Strengthening the EU Emissions Trading System

CLEAN AIR TASK FORCE

Executive Summary

Beginning in mid-2026, the European Union (EU) will undertake a decisive review of its Emissions Trading System (ETS), the bloc's flagship carbon pricing instrument and one of its most effective tools for delivering cost-efficient emissions reductions. As the EU moves toward its 2040 climate target, this review represents a critical opportunity to determine whether the ETS continues to deliver credible, high-integrity emissions reductions while adapting to new technological, geopolitical, and economic realities.

Key issues under consideration include the role of carbon dioxide removals; the potential expansion of the ETS to additional sectors; the treatment of non-permanent carbon capture and utilisation; and the risk of carbon leakage in sectors not covered by the Carbon Border Adjustment Mechanism. Each of these elements carries significant implications for the environmental integrity, economic efficiency, and political durability of the system.

This briefing sets out recommendations by Clean Air Task Force (CATF) to ensure that this review of the ETS reinforces the system's core function: driving deep, rapid, and sustained emissions reductions. It highlights the need for a cautious and integrity-driven approach to integrating permanent carbon removals, alongside greater ambition and policy clarity in the inclusion of aviation and maritime emissions, as well as the expansion to municipal waste incineration and landfills. Across all sectors, robust environmental safeguards and targeted use of ETS revenues will be essential to maintaining credibility and driving real-world decarbonisation.

Recommendations for the revision of the EU ETS Directive

Carbon removals

- Integrate permanent carbon removals into the EU ETS gradually and with strong safeguards, ensuring environmental integrity is preserved and emissions reductions are not displaced.
- Prioritise high-integrity permanent removals, such as DACCS and BioCCS, and apply robust rules on MRV.
- Maintain the gross emissions cap for initial integration so that for each extra carbon removal allowance entering the EU ETS, one fewer traditional emission allowance is released at auction.

- Implement supply controls on different permanent carbon removal methods to address sustainability risks concerning biomass-based permanent carbon removals as well as manage potential fiscal impacts.
- Introduce differentiated allowances to enable a regulatory distinction between traditional emissions allowances and allowances from different permanent carbon removals methods.

Aviation

- Maintain the MRV system for non-CO_2 aviation effects to support the development of robust, science-based policy measures mitigating the full climate effects of aviation.
- Introduce dedicated financial incentives for contrail avoidance within the EU ETS to support airlines in deploying contrail mitigation measures.
- Explore policy options to account for contrail impacts through a dedicated mechanism aligned with the 'polluter pays' principle.
- Extend the EU ETS to extra-EEA flights in order to ensure comprehensive climate coverage of the aviation sector.
- Earmark ETS revenues for aviation decarbonisation to ensure sufficient SAF supply to meet the EU's 2030 and 2035 targets.
- Extend SAF support mechanisms, including SAF allowances, beyond 2030 to provide long-term investment certainty and accelerate deployment.
- Asses the role of carbon removals within the EU ETS as a complementary tool for aviation decarbonisation, ensuring it does not undermine SAF deployment.

Maritime transport

- Preserve the current scope and ambition of the EU ETS for maritime transport as it is already proving effective in driving decarbonisation, supporting the uptake of low- and zero-carbon fuels, and providing a strong carbon price signal in the absence of global progress within the IMO.
- Extend the EU ETS to vessels above 400 gross tonnage, including offshore ships, to ensure consistency across fleets and accelerate the uptake of low-emission technologies.

Municipal waste incineration and landfills

- Extend the scope of the EU ETS to cover municipal waste incineration, on a full-auctioning basis with no free allocation, to incentivise waste reduction, waste diversion, recycling, and GHG abatement.
- Do not allocate credits, inside or outside the EU ETS, for emissions notionally avoided by incineration.
- Develop an appropriate measurement-based MRV methodology for landfill methane, including a protocol for third-party verification, and require landfills to obtain allowances for their emissions.

SECTION 1

Carbon removals

Integrating permanent carbon removals into the EU ETS is one of the most consequential design decisions of this review. As the EU advances towards its 2040 climate target and net-zero by 2050, carbon dioxide removal technologies — particularly biogenic carbon capture and storage (BioCCS) and direct air carbon capture and storage (DACCS) — will be essential to address residual emissions from hard-to-abate sectors that cannot be fully decarbonised through direct mitigation alone.

The EU Carbon Removal and Carbon Farming (CRCF) Regulation (EU/2024/3012) has established a foundation for certifying carbon removals, but demand-side instruments remain underdeveloped, and the EU ETS represents one of the most credible existing mechanisms to create durable demand at scale, provided that supporting policies are developed in tandem.

Carbon removals also offer a potential solution to the so-called endgame challenge of the EU ETS: as the emissions cap approaches zero under the current linear reduction factor, potentially as early as 2039, issues of price volatility and market liquidity, as well as cost-efficiency are expected to intensify. Integrating permanent carbon removal allowances could help stabilise the system by sustaining traded volumes and mitigating scarcity-driven volatility as the cap declines, offering emitters a cost-effective means to address their residual emissions with carbon removals.

However, integrating removals into a cap-and-trade system designed around emissions reductions requires careful design to preserve environmental integrity and avoid deterring the abatement action the ETS is built to drive.

Policy recommendations

CATF calls for a careful and gradual integration of permanent carbon removals into the EU ETS that preserves the environmental integrity of the system while creating sustainable demand for critical carbon removal technologies needed to achieve EU climate targets.

Integration efforts should focus on BioCCS and DACCS, while excluding biochar and temporary removals. Analysis by CATF and Concito indicates that biochar integration could affect deployment of other permanent carbon removal methods and amplify risks regarding deterrence of emissions reductions and sustainability due to its use of biomass resources and relatively low technology costs. The European

Commission should carefully analyse biochar's permanence, impacts on environmental integrity, and biomass resource demand before considering the inclusion of this technology.

Five critical safeguards should be implemented simultaneously to ensure environmental integrity:

1. Maintain the gross emissions cap during initial integration, ensuring that for each carbon removal allowance entering the EU ETS, one fewer traditional emission allowance is released at auction. This approach can effectively address mitigation deterrence and ensure the system continues to drive abatement rather than allowing substitution of carbon removals for emission reductions.

2. Implement supply controls on different permanent carbon removal methods to address sustainability risks concerning biomass-based permanent carbon removals and manage potential fiscal impacts.

3. Introduce differentiated allowances to enable regulatory distinction between traditional emissions allowances and allowances from different permanent carbon removal methods, enhancing information flow to market participants and policymakers while potentially supporting price discovery.

4. Establish robust rules on permanence and monitoring, reporting and verification (MRV) to ensure carbon removals provide a climate impact equivalent to traditional emission allowances, with possible adjustments to the certification methodologies under the CRCF Regulation, regarding life-cycle calculations and ETS accounting.

5. Include a review clause requiring the Commission to assess the impact of integrating permanent carbon removals into the system, no later than two years after the entry into force of the revised EU ETS Directive, including on environmental integrity, system functioning, abatement costs, and evolution of supporting policies, before considering any adjustments to existing safeguards.

This comprehensive approach addresses the fundamental challenge that integrating permanent carbon removals into the EU ETS entails careful balancing of trade-offs between environmental integrity, cost-effectiveness, and administrative concerns. Without safeguards, direct integration risks leading to deterrence of emissions reductions as companies substitute carbon removals for emission reductions, potentially allowing gross emissions to increase beyond agreed trajectories.

Integration must be accompanied by comprehensive supporting policies to ensure sustainable deployment, such as public procurement programmes, reverse auctions, or carbon contracts for difference schemes. These should be developed outside or in conjunction with the EU ETS to bridge cost gaps between allowance prices and permanent carbon removal costs, particularly for DACCS, while avoiding weakening support for other critical emission reduction technologies.

A phased approach to carbon removals could be envisioned:

Stage 1 (2026 review)	Initial integration with all five safeguards and design features, set up of supporting policies, including additional EU funding and stronger biomass regulation, and separate reduction and removal targets within the EU's climate and energy architecture.
Stage 2 (towards 2040)	Potential adjustments to safeguards based on review findings. Any adjustments must be conditional on addressing risks related to abatement deterrence and unsustainable biomass use. This stage should also consider the broader evolution of emissions trading systems and the development of supporting policies.
Stage 3 (post 2040)	Introduction of additional policies for achieving net-negative emissions, such as Member State obligations, net-negative emissions caps, or separate compliance mechanisms, since the integration of permanent carbon removals into the EU ETS alone will be insufficient for post-2050 net-negative commitments.

The role of carbon removals in aviation decarbonisation

Aviation is one of the sectors that are hardest to decarbonise. Synthetic low-carbon fuels are expected to play a central role in this process, as biofuel supply will be insufficient to meet the net-zero demand and may create risks associated with land use, ecosystems, and food security. A mix of energy carriers will therefore be needed, including low-carbon biofuels, synthetic fuels, and other hydrogen-based alternatives. CATF analysis indicates that synthetic fuels could meet a significant share of demand in mid-century scenarios (up to 56%), but their large-scale deployment will depend on substantial cost reductions, access to low-carbon hydrogen and electricity, and strong policy support.

Given the uncertainty around these enabling conditions, it is essential to also assess alternative pathways for reducing the climate impact of aviation, including the role of permanent carbon removals. In this context, the integration of carbon removals into the EU ETS could affect decarbonisation pathways, investment decisions, and the effectiveness of existing legislation like ReFuelEU Aviation. If not carefully designed, the availability of carbon removal options like DACCS could weaken incentives to scale synthetic low-carbon aviation fuels and advanced biofuels, especially for projects that have not yet reached final investment decision.

Policy recommendations

The Commission should assess whether, and under what conditions, permanent carbon removals could contribute to a credible pathway to net-zero aviation by 2050, including their potential role beyond emissions not abated by sustainable aviation fuels (SAF). Carbon removals should not be framed as a substitute for scaling SAF, but rather as part of a cost-effective balance across decarbonisation pathways over time to reach net zero by 2050.

The Commission should also assess whether a differentiated and ring-fenced approach to removals is warranted for the aviation sector. In particular, it should evaluate how the potential availability of removals within the EU ETS would interact with fuel-based decarbonisation pathways, including the risk of diverting investment away from synthetic low-carbon fuels and advanced biofuels that are critical to achieving long-term emissions reductions. The assessment should also explicitly analyse trade-offs between competing uses of captured carbon for synthetic fuels versus permanent storage, relative climate effectiveness on a lifecycle basis, system-level costs, infrastructure implications, as well as impacts on air quality, non-CO_2 effects, and public health outcomes. It should consider the interactions with ReFuelEU Aviation and broader fuel policy frameworks at both the EU and international level.

Future EU ETS design choices should avoid structurally favouring removals over in-sector mitigation, while recognising that both will be required and that their relative roles may evolve as technologies mature. Any inclusion of carbon removals in relation to aviation should be subject to a dedicated review clause to ensure continued alignment between the EU ETS and ReFuelEU Aviation, safeguarding environmental integrity, investment signals, and a coherent aviation decarbonisation strategy.

SECTION 2

Aviation

A. Non-CO_2 impacts

Contrails are a significant and currently under-addressed driver of aviation's climate impact, while also representing one of the most immediate and cost-effective mitigation opportunities. The EU ETS should promote early action and contribute to a robust policy framework addressing these non-CO_2 impacts.

Contrails are wispy cloud formations that form when aircraft fly through ice-supersaturated regions (ISSRs) at high altitudes emitting soot particles that serve as nuclei for ice crystal formation. These contrails can trap heat and contribute significantly to warming. Their unique characteristics mean they can be mitigated quickly, at relatively low cost, and through highly targeted interventions.

Depending on the methodology and the timescale of the climate metric employed, the warming impact from contrails is comparable to aviation's CO_2 emissions. Recent scientific literature finds that near-term warming from contrails (i.e. warming over the 20-year period after a flight) is equal to or somewhat higher than the near-term warming caused by the flight's CO_2 emissions.[1] Even when assessed over a 100-year period after the flight (which discounts the impact from contrails, since they are short-lived in the atmosphere), contrails add about one third to the warming caused by CO_2 emissions from aviation. Crucially, this impact is highly concentrated: around 80% of contrail warming is generated by just 2% of flights, often on long-haul routes such as transatlantic flights. This concentration makes contrail mitigation particularly effective, as a small number of targeted interventions can deliver disproportionate climate benefits.

Mitigating contrails requires a combination of approaches, as highlighted in the CATF report on non-CO_2 effects of aviation, given that contrail formation depends on fuel composition, engine technology, and atmospheric conditions. In particular:

- Small adjustments to flight paths to avoid ISSRs, on a small fraction of flights, can dramatically reduce overall contrail occurrence. Tests performed by Google and American Airlines show that around 2% additional fuel usage to avoid these areas on 3-5% of flights resulted in a 54% reduction in contrail-related warming according to post-flight analysis of satellite imagery. This highlights the potential of targeted contrail mitigation measures.[2]
- SAF contains lower levels of aromatics and sulphur than conventional jet fuel and can significantly reduce soot emissions which play a key role in contrail formation, thereby limiting it. Further reductions may also be achieved through treatment of conventional kerosene to lower its aromatic content.
- Advancements in engine technology present a significant opportunity to mitigate contrail formation by reducing soot emissions.[3] Supporting fleets modernisation towards lower-soot engines could help cut the non-CO_2 climate impacts from aviation.

Policy recommendations

Contrails represent a significant climate impact that is not yet adequately addressed by EU policy. The EU ETS Directive should incentivise immediate mitigation and the development of robust long-term measures.

- All effective policy must be grounded in robust and reliable data. **Maintaining and fully implementing the MRV system for non-CO_2 aviation effects is therefore critical,** particularly given the high variability of contrail formation. The full implementation of the Non-CO_2 Aviation Effects Tracking System (NEATS), the EU system for monitoring and reporting aviation non-CO_2 effects, and its expansion to all flights as of 2027 will be key. This expanded dataset will be critical to developing policy measures that are robust, proportionate, technology-neutral, and aligned with evolving scientific evidence.
- **The EU ETS should support early deployment of mitigation measures by introducing targeted financial incentives for contrail avoidance.** Given that a small share of flights is responsible for a large proportion of warming, operational measures such as flight rerouting can deliver immediate climate benefits. Incentivising voluntary action at this stage can accelerate uptake.
- **The Commission should explore options to account for contrail impacts through a mechanism aligned with the 'polluter pays' principle.** This could be done by assessing the feasibility of integrating contrails into the EU ETS or developing a dedicated mechanism, recognising the significant challenges this entails, given that contrail formation is highly variable and dependent on atmospheric conditions, making it difficult to reflect within a predictable and linear reduction pathway. In addition, the estimated climate impact is highly sensitive to the choice of metric (e.g. 20-year global warming potential (GWP20) vs. 100-year global warming potential (GWP100)), given the short-lived but intense nature of contrail warming.

Any policy approach should allow for a multipronged non-CO_2 mitigation strategy, combining operational measures, fuel improvements, high SAF blends in high-impact airports or flights, and engine innovation, as combined strategies can deliver substantially higher climate benefits than isolated interventions. Prioritising a single solution risks constraining innovation, slowing R&D investment, and limiting overall mitigation potential.

B. Expansion of scope to extra-EEA flights

International aviation accounts for a disproportionate share of emissions yet remains largely outside of the scope of the EU ETS. While long-haul flights account for less than 10% of departures, they account for more than half of aviation's carbon emissions, a proportion expected to rise to around 56% by 2050.[4]

Currently, extra- European Economic Area (EEA) flights are excluded from the EU ETS, meaning that the segment responsible for the majority of emissions is not subject to an effective carbon price. This also represents a significant missed revenue opportunity: pricing emissions from all departing flights between 2012 and 2023 could have generated around €41 billion, which could have been reinvested to accelerate the uptake of sustainable aviation fuels and support the sector's transition to climate neutrality.

Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) was designed to address emissions from international aviation, but its current design and implementation raise serious concerns about its effectiveness. While it is expected to enter its implementation phase in 2027, major aviation countries are unlikely to apply it in practice, calling into question whether it will achieve sufficient global coverage to reach the 70% threshold minimum established by the European Commission.[5] As a result, CORSIA cannot currently be relied upon to deliver meaningful emissions reductions at scale. This reinforces the need to consider extending the EU ETS to international flights, in line with the original scope agreed in 2008.

While a robust multilateral system remains the optimal outcome for climate, CORSIA's current design and implementation show that it cannot serve as the main instrument for cutting emissions from international aviation effectively, given that:

- CORSIA is not a cap-and-trade system, but an offsetting scheme based on a baseline (85% of 2019 emissions for 2024–2035).[6] It aims at "carbon-neutral growth" rather than absolute emission reductions and only covers emissions above that baseline. By contrast, the EU ETS applies to total emissions and provides a clearer pathway to net zero, supported by a significantly stronger carbon price signal to drive emissions reductions and investment in low- and zero-carbon fuels.[7]
- Participation remains low and implementation weak. Major aviation markets, including the US or China[8], have yet to transpose key elements such as offsetting obligations into domestic law. So far, the US has only implemented MRV on a voluntary basis, without a legal framework to enforce compliance.
- Enforcement is limited under CORSIA. It lacks a binding international compliance system, leaving enforcement and penalties to national authorities or voluntary application, which reduces incentives for airlines to comply.
- Sustainability safeguards for SAF under CORSIA remain weaker than EU standards, particularly regarding indirect land-use change risks, potentially allowing a greater role for food-based fuels that would not meet EU Renewable Energy Directive (RED) criteria.

Policy recommendations

The scope of the EU ETS should be extended to flights departing from EU/EEA airports, to ensure that all emissions linked to these departures are subject to a binding carbon price, addressing the current gap in coverage of long-haul flights. A departure-based approach, with appropriate interaction with CORSIA, would maintain a clear territorial link and be consistent with international law.[9]

While **a well-functioning international market-based measure for aviation remains the preferred mechanism,** CORSIA in its current form is not sufficiently robust, nor effectively implemented to deliver the emissions reductions in line with the Paris Agreement and International Civil Aviation Organization's (ICAO) objective of net-zero carbon emissions by 2050. The EU ETS provides a more credible and immediate pathway to driving emission reductions and supporting the uptake of low- and zero-carbon fuels.

At the same time, **the Commission and Member States should continue to actively participate in ICAO discussions to strengthen CORSIA's ambition, coverage, enforcement, and environmental integrity, with inclusion of contrails,** as a well-functioning, climate-ambitious and fully applied international system remains the preferred outcome. Clear criteria should be established to assess whether CORSIA can credibly replace EU action, including effective implementation, comprehensive emissions coverage, robust sustainability safeguards, enforceable compliance, and a meaningful carbon price signal.

C. Earmarking of revenues

We are entering the critical years for the development of sustainable aviation fuels in Europe. With 2030 ReFuelEU Aviation targets fast approaching, reliance on Hydroprocessed Esters and Fatty Acids (HEFA)[10] alone will not be sufficient. As highlighted in CATF's Decarbonising Aviation report,[11] it will be necessary to have a multifuel approach, including scaling up e-SAF and advanced biofuels. There are currently no final investment decisions for e-SAF projects in the EU,[12] highlighting the scale of the challenge and the risk of missing both climate and industrial objectives.

This reflects a persistent investment gap. While the EU ETS Innovation Fund supports investments in SAF-related projects, current support remains insufficient relative to the capital required to bring these technologies to commercial scale, given high upfront costs, long lead times, and a continued price gap with fossil jet fuel. In this

context, reinvesting revenues generated by the aviation sector into its own decarbonisation is both necessary and justified, particularly given the limited technological options available to the sector for reducing its emissions.

Policy recommendations

Member States should be required to earmark a defined share of their EU ETS revenues from aviation for SAF and e-SAF projects. In particular, revenues generated from the potential extension of the EU ETS to international flights should be reinvested in the sector to support its transition.

Given that decarbonising the sector will require multiple technology and fuel pathways, investment support should cover all SAF that contribute to emissions reductions in line with RED, rather than focusing narrowly on a single technology pathway. Making use of multiple fuel options is essential for scaling supply, managing cost, and ensuring progress towards climate targets. This approach must follow strict sustainability safeguards that explicitly address indirect land use change risks, ensuring that support does not incentivise biofuels with detrimental impacts on land use or biofuel pathways whose feedstock availability and realistic scalability projections are incompatible with long-term climate objectives.

Earmarking should also support complementary measures like contrail mitigation strategies, enabling a more cost-effective and comprehensive decarbonisation strategy.

Finally, investment support must be complemented by a stable and predictable legislative framework, including not only the ETS but also other critical legislations like RefuelEU Aviation or RED. Regulatory uncertainty around fuel eligibility, sustainability criteria, or long-term demand signals risks undermining investment and slowing deployment.

D. Incentives for sustainable aviation fuels

The EU ETS has been an essential instrument incentivising the uptake of SAF by airlines, particularly the dedicated allowances for the use of SAF. These allowances are intended to partially compensate for the price differential between SAF and fossil kerosene. The level of compensation varies by fuel type, covering up to 95% of the price gap for renewable fuels of non-biological origin and up to 70% for advanced biofuels. Between 2024 and 2030, up to 20 million aviation allowances are reserved for this purpose[13], but the continuation or scale of this support beyond 2030 has not been clarified.

Policy recommendations

Given that the system is proving to be effective in supporting SAF uptake while avoiding overburdening consumers with very high prices, **SAF allowances should be maintained beyond 2030 and reinforced**, doubling the current support to align with the linear increase established in RefuelEU Aviation.

The highest level of support should continue to be directed towards synthetic fuels, given their potential to deliver deep and durable emissions reductions. The incentive framework should also maintain meaningful support for transitional fuels, which can deliver near-term emissions reductions, support early market development, and help bridge the period until synthetic fuels become available at scale, provided that such support is aligned with clear sustainability safeguards and does not undermine long-term climate objectives.

SECTION 3

Maritime transport

The EU ETS for maritime remains a critical instrument for driving decarbonisation of the shipping sector, particularly as progress at the International Maritime Organization (IMO) on a global carbon pricing framework has effectively stalled and there are few indications of a near-term breakthrough. Maintaining a robust EU ETS covering international voyages is therefore essential. By upholding a credible carbon pricing signal, the EU plays a key role in advancing innovation and accelerating the transition towards low- and zero-carbon shipping both within Europe and globally.

The system is already acting as a pull factor for the deployment of low-carbon vessels and fuels, including dual-fuel ships and the development of scalable options such as ammonia. As such, the EU ETS should remain a cornerstone of the EU's shipping decarbonisation strategy and continue to support early investment in clean maritime technologies and infrastructure.

Policy recommendations

The scope of the EU ETS should be extended to cover emissions from smaller vessels above 400 gross tonnage (GT), including offshore ships. Bringing these vessels into the EU ETS would close an important regulatory gap, ensure greater consistency across the fleet, and strengthen incentives for early deployment of scalable low- and zero-carbon fuels such as hydrogen, ammonia or e-fuels. It would also expand the revenues available for reinvestment in clean fuel development and infrastructure. Additionally, smaller ships that perform shorter routes are better suited to early adoption of alternative propulsion technologies, including full electrification and hybrid solutions, given their predictable operational profiles and proximity to ports where charging or clean fuel bunkering infrastructure can be deployed efficiently.

SECTION 4

Municipal waste incineration and landfills

The waste sector accounts for roughly one quarter of EU anthropogenic methane emissions.[14] While total methane emissions from the EU waste sector have been reduced over the past 25 years[15], likely due to the diversion of biodegradable waste mandated by the EU Landfill Directive, independent measurement campaigns[16] and satellite data[17] continue to reveal significant emissions at many EU sites.

A. Incineration

Municipal waste incineration (MWI), also known as thermal waste-to-energy, refers to a suite of technologies that treat solid waste by combusting it in a controlled environment to reduce its volume and destroy pathogens. At present, MWI falls outside the scope of the EU ETS.[18] Integrating it would require waste management companies to purchase carbon allowances for CO_2 generated in the process. This would add an extra cost to unabated waste incineration, disincentivising this practice and instead bolstering the economic appeal of waste prevention, waste diversion, recycling and emissions abatement with CCS where necessary.

An undesirable consequence of disincentivising incineration would be to encourage landfilling of municipal solid waste as an alternative. Therefore, **it is critical that landfill methane emissions be also covered by the EU ETS**. Not including them could cause a net increase of greenhouse gas emissions, given that landfilling of biowaste without pretreatment or the use of landfill gas capture systems leads to methane emissions, which are much more potent than CO_2 at warming our planet. Thus, incentivising greater landfilling of untreated solid waste would lead to higher emissions of landfill methane.

It is also important that **operators of waste incinerators not be allowed to utilise accounting that allows any form of credit for avoided emissions**, either within the ETS or through a parallel mechanism, based on claims of emissions that would have occurred from landfills if waste had not been incinerated. First, given the variability in methane emissions, it is inherently challenging to produce a credible estimate of the amount of methane emissions that would have resulted from landfilling waste, making the "baseline" needed to quantify avoided emissions uncertain. Second, such an approach could lead operators of incinerators to pursue actions that would be detrimental to climate, particularly due to the potential high value of the credits (a result of the high global warming potential of methane). For example, operators might seek to incinerate food waste (despite its low heating value) because food waste generates large amounts of methane when landfilled. It is very challenging to create general guardrails to prevent all such detrimental practices, so they should not be allowed within or outside of the EU ETS for incineration.

Policy recommendations

- The scope of the EU ETS should be extended to cover municipal waste incineration, on a full-auctioning basis with no free allocation, to incentivise waste reduction, diversion, recycling, and greenhouse gas (GHG) abatement.
- Credits should not be given, inside or outside the EU ETS, for emissions notionally avoided by incineration.

B. Landfills

Emissions of methane from landfills are substantial. While regulatory requirements (e.g., mandating pre-treatment of waste, minimisation of landfilling, and restrictions on landfilling recyclable materials), have led to critical mitigation of this source, emissions are highly variable and are determined by a number of factors, including local climate and topography. Including landfills in the scope of the EU ETS as a complement to other regulatory measures would incentivise operators to rapidly implement measures tailored to individual landfills and so prevent the release of methane, further reducing emissions substantially, as well as the harmful co-pollutants that are present in landfill gas. This would also incentivise systems to separate food waste and other organics for composting, as well as research and the dissemination of innovations. It would also complement efforts to capture and use landfill gas (rather than controlling landfill gas through flaring).

The inclusion of methane emissions from municipal solid waste into the EU ETS requires standardising MRV to ensure accurate and credible emissions accounting. No standard MRV framework for landfill methane exists, however best practices use a mix of facility-level direct measurement (using drones, aircraft, or optical gas imaging), facility-specific emissions factors derived from these campaigns, and annual reconciliation with satellite observations. Reporting should be subject to independent third-party verification.

Policy recommendations

- The Commission should develop an appropriate measurement-based MRV methodology for landfill methane, including a protocol for third-party verification based on relevant International Organization for Standardization (ISO) standards, and require landfills to obtain allowances for their emissions.

SECTION 5

Non-permanent carbon capture and utilisation (CCU)

The inclusion of MWI in the ETS increases the possibility of any non-permanent CCU products facing 'double pricing' under the ETS – both at the point of capture and disposal at the MWI. CATF and Concito have explored policy options and developed recommendations for the inclusion of fossil-based, non-permanent CCU in the ETS in this report, including downstream (emitter pays) and upstream (capture installation pays) approaches. Both approaches face similar challenges of mitigating double pricing, minimising carbon leakage from the ETS, and ensuring the incentive to decarbonise is appropriately distributed among actors in the value chain. Both approaches require the categorisation of CCU applications to identify those product classes likely to be disposed of at MWIs or other ETS facilities, as well as regular analysis of the scale of leakage pathways for this embedded carbon (via landfill, waste export, product export etc.).

Downstream pricing risks over-incentivising CCU, as captured CO_2 will be freely available to CCU producers. To provide a level playing field with alternative decarbonisation routes, producers of all fossil-based materials would have to be exposed to the costs and carbon price of disposal to some degree. Maintaining upstream pricing would be a more prudent approach, maintaining the incentive on emitters to deploy emissions abatement technologies. To avoid double pricing of CCU products, a Guarantee of Origin (GoO) certification system for select products could be implemented to register the quantity of 'ETS-paid' carbon in the system. These GoO would be surrendered in place of an ETS Allowance by MWI or other relevant waste-burning ETS facilities. However, there would be little incentive for fossil CCU production routes in this model, without a mechanism for distributing the benefit accrued by MWI to upstream producers. While a market for GoO certificates could enable this cost pass-through, it may also over-incentivise CCU relative to alternative upstream decarbonisation options, unless used in conjunction with certification and incentives for other, non-fossil feedstocks.

CCU with CO_2 of fossil origin is, in any case, unlikely to play a significant role in meeting the EU's decarbonisation targets. Fossil CO_2 must be recaptured and either re-used or permanently stored at the product's end-of-life. The recapture of CO_2 is challenging for most fuel applications, and other routes to the circular use of carbon (such as mechanical or chemical recycling) are likely to be lower cost than recycling (relatively stable) CO_2. As such, modelled pathways to net-zero (including the Impact Assessment underpinning the EU 2040 climate target) shift towards the use of biogenic and atmospheric CO_2 by 2050.[19] Projections by Cefic foresee CCU contributing around 2% of total carbon feedstock for the chemical sector by 2050, while Plastics Europe modelling shows CCU-based materials accounting for 4.8% of European plastic production by 2050 (unclear partition between fossil and biogenic CO_2).[20] Consequently, any steps taken to account for fossil CO_2 utilisation in the ETS should also aim to minimise administrative complexity, while ensuring the environmental integrity of the ETS.

References

1 Teoh, R., Engberg, Z., Schumann, U., Voigt, C., Shapiro, M., Rohs, S., & Stettler, M. E. J. (2023). Global aviation contrail climate effects from 2019 to 2021. EGUsphere https://egusphere.copernicus.org/preprints/2023/egusphere-2023-1859/egusphere-2023-1859.pdf

2 Tests performed by American Airlines and Google show that the flights that attempted to avoid creating contrails burned 2% additional fuel. However, given that only an average of 3- 5% of flights need to be adjusted in Europe to avoid 80% of contrail warming the total fuel impact could be as low as 0.3% across an airline's flight.Google and American Airlines AI contrail mitigation project: https://blog.google/innovation-and-ai/technology/ai/ai-airlines-contrails-climate-change/

3 For example, the CFM Leap-1B engine, used in Boeing's 737 MAX aircraft, has demonstrated lower soot emissions, potentially reducing contrail formation. Newer aircraft engines burn fuel more efficiently and produce fewer soot particles, which leads to weaker and shorter-lived contrails.

4 EUROCONTROL, Think Paper No. 22: Decarbonising long-haul flights by 2050: Is there a pathway through sustainable aviation fuel use, fleet renewal and green energy upscaling?, 17 October 2024. www.eurocontrol.int/sites/default/files/2024-10/eurocontrol-think-paper-22-long-haul-decarb.pdf

5 Report from the European Commission on the functioning of the European Carbon Market in 2024 climate.ec.europa.eu/document/download/ddc1b1de-652b-49ed-8f15-d9fa8badd39f_en

6 Under CORSIA, the offsetting baseline for the period 2024–2035 is set at 85% of 2019 aviation emissions. Airlines are only required to offset emissions above this level, meaning a significant share of total emissions remains outside the scheme.

7 Platts, part of S&P Global Energy, assessed the price of EU Allowances at Eur71.81/mt of CO_2 equivalent ($83.95/mt$CO_2$e) on Aug. 12, while Platts CEC prices, which reflect CORSIA Phase 1-eligible credits, were assessed at $22/mt$CO_2$e (Eur18.82/mt$CO_2$e).

8 The United States remains the largest civil aviation market, followed by China. Source: IATA, 2024 World Air Transport Statistics Report https://www.iata.org/en/pressroom/2025-releases/2025-08-04-01/

9 The Court of Justice of the European Union confirmed that EU ETS obligations can be lawfully triggered by departures from or arrivals at EU/EEA airports, and that covering emissions from the full flight is proportionate and compatible with international law (Case C-366/10, Air Transport Association of America and Others v Secretary of State for Energy and Climate Change). The Court found that the obligation is triggered by the operator's decision to depart from or land at an EU/EEA airport, providing a sufficient jurisdictional link, and rejected claims of extraterritoriality. It also upheld the ETS as a non-discriminatory environmental measure, not a tax on fuel, and considered the coverage of full-flight emissions proportionate given the practical difficulty of separating emissions by airspace.

10 Though a conversion process known as hydro-processed esters and fatty acids (HEFA), fats and oils are processed with hydrogen to create hydrocarbon fuels that match the energy density of fossil kerosene and can be readily blended with conventional jet fuel. HEFA biofuels are already commercially available through mature supply chains, most of which make use of waste biogenic feedstocks such as used cooking oils, animal fats, or vegetable oils. More information: CATF, Decarbonizing Aviation: Enabling Technologies for a Net-Zero Future, 2024. www.cleanairtaskforce.org/resource/decarbonizing-aviation-enabling-technologies-net-zero-future/

11 Clean Air Task Force, Decarbonizing Aviation: Enabling Technologies for a Net-Zero Future (2024) https://www.catf.us/resource/decarbonizing-aviation-enabling-technologies-net-zero-future/

12 European Commission, Communication on the Sustainable Transport Investment Plan, COM(2025) 664 final

13 Directive 2003/87/EC, as amended by Directive (EU) 2023/958, Article 3c(6)

14 EEA, 2025. Methane, climate change and air quality in Europe: exploring the connections. www.eea.europa.eu/en/analysis/publications/methane-climate-change-and-air-quality-in-europe-exploring-the-connections

15 Ibid.

16 Papaconstantinou et al., 2026 Concurrent Mobile–Aerial Monitoring of Landfill Methane Emissions, EGU General Assembly 2026, https://doi.org/10.5194/egusphere-egu26-13620, 2026.

17 Domínguez-Sáez et al., 2026. Detection and quantification of large fugitive methane emissions in the Madrid region using ambient concentration measurements and dispersion modeling. Atmospheric Environment, https://doi.org/10.1016/j.atmosenv.2026.121931.

18 Since 2024, municipal waste incineration (MWI) installations have been required under the EU ETS to monitor and report their GHG emissions. This obligation does not entail participation in the EU ETS compliance system and therefore does not require the surrender of emission allowances. The requirement applies to MWI installations with a total rated thermal input exceeding 20 MW, as listed in Annex I of the EU ETS Directive. Operators of these installations must monitor and report their CO_2 emissions annually, with Member States required to submit verified emissions data to the European Commission by 30 April each year.

19 Butnar et al. (2020) Review of carbon capture utilisation and storage in future EU decarbonisation scenarios. UCL Energy Institute. European Commission (2024) Commission staff working document impact assessment report accompanying the document Europe's 2040 climate target and path to climate neutrality by 2050.

20 Cefic (2025) The carbon managers; Plastics Europe (2024) The plastics transition.

About Clean Air Task Force

Clean Air Task Force (CATF) is a global non-profit organisation working to safeguard against the worst impacts of climate change by catalysing the rapid development and deployment of low-carbon energy and other climate-protecting technologies. With 30 years of internationally recognised expertise on climate policy and a fierce commitment to exploring all potential solutions, CATF is a pragmatic, non-ideological advocacy group with the bold ideas needed to address climate change. Visit cleanairtaskforce.org and follow us on LinkedIn.