LIFE COASE

POLICY BRIEF

Climate Neutrality - Policy scenarios for emissions trading

Policy insights

- Achieving climate neutrality by 2050 requires tailored approaches for each sector, with an in-depth assessment of the technical, political, and social feasibility of relying on an emissions trading system (ETS).
- To ensure a cohesive decarbonisation strategy, interaction effects between the EU ETS and other climate policies warrant further evaluation. Alignment between the ETS extension to fuel combustion in buildings and transport (ETS2), the Effort Sharing Regulation (ESR), and national policies must be verified.
- For ETS2, a 45 €/tCO2 price cap will not be enough to reach desired abatement targets. Additional measures such as technology standards or subsidies will thus be essential.
- High costs, monitoring issues, and public opposition suggest alternative policies may be more effective than an ETS to decarbonise the agri-food sector. The adopted strategy should focus on options beyond on-farm commitments, with stakeholders' involvement being key for policy acceptance.
- Concerns remain about the integration of industrial carbon dioxide removal (CDR) into the EU ETS. Alternatives to support their development include purchase obligations or public procurement.
- To address the risk of mitigation deterrence, separate targets of gross GHG reductions, land-based sequestration and permanent CDR should be defined. Policymakers should explore establishing an independent body to evaluate the balance between emissions reductions and removals for climate neutrality.
- Hybrid models combining sectoral and top-down approaches with Computational General Equilibrium (CGE) are essential for reflecting energy system interconnections. Integrating ETS models with energy, land use, and household models will enhance policy insights on ETS policy scenarios.
- Knowledge brokering organisations play an increasingly important role in shaping and producing evidence for policy. Strengthening dialogue between modellers and policymakers while promoting transparency in model assumptions and findings is crucial for informed policymaking.

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Introduction

In line with the recommendations of the European Scientific Advisory Board on Climate Change, the European Commission President Ursula Von der Leyen has confirmed plans to enshrine a 90% GHG reduction target by 2040 compared to 1990 levels into law.[1] Setting this target would support the EU's ambition to reach climate neutrality by 2050, a legal commitment under the European Climate Law. In the short term, implementing the Fit-for-55 legislative proposals will be crucial for reaching the 2030 target.

In this context, it is important to evaluate if all sectors are on track and identify effective policy measures to increase ambition. The future of the EU ETS, its role in the policy mix to reach the decarbonisation targets, and the adequacy of carbon pricing for other sectors need to be discussed.

To nourish the policy debate on the future of emissions trading in the EU, a yearly Net Zero Carbon Market Policy Dialogue (NZCMPD) is organised under the framework of the project LIFE COASE. The policy dialogue held on October 4, 2024, focused on the opportunities and challenges of extending carbon pricing to new sectors, considerations regarding the inclusion of domestic industrial carbon removals in ETSs, and the methodological issues relating to modelling the development of ETSs.[2] This policy brief builds upon the discussions held during this event.

1. To ETS or not to ETS? Considerations for sector expansion

Extending a carbon price to cover additional emitting activities should always be evaluated with care. Is an emissions trading system the most appropriate policy instrument to drive emissions reduction? Should the sector(s) be covered by extending the existing system or by creating another parallel mechanism? How would it affect regulated entities and households? How is carbon pricing interacting with other policies? Those are all aspects to assess.

a. ETS2: a system for buildings, road transport and additional sectors

For the biggest scope extension of the EU ETS to date, the EU has opted to create a second system (ETS2) to cover the emissions of road transport, heating of buildings and small industries.[3] This initiative represents the first expansion of European carbon pricing to sectors where Member States manage their emissions reductions in line with their emissions budgets as outlined in the Effort-Sharing Regulation (ESR).[4] Other environmental and energy policies are implemented at the national level to stay within these budgets. Overlapping policies produce interactions that can lead to different economic outcomes than if applied as a standalone policy. Research indicates that both the type of ETS and the nature of any overlap significantly influence economic interactions.[5] It is therefore essential to consider these factors together when implementing reforms. In the EU climate policy framework, **the interaction effects between the EU ETS, ETS2 and ESR should be further considered to ensure the overall effectiveness of the EU decarbonisation strategy.**

The ETS2 discussions must be viewed in conjunction with the delayed Energy Taxation Directive reform, which requires the Council's unanimous approval to be amended.[6] Thus, ETS2 could serve as a compensatory mechanism to address the lack of progress in the Energy Taxation Directive and help

1 Cartalis, C., Dessai, S., Diaz Anadon, L., Edenhofer, O., Eory, V., Hertwich, E. G., ... & Van Aalst, M. (2023). Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050.

2 This discussion was informed by a background report summarising the main insights from the academic Joint Session of Workshop (JSW) organised in July, which gathered researchers working on the topic.

3 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 ETS

4 The ESR governs emissions not included in the EU ETS, specifically from land transport, buildings, waste, agriculture and small industry, which collectively account for around 60% of total EU emissions.

5 Fischer, Qu & Goulder (2024) find that renewable subsidy or electricity consumption tax implies higher efficiency costs with a cap-and-trade system. Fischer, C., Qu, C., and Goulder, L. H. (2024). Rate-Based Emissions Trading with Overlapping Policies. Development Research.

6 COM(2021) 563 final. Proposal for a Council Directive restructuring the Union framework for the taxation of energy products and electricity (recast)

meet the 2030 national emission targets. **Clarity is needed on how the ESR and the resulting national policies will align with ETS2 to ensure they complement each other effectively.**

Economic efficiency considerations would suggest that the EU ETS and ETS2 should be merged to reach a uniform allowance price across all covered sectors. In practice, administrative burden and adverse competitiveness effects for EU ETS industries justify a separate system in the first stage. This would also enable carbon price discovery for ETS2 sectors along with providing time to develop a robust and mature system.[7] The prevailing view in the modelling literature on ETS2 indicates that the system would produce significantly higher prices than the Commission's "indicative cap" of 45 €/tCO2.[8] **Yet, there are concerns about the political feasibility of such high prices. To achieve the desired abatement targets within this price limit, additional measures such as technology standards or subsidies will be essential.[9]**

b. Agriculture: the sector trailing behind in decarbonisation

Once the ETS2 is in place, agriculture will remain the major sector not covered by an emissions trading system. The sector represents around 10% of total EU GHG emissions.[10] Non-CO2 emissions from agricultural land-use fall under the national ESR provisions, while CO2 emissions and removals are reported under the LULUCF land category. Both policies regulate agricultural emissions until 2030, with the framework for the period beyond 2030 still under development.[11]

In 2023, the EC analysed the feasibility of extending emissions trading to agriculture (ETSAg) after 2030.[12] It considered different options for a separate ETSAg, with different points of regulation. Limited data quality on emissions, abatement potential and costs, and concerns over the public acceptability of the measure, pose challenges to extending the ETS to that sector. Lessons can be learned from New Zealand, which has been investigating the extension of its ETS to agriculture since 2008 and has made considerable efforts to develop a mechanism to monitor emissions at the farm level. Implementation failed due to the challenges related to emissions monitoring and resistance from farmers facing international competition. **A careful assessment is required to determine if emissions trading is the most effective policy for reducing agricultural emissions**. Policy alternatives, such as taxes, targeted subsidies, and regulation, should also be further explored.

First, the significant subsidisation in the EU agriculture sector is a hurdle for setting a carbon price, as price signals could be distorted or offset. The 2023-2027 Common Agricultural Policy (CAP)[13] allowed member states to adapt to the EU's green objectives, but many exploited exemptions to agricultural and environmental standards and postponed necessary green measures, resulting in CAP plans that failed to align with the EU's environ-

7 Rickels, W., Rischer, C., Schenuit, F., and Peterson, S. (2023). Potential efficiency gains from the introduction of an emissions trading system for the buildings and road transport sectors in the European Union (No. 2249). Kiel Working Paper.

8 Abrell et al (2024) show that the necessary carbon prices to reach the proposed 2030 targets elevate to 130-286 €/tCO_2 in the EU ETS and 175-360 €/tCO_2 in the ESR, based on a multi-model assessment. Abrell, J., Bilici, S., Blesl, M., Fahl, U., Kattelmann, F., Kittel, L., ... and Siegle, J. (2024). Optimal allocation of the EU carbon budget: A multi-model assessment. Energy Strategy Reviews, 51, 101271

9 Van den Bergh, J., Castro, J., Drews, S., Exadaktylos, F., Foramitti, J., Klein, F., … Savin, I. (2021). Designing an effective climate-policy mix: accounting for instrument synergy. Climate Policy, 21(6), 745–764.

10 Based on the EU-27 greenhouse inventories in 2022 (EEA greenhouse gas data viewer, European Environment Agency).

11 For further specification on European regulations that govern these emissions: Koundouri, P., Anquetil-Deck, C., Becchetti, L., Berthet, E., Borghesi, S., Cavalli, L., Chioatto, E., Cruickshank, E., Devves, S., Dibattista, I., Giovannini, E., Halkos, G., Hansmeyer, C., Landis, C., Mazzarano, M., Papa, C., Patel, K., Plataniotis, A., Salustri, F., Tiwari, M.M., (2023) Transforming Our World: Interdisciplinary Insights on the Sustainable Development Goals, SDSN European Green Deal Senior Working Group.

12 European Commission: Directorate-General for Climate Action, Bognar, J., Lam, L., Forestier, O., Finesso, A., Bolscher, H., Springer, K., Nesbit, M., Nadeu, E., Hiller, N., Dijk, R., Jakob, M., Tarpey, J., McDonald, H., Zakkour, P., Heller, C., Görlach, B., Scheid, A., and Tremblay, L. (2023). Pricing agricultural emissions and rewarding climate action in the agri-food value chain, Publications Office of the European Union.

13 The CAP, which is the EU's principal financing mechanism for the agricultural sector, should channel 40% of its budget towards providing climate-relevant support.

mental and climate targets.[14] **Streamlining policies to strengthen environmental incentives would be an important precondition for implementing a carbon price in the agricultural sector.**

Second, it is necessary to specify which actors should be regulated by an ETSAg. Downstream and upstream options would be preferable to an on-farm obligation. This is mainly because of the administrative costs of ensuring accurate monitoring, reporting and verification (MRV) for on-farm approaches, a chief prerequisite for successful implementation.[15] Generally, MRV poses a major challenge to carbon pricing in the agricultural sector, as accounting for emissions at the farm level as well as along the entire supply chain (Scope 3 emissions) faces technical and administrative hurdles. **Tackling these challenges will determine the feasibility of ETSAg.**

Third, regulation of the agricultural sector is politically sensitive due to the potential impact on food prices and consumer diets. **Comprehensive stakeholder involvement in the policy process and initial voluntary mechanisms can address this issue**. The Strategic Dialogue on the future of EU agriculture established by the EC, which involved farmers' unions, NGOs, and industry representatives, is a constructive initial step. The EC's consideration of the outcomes from this dialogue will be key in ensuring policy acceptability.[16]

2. Integrating industrial carbon dioxide removals: challenges ahead

Carbon dioxide removals that durably remove GHG from the atmosphere are an essential element of a net-zero strategy to keep global CO2 emissions negative after 2050 and to tackle residual emissions.[17] To reach climate neutrality by 2050, industrial carbon dioxide removals (CDR) from biogenic and atmospheric sources, along with natural carbon sinks and carbon farming, will be instrumental for offsetting residual emissions in energy-intensive industries and energy production facilities considered hard-to-abate.[18] The Commission has proposed Union-level targets to geologically store 50 million tonnes of CO2 annually by 2030, with an aim to capture approximately 280 million tonnes by 2040, increasing to around 450 million tonnes by 2050.[19] To address this need, an industrial carbon management strategy was adopted in February 2024, outlining actions to support the development of technologies to capture, store, transport and use CO_2 emissions from industrial facilities, as well as to remove CO_2 from the atmosphere.[20] Establishing a CDR deployment target will be the first step for reaching the net GHG emission reduction objective for 2040. It can be anticipated that scaling country-level efforts to achieve the Union-level CDR ambitions will present a significant challenge, calling for strong coordination and planning between Member States and the European Commission.[21]

14 Special report 20/2024: Common Agricultural Policy Plans – Greener, but not matching the EU's ambitions for the climate and the environment. (2024). Official Journal, C 5766.

15 Görlach, B., Mc Donald, H., & Bognar, J. (2024). Options to Expand Emissions Trading to Agriculture in Europe.

16 Report 09/2024: Strategic Dialogue on the Future of EU Agriculture – A shared prospect for farming and food in Europe. (2024).

17 IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 35-115

18 In this document, CDR will only refer to industrial CDR, unless mentioned otherwise.

19 The 2030 target is set under the Net-Zero Industry Act Regulation (EU) 2024/1735 of the European Parliament and the Council of 13 June 2024 on establishing a framework of measures for strengthening Europe's net-zero technology manufacturing ecosystem. The numbers for 2040 and 2050 emerge from the modelling results conducted for the impact assessment (SWD(2024) 63 final) accompanying the Communication Securing our future Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society (COM(2024) 63 final).

20 Communication from the European Commission Towards an ambitious Industrial Carbon Management for the EU (COM(2024) 62 final).

21 Based on the draft national energy and climate plans (NECPs) submitted in 2023, Member States' projections for capacity of CO2 captured for storage and utilisation were already falling short of the mandated 2030 target. The draft NECPs plan an overall injection capacity of 39.3 million tonnes annually in 2030 (COM(2024) 62). The climate action tracker also provides evidence of the failure of the NECPs to align with the EU's targets.

The Commission is currently assessing if and how CDR could be accounted for and covered by emissions trading.[22] **A strand of the academic literature concludes that integrating them into the EU ETS is the most straightforward policy option**.[23] It would enhance the build-up of CDR capacity and would provide a policy architecture suitable for managing the balance between emissions abatement and carbon removal. This approach may also address the liquidity challenges associated with the hoarding of allowances, which is anticipated to occur as the cap of the EU ETS approaches zero. Macroeconomic models assessing the paths to decarbonisation have also started incorporating removals in their studies.[24] These models generally assume full fungibility between removal units and emissions allowances. The main model constraints include the deployment rate, geographical formations, biomass availability, transport and storage capacities, and technical limitations.

Concerns remain about the integration of CDR into the EU ETS. The primary issue is the anticipated discrepancy between the carbon price in the EU ETS and the costs associated with CDR. The latter vary depending on the technologies employed, but they are generally higher than the current carbon prices in the ETS.[25] Another challenge is the impact of CDR integration on ETS integrity, which heavily depends on having a secure and robust MRV process for removals. The EU-wide certification scheme mentioned in the carbon removals and carbon farming (CRCF) regulation should ensure the quality of CDR, with a strong focus on the permanence of storage and additionality of the units.[26] Another factor to consider is the liability requirements in case of a reversal, which would strengthen the credibility of the unit's guaranteed permanence.

In light of these challenges, the Commission will also consider policy instruments beyond the ETS in its assessment to determine the most effective approach to support the development of industrial carbon removals. **Potential alternatives or complementary options under consideration include CDR purchase obligation for specific activities and public procurement.**[27]

Regardless of the policy instrument employed, a significant risk remains related to the development of removals. This risk pertains to potential mitigation deterrence, wherein companies may delay their decarbonisation efforts by relying on removals to offset their emissions. **Moving from net targets to three targets separating gross GHG reductions, land-based sequestration, and permanent CDR would avoid the potential slowdown of emissions reduction efforts and secure the path to climate**

22 The Commission has been mandated by co-legislators to assess the option of integrating removals (as well as emissions from residual waste) in the EU ETS (Directive (EU) 2023/959). These assessments should be done by July 2026, with an open public consultation which will take place early 2025.

23 See for example: Sultani, D., Osorio, S., Günther, C., Pahle, M., Sievert, K., Schmidt, T. S., ... and Edenhofer, O. (2024). Sequencing Carbon Dioxide Removal into the EU ETS (No. 11173). CESifo Working Paper. & Pahle, M., Quemin, S., Osorio, S., Günther, C., and Pietzcker, R. (2023). The emerging endgame: the EU ETS on the road towards climate neutrality. Available at SSRN 4707860.

24 Read the technical report to learn more about the main findings comparing ex-ante models.

25 The cost of carbon credits within the voluntary carbon market for industrial removals is clearly above the current price of an allowance, with 2023 volume-weighted average credit price of 300$ and 715$ for BECCS and DACCS respectively. Smith, S. M., Geden, O., Gidden, M. J., Lamb, W. F., Nemet, G. F., Minx, J. C., Buck, H., Burke, J., Cox, E., Edwards, M. R., Fuss, S., Johnstone, I., Müller-Hansen, F., Pongratz, J., Probst, B. S., Roe, S., Schenuit, F., Schulte, I., Vaughan, N. E. (eds.) The State of Carbon Dioxide Removal 2024 - 2nd Edition. DOI 10.17605/OSF.IO/F85QJ (2024). For 2050 cost estimates, refer to: Bednar, J., Höglund, R., Möllersten, K., Obersteiner, M, and Tamme, E. (2023). The role of carbon dioxide removal in contributing to the long-term goal of the Paris Agreement. Swedish Environmental Research Institute.

26 The certification of permanent carbon removals falls under the framework of the Carbon Removals and Carbon Farming (CRCF) proposed regulation (COM/2022/672 final) which was agreed upon in April 2024 but still needs to be formally adopted to enter into force. Tailored EU certification methodologies for different removal activities will be established through delegated acts.

27 A carbon takeback obligation for the fossil fuel sector could also be considered. See for example: Jenkins, S., Mitchell-Larson, E., Ives, M. C., Haszeldine, S., and Allen, M. (2021). Upstream decarbonization through a carbon takeback obligation: an affordable backstop climate policy. Joule, 5(11), 2777-2796.

neutrality.[28] It would also provide increased transparency and clarity for project developers and pave the way for improved governance.

To establish a scientifically and politically appropriate balance among the various sub-targets, the involvement of an independent agency would be beneficial. **In this context, the idea of establishing an independent body warrants further exploration.**[29]

3. Assessing emissions trading policy scenarios: comparison of ex-ante models

Ex-ante models provide policymakers with valuable estimates of the impacts of different policy scenarios. In the context of emissions trading, these models predict future carbon prices and evaluate the macroeconomic impacts of decarbonisation, economic activity, and competitiveness. They also assess the potential for cost pass-through and its associated distributional effects, scope expansion, integration of removals, ETS linking, and the effects of interacting policies.

As ETSs expand globally and face similar challenges, few comparisons of macroeconomic models assessing ETS developments exist. The findings from a survey of models simulating decarbonisation strategies in regions with an ETS indicates an increase in carbon price in Europe and globally, with predicted EU carbon prices of around 70 to 250 €/tCO2 in 2030, increasing to around 400 to 500 €/tCO2 by 2050.[30] The EU ETS predicted price range increases due to uncertainty regarding abatement costs, coverage scope and overlapping policies.

The survey results indicate a rising interest in integrating uncertainty to better understand market dynamics. **Hybrid models, combining top-down and sector-specific approaches with Computational General Equilibrium (CGE), are being used more frequently to reflect the growing interconnections in energy systems.** These models offer policymakers a better understanding of the broader economic impacts of an ETS, particularly on key issues concerning industrial competitiveness and supply chain security. **To respond to the increasing complexity of policy interactions within the climate policy framework, it would be beneficial for ETS models to be further integrated with energy, integrated assessment, land use, and household-level models.**

While linking ETSs poses regulatory and political challenges, ex-ante assessments indicate potential economic gains from linking, with cost savings of up to 60%.[31] Assessing the potential expansion of the EU ETS to include additional countries, such as those in the Western Balkans, or establishing a linkage with the UK ETS may be relevant, depending on the evolution of the geopolitical context.

To close the loop between the policy processes and scientific work on modelling ETS, direct engagement opportunities and improvements in data transparency and availability are key. **Knowledge brokering organisations such as the JRC and the OECD, play an increasingly important role in shaping**

28 In the EC's public consultation on the 2040 target, most respondents voiced the need to adopt three separate targets. This proposal was reiterated by an open letter calling for a separation of targets in the EU climate architecture.

29 Different proposals have been mentioned in the literature, ranging from establishing an advisory body to a central bank, with options for both a strict mandate and a broader one, not limited to overseeing the integration of CDR. See for example: Edenhofer, O., Franks, M., Kalkuhl, M., and Runge-Metzger, A. (2023). On the governance of carbon dioxide removal–a public economics perspective. & Baudry, M., and Dumont, B. (2024). Credibility of the EU-ETS to decarbonize the European economy. In Financial Stability, Economic Growth and Sustainable Development (pp. 30-41). Routledge. Quemin, S., and Pahle, M. (2023). Financials threaten to undermine the functioning of emissions markets. Nature Climate Change, 13(1), 22-31. & Pyrka M., Jeszke R., Boratyński J., Witajewski-Baltvilks J., Antosiewicz M., Tatarewicz I., … and Sekuła M. (2024). VIIEW on EU ETS 2050: Exploring synergies between the EU ETS and other EU climate policy measures - carbon removal, hydrogen, and sectoral transport policy, Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

30 A survey was sent out to different modellers. The 17 carbon market models included in the analysis cover a broad geographical scope, including simulations from ETSs in the UK, EU, New Zealand, China, USA, and Canada, as well as global simulations. Information collected includes a model fact sheet, carbon removal modelling information, main scenario assumptions, carbon prices and interaction with policymakers. More details about the survey results can be found in the technical report.

31 See for example : Rose, A., Wei, D., Miller, N., Vandyck, T., and Flachsland, C. (2018). Policy brief—Achieving Paris climate agreement pledges: Alternative designs for linking emissions trading systems. Review of Environmental Economics and Policy. & Nachtigall, D., Ellis, J., Peterson, S., and Thube, S. (2021). The economic and environmental benefits from international co-ordination on carbon pricing: Insights from economic modelling studies.

and producing evidence for policy. For example, the International Forum on Carbon Mitigation Action, initiated by the OECD, conducts a comprehensive stocktake of current climate policies across various countries and provides assessments of their effectiveness. In general, **strengthening the dialogue between modellers and regulators, disseminating key results, and enhancing the transparency of model inputs and limitations will foster informed policymaking and enable researchers to better incorporate policy priorities and generate useful recommendations.**

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The Florence School of Regulation (FSR) was founded in 2004 as a partnership between the Council of the European Energy Regulators (CEER) and the European University Institute (EUI), and it works closely with the European Commission. The Florence School of Regulation, dealing with the main network industries, has developed a strong core of general regulatory topics and concepts as well as inter-sectoral discussion of regulatory practices and policies.
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