

Future of emissions trading in the EU: Coverage Analysis



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Disclaimer

The views expressed in this paper are attributable only to the authors of this paper and not to the supporters of this initiative or any stakeholders that have participated in the consultation process.

Definitions

ETS1	The EU Emission Trading System, as defined in the EU ETS Directive, including Annex I (Stationary installations, aviation, and maritime transport). European Union (EU) Emission Trading System, as defined in the EU ETS Directive, including Annex I (Stationary installations, aviation, and maritime transport), and Annex III (buildings, road transport and additional sectors).
ETS2	Emission Trading System to Buildings, Road Transport and Additional Sectors, as defined in the EU ETS Directive, including Annex III (Activity covered by Chapter IVa).
ETSAg	Emission Trading System to Agriculture.
ETSTürkiye	Turkish Emission Trading System (ETS), as a projected ETS applying to Turkish installations and/other compliance entities within its territory.
ETSSwitzerland	Switzerland Emission Trading System, linked to the EU ETS since January 2020.
ETSUK	United Kingdom Emission Trading System, which replaced the UK's participation in the European Union Emissions Trading Scheme (EU ETS) on 1 January 2021.
ETSUkraine	Ukraine Emission Trading System (ETS), as a projected ETS applying to Ukrainian installations and/other compliance entities within its territory.

List of acronyms

AAUs	Assigned Amount Units
AFOLU	Agriculture, Forestry and Other Land Use
BECCS	Bioenergy with Carbon Capture and Storage
CAP	Common Agricultural Policy
CAPEX	Capital Expenditures
CBAM	Carbon Border Adjust Mechanism
CCfDs	Carbon Contracts for Differences
CCU	Carbon Capture and Utilisation
CCUS	Carbon Capture, Utilisation and Storage
CCS	Carbon Capture and Storage
CDM	Clean Development Mechanism
CSU	Carbon Storage Units
CDR	Carbon Dioxide Removals
CH ₄	Methane
CO ₂	Carbon Dioxide
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CRCF	Carbon Removal and Carbon Farming
DAC	Direct Air Capture
DACCS	Direct Air Capture with Carbon Storage
EC	European Commission
EASA	European Aviation Safety Agency
ECA	European Court of Auditors
ECCB	European Central Carbon Bank
EFTA	European Free Trade Association
EPR	Extended Producer Responsibility
GHG	GreenHouse Gas
ICMS	Industrial Carbon Management Strategy
IED	Industrial Emission Directive
JI	Joint Implementation
LULUCF	Land Use, Land Use Change, and Forestry
LRF	Linear Reduction Factor
MAC	Marginal Abatement Cost
MACC	Marginal Abatement Cost Curve
MEPC	Marine Environment Protection Committee
MRV	Monitoring, Reporting and Verification
MRVA	Monitoring, Reporting, Verification and Accreditation

MS	Member State
MSR	Market Stability Reserve
MWI	Municipal Waste Incineration
NDCs	Nationally Determined Contributions
NBS	Nature-Based Solutions
NIMBY	Not-In-My-Backyard
NO _x	Nitrogen Oxide
OPEX	Operating Expenses
PSM	Price Stabilisation Mechanism
EEA	European Economic Area
ESR	Effort Sharing Regulation
ETD	Energy Taxation Directive
EU	European Union
EUTL	European Union Transaction Log
EUA	European Union Allowances
EUAA	European Aviation Allowances
ICAO	International Civil Aviation Organisation
IEA	International Energy Agency
IMO	International Maritime Organisation
ITMOs	Internationally Transferred Mitigation Outcomes
MRR	Monitoring and Reporting Regulation
N ₂ O	Nitrous Oxide
NETPs	Negative Emissions Technologies and Practices
NZIA	Net Zero Industry Act
TRL	Technology Readiness Levels
RA	Removal Allowances
RED	Renewable Energy Directive
RFNBO	Renewable Fuel of Non-Biological Origin
RQL	Rich-Burn, Quick-Mix, Lean-Burn
SAF	Sustainable Aviation Fuels
SMEs	Small and Medium-sized Enterprises
UKA	United Kingdom Allowances
UNFCCC	United Nations Framework Convention on Climate Change
WFD	Waste Framework Directive
WtE	Waste to Energy

Takeaways

This topic has proven broader than initially anticipated, with many complexities. Needless to say, each sector or approach that would increase the scope and reach of emissions trading in the EU merits its own stand-alone discussion. More in-depth discussions will emerge from other papers in this project on a number of topics, which by necessity will follow this paper, rather than precede it.

It is difficult to provide a succinct set of takeaways for such diverse set of sectors, architectures and approaches that emissions trading could cover in the EU. There can be a significant number of permutations possible, feasible and credible.

While many new possible areas where an emissions trading system could be implemented by the EU are explored, this cannot be considered an exhaustive list. For illustration purposes only, one area that becomes in many ways connected to the emissions trading in the EU (currently through ETS1), and which will impact market functioning and EUA prices, is the Carbon Border Adjust Mechanism (CBAM). Some stakeholders will see the CBAM, which is a de facto extension of carbon pricing from the EU to exporting countries, and which could end up using ETS1, as it currently stands, as a hedging tool for CBAM exposure.

It is clear that the political direction is to expand the coverage of carbon pricing in the EU through an emission trading system and a single market for CO₂ in the EU. Ursula van der Layen, the President of the European Commission, has said that much in the President's letter to the Commissioner designate for Climate, Net Zero and Clean Growth, which refers to "the aim to accelerate the build-up of a Single Market for CO₂".

Therefore, our conclusion is that while some sectors might start as separate trading systems, with ETS1 and ETS2 already there, there will be a push to put them under one roof. In the end, the main reason for keeping them separate is their different abatement costs, resulting prices, and the political exposure that this would bring to politicians as the impacts are increasingly felt closer to home by EU citizens.

While there is a political will expressed at the highest levels to move in the amalgamation direction, it is not a done deal. The timing of any move in this direction will depend on many factors. While the political instinct may push in this direction, other matters will also play a role, including technology development in different sectors and its placement on the Marginal Abatement Cost Curve (MACC) financial capability, political and public acceptability, as well as international developments.

It is also impossible to treat some of the sectors and approaches separately. Given the reality of public perception in the EU and the geological availability, removals are, in our view, in the medium to long-term, inherently connected to international credits. Agriculture will be impacted by geographical expansion, with Ukrainian agriculture being a potent factor, should it be included in an emission trading system in the EU, together with the rest of EU agriculture.

It is unlikely that expanding emissions trading to new areas and sectors will be done independently of the current schedule of climate change policy calendar. The new 2040 target, which will need to be presented in 2025, will also require changes to the ETS1 and likely, ETS2, and will provide an opportunity to consider other changes. The timetable for these discussions would seem to be end of 2025 or more likely, 2026, just in time for the review of inclusion of removals in ETS1, as well as the EU review of the effectiveness and alignment of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) under the

International Civil Aviation Organisation (ICAO) with EU objectives, and the treatment of international aviation under ETS1.

By 2026, the European Commission has also the mandate to come with an assessment for the inclusion of municipal waste incineration in ETS1 by 2028, while small energy and industrial installations will be part of ETS2 by 2027/2028. While there may be different mandates for different sectors, it seems to us to be counter-intuitive that they will be treated piecemeal instead of looking at emissions trading in the EU in a coherent manner.

Some of the sectors are likely to join ETS1 sooner rather than later, including municipal waste incineration (and landfills), and small energy and industry installations in ETS2.

In this context, the inclusion of municipal waste incineration in ETS1 in 2028 is a scenario that is likely and makes sense. There are some aspects that will need to be managed, including the interaction of municipal waste incineration along the whole value chain, the environmental implications and interlinkages with different EU legislative files, safeguards to leakage, and cost pass-through mechanisms, are all aspects that will need to be addressed before deciding if including or not municipal waste in ETS1.

The same applies to the inclusion of smaller installations in ETS2, and of installations below 20 MW total rated thermal input threshold. However, the integration of the first group of installations in this category under ETS2 will depend on the success of the full implementation of ETS2. This is true since ETS2 is a new system yet to be tested, one whose creation was hotly contested. Another element that will need to be considered is the evolution of energy prices, which could delay the start of ETS2 in 2028.

Two years before, in 2026, the Commission will have already made an assessment to decide if, in addition to small installations of categories 1A1 and 1A2 already included in ETS2 in 2027, installations below 20 MW total rated thermal input will also be covered by carbon pricing starting in 2031. The year 2031 is not randomly chosen as it is also the date the policymaker will assess if ETS1 and ETS2 are to be merged in a single emissions trading system in the EU.

Negative emissions, with special focus on permanence, is an area that has attracted a significant amount of attention and one we would take the view that its treatment in relation to the emissions trading system in the EU will continue to be central to many stakeholders. There is no apparent reason to delay integrating Carbon Dioxide Removals (CDR) into the current (and future) emissions trading system in the EU. There are many pros to their inclusion, and there are risks, but we see these risks as manageable. The commercial viability aspects should be the domain of those that may want to use CDRs for compliance, and not of the regulator. If CDR proves not viable, this will become evident, and they will not be used.

It would seem to us that methodology issues, including under Art 6.4 of the Paris Agreement, are a matter that is held back more by politics than by the need for substantive work and more discovery. Implementation should be gradual, with other mechanisms, such as temporary inclusion of Carbon Contracts for Differences (CCfDs), making the inclusion of CDRs in an emissions trading system in the EU possible, and while necessary assuring commercial viability and price convergence. It is likely that CDRs will be included in ETS1, even though we see no reason why they could not also be included in ETS2.

Integration of CDRs in emissions trading system in the EU should be done gradually, allowing for a learning curve and ensuring viability through different support mechanism in the transition period, while we reach price convergence. To integrate CDRs in the emissions trading system in the EU, two equally viable scenarios emerge: i) introduce CDR as a crediting mechanism; ii) incorporate CDR installations into emissions trading coverage while issuing Carbon Storage Units (CSU) for sequestered carbon. The legislative process need not wait until 2026.

Agriculture is a sector whose treatment is important, especially due to its climate impact and since it will interact with food security and prices. It will touch the CAP, the CBAM, and international climate change diplomacy. It has many unknowns and risks, but there are as well benefits in setting up an ETS for agriculture to ensure a cost-effective reduction effort.

Looking at the different scenarios, we would argue, at least initially, for an ETSAg that is separate and independent system rather than one that is merged or linked initially to other emissions trading systems in the EU. ERCST sees the expansion of carbon pricing to agriculture as an option that deserves, at least, to be explored. We recognize that it will be controversial and maybe painful. At the same time, it can give the sector a competitive advantage as the rest of the world also needs to decarbonize. ETS revenue can support the green transition of the sector which in turn will also benefit the climate, nature and environment. All sectors need to deliver to reach EU's climate targets to become climate neutral by 2050. If agricultural emissions, are not reduced other sectors such as transport and industry will need to deliver beyond what is cost-effective with the risk of hampering industrial competitiveness. Therefore, this is likely the best way, at an EU wide level.

Its success will depend on whether the model provides effective incentives to reduce emissions, as well as the accompanying incentives and interaction with other existing EU related policies. The impact of creating an ETSAg on society and farmers should be at the core of the discussion, as an ETSAg will not succeed without a wide public and political support. How agribusiness will be treated with respect to competitiveness and carbon leakage will be central. Applying CBAM to agriculture will test the skills of EU diplomacy in their relations with many in the G77.

Agriculture could be incorporated in emissions trading in the EU upstream (at farm level), mid-stream (at processing stage) or downstream (at supermarket/retail level). Our sense is that, for political and administrative reasons, a mid-stream application is the one that is more viable and makes most sense.

Geographical expansion of the emissions trading system in the EU is important for agriculture, but not only for agriculture. Expansion to new jurisdictions, and more specifically the potential inclusion of Ukraine, offers potential benefits, with unknowns that need to be managed. Some of the benefits will include increased market liquidity, international alignment with EU climate policies, and opportunities for exporting green technologies. However, the challenges, such as the lack of data from Ukraine, the geopolitical uncertainty, and the post-war economic conditions, are significant, and should not be overlooked. The impact on the emissions trading system in the EU will depend heavily on how these factors play out, but they need to be addressed. Clearly, this is something that will be driven by broader political

considerations and decisions, namely, accession to the EU by new countries, and not driven by the impact on emissions trading issues only.

International credits seem as a more possible proposition when it comes to removals, given the political realities and public perception in the EU, and the case that can be made regarding their necessity when we reach towards net-zero and beyond. ERCST sees international expansion as a necessity, under a scenario that will bring in credits in the emissions trading system in the EU and treat them as compliance instruments, with same attributes as EUAs, preferably re-issued as EUAs.

There are caveats which are outlined in Chapter 6.2, as part of the sub-scenarios. These caveats would result in removals being the category of international credits created under Art 6.2 or 6.4 of the Paris Agreement that will be admitted in the emissions trading system in the EU, with a strong SDG component, and some way to re-assure the EU institutions that the introduction of international credits will not put significant downwards price pressure on EUA prices.

International aviation, maritime transport and smaller vessels are covered by international treaties other than the UNFCCC, under ICAO for aviation and IMO for maritime transportation.

With respect to aviation, the coverage of international departing flights (rather than both departing and arriving flights) would be in line with what can be considered as the EU's fair share of emissions. Departing international flights could be integrated through two different approaches.

One way would be including extra-EEA departing flights together with domestic aviation in a separate emissions trading system as this would ensure in-sector emissions reduction and dynamic efficiency/innovation, at the expense however of cost efficiency losses with respect to economy-wide emissions reduction. The separate emissions trading system would become the main decarbonization driver for the sector, rendering other measures such as SAF blending quotas unwarranted.

While this is an attractive approach as a strong driver for decarbonization in the sector, a second option, politically more realistic and therefore more viable, would be to retain aviation in ETS1 and to also include extra-EEA departing flights, but introduce a limit on the quantity of allowances that airlines can use from the stationary sector, as a way of introducing a hard cap on aviation emissions and inducing greater in-sector emissions reduction.

With respect to international shipping, ERCST recommends maintaining the current 50% scope with respect to international maritime voyage emissions even in the absence of progress on a global market-based climate protection measure, as the reduced scope is in line with what can be considered as the EU's fair share of emissions. With respect to smaller vessels, we recommend their inclusion after a transitional period (i.e.: from the next phase of the ETS1), giving relevant stakeholders in the value chain the necessary time for developing and streamlining data collection solutions, and for scaling them to a fleet of smaller vessels. Moreover, the possible inclusion of the maritime sector (including domestic and part of emissions from international voyages) in a separate emissions trading system in the EU, possibly together with aviation, warrants more assessment.

Finally, linking emissions trading system in the EU to other emissions trading systems around the world has been the dream for those involved in climate change policy discussions since before the year 2000. It has not happened except in countries with which the EU has a strong economic and governance relationship

in a broader sense and has taken a long time. We need to conclude that the EU should focus its efforts to link to the UK, which has political barriers but otherwise would be possible and it is desired by many stakeholders. The timeline is impossible to predict, it is all politics. For other countries, Turkey may present an opportunity to consider. However, while Turkey will see advantages, there are barriers especially related to price levels that will be difficult to bridge, except maybe through a temporary one-way link.

1. Background

The review of the scope of the Emission Trading System (ETS) in the EU and how the architecture emerges should there be an expansion, or in any other changes that we may see necessary, is an issue of increasing urgency. This has also been recognized by the European Commission, which has already started its own examination of this matter.

ETS1, as we currently know, has gone from being a great hope, to being written off with EUA prices languishing in the 5 Euro range. With changes, especially the Market Stability Reserve (MSR), ETS1 became effective and gained new impetus, and is seen as an important tool in the EU decarbonization toolbox.

However, things change rapidly in climate change policy and with it, there is a need to examine the role and architecture of the emissions trading in the EU. We have learned that markets, especially regulatory markets, require policy stability and predictability, and that it takes time to make these changes and for the markets to adapt to them.

We are also entering into new territory with the introduction of CBAM, the much-discussed expectation of zero EUAs by 2039 in the ETS1, and the need to have a system that works for net zero and net negative. Also, if indeed we have zero allowances by 2039 in ETS1, then the problem of liquidity will emerge before that, and it is likely that we will see a more unstable market in the mid-30s. The transition to zero EUAs also needs to be managed and provisions, including in governance, may be needed.

All this requires deep examination, and the time needed for this examination and the passing of any new legislation that may be needed, militates for the urgency to start the review of the “Future of the EU ETS”. ERCST has been, and is, historically, a strong supporter of emissions trading in the EU and seeks to provide its reflection on this important matter.

This paper examines one item in the “Future of the EU ETS” overall reflection - the areas for potential scope expansion under an emissions trading system in the EU. As appropriate, we will refer to ETS1 (the term often used to refer to the original EU ETS¹, operating since 2005), or ETS2, a new ETS created as part of the 2023 revisions of the EU ETS Directive, separate from the existing ETS1.

As announced in 2023, both ETS1 and ETS2 are being regulated by the EU ETS Directive². Moreover, it is possible that a new emissions trading system in the EU might be proposed in the future to cover additional sectors e.g.: on agriculture.

Where relevant, this paper will consider the possible merging and linking of the various ETSs (ETS1, ETS2, ETSAg, etc.) under one or several umbrellas and how the architecture of the various ETSs relate to each other. When referring simply to emissions trading, the paper refers to the concept of a cap-and-trade system in general.

¹ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (Text with EEA relevance); Available at: <https://eur-lex.europa.eu/eli/dir/2003/87/oj>

² Directive (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system (Text with EEA relevance); Available at: <https://eur-lex.europa.eu/eli/dir/2023/959/oj>

Besides sectoral coverage, this paper also considers other scope expansions, including through the inclusion of additional GHGs, negative emissions, the potential for geographical EU expansion, as well as international aspects with respect to linking and the use of international credits.

1.1. EU Climate Ambition /coverage

The European Union (EU) has committed to achieving Net Zero emissions by 2050, a target that requires comprehensive efforts across all sectors of the economy. A pivotal instrument in this endeavor is the current ETS1, which plays a critical role in reducing GHG emissions through a decreasing cap in a number of covered installations in energy intensive sectors.

Article 1 of the EU ETS Directive highlights its objectives: to promote emissions reductions in a cost-effective and economically efficient manner. The fundamental principles for ETS1 should include the goal of cost-effectiveness and technology neutrality which should remain central when considering expanding the scheme to other sectors. This is especially relevant when removals are considered for inclusion in ETS1.

Originally, emissions trading was envisioned as a tool that would have an international dimension, also considering linking and geographical expansion, in addition to the eventual expansion to other sectors, covered initially by the ESR.

With time, the EU has accelerated its decarbonization efforts, culminating in the Climate Law objective of net neutrality by 2050. The 2040 target, currently under discussion, seems to aim somewhere between 80 and 95% as objective, to be decided probably in 2025. Regardless of the final target for 2040, the pressure on all sectors of the economy and society to contribute to decarbonization is intensifying, and with it, the need to ensure that these targets are set and met.

However, in the current context, each sector's coverage by emissions trading needs careful assessment with respect to its impact on competitiveness and the risk of carbon leakage, affecting both new entrants and historical participants.

Other considerations would include impact on market functioning. While economic theory suggests that cap and trade system is the most cost-effective approach to achieving emission reduction goals, it is essential to evaluate whether an emissions trading system should be the sole policy for each sector. The EU may also want to consider whether a mix of policies might be more effective in addressing decarbonization goals for specific sectors, regardless of whether they are already part of an emissions trading system in the EU or are potential candidates for inclusion.

As the EU looks towards 2030, ETS1 will cover various sectors with tailored ambitions. ETS1 targets a 62% reduction in emissions by 2030, while ETS2 aims for a 42% reduction. These differentiated targets recognise the unique challenges and capacities of different sectors, enabling a balanced and realistic path towards significant emissions reductions. The inclusion of other areas in emissions trading in the EU, no matter what the final architecture is, derives from the need for certainty in delivery of a cap and the increasing need for flexibility and efficiency.

To maintain momentum towards its Net Zero goal, the EU has set an intermediate target for 2040. This target will be underpinned by a legislative proposal from the European Commission in 2025, providing clear guidance and a structured timeline for achieving further emissions cuts.

The expansion and adaptation of the coverage of emissions trading in the EU are critical to meeting the EU's long-term climate goals. By integrating with other policy tools and setting sector-specific targets, the EU can effectively drive the transition towards a Net Zero future.

1.2. Why consider emissions trading expansion?

Expanding the trading system coverage to new sectors is driven by the urgency we feel in avoiding the risks of the "ETS endgame," where allowance supply approaches zero and threatens the system's effectiveness. This looming challenge justifies the need for discussions around opening emissions trading to more industries to accelerate emissions reductions across the economy. However, adding new sectors will not necessarily ease the management of the endgame nor will it solve the problem. Expanding the coverage of an emissions trading system in the EU to additional sectors, gases or geographical areas will more likely be a stop gap for the EU cap-and-trade system as we know it. The end game, net negative, will likely require a different approach with different obligations and maybe different governance. Which indicates that what is necessary and maybe sufficient for the 2030s, may not be sufficient for the 2040-50s.

If these additional sectors also face emissions caps that trend toward zero, the core issue persists, expanding the problem to a broader scale without simplifying its resolution. As already mentioned, there are a number of reasons that militate for the expansion of emissions trading in the EU coverage to other areas, which include:

- No direct or indirect policies impacting levels of GHG emissions

Expanding the coverage of the emissions trading system in the EU can fill gaps in areas where there are no existing policies targeting greenhouse gas emissions, ensuring comprehensive coverage and regulation across all sectors.

- Sectors not reducing GHGs emissions with current policies

The inclusion of sectors that have not effectively reduced their emissions under current policies can drive necessary changes through market-based incentives.

- No EU wide harmonised approach

A broader emissions trading system in the EU can provide a consistent, harmonised framework across the EU, reducing fragmentation and promoting equitable climate action.

- No market approach/ no incentives

Introducing sectors lacking market-based incentives into emissions trading system in the EU can create economic drivers for emission reductions, encouraging innovation and efficiency improvements.

- New targets

Expanding the emissions trading system in the EU can help meet new, more ambitious climate targets by encompassing a broader range of emission sources, ensuring a more comprehensive approach to achieving overall GHG reduction goals.

- Improvement of the functioning of the ETS

Expanding the emissions trading system in the EU can enhance its overall effectiveness by increasing the number of compliance entities and the volume of tradable allowances, which improves market liquidity and stability (making it easier for participants to trade allowances without significantly affecting prices).

- Reducing the cost of climate policies

A broader emissions trading system in the EU can lower the overall cost of achieving climate targets by allowing for more cost-effective emission reductions across a wider range of sectors.

- The acceptability of climate policies

Expanding the emissions trading system in the EU can increase the acceptability of climate policies by distributing the responsibility for emission reductions more evenly across sectors, potentially reducing resistance from any single industry.

1.3. What should be considered in assessing expansion?

In this paper, the same pattern is applied to the discussion in each section (a “template”).

For each sector, or a new potential expansion area, the topics covered include a number of areas that we believe can give a good indication if this is a good candidate for coverage by an emissions trading system. The template covers the following:

1. **‘current status’** describes the state of play of the current situation in terms of size of emissions, installations, current regulations, etc.
2. **‘timeline’** details the expected or anticipated chronology for expansion.
3. **‘scenario’** looks at whether the considered expansion should take place under ETS1, ETS2, a separate emissions trading system in the EU, as well as modalities under which this expansion could take place. They show possible outcomes, considering the status of EU regulation, rather than choosing a likely path. The scenario of merging ETS1 and ETS2 is more speculative, considering that ETS2 has not kicked off yet.
4. **‘impacts on supply/demand balance’** analyzes the impact on demand and supply in the emissions trading system where this new area would be included and implicitly the impact on prices.
5. **‘impacts on market functioning’** analyzes impacts on liquidity, volatility, price discovery, stability, and overall market efficiency
6. **‘discussion’** is a section that intends to bring the above considerations together, and include others, in making the case for inclusion or non-inclusion.

While for some areas of the template the discussion is very factual, a number of factors will impact the analysis for areas 4 and 5 of the template, including:

- Size and emissions profile of the sector (number of installations, share of GHG, ...)
- Method and volume of EUAs allocation.
- Linear Reduction Factor (LRF), relative to the existing LRF in emissions trading system where it is being introduced.
- Marginal Abatement Cost (MAC), relative to the MAC of the already covered sectors.
- Market specificities of the sector (number of installations, sophistication of covered entities in terms of general market participation, etc.).

Impact on supply/demand balance

In assessing the impact on supply/demand balance, attention is given to the method and volume of EUAs allocation, as well as potential LRFs for the supply side, while understanding the size and emissions profile, and the MAC of a sector gives a good indication on the expected demand.

Impact on the supply side:

The LRF for the new sector will determine the rate at which the cap on allowances for this sector is reduced annually. A LRF higher than the currently covered sectors will mean a faster reduction in the number of allowances available, thereby decreasing the supply of EUAs more quickly and tightening the market.

Conversely, a lower LRF will slow the reduction in supply, providing more allowances over time and exerting less pressure on the market balance. To understand the impacts of adding a new sector into the emissions trading system in the EU, with a potentially LRF, consideration will be given to the following key aspects:

- **Adjustment to overall cap:** Examine how the new sector's LRF affects the total emissions cap of the emissions trading system in the EU. Different LRFs can alter the trajectory of overall emissions reductions, influencing whether the system meets its long-term climate targets.
- **Supply and demand for allowances:** Assess how the new sector's LRF influences the supply of emissions allowances and overall market dynamics. Changes in LRF can impact allowance prices by affecting the balance between supply and demand in the carbon market.
- **Sector-Specific abatement costs:** Assess the financial implications for both the new sector and existing sectors. Different LRFs can alter the cost-effectiveness of emissions reductions, affecting overall compliance costs and potentially influencing business competitiveness and investment decision.

The method and volume of EUA allocation to the new sector will also affect the supply side. If a significant number of EUAs are allocated freely to the new sector, the immediate supply in the market will increase. If more EUAs are auctioned, it can create a scarcity effect, reducing the available supply and potentially raising prices. The initial allocation strategy and subsequent adjustments will therefore play a crucial role in shaping the supply dynamics within the overall market.

Impact on the demand side:

When adding a new sector to an emissions trading system, the size of the new sector and its MAC will have significant impacts on the demand side of the supply-demand balance:

- **Size and emissions profile:** The size of the new sector, measured by its total emissions, directly affects the demand for EUAs. A larger sector with substantial emissions will require a greater number of allowances to comply with the regulations of emissions trading in the EU, thereby increasing the overall demand for EUAs. This heightened demand can drive up EUA prices as the new sector participants compete for the limited supply of allowances. Conversely, a smaller sector with relatively lower emissions will add less to the overall demand, exerting less upward pressure on EUA prices.
- **Marginal Abatement Costs (MAC):** The MAC of the new sector indicates the cost of reducing emissions for that sector. If the MAC is low (indicating that emission reductions are relatively inexpensive), companies in the new sector may prefer to invest in emission reduction measures rather than purchasing EUAs, leading to a lower increase in demand for allowances. However, if the MAC is high (indicating that emission reductions are costly), companies are more likely to purchase EUAs to cover their emissions, thus significantly increasing the demand for allowances. Therefore, the MAC

shapes the new sector's behavior regarding emission reductions versus buying allowances, directly influencing the overall demand in the emissions trading system in the EU market.

Impacts on market functioning

Covering a new sector with an emissions trading system in the EU, depending on how it is done, may have significant implications for market functioning (liquidity, volatility, price discovery, stability, and overall efficiency). The potential impacts on market functioning are being looked at through the following indicators:

- **Size and emissions profile:** a large player with a significant emissions profile will likely increase the demand for EUAs, potentially leading to higher trading volumes. This can enhance market liquidity, as more allowances are bought and sold, making it easier for other participants to execute trades without causing large price changes.
If the new player has a substantial emissions profile and engages in large trades, it could introduce more price volatility, especially if their trading behavior is unpredictable or if they make large purchases or sales at once, leading to abrupt price fluctuations. The sector's demand helps refine price discovery by providing more data points on the market's valuation of allowances, potentially leading to more accurate pricing. The impact on stability can vary; while increased liquidity and consistent demand can support price stability, erratic behavior or large trades may cause instability. Overall, market efficiency might improve if the sector's emissions and trading activities contribute to a more comprehensive reflection of supply and demand dynamics.
- **Market specificities:** an increase in market participation, particularly through the addition of more players to emissions trading system in the EU, generally enhances liquidity by expanding the pool of buy and sell orders, leading to smoother transactions and narrower bid-ask spreads. The presence of a more diverse range of participants can reduce volatility by distributing market influence more evenly, minimizing the impact of any single entity on price movements.
- **Sophistication of market players.** This broader participation also improves price discovery, as the diversity of trading strategies and information sources leads to more accurate market valuations. When these new participants are sophisticated players, liquidity is further boosted through their consistent and strategic trading, and their advanced risk management techniques help mitigate large price swings, enhancing overall stability. The combination of increased participation and sophistication results in a more robust and efficient market, where EUA prices more accurately reflect the true balance of supply and demand, contributing to a clearer and more stable picture of the cost of emissions

What are the drawbacks?

Expanding an emissions trading system can also bring several potential drawbacks, such as:

- **Higher costs for businesses:** companies in newly included sectors may face increased operational costs due to the need to purchase emissions allowances and invest in compliance measures, potentially impacting their financial stability and competitiveness.

- **Market instability:** the integration of new sectors can lead to fluctuations in carbon market prices and increased volatility as the market adjusts to the changes in supply and demand dynamics, potentially disrupting market stability.
- **Risk of carbon leakage:** expanding an emission trading system might lead to carbon leakage, where businesses relocate to regions with less stringent emissions regulations, potentially undermining the effectiveness of the system in reducing global emissions. In addition, it is unlikely that free allocation will be the preferred method to address the risk of carbon leakage while applying CBAM to sectors such as agriculture may be politically explosive internationally.
- **Increased administrative complexity:** expanding emission trading in the EU involves developing and enforcing new regulations, monitoring, reporting, and verification (MRV) systems for additional sectors, which can add significant administrative and bureaucratic burdens. When it comes to negative emissions, reaching to net negative, there will be additional aspects that will need to be addressed that cannot work under the current system.
- **Technical and measurement challenges:** accurately measuring and verifying emissions from diverse and complex sectors can be difficult, requiring sophisticated and often costly monitoring and reporting infrastructure.
- **Public and Political Resistance:** the expansion could face opposition from industries and consumers due to perceived or real increases in costs, leading to political challenges and potential resistance that could affect the implementation and success of the expansion.

1.4. Where can expansion take place?

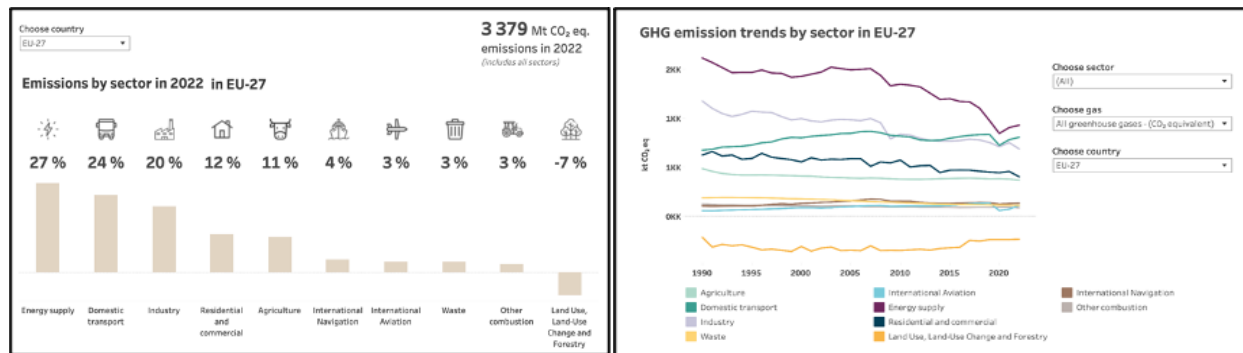
The expansion of coverage by emissions trading in the EU, which that is being considered in this paper, includes the following aspects:

- Sectoral expansion
- Emission expansion
- Negative emissions
- Geographical expansion
- International expansion

2. Sectoral scope expansion

The estimated share of GHG emissions in the EU in 2022 by sector amounted to: Energy supply (27%), domestic transport (24%), industry (20%), buildings (12%), agriculture (11%), international navigation (4%), international aviation (3%), and waste (3%).

Figure 2.1. Sectoral GHG emissions in 2022, and GHG emissions trends in the EU-27



Source: [European Environment Agency, Greenhouse gas emissions inventory](#).

With ETS1 covering energy supply and industry from installations above a certain threshold, domestic aviation, domestic and part of international maritime transport, and the ETS2 to cover road transport and buildings as of 2027, there are few sectors or sub-sectors that are not already covered by an emissions trading system. This is the case for agriculture, waste, and international aviation. International maritime transport emissions are currently covered at 50%, while also smaller energy and industrial installations could be covered.

The following sub-sections of this paper consider one by one these sectors or segments that are not already covered by emissions trading. The focus is on possible areas of expansion that are more concretely on the drawing board and part of the EU debate, i.e.: they are either mentioned in the review clauses of the EU ETS Directive (e.g.: international aviation) or are under ongoing scrutiny by the European Commission (e.g.: agriculture). There are however additional areas of possible expansion that are not covered in this report but may need further consideration in the future: in Germany for example, initial discussions are taking place regarding the possible pricing of upstream methane (CH₄) and CO₂ chain emissions of fossil fuels^{3 4}. While there are many options of how this could be practically done, one option would be through the inclusion of fossil fuel extraction in the sectoral scope of the ETS1 (while mirroring this for fossil fuel imports in the CBAM).

When evaluating the nature of the expansion to carbon pricing, it makes sense to examine whether these changes represent an evolution or revolution in the system. Following this approach, developments with regards to the development of emissions trading in the EU can be considered:

- Evolutionary: if they are the result of progressive changes over time and do not lead to a fundamental change in the overall concept.

³ The EU Methane Regulation (EU 2024/1787) introduces an MRV system of methane emissions for the fossil gas, oil and coal industry in Europe. It does not price methane emissions, however, the review clause (article 36) mentions that the first report reviewing the Methane regulation in 2028 will review among other things “whether additional or alternative measures are necessary to foster and accelerate the reduction of methane emissions in the value chain of crude oil, natural gas and coal placed on the Union market to support the Union’s target of net-zero greenhouse gas emissions by 2050 and its commitments under the Paris Agreement.” Moreover, CO₂ upstream emissions are not covered by the Methane regulation but can be significant during the extraction of some fossil fuels, i.e.: natural gas.

⁴ According to a recent German Government document: “As long as natural gas is still being consumed in Germany, it will also be necessary to reduce to a minimum the extremely climate-damaging methane emissions which take place around the world in the course of extraction and transport. The Federal Government is therefore calling for an ambitious implementation of the European Methane Regulation, including the examination of future pricing for upstream chain emissions of fossil fuels placed on the EU market (methane slip).” (source: Federal Ministry for Economic Affairs and Climate Action, Key principles of the Federal Government for a Carbon Management Strategy, February 26, 2024 https://www.bmwk.de/Redaktion/EN/Downloads/E/240226-eckpunkte-cms-en.pdf?__blob=publicationFile&v=4)

- Revolutionary: when underscoring a radical transformation of emissions trading in the EU. While the changes may be seen as evolutionary in some cases as they do not introduce new concepts or provisions, their impact may be far from evolutionary.

2.1. Municipal waste incineration and landfills

The expansion of carbon pricing to municipal waste and landfills should be looked at as evolutionary. It should also be looked holistically, as it raises environmental issues other than climate ones. The extension of the current ETS1 to municipal waste as new sector, may not bring significant implications for the functioning of ETS1 overall. In addition, the smaller size of municipal waste and landfill, in terms of GHGs coverage but also number of installations, seems to also indicate a small impact on current ETS1, if extension takes place. Although the inclusion of waste incinerators and landfills would have little impact on the carbon market, it could have environmental consequences on the waste markets and circular economy. We look at the reasoning behind in more detail in the current chapter.

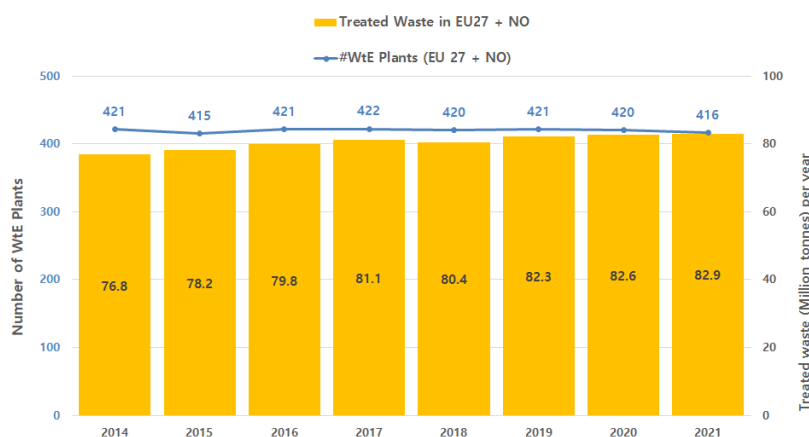
2.1.1. Current status

Waste incineration plants with energy recovery (often known as Waste-to-Energy or simply WtE) are dedicated facilities for the treatment of waste, coming from municipal but also commercial and industrial activities, not suitable for recycling (commonly referred to as residual waste).

Around 416 WtE plants are currently operating in the EU and Norway (Figure 2.1.), treating around 82.9 Mt of residual waste⁵. Fossil CO₂ emissions from WtE plants represent 1% of all GHG sources in Europe. Despite an increase in the amount of waste treated, this number has essentially remained constant over the last decade⁶. In 2021, WtE installations emitted cumulatively 42,43 MtCO₂ in EU27⁷.

Article 3 of the IED⁸ defines a waste incineration plant as any stationary or mobile technical unit and equipment dedicated to the thermal treatment of waste, with or without recovery of the combustion heat generated, through the incineration by oxidation of waste as well as other thermal treatment processes, such as pyrolysis, gasification or plasma

Figure 2.2. WtE Plants in EU 27 + Norway, 2014-2021.



Source: CEWEP, 2024, Map of European Waste-to-Energy Plants.

⁵ CEWEP (2022): Maps of European Waste-to-Energy plants. Available at: <https://www.cewep.eu/waste-to-energy-plants-in-europe-in-2021/>

⁶ CEWEP (2022). Waste to Energy Climate Roadmap. The path to carbon negative. Pp.9.

⁷ Data is based on estimation of national inventory reports using average emission factors to report fossil CO₂ emissions for WtE installations in each country. Annual European Union greenhouse gas inventory 1990–2021 and inventory report 2023. Submission to the UNFCCC Secretariat. 15 April 2023.

⁸ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Recast) (Text with EEA relevance)

process, if the substances resulting from the treatment are subsequently incinerated.

In the EU, municipal waste is regulated by the Waste Framework Directive (WFD) 2008/98/EC⁹. The WFD did not provide a definition for municipal waste as according to its origin, but defined *waste* as the substance the holder discards or intends or is required to discard, and *hazardous waste* as the waste which displays one or more of the hazardous properties listed in Annex III of Directive 2008/98/EC¹⁰. The legislator extended this vague definition of waste in the revision of the WFD¹¹ in 2018, when municipal waste was defined as the mixed and separately collected waste from households (or other sources where is similar in nature and composition to waste from households).

Municipal waste incineration is also covered in the Guidance on Interpretation of Annex I of the EU ETS Directive¹². Until now, the EU ETS Directive has explicitly excluded GHGs emitted by hazardous and municipal waste incinerators from its scope. This exclusion is explicitly mentioned in the “combustion of fuels” activity, under the Annex I of the EU ETS Directive. Municipal waste and hazardous waste used as fuel, are also explicitly excluded from the ETS2 scope in Annex III of the Directive¹³.

The exclusion of waste from ETS1 is not complete, as units for the incineration of other wastes than municipal and hazardous waste are included in the ETS1. This means that the EU ETS Directive exempts units incinerating municipal and hazardous waste, from surrendering EUAs. This is true even if facilities are included in an ETS1 covered installation¹⁴.

Not much information is available regarding the reasons why municipal and hazardous waste were originally excluded from the ETS1. One of the main reasons could be found in the size of the sector itself and its climate impacts. As said, the relatively small size of the waste sector in terms of GHGs coverage has not been a policy priority compared to other larger sectors. Another rational is given in Ecofys study for DG Environment (2006): “finding a scope for emission reductions with the numerous legal requirements waste incineration plants face, seems rather difficult, especially in the case of hazardous waste incineration”¹⁵. The Report also recognised that the scope of the municipal waste sector should be further explored.

Why is municipal waste incineration relevant for the scope of ETS1? Municipal waste is incinerated to address a waste management issue (i.e. safely treating waste as an environmental service). In addition, residual waste can be recovered in terms of energy from its combustion, for district/process heating and/or electricity generation. However, inevitably, the thermal treatment of residual waste generates fossil CO₂ emissions.

Currently, municipal waste is covered under the ESR, and responsibility is given to EU Member States on a case-by-case basis. Municipal waste incineration installations have been voluntarily covered under emission trading in some EU Member States: Denmark, Sweden and for some installations in Lithuania. From 2024, Germany waste incineration plants for the incineration of municipal waste will also be subject

⁹ [Directive 2008/98/EC](#) of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance)

¹⁰ Properties of waste which made them hazardous included explosive waste, oxidizing, highly inflammable waste, flammable, irritant, harmful, toxic, carcinogenic, corrosive, infectious, mutagenic, sensitizing, and ecotoxic waste.

¹¹ Article 3 (2.b.) of [Directive \(EU\) 2018/851](#) of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (Text with EEA relevance).

¹² Guidance on Interpretation of Annex I of the EU ETS Directive, update applicable from 2024, 19/12/23

¹³ European Commission (2024). Guidance Document MRR for ETS2 regulated entities. Pp. 11, March 26th.

¹⁴ See Case C-166/23 of the European Court of Justice, 6 June 2024

¹⁵ Ecofys (2006). Inclusion of additional activities and gases into the EU Emissions Trading Scheme DG Environment. October. Pp. 39.

to reporting obligations. Germany intends to opt-in waste incineration plants into ETS1 from 2027¹⁶, a separate special waste- incineration plant will be added via the opt-in instead integrated WtE operators in its national emissions trading system¹⁷. A CO₂ ¹⁸. The Netherlands has banned the landfilling of mixed municipal waste and applies in 2022 a landfill and incineration tax of 33.58 EUR/t, with an annual adjustment mechanism in place.

A mandatory waste incineration tax on fossil CO₂ also applies in Norway as from 2022, while waste incinerator facilities covered by ETS1 pay 50% less tax compared to 2022¹⁹. These practices are examples for the potential expansion of carbon pricing to municipal waste incineration.

In 2023 UK authorities confirmed their intention to include waste incineration and energy from waste in the ETSUK from 2028, preceded by a 2-year MRVA phasing period from 2026-2028. A consultation on options and scope was opened until 2nd August 2024²⁰.

The discussion on the extension of municipal waste incineration to ETS1 goes in parallel with its impact on landfills, as less favourable option according to the Waste Hierarchy (WFD). When deciding for the inclusion of municipal waste incineration, the EU ETS Directive requires the Commission to also evaluate the possibility of including other waste management processes, such as landfills.

Art 2 of Directive 1999/31/EC²¹ defines a landfill as a waste disposal site for the deposit of the waste onto or into land. The definition excludes facilities where waste is unloaded in order to permit its preparation for further transport for recovery, treatment or disposal elsewhere, and storage of waste prior to recovery or treatment for a period less than three years as a general rule, or storage of waste prior to disposal for a period of less than one year.

Data shows that on EU average, 23% of municipal waste treated in 2021 ended up in landfills, while 11 Member States landfilled more than 40% of their municipal waste²². Europe landfills count for almost 60 million tonnes of municipal waste only, annually. Considering also commercial and industrial waste, ca. 100 Mt of waste are landfilled in Europe in total²³.

Art 30 (7)) EU ETS Directive states that the assessment on landfills should not focus on CO₂ only, but also look at the potential of including CH₄ and nitrous oxide (N₂O) (Art 30 (7)) EU ETS Directive. This logic makes sense considering that decomposing waste in landfills generates CH₄, a GHG that is 28 times more potent than CO₂ on a 100-year perspective and 86 times more on a 20-year perspective. CH₄ emissions from solid waste disposal on landfills corresponds to ca. 100 MtCO₂eq²⁴.

¹⁶ [German Federal Ministry for Economic Affairs and Climate Protection \(2024\)](#). Draft Act on the adaptation of the Greenhouse Gas Emissions Act- to the amendment of Directive 2003/87/EC. [GE]. Pp. 68

¹⁷ ICAP (2022) Germany reforms national ETS to broaden scope and postpone price increase

¹⁸ EEA (2022). Early warning assessment related to the 2025 targets for municipal waste and packaging waste. Netherlands Country Profile. Pp 11.

¹⁹ Nordic Council of Ministers (2024). Waste incineration in the Nordic countries. Pp. 43.

²⁰ UK Government (2024): UK Emissions Trading Scheme Scope Expansion: Waste. May.

²¹ Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste. OJ L 182, 16.7.1999

²² CEWEP (2023). Latest Eurostat Figures: Municipal Waste Treatment 2021. September 26th.

²³ CEWEP (2022) Waste to energy climate roadmap. The path to carbon negative. Pp. 7

²⁴ [Wang, Y. et al \(2019\)](#) An Assessment of the Dynamic Global Warming Impact Associated with Long-Term Emissions from Landfills. Policy analysis. December 3.

Landfilling is not expected to be minimised anytime soon. The new EU landfill targets still allow for 10% landfilling of municipal waste by 2035 or, by derogation, even 2040 for countries which are currently landfilling most of their waste²⁵.

2.1.2. Timeline

Following the revision of the EU ETS Directive 2023, policymakers amended Annex I to include monitoring of installations for municipal waste incineration (MWI) above 20MW_{th}, starting in 2024. By April 30th, 2024, Member States should identify and submit to the European Commission the verified annual emission reports of each installation for the incineration of municipal waste.

By 31 July 2026 there will be the European Commission Assessment. As mandated by Art 30 (7) of the revised EU ETS Directive, the European Commission should present a Report on the feasibility of including municipal waste installations in the ETS1, to the European Parliament and Council. The Report should consider the following elements:

- Potential diversion of waste towards disposal by landfilling in the EU.
- Waste exports.
- Effects on the internal market,
- Distortion of competition,
- Environmental integrity,
- Alignment with Directive 2008/98/EC.
- Robustness and accuracy with regards to monitoring and calculation of GHGs.
- Possibility of including other waste management processes, in particular landfills.

Starting in 2028, MWI installations will be included in ETS1 if the assessment is positive and there is a legislative proposal in 2026. Until 2030, Member States will have the possibility to opt-out MWI from the ETS1 (Art 30 (7)).

2.1.3. Scenario

Art 30 of the EU ETS Directive mentions that the Commission should assess the feasibility of including MWI installations in the ETS1, without providing more details. Some scenarios that could be envisaged include:

Scenario 1: Including municipal waste incineration and landfills in current ETS1.

Some elements may indicate that if expanded, the new sectors could fall under the existing ETS1:

- From 1 January 2024, combustion of fuels for the incineration of municipal waste with a total rated thermal input exceeding 20 MW will have to report their emissions, as indicated in Annex I of the EU ETS Directive. Municipal waste may fall in the same category “combustion of fuels”.
- Annex III of EU ETS Directive, addressing the release for consumption of fuels which are used for combustion in ETS2, clearly indicates that activities should not include the release for consumption of hazardous or municipal waste used as fuel. However, this explicit exclusion in ETS2 was not meant to suggest that waste could be more appropriate under ETS1 as a sector, but simply to make sure that waste would also remain exempted under ETS2. As a matter of fact, taking also the

²⁵Council Directive 1999/31/EC. Article 5.

example of national ETSs now in place (e.g. Germany), it can be pictured a future where municipal waste could be included in an EU system closer to ETS2. This possibility should not be overlooked.

- If municipal waste expansion happens in 2028, while the timeline for ETS2 is still uncertain: ETS2 would kick-in in 2027 with a possibility to delay the system until 2028. In 2028, the new LRF of 4.4% will apply to current ETS1 participants. There is a chance that MWI is included in ETS1 at the same time.

Despite this evidence, we should not overlook other possibilities for including waste into emission trading system in the EU (Scenario 2 and 3)

Scenario 2: Municipal waste incineration and landfills in a separate ETS.

Similarly to what has been proposed for ETS2, an alternative option could be to create a single ETS for municipal waste and landfills. ETS2 could be adopted as a model, where one of the main issues was the cost-pass through from fuel suppliers to final consumers. Similarly to ETS2, a price stabilisation mechanism can be envisaged for waste management in a transitional phase, as a public service to citizens, together with an excessive price mechanism to ensure that price would not rise too sharply at any given time. This would also allow some years to the operators to get familiar with a CO₂ pricing mechanism, after which being exposed to the free market price. Should this scenario be a realistic option is to be questioned, due to the smaller number of players for a dedicated emission trading system in the EU to be functional. It is unlikely that the system would be liquid enough to lead to the conditions for a well function market and good price discovery.

Scenario 3: Covering a new activity with fossil fuels “released for consumption of products”, just as ETS2 which is only for “released for consumption of fuels”.

The fundamental issue to examine when deciding expansion on how to incorporate MWI and landfills into an emission trading system in the EU is related to the most effective way to tackle non-recyclable plastic products that will emit CO₂ once incinerated at the end of their life. The solution in this scenario would be to extend the ETS2 registry to fossil products other than fuels, applying the carbon cost directly at the source and tackling production and consumption of fossil-based materials upstream. However, this ideal possibility of a full upstream approach is much more complex to design and would require more political efforts.

2.1.4. Impact on supply/demand

Supply:

Art 30 (7) of the EU ETS Directive explicitly mentions that if MWI and landfills were to be included from 2028, the Commission should apply the provisions of Chapter IV - provisions applying to aviation, maritime transport and stationary installations - to GHGs permits and the allocation and issuance of additional allowances in respect of municipal waste incineration installations. Therefore, if municipal waste incinerators are included in ETS1, the total supply of EUAs in ETS1 should be increased also.

The ETS1 cap could be expected to decline year on year based on the foreseen LRF in accordance with current carbon reduction trajectories: the LRF for ETS1 will be 4.4% from 2028²⁶. This is the same year

²⁶ Article 9, Directive 2003/87/EC.

matching a potential inclusion of the municipal waste sector in ETS1. The impact on the supply will depend on the final amounts.

The creation of additional EUAs and their supply into the carbon market, to accommodate the extension of carbon pricing to municipal waste and landfills, should smooth a sharp impact of including municipal waste into the carbon market.

Demand:

- Marginal Abatement Cost (MAC).

This discussion assumes an average abatement cost for ETS1 sectors²⁷ of 180 (EUR/tCO₂e), compared to an average cost of abatement for municipal waste and landfill. There are two ways for a waste incineration plant to totally abate its fossil CO₂ emissions:

1. Close the inlet: which means for a plant stop accepting and treating residual waste. This however cannot be considered a valid solution because it will also lead to environmental and health costs to society.
2. Close the outlet: the most promising technology to reduce CO₂ emissions for a waste incineration process at the moment is Carbon Capture, Utilization and storage (CCUS)²⁸. Capital expenditures (CAPEX) and operational expenditures (OPEX) of CCUS applied to WtE are still very expensive. In terms of EUR/tCO₂, costs are currently 2 or 3 times higher than the actual ETS1 prices.

The MAC (CCUS applied to WtE) is hence significantly higher than 180 (EUR/tCO₂ eq), considering all phases in the value chain (CO₂ capture, CO₂ compression and conditioning, transportation, intermediate and final storage). Costs may result even higher in the case of final utilisation of CO₂.

- Size of the sector

Fossil CO₂ emissions from WtE plants represent 1% of all GHG sources in Europe. Current ETS1 from stationary installations and aviation represents around 36% of EEA GHGs emissions²⁹, and maritime transport an extra 4%³⁰. If emissions from municipal waste and landfills are integrated into the existing ETS1, it can be assumed that the resulting prices will continue to be dominated by the abatement options in ETS1³¹.

2.1.5. Impact on market functioning

Bringing municipal waste incinerators and landfills into the carbon market should not impact negatively market indicators. On the contrary, it may increase market participation, thus providing higher liquidity and therefore moderating volatility. However, the size of municipal waste operators and landfills in the EU is low in terms of number of installations and GHGs coverage, compared with current players. The impact on the carbon market should not be substantial as to alter current market indicators; the impact could be rather environmental, on waste markets and circular economy.

²⁷ MACC is taken from (Kobize, (2024)). Pp.8. Reference Fit55 scenario where EU ETS and BRT ETS operate separately.

²⁸ Nageler-Petriz, H., (2024) 10+1 things to know about CCUS and Waste-to-Energy | ISWA Waste Management World, June 2024. July 26.

²⁹ COM(2023) 654 final. Report from the Commission to the European Parliament and the Council on the functioning of the European Carbon Market in 2022 pursuant to articles 10(5) and 21(2) of Directive 2003/87/EC. Pp. 5.

³⁰ European Commission (2024) Reducing emissions from the shipping sector

³¹ If ETS1 and ETS2 were merged, EU ETS GHG coverage will be around 70-80% EU GHGs covered, thus impact of including municipal waste and landfills on demand, due to size, will be even more negligible.

However, different sectors bring bespoke factors. Some questions that need to be asked to understand the impact of including these sectors on market functioning are:

- How long-term in the future, sectors will sign their carbon contracts? Will they hedge?
We can anticipate low (if any) hedging practices for municipal waste operators and landfills, with low experience in trading and with a small number of installations compared to ETS1 sectors.
- To what extent are the operators in this sector experienced in trading and commodity risk management?

As municipal waste incinerators and landfills being new sectors included in ETS1, we do not expect previous expertise in trading carbon commodities. Most waste incineration plants in the EU are entirely publicly owned by municipalities or are managed via a public-private partnership.

- What is the number of compliance entities? What is the role of intermediaries?
416 WtE incinerators were registered in the EU and Norway in 2021. Municipal waste operators may need to rely on market traders with experience in the carbon market rather than participating directly on auctions. Transaction costs could be higher than for larger entities participating in the ETS1, which have more experience in the carbon market.

2.1.6. Discussion

There could be several pros when considering the extension of ETS1 to municipal waste incineration and landfills:

1. No expected negative impact on carbon market functioning, but waste markets should be monitored carefully.
2. The inclusion of MWI in the ETS1 could contribute to create a level playing field with industrial sectors³² currently covered by emissions trading and using waste as a fuel. In the cement industry for instance, waste used as an alternative fuel to decarbonise serves as a raw material to produce clinker³³. Notwithstanding, while for industries the waste stream can be used as a fuel to produce their products, WtE plants treat household garbage while additionally generating power³⁴. While for municipal waste incinerators, the main purpose is the safe treatment and recovery of municipal waste. Also, different environmental requirements apply. Emissions trading could bring different uses of waste streams into the same market.
3. Including WtE plants in ETS1 could also create a level playing field with other power covered plants covered by ETS1 and which generate electricity and heat and already face a price for their CO₂ emissions. WtE uses trash for generating power, as other power plants use coal, oil, or natural gas. The burning of waste heats water and the steam drives a turbine to generate electricity³⁵.
4. Coverage by emissions trading could also allow for wider track/accounting of Carbon Capture and Utilization (CCU), by expanding the ETS1 value chain with the inclusion of municipal waste incinerators. Currently, Art 12 (3b) of the ETS Directive requires non-permanent CCU (e.g.:

³² CEMBUREAU (2016). Cement, concrete & the circular economy. September. Pp. 9

³³ CEMBUREAU (2016). Cement, concrete & the circular economy. September. Pp. 9

³⁴ Hockenos, P. (2021) Waste to Energy – Controversial power generation by incineration. May 26th..

³⁵ Deltaway (2018) Waste-to-Energy: How It Works.

captured CO₂ in an industrial plant which is then used in a product) to be accounted upstream only (at the point of ETS installations).

5. Nowadays there is the lack of a common EU approach to address GHGs emissions from municipal waste. Instead, national/regional authorities have produced national/regional policies to reduce the carbon footprint of municipal waste incinerators. A reason is that the treatment of municipal waste can be affected by the level of economic development, natural conditions, and regional social factors³⁶. The inclusion of MWI in ETS1 could reduce the risk of tax competition intra EU borders, which is a consequence of having fragmented national policies in the EU, while waste management remains a local issue.
6. The discussion is also relevant for CCSU and the contribution of WtE as a net negative emission provider. WtE accounts for approximately 60% of biogenic emissions and the integration of WtE and Carbon Capture and Storage (CCS) could enable waste to be a net zero or even net negative emissions energy source³⁷. Germany is adopting a carbon management strategy that supports CCS technology. The government plans to enable CCS for hard-to-abate industrial emissions, allow offshore CO₂ storage, and create supporting legal and financial frameworks. ³⁸In Europe, the integration of CCS with WtE facilities has the potential to capture about 60 to 70 MtCO₂ annually³⁹.
7. EU experience where municipal waste is already covered by emissions trading in some EU Member States. In these cases, it should be assessed if the ETS1 delivered its goals and brought to a decrease of fossil CO₂ emissions from waste incineration.

There could also be cons that should be considered when assessing the extension of carbon pricing to MWI and landfills:

1. It could result in higher administrative costs for municipalities, which already face low financial resources, as well as for the waste management chain, also resulting in impact on residents receiving heat supplied from WtE as a decarbonized source of energy.
2. Emissions trading is an effective tool to incentive switching to fuels with a lower carbon content in the energy mix. However, WtE facilities for the treatment of residual waste, with an EU average 60% of biogenic emissions, and 40% of fossil emissions⁴⁰ - will not be able to implement fuel switching in many cases. On the opposite, in the future the amount of biogenic content in residual waste could potentially increase because of a higher source separation of plastics and the increase of biobased products in the market⁴¹. Since they are dedicated facilities for the treatment of waste, they have limited possibility to decarbonise their waste feedstock. CCU is the most promising abatement option.

³⁶ Lu, C., et al (2020) The GHG emission determinants research for waste disposal process at city-scale in Baoding, Sustainable Cities and Society. Volume 59, August 2020, 102203.

³⁷ UN Intergovernmental Panel on Climate Change IPCC Report (2022), April.

³⁸ <https://www.bmwk.de/Redaktion/EN/Pressemitteilungen/2024/05/20240529-cabinet-clears-path-for-ccs-in-germany.html>

³⁹ Poretti, F., Stengler E. (2022) The Climate Roadmap of the European Waste-to-Energy Sector The path to Carbon Negative, 16th International Conference on Greenhouse Gas Control Technologies, GHGT-16. October 23rd-27th. Pp. 8.

⁴⁰ CEWEP (2022). Pp. 8.

⁴¹ CEWEP (2022) Waste-to-energy Climate Roadmap. The path to carbon negative. Pp 8.

3. Potential double burden: National CO₂ taxes on WtE or other incineration taxes⁴² could overlap with the ETS1, adding a burden to current policies in place. Notwithstanding Recital 9 of Regulation 2023/857⁴³, clearly specifies that the inclusion of installations for the incineration of municipal waste in Annex I to Directive 2003/87/EC, should not change the scope of Regulation (EU) 2018/842. In addition, revised Art 2 also mentions that ESR applies to energy, industrial processes and product use, agriculture, and waste, excluding GHG from the activities listed in Annex I to Directive 2003/87/EC. While the interaction with national policies should be analyzed, these legal provisions should avoid double burden with ESR, if installations for the incineration of municipal waste are included in ETS1.
4. Carbon leakage risk due to extension to carbon pricing. There is a need to distinguish between different types of carbon leakage risk if carbon pricing is to be extended to municipal waste:
 - Diversion of waste towards disposal by landfills in case only MWI but not landfills⁴⁴ are covered by ETS1. If waste management becomes too expensive, the system may readjust and send waste to cheaper and less sustainable solutions. This could happen for plastics, which may not get incinerated, but sent to landfills. However, the EU ETS Directive also considers a potential inclusion of landfills in parallel to the extension to municipal waste.
 - Exports of waste to 3rd countries outside the EU. If WtE becomes too expensive inside the EU, higher amounts of waste could be shipped and incinerated in other countries outside Europe with lower costs but also with lower environmental/social standards. Additional safeguard mechanism may need to be put in place to avoid such scenario.
 - Illegal waste. Several investigations (Interpol, Europol, etc.) show sharp increase of illegal waste management outside (and inside) Europe⁴⁵, especially for plastics, where waste management is cheaper and with ineffective regulation.
 - Potential measures to reduce the risk of carbon and waste leakage (waste being diverted to landfills or exported outside EU to avoid a more expensive incineration process) can include tax on waste exports, permitting system, and expansion of ETS1 to landfills.
5. Carbon pricing may not be able to provide an incentive to reduce waste volumes and related GHGs. The CO₂ cost is applied too far from the source of GHGs (e.g.: plastic production). An option would be to focus on reducing the volume of waste, and therefore, the GHG generated by municipal waste incinerators. Some academics have put forward a Waste Trading Systems, rather than an emissions trading system, to reduce the volume of waste in a cost-efficient way⁴⁶. If emissions trading will be a driver to foster CCUS in the waste incineration sector it is questionable. Carbon removals could also be more effective as a policy tool to foster CCUS technologies in WtE rather than an emissions trading price signal.

⁴² For a map on the interaction between National Taxes and EU ETS, see Stengler, E. (2024). [WtE and Circular Economy in Europe](#). CEWEP. April 18th. Pp. 20.

⁴³ Regulation (EU) 2023/857 of the European Parliament and the Council of 19 April 2023 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement, and Regulation (EU) 2018/1999 (Text with EEA relevance)

⁴⁴ [FNADE \(2023\)](#) Etude de l'impact sur l'inclusion des unités de valorisation énergétique des déchets ménagers et assimilés dans le système européen d'échange de quotas d'émission de gaz à effet de serre (EU ETS1) [FR]. July 28.

⁴⁵ Ciesla, W., Pena, P. (2023). Authorities struggle to track Europe's Illegal waste trade. Invertigate Europe. May 5th.

⁴⁶ Metta-Vermessen, C., Metta, J., (2024) Waste Trading System: managing waste with high population density and low sorting rate. January 17.

6. MRV can be difficult for waste due to its very heterogeneous nature. Starting in 2024, same monitoring rules will apply to MWI as for regular combustion installations. The data gathered in the MRV phase should provide the basis for the European Commission assessment, by 31 July 2026, on extending ETS1 to municipal waste. In addition, national practices for inclusion of MWI in ETS (e.g.: Sweden, Denmark, Lithuania) can provide some lessons learned on MRVA for municipal waste covered by emission trading system in the EU.

Other important points that policy makers should take into consideration when deciding on the extension of carbon pricing to MWI and landfills, are their interlinkages with other policy instruments and how to assess the mix of policy instruments. Could a combination of a market-based instruments (e.g.: emissions trading) and regulatory approaches like standards, mandates, permitting, Extended Producer Responsibility (EPR) schemes, be more effective to address decarbonisation in the sector? Would that contribute positively to the increase of recycling of waste?

IED, WFD and Landfill Directive are only some of the examples mentioned in this chapter for which environmental considerations should be account for when assessing the expansion of ETS1 to municipal waste. For interlinked sectors like plastics, the following question may be relevant:

- Will an inclusion of fossil fuel emissions from WtE (placed at the end of value chain) will affect the production of plastics upstream? Will ETS1 be able to steer production and consumption patterns in society?
- Will this reduce the release of fossil-based products in the market?
- Who should share the burden across the value chain?
- Will consumers feel the ETS1 price and decarbonisation push? How will WtE plants reflect the carbon costs to the citizens and to the local communities?
- What mechanisms can be designed to pass-through the costs upstream?

Recommendations

ERCST sees the inclusion of municipal waste incineration in ETS1 in 2028 as a scenario that is likely and makes sense. There are some aspects that will need to be managed, which include the interaction of MWI along the whole value chain, the environmental implications and interlinkages with different EU legislative files and safeguards to leakage and cost pass-through mechanisms. All are aspects that will need to be addressed before deciding if including or not municipal waste in ETS1.

2.2. International aviation

We classify the expansion of carbon pricing to international aviation as evolutionary, as the sector has been covered for more than a decade. However, this would depend on the specifics of how this is done. For example, a move to cover 100% of international aviation transport would exceed what is considered as the

EU's 'fair share' of emissions⁴⁷, while a 50/50 scope where half of the total distance and emissions from international flights (similar to the current international maritime voyage coverage under the maritime emissions trading system) or a scenario whereby the EU ETS Directive is only applied to European Economic Area (EEA) outgoing flights would be more evolutionary. Indeed, ETS1 has already exempted incoming flights from two countries (Switzerland from January 2020⁴⁸, and the UK from January 2021⁴⁹).

2.2.1. Current status

Aviation was brought into the ETS1 in 2012. The legislation was initially designed to include all flights departing from or arriving at an airport in the EEA. However, the EU decided to temporarily reduce the scope to cover only intra-EEA flights to give the International Civil Aviation Organisation (ICAO) time to reach and implement an effective worldwide agreement to decarbonize the aviation sector.

The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) was subsequently agreed by ICAO in 2016 with the aim of offsetting GHG emissions from international aviation above their 2020 levels. As of today, a total of 128 countries are set to participate in the CORSIA offsetting requirements from 2025⁵⁰. So far, in addition to the EU, only Canada and the Republic of Korea have instigated the application of CORSIA through domestic law, which is seen by some as necessary for it to be credible.

Intra-European flights

Intra-EU+EFTA flights represented ~77% of flights and ~39% of total aviation CO₂ emissions in 2019⁵¹.

According to the latest EU ETS reform, the ETS1 will continue to apply solely to intra-EEA flights (including departing flights to the UK and Switzerland), while CORSIA is applied to extra-EEA flights of EU-based airlines⁵² to and from third countries participating in CORSIA ('clean cut') other than Switzerland and the UK from 2022 to 2026. This "*should be the last time-bound derogation*", according to the EU ETS Directive⁵³. Moreover, flights to and from around 75 countries are exempted from pricing under the EU ETS also beyond 2026⁵⁴.

A separate 'aviation cap' applies to the aviation sector, but operators can buy allowances from market participants in the ETS1.

- From 2013 to 2020, the aviation cap was constant at 95% of the 2004–2006 emissions (Article 3c).
- From 2021, the cap was reduced by 2.2% per year based on the 2020 allocation, i.e. – the LRF was the same as for the stationary sector (Article 9).

⁴⁷ See recital 20 of Directive 959/2023.

⁴⁸ Commission Delegated Regulation (EU) 2020/1071 of 18 May 2020.

⁴⁹ Commission Delegated Regulation (EU) 2021/1416 of 17 June 2021.

⁵⁰ ICAO, CORSIA newsletter, July 2024, https://www.icao.int/environmental-protection/CORSIA/Documents/CORSIA_Newsletter_Jul2024_web.pdf

⁵¹ EASA, European Environmental Report 2022

⁵² Under the ICAO scheme, an airline should only be regulated by the State where it is established

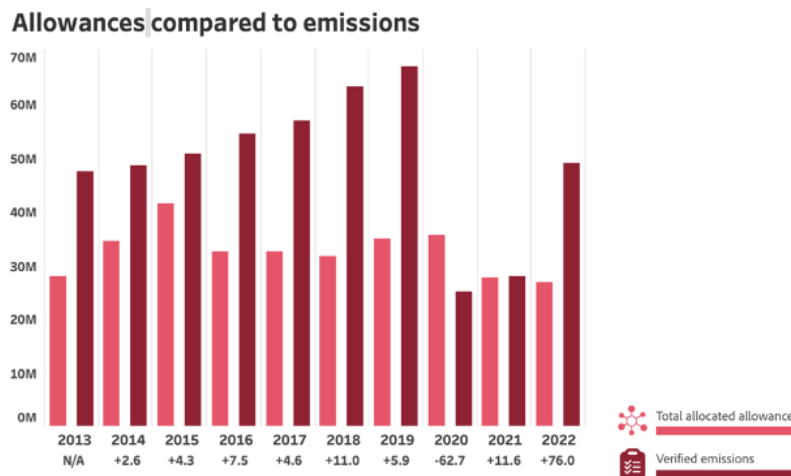
⁵³ Recital 30 of Directive (EU) 958/2023.

⁵⁴ Article 25a(6) of Directive 2003/87/EC, relating to least developed countries and small island developing states whose GDP per capita does not equal or exceed the Union average.

- From 2024 to 2027, the LRF was increased to 4.3% per year and relates to the 2023 emission allowances for active aircraft operators⁵⁵. In addition, the cap has been corrected to take into account the inclusion of flights to outermost regions from 2024, an extension of around 7% with an accompanying increase in the ETS1 cap⁵⁶.
- From 2028 the LRF will be 4.4%⁵⁷.

Airlines can use both specific EU Aviation Allowances (EUAAAs) as well as general ETS1 EUAs to fulfil their EU ETS obligations⁵⁸. Airlines can effectively purchase as many EUAs from the stationary sector as they would like, allowing them to exceed the aviation cap. As such, the separate aviation cap is not a ‘hard cap’ directly limiting aviation’s emissions growth under the ETS1, and aviation has been contributing to emission reductions in other sectors of the economy.

Indeed, unlike stationary installations, domestic aviation emissions under the ETS1 showed an increasing trend between 2013 and 2019, with verified emissions in general exceeding allowances such that the aviation sector needed to buy allowances from the carbon market (see graph below). Emissions were temporarily lower than allocated allowances in 2020 and 2021 reflecting the impact of the COVID-19 pandemic. However, this has again reversed as of 2022, when the sector has started to recover, with overall emissions 3.71% higher than in 2013.



Source: EEA, <https://climate-energy.eea.europa.eu/topics/climate-change-mitigation/european-trading-system-emissions/data>

Free allocation to aviation is being phased out gradually – reduced to 75% in 2024, 50% in 2025 and eventually to 0% from 2026 onwards. However, the reform of ETS1 created a re-investment mechanism

⁵⁵ Commission Decision (EU) 2023/2440 of 27 October 2023 on the Union-wide total quantity of allowances to be allocated in respect of aircraft operators under the EU Emissions Trading System for 2024, https://climate.ec.europa.eu/news-your-voice/news/commission-decides-2024-allowances-aircraft-operators-2023-10-31_en

⁵⁶ idem

⁵⁷ idem

⁵⁸ While initially EUAAAs were unavailable to other sectors, from phase IV (2021) onwards EUAAAs can also be surrendered by fixed installations. Both types of allowances (EUAs and EUAAAs) can therefore from 2021 be used by both fixed installations and aviation operators for their compliance obligations, making them fully fungible. “The reason for introducing EUAAAs was the Kyoto Protocol: international aviation incl. intra-EU inter-national aviation is outside of the “quantified emission limitation and reduction objectives” of the Kyoto Protocol. Aviation ETS allowances could therefore not be backed by assigned amount units (AAUs), the allowance used to account emission targets of countries under the Kyoto Protocol. The whole accounting rules for the Kyoto Protocol do not apply to the Paris Agreement so the distinction between EUA and EUAA is not necessary anymore. At the same time, it does no harm and could be useful, e.g.: when parallel regimes between the ETS and CORSIA are set up” (Source: Oko Institute (2020), Analysis of potential reforms of aviation’s inclusion in the EU ETS). The distinction between EUAAAs and EUAs would also be needed in case a limit on the number of allowances that the aviation sector can buy from the stationary sectors is introduced.

that sets aside 20 million allowances for aircraft operators from January 2024 to cover up to 100% of the cost difference for higher cost sustainable aviation fuel (SAF) production⁵⁹. The EU ETS' Innovation Fund is also supporting SAF production through various projects, as well as the deployment of renewables, electrolyzers, and green hydrogen production.

Aircraft operators can use the allowances to cover 50%-100% of the cost difference between fossil kerosene and SAF. This means that from 2026 onwards, all allowances will be auctioned, except 20 million SAF allowances⁶⁰, which will be given to airlines for free in relation to their actual use of SAF on routes covered by effective carbon pricing⁶¹.

Extra-European flights

Extra-EU+EFTA flights represented ~23% of flights and ~61% of total aviation CO₂ emissions in 2019⁶². International aviation CO₂ emissions accounted for about 3% of the EU's emissions in 2022 (excluding LULUCF)⁶³, with the share projected to increase to about 4.4% in 2030⁶⁴. International aviation emissions were about 7.8% of emissions from stationary installations under the ETS1 in 2022, with the fraction projected to grow to 13.8% in 2030⁶⁵.

EU law applies CORSIA to extra-EEA flights of EU-based airlines to and from third countries participating in CORSIA from 2022 to 2026. EEA-based operators of flights to and from states outside the EEA participating in CORSIA have to cancel certain offsets for these flights if the emissions of the entire sector are higher than in the baseline year 2019, minus 15% ("Carbon Neutral Growth") and are exempted from the surrender obligation of the EU ETS Directive (Article 25a(4)).

Effectively that means that when global aviation emissions under CORSIA offsetting reach levels above 85% of 2019-levels, EU-based airlines operating extra-EEA flights should offset their proportionate share with corresponding carbon credits, invested in emissions reductions in countries participating in CORSIA offsetting.

Moreover, one of the intricacies is that under CORSIA, an airline should be regulated only by the State where it is established. If a third country does not implement/enforce CORSIA, that would effectively mean a non-equal treatment of routes: an EU-based operator would be covered by CORSIA on their extra-EEA routes, while a non-EU based operator from a country that does not implement/enforce CORSIA will face no comparable carbon pricing for the same routes. For this reason, in case other countries do not follow through and implement/enforce CORSIA on airlines based in their respective countries, recital 27 and

⁵⁹ This support is 'first come, first served' on an annual basis from January 2024. If the amount were used up, it could be increased.

⁶⁰ For the period 2024 to 2030 a maximum of 20 million allowances out of the total quantity of allowances for aviation shall be allocated to commercial aircraft operators for the uplifting of sustainable aviation fuels to cover part of or all the price difference to the use of fossil kerosene (Article 3c(5a)).

⁶¹ The EU's NDC under the Paris Agreement only includes emissions from civil aviation "in respect of CO₂ emissions from flights subject to effective carbon pricing through the EU ETS", see <https://www.consilium.europa.eu/en/press/press-releases/2023/10/16/paris-agreement-council-submits-updated-ndc-on-behalf-of-eu-and-member-states/>.

⁶² EASA, European Environmental Report 2022

⁶³ EU European Environment Agency, Greenhouse gas emissions inventory, <https://climate-energy.eea.europa.eu/topics/climate-change-mitigation/greenhouse-gas-emissions-inventory/data>

⁶⁴ Based on figure 2.1, in EEA, Trends and projections in Europe 2023, EEA Report 07/2023

⁶⁵ Estimated based on the following sources: International aviation emissions and total EU emissions in 2022 and 2030: Figure 2.1 Sectoral trends and progress towards achieving the 2030 GHG emissions target, EEA (2023), Trends and projections in Europe 2023, EEA Report 07/2023; Emissions from stationary installations under the EU ETS: EEA indicator 'Greenhouse gas emissions under the EU Emissions Trading System', <https://www.eea.europa.eu/en/analysis/indicators/greenhouse-gas-emissions-under-the>

Article 25a (7) of the EU ETS Directive specifically foresee exempting routes involving those countries for EU-based airlines to preserve equal treatment.

For EEA aircraft operators, the list of permissible offsets⁶⁶ differs from that of ICAO for various reasons, e.g.: incentive participation in the Paris Agreement and in CORSIA, and to avoid double counting of emission reductions.

The obligation to surrender allowances (ETS1) or cancel offsets (CORSIA) differ in several aspects:

	ETS1	CORSIA
Certificates to be cancelled	Aircraft operators surrender allowances for total of emissions	Operators offset the increase compared to the baseline (part of total emissions). According to CE Delft (2016), CORSIA is expected to result in airlines being required to offset an estimated 21.6% of their cumulative emissions in 2021 – 2035.
Surrender obligation	Based on the individual emissions of the respective aircraft operator.	Uses the annual CO ₂ emissions of an operator multiplied with the sector's emissions growth to determine the cancellation obligation up to 2032. This takes into account the earlier growth of airlines in industrialised countries compared to developing countries. From 2033, the multiplied growth factor will be based on a combination of the sectoral growth (85%) and an individual operator's emissions growth factor (15%).
Acceptable offsets	The EU ETS Directive includes different offset requirements for EEA operators' participating in CORSIA: only offsets from Parties to the Paris Agreement that participate in CORSIA and comply with advanced standards can be used (to avoid double counting). In addition to the offsets according to the ICAO list, the ETS allows offsets from an international mechanism established under Article 6(4) of the Paris Agreement, projects in third countries given the operator has not used up their 2008-2012 budget, and emission reductions from projects in EU MSs according to Article 24a.	ICAO decides which offsets are acceptable under CORSIA.

Source: based on Umweltbundesamt, 2023, *Aviation in the EU ETS and CORSIA in the 'Fit for 55' package*, Factsheet, 29 June 2023

2.2.2. Timeline

A review of emissions trading in the EU, especially ETS1, could extend ETS1 to all flights out of (and into) the EU from 2027 onwards, unless CORSIA is “positively evaluated”. If a report by the Commission due by July 2026 shows that CORSIA has not been sufficiently strengthened and that there is participation by major countries, a proposal shall be made to continue to exempt incoming flights and apply the EU ETS Directive on departing flights from the EEA to a number of third countries⁶⁷.

⁶⁶ The offsets that are usable by EU-based airlines are set out in Article 11a of the ETS Directive.

⁶⁷ The EU ETS already covers departing flights to 32 countries, including all members of the European Economic Area, Switzerland and the UK. Flights to and from around 75 more countries are exempted from the EU ETS after 2026, pursuant to Article 25a(6) of Directive 2003/87/EC.

More specifically, according to Article 28b of the EU ETS Directive, the Commission review in 2026 will assess the environmental integrity of CORSIA and accompany it by a legislative proposal to include departing flights from the EEA in case:

- a) *“The ICAO Assembly by 31 December 2025 has not strengthened CORSIA in line with achieving its long-term global aspirational goal [of reducing aviation CO₂ emissions to net zero by 2050], towards meeting the Paris Agreement goals; or*
- b) *States listed in the implementing act adopted pursuant to Article 25a(3) represent less than 70 % of international aviation emissions using the most recent available data”.*

2.2.3. Scenario

There are many possible ways of how international aviation could be integrated in the emissions trading system in the EU. The following possible scenarios can be envisaged:

Scenario 1: Inclusion of international departing flights in the ETS1

- **Scope:** A key aspect to consider is whether a possible expansion would cover 100% of international aviation emissions from both incoming and outgoing flights. In this scenario we assume that the ETS1 covers in addition to all intra EEA flights, all extra-EEA outgoing flights, in line with the EU ETS Directive Article 28b that explicitly only refers to “departing flights” as an area of possible expansion⁶⁸.

At the same time, the EU would apply CORSIA to all flights other than intra-EEA flights, and the EU would provide deductions for international credits purchased to cover extra-EEA outgoing flights, such that the two systems coexist without providing a double burden. This will ensure that the EU will continue to implement CORSIA.

We consider a reduced scope in that respect more likely as it will enjoy higher political feasibility in the international arena: it represents the EU’s fair share of emissions under the Paris Agreement, with third countries able to decide on appropriate actions in respect of the remaining share; it will reflect that more climate action is necessary; and it is less likely to be viewed negatively by good faith partners. A slight variation of this element/scenario would entail a 50/50 scope where half of the total distance and emissions from all international flights (following the current international maritime voyage coverage under the maritime emissions trading system) is covered. This variation would likely not significantly impact the share of total emissions covered by the ETS1.

- **Which emissions trading system in the EU/timeframe:** If international aviation is included, it will most likely be included under ETS1 (together with domestic aviation) as of January 2027.
- **LRF & cap:** The LRF for aviation as of 2027 is aligned with the LRF of the ETS1 as of 2027, namely 4.3% per year as of 2027 and 4.4% as of 2028. The separately calculated cap for aviation would need to be increased to take into account the broader scope, as was the case for the extension to maritime that is already in the legislation. This could lead to an increased issuance of around 80 million allowances annually from January 2027 onwards, although the precise amount would need to be confirmed. We further assume that given the high MACs in the sector, there will continue to be a separate cap for aviation (including domestic or international) under the ETS1, and that there continues to be alignment of the LRF between the stationary installations and aircraft operators.

⁶⁸ However, at least when it comes to cargo flights, the alternative of covering only arriving flights would better reflect the footprint of goods imported in the EU and therefore, EU consumption, but would be challenging to enforce and administer.

The current separate cap is however not a ‘hard’ cap, as since 2021 there is full fungibility between EUAs and EUAAs (for more information see section 2.1.).

- **Free allocation:** We consider likely that from the outset of its inclusion, there will be no free allocation for international aviation, but that the EU co-legislators expand the re-investment mechanism that sets aside allowances for aircraft operators to offset the higher cost of SAF production.

Scenario 2: inclusion of international departing flights in a separate emissions trading system in the EU

- Scenario 2 differs from Scenario 1 in that it encompasses the creation of a separate emissions trading system for aviation, including international departing flights and domestic aviation (currently in ETS1), either alone or possibly together with additional sectors e.g.: maritime (currently in ETS1).

2.2.4. Impact on supply/demand balance

In the past, the aviation sector has been a net buyer of allowances from the stationary sector as mitigation cost tend to be higher. Under Scenario 1, the inclusion of international aviation in ETS1, depending on the level of adjustment of the cap, could exacerbate this, with increased demand leading to upward pressure on ETS1 prices. This is consistent with results of a 2022 study that considered alternative policy scenarios whereby the ETS1 would cover, in addition to intra EEA flights, also EEA outgoing (and incoming flights), and which found that the emissions reduction within the aviation sector would be around 10%. Hence, the vast majority of ETS1 compliance would relate to purchasing EUAs and international credits thereby reflecting emission reductions in other economic sectors⁶⁹.

Different abatement options exist in the short to medium and long-term in aviation, encompassing different abatement costs. More efficient flights thanks to improved air traffic management and aircraft operations and other operational improvements can be implemented already in the short-term as it they do not require to wait for new aircraft technology and at low (possibly negative) MAC.

Evolutionary improvements to aircrafts and engines that render them more fuel efficient (by ~30% for aircrafts forecast to be introduced from 2035⁷⁰) as well as new revolutionary aircraft technologies (e.g.: electric and hydrogen-powered aircrafts) can also contribute starting in the medium- to longer term given that they require further development and depend on fleet renewal.

The use of (drop-in) SAFs is generally considered as one of the most realistic and effective means to reduce aviation emissions in the next decades⁷¹ and as a long-term solution for decarbonizing in particular long-

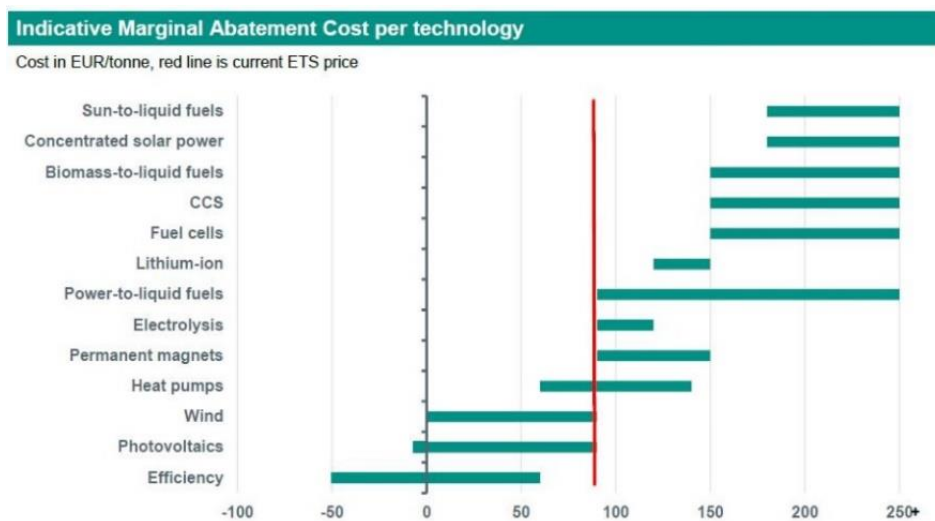
⁶⁹ See André van Velzen (TAKS), 2022, Environmental and economic impacts of EU ETS and CORSIA policy scenarios for European aviation, Report nr: 22-11 prepared for: Transport and Environment (T&E) and Carbon Market Watch (CMW), <https://carbonmarketwatch.org/publications/expanding-the-eus-carbon-market-for-aviation-study-and-briefing/>

⁷⁰ Destination 2050, NLR/SEO, February 2021

⁷¹ The ‘most likely’ scenario in EUROCONTROL’s April 2022 Aviation Outlook 2050 report foresees a 41% relative contribution to the total 279 million tonnes of CO₂ emissions savings required to meet the net zero target in 2050 from gradually increasing the use of SAFs; Similarly the Destination 2050 (NLR/SEO, February 2021) report has estimated that ~40% of the net CO₂ emissions reductions in aviation in 2050 to come through using drop-in SAFs (99MtCO₂ out of a total of 250MtCO₂).

haul aviation, the share of which is expected to increase by 2050⁷² given that it is difficult to substitute for long-haul flying, and that alternatives to liquid fuel for this segment will not be available in a foreseeable timeframe.

The technology to manufacture synthetic fuels for aviation and shipping (i.e.: power-to-liquid technologies to produce e-fuels such as e-methane, e-kerosene and e-methanol, or sun-to-liquid technologies to produce solar hydrogen and ammonia) varies along with their price. Most of the technologies to produce synthetic fuels for aviation are in the expensive territory compared to other technologies relevant for decarbonizing other sectors and compared to currently prevailing carbon prices (see indicative MAC per technology in graph below).



Source: ABN AMRO, based on IEA, CRU, McKinsey, and own estimates, <https://www.abnamro.com/research/en/our-research/sustainaweekly-ets-reforms-to-result-in-adoption-of-more-expensive>

The inclusion of (international) aviation together in a separate emissions trading system in the EU under Scenario 2 would avoid the upward pressure on ETS1 prices and ensure more in-sector abatement, at the expense however of cost efficiency losses with respect to economy-wide emissions reduction.

2.2.5. Impact on market functioning

The inclusion in ETS1 of extra-EEA departing flights (Scenario 1) or 50% of emissions from international flights (Scenario 1 variation) could, depending on the adjustment to the cap, increase the demand for EUAs in ETS1 leading to higher trading volumes and enhanced market liquidity, given that in the short to medium-term large volumes of in-sector emissions abatement are restricted by high costs (see previous section for a discussion on MAC). The magnitude of this effect however is limited by the overall low share of emissions that the sector of international aviation currently accounts for in the EU (3% in 2022, estimated to rise to 4.4% in 2030).

⁷² EUROCONTROL's April 2022 Aviation Outlook 2050 report predicts there will most probably be 16 million flights in 2050, which is an increase in demand of 44% over 2019 at an average annual rise of 1.2% per year. They predict that long-haul flights will continue to be the major source of CO2 emissions.

In 2022, the ETS1 applied to 390 aircraft operators flying between airports in the European Economic Area (EEA) and from the EEA to Switzerland and the UK⁷³. This compares to a total of 699 aircraft operators (EEA-based and non-EEA-based ones) performing aviation activities listed in Annex I of the ETS Directive as of 2024⁷⁴. Thus, the inclusion of international aviation has the potential to significantly increase market participation (from the inclusion of companies offering extra-EEA long-haul flights only), with positive impacts on market liquidity, stability, and efficiency.

This is of relevance in view of the fact that aviation companies can be considered as highly sophisticated players with trading departments that are familiar with trading e.g.: fuel products and hedging associated risks. The introduction into the ETS1 of additional players with advanced risk management and trading strategies can thus improve liquidity, enhance price discovery, stability, and market efficiency.

Overall, the impact of the inclusion of international aviation on the ETS1 market functioning is expected to be positive, yet to an extent limited by the relative contribution of this segment to overall emissions.

2.2.6. Discussion

There could be several pros when considering the extension of the ETS1 to international aviation:

- The carbon price will serve as a signal for the sector to decarbonize. The coverage of (international) aviation by the ETS1 will incentivize emissions reduction through operational improvements in the short term and the introduction of new aircrafts with significantly improved fuel efficiency in the medium-term. In addition, if aviation remains integrated in ETS1, the upward pressure on ETS1 allowance prices will encourage the adoption of other relatively less expensive technologies to SAFs, such as carbon capture and storage. In other words, by lowering the cap and by introducing hard-to-decarbonize sectors such as aviation (and maritime transport), ETS1 will incrementally bring into play rather less expensive technologies that are currently too expensive relative to the prevailing carbon prices⁷⁵.
- An integrated ETS1 assumed under Scenario 1 leads to lower economy-wide decarbonization costs.
- A separate emissions trading system in the EU (or ‘hard’ cap) for aviation alone or potentially combined with other sectors (e.g.: maritime) (Scenario 2) would lead to higher prices for the sector but would ensure that it also reduces emissions. The ongoing discussion on addressing non-CO₂ emissions aviation may be an additional argument in favour of managing the sector separately (see section 3.1. of this Report).
- Integrating (part of) international flights together with domestic aviation in ETS1 (Scenario 1) will likely lead to higher trading volumes and enhanced market liquidity, as well as to a moderate increase in market participation of primarily sophisticated players, with a positive impact on market liquidity, stability, price discovery and efficiency. The magnitude of these effects on market functioning, however, will be limited by the overall low share of emissions that international aviation currently accounts for in the EU (3% in 2022, estimated to increase to 4.4 % in 2030 or higher when also considering non-CO₂ emissions).

⁷³ ICF (2024), EU ETS Phase 4 Analysis, ICF Report for IenW, February 2024, <https://zoek.officielebekendmakingen.nl/blg-1135946.pdf>

⁷⁴ Number based on Commission Regulation (EU) 2024/1030 of 27 March 2024 amending Regulation (EC) No 748/2009 as regards the update of the list of aircraft operators performing an aviation activity listed in Annex I to Directive 2003/87/EC of the European Parliament and of the Council

⁷⁵ <https://www.abnamro.com/research/en/our-research/sustainaweekly-ets-reforms-to-result-in-adoption-of-more-expensive>

- Including international aviation under an emissions trading system in the EU would also resolve questions with respect to CORSIA's alignment with the EU's (2040 and) 2050 target(s) and climate measures in other sectors. For instance, CORSIA is less ambitious in terms of CO₂ reduction targets than the EU ETS Directive for aviation, as CORSIA aims at CO₂-neutral growth from 2020 onwards, whereas the currently applicable ETS1 already starts at the total CO₂ emissions of the years 2004-2006 and reduces them thereafter. Also, the obligation by aircraft operators under CORSIA is to offset part of their total emissions (i.e.: the increase in emissions compared to the baseline), while ETS1 applies to operators' total emissions.
- Finally, the coverage of international aviation by emissions trading would enhance 'fairness' vis-à-vis other sectors. Current requirements for airlines may be considered as not well balanced when compared to those for emitters in industry. Airlines can use CORSIA credits both for growth and international aviation emissions, while European industries competing internationally are facing strict requirements regarding how fast and how much emissions need to be reduced (through the LRF), as well as a cut in free allocation and no offset flexibility.

There could also be cons that should be considered when assessing the extension of the EU ETS Directive to international aviation:

- Under Scenario 1 (inclusion of international aviation together with domestic aviation in ETS1), emissions reductions in the short- to medium-term would mainly take place out of the aviation sector (in the stationary ETS1 installations) given the high marginal abatement costs in the aviation sector. Indeed, most of the technologies to produce (drop-in) SAFs - considered as one of the key contributing technologies to achieving net zero aviation emissions mid-century - are in the expensive territory compared to the currently prevailing carbon prices. Hence complementary measures in the legislative package like obligations on fuel distributors with respect to blending of SAFs under ReFuelEU Aviation, or obligations with respect to the reduction in GHG intensity in transport using alternative fuels and electricity under RED, or the taxation of kerosene (under ETD) will be key in driving decarbonisation by aircraft operators.
- Aviation has in the past being a net buyer of EUAs from the stationary sectors, and the inclusion of international aviation together with domestic aviation in ETS1 could, depending on the level of adjustment of the cap, exacerbate this, with increased demand leading to upward pressure on ETS1 prices.
- On the other hand, a separate 'hard' cap/emissions trading system in the EU for aviation alone or potentially combined with other sectors (e.g.: maritime) would lead to higher allowance prices for the sector.
- Moreover, over the years some stakeholders have questioned the legal basis for a geographical scope extension and cautioned that it might hamper progress with a multilateral emissions reduction approach through CORSIA. However, these concerns can be eased by a partial coverage of aviation emissions from international flights assumed by both Scenarios (i.e. only departing flights or 50% of emissions from both departing and arriving flights): this option might be less likely to be challenged as it could be argued that it effectively covers the EU's share of such emissions without violating the sovereignty of foreign territories. Moreover, the intention would be to implement an emissions trading system in the EU for international aviation in parallel to CORSIA (rather than instead of), with compensation for CORSIA offsetting costs provided to avoid double charging. Nonetheless, the inclusion of international aviation could still face opposition from some stakeholders.
- When it comes to the risk of carbon leakage, carriers would in general have an incentive to offer routings to non-EEA destinations via non-EEA hubs rather than direct flights or flights via EEA

hubs, in the absence of action by the States where those hubs are based, as a means to minimising the distance/emissions covered by the EU ETS. Overall, this would strengthen non-EEA as opposed to EEA-hubs, while the reduction in the offering of direct routes may lead to overall higher emissions. These are both examples of forms of carbon leakage. The need for a possible carbon leakage mitigation mechanism would depend on the degree of this incentive and the risk of carbon leakage associated with the increase in compliance costs from the inclusion of international aviation, considering consumer, airline, and investor responses, including switching of carriers, switching of routes, or shifts in demand⁷⁶. This is an empirical question that would among other things depend on assessing how the additional fuel and other costs incurred from adding a stop-over or changing the stop-over location compares to the saved CO₂ costs, and on fuel and allowance prices, but also the extent to which airlines can pass through the CO₂ costs, and the impacts on ticket prices and profitability.

Recommendations

With respect to aviation, the coverage of international departing flights (rather than both departing and arriving flights) would be in line with what can be considered as the EU's fair share of emissions. Departing international flights could be integrated through two different approaches. One way would be including extra-EEA departing flights together with domestic aviation in a separate emissions trading system in the EU as this would ensure in-sector emissions reduction and dynamic efficiency/innovation, at the expense however of cost efficiency losses with respect to economy-wide emissions reduction. The separate emissions trading system in the EU would become the main decarbonisation driver for the sector, rendering other measures such as SAF blending quotas unwarranted. While this is an attractive approach, given the political realities and the general direction of travel towards an integrated emissions trading system in the EU, a second more viable option, would be to retain aviation in ETS1 and to also include extra-EEA departing flights, but introduce a limit on the quantity of allowances that airlines can use from the stationary sector, as a way of introducing a hard cap on aviation emissions and inducing greater in-sector emissions reduction.

2.3. International maritime transport and smaller vessels

We classify changes to the current 50% coverage under ETS1 of the total distance and emissions from incoming and outgoing international maritime voyages (i.e.: voyages between EEA ports and third country ports) as revolutionary, however this is subject to the specifics and rationale behind such a change.

For example, a move to cover 100% of international maritime transport could be considered as going beyond what may represent the EU's "fair share" of maritime emissions under the Paris Agreement and therefore as revolutionary. Similarly, a move to cover only incoming voyages as an alternative to the current 50/50 scope (where half of the total distance and emissions from a voyage to/from an EEA port from/to a non-EEA port) to reflect the footprint of goods imported in the EU and therefore EU consumption, would entail a change in the rationale behind the current coverage, even though it would likely not significantly impact the share of total emissions covered by the ETS1.

⁷⁶ In this context, it should be noted that the 100% ETS support for SAF is only available on flight routes where there is effective EU ETS carbon pricing, which lessens the incentive for evasion.

Moreover, we classify possible changes to the current threshold on vessel tonnage as evolutionary.

2.3.1. Current status

Following the introduction of a MRV system in 2018, the maritime sector is gradually integrated into the existing ETS1 as of 2024 (full integration as of 2026), covering CO₂ emissions from cargo and passenger ships with a gross tonnage (GT) above 5,000. From 2026 onwards CH₄ and N₂O emissions will also be covered (covered from 2024 by the maritime MRV), and so will offshore ships (i.e.: vessels engaged in offshore activities such as oil and gas exploration or maritime construction) above 5,000 GT from 2027.

There was a corresponding cap adjustment, with the number of emissions allowances in ETS1 accordingly increased by 74.5 million in 2024 (no separate cap for maritime). The 74.5 million allowances were derived from the 2018 and 2019 average CO₂ emissions from EU maritime transport in the MRV (taking into account the reduced geographical scope), for which the 4.3% LRF applicable in ETS1 was applied from those years resulting in 78.4 million allowances which, in order to calculate the value for 2024, was then reduced by the LRF⁷⁷. From 2028 onwards, the LRF will be increased to 4.4%. Further, the quantity of allowances will be increased in 2026 and 2027 respectively (Article 9) to account for the inclusion of GHGs other than CO₂ emissions (methane and nitrous oxide emissions) and offshore ships in the scope of the maritime ETS.

Access to allowances will take place entirely via regular auctions, with the point of regulation at the shipping company level (downstream approach). The use of auction revenues from emissions trading is extended to “*measures to decarbonise the maritime sector, including the improvement of the energy efficiency of ships, ports, innovative technologies and infrastructure, and sustainable alternative fuels, such as hydrogen and ammonia that are produced from renewables, and zero-emission propulsion technologies*”⁷⁸. The Commission also made a formal statement that, from the Innovation Fund which is financed from the ETS1, “*The dedicated topics for maritime in calls for proposal referred to in Article 10a(8) should deploy 20 million allowances up to 2030 in these areas, following the applicable rules thereunder*”⁷⁹.

The geographical scope covered by the maritime sector in ETS1 includes (Article 3ga):

- 100% of emissions in the port (berth) or between ports within a MS and Iceland and Norway,
- 100% of emissions on intra-EEA voyages,
- 50% of emissions on voyages from an EEA port to a third country port,
- 50% of emissions on voyages from a third country port to an EEA port.

In terms of vessel types, the ETS1 currently excludes military vessels and government ships used for non-commercial purposes, ships not propelled by mechanical means, some wooden ships, and fishing vessels. In addition, certain ship types, which often include ships well below 400 GT could also be included (e.g.: under the ETS2). Similarly, the ETS1 does not cover inland waterway transport. Some of these options could be covered in the future, however, we do not consider them in this report.

⁷⁷ See Commission Decision C(2023)4950, https://climate.ec.europa.eu/news-your-voice/news/adoption-commission-decision-union-wide-quantity-allowances-2024-2023-07-28_en

⁷⁸ Article 10(3)(f) of Directive 2003/87/EC

⁷⁹ See SP(2023)260-0, at [https://oeil.secure.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2021/0211A\(COD\)&l=en](https://oeil.secure.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2021/0211A(COD)&l=en)

2.3.2. Timeline

With respect to international voyage coverage expansion under the ETS1, a review is foreseen in case the International Maritime Organization (IMO) decides on a global market-based climate protection measure (Article 3gg(1)). If the IMO does not adopt a global market-based measure by 2028 which is in line with the ambitions of the Paris Agreement, the EU Commission will provide a report which examines the need to extend the geographical scope of emissions trading to more than 50% of incoming and outgoing voyages. Where appropriate, the report will be accompanied by a legislative proposal.

In the international arena, a revised IMO GHG Strategy committing international shipping to a net zero target by or around (i.e.: close to) 2050 was adopted in July 2023 at the 80th meeting of IMO's Marine Environment Protection Committee (MEPC). An impact assessment of GHG reduction measures including marine fuel GHG intensity standards and economic mechanisms such as a GHG levy is currently ongoing and will be submitted to MEPC 82 in autumn 2024⁸⁰. The selected measure(s) are set to be agreed in Spring 2025 (MEPC 83) and enter into force in 2027⁸¹.

With respect to changes to the vessel size threshold, a review by December 2026 by the Commission will examine the feasibility and economic, environmental and social impacts of the inclusion of emissions from ships, including offshore ships, between 400 and 5 000 GT, and their possible inclusion in the EU ETS Directive as of 2027 (offshore and general cargo ships between 400 and 5000 GT will fall under the EU MRV Regulation and will be required to report emissions as of 2025).

2.3.3. Scenario

There are many possible ways to integrate international maritime and smaller vessels in emissions trading in the EU. The following possible scenarios can be envisaged:

Scenario 1: Maintaining 50% scope of international voyages emissions in ETS1 + smaller vessels coverage

- **International voyage scope:** Even in the absence of progress on a global market-based climate protection measure, we consider unlikely that the ETS1 will be expanded to cover 100% of emissions from international voyages, as this would exceed what the EU considers its' fair share of emissions. We consider likely that the current reduced international scope be maintained, such that the current 50/50 scope of distance and emissions from international incoming and outgoing voyages is kept. A variation of this scenario would be to cover only outgoing or only incoming voyages (the latter reflects the footprint of goods imported in the EU and therefore EU consumption and might be more aligned with the logic of the EU CBAM).
- **Which emissions trading system in the EU:** Domestic and part of international maritime transport would continue to be covered under ETS1.
- **Vessel size:** With respect to the inclusion of smaller vessels between 400 and 5 000 GT, we assume that they will be included as of 2031 such that there is a level playing field, but at the same time give sufficient time to smaller vessels to be ready to apply the monitoring, reporting and verification rules (e.g. through the use of digital data collection solutions).

⁸⁰ Wood Mackenzie (2024), IMO 2050: Outlook for global marine fuels, July 2024, <https://www.woodmac.com/news/opinion/full-steam-ahead-the-changing-outlook-for-global-marine-fuels-to-2050/>

⁸¹ idem

Scenario 2: inclusion of maritime into a separate emissions trading system in the EU, maintaining 50% scope of international voyages emissions + smaller vessels coverage

- **International voyage scope:** reduced international scope, where the current 50/50 scope of distance and emissions from international incoming and outgoing voyages is maintained.
- **Which emissions trading system in the EU:** Scenario 2 differs from Scenario 1 in that it encompasses the creation of a separate emissions trading system in the EU for maritime (currently in ETS1), and possibly other sectors e.g.: aviation (currently in ETS1).
- **Vessel size:** smaller vessels between 400 and 5 000 GT are included as of 2031.

2.3.4. Impact on supply/demand balance

Operational measures like voyage optimisation or slow steaming (i.e.: speed reduction), as well as evolutionary design/technical measures such as maintenance of the hull or propeller or improving the engine can be cost effective as they improve vessel energy efficiency and can have a significant impact in GHG emissions reduction, especially in the short term. While wind assistance or battery-electric propulsion can contribute to a small degree and in niches, the switch to sustainable fuels based on renewable or decarbonised electricity (so-called e-fuels) is the biggest lever for reducing emissions from shipping⁸². It is not yet clear which e-fuel(s) will dominate in maritime transport in the future, with both ammonia and methanol being promising candidates.

Based on current state of technological developments, the maritime sector will likely make efficiency improvements incentivized by the carbon price as well as by financial support from the Innovation Fund. The use of renewable and low-carbon fuels also will be supported both through the FuelEU Maritime initiative and the ETS1. However, until the emergence of cost-effective sustainable zero and low-carbon fuels and technologies addressing the needs of the sector, shipping companies are likely to buy allowances, resulting in upward pressure on ETS1 prices.

The Impact Assessment study⁸³ assumed comparatively low allowance prices (EUR 46/tCO₂ in 2030) resulting in moderate emissions reductions within the maritime transport sector, translating in substantial demand for EUAs from other ETS1 sectors. However, given the developments with higher carbon prices, more in-sector emission reduction compared to the Impact Assessment's findings can be anticipated.

If 100% of international maritime emissions were to be covered by the ETS1, this would likely result in an upward pressure on allowance prices.

Notwithstanding, Scenario 1 maintains the current reduced scope of international voyage coverage and entails no changes with respect to the share of emissions from international voyages, with therefore no impact on the supply/demand balance.

Like Scenario 1, Scenario 2 also assumes a reduced scope of international voyage coverage, however, it assumes in addition the creation of a separate emissions trading system in the EU for maritime, which would imply the withdrawal of the maritime sector from the ETS1. Given the relatively high MAC in the sector,

⁸² DNV GL (2019): Maritime Forecast to 2050, Energy Transition Outlook 2019.

⁸³ Trinomics, E3 Modelling, Ricardo (2021). Study on EU ETS for maritime transport and possible alternative options of combinations to reduce greenhouse gas emissions, Final Report, <https://op.europa.eu/o/oportal-service/download-handler?identifier=ba865136-353b-11ec-bd8e-01aa75ed71a1&format=pdf&language=en&productionSystem=cellar&part=>

the withdrawal would likely translate into a lower demand for EUAs in ETS1 and therefore a downward pressure on ETS1 allowance prices.

If smaller vessels are covered, this will increase the potential for cost-effective operational and technical abatement options, at least initially. Similarly, solutions like wind assistance or battery-based electric propulsion that have a higher TRL compared to e-fuels may be more suitable for smaller vessels. Therefore, the inclusion of smaller vessels that both of our scenarios assume has the potential to increase in-sector abatement thus reducing EUA demand and lessening pressure on prices. The magnitude of this effect is limited however by the fact that the current threshold of 5000 GT already covers around 90% of emissions from shipping and lowering it to 400 GT will increase coverage of emissions to 99%⁸⁴.

2.3.5. Impact on market functioning

If 100% of international maritime emissions were to be covered by the ETS1, this would likely have some positive impact on market functioning thanks to increased trade volumes. Notwithstanding, Scenario 1 assumes no changes with respect to the share of emissions from international voyages, with therefore no material impact on ETS1 functioning. Scenario 2, however, which assumes the creation of a separate emissions trading system in the EU, would imply the withdrawal of the maritime sector from the ETS1, with negative impacts on the ETS1 functioning in terms of participation and trade volumes.

The inclusion of smaller vessels (lowering the threshold for vessel coverage from 5000 GT to 400 GT) assumed by both scenarios will increase coverage of emissions from the sector from 90% to 99%, while increasing the share of the number of ships calling into EU ports from 55% to 93%⁸⁵. While this does not necessarily translate into an increase of an equal magnitude in the number of ship owners covered by the emissions trading system obligations, participation and trade volumes are bound to increase to some extent, with a positive overall impact on market functioning. Some owners of smaller vessels might not be considered as highly sophisticated players and therefore the positive impacts stemming from higher market participation on market liquidity, stability and efficiency might only be felt in the medium-term.

Finally, the inclusion of smaller vessels might revive discussions with respect to creating a CO₂ Price Stabilisation Mechanism (PSM) for the maritime sector.

2.3.6. Discussion

The main advantage when considering the extension of the ETS1 to cover 100% of international voyages would be a higher environmental effectiveness.

At the same time, there could be a number of cons when considering the extension of the EU ETS Directive to cover 100% of international voyages:

- The expansion from the current 50% to 100% of emissions from international voyages under ETS1 would likely result in an upward pressure on EUA prices. The relative size of the maritime sector compared to the stationary market and the relatively low-price elasticity of the seaborne transport

⁸⁴ P.34, Trinomics, E3 Modelling, Ricardo (2021). Study on EU ETS for maritime transport and possible alternative options of combinations to reduce greenhouse gas emissions, Final Report, <https://op.europa.eu/o/oportal-service/download-handler?identifier=ba865136-353b-11ec-bd8e-01aa75ed71a1&format=pdf&language=en&productionSystem=cellar&part=>

⁸⁵ p.34, Trinomics, E3 Modelling, Ricardo (2021). Study on EU ETS for maritime transport and possible alternative options of combinations to reduce greenhouse gas emissions, Final Report

demand means that shipping would likely draw on ETS1 allowances from the stationary sectors in the foreseeable future. If 100% of international maritime emissions were to be covered by the ETS1, it would likely exacerbate the demand, putting an upward pressure on ETS1 allowance prices. Moreover, as the switch to sustainable low-carbon fuels, when combined with energy efficiency improvements, is the biggest lever for reducing emissions from shipping and given the higher costs and availability of alternative fuels, other regulatory measures (e.g.: the FuelEU Maritime Initiative) will be key to decarbonise the maritime sector. In contrast, a 100% coverage of international voyage emissions if integrated together with the creation of a separate emissions trading systems in the EU for maritime (and possibly other sectors, e.g.: aviation), would likely result in lower demand for allowances in ETS1, and therefore a downward pressure on EUA prices.

- Even in the absence of progress on a global market-based climate protection measure, we consider unlikely that the EU ETS Directive will be expanded to cover 100% of emissions from international voyages, as this would exceed what could be considered as the EU's fair share of emissions. An alternative to the current 50/50 scope (where half of the total distance an emissions) from a voyage to/from an EEA port from/to a non-EEA port) is to cover only incoming or only outgoing voyages. It could be argued that covering incoming voyages reflects the goods imported in the EU and therefore EU consumption and the environmental footprint.

There are number of pros with respect to a possible inclusion of smaller vessels under the EU ETS Directive:

- The inclusion of smaller vessels has the potential to increase in-sector abatement thus reducing EUA demand in ETS1 and depending on the LRF/level of adjustment of the cap, lessening pressure on prices, at least initially until low-cost abatement options are deployed. The magnitude of this effect is limited by the fact that the lowering of the threshold for vessel coverage from 5000 GT to 400 GT will merely increase coverage of emissions from the sector from 90% to 99%.
- A more stringent threshold of 400 GT is aligned with thresholds used in IMO conventions such as MARPOL and the International Convention on the Control of Harmful Anti-fouling Systems on Ships, would demonstrate greater ambition with respect to GHG emission reduction, and would contribute to a level playing field among actors.

There are also potential cons with respect to covering smaller vessels:

- The inclusion of smaller vessels above 400 GT could potentially place a high administrative burden on small ship operators⁸⁶, as it will increase the share of the number of ships calling into EU ports from 55% to 93%, leading to higher administrative costs for both the industry and public authorities in charge of monitoring and enforcement⁸⁷. The increase in administrative burden would reflect what is a complex maritime value chain, involving many and diverse stakeholders, i.e.: from ship manager/owner to operator/pool company, to the recharter, and the cargo owner.
- Based on the experience with the maritime MRV, there are difficulties posed by non-harmonised data: there are cases where 1 vessel uses several (e.g.: 5) different noon reporting systems (daily collection and communication of vital information about a vessel's status, voyage, and performance), because the involved stakeholders do not trust 1 system. Different reporting systems use different methods to consolidate data, and this results in inconsistencies, which in turn lead to (legal) disputes. There are some good examples of digitalized and not manual handling of datasets.

⁸⁶ Small ship operators are not necessarily small but could be large companies operating small ships.

⁸⁷ p.34, Trinomics, E3 Modelling, Ricardo (2021). Study on EU ETS for maritime transport and possible alternative options of combinations to reduce greenhouse gas emissions, Final Report

Overall, there is a need for consistent/harmonised and verified data that enables data sharing along the maritime value chain. There is a need for digitalized and non-manual handling of datasets, especially as the amount of data handling will grow with more voyages, more vessels and more gases covered.

Recommendations

ERCST recommends maintaining the current 50% scope with respect to international maritime voyage emissions even in the absence of progress on a global market-based climate protection measure, as the reduced scope is in line with what can be considered as the EU's fair share of emissions. With respect to smaller vessels, we recommend their inclusion after a transitional period (i.e.: from the next phase of the emissions trading system in the EU), giving relevant stakeholders in the value chain the necessary time for developing and streamlining data collection solutions and for scaling them to a fleet of smaller vessels. Moreover, the possible inclusion of the maritime sector (including domestic and part of emissions from international voyages) in a separate emissions trading system in the EU, possibly together with aviation, warrants more assessment.

2.4. Smaller energy and industry installations

The inclusion of smaller energy and industrial installations must be seen as evolutionary. The size of the sector in terms of GHGs emissions is not significant in comparison with emissions from current ETS1 sectors. In addition, their inclusion in emission trading system in the EU is an expansion of sectors currently covered by carbon pricing.

2.4.1. Current status

When looking at expanding emissions trading in the EU to small combustion installations, it is important to differentiate between two groups.

On the one hand, Art 30(5b) EU ETS Directive mandates the Commission to undertake a revision or review of the feasibility of lowering the 20 MW total rated thermal input threshold from 2031, for the activities included in Annex I. This may directly impact the following ETS1 activities, for which installations with a rated thermal input below or equal to 20 MW are explicitly excluded from Annex I: combustion of fuels (EU ETL code 20), refining of oil (21), production or processing of ferrous (25), and non-ferrous metals (28), and production of secondary aluminium (27).

On the other hand, the ETS2 scope also includes ‘‘additional sectors’’, that include a list of activities under Energy Industries (source category code 1A1) and Manufacturing Industries and Construction (source category code 1A2).

Those two categories should be kept separate: activities that are not yet under the EU ETS Directive because they are excluded from Annex I (ETS1) (1); and activities that are already under the EU ETS Directive and will be covered by the scope of the ETS2 (2).

1. Existing exemptions under ETS1 for small installation or small installations subject to equivalent measures.

Until now, small installations in the ETS1 were regulated under Art 27 of the EU ETS Directive, which addressed the exclusion of small installations subject to equivalent measures. Art 27 defines two types of small ETS1 installations:

- i. Installations which carry out combustion activities, and have a rated thermal input below 35 MW, excluding emissions from biomass.
- ii. Installations which have reported to the competent authority emissions of less than 25,000 tonnes of carbon dioxide equivalent per year and,

Through the extension of Art 27, Art 27a allows Member States to exclude two additional types of small installations:

- iii. Installations emitting less than 2,500 tonnes of CO₂ equivalent in each of the three years preceding the notification of the exclusion to the European Commission.
- iv. Reserve or back-up units that do not operate more than 300 hours per year.

Based on Art 27 and Art 27a, Member States can, on a voluntary basis, decide to exclude installations within their territory where certain conditions related to notification period, simplified MRVA and equivalent emission reduction measures, and publication, are fulfilled. In 2013, only seven Member States made use of the opt-out of small installations, excluding around 4,500 installations, which amount to about 0.3 %⁸⁸ of the total verified emissions in the ETS1. In 2022, 15 countries opted to exclude installations from the ETS1, accounting for a total of 4.2 MtCO₂eq. This represented 0.32% of emissions from installations included in the ETS1.⁸⁹

The legislator included Articles 27 and 27a in the EU ETS Directive to address potential drawbacks of including small installations in ETS1, such as the transaction costs of MRV, considered too high for small installations compared to larger emitters. Small emitters may, in many cases, be owned by SMEs or micro enterprises⁹⁰. By introducing the option to opt out these small installations, the articles aimed to improve the cost-effectiveness of the system.⁹¹

2. “Additional sectors”: activities under Energy Industries (source category code 1A1) and Manufacturing Industries and Construction (1A2) – ETS2 (including installations or units excluded under Art. 27a EU ETS Directive, excluding other ETS1 installations).

Annex III of the EU ETS Directive explicitly states that ETS2 activities should not include *(a), the release for consumption of fuels used in the activities listed in Annex I, except (...) if used for combustion in installations excluded under Article 27a*. Therefore, in addition to fuel suppliers or road transport and heating of buildings, ETS2 is expected to apply to the release for consumption of fuels used for those small energy and industrial combustion installations covered by Article 27a of the EU ETS Directive: below 2,500 tonnes of CO₂, and back units which operate 300 or less hours per year.

⁸⁸ [European Commission \(2015\)](#). Evaluation of the EU ETS Directive. Pp. 242. November.

⁸⁹ COM(2023) 654 final. Pp.6.

⁹⁰ COM(2021) 551 final. Pp.16.

⁹¹ COM(2021) 551 final. Footnote 94. Pp 58.

Installations or units excluded under Art. 27a, are considered part of the fuel supply side, meaning the supply of energy product referred in Article 2(1) of Directive 2003/96/EC, as well as any other product intended for use, offered for sale or used as motor fuel or heating fuel, including for the production of electricity, and therefore to be included under the scope of ETS2. Other ETS1 installations under Annex I are to be excluded from the scope of ETS2⁹². The owner of the industrial installation will still need to report the fuel (to avoid double counting with ETS1), while the fuel supplier (the ETS2 regulated entity) will have to pay for the CO₂.

This categorisation fits the basic principle for the coverage of regulated entities under ETS2: upstream system, regulating the fuel suppliers (i.e.: entities putting the fuels onto the market) and not the end consumers. The triggering of a compliance obligation is the releasing on the market of fuels for combustion in the sectors concerned.

Table 2.2: ETS2 regulated entities (Energy and industry sectors) coverage comparison.

	Fuels used for combustion in activities which are covered by ETS1	Fuels used for combustion in activities which are not yet covered by ETS1
Including	CRF 1A1: Small scale energy industries: • Production of electricity and heat plants • Combined heat and power generation. • Petroleum refining. • Coke ovens iron and steel industry. • Manufacture of solid fuels and other energy intensive industries. CRF 1A2: Small manufacturing industries and construction • Emissions from fuels combustion in industry (iron & steel, cement, chemicals, etc.), including own use.	
	Including installations excluded from ETS1 pursuant Art 27: • Below 25,000 tonnes (CO₂eq. year). • Below rated thermal input of 35 MW.	Including installations excluded from ETS1 pursuant Art 27a. • Below 2,500 tonnes (CO₂eq. year). • Back units which operate 300 or less than hours per year. • Below rated thermal input of 20 MW (as from 2031 is positive review).
Excluding	• Large end consumers, already covered by ETS1 (combustion units > 20 MW). • Large industrial installations already covered by ETS1 (Annex I). • Fuels used for non-energetic purposes for process input (e.g.: natural gas for ammonia, reducing agent for iron and steel). • Release for consumption of fuels for which the emission factor is zero.	

Source: Own elaboration based on European Commission (2024). MRR Guidance document for ETS2.

⁹² [European Commission \(2023\)](#). EU ETS Compliance Forum Training Event on new developments in the EU ETS from 2024. Slide 44. October 17th.

For the ETS2, estimates expect up to 11,400 fuel suppliers, distributors, and resellers to be regulated (regulated entities)⁹³. However, the exact number of entities that will be included under ETS2 (including small energy and industrial installations) is still uncertain. Companies should be registered in 2024; therefore, authorities should be able to produce a list by the end of 2024⁹⁴.

2.4.2. Timeline

Before January 1, 2025, ETS2 regulated entities should have GHGs emission permits approved by the National Competent Authority and start monitoring their GHGs emissions. By April 30, 2025, Regulated entities must submit a report on 2024 historical emissions. No verification required at this stage. In 2026, a first verified report will be based on 2025 emissions.

By July 2026 the European Commission has the mandate to come with a revision on inclusion installations below 20MW total rated thermal input threshold (Annex I) (Art 30(5b)) EU ETS Directive.

January 1, 2027, is the earliest date when the legislation ETS2 could kick in, with the auctioning of ETS2 EUAs and beginning of the trading phase. May 31, 2028, will be the first surrendering deadline for ETS2 regulated entities, including small installations covered. From 2031, if positive assessment in 2026, ETS2 will be completed with the inclusion of installations below 20MW total rated thermal threshold (Annex I).

2.4.3. Scenario

As part of the ETS2, additional sectors exposure to carbon pricing will follow the same timeline as buildings and road transport. The separate system will start in 2027 with the possibility to be delayed until 2028 in the event of exceptionally high energy prices (Article 30k of EU ETS Directive)⁹⁵.

Therefore until at least 2031, small industry and combustion installations covered by ETS2 should remain covered by ETS2. The question is, under which scenario will they participate after 2031? By October 31, 2031, the Commission shall assess the feasibility of integrating the sectors covered by Annex III into the EU ETS Directive, into the ETS1 covering the sectors listed in Annex I (Art 30i). The expansion of ETS below the 20 MW total rated thermal input thresholds for the activities in Annex I (Article 30 (5b)) in 2031, will occur if there is a positive assessment by July 31, 2026. Taking these factors into account, four potential scenarios could be foreseen:

Scenario 1: ETS2 is merged with ETS1 in 2031, following a positive European Commission assessment. In addition, the regulator decides to lower the 20 MW total rated thermal input threshold.

As part of ETS2, small industry and energy combustion installations will join *the facto* the ETS1. Annex I covering current ETS1 will have to be amended so small installations currently excluded due to low production capacity (tonnes per day) will be included in a single emission trading system in the EU. Same activities will be covered in the same ETS1. Articles 27 and 27a will have to be revised. In addition, small installations currently excluded due to the 20 MW total rated thermal input threshold will be included in ETS1, with the same activities already participating in ETS1.

⁹³ Göß, S., Schuldt, H. (2024) The EU ETS 2: Pricing emissions in buildings and road transport. Illuminen. July 30th

⁹⁴ Carbon Pulse (2024). Comment: A Q&A on EU ETS 2. April 16th. <https://carbon-pulse.com/278185/>

⁹⁵ In addition, until 31 December 2030, where a regulated entity in a given Member State is subject to a national carbon tax for the years 2027 to 2030, the Member State concerned may exempt that regulated entity under certain conditions (Article 30e (3) EU ETS Directive).

Scenario 2: ETS2 is merged with ETS1 in 2031, following a positive European Commission assessment. However, authorities decide in 2026 against lowering the 20 MW total rated thermal input threshold in 2031.

This scenario will require amendments to Annex I to include small installations currently excluded from ETS1 based on low production capacity. The exclusion for small combustion installations due to the 20 MW total rated thermal input threshold will remain.

Scenario 3: ETS2 is not merged with ETS1, following a negative European Commission assessment in 2031. In addition, as in Scenario 2, the regulator decides against lowering the 20 MW total rated thermal input threshold in 2031.

This scenario means keeping the current status quo, with no amendments to current legislation.

Scenario 4: ETS2 is not merged with ETS1 after 2031. Instead, the regulator presents a legislative proposal in 2026 to lower the 20 MW total rated thermal input threshold in 2031.

Amendments should be made to Annex III, regulating all activities covered by Chapter IV of the EU ETS Directive (buildings, road transport and additional sectors). All small combustion installations included in ETS2 as from 2027 and all installations with a lower and equal 20 MW total rated thermal input threshold, that will be covered by ETS2.

2.4.4. Impact on supply/demand balance

Supply:

EUAs will be issued in ETS2 in 2027 with full auctioning (no free allocation). The cap is set with a 5.10% LRF, using the 2024 emission level. In 2028 the LRF will be increased to 5.38% based on 2024, 2025 and 2026 data. The same will apply to small installations covered by ETS2. For the full ETS2, Art 30d of the EU ETS Directive states that an additional 30% amount should be auctioned during the first year of ETS2 auctioning, frontloaded from 2029-2031 volumes until May 2028. The total supply of EUAs should be 1,3 billion EUAs in 2027, 1,1 billion in 2028 and 830 billion in 2029⁹⁶.

Demand:

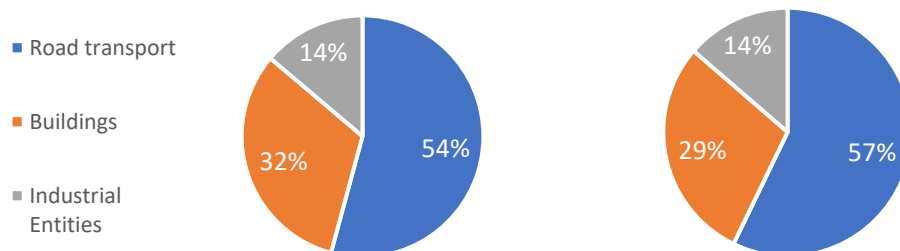
Vertis Environmental forecast model is so far the most complete and up to date, with the analysis of potential small combustion installations to be covered by ETS2. Some of the data is publicly available⁹⁷, which allows to better understand the potential demand behavior of additional sectors not covered by the ETS1. According to the results of the analysis, small entities to be covered by ETS2 represented around 14% of overall ETS2 GHGs in 2022 (road transport 54%, buildings 32%). A similar share will also be present in 2030 (figure 2.2.), one year before the European Commission assessment of a potential integration of ETS2 in ETS1 by 2031 (Article 30i of EU ETS Directive).

Small industrial entities covered by ETS2 would emit around 182 MtCO₂eq in 2022, and 141 MtCO₂eq in 2030. The Vertis' model foresees a demand deficit (cap – emissions) for the whole ETS2 close to 200 million EUAs by 2030.

⁹⁶ Feuchtinger, S., Sheytanov, P., (2023). EU ETS 2 will likely be bigger and tighter market than current EU ETS. Balkan Green Energy News.

⁹⁷ Feuchtinger, S., Sheytanov, P., (2023).

Figure 2.5. Estimated ETS2 shares, per sector, in 2022 (right) and 2030 (left), EEA covered, Emissions – MtCO₂eq.



Source: Own elaboration based on data from Vertis Environmental Forecast.

How much of this deficit is due to the future demand of EUAs by small plants to cover their cap is unknown. If we assume that from the total ETS2 deficit, 14% is due to the remaining GHGs share of industrial small entities in ETS2, we can anticipate a deficit of EUAs close to 28 million EUAs by 2030. This amount of GHGs looks small to trigger substantial impact on the demand/supply of EUA certificates in the ETS if small installations join ETS.

- Marginal Abatement Cost (MAC).

Following the analysis in previous sectors, another way to measure the potential impact on demand of extending carbon pricing small industrial and energy installations in ETS2 is through the MAC. However, we have not found studies with cost of abatement for these small installations that we can use as a reference. This could be because monitoring for ETS2 is not completed, and that still there is not a clear picture of the small energy and combustion installation that will join ETS2.

- Size of the sector:

In terms of size, GHGs emissions from small energy and industrial plants represented around 0.32 % of all ETS1 GHGs in 2022. If emissions from small emitters in ETS2 were integrated into the existing EU ETS we should not anticipate a substantial impact in terms of supply demand/balance. If ETS1 and ETS2 were merged, the biggest impact from ETS2 should be expected to be driven by the GHGs of road transport and buildings, counting 86% of GHGs in ETS2, rather than by small combustion and industrial installations.

2.4.5. Impact on market functioning

In general terms, the sectoral expansion of ETS2 to smaller installations should be a positive factor for market functioning indicators, as was the case for municipal waste and landfills. Typically, the inclusion of small combustion and industrial installations not covered by ETS1, in ETS2, should bring additional participants into the market, including participation in the auctions. The installations are unlikely to increase trading activity in the carbon market substantially⁹⁸. That is even more true if a part of ETS2, small combustion and industrial installations were merged with ETS1 after 2031. Their comparative size will be even smaller in a bigger merged market ETS1+ ETS2.

Some of the issues that we need to examine include:

⁹⁸ [E.ON \(2007\)](#). Towards an Increased Harmonization of European Emissions Trading. June. Pp.5.

- To what extent small energy and industrial installations are experienced in trading and commodity risk management? How long-term in the future, these installations will sign their contracts? Will they hedge?

As small industrial and energy players in many cases belong to sectors already in ETS1, we can expect some carbon trading experience from covered installations and their owners. This is significantly different from municipal waste incinerators, which have not been so far involved in carbon markets. However, when looking at the impact on market functioning, it is important to consider the size of the company to which the small installation belongs to. Here we could anticipate two possible scenarios:

- Small energy and industry combustion installations owned by large companies. Evidence would indicate that large (especially energy) companies have a more active participation in commodity markets. This also in their ability to manage compliance across their carbon market covered portfolio of companies. As energy suppliers, companies can also have experience with trading non-carbon markets⁹⁹. Same can apply to large industrial companies.
- Small energy and industry combustion installations owned by SMEs. For small and medium-sized enterprises with lower than 250 employees, operating in the carbon market could be more challenging. Instead of auctioning, they tend to rely on financial intermediaries or directly buy allowances from other ETS installations¹⁰⁰ through bilateral agreements. Companies will buy allowances; thus, they can have low or zero experience in trading.

Extending the carbon pricing market to small combustion installations could be specially challenging for the ceramic sector since 80% of the emitters in this sector belong to small emitting installations¹⁰¹, and ceramic manufactures are mainly represented by SMEs¹⁰².

- Amount of compliance entities and whether an upstream/downstream approach is taken. What is the role of intermediaries?

Small combustion installations which are SMEs could face relatively higher costs per unit when buying EUA than large companies. Since a large share of these transaction costs is not proportional to company size, transaction costs are particularly burdensome to SMEs¹⁰³. With low expertise in trading, SMEs will rely more on intermediaries (banks or specialist traders) or using the services of a brokers, rather than participating directly in auctioning. Typically, the benefits of continuous participation on the carbon market only outweigh the costs for the biggest emitters, such as large utilities and industrial facilities¹⁰⁴.

2.4.6. Discussion

There are potential cons that should be considered when assessing the extension of emission trading system in the EU to small combustion installations.

1. Administrative burden:

⁹⁹ Europe Economics (2023) Participation in the EU ETS markets. A report for DG CLIMA. January. Pp 13.

¹⁰⁰ Europe Economics (2023). Pp 14.

¹⁰¹ Cerame- Unie (2021). Ceramic industry position the EU ETS review. November 8th. Pp 1.

¹⁰² [European Commission \(n.d.\)](#). Ceramics. Internal Market, Industry, Entrepreneurship and SMEs.

¹⁰³ Regina, B., et al (2004) EU ETS and transaction cost for SMEs. Pp. 121.

¹⁰⁴ Umwelt Bundesamt (2023) Emission Trading and Regulation of Financial Markets. Pp. 34.

Small combustion installations which are owned by SMEs can have low administrative and financial capacity to support the additional administrative burden created by carbon pricing. The EU ETS regulation should be set up in a way that it is feasible to fulfil compliance requirements. Barriers to participate in auction could be related to high fixed cost of participation to access the carbon market compared to the number of allowances needed to surrender, which is low.

2. Small installations and small incentives to participate in auctioning:

To address the potential transaction cost experienced by small installations; the regulator should explore incentives for small installations to participate in auctions. If owned by large companies already participating in ETS1, this situation could differ.

3. Lack of safeguard mechanism to ensure carbon leakage protection for small installations participating in ETS2:

The revision of the EU ETS Directive makes clear that buildings and road transport sectors are under little competitive pressure from outside the Union. They are not exposed to a risk of carbon leakage, and therefore will not receive free allocation¹⁰⁵. However, small combustion installations covered by ETS2 will belong to activities included in the carbon leakage list. As such, as it is the case for current industrial installations, they should be entitled to receive free allocation also. The inclusion of small installations in ETS2 can create situations in which same activities/sectors will be exposed to different prices (ETS1 and/or ETS2) and will receive free allocation if the large installation is part of the current ETS1, but not if the small installation is covered by ETS2. This is true even when reporting under the same activity.

For small industrial installations falling under ETS2, there will be the need to think about a reimbursement mechanism to guarantee a level playing field in the same sector of activity, in case they do not receive carbon leakage protection. These installations will fall under ETS2, where no carbon leakage provisions are in place, but being part of the industrial sector covered by ETS1. A European scheme of incentives, rather than a national one, looks a more logical approach to tackle this issue and avoid discrimination between different Member States also.

4. Risk of double reporting and/or double cost

Where the end consumers are ETS1 operators, such cost pass-through would constitute double counting or a double burden on them as they would have to bear both the ETS1 and ETS2 costs. This should be avoided¹⁰⁶. An ETS2 must ensure that no EU installation have a double CO₂ burden, meaning no double CO₂ costs.

There are potential pros that should be considered when assessing the extension of carbon pricing to small combustion installations.

1. MRVA: Small ETS2 companies will be allowed to use a simplified MRV system for 3 years before compliance in 2027.

¹⁰⁵ Directive (EU) 2023/959. Recital 81.

¹⁰⁶ European Commission (2024). MRR Guidance document for ETS2. March 26th. Pp. 39.

2. Higher coverage of GHGs emissions: Even if small energy and industry installations represent a relative amount of GHGs emissions, their inclusion could avoid GHGs loopholes across the value chain. It will contribute also to ensure that more energy and industrial activities are covered by emission trading system in the EU.
3. Risk of double reporting and/or double cost. Art 30j of the EU ETS Directive, procedures for unilateral extension of the activity referred to in Annex III, states that the Commission may supplement the extension with further rules governing measures to address possible instances of double counting, including for the issue of additional allowances to compensate for allowances surrendered for use of fuels in activities listed in Annex I. Art 30d (6) Member States can provide financial compensation to the final consumers of fuels in cases where it has not been possible to avoid double counting of emissions or where allowances have been surrendered for emissions not covered by ETS2.

Recommendations

ERCST sees the inclusion of smaller installations in ETS2, and of installations below 20 MW total rated thermal input threshold as a likely scenario. However, the integration of the first group of installations in this category under ETS2 will depend on the success of the full implementation of ETS2. This is true since ETS2 is a new system yet to be tested, one whose creation was hotly contested. Another element that will need to be considered is the evolution of energy prices, which could delay the start of ETS2 in 2028.

2 years before, in 2026, the Commission will have already made an assessment to decide if, in addition to small installations of categories 1A1 and 1A2 already included in ETS2 in 2027, installations below 20 MW total rated thermal input will also be covered by carbon pricing starting in 2031. The year 2031 is not randomly chosen as it is also the date the policymaker will assess if ETS1 and ETS2 are to be merged in a single EU ETS.

As not substantial impact on the carbon market functioning is expected, the assessment of small installations on EU ETS should be looked at considering the potential administrative and transaction burden for small companies. Small installations could require financial schemes in place and similar carbon leakage provisions to small installations covered by ETS1, to allow them to compete fairly in the carbon market.

2.5. Agriculture

While on the face of it, agriculture can be seen just as another sector, it can and should be considered as revolutionary, for several reasons. Agriculture is a bigger sized sector in comparison with other sectors for which expansion have been presented before. Agriculture has a bigger number of players, with important volumes of non-CO₂ GHG emissions for which there is no experience in carbon pricing so far.

Agriculture is a strategic sector for the EU economy, with multiple interactions across the value chain and with a direct impact on final consumers. This makes the discussion of ETSAg politically sensitive and subject to strong public opinion. The expansion of emission trading to agriculture in the EU, and potentially also to CBAM, present itself great challenges. Whether ETSAg is a structural change, it may depend on the ambition and the design and architecture of such a system: new ETSAg (ETS3) or extension of the current ETS1.

The adoption of carbon pricing in agriculture could impact current EU agriculture related policies such as the CAP or the Land Use, Land-use Change and Forestry (LULUCF), and Effort Sharing Regulation (ESR), which is set to expire and may not be renewed.

2.5.1. Current status

Non-CO₂ emissions from land-use practices in the agricultural sector are regulated under the ESR, while CO₂ emissions or removals related to agricultural lands are reported under the LULUCF land category. Both policies govern agriculture emissions up to 2030. The post-2030 policy framework is still in the works, kicked off by the Commission's publication of its Communication for a 2040 target.

In the EU, Agriculture was responsible for 10.82 % of EU's ESR emissions in 2022¹⁰⁷, and the sector's absolute emissions have not significantly decreased since 2010. Carbon intensity decreased on average 6% in 25 EU Member States (2000-2018), explained by the fact that emissions drops were offset by a general increase in production and efficiency gains¹⁰⁸. In addition to road transport and buildings, agriculture is one of the three sectors for which the European Commission has publicly prioritised the need to reduce emissions. The European Commission draft communication on the 2040 EU climate target indicated that with the right policies and support, there is a potential to reduce non-CO₂ GHG emissions in the agriculture sector by at least 30% in 2040 compared to 2015¹⁰⁹, without reducing any output.

GHGs emissions in agriculture can be attributed to three main types of activities:

- Farm production activities (crop and livestock),
- Land use change (such as deforestation and peatland drainage); and
- Pre-/post-production processes (retail, consumption, and disposal).¹¹⁰

The discussion regarding CO₂ emissions from agricultural products cannot be isolated from non-CO₂ GHGs. 50% of agricultural GHGs come from livestock, mainly CH₄, 36% GHGs comes from nutrients in soils, mainly N₂O used in applications of chemical fertilisers, including emissions from manure application¹¹¹, and 14% GHGs from land use change, mainly CO₂ from peatlands and carbon sequestration on cropland and grassland.¹¹² The agricultural sector is also fragmented in a large number of installations,

¹⁰⁷ [EEA greenhouse gases — data viewer \(2024\)](#). Data viewer on greenhouse gas emissions and removals, sent by countries to UNFCCC and the EU Greenhouse Gas Monitoring Mechanism (EU Member States). Accessed on August 2nd, 2024.

¹⁰⁸ [Jensen, L., Scalamandrè, C., \(2023\)](#). EPRS: EU-27 Emission intensity evolution. February 7th.

¹⁰⁹ [Di Mambro, A. \(2024\)](#) Agriculture 'core area' for EU's 2040 climate targets – Commission report. Euractive. January 29.

¹¹⁰ [Jensen, L., Scalamandrè, C. \(2023\)](#) Climate Impact of the EU agrifood system. European Parliament. February.

¹¹¹ [Petersen, S. O., et al. \(2023\)](#). Higher N₂O emissions from organic compared to synthetic N fertilizers on sandy soils in a cool temperate climate. *Agriculture, Ecosystems and Environment* 358 (2023) 108718. Pp. 3. May 18th.

¹¹² [ECA \(2021\) Common Agricultural Policy and climate](#). Half of EU climate spending but farm emissions are not decreasing. Special Report 16/2021. Figure 2 – Key sources of greenhouse gas emissions (in CO₂eq). Pp.7. Accessed on August 2nd, 2024.

with over 9 million farms in the EU. Most of the EU's farms are small in nature¹¹³, a 75% below ten hectares¹¹⁴.

In 2021 the European Court of Auditors (ECA) tasked the European Commission to come with a study to analyse the feasibility of extending emission trading to agriculture after 2030¹¹⁵. The results of the study were published in 2023¹¹⁶ and are expected to inform the role of agriculture in the 2040 policy debate.

The study considers different options for a separate ETSAg:

1) Farm level: Where the point of obligation or ownership falls on farm operators. Farmers will be required to pay for the GHGs they emit. The study presents different sub-options depending on the source of GHG covered (all GHGs, livestock and mixed farms, peatlands used for agricultural production).

2) Upstream: Where the point of obligation or ownership falls on fertiliser producers and importers. Upstream ETS policy option could cover up to about 57% of GHG emissions from the agriculture sector (approximately 220 MtCO₂eq.) with approx. 5300 manufacturing companies.

3) Downstream: Where the point of obligation or ownership falls on meat and dairy processors. In this case food processors will have the obligation to buy allowances to cover agricultural emissions. Food processors could reduce obligations buying carbon removals or emission reduction credits from farmers. Downstream ETS could cover up to 82-91% emissions linked to meat and dairy processors, including 1600 participants is de minimis threshold in place¹¹⁷.

DG CLIMA has commissioned a follow-up study on “Incentivising climate action for a sustainable and competitive agri-food value chain”. The European Commission announced the study at a workshop in July 2024, which is expected to be delivered on July 2025¹¹⁸. The study will look into design options for agri-food climate solutions in GHGs reductions (including CH₄) and carbon removals, including carbon leakage, scope of emissions, thresholds, EU interlinkages, MRV and transaction and compliance costs.

Current EU Policies addressing emission in the agricultural sector include:

The Common Agricultural Policy (CAP)

The CAP is one important, if not the main legislative file regulating agriculture in the EU. Its general objective is to supply affordable food to EU citizens and guarantee a fair standard of living for farmers, while preserving the environment and its natural resources¹¹⁹.

The CAP was lately revised in 2021 and will channel 40% of its budget towards climate neutrality¹²⁰. Whilst representing 30.9 %¹²¹ of current Multiannual Financial Framework expenditure, the nature of the

¹¹³ Almost two-thirds of the EU's farms were less than 5 hectares (ha) in size in 2020. [Source: Eurostat \(2022\)](#) Farms and farmland in the European Union – statistics.

¹¹⁴ Trinomics (2023) Pricing agricultural emissions and rewarding climate action in the agri-food value chain. Pp. 36.

¹¹⁵ [European Court of Auditors. \(2021\)](#). Special Report 16/2021: Common Agricultural Policy and climate. Half of EU climate spending but farm emissions are not decreasing.

¹¹⁶ [Bognar, J., et al. \(2023\)](#). Pricing agricultural emissions and rewarding climate action in the Agri-food value chain. Trinomics. Client: DG CLIMA.

¹¹⁷ Trinomics (2023). Pp 116.

¹¹⁸ [DG CLIMA \(2024\)](#). Incentivising climate action for a sustainable and competitive agri-food value chain. Conferences and submits. Agenda. Wednesday 19 June 2024, 10:00 - 16:30 (CEST).

¹¹⁹ [Jensen, L., Scalamandrè, C. \(2023\)](#)

¹²⁰ A similar principle is followed for the expenditures of the Multiannual Financial Framework, where at least 30% of the budget should be used to achieve climate relevant objectives.

¹²¹ Draghi, M (2024) The future of European competitiveness Part A | A competitiveness strategy for Europe, page 60, and Part B “In depth analysis and recommendations” page 289.

CAP and the size of the EU budget (just over 1% of EU gross domestic product) means that CAP expenditure represents some 0.4% of EU gross domestic product. Therefore, a serious reduction of GHGs emissions in the agricultural sector is unlikely under current policies. The recent strikes by farmers had a negative impact on the political will for strong climate change in this sector.¹²²

Effort Sharing Regulation (ESR)

ESR covers all non- emission trading system emissions, except LULUCF. Around half of the non-CO₂ emissions in the EU come from the agriculture sector. Non-CO₂ emissions from agriculture sector under ESR accounted for around 400 MtCO₂eq in 2023, representing around 18% of ESR emissions¹²³, and only a modest EU-level decline of 4%-8%¹²⁴ of agricultural emissions in ESR is expected by 2030 compared with 2005 levels

Land Use, Land-use Change and Forestry (LULUCF)

The goal of the LULUCF regulation is to ensure the accounting of LULUCF emission and removals in the EU, and to increase the land sector's capacity to act as a "carbon sink," with the EU MS collectively aiming to remove 310 MtCO₂eq by 2030. The LULUCF sectors work both, as emitter and as absorber of GHGs. Under this regulation, the agricultural sector acts as a positive source of carbon, with emissions of 69 MtCO₂eq reported and 230 MtCO₂eq removed in 2021. For the same year, LULUCF accounted for 7% of EU GHGs emissions¹²⁵. Soil carbon is considered the main blind spot of GHG reporting.¹²⁶

Industrial Emission Directive (IED)

EU regulates emissions of large pigs and poultry farms through the IED. Installations are required to have a permit, including emission limits for air pollutants. The revised IED entered into force in 2024, among others, widening obligations for farmers. After the revised IED, large pig and poultry farmers will have to comply from 2030 with rules for clean air and water within their installations¹²⁷.

EU methane strategy

In 2020, the EC put forward a strategy to reduce CH₄ emissions in the energy, agricultural, waste and wastewater sectors. According to the strategy¹²⁸, in the EU, agriculture is the second sector with the highest potential in overall benefits for reducing methane emissions.

Agriculture, Forestry and Other Land Use (AFOLU)

Given that emissions from the agriculture sector are reported in two separate regulations (ESR and LULUCF), in 2021 the EU agreed to expand LULUCF to non-CO₂ emissions from agricultural sector, starting from 2031¹²⁹, pending a positive assessment in 2024 (6 months after the Global Stocktake). This sector, dubbed as AFOLU, combines the emissions of the land sector with emissions of agriculture. In

¹²² ECNO (2024) Flagship Report: State of EU progress to climate neutrality. An indicator-based assessment across 13 building blocks for a climate neutral future. July. Pp 74. Accessed on August 2nd, 2024

¹²³ [EEA \(2023\)](#) Climate and Energy in the EU. Climate change mitigation. Effort Sharing Emissions. Data.

¹²⁴ [EEA \(2023\)](#) Greenhouse gas emissions from agriculture in Europe. October 24th.

¹²⁵ Carbon Gap (2022) LULUCF Regulation: <https://tracker.carbongap.org/policy/lulucf-regulation/>

¹²⁶ Bellassen, V., Angers, D., Kowalczewski, T. and Olesen, A., 2022. Soil carbon, the blind spot of European national greenhouse gas inventories. *Nature Climate Change*, 12(4), pp.324-331. doi:10.1038/s41558-022-01321-9.

¹²⁷ [Sanchez Manzanaro, S. \(2024\)](#) EU to adopt new livestock farming emissions rules after Parliament backs compromise. Euractive. March 12th.

¹²⁸ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on an EU Strategy to reduce methane emissions. [COM/2020/663 final](#). Pp3.

¹²⁹ [Jensen, L. \(2023\)](#) Revision of the LULUCF Regulation. Strengthening the role of the land use, land-use change and forestry sector in climate action. BRIEFING. EU Legislation in Progress. European Parliament. May.

addition to national binding land sector targets, it proposed the establishment of an emission trading system in the EU unique to the land sector, complete with a fund to purchase certified land-based credits and agriculture emission reduction targets, the AFOLU sector has being brought up once again in discussions surrounding the post-2030 climate change policy framework.

Other measures:

National MS measures are also in place to support the reduction of fertilisers manure use on cropland, improved livestock management, cropland management, improved animal waste management, grassland management and management of organic soils, among others ¹³⁰.

A key question is how an ETSAg would be articulated with the EU related agriculture policies. Should agriculture GHGs emissions be regulated via market-based instrument or command and control (setting permit requirements or standards) or a mix? Some options that deserve discussion:

- Not looking at the CAP in isolation. Instead, a revamp of the CAP should be looked at considering the potential interlinkages with ETS and the fact that an ETSAg could not stand alone to be successful. Its success could need to be combined with CAP measures, including a departure from the efficiency-focused mindset that encourages overproduction, move away from area-based payments, ensure farmer prosperity, enhance soil health, improve water quality, promote animal welfare, etc.
- Expanding IED to livestock and lowering the threshold for sheep and pigs.
- Sustainable food systems regulation that focuses on plant-based protein and reduction in meat consumption.

2.5.2. Timeline

The timeline is currently uncertain and is seen as on the table for the next Commission since there is currently no legal compromise. But 2040 Target Consultation in 1Q 2025 and the results of the consultant study in July 2025, may bring the discussion back. Sectoral legislation to deliver on the 2040 target could follow. However, the recent protests of EU farmers have shown that this could slow down the discussion, whilst the report on ‘Strategic Dialogue on the Future of EU Agriculture’ “calls on the European Commission to further work with stakeholders and experts to assess the feasibility and relevance of such a system”, with a view to addressing a number of “fundamental concerns and aspects”¹³¹.

The consultant study¹³² and on-going discussions¹³³ seem to indicate that a midstream system looks the most likely option. Pending legislative developments, this scenario, and timeline, is to be confirmed as it is based on pure supposition.

2.5.3. Scenario

So far there has been no legal reference if the ETSAg, if created, should be merged with the current ETS1 and/or upcoming ETS2 legislation. The discussion on an ETSAg is quite incipient and the European Commission has not made any legislative proposal up to now.

¹³⁰ European Commission (2023). Climate Action Progress Report 2023. Figure 15 b reported policies and measures for the agriculture sector (by objectives). Pp. 27.

¹³¹ Strohschneider, P (2024) Strategic Dialogue on the Future of EU Agriculture – A shared prospect for farming and food in Europe.

¹³² Bogner, J., et al. (2023).

¹³³ See ERCST session on “The [Future of Agriculture in the EU ETS – Public Event](#)” of March 22, 2024.

Should there be an ETSaG, three scenarios can be envisaged:

Scenario 1: An Emission trading system in the EU for agriculture (ETSaG) is created as separate system from current ETS (1+2).

ETS1 and ETS2 could merge after 2031, ETSaG will remain separate. In this scenario, no interlinkages will be created between new ETSaG and current ETS1 and ETS2. Therefore, no direct impact on the EU ETS.

Compliance entities will assume the ownership of their emission reductions and removals. This will ensure that the supply of compliance credits is available to farmers and food companies for their own compliance, while setting a new business model for emission reductions/ removals in agriculture that does not interact with other emission trading system in the EU.

Scenario 2: ETSaG is created as a separate system but some link is set up with current ETS1.

In this case, ETSaG could be set as a separate system but trading will be allowed between both emission trading system with certain limitations in terms of volumes and/or offsets. Participants in AgETS would be able to exchange a limited number of quotas with current ETS1 compliant entities and vice versa. This option will allow to partially isolate the agricultural sector while providing flexibility to current ETS1 covered sectors. Considering the potential of the agricultural sector to deliver carbon removals, the concept could be quite interesting if negative emissions are included in ETS1 after 2026. Agriculture could become a provider of liquidity (including through carbon removals to ETS1), which endgame has been announced for 2039.

ETSaG participants could be rewarded for being removal providers to current ETS1 operators, thus receiving a strong incentive to participate in ETSaG. The incentive will be also for ETSaG operators, who will benefit from a wider supply of removals they can use to address their emissions.

Scenario 3: ETSaG is directly included as an extension to current ETS1 activities.

ETS1 currently covers industrial sectors which are part of the agricultural value chain. A possibility could be to extend the current ETS1 to those GHGs emissions related to agriculture, which are not covered by ETS1, such as CH₄. Agriculture and ETS1 covered entities will operate in the same carbon market and will be able to trade under the same market conditions.

However, and pending a targeted impact assessment, the impact that the inclusion of agriculture will have on ETS1 generates significant uncertainties, with potential risk for current sectors. ETS1 covered activities have been reducing emissions, while the agricultural sector has experienced no substantial improvements in terms of GHGs emissions.

2.5.4. Impact on supply/demand balance

Supply:

If a decision to expand carbon pricing to agriculture is made, then the LRF will depend on the final scenario (see section 2.5.3 of this Report).

If it is separate ETSaG, there will be an LRF that will apply to the agricultural sector only. The significant supply of allowances from the ETSaG will have to decrease in a linear manner. EU agricultural emissions

reached 365 MtCO₂eq in 2022 while GHGs are expected to decrease only slightly by 2030, if no additional measures are put in place¹³⁴.

It can be expected that ETSAg LRF will be based on the political ambition to achieve decarbonisation of agriculture as a sector before a certain date, so we see as a political decision. ETSAg will have to be aligned to the European Climate Law objective of at least 55% GHG emission reduction by 2030.

Examples of current targets envisaged in EU climate related legislation are ETS1 (-62% GHGs emission reduction by 2030 compared to 2005) and ESR (-40% GHGs emission by 2030 compared to 2005). The creation of an ETS2, with a more ambitious LRF than for current ETS1 (5.38% vs 4.4%), sets a precedent for the introduction of a more stringent LRF for a new and single ETSAg.

If ETSAg is merged with current ETS1, there is the possibility that the same LRF could apply to the agricultural sector. However, this is an unlikely scenario, considering the higher ambition target that will need to be set for agriculture in order to contribute in a manner similar to other sectors to the net zero objective.

Demand:

- **MACC**

While assuming an average cost of abatement for ETS1 sectors of 180 (EUR/tCO₂e) (Kobize (2024))¹³⁵, it is difficult to use MACC as a comparison with agricultural sector as a whole due to its heterogeneity and abatement options. Perez Dominguez et al¹³⁶ provides different values for MACC that vary between different abatement options in agriculture. MACC values below 100 EUR/tCO₂e by 2030 are given for higher legume share, nitrification inhibitors and precision farming, among others; while MACC values above 100 EUR/tCO₂e by 2030 are given for vaccination, winter cover crops. MACCs above 550 EUR/tCO₂e by 2030 are given for feed additives (nitrate and linseed).

The different MACC values for the agriculture show the heterogeneity of the sector and its potential to abate. If compared with MACC for ETS1, it looks difficult to come with a final conclusion that justifies the two systems merging in a short term.

- **Size of the sector**

GHGs emissions from agriculture represent 10.82% of all GHG sources in Europe. Currently ETS1 from stationary installations and aviation represent around 36% of GHGs emissions¹³⁷, and maritime transport an extra 4%¹³⁸. If all emissions from ETSAg are integrated into the existing ETS1, it can be assumed that the dominant factor in the combined price will be the abatement options in the stationary sector.

However, the size of the agriculture sector is not negligible, representing close to 1/4th of ETS1 GHGs covered. From the different sectors analysed in this Report, the agricultural sector is the biggest sector in

¹³⁴ EEA (2023) Greenhouse gas emissions from agriculture in Europe. Figure 1. EU agricultural emissions by source and projected emissions. October 24th.

¹³⁵ MACC is taken from (Kobize, (2024)). Pp.8. Reference Fit55 scenario where EU ETS and BRT ETS operate separately.

¹³⁶ Pérez Domínguez, I., et al (2020), Economic assessment of GHG mitigation policy options for EU agriculture. JRC. Pp. Figure 9. EU standalone measures MACC. Pp59.

¹³⁷ COM(2023) 654 final. Report from the Commission to the European Parliament and the Council on the functioning of the European Carbon Market in 2022 pursuant to articles 10(5) and 21(2) of Directive 2003/87/EC. Pp. 5.

¹³⁸ European Commission (2024) Reducing emissions from the shipping sector

terms of GHGs emissions emitted. Because of its big size, the inclusion of a big sector such as agriculture could have uncertain consequences on ETS1 and its merging with ETS1 should be carefully considered.

- Number of installations

In the EU there are more than 41,000 farmer producer organisations of which 22,000 are cooperatives¹³⁹, while in 2020, there were 9,1 million farms in the EU¹⁴⁰. The number of installations covered by ETS will depend on the point of obligation or ownership and final model design (farm level, downstream, upstream).

The number of installations representing the agricultural sector could be a relevant criterion to consider when looking at the impact on ETS1, and ETSAg. To give an example, a high number of farms covered will make the system burdensome to implement (more onsite verification visits, administration cost, etc). In addition, it could make more difficult the achievement of a common vision for an ETSAg, involving a higher number of stakeholders during the policy making process.

2.5.5. Impact on ETS functioning

It is difficult to make a definitive statement of the impact of bringing agriculture under an emission trading system in the EU. The final design model choice will impact it markets functioning indicators.

In principle, the integration of agriculture into emission trading system in the EU should increase the underlying traded commodity as well as market participation, therefore providing higher liquidity and moderating volatility. It will not solve but postpone the market liquidity problem. The number of covered actors in agriculture sector, as well as the GHG emissions, also depending on the model used, is large both in terms of number of installations and GHGs coverage (see chapter 5.5.1. current status). The impact on the carbon market could be substantial change market dynamics and impact market functioning indicators.

Table 2.3: Impact on market functioning of ETSAg

	How long-term sectors will sign their carbon contracts? Will they hedge?	To what extent they are experienced in trading and commodity risk management?	Amount of compliance entities and whether an upstream/downstream approach is taken. Role of intermediaries?
Farm level	Lower financial capacity, and small size could be a barrier for farmers to get involve in hedging activities.	Low or none experience in trading, and/or commodity risk management. Higher administrative cost to access trade.	Big number of compliance entities. We can expect farmers relying on traders rather than directly participating in auctions.
Upstream	High financial capacity but no evidence in hedging practices up to date.	Experience in carbon trading and commodity risk, but no evidence of direct participation in carbon trading.	Lower number of compliance entities than farm level model. We can expect companies relying on

¹³⁹ COPA-COGECA (n.d.). European Farming Figures. <https://copa-cogeca.eu/europeanfarming>

¹⁴⁰ [World Economic Forum \(2023\)](#) EU farms: 5.3 million fewer in 2020 than in 2005. April 12th.

			intermediaries to participate in auctions.
Downstream	Big food companies do have experience in hedging energy commodities, while they tend to not disclose their hedging positions ¹⁴¹ .	We can anticipate a scenario with direct participation of big food players in the market, if they have exposure to carbon.	Smaller number of entities and better organised. While they could rely on intermediaries, they may also participate directly in auctions.

2.5.6. Discussion

There are potential pros that should be considered when assessing and ETSAg:

1. New revenues and business opportunities: Carbon pricing is one of the most effective policy instruments to tackle climate change and generates substantial revenues¹⁴². Extending carbon price to agriculture substantially increases EU revenues that could be re-used in climate activities. However, at ERCST we do not believe that to use the ETS as a “cash-flow” is the right approach.
2. ETSAg revenue that could be re-used in climate activities:
 - ETSAg revenues could be recycled to finance farmers and invest in carbon sequestration projects on agriculture.
 - CAP might serve as an important tool to finance investments in emissions reductions (through subsidies for feed additives, nitrogen inhibitors etc.), whilst an ETSAg would provide a new source of very substantial financing for removals, ensuring that more new revenue than new costs would flow to the sector. It may be useful to relate an ETSAg with the CAP in the best possible way to ensure the necessary emission reductions in agriculture in a cost-effective way.
 - Revenues could also be re-used to adopt innovative and low-carbon technologies in the European farming sector (following the approach of the Innovation Fund in the ETS1), thus generating a competitive advantage towards third countries.
 - A carbon pricing lever in the EU for agriculture could trigger 229.6 billion EUR between now and 2048¹⁴³. These revenues could be used to finance initial failures of the system and to support the decarbonisation of the entities covered by ETSAg.
3. Carbon removals: Agriculture is a sector with a potential to supply additional high-quality removals. Carbon removal credits generated in the ETSAg could be exported to support the decarbonisation of sectors covered (e.g.: biochar, ...). An ETSAg could set a business case for farmers and landowners to invest in carbon removals with a view to exporting credits to ETS1 and ETS2.
4. EU wide harmonisation: In Denmark, a deal has been struck on a carbon tax of DKK 750 (some EUR 100) by 2035 on agriculture emissions from livestock with a 60% tax break. While the Danish approach could become a first step, and a model for inspiration, Member States are also considering setting a carbon price on agriculture. The lack of a common EU approach to tackle agricultural emissions could create a different treatment between different M S and even carbon leakage intra-EU. If no EU approach, there is a risk that farmer activities could be displaced to EU M Ss with a less restrictive climate burden.

¹⁴¹ Dorfman, D. (2008) Food companies' hedges remain hard to pin down. July 3rd.

¹⁴² See Marcu, A., Hernández, et al. (2024) State of the EU ETS Report. Pp.16-17.

¹⁴³ Oxera (2024). Growth Zero. Reforming net zero as a driver of growth. Pp. 38. Accessed on August 2nd, 2024.

There are potential cons that should be considered when assessing the extension of carbon pricing to agriculture:

1. Administrative burden: Administrative cost of extending carbon pricing and MRVA to actors in the agricultural value chain could be substantial. Specially if an on-farm option is implemented, due to the big number of small number of players, their low financial capacity and lack of expertise in the carbon market.

The exclusion of small farmers below a certain GHGs threshold (“de minimis threshold”) could generate incentives for the ETSAg to be implemented. Small farmers could also be considered for support through ETSAg revenues or carbon removal credits, whilst ensuring a level playing field between big and small entities.

2. Social impact. The social impact can be important if an ETS regulation turns out to be perceived as a considerable cost burden for the agriculture players and food consumers. If burdensome, we could witness more yellow vests protests, following the example of ETS2 thus undermining public support to climate policy. The semantic need to juxtapose ‘point of obligation’ with ownership.

3. Competitiveness of European agriculture. If farming products become more expensive, this could make non-EU production more attractive. ETSAg might inspire a system with safeguards to carbon leakage risk of a similar magnitude, and the possible reintroduction of export subsidies on certain agricultural products, in order to compensate for above global market carbon costs in Europe.

4. Inflationary impact. Setting a carbon price on agriculture could increase the production cost for farmers. A big concern is that they could pass the cost to final consumers, thus making food more expensive. Revenues to ETSAg regulated entities who succeed generating carbon removal could shield the agriculture and food sector from too high carbon cost. This will also contribute to achieve social acceptance as farmers are paid for removing CO₂.

5. Impact on food independency. Agriculture and food production is of geostrategic importance for the EU, which is the world’s largest food exporter¹⁴⁴, supplying emerging markets in Asia and Africa with global implications for food security. Setting a carbon price on agriculture could increase food prices, make EU agricultural products less competitive, reduce EU food independency, and make third countries more food insecure and dependent on food imports from strategic adversaries.

6. Efficiency: Is it efficient to put a price on natural emission sources (e.g.: livestock, land use change) that are hard-to-abate? ETSAg may not be enough to achieve real decarbonization of the sector. A possibility could be to prioritize existing low-emission farming methods such as farm-specific nutrient management and nutrient use efficiency, which could be effective to reduce emissions and less complex than creating an ETSAg. However, carbon pricing is considered the main EU climate tool to achieve decarbonization and could provide an example, while no major alternatives seem to be currently in place.

¹⁴⁴ [European Commission \(2024\)](#) Processed agricultural products in the EU. DG GROW.

Recommendations

Looking at the different scenarios, we would argue, at least initially, for an ETSAg that is separate and independent system rather than one that is merged or linked initially to other emissions trading system in the EU. ERCST sees the expansion of carbon pricing to agriculture as an option that deserves, at least, to be explored. We recognize that it will be controversial and maybe painful. At the same time, it can give the sector a competitive advantage as the rest of the world also needs to decarbonize. ETS revenue can support the green transition of the sector which in turn will also benefit the climate, nature and environment. All sectors need to deliver to reach EU's climate targets to become climate neutral by 2050. If agricultural emissions are not reduced other sectors such as transport and industry will need to deliver beyond what is cost-effective with the risk of hampering industrial competitiveness. Therefore, this is likely the best way, at an EU wide level.

Its success will depend on whether the model provides effective incentives to reduce emissions as well as the accompanying incentives and interaction with other existing EU related policies. The impact of creating an ETSAg on society and farmers should be at the core of the discussion, as an ETSAg will not succeed without a wide public and political support. How agribusiness will be treated with respect to competitiveness and carbon leakage will be central. Applying CBAM to agriculture will test the skills of EU diplomacy in their relations with many in the G77.

Agriculture could be incorporated in emissions trading in the EU upstream (at farm level), mid-stream (at processing stage) or downstream (at supermarket/retail level). Our sense is that, for political and administrative reasons, a mid-stream application is the one that is more viable and makes most sense.

3. Emissions scope coverage

3.1. Non-CO₂ emissions in aviation

3.1.1. Current status

In terms of GHGs from aviation, the EU ETS Directive currently covers CO₂ alone. Aviation has an additional climate impact through the release of aircraft engine emissions of NO_x, water vapour¹⁴⁵, and sulphate and soot particles at high altitudes¹⁴⁶. A November 2020 study by the European Aviation Safety

¹⁴⁵ When water vapor is released from jet engines at altitude under certain high humidity conditions (ice supersaturated regions) it can condense into exhaust carbon particles as well as into atmospheric aerosols. If the air is sufficiently humid, the water vapor can condense further into crystals and a cloud can be formed. Such clouds are called condensation trails or contrails. (Source: IATA, Non-CO₂ Aviation Emissions, <https://www.iata.org/contentassets/5499da2b3b7d46b3b13be4dad54a9689/policy-position-non-co2-aviation-emissions.pdf>)

¹⁴⁶ The main climate change contributions from non-CO₂ emissions of aviation come from the formation of persistent contrails and particularly the resulting aviation-induced clouds, as well as from the chemical atmospheric reactions driven by NO_x emissions. (Source: IATA, Non-CO₂ Aviation Emissions, <https://www.iata.org/contentassets/5499da2b3b7d46b3b13be4dad54a9689/policy-position-non-co2-aviation-emissions.pdf>)

Agency (EASA) confirmed the significance of combined non-CO₂ climate impacts from aviation to be at least as important as those of CO₂ alone¹⁴⁷.

Against this background, the EU ETS' Innovation Fund offers financial support from 2024 for reducing these broader climate impacts. Also, the EU law will require aircraft operators to monitor and report their non-CO₂ emissions from January 2025. According to a draft implementing act, this requirement initially applies to intra-EEA flights only, with extra-EEA flights exempted from mandatory reporting in the first two years¹⁴⁸. The European Commission was to issue by August 31, 2024, the final implementing act detailing the inclusion of non-CO₂ effects in the MRV framework (to contain, at a minimum, the 3D aircraft trajectory data available, ambient humidity, and temperature) enabling CO₂e per flight to be produced.

The introduction of an MRV is typically seen as a stepping stone towards the inclusion under emissions trading of what is subject to monitoring. In this case, however, according to the draft implementing act, the *“MRV of non-CO₂ effects constitutes a stand-alone, distinct exercise from carbon pricing”* and *“given the uncertainties surrounding the impacts of non-CO₂ effects, it is key to start the MRV on non-CO₂ effects with a view to ensuring scientific validation of the impacts”*¹⁴⁹.

3.1.2. Timeline

By 31 December 2027 – based on the results of the MRV of non-CO₂ aviation effects, the European Commission will submit a report and if appropriate, a legislative proposal, after having carried out an impact assessment to mitigate such effects by expanding the scope of the EU ETS Directive to include non-CO₂ aviation effects.

3.1.3. Scenario

If non-CO₂ emissions from aviation were to be covered by the EU ETS Directive, we would envisage the following main scenario:

- **Timeframe:** Coverage of non-CO₂ emissions from aviation as of the next phase of emissions trading in the EU, i.e. as of 2031, for both intra-EEA and possibly extra-EEA departing flights (provided that CO₂ emissions from extra-EEA departing flights are also covered – see section 2.2 for a discussion on that). This timeframe would give airlines sufficient time to get their aircrafts equipped with relevant measurement equipment and scale solutions for the collection of technical and climatological data to the entire fleet. It will also allow the collection and assessment of sufficient time series of data that will enable a better understanding on non-CO₂ emissions impact and potential trade-offs with CO₂ emissions, as well as progress with respect to the operational and technological solutions for addressing non-CO₂ emissions.
- **Which emissions trading system in the EU:** Moreover, we assume that if non-CO₂ emissions were to be covered, that they would most likely be included under ETS1 (together with CO₂ emissions from aviation).

¹⁴⁷ EASA (2020), Updated analysis of the non-CO₂ climate impacts of aviation and potential policy measures pursuant to the EU Emissions Trading System Directive Article 30(4), SAFE AND SUSTAINABLE AVIATION, FINAL REPORT, https://climate.ec.europa.eu/news-your-voice/news/updated-analysis-non-co2-effects-aviation-2020-11-24_en

¹⁴⁸ Draft implementing regulation - Ares(2024)4738358, https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14217-Emissions-trading-system-ETS-Monitoring-and-Reporting-Regulation-amendment-in-response-to-the-ETS-revision_en

¹⁴⁹ Draft implementing regulation - Ares(2024)4738358, https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14217-Emissions-trading-system-ETS-Monitoring-and-Reporting-Regulation-amendment-in-response-to-the-ETS-revision_en

3.1.4. Impact on supply/demand balance

Operational measures such as avoiding flying over ice-supersaturated regions (ISSRs) in the atmosphere and supporting climate-optimised flight trajectories represent cost-effective ways of reducing non-CO₂ impacts, as operators can reduce the likelihood of forming persistent contrail. Optimised air traffic management could support optimised flight profiles with respect to non-CO₂ impacts whilst limiting trade-offs with fuel consumption¹⁵⁰.

The assumption is that non-CO₂ emissions be covered by the ETS1 as of 2031 (see ‘Scenario’ section) by which time reporting of non-CO₂ emissions and surrendering of EUAs will be done on a per-flight basis and based on accurate real flight data rather than default values, while at the same time there are improvements in the accuracy of predictions of ice supersaturated regions. That said, it is likely that aircraft operators can primarily avail of the above mentioned cost-effective operational measures to abate non-CO₂ emissions at relatively low cost. This would mean that a lot of the emissions reduction would at least initially come from in-sector abatement rather than buying EUAs from the stationary sector in ETS1. Given that the stationary sector is as of 2021 allowed to buy aviation allowances, the increase in supply would lead to a downward pressure on the carbon price. This could counterbalance to some extent the pressure on ETS1 prices from the increased demand associated with a possible coverage of CO₂ emissions from international aviation (see section 2.2).

With time, as the potential of the more cost-effective abatement options is reduced, more expensive technological solutions, such as the use of lean burn and Advanced RQL (Rich burn Quick quench Lean) combustors but also improved fuel quality and a more widespread uptake of SAFs, will contribute to addressing non-CO₂ effects¹⁵¹.

3.1.5. Impact on market functioning

With non-CO₂ climate impacts from aviation estimated to be at least as important as those of CO₂ alone, the inclusion of non-CO₂ gases from aviation will, other things equal, roughly double the size of the sector’s emissions subject to carbon pricing. This will likely lead to higher trading volumes and enhanced market liquidity.

Moreover, as aviation is already covered by the ETS1, we expect no impact on market participation, and thus no associated impacts on market liquidity, stability or efficiency.

Overall, the impact of a possible inclusion of non-CO₂ emissions from aviation on market functioning would be positive.

3.1.6. Discussion

There could be a number of pros when considering the extension of the EU ETS Directive to non-CO₂ emissions from aviation:

¹⁵⁰ The EASA, Eurocontrol, European Environmental Agency (EEA) European Aviation Environmental Report 2022 for instance recommends a limit on time or flight kilometers, so that the avoidance of ISSRs can never lead to a net warming effect on the climate. The avoidance of ISSRs and the associated non-CO₂ mitigation can be achieved without significantly affecting CO₂ emissions.

¹⁵¹ It is expected that a widespread uptake of SAFs, which typically have a lower Sulphur and aromatics content, will contribute to reducing contrail formation, thus not only leading to a reduction in CO₂ emissions but also in non-CO₂ emissions. However, further research into the aromatic and Sulphur contents of SAF and how it influences contrail formation is needed. Source: https://a4e.eu/wp-content/uploads/A4E-Position-Paper-and-Recommendations-Non-CO2-in-Aviation-OCT-2022_FINAL.pdf

- If non-CO₂ emissions are covered by the ETS1, we expect this not before 2031. If this were to be the case, we expect initially a lot of the non-CO₂ abatement to come from in-sector cost-effective operational measures, rather than buying EUAs from the stationary sector in ETS1, therefore easing pressure on ETS1 prices.
- The inclusion of non-CO₂ gases from aviation will roughly double the size of the sector's emissions subject to carbon pricing, possibly leading to higher trading volumes and enhanced market liquidity.

The scientific understanding of the climate change effects of non-CO₂ emissions from aviation activities has advanced over the last 10 years, however scientific uncertainty remains e.g. regarding the different warming and cooling effects of individual gases or their CO₂ equivalence. Questions then arise as to:

- *'What the required degree of certainty would be for recognising these gases under emissions trading or introducing other policy measures.'*; *'What degree of MRVA capability accuracy is considered sufficient for effective carbon pricing?'* etc.

Several open questions remain that would impact whether and how to cover non-CO₂ emissions from aviation under the EU ETS Directive, e.g.:

- *Can some of the non-CO₂ gases (NO_x, water vapour, sulphate and soot particles) be mitigated by requiring the installation of (close to) commercially available technologies, or modernising and improving air traffic management technologies? E.g.: technological options such as the use of lean burn and Advanced RQL (Rich burn Quick quench Lean) combustors, and the future potential to inject atomized water droplets for cooling the engine airflow during take-off, have the potential to reduce NO_x emissions by up to 40% and to 50% respectively¹⁵².*
- *What are the trade-offs between CO₂ and non-CO₂ emissions and also among the different types of non-CO₂ emissions (more efficient engines will reduce CO₂ emissions but could be more prone to creating contrails)? Should the MRV lead to clear science-based guidelines on how to arbitrate between CO₂ and non-CO₂. Is it that non-CO₂ mitigation should never come at the expense of CO₂ mitigation? Or is it that non-CO₂ mitigation should never come at the expense of CO₂ unless it is offset by Sustainable Alternative Fuels (SAF)? Are there technological and operational solutions that reduce both CO₂ and non-CO₂ emissions?*

Recommendations

Including non-CO₂ provisions for aviation in the EU ETS Directive would at this stage be premature. There is still a need to better understand non-CO₂ emissions, including their trade-offs with CO₂ emissions. We expect that a better understanding is formed by the end of the decade, which will allow non-CO₂ emissions to be addressed, while at the same time giving aircraft operators sufficient time to equip their aircrafts with the relevant measurement equipment for the collection of technical and climatological data.

¹⁵² Source: IATA, Non-CO₂ Aviation Emissions, <https://www.iata.org/contentassets/5499da2b3b7d46b3b13be4dad54a9689/policy-position-non-co2-aviation-emissions.pdf>

However, emissions trading is one of the options of possible measures to address non-CO₂ emissions. All options, including inter alia operational measures/better routing, improved fuel quality, continuing/expanding support through the Innovation Fund merit, further assessment.

4. Negative emissions

The inclusion of negative emissions represents a significant and revolutionary change in the emissions trading system in the EU. This transition needs to begin well before net zero is achieved. As we progress towards our climate goals, the emissions trading system in the EU will need to evolve, starting from its scope and gradually incorporating mechanisms to account for and incentivize negative emissions. By the time net zero is achieved and we move towards net negative, a comprehensive system of incentives for negative emissions should already be in place. It must also be noted that this section addresses domestic Carbon Dioxide Removal (CDR) and does not refer to international opportunities for CDR as covered under Article 6 of the Paris Agreement. International CDR represents in many ways the essence of Article 6 of the Paris Agreement and will be covered under the International Crediting section of this report.

Negative emissions are crucial to manage the future demand/supply balance of the emissions trading system in the EU. In this regard, Before delving into their role in the future of the emissions trading in the EU, it is essential to recall that an emissions trading system should be, by definition, technology-neutral, meaning that it should not promote the use of one specific technology over another, but rather provide equal conditions to all technologies that contribute to "stabilizing greenhouse gas concentrations in the atmosphere," the international goal set out in Article 2 of the UNFCCC.

The choice of applying one technology or another should depend solely on its ability to reduce emissions. The regulator's role should be limited to establishing the correct framework, including accounting, which would enable the market to work and to ensure that it is environmentally sound. In a market economy, such as the EU, it is the role of management to make economic decisions and choose how to comply. If not, the case for having an emissions trading in the EU crumbles rapidly.

At this point, it is necessary to distinguish between different types of Carbon Dioxide Removal (CDR) methods. The Carbon Removal and Carbon Farming (CRCF) Regulation¹⁵³ outlines various approaches, broadly categorized into engineered solutions and nature-based solutions (NBS). Engineered solutions, particularly those enabled by CCS technology, offer a key advantage: permanence. This characteristic makes them a more suitable fit for integration into ETS1. In contrast, nature-based solutions, while valuable, often present challenges related to time-limited storage and additional complexity in measurement and verification.

For the purposes of this discussion on integration into ETS1, we will focus primarily on CCS-enabled CDR technologies¹⁵⁴. Nature-based solutions, while important in the broader climate strategy, are not currently

¹⁵³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0672>

¹⁵⁴ A wider discussion on the integration of CDRs in the emission trading system in the EU will take place in a separate report under the framework of the Future of the EU ETS project.

being considered for inclusion in ETS1 due to their temporary nature and the complexities they would introduce to the system.

However, the issue of permanence related to Carbon Dioxide Removals (CDRs) is still debated, with some stakeholders advocating for only technology-based removals being recognised as generating permanently stored CO₂. Others are asking instead to also recognise some CCU application as permanent removals, given the capacity of these products to store CO₂ for a long period, while in other cases the use of the CCU product may result in the release of the CO₂ that was previously captured to prepare the product.

When talking about negative emissions, it is also necessary to distinguish between carbon capture, utilization, and storage (CCUS) and CDRs, which is typically based on their application: CCUS is applied to emissions, while CDRs remove CO₂ from the atmosphere and durably store it in geological, terrestrial, or ocean reservoirs, or products, resulting in carbon removals or negative emissions.

While not impacting this discussion, CCS/CCU and CDR share elements in the same value chain. The primary difference lies in the point of CO₂ capture. In reality, both technologies should be treated equally, with negative emissions generated either by abatement or removal of CO₂ emissions. For the purpose of this paper, such a distinction between CCUS and CDR is kept, and the EU's definitions of the technologies is adopted.

According to the recently adopted Industrial Carbon Management Strategy (ICMS)¹⁵⁵ CCS is defined as the capture, transport, and permanent and safe geological storage of CO₂ emissions of fossil, biogenic or atmospheric origin; CCU occurs when industry uses captured CO₂ in synthetic products, chemicals, or fuels.

CDRs are instead defined in the CRCF Regulation 'the anthropogenic removal of carbon from the atmosphere and its durable storage in geological, terrestrial or ocean reservoirs, or in long-lasting products' (Article 2.1, para. a), even though this regulation is still at the stage of provisional agreement, not yet adopted into EU legislation.

While CCS and CCU are already integrated into the EU policy framework through various pieces of legislation – namely, the CCS Directive¹⁵⁶ and through the integration of CCS under the ETS1, and multiple regulations for CCU based on the final use of CO₂ – this chapter will focus on negative emissions generated exclusively by CDRs, specifically Direct Air Capture with Carbon Storage (DACCS) and Bioenergy with Carbon Capture and Storage (BECCS).

4.1. Current status

4.1.1. The EU policy framework

While this chapter focuses on negative emissions generated by CDR, it is still important to mention the legislation governing CCS and CCU, as there may be overlapping in the value chain and the same legislation

¹⁵⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2024:62:FIN>

¹⁵⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32009L0031>

could be applied in some of the stages of the CDR process, for instance when CDR is associated with CCS for long-term storage.

CCS has been regulated since 2009 through the CCS Directive, which ensures the safe geological storage of CO₂. The Directive sets standards for site selection, closure, and the transfer of responsibility. On the other hand, CCU technologies have different uses of CO₂ regulated individually, with the main applications being combining captured CO₂ with renewable hydrogen to make renewable fuels of non-biological origin (RFNBOs), using captured CO₂ as a feedstock to replace fossil resources for chemicals production, and storing CO₂ in construction products, notably via mineral carbonation.

CCS technologies are also mentioned in other pieces of legislation, such as the Net Zero Industry Act (NZIA), which sets a target of achieving an annual injection capacity of at least 50 million tonnes of CO₂ by 2030 within the EU's territory. It also puts an obligation on the oil and gas sector to contribute to this target based on a pro-rated share of their crude oil and natural gas production from 2020 to 2023.

CCS is also regulated under Article 12 (3a) and Annex I of the EU ETS Directive: when CO₂ is effectively captured and stored following the CCS standards by entities covered by the Directive, these entities are exempted from the surrendering of emission allowances. Furthermore, the latest 2023 update of the Monitoring and Reporting Regulation (MRR) linked to the EU ETS Directive sets that when the CO₂ is being permanently bound in products it does not need to surrender emissions allowances (Article 49, MRR)¹⁵⁷. The accounting of negative emissions in emissions trading system in the EU would be a step further, as this latter in its current design is an abatement tool that does count for GHGs going beyond zero.

The EU's policy framework for CDR and negative emissions initially focused on nature-based solutions. These are regulated under the LULUCF Regulation and supported by the Sustainable Carbon Cycle communication, published in December 2021.

Building on this, the CRCF Regulation, which was proposed in November 2022, has by now reached the stage of provisional agreement¹⁵⁸. The CRCF Regulation is set to become the EU's first regulatory framework for certifying high-quality carbon removals by establishing an EU-wide certification system, while uses of CDRs are anticipated in other pieces of legislation such as the Corporate Sustainability Reporting Directive¹⁵⁹ for net-zero and climate neutrality claims, as well as the Green Claims Directive¹⁶⁰.

The ICMS¹⁶¹, launched in February 2024, represents the most recent development in the EU's evolving carbon removal policy framework. Although not legally binding, the ICMS signals the EC's commitment to developing and deploying CDR solutions and of a CO₂ infrastructure in the EU. It emphasizes the importance of capturing, using, or storing residual emissions from hard-to-abate sectors as a key to decarbonizing industry. The strategy aims to balance out remaining emissions by 2050 through natural sinks or technological solutions such as DACCS.

157 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02018R2066-20240701>

158 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0672>

159 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022L2464>

160 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2023%3A166%3AFIN>

161 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2024%3A62%3AFIN>

The EU's CDR regulatory framework remains in its early stages, with significant uncertainty about future regulations, which in many cases are just foreseen. This could impede investment in CDR projects until more concrete policies are established.

4.1.2. CDR development in the EU

Looking at the development of the technology and storage sites, the EU currently has a total CO₂ storage capacity of approximately 300 Gt, with the majority located in deep saline aquifers¹⁶². However, only a small portion of this capacity is currently in use.

To achieve the EU's 2030 climate targets, CDR technologies would also need to scale up significantly: by 2030, the EU may need to remove between 200-300 MtCO₂ annually through a combination of nature-based and technological solutions.

Several prominent CDR projects (currently at an early pilot stage) and initiatives have been launched and are currently in various stages of development and operation across Europe, although some of them are not strictly located in the EU territory. These projects focus on regions with concentrated industrial emissions and available geological storage potential and/or renewable energies.

Starting with DACCS-related projects, a first example is given by the Climeworks' Orca project in Iceland, which has been operational since 2021. It is one of the world's largest direct air capture and storage plants, with a capacity to remove 4,000 tonnes of CO₂ per year¹⁶³. By 2024, Climeworks is also finalizing the construction of a second project, called Mammoth, which has an estimated removal capacity of 36,000 tons per year, although the net amount of emissions removed will be lower¹⁶⁴.

The NEGEM Project, funded under the EU's Horizon 2020 program, is a research initiative involving 15 European partners. It assesses the realistic potential of negative emission technologies and practices (NETPs) and their contribution to climate neutrality by 2050¹⁶⁵.

BECCS initiatives are also underway. Stockholm Exergi in Sweden plans a BECCS facility at its Värtan biomass-fired combined heat and power plant, aiming to capture 800,000 tonnes of CO₂ annually, which also is supported by the Innovation Fund¹⁶⁶. In the UK, the Drax Power Station aims to become carbon negative by 2030 by implementing BECCS technology. This project has the potential to remove 8 Mt of CO₂ annually¹⁶⁷.

Despite the increasing number of projects and clear targets, CDR deployment across Europe faces several challenges¹⁶⁸. The key challenges facing CDR deployment include high costs, with current estimates placing technological CDR methods approximately between €600-1,000 per tonne of CO₂ removed¹⁶⁹.

162 <https://publications.jrc.ec.europa.eu/repository/handle/JRC134999>

163 <https://climeworks.com/plant-orca>

164 <https://climeworks.com/plant-mammoth>

165 <https://www.negemproject.eu/>

166 https://climate.ec.europa.eu/system/files/2022-07/if_pf_2022_beccs_en.pdf

167 <https://knowledge.energyinst.org/new-energy-world/article?id=138541>

168 <https://www.iea.org/commentaries/it-is-time-for-ccus-to-deliver>

169 <https://www.weforum.org/agenda/2023/08/how-to-get-direct-air-capture-under-150-per-ton-to-meet-net-zero-goals/>

Many CDR technologies, particularly DACCS, have high energy demands requiring low-carbon sources to ensure net negative emissions. Moreover, storage projects typically take 7-12 years from inception to the start-up phase. Given this long gestation period, regulatory uncertainty creates challenges for investors and project developers. Public acceptance remains an issue, with ongoing debates about CDR's role in climate strategy. The complexity of integrating CDR into existing legislation and the need for more robust public and private investment also present significant hurdles.

4.2. Timeline

In the context of CDR technologies, several upcoming milestones are noteworthy.

By 2026, the Commission is required to prepare an impact assessment on the feasibility of including negative emissions under ETS1. This report will consider factors such as the scope and criteria for CDRs, their impact on the carbon market, and whether an alternative system might be more appropriate. The year 2026 will also see the review of the LULUCF Regulation, which may provide more incentives for the use of CRCF certificates for carbon farming and carbon storage products.

Concurrently, the Commission is developing CDR methodologies to be adopted through Delegated Acts under the framework of the CRCF Regulation, with assistance from the Carbon Removal Expert Group. A proposal for the first certification methodologies is expected by 2025, with the first certified units anticipated from 2026. An electronic Union registry is scheduled to be in place starting in 2028 in order to ensure transparency and full traceability of certified units, and to avoid the risk of fraud and double counting. While waiting for the registry to be set up, certification schemes recognised by the Commission should establish and maintain interoperable certification registries.

According to the ICMS, from 2024, the Commission will initiate preparatory work for a potential CO₂ transport regulatory package. This package will address market structure, cross-border integration, technical harmonization, investment incentives, third-party access, and regulatory frameworks. The Commission will also begin working on proposing an EU-wide CO₂ transport infrastructure planning mechanism in collaboration with Member States and the ICM Forum. This initiative will include assessing the potential for reusing existing infrastructure for CO₂ transport and storage, considering the needs of renewable gases, and determining necessary regulatory changes.

The proposed Green Claims Directive, introduced in March 2023, may have also significant implications for CDRs by indirectly regulating the use of carbon credits in environmental claims

4.3. Scenario

The discussion surrounding CDRs emphasizes the need for a holistic approach to understand their role in EU climate policy. As the EU transitions from a net-zero economy by 2050 to a net-negative economy, a shift in the EU's climate framework will be necessary. This will also require substantial changes to the emissions trading system in the EU, which is currently designed to achieve zero emissions but will need to adapt to support a carbon-negative future.

In trying to design scenarios, it must be recognized that CDR can comprise up to three elements in the value chain: capture, transportation, and storage. They may be aggregated or disaggregated. That is, different actors may own and operate each of the three components. As in the case of CCS, the regulator will need to decide which elements get the credit, with the rest being a commercial arrangement which shares the economic benefit. The result will be that there is the ownership of a ton of CO₂ removed from the atmosphere, and permanently stored.

The integration of CDRs into the ETS1 framework could be addressed through various approaches but the fundamental principle is the accounting of -1/+1 impact on the atmosphere. Not allowing for this approach would seem to defy the logic for engaging in a CDR activity.

There are two primary models for integrating CDRs – direct integration or the creation of a separate market for removals with potential future linkage to the ETS1 – although other scenarios may be envisioned when considering different aspects related to the technology.

Scenario 1 – Direct integration of CDRs as an activity under the ETS1:

In this model the activities under the CDR value chain are under the ETS1. CDR activities will result in the issuance of an allowance to one designated segment of the value chain, as decided by the regulator – this cannot be decided commercially, the initial assignment has to be a regulatory decision. It would seem to us that the storage segment is the prime candidate to receive the credit. Allowances issued for CDR activities will be traded within the ETS1 framework. This approach could benefit covered entities by enabling them to use allowances from the CDR activity to meet their obligations. This could foster positive behavior among industries required to reduce their carbon footprint, making CDRs an integral part of their compliance strategy. This scenario offers a streamlined approach, leveraging the existing infrastructure. It could potentially accelerate the adoption of CDR by providing immediate economic incentives within a familiar regulatory framework. Additional elements may need to be put in place to energize this approach, such as what is being described as the Carbon Bank, a function to take the liability for the ex-ante issuance of CDR-linked allowances. It could also act as a purchaser of CDR linked allowances to provide a first buyer for this asset. The three CDR activities will be subject to normal ETS obligations, in all three segments. Given that CDR itself is energy and emission intensive, this would seem to make the case that CDR will be economical with access to renewable or nuclear based energy, but that is not a policy or regulatory decision.

Scenario 2 – Separate CDR trading system:

A separate CDR trading system could be established, focusing on setting specific removal targets that gradually increase over time. One approach could be to issue Carbon Storage Units (CSU) or Removal Allowances (RA) as carbon is removed from the atmosphere. As in Scenario 1, the functions of what is being labelled in literature a Carbon Bank would be helpful, by taking the liability for the ex-ante issuance of allowances. This system could be linked to the emission trading system in the EU at a later stage, say when there is a price convergence between the two systems, with CSUs being compliance units in the linked ETS1. ETS1 installations could have the option to buy CDRs, under certain conditions, in order to reduce their carbon footprint. This approach would allow for more controlled integration of CDRs, potentially starting with minimal obligations and scaling up as the supply of CDRs increases. It provides flexibility to

tailor regulations specifically for CDRs and allows for a gradual, measured integration. It could help manage potential market disruptions and allow time for the CDR industry to mature.

Scenario 3 – Different integration based on CDR type:

This scenario considers whether different types of CDRs, namely technology-based versus nature-based removals, should be integrated into the EU ETS in different ways, as they may present different issues related to MRV. Following this idea, one possibility is to integrate nature-based solutions under a potential emissions trading system. Another possible approach is expansion through LULUCF, which currently regulates GHGs from land use, land use change, and forestry. Technology-based CDRs could instead be integrated into ETS1, given their similarities with the CCS value chain. The approach underlined under this scenario could allow for more targeted incentivization, potentially leading to a more balanced development of various CDR technologies and practices.

Scenario 4 – CDRs as carbon credits:

This scenario envisages the CDR as a separate crediting system, whereby CDR operation will result in a CSU. In this case, the CDRs will not fall under the scope of ETS1 but will result in CSUs being issued and accepted as compliance instruments in the system. The CSUs would be similar to credits issued under a baseline-and-credit system and used for compliance in an ETS.

4.4. Impact on supply/demand balance

The integration of CDRs into the ETS1 framework is likely to have significant implications for the supply and demand dynamics of the carbon market. Given the uncertainty over prices, regulation, storage capacity and public acceptance, it is virtually impossible to make any precise statements on the impact on the functioning of the emissions trading system in the EU.

Looking at the potential supply of EU domestic CDR when compared to the size of the emissions trading system underlying commodity and its coverage, one statement that can be made is that CDR is unlikely to solve the problems of the emissions trading system. It may postpone some issues, and act as a stopgap, but it is unlikely to be a definitive solution.

Abatement costs associated with CDR technologies, particularly for technology-based solutions like DACCS and BECCS, are currently high but expected to decrease as the technologies mature. The IEA estimates that costs for DACCS could fall to €100-300 per tonne of CO₂ by 2050, while BECCS costs could range from €50-200 per tonne¹⁷⁰. At EU level, the Commission estimates that the future cost of CDRs, including DACCS, may range between €122-539 per tonne of CO₂¹⁷¹. These projections suggest that demand for CDRs to be used as compliance instruments in the EU ETS could increase substantially, as costs become more competitive with traditional abatement measures, especially for hard-to-abate sectors.

The existing ETS1 LRF is meant to increase stringency over the years. This accelerated cap reduction could further drive demand for CDRs as a compliance option. The steeper LRF trajectory will likely push EUA

¹⁷⁰ <https://www.iea.org/reports/direct-air-capture-2022/executive-summary>

¹⁷¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2024%3A62%3AFIN>

prices higher, potentially making CDR technologies more economically appealing for compliance purposes. The impact on the overall supply of allowances will depend on how CDRs are integrated into the system.

Furthermore, the upcoming Commission assessment will be crucial in determining the specific mechanisms for integration and their subsequent effects on the supply/demand balance.

Lastly, the impact on supply and demand will likely vary across different sectors within ETS1. Energy-intensive industries and the power sector may see different adoption rates of CDR technologies based on their specific abatement cost curves and technological readiness.

When considering the MACC, 'strict' CDR technologies currently have higher costs compared to many traditional abatement measures in sectors covered by ETS1. For instance, while some industrial energy efficiency measures have negative or low abatement costs, CDR technologies like DACCS are still in the higher range of the MACC curve¹⁷². This cost differential may influence the demand for CDRs within ETS1.

Both the size of the CDR sector and the number of participants are still uncertain, as the technology is in its early stages. However, the potential market is significant. The European Commission estimates that by 2050, the EU will need to remove 300-500 million tonnes of CO₂ annually to achieve climate neutrality¹⁷³. In best case scenarios, the expected volumes of removals¹⁷⁴ by 2040 may not be massive compared to ETS needs.

4.5. Impact on market functioning

The integration of CDRs into ETS1 presents both opportunities and challenges, as discussed in the sections above in this CDR chapter. The main issue in ETS1 is likely to be a lack of liquidity in the market, especially if the modelling that shows EUA availability going to zero in 2039 proves to be correct.

While 2039 is a specific date that has been discussed, the principle stays the same, regardless of the precise date. CDRs can provide limited relief from liquidity problems, especially as we reach towards net zero. In this case, whatever the scenario chosen from the ones described above, the demand for CDRs will come from ETS1 covered installations that have emissions. CDR, whether in the form of allowances or credits, discussed under different scenarios, will be used as compliance instruments in the ETS1.

The mechanics for the CDR becomes more complex in the post net-zero period, when we enter the net-negative functioning of the EU economy. In this case, CDRs can continue to be produced, as the supply can be there. To have a market, there will have to be an obligation to go beyond net zero and it is more challenging to determine who will have the obligation to do net negative. The demand could come from scope 3 emissions, or alternatively it could be socialized, with the state taking on the obligation. Then the

¹⁷² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021SC0601>

¹⁷³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0800>

¹⁷⁴ SWD(2024) 63 final. PART 1/5. Table 7: Industrial removals and net LULUCF removals. Pp. 38.

market for CDRs ceases to be an emissions trading system-like market and is likely to become more of a reverse auction, with the state as a potential buyer.

One noticeable remark is to recall that this chapter covers domestic CDRs, and that the storage capacity may limit the supply of CDR units to the ETS1. If internationally originated CDRs, as envisaged when the Paris Agreement was negotiated, are available for use as compliance instruments in the ETS1, the supply and impact on the functioning of the ETS1 will change significantly.

How the integration of CDRs in the ETS1 will take place will also significantly impact market functioning. It must be assumed that it will be gradual, as supply ramps up and as prices converge. It is unlikely that there will be an abrupt introduction, and the economics would be unlikely to support it.

Introducing CDRs in the ETS1, and creating a limited obligation to use CDRs, which increases over time, is something that has been discussed, but is currently an option among many. This option is not aligned with the technology neutrality principle, but it could be thought of as an initial impulse.

Another potential approach could be to gradually incorporate CDRs into the emissions trading system cap-setting process. As the cap tightens over time, it could account for the potential of both emission reductions and removals, allowing the market to determine the optimal mix. This approach would maintain the integrity of the price signal while providing long-term certainty for investments in both abatement and removal technologies.

For CDR technologies to be effectively integrated into ETS1, the carbon price should ideally reflect the true cost of emissions, including the cost of removal. Current estimates suggest that DACCS costs could fall to €100-300 per tonne of CO₂ by 2050¹⁷⁵. While these costs are currently higher than many traditional abatement measures, they are expected to decrease as technologies mature.

While CCfDs or targeted subsidies have been proposed to bridge the gap between current carbon prices and CDR costs, these out-of-market provisions could lead to parallel markets, instrument overlaps, and potentially distort the carbon price signal. If such measures are deemed necessary to accelerate CDR deployment, they should be designed as temporary, transitional tools that do not undermine the long-term functioning of the emissions trading system in the EU.

The use of CDRs in ETS1 should be guided by market principles rather than predetermined sectoral prioritization. This approach aligns with the core principle of technology neutrality for an emissions trading system and allows for the most cost-effective emissions reductions across the economy.

Sectors with the highest marginal abatement costs, such as certain heavy industries, may naturally gravitate towards CDR technologies as a cost-effective compliance option. Similarly, sectors with greater financial means might be better positioned to invest in and utilize CDR technologies. Sectors with hard-to-abate residual emissions could also find CDR technologies particularly valuable. However, rather than mandating which sectors should benefit from CDRs, the emissions trading system in the EU should provide a framework where all sectors can access these technologies based on their individual circumstances and the

¹⁷⁵ <https://www.iea.org/events/direct-air-capture-a-key-technology-for-net-zero>

prevailing carbon price. This market-driven approach ensures that CDRs are used where they provide the greatest economic benefit and contribute most effectively to overall emissions reduction goals.

The inclusion of CDRs in the ETS1 has the potential to enhance its effectiveness as a climate policy tool and to bring liquidity. By adhering to the principles of market efficiency, competitiveness, and technology neutrality, an emissions trading system that includes CDRs can create a framework that encourages both emission reductions and the development of removal technologies.

4.6. Discussion

There are some potential pros of integrating CDRs into the ETS1.

Internationally, it could give the added credibility and stability of the emissions trading system in the EU to CDR deployment and drive investment in CDR technologies, positioning the EU as a leader in this field and facilitating global decarbonisation efforts in line with the Paris Agreement. CDR could also enhance the credibility, operability, and flexibility of the system by increasing market liquidity, reducing compliance costs for operators, and fostering competition among CDR technologies. While challenges remain, they should be viewed as opportunities to improve the emissions trading system in the EU potentially expanding its benefits beyond its current scope.

The integration of negative emissions technologies into the ETS1 framework raises several critical points for consideration:

- **Methodological challenges:** There is currently no internationally approved methodology for carbon removals. Efforts under the UNFCCC through Article 6 of the Paris agreement have so far not been successful. Developing robust MRV protocols will be essential to ensuring the integrity, credibility and trust in CDR.
- **Mitigation efforts:** One concern that has been expressed is that the emergence of CDR as a solution to meeting obligations within the emissions trading system in the EU, and decarbonization objectives in general, is the prioritization of CDR over mitigation, which is the stated objective of the EU. This is a valid concern but one that needs to be examined in the context of the root document in combating climate change, the UN Framework Convention on Climate Change, which refers in its Article 2 to "concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". Without doubt, the main objective is to achieve net zero emissions - how that is achieved, and the timing of different measures and technologies, should only be guided by the most efficient approach, in such a way as to minimize overall societal costs. That was the case in the US SO₂ market which served as an inspiration for ETS1, where while the real solution, the installation of scrubbers was in the process of being put in place, it was preceded by the use of low SO₂ coal from the Western US. Whether CDRs are a permanent solution or provide the time for developing and implementing new technologies is something that obligated parties should decide, as long as they meet their environmental obligations. Otherwise, the clear signal is that there is no trust in the market economy.
- **Technology development:** While CDR technologies – whose importance to the survival of EU industry is a consideration that has to be heavily weighted - have demonstrated effectiveness at

various scales, their full-scale deployment within the ETS1 depends on continued innovation and the establishment of reliable methodologies and scalable technologies.

- **Economic feasibility:** High costs remain a significant barrier to widespread implementation. The principle of cost-effectiveness, emphasized in the most recent EU ETS Directive underlines that the inclusion of negative emissions must be economically viable. The expanded Innovation Fund could play a crucial role in supporting the development and deployment of CDR technologies, ensuring their competitiveness within the market. However, in a market economy, as opposed to a centrally planned economy, this should not be a matter for the regulator to decide - it is a matter for the management and asset owners to decide what tools and approaches are best to meet targets set by the government.
- **Use of CDR-linked instruments:** While CDR technologies offer promising solutions for emissions reduction, the use of CDR-linked compliance instruments in ETS1 is a matter under discussion. Some see CDR-linked instruments as available only to hard-to-abate sectors, for a variety of reasons. It is difficult to justify in the context of an emissions trading system, an instrument presented and defended as technologically neutral by definition, for the regulator to put such restrictions and decide on asset allocation. This, in our view, is incompatible with a market-driven economy.
- **Timing:** The timing of this integration is crucial. A well-timed introduction is essential before market liquidity diminishes due to the gradual reduction of allowances to zero. Early integration would help avoid disruptions in market functioning and ensure a balanced supply and demand as the EU approaches its climate neutrality goals.
- **International dimension:** Since the EU's climate targets are part of a global commitment under the Paris Agreement, achieving these goals solely through domestic actions is insufficient. International cooperation is essential.
- **Governance:** The complexity of integrating CDRs may require new approaches, including governance. There is growing support for the creation of a European Central Carbon Bank (ECCB) or a similar mandate within EU institutions¹⁷⁶ - the exact institutional arrangements should not detract from the functions that are needed, which should be the main focus. This mandate could ensure liquidity and price stability in the ETS1 market, manage carbon removals, including those from other markets, and address "intertemporal flexibility" by borrowing emissions from future periods, compensated by future removals. The precise and final task or mandate of a CCB could in turn impact the functioning of the emissions trading system in the EU.
- **Public acceptance:** CDR will face a problem of public acceptance, which has a number of aspects. One is related to the safety of the technology, especially as it relates to the storage and the impact of storing what is deemed a pollutant underground, especially from NIMBY syndrome. The second one is related to the environmental credentials of the use of the technology, especially with respect to the permanence of the storage. That is why technology-based removals, which are deemed more permanent, are the ones that will have priority for deployment. Last but not least is the success of the environmental community in portraying CDR as somehow immoral and less than pure, when compared to mitigation. If CDR delays mitigation that is seen as bad. Finally, in the same vein, another aspect that has been successfully inserted in the public image is the negative associated with using CDR for anything less than what are called residual or hard-to-abate emissions. This public perception will be difficult to address – but not impossible.

176 Sultani, D., Osorio, S., Günther, C., Pahle, M., Sievert, K., Schmidt, T., ... & Edenhofer, O. (2024). Sequencing Carbon Dioxide Removal into the EU ETS.

- **Market impacts:** While integrating CDRs into ETS1 may affect allowance prices and compliance costs, it will also drive technological development and market liquidity.

Recommendations

ERCST sees CDR in ETS1 as a solution that warrants exploration and requires a legislative and regulatory framework provided by the regulator. The technical feasibility and commercial viability of CDR are aspects that will ultimately be determined by its users. There is no apparent reason to delay integrating CDR into the current (and future) emissions trading system in the EU. Implementation should be gradual, with parallel efforts to enhance CDR's commercial viability through CCfDs. Two equally viable scenarios emerge: i) introduce CDR as a crediting mechanism; ii) incorporate CDR installations into ETS1 coverage while issuing CSU for sequestered carbon. The legislative process need not wait until 2026. If CDR proves unviable at scale, either commercially or technologically, this will become evident, and appropriate measures can be taken accordingly.

5. Geographical expansion

The geographical expansion of the EU emissions trading coverage to new countries could be considered as evolutionary rather than revolutionary. There are precedents for the geographical expansion of the emissions trading system in the EU since its creation. In 2008, the ETS1 was expanded to EFTA countries, including Norway, Liechtenstein, and Iceland. Croatia also joined the ETS1 in 2013, the same year it became an EU member. Croatian aircraft operators joined the system one year later. Potential geographical expansion of the emissions trading system in the EU will likely follow these examples. Currently, there are ongoing discussions to expand ETS1 in the EU candidate countries of the Western Balkans and Ukraine. The case of Ukraine is analyzed in detail in this chapter due to its potential impact on the emissions trading system in the EU.

5.1. Current status

Typically, the geographical expansion of the ETS1 has been the outcome of the accession of a new MS into the Union. However, historically this has not always been the case as EFTA countries are part of the ETS1, while they are not part of the EU. Regardless of whether the ETS1 is geographically expanded to include a new EU Member State or a non-EU Member State, the EU requires the development of a robust system of MRV before integration in ETS1.

Currently, there are nine countries that have candidate member status, making them in the process of joining the EU, and potentially the emission trading system in the EU: Six of them—Montenegro, Serbia, Albania, North Macedonia, Moldova, and Ukraine—currently in the membership negotiation stage.

Carbon market developments in these countries vary. Albania, Montenegro, North Macedonia, Serbia, Moldova, and Ukraine¹⁷⁷ have all adopted MRV legislation for GHG emissions, with Montenegro being a step ahead having introduced a national emissions trading system in 2020. Türkiye is also developing his own carbon market while negotiations to join the EU have been at a standstill since June 2018¹⁷⁸.

Falling within the scope of this report is the potential expansion of the emissions trading system in the EU to Montenegro and Ukraine. Montenegro is in the most advanced stage of accession, with a political goal to become the 28th¹⁷⁹. Montenegro has a total number of three installations, with a total of 3.4 MtCO₂eq.¹⁸⁰. This renders its potential impact minimal. However, given its advanced stage in the development of a national emissions trading system framework, it is still useful to analyse and draw parallels.

Ukraine has no official target date, however, some political¹⁸¹ and expert¹⁸² proposals suggest a 2030 target. Ukraine's path and timeframe towards accession are highly politically sensitive. This report will not engage in such a debate and will not take a position on the timeline for Ukraine's accession. However, without making assumptions on the potential order of candidate countries joining the EU, ERCST believes that the expansion of the emissions trading system in the EU to Ukraine merits evaluation in light of:

- The sheer size of Ukrainian industry and approx. 327.3 MtCO₂eq¹⁸³ of total national GHG Emissions (excl. LULUCF, 2021)¹⁸⁴ and 1300 installations estimated in the pre-war period.
- Proposed target dates for the next enlargement as early as 2030¹⁸⁵.

5.1.1. Montenegro

In February 2020, Montenegro introduced a cap-and-trade scheme¹⁸⁶ with a minimum price set at EUR 24. The cap was set to decrease by 1.5% annually until 2030, according to Montenegro's first NDC. Montenegro has three installations, of which only one is currently operational (as of 2023). Free emissions allowances were allocated to three key plants: the Pljevlja coal plant, the KAP aluminium plant, and the Tosçelik steel mill.

The following three issues were identified:

1. Free allowances for KAP and Tosçelik were based on outdated data from 2005-2008 emission levels, which were 2-3 times higher than those in 2020-2021. The European Commission Decision allowed 2005-2008 as the reference years, but it required the use of new data if production levels changed significantly. This requirement from the European Commission to update the production data determining free allocation was ignored by Montenegro authorities.
2. Credits were allocated to the Pljevlja plant, whilst it was offline for a modernization project.

177 The World Bank (2024) '[Western Balkans: Regular Economic Report](#)'

178 [Council of the European Union](#) (2024), January 11.

179 European Economic and Social Committee (2024) '[EU-Montenegro Joint Consultative Committee: Montenegro advancing on EU accession path](#)'.

180 International Carbon Action Partnership (ICAP). (2022). [Montenegro - ETS](#).

181 Politico (2023) '[EU could be ready to expand by 2030, European Council president says](#)'.

182 [Report of the Franco-German Working Group on the EU Institutional Reform](#) (2023)

183 Ukraine. (2023) [Ukraine 2023 National Inventory Report \(NIR\)](#)

184 International Carbon Action Partnership (ICAP). (2022). [Ukraine - ETS](#).

185 Politico (2023) '[EU could be ready to expand by 2030, European Council president says](#)'.

186 Reuters (2020) '[Montenegro introduces cap and trade scheme for major CO2 emitters](#)'.

3. Free credits were allocated to KAP whilst the plant was undergoing bankruptcy proceedings since 2013¹⁸⁷.

All three cases pose a risk of accumulating surplus credits, such that in effect the objectives of an emissions trading system will be undermined. Surplus credits lead to both static and dynamic inefficiencies as the cap on emissions is set at a level which is not consistent with the realistic levels of emissions.

The emissions trading system in Montenegro exposed the potential implications of including installations with unpredictable financial health, limited operational capacity and outdated baseline years for free allowances. Although the Montenegro example is not comparable in size to Ukraine, parallels can be drawn, and lessons can be learnt about the potential impact of the expansion of the emissions trading system in the EU to Ukraine.

5.1.2. Ukraine

Policy Status

In 2011 Ukraine introduced a carbon tax with a low rate of approximately 0.8 EUR/tCO₂. Its dependence on self-regulation increased the risk of tax avoidance.

Ukraine adopted an MRV Law in 2021¹⁸⁸ that established a national MRV system compatible with the MRV system in the EU. Due to the war, the MRV system has not functioned as intended, reporting is not mandatory, and MRV reporting compliance is limited. Comprehensive carbon emissions data is lacking as submissions for the year 2021, were to be submitted in April 2022, but this did not occur. Current Ukrainian MRV covers only 11 activity types, compared to 30¹⁸⁹ in the ETS¹⁹⁰. A minimum of three years of uninterrupted MRV operation is necessary to gather sufficient data to support a Ukrainian emissions trading system.

A national emissions trading legislation is under development as required by the EU-Ukraine Association Agreement, which came into force in 2017. The Ukrainian business community, through organizations like the European Business Association, supports the establishment of an emissions trading system¹⁹¹. The Ukrainian government is considering a two-stage approach to the domestic emissions trading system— first to develop the ETS Road Map and then start developing national legislation on emissions trading. The ETS Roadmap is expected by the end of 2024.

Data

The data underpinning the development of an emissions trading system date from before the war, and any assumptions or conclusions drawn from these numbers cannot necessarily be extrapolated to the present situation in Ukraine.

Caution should be used, as the content does not account for changes, events, or conditions that have transpired since the date of this report. Under the current war environment, obtaining emission data from Ukrainian installations is a potential challenge, thus an emissions trading system in Ukraine could need to

187 Bankwatch Network (2022) ‘[The cautionary tale of Montenegro’s emission trading scheme](#)’.

188 "Law on Monitoring, Reporting, and Verification of GHG Emissions"

189 European Commission (2022) , EU Union Registry classification accounts for 39 activities:

https://climate.ec.europa.eu/document/download/7e7268a1-fa21-4f73-b368-6e9571262e2f_en?filename=compliance_2022_code_en.xlsx

190 Annex II of the EU ETS Directive determines "ETS2" activities. ETS2 activities are to be covered by ETS starting in 2027 at the soonest.

191 [EBI \(2023\)](#). Concept of Building and Emission Trading System in Ukraine. Towards sustainable development and integration into the EU.

rely on national emission inventories. This is a substantial difference from the ETS1 in the EU, which is based on the annual monitoring of emissions.

An initial assessment in 2021 estimated that Ukraine had approximately 1,300 installations and currently only 491 are registered. Around 200 monitoring plans have been submitted, with 212 for 2021, 134 for 2022, and 54 for 2023. When Ukraine joins the European Union, it will likely be required to participate in the current ETS1 for industry and energy, the upcoming ETS2 for transport and buildings and any other potentially existing emissions trading system in the EU at the time of accession (ex. ETSAg).

As per the annual National Inventory Report (NIR), the total emissions in Ukraine amounted to 327.3 MtCO₂eq in 2021 with 87% in the Energy Sector (total fuel combustion in the economy) Considering that around 40% of the energy sector will be covered by ETS1, the emissions trading system will account for around 90-100 MtCO₂eq, with 70% covering fuel combustion and 30% industry.

Data from Ukraine is insufficient to establish a cap on installation levels and the European Commission provided recommendations not to establish a cap at the beginning of the domestic emissions trading system in Ukraine. An alternative approach would be to set a cap based on the NIR, where a cap could be set on the estimated level of cap coverage of emissions of approximately 90-100 MtCO₂eq.

There are eleven sectors that could be covered by an emissions trading system and that are covered by national MRV during the pilot and first phase, and also in the expanded coverage in the second phase. These eleven sectors include:

- Combustion of fuels in installations with a total rated thermal output of more than 20 MW.
- Oil processing
- Production of coke
- Firing or sintering, including agglomeration of metal ore
- Production of iron or steel,
- Production or processing of iron-containing alloys,
- Production of cement clinker in rotary kilns
- Production of lime or calcination of dolomite or magnesite in furnaces
- Production of nitric acid
- Production of ammonia
- Production of glass, including fiberglass.

5.2. Timeline

The timeline of Ukraine joining the EU is political and beyond the scope of this report. As discussed previously, there have been political¹⁹² and expert¹⁹³ calls for a 2030 target. Ukraine aims to adopt the Emissions Trading System Road Map by the end of 2024 and the legislative package during 2025-2026,

192 Politico (2023) ‘[EU could be ready to expand by 2030, European Council president says](#)’.

193 Report of the Franco-German Working Group on the EU Institutional Reform (2023) <https://institutdelors.eu/en/publications/sailing-on-high-seas-reforming-and-enlarging-the-eu-for-the-21st-century/>

with the view of piloting a full or partial emissions trading system starting in 2026, or after the end of the war.

5.3. Scenarios

Broadly speaking, there are two national policy pathways towards Ukraine's eventual inclusion within the emissions trading system in the EU. One pathway involves having a fully-fledged national emissions trading system that either functions independently or within a broader region, and which allows for seamless integration into the emissions trading system within the EU.

The second pathway involves solidifying and perfecting the MRV system as the first step. The next would be to establish a national emissions trading market as a pilot phase. The last and final step would be for a full Ukrainian accession that allows for the direct transfer of administrative and legislative capacity from the EU to Ukraine. Both scenarios are discussed below in more detail:

Scenario 1 – National emissions trading system outside the emissions trading system in the EU

Ukraine could prioritize the development of a national emissions trading system that aligns with the principles of the emissions trading system in the EU while being tailored to Ukraine's unique economic conditions. This approach would involve building the emissions trading system framework based on the existing MRV system and gradually expanding it to cover more sectors, eventually reaching a level comparable to the emissions trading system in the EU. No linking with the emissions trading system in the EU is envisaged under this scenario.

Establishing a national emissions trading system would allow Ukraine to develop its institutional capacities and regulatory frameworks independently, providing the flexibility to address its specific economic and environmental challenges. However, this approach carries significant obstacles. The lack of reliable and transparent MRV data, coupled with weak administrative capacity and infrastructure gaps, could hinder the effective implementation of an emissions trading system. In addition, the lack of maturity of carbon markets in Ukraine, limited verification capacity, and the ongoing war further complicate the situation. Disagreements on roles and ambition levels, alongside security concerns affecting key infrastructure, exacerbate these challenges. As no direct link to the emissions trading system in the EU is envisaged in this scenario, we can expect no impact on the European carbon market.

Scenario 2 - Setting up an MRV system and scaling it up to an EU standard aiming a future expansion to the emissions trading system in the EU

The second route involves giving priority to the current MRV system. Where the focus is on improving it from its current status and scaling it up to EU standards by also aligning the sectoral coverage. This approach may also target a scenario where Ukraine's EU accession occurs before the establishment of a national emissions trading system. This scenario entails the potential recognition of EU verifiers by the Ukrainian MRV system aiming at a potential integration into the emissions trading system in the EU.

The re-launching of an MRV system as mandatory legislation is part of the Ukraine Facility. With proper implementation, a fully operational MRV system could be achieved in approximately six years, with

valuable data potentially becoming available after just three years. A sophisticated MRV system could build up market confidence, build up the system, and establish a solid market foundation.

The establishment of a fully-fledged national emissions trading system could overload the already stretched capacity of the Ukrainian administration. Accession to the EU might offer the stability needed to immediately transfer and install the emissions trading system institutional capacity in a Ukrainian system.

By the time a fully operational MRV system is in place, Ukraine could be ready to join the EU. The impact of this scenario on the emissions trading system in the EU is difficult to predict. However, due to the considerable size and the large number of installations in a Ukrainian emissions trading system (see Chapter 5.1), the impact on the ETSs market functioning will not be negligible. The impact could be even more notable if there is a decision to include Agriculture in the emissions trading system in the EU, considering that Agriculture in Ukraine currently represents 14% of Ukraine's GHG emissions.

Scenario 3 – Linking with the emissions trading system in the EU

A third potential option could be to establish a linking mechanism between a national Ukrainian emissions trading system and the EU's emissions trading system, while no geographical expansion takes place. Instead, both emissions trading systems would be linked following as was the case for Switzerland (see Chapter 6 on international expansion). In this scenario, both Ukrainian and EU authorities will be required to negotiate bilateral agreements. However, this scenario looks unlikely. A linking agreement can take about 5-6 years, in a best-case scenario, while Ukraine would need to have an emissions trading system which is fully compatible with the emissions trading system in the EU.

The benefits of this scenario are that the Ukrainian installations will not be directly integrated into the carbon market and the impact on the emissions trading system in the EU would be less significant. Linking could also be a preliminary step to full integration in the latter, thus minimizing the potential impact of Ukraine joining the emissions trading system in the EU, compared to the second scenario of full integration.

5.4. Impact on supply/demand balance

Any assessment of the future impact of Ukraine potentially joining the emissions trading system in the EU is heavily reliant on significant assumptions. The main assumption relates to the timeframe of a Ukrainian post-war recovery and the date of accession. Different scenarios for Ukraine's post-war industrial base and the speed of the reconstruction process could lead to starkly different realities.

Option - Quick) recovery:

Under a quick recovery scenario, where a larger share of the metallurgy sector remains intact or is repaired under similar parameters as pre-war, the rapid reconstruction process creates significant demand for cement, steel and other energy-intensive products, and electricity demand rebounds faster. This is a business-as-usual scenario as a reconstructed Ukraine has a GHG profile similar to the pre-war one.

Option - Green Recovery:

In a green recovery scenario, the focus is shifted to rebuilding in a green way, for the long term, with a goal of becoming net zero. The success of this scenario will depend on solid support for the adoption of low-carbon technologies.

Supply

In the case of Ukraine's inclusion in the emissions trading system in the EU, the EU market would need to account for the significant size of Ukrainian sectors by increasing the total supply of EUAs. This will involve recalculating the cap allowing for the inclusion of Ukrainian sectors. Depending on the recovery timeline, this inclusion could overlap with the existing LRF-driven cap decline, complicating the alignment. However, the final supply will heavily depend on the sectoral data from post-war emissions and the pace of recovery.

Demand

- Marginal Abatement Cost (MAC)

The analysis of demand and MAC makes more sense in a scenario in which Ukraine joins the emissions trading system in the EU. As outlined in the previous section, one could expect a stronger impact on the carbon market. Assuming that Ukraine joins the emissions trading system in the EU, the final results and impact on the EU carbon market will depend on how the Ukrainian economy recovers (see BAU and Green recovery options).

The demand for carbon allowances and MAC in post-war Ukraine is uncertain. If the MAC in the Ukrainian emissions trading system sectors is lower than the MAC in the emission trading system in the EU, there may be a flow of EUAs towards the EU. If the reconstruction is rapid and green, then we could expect higher MAC in Ukraine and the flows would reverse.

- Size of GHG emissions and number of installations

Ukraine's estimated number of installations to be covered by an emissions trading system in Ukraine could reach 1,300 installations, while the potential GHG emissions for the emissions traded sectors could reach 90-100 MtCO₂eq in 2021. This means that if Ukraine's emissions remain at the same level when joining the emissions trading system in the EU, it will be in the top four GHG emitters, joining Germany, Poland and Italy. The geographical expansion of Ukraine will not be negligible and based on GHG size, could have a direct impact on the European carbon market.

5.5. Impact on market functioning

Geographical expansion could be a positive factor for market functioning indicators as is the case with sectoral expansions into sectors not currently covered by ETS1 and ETS2. Ukrainian accession would bring new participants into the market and with it, participation in auctions. This would likely increase trading activity in the carbon market. However, for a better assessment of the potential impact on ETS functioning some issues need to be examined. One issue is the extent to which the operators of Ukrainian installations are experienced in trading and commodity risk management.

While we can assume Ukrainian compliance and financial entities have previous expertise in trading in commodity energy markets, operating in the carbon market will be a new activity. If Ukrainian joins the emissions trading system in the EU, all EU participants should take an active role in trading, and this may not be the case for the new participants from Ukraine.

In addition, European companies covered by an emission trading system in the EU may also have installations in Ukraine territory and therefore they can provide trading expertise and knowledge to Ukrainian installations. We should not expect a strong negative impact on carbon market functioning in the EU.

- Short-term impact

There will be no short-term impact on EU market functioning, as the emerging emissions trading system in Ukraine will not be linked to the emissions trading system in the EU. Only after the accession, Ukrainian companies will be regulated by the emissions trading system in the EU. This will also make Ukrainian installations eligible for financial assistance based on the auction of allowances (Innovation Fund, Modernization Fund and Climate Justice Fund), potentially leading to major disruption and relevant measures ought to be considered.

- Volume of emissions and number of compliance entities

One advantage of an emissions trading system is that it provides quantity certainty regarding emissions and targets. However, given the current situation in Ukraine, the calculation of emissions is not yet certain. Some assumptions could be made considering the significant volume of emissions of Ukraine when compared to the EU. While the emissions trading system in the EU is larger in size and will be the driver of the carbon market, the significant size of the Ukrainian economy and its emissions cannot be overlooked.

A particularly complex issue is the inclusion of agriculture in an emissions trading system, which cannot be fully ascertained at this time. If agriculture is integrated into the emissions trading system in the EU by the time Ukraine joins, this could introduce additional challenges, given the sector's significance in Ukraine's economy and the difficulties associated with measuring and reducing emissions in this area.

- Impact on price discovery

Inherently within an emission trading system scheme, the price is set by the market forces as a function of abatement costs, the demand for carbon-intensive goods, economic health, and technological progress. Although price uncertainty is fundamental for the adequate functioning of a carbon market, some level of price visibility and predictability is necessary in order to trigger investments.

Investments can be planned, risks can be assessed and hedged, and the market players can gauge future performance. While not desirable in a normal market situation, given the circumstances, a temporary price corridor could be considered set for Ukraine during a transitional phase, converging to the prices in the emissions trading system in the EU to avoid potential market disruptions.

5.6. Discussion

Given the complexity of Ukraine's potential integration into the emissions trading system in the EU, any analysis of the impact will rely heavily on assumptions. The main factors that will need to be examined

include the availability and reliability of data, the speed and nature of Ukraine's post-war recovery, and the specific national policy pathways Ukraine may choose for developing its own emission trading system.

There are potential pros for the emissions trading system in the EU in case of a geographical expansion to Ukraine:

1. The integration of Ukraine into the emissions trading system in the EU could significantly enhance the market liquidity. Ukraine's large and emissions-intensive economy, particularly in sectors like steel, presents a substantial contribution to the depth and liquidity of an emissions trading system in the EU.
2. The increased role of the emissions trading system in the EU as an international example for implementing climate policy. The integration of Ukraine into the emissions trading system in the EU will send a strong political message regarding the European model. It will provide a message of credibility that the emissions trading system in the EU is working and is capable of exporting its model outside the EU.
3. Ukraine's integration could provide a significant market for the export of green technologies already developed by EU installations. Ukraine needs to modernize its post-war industrial base which presents an ideal opportunity for EU companies to supply the necessary technology and expertise to help Ukraine transition to cleaner, more efficient production processes. This would support both economic growth in the EU and Ukraine's decarbonization efforts.

There are potential cons for the emission trading system in the EU that should be considered for Ukraine joining the emissions trading system in the EU:

1. The lack of accurate data for Ukraine's sectors presents a major obstacle to integration into the emissions trading system in the EU. Even if such data were available, the volatile situation in Ukraine makes it subject to rapid changes, complicating the establishment of a reliable emissions cap.
2. Developing a national emissions trading system that aligns with EU principles while addressing Ukraine's unique market conditions is essential. However, this approach carries risks, particularly given the immature carbon financial market, weak administrative capacity, and ongoing conflict. There is a risk of including installations with unpredictable financial health and operational capacity, which could lead to market distortions and undermine the effectiveness of the emissions trading system in the EU if the process is done in a rush.
3. A particularly complex issue is the inclusion of agriculture in an emissions trading system in the EU, which has not yet been assessed. If agriculture is integrated into an emissions trading system in the EU by the time Ukraine joins, this could introduce additional challenges, given the sector's significance in Ukraine's economy and the difficulties associated with measuring and reducing emissions in this area.
4. Ukrainian stakeholders argue that due to the geopolitical situation, the allocation of allowances to industries in occupied regions, could result in a surplus of allowances and destabilize the market.

Allocating free allocation to Ukraine installations while EU sectors experience a faster free allocation phase-out, could undermine the level playing field in the European carbon market. Consideration should be given to this aspect before deciding on final integration.

5. The uncertain economic situation of the Ukrainian economy. The uncertainty surrounding the future state of Ukraine's energy production plants, metallurgic industries, and other key sectors adds another layer of complexity. The price uncertainty in this context is unprecedented, making it difficult for market participants to gauge future performance or plan investments.
6. The social impacts on participants in the emissions trading system in the EU, as a result of the geographical expansion, must also be considered. What the impact of Ukrainian integration can be on the economy of the EU is something that is currently not well understood. Similarly, the social impact on neighbouring countries should also be carefully assessed, as cross-border economic and labour market effects could further compound these issues. Strategies for addressing these impacts include engagement with affected communities, as well as leveraging EU funds such as the Social Climate Fund and the Innovation Fund if Ukraine is expanded to the EU.

Recommendations

ERCST considers the geographical expansion of the emissions trading system in the EU to new jurisdictions and more specifically the potential inclusion of Ukraine, as potentially beneficial, with unknowns that need to be managed. This includes increased market liquidity, international alignment with EU climate policies, and opportunities for exporting green technologies. However, the challenges outlined above are significant and should not be overlooked. Key concerns include the lack of data, the inexperience with carbon markets, the repercussions of agriculture, the geopolitical uncertainty, the post-war economic conditions and social impacts. The impact on the emissions trading system in the EU will depend heavily on how these factors play out.

6. International linking and use of international credits

6.1. International linking of ETSs

6.1.1. Current status

In this chapter we examine some of the possible candidates for linking with the emissions trading system in the EU and the issues/KPIs that are relevant in a linking discussion. The EU has been a pioneer in international carbon markets, with the early linking Directive in 2003, and introduction of international credits in phase 2, starting in 2008, which led to a significant inflow of international credits from the CDM and JI mechanisms under the Kyoto Protocol, as well as Assigned Amount Units (AAUs) under Art 17 of

the Kyoto Protocol. This inflow was blamed, some will say unfairly, for the price collapse in ETS1 experienced before 2020, while at least part of the blame must be attributed to design deficiencies in ETS1.

With the Paris Agreement now in force, the EU expressing high level of ambition, and the design deficiencies corrected, the EU has made it clear that it does not intend to use credits emanating from Art 6 of the Paris Agreement, be they under Art 6.2 or Art 6.4. The only linking provision currently provided in the ETS1 is under Art 25 of the EU ETS Directive provides for the possibility of linking with other emissions trading systems in other jurisdictions.

Article 25 of the EU ETS Directive allows for the possibility of linking the ETS1 with other emissions trading systems to facilitate international cooperation. There are no specific reasons to limit this provision to ETS1 it appears to be “by default”. The EU Climate Law is also specific in that the current targets for 2030 and 2050 need to be achieved through domestic reductions only.

Recently there has been increasing discussion of opening ETS1 to international markets, but that has been, to a large degree, focused on removals. There are provisions in Directive 2003/87/EC that require and examination by 2026 of the inclusion of removals in ETS1, but there is no reference to an international dimension.

Linking of ETS1 has to take place under Art 6 of the Paris Agreement, since any transfer of allowances between two linked emission trading systems need to be accounted under Art 6 in order to help meet the Nationally Determined Contributions (NDCs) of collaborating countries.

Article 6 under the Paris Agreement

Under Article 6 of the Paris Agreement, countries can meet their NDCs—national commitments towards the Paris Agreement objectives—through cooperative approaches, including linking their emission trading systems. This international linking allows countries to leverage the most cost-effective emission reduction opportunities globally, rather than being confined to their domestic resources.

By participating in linked emissions trading systems, countries can use emission reductions achieved in other jurisdictions to count towards their own NDCs, thus enhancing the flexibility and efficiency of climate policies. This linkage helps in achieving more ambitious emission reduction targets and fosters a global market for carbon credits, facilitating international cooperation and ensuring that countries can meet their climate commitments more effectively.

Linking emissions trading systems under Article 6 require careful accounting to ensure that emission reductions are accurately tracked and credited towards the NDCs of participating countries. This involves establishing robust MRV systems as well as accounting rules to prevent.

Proper accounting protocols are crucial to maintaining trust in international carbon.

Considerations for linking to the emissions trading system

In examining linking of an emissions trading systems in the EU to other emissions trading systems, we can list a few considerations:

- CBAM considerations: some jurisdictions are developing emissions trading systems and considering linking to address challenges associated with the costs and administrative complexity of being subject to CBAM.
- Linking is largely a political decision, driven by economic considerations. By linking, there is a significant loss in the freedom to manage the energy matrix and the economy of a country. For illustration purposes, adjustments to manage supply/demand or prices in an emissions trading system are now decisions that cannot be made independently anymore but can only be made in agreement between the two linked systems.
- Market functioning is a serious consideration. As we approach 2035 liquidity in markets and market inertia will decrease. Linking will, to some degree, alleviate these concerns.
- Size of the two linking systems will determine the complexity of the negotiations. Obviously negotiating power will rest with the dominant system, with the smaller system likely to adopt many of the other features.
- Economic ties and integration. While there are a number of emissions trading systems that could in principle link to an emissions trading system in the EU, economic and political integration are likely to play a significant factor in the reality of pursuing a linking agreement.

EU Climate Diplomacy Task Force

The European Commission launched the EU Climate Diplomacy Task Force April 2024. Exploring the pathways to linkage with other emissions trading systems would be instrumental for emissions trading systems in the EU continuation post-2040, potentially to also contributing to solving some competitiveness issues along the way.

The EU Climate Diplomacy Task Force is exploring opportunities for linking the emissions trading systems in the EU with other national or regional emissions trading systems. This exploration involves assessing potential partners, evaluating the compatibility of different emissions trading systems designs, and negotiating the terms of linkage. Such international cooperation can enhance the efficiency and effectiveness of the emissions trading systems in the EU by expanding the carbon market, increasing liquidity, and enabling broader trading opportunities. It also helps in addressing competitiveness issues by providing more cost-effective emission reduction options and creating a more integrated global carbon market.

6.1.1. Linking of EU ETS

Existing ETS1 linkages

The EU ETS1-ETSSwitzerland is the world's first international treaty to link emissions trading systems. The linking agreement¹⁹⁴ entered into force in January 2020. This linkage enables mutual recognition of emission allowances, including the exchange of emission allowances, accounting rules and auctioning. It facilitates a broader and more integrated carbon market between the EU and Switzerland.

¹⁹⁴ EU (L322/3). Agreement between the European Union and the Swiss Confederation on the linking of their greenhouse gas emissions trading systems. 7 December 2017. Current consolidated version from 09-12-2022 available at: <https://eur-lex.europa.eu/legal-content/EN/TEXT/?uri=CELEX%3A02017A1207%2801%29-20221209>

The main points of contention were the requirement to include aviation in the ETSSwitzerland and the establishment of a direct link between both emissions trading systems registries to transfer allowances¹⁹⁵. In the end, ETSSwitzerland mirrors the ETS1 approach to activities and GHGs coverage, cap, and allocation of EUAs.

Around 100 installation operators and almost 200 aircraft operators participate in the ETSSwitzerland, with emissions totalling approximately 5 and 1 Mt CO₂eq per year, respectively¹⁹⁶. Analysis¹⁹⁷ show that Swiss entities are far more likely to use EUAs generated in the ETS1 (67% of allowances surrendered by airlines in Switzerland were generated in the EU) than EU entities use allowances generated in the ETSSwitzerland (6% of EUA allowances surrendered by Swiss stationary installations in 2022).

Potential linkages for an emissions trading system in the EU

There is currently no decision or initiative of to work towards any new linking for the emissions trading system in the EU. The discussion regarding potential linkages is pure speculation at this stage.

When discussing potential linkages of emissions trading systems to an EU emissions trading system, potential targets can be divided into two groups. A first group, where emissions trading systems are technically compatible to an emission trading system in the EU (ambition, coverage, market design, etc.) and where linkage decision are mainly a political decision. This is the case of the ETSUK.

A second group comprises recently created emissions trading systems, or some that are about to be put in place. In these cases, trading systems still need to be built before consideration can be given to the compatibility of linking. In this case, in addition to political will, technical aspects are a key component of any linkage negotiation and agreement. These are key before the signature of a final linkage agreement.

- United Kingdom

Following Brexit, the UK established in January 2021 its own emissions trading system. While the ETSUK is currently separate from the ETS 1 and ETS2, there are ongoing discussions regarding a potential future discussion. For political reasons there is no expectation of a political breakthrough anytime soon.

The ETSUK covers around 1 000 stationary installations and around 400 aircraft operators¹⁹⁸. Similarly to ETS1, ETSUK currently applies to power generation, energy intensive sectors and aviation (intra UK flights and flights from UK to EEA and Switzerland). The ETSUK aims to expand the scope of the system to include domestic maritime transport by 2026. The UK regulatory authority opened consultations in summer 2024 on the expansion of its trading system to waste incineration starting in 2026, and to the integration of GHGs removals¹⁹⁹.

In 2023, total UK territorial emissions were estimated at 384 MtCO₂eq, compared to the 1 115 Mt CO₂e experienced for the same year in ETS1 (stationary installations and aviation)²⁰⁰.

¹⁹⁵ Report from the European Commission to the European Parliament and the Council on the Functioning of the European Carbon Market in 2020 pursuant to Articles 10(5) and 21(2) of Directive 2003/87/EC. COM(2021) 962 final

¹⁹⁶ [Federal Office for the Environment \(2024\)](#) Linking the Swiss and EU emissions trading systems.

¹⁹⁷ 2024 State of the EU ETS Report. Pp.9.

¹⁹⁸ [ICAP \(2024\)](#) United Kingdom factsheet.

¹⁹⁹ [UK Department for Energy Security and Net Zero, The Scottish Government, Welsh Government, Department of Agriculture, Environment and Rural Affairs \(Northern Ireland\) \(2024\)](#). Proposals to expand the UK Emissions Trading Scheme. Press release. May 23rd.

²⁰⁰ [EEA \(2024\)](#) EU Emissions Trading System (ETS) data viewer.

The EU-UK Trade and Cooperation Agreement²⁰¹ foresees cooperation between the EU and the UK on carbon pricing. While there are small differences, the two emissions trading systems are almost identical. Linking these emissions trading systems would lead to carbon price convergence and lower decarbonisation cost.

However, the longer the lack of agreement persists, the higher the likelihood that either emissions trading systems will change their design and complicate any linking perspectives. Since ETSUK and ETS1 prices diverged during 2023 and 2024²⁰², and in light of the recent reforms, a linkage is now perceived as less likely. Linking the emissions trading system in the EU to the ETSUK is perceived positively by the EU and UK business communities²⁰³.

- Western Balkans and Turkey

In 2020, Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia endorsed the Sofia Declaration and committed to align with the EU Green Deal, including the implementation of carbon pricing²⁰⁴. The discussion about carbon pricing in the region took centre stage in the Energy Community²⁰⁵.

The adoption of EU CBAM and the interest of these countries to join the EU has accelerated the discussion and the need to consider carbon pricing as a requirement to adopt EU Acquis. While the main priority will be joining the EU and then ETS1 the fact a potential linkage is seen as a second-best option.

Turkey is outside this group but should not be forgotten. A ETSTürkiye is still under development while Turkish authorities announced that a pilot system may be put in place by the end of this year, or post 2026 at the latest.

The ETSTürkiye will be smaller in coverage than the emissions trading system in the EU and will be run by the national electricity and natural gas market operator. The system will cover industry, energy, and civil aviation sectors. The ETSTürkiye is expected to cover around 130 installations in energy and industry sectors and to cover around 564.4 MtCO₂, based on 2021 data²⁰⁶.

Possible linkages to an emissions trading system in the EU

A third group of possible jurisdictions linking to the emissions trading system in the EU are those that, just as the ETS1, have a solid emissions trading system in place for a number of years. In this case, economic interactions with the EU are not a determinant factor as in previous groups. The interest to link is the carbon policy experience of this jurisdiction and the achievement of decarbonisation goals. California-Quebec emissions trading system, New Zealand emissions trading system, and South Korean emissions trading system are good examples of markets worldwide that base their decarbonisation policy on carbon pricing. They could become serious candidates to link an emissions trading system in the EU, if the political will and technical expertise are in place.

²⁰¹ [European Commission \(2021\)](#) The EU-UK Trade and Cooperation Agreement.

²⁰² See [2024 State of the EU ETS Report](#), Figure 3.2: EU ETS and ETSUK allowance price evolution

²⁰³ [Eurelectric \(2021\)](#) Official letter to EC by coalition of EU and UK based trade associations highlighting the importance of linking the EU and ETSUK ahead of COP 26

²⁰⁴ [Hafner, A; Santikarn, M. \(2023\)](#) Challenges and opportunities for carbon pricing in the Western Balkan. June 5th.

²⁰⁵ [Energy Community \(2023\)](#) Report on the Implementation of the Declaration on Energy Security and Green Transition in the Western Balkans. October.

²⁰⁶ [ICAP \(2024\)](#) Turkish Emission Trading System Factsheet.

6.1.2. Timeline

The EU has expressed its desire to link to other emissions trading systems anytime, but the process to agree with Switzerland has been a long one (about 10 years). While other linkages may be done more expeditiously, it is unlikely that we will see any this decade, which then makes it increasingly questionable in general. Linking to anyone outside the EU neighbourhood (Ukraine, Turkey, Western Balkans) is seen as a challenging undertaking, in the short to midterm.

6.1.3. Impact on supply/demand balance

Almost all the emissions trading systems in jurisdictions that can realistically be seen as candidates to linking do not currently exist, therefore the discussion of the supply/demand balance is strictly theoretical.

The only emissions trading system that currently exists, and is operational, is the ETSUK and there is enough knowledge and capacity in designing a linking to ensure that it does not cause imbalances. UKA prices are lower, and it would seem unlikely that the EU would link if the conditions would lead to a significant down pressure on EUA prices.

While legislative developments in ETS1 and UK look to moving forward in parallel (so far UK has been mirroring the 2023 revision of the EU ETS Directive), the different evolution of carbon price experienced by these emissions trading systems (especially after January 2023 and first quarter of 2024, with a price difference of 43%²⁰⁷), could become a major impediment for consideration if both emissions trading systems wish to link the future. A temporary price correction mechanism to equalise prices could be necessary to avoid potential impacts on supply /demand balance of the linked markets.

6.1.4. Impact on market functioning

In the context of this sections, one thing that can be said is that linking is likely to add to the diversity of MACs and to increase its underlying tradable commodity. The positive aspect will be the increase in liquidity, which will become a problem in ETS1 post-2030 and especially as we approach 2040.

Some jurisdictions are more sophisticated when it comes to trading, with an existing good infrastructure and entities used to hedging risk and trading. Other less so. Turkey, as an example, has had strong economic ties to the EU and globally, so linking with Turkey is likely to have a positive impact on market functioning and price discovery as both covered entities and the financial sector will be not new to this environment and is also quite sophisticated.

In the case of linking UK with an emission trading system in the EU, the impact on the functioning of an emissions trading system in the EU should not be a concern. Not only UK participated in ETS1 from its inception until 2021, with a shared designed structure, but ETSUK may also be expected to evolve (at least during Phase IV) mirroring the EU legislative changes (see chapter 6.1.2). Linking the two emissions trading systems together should bring additional liquidity and increase market participation. The fact that both systems are in the process of phasing out free allocation, is also likely to increase auction participation.

In addition, it makes sense to think that an emissions trading system in the EU, which is larger in terms of the number of installations and GHG emissions, will continue to be the main market driver if a linking of these systems should take place. In the case of aviation, the fact that both emissions trading systems are

²⁰⁷ [2024 State of the EU ETS Report](#). Figure 3.2: EU ETS and ETSUK allowance price evolution.

already covering intra EEA and Swiss flights should also contribute to reducing negative impacts on market functioning.

6.1.5. Discussion

Benefits from linking.

- Towards global climate goals: the international linking of emissions trading systems will promote a more coordinated and robust approach to climate change mitigation. By linking carbon markets, countries can leverage collective efforts to achieve more substantial and cost-effective emissions reductions.
- Long-term viability of emissions trading systems: linking to other systems can enhance market efficiency, increase liquidity, and stabilize prices, contributing to more effective and widespread emissions reductions.
- Reduce abatement cost: access to new carbon markets can bring a wider supply of mitigation options and increase market liquidity.
- Address competitiveness: linking emissions trading systems can also help address competitiveness concerns by harmonizing carbon pricing across regions, thereby reducing the risk of carbon leakage and ensuring that industries face similar regulatory environments.

Barriers to linking.

- Complexity: aligning activities coverage, GHGs, ambition, carbon leakage protection instruments, compatibility, cap, etc. All of these are examples of the complexity of linking emissions trading systems. Linking may take several years of negotiations between policy makers (see Swiss-EU example), before linking can be agreed to.
- Impact on price signal, volatility, and predictability (correction mechanism), may be needed to be put in place to avoid potential disruptions in the carbon market, resulting from the linking of emissions trading systems with different levels of ambition.
- Timing: the linking with Switzerland has taken a long time. It is unlikely that other linking agreements could be worked out significantly faster. Linking is a challenge unless there are strong overall economic and governance ties.
- Technical constraints and political will: in some cases, such as linking to the UK, the barriers seem to be political rather than technical.

Recommendations

Linking emissions trading systems around the world had been the dream of those involved in climate change policy discussions since before the year 2000. It has not happened except in countries with which the EU has a strong economic and governance relationship in a broader sense, and it has taken a long time. We need to conclude that the EU should focus its efforts to linking with the UK, which has political barriers but otherwise is possible and desired by many stakeholders. The timeline is impossible to predict, it is all politics. For other countries, Turkey may present an opportunity to consider. However, Turkey will see advantages there are barriers related to price levels that will be difficult to bridge, except maybe through a temporary one-way link.

6.2. Use of international credits

6.2.1. Current status

The EU was a pioneer in international markets and introduced the EU ETS Directive in 2003, which linked the ETS1 with the crediting mechanisms under the Kyoto Protocol (KP) (Article 25): CDM (Clean Development Mechanism) and JI (Joint Implementation). For sovereign compliance with the KP, the EU Member States also used these crediting mechanisms, and in addition also used Assigned Amount Units (AAUs) under Article 17 of the KP.

Until 2020 entities covered by ETS1 could use international credits from CDM and JI towards fulfilling part of their obligations under the ETS1. The KP mechanisms have, undeservedly, a negative name in the EU and in the ETS1, being accused of being cheap and not providing the environmental integrity that the EU expected. They are seen as part of the reason that prices in ETS1 crashed.

Both these criticisms are, in our view, unfair and unwarranted and reflect overwhelmingly views that come from that section of stakeholders which are ideologically not favourable to markets in general, and international carbon markets in particular, in contradiction to science. The standards used by the KP mechanisms were the result of a legitimate and transparent international negotiation process, in which the EU was a very active participant, and which resulted in standards in which no one got all their wishes. The KP credits did contribute to a surplus of compliance instruments in ETS1, and the crash in prices, but the true problem was identified as a design flaw, the lack of supply flexibility provisions in the ETS1 design, which was later addressed through the MSR.

International markets are in the process of moving to the new market approaches under the Paris Agreement, that is, Art 6.2 and 6.4. This is currently on-going, but clearly the rulebook for Art 6.2 and 6.4 is still incomplete which is hindering their use by willing Parties.

However, it is quite clear that the EU currently is not willing to engage ETS1 at this time in international markets through Art 6.2 and 6.4. That was made abundantly clear in the provisions of the EU Climate Law which came into effect in 2021 which stated, “Regulation sets out a binding objective of climate neutrality in the Union by 2050”.

At the same time, we did see EU Commission President van der Leyen making encouraging statements at the African Carbon Week in Nairobi in 2023 which seems to point to consideration of some categories of international credits at some point in the future: “There is another solution that would unlock huge resources for climate action in Africa. That is carbon pricing and true carbon credits – and this is my second point. ... that setting a price on carbon emissions is one of the most efficient and one of the most effective tools in our hands. Because it fosters innovation by the private sector – that is crucial.”

6.2.2. Timeline

No official timeline exists at this time – but the sense is that if there is a consideration for this it would be post 2030. A number of factors would militate for such a possible timeline, including the rapidly decrease in liquidity leading to 2039, and the ETS1 operation leading to a net zero, and a net negative regime.

Another opportunity for the consideration of reintegration of international markets in the emissions trading system in the EU is that the Climate Law will have to be reopened in 2025 to address the legislated need

for the incorporation of a 2040 target. At that time one can expect that other provisions, such as a discussion of international credits, could become part of a package.

Finally, the key may be in the review of the integration or removals through a review that is mandated by the EU ETS Directive in 2026. While that review would seem to currently address only domestic removals, there will be those that will remember that Art 6 of the Paris Agreement was introduced explicitly due to the fact that it contained a global net zero target in the second half of the century, that emissions and removals were in different geographies and Art 6 was a way of linking demand and supply for removals.

However, it must be again emphasized, there is no real political engagement for a discussion on the acceptance of ITMOs in the emissions trading system in the EU.

6.2.3. Scenarios

The Paris Agreement is fundamentally different from the KP through its requirement that any first transfer and use of international transferred mitigation outcomes (ITMOs) need to also trigger corresponding adjustments. This provision may open the way to integrate international credits in ETS1, or as a matter of fact, in any emissions trading system in the EU. As we have little visibility on how the emissions trading system in the EU will relate to each other, the only indication on how would be achieved can be found in the EU Commission President's letter to the Commissioner designate for Climate, Net Zero and Clean Growth which refers to "the aim to accelerate the build-up of a Single Market for CO₂".

Scenario 1: Conversion of international credits into ETS compliance instruments

In this scenario, ITMOs under Art 6 would become compliance instruments under an emission trading system in the EU and will be transformed into EUAs. While the expectation is that there will be many among stakeholders that would argue for a visible differentiation between ITMOs and EUAs issued by the EU regulator, we see no reason to do so, as this would lead to market fragmentation. From a market functioning and price discovery point of view, it is axiomatic that fragmenting the market is never a good idea.

Since corresponding adjustments are compulsory under Art 6 of the Paris Agreement, there is no danger of double counting or damaging the Paris Agreement objectives of 1.5°C or net zero, or for that matter the EU Climate Law objectives.

Broadly, this would be the normal way of integrating international credits under emissions trading system in the EU. There are sub-scenarios that should undoubtedly be put forward and given consideration. These sub-scenarios could become cumulative, which will be political decisions to make a possible integration of international credits in the emissions trading system in the EU politically palatable.

Sub-scenario 1.1: a quantity limitation of ITMOs may be applied, which may increase over time. This will allow for a gradual adjustment, as well as monitor the impact on prices, which is the main concern for some stakeholders and for politicians.

Sub-scenario 1.2: a qualitative filter may be applied, in that only certain types of ITMOs may be accepted. There could be geographical filters, as well as conditionality related to additional SDG benefits, but especially the type of cooperative approaches that sit behind the ITMO creation. Removals would be at the top of most people's list, and there may be further bifurcation between technical and nature-based removals.

Sub-scenario 1.3: concerns related to impacts on prices in the emissions trading system in the EU could be addressed by creating a price floor for ITMOs, or alternatively using some type of supply mechanism with an auction approach which would avoid a price crash due unexpected large supply of ITMOs.

Alternative scenarios could emerge, but we see this as counterproductive and defeating the whole idea of integrating international markets in emissions trading system in the EU. One such options is to swap EUAs for ITMOs, but we find it difficult to see the merits for such approach.

6.2.4. Impact on supply/demand balance

In principle, by introducing ITMOs, supply will be increased, with downward impact on the price in the carbon market in the emission trading system in the EU. This is a concern for some. Others see the EUA price forecast in the range of Euro 100-130 in early 2030s, as a competitive and carbon leakage concern that needs to be addressed. These concerns cannot be totally alleviated through CBAM, especially in its current architecture, and therefore international credits may be called to play a role.

The impact will clearly depend on the ITMO quantity allowed for use, as well as any price mechanisms, as outline above in Sub-scenario 1.3

Quantitative forecast on the impact on supply/demand balance is quasi-impossible unless assumptions are made to use with models. Due to the lack of any political engagement, any assumptions would be totally subjective.

6.2.5. Impact on market functioning

One of the main reasons for introducing ITMOs is the concern, under current architecture, over ETS1 liquidity in the period post 2035 and leading to 2039. There is no doubt that ITMOs will help with market functioning and will become absolutely necessary for any emissions trading system in the EU post 2039, when the forecast shows no more EUA availability.

From that point of view, ITMOs would have a positive impact on ETS functioning. There is without any doubt little understating, but a lot of anxiety, about the impact that ITMOs may have on price direction and price volatility, which was a concern for some over the last few years.

Other factors, such as market participation, would also seem to point in a positive contribution. The architecture and governance of Art 6, still under development, will with no doubt also play a critical role, as well as any additional governance that will direct the filters outlined above, which may result in limiting the number of new actors and the degree of freedom that they would have in market participation.

These concerns can be addressed under different sub-scenarios outlined above, the main factor in making decisions will be the objectives that will weight heaviest and the political commitment.

6.2.6. Discussion

The discussion above would lead us to conclude that there are pros and cons related to the introduction of ITMOs in an emissions trading system in the EU.

Pros: ITMOs may/could

- Contribute to increase liquidity and good market functioning, especially in a net zero and net negative world,
- Help with competitive pressure on emission trading system in the EU covered entities,
- Contribute to the EU objectives of incentivizing the private sector to provide carbon finance to developing countries,
- Contribute to the development and deployment of new technologies in developing countries,
- Reinforce the credibility and solidity of the international climate regime and lead to the further deployment of carbon pricing world-wide.

Cons: ITMOs may/could

- Create (temporary) instability in prices in the emissions trading system in the EU,
- Lead to downward price impact in EUA prices (which is a negative for some), unless additional mechanisms are put in place,
- Lead to renewed regulatory debate and instability as there will be strong contestation from parts of civil society.

Recommendations

ERCST sees international expansion as a necessity, under the scenario outlined above, with the only caveat being which of the sub-scenarios outlined above become necessary to ensure that the emissions trading system in the EU delivers the objectives of the Climate Law, with minimal need for additional regulatory constraints and that it has political buy-in.

In light of this, removals, with a strong SDG component, and some price control mechanism that will ensure that there is no strong deviation from EUA prices, will be seen as necessary.

7. Outlook

This topic has proven broader than was initially anticipated, with many complexities. Needless to say, each sector or approach that would increase the scope and reach of the emissions trading in the EU merits its own stand-alone discussion. Some of the more in-depth discussions will emerge from other papers in this project, which by necessity will follow this paper, rather than precede it.

It is difficult to summarize and provide an outlook for such a broad and diverse topic, which is why it is hoped that the table below will provide an overview of what we think is most likely to happen. In this table we limit our views to the **most likely** impacts on ETS1/ETS2. ERCST **recommendations** are encompassed in the boxes included at the end of each chapter.

While the timing of the expansion of the scope and the evolution of the architecture of the emissions trading system in the EU is difficult to predict, it is quite clear that the European Commission sees it in the direction of a single CO₂ market, which would mean that while various emissions trading systems in the EU may emerge separately, there is a will to push them into a single CO₂ market. While the political instinct may push in that direction, other matters will also play a role, including technology development and their placement on the MAC curve, financial capability, political and public acceptability, as well as international developments.

Most likely scenarios

Sector/ area of expansion	Sub-sector/area of expansion	Likely emissions trading system in the EU	Likely year of coverage	Likelihood of coverage	Impact on ETS1/ETS2	
					Supply/ demand balance*	Market functioning**
Municipal waste incineration and landfills		ETS1	2028	High	+	+
International aviation	Emissions from extra-EU departing flights	ETS1	2027	Medium/high	-	+
Maritime	100% of international maritime emissions	ETS1	2029	Low	-	0
	Smaller vessels	ETS1	2031	Medium/high	+	+
Smaller energy & industry installations	Small scale energy industries (CRF 1A1) + Small manufacturing industries and	ETS2	2027/2028	High	0	0

	construction (CRF 1A2).					
	Combustion installations below rated thermal input of 20 MW	ETS2	2031	Uncertain	0	0
Agriculture	Midstream	ETSAg	After 2030	Medium/high	0 (Separate ETS)	0 (Separate ETS)
Non-CO ₂ emissions in aviation		ETS1	2031	Medium/low	+	+
Negative emissions	CDR technologies (specifically DACCS and BECCS)	ETS1	2031	Medium	+	+
Geographical expansion	e.g.: Ukraine	All (depending on timeline)	After 2030	Not an environmental decision	Uncertain	0/+
International linking	Targeted to the UK and EU neighborhood countries	ETS1+ETS 2, ETS3 etc	After 2030	Medium (for targeted countries) Low (outside targeted countries)	+	++
International credits	Removals	ETS1 ETS2	After 2030	Medium/high	+	+

Notes:

* high downward pressure on prices (++); low downward pressure (+); neutral/no impact (0), low upward pressure on prices (-), high upward pressure on prices (--)

** high positive (++), low positive (+), neutral/no impact (0), low negative (0), -- (high negative)

In the following notes, we provide a further delineation of what we consider as the most likely development per sector/area of potential expansion.

- **Municipal waste incineration and landfills:** We see the inclusion of municipal waste incineration in ETS1 by 2028 as highly likely. The sector is not big in terms of GHGs and number of installations to expect a substantial impact on the carbon market, but environmental considerations and interlinkage with current EU policies regulating waste is important. The assessment for the inclusion of municipal waste in ETS1 is likely to be accompanied by an assessment on including landfills, as this is key to avoid diversion of waste.
- **International aviation:** We expect a medium to high probability that extra-EEA outgoing flights be covered under the ETS1 (in addition to all intra-EEA flights) as of 2027. With the aviation sector generally being a net buyer of allowances from the stationary sector because their mitigation costs tend to be higher, the inclusion of extra-EEA outgoing flights would exacerbate demand for ETS1 allowances. This could, depending on the level of adjustment of the cap, translate into an upward

pressure on ETS1 prices. The impact on the ETS1 market functioning is expected to be positive, thanks to increased trading volumes and participation by rather sophisticated players.

- **Maritime:** We consider likely that the current 50/50 scope of distance and emissions from international incoming and outgoing voyages is kept, but that smaller vessels between 400 and 5000 GT are also included in ETS1 as of 2031 such that there is a level playing field. The inclusion of smaller vessels has the potential to increase in-sector abatement thus reducing demand for ETS1 allowances and possibly lessening pressure on prices. The magnitude of this effect is limited however by the fact that the current vessel size already covers about 90% of emissions from shipping. Market participation and trade volumes are bound to increase to some extent, with a positive overall impact on market functioning.
- **Smaller energy & industry installations:** We see the inclusion of small energy and industry installations in ETS2 in 2027/2028 as highly likely, as an evolutionary expansion of current ETS covered sectors, and mandated in the EU ETS Directive. Its inclusion will be affected by the success of ETS2, a new system still to be tested. Due to small GHGs size, we do not expect a material impact on the functioning of the carbon market nor on the supply/demand balance.
- **Agriculture:** We see the inclusion of Agriculture in ETS1/ETS2 as a scenario that will emerge, but the timing is uncertain. We would rate it neutral to positive. An unlikely scenario, at least in the short term. As such, we do not expect an impact on the current ETS1 and upcoming ETS2 market until well into the 2030s. When the decision is taken to cover agriculture, it will most likely be initially under a separate ETS_{Ag} and after 2030, with again no (immediate) impact on the current ETS1 and upcoming ETS2 market.
- **Non-CO₂ emissions in aviation:** We consider the likelihood of coverage of non-CO₂ emissions from aviation by an emission trading system in the EU as low/medium. If non-CO₂ emissions were to be covered, this would likely be the case as of the next phase of the ETS1, i.e.: as of 2031. If this is the case, this could potentially increase in-sector abatement, with the increase in supply leading to a downward pressure on the carbon price. Also, the impact of a possible inclusion of non-CO₂ emissions from aviation on market functioning would be positive thanks to higher trading volumes and enhanced market liquidity. However, emissions trading is one of the options to address non-CO₂ emissions from aviation, that together with other options, e.g.: operational measures/better routing, merit further assessment.
- **Negative emissions:** Negative emissions, specifically CDR technologies like DACCS and BECCS, are likely to be included in ETS1 by 2031, with medium likelihood. This integration is seen as necessary for the long-term viability of emissions trading in the EU, especially as it approaches net-zero and potentially net-negative emissions. The impact on supply/demand balance is expected to be positive (+) as it would increase allowance supply. The effect on market functioning is anticipated to be positive (+) due to increased liquidity and market participation. However, the exact impacts will depend on the specific implementation approach chosen.
- **Geographical expansion:** We consider the geographical expansion to include Ukraine as uncertain, as all such political processes are. Such an event is not dependent on environmental legislation progression but on political outcomes. Similarly, it is uncertain as to when this expansion might occur. What can be said with a certain degree of certainty is that the expansion will involve any potential emissions trading system in the EU operating at the time of accession. The impact of supply and demand remains unclear and is dependent on key factors such as the evolution of Ukraine in the postwar period allocation of free allowances and the MAC of a post-war Ukraine. Based on the current information available and on the progression of national ETS policy in Ukraine, it is expected that the impact on the market functioning will be neutral to positive, with higher uncertainty related to the agricultural sector. This is fully dependent on whether the key challenges outlined in the report are addressed appropriately.

- **International linking:** It is unlikely that international linking will occur in the near future. Should it occur, the prime candidate should be the UK, followed by Turkey, but the latter is seen as a distant possibility.
- **International credits:** While currently not included in ETS1, a broader introduction of international credits in an emissions trading system in the EU does not seem to be in the cards. There will be increasing international pressure for the EU to consider opening again, and it is likely to happen maybe even before 2030, but with a very limited window, focused on high SDG content, and with prices that will not put downward pressure on EUA prices. Removals would seem to be the prime candidates for examination.