 emissions				
Transport (non-aviation) energy use	% change	0.39%	0.35%	0.28%
Total (non-aviation) energy use	% change	0.08%	0.06%	0.03%
Transport (non-aviation) CO_2 emissions	Change (Mt)	2.8	2.3	1.3
	% change	0.39%	0.36%	0.29%
Aviation CO_2 emissions (intra-EEA and extra-EEA flights)	Change (Mt)	-9.4	-9.5	-9.5
	% change	-6.55%	-6.18%	-5.98%
Total (all sectors) CO_2 emissions	Change (Mt)	-6.5	-7.5	-8.5
	% change	-0.25%	-0.32%	-0.49%

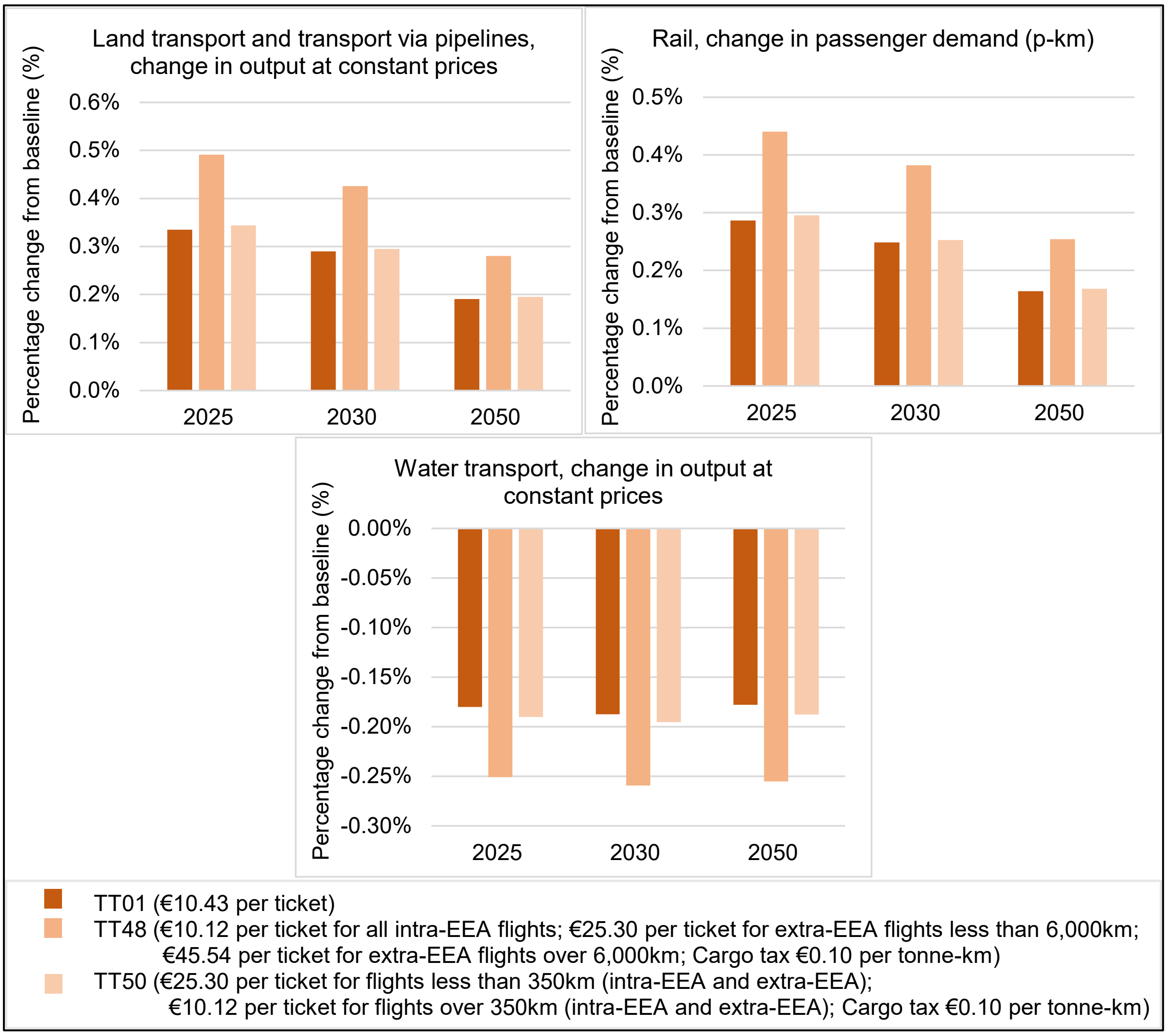
Table 6-23: Overview of macroeconomic results in EU27 for inverse stepped rate ticket tax option

EU27		Inverse stepped rate ticket tax of €25.30 per ticket for flights less than 350km, €10.12 per ticket for flights over 350km		
Topic/Indicator	Unit	2025	2030	2050
Demand effects on other modes of transport				
Land transport and transport via pipelines, output at constant prices	% change	0.34%	0.29%	0.20%
Rail passengers transported (% change in pkm)	% change	0.30%	0.25%	0.17%
Water transport, output at constant prices	% change	-0.19%	-0.20%	-0.19%
Effects on employment in the aviation and transport sector				
Air transport, number of persons engaged	% change	-1.45%	-1.41%	-1.37%
Transport, total, number of persons engaged	% change	0.04%	0.02%	-0.01%
Tax revenue effects				
Air transport, revenue from ticket taxes	Billion €	8.9	10.1	14.0
Net indirect taxes	% change	0.01%	-0.01%	-0.03%
Direct taxes	% change	-0.03%	-0.04%	-0.04%
Tax revenues, total (incl. new aviation taxes)	% change	0.25%	0.25%	0.21%
Second-order macroeconomic effects				
GDP at constant prices	% change	-0.03%	-0.04%	-0.04%
GDP deflator	% change	0.03%	0.03%	0.02%
Employment, total, number of persons engaged	% change	0.01%	0.00%	0.00%
Employment , manufacturing, number of persons engaged	% change	0.00%	0.00%	-0.01%
Energy use and CO_2 emissions				
Transport (non-aviation) energy use	% change	-0.27%	-0.25%	-0.20%
Total (non-aviation) energy use	% change	0.05%	0.04%	0.02%
Transport (non-aviation) CO_2 emissions	Change (Mt)	2.0	1.6	1.0
	% change	0.28%	0.25%	0.21%
Aviation CO_2 emissions (intra-EEA and extra-EEA flights)	Change (Mt)	-7.8	-7.8	-7.8
	% change	-5.40%	-5.09%	-4.94%
Total (all sectors) CO_2 emissions	Change (Mt)	-5.8	-6.4	-7.1
	% change	-0.22%	-0.28%	-0.21%

The stepped ticket tax rate leads to a significantly higher tax revenue than the flat ticket tax rate. The socio-economic effects are correspondingly higher. In contrast, the inverse stepped ticket tax rate differs only to a very limited extent from the flat ticket tax rate, so the socio-economic effects are also similar. The results are described in greater detail below.

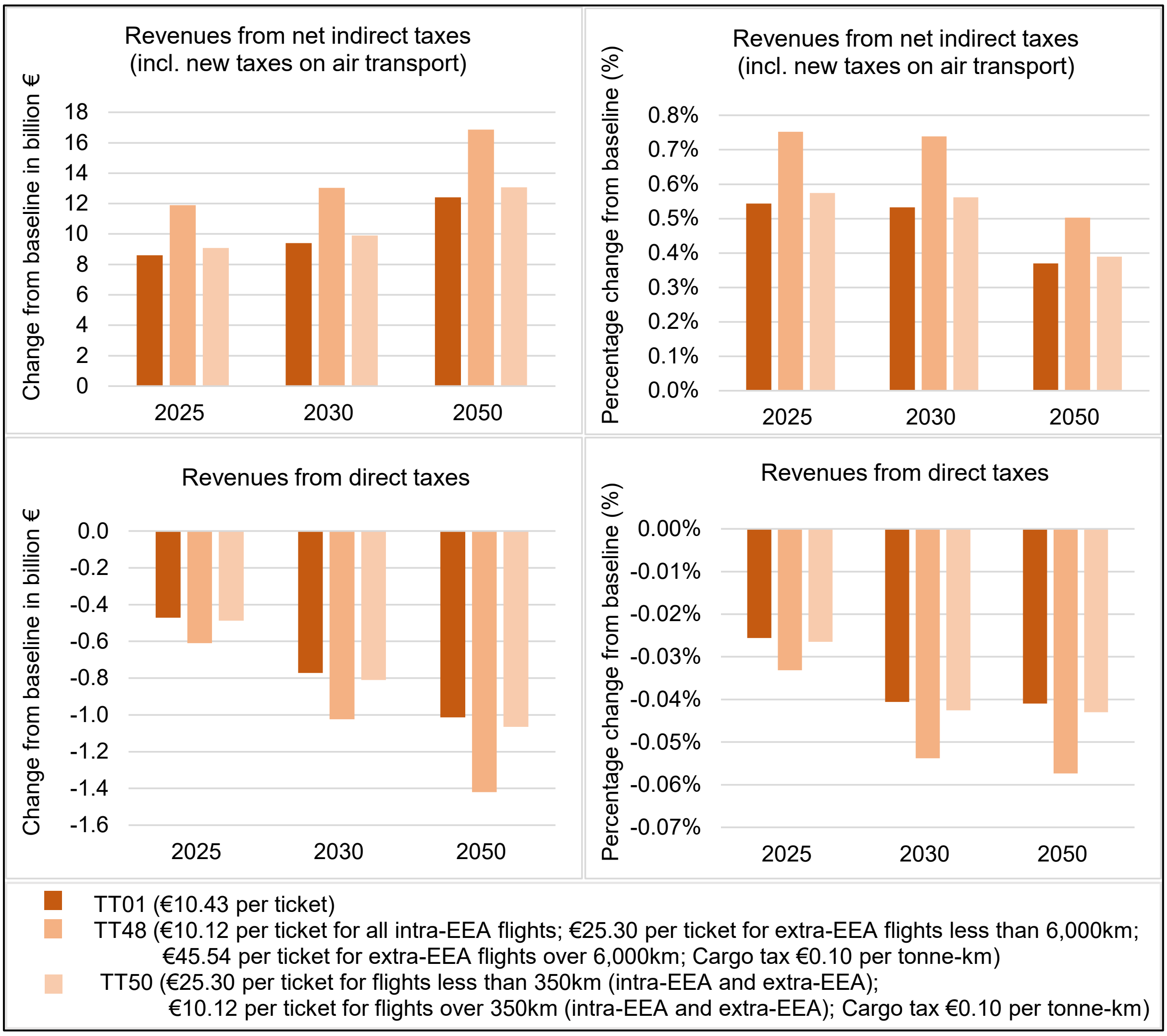
Demand for land transport will increase due to ticket taxes, because it becomes relatively cheaper and there are substitution effects. The results show only very minor differences in the impacts on road and rail transport. Note the very different magnitudes in transport performance across the three modes. The activity in land transport is much higher than in air transport, so that the percentage change is lower. Water transport also shows a small decrease in demand; as noted in Section 6.2.6, this is most likely related to a reduction in demand for cruises as a result of the increase in the aviation prices.

Figure 6-59: Ticket tax scenarios - demand effects on other modes of transport in EU27



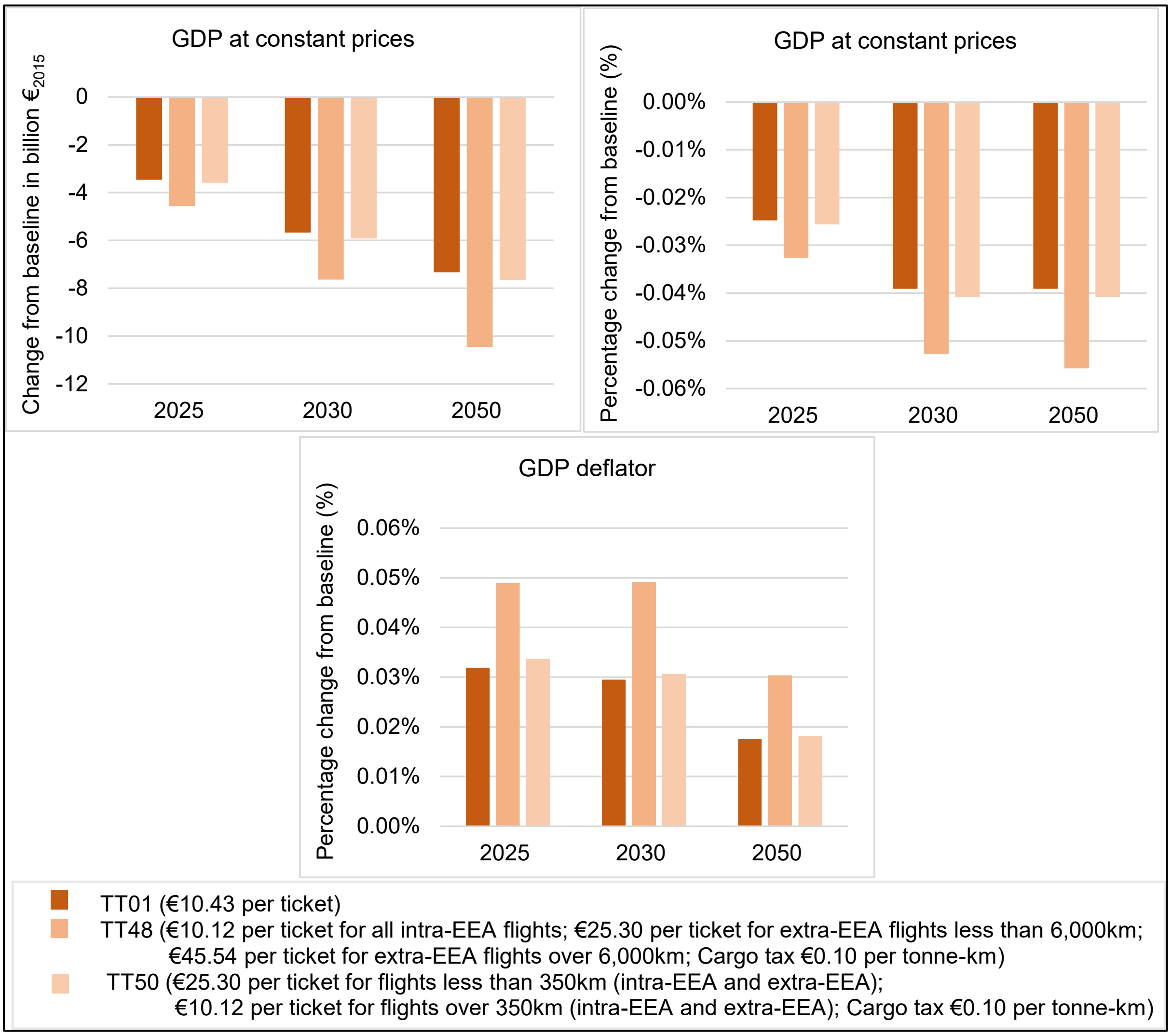
The effects on tax revenue are shown in the following figure. The ticket tax revenue is taken directly from AERO-MS. The other variables are calculated in GINFORS-E. Indirect taxes, which include taxes on air travel, increase due to ticket taxation. In contrast, direct taxes (on income and wealth) decrease slightly because economic output (GDP) decreases slightly due to the assumption that fuel tax revenues are used to reduce government debt. Over time, ticket tax revenues increase in all three scenarios, as the number of passengers and freight volumes increase.

Figure 6-60: Ticket tax scenarios - effects on tax revenues



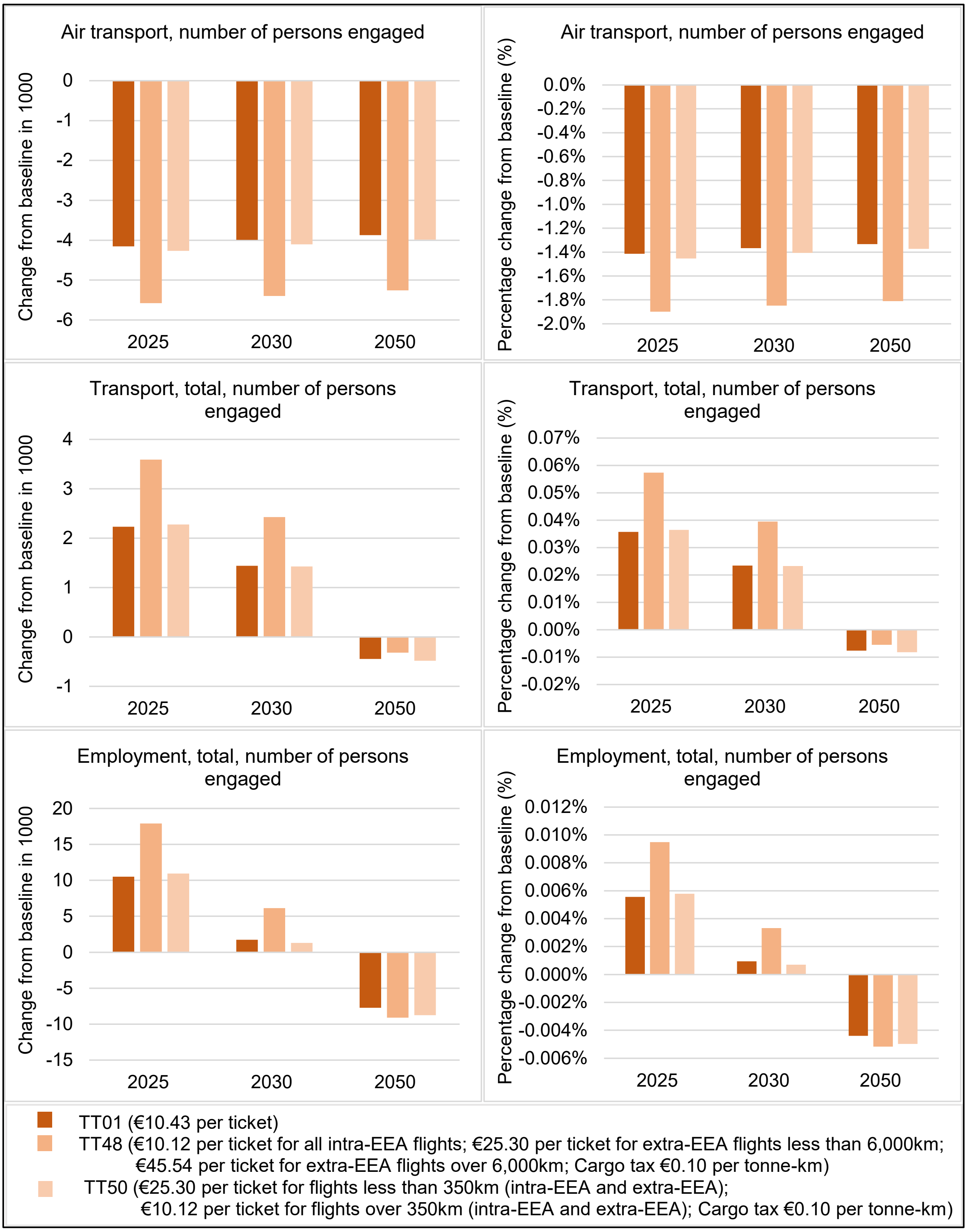
At the macroeconomic level, the ticket taxes in air transport lead to a slight increase in the macroeconomic price level (GDP deflator). It is assumed that 100% of the cost increases are added to the prices (full cost passthrough). Due to the lack of recycling of the additional tax revenues, which are left in the budget for debt reduction, prices do not fall elsewhere in the economy. This is also the main reason for the slight negative effect on GDP, which increases over time.

Figure 6-61: Ticket tax scenarios – macro-economic effects in EU27



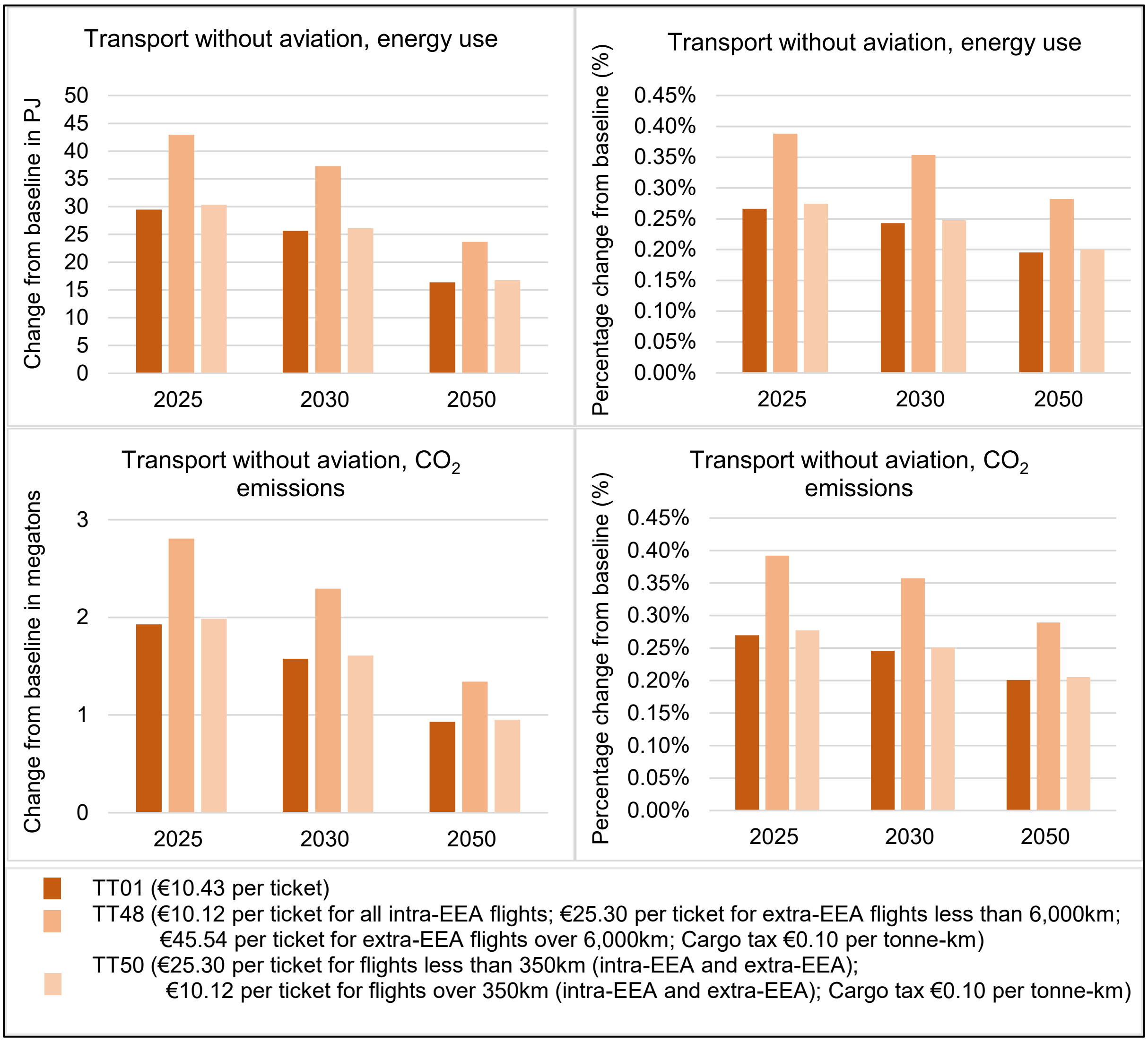
The impact on employment in the air transport sector is smaller than the impact on passengers and freight carried due to wage adjustments and labour demand elasticities of output that are lower than 1. The negative employment effects are somewhat more pronounced in air transport. Due to the ticket tax and the lower air transport performance, employment is lower than in the reference in the order of around four to five thousand, largely stable over time. Employment in total transport and in the economy as a whole is initially slightly higher in 2025 than in the reference because land transport is more employment-intensive (with lower wages) than air transport. Over time, employment declines slightly with the slight decline in economic output compared to the reference. However, the impact on total employment remains small and is largely due to the way revenue is (not) recycled.

Figure 6-62: Ticket tax scenarios – employment effects in EU27



The effects on energy consumption are determined by the higher prices in air traffic and the partial shift of traffic to road and rail. Overall, energy consumption in the non-aviation transport sector increases slightly due to the shift in demand from aviation. The effects are very similar for transport-related CO_2 emissions if only domestic flights are considered in the usual classification of territorial emissions. Under the flat rate ticket tax (TT01 in Figure 6-53), the reduction in CO_2 emissions (converting the fuel consumption results in Figure 6-42) from intra-EEA aviation is 4.65 million tonnes in 2025, reducing to 4.53 million tonnes in 2050. The equivalent increases in emissions from other modes are 1.86 million tonnes in 2025, reducing to 1.00 million tonnes by 2050. Thus, the overall reduction in emissions from the fuel tax is about 2.8 million tonnes in 2025, increasing to about 3.5 million tonnes in 2050.

Figure 6-63: Ticket tax scenarios – effects on non-aviation transport energy use and CO_2 emissions in EU27

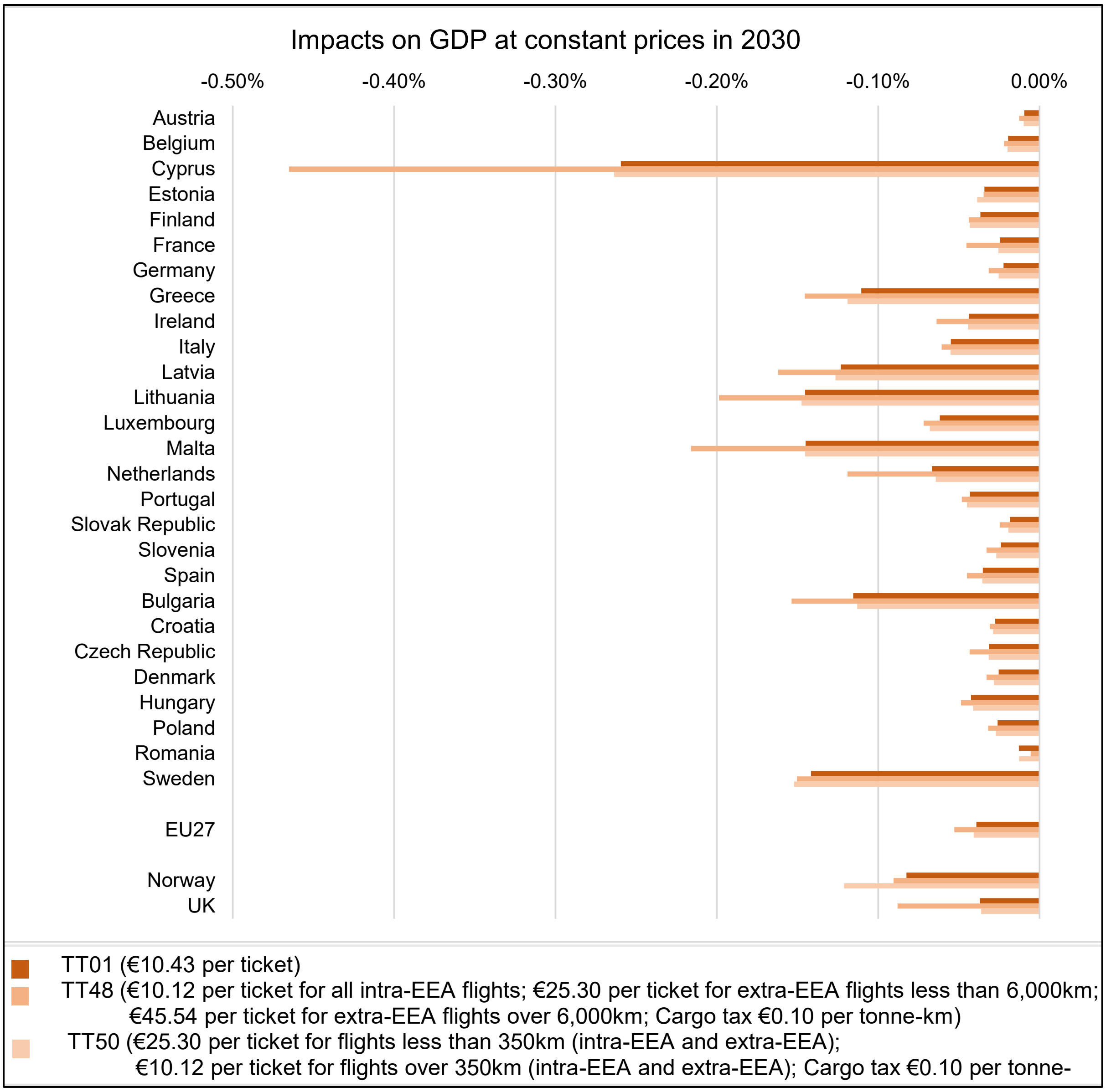


All individual EU member states are slightly negatively affected by the ticket taxes. However, there are visible differences in the impact on GDP, which are shown in the figure for the year 2030. In particular, some countries in Eastern Europe, the Mediterranean region and Scandinavia show above-average impacts on GDP. Some countries such as Germany, France and Austria, which already levy a national ticket tax today, are relatively less burdened, which makes a difference in relative cost increases due to the EU-wide ticket taxation, especially for low-cost carriers. Macroeconomic effects are small for these countries.

Some countries are disproportionately affected by extra-EEA flights being taxed more heavily in scenarios with the stepped and inverse stepped tax options. The majority of these Member States are towards the southern or eastern ends of Europe (such as Cyprus and Bulgaria) and the increased impact is consistent with such countries having a high dependence on tourists from outside the EEA, who have easy access to other destinations as the costs of travelling to the EEA increase due to the implementation of taxes. A higher ticket tax for flights over 6,000km in the stepped ticket tax option have some impact on countries with many long-distance flights. Also for Norway and the UK, the design of the ticket tax can make a significant difference.

The importance of air transport varies between Member States. In addition, low-cost carriers (whose operations are more sensitive to additional costs) have greater penetration in the aviation sector in some Member States than others. It should be emphasised again at this point that ticket taxes do not *per se* lead to negative macroeconomic effects. Other uses could lead to somewhat more positive effects in the macro econometric model if recycling increases demand elsewhere or reduces costs elsewhere in the EU-27 economy.

Figure 6-64: Ticket tax scenarios – effects on national GDP in constant prices

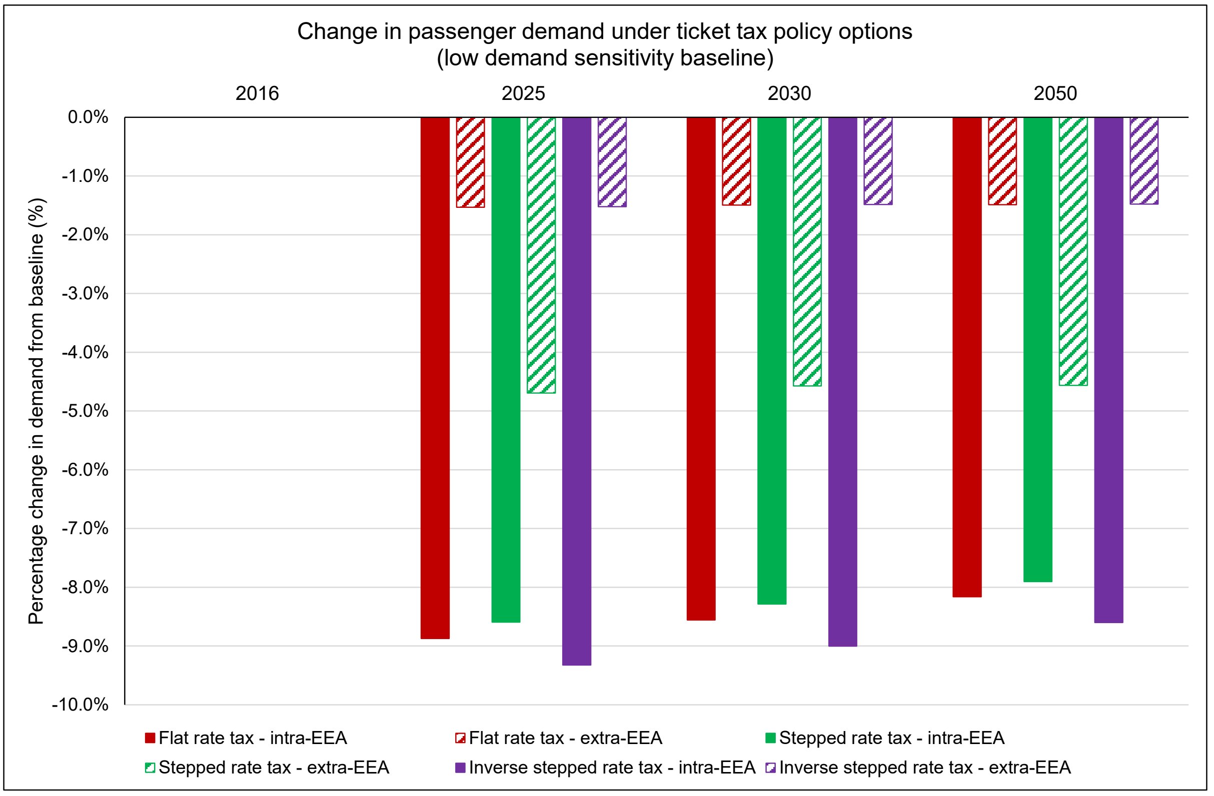


6.3.7 Sensitivity cases

6.3.7.1 Low demand baseline

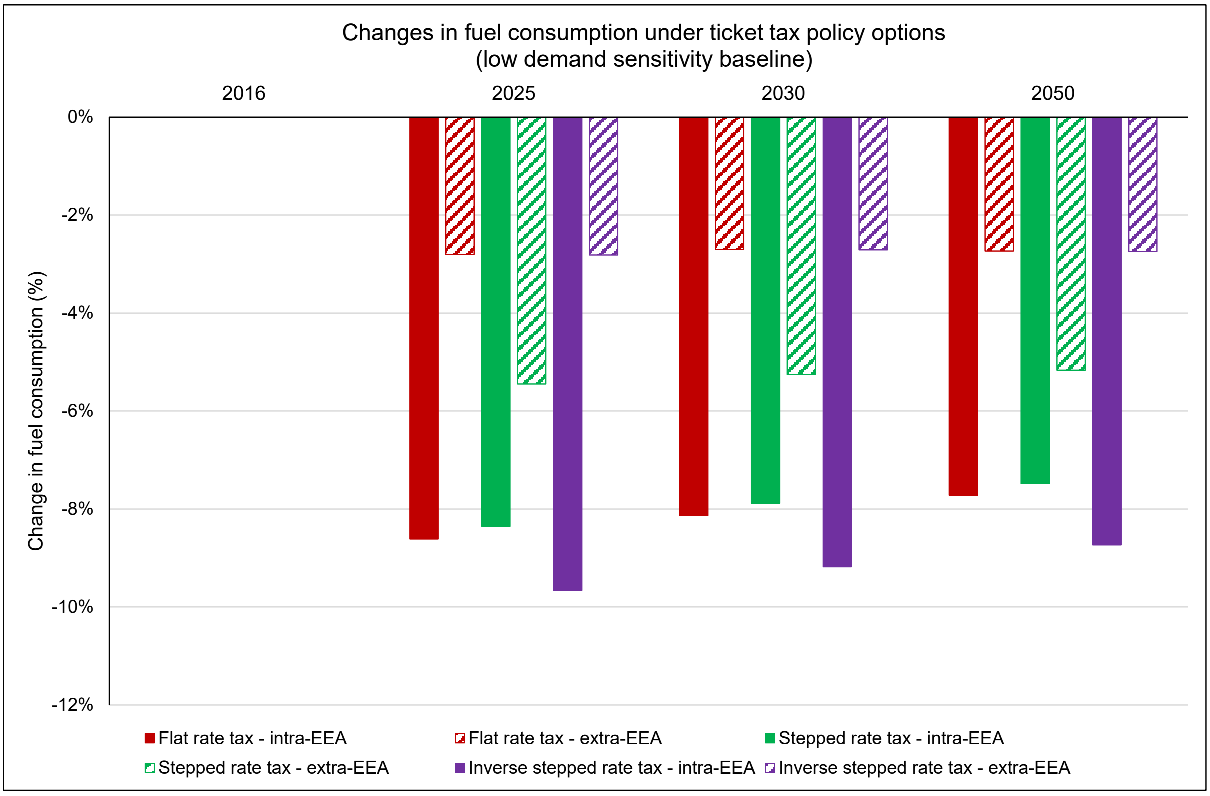
The ticket tax options (with no premium multipliers) have also been assessed against the low demand baseline, described in Section 6.2.7.1. The percentage changes in passenger demand that result are shown in Figure 6-65.

Figure 6-65: Percentage change in passenger demand on intra-EEA and extra-EEA flights from ticket tax options under low demand sensitivity baseline



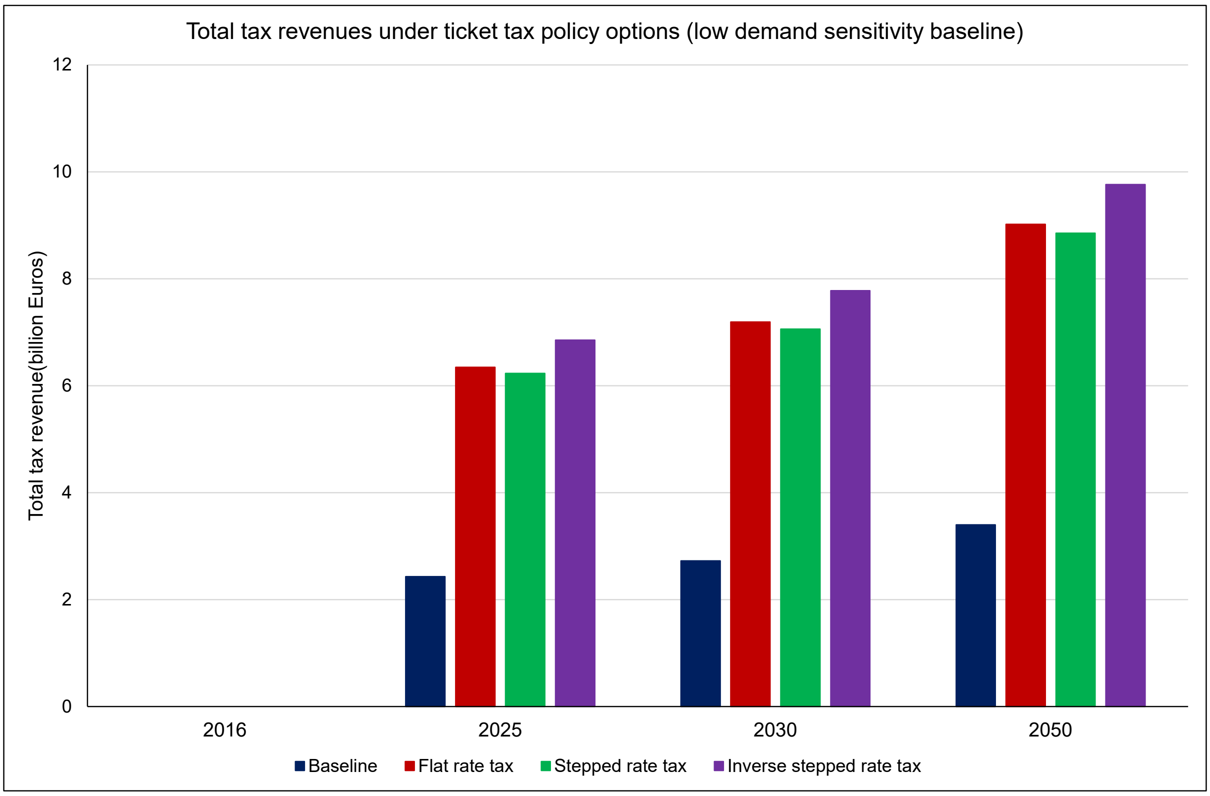
The impact of the three ticket tax options, in terms of percentage reductions in demand, are very similar to those under the main baseline shown in Figure 6-44 to Figure 6-46. The impacts of these changes in demand on fuel consumption, again presented as percentage reductions relative to the baseline, are shown in Figure 6-66. Again, the percentage reductions in fuel consumption against the low demand baseline are essentially unchanged from those against the primary baseline.

Figure 6-66: Percentage change in fuel consumption on intra-EEA and extra-EEA flights from ticket tax options under low demand sensitivity baseline



Under the low demand baseline, the tax revenues are reduced by the lower demand (Figure 6-67). In 2025, the total tax revenue under the low demand baseline is approximately 94% of that under the primary baseline (for all three ticket tax options), while for 2050, the revenue is about 91% of that under the primary baseline.

Figure 6-67: Impact of ticket tax options on tax revenue under low demand sensitivity baseline



6.3.7.2 Existing national ticket taxes set to harmonised minimum level

As noted above, the main calculations for the ticket taxes have assumed that the existing national ticket taxes that are higher than the harmonised minimum are maintained at their current levels, while those that are lower are increased to the minimum. This analysis considers the sensitivity of the results to that assumption, by analysing the case in which all existing national ticket taxes are set to the harmonised minimum after implementation applied to the stepped rate ticket tax option.

Figure 6-68 shows that the different assumptions have only a very small impact on the ticket prices for both network carriers and LCC and charter carriers. This leads to a small change in the impact of the ticket tax option on passenger demand, as shown in Figure 6-69. The primary reason for this limited effect of the alternative assumption is that there are only a few Member States with existing ticket taxes and the most significant (Germany) has a set of taxes that are similar in value to those defined for this ticket tax option. Therefore, changing the assumptions on how Member States would deal with existing ticket taxes has only a very small impact on the taxes being modelled and hence their impact. Much more significant differences are seen between the three ticket tax options.

As the effects of changing this assumption on demand are so small, the effects on fuel consumption, emissions and tax revenues are also very small (not shown).

Figure 6-68: Impact of ticket tax on ticket prices, including different assumptions for the treatment of existing national ticket taxes

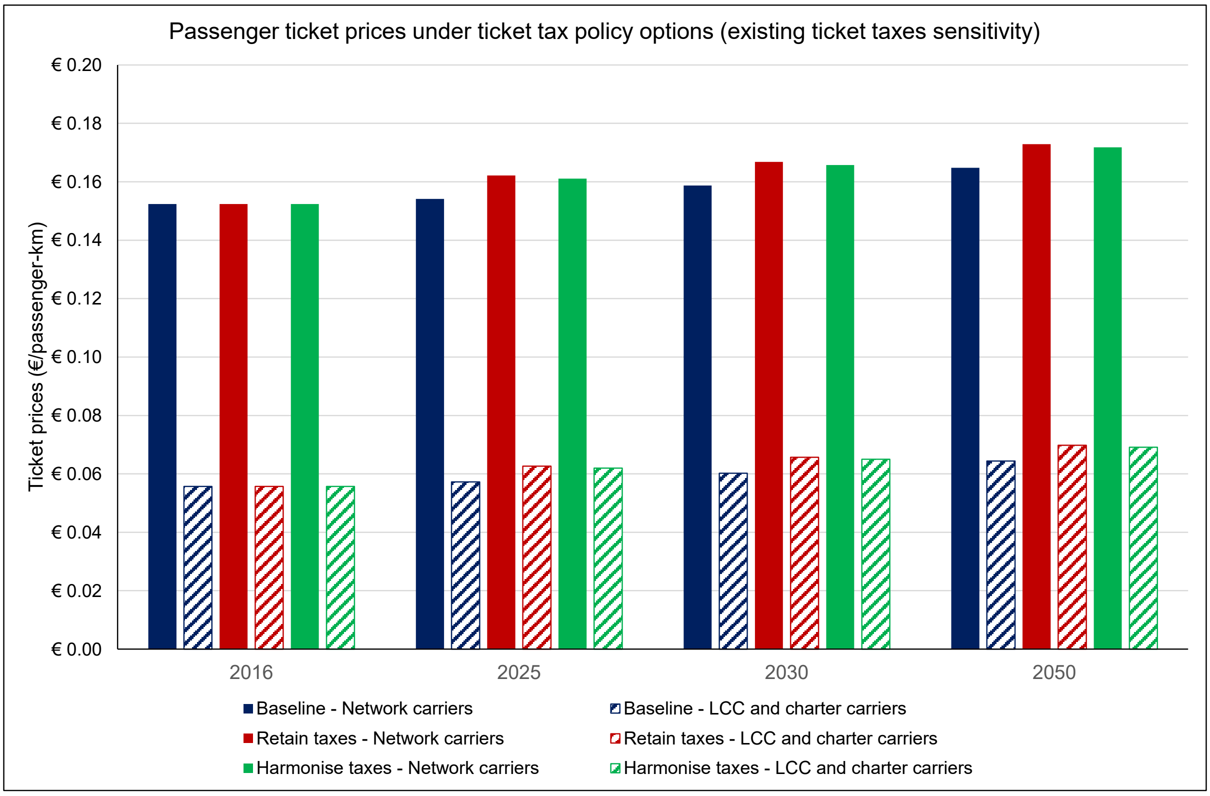
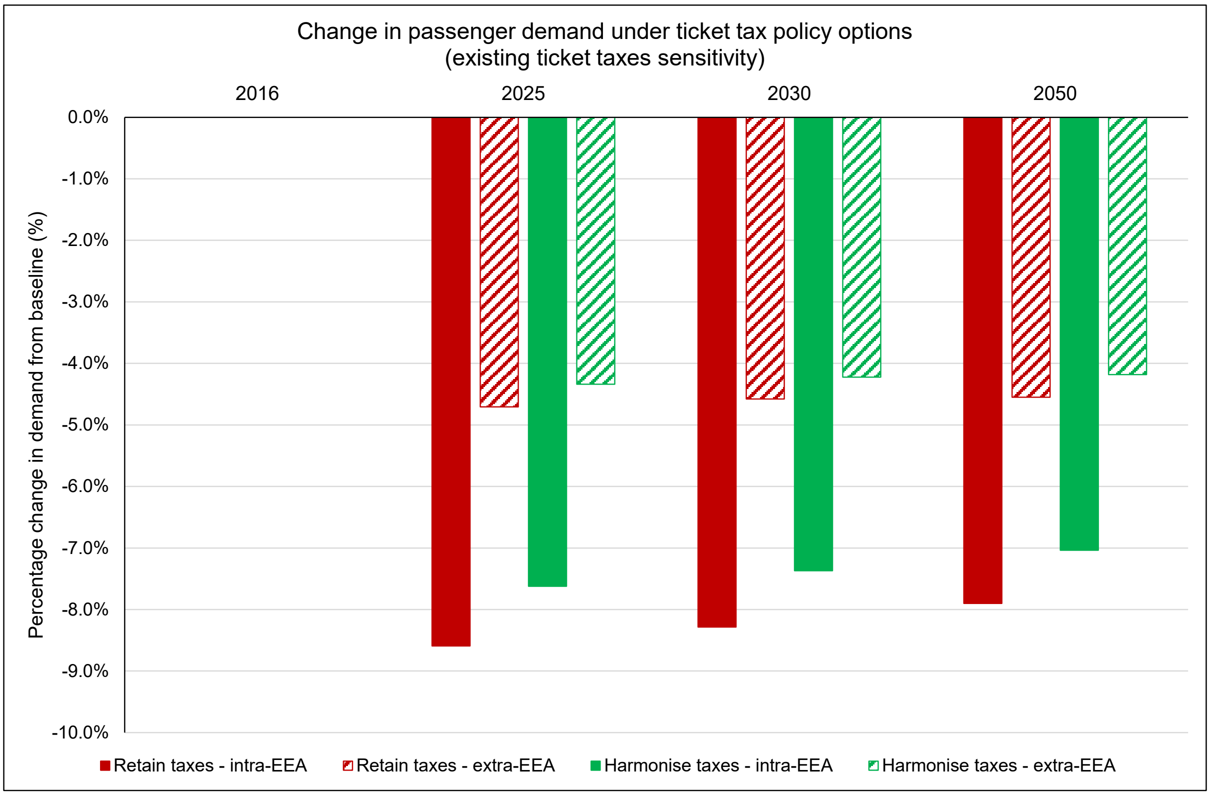


Figure 6-69: Percentage change in passenger demand on intra-EEA and extra-EEA flights, including different assumptions for treatment of existing national ticket taxes



6.3.8 Summary of analysis of ticket tax options

- Three types of ticket tax option have been analysed in this study:
  - a flat rate option, with a single tax rate applied to all flights
  - a stepped rate option, with a higher tax rates applied to longer flights (over 6,000 km)
  - an inverse stepped rate, with a higher rate applied to short flights (below 350 km)
- The taxes are assumed to apply both to intra-EEA and outbound extra-EEA flights
- The flat rate ticket tax option leads to reductions in demand of about 9% on intra-EEA flights and about 1.5% on extra-EEA flights.
- The stepped rate tax option has a slightly lower impact on intra-EEA demand, but a significantly greater impact on extra-EEA demand (about 4.5% reduction in demand), compared to the flat rate option
- The inverse stepped rate tax option has a slightly higher impact on intra-EEA demand, and a very similar impact on extra-EEA demand, compared to the flat rate option. This increased impact on intra-EEA flights (particularly for those flown by LCCs) reflects the higher tax rate on shorter flights (less than 350km). This high impact on short flights is likely to lead to a shift to other modes (particularly rail and road) for such journeys, as the journey time is not increased significantly over flying (note that the modelling approach for non-aviation modes does not capture this focussed effect, so the rail demand does not increase more than under the other tax options in the results).
- The ticket tax options lead to reductions in CO_2 emissions of between 8% and 10% on intra-EEA flights and between 3% and 5.5% on extra-EEA flights
- Under the flat rate ticket tax (with no multiplier for premium seats), the total tax revenue is about €6.7 billion in 2025, rising to €9.9 billion in 2050, representing increases of €4.1 billion to €6.2 billion above the baseline values
- Under the stepped and inverse stepped tax options, the increase over the baseline in 2050 reduces to €6.0 billion and increases to €7.0 billion, respectively
- The impacts of the ticket tax and the consequent changes in demand reduce total GDP in the EU27 by approximately €7 billion (about 0.04%) by 2050, with strong variations between Member States as a function of the importance of aviation for their economy. This is however under the assumption that revenue is used for deficit reduction; if the revenue is recycled, the impact would be even smaller.
- The implementation of a ticket tax may have some impacts on connectivity. In general, the forecast growth in air transport more than offsets the reductions in demand (against the baseline) due to the taxes. However, the reductions in profitability may make some marginal routes less commercially viable, but overall the effects are expected to be minor. Similarly, there may be some impacts on the competitiveness of EEA carriers as they compete with non-EEA carriers that are not impacted in the same way on the totality of their route network; unlike the fuel tax, the ticket tax options apply to extra-EEA flights as well as intra-EEA flights, but again apply to all carriers on those routes..
- The application of tax multipliers of 3.0 and 7.5 for premium seats has only a small effect on the demand impacts of the tax options. They have a more significant effect on the tax revenue, increasing revenue to about €13 billion in 2050 under the flat rate tax with a 7.5 premium multiplier.
- The impacts of the ticket taxes (as percentage changes) are not affected when considering them against a lower baseline demand (representing a slower recovery following the COVID-19 pandemic).

6.4 Impact assessment results – combined tax options

This section describes the results of the analyses on the combined tax options, including a fuel tax on intra-EEA flights and a ticket tax on extra-EEA flights.

In each case, the fuel tax has been applied at a rate of €0.33 per litre[109]. The ticket tax options that have been considered are the extra-EEA elements of those considered in Section 6.3. The set of tax options considered is summarised in Table 6-24.

Table 6-24: Harmonised minimum tax rates under the combined tax options

Fuel tax on intra-EEA flights, flat rate ticket tax on extra-EEA flights	Fuel tax on intra-EEA flights, stepped rate ticket tax on extra-EEA flights	Fuel tax on intra-EEA flights, inverse stepped rate ticket tax on extra-EEA flights
€0.33 per litre fuel tax on intra-EEA flights €10.43 per ticket on all extra-EEA flights Cargo tax €0.10 per tonne-km on extra-EEA flights	€0.33 per litre fuel tax on intra-EEA flights €25.30 per ticket for extra-EEA flights less than 6,000km €45.54 per ticket for extra-EEA flights over 6,000km Cargo tax €0.10 per tonne-km on extra-EEA flights	€0.33 per litre fuel tax on intra-EEA flights €25.30 per ticket for extra-EEA flights less than 350km €10.12 per ticket for extra-EEA flights over 350km Cargo tax €0.10 per tonne-km on extra-EEA flights

In each case, these tax rate options have been analysed assuming a 10-year transition phase starting in 2024 (as applied to the fuel tax options). When considering the tax, it was assumed that Member States with existing ticket taxes would not reduce their taxes to the harmonised minimum, as this would lead to a reduction in total tax burden in the initial part of the transition period, resulting in increased demand and emissions.

In addition to the main calculations described above, additional sensitivity analyses have been performed on:

- Low demand baseline;
- Fuel tax on flights to selected third countries.

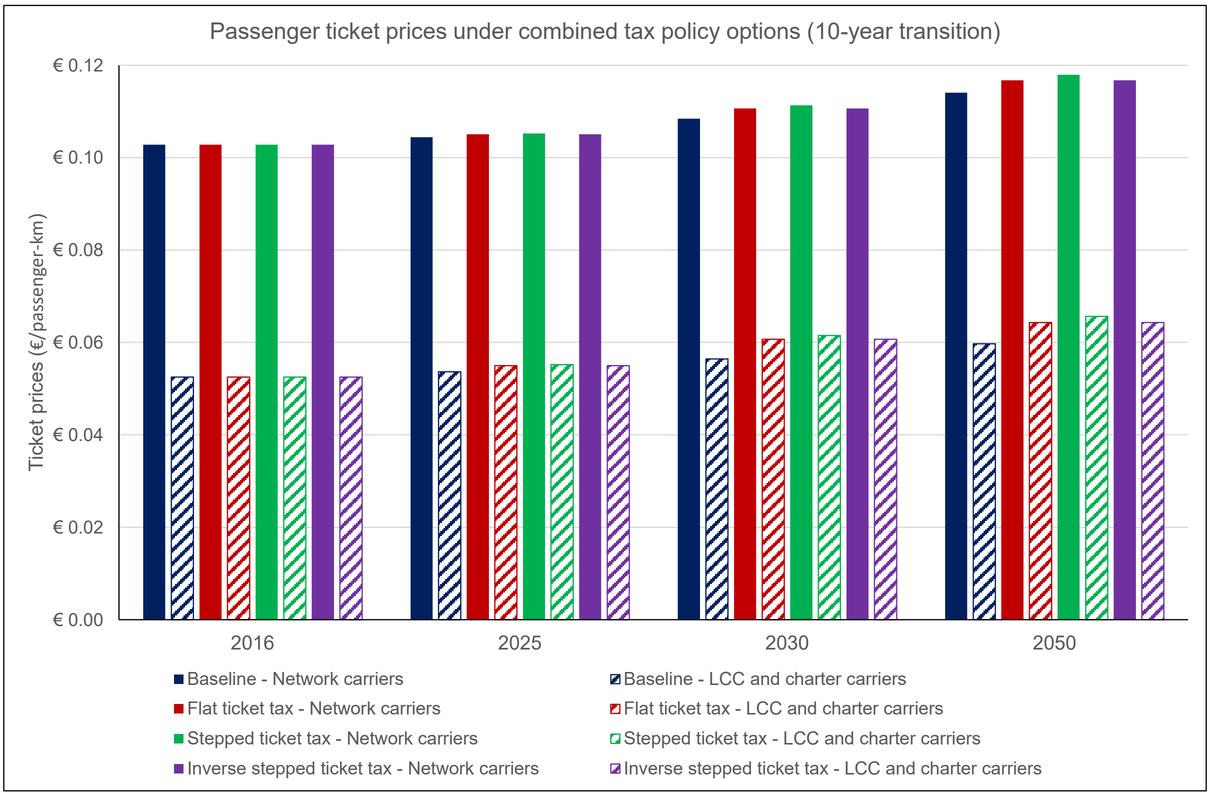
The results from these sensitivity calculations are described in Section 6.4.1

6.4.1 Impacts on ticket prices

The implementation of the combined tax options follows the same approach as described for the fuel tax options (Section 6.2.1) and the ticket tax options (Section 6.3.1), with the former implemented on intra-EEA flights and the latter on extra-EEA flights. Figure 6-70 shows the impacts of the combined tax options on ticket prices for the different carrier types, covering intra-EEA and extra-EEA flights combined, presented as prices per passenger-km. As all three combined tax options shown include a tax on fuel supplied for intra-EEA flights of €0.33 per litre, the identification of the different options in the chart legend refers only to the differences in ticket taxes applied to extra-EEA flights.

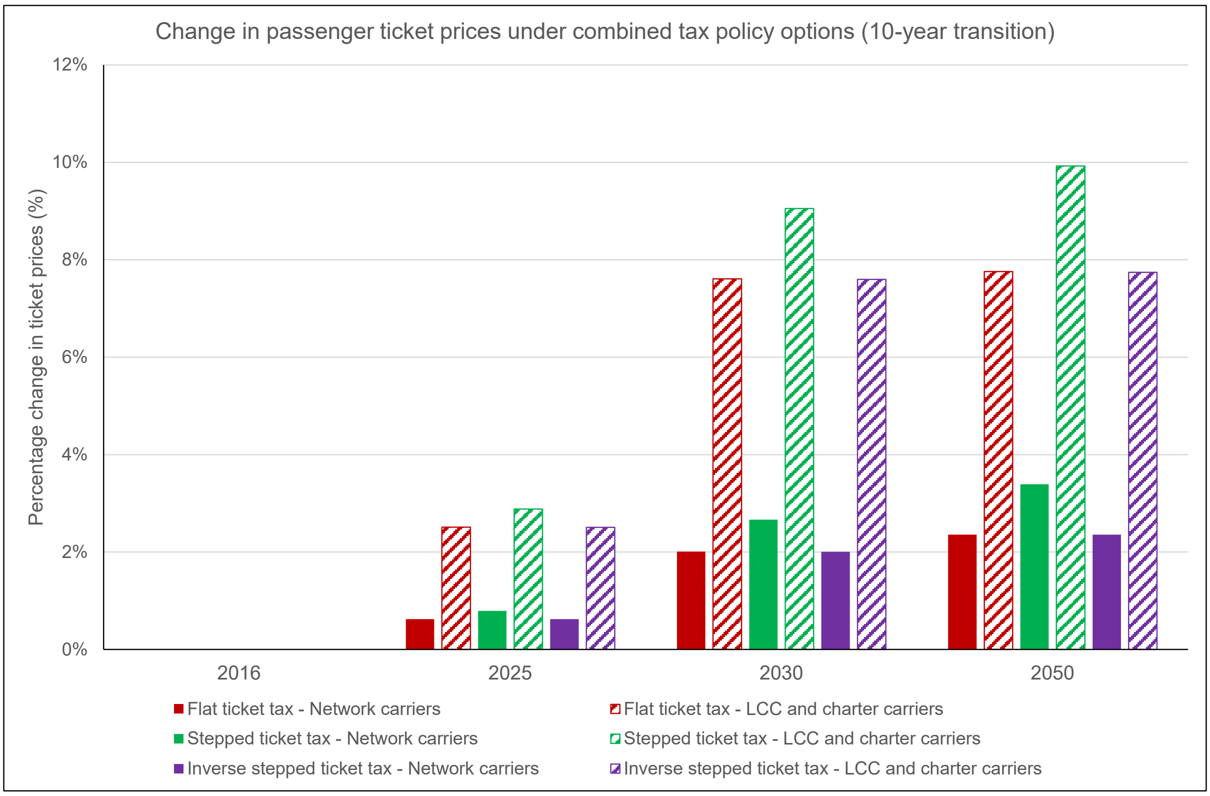
[109] As for the fuel tax policy options and the ticket tax options, the use of constant tax rates with constant year prices replicates the impacts of tax rates being indexed with inflation when implemented.

Figure 6-70: Impacts of combined tax options on ticket prices



The changes in ticket prices shown in Figure 6-70 range from 2.4% (for network carriers) to 10% for LCCs) in 2050, with additional variations for the different policy options. Figure 6-71 shows more details of the percentage increases in ticket prices for the different carrier types.

Figure 6-71: Percentage change in ticket prices from combined tax options



Similarly to the ticket tax options, the combined tax options with a flat ticket tax on extra-EEA flights and the inverse stepped ticket tax on extra-EEA flights have almost identical impacts on the ticket prices, with increases in 2050 of approximately 2.4% for traditional network carriers and 8% for LCC and charter carriers. The stepped ticket tax option has a greater impact on ticket prices, with an approximately 3.4% (for network carriers) and 10% (for LCC and charter carriers) increase over the baseline by 2050, due to the higher levels of ticket tax rate (particularly for flights over 6,000km.

6.4.2 Impacts on demand

The impacts of the ticket price increases under the combined tax options, shown in Figure 6-71, on passenger demand are shown in Figure 6-72 and Figure 6-73. As expected, the impacts on intra-EEA demand (about 9.7% reduction by 2050) are very similar to that for the fuel tax of €0.33 per litre, while the impacts for extra-EEA demand are very similar to those for the equivalent ticket taxes (approximately 1.5% reduction in 2050 for the flat rate and inverse stepped rate ticket taxes, and approximately 4% for the stepped rate ticket tax).

Figure 6-72: Impact of combined tax options on passenger demand on intra-EEA and extra-EEA flights

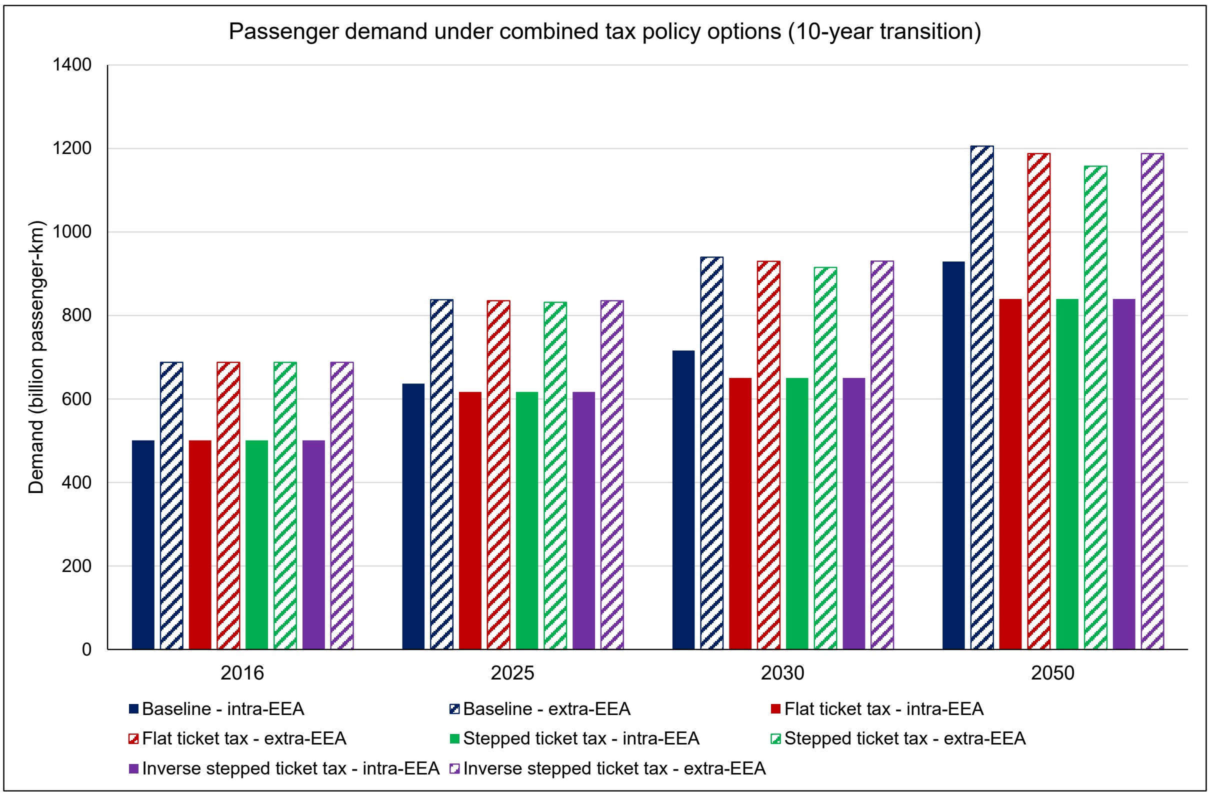
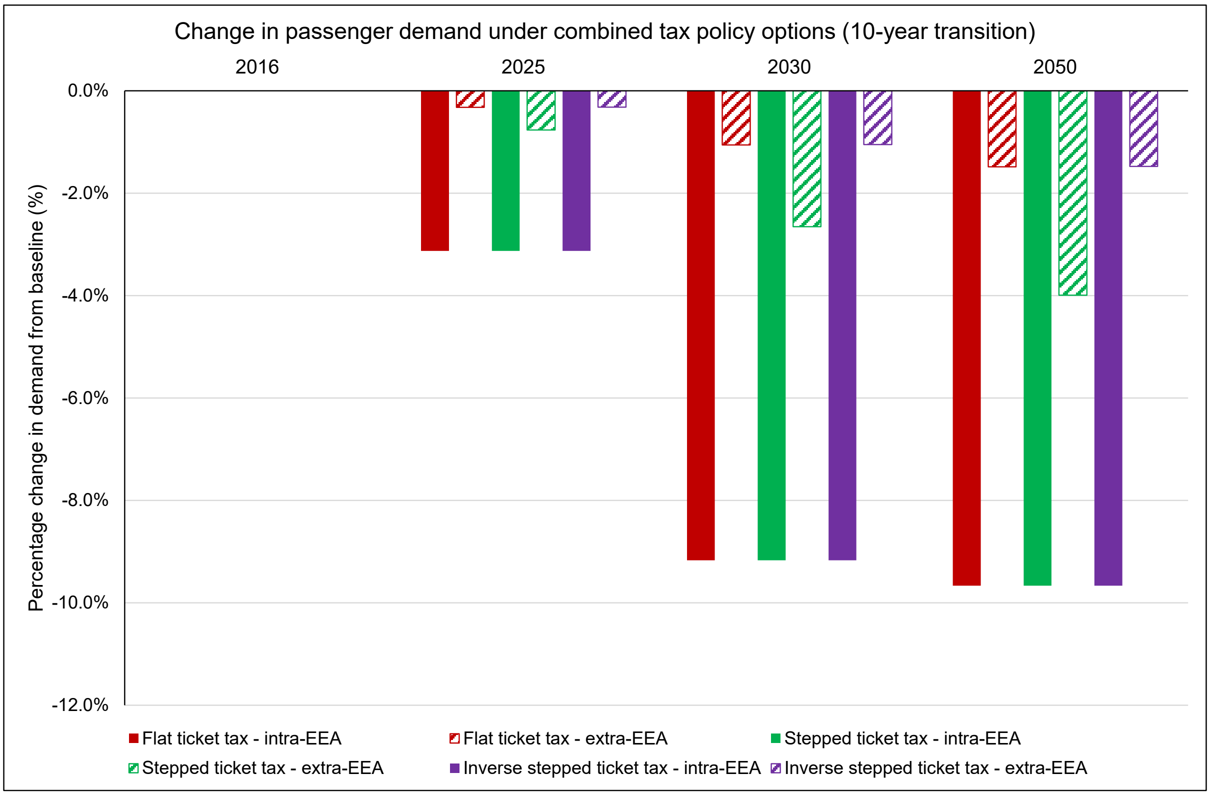


Figure 6-73: Percentage change in passenger demand from combined tax options on intra-EEA and extra-EEA flights



The percentage changes in passenger demand are presented in additional detail in Table 6-25, separating the impacts on network carriers and LCC/charter carriers, as well as intra-EEA and extra-EEA flights. For the combined tax policy option, the three ticket taxes on extra-EEA flights were each analysed with the same fuel tax (€0.33 per litre) applied to intra-EEA flights, so the results are the same for intra-EEA flights between the three cases. No premium multipliers were assessed in conjunction with the combined tax option, so the table only includes results excluding premium multipliers.

Table 6-25: Percentage changes in demand for different combined tax policy options

Case	2025	2030	2050
Fuel tax in intra-EEA flights plus flat rate ticket tax on extra-EEA flights			
No premium multiplier			
Network carriers, intra-EEA	-1.50%	-4.68%	-5.10%
Network carriers, extra-EEA	-0.14%	-0.46%	-0.63%
LCC/charter carriers, intra-EEA	-4.28%	-12.30%	-12.73%
LCC/charter carriers, extra-EEA	-0.94%	-2.95%	-3.60%
Fuel tax in intra-EEA flights plus stepped rate ticket tax on extra-EEA flights			
No premium multiplier			
Network carriers, intra-EEA	-1.50%	-4.68%	-5.10%
Network carriers, extra-EEA	-0.44%	-1.71%	-2.48%
LCC/charter carriers, intra-EEA	-4.28%	-12.30%	-12.73%

Case	2025	2030	2050
LCC/charter carriers, extra-EEA	-2.27%	-7.44%	-9.68%
Fuel tax in intra-EEA flights plus inverse stepped rate ticket tax on extra-EEA flights			
No premium multiplier			
Network carriers, intra-EEA	-1.50%	-4.68%	-5.10%
Network carriers, extra-EEA	-0.14%	-0.46%	-0.62%
LCC/charter carriers, intra-EEA	-4.28%	-12.30%	-12.73%
LCC/charter carriers, extra-EEA	-0.93%	-2.93%	-3.58%

6.4.3 Impacts on fuel burn and CO_2 emissions

The impacts of the reductions in demand from the different combined tax options on fuel consumption and CO_2 emissions on both intra-EEA and extra-EEA flights are shown in Figure 6-74 and Figure 6-75.

Figure 6-74: Percentage change in fuel consumption from combined tax options on intra-EEA and extra-EEA flights

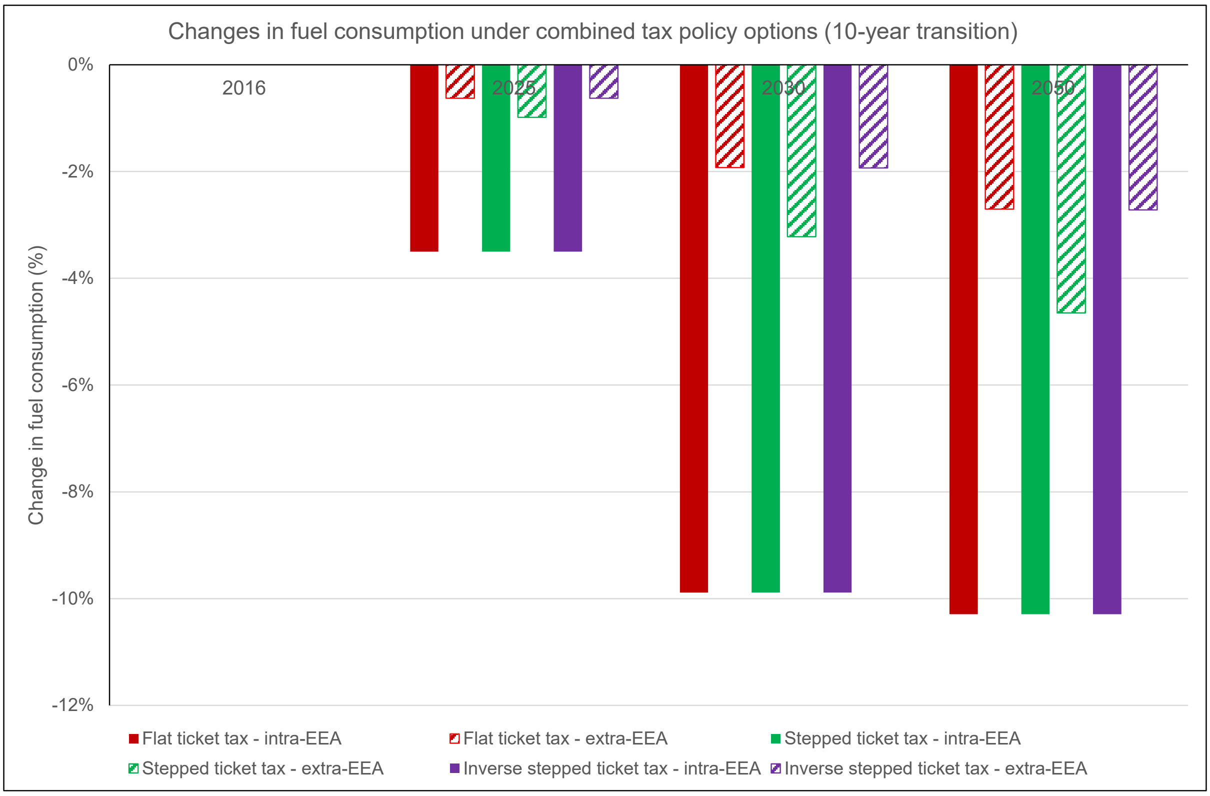
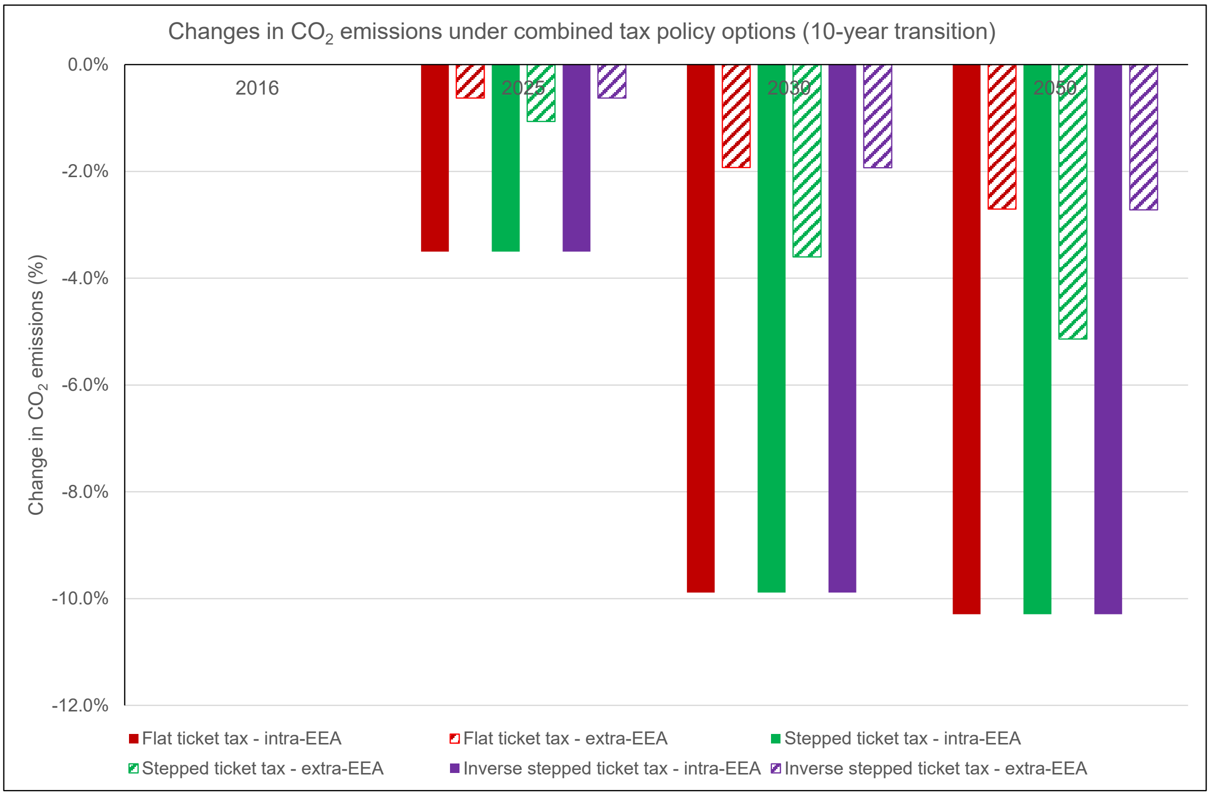


Figure 6-75: Percentage change in CO_2 emissions from combined tax options on intra-EEA and extra-EEA flights



As expected, the reduction in demand on intra-EEA flights, following the implementation of a fuel tax on them, leads to significant reductions in fuel consumption (and, hence, CO_2 emissions). In 2050, the 9.7% reduction in demand leads to a slightly greater reduction in fuel consumption and emissions of 10.3%, as the increase in effective fuel prices provides incentives for greater efficiency improvements on such routes. On extra-EEA flights, the reductions in demand also generate slightly greater reductions in fuel consumption, of about 2.7% and 4.7% for the flat rate/inverse stepped rate and stepped rate tax options, respectively.

6.4.4 Impacts on connectivity and competitiveness

The impacts on connectivity and competitiveness derived from the implementation of a combination of fuel and ticket taxes are in line with the impacts discussed under the policy options where such taxes are implemented separately. See sections 6.2.4 and 6.3.4 for, respectively, the analysis for fuel and ticket taxes.

As described in Section 6.2.4, the implementation of the fuel tax element of the combined tax in intra-EEA routes would be expected to lead to reductions in flight frequencies on all routes and could impact the financial viability of routes that already have low levels of demand. However, this is against a background of significant increases in demand on all routes since 2016 (the base year for the analysis) and the reductions calculated due to the tax are lower than the growth. If a route is considered important to maintain a minimum level of connectivity for a peripheral region, a PSO flight could be instigated (such a route would be expected to be exempt for the fuel tax).

Also as noted in Section 6.2.4, the agreements between the EU and some third countries do exempt their carriers from fuel taxes when flying intra-EU routes. At present, the number of intra-EU flights by such carriers is small; however, changes in their practices (including the use of smaller, but efficient, aircraft on the long-haul flights to the EU, with the potential for subsequent use on intra-EU or intra-EEA flights) may increase this number. As such, impacts on the competitiveness of EEA carriers on intra-EEA routes cannot be excluded.

The risks associated with hub switching would be expected to be less than under the fuel tax option, as an indirect flight from the EEA to a third country would be subject to a tax, whether the connection takes place at an EEA airport or a non-EEA airport.

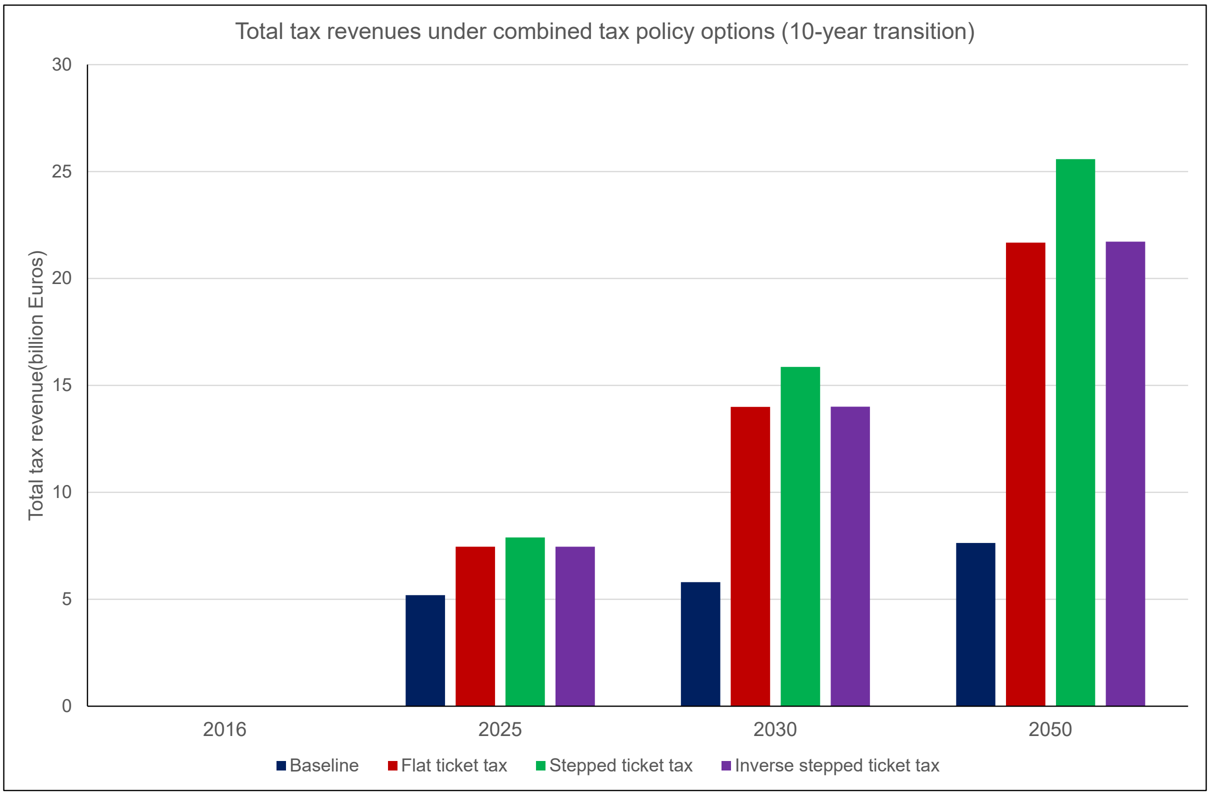
For extra-EEA flights, the combined tax options implement the same ticket taxes as discussed in Section 6.3.4, with similar impacts on competitiveness. In principle, all airlines flying the same (extra-EEA) routes will be subject to the same ticket taxes, so there would be no direct impacts on competitiveness between airlines. There might be some impacts as the non-EEA airlines would not be subject to the same tax regime in their home markets, so improving their overall profitability and allowing them a competitive advantage on routes on which they compete with EEA carriers. On the other hand, EEA carriers are likely to have an advantage compared to non-EEA carriers in the EEA market, notably thanks to their brand recognition, loyalty programmes and intra-EEA connectivity.

Overall, the impact of the combined tax on connectivity and on the competitiveness of EEA carriers vis-à-vis non-EEA carriers are expected to be limited.

6.4.5 Impacts on revenues

The combined effects of the tax on fuel supplied for intra-EEA flights and the ticket taxes on extra-EEA flights on tax revenues are shown in Figure 6-76. All three options provide significant increases in tax revenue relative to the baseline, with the flat rate ticket tax and the inverse stepped rate ticket tax (on extra-EEA flights), combined with the fuel tax at €0.33 per litre on intra-EEA flights, leading to an increase in annual tax revenue of approximately €14 billion, while the stepped ticket tax, combined with the same fuel tax rate, leads to an increase in tax revenues of approximately €16 in the same year.

Figure 6-76: Impact of combined tax options on tax revenue



The distributions of tax revenue amongst the Member States in 2050 under these combined tax options are shown in Table 6-26.

Table 6-26: Changes in tax revenue from the baseline for combined taxes in 2050 (values show the increase in revenue for each MS relative to the baseline in millions of Euros)

Member State	Fuel tax on intra-EEA flights plus flat rate ticket tax		Fuel tax on intra-EEA flights plus stepped rate ticket tax		Fuel tax on intra-EEA flights plus inverse stepped rate ticket tax	
	Change in tax revenue relative to baseline (€ millions)	Percentage of total change in tax revenue	Change in tax revenue relative to baseline (€ millions)	Percentage of total change in tax revenue	Change in tax revenue relative to baseline (€ millions)	Percentage of total change in tax revenue
AT	289.0	2.1%	416.0	2.3%	289.3	2.1%
BE	514.6	3.8%	616.5	3.4%	514.7	3.8%
BG	104.0	0.8%	143.6	0.8%	104.0	0.8%
CZ	107.8	0.8%	170.7	0.9%	106.5	0.8%
CY	134.6	1.0%	225.4	1.2%	139.3	1.0%
DE	2610.8	19.1%	3054.9	16.6%	2625.5	19.2%
DK	401.4	2.9%	527.9	2.9%	399.3	2.9%
EE	25.1	0.2%	29.3	0.2%	25.0	0.2%
ES	2014.3	14.8%	2905.7	15.8%	1999.8	14.6%
EL	463.0	3.4%	633.0	3.4%	460.7	3.4%
FI	213.2	1.6%	303.2	1.6%	214.4	1.6%
FR	1577.7	11.6%	2287.6	12.4%	1605.6	11.7%
HR	87.4	0.6%	116.0	0.6%	88.6	0.6%
HU	109.5	0.8%	155.9	0.8%	108.5	0.8%
IE	288.7	2.1%	454.0	2.5%	309.7	2.3%
IT	1654.1	12.1%	2290.1	12.4%	1650.5	12.0%
LV	41.5	0.3%	62.4	0.3%	41.3	0.3%
LT	33.8	0.2%	47.7	0.3%	33.6	0.2%
LU	293.3	2.1%	301.1	1.6%	293.9	2.1%
MT	71.5	0.5%	99.6	0.5%	71.3	0.5%
NL	1453.8	10.6%	2046.8	11.1%	1456.0	10.6%
PL	264.0	1.9%	371.3	2.0%	263.1	1.9%
PT	373.2	2.7%	524.2	2.8%	370.3	2.7%
RO	163.0	1.2%	203.0	1.1%	162.3	1.2%
SE	331.6	2.4%	355.4	1.9%	331.6	2.4%
SI	13.8	0.1%	23.5	0.1%	13.6	0.1%
SK	20.3	0.1%	29.9	0.2%	20.0	0.1%

6.4.6 Macroeconomic and other transport mode impacts

As for the fuel tax and ticket tax policy options, the results from the aviation sector analyses have been used as inputs to the macroeconomic modelling. A single option has been analysed in this way, that of the €0.33 per litre fuel tax on intra-EEA flights and a flat rate of €10.43 per ticket on all extra-EEA flights.

An overview of the macroeconomic effects of the combined tax option is shown in Table 6-27.

Table 6-27: Overview of macroeconomic results for EU27 for combined tax option

EU27		Fuel tax of €0.30 per litre on intra-EEA flights; flat rate ticket tax of €10.43 per ticket on extra-EEA flights		
Topic/Indicator	Unit	2025	2030	2050
Demand effects on other modes of transport				
Land transport and transport via pipelines, output at constant prices	% change	0.10%	0.29%	0.22%
Rail passengers transported (% change in pkm)	% change	0.09%	0.26%	0.20%
Water transport, output at constant prices	% change	-0.06%	-0.18%	-0.19%
Effects on employment in the aviation and transport sector				
Air transport, number of persons engaged	% change	-0.43%	-1.29%	-1.46%
Transport, total, number of persons engaged	% change	0.01%	0.02%	-0.01%
Tax revenue effects				
Air transport, revenue from combined and fuel taxes	Billion €	2.2	7.9	13.7
Net indirect taxes	% change	0.00%	0.00%	-0.02%
Direct taxes	% change	-0.01%	-0.04%	-0.05%
Tax revenues, total (incl. new aviation taxes)	% change	0.06%	0.20%	0.20%
Second-order macroeconomic effects				
GDP at constant prices	% change	-0.01%	-0.04%	-0.04%
GDP deflator	% change	0.01%	0.04%	0.03%
Employment, total, number of persons engaged	% change	0.00%	0.00%	0.00%
Employment , manufacturing, number of persons engaged	% change	0.00%	0.00%	0.00%
Energy use and CO_2 emissions				
Transport (non-aviation) energy use	% change	0.08%	0.24%	0.23%
Total (non-aviation) energy use	% change	0.02%	0.04%	0.03%
Transport (non-aviation) CO_2 emissions	Change (Mt)	0.6	1.6	1.1
	% change	0.08%	0.25%	0.23%

Aviation CO_2 emissions (intra-EEA and extra-EEA flights)	Change (Mt)	-2.9	-9.2	-11.2
	% change	-1.99%	-5.98%	-7.07%
Total (all sectors) CO_2 emissions	Change (Mt)	-2.3	-7.7	-10.3
	% change	-0.09%	-0.33%	-0.59%

Figure 6-77: Demand effects on other modes of transport in EU27 from combined tax option

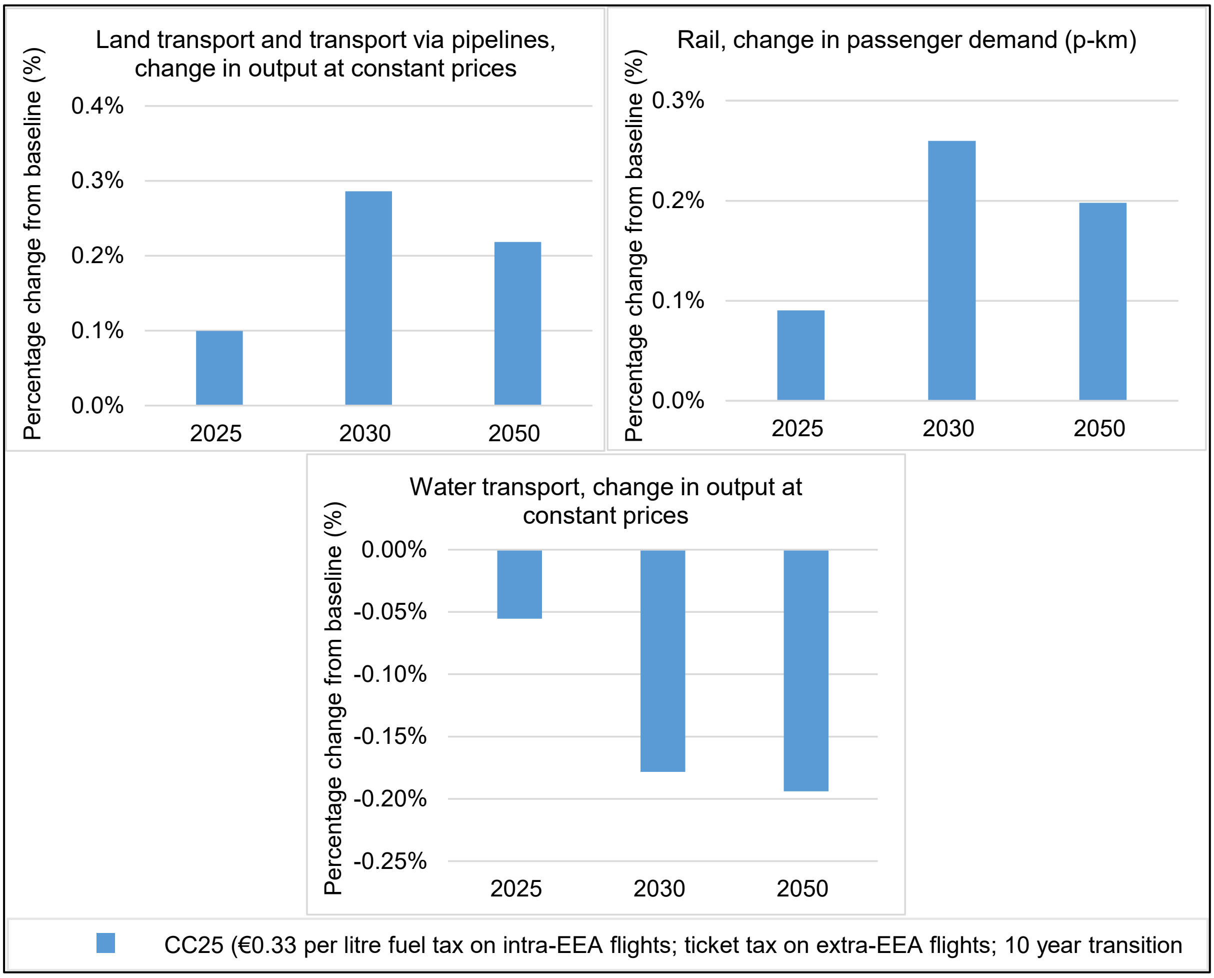


Figure 6-77 shows that the reduction in demand for air transport in the EU resulting (primarily) from the implementation of a fuel tax on intra-EEA flights under the combined tax option leads to an increase in demand for both road and rail transport. In a similar manner to the case for the implementation of a fuel tax on intra-EEA flights alone (Section 6.2.6), with the 10-year transition period, the percentage increase in demand rises from 2025 to 2030, then decreases slightly to 2050. The impact on waterborne transport in the EU is also similar to that under the fuel tax option; again this can be attributed to the impacts on demand for cruises due to the increased cost of flying to the start point.

Figure 6-78: Impacts on tax revenue from combined tax option

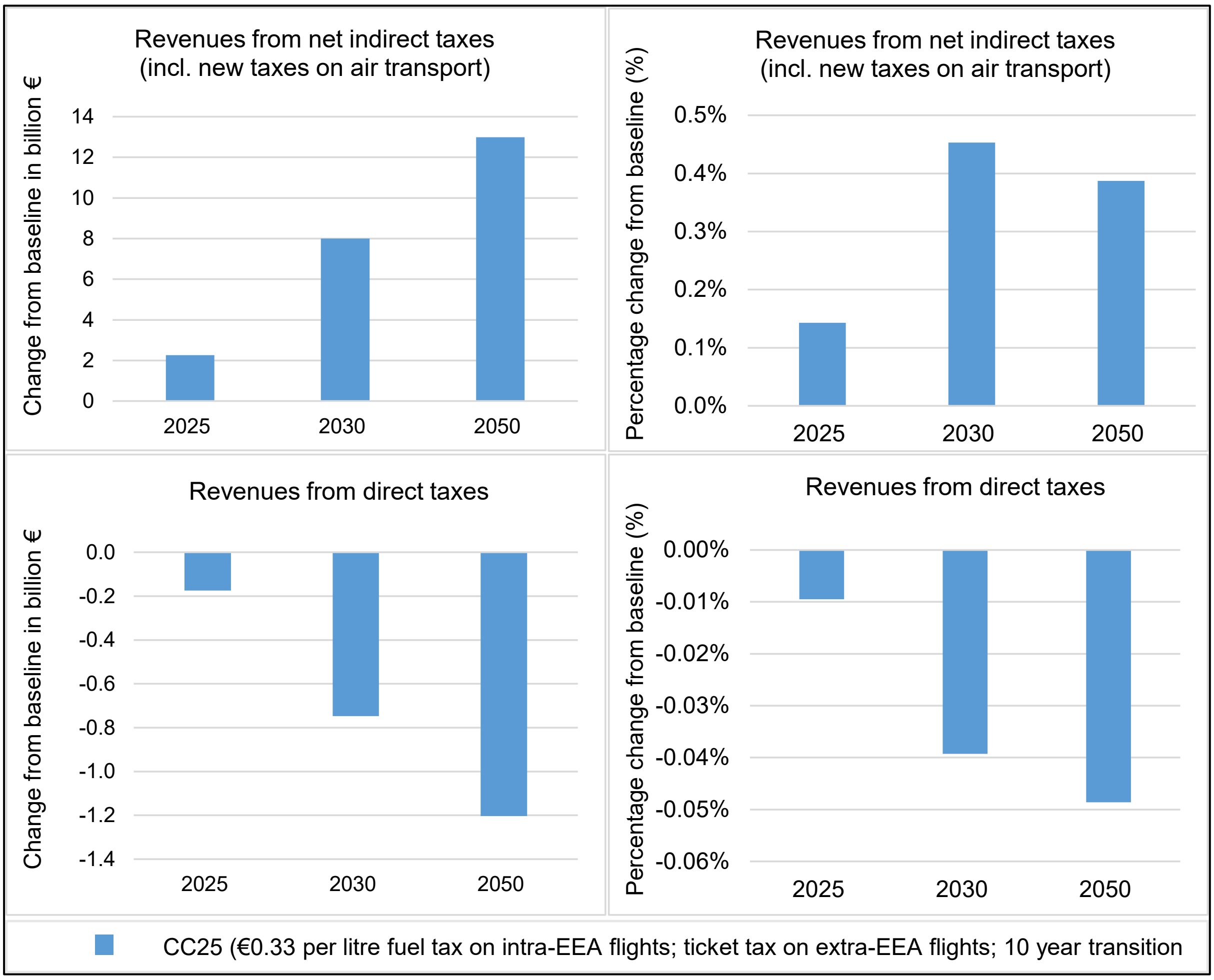
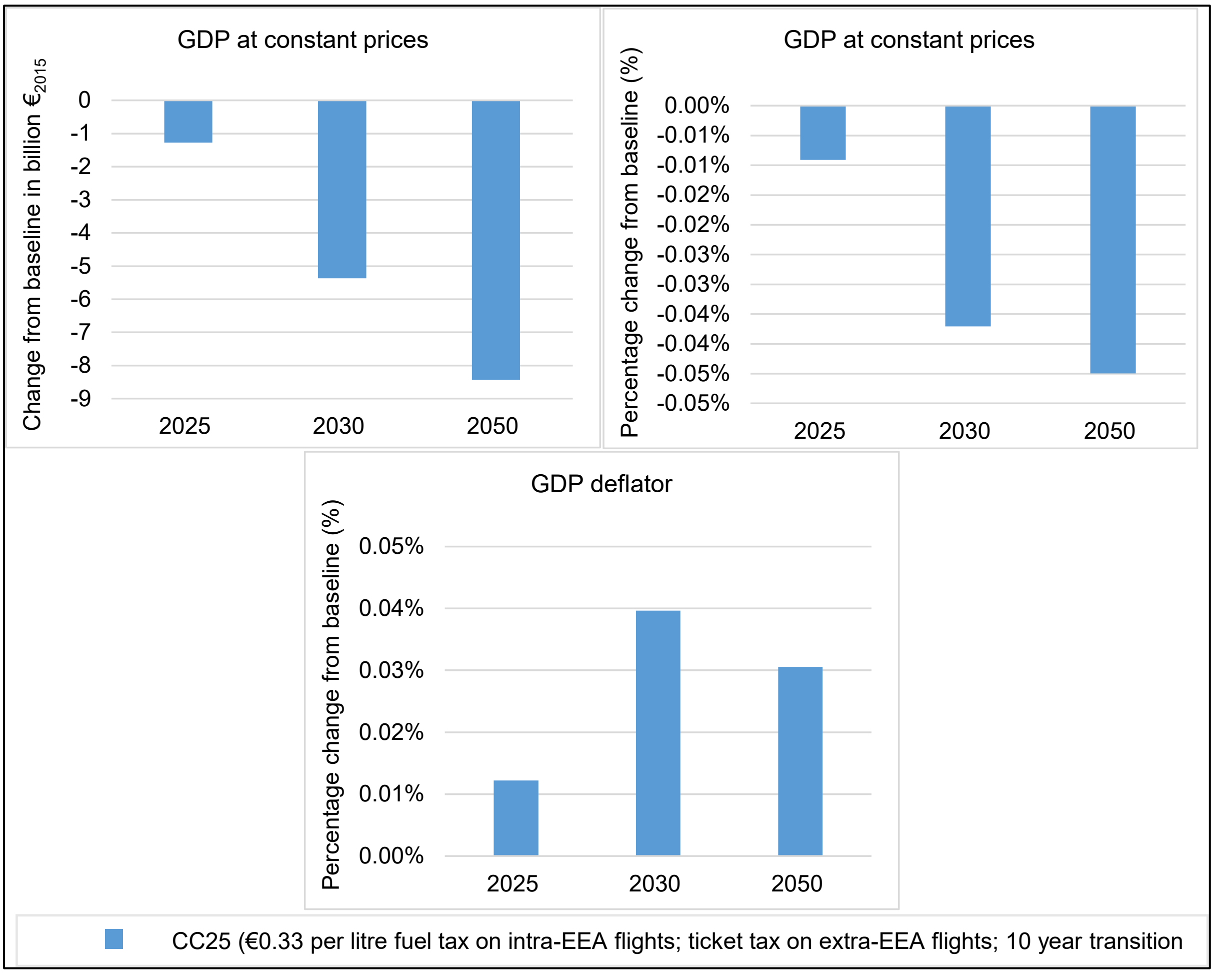


Figure 6-78 shows the impacts on total tax revenues from the combined tax option. The increase in revenue in 2050 of approximately €12 billion can be compared to the equivalent values of €5.4 billion and €11.5 billion for the fuel tax and ticket tax (using the flat rate tax option on both intra-EEA and extra-EEA flights).

At the macroeconomic level (Figure 6-79), the combined tax on air transport leads to a slight increase in the price level (GDP deflator). Two key assumptions determine this result: 100% cost pass-through and the lack of revenue recycling for the funds collected by the tax.

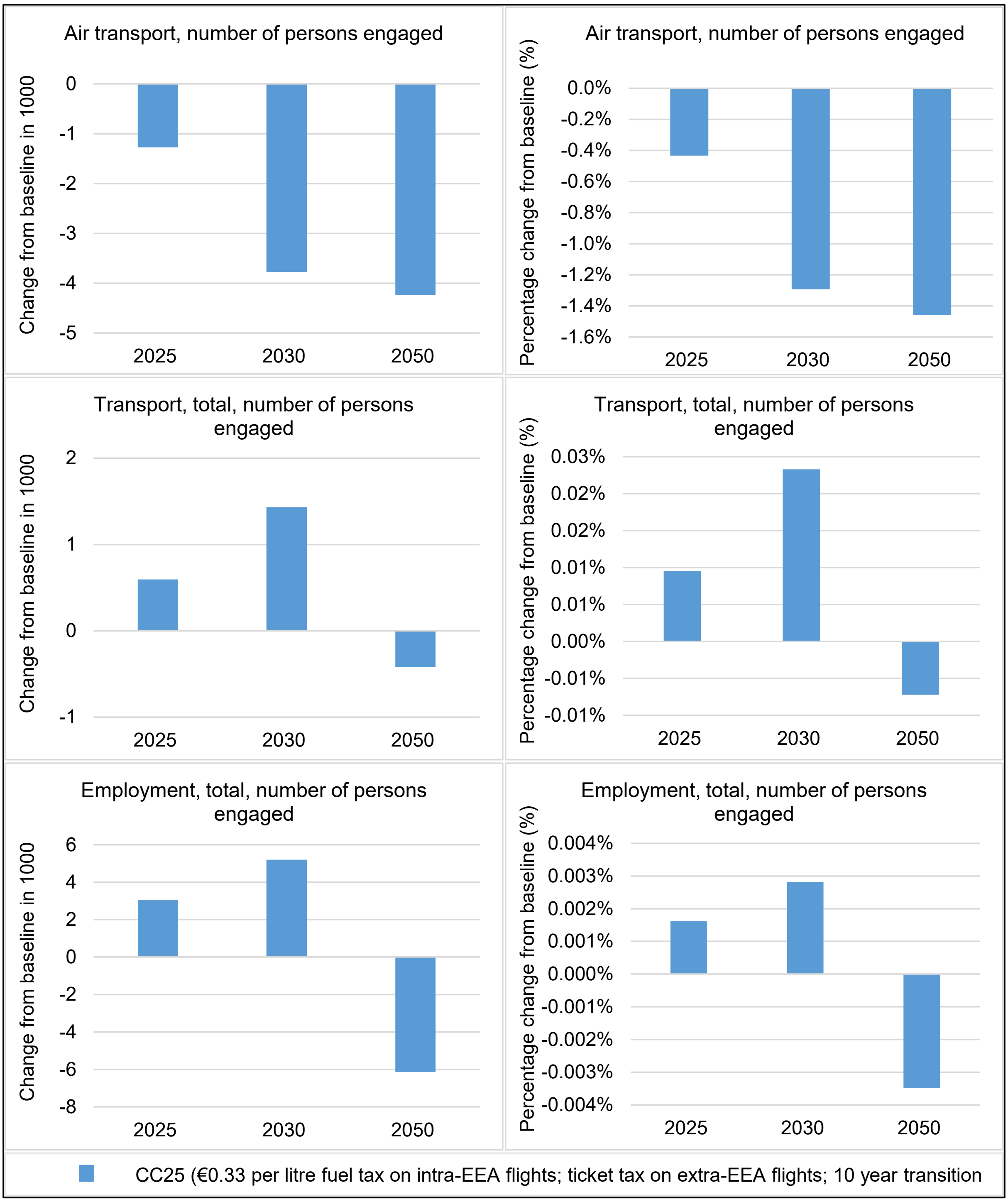
Figure 6-79: Macro-economic effects in EU27 from combined tax option



For the EU27, a decline of employment by 1.4% is projected for the aviation sector in 2050 (Figure 6-80), while the AERO-MS results for departing passenger kilometres show an impact of -9.7% for intra-EEA flights and 1.5% for extra-EEA flights (for the same combined tax option).

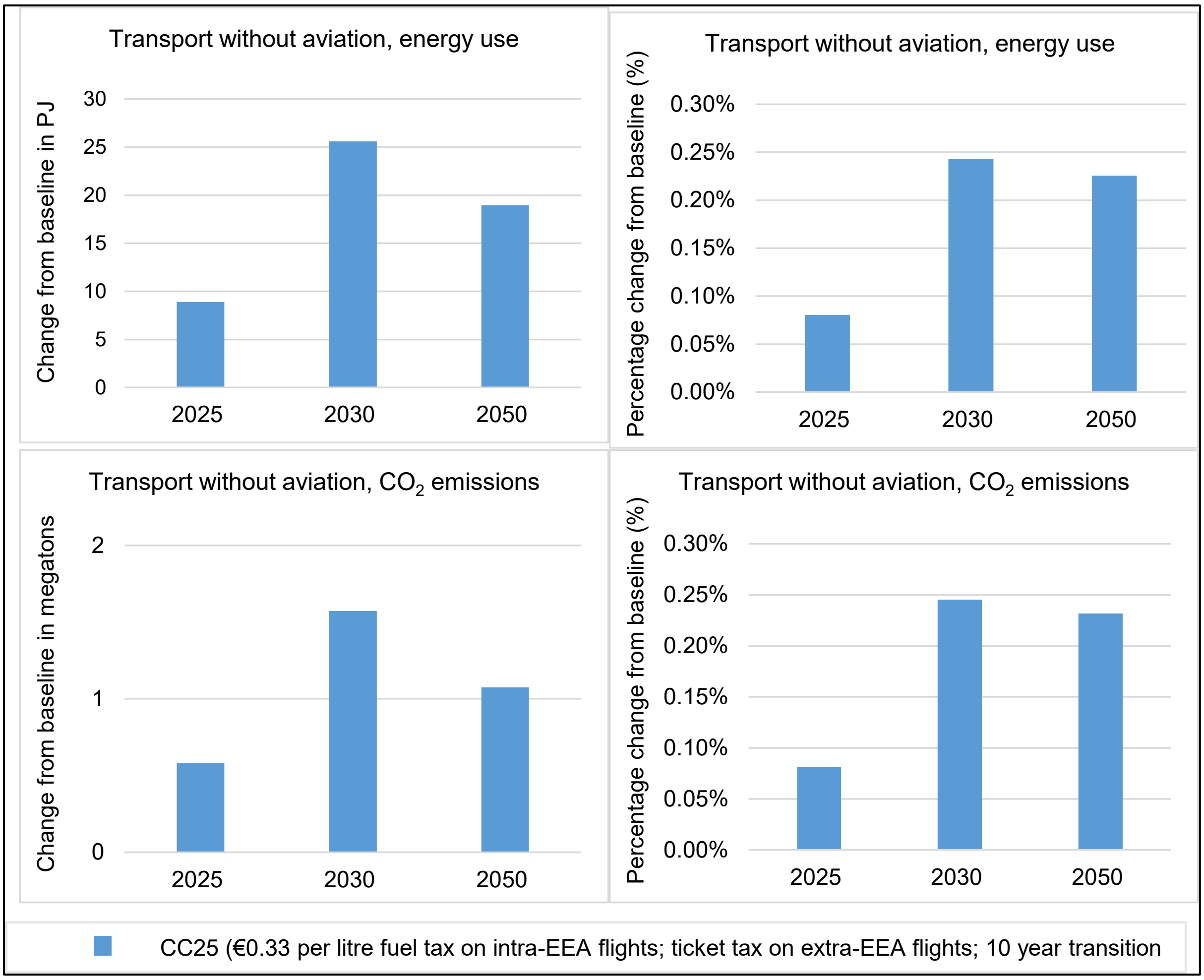
In the short term, the reductions in employment in the aviation sector are offset by increases in other transport sectors, leading to a small overall increase. In the longer term, the total employment also reduces, although the value is very small in overall terms at approximately 0.01%.

Figure 6-80: Employment impacts in EU27 from combined tax option



The increased demand for road and rail transport, resulting from the reduction in demand for aviation, leads to increases in the energy consumption and emissions from those other modes (Figure 6-81). By 2050, the increase in emissions from other modes is about 1.2 million tonnes, while the reduction in emissions from intra-EEA aviation is about 6.1 million tonnes, giving an overall saving of 4.9 million tonnes CO_2.

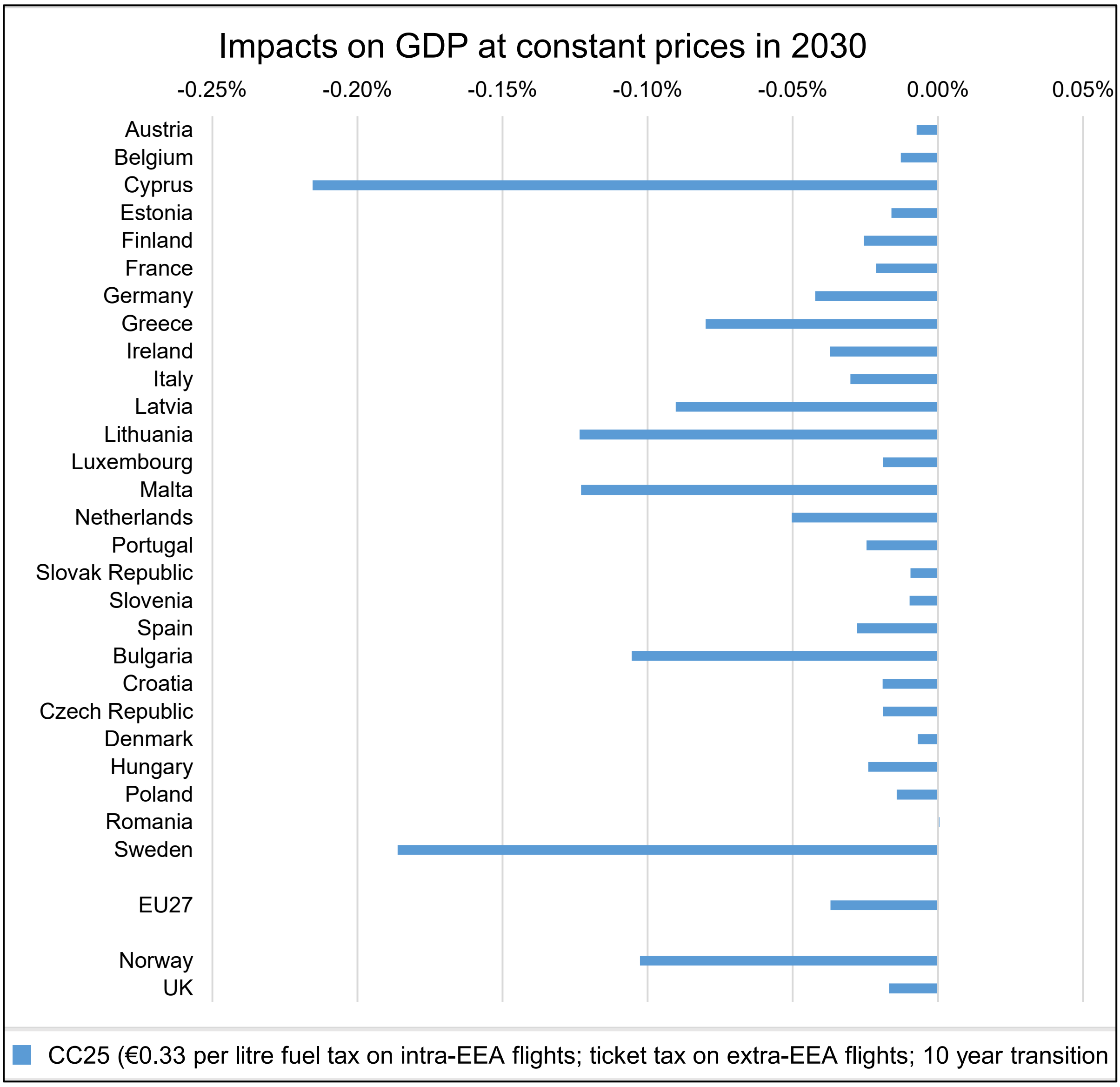
Figure 6-81: Impacts on non-aviation transport energy use and CO_2 emissions in EU27 from combined tax option



In 2025, tax revenues are still low in this tax scenario. In the long term, the combined tax variant achieves a similar level of revenue as the ticket tax scenarios. The socio-economic effects are similar to those in these scenarios. There is a substitution effect towards land transport. GDP and related tax revenues decrease slightly due to the use of revenues for debt reduction. Energy consumption and CO_2 emissions decrease slightly both in transport and overall. The effect is more pronounced in international air transport.

At the national level, the combined tax option leads to particularly higher negative effects in Cyprus and Sweden in 2030. The effects are also above average in Greece, Latvia, Lithuania, Malta, Bulgaria and Norway. In contrast, the effects are particularly low in Austria, Belgium, Luxembourg, Slovakia, Slovenia and Romania.

Figure 6-82: Combined tax – effects on national GDP in constant prices

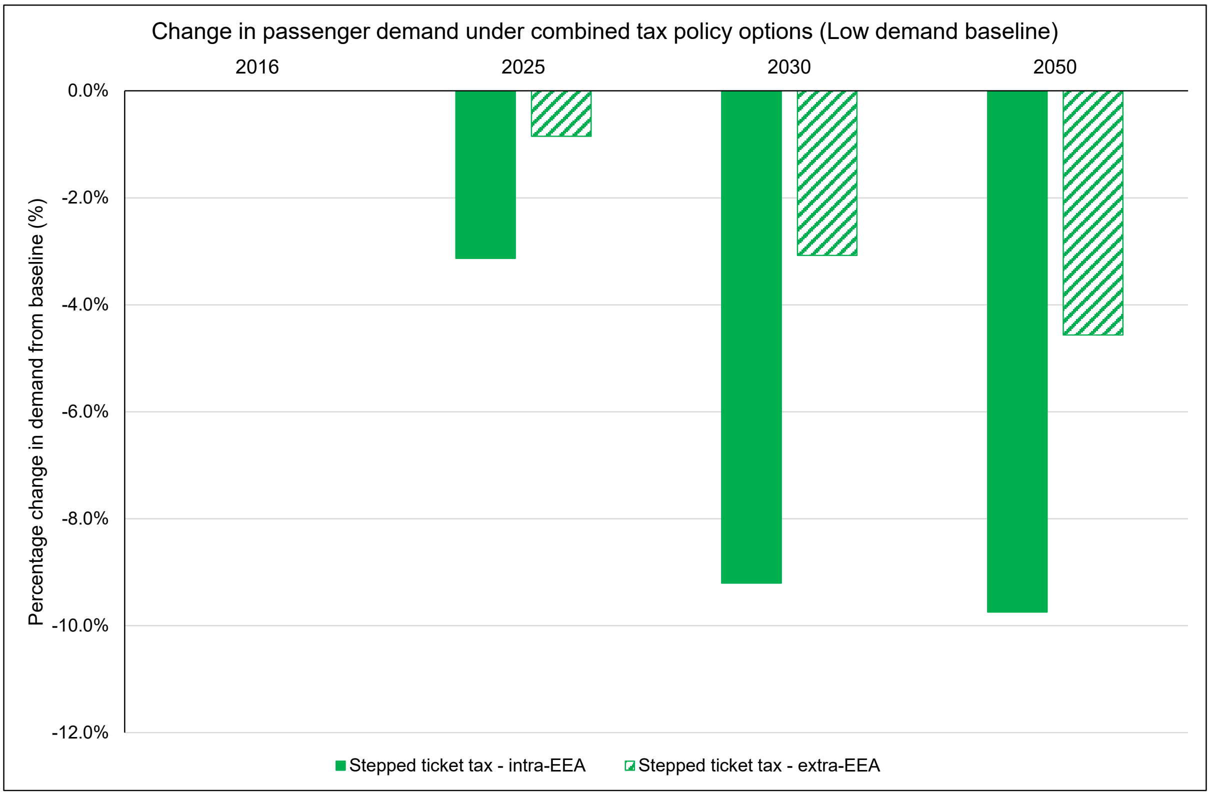


6.4.7 Sensitivity cases

6.4.7.1 Low demand baseline

The combined tax option based on the €0.33 per litre fuel tax on intra-EEA flights and stepped rate ticket tax on extra-EEA flights has also been assessed against the low demand baseline, described in Section 6.2.7.1. The percentage changes in passenger demand that result are shown in Figure 6-83.

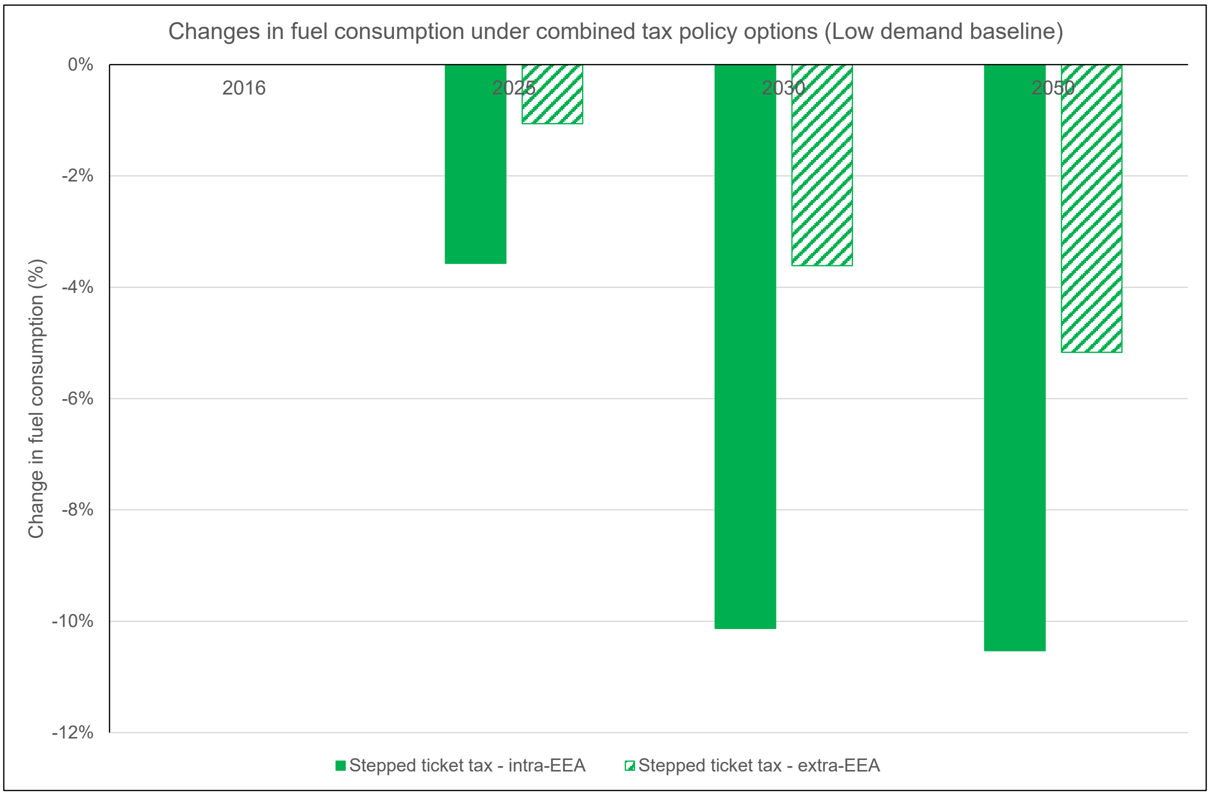
Figure 6-83: Percentage change in passenger demand on intra-EEA and extra-EEA flights from combined tax option under low demand baseline



By 2050, the percentage reductions in demand (relative to the low demand baseline) are 9.8% on intra-EEA flights and 4.6% on extra-EEA flights. The equivalent values for the analysis of the same tax option against the primary baseline were 9.7% and 4.0%, showing that the percentage impact of the combined tax option is only marginally affected by the choice of baseline scenario, with a slightly greater difference on extra-EEA flights than on intra-EEA flights apparent.

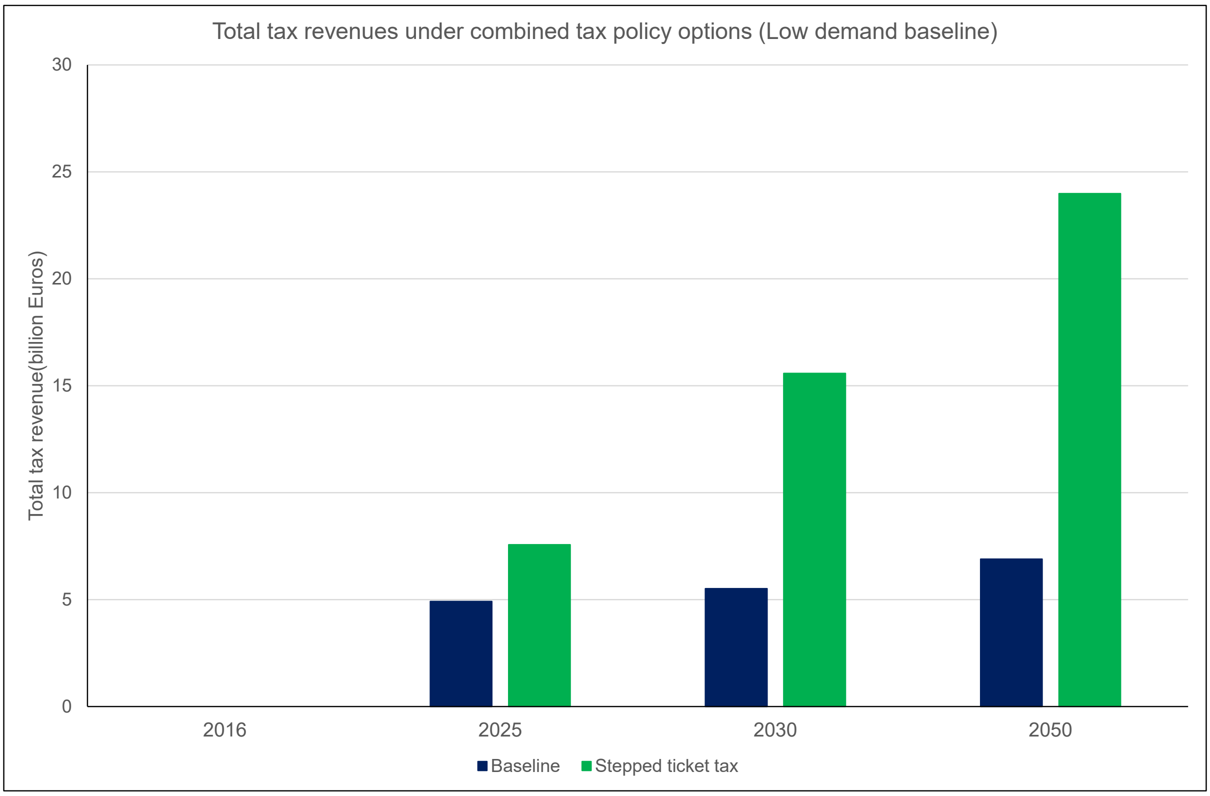
The percentage reductions in fuel consumption arising from the combined tax option, and its effect on demand, are shown in Figure 6-84. As for the other tax options, the percentage impacts on fuel consumption are slightly greater than those on demand, reaching 10.5% (for intra-EEA flights) and 5.2% (on intra-EEA flights) in 2050, compared to 10.3% and 4.7% for the same geographic scopes under the primary baseline.

Figure 6-84: Percentage change in fuel consumption on intra-EEA and extra-EEA flights from combined tax option under low demand baseline



The total tax revenue collected under the combined tax option under the low demand baseline is shown in Figure 6-85. The increase in tax revenue compared to the baseline is very similar to that for the same tax option under the primary baseline; in 2050, it is slightly greater at €19 billion under the low demand baseline, compared to €18 billion under the primary baseline.

Figure 6-85: Impact of combined tax option on tax revenue under low demand baseline



6.4.7.2 Immediate implementation compared to 10-year transition

The main options for the combined tax described in section 6.4 are based on a 10 year transition period for both the fuel tax (on intra-EEA flights) and the ticket tax (on extra-EEA flights). This sensitivity analysis considers the effects of the alternative option, with a full implementation of the tax from 2024.

Figure 6-86 presents the percentage change in passenger demand under both the 10 year transition and the immediate implementation. As seen for the fuel tax option, the 10 year transition results in a low impact on demand in 2025 with a greater impact in 2030 and a further increase by 2050. Under the immediate implementation, the greatest impact is seen in 2025, with a reduction in demand relative to the baseline of over 13%. This impact reduces over time as the baseline fuel and ticket costs increase, reducing the effect of the taxes. By 2050, both implementation periods produce the same results, as expected. A similar set of impacts for the two implementation periods is also seen in the impacts on fuel consumption (Figure 6-87).

Figure 6-86: Percentage change in passenger demand on intra-EEA and extra-EEA flights from combined tax option, including immediate implementation and 10-year transition

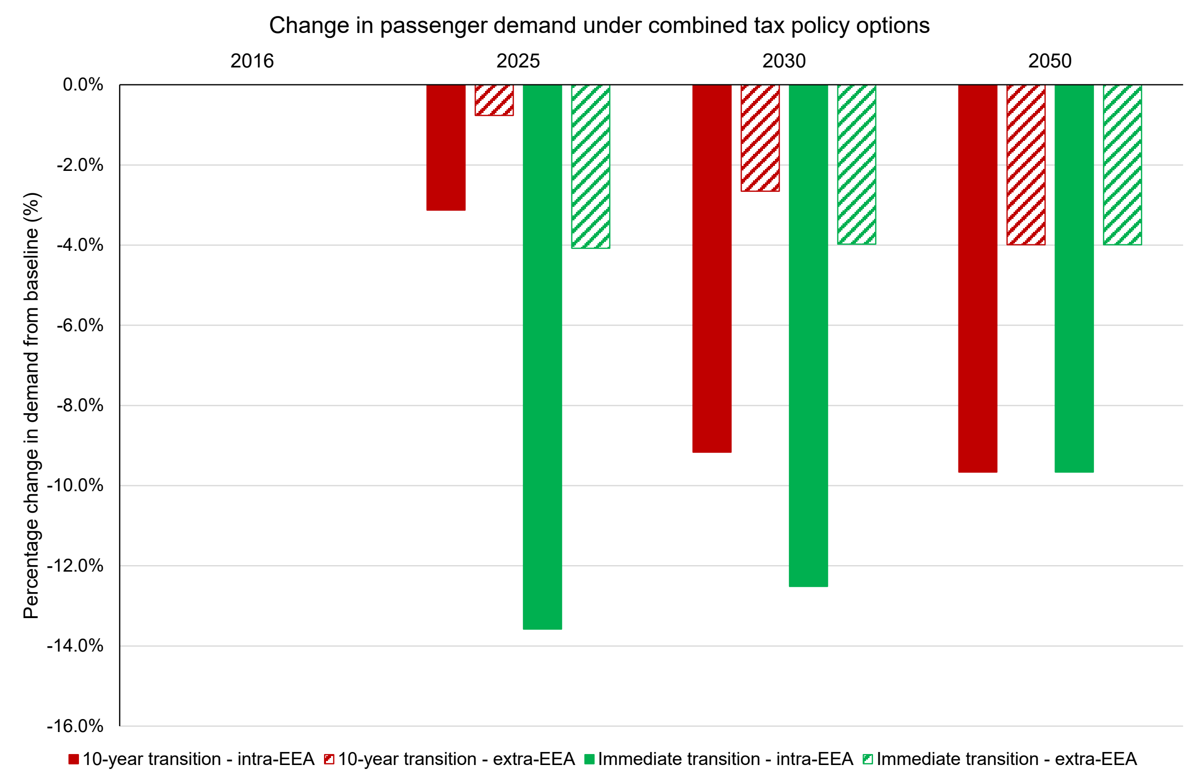


Figure 6-87: Percentage change in fuel consumption on intra-EEA and extra-EEA flights from combined tax option, including immediate implementation and 10-year transition

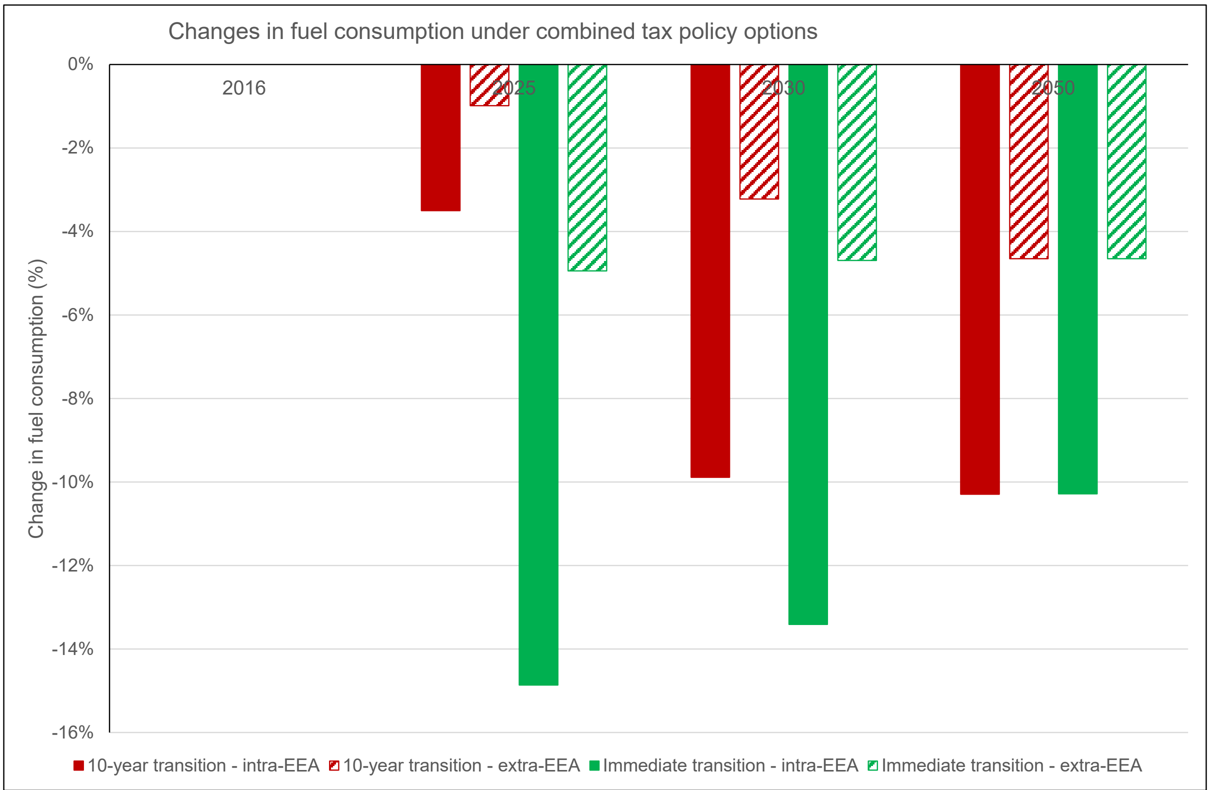
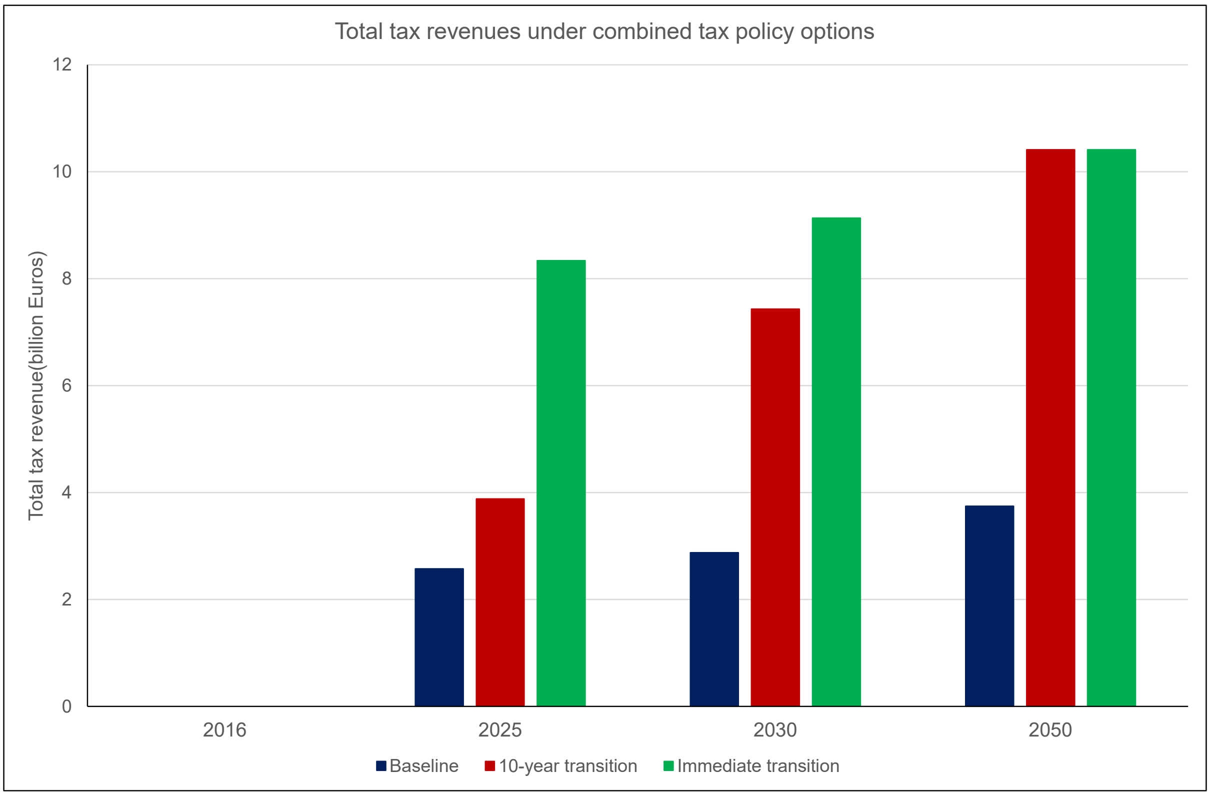


Figure 6-88 shows the impact of the two implementation periods on the tax revenue raised. In 2025, the tax revenue from the combined tax with full implementation is €8.3 billion, an increase of €5.8

billion over the baseline. Under the 10 year transition period, with only 20% of the full tax rates implemented in 2025, the total revenue reduces to €3.9 billion, €1.3 above the baseline.

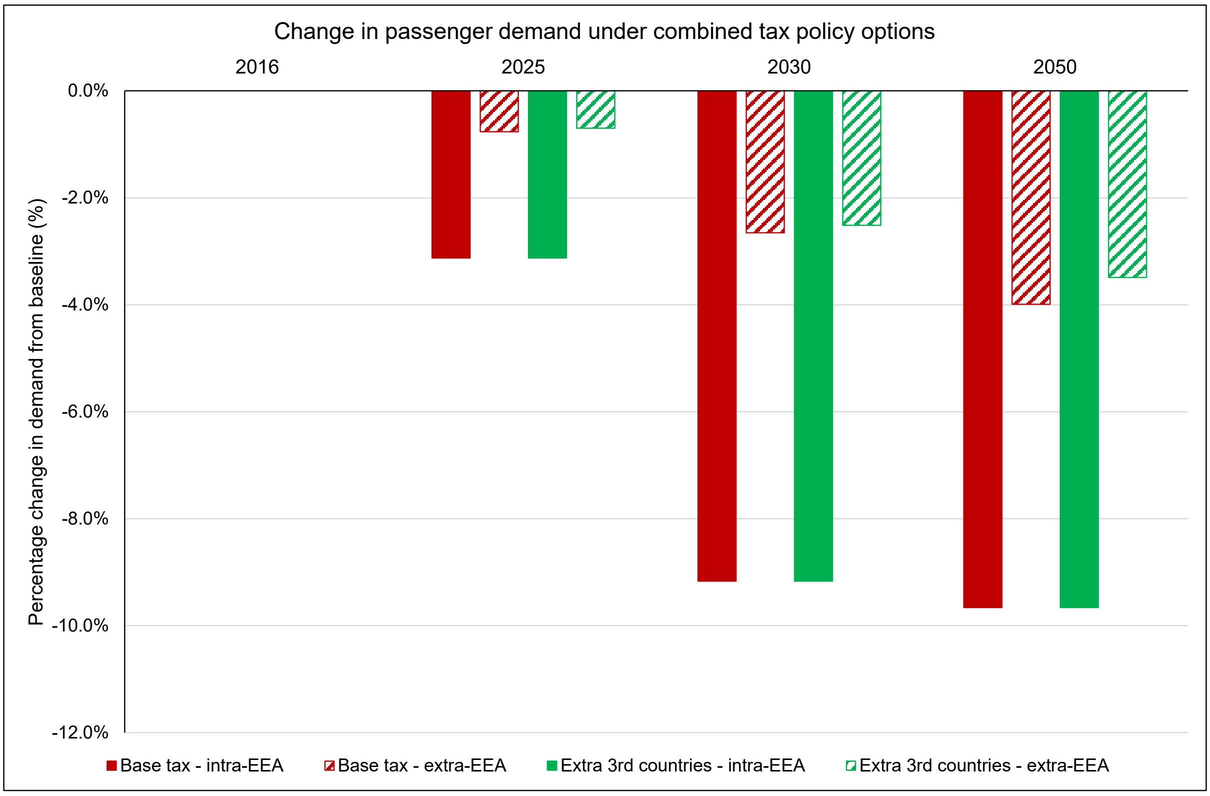
Figure 6-88: Impact of combined tax option on tax revenue, including immediate implementation and 10-year transition



6.4.7.3 Fuel tax on flights to selected third countries

Similarly to the sensitivity analysis presented for the fuel tax in Section 6.2.7.6, this analysis considers the option under which flights from the EEA to third countries with whom the aviation agreements allow for fuel supplied (for use on those flights) to be taxed (specifically Morocco and the UK), would be subject to the fuel tax and not the ticket tax. The impacts of this option on demand (as the percentage change from the baseline) are shown in Figure 6-89. In this figure (and others in this section), the results marked as 'Base tax' are those for the €0.33 per litre fuel tax applied to intra-EEA flights and the stepped rate ticket tax applied to extra-EEA flights.

Figure 6-89: Percentage change in passenger demand on intra-EEA and extra-EEA flights from combined tax option, including tax on fuel for flights to UK and Morocco



When considering the similar sensitivity against the fuel tax option (Section 6.2.7.6), the addition of Morocco and the UK as destination to which flights are subject to the fuel tax had no impact on intra-EEA flights (as both destinations are outside the EEA) and a small reduction in demand on extra-EEA flights. In the case of the combined tax, there is again no additional impact on the intra-EEA flights (as expected), but the impact on demand on extra-EEA flights (relative to the baseline) is slightly less than that with the ticket tax applied on flights to those destinations. This indicates that the fuel tax at €0.33 per litre is slightly less burdensome on ticket prices on flights of the average distance to those countries from EEA airports than the ticket tax at €25.30 per ticket (which would apply as the destinations are extra-EEA and within 6,000km of all EEA countries).

The impact of applying the fuel tax on flights to Morocco and the UK is again almost identical to those from the ticket tax element of the combined tax (as in the base combined tax option) on fuel consumption and tax revenue.

It should be noted that the conclusion that the inclusion of Morocco and the UK as destinations to which the fuel tax is applied under the combined tax gives almost identical results to the case in which the ticket tax is applied on those routes is very dependent on the ticket tax option considered for the extra-EEA flights. Under the case with the flat rate ticket tax (at €10.43 per ticket) applied, the fuel tax of €0.33 per litre would be expected to have a greater impact than the ticket tax, for example.

6.4.8 Summary of analysis of combined tax options

- The combined tax options considered in this study have all included a tax on the fuel supplied for intra-EEA flights and a ticket tax on extra-EEA flights. The cases considered have combined a €0.33 per litre fuel tax on intra-EEA flights and a ticket tax on extra EEA flights of either:
    - a flat rate of €10.43 per ticket on all flights; or
    - a stepped rate of €25.30 per ticket for extra-EEA flights less than 6,000km and €45.54 per ticket for extra-EEA flights over 6,000km; or
    - an inverse stepped rate of €25.30 per ticket for extra-EEA flights less than 350km and €10.12 per ticket for extra-EEA flights over 350km.

- The tax options analysed all have significant impacts on CO_2 emissions in the long-term, with reductions of about 10% on intra-EEA flights and up to almost 5% on extra-EEA flights. The option with the stepped ticket tax on extra-EEA flights has a greater impact than the other two combined tax options considered.
- The impacts on demand are very similar to those on emissions, with slightly lower magnitudes of change (up to 9.7% on intra-EEA flights and 4.0% on extra-EEA flights).
- The additional tax revenue from aviation under the combined tax options is from €14 billion to €16 billion per annum by 2050. The impacts on the economy from the reduction in aviation demand reduce the rise in total tax from the transport sector to about €12 billion per annum.
- The impacts of the combined tax and the consequent changes in demand reduce total GDP in the EU27 by approximately €12 billion by 2050.
- The impacts on connectivity and competitiveness derived from the implementation of a combination of fuel and ticket taxes are similar to those discussed under the policy options where such taxes are implemented separately.
- The impacts of the combined tax (as percentage changes) are unaffected when considering them against a lower baseline demand (representing a slower recovery following the COVID-19 pandemic).
- A scenario in which the fuel tax is applied to fuel supplied for flights from the EEA to Morocco and the UK instead of a ticket tax (as allowed for by the aviation agreements with those countries) has an almost negligible impact on demand, fuel consumption or revenue compared to the case in which they are subject to the ticket tax element of the combined tax.

6.5 Additional impacts and corresponding measures

6.5.1 Minimisation of tax burden

This section presents our methodology for the analysis of potential tax minimisation mechanisms typically employed by airlines, including tankering and traffic diversion through destination switching and hub switching. The recourse to these mechanisms may be further incentivised by the introduction of new aviation taxes.

6.5.1.1 Tankering

In case of an application of a fuel tax on a selected number of flights, price differences between airports might increase which may trigger additional fuel tankering strategies. Such behaviour reduces the effectiveness of a fuel tax, as discussed in this section[110].

By being able to avoid the price increase through tankering, airlines may be able to maintain traffic volumes, while incentives to use more fuel-efficient aircraft would be reduced, as would be the revenues generated from the taxation measure. Moreover, additional adverse environmental impacts would be introduced by increasing take-off weights of aircraft carrying extra fuel. With a fuel tax being applied to intra-EEA flights only, the additional fuel would be taken on board at a non-EU airport; hence, such fuel tankering may be viewed as a form of carbon leakage.

A recent study by Eurocontrol (Tabernier, Calvo Fernández, Tautz, Deransy, & Martin, 2021) shows that tankering is already a widespread practice in the EEA. The study focuses on tankering for return flights to take advantage of existing fuel price differences between airports. This shows that full tankering is technically feasible for flights of 600 nautical miles[111] (nm) (approximately average distance in intra-EEA flights) and financially viable when the fuel price difference between airports is larger than 10%. The results of their simulation indicate that 21% of flights up to 2500 nm[112] within the

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[110] For a discussion of the policy measures under consideration to mitigate the air carriers' willingness to tanker fuel into the EEA (namely the policy measure on the creation of a minimum tax burden for each flight and the measure on the gradual implementation of the fuel tax over a 10-year period) see Section 4.2.1.
[111] 1,111 km.
[112] 4,630 km.

ECAC[113] in 2018 would perform fuel tankering beneficially. As a result, 286,000 tonnes of additional fuel would be burnt (equivalent to 0.54% of ECAC jet fuel used), equivalent to 901,000 tonnes of CO_2 per year.

In principle, two types of tankering can be distinguished as a response to fuel taxation:

- Direct tankering, which applies to the situation where flights are taxed only in one direction (e.g. fuel loaded for a flight from the EEA to a third country is taxed, while fuel loaded in the third country is not taxed). In this case, the airline may choose to load more fuel in the third country than is needed for the flight to the EEA airport, so that it does not need to refuel in the EEA before the return flight to the third country. This is the tankering mechanism studied in the Eurocontrol study (Tabernier, Calvo Fernández, Tautz, Deransy, & Martin, 2021).
- Indirect tankering, which applies to the situation where aircraft are scheduled in such a way that a taxed flight of an aircraft is preceded by a non-taxed flight. For example, an airline that flies both from the EU to a third country and on intra-EEA flights might load sufficient fuel on the aircraft in the third country to fly to the EEA airport and then on to another EEA airport (an intra-EEA flight).

As noted above, the focus of the fuel tax aspects of this study is on intra-EEA flights. Therefore, direct tankering is not relevant (as the fuel loaded for the flight from the EEA to the third country will not be subject to fuel tax), so only indirect tankering needs to be considered.

Based on this, a quantified estimation of the impacts of indirect tankering was made taking into account:

- Operational feasibility considering to what extent the same aircraft is (or can be) used for an intra-EU flights right after an extra-EU flight.
- Technical feasibility of tankering considering flight distances and technical characteristics of aircraft (e.g. fuel tank capacity and maximum range with a representative payload)
- Financial incentives for tankering which depend on the differences in fuel prices between different countries; in the context of this study, the key differentiator is the level of the fuel tax.

Data on the fuel tank capacity of aircrafts operating both intra-EEA and extra-EEA flights, along with their range and fuel consumption for typical payloads has been extracted from publicly available information provided by manufacturers, where available, and data gaps have been filled with the aviation emissions calculator attached to the EMEP/EEA emission inventory guidebook 2019[114]. The additional fuel consumption due to the extra weight of tankered fuel has been assessed with data from Piano-X, an aircraft performance and emissions database[115].

For the assessment of the operational feasibility, flight data per type of aircraft and distance range has been extracted from the AERO-MS model for 2016. Table 6-28 presents the flight groups that have been considered in our analysis. These encompass routes where the use of tankering may be increased to minimise the tax burden associated to an intra-EEA fuel tax. Our analysis focuses only on passenger flights and excludes cargo-only flights, for which such detailed flight data was not available[116].

Table 6-28: Split of flight groups for the tankering analysis

Flight group	Origin /Destination	Carrier Region	Type of carriers	Intra EEA flights where tankered fuel could be used
1	Rest of the world – EEA	EEA	Scheduled - network carriers	Intra EEA flights with scheduled network carriers from EEA
2	Rest of the world – EEA	EEA	LCC	Intra EEA flights with LCC from EEA

[113] 44 member states that signed the European Civil Aviation Conference
[114] https://www.eea.europa.eu/publications/emep-eea-guidebook-2019
[115] For further information see https://www.lissys.uk/PianoX.html
[116] Passenger flights represent 97% of fuel consumption in intra-EEA flights, so only a marginal proportion of tankering would be attributed to cargo-only flights, according to the AERO-MS baseline results

Flight group	Origin /Destination	Carrier Region	Type of carriers	Intra EEA flights where tankered fuel could be used
3	Rest of the world – EEA	Rest of the world	Scheduled - network carriers	Intra EEA flights with scheduled network carriers from third countries
4	Rest of the world – EEA	Rest of the world	LCC	Intra EEA flights with LCC from third countries
5	UK – EEA	EEA	Scheduled - network carriers	Intra EEA flights with scheduled network carriers from EEA
6	UK – EEA	EEA	LCC	Intra EEA flights with LCC from EEA
7(*)	UK – EEA	UK	Scheduled - network carriers	Intra EEA flights with scheduled network carriers from UK
8 (*)	UK – EEA	UK	LCC	Intra EEA flights with LCC from UK

Note (*): This reflects the situation in 2016 where UK carriers are part of EU internal aviation market and able to operate all intra EEA flights. This is no longer the case after the Brexit transition period, and hence also not in the Baseline scenario

The indirect tankering effect has been quantified based on the following assumptions:

- **Operational feasibility (aircraft eligibility)**: For each group of flights, aircrafts eligible for tankering have a ratio of number of annual intra-EEA flights over number of annual extra-EEA flights higher than 5 (i.e. aircrafts are used in 5 intra-EEA flights for every extra-EEA flight within each flight group). This ratio measures the feasibility of organising routes in such a way that the same aircraft can be used for an incoming extra-EEA flight and a consecutive intra-EEA flight, which is the configuration needed for indirect tankering. A higher ratio (more intra-EEA flights for each extra-EEA flight for a given aircraft) indicates that air carriers have higher flexibility to adopt such a route pattern as there is a wider range of intra-EEA routes to allocate an aircraft to following an incoming extra-EEA flight. However, this parameter cannot be defined with precision in the aggregate as it will depend on the flexibility to adopt this route pattern by each individual carrier and specific scheduling restrictions of particular routes. A ratio of 5 has been assumed for this calculation by considering this could provide sufficient flexibility for an aircraft to undertake indirect tankering. A sensitivity analysis on this parameter confirmed that results are very robust for a range of this ratio between 1 and 8.
- **Technical feasibility (tankering potential)**: The tankered fuel carried in incoming extra-EEA flights is assumed to be used for a single intra-EEA flight and will be limited by the remaining fuel within the tank upon arrival at an EEA airport. Hence, the potentially tankered fuel per eligible aircraft is the minimum among the following values:
  - Amount of fuel required for 1 intra-EEA flights with an average distance of 920 km (average flight distance in intra-EU passenger flights in 2016).
  - Unused fuel tank capacity in the incoming extra-EEA flight available for tankering, considering the additional fuel consumption due to extra weight.
- **Financial incentive**: There is a financial case for tankering when tax savings due to tankering are higher than the cost of additional fuel consumed due to tankering.

Under the assumptions above, the potential for tankering based on 2016 flight data is estimated at 1.15 megatonnes of fuel, which would represent around 7.8% of the total fuel consumption for intra-EEA passenger flights (see Table 6-29). Similarly, foregone tax revenue would be 7.8% of the revenues estimated to arise from fuel taxes and shown in Figure 6-4. Assuming a tax rate of €0.33 per litre of fuel charged on intra-EEA flights consistent with the default policy option presented in section 6.2, tankering would represent a loss of around €0.5 bn.

The additional fuel consumed due to tankering in incoming extra-EEA flights would lead to an increase in fuel consumption and CO_2 emissions by 0.4% in extra-EEA flights.

Table 6-29 presents the split of tankering effects by flight group. This shows that 42% of tankering would come from EEA carriers operating flights from the rest of the world (excluding the UK) to the EEA, while the remaining 58% would come from flights from the UK to the EEA operated by EEA carriers[117].

By distance range (see Table 6-31), our tankering calculations suggests that a large majority of tankering (81%) would be associated to flights below 2,000 km. The higher tankering effect in short and medium-haul flights is explained by the following reasons. First, tankering has a higher operational feasibility as it is more likely for an aircraft to be operated in extra-EEA and intra-EEA flights consecutively. Second, in terms of the technical feasibility, short and medium-haul flights have an increased capacity to tanker fuel as the fuel consumed upon arrival at EEA airports is likely to be well below the available fuel tank capacity. Third, the shorter flight distance is also associated with less additional fuel consumption when considering the extra weight of tankered fuel, which improves the financial case for tankering.

Table 6-29: Tankering summary results

Indicator	Unit	Value
Total tankering for intra-EEA flights	Megatonnes	1.15
Tankering out of total fuel consumption in intra-EEA passenger flights	%	7.8
Foregone (annual) tax revenue	€ bn	0.48
Total additional fuel consumption in incoming extra-EEA flights	Megatonnes	0.09
Total additional CO_2 emissions in incoming extra-EEA flights	Megatonnes	0.28
Additional fuel consumption out of total fuel consumption in incoming extra-EEA passenger flights	%	0.4

Table 6-30: Tankering potential per flight group

Flight group	Outbound flights	Carrier Region	Type of carriers	Tankering (ktonnes)	Tankering (%)
1	Rest of the world – EEA	EEA	Scheduled - network carriers	317	28%
2	Rest of the world – EEA	EEA	LCC	161	14%
3	Rest of the world – EEA	Rest of the world	Scheduled - network carriers	3	0%
4	Rest of the world – EEA	Rest of the world	LCC	0	0%
5	UK – EEA	EEA	Scheduled - network carriers	229	20%
6	UK – EEA	EEA	LCC	444	38%
7	UK – EEA	UK	Scheduled - network carriers	0	0%
8	UK – EEA	UK	LCC	0	0%
Total				**1,154**	**100%**

[117] Please note that this considers flight data for 2016 but the market structure of operations between the UK and the EEA may change as the UK leaves the EU, with high uncertainties at the time of drafting this report.

Table 6-31: Tankering potential per distance range

Distance range for incoming extra-EEA flights (km)	Tankering (ktonnes)	Tankering (%)
0-1000	452	39%
1000-2000	488	42%
2000-3000	153	13%
>3000	60	5%

Measures to mitigate tankering

As noted in section 4.2.1, we have considered two potential ways to mitigate tankering:

- Gradual introduction of the fuel tax over a 7- or 10-year period.
- Introduction of a minimum tax burden on each flight.

The rationale for the gradual introduction of a fuel tax is greater political support while giving airlines more time to adapt to higher tax levels (e.g., by investing in a cleaner fleet or transitioning to SAF). This was modelled in AERO-MS and the results are shown in section 6.2.7.3. However, as shown in a recent study by Eurocontrol experts, in terms of mitigating tankering, the introduction of a transition period for the full implementation of a fuel tax would not be effective: in that study, it was found that some airlines decide to tanker fuel if the savings are as low as €15 per flight, and they use software to make those tankering decisions on a daily basis (Tabernier, Calvo Fernández, Tautz, Deransy, & Martin, 2021). Therefore, it is not expected that such a transition period would be enough to have a meaningful effect to reduce tankering in the long term, although some small effect on disincentivising tankering might be expected in the early transition period.

The second measure considered, the introduction of a minimum tax burden, is more likely to be effective in reducing tankering. As discussed in section 4.1.1 this measure would work by ensuring that the airline pays a representative tax related to the fuel used on the flight, whether they loaded the fuel for the flight at the departure airport or elsewhere. For each origin-destination pair, there would be a need to define the minimum fuel needed to fly that route (e.g. 1,000 litres). When operating that route, the airlines would then pay the tax based on the amount of fuel they put onboard (say, tax on 1,200 litres) or the tax based on that 'minimum fuel needed' for that route (the tax on 1,000 litres, in this example). Airlines would pay whichever value is higher (tax on actual fuel put onboard, in the case of this example).

There are however two important aspects to consider for this measure:

- How to set the level of the minimum tax on each origin-destination pair: if the minimum tax burden is set at a very high level, the airline might end up incurring in the minimum tax burden even if it did not tanker[118]. To solve this, the minimum tax burden would have to be set 'conservatively'. That is, the minimum tax burden (likely to be set on a fuel burn per kilometre travelled) would have to assume is using a small aircraft that is not very fuel efficient, and not include any additional fuel taken onboard (e.g. due to adverse meteorological conditions)[119]. However, setting the minimum tax burden this way, would mean that some airlines would be able to tanker nonetheless without being subjected to the minimum tax burden, reducing the effectiveness of the measure.

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[118] This could happen if, for example, the minimum tax burden was estimated using a larger aircraft than the one the airline used in that flight or if the minimum tax burden was estimated using an aircraft less efficient than the one the airline used in that flight.
[119] For example, for shorter flights (up to 1,000km) the minimum fuel need to fly that route would be based on a 70-seater regional jet (for example an Embraer E170), and for longer distance based on 150-seater mainline aircraft (for example an Airbus A319). So, if the airline used a larger aircraft and/or a more fuel-efficient aircraft, they would not fall under the minimum tax burden unless they tankered fuel.

- How to make this measure operational reducing administrative burden. For the measure to be implemented and the minimum tax burden enforced, airlines would need to keep track of the quantity of fuel taken at the airport before each intra-EEA flight and report it to the relevant tax authorities. These tax authorities would then need to check whether that quantity of fuel was above the minimum quantity for that specific route and, if not, require the airline to pay the difference in taxes. This will likely increase the administrative burden of a fuel tax significantly, with unproven benefits in terms of effectiveness[120]

In summary, this measure on a minimum tax burden on each flight was considered to be the one likely to be somewhat effective in reducing the incentives for tankering if a fuel tax is imposed in intra-EEA flights. However, the administrative burden such a measure would impose both on airlines and tax authorities is expected to be significant compared to a situation where a fuel tax was imposed without such a measure. Additionally, in order to reduce the risks of such a minimum tax incentivising the use of less efficient aircraft, this minimum tax would need to be imposed on such a way that it would not allow for it to be fully effective in reducing tankering. Given this, it is likely that such a measure would not be practical to implement.

6.5.1.2 Destination switching

Destination switching may happen in case of a fuel tax on intra-EU flights, where flight destinations outside the EU become relatively more attractive as these would not be subject to a policy-induced price increase. This would lead to a shift in demand from intra-EEA flights to extra-EEA flights, which would be associated with carbon leakage and a loss of revenues from fuel taxes for EU Member States.

The impacts on demand from the fuel tax have been assessed for intra-EEA flights with the AERO-MS model (see section 6.2). Elasticities used in AERO-MS based on IATA estimates (IATA, 2007) encompass all demand effects, including reduced air travel but also route substitution (i.e. destination switching). As such, a proportion of the reduced demand for intra-EEA flights as per the AERO-MS results in section 6.2 already takes into account a shift from EEA destinations to non-EEA destinations.

The set of price elasticities used in AERO-MS depend on the scope of the price impact, such that differences in route substitutability are captured. An average price elasticity of -0.8 was found for a uniform price increase at national level while the average price elasticity at pan-national level was estimated at -0.6. This difference is due to the lower route substitution effect for the pan-national scope, where more alternative routes are equally affected by the price increase and the demand effect is more closely related to the own price elasticity. This difference in relative price elasticities indicates that 25% of the demand effect at national level would be associated with the substitution effect (i.e. shifted from domestic to non-domestic flights). This substitution effect represents an upper bound of the destination switching effect that may be expected from EEA destinations to non-EEA destinations should the tax be imposed on intra-EEA flights. Based on this, an upper bound of the destination switching effect for the fuel tax options considered is presented in Table 6-32 below. This indicates that up to 2.4% of demand in pax-km in the baseline may be shifted from EEA destinations to non-EEA destinations as a result of a €0.33/litre fuel tax by 2050.

Table 6-32: Potential demand shifted from intra-EEA flights to extra-EEA flights as a result of destination switching caused by the fuel tax (share over intra-EEA pax-km in the baseline)

Year	€0.17/litre	€0.33/litre	€0.50/litre
2025	0.4%	0.8%	1.2%
2030	1.3%	2.3%	3.3%
2050	1.3%	2.4%	3.5%

[120] To reduce this burden, such reporting requirements could be included in the existing reporting requirements under the EU ETS for aviation, where airlines already have to report an extensive set of operational data – although not on a 'flight by flight' basis.

Existing literature on price elasticity of air travel indicates that the price sensitivity of leisure travel is significantly higher than that of business travel (IATA, 2007) (Brons, 2002). This means that destination switching would be particularly prominent in leisure trips, especially for tourist destinations in neighbouring countries (e.g. North Africa) which compete with tourist destinations in the EU (e.g. Southern Member States). In addition, in a post-Brexit context, touristic destinations in the UK may also become more attractive compared to competing destinations in the EEA.

To illustrate this effect, we look at a flight distance threshold at which some extra-EEA destinations may become cheaper to reach than closer EEA destinations as a result of the fuel tax. For simplicity we assume that flight distance is positively correlated to prices.[121] Since prices per pax-km for intra-EEA flights increase as a consequence of the fuel tax, the distance at which a non-EEA flight may cut even in terms of total price compared to an intra-EEA flight increases at the same rate as the price per pax-km. According to Table 6-1, a fuel tax of 0.33 €/l would increase prices per pax-km of LCC by 10.9%. Hence, it can be considered that extra-EEA LCC flights within a flight distance up to 11% higher than competing intra-EEA flights are likely to become relatively cheaper and attract more demand. As a way of illustration, Table 6-33 shows differences in flight distances from Munich, as an example of a central European airport to some EEA and non-EEA destinations.

Table 6-33: Illustrative comparison of flight distances for some EEA and non-EEA destinations from Munich

Origin	EEA destination	Non-EEA destination	Difference in flight distance	Risk of destination switching
Munich	Malaga	Marrakesh	26%	Low
Munich	Athens	Istanbul	5%	High
Munich	Palermo	Tunis	11%	High
Munich	Paris	London	25%	Low

It should be noted, however, that the destination switching effect may be partially offset if affected Member States respond by lowering tourism taxes to mitigate the effects of fuel taxation (Álvarez-Albelo, Hernández-Martín, & Padrón-Fumero, 2007).

Another potential effect would be a switch to a non-EEA airport to travel from/to a final origin/destination in the EEA via a land connection. Previous studies have found this effect as a result of the application of ticket taxes in Germany and the Netherlands, where airports right across the border have increased their activity levels (Borberly, 2019). In the case of an application of a fuel tax at EEA level, this effect would be limited to cases where non-EEA airports are close enough to EEA airports and have a good transport connection to EEA travel generation nodes across the border, which includes a very limited set of options.

A ticket tax for departure flights (both intra-EEA and extra-EEA) could also result in destination switching should the applied tax rate significantly modify the relative price of different destinations. For example, a flat tax would raise the price of flights to closer destinations relatively more than the price of flights to further destinations. Insights from the literature suggest that this could shift demand to further destinations and lead to increased CO_2 emissions under the assumption that the number of trips would not change significantly (Mayor & Tol, 2007). On the contrary, a stepped ticket tax would lead to a lower destination switching potential, as the relative price difference between intra-EEA and extra-EEA destinations would be lower. Similarly, a combined tax is likely to lead to a lower destination switching effect. Table 6-34 illustrates the potential for destination switching for the main

[121] This assumption may not be true for specific routes as many other factors, such as air carriers' commercial strategies, play a role, but this simplification aims to illustrate potential effects in the aggregate

ticket tax and combined tax options. The destination switching potential in 2050 would be between -1.8% and -0.8% of pax-km, which is lower than the 2.4% found for the equivalent fuel tax option (0.33 cents per litre).

Table 6-34: Potential demand shifted from intra-EEA flights to extra-EEA flights as a result of destination switching caused by the ticket tax and combined tax options (share over intra-EEA pax-km in the baseline)

Year	Flat rate ticket tax	Stepped rate ticket tax	Combined option with stepped rate ticket tax
2025	-1.8%	-1.0%	-0.6%
2030	-1.8%	-0.9%	-1.6%
2050	-1.7%	-0.8%	-1.4%

6.5.1.3 Hub switching and exemptions to transit and transfer passengers

In the case of a ticket tax for flights departing from the EEA, transfer passengers with both the origin and destination of their travel outside the EEA might choose to use a hub outside the EEA, where in the current situation they use an EEA airport as the hub. However, the ticket tax policy options assessed in this study all include an exemption for connecting passengers with origin and destination both outside the EEA, in line with existing ticket taxes in the EEA, which mostly[122] exempt transit and transfer passengers with origin and destination outside the relevant Member State.

As noted in section 4.1.2, this exemption exists for two reasons. The first is the risk of hub switching discussed on the previous paragraph-. The second reason is one of practical nature, as taxing multiples segments of a trip could lead to risks to double taxation and could also constitute a greater administrative burden for air carriers, leading to potential errors and inaccuracies that would require more frequent inspection and appeals by public authorities.

Should the exemption be waived, we can estimate the potential impact of hub switching, by looking at data on transit/transfer passengers. The most recent estimate is for the year 2013, based on a paper by the German Aerospace Centre, DLR (Maertens & Grimme, 2015). For 2013, the number of transfer passengers[123] in the EU27 airports was in the range of 10-15%[124]. As noted in section 4.2.2, for our analysis we consider that the share of transit/transfer passengers would be at the top end of the scale (15%). It was not possible to disaggregate the percentage of those passengers that could potentially switch to a non-EEA hub to avoid higher levels of taxation, but this is expected to be a small sub-set of the 15% total (as for many of those passengers it would not be convenient to switch to a non-EEA hub).

6.5.2 Other measures

6.5.2.1 Exemptions for flights to and from outermost regions and PSO flights

For both ticket taxes and fuel taxes, it is considered that flights to and from outermost regions as well as flights operating under a PSO should be exempt from such taxes due to the negative effects on the connectivity of these regions.

Such an exemption would reduce the effectiveness of a fuel or ticket tax in reducing the environmental impact of aviation. Although there are no precise recent numbers available, a study looking at PSO routes in 11 EU Member States in 2010 found that a little over 1% of seats flown from

[122] Portugal being one exception, where the new €2 ticket tax to be introduced in 2021 will apply to connecting passengers.
[123] It is not expected that the number of transit passengers is substantial.
[124] For EU28, which includes the major hub of London Heathrow, the figures are in the same range.

those MS' airports were on PSO flights (Wittman, Allroggen, & Malina, 2016)[125]. Since 2010, the number of PSO routes has been declining, so the figure in terms of seats could be smaller now (European Commission, 2019). Given this, it is not expected that these flights would represent a large portion of intra-EEA flights or fuel consumed in intra-EEA flights, and as such the reduction in effectiveness is likely to be minimal and the exemption would mean that no extra burden were imposed on the connectivity of these regions.

7 Comparison of options

This section provides comparisons of the different policy options, and key sub-options, analysed in this study. For ease of comparison, these are presented in the form of tables, with consistent information on the results of the analysis against a number of parameters.

Overall, three primary policy options (fuel tax, ticket tax and combined tax), with, in each case, three different sets of tax rates under each. To simplify the presentation, comparisons are first provided for three fuel tax rates (Table 7-1), three ticket tax rates (Table 7-2) and three combined tax rates (Table 7-3). Following those three tables, a comparison is provided of the central sub-option under each of the three main policy options (Table 7-4).

In each case, the taxes have been analysed as being introduced first in 2023, but (in the case of the fuel tax and the combined taxes) implemented over a 10-year transition period, reaching full implementation in 2033. The years analysed are 2025, 2030 and 2035. For the comparisons in the following tables, the results in 2030 are used, unless stated otherwise.

The results used for the comparisons of tax revenue are based on cases in which the existing national ticket taxes are retained when the harmonised minimum fuel taxes are implemented (and/or the existing ticket tax rates are retained if they are higher than the harmonised minimum). Therefore, the percentage increases shown represent the sum of the fuel and ticket tax revenues in the policy case referenced to just the existing ticket tax revenues in the baseline case. Such a percentage calculation would be meaningless at a Member State level for Member States that do not have existing ticket taxes.

The socioeconomic analyses are all based on the assumption that taxes raised accrue to general Government budgets and are not recycled into the aviation sector. This assumption can have significant impacts on the results of the analyses and alternative assumptions could lead to different results (for the impacts on GDP, for example).

For the fuel tax comparisons (Table 7-1), the policy option impacts only intra-EEA flights; therefore, for the environmental impacts, results are provided at intra-EEA and total levels. For the ticket tax and combined tax comparisons (Table 7-2 and Table 7-3), total environmental impacts are provided. In the comparison of the three main policy options (Table 7-4), environmental impacts are also presented at the total level (including for the fuel tax policy option).

All three tables include the impacts on cargo flights. As noted in Section 4.1.1, it has been concluded that a fuel tax would not be applied to cargo-only flights under the fuel tax policy option (and also under the combined tax policy option, which implements a fuel tax on intra-EEA flights). However, the modelling performed did include such a tax (as the model is not set up to differentiate between the tax applied to passenger and cargo flights), so the results are included here for information on what might occur if the fuel tax was applied to intra-EEA cargo flights. In the event that a fuel tax was applied to intra-EEA cargo-only flights, carriers from some countries (most notably the US) would be exempt, which would offer them a competitive advantage over EEA carriers. This could lead to a shift in demand from EEA carriers to US carriers, reducing the emissions reductions and tax revenues. These potential additional effects are not included in the results presented here.

[125] Given that PSO flights generally operate with smaller aircraft, those 1% of seats correspondend to around 2.5% of commercial movements for those Member States. It should also be noted that more than 90% of PSO routes relate to intra-MS flights, with very few PSO routes between MS (Ricardo, 2018).

To simplify the following tables, all increases in parameters (demand, tax revenue, etc.) are marked as '+', while all reductions are marked as '-'.

Table 7-1: Comparison of sub-options for the fuel tax policy option

	€0.17 per litre fuel tax on fuel loaded for intra-EEA flights	€0.33 per litre fuel tax on fuel loaded for intra-EEA flights	€0.50 per litre fuel tax on fuel loaded for intra-EEA flights
Economic impacts			
Traditional scheduled carrier passenger flights	-3.4% intra-EEA; 0.0% extra-EEA	-6.2% intra-EEA; 0.0% extra-EEA	-8.9% intra-EEA; 0.0% extra-EEA
Low-cost carriers and charter passenger flights	-7.3% intra-EEA; 0.0% extra-EEA	-13.0% intra-EEA; 0.0% extra-EEA	-18.3% intra-EEA; 0.0% extra-EEA
Cargo flights	-4.1% intra-EEA; 0.0% extra-EEA	-7.3% intra-EEA; 0.0% extra-EEA	-10.3% intra-EEA; 0.0% extra-EEA
Total flights	-5.0% intra-EEA; 0.0% extra-EEA	-9.1% intra-EEA; 0.0% extra-EEA	-12.8% intra-EEA; 0.0% extra-EEA
Total aviation passenger demand (p-km)	-5.0%intra-EEA; 0.0% extra-EEA	-9.2% intra-EEA; 0.0% extra-EEA	-13.2% intra-EEA; 0.0% extra-EEA
Total rail passenger demand (p-km)	n/a	+0.2% (428.2 billion p-km)	n/a
Total rail + aviation passenger demand (p-km)	n/a	-5.6% (1,078.8 billion p-km)	n/a
Revenues in aviation sector	-0.3% intra-EEA; 0.0% extra-EEA; -1.7% total net revenue	-0.5% intra-EEA; 0.0% extra-EEA; -3.2% total net revenue	-0.8% intra-EEA; 0.0% extra-EEA; -4.6% total net revenue
Revenues from taxation (aviation)[126]	€5.34 billion intra-EEA; €8.27 billion total	€7.44 billion intra-EEA; €10.36 billion total	€9.46 billion intra-EEA; €12.39 billion total
Direct taxes	n/a	-0.03%	n/a
Total tax revenues	n/a	+0.10%	n/a
GDP	n/a	-0.04%	n/a
Environmental impacts			
Fuel use per RTK (aviation)	-0.6% intra-EEA -0.3% total	-1.0% intra-EEA -0.5% total	-1.4% intra-EEA -0.7% total
CO_2 emissions (aviation)	-5.4% intra-EEA 0.0% extra-EEA -2.1% total	-9.9% intra-EEA 0.0% extra-EEA -3.7% total	-14.1% intra-EEA 0.0% extra-EEA -5.3% total
NOx emissions (aviation)	-5.3% intra-EEA -1.8% total	-9.7% intra-EEA -3.3% total	-13.9% intra-EEA -4.7% total
Energy use (transport total)	n/a	-0.50% intra-EEA; -0.45% total	n/a
CO_2 emissions (transport total)	n/a	-0.63% intra-EEA; -0.55% total	n/a
Social impacts – number of persons employed			
Air transport services	n/a	-1.0%	n/a
Total transport services	n/a	+0.02%	n/a
Additional impacts			
Fuel tankering	Potential risk of indirect fuel tankering, with up to 7.8% fuel on intra-EEA flights being tankered from extra-EEA airports		
Traffic diversion	Risk of up to 1.3% of intra-EEA demand switching to extra-EEA destination by 2050	Risk of up to 2.3% of intra-EEA demand switching to extra-EEA destination by 2050	Risk of up to 3.3% of intra-EEA demand switching to extra-EEA destination by 2050

[126] Tax revenue figures are total values, including both fuel taxes (as the result of this policy measure) and the existing ticket taxes (assumed to continue in force).

	€0.17 per litre fuel tax on fuel loaded for intra-EEA flights	€0.33 per litre fuel tax on fuel loaded for intra-EEA flights	€0.50 per litre fuel tax on fuel loaded for intra-EEA flights
Connectivity and competitiveness	Overall, limited impact expected on connectivity, given the increase in demand in baseline scenarios. However, reductions in profitability may make some marginal routes less commercially viable. Some possible impacts on the competitiveness of EEA carriers as they compete with non-EEA carriers that are not impacted in the same way on the totality of their route network. Impacts are likely to be greater for the higher fuel tax options.		
Legal aspects	No legal issues identified for the implementation of a tax on fuel loaded for intra-EU flights by EEA carriers. Majority of agreements (HAs and CATAs) with third countries also allow their carriers to be taxed on intra-EU flights, though not all (the US being the most notable exception). Will need updated agreements with third countries to allow the tax to be applied to fuel loaded for flights by their carriers between the EU and (non-EU) EEA countries (and there may be challenges to do so with many countries).		

Table 7-2: Comparison of sub-options for the ticket tax policy option

	Flat rate ticket tax at €10.43 per ticket on intra-EEA and extra-EEA flights	Stepped rate ticket tax (€10.12 per ticket on intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km)	Inverse stepped rate ticket tax (€25.30 per ticket on flights less than 350km, €10.12 per ticket on flights over 350km)
Economic impacts			
Traditional scheduled carrier passenger flights	-5.9% intra-EEA; -1.7% extra-EEA	-5.7% intra-EEA; -5.1% extra-EEA	-9.9%intra-EEA; -2.2% extra-EEA
Low-cost carriers and charter passenger flights	-12.0% intra-EEA; -5.2% extra-EEA	-11.6% intra-EEA; -13.8% extra-EEA	-14.7% intra-EEA; -5.8% extra-EEA
Cargo flights	-6.6% intra-EEA; -8.4% extra-EEA	-6.6% intra-EEA; -8.4% extra-EEA	-6.6% intra-EEA; -8.4% extra-EEA
Total flights	-8.4% intra-EEA; -3.6% extra-EEA	-8.1% intra-EEA; -8.9% extra-EEA	-11.7% intra-EEA; -4.1% extra-EEA
Total aviation passenger demand (p-km)	-8.6% intra-EEA; -1.5% extra-EEA	-8.3% intra-EEA; -4.6% extra-EEA	-9.0% intra-EEA; -1.5% extra-EEA
Total rail passenger demand (p-km)	+0.3% (428.3 billion p-km)	+0.4% (428.9 billion p-km)	+0.3% (428.3 billion p-km)
Total rail + aviation passenger demand (p-km)	-5.3% (1,083.2 billion p-km)	-5.1% (1,085.8 billion p-km)	-5.1% (1,085.2 billion p-km)
Revenues in aviation sector	-0.7% intra-EEA; +0.7% extra-EEA; -6.3% total net revenue	-0.7% intra-EEA; +0.8% extra-EEA; -8.5% total net revenue	-0.9% intra-EEA; +0.7% extra-EEA; -6.8% total net revenue
Revenues from taxation (aviation)	€7.58 billion intra-EEA; €15.58 billion total	€7.44 billion intra-EEA; €19.14 billion total	€8.20 billion intra-EEA; €16.22 billion total
Direct taxes	-0.04%	-0.05%	-0.04%
Total tax revenues	+0.24%	+0.33%	+0.25%
GDP	-0.04%	-0.05%	-0.04%
Environmental impacts			
Fuel use per RTK (aviation)	+0.6% intra-EEA; +1.1% total	+0.6% intra-EEA; +0.9% total	-0.1% intra-EEA; +0.9% total
CO_2 emissions (aviation)	-8.0% intra-EEA; -2.7% extra-EEA; -4.7% total	-7.8% intra-EEA; -5.2% extra-EEA; -6.2% total	-9.1% intra-EEA; -2.7% extra-EEA; -5.1% total
NOx emissions (aviation)	-8.2% intra-EEA; -4.7% total	-7.9% intra-EEA; -6.2% total	-9.2% intra-EEA; -5.0% total
Energy use (transport total)	-0.23% intra-EEA; -0.48% total	-0.21% intra-EEA; -0.73% total	-0.40% intra-EEA; -0.64% total
CO_2 emissions (transport total)	-0.44% intra-EEA; -0.71% total	-0.31% intra-EEA; -0.90% total	-0.52% intra-EEA; -0.78% total
Social impacts – number of persons employed			
Employment, air transport services	-1.4%	-1.8%	-1.4%
Employment, transport services	+0.02%	+0.04%	+0.02%
Additional impacts			
Fuel tankering	Ticket tax does not introduce risk of tankering		

	Flat rate ticket tax at €10.43 per ticket on intra-EEA and extra-EEA flights	Stepped rate ticket tax (€10.12 per ticket on intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km)	Inverse stepped rate ticket tax (€25.30 per ticket on flights less than 350km, €10.12 per ticket on flights over 350km)
Traffic diversion	Risk of up to 1.8% of intra-EEA demand switching to extra-EEA destination by 2050	Risk of up to 0.9% of intra-EEA demand switching to extra-EEA destination by 2050	N/A
Connectivity and competitiveness	Overall, limited impact expected on connectivity, given the increase in demand in baseline scenarios. However, reductions in profitability may make some marginal routes less commercially viable. Some possible impacts on the competitiveness of EEA carriers as they compete with non-EEA carriers that are not impacted in the same way on the totality of their route network. Potential risk of significant levels of hub switching, if the ticket tax was applied to all transit and transfer passengers. Therefore, ticket tax options considered all exempt transit and transfer passengers where their origin and destination are both outside the EEA. If the origin (or ultimate destination) are within the EEA, the risk of hub switching could be reduced by the design of the ticket tax (e.g. applying to the full ticketed journey, not individual legs).		
Legal aspects	Precedents exist for this design of ticket tax. No legal issues identified.	Precedents exist for this design of ticket tax. Final design may need refinement of tax rates and distance boundaries to ensure compliance with all existing jurisprudence.	Precedents exist for this design of ticket tax. No legal issues identified.

Table 7-3: Comparison of sub-options for the combined tax policy option

	€0.33 per litre fuel tax on fuel loaded for intra-EEA flights, flat rate ticket tax at €10.43 per ticket on extra-EEA flights	€0.33 per litre fuel tax on fuel loaded for intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km	€0.33 per litre fuel tax on fuel loaded for intra-EEA flights, €10.12 per ticket on extra-EEA flights over 350km
Economic impacts			
Traditional scheduled carrier passenger flights	-6.2% intra-EEA; -1.2% extra-EEA	-6.2% intra-EEA; -3.3% extra-EEA	-6.2% intra-EEA; -1.5% extra-EEA
Low-cost carriers and charter passenger flights	-13.0% intra-EEA; -3.7% extra-EEA	-13.0% intra-EEA; -9.4% extra-EEA	-13.0% intra-EEA; -4.1% extra-EEA
Cargo flights	-7.3% intra-EEA; -6.1% extra-EEA	-7.3% intra-EEA; -6.1% extra-EEA	-7.3% intra-EEA; -6.1% extra-EEA
Total flights	-9.1% intra-EEA; -2.5% extra-EEA	-9.1% intra-EEA; -6.0% extra-EEA	-9.1% intra-EEA; -2.9% extra-EEA
Total aviation passenger demand (p-km)	-9.2% intra-EEA; -1.1% extra-EEA	-9.2% intra-EEA; -3.1% extra-EEA	-9.2% intra-EEA; -1.0% extra-EEA
Total rail passenger demand (p-km)	n/a	+0.3% (439.8 billion p-km)	n/a
Total rail + aviation passenger demand (p-km)	n/a	-5.6% (1078.9 billion p-km)	n/a
Revenues in aviation sector	-0.5% intra-EEA; +0.5% extra-EEA; -5.3% net revenue	-0.5% intra-EEA; +0.6% extra-EEA; -6.8% net revenue	-0.5% intra-EEA; +0.5% extra-EEA; -5.3% net revenue
Revenues from taxation (aviation)	€7.43 billion intra-EEA; €13.99 billion total	€7.43 billion intra-EEA; €16.40 billion total	€7.43 billion intra-EEA; €14.01 billion total
Direct taxes	n/a	-0.04%	n/a
Total tax revenues	n/a	+0.20%	n/a
GDP	n/a	-0.04%	n/a
Environmental impacts			
Fuel use per RTK (aviation)	-1.0% intra-EEA; +0.3% total	-1.0% intra-EEA; +0.1% total	-1.0% intra-EEA; +0.2% total
CO_2 emissions (aviation)	-9.9% intra-EEA; -1.9% extra-EEA; -4.9% total	-9.9% intra-EEA; -3.6% extra-EEA; -6.0% total	-9.9% intra-EEA; -1.9% extra-EEA; -4.9% total
NOx emissions (aviation)	-9.7% intra-EEA; -4.7% total	-9.7% intra-EEA; -5.7% total	-9.7% intra-EEA; -4.7% total
Energy use (transport total)	n/a	-0.46% intra-EEA; -0.79% total	n/a
CO_2 emissions (transport total)	n/a	-0.59% intra-EEA; -0.96% total	n/a
Social impacts – number of persons employed			
Air transport services	n/a	-1.3%	n/a
Total transport services	n/a	+0.02%	n/a
Additional impacts			
Fuel tankering	Potential risk of indirect fuel tankering, with up to 7.8% fuel on intra-EEA flights being tankered from extra-EEA airports		
Traffic diversion	N/A	Risk of up to 1.6% of intra-EEA demand switching to extra-EEA destination by 2050	N/A

	€0.33 per litre fuel tax on fuel loaded for intra-EEA flights, flat rate ticket tax at €10.43 per ticket on extra-EEA flights	€0.33 per litre fuel tax on fuel loaded for intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km	€0.33 per litre fuel tax on fuel loaded for intra-EEA flights, €10.12 per ticket on extra-EEA flights over 350km
Connectivity and competitiveness	Overall, limited impact expected on connectivity, given the increase in demand in baseline scenarios. However, reductions in profitability may make some marginal routes less commercially viable. Some possible impacts on the competitiveness of EEA carriers as they compete with non-EEA carriers that are not impacted in the same way on the totality of their route network. Potential risk of significant levels of hub switching, if the extra-EEA ticket tax was applied to all transit and transfer passengers. Therefore, ticket tax options considered all exempt transit and transfer passengers where their origin and destination are both outside the EEA. If the origin (or ultimate destination) are within the EEA, the risk of hub switching could be reduced by the design of the ticket tax (e.g. applying to the full ticketed journey, not individual legs).		
Legal aspects	No legal issues identified for the implementation of a tax on fuel uploaded for intra-EEA flights, though nearly all agreements with third countries will need to be renegotiated to allow the tax to be applied to their carriers on flights between the EU and the (non-EU) EEA countries (and there may be challenges to do so with many countries).		
	Precedents exist for these designs of ticket tax on extra-EEA flights. Final design may need refinement of tax rates and distance boundaries to ensure compliance with all existing jurisprudence.		

Table 7-4: Comparison of main policy options

	Policy option 1: €0.33 per litre fuel tax on fuel loaded for intra-EEA flights	Policy option 2: Stepped rate ticket tax (€10.12 per ticket on intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km)	Policy option 3: €0.33 per litre fuel tax on fuel loaded for intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km
Economic impacts			
Traditional scheduled carrier passenger flights	-6.2% intra-EEA; 0.0% extra-EEA	-5.7% intra-EEA; -5.1% extra-EEA	-6.2% intra-EEA; -3.3% extra-EEA
Low-cost carriers and charter passenger flights	-13.0% intra-EEA; 0.0% extra-EEA	-11.6% intra-EEA; -13.8% extra-EEA	-13.0% intra-EEA; -9.4% extra-EEA
Cargo flights	-7.3% intra-EEA; 0.0% extra-EEA	-6.6% intra-EEA; -8.4% extra-EEA	-7.3% intra-EEA; -6.1% extra-EEA
Total flights	-9.1% intra-EEA; 0.0% extra-EEA	-8.1% intra-EEA; -8.9% extra-EEA	-9.1% intra-EEA; -6.0% extra-EEA
Total aviation passenger demand (p-km)	-9.2% intra-EEA; 0.0% extra-EEA	-8.3% intra-EEA; -4.6% extra-EEA	-9.2% intra-EEA; -3.1% extra-EEA
Total rail passenger demand (p-km)	+0.2% (428.2 billion p-km)	+0.4% (428.9 billion p-km)	+0.3% (439.8 billion p-km)
Total rail + aviation passenger demand (p-km)	-5.6% (1,078.8 billion p-km)	-5.1% (1,085.8 billion p-km)	-5.6% (1,078.9 billion p-km)
Revenues in aviation sector	-0.5% intra-EEA; 0.0% extra-EEA; -3.2% total net revenue	-0.7% intra-EEA; +0.8% extra-EEA; -8.5% total net revenue	-0.5% intra-EEA; +0.6% extra-EEA; -6.8% net revenue
Revenues from taxation (aviation)	€7.44 billion intra-EEA; €10.36 billion total	€7.44 billion intra-EEA; €19.14 billion total	€7.43 billion intra-EEA; €16.40 billion total
Direct taxes	-0.04%	-0.05%	-0.04%
Total tax revenues	+0.09%	+0.33%	+0.20%
GDP	-0.04%	-0.05%	-0.04%
Environmental impacts			
Fuel use per RTK (aviation)	-1.0% intra-EEA -0.5% total	+0.6% intra-EEA; +0.9% total	-1.0% intra-EEA; +0.1% total
CO_2 emissions (aviation)	-9.9% intra-EEA; 0.0% extra-EEA; -3.7% total	-7.8% intra-EEA; -5.2% extra-EEA; -6.2% total	-9.9% intra-EEA; -3.6% extra-EEA; -6.0% total
NOx emissions (aviation)	-9.7% intra-EEA -3.3% total	-7.9% intra-EEA; -6.2% total	-9.7% intra-EEA; -5.7% total
Energy use (transport total)	-0.5% intra-EEA; -0.45% total	-0.21% intra-EEA; -0.73% total	-0.46% intra-EEA; -0.79% total
CO_2 emissions (transport total)	-0.63% intra-EEA; -0.55% total	-0.31% intra-EEA; -0.90% total	-0.59% intra-EEA; -0.96% total
Social impacts – number of persons employed			
Air transport services	-1.0%	-1.8%	-1.3%
Total transport services	+0.02%	+0.04%	+0.02%
Additional impacts			
Fuel tankering	Potential risk of indirect tankering, with up to 7.8% fuel on intra-EEA flights being tankered from extra-EEA airports	Ticket tax does not introduce risk of tankering	Potential risk of indirect tankering, with up to 7.8% fuel on intra-EEA flights being tankered from extra-EEA airports

<table>
<tr><th></th><th>Policy option 1: €0.33 per litre fuel tax on fuel loaded for intra-EEA flights</th><th>Policy option 2: Stepped rate ticket tax (€10.12 per ticket on intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km)</th><th>Policy option 3: €0.33 per litre fuel tax on fuel loaded for intra-EEA flights, €25.30 per ticket on extra-EEA flights up to 6,000km, €45.54 per ticket on extra-EEA flights over 6,000km</th></tr>
<tr><td>Traffic diversion</td><td>Risk of up to 2.3% of intra-EEA demand switching to extra-EEA destination by 2050</td><td>Risk of up to 0.9% of intra-EEA demand switching to extra-EEA destination by 2050</td><td>Risk of up to 1.6% of intra-EEA demand switching to extra-EEA destination by 2050</td></tr>
<tr><td rowspan="2">Connectivity and competitiveness</td><td colspan="3">Overall, limited impact expected on connectivity, given the increase in demand in baseline scenarios. However, reductions in profitability may make some marginal routes less commercially viable. Some possible impacts on the competitiveness of EEA passenger carriers as they compete with non-EEA carriers that are not impacted in the same way on the totality of their route network.
Impacts on passenger carriers are likely to be similar for all three policy options.</td></tr>
<tr><td colspan="3">Potential impacts on competitiveness of EEA cargo carriers if all-cargo flights are not exempt from fuel tax on intra-EEA flights (under policy options 1 and 3), due to exemption of some countries from a fuel tax and significant number of all-cargo intra-EEA flights performed by non-EEA carriers.</td></tr>
<tr><td>Legal aspects</td><td>No legal issues identified for the implementation of a tax on fuel loaded for intra-EU flights by EEA carriers. Majority of agreements (HAs and CATAs) with third countries also allow their carriers to be taxed on intra-EU flights. Will need updated agreements with all but two third countries to allow the tax to be applied to fuel loaded for flights by their carriers between the EU and (non-EU) EEA countries.</td><td>Precedents exist for this design of ticket tax. Final design may need refinement of tax rates and distance boundaries to ensure compliance with all existing jurisprudence.</td><td>No legal issues identified for the implementation of a tax on fuel uploaded for intra-EEA flights, though all but two agreements with third countries may need to be renegotiated to allow the tax to be applied to their carriers on flights between the EU and the (non-EU) EEA countries (and there may be challenges in doing so with many countries).
Precedents exist for this design of ticket tax on extra-EEA routes. Final design may need refinement of tax rates and distance boundaries to ensure compliance with all existing jurisprudence.</td></tr>
</table>

For the fuel tax options, the results can be summarised as:

- The fuel taxes analysed in this study have all been restricted to fuel supplied for intra-EEA flights, due to potential challenges under the air transport agreements with third countries if a tax was applied to fuel supplied for extra-EEA flights.
- The tax options analysed all have impacts on CO_2 emissions in the long-term, with reductions of between 6% and 15% for tax rates from €0.17 to €0.50 per litre.
- Although the analysis shows that the fuel tax leads to a small improvement in aircraft fuel efficiency, the large majority of the reduction in emissions is due to a reduction in demand due to increased ticket prices. The €0.33 per litre tax option results in a 10% reduction in demand by 2050, with a spread from 5% to 14% for the lower to higher tax rates.
- The additional tax revenue from aviation under the €0.33 per litre rate is about €6.7 billion per annum in 2050. The impacts on the economy from the reduction in aviation demand reduce the rise in total tax from the transport sector to €5.4 billion per annum.
- The impacts of the fuel tax and the consequent changes in demand reduce total GDP in the EU27 by approximately €9 billion (about 0.05%) by 2050.
- Fuel tankering is likely to increase under a fuel tax on intra-EEA flights; about 8% of intra-EEA flights would be likely to exploit indirect tankering by loading more fuel than required on an inbound flight from outside the EEA. Direct tankering would also be expected to increase under a scenario in which a tax is applied to fuel loaded for flights from the EEA to the UK (or Morocco), without a reciprocal tax on the return flight.
- The impacts of the fuel tax (as percentage changes) are not significantly affected when considering them against a lower baseline demand (representing a slower recovery following the COVID-19 pandemic).
- A scenario in which there is a significantly higher uptake of sustainable aviation fuels (through a blending mandate, as investigated by the ReFuelEU Aviation initiative) shows a small additional reduction in demand under a €0.33 fuel tax (compared to the same fuel tax with the baseline uptake of sustainable fuel). The reduction in CO_2 emissions (relative to the baseline) in 2050 rises from 10% (for just the fuel tax) to 66% (for the blending mandate and fuel tax combined), under the assumption that sustainable fuels cause zero net emissions. The revenue from the fuel tax is reduced by 63% under such a scenario.

For the ticket tax options, the results can be summarised as:

- Three types of ticket tax option have been analysed in this study:
  - a flat rate option, with a single tax rate applied to all flights
  - a stepped rate option, with a higher tax rates applied to longer flights (over 6,000 km)
  - an inverse stepped rate, with a higher rate applied to short flights (below 350 km)
- The taxes are assumed to apply both to intra-EEA and extra-EEA flights
- The flat rate ticket tax option leads to reductions in demand of about 9% on intra-EEA flights and about 1.5% on extra-EEA flights.
- The stepped rate tax option has a slightly lower impact on intra-EEA demand, but a significantly greater impact on extra-EEA demand (about 4.5% reduction in demand), compared to the flat rate option
- The inverse stepped rate tax option has a slightly higher impact on intra-EEA demand, and a very similar impact on extra-EEA demand, compared to the flat rate option
- The ticket tax options lead to reductions in CO_2 emissions of between 8% and 10% on intra-EEA flights and between 3% and 5.5% on extra-EEA flights
- Under the flat rate ticket tax (with no multiplier for premium seats), the total tax revenue is about €6.7 billion in 2025, rising to €9.9 billion in 2050, representing increases of €4.1 billion to €6.2 billion above the baseline values
- Under the stepped and inverse stepped tax options, the increase over the baseline in 2050 reduces to €6.0 billion and increases to €7.0 billion, respectively.
- Additional tankering is unlikely under the ticket tax options.
- Significant levels of hub switching might occur if the ticket tax was applied to all transit and transfer passengers. Therefore, the ticket tax options considered all exempt transit and transfer passengers where their origin and destination are both outside the EEA.

- The application of tax multipliers of 3.0 and 7.5 for premium seats has only a small effect on the demand impacts of the tax options. They have a more significant effect on the tax revenue, increasing revenue to about €13 billion in 2050 under the flat rate tax with a 7.5 premium multiplier.
- The impacts of the fuel tax (as percentage changes) are not affected when considering them against a lower baseline demand (representing a slower recovery following the COVID-19 pandemic).

For the combined tax options, the results can be summarised as:

- The combined tax options considered in this study have all included a tax on the fuel supplied for intra-EEA flights and a ticket tax on extra-EEA flights. The cases considered have combined a €0.33 per litre fuel tax on intra0-EEA flights and a ticket tax on extra EEA flights of either:
  - a flat rate of €10.43 per ticket on all flights; or
  - a stepped rate of €25.30 per ticket for extra-EEA flights less than 6,000km and €45.54 per ticket for extra-EEA flights over 6,000km; or
  - an inverse stepped rate of €25.30 per ticket for extra-EEA flights less than 350km and €10.12 per ticket for extra-EEA flights over 350km.
- The tax options analysed all have significant impacts on CO_2 emissions in the long-term, with reductions of about 10% on intra-EEA flights and up to almost 5% on extra-EEA flights. The option with the stepped ticket tax on extra-EEA flights has a greater impact than the other two combined tax options considered.
- The impacts on demand are very similar to those on emissions, with slightly lower magnitudes of change (up to 9.7% on intra-EEA flights and 4.0% on extra-EEA flights).
- The additional tax revenue from aviation under the combined tax options is from €14 billion to €16 billion per annum by 2050. The impacts on the economy from the reduction in aviation demand reduce the rise in total tax from the transport sector to about €12 billion per annum.
- The impacts of the combined tax and the consequent changes in demand reduce total GDP in the EU27 by approximately €12 billion by 2050.
- Fuel tankering is likely to increase under the fuel tax on intra-EEA flights element of the combined tax; about 8% of intra-EEA flights would be likely to exploit indirect tankering by loading more fuel than required on an inbound flight from outside the EEA.
- Significant levels of hub switching might occur if the ticket tax element of the combines tax was applied to all transit and transfer passengers. Therefore, the ticket tax options considered all exempt transit and transfer passengers where their origin and destination are both outside the EEA.
- The impacts of the combined tax (as percentage changes) are unaffected when considering them against a lower baseline demand (representing a slower recovery following the COVID-19 pandemic).
- A scenario in which the fuel tax is applied to fuel supplied for flights from the EEA to Morocco and the UK (as allowed for by the aviation agreements with those countries) has an almost negligible impact on demand, fuel consumption or revenue compared to the case in which they are subject to the ticket tax element of the combined tax. Direct fuel tankering is likely to increase under this scenario, unless a reciprocal tax is also applied to the fuel loaded for the return flight.

8 Peripheral and island regions case study

To complement the main analysis under this study, a case study has been performed on the potential impacts of peripheral and island regions. Due to their lower connectivity to mainland Europe through other modes, and (often) their higher dependence on tourism for their income, the economies of such regions are usually more dependent on aviation and, hence, they may be subject to greater impacts of measures that increase costs for flying.

The case study analysis has focused on the areas of the analysis where negative impacts were expected to be felt the most, namely: impacts on GDP, tourism activity, connectivity and cargo cost.

8.1 Rationale for selecting areas for the case study

The main unit of analysis of the case study is the selected peripheral- and island regions, for which the evaluation team assessed how aviation taxation could impact the employment in sectors such as aviation, transport and tourism, and related socio-economic aspects – for example a decrease in average income driven by a displacement of regular tourist volume to other regions where air transport tax is not applicable.

The study team have sought to select regions that are expected to be the most impacted by an aviation sector taxation, while also ensuring a good coverage of possible impacts, through the selection of a diverse sample from a geographical, connectivity and economic point of view. To that end, four typologies of regions were devised as depicted in Table 8-1. This table also provides the rationale for selecting the specific regions within each of these typologies.

Table 8-1: Selected case study areas

Region Typology	Selected region(s)	Rationale for selection
A. An outermost region[127] with high tourism dependency which would be highly impacted by loss of tourism coming from the EU.	Canary Islands	Across all outermost regions, the Canary Islands are the one whose economy is arguably the most dependent on tourism[128] and, given its proximity to the EU mainland, it is likely to be the most vulnerable to a decline in tourism levels. **Other regions that might benefit from the learnings** of the Canary Islands case study include: Azores (PT), Madeira (PT) and, to a lesser extent[129], French Guyana (France), Guadeloupe (France), Martinique (France), Mayotte (France), Reunion Island (France) and Saint-Martin (France)
B. An island region within a mainland Member State, which does not have special status in EU treaties, and which therefore could be more impacted if outermost regions became exempt from a tax, but not them; on the other hand, these regions might see an increase in domestic tourism if higher taxes discourage citizens from flying abroad.	Crete	Crete has been selected as it is a lower-income region among other islands as part of a mainland Member State and it is highly dependent on tourism. It is also covered within the SOCLIMPACT model enabling quantitative analyses of impacts. **Other regions that might benefit from the learnings of this case include:** Corsica (France), Ionian Islands (Greece), Sicily, Sardinia (Italy), Balearic Islands (Spain).
C. An island Member State with high tourism dependency and which does not have special status in EU treaties (hence it could be more impacted if outermost regions became exempt from a flight tax, but not them).	Malta	Malta has been selected given its high dependency on tourism (15% of the country's GDP is dependent on tourism)[130] and given its geographical set up, being further away from Europe mainland and consequently less accessible by means other than aerial. **Cyprus** will potentially benefit from the learnings from this case study.

[127] Outermost regions have a 'structural social and economic situation' which is 'compounded by their remoteness, insularity, small size, difficult topography and climate, economic dependence on a few products'. These regions have special status in EU treaties (e.g. they are not part of the EU Emission Trading Scheme). (https://www.eprc-strath.eu/public/dam/jcr:2d3d3259-8f99-4769-9576-196531a32ff2/EoRPA%20paper%202011-6.pdf)
[128] The Canary Islands has the highest number of accommodation nights among the outermost regions (approximately 10 million in 2018). See: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=tour_occ_nin2&lang=en
[129] Given these regions are at a higher distance from EU mainland, they are presumably less dependent on EU tourism and hence, the Canary Islands case-study might only represent an extreme case of the possible effects in these regions.
[130] http://www3.weforum.org/docs/WEF_TTCR_2017_web_0401.pdf

Region Typology	Selected region(s)	Rationale for selection
D. An island Member State with lower tourism dependency, but which might be impacted by lower connectivity	Ireland	Although its tourism dependency is low, Ireland will likely be amongst the most impacted across Europe's northern Member States, given its insular conditions. Ireland is also an interesting case to study, given its unique condition of having close economic relations and bordering a third country (Northern Ireland, UK), which creates a potential for leakage. For example, while the flight tax might affect the cost of consumable goods in this Member State, this effect could be counterweighted by the Member State's ability to import goods from the UK which will not have been subject to a flight tax. **Other regions which might benefit from the learnings from this case study** include insular regions within the Nordic Member States (Denmark, Finland and Sweden).

8.2 Approach to case study

The direct negative impacts of an aviation tax on those regions mainly relate to reduction in tourism activities and increased isolation. Indirectly, it may also include reduced levels of economic activity leading to negative impacts on employment, wages and investments. The case study used quantitative and qualitative research to:

- Map these and other possible negative impacts.
- Map key stakeholder groups affected.
- Assess the level of impacts.
- Assess options for mitigating such impacts.

An initial rapid evidence review was conducted to determine the key areas of possible impacts and key stakeholders affected, and to collect secondary quantitative and qualitative data on the level or intensity of impacts expected in each area.

The **quantitative assessment of impacts** followed, based on demand (e.g. passengers or passenger-km) and supply (e.g. direct connections) indicators from the AERO-MS model for airports in those regions. These indicators were used to inform potential wider economic impacts (e.g. losses in the touristic sector) in these regions resulting from a reduction in air travel demand and supply.

The quantification of wider economic impacts on those regions was completed by applying the macroeconomic model (GINFORS-E) for regions covered by the SOCLIMPACT project[131]. This provides insights into the air taxation impacts over production, value added, final demand, prices, and employment as well as the cost structure of each industry (input-output relations). Results are provided at sector level[132].

Table 8-2 provides an outline of how the case study investigated the socioeconomic impacts on peripheral- and island-regions.

[131] Includes Azores, Canary Islands, Madeira (outermost regions), but also other island regions: Baleares, Corsica, Sardinia, Sicily, Malta, Crete, and Cyprus.
[132] Sectors are broken down into: Agriculture, Fishery and Aquaculture, Manufacturing, Energy utilities, Water utilities, Water transport, Construction, Other transport, Accommodation and Food services, Travel Agencies and Tour operators, Recreational services, Other market services and Non-market services.

Table 8-2: Questions to be analysed in case study

Research question	Hypotheses	Methods
What are the possible negative socio-economic impacts of an aviation tax over the target regions?	• Direct: reduction in demand in hospitality, transport, recreational and consumable goods sectors • Indirect: reduction in demand in sectors servicing the hospitality sector: agriculture, fishery, manufacturing, etc. • Reduced opportunities for local population (increased sense of isolation)	• Qualitative assessment based on rapid evidence assessment • Modelling of demand and supply changes on regional airport from AERO-MS • Macroeconomic modelling at regional level from GINFORS-E
Who are the stakeholders impacted by an aviation tax in the target case study regions?	• Small and large hotel chains • Travel agencies and tour operators • Bed-and-breakfast owners • Restaurants, bars and cafes • Non-aviation transport businesses and autonomous workers • Population living close to the airport • Airport and airport shop workers	• Qualitative assessment based on rapid evidence assessment
What are the options for mitigating negative impacts?	• Tax revenue recycling towards affected regions • Exemptions for regions	• Qualitative assessment based on rapid evidence assessment

8.3 Summary of case study analysis

The impact assessment at regional level, applying a case-study approach, has shown that a flight carbon tax could potentially have a significant impact in local economies of peripheral regions.

Total number of tourists across the regions is estimated to fall by up to 15% by 2050 in the most affected region (Crete), generating losses from €600m to €5.2 billion across the economies analysed. As a reference, this corresponds to about 10% of the regions' GDP as of 2018 (though their GDP is modelled to have grown by 2050). Using GINFORS' GDP projections for Malta and Ireland's GDP, and the estimated projections for the Canaries and Crete,[133] the decrease in tourism expenditure would lead to a decrease of up to 9% in the GDPs of Canaries and Crete, and of up to 2.6% in Malta and 0.14% in Ireland. Such decrease would be partially countered by the increased tax revenues from the carbon tax. However, these regions would still see an impact in their overall GDP.

As shown in the case studies for the Canaries, Malta and Crete, regions whose economies are highly dependent on tourism could see a decrease in their annual GDP of between 0.02% and 0.22% by 2050, owing to the introduction of a flight carbon tax. In absolute terms, this would be driven directly by the reduced activity in air transport and in tourism activity and indirectly through effects in other sectors dependent on tourism.

The scenarios with the highest negative impacts in terms of economic activity (GDP and tourism activity) are the ticket-tax scenarios. The negative impact of the inverse stepped ticket tax option, which charges more on shorter-haul flights, leads to higher impacts in the Canaries and Crete, while

[133] The GDP impacts in this report were modelled at the national, rather than at the regional level. To estimate the GDP impact at the regional level for Canaries and Crete, it was assumed that these regions' contributions to their national GDPs would remain constant at historical levels throughout the periods of analysis. Using Eurostat data, this was estimated that Canaries would account 3.8% of the national Spanish GDP, while Crete would account for 4.9% of the Greek GDP.

the stepped ticket tax option (where the higher rates are charged on extra-EEA flights - typically longer-haul), is most critical to Ireland and Malta - which may be linked to the relatively high dependency of these regions on UK visitors.

While the negative impacts of fuel tax scenarios are lower than those of the ticket tax scenarios, the short-term impact of the fuel tax scenario without a transition period could be noticeable in the tourism sector, as it is projected to lead to a fall of up to 10.6% tourist numbers by 2025 in the Canaries, 8.7% in Crete, 7.2% in Malta and 6.9% in Ireland.

It should, however, be noted that the impacts on tourism activity as estimated through the modelling in this report does not account for effects that may contribute to a more nuanced impact on GDP, as these were considered outside the remit of this report. The decrease in tourism expenditure is based on the modelled decrease in tourist visitors and on the average tourism expenditure -hence assuming a linear change in expenditure. However, it can be expected that the introduction of a carbon tax is most likely to affect (that is, lead to the cancellation of) short-stay tourism visits, which tend to have a smaller contribution to overall tourism expenditure[134]. Secondly the flight taxes are most likely to affect price-sensitive visitors, which similarly, tend to have a lower overall contribution to overall tourism expenditures.

Table 8-3: Summary of flight tax impact on GDP (lowest and highest impact across six scenarios assessed)

Region/Country	% GDP decrease by 2050		Total GDP decrease by 2050 (€ billion)	
	Lower-bound [corresponding scenario]	Upper-bound [corresponding scenario]	Lower-bound [corresponding scenario]	Upper-bound [corresponding scenario]
Canaries	0.02% [€0.33/litre fuel tax]	0.04% [stepped rate ticket tax]	1.15 [€0.33/litre fuel tax]	2.30 [stepped rate ticket tax]
Crete	0.08% [€0.33/litre fuel tax]	0.22% [stepped rate ticket tax]	0.82 [flat rate ticket tax]	2.25 [stepped rate ticket tax]
Malta	0.10% [€0.33/litre fuel tax]	0.20% [stepped rate ticket tax]	2.28 [€0.33/litre fuel tax]	4.56 [stepped rate ticket tax]
Ireland	0.03% [€0.33/litre fuel tax]	0.06% [stepped rate ticket tax]	17.52 [€0.33/litre fuel tax]	35.04 [stepped rate ticket tax]

Table 8-4: Summary of flight tax impact on tourism expenditure (lowest and highest impact across six scenarios assessed)[135]

Region	% Decrease in number of tourists decrease by 2050		Total decrease in tourism expenditure by 2050 (€ million)	
	Lower-bound [corresponding scenario]	Upper-bound [corresponding scenario]	Lower-bound [corresponding scenario]	Upper-bound [corresponding scenario]
Canaries	7.10% [€0.33/litre fuel tax]	13.97% [inverse stepped rate ticket tax]	2,642.94 [€0.33/litre fuel tax]	5,202.66 [inverse stepped rate ticket tax]

134 Note, however, that short-stay visitors may spend more per day than long-stay visitors (see García–Sánchez, 2013, https://core.ac.uk/download/pdf/19492492.pdf), and hence, depending on the overall share of tourism composed by short-stay visits, this category could potentially have a significant contribution.
135 Scenarios analysed encompassed two fuel-tax options (with and without a 10-year transition), three ticket-tax options (flat rate, stepped rate and inverse stepped rate) and one combined fuel and ticket tax scenario (based on the €0.33/litre fuel tax on intra-EEA flights and the flat rate ticket tax on extra-EEA flights)

Region	% Decrease in number of tourists decrease by 2050		Total decrease in tourism expenditure by 2050 (€ million)	
	Lower-bound [corresponding scenario]	Upper-bound [corresponding scenario]	Lower-bound [corresponding scenario]	Upper-bound [corresponding scenario]
Crete	6.03% [€0.33/litre fuel tax]	15.30% [inverse stepped rate ticket tax]	351.32 [€0.33/litre fuel tax]	891.08 [inverse stepped rate ticket tax]
Malta	5.91% [€0.33/litre fuel tax]	10.00% [stepped rate ticket tax]	353.75 [€0.33/litre fuel tax]	598.33 [stepped rate ticket tax]
Ireland	5.0% [€0.33/litre fuel tax]	13.3% [stepped rate ticket tax]	299 [€0.33/litre fuel tax]	790 [stepped rate ticket tax]

A carbon flight tax is also expected to affect the peripheral regions through increased cost of goods imported by air, pending the extent to which the tax is passed on to the end-consumer. Here again the ticket tax options are the ones that affect costs the most, with the increase in the cost of cargo per tonne ranging from 11%-16% by 2050.

Table 8-5: Summary of impact on cargo cost (lowest and highest impact across six scenarios assessed)

Region/Country	% increase in cargo cost by 2050	
	Lower-bound [corresponding scenario]	Upper-bound [corresponding scenario]
Canaries	2.32% [€0.33/litre fuel tax]	15.87% [ticket taxes][136]
Crete	0.8% [€0.33/litre fuel tax]	14.9% [ticket taxes]
Malta	3.30% [€0.33/litre fuel tax]	11.06% [ticket taxes]
Ireland	2.4% [€0.33/litre fuel tax]	14.0% [ticket taxes]

Finally, the case studies also explored impacts of different scenarios over connectivity with main land, using ticket price to estimate the impacts on the population mobility towards outside the peripheral region. While the impact seems the lowest across the parameter analysed in the case studies (varying from 2%-6% increase in the price per pax-km) the flight price increase is more than double than the average increase across EEA29, where the price increase is expected to vary between 0.5% and 3.2%.

Table 8-6: Summary of impact on connectivity (lowest and highest impact across six scenarios assessed)

Region/Country	% increase in ticket cost by 2050 (price per pax-km for traditional carriers)	
	Lower-bound [corresponding scenario]	Upper-bound [corresponding scenario]
Canaries	5.54% [stepped rate ticket tax]	6.18% [€0.33/litre fuel tax]
Crete	1.82% [€0.33/litre fuel tax]	5.80% [inverse stepped rate ticket tax]

[136] Results for increased cargo price are the same across the three ticket tax scenarios because the cargo tax assumed is exactly the same across the three ticket tax scenarios (€0.10 per tonne-km).

Region/Country	% increase in ticket cost by 2050 (price per pax-km for traditional carriers)	
	Lower-bound [corresponding scenario]	Upper-bound [corresponding scenario]
Malta	4.40% [stepped rate ticket tax]	5.92% [€0.33/litre fuel tax , combined tax]
Ireland	4.92% [stepped rate ticket tax]	5.96% [€0.33/litre fuel tax]

8.4 Canary Islands

8.4.1 Profile

The Canary Islands are composed by seven islands located nearby the south coast of Morocco. The territory has an extension of 7,447 km2 and is inhabited by 2,154,978 people (2017), accounting for 4.7% of the total population in Spain[137]. Besides already being one of the regions with the highest density of population, it is also among those that have been experiencing demographic growth over the past few years.

Important factors such as its insularity, the distance from the European continent and the lack of raw materials constitute important disadvantages for the development of the Canary Islands' economy. In order to compensate for these drawbacks, the Canary Islands enjoy a special economic and fiscal regime, which contains particular regulations about the VAT or its free zone characteristics, among other specific normative. One of these compensations is a discount on the price of air tickets to residents in the Canary Islands on flights between islands and with the peninsula. This compensation is explained in section 8.3.2.1.

In 2018, the gross domestic product (GDP) of the Canary Islands was €45,720 million, making it the ninth Spanish economy. The GDP in purchasing power standard (PPS) per inhabitant was 22,800 in 2018, staying below the national and EU average, 28,100 and 31,000, respectively. The economy of Canary Islands relies in the service sector (responsible for 86% of the regional GVA), especially in those activities related to tourism[138].

In 2019, the unemployment rate in Canary Islands was 20.5%, which is above the national and EU averages of 14.1% and 6.3%, respectively[139]. The Canary business network consists largely of freelancers and SMEs.

This section presents quantitative data extracted from Eurostat, and complements that data with national statistics on tourism and international cargo dependency on air transport.

Table 8-7: Canary Islands and Spain profiles: demographics, economy and environment

Category	Unit	Year	Value	% change (10 y. avg)
Demographics				
Population	number	2017	2,154,978	1.0%
Economy				
GDP - total	million Euros, current prices	2017	44,251.47	0.7%
Employment - total	Thousand	2017	805.2	-0.9%
Employment - tourism	Thousand	2017	336.9	-0.1%
Employment - tourism	as a % of total regional economy	2017	41.8%	0.8%

[137] Source: Eurostat 2020.
[138] All figures in the paragraph are based on Eurostat 2020 data.
[139] All figures in the paragraph are based on Eurostat 2020 data.

Category	Unit	Year	Value	% change (10 y. avg)
Wages (compensation of employees) - total	million Euros, current prices	2017	19,847.7	0.2%
Wages (compensation of employees) - tourism	million Euros, current prices	2017	7,173.9	1.1%
Wages (compensation of employees) - tourism	as a % of total regional economy	2017	36.1%	0.9%
Active businesses - total	number	2017	314,294.00	1.1%
Active businesses - tourism	number	2017	32,209.00	1.5%
Active businesses - tourism	as a % of total regional economy	2017	10%	0.5%
Environment (all values are at national level)				
Final energy consumption - total	Terajoule	2017	3,553,251.53	-1.5%
Final energy consumption - International maritime bunkers	Terajoule	2017	279,721.40	-2.3%
Final energy consumption - International aviation	Terajoule	2017	191,790.90	2.8%
Final consumption - transport sector - road - energy use	Terajoule	2017	1,173,229.37	-1.9%
Final consumption - transport sector - domestic aviation - energy use	Terajoule	2017	90,538.10	-1.6%
Final consumption - transport sector - domestic navigation - energy use	Terajoule	2017	40,122.60	-4.2%
GHG emissions - total	ktonnes CO_2e	2017	301,362.04	-2.4%
GHG emissions - air transport (domestic)	ktonnes CO_2e	2017	2,828.57	-4.1%
GHG emissions - road transport	ktonnes CO2e	2017	82,754.34	-1.8%
GHG emissions - maritime transport (domestic)	ktonnes CO_2e	2017	3,065.79	-3.9%
GHG emissions - air transport (intl, memo)	ktonnes CO_2e	2017	17,065.81	2.9%
GHG emissions - maritime transport (intl, memo)		2017	484.74	21,680.42

Source: Eurostat, multiple datasets

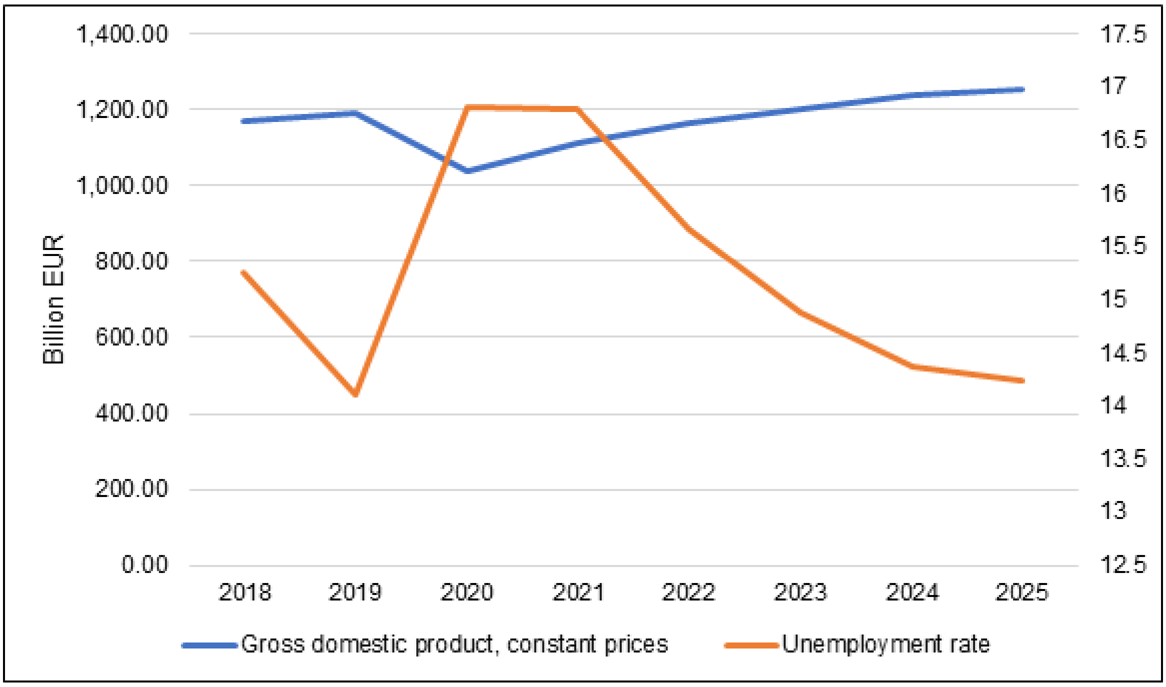
8.4.1.1 Economic projections in the baseline scenario

The economy in the Canary Islands has been severely affected by COVID-19. Its GDP has decreased by 20.1% in 2020, much higher than the national average (-11%)[140]. Funcas (2020) foresees that GDP in the region will grow by 9.9% in 2021[141]. At the national level, the IMF expects a gradual recovery of the GDP and unemployment in Spain from 2021 onwards, with the rate of unemployment reaching the levels of 2019 in 2025.

[140] Source: http://www.gobiernodecanarias.org/istac/.content/noticias/contabilidad-trimestral-canarias-noticia.html

[141] Source: https://www.funcas.es/textointegro/previsiones-economicas-para-las-comunidades-autonomas-2020-2021-canarias/

Figure 8-1: GDP and unemployment projection in Spain



Source: IMF World Economic Outlook, October 2020

Our baseline scenario (GINFORS-E) forecasts that GDP in Spain will be €1,350 billion in 2030, and €1,512 billion in 2050 (in constant prices, base 2015).

8.4.1.2 Connectivity

Each of the seven Canary Islands has an airport, with the largest being located on Gran Canaria, Lanzarote, and Tenerife (which has two airports). The largest single airport is Gran Canaria, coming first in the Canary Islands in terms of passengers, operations, and cargo transported. However, when combined, the two Tenerife airports have higher passenger numbers. The four airports serve international, national (into and out of mainland Spain) and inter-island destinations, enabling access to smaller islands for travellers and cargo.

Table 8-8. Number of departure flights from the Canary Islands, 2016

Name	Location	ICAO	Number of departures (2016)
El Hierro Airport	Valverde, El Hierro	GCHI	1,542
Fuerteventura Airport	El Matorral, Fuerteventura	GCFV	20,862
Gran Canaria Airport	Telde, Gran Canaria	GCLP	50,778
La Gomera Airport	Playa Santiago, La Gomera	GCGM	671
La Palma Airport	Breña Baja and Villa de Mazo, La Palma	GCLA	8,061
Lanzarote Airport	Las Palmas, Lanzarote	GCRR	25,367
Tenerife North Airport	San Cristóbal de La Laguna, Tenerife	GCXO	24,356

Name	Location	ICAO	Number of departures (2016)
Tenerife South Airport	Grandilla de Abona, Tenerife	GCTS	31,267
		Total	**162,905**

Source: AERO-MS

The Canary Islands are also connected to Spain and parts of Portugal (primarily Madeira) by ferry. Cadiz, southern Spain's main port on the Atlantic, has routes to Gran Canaria, Lanzarote, Tenerife, and La Palma islands. Huelva Ferry Port also operates routes to Tenerife, Gran Canaria, and Lanzarote. However, crossing take place only once weekly, and the travel times ranges from 25 to 64 hours. From these main islands, smaller ferry-hopping routes are available for remaining islands, which can take anywhere from 25 minutes to 2 hours.

Table 8-9. Maritime connections with the Canary Islands

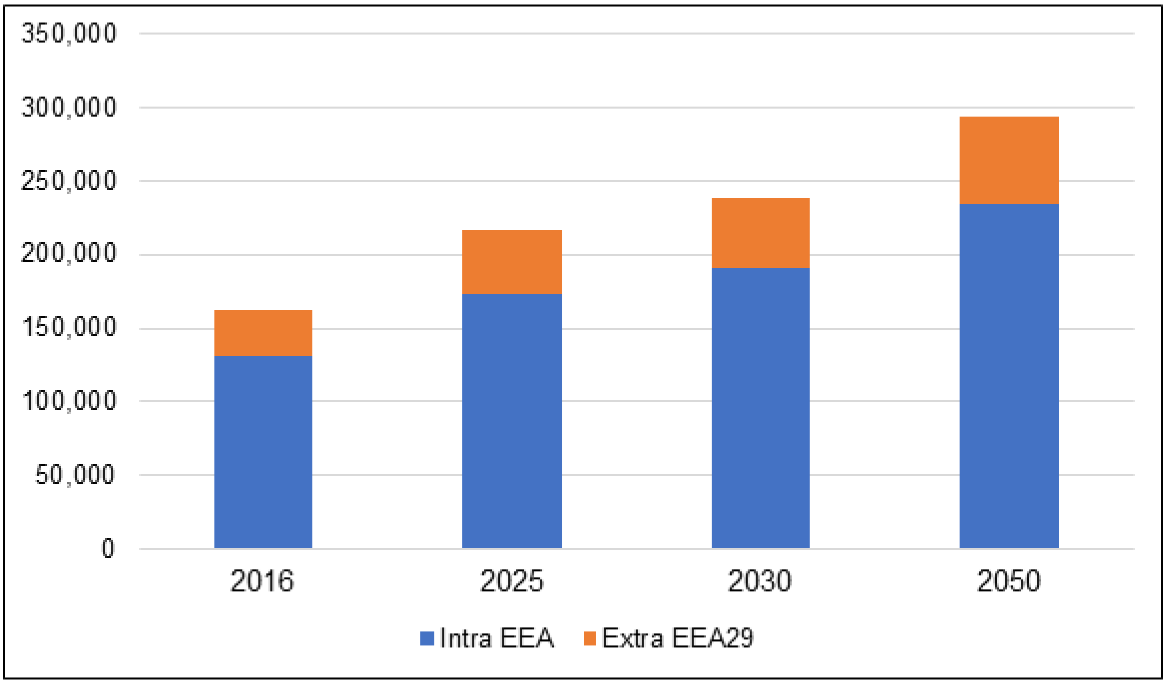
Route Name	No. of crossings per week	Average time per crossing
Cadiz - Gran Canaria	1	35 hours
Cadiz - Lanzarote	1	27 hours
Cadiz - Tenerife	1	42 hours
Cadiz - La Palma	1	54 hours
Huelva - Tenerife	3	38 hours
Huelva - Gran Canaria	3	33 hours
Huelva - Lanzarote	1	28 hours

Source: www.directferris.com (accessed on 25 June 2021 for maritime connections operating in July 2021)

8.4.1.3 Projection of flights in the baseline scenario

Flights departing from Canarias represent 19% of all flights departing from Spanish airports (as per AERO-MS). In the baseline, the number of flights departing from Canarias will increase up to 294,000 flights per year in 2050, most of them (80%) being intra-EEA flights.

Figure 8-2. Projection of number of flights departing from Canarias in the baseline scenario



Source: AERO-MS

8.4.2 Analysis of impacts

8.4.2.1 Mapping of impacts

The introduction of a carbon flight tax could impact the economy in the Canaries by increasing the cost of travel and the movement of cargo. The region is highly dependent on tourism, and therefore small variations in number of tourists visiting the Canary Islands may have a strong negative impact in its economy. Given their insularity and remoteness, nearly all tourists visiting the Canary Islands arrive by plane.

A higher ticket tax may also decrease its population's capacity to travel to mainland Spain or other parts of Europe, hence increasing their isolation. In Spain, there are different forms of support for the connectivity of extra-peninsular territories. One of the most important is the partial discount on the prices paid by residents in the Canary and Baleares islands for travel between the islands and with the Peninsula. Residents only have to pay part of the ticket, and the rest is subsidised by the Government. The subsidy was traditionally 50%, but it increased to 75% for routes between islands in July 2017, and for links with the rest of the national territory in July 2018. It is unclear how the aviation tax would be applied in the Canary Islands. If the government subsidises the tax, then the effective tax paid by residents in the Canary Islands would be 25%, hence reducing potential impacts on insularity, but reducing also tax revenues. If, on the other hand, residents in the islands assume 100% of the cost, then the tax would effectively represent a higher percentage of the price that they currently pay (four times higher).

8.4.2.2 Effect of an aviation tax on GDP

According to IATA, air transport supports 1.7 million jobs and contributes 102.4 billion EUR to the Spanish economy, equivalent to 9.2% of its GDP[142]. Air transport generates direct impacts on employment and activity within the air transport industry including airline and airport operations, aircraft maintenance, air traffic control and regulation, and activities directly serving air passengers, such as check-in, baggage-handling, on-site retail and catering facilities. They also include activities

[142] Source: IATA. Spain Air Transport Regulatory Competitiveness Indicators, available at: https://www.iata.org/contentassets/ba5a283dbd7e4674936415a59f979412/spain-competitiveness-index-report-final-2019.pdf

of the aerospace manufacturers selling aircraft and components to airlines and related businesses. The latter, although relevant for mainland Spain, is less relevant for Canarias.

The spill over effects of the air transport in the economy are multiple, but the most relevant for Canarias is its effect on tourism (explained in section 8.3.2.3).

Through GINFORS-E model, the study team has calculated the effects on GDP at the national and EEA level for the main policy options. Table 8-10 shows the impacts for Spain's GDP of each policy option. The effects are compared to changes in revenue tonne km (RTK), which is the product of total tonnes of cargo and passengers transported in a year and the total kms of flight travel that served for this transport.

Table 8-10. Impact of policy options on GDP in Canaries

Taxation option	2025		2030		2050	
	RTK	GDP	RTK	GDP	RTK	GDP
Baseline (billion tonne-km / billion EUR)	28.30	1267.73	31.53	1350.12	39.62	1511.53
Fuel taxation of €0.33 per litre for Intra EEA	-11.04%	-0.03%	-10.29%	-0.04%	-7.96%	-0.03%
Fuel taxation of €0.33 per litre for Intra EEA	-1.86%	-0.01%	-5.45%	-0.03%	-5.78%	-0.02%
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	-7.43%	-0.03%	-7.15%	-0.04%	-6.94%	-0.03%
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	-9.17%	-0.03%	-8.83%	-0.05%	-8.56%	-0.04%
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	-7.54%	-0.03%	-7.27%	-0.04%	-7.07%	-0.03%
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10	-2.27%	-0.01%	-6.76%	-0.03%	-7.60%	-0.03%

Source: AERO-MS (RTK) and GINFORS-E (GDP)

Overall, the impact on GDP in Spain (at the national level) is lower than the average in EU across all the scenarios. A decrease in the demand for flights is normally compensated with an increase of demand for other means of transport, which in turn compensates the decrease in GDP from the aviation sector. However, given the Canary Islands' insularity and remoteness (travelling by ferry from the peninsula takes at least 3 days), it is likely that the impact on GDP in the islands will be more acute than in the peninsula.

The policy option that would most negatively affect GDP in Spain is the stepped rate ticket tax, and the one with the least negative impact is the €0.33/litre fuel tax with a 10 year transition period.

8.4.2.3 Effect of aviation taxation on tourism industry

On average, the expenditure per person visiting Canarias was €1,272 in 2020[143]. The flights departing from the Canary Islands represent 19% of flights departing from Spanish airports. Assuming a similar proportion for number of passengers, it can be estimated that, in the baseline, there will be 31 million passengers departing from the Canary Islands in 2025, 35 million in 2030, and 44 million in 2050.

Some passengers will be residents in Canarias travelling out, and some passengers will be visitors. In 2016, the number of tourists visiting Canarias was 14.98 million, which represents 67% of total passengers. With all these figures, it is possible to estimate the number of visitors to the Canary Islands per scenario.

In Table 8-11, we have assumed that each tourist spends €1,272 during their stay in the Canaries. Expenditure is calculated in constant prices (base year: 2020).

Table 8-11. Impact of policy options on tourism

Taxation option	2025		2030		2050	
	Number of tourists	Expenditure	Number of tourists	Expenditure	Number of tourists	Expenditure
Baseline (million pax / million EUR)	20.77	26,418.47	23.18	29,486.51	29.28	37,239.19
Fuel taxation of €0.33 per litre for Intra EEA	-10.57%	-2,791.88	-9.65%	-2,846.92	-7.27%	-2,708.07
Fuel taxation of €0.33 per litre for Intra EEA	-2.27%	-599.24	-6.73%	-1,983.70	-7.10%	-2,642.94
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	-12.69%	-3,352.38	-12.24%	-3,609.25	-11.75%	-4,374.62
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	-14.08%	-3,718.40	-13.58%	-4,004.63	-13.06%	-4,861.83
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	-14.92%	-3,942.80	-14.47%	-4,265.91	-13.97%	-5,202.66
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10	-2.56%	-675.73	-7.67%	-2,260.73	-8.37%	-3,117.51

Source: Number of visitors is estimated using AERO-MS.

[143] Source: Instituto Nacional de Estadistica (https://www.ine.es/jaxiT3/Datos.htm?t=10839)

An aviation tax would severely affect the tourism sector in Canarias, with a direct impact in the reduction of the number of visitors to the islands of between 2.56% (combined tax with stepped ticket tax on extra-EEA flights) and 14.92% (inverse stepped ticket tax) in the short term (in 2025), and between 7.10% (€0.33/litre fuel tax) and 13.97% (inverse stepped ticket tax) in 2050. The decrease in tourism would be reflected in foregone revenue from tourism of between €2.6 billion and €5.2 billion per year in the long term (2050).

In addition to the direct effects on existing routes, the aviation tax might also impact negatively on the emergence of new transport routes. Since 2013, Spain has put in an aid scheme for the Canary Islands to open up new routes between airports in the Canary Islands and other airports located both within the EU and in third countries. This is known as the *Flight Development Program in the Territory of the Outermost Region of the Canary Islands*, registered as State aid cases SA.37121 and SA.48872[144]. The scheme targets new tourism markets outside the EU with the aim of achieving greater geographical diversification of the sector, create employment, and improve its connectivity. The scheme provides periodic calls for proposals from airlines interested in opening new routes. Airlines whose proposals are selected receive a subsidy, which is intended to pay up to 50% of the cost of the airport fees incurred to operate the new route for up to three years. The scheme, which falls within the State aid rules, is authorised to operate until 2021.

8.4.2.4 Effect of an aviation tax on the goods traded with aviation as means of transport

The volume of freight moved out, in, or within the Canary Islands by maritime transport was around 40 million tonnes between 2017 and 2019, with a slight decrease in 2020 to 37 million tonnes, probably due to the effects of the pandemic[145].

Freight moved by aircraft was low, compared to maritime traffic: around 43 million kg per year between 2016 and 2019[146]. Freight transport in Canarias represents, approximately, 5% of total freight moved by air transport in Spain[147]. Table 8-12 presents the price per freight tonne km in Spain under each policy option.

Table 8-12. Price per freight tonne km in Spain (constant prices, base 2019)

Taxation option	2025	2030	2050
Baseline (EUR)	0.43	0.46	0.49
Fuel taxation of €0.33 per litre for Intra EEA	6.64%	6.18%	4.72%
Fuel taxation of €0.33 per litre for Intra EEA	0.69%	2.15%	2.32%
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	18.40%	17.15%	15.87%

[144] The decision from the Commission can be accessed here: https://ec.europa.eu/competition/state_aid/cases/249515/249515_1580262_98_2.pdf
The scheme SA. 37121 had a duration of four years (2013 to 2017) and it was extended to December 2021 in SA.48872
[145] Source: Instituto Canario de Estadística (ISTAC), Tráfico marítimo de mercancías de Puertos del Estado por puertos de Canarias y periodos.
[146] Source: Instituto Canario de Estadística (ISTAC), Tráfico aéreo comercial de mercancías según clases de tráfico y servicios por aeropuertos por islas de Canarias y periodos.
[147] Source: Observatorio del Transporte y la Logística en España (https://apps.fomento.gob.es/BDOTLE/visorBDpop.aspx?i=600).

Taxation option	2025	2030	2050
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	18.40%	17.15%	15.87%
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	18.40%	17.15%	15.87%
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10	3.52%	11.15%	13.99%

Source: AERO-MS

Overall, the impact on cost of freight transport is higher in Spain than in the average EU27 across all scenarios. The policy options that include a tax on cargo increase prices considerably more than the fuel tax options.

8.4.2.5 Effects on connectivity

A proxy to assess the effects of isolation can be the variations in ticket price expected with the different policy options. Most flights departing from the Canary Islands have a destination in the EEA, therefore this will be the metric that we will use.

Table 8-13 presents the variations in price, on average, of an outbound ticket from Tenerife to Madrid, in constant prices of 2019.

Table 8-13: Impacts of tax options on ticket price for a flight from Tenerife to Madrid

Taxation option	2025		2030		2050	
	Price per pax-km - traditional scheduled carriers	Price ticket Tenerife-Madrid	Price per pax-km - traditional scheduled carriers	Price ticket Tenerife-Madrid	Price per pax-km - traditional scheduled carriers	Price ticket Tenerife-Madrid
Baseline (million pax / million EUR)	0.14	239.22	0.14	246.14	0.15	255.45
Fuel taxation of €0.33 per litre for Intra EEA	9.13%	21.85	8.34%	20.52	6.18%	15.78
Fuel taxation of €0.33 per litre for Intra EEA	1.62%	3.88	5.29%	13.01	5.84%	14.91
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	6.09%	14.57	5.92%	14.58	5.72%	14.60

Taxation option	2025		2030		2050	
	Price per pax-km - traditional scheduled carriers	Price ticket Tenerife-Madrid	Price per pax-km - traditional scheduled carriers	Price ticket Tenerife-Madrid	Price per pax-km - traditional scheduled carriers	Price ticket Tenerife-Madrid
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	5.90%	14.12	5.74%	14.14	5.54%	14.16
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	6.33%	15.15	6.17%	15.18	5.96%	15.21
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10	1.62%	3.88	5.29%	13.01	5.84%	14.91

The policy option with the highest impact on ticket prices is the €0.33 per litre fuel tax without transition period, whereas the same fuel tax, but with a 10-year transition period, and the combined tax based on the flat rate ticket tax are the options with the lowest increase in ticket prices in the short term. In the long term, the stepped rate ticket tax appears to have the least impact on ticket prices. The real effect on insularity depends on whether the tax is subsidised by the government or not. If residents in the Canary Islands had to pay for the tax entirely (the most likely scenario), then the effective increase in their cost to their flight tickets would be four times higher. For example, in FT01, the ticket price would increase by 36% in 2025, 33% in 2030, and 24% in 2050.

According to CNMC (2020), circa 40% of the passengers flying between Canarias and mainland Spain in 2018 were residents in Canarias, and this percentage increases to almost 90% in flights between islands. Therefore, it can be concluded that the aviation tax would have a very significant negative effect on insularity for residents in Canarias.

8.4.2.6 Conclusion

In the Canary Islands, the fuel taxation options, and in particular that with the 10-year transition period, appear to be the ones with the least negative effects on GDP, tourism, and the cost of transport. Overall, considering the socioeconomic impacts described in this case study, the €0.33/litre fuel tax with the 10-year transition period is the preferred option, followed by the option that combines a fuel tax and a flat rate ticket tax. The fuel tax displays the best results in the short term across all impacts due to the 10-year transition period applied in this option.

Out of the four impacts analysed, tourism and isolation are the most important impacts for Canarias. All the options, including the fuel tax, would have a considerable negative impact in isolation. The tax may also be controversial, given that a subsidy currently exists. An exemption may need to be considered for residents in the islands to avoid isolation, of for routes connecting islands to assure connectivity.

Impacts on tourism are also very significant and would affect the region's GDP (a limitation of our analysis is that GDP impacts are only available at the national level). The ticket tax options are the most detrimental for tourism in Canarias.

The ticket tax options are also the most detrimental for freight transport, since they also incorporate a cargo tax. However, most cargo arrives and leaves the Canary Islands by maritime transport.

8.5 Crete

8.5.1 Profile

The region of Crete is formed by Crete and a number of islands and islets that surround it. With a total area of 8,336 km^2 and a population of 634,930 inhabitants (2019) (Eurostat, 2020), it is an important tourism and services hub and, despite being an island, is one of the most important agricultural regions in Greece.

It has a GDP of €9 billion, representing 4% of Greece GDP (Trading Economics, 2018). In past years, the region has experienced a period of economic turbulence, with its GDP having steadily decreased from 2008 until 2013, then becoming stable until 2016, when it started to grow again (2017 saw a 4.1% increase in GDP, and ranking as the region with the 6th highest GDP in Greece in 2020)[148].

In 2019, the region employed 6.5% (252.9 thousand) of the country's workforce: 70.6% in the tertiary sector, 12.9% in the secondary sector and 16% in the primary sector. According to Eurostat (2020), the services sector dominates the regional economy and accounts for 79.3% of the regional Gross value added (GVA), which totalled €8,170 in 2018, while the secondary sector share was 13.5% and the primary sector 7.3%.

Tourism is a significant part of Crete's economy, accounting for 22% of GVA[149] and estimated to generate 40% of the employment and a similar proportion of total wages paid in the region[150]. It has been the most dynamic sector in recent years, with an increase in arrivals driving investment in hotels and other infrastructure.[151] Tourism activity in Crete is estimated to be significantly driven by European tourists. Official data shows that, in 2018, 90% of arrivals at tourism accommodations in Crete were from foreign nationals[152], while the SOCLIMPACT study recently estimated that one-third tourists visiting Crete in were either from Germany (28.7%) or France (11.8%). One in 10 were from the UK[153]. These estimates are in line with modelled data on flight departures (which provide a proxy for arrivals), which indicate that, in 2016, 50% of flights departed from Crete airports were to airports in the EEA region[154].

Dependency on air transport is low-to-average in Greece compared to other EU countries[155]. 69% of all travel traffic to Greece in 2019 took place by air, mostly through charter flights[156]. In 2017, 11% of its transport energy demand was from international aviation fuel, 24% was international maritime and 56% was road transport, while in the rest of the EU these values were 13.6%, 10% and 72% respectively[157]. However, given that this data pertains to Greece as a whole, which has land borders with other EU member states, it is likely that Crete's reliance on air and sea transport for freight is significantly higher than it is on a national level.

Greece also experienced significant levels of emigration in recent years. The country saw a sharp increase in emigration in 2011 and 2012, following the crisis, before falling back slightly in 2014 and

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148 https://ec.europa.eu/eurostat/databrowser/view/NAMA_10R_2GDP$DEFAULTVIEW/default/table
149 SOCLIMPACT ; https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/region-kriti
150 https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do
151 https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/region-kriti
152 https://ec.europa.eu/eurostat/databrowser/view/TOUR_OCC_ARN2__custom_418775/default/table?lang=en
153 SOCLIMPACT, 2020. Blue Economy Sectors. Available at: https://soclimpact.net/blue-economy-sectors-7/
154 AERO-MS data-
155 Tourism statistics - intra-EU tourism flows - Statistics Explained (europa.eu) – data from 2018. Shows 88% of journeys to Greece by EU-27 residents were by air; most other countries are significantly lower aside from Cyprus and Malta.
156 Source: Deloitte 'Bringing the latest insights on the Greek Tourism & Hospitality sector. Scenarios on the impact of COVID-19', available at: https://www2.deloitte.com/content/dam/Deloitte/gr/Documents/consumer-business/gr_latest_insights_on_tourism_and_hospitality.pdf
157 Final energy consumption by transport mode — European Environment Agency (europa.eu)

remaining at a stable level since then[158]. A 2014 OECD study found that 6.6% of native born Greeks lived abroad, giving it the 7th highest population living abroad in the EU[159]. Although regional emigration figures are not available for Crete, it could be expected that a similar proportion of the island population may be living abroad, possibly in the EU, and would be directly impacted by the introduction of a carbon flight tax.

This section presents quantitative data extracted from Eurostat, and complements that data with national statistics on tourism and international cargo dependency on air transport.

Table 8-14: Crete and Greece profiles: demographics, economy and environment

Category	Unit	Year	Value	% change (10 y. avg)
Demographics				
Population	number	2017	632,674	0.4%
Economy				
GDP - total	€ million, current prices	2017	9,095.15	-2.1%
Employment - total	Thousand	2017	248.95	-1.4%
Employment - tourism	Thousand	2017	97.68	-0.3%
Employment - tourism	as a % of total regional economy	2017	39.2%	1.1%
Wages (compensation of employees) - total	€ million, current prices	2017	5,997.88	-2.1%
Wages (compensation of employees) - tourism	€ million, current prices	2017	2,359.26	-1.2%
Wages (compensation of employees) - tourism	as a % of total regional economy	2017	39.3%	1.0%
Environment (all values are at national level				
Final energy consumption - total	Terajoule	2017	687,391.26	-2.9%
Final energy consumption - International maritime bunkers	Terajoule	2017	89,356.12	-4.1%
Final energy consumption - International aviation	Terajoule	2017	41,305.19	0.1%
Final consumption - transport sector - road - energy use	Terajoule	2017	209,008.68	-2.9%
Final consumption - transport sector - domestic aviation - energy use	Terajoule	2017	8,171.09	-6.1%
Final consumption - transport sector - domestic navigation - energy use	Terajoule	2017	23,887.81	-1.5%
GHG emissions - total	ktonnes CO_2e	2017	92,376.88	-3.6%
GHG emissions - air transport (domestic)	ktonnes CO_2e	2017	406.96	-3.3%
GHG emissions - road transport	ktonnes CO_2e	2017	14,723.67	-3.1%
GHG emissions - maritime transport (domestic)	ktonnes CO_2e	2017	1,947.70	-1.4%
GHG emissions - air transport (intl, memo)	ktonnes CO_2e	2017	3,463.76	1.5%
GHG emissions - maritime transport (intl, memo)		2017	484.74	7,150.88

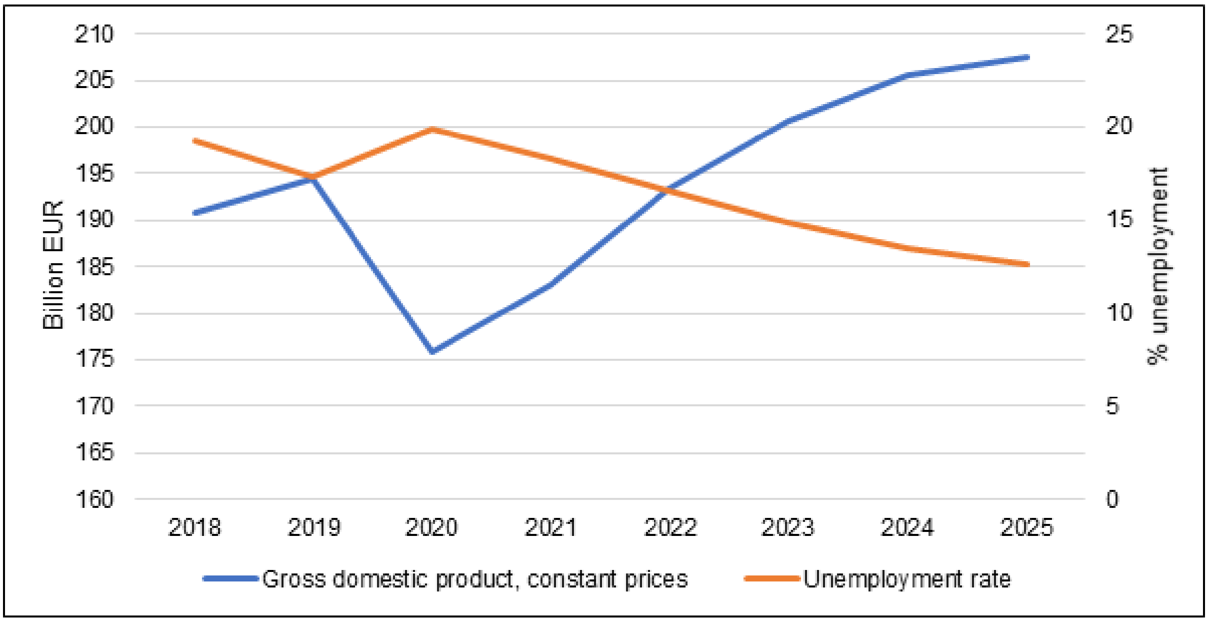
[158] https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do
[159] www.statista.com/chart/4237/the-countries-with-the-most-people-living-overseas/

Source: Eurostat, multiple datasets

8.5.1.1 Economic projections in the baseline scenario

With a contraction in its GDP of 9.5%, Greece has been severely affected by COVID-19 in 2020. Nevertheless, the IMF projects a steady recovery for Greece, with its GDP growing by 18% between 2020 and 2025 and a reduction in the unemployment rate of 7pp within the same period.

Figure 8-3: GDP and unemployment projection in Greece



Source: IMF World Economic Outlook, October 2020

In the long-term, the GINFORS-E model projects that GDP at constant prices in Greece will be €267 billion in 2050 (base year: 2015).

8.5.1.2 Connectivity

The island of Crete has three commercial airports: one in Heraklion, one in Chania, and a smaller one in Sitia. The first two serve international routes, acting as the main gateways to the island for travellers. Sitia is covered by a Public Service Obligations (PSO) in the connection with Alexandroupoli and Aktio, in Greece mainland.

Table 8-15: Total number of departure flights per airport, 2016

Name	Location	Use	ICAO	IATA	Number of departure flights (2016)
Heraklion International Airport	Heraklion	Civil/Military	LGIR	HER	22,640
Chania International Airport	Chania	Civil/Military	LGSA	CHQ	9,133
Sitia Public Airport	Sitia	Civil	LGST	JSH	758
Kasteli Airport	Kastelli	Military	LGTL	–	0
Maleme Airport	Maleme	Civil	–	–	N/A
Tympaki Airport	Tympaki	Military	–	–	N/A
Total					**32,530**

Source: AERO-MS

Over a quarter (27%) of the flights departing from Crete correspond to domestic flights and just over two thirds (61%) are intra-EEA flights, including UK (2016, AERO-MS modelled data).

Assuming an average of 145 passengers per flight, it can be estimated that around 4.7 million passengers departed from an airport in Crete. In comparison to this, in 2016 a total of 1 million passengers embarked from Crete's main ports[160].

The island is also served by ferries, mostly from Athens. A trip by ferry from Athens to Heraklion takes approximately nine hours.

In terms of cargo transport, most of it is transported through the Heraklion and the Sitia ports, and through Souda Bay.

Table 8-16. Total number of passengers embarked and goods loaded at ports in Crete, 2016

Port Name	Location (town/city)	Use	Total Passengers Embarked in 2016	Total Goods Loaded in 2016 (national and from abroad)
Heraklion	Heraklion	Civil	723,182	698,130
Kastelli Kissamou	Chania	Civil	4,459	1,906
Rethymno	Rethymno	Civil	0	8,624
Sitia	Sitia	Civil	4,393	670,447
Souda Bay	Chania	Civil/Military	336,127	417,745
Total			1,068,161	1,796,852

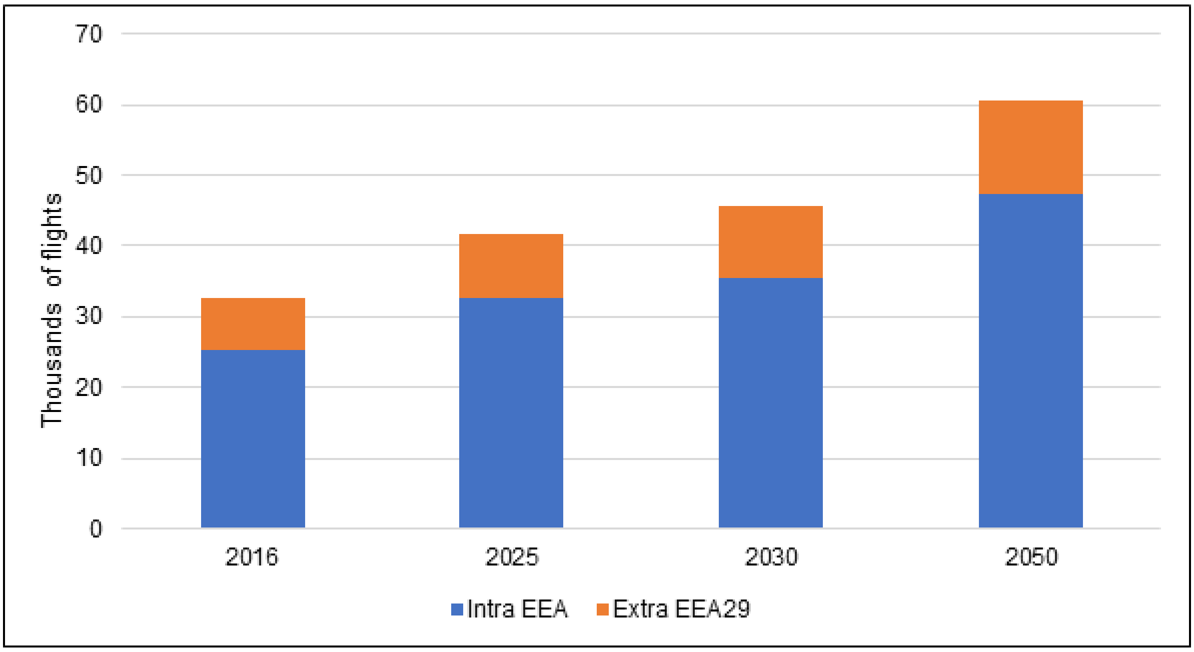
Source: Hellenic Statistical Authority, 2020. Available at: https://www.statistics.gr/en/statistics/-/publication/SMA06/- Accessed 11 March 2021

8.5.1.3 Projection of flights in the baseline scenario

The baseline scenario shown in Figure 8-4, projects that total flights from Crete would nearly double by 2050 (from c.32,000 to over 60,000 per year), with intra-EU flights expected to account for around 78% of the total flights out of the island as the total flight volume increases.

[160] https://www.statistics.gr/en/statistics/-/publication/SMA06/-

Figure 8-4. Projection of number of flights departing from Crete in the baseline scenario



Source: AERO-MS

8.5.2 Analysis of impacts

8.5.2.1 Mapping of impacts

The introduction of a carbon flight tax could impact Crete's economy by increasing the cost of travel and the movement of cargo. If travel becomes more expensive, there could be a decline in the number of EEA and Extra-EEA visitors to the country, which would negatively impact the tourism sector and its supply chain. This may also cause isolation effects in the population and lead to negative impacts to the local economy, by increasing the costs of goods imports.

8.5.2.2 Effect of an aviation tax on GDP

Air transport plays a pivotal role in Greece's economy. In 2019, the sector contributed 10% of Greece's total GDP and supported roughly 500,000 jobs[161]. As per the AERO-MS model, in 2016, Greece saw approximately 219,000 flights, approximately 15% of which flew out of Crete – totalling approximately 32,500 flights.

Air transport generates employment and economic activity both directly and indirectly, through industries related to and supported by aviation, such as airline and airport operations, maintenance and manufacturing, on-site retail and catering, tourism and hospitality.

Taxes on air tickets or aviation fuel will likely impact the air industry's activities, its contribution to GDP, and, in turn, other industries such as tourism.

In the table below, two models have been used to calculate the impact of taxes on aviation fuel or air tickets on activities in Greece's economy in terms of revenue tonnes kilometres (RTK), that is, the total cargo and passengers transported each year and the total kilometres of flight travel, and in terms of GDP impacts. The GINFORS-E model has been used to calculate the impacts on the economy, including GDP and employment, of the policy options using AERO-MS inputs. AERO-MS estimates RTK will be at 5.24 billion tonnes in 2025, rising to 7.99 billion in 2050.

[161] IATA: What Greece Needs for its Aviation Sector to Recover.

Table 8-17. Impact of taxation on revenue tonne km and GDP 2025-2050

Taxation option	2025	2025	2030	2030	2050	2050
	RTK	GDP	RTK	GDP	RTK	GDP
Baseline (billion tonne-km / billion EUR)	5.24	176.90	5.80	198.91	7.99	209.09
Fuel taxation of €0.33 per litre for Intra EEA (*No transition period*)	-4.82%	-0.07%	-4.44%	-0.15%	-3.35%	-0.12%
Fuel taxation of €0.33 per litre for Intra EEA (2024 start; 10-year transition period)	-1.79%	-0.02%	-5.25%	-0.09%	-5.49%	-0.11%
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	-7.30%	-0.15%	-7.04%	-0.15%	-6.81%	-0.08%
Ticket tax Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	-9.14%	-0.08%	-8.81%	-0.20%	-8.51%	-0.22%
Ticket tax <350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	-7.87%	-0.07%	-7.62%	-0.16%	-7.37%	-0.16%
Intra EEA: fuel tax €0.33 / Extra EEA: ticket tax €10.43 + Cargo €0.10 (*2024 start; 10-year transition period*)	-2.22%	-0.02%	-6.62%	-0.11%	-7.36%	-0.16%

Across all scenarios, the ticket tax that foresees higher charges for extra-EEA flights is the one with the highest negative impact. The Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km is projected to result in nearly 10% decrease in RTK (9.14%) in 2025, ending in 2050 with an 8.51% RTK decrease, and a 0.22% decrease in GDP against the baseline. Alongside the fuel taxation scenario that does not incorporate a transition period, Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km was the steadiest across the 2025-2050 period, although remained higher than both fuel tax options.

Overall, the fuel taxation options are projected to have the least impact on GDP and RTK. Of the two, the fuel tax scenario which incorporates a 10-year transition period sees the lowest initial decrease in RTK and GDP in comparison with the baseline. The combined tax option, which also includes a 10-year transition period, also has a smaller impact on the baseline in 2025. However, both then see steep increases upon completing the transition period, with RTK decreasing by around 4% each, and GDP going from -0.2% for each, to -0.7% for fuel taxation and -0.11% for combined tax.

On the other hand, the fuel tax scenario which does not include the transition period and which initially began with -4.82% RTK decrease and -0.07% for GDP, finishes in 2050 with the lowest overall decreases for both measures (tied with the other fuel tax option at -0.1% for GDP).

8.5.2.3 Effect of aviation taxation on tourism industry

As discussed in Section 1.1.1., tourism is a significant part of the Cretan economy. In 2016, Crete welcomed 4.3 million tourists[162]. The industry accounts for 22% of GVA[163] and is estimated to generate 40% of the employment and a similar proportion of total wages paid in the region[164]. The majority of tourists arrive in Crete by air, rather than by ferry; as a result, taxes on aviation stand to significantly impact the tourism industry by making flying more expensive, less accessible, and less frequent[165].

Table 8-18 indicates how much revenue from tourism Crete may lose in each of the policy options that have been suggested, mapping the number of tourists and euros of expenditure in millions. Projections have been based on the estimated impacts on total number of passengers travelling to Greece as a whole by air and downscaled to Crete tourism based on: total number of tourists arriving by flight in Crete in 2016[166], average expenditure per visitor (€663), according to INSETE in 2016[167].

Table 8-18: Impact of taxation on tourist numbers and expenditure 2025-2050

Taxation option	2025	2025	2030	2030	2050	2050
	Number of tourists	Expenditure	Number of tourists	Expenditure	Number of tourists	Expenditure
Baseline (million pax ; million EUR)	5.79	3,838.33	6.40	4,242.51	8.79	5,825.03
Fuel taxation of €0.33 per litre for Intra EEA (*no transition period)*	-8.71%	-334.45	-8.00%	-339.37	-6.12%	-356.57
Fuel taxation of €0.33 per litre for Intra EEA (*10-year transition period*).	-1.94%	-74.37	-5.76%	-244.42	-6.03%	-351.32
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	-11.47%	-440.12	-11.13%	-472.22	-10.77%	-627.39
Ticket tax Intra EEA: €10.12; Extra EEA: €25.30/€45.54 /	-12.68%	-486.68	-12.29%	-521.45	-11.89%	-692.84

[162] Vourdoubas, J., 2020. The Tourism Industry in the Island of Crete, Greece: Is It Carbon-Intensive? *In: Sustainability in Environment*. Available at: https://www.researchgate.net/publication/337905848_Original_Paper_The_Tourism_Industry_in_the_Island_of_Crete_Greece_Is_It_Carbon-Intensive Accessed: 11 March 2021
[163] SOCLIMPACT
[164] https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do
[165] Vourdoubas, J., 2020. The Tourism Industry in the Island of Crete, Greece: Is It Carbon-Intensive? *In: Sustainability in Environment*. Available at: https://www.researchgate.net/publication/337905848_Original_Paper_The_Tourism_Industry_in_the_Island_of_Crete_Greece_Is_It_Carbon-Intensive Accessed: 11 March 2021
[166] Vourdoubas, J., 2020. The Tourism Industry in the Island of Crete, Greece: Is It Carbon-Intensive? *In: Sustainability in Environment*. Available at: https://www.researchgate.net/publication/337905848_Original_Paper_The_Tourism_Industry_in_the_Island_of_Crete_Greece_Is_It_Carbon-Intensive Accessed: 11 March 2021
[167] Expenses per visitor in Crete, in Euros, according to the Association of Greek Tourism Enterprises Institute (INSETE): https://www.greece-is.com/news/average-tourist-greece-spends-67-euros-per-day/

Cargo: €0.10 per t-km						
Ticket tax <350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	-16.06%	-616.57	-15.70%	-665.87	-15.30%	-891.08
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10 (*10-year transition period*).	-2.19%	-84.02	-6.57%	-278.81	-7.13%	-415.29

Similarly to the previous section, the fuel tax policy options have the least negative impact.

Due to its 10-year transition period, fuel taxation of €0.33 per litre for Intra EEA (*10-year transition period*) had the lowest initial decrease in tourist numbers and expenditure, and ended with the lowest decrease in the base in 2050. This policy option had the lowest impact throughout, beginning with a 1.94% decrease in tourist numbers and a €75 million decrease in tourists expenditure earned, and ending with -6.03% and -€351million in tourists and tourist expenditure, respectively. The other fuel tax option, which does not have the transition period, begins with significantly higher impacts, but levels out by the end of the period.

The combined tax scenario had a middling impact, projected to have the second smallest initial impact in 2025, and ending with the third lowest decreases in terms of both number of tourists and expenditure by 2050.

The ticket tax scenarios again had the most negative impact, with the tax based on distance (not that based on intra- or extra-EEA origin) seeing the most negative results; tourist numbers and expenditure are projected to decline precipitously in the first year, by 16% and over €616m respectively.

It should be noted, however, that despite having the largest decreases on the baseline, the ticket tax scenarios remain relatively steady across the period 2025-2050, whereas there is more significant fluctuation for fuel tax and combined tax scenarios.

8.5.2.4 Effect of an aviation tax on the good traded with aviation as means of transport

On a national basis, roughly 100,000 tonnes of air freight flying to, from and within Greece[168]. In comparison, in 2018 Greece transported just under 200,000 tonnes of seaborne freight[169]. Air transport is crucial for distributing high value to weight products – according to Oxford Economics, despite accounting for less than 1% of the tonnage of EU worldwide trade, in value terms this makes up 22% of the total. By being integrated into the global air transport network, Crete and the country as a whole benefit enormously from being able to, for example, access and trade within foreign markets and lowering long-distance transport costs[170].

It should be noted these are statistics based on a national level; Greece as a whole has the benefit of both land and sea transportation for exports. It is likely that Crete, considering its island condition, is significantly more dependent on air cargo than the rest of Greece.

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168 File:Air freight and mail by type of transport, 2018 (thousand tonnes).png - Statistics Explained (europa.eu)
169 Ibid
170 120326_Economic Benefits from Air Transport in Greece.pdf (sete.gr)

In Table 8-19 (below), the weight freight in Crete is calculated in relation to total freight in Greece, based on statistics from 2016 establishing air traffic by airport[171]. The table indicates the difference in the price in euros per freight tonne-kilometre.

Table 8-19. Impact of taxation on price per freight tonne of cargo 2025-2050

Taxation option	2025	2025	2030	2030	2050	2050
	Cargo tonne km	Price per freight tonne km	Cargo tonne km	Price per freight tonne km	Cargo tonne km	Price per freight tonne km
Baseline (million tonne-km ; Euro-2019)	1.83	0.53	2.08	0.56	3.16	0.59
Fuel taxation of €0.33 per litre for Intra EEA	-0.5%	1.1%	-0.5%	1.0%	-0.4%	0.8%
Fuel taxation of €0.33 per litre for Intra EEA (*10-year transition period*)	-0.5%	0.8%	-1.5%	2.5%	-1.5%	2.6%
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	-11.0%	17.1%	-10.4%	16.0%	-9.7%	14.9%
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	-11.0%	17.1%	-10.4%	16.0%	-9.7%	14.9%
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	-11.0%	17.1%	-10.4%	16.0%	-9.7%	14.9%
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10 (*10-year transition period)*	-2.4%	3.3%	-7.2%	10.5%	-8.7%	12.9%

A similar pattern emerges in these projects as with GDP and tourism.

Combined tax option remains middling, with the negative impact starting off low and ending at its highest in 2050, while the fuel tax policy options remain the scenarios impacting the price of cargo the least. The scenario fuel taxation of €0.33 per litre for Intra EEA is projected to have the lowest impact in comparison with the baseline, ending in 2050 with a 0.8% increase in the price of cargo, significantly lower than all other measures.

The ticket tax policy options are projected to cause a significantly higher impact on both parameters throughout the period. Unlike in previous sections, all ticket tax options are consistent; starting high in 2025 at a 17% increase in cost of cargo and ending on a 15% increase in cost in 2050 against the baseline. This is 2% more than the combined approach, and 12% higher than the largest increase in costs projected for the fuel tax options.

[171] Weight freight in Crete in relation to total freight in Greece, in 2016, based on '02. Domestic and international air traffic, by airport' table in https://www.statistics.gr/en/statistics/-/publication/SME09

8.5.2.5 Effects on connectivity

Table 8-20 shows how ticket prices per group and per customer is projected to change in each tax scenario over the period 2025-2050, with the baseline showing only slight increases in prices over the 25 years. These results are based on impacts on ticket prices per person-kilometre for Greece as a whole, and adapted to Crete, based on the distance between Crete's main airport (Heraklion) and Greece's capital, Athens.

Table 8-20. Impact of taxation on price per variations for intra-EEA flights 2025-2050

Taxation option	2025	2030	2050	2025	2030	2050
	Price per pax-km - traditional scheduled carriers	Price per pax-km - traditional scheduled carriers	Price per pax-km - traditional scheduled carriers	Price ticket Crete-Athens	Price ticket Crete-Athens	Price ticket Crete-Athens
Baseline (EUR-2019)	0.13	0.13	0.14	47.66	49.29	51.56
Fuel taxation of €0.33 per litre for Intra EEA	2.41%	2.26%	1.82%	1.15	1.11	0.94
Fuel taxation of €0.33 per litre for Intra EEA (*10-year transition*)	1.00%	3.25%	3.65%	0.48	1.60	1.88
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	4.85%	4.74%	4.66%	N/A	N/A	N/A
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	6.12%	5.94%	5.74%	N/A	N/A	N/A
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	5.97%	5.86%	5.80%	N/A	N/A	N/A
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10 (*10-year transition*)	1.20%	3.92%	4.52%	N/A	N/A	N/A

As with previous measures, both fuel taxation scenarios result in the least increases in price per person-kilometre and ticket prices for Crete-Athens.

The fuel tax and combined tax scenarios which include a 10-year transition period have, the lowest changes one year into the scheme, , at around 1% increase in price per person-kilometre between 2025 and 2030, with ticket prices increasing by €0.50 and €0.60. However, these prices are projected to rise more precipitously as the transition period ends, and, in 2050, the option that is projected to have had the least impact on prices is the fuel tax option that began without the 10-year transition period. This is also the option that fluctuated the least, with price per pax km remaining increases remaining between 2.4% (2025) and 1.8% (2050, and ticket prices increasing on the baseline by 1%.

Once again, the scenarios based on ticket taxation have the highest impacts. The scenario in which tickets are taxed €10.43 for all EEA departures, while still higher than fuel and combined tax scenarios, saw the lowest impact of the ticket taxation options, seeing an increase in price per pax-km of nearly 5% initially, dropping by 2050 to 4.66%. The other two ticket tax scenarios were markedly similar and consistent throughout the period, with very little fluctuation, while nonetheless remaining the two scenarios with the highest impact.

8.5.2.6 Conclusion

Overall, a fuel tax of €0.33 per litre for Intra EEA flights with no transition period appears to present the best overall outcome. It had the least detrimental impact on Crete's GDP, freight transport, and isolation, while having a moderate impact on tourism. Although the differences were slight, the fuel taxation method which incorporated a 10-year transition period consistently began in 2025 with lesser impact, but, other than in the tourism sector, went on throughout the period to impact the different sectors more.

8.6 Malta

8.6.1 Profile

Malta is the smallest member of the European Union in terms of area, population and GDP. Malta produces less than a quarter of its food needs, has limited fresh water supplies, and has few domestic energy sources. It is highly dependent on international trade and tourism[172].

Malta has experienced a period of economic growth, with its GDP increasing steadily year on year over the past decade. Between 2008 to 2017, GDP grew by 7%[173]. Malta's services sector continued to flourish, with sustained growth in the financial services and online gaming sectors.

Tourism is a significant part of Malta's economy, accounting for 18% of GVA[174] and estimated to be responsible for 26% of the jobs and 21% of total wages in the country[175]. In 2019, 90% of arrivals at tourism accommodation in Malta were foreign nationals[176]. The number of nights spent in tourist accommodation by foreign nationals has seen an upward trend over the past decade, increasing by 3% between 2010-2019. Tourism activity in Malta is significantly driven by European visitors. According to the Malta Tourism Authority three in ten tourists visiting Malta in 2019 were either from Italy (14%), France (9%) or Germany (8%) and almost one in four (24%) from the UK[177]. These estimates are in line with modelled data on flight departures (which provide a proxy for arrivals), which indicate that, in 2016, 63% of flights departed from Malta were to airports in the EEA region and 24% to the UK (see section 8.5.1.3).

Malta has also experienced significant levels of emigration in recent years. There has been an upward trend since 2014 and in 2018, 2% of the population emigrated[178].

This section presents quantitative data extracted from Eurostat, and complements that data with national statistics on tourism and international cargo dependency on air transport.

Table 8-21: Malta profile: demographics, economy and environment

Category	Unit	Year	Value	% change (10 y. avg)
Demographics				
Population	number	2017	460,297	1.3%
Economy				

172 Source: Moody's Analytics, available at: https://www.economy.com/malta/indicators#:~:text=Economic%20Overview,has%20few%20domestic%20energy%20sources
173 Source: Eurostat (https://ec.europa.eu/eurostat/databrowser/view/NAMA_10R_2GDP$DEFAULTVIEW/default/table)
174 SOCLIMPACT
175 Source: Eurostat (https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do)
176 Source: Eurostat (https://ec.europa.eu/eurostat/databrowser/view/TOUR_OCC_ARN2__custom_418775/default/table?lang=en)
177 www.mta.com.mt/en/file.aspx?f=32328
178 Source: Eurostat (https://ec.europa.eu/eurostat/databrowser/view/tps00177/default/table?lang=en)

Category	Unit	Year	Value	% change (10 y. avg)
GDP - total	€ million, current prices	2017	11,332.1	7.0%
Employment - total	Thousand	2017	222.34	3.5%
Employment - tourism	Thousand	2017	58.26	2.7%
Employment - tourism	as a % of total regional economy	2017	26.2%	-0.8%
Wages (compensation of employees) - total	€ million, current prices	2017	4,647.97	6.4%
Wages (compensation of employees) - tourism	€ million, current prices	2017	960.1	4.9%
Wages (compensation of employees) - tourism	as a % of total regional economy	2017	20.7%	-1.4%
Environment (all values are at national level				
Final energy consumption - total	Terajoule	2017	26,052.93	2.6%
Final energy consumption - International maritime bunkers	Terajoule	2017	87,585.46	9.5%
Final energy consumption - International aviation	Terajoule	2017	5,835.75	4.1%
Final consumption - transport sector - road - energy use	Terajoule	2017	8,087.33	1.6%
Final consumption - transport sector - domestic aviation - energy use	Terajoule	2017	23.05	-6.0%
Final consumption - transport sector - domestic navigation - energy use	Terajoule	2017	559.64	2.9%
GHG emissions - total	ktonnes CO_2e	2017	2,160.29	-3.9%
GHG emissions - air transport (domestic)	ktonnes CO_2e	2017	0.43	9.7%
GHG emissions - road transport	ktonnes CO_2e	2017	563.26	1.0%
GHG emissions - maritime transport (domestic)	ktonnes CO_2e	2017	71.13	5.2%
GHG emissions - air transport (intl, memo)	ktonnes CO_2e	2017	431.12	4.2%
GHG emissions - maritime transport (intl, memo)	ktonnes CO_2e	2017	6,963.06	10.1%

Source: Eurostat, multiple datasets

8.6.1.1 Economic projections in the baseline scenario

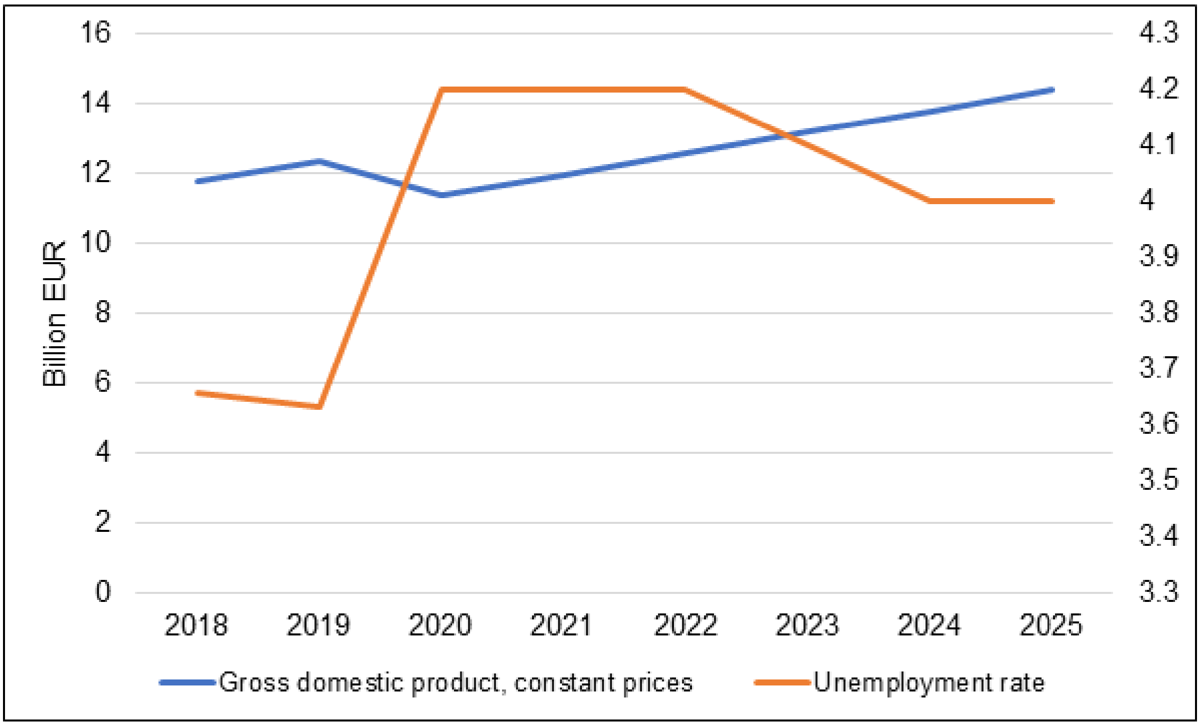
Figure 8-5 shows Malta's GDP and unemployment rate from 2018, and projections up to 2025 which indicate an expectation that GDP will steadily rise and unemployment rates fall over the next five years. The fall in 2020 GDP may reflect the impact of COVID-19. Malta's tourism industry was heavily impacted by the pandemic, with the second wave of infections across Europe disrupting Malta's peak tourism season in summer 2020[179]. The Times of Malta reported a 77% drop in tourist numbers in July to September 2020, and an 81% drop in tourist expenditure[180]. Malta's vaccination programme is

[179] Source: Malta Tourism Authority (2020) Tourism in Malta. Facts and figures 2019, available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7528869/

[180] Source: Article published in Times of Malta (https://timesofmalta.com/articles/view/hotel-chain-is-closing-some-of-its-doorsas-another-dares-to-open-them.817876)

progressing relatively quickly, with 19% of the population having received one vaccination dose by 3 March 2021, the third highest rate in Europe after the UK and Serbia[181].

Figure 8-5. GDP and unemployment projection in Malta



Source: IMF World Economic Outlook, October 2020

The GINFORS-E model predicts that the GDP in Malta will reach 17 billion EUR in 2030 and 23 billion EUR in 2050, at constant prices (base 2015).

8.6.1.2 Connectivity

Malta is home to one airport, situated in Gudja, a town southwest of Valletta, the Maltese capital. It is used for civilian flights, cargo, and is home to the Maltese army's Air Wing. Its busiest routes fly to London, Italy and Germany. There has recently been a growth in passenger numbers, prior to COVID-19, reaching 7.3 million in 2019, up by 7.4% over 2018's numbers[182]. This is in part due to a growth in routes served by low-cost airlines.

Table 8-22. Number of flights departing from Malta, per destination, in 2016

	Total
EEA (excluding UK)	26
UK	11,869
Other international	4,540
EEA (excluding UK)	2,362
Total	**18,797**

Source: AERO-MS

[181] Source: Statista (https://www.statista.com/statistics/1196071/covid-19-vaccination-rate-in-europe-by-country/)
[182] https://www.routesonline.com/airports/4882/malta-international-airport/#:~:text=2019%20marked%20another%20record%20for,stand%20at%20a%20healthy%2081.8%25.

Malta is also connected by ferry to mainland Italy, via the port in Salerno on the Amalfi coast, and Sicily. Typically, there is only 1 sailing a week from Salerno, lasting approximately 27 hours 30 minutes. The Sicilian ports of Catania and Pozzallo offer more frequent and much quicker crossings. While timings and frequency vary week-by-week depending on the season, generally there is a total of 14 sailings a week between the two ports.

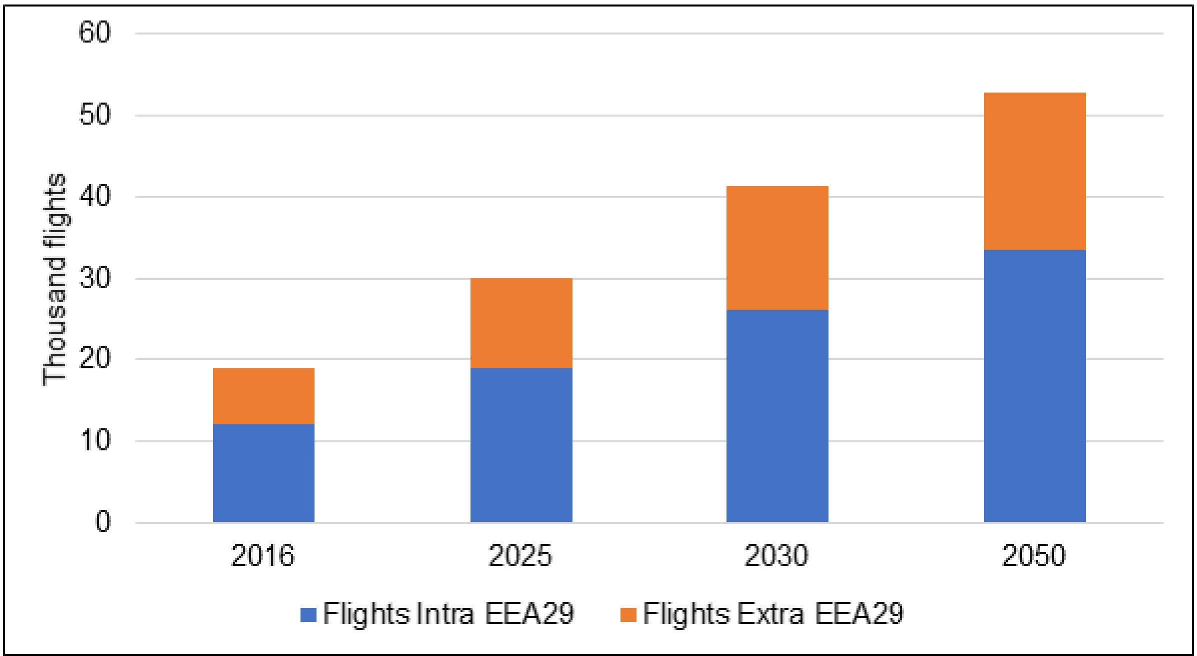
Table 8-23. Routes by ferry connecting Malta with mainland Europe

Route Name	No. of crossings per week	Average time per crossing
Catania – Valletta	5	4 hours 15
Pozzallo – Valletta	10	1 hour 45

8.6.1.3 Projection of flights in the baseline scenario

The baseline scenario shown in Figure 8-6 projects that total flights from Malta would more than double by 2050 (from c.19,000 to over 52,000 per year), with intra-EU flights expected to account for around 63% of the total flights out of the country as the total flight volume increases.

Figure 8-6. Projection of number of flights departing from Malta in the baseline scenario



Source: AERO-MS

8.6.2 Analysis of impacts

8.6.2.1 Mapping of impacts

The introduction of a carbon flight tax could impact Malta's economy by increasing the cost of travel and the movement of cargo. If travel becomes more expensive, there could be a decline in the number of EU visitors to the country, which would negatively impact the tourism sector and its supply chain. This may also impede growth in the burgeoning services sector and cause isolation effects in the population.

Malta is highly dependent on international trade of goods, and therefore an increase in the cost of freight air transport may have a significant effect in retail prices.

8.6.2.2 Effect of an aviation tax on GDP

There are different ways of measuring air transport's impact on an economy. An Oxford Economics study quoted by the IATA quantifies this in terms of direct and indirect equivalent jobs created and

GVA to GDP. In 2018, the aviation industry directly supported 4,000 jobs in Malta, and indirectly supported 45,000 jobs; the latter figure includes 41,000 jobs in the tourism industry that rely on aviation. The aviation industry – and associated foreign tourism – supports 24% of the country's GDP, and adds €2.3billion GVA to the GDP[183].

Table 8-24 Quantified effects of Malta's aviation sector[184]

Type of Impact	Monetary impact (Millions of USD)[185]	Jobs created
Direct	174	4,000
Supply chain	136	3,000
Employee spending	44	1,000
Tourism	1949	41,000
Total	2304	49,000

Source: IATA

In the table above, direct impact includes the direct value added by the services offered by various airlines and airport operators for movement of passengers and cargo. This also includes airport on-site enterprises (such as restaurants and retail), aircraft manufacturers and air navigation service providers. Supply chain includes the value created by the suppliers of the airlines and airports. Employee spending includes the spending of the employees of both suppliers and airport operators on consumer goods and services. Tourism includes the business created by the movement of tourists in the form of hotel reservations, travel reservations and other expenditure.

Taxes on fuel or air tickets is expected to affect the activities in the air sector, which in turn affects its contribution to GDP. The indicator Revenue tonne kms is used as a proxy to study the effect of aviation taxes on Malta's GDP. Revenue tonne km (RTK) is the product of total tonnes of cargo and passengers transported in a year and the total kms of flight travel that served for this transport. The AERO-MS model used for this study considers an input of 0.38 billion tonne km as a starting value and forecasts that the value will be 0.62 and 0.87 billion tonne kms in 2025 and 2030 respectively under BAU scenario. The GINFORS-E model calculates the impacts on the economy, including GDP and employment, of the policy options using AERO-MS inputs. Table 8-25 shows the results of both models in terms of RTK and GDP per policy option.

Table 8-25: Impact of taxation on revenue tonne km and GDP 2025-2050

Taxation option	2025		2030		2050	
	RTK	GDP	RTK	GDP	RTK	GDP
Baseline (billion tonne-km / billion EUR)	0.62	14.09	0.87	16.82	1.14	22.79
Fuel taxation of €0.33 per litre for Intra EEA	-7.17%	-0.12%	-6.57%	-0.15%	-5.15%	-0.11%

[183] IATA (unknown date) The importance of air transport to Malta, available at: https://www.iata.org/en/iata-repository/publications/economic-reports/malta--value-of-aviation/#:~:text=The%20air%20transport%20industry%2C%20including,totaling%20to%20US%20%242.7%20billion.

[184] Ibid

[185] Originally reported in dollars. Values are converted to euros using conversion rate of 0.8475

Taxation option	2025		2030		2050	
	RTK	GDP	RTK	GDP	RTK	GDP
Fuel taxation of €0.33 per litre for Intra EEA	-1.66%	-0.03%	-4.82%	-0.10%	-5.15%	-0.10%
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	-7.00%	-0.12%	-6.75%	-0.17%	-6.48%	-0.14%
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	-9.31%	-0.17%	-8.99%	-0.25%	-8.61%	-0.20%
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	-6.99%	-0.12%	-6.74%	-0.17%	-6.48%	-0.13%
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10	-2.10%		-6.23%		-7.03%	

Overall, the €0.33/litre fuel tax presents the best outcome of all scenarios in terms of reduction of GDP, causing this to be only 0.03% lower than the baseline by 2025 and 0.1% lower from 2030 onward. This is as a result of the 10-year transition period allowing for the economy to adjust to this new form of taxation. It also has the smallest impact of all scenarios on RTK, leading to a reduction of 1.66% in 2025 compared to the baseline. However, this rises to a reduction of 4.82% halfway through the transition period in 2030, and leads to RTK 5.15% lower than the baseline in 2050. The impact of the fuel tax with the 10-year transition period is less severe than the initial impact of the fuel tax without a transition period which would introduce the fuel tax in full in 2024, although the impact on RTK and GDP will come into line with the scenario with the transition period by 2050.

The ticket tax scenarios with the flat rate and inverse stepped rate taxes will have similar impacts to each other on RTK and GDP. Of all the tax scenarios analysed, the stepped rate ticket tax will have the largest negative impact on RTK and GDP. For the latter, this scenario results in a decrease of 0.17% in GDP versus the baseline within a year of introduction, resulting in a decrease of 0.25% by 2030 and 0.20% in 2050. It also has the greatest negative impact on RTK, with levels almost 10% lower than the baseline being projected in 2025, falling to 8.61% lower in 2050. Analysis of the impact of the combined tax scenario shows that the 10-year transition period means that it would begin by having one of the smallest negative impacts on RTK. However, by 2030 this impact would be in line with most other forms of taxation examined and by 2050 it would have the second largest impact of all scenarios, leading to a reduction of around 7% in RTK versus the baseline.

8.6.2.3 Effect of aviation taxation on tourism industry

The number of tourists visiting Malta in 2017 was 2.27 million (excluding overnight cruise passengers)[186], which approximates to the number of passengers embarking in Malta in 2016, as per AERO-MS data (2.31 million). Therefore, our estimations assume that the number of tourists arriving

[186] Source: https://www.mta.com.mt/en/file.aspx?f=32328

by air equals the number of passengers embarking in flights. In 2019[187], tourists spent €2.2 billion in Malta, which was an increase of 5.7% on the previous year and equivalent to €807 per tourist, per visit. Tourist arrivals in 2018/19 were up by 3.8% on the previous years, with growth fuelled by an increase in tourists from the middle East (+7.6% on 2017/18).

Table 8-26 reflects the volume of income from tourism that Malta would stop receiving under each of the policy options. As in the previous section, the fuel tax scenario with the 10-year transition period has the smallest impact in terms of reducing tourist numbers and expenditure relative to the baseline. Tourist numbers would be around 2% lower within the first year of the scheme being introduced, rising to a reduction of 5.5% halfway through the transition period and resulting in a reduction of almost 6% by 2050. Tourist expenditure would be around €62m lower than the baseline in 2025 and almost €354m lower by 2050. Again, despite the transition period described, the impact of this is the same as the tax without a transition period by 2050.

The stepped rate ticket tax scenario has the worst outcomes for tourist numbers and expenditures of all possible scenarios across the period 2025-2050. Tourist numbers would remain around 10-11% lower than the baseline across this period. Tourist expenditure would also be €£351m lower than baseline in 2025 – equivalent to the impact of the fuel tax scenarios in 2050 – and would be over half a billion Euros lower than baseline in 2050. However, it should be noted that for all ticket tax scenarios, the impact on tourist numbers remains largely stable throughout the period 2025-2050, while for the fuel tax and the combined tax based on the flat rate ticket tax, the impact becomes greater over time. The fuel tax without a transition period is the only scenario to see its impact decrease over the same period. Concerning tourist numbers and expenditure, the combined tax (based on the flat rate ticket tax) has a middling impact compared to all tax scenarios.

Table 8-26: Impact of taxation on tourist numbers and expenditure 2025-2050

Taxation option	2025		2030		2050	
	Number of tourists	Expenditure	Number of tourists	Expenditure	Number of tourists	Expenditure
Baseline (million pax / million EUR)	3.81	3,259.20	5.38	4,609.13	6.99	5,982.38
Fuel taxation of €0.33 per litre for Intra EEA	-8.31%	-270.70	-7.56%	-348.23	-5.91%	-353.75
Fuel taxation of €0.33 per litre for Intra EEA	-1.91%	-62.36	-5.53%	-254.97	-5.91%	-353.75
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	-8.92%	-290.83	-8.62%	-397.49	-8.32%	-497.54
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	-10.76%	-350.56	-10.40%	-479.25	-10.00%	-598.33

[187] Source https://www.mta.com.mt/en/file.aspx?f=32328

Taxation option	2025		2030		2050	
	Number of tourists	Expenditure	Number of tourists	Expenditure	Number of tourists	Expenditure
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	-10.03%	-327.03	-9.74%	-448.82	-9.45%	-565.36
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10	-2.25%	-73.49	-6.65%	-306.33	-7.40%	-442.40

8.6.2.4 Effect of an aviation tax on the goods traded with aviation as means of transport

In 2017, 6% of Malta's transport energy demand was from international aviation fuel, 86% was international maritime and 8% was road transport. Malta is heavily dependent on air for exports, with half (51%) being via air compared to 31% for the EU as a whole. For imports, Malta's figure of 27% via air is slightly higher than the EU average of 23%. Malta's dependency on air for cargo has fluctuated. The proportion of exports via air has generally been consistent at around 50% but reached highs of 59% in 2014 and 68% in 2016 (the lowest figure was 47% in 2018). There is more fluctuation in import figures with a high of 45% being via air in 2011 and a low of 20% in 2014. When the proportion of exports and imports via air decreases, the proportion via sea tends to increase.

According to AERO-MS data, the price per freight tonne km in Malta is high, compared to the average price in the EEA29 (€0.65 and €0.33, respectively). Given that Malta is highly dependent on imports of goods, an increase in the price of freight transport may have a significant effect on Malta's economy and the population's acquisition power.

Table 8-27 shows the difference in price in relation to the baseline of the different policy options.

Table 8-27: Impact of taxation on price per freight tonne of cargo 2025-2050

Taxation option	2025	2030	2050
Baseline (EUR / tonne-km)	0.67	0.70	0.74
Fuel taxation of €0.33 per litre for Intra EEA	4.75%	4.32%	3.30%
Fuel taxation of €0.33 per litre for Intra EEA	0.98%	3.05%	3.30%
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	12.44%	11.79%	11.06%
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	12.44%	11.79%	11.06%
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	12.44%	11.79%	11.06%
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10	2.01%	6.39%	7.67%

Whilst all the options would increase prices of freight transport, those that include a cargo tax of €0.10 per tonne-km are the ones which would generate a higher increase in transport cost. The only exception is the combined tax, since the cargo tax in this case is only applied to flights with destinations outside the EEA.

8.6.2.5 Effects on connectivity

Table 8-28 details the variation in prices for intra-EEA flights under each proposed scenario. The price of an outbound ticket for a Malta-Paris flight (1,743 km) is used as an example, as this is one of the main destinations for Maltese tourists. In the baseline, the approximate price per person per kilometre does not vary across the period 2025-2050.

Table 8-28: Impact of taxation on price variations for intra-EEA flights 2025-2050

Taxation option	2025		2030		2050	
	Price per pax-km - traditional scheduled carriers	Price ticket Malta-Paris	Price per pax-km - traditional scheduled carriers	Price ticket Malta-Paris	Price per pax-km - traditional scheduled carriers	Price ticket Malta-Paris
Baseline (million pax / million EUR)	0.13	218.6	0.13	225.1	0.13	233.9
Fuel taxation of €0.33 per litre for Intra EEA	8.60%	18.80	7.81%	17.58	5.92%	13.85
Fuel taxation of €0.33 per litre for Intra EEA	1.73%	3.77	5.47%	12.32	5.92%	13.85
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	4.84%	10.58	4.71%	10.59	4.54%	10.61
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	4.69%	10.24	4.56%	10.26	4.40%	10.28
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	4.87%	10.65	4.74%	10.67	4.57%	10.70
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10	1.73%	3.77	5.47%	12.32	5.92%	13.85

The fuel tax scenario and combined tax scenario (based on a flat rate ticket tax) would have the same impact on price per pax/km and the price of a Malta-Paris air ticket. Initially, this would have the smallest impact on these price metrics in 2025 as these are the tax scenarios that include transition periods beginning in 2024. These two tax options would increase price per pax-km by 1.73% and the price of an air ticket on this route by €3.77 above the baseline. However, by 2050 both scenarios would have the largest impact out of all scenarios analysed, increasing price per pax-km by almost 6% and the price of a Malta-Paris air ticket by nearly €14. While the fuel tax without a transition period has the greatest impact on price rises in 2025 and 2030, this comes into line with the fuel tax with a 10-year transition and the combined tax (based on the flat rate ticket tax) in 2050 as by this point their transition periods would have ended.

Ticket tax scenarios would have a similar and more stable impact on prices across the period 2025-2050, with the stepped rate ticket tax faring marginally better. Across the period, this would increase price per pax-km by around 4.5% above the baseline and add just over €10 to the baseline price of a Malta-Paris air ticket.

8.6.2.6 Conclusions

The fuel taxation scenario with a 10-year transition appears to present the best overall outcome across the four metrics analysed. It has the least detrimental impact on the country's crucial tourism sector, and on GDP and freight transport costs, and a moderate impact on isolation. The similar fuel tax without a transition period scenario has similar impacts by 2050, but slightly more detrimental immediate impacts as well as the most detrimental impacts of all the options on isolation.

8.7 Ireland

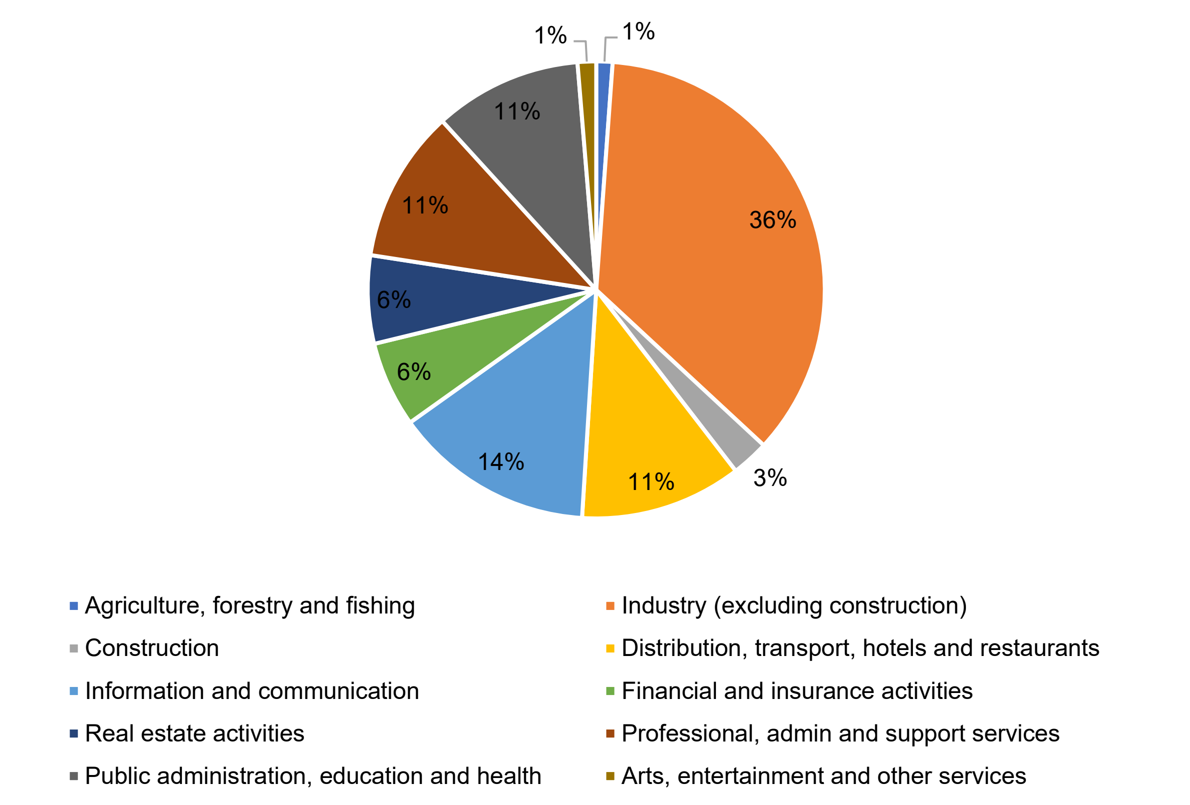
8.7.1 Profile

After exiting the EU-IMF bailout programme in 2013, Ireland positioned itself as the fastest growing European economy, with an average real GDP growth of 7.7% over the period 2017-2019 compared to 2.2% for the EU-27 on average. In addition, Ireland is the only economy in the EU that has grown in 2020, despite the effects of the coronavirus pandemic[188]. The national economy has been supported by strong domestic demand and by significant growth in the export sector, dominated by foreign multinationals. Ireland's low corporation tax of 12.5% and a loose tax residency requirement made Ireland a common destination for international firms. The GDP per capita in purchasing power standard (PPS) was 191 in 2019 (Index EU-27 = 100)[189], hence significantly higher than the EU-27 average.

As an island nation, except for the land border with the UK in Northern Ireland, the Irish economy heavily relies on air transport connectivity. Economic activity related to trade, transport, hotels and restaurants (NACE codes G-I), which has strong links with air transport, represents 11% of the gross added value of Ireland (Figure 8-7). In addition, tourism represents 29% of the employment in Ireland (Table 8-29).

[188] Eurostat: Real GDP growth rate – volume (TEC00115)
[189] Eurostat: GDP per capita in PPS (TEC00114)

Figure 8-7: Gross value added in Ireland per economic sector in 2019



*Source: Eurostat: Gross value added and income by A*10 industry breakdowns (NAMA_10_A10)*

Table 8-29: Ireland profile: demographics, economy and environment

Category	Unit	Year	Value	% change (10 y. avg)
Demographics				
Population	number	2017	4,784,383	1.0%
Economy				
GDP - total	€ million, current prices	2017	297,130.8	4.2%
Employment - total	Thousand	2017	2,144.14	0.0%
Employment - tourism	Thousand	2017	610.88	1.3%
Employment - tourism	as a % of total regional economy	2017	28.5%	1.2%
Wages (compensation of employees) - total	€ million, current prices	2017	88,152.85	1.0%
Wages (compensation of employees) - tourism	€ million, current prices	2017	17,819.93	1.6%
Wages (compensation of employees) - tourism	as a % of total regional economy	2017	20.2%	0.6%
Environment (all values are at national level				
Final energy consumption - total	Terajoule	2017	490,812.82	-1.3%
Final energy consumption - International maritime bunkers	Terajoule	2017	6,553.81	3.3%
Final energy consumption - International aviation	Terajoule	2017	42,600.60	0.2%
Final consumption - transport sector - road - energy use	Terajoule	2017	163,228.98	-1.9%

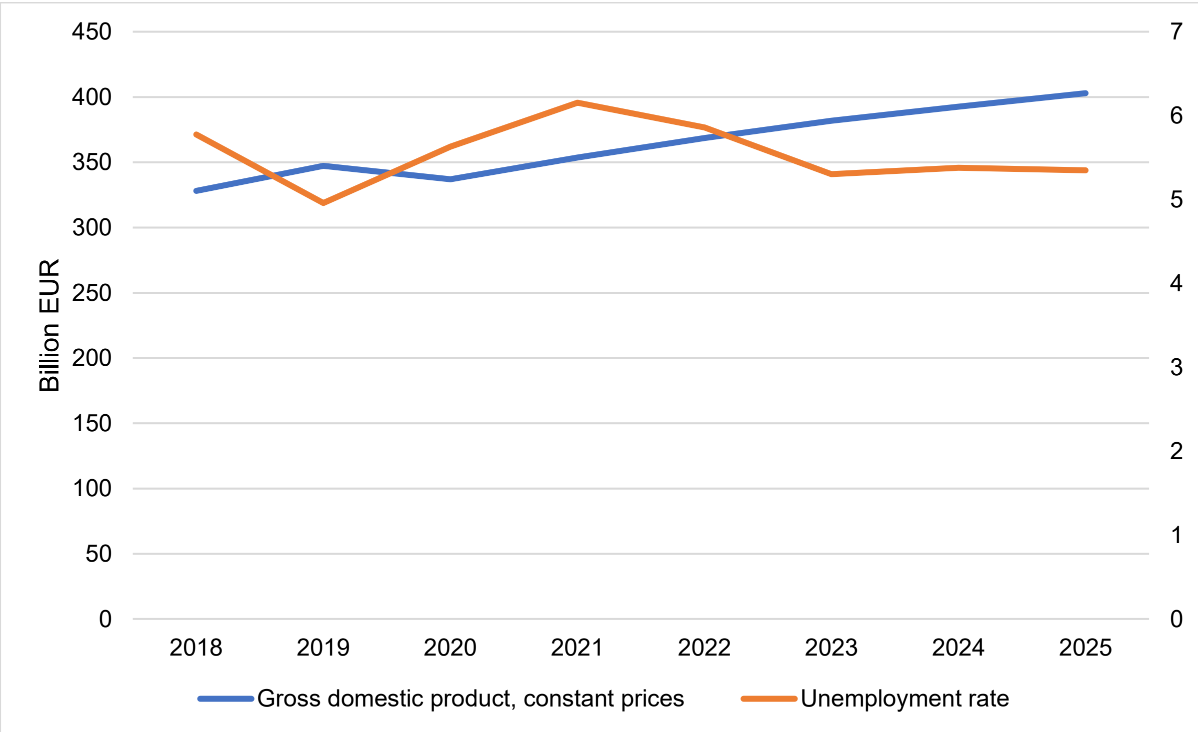
Category	Unit	Year	Value	% change (10 y. avg)
Final consumption - transport sector - domestic aviation - energy use	Terajoule	2017	150.54	-23.8%
Final consumption - transport sector - domestic navigation - energy use	Terajoule	2017	3,161.48	-1.7%
GHG emissions - total	ktonnes CO_2e	2017	66,343.05	-0.9%
GHG emissions - air transport (domestic)	ktonnes CO_2e	2017	17.45	-14.6%
GHG emissions - road transport	ktonnes CO_2e	2017	11,517.86	-1.8%
GHG emissions - maritime transport (domestic)	ktonnes CO_2e	2017	235.28	1.8%
GHG emissions - air transport (intl, memo)	ktonnes CO_2e	2017	3,062.72	0.0%
GHG emissions - maritime transport (intl, memo)		2017	484.74	3.0%

Source: Eurostat, multiple datasets

8.7.1.1 Economic projections in the baseline scenario

The Irish economy has been negatively affected by the Covid-19 pandemic but Ireland has still grown in 2020 by 3.4%[190]. In October 2020, the IMF forecasted for Ireland a slight reduction of the GDP in 2020 but a steady growth over the period 2020-2025. Unemployment levels however are expected to increase to around 6% in 2021 and progressively decrease over the period 2021-2025 (see Figure 8-8).

Figure 8-8: GDP and unemployment projection in Ireland



Source: IMF World Economic Outlook, October 2020

[190] Eurostat: Real GDP growth rate – volume (TEC00115)

Our baseline scenario (GINFORS-E) forecasts that GDP in Ireland will be €412 billion in 2030, and €854 billion in 2050 (in constant prices, base 2015).

8.7.1.2 Connectivity

The main airport in Ireland is in Dublin with around 81% of total flight departures in 2016 (see Table 8-30), followed by Cork and Shannon with 8% and 6% of departure flights respectively. Irish airports connected to 133 destinations in the EEA with around 50 thousand flights in 2016, which represents 40% of all departing flights. The connectivity with Great Britain is even higher with 58 thousand flights in 2016, which represent 46% of total departing flights (see Table 8-31 and Table 8-32).

Table 8-30: Number of flights departing from airports in Ireland (2016)

Location	ICAO code	Number of departure flights (2016)
Cork	EICK	10,658
Donegal	EIDL	915
Dublin	EIDW	102,036
Knock	EIKN	3,024
Tralee	EIKY	1,630
Shannon	EINN	7,486
Waterford	EIWF	279
Weston	EIWT	113
	Total	**126,139**

Source: AERO-MS

Table 8-31: Number of destinations (i.e. different airports) of flights departing from airports in Ireland (2016)

		< 1 flight per week	< 1 flight per day and >= 1 flight per week	>= 1 flight per day	Total
Domestic		0	2	4	6
International	EEA	25	68	40	133
International	GB	5	6	17	28
International	OTH	29	14	13	56
Total		**59**	**90**	**74**	**223**

Source: AERO-MS

Table 8-32: Number of flights departing from airports in Ireland (2016)

		< 1 flight per week	< 1 flight per day and >= 1 flight per week	>= 1 flight per day	Total
Domestic		0	166	3,982	4,148
International	EEA	453	11,085	38,569	50,107
International	GB	96	1,203	56,530	57,828
International	OTH	340	2,301	11,416	14,056
Total		**889**	**14,753**	**110,497**	**126,139**

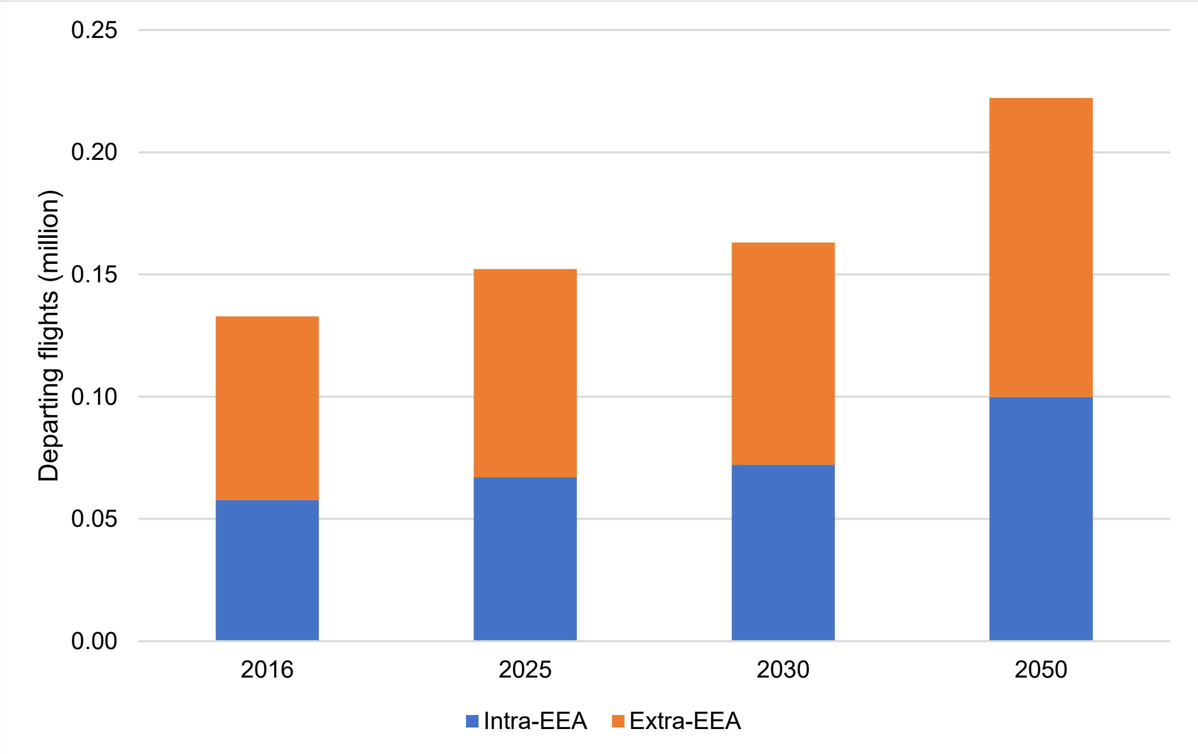
Source: AERO-MS

There are numerous ferry routes to and from Ireland, with connections to Northern Ireland and Great Britain mainly and to a lesser extent to France and Spain. The connection from Dublin to Holyhead in Wales takes approximately 3 hours while the trip from Dublin to Liverpool takes around 8 hours[191].

8.7.1.3 Projection of flights in the baseline scenario

The number of flights is estimated to grow by around 1.4% annually between 2025 and 2030, and by 1.6% from 2030 to 2050. Based on these projections, the number of departing flights in 2030 is expected to be around 160 thousand and 220 thousand by 2050 (Figure 8-9). The share of intra-EEA flights is expected to remain stable in the baseline at around 44% of total flights, compared to an average share of around 75% for the EEA on average. This difference is explained by the large connectivity with Great Britain.

Figure 8-9. Projection of number of flights departing from Ireland in the baseline scenario



Source: AERO-MS

8.7.2 Analysis of impacts

8.7.2.1 Mapping of impacts

A tax levy on fuel or ticket can have negative effects on international aviation and in turn can affect the sectors that are dependent on aviation either for tourist flows or transportation of goods. This case study analyses various the effects that fuel or ticket taxation for aviation can have on different economic aspects of Ireland. It is important to note that, unlike other European countries, the share of intra-EEA flights is much smaller as around 46% of flights connect with destinations in Great Britain. This means that Ireland would be less affected by a fuel tax applied to intra-EEA flights compared to other EEA countries.

8.7.2.2 Effect of an aviation tax on GDP

Air transport connectivity tends to have spill over effects on the economy. These spill over effects include increased corporate business due to improved connectivity, business created by the incoming tourists and other similar effects. The report Aviation Benefits Beyond Borders (IATA, 2019) contains

[191] https://www.directferries.co.uk/

the monetized effects of aviation sector in Ireland along with the equivalent jobs created by the sector. These are shown in Table 8-33 below.

Direct impact includes the direct value added by the services offered by various airlines and airport operators for the movement of passengers and cargo. Indirect impacts to the supply chain include the value created by the suppliers of the airlines and airports, while employee spending accounts for the spending of the employees of both suppliers and airport operators as a multiplier effect on the economy. Finally, tourism includes business generated by air transport for the hospitality sector and other expenditure by the incoming tourists.

While the direct economic effect of aviation represented € 4.63 billion in 2018 (1.4% of the GDP for 2018[192]), the total economic impact, including indirect effects, is estimated at € 17.42 billion (5.4% of the total GDP) and associated with 144,000 jobs (6.5% of total employment for 2018).

Table 8-33: Direct and indirect economic impacts of Ireland's aviation sector

Type of Impact	Monetary impact (€ Billions)[193]	Jobs created
Direct	4.63	39,000
Supply chain	3.05	25,000
Employee spending	1.27	11,000
Tourism	8.47	69,000
Total	17.42	144,000

Source: (IATA, 2019)

The indicator Revenue tonne kms from the AERO-MS is used as a proxy to study the direct effect of aviation taxes on the aviation section in Ireland. Revenue tonne km (RTK) is the product of total tonnes of cargo and passengers transported in a year and the total kms of flight. These are compared with GDP effects resulting from the GINFORS-E model. Table 8-34 shows the impacts for Ireland's GDP of each policy option.

Table 8-34: Impact of policy options on GDP in Ireland

Taxation option	2025		2030		2050	
	RTK	GDP	RTK	GDP	RTK	GDP
Baseline (billion tonne-km, € billions 2015)	2.86	366	3.09	412	4.32	584
Fuel taxation of €0.33 per litre for Intra EEA	-6.5%	-0.04%	-6.0%	-0.04%	-4.8%	-0.03%
Fuel taxation of €0.33 per litre for Intra EEA, 10 years transition	-1.5%	-0.01%	-4.4%	-0.03%	-4.8%	-0.03%

192 Office, C. S. (2021, 2 2). *Quarterly National Accounts*. Retrieved from Central Statistics Office: https://www.cso.ie/en/releasesandpublications/er/na/quarterlynationalaccountsquarter42018/

193 Originally reported in dollars. Values are converted to euros using conversion rate of 0.8475.

Taxation option	2025		2030		2050	
	RTK	GDP	RTK	GDP	RTK	GDP
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	-8.8%	-0.04%	-8.5%	-0.05%	-8.1%	-0.04%
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	-8.4%	-0.05%	-8.1%	-0.07%	-7.9%	-0.06%
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	-6.8%	-0.04%	-6.5%	-0.05%	-6.4%	-0.04%
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10	-2.0%	-0.01%	-5.9%	-0.04%	-6.8%	-0.04%

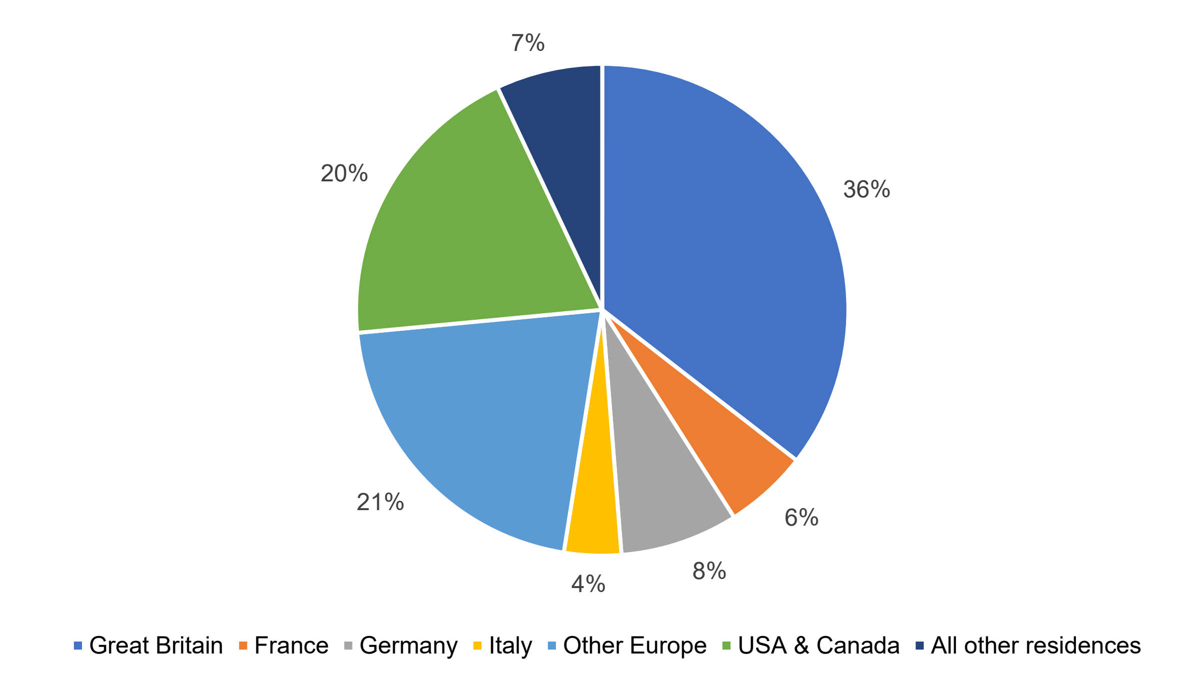
Source: AERO-MS (RTK) and GINFORS-E (GDP)

Overall, the impact on GDP in Ireland is lower than the average in EU across all the scenarios. A decrease in the demand for flights is normally compensated with an increase of demand for other means of transport, which in turn compensates the decrease in GDP from the aviation sector.

8.7.2.3 Effect of an aviation tax on the tourism industry

Out of all the visitors to Ireland in 2019, 36% were from Great Britain followed by 34% that are from European countries excluding Great Britain. International visitors other than European countries comprise 27% of tourists visiting Ireland.

Figure 8-10: Share of tourists in Ireland in 2019 by country of origin



Source: Central Statistics Office[194]

Because of its insular nature, Ireland depends heavily on air transport for passenger travel to other countries. The only exception being UK, whose Northern Ireland shares a border with Ireland. This heavy reliance on air travel makes the tourism and hospitality industry vulnerable to the changes in the air fares of the flights from and to Ireland. The first step in analysing the effect of air fuel tax or ticket tax is to study the existing data corresponding to the tourism industry. This data is then linked to the results of AERO MS model to calculate the effects of policy options in terms of reduced tourists and expenditure. Table 8-35 summarizes relevant tourism and travel industry related information available from the Central Statistics Office.

Table 8-35 Tourism and travel related data for the year 2019

Tourists to Ireland	Tourists trips as a % of total trips	Expenditure by visitors (€ million)	Average Expenditure per incoming trip (€)
5,216,000	56%	5101	978

Source: Statistics Central Office, Tourism and Travel

Table 8-36 shows the results of calculations performed using results of AERO MS model and 2019 tourism and travel related data under the following assumptions:

1) The proportion of tourists visiting Ireland out of total passengers handled by the airports remains the same throughout the period of study
2) The response level to the policy change is same for all categories of the people visiting Ireland

[194] Office, C. S. (2021, 02 02). *Tourism and Travel*. Retrieved from Central Statistics Office: https://www.cso.ie/en/statistics/tourismandtravel/tourismandtravel/

Table 8-36 Effects of taxation options on tourism (prices 2018)

Taxation option	2025		2030		2050	
	Number of tourists	Expenditure	Number of tourists	Expenditure	Number of tourists	Expenditure
Baseline (million pax / million EUR)	6.10	5,963	6.58	6,432	9.32	9,117
Fuel taxation of €0.33 per litre for Intra EEA	-6.9%	-412	-6.4%	-382	-5.0%	-299
Fuel taxation of €0.33 per litre for Intra EEA	-1.6%	-94	-4.7%	-280	-5.0%	-299
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	-9.6%	-569	-9.2%	-550	-8.9%	-531
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	-14.1%	-841	-13.7%	-815	-13.3%	-790
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	-11.2%	-667	-11.2%	-669	-11.0%	-657
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10	-2.6%	-152	-7.7%	-462	-9.1%	-542

8.7.2.4 Effect of an aviation tax on the good traded with aviation as means of transport

Because of its insular nature, road freight transport is limited to Northern Ireland. Out of the 280 million tonnes of freight had been moved in 2019, around 55% of the freight movements took place withing the national boundary whereas 9.5% was between UK and Ireland. In addition, 16% of freight transport was between EU (excluding the UK) and Ireland, and 20% was with other international countries. Table 8-37 illustrates the total freight movements (in tonnes) in 2019 by mode of transport.

Table 8-37: Total freight movement for the year 2019 in tonnes

Mode	International	EU28 (Excl. Ireland)	United Kingdom
Road	5,968,000	5,950,000	5,411,000
Air	138,171	70,100	41,400
Maritime	48,842,000	39,455,000	20,989,000

Out of the entire international freight transport volume in Ireland, air transport represents is a small 0.2% with most of the freight volume (86%) handled by ports around Ireland. Though the cargo handled by aviation sector is only 0.2% by mass, this constitutes 35%[195] of total exports/imports of Ireland in terms of value of goods handled. The total value of imports for the year 2019 is €226 billion[196] and the total value of exports is €489 billion[197], with total value of externally traded merchandise equalling €715 billion.

Goods transported by air transport are essentially chemicals (64% in value) and machinery equipment (25% in value) (Brass & Mudaliar, 2020). Chemicals comprise mainly pharmaceutical products like test samples and other short living product that are sensitive to the time in transit and require fast means of transport. Machinery equipment involve high end products that are required on time for the assembly.

Most of Ireland's international air-cargo is carried in the hold of passenger aircraft. However, not all carriers provide a cargo service, which means that there is less choice in terms of frequency and range of locations served for cargo services than is the case for passenger services (Department for Transport, Tourism and Sport, 2015). Table 8-38 indicates the effect on freight transport costs. Since only high value commodities tend to be transported by air, the ad valorem transport costs of these commodities is expected to be very small. This means that even if transport costs increase significantly, the final impact on the commodity price would be marginal.

Table 8-38: Price per freight tonne km in Ireland (constant prices, base 2019)

Taxation option	2025	2030	2050
Baseline (EUR)	0.47	0.50	0.54
Fuel taxation of €0.33 per litre for Intra EEA	3.4%	3.1%	2.4%
Fuel taxation of €0.33 per litre for Intra EEA	0.7%	2.2%	2.4%
Ticket tax for EEA departures: €10.43 / Cargo: €0.10 per t-km	16.2%	15.1%	14.0%
Intra EEA: €10.12; Extra EEA: €25.30/€45.54 / Cargo: €0.10 per t-km	16.2%	15.1%	14.0%
<350km: €25.30; >=350 km: €10.12 / Cargo: €0.10 per t-km	16.2%	15.1%	14.0%

195 Department of Transport, T. a. (2015). *A National Aviation Policy for Ireland.*

196 Office, C. S. (2019). *TSA07 - Value of Merchandise Imports by Main Use*. Retrieved from data.cso.ie: https://data.cso.ie/

197 Office, C. S. (2021, March 2). *TSM08 - Value of Merchandise Exports*. Retrieved from data.cso.ie: https://data.cso.ie/

Taxation option	2025	2030	2050
Intra EEA: FT €0.33 / Extra EEA: TT €10.43 + Cargo €0.10	3.2%	10.2%	12.8%

8.7.2.5 Conclusion

Overall, the analysis above indicates that the fuel tax of €0.33 per litre for Intra EEA with a 10 year transition period is the option with the least negative impacts on the Irish economy.

Compared to other case studies, the economy of Ireland is more diversified and relies less on tourism. At the same time, the level of air travel with Great Britain is equivalent to that with EEA Member States, which means that Ireland would be less impacted by a fuel tax for intra-EEA flights compared to other EEA countries.

9 External review

The proposal for this study included a proposal for two main external reviewers, plus one backup. Unfortunately, one of the main reviewers (Anna-Alexandra Marhold, Assistant Professor at the Leiden Law School) has indicated that she is no longer available, given other work commitments through the rest of 2020.

Given this, we have established contacts with the other main reviewer and the backup reviewer. These reviewers are:

- Kenneth J. Button, Professor of Public Policy at the George Mason Schar School of Policy and Government. Professor Button will be the main external reviewer in the field of aviation policy.
- Andreas Hardeman, an independent consultant. Mr. Hardeman will bring expertise in both policy and regulatory issues.

The external reviewers provided comments and a critical review of the approach and methodology and the scale and scope of the activities planned in the inception report. This was shared with the Commission. The external reviewers then provided a critical review of the validity, relevance and adequacy of the findings, conclusions and recommendations in the draft final report. The results of that review have been taken into consideration in the development of this final report.

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Annexes

A1 Legal Analysis

A1.1 Introduction

The legal analysis covered the legal framework currently in place and contributed to the following parts of the report: the problem analysis (Section 2.1); the feasibility of the proposed policy options, sub-options and measures to ensure their effectiveness under current legislation (Section 3); an assessment of the potential legal consequences of the interventions (Section 6).

The list of relevant legislation and related documents has been identified for review as part of this task (see Table 10-1 below).

The objective of this section is to draw attention to the provisions in international and European law that could serve as the legal basis for the adoption of taxes on the air transport sector in the European Union, as well as the provisions that could form a legal obstacle to the taxation of the air transport sector. Moreover, this section draws the attention to the provisions in Member States' legislation and EU law that could interact with proposals for new taxes on the aviation sector.

Table 10-1: Literature for legal analysis

Scope	Relevant legislation
Relevant EU legislation in the field of taxes and civil aviation	EU Energy Taxation Directive 2003/96 General Arrangements for Excise Duty Directive 2008/118 VAT Directive, 2006/112/EC Air services Regulation 1008/2008 Airport charges Directive 2009/12 Implementing Regulation (EU) 2019/317 (performance and charging scheme) EU competition law and State aid rules Freedom of establishment and freedom to provide services under the Treaty on the Functioning of the EU (TFEU)
Regulations for carbon pricing or offsetting schemes	EU ETS Directive, 2003/87/EC Directive 2008/101/EC on EU ETS for aviation Regulation (EU) 2017/2392 on EU ETS for aviation ICAO's Resolutions A38-18 and A40-19 on CORSIA; CORSIA SARPs ('standards and recommended practices') and implementation elements
International aviation law	Convention on International Civil Aviation ('Chicago Convention') Relevant ICAO resolutions and policies Bilateral, horizontal and comprehensive air services agreements

A1.2 European Union legal framework and legal basis for adopting harmonised taxes on the aviation sector

Proposals for new harmonised taxes on the aviation sector would require an appropriate legal basis (A1.2.1). In order for the EU to be able to adopt these proposals, action at the EU level would need to comply with the proportionality and subsidiarity principles (A1.2.2). Moreover, the proposals would need to be in line with EU primary law (A1.2.3). Finally, the interactions between such proposals and the existing legal frameworks that apply to taxation and the aviation sector would need to be clarified (A1.2.4 to A1.2.7).

A1.2.1 Legal basis for tax harmonization[198]

Two main provisions in the Treaty on the Functioning of the European Union (TFEU) provide for the legal basis for the harmonisation of tax provisions. Article 113 of the TFEU is the legal basis for the harmonization of 'legislation concerning turnover taxes, excise duties and other forms of indirect taxation'. Regarding other taxes, Article 115 of the TFEU serves as the legal basis for adopting EU legislation.

Article 192(2) of the TFEU could also serve as the legal basis for the harmonisation of environmental tax measures[199.]

A1.2.2 Proportionality and subsidiarity principles (Article 5 of the Treaty on European Union (TEU))

If the Union exercises its competences in the field of tax, it should do so in accordance with the subsidiarity and proportionality principles (article 5, para. 3 and 4 of the TEU)[200]. The principle of subsidiarity requires the Union to '*act only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States, either at central level or at regional and local level, but can rather, by reason of the scale or effects of the proposed action, be better achieved at Union level*' (article 5, §3 TEU).

The principle of proportionality requires the content and form of Union action not to '*exceed what is necessary to achieve the objectives of the Treaties*' (article 5, para § 4 TEU).

Whether proposals in favour of new harmonised taxes on the aviation sector will comply or not with the subsidiarity and proportionality principles will need to be assessed on a case-by-case basis. Indeed, compliance with the subsidiarity and proportionality principles will depend on the specific design features and objectives of the proposed policy measures.

For example, a modification to the Energy Taxation Directive requiring Member States to impose a minimum tax on fuel supplied to aircraft operating domestic and intra-EU flights would likely comply with both the subsidiarity and proportionality principles. The cross-border nature of the externalities linked to the aviation sector and its impact on climate change justifies the need and the relevance of action at the EU level. A minimum degree of coordination is justified in the light of the practical obstacles that prevent Member States from unilaterally adopting energy taxes on the supply of aviation fuel, including the practice of fuel tankering by air carriers and risks related to the international competitiveness of airports, the carriers operating there and the territories they serve.

A proposal for a harmonised ticket tax would also, most likely, comply with the proportionality and subsidiarity principles but, potentially, on different grounds. Clear added value would derive from EU action in comparison to action at the Member State level as national policies could lead to a fragmentation of the internal market. Harmonisation at the EU level would instead contribute to achieving a minimum degree of coordination to avoid the risks that domestic action leads to very different levels of air ticket taxes (e.g. by ticket class, in relation to transit/transfer journeys, etc.) across the EU.

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198 On this, see 'Better Regulation Toolbox 5', available at https://ec.europa.eu/info/sites/info/files/file_import/better-regulation-toolbox-5_en_0.pdf

199 See Commission in European Commission, Communication from the Commission to the European Parliament, the European Council and the Council, Towards a more efficient and democratic decision making in EU tax policy, 15 January 2019, COM(2019) 8 final; European Commission, Communication from the Commission to the European Parliament, the European Council and the Council, A more efficient and democratic decision making in EU energy and climate policy, 9 April 2019, COM(2019) 177 final. See also article 48(7) of the TFEU.

200 See also the Protocol (No 2) on the application of the principles of subsidiarity and proportionality.

A1.2.3 EU primary law

Secondary EU law should comply with EU primary law. Therefore, proposals for a harmonised minimum fuel tax or ticket tax should be designed in line with EU primary law, including EU State aid law and the EU free movement provisions[201]. With regard to the taxation of the aviation sector, it is worth noting the case-law of the Court of Justice on the Irish air travel tax[202]. This case-law highlights that differentiated tax rates applicable to flight destinations within a certain distance from a given airport can, under certain circumstances, constitute State aid.

A1.2.4 Energy taxation directive (2003/96/EC) and the general arrangements for excise duty directive (2008/118/EC)

These directives provide the regulatory framework for the adoption of excise duties on energy products and electricity. Directive 2003/96/EC specifically concerns the taxation of energy products and electricity. Directive 2008/118/EC, as its name indicates, provides for the general rules that apply to excise duty legislation within the EU.

According to article 14, para. 1(b) of the energy taxation directive, '*energy products supplied for use as fuel for the purpose of air navigation other than in private pleasure-flying*' shall be exempted from taxation by Member States. However, Article 14, para.1(b) also states that '*Member States may limit the scope of this exemption to supplies of jet fuel (CN code 2710 19 21)*'. Moreover, article 14 para. 2 indicates that '*Member States may limit the scope of the exemptions (….) to international and intra-Community transport. In addition, where a Member State has entered into a bilateral agreement with another Member State, it may also waive the exemptions (…). In such cases, Member States may apply a level of taxation below the minimum level set out in this Directive*'.

In case a new harmonised minimum tax was proposed on fuel supplied for the purpose of air navigation for domestic and intra-EU flights, Article 14 of the Energy Taxation Directive (ETD) would need to be modified.

A1.2.5 EU ETS Directive (2003/87/EC)

Although the EU ETS does not qualify as a tax[203], it is a carbon pricing policy used to internalise the greenhouse gas emissions of different sectors, including the aviation sector. Therefore, interactions could arise between the EU ETS and new environmental tax measures on the air transport sector, unless these two policy measures are applied concurrently[204].

The Commission is currently assessing potential revisions to the EU ETS Directive, in particular as it applies to aviation. At the moment, the scope of the EU ETS is restricted to intra-EEA flights (domestic and international), through the 'stop the clock' derogation that was introduced in 2013 in response to the progress being made in ICAO on the development of a global market-based measure

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[201] On the impact of EU primary law on EU secondary law and Member States' law in the context of energy and environmental taxation, see Alice Pirlot, 'Exploring the Impact of EU Law on Energy and Environmental Taxation', in: C. HJI Panayi, W. Haslehner, E. Traversa (Eds.), Research Handbook in European Union Taxation Law (2020) Cheltenham, UK, in particular section 3, available on SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3473726

[202] *See* See CJEU, European Commission v. Aer Lingus, 21 December 2016, joined cases C-164/15 P and C-165/15 P; General Court, Aer Lingus v. Commission, 5 February 2015, T-473/12.

[203] See the Opinion of Advocate General Kokott delivered on 6 October 2011 (in particular at para. 215) in the following case: CJEU, *Air Transport Association of America and Others*, 21 December 2011, C-366/10.

[204] On the interactions between the EU ETS and the energy taxation directive, see Alice Pirlot, 'Exploring the Impact of EU Law on Energy and Environmental Taxation', in: C. HJI Panayi, W. Haslehner, E. Traversa (Eds.), Research Handbook in European Union Taxation Law (2020) Cheltenham, UK, in particular section 3, available on SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3473726*,* section 2.3.

(MBM)[205]. In 2017, this derogation was extended to 2023 in recognition of the agreement at the 2016 ICAO Assembly on the implementation of a global market-based measure from 2021 to offset international aviation emissions above 2020 levels[206]. In the absence of any further amendment, the EU ETS will revert to its initial geographical scope (applying to all flights departing from, or arriving at, EEA airports) from 2024. The Commission's assessment includes a range of options on ways to implement CORSIA through the EU ETS directive.

A1.2.6 VAT Directive (2006/112/EC)

The VAT Directive contains several provisions that can have an impact on the taxation of the air transport sector by the Member States.

First, Article 148 of the Directive provides that '*Member States shall exempt the following transactions: (…) (e) the supply of goods for the fueling and provisioning of aircraft used by airlines operating for reward chiefly on international routes; (f) the supply, modification, repair, maintenance, chartering and hiring of the aircraft referred to in point (e), and the supply, hiring, repair and maintenance of equipment incorporated or used therein; (g) the supply of services, other than those referred to in point (f), to meet the direct needs of the aircraft referred to in point (e) or of their cargoes*'[207]. There is some case-law as to the definition of '*airlines operating for reward chiefly on international routes*'[208].

Second, the VAT Directive provides that the '*transport of passengers and their accompanying luggage'* might benefit from reduced rates or from standstill exemptions[209]. It is worth noting that the Commission has proposed to amend the VAT directive as regards the provisions that apply to VAT rates[210]. These amendments, if they are adopted, would give Member States more leeway in how they apply reduced rates and the exemption with deductibility of the VAT paid at the preceding stage.

These provisions would not affect the adoption of a new harmonised minimum tax on fuel supplied. However, they might interact with proposals in favour of new harmonised ticket taxes. In addition to the adoption of a new, ad hoc, ticket tax, the EU could consider reviewing the VAT provisions on the taxation of the transport of passengers.

A1.2.7 Air Services Regulation (1008/2008), Airport Charges Directive (2009/12/EC) and Commission Implementing Regulation (EU) 2019/317 (laying down a performance and charging scheme in the single European sky)

Some specific regulations and directives related to the aviation sector might also interact with new taxes that would be adopted on the air transport sector. For example, according to article 23 of Regulation 1008/2008 (the Air Services Regulation), '*(…) The final price to be paid shall at all times*

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[205] See Decision No 377/2013/EU of the European Parliament and of the Council of 24 April 2013 derogating temporarily from Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, OJ L 113, 25 April 2013, pp. 1-4; Regulation (EU) No 421/2014 of the European Parliament and of the Council of 16 April 2014 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in view of the implementation by 2020 of an international agreement applying a single global market-based measure to international aviation emissions, OJ L 129, 30 April 2014, pp. 1-4.

[206] Regulation (EU) 2017/2392 of the European Parliament and of the Council of 13 December 2017 amending Directive 2003/87/EC to continue current limitations of scope for aviation activities and to prepare to implement a global market-based measure from 2021, OJ L 350, 29 December 2017, pp. 7-14.

[207] See also Article 169(b) of Directive 2006/112, which ensures the right for deduction.

[208] CJEU, *Cimber Air A/S v. Skattenministeriet,* 16 September 2004, C-383/02; CJEU, *A Oy,* 19 July 2012, C-33/11. See also James D. Walker, Harmonization of the EU 'Zero Rate for Airlines' (2013) International VAT Monitor pp. 287-293.

[209] See, for the provisions on reduced rates, Article 98 of the VAT Directive as well as Annex III, point (5) and, for the provisions on the standstill exemption, Article 371 of the VAT Directive as well as Annex X, Part B, point 10

[210] Proposal for a Council Directive amending Directive 2006/112/EC as regards rates of value added tax, 18 January 2018, COM(2018) 20 final.

be indicated and shall include the applicable air fare or air rate as well as all applicable taxes, and charges, surcharges and fees which are unavoidable and foreseeable at the time of publication'. Article 23 compels carriers to specify, in addition to the indication of the final price, at least a number of component parts of the final price. Taxes are one of the items to be specified, i.e. in the event they have been added to the air fare or air rate.

The Airport Charges Directive 2009/12/EC is unlikely to be relevant to taxes on the air transport sector. Indeed, taxes do not qualify as 'airport charges', which are defined as levies '*collected for the benefit of the airport managing body and paid by the airport users for the use of facilities and services, which are exclusively provided by the airport managing body and which are related to landing, take-off, lighting and parking of aircraft, and processing of passengers and freight'* (Article 2(4) of the airport charges directive). Similarly, the provisions of the Commission Implementing Regulation on performance and charging scheme are not directly relevant given that air navigation charges do not qualify as taxes[211].

A1.3 Potential legal obstacles to introducing harmonised indirect taxes on the aviation sector

A number of legal provisions put limits on the introduction of taxes on the air transport sector. They are listed below[212].

A1.3.1 Chicago Convention (the Convention on International Civil Aviation)

The Chicago Convention contains two provisions that deal with tax matters, namely articles 15 and 24. Article 15 prevents members from adopting '*fees, dues or other charges (. . .) in respect solely of the right of transit over or entry into or exit from its territory of any aircraft of a contracting State or persons of property thereon*'[213]. According to some authors, this provision could prevent the adoption of air transport taxes and ticket taxes if they are considered to be paid 'solely to obtain the right to exit from the territory' of the taxing state[214]. However, case-law in some Member States suggests that that ticket taxes do not violate this provision[215].

Article 24 prevents signatories from imposing taxes on '*fuel, lubricating oils, spare parts, regular equipment and aircraft stores on board an aircraft of a contracting State, on arrival in the territory of another contracting State and retained on board on leaving the territory of that State*'[216]- Article 24 does not prevent signatories of the Chicago Convention from taxing fuel that is loaded into aircraft on their territory.

As such, neither article 15 nor article 24 of the Chicago Convention prevent the adoption of a harmonised minimum tax on the supply of fuel. Similarly, these two provisions do not, in principle,

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211 See, for example, article 32 on the modulation of air navigation charges of Commission Implementing Regulation (EU) 2019/317 of 11 February 2019 laying down a performance and charging scheme in the single European sky and repealing Implementing Regulations (EU) No 390/2013 and (EU) No 391/2013, OJ L 56, 25 February 2019, pp. 1-67.
212 In addition to the provisions listed below, other agreements could also have an impact on the taxation of the air transport sector, such as WTO agreements and the Energy Charter Treaty. They are not analysed in detail here, but they should still be considered. Both WTO agreements as well as the energy charter includes non-discrimination provisions, which could have an impact on the design of new tax measures on the aviation sector.
213 Article 15, last paragraph of the Convention on International Civil Aviation ('Chicago Convention'), signed on 7 December 1944, Doc. 7300/9, Ninth edition, 2006. The French and Spanish versions contain a clear reference to 'taxes' and 'impuestos' in the last paragraph of article 15 of the Convention. The English version solely refers to 'fees, dues or other charges'.
214 For a more detailed discussion of the legal arguments, see Uwe Erling, 'The German Air Transport Tax: A Treaty Override of International Law' (2015) 10(2) *FIU Law Review* 467-92; Brian F. Havel & Niels van Antwerpen, *Dutch Ticket Tax and Article 15 of the Chicago Convention* (2009) 34(2) Air and Space Law, pp. 141-146; Brian F. Havel & Niels van Antwerpen, *Dutch Ticket Tax and Article 15 of the Chicago Convention (Continued)* (2009) 34(6) Air and Space Law, pp. 447-451; Robert Lawson, *UK Air Passenger Duty held to be Consistent with the Chicago Convention* (2008) XXXIII(1) Air & Space Law, pp. 3-9.
215 See CE Delft, A study on aviation ticket taxes, November 2018.
216 Article 24(a) of the Chicago Convention.

prevent the adoption of a non-discriminatory harmonised ticket tax. However, one should be aware that ticket taxes might be controversial under article 15 of the Chicago Convention (for the reasons mentioned above). Moreover, they might be controversial under article 24 of the Chicago Convention if they are designed in such a way that they can be assimilated to a tax on the fuel on board an aircraft.

A1.3.2 ICAO resolutions

The International Civil Aviation Organization (ICAO) encourages its members to follow recommendations on the taxation of the aviation sector.

First, with respect to the taxation of fuel, lubricants and other consumable technical supplies, the ICAO Council resolution on taxation of international air transport encourages states to exempt fuel, lubricants and other consumable technical supplies such as hydraulic and cooling fluids from taxation[217]. This goes beyond Article 24 of the Chicago Convention: fuel, lubricants and other consumable technical supplies on board upon arrival should be exempt, '*so long as they are not offloaded' and they 'can be consumed without any obligation that they or their equivalent be 'retained on board on leaving the territory' of the State granting the exemption*'[218]. Moreover, the Council resolution also '*provides for exemption or refund for the fuel, lubricants and other consumable technical supplies taken on board at the final international airport of call in a customs territory of a State, whether or not such airport is located at the border of the customs territory'*[219].

Second, with respect to taxes related to the sale or use of international air transport, the ICAO Council resolution on taxation of international air transport encourages states to eliminate '*all forms of taxation on the sale or use of international transport by air, including taxes on gross receipts of operators and taxes levied directly on passengers or shippers*'[220].

Third, the ICAO Council issued a specific resolution on environmental charges and taxes in 1996, which supports the adoption of '*environmental charges'* over '*environmental taxes'*[221]. In contrast to charges (supposed to be reallocated to the aviation sector), taxes generate '*general national and local governmental revenues that are applied for non-aviation purposes*'[222].

The more recent statements of the ICAO Assembly remain in line with the past approach of the ICAO Council. The Assembly plans to address the climate impact of the sector by means of a global market-based mechanism (GMBM), not through taxation[223]. Established in 2016, this 'Carbon

[217] See ICAO's Policies on Taxation in the Field of International Air Transport, Approved by the Council on 24 February 1999, 3rd edtn (2000), Doc. 8632, Council Resolution on Taxation of International Air Transport (hereafter: ICAO Council Resolution on Taxation of International Air Transport), available at https://www.icao.int/publications/Documents/8632_3ed_en.pdf. See in particular clause 1, a) i).
[218] ICAO Council Resolution on Taxation of International Air Transport, Commentary on Council Resolution, Taxes on fuel, lubricants or other consumable technical supplies, para. 2, available at https://www.icao.int/publications/Documents/8632_3ed_en.pdf.
[219] ICAO Council Resolution on Taxation of International Air Transport, clause 1, a) ii) Note that clause 1a) iii) extends that exemption when an aircraft engaged in international air transport 'takes successive stops at two or more international airports in a single customs territory'.
[220] ICAO Council Resolution on Taxation of International Air Transport, see in particular clause 3.
[221] Council Resolution on Environmental Charges and Taxes adopted by the Council on 9 December 1996 at the 16th Meeting of its 149th Session, available at https://www.icao.int/sustainability/Pages/eap-im-levies.aspx.
[222] ICAO Council Resolution on Taxation of International Air Transport, see preamble.
[223] See ICAO, Assembly Resolutions in Force (as of 4 October 2013), Resolution A18-18 ICAO, Consolidated Statement of Continuing ICAO Policies and Practices Related to Environmental Protection—Climate Change, para. 18, available at https://www.icao.int/sustainability/Documents/A38-Res_10022_en.pdf. See also Consolidated Statement of Continuing ICAO Policies and Practices Related to Environmental Protection—Climate Change, A37-19, available at https://www.icao.int/ sustainability/Documents/A37-Env-Resos-9958.pdf.

Offsetting and Reduction Scheme for International Aviation (CORSIA)' will enter into a pilot phase as of 2021. EU Member States will take part to this voluntary phase, subject to the differences filed[224].

The interactions between the EU ETS and CORSIA will be clarified in the revision of the EU ETS Directive[225]. Similarly, the potential interactions between the mechanism of CORSIA and other market-based instruments adopted by ICAO contracting states remain unclear.

Although the ICAO has been recognized an important role in the mitigation of the climate impact of international civil aviation[226], countries remain free to adopt instruments to pursue that objective at the domestic and regional levels. Against this background, several ICAO contracting states, including Austria, France, Iceland, the United Kingdom, the Netherlands, Norway and Switzerland, have notified the ICAO that they have adopted or are considering adopting economic instruments, including taxes, so as to internalize the environmental impact of the aviation sector[227].

In summary, ICAO recommendations do not form a strict obstacle to the adoption of new harmonised minimum tax on fuel or ticket tax at the EU level. In some cases, however, they might be integrated into air services agreements, which will give them binding legal effect (see next section, A1.3.3).

A1.3.3 Aviation agreements: bilateral, horizontal and comprehensive

A1.3.3.1 Types of air services agreements

Air services agreements are agreements establishing the conditions covering air services between the agreeing states. Over the years, EU Member States have concluded a large number of **bilateral air services agreement** (BA) with third countries.

A **horizontal agreement** (HA) is an 'international agreement negotiated by the European Commission on behalf of EU Member States, in order to bring all existing bilateral air services agreements between EU Member States and a given third country in line with EU law'[228]. The European Commission has started negotiating HAs in 2003 following a judgement by the Court of Justice of the European Union (CJEU) which concluded that limitations on the designation of airlines to airlines owned and controlled by nationals was discriminatory and contrary to EU law[229]. Moreover,

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[224] See Council decision (EU) 2018/2027 of 29 November 2018 on the position to be taken on behalf of the European Union within the International Civil Aviation Organization in respect of the First Edition of the International Standards and Recommended Practices on Environmental Protection – Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), OJEU, L 325, 20 December 2018, pp. 25-28; Council Decision (EU) 2020/954 of 25 June 2020 on the position to be taken on behalf of the European Union within the International Civil Aviation Organization as regards the notification of voluntary participation in the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) from 1 January 2021 and the option selected for calculating aeroplane operators' offsetting requirements during the 2021-2023 period, OJ L 212, 3 July 2002, pp. 14-17

[225] See article 28(b) inserted in Directive 2003/87/EC by Regulation (EU) 2017/2392 of the European Parliament and of the Council of 13 December 2017, OJ L 350, 29 December 2017, pp. 7-14. See also European Commission, Inception Impact Assessment, Revision of the EU Emission Trading System Directive 2003/87/EC concerning aviation, Ref. Ares(2020)3515933, 3 July 2020, https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12494-Revision-of-the-EU-Emission-Trading-System-Directive-concerning-aviation-. On this topic, see Sven Maertens, Wolfgang Grimme, Janina Scheelhaase & Martin Jung, 'Options to Continue the EU ETS for Aviation in a CORSIA-World' (2019) 11(20) Sustainability, p. 5703.

[226] See Article 2(2) of the Kyoto Protocol, which states as follows: 'the Parties (…) shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization and the International Maritime Organization, respectively'. Under EU law, the effect of this provision seems limited given its lack of direct effect (CJEU, *Air Transport Association of America and Others*, 21 December 2011, C-366/10, paras. 73-78).

[227] ICAO's Policies on Taxation in the Field of International Air Transport, 3rd edtn, 2000, Supplement (January 2013) to Doc 8632, available at https://www.icao.int/publications/Documents/ 8632_cons_sup_en.pdf.

[228] European Commission, Mobility and Transport, External Aviation Policy – Horizontal Agreements, available at https://ec.europa.eu/transport/modes/air/international-aviation/external-aviation-policy/external-aviation-policy-horizontal_en

[229] See CJEU, *Commission v. United Kingdom,* C-466/98, 5 November 2002; CJEU, *Commission v. Kingdom of Denmark,* C-467/98, 5 November 2002; CJEU, *Commission v. Kingdom of Sweden*, C-468/98, 5 November 2002; CJEU, *Commission v. Republic of Finland,* C-469/98, 5 November 2002; CJEU, *Commission v. Belgium,*

the Court also found that the EU had exclusive competences to conclude agreements in certain areas, such as the allocation of slots at Community airports and computerised reservation systems[230]. In the case of HAs, the Commission acts on a mandate from EU Member States and the concluded HAs amend 'relevant provisions of all existing BAs in the context of a single negotiation with a third country'[231]. Member States can also choose to start bilateral negotiations with third countries in order to amend each BA that would otherwise not comply with EU law.

The Council may grant the European Commission an authorisation for negotiating a **comprehensive air transport agreement** (CATA). When it enters into force, a CATA replaces all the BAs concluded by EU Member States with a specific third country or group of countries,[232] although any rights in the BA that exceed those provided for in the CATA may be grandfathered.

The following sections provide an overview by type of air services agreements with a view of identifying potential legal obstacles to the adoption of harmonised indirect taxes on the aviation sector, especially in relation to taxes on fuel supplied to EU and no-EU carriers operating intra-EU flights[233].

A1.3.3.2 Horizontal and comprehensive agreements

The EU has concluded horizontal and comprehensive agreements with a large number of third countries[234] and reports that horizontal agreements have been concluded with '41 countries and one regional organisation with eight Member States, representing an additional 670 bilateral agreements'[235].

In many cases, HAs guarantee Member States' ability to introduce taxes on fuel supplied for in their territory for use in an aircraft operating intra-EU flights. This is the case when HAs include a provision in line with the one contained in the EU model agreement (Article 4 on the taxation of aviation fuel).[236] This provision states as follows:

> '1. The provisions in paragraph 2 of this Article shall complement the corresponding provisions in the articles listed in Annex 2(d).
> 2. Notwithstanding any other provisions to the contrary, nothing in each of the agreements listed in Annex 2(d) shall prevent a Member State from imposing, on a non-discriminatory

C-471/98, 5 November 2002; CJEU, *Commission v. Luxembourg,* C-472/98, 5 November 2002; CJEU, *Commission v. Austria,* C-475/98, 5 November 2002; CJEU, *Commission v. Federal Republic of German,* C-476/98, 5 November 2002. See also Commission of the European Communities, Communication from the Commission on the consequences of the Court judgements of 5 November 2002 for European air transport policy, 19 November 2002, COM(2002) 649 final; Regulation (EC) No 847/2004 of the European Parliament and of the Council of 29 April 2004 on the negotiation and implementation of air service agreements between Member States and third countries, OJ L 157, 30 April 2004, pp. 7-17. See also Frank Hoffmeister, 'Bilateral Air Transport Agreements between Several EU Member States and the United States (Open Skies) - Right to Establishment under European Law - External Competence of the European Community' (2004) 98 AM. J. INT'l L. 567-572.

[230] See the cases mentioned above.

[231] European Commission, Mobility and Transport, External Aviation Policy – Horizontal Agreements, available at https://ec.europa.eu/transport/modes/air/international-aviation/external-aviation-policy/external-aviation-policy-horizontal_en

[232] European Commission, Mobility and Transport, International Aviation, https://ec.europa.eu/transport/modes/air/international_aviation_en

[233] This question had already been discussed in 2005 by the Commission. See Communication from the Commission to the Council, the European Parliament, the European Economic and Social committee and the Committee of the Regions - Reducing the Climate Change Impact of Aviation {SEC(2005) 1184}.

[234] See the list on this website: European Commission, Mobility and Transport, Status of aviation relations by country, available at https://ec.europa.eu/transport/modes/air/international_aviation/country_index_en

[235] European Commission, Mobility and Transport, External Aviation Policy – Horizontal Agreements, available at https://ec.europa.eu/transport/modes/air/international-aviation/external-aviation-policy/external-aviation-policy-horizontal_en

[236] Among others, see Article 4(2) of the Agreement between the European Community and the Republic of Azerbaijan on certain aspects of air services (see Council Decision of 8 November 2005, OJ EU, L 265/24, 9 October 2009). See also Article 4(2) of the Agreement between the European Community and New Zealand on certain aspects of air services, OJ L 184, 6 July 2006, pp. 26-33. For the complete list of agreements including a similar clause, see Table A.1.2.

> basis, taxes, levies, duties, fees or charges on fuel supplied in its territory for use in an aircraft of a designated air carrier of [name of the third country] that operates between a point in the territory of that Member State and another point in the territory of that Member State or in the territory of another Member State.'

Conversely, where horizontal agreements do not contain any provision similar to the one quoted above from the EU model agreement, the applicable regime for fuel taxes is the one established in the existing BAs between Member States and the specific third country[237]. This may include instances in which the supply of aviation fuel is explicitly exempted from taxes, as is the case in the Spain-Ethiopia agreement mentioned in A.1.3.5.3.

Table A.1.1 provides an overview of the HAs concluded between the EU and third countries and their implications for the taxation of fuel supplied to non-EU air carriers operating intra-EU flights.

Table A.1.1 – Horizontal agreements between the EU and third countries[238]

Country	Presence of a clause in the agreement allowing for the taxation of fuel supplied for intra-EU flights
Armenia	✔
Australia	✗
Azerbaijan	✔
Cape Verde	✔
Chile	✔
Georgia	✔
India	✗
Indonesia	✔
Kyrgyzstan	✔
Lebanon	✔
Macao	✔
Malaysia	✔
Maldives	✔
Moldova	✔
Mongolia	✗
Mexico	✗
Nepal	✔
New Zealand	✔
Panama	✔

[237] See, for example, the HA with Australia, India, Mexico, Mongolia, Singapore, Sri Lanka and Vietnam (Agreement between the European Community and the Government of Australia on certain aspects of air services, OJ L 149, 7 June 2008, pp. 65-73; Agreement between the European Community and the Government of the Republic of India on certain aspects of air services, OJ L 273, 15 October 2008, pp. 9-17; Agreement on certain aspects of air services between the European Union and the United Mexican States, OJ L 38, 12 February 2011, pp. 34-39; Agreement between the European Community and the Government of Mongolia on certain aspects of air services, OJ L 336, 18 December 2009, pp. 5-11; Agreement between the European Community and the Government of the Republic of Singapore on certain aspects of air services, OJ L 243, 6 September 2006, pp. 23-31; Agreement between the European Union and the Government of the Democratic Socialist Republic of Sri Lanka on certain aspects of air services, OJ L 49, 22 February 2013, pp. 2-9; Agreement between the European Union and the Government of the Socialist Republic of Vietnam on certain aspects of air services, OJ L 288, 5 November 2010, pp. 2-9)

[238] This list does not include HAs concluded with countries with which the EU has now concluded a CATA which has entered into force (see, among others, Morocco and the Western Balkans).

Country	Presence of a clause in the agreement allowing for the taxation of fuel supplied for intra-EU flights
Paraguay	✔
Singapore	✗
Sri Lanka	✗
UAE	✔
Ukraine	✔
Uruguay	✔
Vietnam	✗
WAEMU/UEMOA[239]	✔

Source: Ricardo analysis of publicly available HAs concluded between the European Union and third countries or group of countries

In contrast to HAs, CATAs supersede the bilateral agreements that have been concluded by individual Member States with third countries[240]. These agreements include explicit rules on the taxation of aviation fuels. With regard to the taxation of fuel supplied to non-EU air carrier operating intra-EU flights, some CATAs include a specific provision clarifying that they shall not prevent a Party from imposing such taxes. For example, it is worth noting that the agreement with Morocco contains such a provision, stating as follows:

> 'this Agreement does not exempt fuel supplied by a Contracting Party to air carriers within its territory from taxes, levies, duties, fees, and charges similar to those referred to in paragraph 1.(…)'[241].

Another example is to be found in the agreement with Israel. Article 9, paragraph 3 states as follows:

> '3. Nothing in this Agreement shall prevent a Contracting Party from imposing taxes, levies, duties, fees, or charges on fuel supplied in its territory, on a non-discriminatory basis, for use in an aircraft of an air carrier that operates between two points in its territory'[242].

The CATAs with Georgia, Jordan and Moldova also contain similar provisions[243].

CATAs between the EU and Switzerland, as well as the ECAA, include a reference to the ETD, which implies that Member States remain free to tax fuel supplied for use by airlines from those countries on domestic flights. Member States also have the possibility to negotiate bilateral agreements with those

[239] Referring to the West African Economic and Monetary Union
[240] Note, however, that some CATAs provide that 'existing traffic rights security arrangements which originate from the Member States' bilateral agreements or other arrangements, which are not covered under the comprehensive Agreement, or which are more favourable, can continue to be exercised'. See, for example, article 26.1 of the Agreement with Israel. See also Article 26.1 of the Euro-Mediterranean aviation agreement with Morocco, which states as follows: 'The provisions of this Agreement supersede the relevant provisions of existing bilateral agreements between Morocco and the Member States. However, existing traffic rights which originate from these bilateral agreements and which are not covered under this Agreement can continue to be exercised, provided that there is no discrimination between the Member States and their nationals'. See also article 25.1 of the 9(3) of EU-Jordan aviation agreement.
[241] See article 10, (3) of the Euro-Mediterranean aviation agreement between the European Community and its Member States, of the one part, and the Kingdom of Morocco, of the other part OJ L 386, 29 December 2006, pp. 57-88
[242] Article 9, (3) of the aviation agreement between the European Union and the government of the State of Israel, OJ L 208, 2 August 2013, pp. 3-67. See also article 9(3) of EU-Jordan aviation agreement.
[243] Article 10, (3) of the Common Aviation Area Agreement between the European Union and its Member States, of the one part, and Georgia, of the other part, OJ L 321, 20 November 2012, pp. 3-32; Article 9, (3) of the Euro-Mediterranean Aviation Agreement between the European Union and its Member States, of the one part, and the Hashemite Kingdom of Jordan, of the other part, OJ L 334, 6 December 2012, pp. 3-30; Article 10, (3) of the Common Aviation Area Agreement between the European Union and its Member States and the Republic of Moldova, OJ L 293, 20 October 2012, pp. 3-37.

States (Switzerland and Western Balkan States) to tax fuel on flights between them (e.g. to tax fuel on a flight between France and Serbia based on a bilateral agreement between France and Serbia.

For example, the agreement with Switzerland includes an explicit reference to article 14(1)(b) and Article 14(2) of Council Directive 2003/96/EC[244]. Moreover, in the case of Switzerland, it is worth noting that the EU aviation acquis is regularly incorporated in the Swiss legal order by Decisions of the Joint Committee established under the EU-Swiss Air Transport Agreement. With rare exceptions and adaptations, aviation-related acquis is generally accepted by Switzerland and it would be safe to assume that harmonisation might take place should some form of taxation on fuel be introduced and this study has proceeded under that assumption.

Similarly, the European Common Aviation Area (ECAA) agreement between the EU and partners in South-Eastern Europe refers in its Annex to 'applicable legislation' which includes article 14(1)(b) and (2) of the Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity ('ETD', see A.1.2.4).

Finally, some CATAs do not automatically authorise the taxation of fuel supplied for intra-EU flights. For example, article 11 of the air transport agreement between the European Community and its Member States and the USA contains an article on 'customs duties and charges' that significantly limits the power of national authorities and the European Community to impose certain types of taxes on the aviation sector[245]. The first paragraph of this article concerns the exemption of fuel and equipment that remain onboard the aircraft. The second paragraph of this provision on customs duties and charges provides for the exemption of '*fuel, lubricants, and consumable technical supplies introduced into or supplied in the territory of a Party for use in an aircraft of an airline of the other Party engaged in international air transportation, even when these supplies are to be used on a part of the journey performed over the territory of the Party in which they are taken on board*'[246]. Article 11, paragraph 2 of this air transport agreement states as follows (see point (c)):

> '2. There shall also be exempt, on the basis of reciprocity, from the taxes, levies, duties, fees and charges referred to in paragraph 1 of this Article, with the exception of charges based on the cost of the service provided:
> (a) aircraft stores introduced into or supplied in the territory of a Party and taken on board, within reasonable limits, for use on outbound aircraft of an airline of the other Party engaged in international air transportation, even when these stores are to be used on a part of the journey performed over the territory of the Party in which they are taken on board;
> (b) ground equipment and spare parts (including engines) introduced into the territory of a Party for the servicing, maintenance, or repair of aircraft of an airline of the other Party used in international air transportation;
> (c) fuel, lubricants and consumable technical supplies introduced into or supplied in the territory of a Party for use in an aircraft of an airline of the other Party engaged in international air transportation, even when these supplies are to be used on a part of the journey performed over the territory of the Party in which they are taken on board;
> and
> (d) printed matter, as provided for by the customs legislation of each Party, introduced into or supplied in the territory of one Party and taken on board for use on outbound aircraft of an airline of the other Party engaged in international air transportation, even when these stores are to be used on a part of the journey performed over the territory of the Party in which they are taken on board.'

[244] See Annex, point 8 of the Agreement between the European Community and the Swiss Confederation on Air Transport (OJ L 114, 30 April 2002, as later amended).
[245] Air transport agreement between the United States of America and the European Community and its Member States (EU-US air transport agreement), OJ L 134, 25 May 2007, pp. 4 et sequ., as amended.
[246] Article 11(2)(c) of the Air transport agreement between the United States of America and the European Community and its Member States (EU-US air transport agreement), OJ L 134, 25 May 2007, pp. 4 et sequ., as amended.

The agreement concluded with Canada contains similar provisions[247].

The extent to which these provisions will have an impact on the taxation of the air transport sector with regard to domestic or intra-Community flights will depend on each of these agreements. For the air transport agreement with the United States, article 11, (6) states as follows:

> 'In the event that two or more Member States envisage applying to the fuel supplied to aircraft of US airlines in the territories of such Member States for flights between such Member States any waiver of the exemption contained in Article 14(b) of Council Directive 2003/96/EC of 27 October 2003, the Joint Committee shall consider that issue, in accordance with paragraph 4(e) of Article 18'.

Moreover, in addition to the provisions that directly relate to fuel taxation, article 11(5) of the EU-US air transport agreement states as follows:

> 'Nothing in this Agreement shall prevent either Party from imposing taxes, levies, duties, fees or charges on goods sold other than for consumption on board to passengers during a sector of an air service between two points within its territory at which embarkation or disembarkation is permitted'[248].

Regarding the EU-Canada Air Transport Agreement, a declaration by the European Community and its Member States indicates that the Agreement '*does not provide for the exemption from value added tax (VAT), with the exception of turnover tax on imports, and does not preclude Member States from taxing aviation fuel for domestic or intra-Community flights in line with Council Directive 2003/96/EC*'[249].

At the time of writing, the latest EU agreement reached with a third country is the one concluded with the United Kingdom in December 2020. The EU-UK Trade and Cooperation Agreement[250] (EU-UK TCA) is applicable since January 2021 and sets out preferential arrangements in several areas including air transport. The agreement limits air traffic rights to 3rd and 4th freedom rights, with possibility of extension, under certain conditions and at the Member State and UK level, to 5th freedom rights for all-cargo air transport services[251]. This effectively limits the ability of UK carriers to operate domestic (i.e. within an EU Member State) and intra-Community flights. With respect to the taxation of fuel supplied for use on international air transport, Article 14(2) (in particular, paragraph (c)) is relevant, stating as follows:

> 2. The following goods shall also be exempt, on the basis of reciprocity, from the taxes, levies, duties, fees and charges referred to in paragraph 1:
>
> > (c) lubricants and consumable technical supplies other than fuel introduced into or supplied in the territory of a Party for use in an aircraft of an air carrier of the other Party used in international air transport, even when those supplies are to be used on a part of the journey performed over the said territory.

This wording indicates that Article 14(2)(c) does not disallow the taxation of fuel supplied. Of note, the clause does not disallow the taxation of fuel supplied in the EU for flights from the EU to the UK. The

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[247] See Article 8, (2)(c) of the Agreement on Air Transport between Canada and the European Community and its Member States, OJ L 207, 6 August 2010, p. 32. Please note that Article 8(1) is formulated slightly differently. [Article 8(1) concerns fuels on the board the aircraft, whereas Article 8(2)(c) is about fuel delivered to aircraft.]
[248] Article 11(5) of the EU-US air transport agreement. See also article 9(6) of the Euro-Mediterranean aviation agreement between the European Union and its Member States, of the one part, and the Hashemite Kingdom of Jordan, of the other part (EU-Jordan aviation agreement), OJ L 334/3, 6 December 2012, p. 3.
[249] Declaration by the European Community and its Member States on the EU-Canada Air Transport Agreement to be made at signature.
[250] Trade and Cooperation Agreement between the European Union and the European Atomic Energy Community, of the one part, and the United Kingdom of Great Britain and Northern Ireland, of the other part, OJ L 444, 31 December 2020, pp. 14-1462.
[251] See Article AIRTRN.3, in particular paragraphs 2, 3, and 4. Please note also that Article AIRTRN.3, paragraph 9 allows, under certain conditions, the authorisation of 'non-schedule air transport services beyond the rights' provided elsewhere in Article AIRTRN.3.

agreement reached with Morocco also does not disallow the taxation of fuel supplied in the EU for flights to Morocco,

Table A.1.2 gives an overview of the CATAs concluded or being negotiated[252] with third countries and highlights their implications for the taxation of the supply of fuel in the case of intra-EU flights operated by carriers from the third country with which the agreement is concluded. The table below does not include agreements currently negotiated for which the negotiation text has not yet been made available online.[253]

Table A.1.2 – Comprehensive agreements between the EU and third countries for which an agreement has been concluded or negotiated and it is publicly available

Country	Presence of a clause allowing for the taxation of fuel supplied for intra-EU flights	Reference to article 14(1)(b) and (2) of the ETD
Canada	✗ (but, see, EU declaration mentioned above)	✗
Israel	✔	✗
Morocco	✔	✗
USA	✗	✗
Switzerland	✗	✔
ECAA[254]	✗	✔
Georgia	✔	✗
Jordan	✔	✗
Moldova	✔	✗
Ukraine	✔	✗
United Kingdom[255]	✔[256]	✗

Source: Ricardo analysis of publicly available CATAs concluded or negotiated between the European Union and third countries or group of countries

A1.3.3.3 Bilateral aviation agreements between Member States and third countries

The number of BAs between EU Member States and third countries is significant, with the vast majority having relevance to issues related to the taxation of fuel in the aviation sector. Therefore, each of these agreements should ideally be analysed in order to determine to what extent they limit Member States' possibility to introduce taxes on the aviation sector. Historically, provisions limiting the possibility to introduce taxes on fuel have been commonly found in BAs. However, as indicated by DG MOVE staff in conversation with the consultants, over the past years, the situation has evolved and newly (re)negotiated BAs might not include this provision. Based on information available on the Commission's website, to date bilateral (re)negotiations have led to 'changes with 73 partner States,

[252] The table includes only those agreements of which the text is publicly available.
[253] The EU has initiated negotiations with the following countries: Armenia, ASEA, Azerbaijan, Oman, Qatar, Tunisia.
[254] Multilateral Agreement between the European Community and its Member States, the Republic of Albania, on the Establishment of a European Common Aviation Area (ECAA) between the European Union, its Member States and Albania, Bosnia and Herzegovina, the Republic of Bulgaria, the Republic of Croatia, the former Yugoslav Republic of Macedonia (FYROM), the Republic of Iceland, the Republic of Montenegro, the Kingdom of Norway, Romania, the Republic of Serbia and the United Nations Interim Administration Mission in Kosovo on the Establishment of a European Common Aviation Area (ECAA).
[255] For the purpose of this analysis, the aviation agreement contained in the Trade and Cooperation Agreement between the EU and the UK is treated as a CATA.
[256] There is no specific clause to this effect, but note that Article AIRTRN.14, para. 2(b) (c) of the EU - UK TCA does not require the exemption of taxes on fuel '*supplied in the territory of a Party for use in an aircraft of an air carrier of the other Party used in international air transport*'.

representing 340 bilateral agreements'[257]. Moreover, as explained above, many BAs have been amended by HAs.

Given the short timeframe and the scope of this study, it is not possible to provide an exhaustive review of all the agreements concluded, as well as renegotiated, by Member States with third countries. Some BAs contain provisions that explicitly allow the taxation of aviation fuel supplied to EU and non-EU air carriers operating intra-EU flights. Agreements including such a clause protect the taxing power of EU Member States with regard to the taxation of fuel supplied for domestic and intra-EU flights.

However, other BAs do not contain such a clause and rather forbid the taxation of fuel supplied. In this case, the implementation of taxes on fuel supplied to air carriers from the third country (with which such BA has been concluded) will not be possible even if they operate intra-EU flights, unless the BA is amended accordingly. Consequently, these operators may be able to operate without being subject to fuel taxes, taking into account on the provisions of the air services agreement that grant them the right to operate intra-EU flights.

The analysis of fuel burnt using the EU ETS Transaction Log has enabled the identification of the passenger carriers (and their country of establishment) that operated most intra-EU flights in recent years. The third countries where the major carriers come from are Switzerland, UAE, Korea, Ethiopia, Qatar and Chile. Except for Ethiopia, the EU has been able to conclude or initiate negotiations for either CATAs or HAs with the countries above. For example, for UAE and Chile, a specific clause in the HA negotiated by the EU allows for the taxation of fuel supplied for intra-EU flights (see 3.3.2)[258]. In the case of Ethiopia, two BAs have been identified with EU Member States; Ethiopian Airlines has operated flights between Madrid (Spain) and Dublin (Ireland) as part of its operation between these Member States and Ethiopia (a so called 'fifth freedom' flight, where an air carrier has the right to fly between two foreign countries on a flight originating or ending in one's own country):

- The air services agreement between Spain and Ethiopia (2015) [259]: in this agreement, the supply of aviation fuel is explicitly exempted from indirect taxation (see art.5(2)(c)).
- The air services agreement between Ireland and Ethiopia (2017) [260]: in this agreement, the supply of aviation fuel for domestic flights (and, in the case of Ireland, intra-EU flights) may be taxed on a reciprocal basis (see art.12.7).

Assuming that a tax on fuel supplied to air carriers operating intra-EU flights was introduced, the agreement between Spain and Ethiopia would prevent Spain from taxing fuel supplied to Ethiopian Airlines. From an economic perspective, this implies that Ethiopian Airlines would enjoy a competitive advantage over EU carriers and carriers from countries for which air services agreements allow for the taxation of fuel supplied for intra-EU flights. Nonetheless, we note that the fuel burnt by Ethiopian Airlines represents a very small proportion of all fuel consumed for intra-EU passenger flights by non-EU carriers, which in turn represents only 0.9% of all fuel burnt by civil aviation under the EU ETS Transaction Log (see Interim Report, section 4.2 for more details). Therefore, the potential impact of the tax exemption would be limited.

One important caveat, though, should be added to this conclusion: today's analysis may not accurately describe tomorrow's situation. An important unknown factor is that, assuming that EU air-carriers are subject to a new tax on the supply of fuel for intra-EU flights, some third-party carriers currently enjoying

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[257] European Commission, Mobility and Transport, External Aviation Policy – Horizontal Agreements, available at https://ec.europa.eu/transport/modes/air/international-aviation/external-aviation-policy/external-aviation-policy-horizontal_en
[258] See Article 4(2) of the Agreement between the European Community and the Republic of Chile on certain aspects of air services (OJ L 3000, 31 October 2006); article 4(2) of the Agreement between the European Community and the United Arab Emirates on certain aspects of air services (OJ L 28, 1 February 2008).
[259] Acuerdo sobre transporte aéreo entre el Reino de España y la República Federal Democrática de Etiopía, hecho en Addis Abeba el 19 de febrero de 2013, available at https://www.boe.es/diario_boe/txt.php?id=BOE-A-2015-2966
[260] Air Transport Agreement between the Government of Ireland and the Government of the Federal Democratic Republic of Ethiopia, Addis Ababa, 3 November 2014, available at https://www.dfa.ie/media/dfa/alldfawebsitemedia/treatyseries/2017/ITS-No.-16-of-2017.pdf

fifth-freedom rights but not actively pursuing intra-EU passenger routes may be incentivised to do so in the future in case they benefit from a tax exemption due to the reasons explained above.

A1.3.4 Agreement on Trade in Civil Aircraft

This agreement requires its signatories (including the EU and most Member States) to eliminate all customs duties and other charges on the importation of civil aircraft, as well as other related products (civil aircraft engines, aircraft components, etc.)[261].

As such, this agreement would not prevent the adoption of a harmonised minimum fuel tax or a ticket tax.

A1.3.5 Customary international law

Some principles of customary international law, such as the principle of exclusive sovereignty of the airspace, might limit the adoption of taxes on the air transport sector, if they include elements of extraterritoriality[262].

Neither a harmonised minimum fuel tax nor a ticket tax would qualify as an extraterritorial tax. Consequently, the principle of exclusive sovereignty of the airspace should not prevent their adoption.

A1.4 Reflections based on the experience of Member States in implementing ticket taxes

The adoption of a directive to harmonise the taxation of the air transport sector at the EU level might affect existing domestic taxes on the sector. Consequently, it might be worth anticipating the potential interactions that could arise between the directive and Member States' existing tax measures on the air transport sector as well as any legal issues that may emerge from a review of national experiences in enacting ticket taxes. To this end, the study team has engaged in conversations with experts at the European Commission (DG MOVE) and national tax administrations (Austria and Germany's Finance Ministries – interviews undertake; Netherlands and Sweden – interviews planned in January 2021; UK, France and Switzerland – awaiting confirmation).

[261] See Article 2 of the Agreement on Trade in Civil Aircraft.
[262] Note, however, that similar arguments were rejected by the Court of Justice of the European Union in the case *Air Transport Association of America and Others* (21 December 2011, C-366/10).

A2 Stakeholder consultation

We note that the initial discussion with DG TAXUD indicated that stakeholder consultation should only be done in coordination with the Commission, unless to clarify specific technical issues. Therefore, the plan to have a coordinated set of interviews in the manner envisaged in the proposal was dropped.

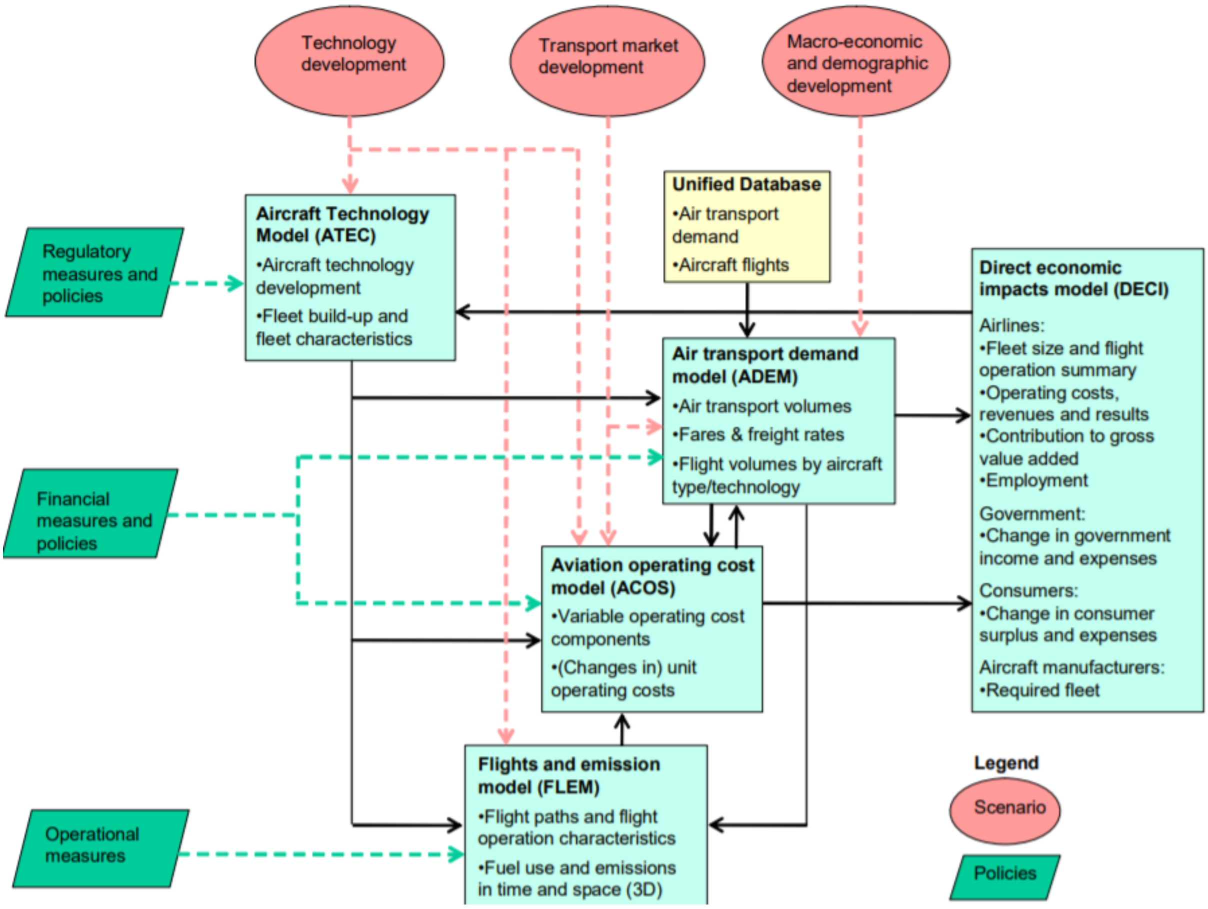
Additionally, the proposal included a survey of EU Member States to obtain their views on the effectiveness of different measures and on the administrative costs they would incur. This survey was instead replaced with a set of targeted interviews aimed at discussing technical issues with tax authorities in Member States that already impose a ticket tax. Conversation have been held with experts in the finance ministries of Austria, Germany, Sweden and the Netherlands. Further contacts were established with experts in the finance ministries of France, Switzerland and the UK, but no interviews were held with them.

A3 Model descriptions

A3.1 AERO-MS

An overview of the AERO-MS modules, and the interactions between the modules, is provided by the figure below. In the subsequent text box a description of the AERO-MS, including the various modules, is provided.

Overview of AERO-MS main modules



Overview of AERO-MS

The key of the AERO-MS is to compute the impacts of alternative options to reduce GHG emissions from aviation. The model has global coverage.

In 2009 EASA inherited the property rights of AERO-MS. Since then, as part of various assignments for EASA, AERO-MS has been updated and enhanced. Hereby use is made of EUROCONTROL WISDOM Operations Database as a basis for the AERO-MS Unified Database which contains a detailed record of global aviation movements in the Base Year. The Unified Database records 123,025 airport-pairs, covering a full network of all key airports. Airline cost and fare data were updated using IATA and ICAO data. The update of aircraft type input data was based on fleet inventory properties from the EUROCONTROL PRISME Fleet 2, OAG Fleet Databases, ICAO emissions databank as well as the FESG retirement curves. For the specification of aircraft operational characteristics use was made of the EUROCONTROL BADA data. Hence, all AERO-MS data are based on data sources from internationally well-reputed organisations.

AERO-MS has a global coverage, including data for both Intra European routes and routes to and from Europe. The AERO-MS computes a wide range of impacts of alternative policy options for the reduction of aviation GHG emissions, including the impact on:

- Total number of flights and flight km;

- Aviation demand in terms of passengers, passenger km, freight km;
- Airline revenues;
- Taxation revenues;
- Ticket prices;
- Fuel use and fuel efficiency;
- CO_2 and NO_x emissions.

The AERO-MS has formed a key part of about 40 international studies where the model results have provided a quantified basis for policy judgement. Recently AERO-MS was applied for the European Aviation Environmental Report[263]. Also the AERO-MS has been applied in various impact assessment studies for the European Commissions, Further studies, in which the AERO-MS was applied, were executed for a range of other clients like EASA, IATA, ICAO, Airbus, and national governments (Germany, UK, the Netherlands).

The Unified Database and the five modules of the AERO-MS model are briefly described below.

Unified Database: The starting point for the modelling of air transport demand and aircraft flights is provided by the Unified Database of the AERO-MS, which is a computerised description of the volume and pattern of global air transport activity in the base year.

Aircraft technology model (ATEC): The ATEC model is used to calculate the technical characteristics by aircraft type and technology level based on a modelling of fleet development over time. Aircraft technology are particularly relevant to the fuel use and emission characteristics of different aircraft types. The technology characteristics are expressed as a function of aircraft 'technology age' which is defined by the year in which the aircraft (type) is certified. The technology age distribution is determined by the fleet build-up which depends on the development in time of aircraft sales (following air transport demand) and aircraft retirement.

Air transport demand model (ADEM): The ADEM model matches the demand and supply side of air transport, i.e. air transport demand in terms of passengers and freight as well as the frequency and capacity of air transport services offered. Volumes of passengers and cargo transported, passenger fares and freight rates are determined in the process of balancing supply and demand. Aircraft flights are determined by origin-destination (airport pairs) and expressed in terms of aircraft types and technology levels, in accordance with available fleets.

Aviation cost model (ACOS): The ACOS model computes the relevant variable aircraft operating cost components and total operating costs. Variable operating costs are associated with flights by aircraft type and technology level and include: fuel costs; route and landing (airport) charges; flight and cabin crew costs; maintenance costs; capital costs (depreciation) and finance costs. In addition, total operating costs include a number of other, volume-related, costs such as the costs of ground-handling, sales, ground facilities (buildings) and general and administration costs. Based on the total operating costs, ACOS determines the unit costs (per passenger and kg of cargo transported) of air transport by aircraft type, technology level and IATA region-pair. In particular, the model ACOS converts the costs of possible measures in the air transport sector to changes in unit operating costs.

Flights and emissions model (FLEM): The FLEM model provides a detailed description of the actual flight profiles of individual aircraft flights. Fuel-burn and emissions for each flight are computed in three-dimensional space, taking into account the geographical flight specification and the technical characteristics by aircraft type and technology level. There is a direct connection between ATEC and FLEM allowing FLEM to take into account developments in aircraft technical and environmental performance as projected from a baseline scenario and policies. Finally, FLEM provides information on fuel-burn as a basis for the cost computations in ACOS.

Direct economic impacts model (DECI): The DECI model is essentially a post-processing model. One of its main functions is to provide a comprehensive overview of the results of the other modules in the AERO-MS, in particular the information related to air transport volumes; air transport demand, airline revenues and ticket prices.

263 https://www.easa.europa.eu/eaer/

In relation to the outputs from AERO-MS, the following remarks apply:

- Separate outputs are presented for all 29 EEA Member States (EU27, NO, IS [264]) plus Switzerland (as a member of the EFTA), including aggregated outputs for EEA29.
- The outputs per Member State (MS) are allocated based on country of departure of a flight
- A separate output table is provided for each MS for intra EEA traffic (including both domestic traffic and international intra EEA traffic) and extra EEA traffic (i.e., destination outside EEA).
- For a number of indicators there is distinction between impacts for traditional scheduled carriers and low-cost carriers. This show if different airline categories are affected differently by the taxation options.
- For calculations of the impacts of tax options, the results are presented as percentage changes relative to the baseline (Note: taxation revenues are presented in absolute terms).

Table 11-2 provides an overview of the results output from AERO-MS for the different policy options.

Table 10-2: Overview of AERO-MS outputs per taxation option

Indicator*	Unit	2025	2030	2050
Flights				
1. Traditional scheduled carrier passenger flights	million flight			
2. Low-cost carriers and charter passenger flights	million flight			
3. Cargo flights	million flight			
4. Total flights	million flight			
Aircraft km				
5. Total Aircraft km	billion ac-km			
Nr. of passengers				
6. Traditional scheduled carriers	million pax			
7. Low-cost carriers and charter flights	million pax			
8. Total passengers	million pax			
Passenger Km				
9. Traditional scheduled carriers	billion pax-km			
10. Low-cost carriers and charter flights	billion pax-km			
11. Total passenger km	billion pax-km			
Cargo demand				
12. Cargo demand tonne km	billion tonne-km			
Revenue Tonne-Km (RTK)				
13. RTK (passenger km plus cargo tonne km)	billion tonne-km			
Air carrier revenues				
14. Traditional scheduled carriers – passengers	billion $€_{2019}$			
15. LCC and charter flights – passengers	billion $€_{2019}$			
16. Cargo revenues	billion $€_{2019}$			
17. Total air carrier revenues	billion $€_{2019}$			
Taxation revenues				

[264] Liechtenstein is also part of the EEA but has not been taken into account because it has no aviation sector.

Indicator*	Unit	2025	2030	2050
18. Revenues from taxation	billion €2019			
Ticket prices				
19. Revenues per passenger km	€2019/pax-km			
Fuel use and emissions				
20. Fuel use	megaton			
21. CO_2 emissions	megaton			
22. NO_x emissions	megaton			
Fuel efficiency				
23. Fuel use per RTK	Kg/RTK			

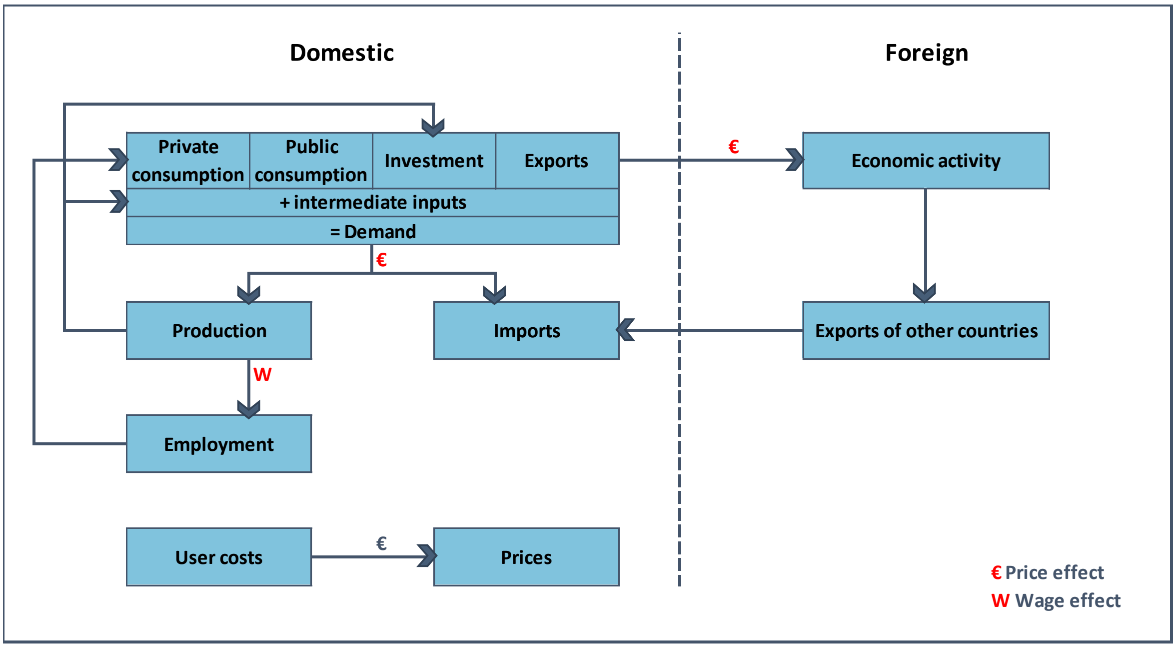
** For all indicators, separate outputs were generated by EEA29 Member States with a distinction between intra and extra EEA traffic.*

A3.2 Macroeconomic model: GINFORS-E

GINFORS-E as a global model, with inter-industry and bilateral trade relations endogenously modelled, can inform about indirect and total macroeconomic impacts. This includes indirect, induced and total effects on GDP and employment, and effects in industries with close links to aviation. Impacts on other modes of traffic, i.e. land and water transport, will also be accounted for.

An overview of the key functionalities of GINFORS-E is given in Figure 10-1 and Box 11-1. Industry classification granularity is described in Table 11-3.

Figure 10-1: Country model of GINFORS_E



Box 10-1: Description of the GINFORS-E model

The **GINFORS-E** (global inter-industry forecasting system – energy) model is a bilateral world trade model based on OECD data, which consistently and coherently models exports and imports of 25 goods groups for 64 countries and one 'rest of the world' region (Figure 10-1). It incorporates a macro-model, consisting of exports and imports, other core components of final demand (private and public sector consumption and investment), markets for goods and the labour market, for each country. The models are also divided into 36 goods categories in accordance with the latest OECD (2019) internationally harmonised input-output (IO) tables. For every country OECD bilateral trade data on industry level is linked to the IO tables. In Lutz et al. (2010) the model is clearly described in detail, although some of the relations have changed (e.g. OECD has adjusted the sector classification several times). Transport is further distinguished in land, water, air plus warehousing and support activities based on the WIOD World Input-Output Database (Timmer et al. 2015). Thus, the model reports for 40 industries. An IEA (2014) overview describes different macroeconomic models to calculate energy efficiency impacts. The GINFORS-E model is classified as econometric such as the E3ME model. For a comparison of the two models see Barker et al (2011).

GINFORS-E can be used to analyse the macroeconomic effects of a variety of price changes and policies in individual countries. It flexibly models trade structures, labour markets, energy intensities and energy source structures, taking into account price dependencies and the situation in specific countries. The use of intermediate inputs, domestic and imported, labour demand and foreign trade are modelled price dependent. Changes in prices due to tax adjustments will be accounted for. The parameters used in the model equations are econometrically estimated (OLS) on the basis of time-series data.

Production prices of industries are driven by unit costs. If prices of electricity in the steel industry increase, producer prices will increase according to their electricity price share. Higher producer prices will influence global competitiveness of the respective industry and other downstream production (e.g. in the automotive industry).

All behavioural parameters of the model are estimated econometrically, and different specifications of the functions are tested against each other, which gives the model an empirical validation. An additional confirmation of the model structure as a whole is given by the convergence property of the solution which has to be fulfilled on a yearly basis. The econometric estimations build on times series from OECD, UN, IMF and IEA from 1990 to 2015/2017.

Major data source of GINFORS_E are OECD data, which are used for the Trade in Value Added (TiVA) initiative for OECD and WTO for G20. The data set includes input-output tables, which are consistently linked by bilateral trade flows in Inter-Country IO tables and annual OECD National Accounts.

Each national model is linked to an energy model, which determines energy conversion, energy generation and final demand for energy for 19 energy sources disaggregated by economic sector. The model takes into account technological trends and price dependencies.

In recent years, the way the model deals with the energy sector has been further refined to take account of global developments in renewable energy technologies. The model has also started to be used to examine future changes in consumption-based greenhouse gas emissions, which is why the name has been extended to GINFORS-E. Recent simulations of macroeconomic impacts of different electricity price scenarios have been calculated for the German Ministry of Economic Affairs and Energy (Grave et al. 2015, Lutz et al. 2015, Wünsch et al. 2015). Earlier work includes economic impacts of international different climate regimes (Lutz, Meyer 2009a, Lutz, Wiebe 2012), high oil and gas prices (Lutz, Meyer 2009b) and peak oil (Lutz et al. 2012), explicit modelling of learning curves for renewable energy technologies (Rogge et al. 2015; Wiebe, Lutz 2016). For DG CLIMA the model has been used to project consumption-based emissions and evaluate specific technology scenarios taking global supply chains into account (Wiebe et al. 2016). It also shows how electric cars can be captured in an input-output framework. For DG GROW (2017) the model has been used to explore macroeconomic impacts of different scenarios for powertrains and the competitiveness of the European automobile industry.

Another strand of research has focused on resource use and developed a model version GINFORS3 based on WIOD data (Meyer 2011). It has been further developed and extensively applied in various EU FP 7 research projects (Aaheim et al. 2015, Ahlert et al. 2018, Distelkamp, Meyer 2017). Experiences made will be useful to separately model the air transport sector, which is distinguished in the WIOD data.

Currently, the model is applied in a project for the German Federal Environment Agency on ‘Models to analyse international interrelations of the EU ETS’, ‘Bioeconomy in Europe and SDGs:

Development, Contribution, Trade-off' for the German Ministry of Education and Research, 'Climate impacts and sustainable options for action' for a German industry association

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Table 10-3: Industry classification of OECD Input-Output Tables (GINFORS_E)

Industries 1-24	Industries 25-48
1 Agriculture, hunting, forestry and fishing	19 Other transport equipment
2 Mining and quarrying	20 Manufacturing nec.; recycling
3 Food products, beverages and tobacco	21 Electricity, gas and water supply
4 Textiles, textile products, leather and footwear	22 Construction
5 Food products, beverages and tobacco	23 Wholesale & retail trade; repairs
6 Textiles, textile products, leather and footwear	24 Hotels & restaurants
7 Wood and products of wood and cork	25 Transport & storage
8 Pulp, paper, paper prod., printing and publishing	26 Post & telecommunications
9 Coke, refined petro. products and nuclear fuel	27 Financial intermediation
10 Chemicals and chemical products	28 Real estate activities
11 Rubber & plastics products	29 Renting of machinery & equipment
12 Other non-metallic mineral products	30 Computer & related activities
13 Basic metals	31 Computer & related activities
14 Fabricated metal products	32 R & D and other business activities
15 Machinery & equipment, nec	33 Public admin. & defence; compulsory social sec.
16 Computer, Electronic and optical equipment	34 Education
17 Electrical machinery & apparatus, nec	35 Health & social work
18 Motor vehicles, trailers & semi-trailers	36 Other community, social & personal services
37 Land transport	39 Air transport
38 Water transport	40 Warehousing and support activities

Source: OECD 2019 https://www.oecd.org/sti/ind/IOT_Industries_Items.pdf, WIOD: http://www.wiod.org/database/wiots16

Table 11-4 provides an overview of GINFORS-E computational results that may be presented for each of the taxation options. GINFORS-E results are reported for all EU-27 member states, the UK and Norway.

Table 10-4: Overview of GINFORS-E outputs per taxation option

Topic / Indicator*	Unit	Sources
Demand effects on other modes of transport		
1. Land transport services, output	billion €2015	Eurostat: National accounts aggregates by industry (up to NACE A*64) [nama_10_a64]

Topic / Indicator*	Unit	Sources
2, Rail passengers transported	billion pkm	European Commission - DG MOVE: EU transport in figures - Statistical pocketbook 2020
3. Water transport services, output	billion $€_{2015}$	Eurostat: National accounts aggregates by industry (up to NACE A*64) [nama_10_a64]
Effects on employment in the aviation and transport sector / Number of persons engaged		
4. Air transport services	1000 Persons	Eurostat: National accounts employment data by industry (up to NACE A*64) [nama_10_a64_e]
5. Transport services, total		Eurostat: National accounts employment data by industry (up to NACE A*64) [nama_10_a64_e]
Net tax revenue effects / Tax revenues from		
6. Air transport services (from AERO-MS)	*billion €*	*Vital-link policy analysis: AERO-MS data*
7. Other taxes less subsidies on intermediate and final products		OECD: Input-output tables, ISIC Rev.4
8. Taxes on income and wealth		Eurostat: Non-financial transactions [nasa_10_nf_tr]
9. Total tax revenues		Sum of (6) to (8)
Other knock-on or spill-over effects / GDP, prices and total employment		
10. GDP	billion $€_{2015}$	Eurostat: GDP and main components (output, expenditure and income) [nama_10_gdp]
11. GDP deflator	price $index_{2010=100}$	Eurostat: GDP and main components (output, expenditure and income) [nama_10_gdp]
12. Total number of persons employed	1000 Persons	Eurostat: Population by sex, age, citizenship and labour status (1 000) [lfsa_pganws]
13. Number of persons employed, manufacturing	1000 Persons	OECD: Numbers of persons engaged; http://www.oecd.org/industry/ind/stanstructuralanalysisdatabase.htm

Topic / Indicator*	Unit	Sources
Effects on energy use and CO_2 emissions		
14. Energy use, transport total	PJ	IEA energy balances [Consumption in transport covers all transport activity (in mobile engines) regardless of the economic sector to which it is contributing [ISIC Rev. 4 Divisions 49 to 51].
15. Energy use, total	PJ	IEA energy balances [Total energy supply]
16. CO_2 emissions, transport total	Megaton	IEA CO_2 emissions from fuel combustion
17. CO_2 emissions, total	Megaton	IEA CO_2 emissions from fuel combustion
18. Memo: CO_2 International aviation bunkers	Megaton	IEA CO_2 emissions from fuel combustion

* For all indicators, separate outputs are generated by country. (15) – (18) National energy use / emissions without international aviation and navigation bunkers

The items ‘Changes in employment in other economic sectors at regional level, in particular for islands’ and ‘Impacts on low-income consumers’ are addressed in case studies. Reporting detail depends on data availability based on GINFORS-E results. Therefore, they are not included in Table 11-4.

A4 Discarded policy measures

Measures for policy package 1

Exemptions to transit and transfer passengers

In order to mitigate the risk of hub switching on routes between the EEA and a third-country via an EEA hub and on routes within the EEA, this measure would exempt transit and transfer passengers from 'paying' a fuel tax on the segment(s) within the EEA. As passengers do not pay directly the fuel tax – rather, they pay via increased ticket prices – the operationalisation of such a measure would be difficult and potential burdensome to implement from and administrative perspective[265]. Furthermore, in relation to indirect flights within the EEA via an EEA hub, the scope for hub switching is not as significant, as flights between two EEA destinations via an extra-EEA hub are likely to not be very attractive for most passengers when compared to direct flights or flights via an intra-EEA hub – London Heathrow (and other London airports) being an exception where such intra-EEA travel via an non-EEA hub might be as convenient as using an intra-EEA hub for many intra-EEA trips[266]. However, it must be noted a fuel tax on flights between the EEA and the UK is legally possible. Such a tax on EEA-UK flights would limit the attractiveness of switching from an EEA hub to a UK hub. Besides, the switch from EEA hubs to UK hubs might be restrained by airport capacity issues, in particular in London airports.

Given these considerations, this measure has been discarded.

Exemptions to flights departing from smaller airports

This measure would align the regulatory regime of fuel taxes with the Airport Charges Directive (2009/12/EC). This Directive exempts from its applicability all airports whose annual traffic is over five million passenger movement, unless they are the biggest airport (in terms of passenger movements) in a given Member State.

Such an exemption would greatly reduce the effectiveness of the fuel tax, as many flights would be exempted. It would also create an incentive for tankering, as air carriers could fill up their aircraft in flights departing these smaller airports and then use the same aircraft for flights subjected to the fuel tax. While some of these smaller airports serve regions that are under-developed economically, many of these regions are served by PSO routes, which are covered by a separate exemption.

Given all of these factors, the measure is not justifiable and has been discarded.

Tankering mitigation: financial incentives

To mitigate the possibility of tankering, this measure would create financial incentives to reduce the practice. From a practical perspective, there would be a need to define how such an incentive scheme might work. Depending on this, the measure could have a negative impact on the level playing among operators and the functioning of the internal market Overall, such a measure would reduce the effectiveness of the fuel tax in reducing emissions as it would, in practice, give a rebate to air carriers have the possibility of tankering.

Because of these negative aspects, this measure has been discarded.

Tankering mitigation: maximum fuel reserve requirement

With this measure, for each flight there would be not only a minimum fuel reserve requirement as per current EASA and international policy, but also a maximum fuel reserve requirement. With this requirement, aircraft would not be able to have fuel onboard above a certain amount (to be defined later) when they start a given flight. This would reduce the incentive for tankering.

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[265] One potential way to implement such an exemption would be for airlines to request a rebate of the fuel taxes they paid taking into account the number of transfer passengers that were onboard that flight.
[266] For example, a trip from Stockholm to Lisbon would be shorter via Heathrow (3,030km) than via Frankfurt (3,101km).

However, this measure is problematic from a safety perspective: fuel policy, including the obligation for air carriers to follow minimum fuel requirements procedures, are set out in EU law in Regulation 965/2012. This Regulation also gives authority to the commander of the flight to request any extra fuel she or he deems necessary. Given that this measure would preclude the commander from being able to exert that authority, the measure has been discarded.

Measures for policy package 2

Tax for cargo: based on maximum take-off weight of the aircraft

This tax would be charged based on the maximum take-off weight (MTOW) of the aircraft. This would apply to both passenger flights (with cargo in the cargo hold of the aircraft) and cargo-only flights. For the former, this tax would in practice translate into double taxation for passengers: passengers would pay the ticket tax and they would also pay a higher ticket price since the airline has to pay a tax because they take cargo on the belly of the aircraft. Ultimately, if the tax is very high, this could be an incentive for airlines to stop using the cargo hold of aircraft to take cargo in passenger flights (and avoid paying the cargo tax), and shift all cargo to cargo-only flights. This would have negative environmental impacts, as more flights would be needed.

Exemptions to flights departing from smaller airports

Like with the similar exemption for the fuel tax, this measure would align the applicability of the ticket tax with the Airport Charges Directive (2009/12/EC). Such an exemption would reduce the instances where a ticket tax would apply, diminishing the effectiveness of creating such a tax. Additionally, such an exemption would be hard to justify and could be perceived as unfair – flights to and from outermost regions and PSO flights would be exempted anyhow under other exemptions, so there is no need to exempt all flights in an airport because of equity and connectivity concerns.

Exemptions to flights to developing countries

This measure would support air connectivity between the EEA and developing countries. While that might be a worthwhile goal, the practical application of such an exemption would be difficult. Namely, it would be difficult to determine of what constitutes a ‘developing country’, and it could become a politically sensitive issue. Constant revisions would need to be required as countries’ economies expand or contract over time.

T: +44 (0) 1235 753000
E: enquiry@ricardo.com
W: ee.ricardo.com