Berenschot

POSITIONPAPER

Linking ETS3 to ETS1: impact on emission reduction and finances

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Executive summary

I. Introduction

This position paper examines the financial implications of establishing a ***(partial) linkage*** between ***EU ETS1*** (covering power generation, energy-intensive industry and domestic aviation) and ETS3, a system proposed for the livestock sector (covering methane (CH_4) from cattle and nitrous oxide (N2O) from fertilisers). This paper assesses whether this linkage could help achieve greenhouse gas (GHG) reduction more cost-effectively while supporting industrial competitiveness and finance the transition of the livestock sector, and explores whether this linkage has relevant co-benefits.

Two distinct climate policy bottlenecks underpin the rationale for exploring this mechanism:

- For ***EU ETS1 sectors***, the 2030-2040 period poses a significant timing challenge: the ETS1 compliance schedule is tightening rapidly as the CO_2 price rises and free allowances are phased out. Yet many large-scale abatement projects—particularly hydrogen infrastructure, deep electrification and carbon capture and storage (CCS)—will not be operational until well into the mid-2030s. Allowing a share of ETS1 compliance to be met with ETS3 allowances would ease short-term cost pressures and better align obligations with realistic project-delivery timelines. Importantly, this flexibility could be achieved without diluting ETS1's long-term decarbonisation, in case only a partial link between the two systems would be established. This system could help reduce pressures in the mid-/to long-term. In the short-term other policy measures such as regulation to create "green" demand along the value chain are better suited.
- For the ***ETS3/livestock sector,*** there is an absence of effective carbon-reduction policies and no clear path for reducing biogenic emissions. While an ETS3 with a declining cap could create a clear price signal and a signal for reduction, a farmer-only carbon market would likely lack the liquid assets to finance the scale of transformation required.

Partially linking ETS3 with ETS1 would channel financial flows from the industrial to the livestock sector through allowance purchases. This would allow livestock farmers to gain both the means and the incentive to invest in CH_4/N_2O abatement technologies and to improve manure and herd management. Fossil and biogenic emissions are however not similar and land use measures would also need to be taken to ensure carbon sequestration. This system would likely also provide co-benefits regarding water quality and biodiversity objectives; objectives which are also largely not met.

II. Pros and cons of the proposed linkage

On paper, the proposed linkage could drive substantial progress in two sectors that currently face very different policy pressures. It would allow the industrial sector to decarbonise in line with realistic infrastructure delivery timelines, while ensuring that the livestock sector reduces its biogenic emissions to a set target. This coordinated, dual-sector strategy has the potential to be a key lever in achieving the European Commission's proposed -90% net greenhouse gas (GHG) reduction by 2040, as well as the 2050 goal of climate neutrality. If designed and implemented wisely, the linkage could maximise its main advantages: cost-efficient abatement across sectors, a reliable flow of capital to support the reduction of CH_4/N_2O and transition of the livestock sector, and wider co-benefits such as lower nitrogen emissions, improved water quality, and enhanced biodiversity. At the same time, careful design is needed to control the primary risks: possible delays in cutting fossil CO_2 within ETS1 if cheaper ETS3 credits dominate, market volatility, unequal distribution of financial gains between larger and smaller livestock farmers, public perception of "buy-outs" or hidden enforcement and limited biogenic carbon sequestration.

Establishing a successful linkage requires choices on a number of key design elements: How many biogenic emissions would be advisable in a climate neutral scenario whilst ensuring food production? What would the reduction factor look like to reach this goal (linear or non-linear)? How extensively would ETS3 and ETS1 be linked (partial or full)? How would ETS3 allowances be allocated (free allowance of auctioning)? How would trade and data flows be managed?

III. Testing the linkage at the national level – a case study

To see how these choices might play out in practice, we modelled a case study in which ETS1 and ETS3 operators were allowed to trade. Emission data as forecasted for the Netherlands were used. Please note that the results from this simplified case study are indicative, and the actual balance of costs, benefits, and risks would depend heavily on design choices, market behaviour, and complementary policies. Further analysis is required to better understand how such a system would function in other Member States, at the EU-wide level, how individual larger and smaller farmers would be affected, and how the system would interact with expected ESR and LULUCF changes.

Design choices

We decided upon halving biogenic emissions by 2050 compared to 2030 levels, that ETS3 rights would be given to farmers free of charge, that the trading cap between ETS1 and ETS3 would rise from 10 % to 30 %, and we left out transaction and administrative costs because we aimed to see broad trends and directions rather than exact figures.

Main results

If ETS1 operators would be allowed to cover part of their obligations with ETS3 units, we find that the industrial sector's need to decarbonise could fall by 3 to 4 Mton a year from 2035 onwards. On average, the livestock sector would receive around €600 million per year. This income will be partially used to fund methane (CH_4) and nitrous oxide (N_2O) cuts, at an average cost of €375 million per year. Please note that these (abatement) costs would also exist in the baseline scenario, but be born by the livestock sector (taxes/permits), the government (subsidies) and/or consumers (price increases). Between 2030 and 2040, ETS1's decarbonisation average cost per tonne of CO_2 emitted would also drop. After 2040 the ETS costs for the industrial sector would continue, but this revenue would go to livestock farmers instead of the government who auctions current rights.

EU outlook

In case the studied ETS1–ETS3 linkage operated at an EU-wide level, a much larger and more liquid cross-sector carbon market would be created. At the EU level this system would equate to roughly 85 Mton CO_2 equivalent of tradable biogenic allowances in 2040. Resulting into a financial flow to the livestock sector of about €14 billion a year and halving non-CO_2 emissions by 2050. Expanding the linkage EU-wide would allow for further optimization due to the larger system scale. Naturally, it also increases the need for strong MRV systems as the risk of fraud increases.

IV. Closing remarks and suggested next steps

While this paper focuses primarily on the financial channels and incentives created by the proposed system, real-world outcomes would largely depend on design choices regarding reduction factor, linkage caps, allocation rules, and data-management systems, as well as their interaction with broader EU and national climate policies. The case study findings suggest that the linkage between ETS1 and ETS3 could help close the gap between current emissions and EU targets, while also funding a planned, financially supported transition in the livestock sector. These findings can be used as a basis for further analysis and stakeholder discussion, leading to a more robust policy architecture before implementation.

With regard to next steps we would suggest conducting a more comprehensive impact assessment. If results look promising, a national pilot could be conducted in one of the Member States, for instance between 2028 and 2029. Thirdly, the system could be extended to cover all EU member states from 2030 onwards, and be part of the next phase of EU ETS.

CHAPTER 1

Introduction

Climate policy in the European Union has entered a decisive phase, with legally binding greenhouse gas (GHG) reduction targets and interim milestones set out in the European Climate Law (EU Regulation 2021/1119). The law mandates at least a 55% net reduction in EU GHG emissions by 2030, and climate neutrality by 2050, in line with the objectives of the Paris Agreement. These targets are not merely aspirational; they directly shape the design of climate policy instruments, financing mechanisms, and sector-specific measures across the EU. Achieving this will require far-reaching transformation in all major emitting sectors, among others industry and agriculture.

1.1 European climate challenges: industry, energy sector and agriculture

The EU Emissions Trading System (ETS1) — covering power and heat generation, domestic aviation and heavy industry — accounts for roughly 40% of EU emissions and has driven significant decarbonisation through a declining emissions cap, the phase-out of free allowances, and steadily rising carbon prices. These market signals have spurred research and investments in low-carbon technologies, efficiency improvements, and fuel switching. Yet the pace of change is constrained by long investment cycles in core industrial processes (e.g. steel, cement, chemicals, refining), and the need for new infrastructure, such as hydrogen networks, carbon capture and storage (CCS) systems, and grid upgrades. The power sector faces a similar dual challenge: phasing out fossil assets while integrating a rapidly growing share of variable renewables and securing flexible backup capacity. At the moment ETS1-price is around €75,-/tonne of CO_2. The price is relatively low due to economic uncertainty, comparatively high energy prices and the allotment of free allocations[1]. Between 2030 and 2040, as the ETS cap tightens and free allocations largely disappear, compliance and/or abatement costs are expected to rise sharply — raising concerns over competitiveness and potential carbon leakage for trade-exposed sectors. As such, there is an increasing concern whether the speed to decarbonise ETS1 sectors can be met within a decade.

In contrast, the agriculture — more specifically the livestock sector — is a major source of methane (CH_4) and nitrous oxide (N_2O) and operates with few direct incentives for GHG reduction. In the three core scenario's for Europe (S1, S2 and S3) the livestock population remains almost the same compared to 2020 levels[2]. Emissions in this sector are diffuse, linked to many small and medium-sized holdings, and technological advancements to date provide limited real-world results.

1 In the EU ETS1 system, certain industrial installations and power generators receive part of their emission allowances free of charge, in addition to the units they must purchase via auction. This free allocation is intended to reduce the risk of carbon leakage.

2 EU COM, 2025. Impact assessment on a 2040 Climate Target & Methodological note on modelling of agriculture non CO_2-emissions.

Existing policies rely mostly on voluntary measures, subsidies, or regulatory standards such as manure management, but these have so far failed to deliver reductions at the scale needed to meet national and EU non-CO_2 targets. Recognising this gap, various studies have explored options to incentivise and regulate agricultural emissions, including the design of an agricultural emissions trading system (ETS3). An ETS3 could cap sectoral emissions and issue tradable allowances, allowing farmers either to sell surplus units or retain them for compliance[3]. These studies focussed predominantly on the design of such a system and the legal basis.

A key challenge ETS3 is the sector's limited access to financial capital[4]. Trading only between farmers would likely produce a low-liquidity market with weak price signals — insufficient to achieve sustainable biogenic non-CO_2 emission levels. For the Netherlands this would for instance be about half of current emissions[5]. By comparison, many ETS1 operators might need to look for lower-cost abatement opportunities outside their own sector post 2035 as the EU ETS market tightens. Allowing a portion of ETS1 compliance to be met with ETS3 reductions could transfer substantial funds from the industrial to the livestock sector, funding the much needed technological innovation and land use change in this sector. This linkage could optimise national abatement costs and distribute the economic burden of decarbonisation more evenly across sectors.

1.2 Current revision of the EU ETS

To align with its 2030, 2040, and 2050 climate targets, the EU is preparing a comprehensive revision of the EU ETS framework. Building on the Fit for 55 reforms, the review will reassess the post-2030 cap trajectory, the phase-out schedule for free allowances, and the scope of sectoral coverage. Central issues under discussion include tightening the cap to match the proposed -90% EU-wide reduction by 2040, expanding coverage[6], refining market stability mechanisms to ensure stable yet robust price signals, and integrating ETS reform with broader transition policies such as the Carbon Border Adjustment Mechanism and just-transition funding.

Importantly, policymakers are also debating ways to introduce greater flexibility into ETS1. Options range from moderating the pace of the cap decline[7], to temporarily increasing allowance supply, to enabling cross-sector efficiency gains through system linkages (for instance with LULUCF negative emissions). These discussions reflect a recognition that certain low-carbon industrial infrastructure projects will not be operational until well into the 2030s, risking a mismatch between the ETS1 abatement schedule and industrial reality. This convergence — the search for agricultural mitigation instruments on one side, and greater flexibility for industry on the other — provides the need for further exploration into the financial and GHG effects of linkage between ETS1 and ETS3.

1.3 Scope and aim of this paper

The aim of this paper is to initiate a discussion on how we – the European Union — can (re)design measures to enable cross-sectoral cost-effective carbon reduction. In particular, the paper explores whether and how agriculture emissions that are currently outside the EU ETS could (partly) be integrated into the existing carbon pricing framework. The paper seeks to provide policymakers, industry, and civil society with a basis for informed debate on the merits, drawbacks, and design choices to be made for expanding ETS coverage with livestock emissions. Rethinking the existing carbon pricing system can play a role in achieving Europe's 2040 GHG-reduction target of 90%.

The paper is structured as follows:
- First, an overview of the decarbonisation challenges faced by ETS1 and ETS3 sectors.
- Second, an outline of key design considerations for integrating agriculture into the ETS framework.
- Third, an assessment of the main pros and cons of a linkage between ETS1 and ETS3.
- Fourth, a national level case study that shows initial results of such a linkage.
- Finally, some final remarks and suggestions for next steps.

3 Verschuuren, Fleurke and Leach, 2023. Integrating ag. emissions into the EU ETS: legal design considerations
4 Trinomics, 2023. Pricing ag. emissions and rewarding climate action in the agri-food value chain (p.60).
5 Urgenda, 2024. Landinzicht.
6 For example upstream methane emissions: methane released during oil and gas extraction, processing, or transport before the fuel reaches the point of combustion is not (yet) included in the ETS1 scope.

7 Carbon Pulse, 17-2025. Annual EU ETS cap, allowance supply cut rate could be relaxed, says EU COM official.

CHAPTER 2

ETS1 and ETS3:
Contrasting challenges and the case for cross-sector linkage

2.1 ETS1: Rising compliance costs, infrastructure constraints, and long investment cycles

The EU Emissions Trading System Phase 1 (ETS1) sectors — dominated by power generation, energy-intensive industries such as steel, cement, chemicals, refining, and domestic aviation — have formed the backbone of Europe's carbon market since its inception in 2005. Together they account for roughly 40% of total EU greenhouse gas (GHG) emissions, making their decarbonisation pathway critical to meeting 2030 and 2040 targets. ETS1 has already delivered significant emission reductions, particularly through efficiency improvements, fuel switching, and in some instances outsourcing of production. However, the decade from 2030 to 2040 will be more difficult and there are several structural challenges that go beyond price signals.

From 2030 onwards, ETS1 compliance obligations will tighten at an faster pace. The linear reduction factor will steadily reduce the overall cap, and by the mid-2030s the residual share of free allowances will be almost completely phased out. At the same time CBAM will phase in. As carbon prices rise, installations with limited short-term abatement options face steep cost increases. Although this price pressure strengthens the business case for low-carbon transformation, possible transformative technological pathways[8] typically have long investment cycles. These timelines reflect not only capital intensity but also dependencies on permitting[9] and the availability of enabling infrastructure. Industrial decarbonisation is closely linked to the expansion of high-voltage grids, regional hydrogen networks, and CO_2 transport and storage capacity. Delays in any of these enablers, which has been occurring of late, risk pushing significant abatement further into the 2030s, precisely when carbon compliance requirements are becoming more stringent.

Escalating ETS1 costs also raise concerns over the international competitiveness of European industry. While the Carbon Border Adjustment Mechanism (CBAM) is intended to level the playing field, questions remain over its scope, enforcement, alignment with World Trade Organization rules, as well as geopolitical backlash from our trading partners for instance with import tariffs. For globally traded, high-emitting commodities such as steel, cement, and some chemical products, the risk of carbon leakage remains real. Without strong safeguards, these competitive pressures could slow the pace of decarbonisation or lead to industrial restructuring with negative implications for employment and regional economies, potentially undermining the support needed for climate policy. Furthermore, there is uncertainty regarding the effectiveness of CBAM as loopholes are likely to be found and it could provide business case support too little or too late.

The power sector, although generally more adaptable than heavy industry, faces a parallel set of transitional challenges. Beyond the accelerated phase-out of coal and unabated gas, it must integrate a rapidly expanding share of variable renewable energy while maintaining grid stability and sufficient firm generation. Balancing the system will require investment in flexibility tools — storage, demand-side response, and backup capacity. These flexible sources of energy are not always immediately available due to uncertainty about the business case or outdated regulatory frameworks. Periods of low renewable output can trigger short-term increases in fossil generation, causing temporary emissions spikes that complicate compliance with the steadily declining ETS cap towards 2040. Meeting ETS1 obligations whilst ensuring system reliability becomes a challenge.

8 Such as: green hydrogen in steelmaking, electrification of chemical processes, large-scale CCS deployment, and deep retrofits of existing assets.
9 Berenschot, 2024. Permitting study on clean hydrogen projects.

2.2 **ETS2:** Absence of a robust carbon price signal and a liquidity problem

Unlike the ETS1 sectors, the livestock sector is not currently subject to any carbon market regulation[10]. There is no emissions cap, no obligation to surrender allowances, and no explicit carbon price to reward investments in CH_4 or N_2O abatement. Emission reduction efforts therefore rely largely on voluntary initiatives, subsidy schemes, and regulatory measures such as herd reductions, or improved manure treatment standards. While such measures have produced incremental gains in certain areas, they have not been sufficient to put the sector on track for meeting non-CO_2 reduction targets for 2030 and beyond. The urgency to address livestock emissions is heightened by their link to nitrogen pollution. High nitrogen deposition from manure and fertilisers has a negative impact on nature and water quality. In the Netherlands it even resulted in restricted permitting for housing, infrastructure, and industrial projects. In this context, livestock non-CO_2 reduction is not only a climate requirement but also a potential enabler of wider economic activity. Without a predictable, long-term incentive framework. As such, there is a risk that emission reductions will occur mainly through forced closures for regulatory or financial reasons rather than through a managed and investable transition. Such closures are socially and politically sensitive, and are best to be avoided as they can spark civil unrest.

The agriculture carbon pricing concept, so called Agri-ETS or ETS3, seeks to address this policy gap through a dedicated emissions trading system, focused on non-CO_2 greenhouse gases from livestock, fertiliser use, and manure management. The rationale for ETS3 lies in the sector's persistent emissions profile (being biogenic in nature) and the characteristics of its abatement options. CH_4 and N_2O are both potent climate forcers, but their sources are widely dispersed and often small-scale, and mitigation typically involves operational adjustments such as feed changes, manure processing technologies, or shifts in land use to increase carbon sequestration. Without a binding, economy-wide price signal, adoption of these measures will be slower than required for the EU's path to climate neutrality by 2050. Under ETS3, total allowable sectoral emissions would be capped at national or at EU level. Farmers reducing emissions below their allocation could sell surplus allowances to others, creating a direct financial incentive for adoption of cost-effective abatement measures. Although no legislative proposal has yet been tabled, the European Commission has acknowledged the long-term challenge of agricultural emissions. Several Member States, research bodies, and stakeholder groups are exploring potential designs, administration protocols, allocation methods, and alignment with the Common Agricultural Policy (CAP)[11]. ETS3 has potential as instrument to achieve reductions in non-CO_2 emissions, next to subsidies, regulations and innovation.

A key mentioned obstacle to the effectiveness of ETS3 is the limited financial capacity of much of the farming sector as well as the administrative burden such a system might introduce[12]. Many livestock operations run on narrow margins and have little access to the capital needed for investments such as anaerobic manure digestion, advanced feed supplements, or fundamental land-use changes. Where payments for environmental services exist, they are often too low or uncertain to drive the needed systemic change. Even with free allocation of allowances, an ETS3 market composed solely of farmers trading among themselves would likely suffer from low liquidity, suppressing allowance prices and weakening the financial incentive for abatement.

2.3 Case for cross-sectoral (partial) linkage between ETS1 and ETS3

It is this imbalance — capital-rich, high-cost ETS1 sectors alongside capital-poor, low-cost reduction potential in ETS3 — that underpins the case to review a partial linkage between the two systems from a financial point of view. Allowing ETS1 operators to meet a limited share of their obligations with ETS3 allowances could channel significant investment from industry into agriculture. For ETS1, this offers a cost-effective compliance pathway during the critical 2030–2040 infrastructure build-out phase. For ETS3, it injects the liquidity needed to finance accelerated CH_4 and N_2O abatement, technological innovation, and sustainable land-use change — transforming the livestock sector transition from a slow, subsidy-dependent process into one backed by stable private-sector funding. Such a linkage could align incentives across sectors, minimise compliance-cost disparities, reduce carbon-leakage risks, and achieve faster overall national emissions reductions — provided it is designed to preserve the environmental integrity of both systems and to deliver genuine, verifiable abatement in line with 2040 and 2050 climate goals.

10 With the exclusion of Denmark, who introduced a carbon price of roughly €100,- per cow.

11 Strategic Dialogue on the Future of EU Agriculture, 2024. A shared prospect for farming and food in Europe.

12 Carbon Pulse, 29-09-2025. Brussels sceptical about Agri-ETS, sees other decarbonisation pathways.

CHAPTER 3

Key design considerations, pro's and cons

Designing an effective linkage between ETS1 and a future ETS3 requires careful attention to several design elements. This chapter outlines a number of key design consideration that will determine whether such a system can achieve emissions reductions more cost-effectively. It covers:

- The scope, reduction factor, and rationale for limiting the share of ETS3 credits in ETS1 compliance.
- Options for allocating ETS3 allowances to livestock farmers.
- The trading structures available for moving allowances between sectors.
- The main benefits such a system could deliver and the principal risks it would need to manage.

Together, these elements form the blueprint for how a linkage could function in practice. They do not represent a complete set of design choices; further detailed work and stakeholder engagement will be required during later phases of development of this system.

3.1 Scope, reduction factor and full or partial linkage with ETS1

First strategic decision concerns the treatment of biogenic GHG emissions from livestock in the long term. To ensure alignment with climate ambitions, a 2050 sectoral target should be set for methane (CH_4) and nitrous oxide (N_2O). Unlike fossil CO_2, which is targeted for net-zero, these gases will follow a different trajectory: aiming for substantial reduction while maintaining sustainable food production. This target would be embedded in ETS3 through an annual reduction factor from 2030 to 2050, applied either linearly (equal annual percentage cuts) or non-linearly (slower in the early years, faster later). The factor would steadily reduce the number of ETS3 allowances available for both on-farm compliance and trading with ETS1, creating a predictable, declining cap that incentivises abatement and avoids sudden market shocks that might occur as a result of court rulings that revoke permits and lead to farm closures.

Another key choice is whether to allow full or partial use of ETS3 credits for ETS1 compliance. Full linkage would permit ETS1 operators to cover their entire obligation with agricultural units, while a partial linkage imposes a cap — for example, limiting ETS3 sales to 10–30% of a farm's allocation, or restricting ETS1 operators to using a fixed percentage of ETS3 units for compliance. A partial approach maintains the decarbonisation signal within ETS1, protects food supply, whilst still enabling a significant capital flow into agriculture (as long as abatement costs are lower).

By signalling the long-term tightening of ETS3 supply — through both the reduction factor and linkage rules — farmers can plan investments and operational changes over time, while ETS1 operators can factor additional future ETS units into their abatement strategy. In theory, such predictability should lead to more cost-efficient decarbonisation, nationally and across Europe.

3.2 Allowance allocation in ETS3

How ETS3 allowances are allocated will shape overall acceptance, market behaviour, and the scale of capital transfer under linkage. Two principal models are possible[13]:

- ***Option 1 – Free allocation based on historical emissions:*** In this model, participating farmers receive an annual number of ETS3 allowances free of charge, calculated from a multi-year average (e.g. 2025-2030) of verified (or calculated using verified models) historical CH_4 and N_2O emissions. The total allocation declines each year in line with the ETS3 cap trajectory. This approach offers several advantages. First, it creates an immediate asset for farmers from day one, which can be sold if emission reductions exceed allocated levels. Second, it generates a direct and visible revenue stream when allowances are sold to ETS1. These revenues can finance technological upgrades, manure management systems, feed additives, or land-use changes. Free allocation reduces the financial barrier to entry, avoiding the need for farmers to purchase allowances upfront, which likely discourages participation. However, free allocation also carries risks: it can reward higher historical emitters, potentially disadvantaging early movers and stagnate any and all emission reduction during a set period.
- ***Option 2 – Auctioning of allowances:*** A second option is to auction ETS3 allowances (partially), with revenues directed into targeted agricultural transition funds. Auctioning ensures that all participants face an explicit carbon cost signal, which can sharpen internal incentives to reduce emissions. It also avoids windfall profits for participants who would have reduced emissions without the scheme. Revenues generated by auctions could be redistributed through subsidies for buy-out schemes, low-emission technology, payments for ecosystem services, or other public investments in rural areas. The downside of full auctioning is that it requires significant upfront liquidity from farmers, many of whom operate on tight margins, which could risk low participation or even force "cold exit" closures if financial backers are hesitant to provide short-term loans. Full auctioning does benefit future market participants, as the barrier to entry is lower compared to a model that is fully or partially based on free allocation due to the expected increase in land prices. A partial auctioning model could blend both systems: a portion of allowances is given for free to ease the capital burden on farmers, while the remainder is sold to create a price signal and public revenue stream (e.g. equal to the share that can be traded with ETS1 operators, this reduces capital income for farmers).

13 Trinomics, 2023. Pricing ag. emissions and rewarding climate action in the agri-food value chain, section 2.3

3.3 Trading modalities and data handling

Three main trading modalities are envisaged. The first is ***direct bilateral trading,*** where farmers sell their ETS3 allowances directly to ETS1 entities through an approved trading platform. The second is ***a common auction pool***, in which ETS3 units eligible for ETS1 compliance are aggregated and sold at an auction, with the proceeds distributed to participating farmers. The third option is an ***aggregator model***, in which a specialised intermediary purchases ETS3 allowances from multiple farms, bundles them, and manages sales to off-takers (such as ETS1 operators). Alternatively, the aggregator could be an upstream fertilizer provider or downstream food processor such as the dairy industry and slaughterhouses. The aggregator, being a much larger entity with financial expertise does the bulk of administrative handling and will be well placed to 'nudge' the smaller farming firms towards more sustainable practices[14].

A centralised auction system can improve liquidity and price discovery, whereas bilateral transactions may offer greater flexibility and lower transaction costs in the system's early stages. The aggregator approach could combine elements of both, reducing the individual transaction burden for farmers while creating larger, more attractive volumes for buyers. Each route has implications for market efficiency, participant engagement, and administrative complexity. Regardless, each system would need a dedicated administrative body or a joint governance arrangement between the ETS1 regulator and the ETS3 authority to ensure that fraudulent actions and the administrative burden are minimised.

14 Verschuuren, Fleurke and Leach, 2023. Integrating agricultural emissions into the EU ETS: legal design considerations.

3.4 Main risks and benefits of the proposed linkage

The structural differences between ETS1 (infrastructure lag and high marginal abatement costs) and ETS3 (capital-constrained, low-cost abatement potential) suggest that a partial linkage could optimise national and EU climate outcomes.

Key anticipated benefits include:

- ***Cost-effectiveness and sectoral complementarity:*** Capital-intensive ETS1 sectors could meet a (capped) share of their obligations by financing lower-cost reductions in agriculture, lowering total compliance costs while maintaining ETS1's decarbonisation path.
- ***Mobilising capital for agriculture:*** Linking expands the buyer base, raising liquidity and generating predictable revenues for CH_4 and N_2O abatement, farm modernisation, or land-use change. This ensures that the sector meets reduction goals without "cold exit" closures.
- ***Broader co-benefits:*** Emission reduction in agriculture delivers other gains, such as reduced nitrogen emissions, improved water quality, and biodiversity restoration. Linkage can also break political deadlocks by balancing burden-sharing across sectors.

However, several risks and challenges must be addressed:

- ***Environmental integrity and timing:*** Cheaper agricultural credits could delay fossil CO_2 cuts in ETS1; differences in gas lifetimes and metrics may also distort climate-benefit accounting unless discount factors or equivalence metrics are applied.
- ***Market function and equity:*** Linking markets of different sizes and capital bases can generate price volatility; free allocations can incentivise baseline inflation; larger farms may capture disproportionate benefits, marginalising smaller players.
- ***Administrative complexity and political sensitivity:*** Cross-system linkage requires harmonised MRV, registry integration, and coordinated governance. Perceptions of ETS1 "buying out" obligations or ETS3 as hidden enforcement could undermine acceptance without transparent design and benefit-sharing.

A dual-sector strategy has the potential to be a key lever in achieving the European Commission's proposed GHG reduction, as well as provide the agricultural sector with a significant inflow of capital and additional time for industries to decarbonize. If designed and implemented wisely, the linkage can maximise its main advantages and manage identified risks.

CHPTER 4

Case study: linking ETS1 with ETS3 in the Netherlands

To assess the impacts of linking a national ETS1 with the proposed ETS3 further analysis is required. To start this process, we developed a first basic model to better understand the impact of design choices on the financial situation of ETS1 and ETS3 as well as implications for GHG-emissions from these sectors. The objective of this case study is to better understand the dynamics of the proposed system and not to predict the exact level of emissions and/or the volume of financial transfers, which are subject to many choices and factors that vary between countries and even within countries (e.g. abatement price).

First, we discuss the main parameters used for this case study; such as baseline emission levels and opportunity (ETS1) and abatement (ETS3) price-curves. The used values and percentages are summarised in a table. Then we provide the main results and discuss and reflect upon our findings.

4.1 Key parameters and design choices

- ***Emission baseline:*** The historic and forecasted emission data for the Netherlands for both ETS1 and ETS3 GHG emissions were used. Data is available for 2030 and 2035[15]. For 2040 the level of ETS1 allowances is set to 0.[16]/[17] For ETS3 the 2050 GHG levels are taken from PBL TVKN 'Klimaat Basis'[18], resulting in a decline of about 35% between 2030 and 2050.
- ***Allocation baseline:*** We assumed free allocation of ETS3 allowances to participating livestock farms, based on their assumed average CH_4 and N_2O emissions in the period 2025-2030 (with the max being 2025 values). The price is hence set at €0,- per tonne of CO_{2eq} in each year.
- ***Linear reduction factor ETS3:*** Part of the linkage between ETS1 and ETS3 means that ETS3 will fall under a cap and trade regime. We set the cap, or annual reduction factor, at 1,75% per year multiplied by the base year 2030. This means that in 2050 the available ETS3 allowances have been reduced by 35%. The ETS3 LRF or cap ensures that GHG reduction is met with significant more certainty compared to the baseline situation due to the lack of guiding policy. Total biogenic GHG reduction is equal to the baseline.

15 Planbureau voor de Leefomgeving, 2025. Klimaat -en Energieverkenning.
16 For ETS1 the free allocation of emissions is not taken into account; free allocations will decline to 0 in 2035 and the link between ETS1 and ETS3 is mostly relevant from then onwards.
17 Possible future interaction between ETS1 and negative emissions stemming from LULUCF are not taken into account.
18 Planbureau voor de Leefomgeving, 2024. Trajecten naar een 'klimaatneutrale' landbouw, landgebruik en glastuinbouw in 2050. In this report various policy is implemented to achieve the baseline reduction.

- ***Partial linkage limit:*** We set the linkage limit to 10% of the annually allocated emissions in 2030-2035, 20% between 2035-2040 and 30% in later years. This means that in 2030 10% of ETS3 emissions can be used by ETS1 operators. If the forecasted ETS1 price is higher than the abatement cost (proxy for ETS3-price) in any given year, the total amount of tradeable emissions will move from ETS3 to ETS1 (so 10% in 2030). As a result the amount of emissions emitted in the ETS1 and ETS3 sectors shifts and the price of ETS1 is reduced due to increased supply.
- ***ETS1 price (opportunity cost):*** We follow public available estimates for the ETS1 price per tonne of CO_{2eq}. Respectively the price level increases from €120,- in 2030 to €300,- in 2050 in a close to linear upward curve. Allotment of free ETS1 rights is not taken into account.
- ***ETS3 price (abatement cost):*** Selling of ETS3 rights to an ETS1 recipient is not without cost for the owner, as it means that he/she has to reduce the amount of GHG it can emit. To reflect this we use the value of various abatement cost options, starting in time first with the cheapest options (e.g. manure management, precision fertilization) and gradually increase this to more costly options (livestock reduction). For 2030 we use a price of €33,- per tonne of CO_{2eq} and €200 in 2050[19]. The actual abatement cost will significantly vary between countries, type of livestock[20] and soil of a farm.
- ***External effects:*** Downstream and upstream effects of an increase in ETS1 rights and decrease in ETS3 rights are not taken into account. We expect co-benefits in the area of water, nature and biodiversity due to this system, they are however not monetized.

Using this set of key design choices and parameters we developed a 2030-2050 baseline for ETS1 and ETS3 emissions, ETS-prices (opportunity and abatement cost) and decided upon three design criteria (linear reduction factor, linkage limit and allowance allocation) that form the basis of the alternative scenario where ETS1 and ETS3 are partially linked.

4.2 Results

In this case study we compared a baseline scenario, in which ETS1 and ETS3 operate without cross-sector linkage, with our alternative scenario incorporating a partial linkage mechanism at the national level. In this case study the emission levels for the Netherlands have been used as baseline and in the alternative scenario ETS3 can only be traded in the national context. This obviously is a clear simplification of reality. However, it is useful to obtain a better understanding of the general direction and the scale of impact of such a system.

The results highlight clear differences in the trajectory of emissions, the distribution of financial flows, and the pace of decarbonisation in both scenarios, see the figures on the next page.

Table 1. **Design parameters used for the national case study.**

Parameter	Metric	2030	2035	2040	2045	2050
GHG ETS1	Mton $CO_{2eq.}$	34,4	15,9	0	0	0
GHG ETS3	Mton $CO_{2eq.}$	16,5	16,0	14,4	13,6	10,7
LRF ETS3	% of 2030	100%	93%	85%	78%	70%
ETS1 price	€/tonne of $CO_{2eq.}$	120	160	200	250	300
ETS3 price	€/tonne of $CO_{2eq.}$	33	67	100	150	200
ETS1-ETS3 linkage	%	10%	20%	30%	30%	30%

19 EU COM, 2024. Methodological note on modelling of non-CO2 GHG emissions in the ag. sector, table 4.
20 Kalavasta, 2025. Broeikasgasemissiebeprijzing in de veehouderij en de landbouw, page 6.

Figure 1. **GHG emissions in the baseline scenario.**

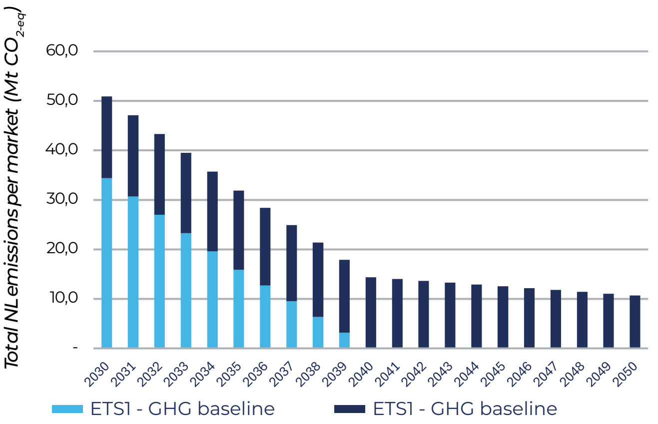


Figure 2. **Market size of ETS1 (x1 bln).**

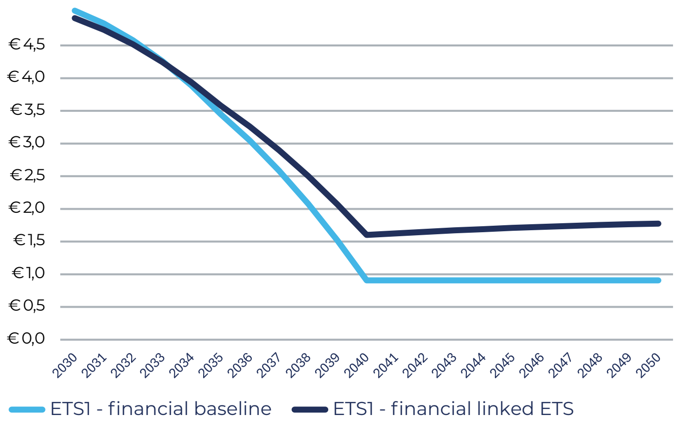


Figure 3. **GHG difference between scenarios.**

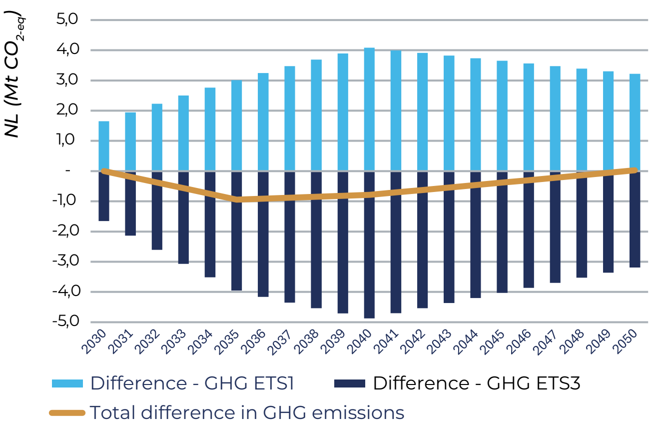
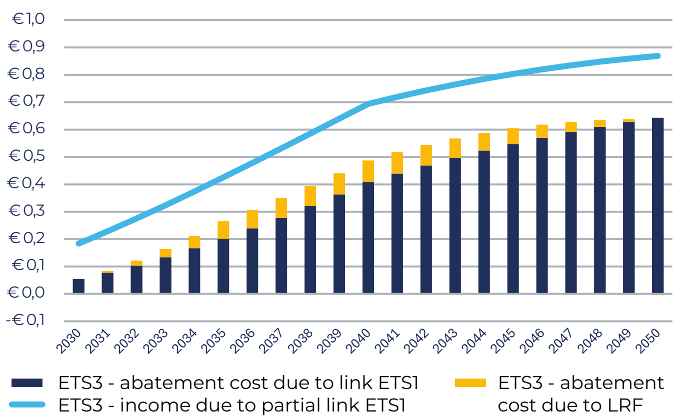


Figure 4. **Income and abatement cost ETS3 (x1 bln).**



In the baseline, total GHG output declines gradually towards 2040 (figure 1), driven primarily by the linear reduction factor mandated under ETS1. This steady decline reflects the ongoing tightening of the ETS1 cap, which limits the available allowances for industry and power generation. The market size is roughly €4 billion in 2030, decreasing to €0 in 2040.[21] For ETS3, no cap and trade mechanism, or any other pricing mechanism, is currently in place. Future instruments are however expected to be put forward, resulting in the baseline reduction[22]. From a financial perspective, auction revenues for ETS1 track closely with the ETS1 cap-reduction pathway: as the cap declines and carbon prices rise, gross auction revenue slowly decline hitting €0 in 2040 (figure 2, light blue). For ETS3, the baseline foresees no direct compliance costs, as the sector is assumed to remain outside carbon pricing. In effect, ETS1 bears the full financial cost burden of GHG compliance under the baseline, while agriculture's emissions trajectory remains unaffected by market incentives.

The ***alternative scenario*** with partial linkage produces a set of trade-offs. ***For ETS1 sectors,*** compliance costs per tonne fall because a modest share of ETS1 obligations can be met with typically lower-priced ETS3 units. This eases short-term cost pressures and results in more ETS1 allowances being available to the market, marginally softening the compliance squeeze (figure 2, dark blue). However, this financial relief comes at the cost of a slower decarbonisation pace within ETS1 compared to the baseline, as a portion of abatement is outsourced to ETS3 (figure 3, light blue). ***For ETS3 sectors,*** the inflow of capital from ETS1 generates significant new revenues for farmers through the sale of ETS3 allowances (figure 4, light blue). This additional income is partly needed to finance methane and nitrous oxide reduction measures and/or herd management (figure 4, dark blue and yellow). Combined with the linear reduction factor this accelerates the agricultural decarbonisation rate beyond the baseline (figure 3, dark blue). The absolute emissions from ETS3 fall more sharply than in the baseline, meaning an accelerated transformation of the sector. Obviously, the introduction of a higher, lower or no linear reduction factor into ETS3 will affect this outcome.

21 Note that not all ETS1 rights are auctioned, various sectors have a number of free rights to allow for international competition – slowly facing out between 2026 and 2035 to allow CBAM to be compatible with WTO rules. The market size comparison values all emissions to the expected market prices (P*Q).

22 Achieving this baseline reduction will likely be through a form of direct taxation (like in Denmark), government subsidies and/or consumer price increases.

From a ***macro-economic and environmental perspective,*** the linked scenario shifts both revenue flows and abatement patterns. Cheaper ETS3 units lower ETS1 auction prices and, in turn, decrease government income in the 2030–2040 period. In the next decade, the ETS1 sector will – compared to the baseline – still pay for obtaining emissions allowances, but this will be directly to farmers rather than the government (figure 2, blue). On the emissions side, linkage slows fossil CO_2 cuts in ETS1 slightly, and provides emission cuts between 2035-2045 (figure 3, green). Measures to reduce ETS3 emissions are taken, requiring not only technical investments in abatement or herd management but also change in land use to ensure biogenic emissions are sequestrated or taken up by plants that store carbon (e.g. miscanthus). Towards 2050 the additional income for ETS3 (farmers) from selling 30% of their emission rights to ETS1 is still a financial sound choice, as the abatement cost (proxy for lost incoming from using these emissions for own production) are lower than the expected willingness to pay for ETS1.

At the ***EU level,*** a similar ETS1–ETS3 linkage could operate across Member States, creating a larger and more liquid cross-sector carbon market. Under the proposed 30% partial linkage, the ETS3 sector would provide about ***70-100 Mton CO_2-equivalent*** of tradable biogenic allowances to the ETS1 sector in 2040. This sizeable potential supply could offer ETS1 operators in industry, power generation, and aviation a cost-effective compliance option, while channelling substantial financial flows into agricultural emissions abatement. At a price of €170,-/tCO_2 this equates to about €12-17 billion each year, or €5-7 billion when subtracting the livestock sector abatement cost. Furthermore, expanding to a EU-wide system allows for more increased optimization due to the larger system scale. Naturally, it also increases the need for strong MRV systems as the risk of fraud increases which would significantly undermine trust.

4.3 Discussion and reflection

This case study offers an initial, exploratory look at the potential financial and GHG impacts of introducing a partial linkage between the national ETS1 and a proposed ETS3. The modelling was intentionally simplified in scope (national vs. EU27) and focused on a defined set of parameters to illustrate directional effects and get a better understanding of magnitudes rather than deliver precise forecasts. Given the many unknowns — including future ETS1 allowance availability, CBAM effectiveness, technology adoption rates, and evolving legislation (e.g. ESR and LULUCF) — these results should be treated with caution.

Even within these simplified boundaries, the exercise reveals some clear dynamics. On the ETS1 side, partial access to lower-priced ETS3 units reduces short-term compliance costs and boosts market liquidity, providing time for slower decarbonisation allowing infrastructure roll-outs to catch up. However, this flexibility comes at the expense of a slightly slower decarbonisation pace within ETS1 compared to a no-link baseline, as part of the abatement burden is shifted to agriculture. For ETS3, the linkage creates a new and stable revenue stream as agricultural allowances are sold to ETS1 operators. These revenues and this system provides certainty regarding the levels of biogenic methane and nitrous oxide compared to the baseline without a cap-and-trade mechanism in place.

From a national perspective, the macro-economic and environmental picture is mixed. Cheaper ETS3 units tend to reduce ETS1 auction prices and, with them, government auction revenues in the 2030–2040 window. At the same time, value flows shift from the state to the farming sector as ETS1 compliance payments are redirected to the livestock sector. This flow likely reduces future subsidy expenses and/or taxes introduced to push change. On the emissions side, modestly slower fossil CO_2 abatement in ETS1 is compensated by accelerated CH_4 and N_2O reductions in agriculture.

CHAPTER 5

Closing remarks and possible next steps

A carefully designed linkage between ETS1 and ETS3 holds significant promise to help achieve Europe's decarbonisation objectives. If designed appropriately it could deliver short-term compliance flexibility for sectors facing steep ETS1 obligations in the 2030–2040 period, while also jump-starting a capital-intensive agricultural transition that currently lacks a viable, market-driven financing mechanism. In doing so, such a system can enable cost-effective, politically feasible, and socially balanced decarbonisation across major emitting sectors. Its benefits extend beyond emission cuts, offering vital co-benefits — notably improved water quality and biodiversity gains — and encourage more sustainable farming practices.

Any systemic change of this nature, however, inevitably has significant societal implications for the groups directly or indirectly affected. For livestock farmers, the introduction of an ETS3 and linkage to ETS1 reshapes both their economic incentives and their operating environment: it alters the logic of long-term investment, likely changes the value of land, and affects the outlook and/or working practices for the next generation. For industry and power generators, it creates new opportunities beyond their own sector's boundaries. Systemic changes such as this require solid technical design, early stakeholder engagement, trust-building, and support mechanisms to ensure that the short-term disruptions are outweighed by medium- and long-term gains that are tangible for the people affected.

This publication hopefully furthers the discussion on how to achieve cost-effective carbon reduction, and that the proposal reviewed here — for linking ETS1 and (partially) ETS3, at either the national or EU27 level — demonstrates genuine promise as a means to meet climate goals while balancing economic efficiency, environmental integrity, and social responsibility. Before moving towards any implementation, further work is however essential: a comprehensive sensitivity analysis on ETS3 price levels, linkage caps, reduction factors, and allocation rules; robust modelling of fiscal impacts; and structured stakeholder dialogues to among others address design concerns or possible flaws. More detailed analysis should also expand the scope of the (limited) case study of this paper to include all EU Member States, as this likely also brings forth additional design questions and challenges to solve. Thereafter, a national pilot could be held. Where over the course of one or two years, a national link is introduced to further test if the system delivers as promised. Alternatively or as a third step, the system can be introduced at the EU27 level as part of the next phase of EU ETS.

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