European Commission Call for Evidence - May 2026

T&E input - Aviation Strategy

In light of the current crisis in Iran and broader conflicts such as the Ukraine war, the dependency of European aviation on fossil fuels and imported kerosene is clearer than ever. Countries like China are quickly catching up in the field of aerospace technologies. If we fail to look ahead, Europe will lose its position as a global leader, remain dependent on fossil imports and risk losing its competitive edge in sustainable technologies.

The aviation sector should be treated as a strategic European industry, yet this comes with a responsibility. The sector must show that it is willing to contribute financially to its own transition and competitive advantage. This requires investments in e-SAF and zero-emission technology that are supported by revenues generated through fair aviation pricing. The aviation sector, supported by strong policy, can achieve moonshot innovation projects, build competitiveness and increase European energy and economic sovereignty.

Developing an aviation sector that can compete in the future means funding **zero-emission technology** and **e-SAF scale up,** kickstarting **non-CO_2 mitigation,** enabling **fair pricing** and shifting away from **volume driven growth**. These are the five pillars of a resilient, powerful and secure aviation sector.

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Summary

In the coming decade, the EU's aviation sector, supported by the European Commission and member states, must tackle its climate warming impact and ongoing dependencies on volatile imported fossil fuels. The sector should strengthen its position as the global leader in sustainable and secure aviation amid external challenges. T&E is advocating for an Aviation Strategy that puts energy security and innovation at its heart while simultaneously meeting competitiveness and environmental objectives. To achieve this, we see four key priorities.

The first priority is to restructure sustainable aviation funding and support. By changing how innovation funding is organised at European level within the MFF, we should create **European Aviation Champions.** This would ensure Europe remains a technology leader in hydrogen, electric and hybrid flight and in the production of long-term, sustainable e-SAF.

Second, we must look beyond just decarbonisation and tackle **non-CO_2 mitigation, a critical climate impact reduction opportunity for European stakeholders**. With a non-CO_2 monitoring tool in place since January 2025, it is time to understand these warming effects and act on them through policy. First through large scale trials that connect airlines and airspace coordinators followed by systematic contrail avoidance at European level within 10 years.

Third, fairer **pricing of emissions** is a key enabler to fund a European industrial plan. By ensuring the polluter pays principle, and reducing unwanted externalities such as carbon leakage to a minimum, the aviation sector itself can take responsibility to generate the scale of funding needed to industrialise sustainable aviation technologies and e-SAF.

Finally, aviation must **shift away from volume driven growth**. Instead, the sector should fit into a broader sustainable mobility framework that avoids unnecessary travel and shifts short-haul trips to rail where adequate alternatives exist.

Priorities for the upcoming Aviation Strategy

EU Aviation Champions	Non-CO_2 mitigation	Fair pricing	Shift away from growth
The next generation of e-SAF, electric and hydrogen tech should be developed in the EU.	Start multi-stakeholder large scale trials, incentivize airline and ATM led avoidance and strengthen the MRV.	Through fair taxation, generate revenues that enable the sector to invest and reduce its environmental impact.	Set limits on volume based aviation growth, focusing on economic benefits rather than blind quantity.

Key recommendations

1. **Set up an ambitious industrial strategy for zero-emission aircraft (ZEA) to retain Europe's global lead in aviation technology**. Restructure European funding mechanisms for zero-emission aviation in the upcoming MFF, invest in EU champions and create - through policy signals - a clear market that rewards leaders.

2. **Develop e-SAF at scale to ensure environmental benefits, energy security and economic advantages.** Provide regulatory certainty and support the bankability of critical e-SAF projects between now and 2030. Continue to invest in production and renewable energy as a key feedstock. In the coming decade, e-SAF should be a critical part of defence and resilience strategies.

3. **Non-CO_2 mitigation is critical to cut aviation's climate impact.** Strengthen the MRV, set up large scale trials that include ATM stakeholders and avoid contrails in low density airspace by 2035.

4. **Increase revenues to fund the industrial strategy with fairer taxation.** Fair taxation, based on the polluter pays principle is critical to fund the transition to sustainable aviation. Investments and support for sustainable aviation technology in the coming decade depend on emission-based pricing through EU ETS, VAT or fuel tax.

5. **Shift away from volume based growth and towards economics benefits over blind quantity.** Binding targets and a reduction of non-essential flights are needed by 2030. These must be in line with global carbon budgets to ensure Europe's airports, private aviation and business travel limit uncontrollable growth. The sector must instead focus on its overall benefit to society, both environmentally and economically, by aligning with the broader European mobility system.

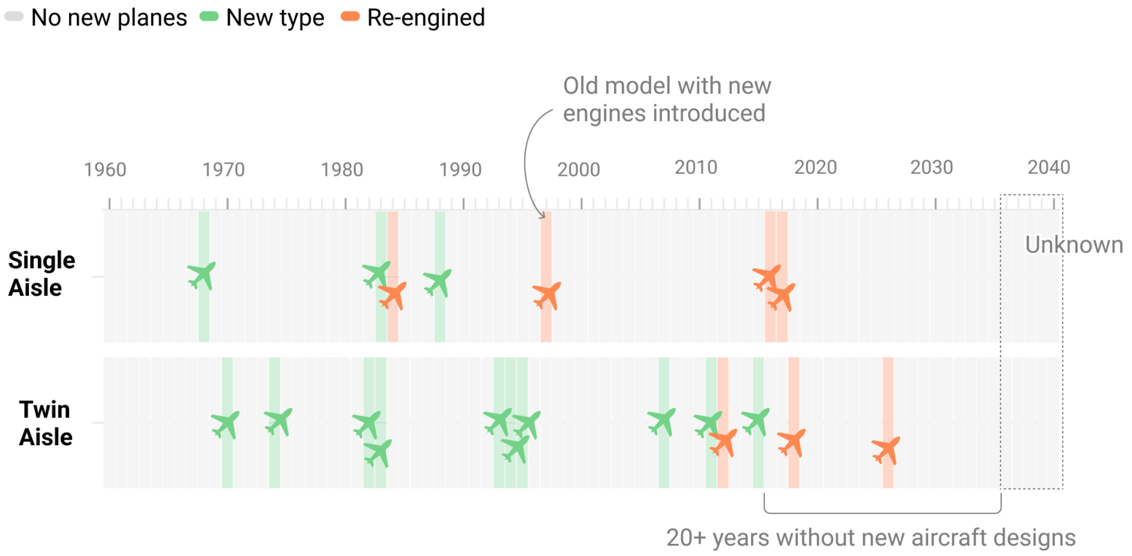
An ambitious industrial strategy for zero-emission made-in-Europe aircraft

After almost two decades of incremental R&D funding, it is time to move from efficiency improvements to radical zero-emission and hybrid technology. Without new momentum, the European aerospace industry could quickly lose its industrial leadership within the geopolitical context, in particular to Chinese firms such as Comac, EHang and others. It is time to reconnect with breakthrough innovation before it is too late. Within the Multiannual Financial Framework (MFF), a restructuring of aviation innovation funding must prioritise an industrial strategy based on breakthrough innovation. New aircraft, both radically more efficient commercial passenger aircraft and zero-emission aircraft must be developed.

Repeated delays in aircraft technology innovation are hindering aviation's green transition. T&E analysis suggests that European aviation could be up to 13% more efficient by 2050 in an ambitious yet achievable innovation scenario, reducing emissions and Europe's dependency on imported fossil fuels. Innovation in the aviation sector has steeply declined over the past decade, with no new aircraft models expected in the next ten years either. Although Airbus and Boeing – the world's two biggest aircraft manufacturers – have unveiled new disruptive designs[1], including the world's first large hydrogen aircraft, these have been delayed or paused.

Fewer new aircraft models are entering the market

An unprecedented 20+ year period without new aircraft designs from Airbus and Boeing is expected



Source: Airbus, Boeing, industry information

[1] Disruptive designs refer to breakthrough innovations like electric or hydrogen propulsion and new airframe concepts that enable much deeper emissions cuts than conventional upgrades.

Instead, the sector has embraced a logic of incremental improvements that bring efficiency gains, but that fail to compensate for the growth in traffic and its emissions. In the past two decades, the EU has provided over four billion euros of public research and development (R&D) funding through the Clean Sky and Clean Aviation Joint Undertaking programs. A part of this funding was used to fund incremental aircraft development such as cockpit or cabin systems. Funding for efficiency improvements such as open fan engines or laminar flow control were originally planned to enter commercial service in the 2020s or early 2030s, but do not have yet a clear date to hit the market, as there are no new aircraft designs in those dates that could use them.

While some innovative technologies such as new engine designs have been developed, there are no new aircraft platforms being developed by Airbus or Boeing to integrate them, and therefore these do not reach industrial scale. More radical aircraft designs - such as electric hydrogen powered aircraft or blended wing bodies - are also missing, due to the absence of startups and scale ups involved in current funding programs and no regulatory incentive for such disruptive aircraft. As Clean Aviation themselves describe: *"Despite its current strong position – due in no small way to its manufacturing capabilities, long-term EU R&I programmes that de-risk breakthrough technologies, and European certification and safety leadership through EASA – the EU aviation sector risks falling into the "technology but no industry" trap"*.

Radically more efficient aircraft platforms should include new technologies developed through EU funded R&D such as open fan engines and laminar flow systems to be at least 30% more efficient. These are needed to replace the current narrow and widebody aircraft by 2035.

At the same time, the EU's start ups and scale ups that have the potential to be zero-emission aviation champions should be supported and nurtured. These companies should deliver new aircraft at an industrial scale within five years. Europe's zero-emission and hybrid technology start-ups and scale ups such as Vaerideon, Beyond Aero, Zeroavia and Aura Aero have already executed several test flights. In addition, EASA is currently working on approval processes for several zero-emission startups and suppliers.

Restructure Europe's clean aviation technology funding to work for innovators

After 20 years of R&D funding, it is time to fund zero-emission and hybrid projects that can deliver step-level changes in emission reductions within a decade or less. This requires daring investments magnitudes higher than earlier clean aviation projects. This can only be done by restructuring the way funding is governed and who decides how funding is spent.

New funding structures for aviation R&D and industrialization should be guided by organisations and experts at the forefront of aviation innovation. Funding oversight bodies should avoid an overly heavy influence by incumbents who may not have a strong commercial interest to bring disruptive innovations to the market. Instead, part of European funding should directly target Europe's start-ups and scale ups who are manufacturing zero-emission aircraft.

New forms of aviation funding are currently being developed within the MFF, notably within the European Competitiveness Fund (ECF) and Framework Programme 10 (FP10) amongst other frameworks. The modernised structure of the MFF 2028-2034 with a higher funding allocation on the Competitiveness Pillar represents a strong opportunity for the development and scaling of disruptive innovation within zero-emission aviation. For this, there needs to be:

- A seamless integration of governance and work programmes between FP10 and ECF,
- A financing toolbox that ensures a continued investment journey from R&D to scale-up for zero-emission aviation,
- Clear environmental eligibility criteria for funding (Do No Significant Harm) across the entire MFF to prevent EU funding going into harmful activities and stranded assets.

Under FP10, a significant part of aviation funding is described within the Single Basic Act (SBA) and Strategic Research and Innovation Agenda (SRIA). The SBA defines the formation of Joint undertakings, where industry and the Commission collaborate on R&D projects and both provide a share of the funding.

The followup to the Clean Aviation Joint undertaking should dedicate more funding for industrialisation of zero-emission technologies and support new entrants. It should target high risk, high reward technologies that go past the era of incremental improvements and really move the needle on decarbonisation. New aircraft architectures, like blended wing body designs, and new energy systems, including electric, hydrogen and plug-in hybrid propulsions, should be explored by the new programme.

The current SRIA pillars, which govern what projects and organisations are funded, must also be changed to enable this. Currently, these are:

1. Hybrid-electric and regional aircraft
2. Ultra-efficient short-and-medium-range (SMR) aircraft and
3. Disruptive technologies for Hydrogen-powered flight.

To reflect the opportunities to invest in zero-emission aviation and support radically more efficient platforms to be deployed within a decade, these should be changed to:

1. Zero-emission or plug-in hybrid aircraft industrialisation, with a focus on EU champions
2. New architecture demonstrator such as a blended wing with hydrogen/electric propulsion.
3. Ultraefficient small-medium range aircraft and wide body aircraft with open fan rotors.

We recommend public intervention that is proactive, selective, and agile. Following the Chinese government's approach to electric vehicles, we recommend that the European Union employ targeted protectionist measures to preserve the necessary space for the development of its own industry players.

We further recommend implementing a "fail fast" selection mechanism based on excellence: subsidizing a wide range of projects to test multiple technological pathways, then concentrating public support on the projects that perform best technically and economically. Finally, we recommend adopting an extremely responsive governance model for support, with a review of the criteria for awarding grants every three months, to allow for a continuous increase in the standards required of projects.

The sector is responsible to fund its own decarbonisation

The T&E zero-emission policy roadmap which will be published soon expects that €1 billion should be ringfenced for electric and electrified aircraft under the 2028–2034 Clean Aviation Moonshot, combining Horizon Europe and ECF support. The source for such highly increased R&D and industrialisation funding must come from the aviation sector. In a period of constrained public budgets, it is not opportune to use general tax payer money to support a polluting sector largely dedicated to leisure. Fair emissions pricing is therefore the key enabler of industrial policy.

Additional ETS revenues from aviation could substantially increase from an annual of €3 billion to €10 billion if the scope of the ETS was extended to flights departing the EU. A part of these additional revenues should flow back to scaling zero-emission technologies. By implementing such a pricing, the sector could largely finance its decarbonisation, its strategic autonomy and future competitiveness.

Moreover, with fossil jet fuel kept artificially cheap, there is a limited commercial case for the multi-billion-euro investment that a genuinely new aircraft requires. The market signal that should be driving that investment, namely the rising cost of polluting, has been deliberately suppressed.

Extending the EU carbon market to all departing flights and reinforcing its effectiveness changes this calculus. A meaningful and rising carbon price raises the operating cost of fossil-fuelled aircraft year after year, while simultaneously narrowing the price gap between today's polluting planes and more efficient planes, as well as zero-emission hydrogen and electric aircraft, that are technically feasible but commercially stranded.

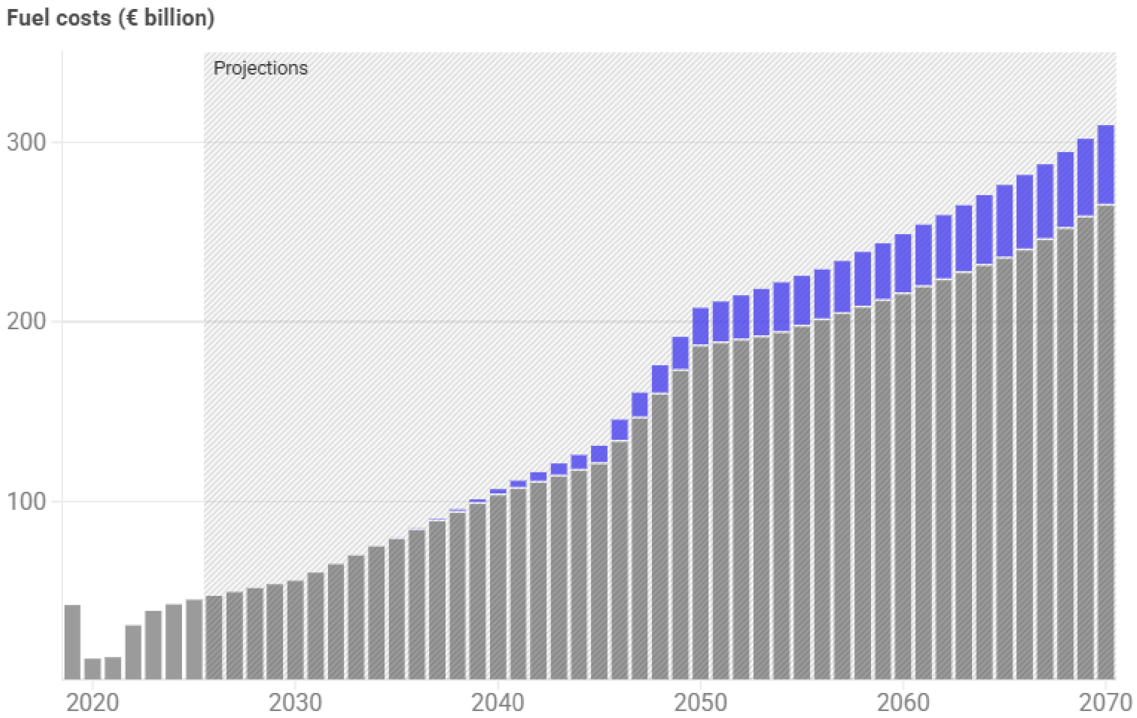
T&E analysis, through the application of a total cost of ownership model, compared two scenarios: one in which the carbon market continues to apply only to intra-European flights and one in which it extends to full scope, covering all departing flights from 2027. The analysis shows that an additional carbon price of €121 per tonne of CO_2 would be sufficient to make cleaner aircraft cost-competitive with conventional alternatives at a system level.

Crucially, this figure sits within the range of carbon prices that current EU ETS projections already imply by the mid-2030s. The policy lever needed to tip the economics is not out of reach.

A stronger carbon price accelerates the shift to cleaner aircraft and saves operators 800 billion in fuel costs over 50 years

Projected operator fuel expenditure under two fleet scenarios

- Fuel costs if next-generation revolutionary aircraft enter service from the 2030s
- Additional fuel costs under a conventional low-innovation fleet trajectory



Source: T&E/PH Shift modelling based on BNEF ETS/CORSIA price projections, ReFuelEU, long-term fuel prices • See Annex for aircraft entry-into-service and technology assumptions

Regulation that builds the market for radically incremental and innovative aircraft

Beyond additional funding, EU Aviation champions need a clear regulatory framework to be able to start producing aircraft at scale, as is mentioned within the AZEA Roadmap. Whilst no dedicated policy instrument is in sight for zero-emission aircraft - in the way that RefuelEU has helped to boost SAFs - existing aviation legislation can be adapted to help boost zero-emission aircraft demand.

First, several routes in Europe - called Public Service Obligations or PSO routes - are currently subsidised by national governments to provide critical forms of connectivity. The EU Commission should modify the Air Services Regulation to strengthen the environmental criteria in tenders for PSO routes to create an entry market for zero-emission aviation. Allowing state aid explicitly for zero-emission aviation from 2030 onwards will allow the EU to guide member states toward such green PSO structures. member states should also explore and implement dedicated "green PSOs" specifically tailored for ZE and hybrid aircraft in suitable routes.

Second, on airport legislation, the EU should require the modulation of airport charges based on CO_2 emissions under the Airport Charges Directive. The Slot Regulation should be amended to create slot pools for ZE and hybrid aircraft or exempt zero-emission aircraft from airport and airspace charges. Finally, the Ground Handling Directive must ensure fair airport access to new suppliers of electric charging and hydrogen refuelling.

Third, regarding the alternative fuels infrastructure regulation (AFIR), member states should identify in National Policy Frameworks the airports that will host ZE and hybrid aircraft, to plan the appropriate deployment of electric charging and related energy upgrades, and prepare for future hydrogen refueling infrastructure. The EU Commission should extend the alternative fuels infrastructure facility (AFIF) for the 2026-2027 period.

Fourth, to ensure the competitiveness of these clean, made in Europe planes, the EU Commission should create a financial support mechanism to bridge the potential increase in operational costs in the first years of deployment for ZE and hybrid aircraft. The mechanism could be integrated under ReFuelEU, following a similar principle to the electricity credits for electric vehicles in the Renewable Energy Directive. Alternatively, they could be introduced in EU ETS, as an extension of the FEETS SAF support scheme.

Finally, a progressive ban on the use of fossil-fuelled aircraft can be implemented. Such a ban would start with specific short-haul routes where sufficient alternatives exist in 2030 and gradually extend to increased ranges as technology develops. As a first step, lower emitting aircraft such as turboprops can be enforced on certain flight routes. These generate less CO_2 and non-CO_2 emissions.

On top of this favourable regulatory framework, project leaders should be able to quickly certify their product. To ensure there is sufficient capacity within EASA and member state authorities, more qualified staff for new technology, better procedures and closer collaboration between EASA and the OEMs is needed. The Commission and member states can also work closely with the industry and regulators to set up dedicated testing areas and fast-lane airspace areas for zero-emission aircraft.

Key measures for ambitious industrial zero-emission aviation

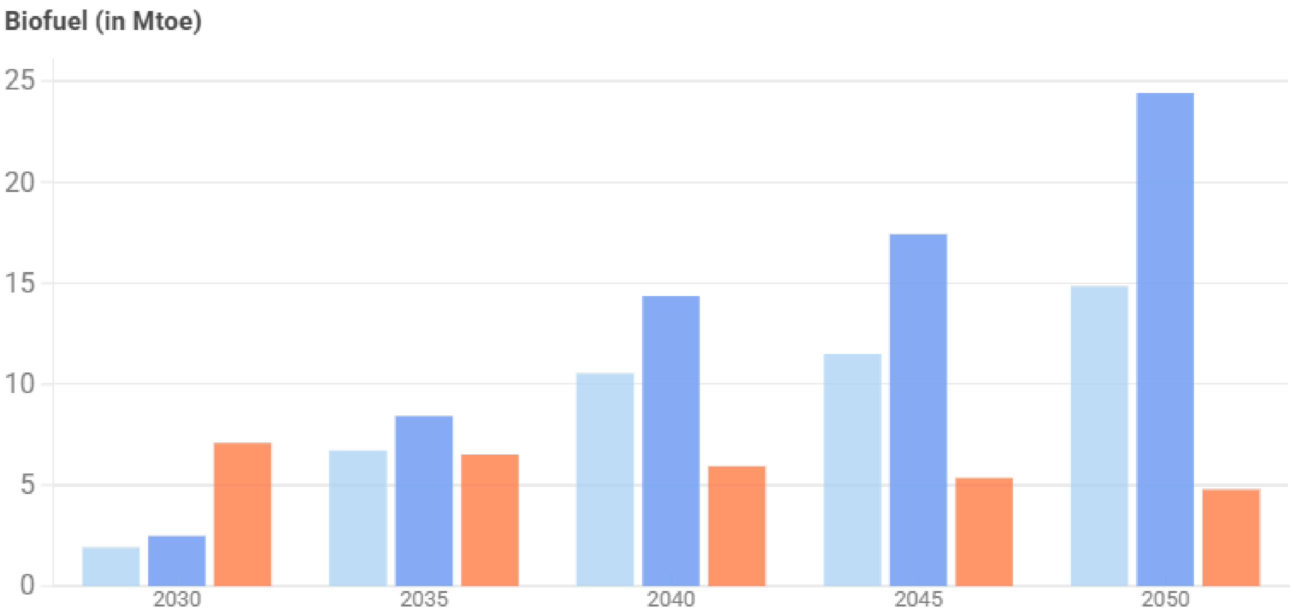
01	**Within the MFF, adapt the SBA (Single Basic Act) and SRIA (Strategic Research and Innovation Agenda) to focus on zero-emission or plug-in hybrid aircraft and a new system architecture demonstrator.**
02	**Generate ambitious funding support for zero-emission targets through fair pricing of aviation emissions.**
03	**Create favourable market conditions for zero-emission technology by adapting regulation on PSOs, AFIR and Airport Charges Directive.**
04	**Implement a “fail fast” selection mechanism based on a responsive governance model in order that European start-ups deliver new aircraft at an industrial scale within five years.**

Boosting e-SAF: a strategic choice for Europe

The EU's policy framework for the decarbonisation of aviation largely relies on sustainable aviation fuels (SAF), promoted via the ReFuelEU Aviation regulation. By including a dedicated submandate for synthetic aviation fuels (e-SAF) in the regulation, the EU acknowledged that biofuels alone cannot substitute the whole aviation fossil fuel demand as their supply potential is heavily constrained by feedstock availability. However, it should be noted that the ReFuelEU bioSAF targets largely exceed the volumes of biofuels that can be produced from sustainable, domestic feedstocks as of 2040, as shown by the graph below.

Biofuel demand on track to exceed sustainable supply up to five times by 2050

Projected aviation biofuel uptake under ReFuelEU, based on EC and industry growth scenarios, against truly sustainable biofuel supply potential



Based on T&E's Down to Earth (2025) and The advanced and waste biofuels paradox (2024). Growth scenarios drawn from the EC 2040 IA and Airbus and Boeing traffic projections.

Unlike biofuels, e-SAF feedstocks - CO_2 and renewable energy - , are available and scalable within Europe in the long term. As renewable energy scales exponentially in the EU in the coming decades, e-SAF can be scaled up to meet a large share of the total fuel demand of Europe's aviation sector.

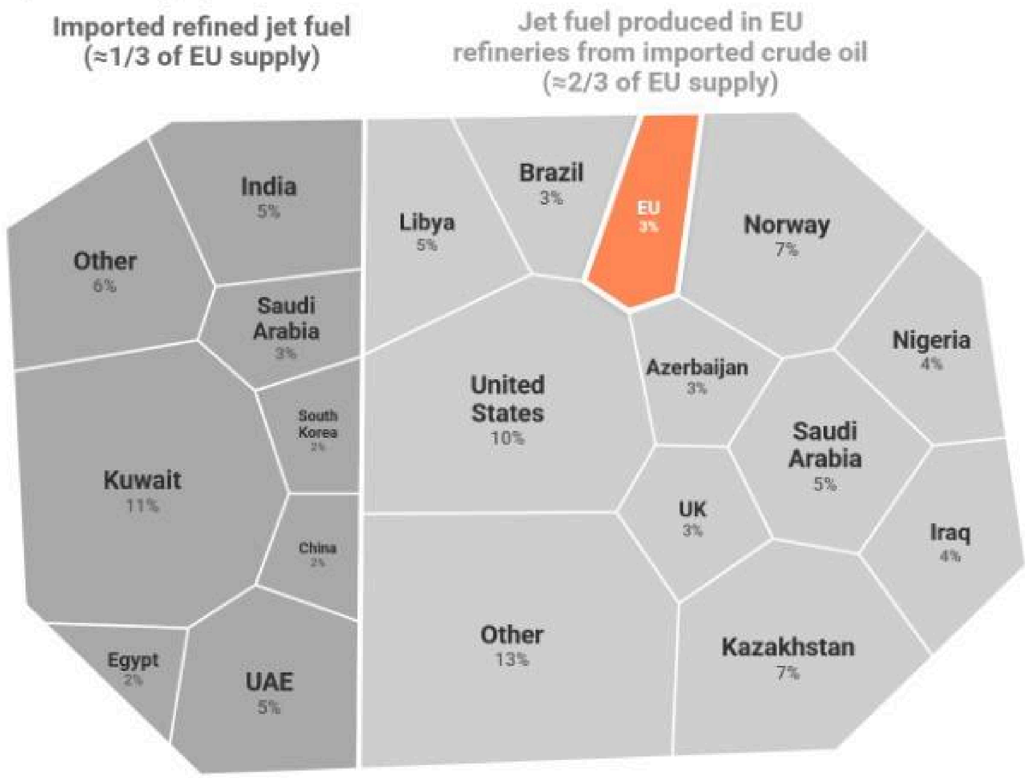
E-SAF as a strategic energy choice

Beyond environmental considerations, e-SAF is also a more strategic choice from an energy security and sovereignty perspective. While renewables form an increasing part of Europe's energy mix, liquid fuels will remain critical, most notably for the defence sector and for aviation. By ensuring feedstocks and refining are EU-based, Europe can build resilience against fossil fuel and bio-feedstock price volatilities and import dependency. Currently, over 95% of the EU's jet fuel supply is dependent on imports.

Europe's bio-SAF supply is also largely reliant on imports: in 2024, according to EASA, the EU imported 40% of its bio-SAF, and 69% of its bio-SAF feedstocks (including 38% from China). This import dependency is likely to increase in the future as the EU runs out of domestic feedstocks. E-SAF, on the other hand, can be produced domestically and, therefore, appears as a more resilient choice for Europe.

Over 95% of EU jet fuel depends on imported fossil fuels

Origin of EU jet fuel supply in 2024



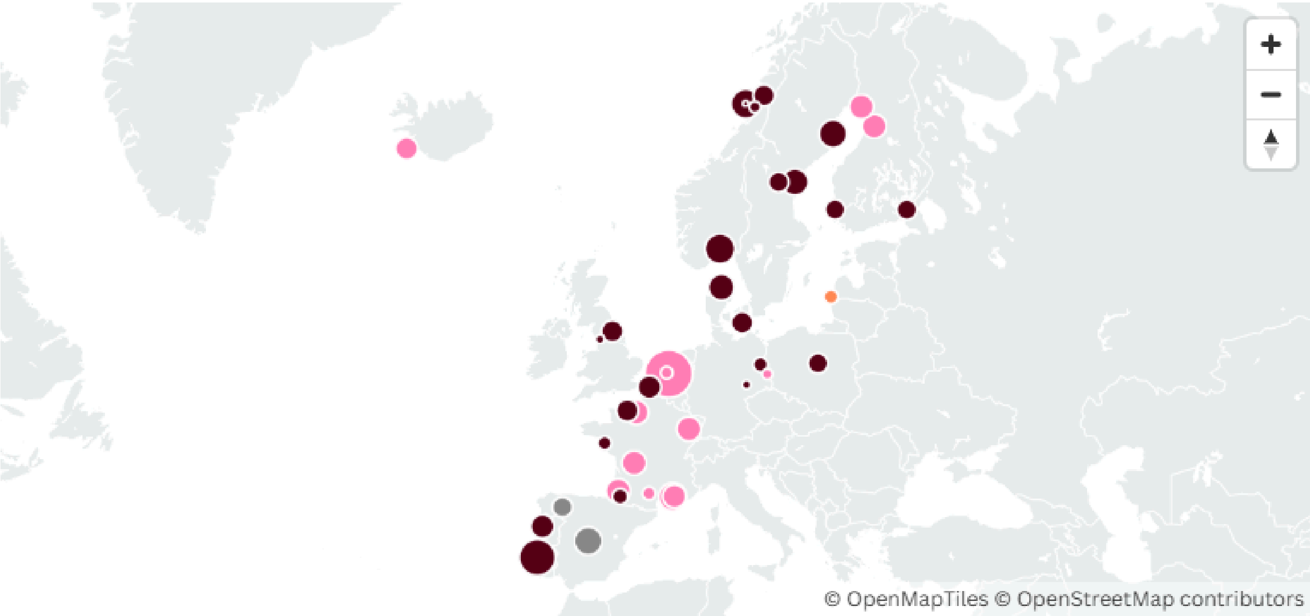
Source: T&E (2026), based on ERM (2026) • Country shares for refined jet fuel are estimated based on the origin of crude oil imports. Differences in crude yield are not reflected but do not materially affect the overall picture. Jet fuel import ratio based on 2023 data.

In addition, scaling e-SAF production allows Europe to rebuild its refining sector capabilities that feed economic prosperity across the continent. There are over 40 e-SAF projects awaiting final investment decisions in Europe, each presenting a major opportunity for local economies and jobs.

Europe's e-kerosene project pipeline keeps expanding

Large-scale e-kerosene projects where dot sizes represent annual production capacity

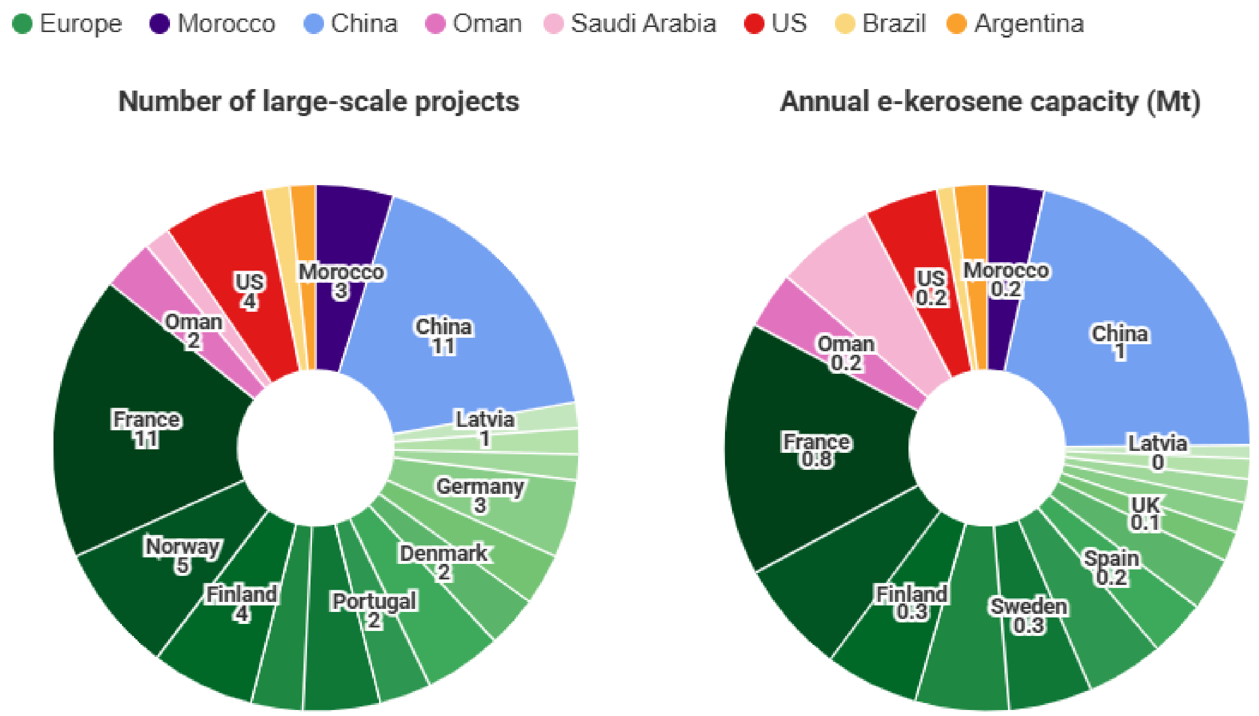
● Fischer-Tropsch ● Methanol-to-Jet ● Other technology ● Unknown technology



Source: T&E (2025), based on Bloomberg (2025), BNEF (2024), Argus (2024), Stratas (2024) and conversations with producers • Locations approximative and estimated for projects with unknown site. Large-scale: > 10 kt annual e-kerosene production capacity. Based on project announcements until May 2025.

While Europe is leading the global e-SAF project pipeline (more than half of the total production capacity of all projects announced globally is located in Europe), it could fail to capitalise on this early-mover advantage if projects fail to secure investments. Other regions like China and the Middle East are developing e-SAF projects and are ready to seize the market, as shown in the graph below. E-SAF production in China has been included in the government's multi-year planning. If Europe fails to develop a strong, competitive domestic e-SAF industry, it will miss the opportunity to strengthen its energy sovereignty and again become dependent on imports for fuel.

Two e-SAF projects out of three are located in Europe



Source: T&E (2025) • Mt = million tonnes. Large-scale: > 10 kt annual e-kerosene production capacity. Based on project announcements until May 2025.

E-SAF requires innovative and catalytic de-risking mechanisms such as double-sided auctions to take off

There is no shortage of e-SAF projects in Europe. Bolstered by the RefuelEU mandate, over 40 large-scale e-SAF projects are being developed in Europe. Despite the submandate in place, fuel suppliers and airlines are reluctant to sign dedicated large scale and long-term offtake agreements. This can be explained by several factors, including doubts in the fate of the submandate, a very high green premium, and different contract length expectations. Yet without offtakes, e-SAF projects cannot reach final investment decisions (FIDs).

To break out of this deadlock, the EU needs to create a dedicated de-risking mechanism that will provide long-term revenue certainty to producers while narrowing the green premium of e-SAF and addressing the first-mover risk faced by airlines and fuel suppliers. A tool like double-sided auctions, explicitly mentioned by the Commission in its Sustainable Transport Investment Plan (STIP), can achieve these objectives in a cost efficient way by minimising the gap that has to be covered by public funding.

Eight member states have expressed interest in this tool by joining the e-SAF Early Mover Coalition launched by the Commission in December 2025. The pilot auction(s) developed in this context must serve as a blueprint for a future EU-wide market intermediary running double-sided auctions for maritime and aviation e-fuels. T&E calls on the European commission to set up such

EU-wide double sided auctions as soon as possible by ensuring funds are allocated within the MFF.

Double sided auctions can be funded by ETS revenues from the aviation sector and backed by the European Investment Bank (EIB) through guarantees. Extending the scope of the ETS would increase revenues and allow to support more volumes of e-SAF: for example, earmarking 25% of aviation ETS revenues expected from 2030 until 2039 (with an extended scope) would generate around €38 billion, which could halve the green premium for the entirety of the annual e-SAF volumes mandated as of 2032.

25% of shipping and aviation ETS revenues could help fund long-term offtake agreements for shipping and aviation e-fuels projects in Europe

Supportable e-fuels production (Mtoe/yr) under 10-year contracts, based on total public funding (€B) and subsidy level (€/toe of e-fuel).

● Fund at least 1 Mtoe/yr of shipping e-fuels capacity at an appropriate subsidy level

● Fund at least 0.3 Mtoe/yr of e-SAF capacity at an appropriate subsidy level

Funding (€B)	500 €/toe of e-fuel	1000 €/toe of e-fuel	1500 €/toe of e-fuel	3000 €/toe of e-fuel	6000 €/toe of e-fuel
€38B (25% of extended-scope aviation ETS revenues from 2030-2039)	7.6 Mtoe/yr	3.8 Mtoe/yr	2.5 Mtoe/yr	1.3 Mtoe/yr	0.6 Mtoe/yr
€30B (25% of extended-scope shipping ETS revenues from 2030-2039)	6 Mtoe/yr	3 Mtoe/yr	2 Mtoe/yr	1 Mtoe/yr	0.5 Mtoe/yr
€24B (25% of shipping ETS revenues from 2030-2039)	4.8 Mtoe/yr	2.4 Mtoe/yr	1.6 Mtoe/yr	0.8 Mtoe/yr	0.4 Mtoe/yr
€13B (25% of aviation ETS revenues from 2030-2039)	2.6 Mtoe/yr	1.3 Mtoe/yr	0.9 Mtoe/yr	0.4 Mtoe/yr	0.2 Mtoe/yr

Source: T&E, inspired by Project SkyPower (2024) • toe = tonne of oil equivalent

In addition to double-sided auctions, existing mechanisms like the ETS SAF allowances could be reformed to better support e-SAF. While the mechanism is designed to incentivize airline SAF purchases by bridging the price gap between SAF and fossil jet fuel (up to 95% in the case of RFNBOs), it has so far only subsidised biofuel purchases as allowances are distributed annually ex-post (after the fuel is burnt) and bio-SAF is the only alternative fuel commercially available.

Extending the mechanism beyond 2030 would not be enough to ensure the allowances support e-SAF. T&E recommends earmarking 50% of the allowances for e-SAF, with the remainder equally shared between advanced biofuels and low-carbon fuels. Support for HEFA SAF, the cheapest and most mature type of SAF, should be phased out to redirect support towards innovative and more scalable pathways. To improve the cost efficiency of the mechanism, T&E also recommends lowering the price gap difference covered by the allowances from 95% to 50% in the case of e-SAF. This way, more volumes can be supported with the same budget, while bringing e-SAF prices much closer to biofuel prices.

To make the system more predictable, allowing airlines to book the SAF allowances in advance should be considered. This could enable them to sign long-term offtake agreements, while having the certainty to benefit from the SAF allowance mechanism before having to use SAF on board a plane. Receiving the SAF allowances would, however, only come after verification of the fuel use and associated emission reduction.

Finally, geographical restrictions should be put in place to ensure the system supports the European SAF industry rather than subsidising imports. The revision of the ETS, expected in July 2026, needs to take forward the above-mentioned reforms to the SAF allowances.

Strengthening the e-SAF regulatory framework

The financial measures proposed above are pointless without a strong mandate. **It is therefore essential to preserve the objectives of RefuelEU and its implementation mechanism**, i.e. the financial penalties fuel suppliers are liable to in case of non-compliance with the targets. However, the existing framework fails to address several structural issues that could hamper SAF scale-up in the long-term:

Over-reliance on biofuels: as described above, the ReFuelEU bio-SAF targets exceed the European sustainable supply potential. Besides, unlike in the UK SAF Mandate, the contribution of HEFA SAF to the overall SAF target is not capped in ReFuelEU, which does not create any demand for advanced biofuels in the near term.

Excessive market power of incumbent fuel suppliers: Incumbent fuel suppliers often own and control access to critical jet fuel infrastructure in Europe, and can block or hinder new producers and suppliers creating a significant competition bottleneck. In addition, suppliers frequently surcharge airlines for SAF, transferring the financial and regulatory compliance risks to carriers instead of taking responsibility themselves. Such abuse of dominance must be further investigated and measures taken to reduce any practices that hinder the uptake of e-SAF.

Over-reliance on biogenic sources of carbon: carbon is a key component of e-SAF. While near-term e-kerosene projects will rely heavily on biogenic CO_2 as industrial fossil point sources phase out by 2041, banking entirely on biogenic streams presents long-term structural constraints. According to T&E, Europe possesses an estimated 92 Mt per year of sustainable, accessible biogenic CO_2 (primarily from pulp mills and waste management). While this is sufficient to meet immediate project announcements, meeting the 2050 ReFuelEU e-kerosene mandate alone will require approximately 70 Mt of CO_2 annually.

This requirement must compete heavily with permanent biogenic carbon capture and storage (CCS) targets, as well as demand from the maritime e-fuel, chemical, and plastics sectors, pushing total potential mid-century demand beyond available supply. Furthermore, over two-thirds of Europe's sustainable biogenic emissions are concentrated in just four countries (Sweden, Finland, France, and Germany), with significant shares geographically landlocked and isolated from planned transport infrastructure and high-yield renewable energy zones.

To avoid regional supply constraints, mitigate infrastructure bottlenecks, and ensure a scalable fuel supply, the EU's aviation strategy must prioritize the development of Direct Air Capture (DAC) technologies alongside biogenic utilization. It can achieve this through a DAC sub-sub-target (a minimum share of the e-SAF mandate that must be produced using Direct Air Capture) starting in e.g. 2040, or other measures.

E-SAF as a strategic choice for defence

European defence equipment, in particular aircraft, rely heavily on liquid fuel. This is currently being imported from outside the EU through a limited number of large ports. E-SAF should become a critical part of Europe's defence strategy to provide resilience from geopolitical externalities and open the door for a more decentralised fuel system.

The defence industry can in turn kick-start the e-SAF market and unlock additional funding by setting up long term offtake agreements. Defence industries should ensure offtake agreements include strategic and energy autonomy goals by including made in Europe provisions. Defence contractors are generally less price-sensitive than commercial offtakers, allowing them to take more risk. Defence contractors often require multiple suppliers to enable a diversified supply chain, ensuring multiple production facilities in Europe can scale up.

Similar to the NATO pipeline - defence-owned infrastructure used by commercial aviation during peacetime - e-SAF offtakes not needed by the defence sector can eventually be sold to the commercial sector to achieve the RefuelEU mandates. This ensures European defence systems are resilient and also supports the decarbonisation of aviation. By defining e-SAF production facilities and supply chains as critical defence infrastructure, member states can fund and support e-SAF initiatives across Europe. This will also ensure that regulatory or permitting requirements may be achieved more effectively.

Key measures for a strong e-SAF Strategy

01	**Support e-SAF to secure energy independence and build a competitive EU market.**
02	**De-risk e-SAF production facilities through smart financial mechanisms that leverage public funding.**
03	**Strengthen the e-SAf regulatory framework by limiting dependence on biofuels, reducing the excessive market power of incumbent fuel suppliers, and redesigning SAF allowances to unlock e-SAF investment.**
04	**Capitalize on the dual-use value of e-SAF by defining it as critical defence infrastructure and by securing defence fuel contracts as a first offtake market.**

Make the systematic avoidance of warming contrails a moonshot objective for 2035

Tackling aviation's non-CO_2 and contrail climate impact in the EU is possible within ten years. Contrary to the production of e-SAF which requires significant investments in energy and refining infrastructure, contrail avoidance is fully in the scope of the aviation sector. Systematic avoidance of warming contrails is sufficiently advanced according to leading research and should therefore be a core pillar of the aviation strategy.

The EU MRV on non-CO_2 emissions is a necessary baseline for improved research, development of non-CO_2 models and monitoring aviation's non-CO_2 impact and should continue to be improved. To move towards real avoidance, large scale trials are needed. These will allow both airlines and Air Traffic Management to operationalize contrail avoidance in their flight planning systems and procedures.

Continuous improvement of the MRV

The EU non-CO_2 MRV acts as a baseline for non-CO_2 emissions monitoring in the EU and globally. By providing insight through a central monitoring system, and allowing this system to be improved over time, the MRV can develop into a key pillar of sustainable aviation strategy.

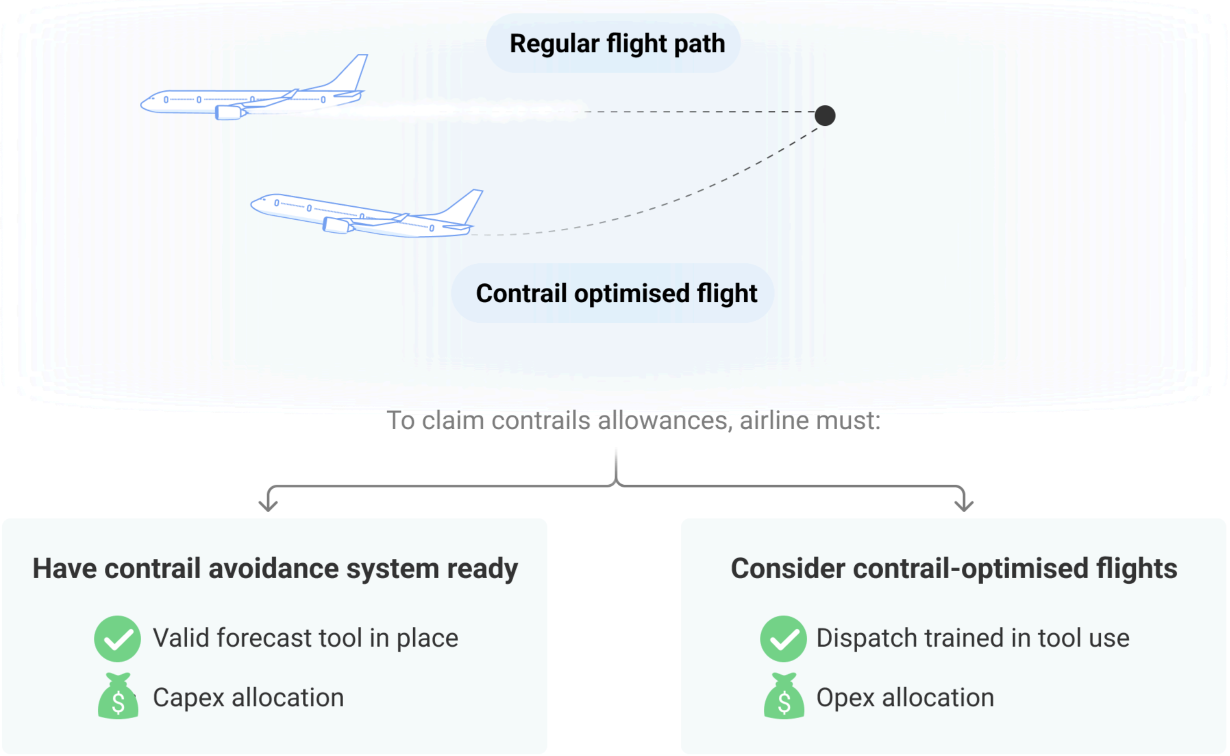
It is critical to uphold the global scope extension of the EU MRV on January 1st 2027, as has been defined within current regulation. Without the full scope, 67% of non-CO_2 emissions will be excluded from the MRV. As the MRV develops, it is important to understand models and metrics are being improved. Therefore, the MRV should allow integration of new datasets, weather models and non-CO_2 model updates. This could include more accurate weather data ensembles, improvements to PyContrails or aCCFs and a better understanding of climate temperature forcing models. Iterative improvements based on peer reviewed science will ensure the MRV continues to evolve.

In addition to new data and models, allowing validation tools and methods to provide insights into MRV accuracy can also be executed to improve the system. Where possible and based on scientific consensus, we propose to integrate these tools to iteratively improve the MRV. Just as the MRV benefits from scientific improvements, researchers should also be able to benefit from MRV data to improve their academic research. This will enable synergy between the MRV outcomes and researchers.

A final step to improve the MRV would be through contrail avoidance incentives. T&E proposes an extension of the EU ETS to include contrail allowances. Contrail allowances, funded by the EU

ETS, can support both CAPEX and OPEX costs for contrail mitigation. While the budget needed for such allowances is minimal, less than 50 million per year, the potential impact in reducing climate impact is significant.

Free ETS allocation for contrail avoidance



Source: T&E

Operationalize non-CO_2 mitigation through large scale trials

Large scale trials are a critical instrument to better understand both non-CO_2 impacts as well as the potential operational changes to mitigate them. Additional trials form a cornerstone of non-CO_2 mitigation as has been mentioned by leading aviation roadmaps and confirmed by the industry.

In addition to and building on trials, additional measures can be taken within 5-10 years, once contrail avoidance has been tested at scale. To expand contrail avoidance safely, open up low density airspace as non-CO_2 testing/trial areas, and expand these progressively. The Borealis airspace, with limited traffic but high contrail potential, is a possible starting point. Airlines flying through such dedicated areas should be facilitated by ANSPs and EUROCONTROL to include non-CO_2 mitigation within their flight plans.

Once best practices are set and contrail avoidance is operational, ideally by 2032, alignment is needed to ensure all stakeholders understand what steps to take, what models and data to use and how to communicate effectively. To enable this, develop pan-European contrail avoidance procedures that are based on the learnings from trials and set standardized ways of working and open source data and models to use. Ensure a central organisation such as EUROCONTROL enables data sharing on contrail avoidance through a centralized non-CO_2 mitigation database. In addition, develop non-CO2 environmental performance indicators for ANSPs, including contrail-related metrics, to ensure that ATM modernization reflects the totality of aviation's climate impact.

ATM involvement in large scale non-CO_2 mitigation trials

Current large scale trials have disproportionately focused on the role of airlines and airline dispatchers in adapting flight plans to avoid non-CO_2, most notably contrails. The limited operational studies that involved ANSPs are executed by MUAC , by NATS within the CICONIA project and by Borealis ANSPs within the CONCERTO project. A large-scale trial that includes NATS supported by the UK JetZero program is expected to be announced soon.

Preliminary results from studies, simulations and trials indicate ANSPs and the Network Manager (EUROCONTROL) are ultimately always affected by contrail mitigation, whether this is enacted by airlines or by ANSPs themselves. To reduce the operational impacts and airspace congestion and increase safety, it is critical to include ANSPs in large scale trials.

Such trials can best be developed in close collaboration with the sector stakeholders, such as individual ANSPs or the Network Manager, EUROCONTROL. Research organisations such as Contrails.org and the research team on contrails within Google have provided their models and data for free to any organisation willing to conduct large trials and share their data. Additional costs for trials mainly relate to personnel costs, which can be funded by organisations themselves in the form of in-kind funding. While some additional budget is required for computing and analysis costs, even multi-year trials generally do not cost more than 5 million euros.

T&E will soon publish scientific, policy and operational roadmaps that provide insights on what can be done to tackle non-CO_2 and contrail impacts. Operationally, we see the following steps can be taken in the coming decade:

1. At least 15 trials across the EU by 2029, with at least one launched by the end of 2026. These trials should aim to provide additional data for research and at the same time help operational stakeholders to understand how contrail mitigation works and what processes could be developed to enable this more broadly. Therefore, the trials should make use of peer reviewed models, use and deliver open source data, and ensure

learnings are integrated into existing models and thereby improved. The trials should also aim to include both airlines and ATM stakeholders to ensure contrail avoidance best practices can be turned into sector wide procedures once consensus on the best way forward is reached.

2. Progressive integration of contrail avoidance tools in both airline flight planning systems and ANSP ATC software systems. This can be achieved through incentives or regulation, as proposed by T&E through the ETS contrail allowances.
3. Introduction of a climate KPI that includes non-CO_2 mitigation in RP5. As mandated by SES2+, a new environmental KPI must be developed to better reflect the impact of Air Navigation Services (ANS) on the climate. Such a KPI would provide a direct incentive for ANSPs and thereby Air traffic controllers to avoid contrails. The KPI would need to take into account overall network congestion and safety constraints. It could be first introduced in 2029 in areas with uncongested airspace and during less busy periods. As contrail avoidance progresses, the KPI would need to be further adjusted.
4. Continuous assessment of all trial data and outcomes on ATC capacity and safety. Trail data should be shared through a centralized database to enable all European ANSPs to gather insights and share learnings.
5. Pan-European contrail avoidance procedures should be put into place by 2032. Such procedures would include what models and data to use, when to execute contrail avoidance and how to communicate this effectively and clearly between dispatchers, pilots, the Network manager, air traffic managers and ANSP coordinators.

Impact of fuels and other non-CO_2 emissions

Fuel composition can reduce the impact of non-CO_2 effects. Though research is ongoing, (e)SAF is expected to reduce local emissions and potentially contrail impact, due to its lower aromatic content and higher hydrogen to carbon ratio. As such it is not the sustainability accreditation of the fuel that reduces non-CO_2 emissions, but rather the overall fuel composition regardless of the feedstock or production pathway. Removing harmful substances from fossil jet fuel or adapting supply chains to prioritize SAF to contrail prone flights could also be considered to reduce non-CO_2 emissions.

The EU must continue working on understanding the environmental, industrial and economic implications of jet fuel composition. The European Jet Fuel Stakeholder forum must be complemented by dedicated Horizon Europe projects, and industrial tests to understand aircraft and infrastructure compatibility with improved jet fuel composition. Ultimately, the EU should aim at creating its own jet fuel standard, and at leading the global movement towards cleaner, less emissive fuel composition.

Alongside this work, the EU should continue research on other sources of emissions, particularly volatile organic compounds and other types of volatile particulate matters. Scientific evidence points to these emissions playing an important role in contrail formation and air pollution. Beyond jet fuel composition, the EU should consider regulations on aspects such as oil venting emissions, to minimise the climate and air quality impacts of aviation.

Key measures to mitigate non-CO_2

01	**Uphold the MRV scope extension to full scope by January 2027 and continuously improve the MRV in line with scientific developments.**
02	**Introduce contrail allowances in the next revision of the EU ETS.**
03	**Initiate, support and fund large scale trials across multiple EU airspaces and with different stakeholders including Air Traffic Management and EUROCONTROL.**
04	**Set up dedicated contrail avoidance areas and develop pan-European contrail avoidance procedures and data sharing.**
05	**Better understand the impact of fuel composition on non-CO_2 emissions to set up a European Fuel standard and put into place emission reduction measures.**

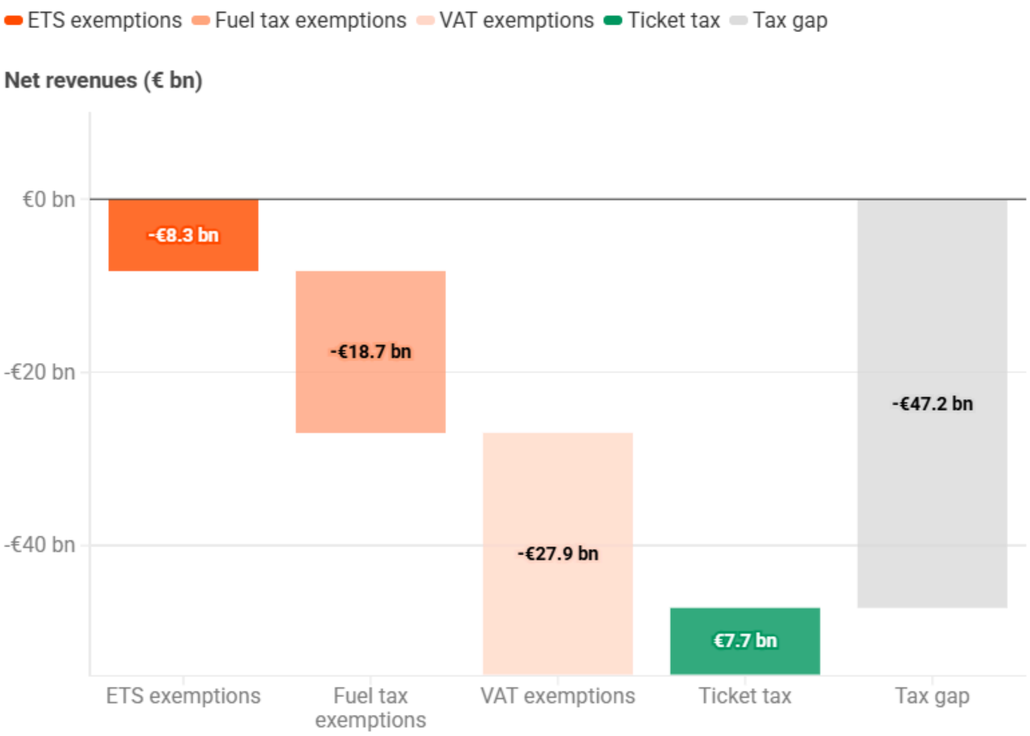
Create a fair pricing system to invest in aviation decarbonisation

The aviation sector cannot credibly ask for public support for decarbonisation while maintaining structural tax exemptions that no longer reflect climate, energy-security or fiscal realities. An intelligently designed pricing framework is necessary, one that is emissions-based, technology-neutral, protective of essential connectivity, and directly linked to reinvestment in aviation decarbonisation. The correct application of the polluter pays principle will end decades of unjust fiscal privileges, and will generate revenues to be reinvested in the decarbonisation of aviation.

A true price for aviation emissions that fund the transformation of the sector

European aviation emissions have surpassed their peak 2019 levels, reaching **195 Mt of CO_2**. Air traffic growth is driven by the development of low-cost carriers. Recent moderate increases in airline ticket taxes have had no measurable effect on air traffic levels. Compared to other sectors, aviation does not contribute equally to the EU ETS system nor through other forms of taxation. Unlike many other sectors, aviation is exempted from fuel tax and VAT, while individual ticket taxes across member states remain low and fragmented. This leads to a total tax gap of 47.2 billion euros.

What will the European tax gap be made of in 2025?

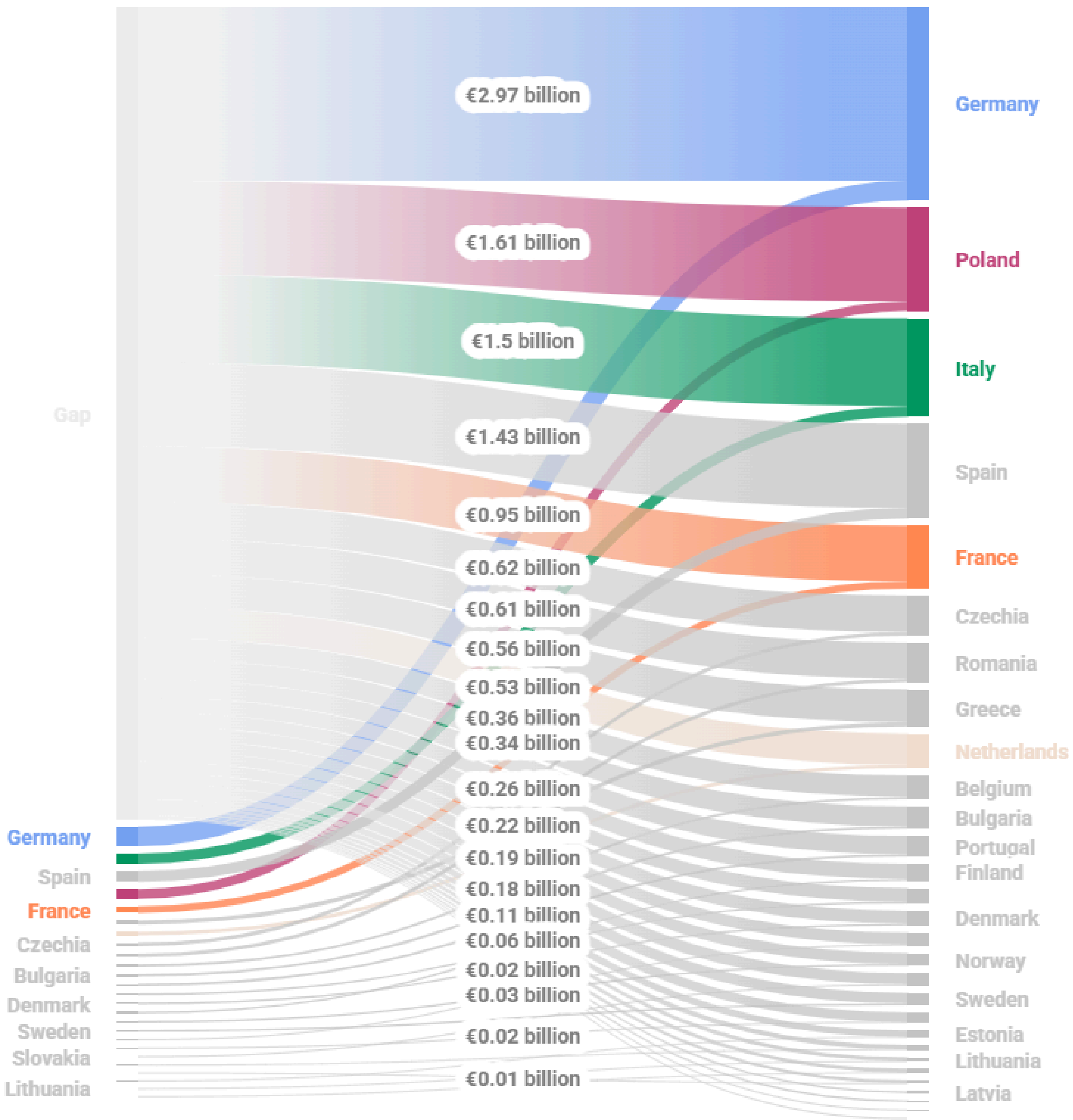


Source: T&E modelling based on 2022 OAG flight schedule and airfare data • Departing flights from the EU27

In the coming decade measures should be taken that ensure the aviation sector pays its fair price for the emissions it generates. Emission-based taxation should reward sustainability leaders and zero-emission solutions and prevent carbon and business leakage wherever possible, aligning competitiveness with environmental standards. The funds generated through aviation taxation should partly flow back to the sector to fund the measures described in the chapters above. This includes ensuring member states use a part of the EU ETS generated funds to invest in sustainable aviation. Whereas EU ETS revenues flow back directly to the sector, international offsetting measures such as CORSIA do nothing for [the sector.](#)

Scope extension and market growth would unlock substantial new revenues to Member States in 2030

Revenues generated under the EU ETS scheme for aviation, broken down by MS (€ billion)



Source: T&E modeling based on Member States' auction shares (Commission Decision 2020/2166), OAG data (EEA departing flights), GMK Center ETS prices

The EU ETS as a cornerstone of the EU's polluter pays principle, should capture all of Europe's aviation emissions. By extending EU ETS to the flights departing Europe, aviation is fairly priced and a level playing field is created. Additional funds that are generated can flow back to innovation and decarbonisation. In addition, such carbon based pricing improves the business case for sustainable aviation alternatives. Gradually increasing the cost of capital for fossil fuelled aircraft through fair taxation can ensure both e-SAF and zero-emission aircraft become more cost competitive. Additional measures such as targeted pricing or earmarked allowances for specific routes should protect the sector from unnecessary carbon leakage, even if these effects are minimal.

Besides the EU ETS, taxation on aviation tickets and aviation fuels should be introduced. As there is currently no centralized ticket tax or VAT across the EU, and aviation fuel remains exempt from taxation, aviation is barely priced. Alternatively, it is possible to encourage individual member states to take decisive action to ensure aviation pays a fair price for its emissions. When developing such taxation, modulation based on emissions is important to ensure sustainability leaders are rewarded.

Excessive emissions through private aviation and premium business travel should be priced effectively through a progressive form of taxation. This ensures the largest emitters contribute most. Considering the higher willingness to pay amongst private jet users and business travellers, this will have a very limited impact economically but can generate critical funds for aviation decarbonisation. Currently, a large part of the private jets are excluded from the EU ETS system and ReFuel obligations, which should be corrected.

Key measures on fair aviation pricing to fund the transformation of the sector

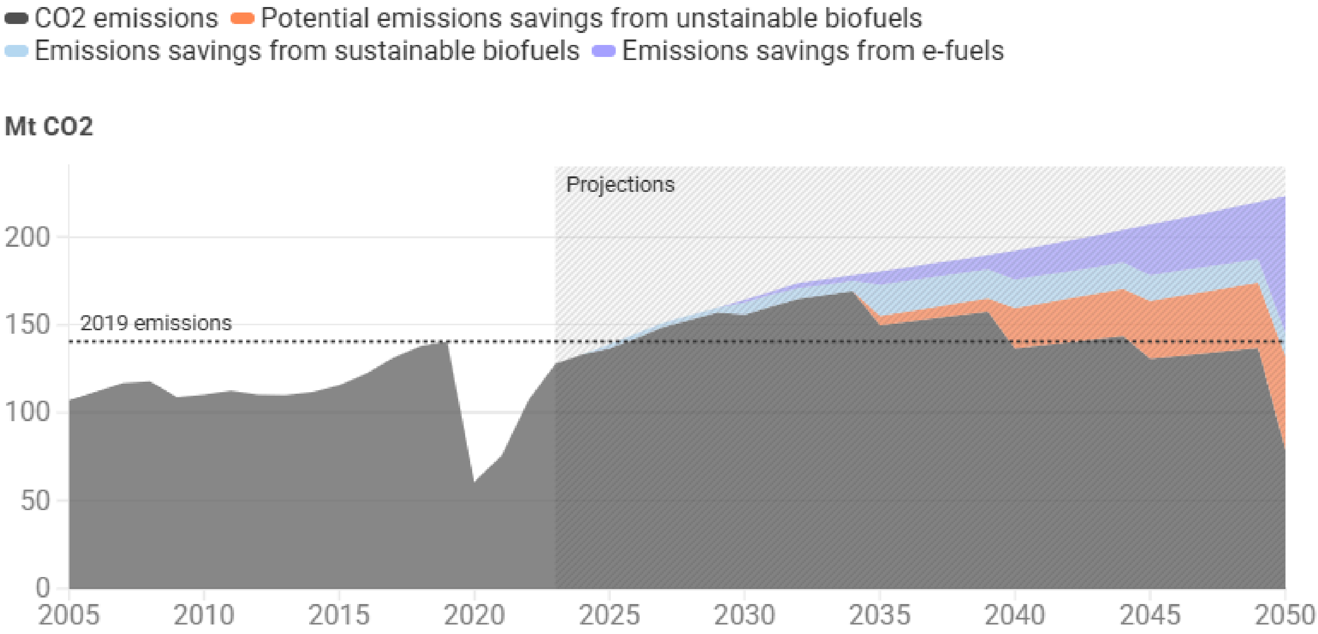
01	**EU ETS becomes a cornerstone of fair aviation emissions pricing and is extended to cover flights departing from the EU.**
02	**Introduce taxation on aviation and aviation fuels through a centralized ticket, jet fuel or VAT tax across the EU, or through individual member states.**
03	**Price private and business aviation effectively.**

Quality of travel over volume driven growth

Even as we scale up e-SAF and zero-emission technologies, Europe must address the expected growth in aviation emissions. Moderating and guiding the trajectory of the sector will ensure associated benefits of aviation, such as tourism, are fairly distributed, removing burden from European regions which are already facing saturation. Moreover, aviation must be part of the broader European mobility system, connecting to high speed rail and other modes of sustainable transport. To truly decarbonize aviation and limit emissions, Europe needs binding emissions targets, limits to airport capacity and a reduction of non-essential flights.

Increase in air travel weakens the savings from SAF: almost no emissions reduction in 2049 compared to 2019 while meeting SAF requirements

If unsustainable biofuels bring no actual reduction, emissions will peak in 2049



Source: T&E modelling based on Airbus and Boeing market outlooks •

Binding targets and limits to private and business aviation

A more coherent approach to aviation is needed that takes into account the sector's value to society and its environmental impact. Aviation that adds relatively little societal value and has a disproportionate amount of impact on the environment must be limited. Excessive and unnecessary travel, business flying and private aviation must be scrutinised, especially where more sustainable alternatives exist or where travel is not explicitly necessary. The need to reduce fossil fuel dependency, increasing societal pressure and ensuring the effective use of scarce resources compels Europe to take these steps.

Measures that reduce excesses and enable aviation to align with fair socio-economic value that can be achieved in the coming decade include setting binding carbon budgets for the aviation sector, making full use of the scope of Article 20 in the Air Services Regulation and limiting private and business aviation.

Setting EU-wide thresholds to aviation emissions in line with aviation climate budgets is key to limit volume based growth of the sector. Aviation emissions should be grounded in a sectoral climate budget consistent with the European Climate Law, which makes climate neutrality by 2050 legally binding and establishes intermediate targets of at least 55% net emissions reduction by 2030 and 90% by 2040 compared to 1990 levels. Budgets on non-CO_2 emissions such as contrails and NOx should also be considered, both for the local impacts at airports as well as climate warming impact.

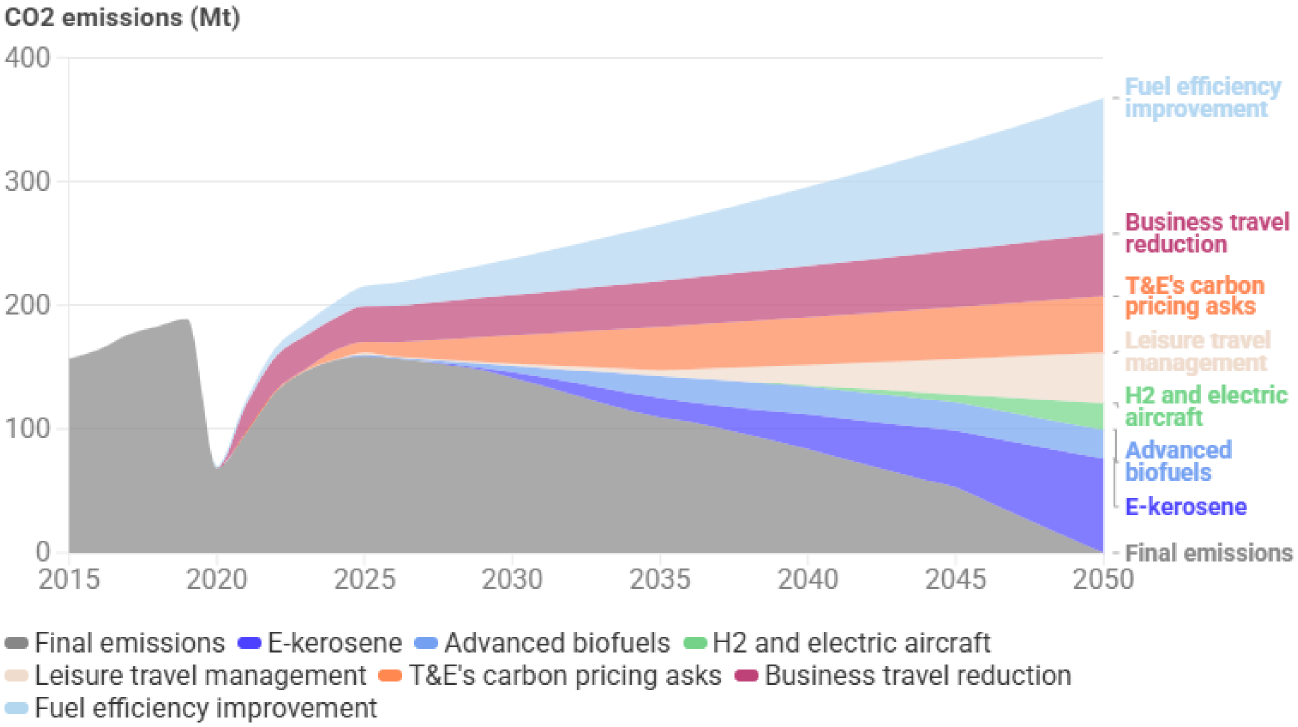
While setting an EU wide threshold will require new legislative action, current legislation already allows member states to limit aviation through Article 20 in the Air Services Regulation. This includes the option to reduce or ban flights of under four hours, eventually extending to up to eight hours.

For business aviation, setting up initiatives on corporate travel and recommending that companies set targets to reduce business flying (e.g. -50% of 2019 levels) can be a first step. To reduce demand and still support equitable access to mobility, progressive taxation on frequent flyers, private jets and premium classes is a clear solution. Policy should distinguish essential connectivity, peripheral and outermost regions, public service obligations and social or medical flights from frequent flying, luxury aviation and private jets.

Private aviation is 5-14 times more polluting than commercial planes (per passenger), and 50 times more polluting than trains. Private jet emissions rose by 46% between 2019 and 2023. Banning fossil fuel private jets by 2030, especially on shorter routes where alternatives exist, is a direct measure to reduce excessive emissions. After 2030, zero-emission aircraft and 100% eSAF aircraft should form the sustainable alternative for private aviation, considering the higher willingness and ability to pay amongst private jet owners. In addition, airports should deprioritise slots for private jets, giving preference to comparable rail routes and commercial flights with higher societal value and lower environmental impact.

Roadmap to climate neutral aviation in Europe

Why “flying less” offers the best path to sustainable aviation



Source: T&E (2022), Roadmap to climate neutral aviation in Europe

Managing airport capacity

Airport expansions are a key driver for uncontrolled aviation growth. T&E research shows that claims that airport expansion always brings economic benefits are not supported by the latest evidence. For much of Northern and Western Europe, and many European capitals, the saturation point - where additional air travel capacity no longer facilitates business growth - has been reached. In the coming decade, both policy makers and the sector must reconsider how to create value through connectivity and tourism. Rather than pushing for growth, airports can realign themselves to provide higher value to both travellers and their local communities.

A T&E study reveals that in the majority of European regions (53%), increased air traffic no longer brings growth to the economy. Instead, income growth primarily stimulates outbound air tourism, leading to economic leakage rather than a source of economic input. In the coming decade, transport and tourism strategies should foster sustainable connectivity and optimise the societal value of the airport network rather than aim for only growth. This includes maximising connectivity and social equity, while minimising environmental costs including frequent long-haul leisure flying.

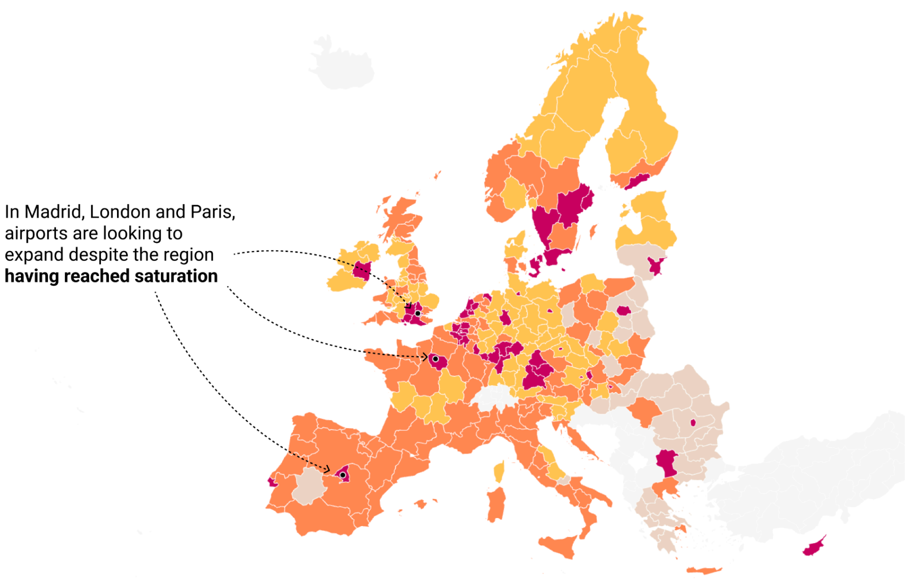
Another T&E study indicates that thousands of cases of high blood pressure, diabetes, and dementia in Europe could be linked to the tiny particles emitted by aircraft at the airports. Such health impact does not appear to be sufficiently taken into account in the socio-economic assessment of expansion projects.

Key measures can facilitate wise use of public resources and infrastructure while ensuring European connectivity. This includes exclusion of airport expansion from EU funding and state aid rules, prioritisation and investment for zero-emission aviation infrastructure and redefining the role of an airport as a key community and energy hub.

Operating and investment aid in its current form, specifically in the form of State aid and funding through the EIB should be discontinued and not be further extended. These types of aid have proven to be ineffective and fail to consider the need to address the environmental impact of aviation. Rather than airport expansion, public funds and state aid should be invested in green infrastructure for e-SAF and zero-emission aviation such as electric charging systems and hydrogen refueling.

Air passenger transport - economy relationship across European regions

- Cluster 1: Business travel demand, lower income
- Cluster 2: Tourism-dependent. Benefits undermined by declines in quality tourism*
- Cluster 3: Low business travel demand, high outbound tourism
- Cluster 4: High income / connectivity, facing saturation



Source: New Economic Foundation: "The economics of air transport in Europe" • NUTS 2016. *Tourism value could be improved via land transport, longer stays and local accommodation, rather than quantity of air arrivals

Key measures to shift aviation from quantity to quality

01	**Make full use of the scope of Article 20 in the Air Services Regulation to limit excessive and unnecessary aviation such as short routes, business aviation and private jets.**
02	**Set binding climate budgets for European aviation and aligned emission thresholds**.
03	**Exclude expansion of airport capacity from EU and EIB funding and direct state aid measures.**

Further information

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