# International aviation: Will the EU restart the clock?

*Exploring the future of aviation under the EU ETS*

carbone4

CARBON MARKET WATCH

# Acknowledgments

This study was conducted by **Carbone 4**.

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# Executive Summary

The EU ETS[1] was introduced for aviation in 2012. It was initially intended to apply to all flights to or from the EEA[2], but due to third country pressure, the so-called "stop-the-clock" measure restricted it to intra-EEA flights. International flights from or to the EEA were to be covered by CORSIA[3], a scheme introduced by the UN organisation for commercial aviation ICAO[4] in 2020. However, this scheme is very superficial, as it only covers the traffic growth compared to 85% of 2019 activity, the rest being exempted, and it consists only in offsetting the additional emissions, a lever often criticized[5], and has no levers for emissions reduction.

The EU will assess CORSIA in July 2026. Depending on this assessment, the "stop-the-clock" may end in 2026 and the EU may propose extending the EU ETS scope to all flights departing from the EEA.

The EU decision on the final scope could have a highly significant impact on the EU-ETS revenues from aviation, which we have modelled in four different scenarios, per geographical broadening:

Scenario 1 – all flights to or from the EEA, as initially planned in 2012.
Scenario 2 – all flights departing from the EEA (arriving flights excluded).
Scenario 3 – all intra-EEA flights as well as all flights from or to countries that do not take part in CORSIA.
Scenario 4 – only intra-EEA flights, the current scope.

Yet, even with geographical scope extension, aviation climate impact would not be completely covered, so we also examine the possible inclusion of non-$CO_2$ effects (mostly due to contrails) and private jets, for which 67% of emissions are still excluded from the EU ETS.

It appears that depending on the extension, the EU could increase the revenues it generates from aviation EU ETS almost four-fold (see graph on the left on Figure 1). The inclusion of non-$CO_2$ effects along with private jets could triple the revenues compared to the narrower perimeter (graph on the left, which only considers commercial aviation, without non-$CO_2$ effects).

[1] European Union's Emissions Trading System
[2] European Economic Area, consisting of the 27 European Union member states, as well as Iceland, Lichtenstein, and Norway
[3] Carbon Offsetting and Reduction Scheme for International Aviation
[4] International Civil Aviation Organisation
[5] See IPCC AR6 WGIII full report, p. 1089.: "By its nature, CORSIA does not lead to a reduction in in-sector emissions from aviation since the programme deals mostly in approved offsets. […] most currently approved CORSIA offsets are avoided emissions, which raises the issue of additionality."

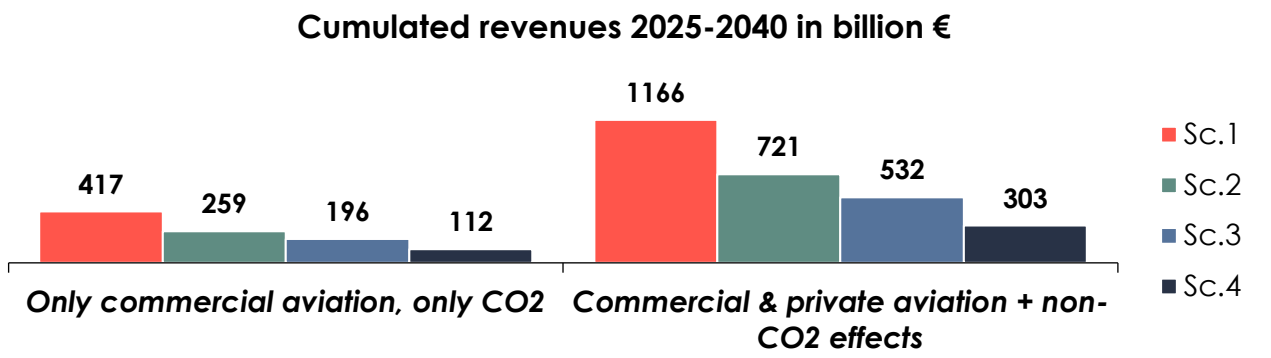



*Figure 1: Cumulated revenues 2025-2040 from EU ETS for aviation in billion €. On the left: considering only commercial aviation, without non-$CO_2$ effects. On the right: adding non-$CO_2$ effects and private aviation.*

Most of the allowances are purchased to the EU directly by operators or indirectly via secondary markets; with revenues allocated to Member States (~75%) or EU funds (~25%). Some of the allowances are currently allocated free; however this will end in 2026. Given the ambitious objective of carbon neutrality in 25 years, **hefty investments are required to drive the transition**, especially in the transport sector. Three key measures were represented in this analysis to give some perspective: the industrial development of **Sustainable Aviation Fuels (bioSAF or eSAF),** and the strengthening of the rail infrastructure with the **Trans-European Transport Core Network (TEN-T)**, as well as the financing of the **New Collective Quantified Goal (NCQG)**, which does not concern the transport sector in particular, but to which the EU is committed and will therefore have to finance.

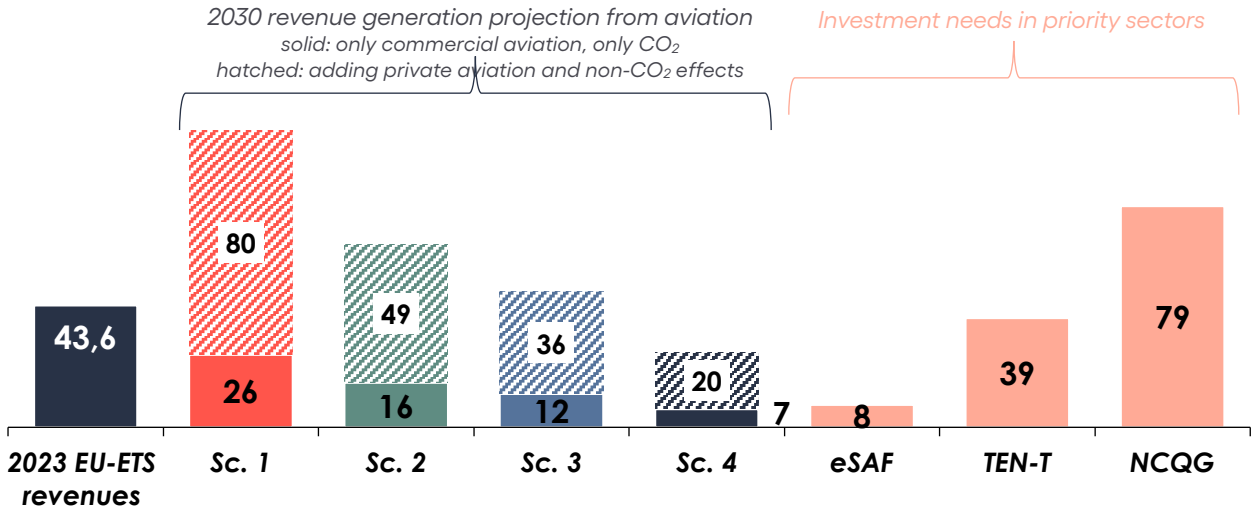
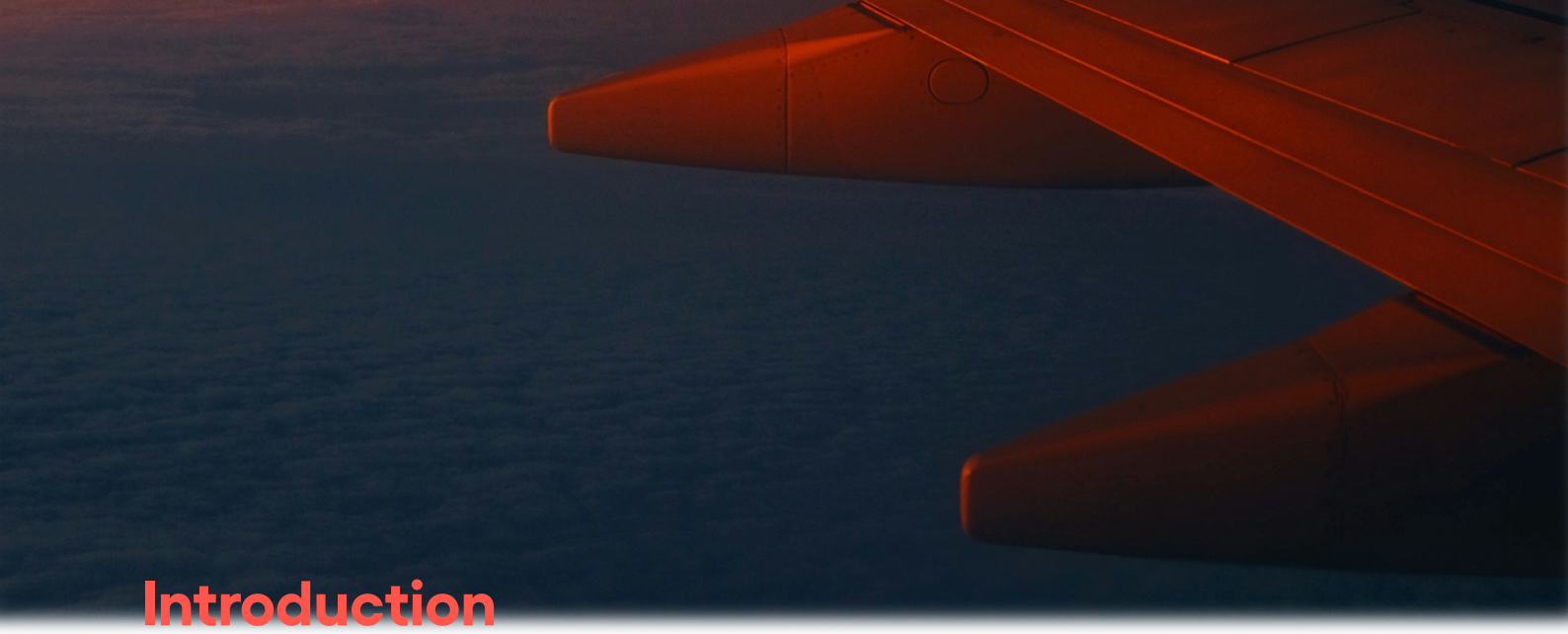



*Figure 2: 2023 EU-ETS revenues, 2030 revenue projection with an average 122€/t$CO_2$ carbon price, next to investment needs across SAF, TEN-T and NCQG categories per year between 2025 and 2030 (billion €)*

Of course, **the EU ETS alone will not be enough to finance all these measures, but it could generate significant additional revenues, up to 1160 billion €€ in 15 years**, depending on scenario and perimeter, to finance the transition, while taking better into account the total impact of aviation on the climate. **Extending the aviation EU ETS** to cover the full scope of commercial aviation impact (geographically, with private jets and non-$CO_2$ effects) **could therefore bring the biggest revenues to finance these investments, as well as being a strong incentive for commercial aviation to accelerate its decarbonisation**, killing two birds with one stone.



# Introduction

With COVID-recovery period, air traffic reconnects with its historic strong growth, especially for international flights, and so do its emissions. Yet international aviation emissions are loosely addressed, as they do not fall within the Nationally Determined Contributions (NDCs)[6] and are regulated by the UN organisation for commercial aviation ICAO (International Civil Aviation Organisation). ICAO has set up the CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation), with no decarbonization ambition[7]. Moreover, kerosene remains exempt from energy taxation for international flights, and international tickets often avoid VAT[8]. These tax advantages contrast sharply with the EU's ambitious climate targets, especially in the European Green Deal and the Fit for 55 package.

Currently, the aviation sector in the EU is subject to two major climate instruments: the EU ETS and CORSIA. The EU-ETS scheme, which requires operators to surrender allowances for their $CO_2$ emissions, should have applied to all flights departing from or arriving at a European airport, but its perimeter was reduced by a so-called "stop-the-clock" measure, restricting its scope to intra-EEA[9] (European Economic Area) flights. Flights between the EEA and the rest of the world are therefore currently liable to CORSIA, but it has been criticized for its limited effectiveness and voluntary nature in its pilot phase (see *What is CORSIA?* page 10). An extension of EU ETS back to the initial scope could be decided in 2026.

This study delves into four different scenarios of an EU ETS framework extension, looking at different geographical scenarios as well as non-$CO_2$ effects and private jets inclusion, which could unlock a substantial source of public revenue. It then compares these potential revenues with the financing requirements needed for decarbonisation, exploring three key decarbonisation measures for revenue allocation: the industrial development of Sustainable Aviation Fuels, the strengthening of rail network, and the financing of climate transition for developing countries.

[6] Commitments defined by governments to contribute to the global targets set out in the Paris Agreement
[7] See the question 6 of our article on this topic
[8] Aviation tax gap – How much revenues are governments losing out, Transport & Environment on due to poor aviation taxation?
[9] The EEA is the European Economic Area, including the member states of the European Union as well as Iceland, Liechtenstein and Norway, see Glossary: European Economic Area (EEA) from Eurostat.

# Revenue generation

## State of play: current revenue generation

The EU ETS (EU Emissions Trading System) is the European Union's mechanism based on a "cap and trade" principle to incentivise the decarbonization of its carbon-intensive activities. It introduces a limit on carbon emissions and puts a price on these emissions[10].

An *emission cap* is defined, representing for each year the total number of allowances issued (1 allowance = 1 tonne of $CO_2$). This cap decreases over time, which aims at encouraging companies to decarbonise their activities.

Among the allowances issued each year, some are allocated free of charge, while the rest are auctioned[11]. The allowances issued for the aviation sector are called "EUAA" (EU Aviation Allowances), whereas the general allowances are called "EUA" (EU Allowances). From 2021, EUAs and EUAAs can be purchased and surrendered by both stationary installation and aviation operators.

Companies covered by the EU ETS must follow a compliance cycle, which consists in the annual monitoring, reporting and verification (MRV) of greenhouse gas emissions. These declared emissions are called *verified emissions*, corresponding to direct $CO_2$ emissions. Companies must surrender a corresponding number of allowances, which they either receive for free or buy at a price determined by the EU carbon market.

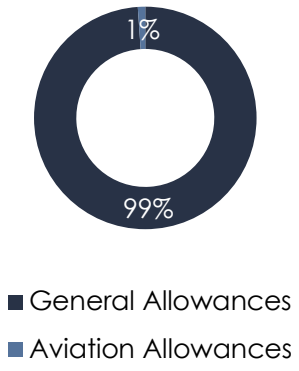



*Figure 3: General allowances in 2023 accounted up to 43,6 billion € Source: Report from the Commission to the European Parliament and the Council on the functioning of the European carbon market in 2023*

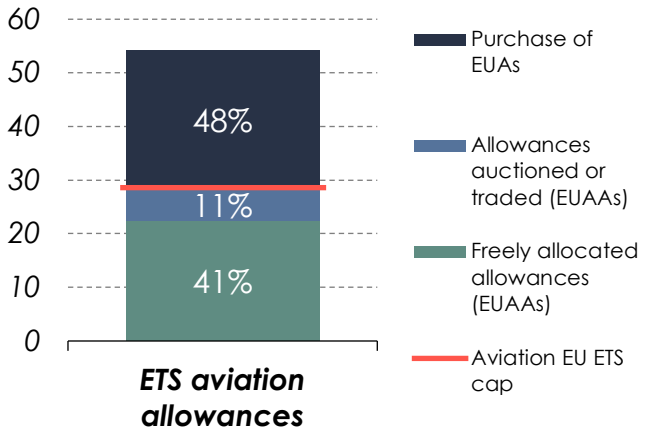



*Figure 4: ETS aviation allowances in 2023 ($MtCO_2$). Source: European Union, European Environment Agency, EU Emissions Trading System (ETS) data viewer*

[10] About EU ETS, European Commission
[11] Note that a portion, which is omitted here for the sake of simplicity, is also reserved for new entrants.

In 2023, auctioning revenue of aviation allowances amounted to 469 million €, representing ca. 1% of the total revenues from the EU ETS (see

Figure 3). The *verified emissions* from the sector totalled 54 $MtCO_2$, well above the *emission cap* of 29 million allowances. This is why the sector not only relied on EUAAs, but also on EUAs allowances to meet their compliance obligations (see
Figure 4). Also accounting for the EUAs paid by the sector, the total sector's allowances amount to around 2,6 billion €. In the rest of the report, we calculate the total revenues generated from taxing aviation emissions, without differentiating between EUA and EUAA. We are basing our calculations on the sector's projected emissions (see below for more details on our assumptions), without taking into account the aviation emissions cap, which is currently being exceeded. The general cap has also not been considered because it includes all the other sectors subject to the EU ETS, which is beyond the scope of this study.

## Potential EU ETS extension scenarios and revenues generated

The EU ETS was introduced for aviation in 2012 and was initially planned to affect all flights departing from or arriving at an airport in the EEA. However, its perimeter was reduced by the so-called "stop-the-clock" measure, restricting its scope to intra-EEA flights. What was meant to be a temporary decision was renewed many times, with a current deadline in 2026. At this point, the European Commission plans to evaluate the effectiveness of CORSIA (see below). Depending on the assessment, the perimeter covered by the EU ETS for aviation could be extended: if CORSIA is found to be effective, extra-EEA flights may continue to be covered by CORSIA and not by the EU ETS. On the contrary, if CORSIA is deemed unsuccessful, the scope of the EU ETS could be extended to cover all international flights from the EEA, possibly working side by side with CORSIA (as per Article 28b.3 of the EU ETS Directive).

We modelled several potential extension scenarios, which are intended to reflect the main choices available to the European Commission for the revision of the EU ETS aviation perimeter:

**Scenario 1 –** covers all flights to or from the EEA, as initially planned in 2012 ("full scope"). This is the largest perimeter modelled.
**Scenario 2 –** covers all flights departing from the EEA (arriving flights excluded).
**Scenario 3 –** covers all intra-EEA flights as well as all flights from or to countries that do not take part in CORSIA. This means that CORSIA is considered effective and therefore only flights not covered by CORSIA are included in the EU ETS.
**Scenario 4 –** covers all intra-EEA flights, covering the same perimeter as today with the "stop-the-clock" measure.

Some countries may not participate in CORSIA's mandatory phase. At this stage, the 5 countries identified by Ricardo firm[12] are Brazil, China, India, the Russian Federation and Vietnam. In our study, we consider that these countries will not participate in CORSIA from 2027 and therefore included the flights from and to these countries in scenario 3. Note that this list is arbitrary and is subject to government announcements and political choices. For example, the United States may end up not taking part in this scheme, while Brazil could choose to participate, based on their latest positions.

***What is CORSIA?***

CORSIA stands for Carbon Offsetting and Reduction Scheme for International Aviation. It is a global mechanism for offsetting $CO_2$ emissions growth of international aviation compared to a baseline equivalent to 85% of 2019 emissions. It was adopted by the International Civil Aviation Organization (ICAO) in 2018. It is currently in a voluntary phase and will be mandatory for most ICAO countries from 2027.
CORSIA has been criticized for its limited effectiveness[13]: the mechanism is based on offsetting credits on the voluntary carbon market, instead of tangible emission reductions[14]. Moreover, it only covers additional emissions compared to the baseline, and not all emissions.

To forecast the emissions in these four scenarios, we used the dataset published by Salgas et al.[15] which provides a baseline for 2019 commercial flights. Then, we used EUROCONTROL Aviation long-term outlook[16] to derive the evolution of the number of flights for each year. We consider the influence of decarbonisation levers following the central scenario proposed by ATAG[17] regarding energy efficiency improvement in their Waypoint 2050 publication. It includes technological levers such as renewing aircraft fleets, as well as operational levers, such as reducing weight or increasing the load factor. We also include the increasing use of alternative fuels (SAF, Sustainable Aviation Fuels) following the compulsory ReFuel EU targets, and considering a 70% reduction of $CO_2$ emissions compared to kerosene (emissions threshold of ReFuel EU for e-SAF)[18]. This gives us the projected *verified emissions* in the four scenarios.

[12] The EU's and ICAO's diverging ambitions to reduce aviation's climate impacts, Ricardo, November 2024
[13] Preconceived ideas on aviation and climate, § 6, Carbone 4
[14] See IPCC AR6 WGIII full report, p. 1089 : "By its nature, CORSIA does not lead to a reduction in in-sector emissions from aviation since the programme deals mostly in approved offsets. […] most currently approved CORSIA offsets are avoided emissions, which raises the issue of additionality." See Carbone 4's Net Zero Initiative framework for more insights on the difference between emission reductions, avoided emissions and offsetting in carbon accounting
[15] Salgas, A., Sun, J., Delbecq, S., Planès, T., & Lafforgue, G. (2023). Open-source traffic and $CO_2$ emission dataset for commercial aviation (1.0.1) [Data set]. ISAE-SUPAERO. https://doi.org/10.5281/zenodo.10143773
[16] EUROCONTROL Aviation Long-Term Outlook: Flights and $CO_2$ emissions forecast 2024 – 2050, EUROCONTROL, 2024
[17] Scenario 2 of Waypoint 2050, ATAG, 2021
[18] Fit for 55: increasing the uptake of greener fuels in the aviation and maritime sectors, Council of the European Union

The revenues not only depend on the projected *verified emissions*, but also depend on the *emission cap*, which represents the number of emission allowances issued under the system. We follow the current emission cap definition[19] with a 4,3% linear factor decrease from 2024 to 2027, followed by a 4,4% decrease from 2028 (due to a lack of information of the evolution beyond 2030, we keep the same decrease rate). The cap was defined for scenario 4 (current scope) and adapted proportionally to the verified emissions in the other scenarios. We have also considered the phasing out of free allowances scheduled for 2026, with the gradual reduction planned.

To convert $CO_2$ emissions from flights to revenues, a carbon price needs to be set. Indeed, if their free allowances were not sufficient, companies need to buy further allowances to cover their emissions. The price of these allowances varies, following the carbon market rules. Many estimates exist up to 2030 but are rarer after that date. What's more, these projections are fairly uncertain. We used the median estimate from Carbon Pulse's carbon pricing aggregate from different forecast studies up to 2030[20], followed by an increase to €200/t in 2040, see Figure 5. We have also defined low and high range price projections to analyse the sensitivity of the calculated revenues to this estimation. The low-range scenario assumes that the carbon price remains constant, while the high-range scenario uses the maximal price projected in Carbon Pulse's carbon pricing forecast.

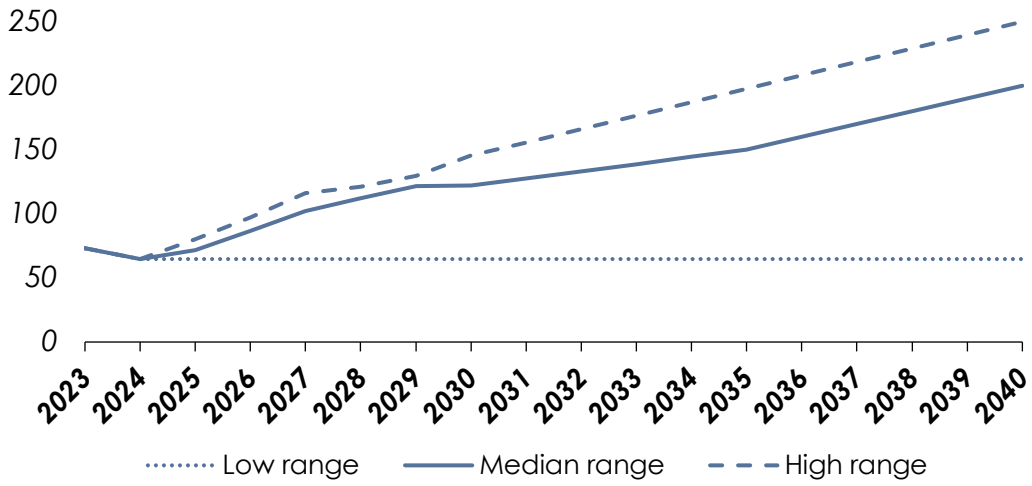



*Figure 5: Projected carbon price (€/t$CO_2$) used in this study*

*By combining the projected flight emissions up to 2040 with the estimated carbon price, we can then deduce the revenues generated by the EU ETS in the different scenarios, see*

Figure 6.

[19] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC (Text with EEA relevance)
[20] POLL: Analysts cut EUA price forecasts as trade tensions, weak demand weigh, Carbon Pulse, 2025

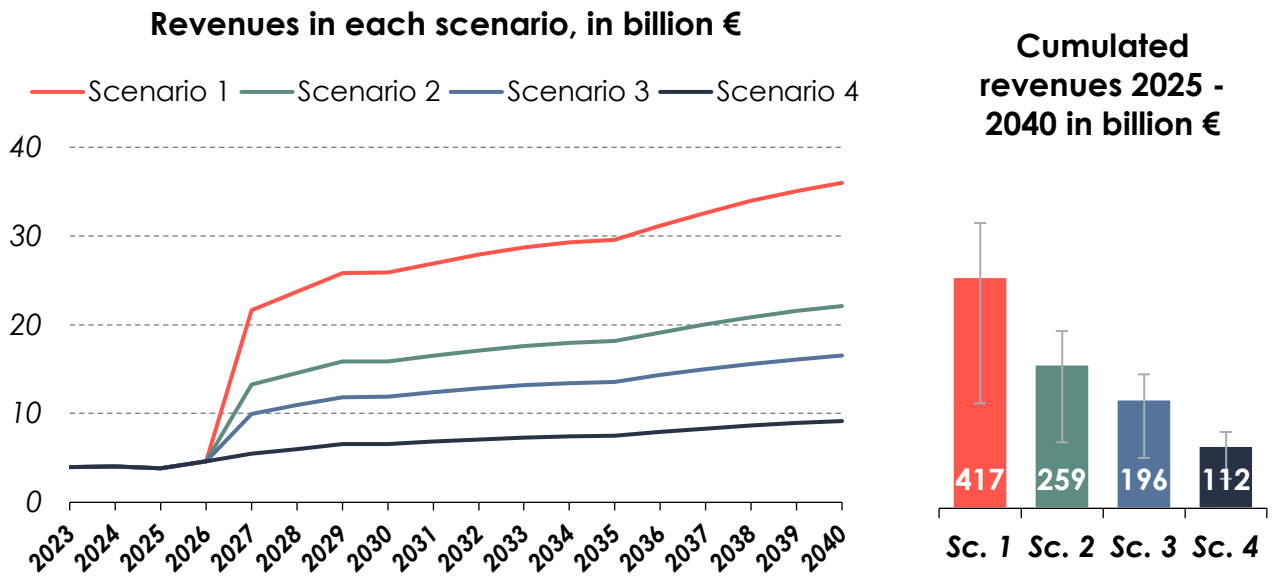



*Figure 6: Revenues (in billion €) generated in each scenario. The uncertainty shown in the chart on the right refers to the uncertainty in carbon price.*

Logically enough, the greater the geographical scope, the greater the revenues generated by the EU ETS, by a ratio of ~4. There is still a great deal of uncertainty about the price of carbon, even more so after 2030, which has a significant impact on the potential revenue from aviation EU ETS. For example, in scenario 4, the low range, assuming a constant carbon price equal to 2024, gives cumulated revenues of 53 billion €, while a high range, with a carbon price rising to 250€/t in 2040, gives cumulated revenues of 138 billion €.

## Addition of a second layer accounting for potential coverage of non-CO2 aviation effects

Currently, only direct combustion emissions are covered by EU ETS. This means that non-$CO_2$ effects are not considered yet, despite their net positive radiative forcing, contributing to climate change (see below).

However, the Monitoring, Reporting and Verification (MRV) of these non-$CO_2$ effects has started in 2025, for intra-EEA flights. If this MRV is successful, it could allow these non-$CO_2$ effects to be considered in the calculation of *verified emissions* and therefore taken into account in the allowances issued. Due to a deferral period, flights connecting the EEA with third countries will only be subject to the MRV obligation as of 2027.

By the end of that year too, the European Commission is to publish a report assessing the findings of the MRV exercise and make a legislative proposal, possibly to cover non-$CO_2$ aviation effects under carbon pricing. Due to this timeline, we consider non-$CO_2$ effects to be only potentially added by 2029.

***Why consider non-$CO_2$ effects?***

Aviation has an impact beyond the $CO_2$ emissions caused by the combustion of fossil fuels, via numerous chemicophysical processes in the atmosphere. The main non-$CO_2$ impact of aviation is the effect of **condensation trails**. These are the famous white streaks that can be seen in the sky. They can become persistent in a sufficiently cold and humid air mass and then evolve into cirrus clouds (ice clouds) depending on the weather conditions. This type of cloud has an overall warming effect on the climate. It reflects the radiation it emits back towards the earth, without having an equivalent albedo effect (reflecting solar radiation back towards space). But these clouds are too small and unstable to be accurately considered in climate models. The magnitude of their effect therefore remains **uncertain**, but this uncertainty is assessed, as in all scientific work. And the latest studies indicate that considering all the non-$CO_2$ effects are **at least as significant as the $CO_2$ emissions** associated with the direct emissions from jet fuel combustion and **could be as much as three times larger**[21,22].

In this study, we choose an intermediary value by considering non-$CO_2$ impacts are two times higher than the direct combustion emissions. We also consider the fact that SAF (Sustainable Aviation Fuels) contribute to decrease the contrails radiative forcing by 26% according to Märkl et al[23] and we apply this effect to the proportion of SAF incorporated (calculated following the ReFuel EU objectives, see page 10). Consequently, emissions in $CO_{2e}$, and the revenues generated are ~2,5 times higher, as shown in Figure 7.

[21] Teoh et. al., 2024, Global aviation contrail climate effects from 2019 to 2021, https://doi.org/10.5194/acp-24-6071-2024
[22] Lee et. al., 2021, The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018, https://doi.org/10.1016/j.atmosenv.2020.117834
[23] Märkl et. Al., 2024, Powering aircraft with 100 % sustainable aviation fuel reduces ice crystals in contrails, https://doi.org/10.5194/acp-24-3813-2024

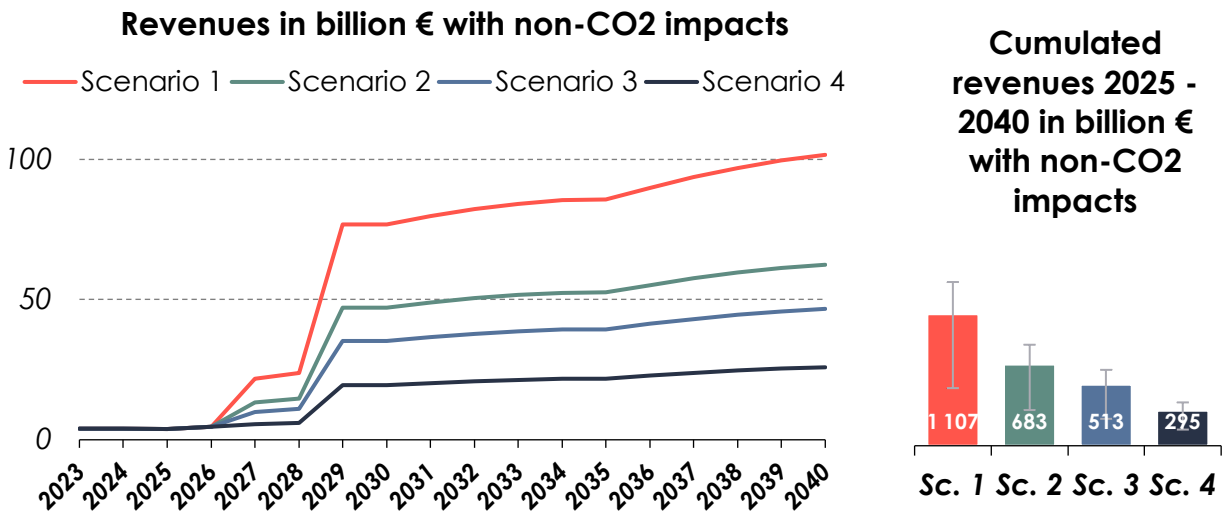



*Figure 7: Revenues generated in each scenario considering non-$CO_2$ impacts. The uncertainty shown in the chart on the right refers to the uncertainty in carbon price.*

As mentioned above, there is still a great uncertainty surrounding the quantification of non-$CO_2$ effects, with an impact on the revenue generated. Research on this topic should reduce the uncertainty in the years to come, and Figure 8 shows the range for scenario 1, between an assumption of non-$CO_2$ climate impact equal to the one of $CO_2$ combustion, or three times higher.

Moreover, some solutions have been developed and are currently tested to avoid the formation of condensation trails, for example by modifying the flight plan[24]. Its implementation could greatly reduce the impact of non-$CO_2$ effects quickly, as a small proportion of flights produces most of the contrail effect. It would be very good news for the climate, but it would greatly reduce EU ETS revenues as a result.

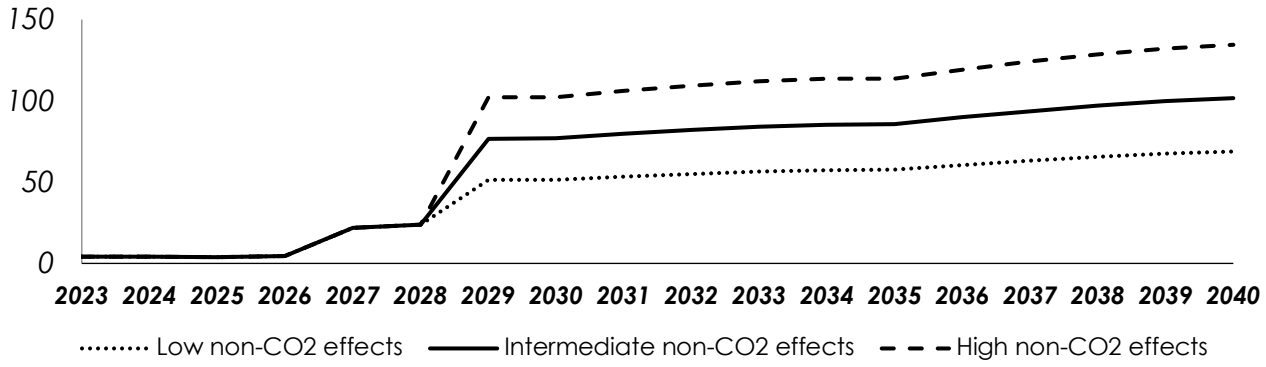



*Figure 8: Revenues with different non-$CO_2$ effects estimates in scenario 1 (in billion €)*

[24] Contrails and aviation's other hidden emissions, Aviation's little-known pollution problem, Transport & Environment

The inclusion of the non-$CO_2$ effects could considerably increase the revenues from aviation in the EU ETS, while better reflecting the overall climate impact of aviation.

## Focus on private jets

Currently, not all private flights are taken into account in the EU ETS[25]. Based on the ICCT assessment[26], 67% of private flights are currently not covered by the EU ETS in scenario 4. If we consider our broader scenario, only 10% of the private flights within scenario 1 are currently covered. The results below show the additional revenues that could be expected by ending the exclusion of some private jets and by extending the geographical scope of the EU ETS.

To estimate their emissions, we used the dataset provided by Gössling et al[27] as a baseline to model the projected emissions of private jets. The evolution is based on EUROCONTROL's outlook[16], the evolution factor being modulated by a factor reflecting the difference in fleet growth forecast between commercial and private aviation (3%/year for private aviation[28], 2.4%/year for commercial aviation[29]). We considered the same decarbonisation levers and kept the same definition of the four scenarios as for commercial aviation (see page 9).

Moreover, to reflect the fact that private aviation has higher emissions per passenger kilometre than commercial aviation, we use a **carbon multiplier**. We define it as the ratio between the fuel consumption per hour and per seat of a private jet compared to a classical commercial aviation such as an Airbus A320 or Boeing 737. Our calculation, considering the top 15 of private jets operating in Europe, representing 60% of emissions, shows that this carbon multiplier is equal to ~4. However, this value is certainly underestimated, as we considered the maximum capacity of private jets (from the certification), whereas the standard configurations tend to include less seats. It should also be noted that the average load factor in private is low compared to commercial aviation. We use this figure of 4 for the carbon multiplier as a conservative hypothesis to represent this gap in emissions per passenger kilometre compared to commercial aviation. We multiply the emissions from private aviation by this carbon multiplier before calculating the revenues.

We then obtain the revenues that could be generated by the generalization of EU ETS on all private jets by multiplying by the carbon price (see Figure 5). The results, without and with considering non-$CO_2$ effects (see page 13) are shown on Figure 9.

[25] This concerns private flights operated by non-commercial operators emitting less than 1 000 $tCO_2$/year or by commercial operators operating fewer than 243 flights in a continuous period of four months or emitting less than 10 000 $tCO_2$. Flights performed by aircraft with a certified maximum take-off mass of less than 5 700kg are also excluded.
[26] ICCT assessment
[27] Gössling, S., Humpe, A. & Leitão, J.C. Private aviation is making a growing contribution to climate change. Commun Earth Environ 5, 666 (2024). https://doi.org/10.1038/s43247-024-01775-z
[28] Data: How Europe's Business Aviation Fleet Is Forecast To Grow, Antoine Fafard, Aviation Week, 2025
[29] Airbus Global Market Forecast 2025-2044

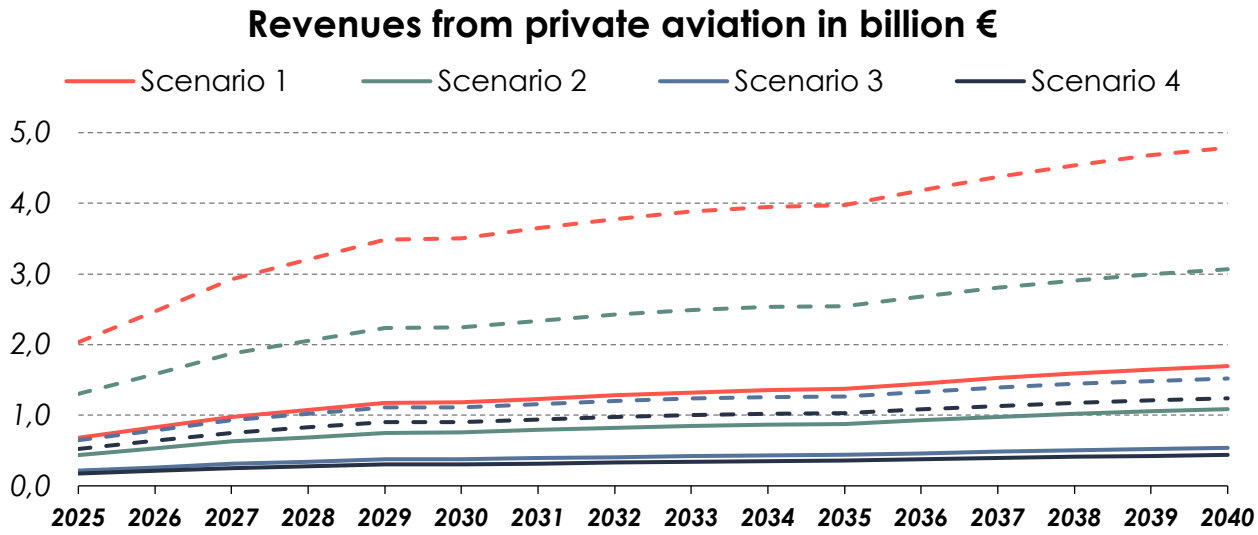



*Figure 9: Revenues from private aviation. Solid lines: without non-$CO_2$ effects. Dotted lines: with non-$CO_2$ effects.*

Including all private flights in the perimeter of the EU ETS for aviation is a way to further expand the revenues from the EU ETS by 5 to 59 billion € on the 2025-2040 (depending on the scope), while preserving the idea of social justice, as private aviation is mainly beneficial to the most well-off. Combining it with a large geographical scope and considering the non-$CO_2$ effects also increases the revenues.

**Taking into account the full climate impact of flights with non-$CO_2$ effects and including all private flights could bring in 300 billion € on the 2025-2040 period (keeping the same geographical perimeter as of today). Extending the scope to all flights operating to and from a European airport could increase the revenues by 380%. While this represents an important amount that can be allocated to the decarbonisation of our transportation, it is at the same time a strong incentive for aviation to accelerate on its decarbonisation roadmap, enabling to kill two birds with one stone.**

# Revenue expenditure

## State of play: current use of revenues

Most allowances purchased by airlines are EUA and smaller share consists of EUAA, both exchanged at a price between different players and not necessarily collected by the EU. Regarding auctioned allowances, revenues collected by the EU from the auction of allowances are primarily distributed to EU ETS Member States and European Union funds, as shown on Figure 9. Auctioning revenues have increased significantly lately as carbon prices have risen and free allowances for aviation are being phased out, reaching nearly 44 billion € in 2023.
Collected EU ETS revenues are directed towards decarbonization, and Member States are obliged to spend ETS revenue on climate action and energy-related actions except for aid to electricity-intensive industries for indirect carbon costs. Climate actions include aid to energy supply, grids and storage, public transport and mobility, and energy efficiency in building among other sectors.

From the total revenue of 43,6 billion € from EU ETS auctions in 2023, 33 billion went directly to Member States, 5,6 billion € to the ETS Modernisation Fund, 2,8 billion € to the Recovery and Resilience Facility (RRF), 1,8 billion € to the Innovation Fund and the remaining 0,3 billion € to the States of Iceland, Liechtenstein, Norway and Northern Ireland.

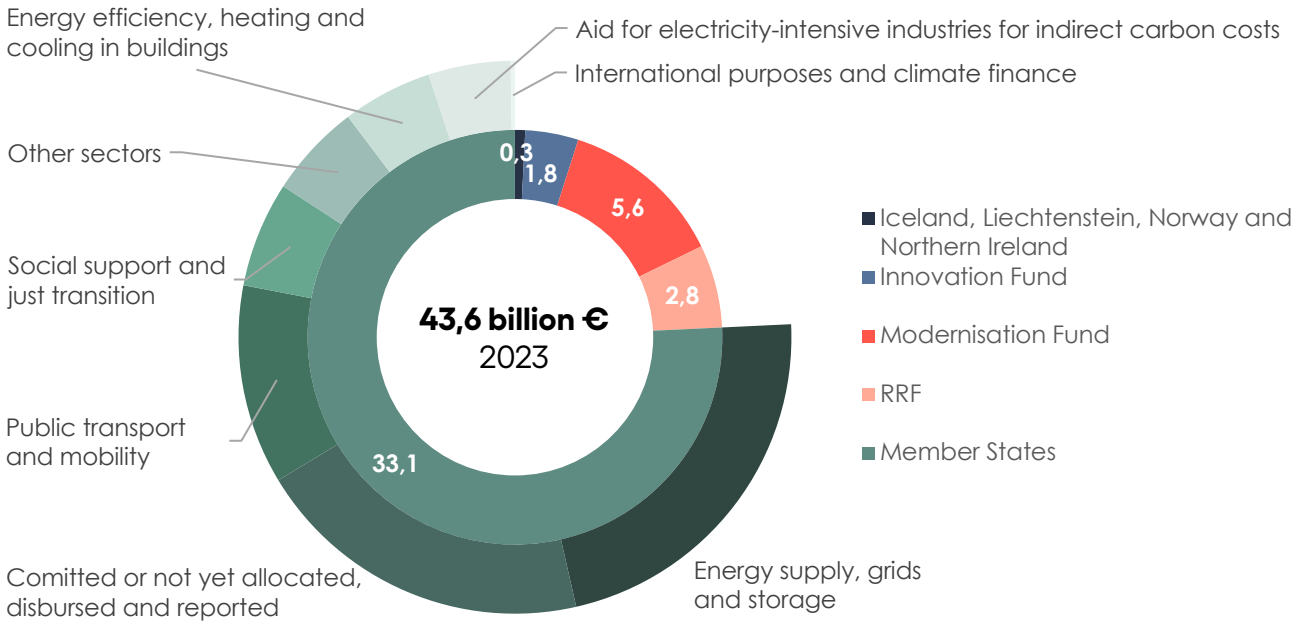



*Figure 10: Auctioning revenues and reported usage, (Billion EUR), 2023, scope EU-27. Source: Auctioning of revenues and reported usage, European Environment Agency (EEA)*

Almost half of the revenue expenditure by Member States is dedicated to energy supply, grids and storage (e.g. renewables, self-consumers) and public transport and active mobility (e.g. railway development, bus electrification) categories, the latter representing 5,1 billion € (15% of Member States expenditure). An important part of the revenues (25%) is not yet allocated as Member States are not obliged to spend 100% of the revenues in the year of generation. Therefore, additional disbursements of 2023 revenues are expected in 2024.

Aids to decarbonize aviation through energy efficiency and alternative fuel development do not appear as a main category of revenue use. The Modernisation Fund prioritises investments in generation and use of energy from renewable sources, energy efficiency and modernizing energy networks including district heating. The RRF programme aims to mitigate the economic and social impact of the coronavirus pandemic. It is the centrepiece of the NextGenerationEU programme.

On the other side, the Innovation Fund focuses on innovative low-carbon technologies. Main sectors include cement and lime production, hydrogen and the manufacturing of components to produce renewable energy or store energy. From the 104 projects in the Innovation Fund portfolio by the end of 2023, only two are dedicated to produce (SAF) aviation fuels with a total investment of 247 million €[30]. One other project is focused on developing a hybrid electric regional aircraft.

Although the Innovation Fund is expected to increase its investments in projects aimed at producing SAF and in other programmes aimed at reducing carbon emissions in the aviation sector, support for the decarbonisation of aviation from revenues generated by the EU ETS has been limited.

[30] Innovation Fund projects

# Identification of priority sectors for revenue allocation

Within the transportation sector, some decarbonization levers require strong investment, especially to reach sufficient size to become efficient. It is the case for the development of an industrial production of Sustainable Aviation Fuels (SAF) within Europe or the renovation and extension of European rail network. Additionally, the EU has committed to contribute financially to the climate transition of developing countries, which has to be financed in some way.

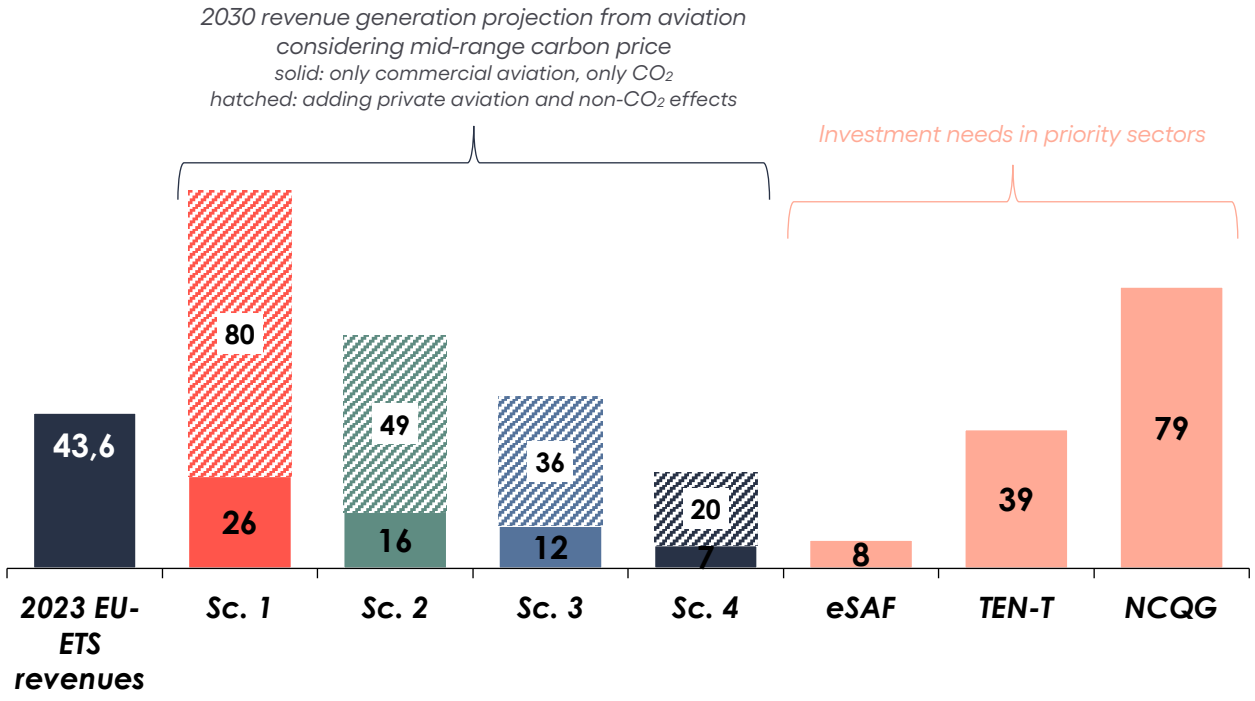



*Figure 11: 2023 EU-ETS revenues, 2030 revenue projection, mid-range carbon price, without non-$CO_2$ effects next to investment needs across SAF, TEN-T and NCQG categories per year between 2025 and 2030 (billion €)*

## Sustainable Aviation Fuels

The Refuel EU Aviation Regulation sets ambitious objectives of SAF uptake from 2025 in order to contribute to the EU's climate targets. It is necessary to boost investments in SAF across the whole supply chain in order to increase SAF production and reach the target of 2% of SAF blend between 2025 and 2029, and 6% in 2030 (of which 20% have to be e-SAF).

To put in perspective the investment requirements needed to fulfil demand for SAF and eSAF by 2030, **total capital expenditure (CAPEX) investments required between 2025 and 2030 would be around 26 to 71 billion € (if only considering eSAF)[31] [32] with an average yearly need estimated to be approximately 4 to 12 billion € (8 billion € on average).**

[31] Guideline for a Sustainable Aviation Fuel Blending Mandate in Europe, World Economic Forum, 2021
[32] Financing transport decarbonisation, Transport & Environment, 2024

## Development of railway

Railways, being a low-carbon and energy-efficient means of transportation for both goods and people, plays a vital role in reducing transport-related emissions. It is essential to ensure a comprehensive and long-term financing for the sector in order to make rail services more competitive, increasing cross-border connectivity, high-speed lines and user-friendly systems. Compared to short-haul flights, which are disproportionately carbon-intensive, rails offer a significantly lower-emission alternative on many routes across Europe main cities. Redirecting EU-ETS aviation revenues to support this shift would not only apply the "polluter pays" principle but also help reduce transport-related carbon emissions, helping the EU meets its climate goals faster and effectively.

In Europe, the Trans-European Transport Network (TEN-T) policy is a key instrument aimed at developing a unified railway network across EU member states. The TEN-T is related to the infrastructure and defines certain rail project as high-priority infrastructure for 2030. Other than developing key rail infrastructure, TEN-T also aims to increase rail travel speed and infrastructure interoperability by developing a single European signalling system.

**The required amount of investment needs in rail lines for the full completion of the Trans-European Transport Core Network (TEN-T) by 2030 is estimated between 30 to 47 billion € annually[33],[34].**

## Climate finance: New Collective Quantified Goal (NCQG)

The Copenhagen Accord, adopted at COP15 in 2009, committed developed nations to raise jointly 100 billion € per year by 2020 to aid developing countries in their climate mitigation and adaptation measures. At the last COP29, negotiations started over a "New Collective Quantified Goal" that includes a much larger target as nations are committing to deliver at least $300 billion per year by 2035 and calls all actors to work towards mobilizing $1,3 trillion in international climate finance. According to the EU, EU27 Member States contributed 28,6 billion € in 2023[35]. Following a similar contribution from the EU to the 100 billion €, the $300 billion target would require an investment over **79 billion €[36] by 2035** from the EU27 Member States.

Although revenues from the EU ETS are expected to grow, other priority sectors are also significantly increasing their investment demands to meet global and EU targets by 2030. While the capital required for developing SAF production facilities in aviation may appear manageable relative to EU ETS revenues, other key sectors such as railways and climate finance, could generate a substantial gap between available revenues and actual expenditure needs.

[33] Sustainable and Smart Mobility Strategy – putting European transport on track for the future, 2020
[34] The European Rail Supply Industry priorities for 2024-2029, UNIFE, 2024
[35] Council conclusions on international Climate Finance in view of the 29th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP29), in Baku on 11-22 November 2024
[36] Average US dollar (USD) conversion change from 27 June 2024 to 27 June 2025, European Central Bank, 2025

# Table of Figures

# Appendix

The following figures show complementary graphics to better understand underlying emissions calculated and the impact of modifying he carbon price.

## Emissions projections calculated to derive revenues

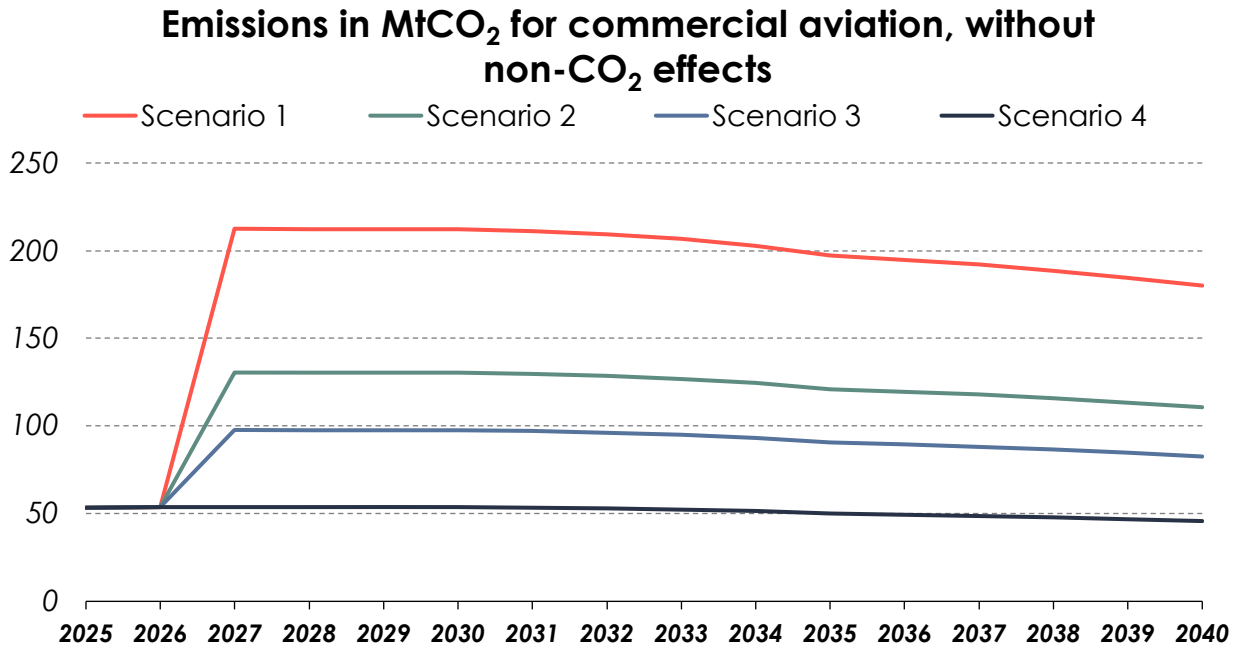



*Figure 12: Emissions from commercial aviation, without non-$CO_2$ effects, in $MtCO_2$*

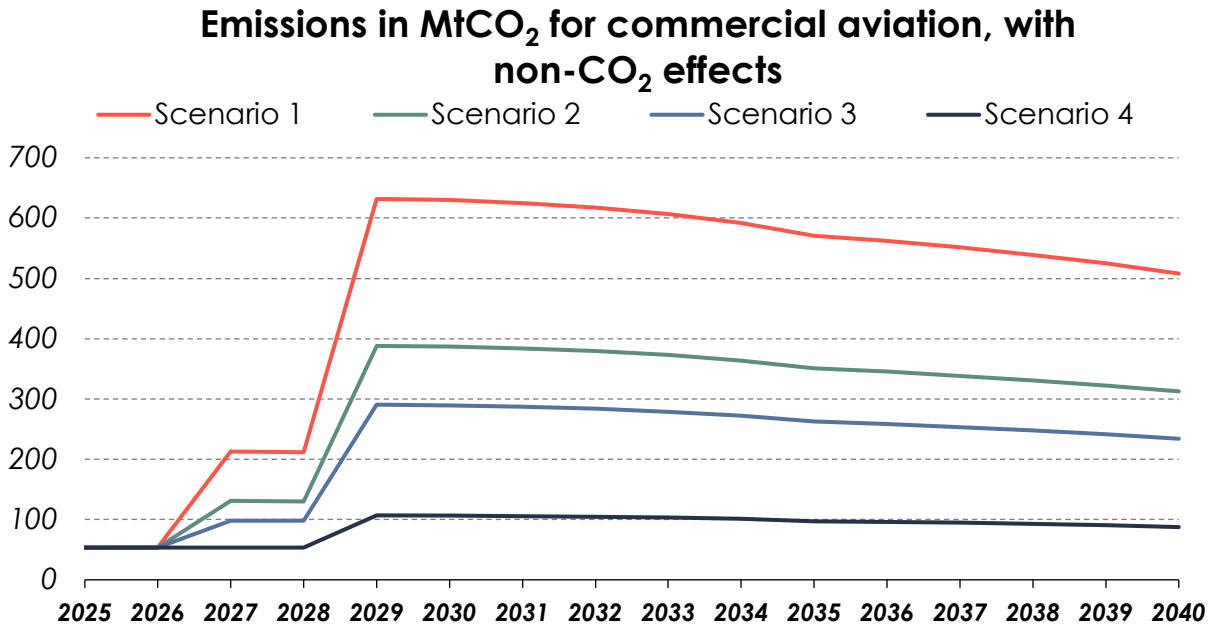



*Figure 13: Emissions from commercial aviation, with non-$CO_2$ effects, in $MtCO_2$*

# Revenues considering only $CO_2$ emissions, with varying carbon price

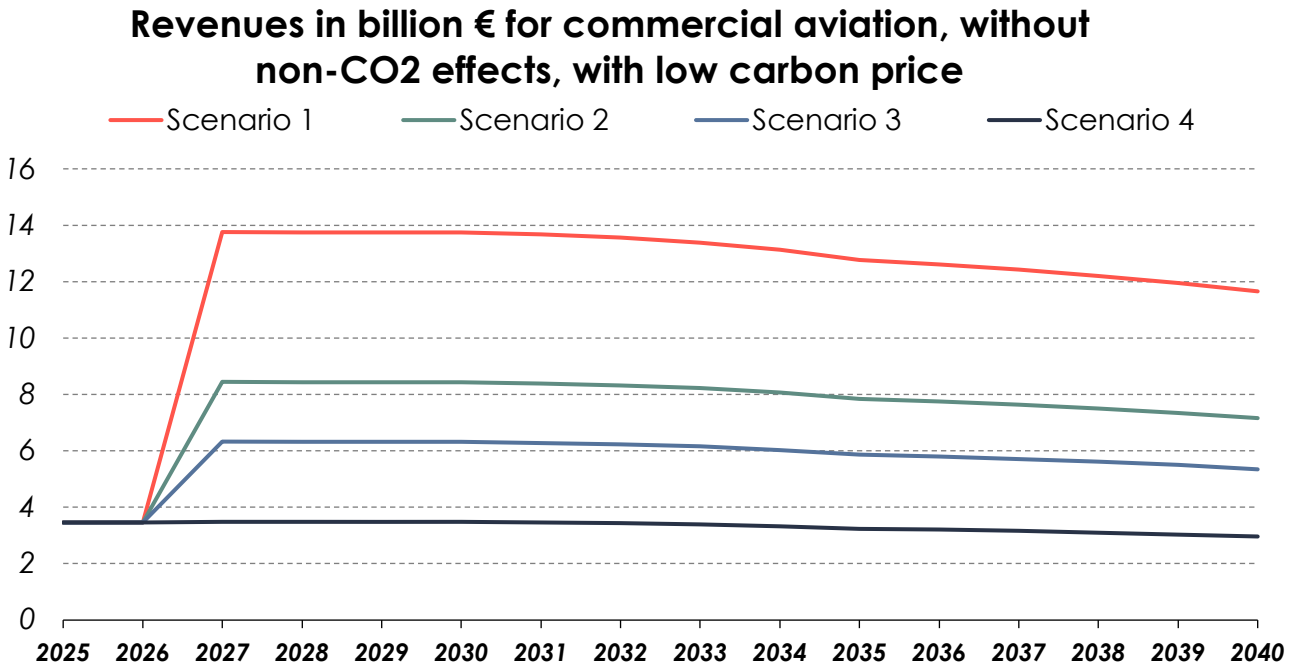



*Figure 14: Revenues from commercial aviation, without non-$CO_2$ effects, with a low-range carbon price estimation, in billion €*

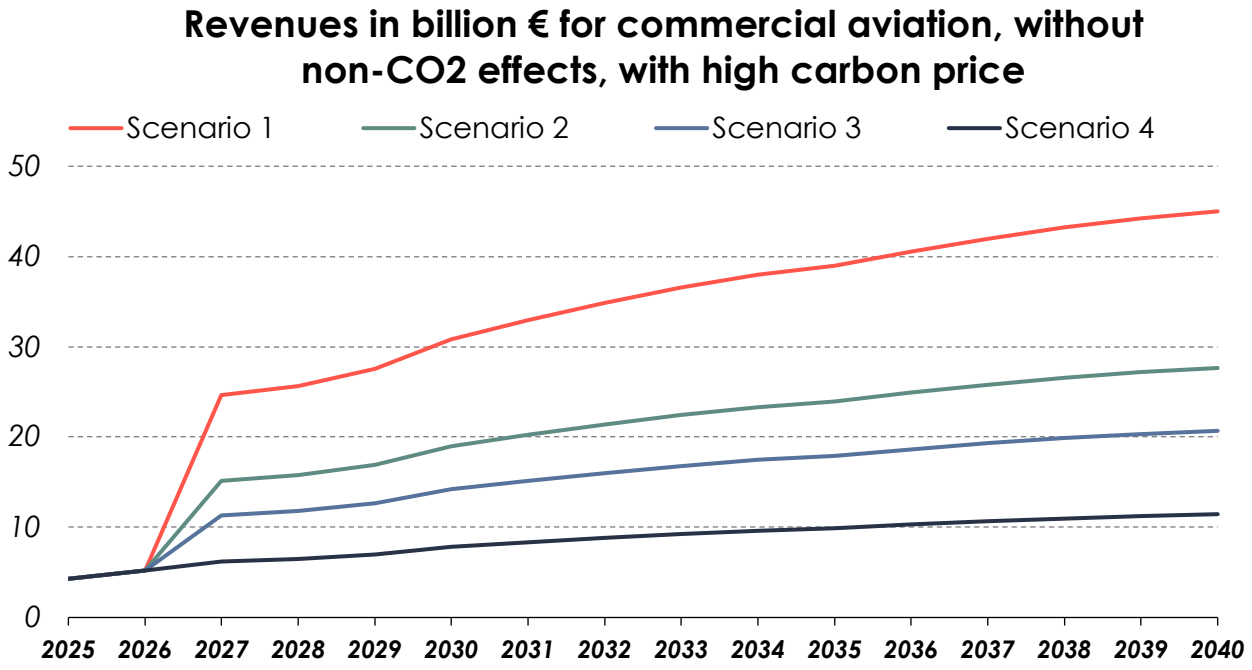



*Figure 15: Revenues from commercial aviation, without non-$CO_2$ effects, with a high-range carbon price estimation, in billion €*

# Revenues considering non-$CO_2$ effects, with varying carbon price

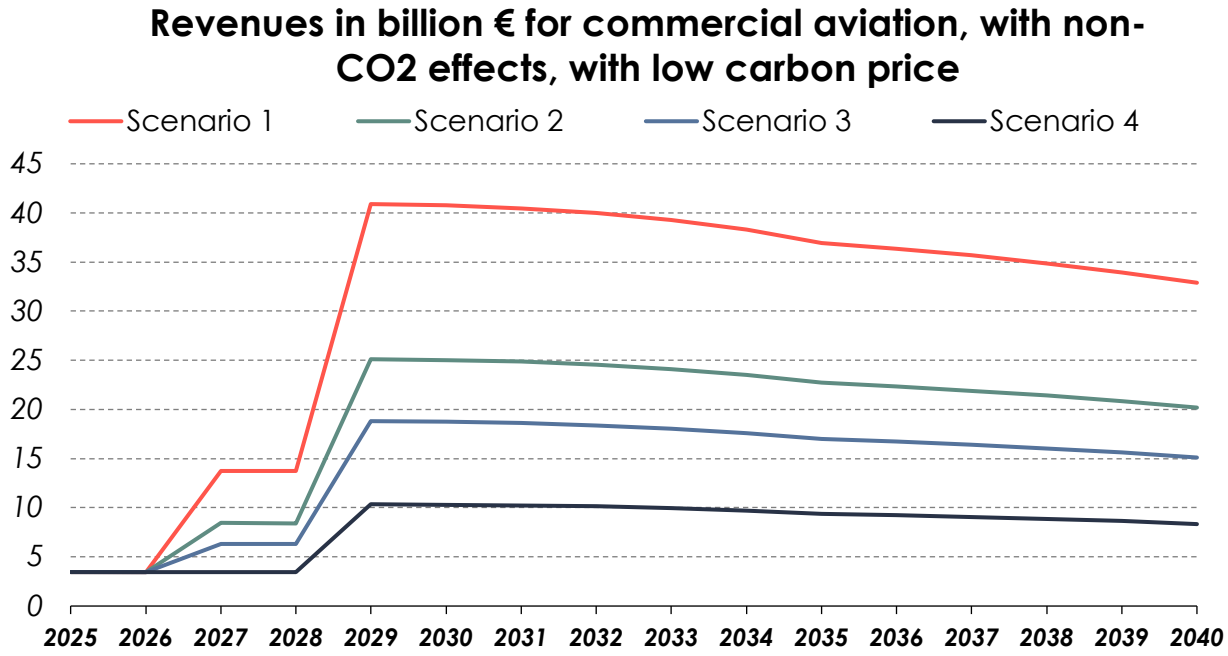



*Figure 16: Revenues from commercial aviation, with non-$CO_2$ effects, with a low-range carbon price estimation, in billion €*

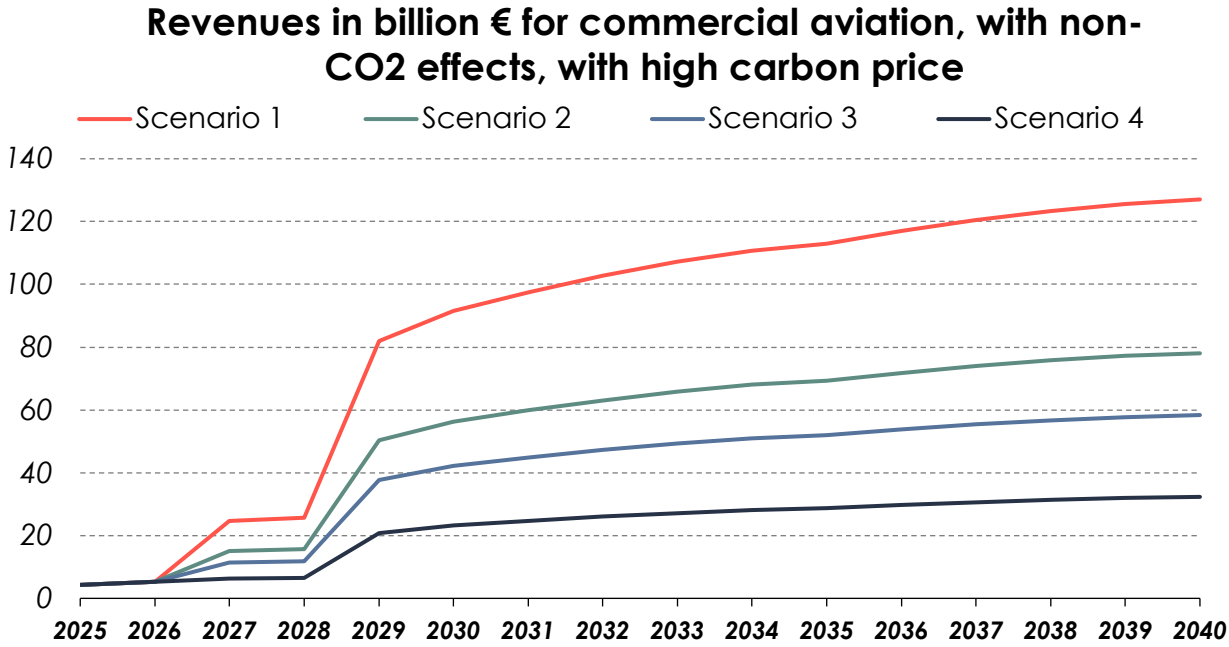



*Figure 17: Revenues from commercial aviation, with non-$CO_2$ effects, with a high-range carbon price estimation, in billion €*

**Carbone 4** is the first independent consultancy specialised in low carbon strategy and adaptation to climate change.

Constantly on the lookout for low amplitude signals, we deploy a systemic view of the energy/climate issue and put all our rigour and creativity to work to transform our clients into leaders in the climate challenge.

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**Carbon Market Watch** is an independent, not-for-profit watchdog and research organisation with unique expertise in carbon pricing and a track record of shaping and influencing international and European climate policy.

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