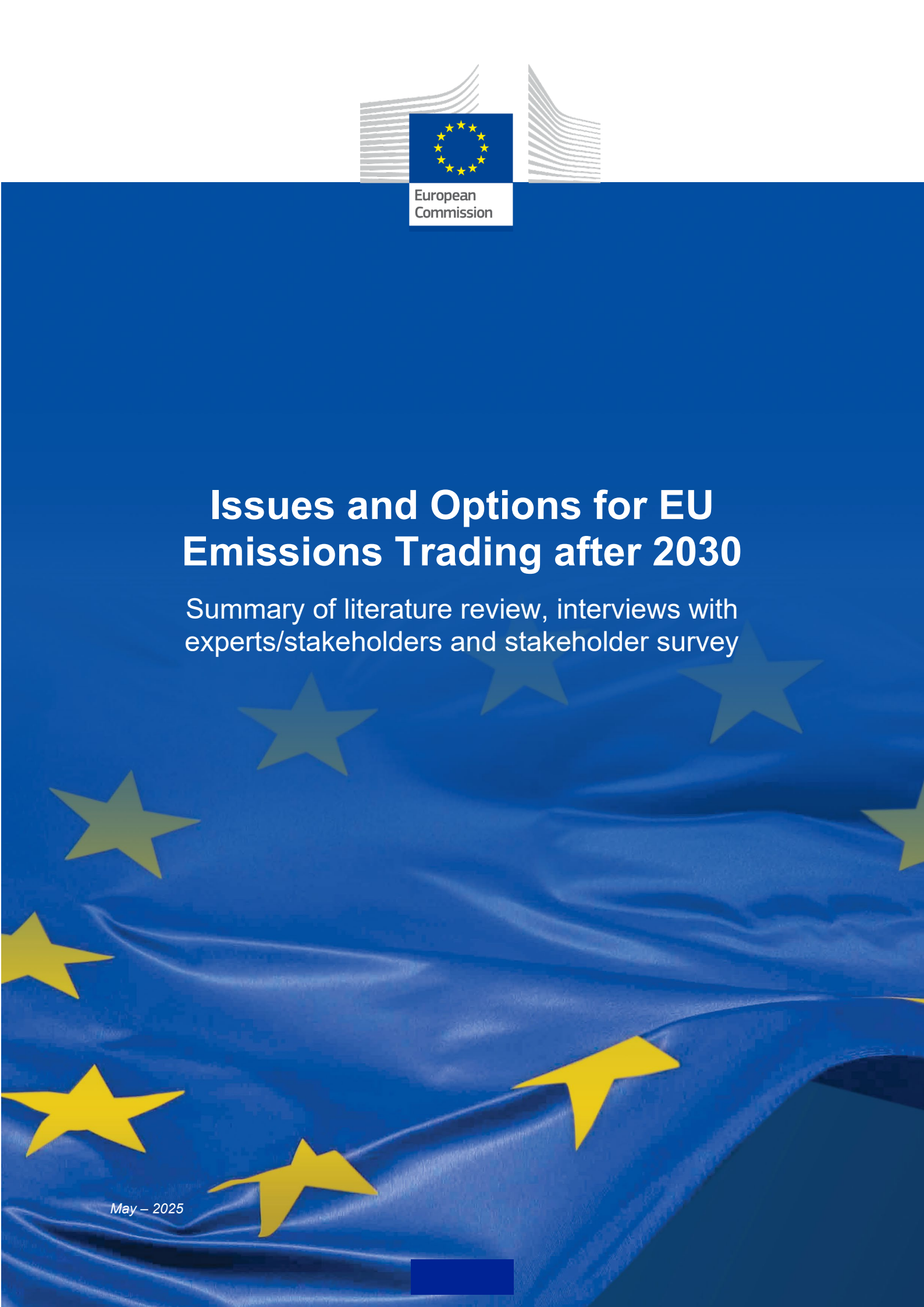
European Commission

Issues and Options for EU Emissions Trading after 2030

Summary of literature review, interviews with experts/stakeholders and stakeholder survey



May – 2025

EUROPEAN COMMISSION

Directorate-General for Climate Action
Directorate B — Carbon Markets and Clean Mobility
Unit B.1 — ETS (I): Policy Coordination, International Carbon Markets

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Printed by OIB in Belgium

Manuscript completed in April 2024

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Luxembourg: Publications Office of the European Union, 2025

PDF	ISBN 978-92-68-27346-3	doi: 10.2834/3724449	ML-01-25-027-EN-N

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July 2024

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Summary of literature review, interviews with experts/stakeholders and stakeholder survey

Contract details
DG CLIMA Unit B.1, CLIMA/2022/OP/0012

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Acknowledgements
The team would like to thank the European Commission for its support throughout the project. We are also sincerely grateful to the individual experts and stakeholders who generously contributed their time and insights during the expert interviews, which significantly enriched our analysis. Our thanks also go to the stakeholders who responded to the targeted online survey, providing valuable input to our work.

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Abbreviations

AEA	Annual Emissions Allocations
BCA	Border carbon adjustment
BEUC	European Consumer Organisation
BECCS	Bioenergy with Carbon Capture and Storage
CAN	Climate Action Network
CAP	Common Agricultural Policy
CCB	Carbon Central Bank
CBAM	Carbon Border Adjustment Mechanism
CCfD	Carbon Contract for Difference
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilization
CCUS	Carbon Capture, Utilization and Storage
CDM	Clean Development mechanism
CDR	Carbon Dioxide Removal
CEFIC	European Chemical Industry Council
CEMBUREAU	European Cement Association
CLECAT	European Association for Forwarding, Transport, Logistics and Customs Services
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CRC	Carbon Removal Certificates
CRCA	Carbon Removal Certification Authority
CRCF	Carbon Removals Certification Framework
CRO	Carbon Removal Obligation
DACCS	Direct Air Carbon Capture and Storage
DAG	Directed Acyclic Graphs
DG	Directorate-General
EC	European Commission
ECCB	European Carbon Central Bank
ECJ	European Court of Justice
EEA	European Environment Agency
EFTA	European Free Trade Association
EITE	Emissions-Intensive Trade-Exposed
EPC	Equal-Per-Capita
ESCA	European Shipowners Association
ESMA	European Securities and Markets Authority
ESR	Effort Sharing Regulation
ETS1	Emission Trading System 1 (current scope) (see "EU ETS")

ETS2	Emission Trading System 2 (separate emissions trading system for buildings, road transport and additional sectors) (see "EU ETS")
EU ETS	EU Emissions Trading System (refers to both ETS1 and ETS2 as in current legislation)
EUA	European Union Allowance
EUROAce	European Alliance of Companies for Energy Efficiency in Buildings
EW	Enhanced Weathering
GHG	Greenhouse gas emissions
GLIA	Green Leap Innovation Authority
ICAO	International Civil Aviation Organisation
ICAP	Carbon Action Partnership
IETA	International Emissions Trading Association
IMO	International Maritime Organisation
ITMO	*Internationally Transferred Mitigation Outcomes*
IPCC	Intergovernmental Panel on Climate Change
LRF	Linear Reduction Factor
LULUCF	Land Use, Land Use Change and Forestry
MBM	Market-Based Measure
MRV	Measurement, reporting and verification
MSR	Market Stability Reserve
OBA	Output-Based Allocation
OECD	Organisation for Economic Co-operation and Development
PIK	Potsdam Institute for Climate Impact Research
RRPs	Recovery and Resilience Plans
SCF	Social Climate Fund
TEU	Twenty-foot Equivalent Unit
TFEU	Treaty on the Functioning of the European Union
TNAC	Total number of allowances in circulation
TRL	Technology Readiness Level
UNFCCC	United Nations Framework Convention on Climate Change
VCM	Voluntary Carbon Markets
WTO	World Trade Organisation

Executive summary

Under the European Climate Law, the European Union must achieve climate neutrality by 2050. The EU Emissions Trading System (EU ETS) serves as a key policy instrument for cost-effective abatement of emissions in the EU. As part of the Fit-for-55 package, the Council adopted key legislation related to emissions trading on 25 April 2023. This includes the revision of the ETS directive, which establishes the EU ETS2 and amends the Market Stability Reserve (MSR) decision. The revised ETS directive and MSR, published on 10 May 2023, aim to increase the overall ambition of emissions reductions by 2030 within sectors covered by the EU ETS1 to 62% compared to 2005 levels. This includes a rebasing of the overall emissions ceiling by 90 million allowances in 2024 and 27 million allowances in 2026, alongside an increase in the linear reduction factor to 4.3% per year from 2024 to 2027 and 4.4% from 2028 onward. This tightens the ETS cap significantly in the post-2030 period. Additionally, the revised EU ETS Directive includes review clauses in Article 30, which contemplate the potential inclusion of negative emissions. Furthermore, Article 3 of the MSR Decision (2015/1814) mandates a review of the MSR by 2026, ensuring continued alignment with the evolving climate goals and market conditions.

The aim of this report is to provide a comprehensive overview of the strategic challenges and policy options for EU emissions trading as perceived by a wide range of external sources for the 2030-2040 time horizon, including the main arguments supporting different perspectives. It does so by surveying scientific literature, experts, and stakeholders to identify the main issues for the development of emissions trading post-2030. It then distils first conclusions on the key policy issues from the insights obtained from the scientific literature, experts, and stakeholders. It fleshes out issues and options warranting deeper analysis, providing a thorough evaluation of the significance of certain developments in shaping the future of EU emissions trading. This report reflects developments until late 2023, since most of the analysis underlying the findings was carried out between February 2023 and October 2023.

The methodological approach involves various qualitative methods to identify key challenges and policy options for the EU ETS. The methods include a literature review, comprising of in-depth analysis of relevant academic and expert papers. The selection process for these papers focused on quality and relevance of the studies. Additionally, 17 semi-structured in-depth interviews with high-level experts, primarily academic but also including some with practical expertise, were conducted to pinpoint challenges and policy options for the future development of the EU ETS. These interviews produced directed acyclic graphs (DAGs) to visualise the causal chains of identified challenges and corresponding policy options, detailed in Section 5 and Appendix B of the report. A stakeholder survey complemented this, aiming for a broad representation of viewpoints from industry representatives, trade unions, consumer organizations, and NGOs. The stakeholder survey included 14 scoping interviews and an online survey with 117 participants, ensuring a diverse range of subjective perspectives.

Issues identified in the literature, interviews, and stakeholder surveys were categorised into seven thematic areas: (1) Market stability and the Market Stability Reserve (MSR), (2) Carbon Dioxide Removals (CDR), (3) distributional aspects, (4) industry – including free allocation, the Carbon Border Adjustment Mechanism (CBAM) and Carbon Capture and Utilisation (CCU) –, (5) international issues, (6) the scope of covered emissions including linking ETS1 with ETS2, and (7) the role of financial actors. Among these, market stability, CDR, as well as industry were prioritised by experts as particularly important. Distributional aspects were also highlighted as important.

For the MSR, the key challenge identified in the study is ensuring the compatibility of the current MSR design with an increasingly tighter emissions cap. The MSR has proven effective in restoring market confidence and correcting oversupply issues, managing historical and unexpected structural surpluses after the global financial crisis and the COVID-19 pandemic. However, ensuring alignment between the MSR operations with a changing market environment, characterised by altered hedging demand and a lower cap, is essential. The literature indicates potential interactions of MSR-1 with market behaviour, particularly in affecting the banking behaviour of market participants. Questions arise on whether faster action may become necessary in the future in response to high carbon prices, as Article 29a's response mechanism operates with a delay. The cyclical nature and time lag in MSR-1's market reaction further complicate this issue. In terms of policy options, the report includes a legal analysis of several policy options for reforming the MSR, such as implementing a price-responsive allowance supply, reserve auction price, price floor, and price ceiling (section 4.2).

A potential integration of Carbon Dioxide Removals (CDR) into the EU ETS is a key challenge. On the opportunity side, CDR can help compensate for residual industrial emissions and increase supply-side flexibility, thereby enhancing the cost-effectiveness of ETS1. However, its inclusion also raises important risks, particularly concerning the environmental integrity of the system and the possibility of mitigation deterrence. As CDR is currently excluded from ETS1, its future integration would require a robust and credible regulatory framework. Such a framework is essential both to enable the effective inclusion of CDR and to support long-term investment in the sector. A particular challenge lies in addressing the potential integration of non-permanent CDR methods, which entail the risk of carbon reversal. Managing the resulting carbon debt would require a long-term, credible commitment to perpetual renewal – effectively ensuring permanent management of the carbon cycle. While some land-based CDR options may appear inexpensive initially, they can become significantly more costly over time, and the ongoing renewal obligation may introduce substantial financial risks for society.

The key challenge related to distributional aspects highlighted by most experts is their increasing relevance as carbon prices rise, as well as potential ramifications for the political stability of the EU ETS. While addressing distributional effects from carbon pricing is key, it is currently uncertain how effectively policies like the Social Climate Fund (SCF) or national measures will address the distributional impacts of potentially high carbon prices once ETS2 is implemented. The price stabilisation mechanisms in both ETS1 and ETS2 may not be effective in preventing high prices, and the soft price cap in ETS2 could foster false expectations about price control. As carbon prices increase, the importance of robust and equitable distributional policies will become increasingly critical to maintain social and economic stability across the EU. Fundamentally, effective redistribution policies would need to tackle economic disparities within as well as between countries, particularly targeting low-income households. This will require both Member State and EU action.

Further key challenges identified include those related to industry, linking (both international and intra-EU), a potential extension of the ETS to agricultural emissions, as well as the role of financial actors. For industry, the key challenge identified is the critical challenge of achieving fast decarbonisation while preventing carbon leakage. This challenge is highlighted throughout the literature, as well as expert and stakeholder interviews and the survey. Barriers to international linking of ETS systems include differing structural features and varying levels of ambition, such as carbon prices. Intra-EU linking faces challenges in broadening the scope, including integrating ETS1 with ETS2 and potentially extending emissions trading to cover agricultural emissions. Additionally, there is a risk that financial actors could distort ETS prices, underscoring the need for careful management and regulation to maintain market integrity.

In addition to these specific challenges, several overarching findings have emerged from the analysis:

- **Interlinkages among the various challenges and policy options identified in the study are significant, underscoring the complexity of addressing the functioning of the ETS**. For instance, ensuring market stability might rely on regulating financial actors, on options for the use of revenue, or expanding the scope to include additional sectors. This raises the question of how extensively these interactions should be considered, suggesting that a singular policy approach per challenge may not be sufficient. It implies that a deeper integration of existing policies with new options could be desirable to create a cohesive strategy. Additionally, this highlights the importance of ensuring coherence with the broader climate policy framework.
- **The design of implementation of key policy options appears underexplored**. The interviews provided substantial insights into challenges and general options but offered limited information on implementation and critical design considerations. It therefore emerged that challenges are relatively well understood, but a development and in-depth analysis of concrete policy proposals is still lacking. For instance, while the need for MSR reform and the importance of linking ETS1 and ETS2 were frequently mentioned in the interviews, concrete proposals for their implementation are lacking. Similarly, while there are views pro and contra the integration of (certain types of) removals into the EU ETS, more work needs to be done on the conditions, modalities and quantitative aspects of potential inclusion of (certain types) of removals. Finally, there is very little literature on how carbon capture and use should be treated in the EU ETS, an area that will require further work. These limitations are true both for the literature, as well as for the interviews, where a divergence in understanding among interviewees about key design features of policy options became apparent. This indicates a need for more detailed exploration and consensus-building on concrete implementation aspects.
- **According to stakeholders and experts, it is critical to deal with carbon leakage risks, distributional aspects and market stability**. Market participants should have trust and confidence in the functioning and governance of the EU ETS, ensuring it is "fit for purpose". This perspective necessitates a stable regulatory framework that anticipates future challenges and, alongside economic market stability, creates a robust investment environment e.g. for investing in climate-neutral production processes for industries. Secondly, it requires broader political support for the EU ETS from key political actors, including the EU Commission and national governments. While political support is currently strong, according to some interviewees future distributional challenges or political pressure from industry could pose a threat to the environmental integrity of the EU ETS, which will increase as carbon prices rise. Industry pressure may escalate if mechanisms like CBAM and complementary policies fail to address carbon leakage risks effectively. Concurrently, consumers might react negatively to potentially higher prices in ETS2, which would result in higher heating and transport costs, unless alternatives are made available.

1 Introduction and scope of the report

The objective of the project was the assessment of strategic challenges, and policy options for the further development of the EU Emissions Trading System (EU ETS) framework in the 2030-2040 period. The EU ETS framework represents a key policy instrument for emission abatement within the EU. With the formal adoption of the reviewed EU ETS directive from the Fit-for-55 package in 2023 and the recommendation of the EU climate target for 2040 in 2024, the Commission's focus is gradually shifting to the further issues and development options for EU emissions trading in the 2030-2040 period.

The objective of this report is to provide a mapping of **challenges** and **policy options** for EU emissions trading in the period 2030-2040 and a first prioritisation of challenges and associated policy options. Methodologically, the mapping of challenges and policy options is based on a literature review, expert and stakeholder interviews and a stakeholder survey.

To bring clarity and coherence to the analysis, the challenges and policy options are organised into seven thematic areas. These areas were defined specifically for the purposes of this study and serve as the structural backbone for presenting the findings:

- **Market stability** and design of the **Market Stability Reserve (MSR)** (including legal perspective on potential price-based rules and interventions)
- Integration of **Carbon Dioxide Removals (CDR)**
- **Distributional aspects, auctioning, redistribution, support for the vulnerable**
- **Industry, free allocation and Carbon Border Adjustment Mechanism (CBAM)**
- **International dimension** (including interaction with international carbon pricing system, international linking, interplay with CORSIA and any future international maritime shipping offsetting scheme)
- **Scope of covered emissions** and **linking ETS1 with ETS2**
- Role of **financial actors**

Within this framework, the report applies the following definitions for challenges and policy options to guide the analysis:

- **Challenge**: A challenge arises when one (or more) developments affect the functioning of the EU ETS (potentially impair or potentially improve) in one (or more) dimensions.
- **Policy option**: A policy option represents a potential course of action or solution that policymakers may consider to address one (or more) of the identified challenges for the EU ETS.

The remainder of the report is structured as follows:

- **Section 2: Background of the study** Provides an overview of the context of the assignment.
- **Section 3: Methodological approach for mapping of challenges and policy options.** Presents the methodological approach for the literature review, expert interviews, stakeholder interviews, and the stakeholder survey.
- **Section 4: Reporting of findings from literature review.** Presents the findings from the literature review. The reporting is structured around the relevant issues identified and the challenges and policy options associated with these issues. The literature review also involves a review

of the legal challenges associated with price-based price control mechanisms for the Market Stability Reserve (MSR) (see Section 4.2).

- **Section 5: Reporting of findings from interviews and stakeholder survey.** Presents the findings from the expert and stakeholder interviews together with the findings from the stakeholder survey. Mirroring the approach for the literature review (Section 4), the reporting is structured around the relevant issues identified and the challenges and policy options associated with these issues.
- **Section 6:** Provides a synthesis and first prioritisation of the challenges and associated policy options identified in the mapping.

2 Background of the study

The European Climate Law[1] was adopted in July 2021. It incorporates the objective set out in the European Green Deal[2] for Europe's economy and society to become climate-neutral by 2050. This means achieving net zero GHG emissions for EU countries, mainly by cutting emissions, investing in green technologies, and protecting the natural environment. To reach the climate-neutrality objective, the binding Union 2030 climate target shall be a domestic reduction of net GHG by at least 55% compared to 1990 levels. The EU Emissions Trading Scheme (EU ETS) is a cornerstone instrument for cost-effective emissions reductions in the EU.

To achieve the higher level of ambition until 2030, the European Commission presented in July 2021 the Fit-for-55 package. A series of legislative proposals for strengthening EU energy and climate policies. The Fit-for-55 package included, among other proposals, a review of the EU Emissions Trading System (EU ETS), the Effort Sharing Regulation (ESR), Land Use, Land Use Change and Forestry Regulation (LULUCF), as well as targets for renewable energies and energy efficiency.

Most importantly for the context of this study, as the last step in the decision-making procedure, the Council adopted on 25 April 2023 key pieces of legislation from the Fit-for-55 package related to emissions trading[3]. This involves the revision of the ETS directive, including the provisions on the establishment of EU ETS2 (Article 30 of the revised ETS Directive) and amending the Market Stability Reserve (MSR) decision. The revision of the ETS directive and the MSR was published on 10 May 2023[4]. Additionally, the Council also adopted the regulation establishing a Social Climate Fund (SCF)[5] and the regulation on establishing the Carbon Border Adjustment Mechanism (CBAM)[6]. Furthermore, also the revision of the ETS Directive regarding aviation[7] and the amendment of the regulation on monitoring, reporting and verification (MRV) in shipping[8] (which prepares the inclusion of maritime shipping emissions in EU ETS1), were adopted.

Decisions regarding amendments to the Market Stability Reserve (MSR) were already formally adopted by the Council on 28 March 2023[9], together with the Effort Sharing Regulation (ESR) and LULUCF regulation[10].

The revision of the ETS directive sets out to increase the overall ambition of emissions reductions by 2030 in the sectors covered by the EU ETS1 to 62% compared to 2005, a rebasing of the overall emissions ceiling of 90 million allowances in 2024 and 27 million allowances in 2026, and an increase of the linear reduction factor' by 4.3 % per year from 2024 to 2027 and 4.4 from 2028. The co-legislators also decided to strengthen the MSR by prolonging beyond 2023 the

[1] Regulation (EU) 2021/1119.

[2] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52019DC0640

[3] https://www.consilium.europa.eu/en/press/press-releases/2023/04/25/fit-for-55-council-adopts-key-pieces-of-legislation-delivering-on-2030-climate-targets/

[4] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32023L0959

[5] https://data.consilium.europa.eu/doc/document/PE-11-2023-INIT/en/pdf

[6] https://data.consilium.europa.eu/doc/document/PE-7-2023-INIT/en/pdf

[7] http://data.europa.eu/eli/dir/2023/958/oj

[8] https://data.consilium.europa.eu/doc/document/PE-10-2023-INIT/en/pdf

[9] https://www.consilium.europa.eu/en/press/press-releases/2023/03/28/fit-for-55-council-adopts-decision-on-market-stability-reserve/

[10] https://www.consilium.europa.eu/en/press/press-releases/2023/03/28/fit-for-55-package-council-adopts-regulations-on-effort-sharing-and-land-use-and-forestry-sector/

increased annual intake rate of allowances (24%), which is further adjusted when the TNAC is below 1.096 Mt to avoid a threshold effect. Moreover, the updated directive sets a threshold of a maximum of 400 million allowances within the MSR, above which allowances are invalidated.[11] Receiving free allocation will be conditional on energy audits and, for certain installations, climate neutrality plans. Moreover, it was decided to phase out free allocation by 2034 for the sectors covered by the CBAM, namely cement, aluminium, fertilisers, electric energy production, hydrogen, iron and steel, as well as some precursors and a limited number of downstream products. Several review clauses are included, e.g. a potential inclusion of negative emissions technologies like carbon capture and storage via direct air capture and a review of the functioning of the MSR in 2026, as well as the impact of CBAM on the risk of carbon leakage by 2028 (and every two years after).

A key element of the revision of the ETS directive is the establishment of a second, separate emissions trading system for buildings and road transport and fuels for additional (industrial) sectors ("EU ETS2"). The EU ETS2 will apply to distributors that supply fuels and will start in 2027. However, suppliers can be exempted from surrendering allowances until December 2030, if they are subject to a carbon tax at national level that is equal to or higher than the auction price in EU ETS2. Moreover, EU ETS2 will be established with a separate MSR[12]. The MSR in EU-ETS 2 involves a price-based indicator that is intended to mitigate carbon prices rising too quickly: Until 31 December 2029, in case the average price of allowances exceeds EUR 45 (in 2020 prices, i.e. adjusted for inflation) during a period of two consecutive months, 20 million allowances will be released from the MSR. Additionally, part of the revenues from the auctioning will be used to support households and micro-enterprises through a dedicated Social Climate Fund. The Social Climate Fund will have a maximum volume of EUR 65 billion and be based in the medium term on auctioning revenues from the EU ETS2, as well as a co-financing by Member States of 25%. Member States will be able to use it to finance measures and investments to address the impact of carbon pricing on vulnerable citizens and micro-enterprises, based on the submission to the Commission of a 'social climate plan'. A maximum of 37.5% of the revenues can be used for direct income support.

The MRV shipping regulation together with the provisions in Article 3 of the revision of the ETS directive paves the way to include maritime shipping emissions within the scope of the EU ETS1. Shipping companies need to surrender allowances for 100% of verified emissions by 2026. Ships with a gross tonnage above 5,000 travelling within the EU will need to surrender allowances for 100% of their emissions, while 50% of the emissions of journeys to or from a non-EU destination will be covered. Non-CO_2 emissions (methane and N2O) will be included in the EU ETS1 from 2026 and offshore vessels with a gross tonnage above 5,000 will be included into the EU ETS from 2027. In the event of the adoption of a global market-based measure to reduce greenhouse gas emissions from maritime transport, the Commission should report on this measure to the European Parliament and the Council before it becomes operational.

On 21 February 2023, the Council has formally adopted the REPowerEU Plan, as the final step of the legislative procedure.[13] REPowerEU was proposed by the Commission in May 2022 and aims to increase energy savings, diversify energy supplies, and accelerate the roll-out of

[11] Decision (EU) 2015/1814 is amended such that allowances above 400 million in the MSR will be invalidated unless decided otherwise in the first of the five-yearly MSR reviews (Article 1, paragraph 5a). This level of 400 million allowances corresponds to the lower threshold for the value of the total number of allowances in circulation (TNAC).

[12] The MSR will be enlarged by a separate section initially containing 600 million allowances from EU ETS2 as of 2027 (Chapter IVa, Article 30d(2) of the proposed directive).

[13] https://www.consilium.europa.eu/en/press/press-releases/2023/02/21/eu-recovery-plan-council-adopts-repowereu/.

renewable energy by financing key investments and reforms specified in national recovery and resilience plans (RRPs). For this purpose, allowances worth EUR 20 billion will be auctioned from the Innovation Fund (60%) and a frontloading of ETS allowances (40%) and transferred to the Recovery and Resilience Facility. The Innovation Fund will be partly replenished through the auctioning of 27 million allowances from the Market Stability Reserve.

3 Methodological approach for mapping of challenges and policy options

The mapping exercise included a literature review, expert interviews, stakeholder interviews and a stakeholder survey. The methodological approach for each is described below.

3.1.1 Literature review

The literature review was conducted in three steps. These included:

Step 1: Identification of literature – In the first step, relevant literature was identified based on a systematic literature search (Scopus, Web of Science, and Google Scholar). Also, papers known to the team and follow-up references from the initially identified literature were added. In addition, the expert interviews were used to ask interviewees about further relevant sources that could provide information on relevant challenges and policy options for the period 2030-2040.

Step 2: Selection of literature – In the second step of the literature search, a selection of papers was made for in-depth review. The screening criteria to identify highly relevant publications included quality, relevance (to the future of the EU ETS), and timeliness of the publications. In the process, especially the relevance criterion proved to be crucial. While the overall body of publications on the EU ETS and related topics is extensive, the number of publications specifically addressing challenges and policy options for the future of the EU ETS is limited in relation to certain issues (e.g., on the integration of carbon removals). In addition to more fundamental papers, recent papers were selected for the literature review as they reflect the current policy context of the EU ETS and do not, for example, take the historical surplus of allowances in the EU ETS1 market as a starting point for their analysis.

Step 3: In-depth review, analysis, and synthesis – In the third step, the selected literature was analysed in-depth to extract findings and arguments related to challenges and policy options. Some publications covered more than one relevant issue due to a more general nature. However, the majority of publications were domain-specific and could be assigned to one issue of relevance for the study. Once the individual publications had been recorded, the main points were summarised issue by issues, again following the structure of the challenges and associated policy options. The synthesis is presented in Section 4. In addition to the papers analysed in-depth, other relevant literature was also included in the synthesis where it provided additional meaningful input.

In addition to the mainly economic literature, a separate literature review on the legal challenges of price-based price control mechanisms for emissions trading was carried out. This review can be found as an excursus in Section 4.2 and complements the literature review on market stability and the functioning of the Market Stability Reserve (MSR) in Section 4.1.

3.1.2 Expert interviews

The expert interviews served as another source of information for identifying relevant challenges and policy options for the EU ETS post-2030. The expert interview programme involved both academic experts and experts with strong practical expertise on the EU ETS. The expert interviews were conducted in two waves, the first wave of interviews took place in April 2023. The second wave of interviews took place July/August 2023. In total, 17 expert interviews

were conducted[14]. The selection of interviewees was done by the Consortium in close consultation with the EU Commission. A list of the experts interviewed is presented in Table 3-1. Three of the experts interviewed wished to remain anonymous.

Table 3-1 List of expert interviewees

Name	Organisation	Geographical focus
Academic experts		
Dallas Burtraw	Resources for the Future / Chair of California's Independent Emissions Market Advisory Committee	US
Karsten Neuhoff / Jörn Richstein (Joint interview)	German Institute for Economic Research (DIW Berlin)	North-west European
Knut Einer Rosendahl	Norwegian University of Life Sciences	North-west European
Luca Taschini	University of Edinburgh	UK
Philippe Quirion	CNRS, CIRED	North-west European
Robert Jeszke	Centrum Analiz Klimatyczno - Energetycznych (CAKE) / KOBiZE	Eastern European
Simone Borghesi	Florence School of Regulation / European University Institute (EUI)	Southern European
Sonja Peterson	Kiel Institute for the World Economy	North-west European
Expert with a strong practical background		
Benjamin Görlach	Ecologic Institute	North-west European
Florian Rothenberg	ICIS	North-west European
Ingo Ramming	BBVA	North-west European / Southern European
István Bart	Environmental Defense Fund/ENERGIAKLUB	Eastern European
Nils Meyer-Ohlendorf	Ecologic Institute	North-west European
Sam van den Plas / Agnese Ruggiero / Sabine Frank (joint interview)	Carbon Market Watch	North-west European

*) Three interviewees preferred to stay anonymous. The input from these interviews was only used in the synthesis of the expert and stakeholder interviews (see Section 5).

**) The individual interview summaries are provided in Appendix B. All interviewees mentioned in the table were given the opportunity to revise their interview summary and explicitly agreed to include it in the reporting. Of the three anonymous interviewees, one agreed to the inclusion of the interview summary in an anonymised form.

All interviews lasted 60 minutes and followed the structure of the expert interview guide presented in Appendix A. The interviewees received materials before the interviews so that they could familiarize themselves with the questions and the structure of the interview. During the interview, the interviewees were asked to establish a list of the three most relevant challenges for the EU ETS post-2030 from their point of view. The purpose of this structure was to

[14] From the 20-25 expert interviews planned originally, resources for five interviews were shifted to the stakeholder interview programme to target a broader group of stakeholders in the interviews.

ensure that there was sufficient time to discuss the issues that were most important to the experts in detail, as well as to create an overview of how many of the experts selected individual issues. The interviews first discussed the challenges and then the related policy options. The focus of most interviews was on defining challenges in detail. The content of the interviews was summarized in individual interview summaries. These summaries were shared with the interviewees so that they had the opportunity to revise them to avoid misrepresentations. The individual interview summaries are attached to the report in Appendix B.

To graphically represent the structured arguments of the interviewed experts in relation to specific challenges and policy options, the consortium used **directed acyclic graphs (DAGs)**. A causal DAG is a network of variables in which connections (links) between variables (nodes) indicate causal relationships. The use of DAGs is a common concept to model relationships and dependencies between different elements in complex representations (Imbens, 2020; McElreath, 2020) and have in recent years also been introduced and applied in the economic literature (Andre et al., 2021; Yang & Zhao, 2014). The main goal of the DAGs is to visualize the causal chain for the challenges of the EU ETS. We add another layer by adding policy options to these graphs, which affect parts of the causal chain. We visualize this second layer by using dashed arrows for the effects of policy options in the DAGs.

DAGs were created for a selection of challenges and policy options from the expert interviews. The DAGs visualise some of the more complex arguments and interactions of challenges and policy options discussed in the interviews.

3.1.3 Stakeholder interviews

The purpose of the stakeholder engagement was to understand the perspectives of a wider group of relevant parties. The main aim was to achieve responses from a broad range of organisations (particularly in terms of interests, sectors, and geographical location) to understand the diversity of perspectives.

Stakeholder engagement began with a series of 14 in-depth interviews. These were designed to develop an initial understanding of some stakeholder perspectives and their arguments/reasoning for these.

The input from the stakeholder interviews informed the design of the stakeholder survey (see Section 3.1.4). The guide used for the interviews took a similar format to that used for the expert interviews to reflect the underlying analytical framework of the study. A new section was added at the end of the guide to gather specific feedback to inform the survey. The full guide is included in Appendix C. Where stakeholders had particular interests/expertise, the interviews naturally focused upon this. Individual summaries for the stakeholder interviews are included in Appendix D[15].

European level organisations representing groups likely to be affected by future changes to the EU ETS were invited to participate in the scoping interviews. These included organisations representing particular industries, trade unions and consumers. Some NGOs were also included on the basis of their expertise in particular relevant topics. Fourteen[16] scoping interviews took

[15] Note that the individual interview summary for IndustriAll European Trade Union is not included in the report as no approval for publication was received.

[16] Two interviews were undertaken with different representatives of the Negative Emissions Platform.

place in May and June 2023. Table 3-2 shows the list of participants, their role and rationale for selection.

Table 3-2 List of stakeholder interviewees

Stakeholder organisation interviewed	Organisation role	Rationale for selection
Industry associations[17]		
CEFIC	Represents the European Chemical Industry	Providing insight into chemical industry perspectives
CEMBUREAU	European Cement Association	Providing insight into cement industry perspectives
CLECAT	Membership organisation for logistics, freight forwarding and customs services businesses.	Providing insight into businesses affected by ETS2 on road transport
Eurelectric	European sector association for the electricity industry	Providing insight into perspectives of the electricity industry, particularly in relation to delivery of removals/BECCS/CCU
EuroACE	European Alliance of Companies for Energy Efficiency in Buildings	Providing insight into implementation of ETS2 in buildings
European Shipowners Association (ESCA)	Membership organisation for national shipping representative bodies in Europe	Providing insight into shipping business perspectives
Fuels Europe	European fuel manufacturers association	Providing insight into fuel manufacturers affected by ETS2
Negative Emissions Platform	Partnership of organisations involved in removals	Providing insight into removals issues
Trade unions & consumer organisations		
BEUC	The European Consumer Organisation	Main consumer organisation – providing insight into considerations relating to consumers
IndustriAll European Trade Union	Federation of unions representing workers in the metal, chemical, energy, mining and textile, clothing and footwear sectors	Broad industrial trade union perspective
NGOs		
Climate Action Network (CAN) Europe	NGO coalition fighting climate change	Broad climate policy perspective from NGOs
IETA (International Emissions Trading Association)	Membership organisation for international companies working on carbon trading	Specific expertise in carbon trading
Transport & Environment	European clean transport campaign group	Insight into aviation and maritime sectors, expertise related to transport emissions in ETS2

[17] It was additionally planned to interview an air transport association. The intended interview could not be scheduled after several attempts.

3.1.4 Stakeholder survey

The aim of the stakeholder survey was to provide greater insight into the views of a range of stakeholders and their reasons/arguments for their views. In order to reach as many stakeholders as possible in an efficient way, the following types of organisations were approached and asked to respond directly and to invite their members/networks to also respond individually: EU level industry associations; EU level trade unions and consumer organisations; European NGO associations; and national climate think tanks. The survey was available online and open for responses for seven weeks from 6 July to 27 August 2023.

The survey content was developed based upon insight from the literature review, the expert interviews and the stakeholder scoping interviews. The initial questionnaire content and design was also tested out with some of the stakeholder scoping interviewees and adjusted as a result. The full questionnaire is given in Appendix E. Closed questions were primarily used to facilitate completion by stakeholders but the opportunity was provided for open responses and additional documents to be submitted if desired. Figures showing quantitative stakeholder survey responses show the options selected by respondents from **pre-defined** options. Insight from additional open/other responses is included in the narrative of the report where it adds new points. Responses from different stakeholder groups in terms of organisation type and sector have been compared. Any differences of note are referred to in the report.

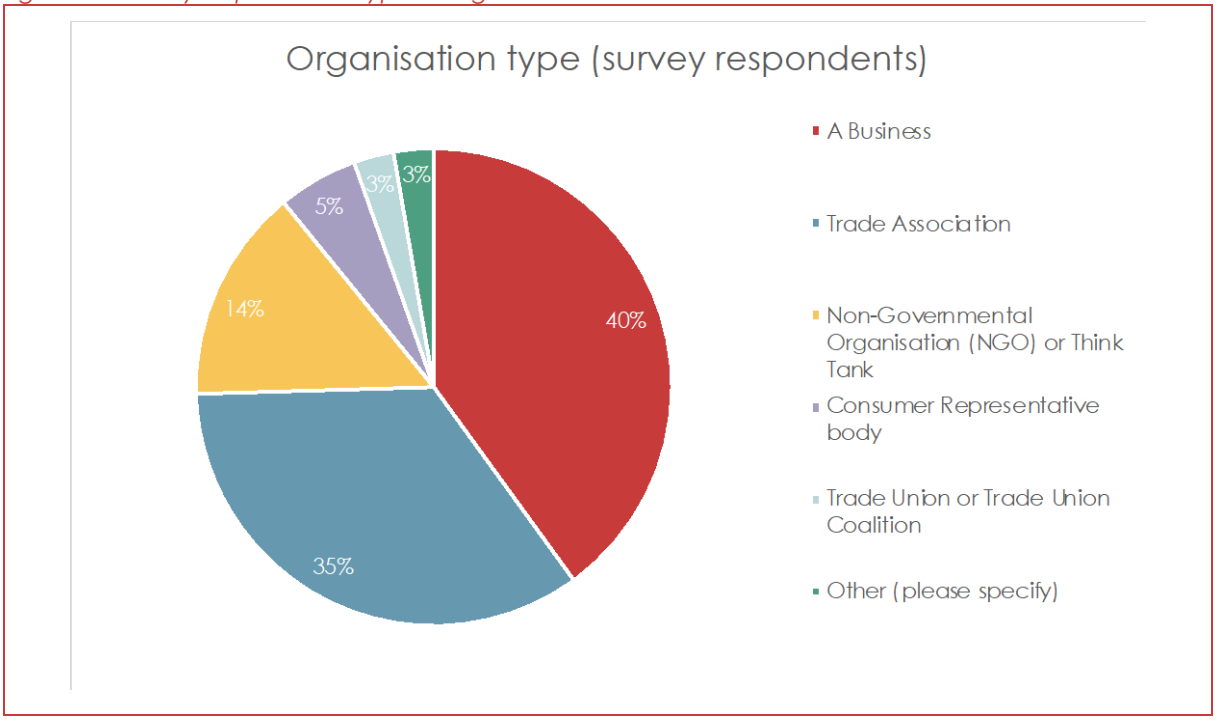
The main results of the stakeholder survey are discussed in section 5. A total of 117 respondents entered data into the survey up to and including the main question 8 asking them to identify the issues of most relevance to them for emissions trading post 2030. The survey was predominantly answered by businesses (40%, n=44) and trade associations (35%, n=38)[18] as shown in Figure 3-1. There was also some representation of NGOs/thinktanks (15%, n=16) and a small number of consumer representative bodies[19] (5%, n=6) and trade union bodies (3%, n=3) also participated[20].

[18] Seven respondents did not complete profile questions.

[19] Of the respondents who identified themselves as consumer representative bodies, one gave their name and their organisational type has been confirmed. The other five all said they represented/were engaged with specific sectors, namely chemicals, buildings, maritime transport, chemicals and cement. We find it difficult to imagine bodies representing consumers in these specific sectors. Hence we are concerned that these respondents may have misunderstood the term 'consumer representative body'. Findings are therefore not highlighted in relation to this sub-sample, although in any case, it was a very small group and only half (n=3) have progressed to answer further questions after the main question 8.

[20] The lower levels of participation amongst consumer representative and trade union bodies may be explained by the following. A stakeholder interviewee representing a consumer body said that emissions trading was not necessarily an issue which many consumer bodies would be considering in detail. The trade union stakeholder interviewee respondent said that trade union bodies might struggle to respond to the survey in English.

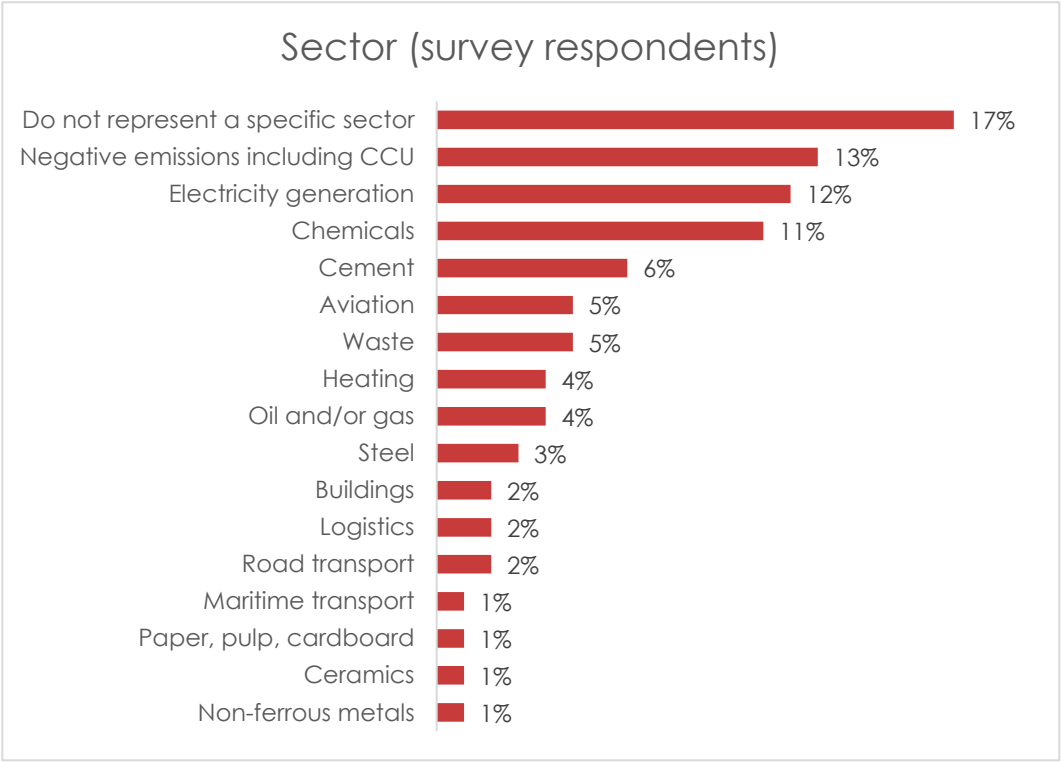
Figure 3-1 Survey respondents: type of organisation



This chart shows the most common organisation type among the survey respondents. This is based off the question 'Please select the option below that best describes your organisation.' (n = 110) Source: Technopolis Group, PIK & E3-Modelling, 2023

A wide range of sectors were represented by survey respondents as shown in Figure 3-2 with particularly high representation from negative emissions (including carbon capture and utilisation) (13%, n=14), electricity generation (12%, n=13) and chemicals (11%, n=12).

Figure 3-2 Survey respondents: sector represented



This chart shows the most common sector/industry type among the survey respondents. This is based off the question 'If your organisation is engaged with or represents a specific sector/industry, please indicate its main focus.' (n = 109) Source: Technopolis Group, PIK & E3-Modelling, 2023

Most responding organisations were either EU level (39%, n=43) or global (36%, n=40), with some national organisations (16%, n=18). National/regional/local organisations were based in a wide range of Member States.

Most of the individuals responding were in policy specialist job roles (73%, n=79). A minority of the total responding sample were senior executives (16%, n=18). Just under three quarters of the individuals responding said they had a detailed knowledge of the EU ETS (73%, n=79). Most of the remainder (23%, n=25) said they had limited/some knowledge of the EU ETS.

Not all survey responses were complete. Of the total sample of 117, 35 respondents did not answer any further follow up questions about the emissions trading issues they selected as relevant. The profile of those progressing to answer the follow up questions was generally very similar to the total sample. The largest profile differences that were present were:

- There were fewer responses proportionally to the follow up questions compared to the initial questions from consumer representative bodies and organisations whose main sector was electricity generation.
- Conversely, there were more responses proportionally to follow up questions from those whose main sector was negative emissions, including carbon capture and utilisation than to the initial questions.

Nine respondents submitted separate files providing detail on their views on future emissions trading alongside their survey responses. These have been analysed and reported on alongside the survey findings.

4 Literature review: Reporting of findings

4.1 Market stability and design of the Market Stability Reserve (MSR)

There are several aspects that may lead to increased market stability challenges for the EU ETS post-2030. In the EU ETS1, the **cap goes down significantly** over the next decade and supply of allowances is predicted to reach zero around 2045. In a model-based analysis, (Pahle et al., 2023) show that this might lead to **changes in the banking behaviour**, i.e. considerably higher banking (and thus a higher total number of allowances in circulation, TNAC) already in the second half of this decade in anticipation of imminent scarcity. This in turn interacts with the Market Stability Reserve (MSR) in ETS1 in the sense that it considerably increases intake and cancellation, which ultimately intensifies allowances scarcity. More specifically, overall cancellation in this analysis amounts to 7.5 Gt, which is 47% more than in the baseline (pre-reform) scenario

The Market Stability Reserve (MSR), that started operation in 2019, is the main instrument in place to address over- or undersupply of emission allowances for the EU ETS1. In ETS1, the main reason for the initial introduction of the MSR has been the surplus of allowances that had built up in the ETS since 2009 due to the global financial crisis and the high import of international credits (Vivid Economics, 2021). Generally, the introduction of the MSR is considered a key change in the design of the ETS1 system in the past (Borghesi et al., 2023). **Measured solely against the objective of addressing the structural surplus of allowances in the ETS market, the MSR has been a success story** (Vivid Economics, 2021). Indeed, the MSR might have played a role in dampening the EUA price decrease during the COVID-19 pandemic (Gerlagh et al., 2020). However, some **MSR features raise doubt in its capacity to also address future challenges** to market stability in a quickly changing EU ETS1 market (Borghesi et al., 2023; Flachsland et al., 2020a; Perino et al., 2021). A separate MSR will be created for the EU ETS2, which in contrast to the MSR in ETS1 will also involve an absolute price trigger, and not just a relative price or quantity-based indicator for triggering actions.[21]

As part of the recent Fit-for-55 reform, several changes to the MSR were implemented[22]. The changes involve that the number of allowances that can be put in the reserve was kept at a rate of 24% of the total number of allowances in circulation (TNAC) until 2030. Furthermore, to address threshold effects for the upper threshold of the MSR, when the TNAC is between 833 and 1,096 million EUAs, the intake will be the difference between the TNAC and 833 million. In addition, from 2023 onwards, EUAs in the MSR which exceed 400 Mt are to be invalidated (Borghesi et al., 2023). These **changes partially addressed some concerns** that were raised regarding the design of the MSR, namely avoiding the threshold effect and ensuring a full cancellation of the effect of overlapping policies when the corresponding demand shock occurs when TNAC is between 1,096 and 833 Mt (compare Perino et al. 2022). But they do not address the full range of challenges the MSR might face in the medium to long run.

Key challenges from the literature

Borghesi et al. (2023) provide a comprehensive overview on the history of the Market Stability Reserve (MSR) in the EU ETS, by critically reviewing the literature assessing the MSR against its

[21] Art. 30h (2) of the ETS Directive: In case the average price of allowances exceeds a price of EUR 45 (in 2020 prices, i.e. adjusted for inflation) for a period of two consecutive months, 20 million allowances will be released from the MSR into the ETS2 market.

[22] https://www.consilium.europa.eu/en/press/press-releases/2023/03/28/fit-for-55-council-adopts-decision-on-market-stability-reserve/

objectives. In doing so, they also identify challenges for the future of the MSR. Multiple challenges relate to the design of the **endogenous cap in EU ETS1** and the interactions in different scenarios with the banking behaviour of the participants in the market.

One specific type of challenge described by Borghesi et al. (2023) is the interaction between the MSR and anticipated overlapping climate policies, such as a planned coal-phase out in EU Member States, and the interaction with the banking behaviour. As first pointed out by Rosendahl (2019) and formally shown by Gerlagh et al. (2021) and Perino et al. (2022), adjusting the long-run cap based on the number of banked allowances, as it is the case for the MSR, works well for unanticipated demand shocks. An unanticipated demand shock would lead to an increase in TNAC, and the MSR would absorb and cancel additional allowances in the market in response. But when an expected demand shock is already anticipated in the market (e.g., in the case of an announcement of a coal phase-out in a Member State) the design of the MSR can lead to a '**green paradox**' (Gerlagh et al., 2021): The anticipation of future demand reductions could translate into lower current prices (reflecting lower future demand for allowances), which could lead to a higher current demand (i.e. lower TNAC/MSR intake) that reduces MSR cancellation more than the corresponding overlapping policy reduces emissions. In consequence, this could then lead to higher levels of cumulative emissions in EU ETS1 – a 'green paradox'. By maintaining the TNAC as a measure of scarcity, the maintained higher intake rate agreed upon in the recent Fit-for-55 reform would reinforce both the stabilising (unanticipated demand shocks) and destabilising (anticipated demand shocks) effects of the MSR design (Gerlagh et al., 2022; Perino, 2022).

Another scenario also arising from the endogenous cap and increasingly becoming relevant as the MSR in EU ETS1 is moving from curbing the historical surplus to the policy objective of **efficiently managing the net-zero transition** is described by Pahle et al. (2023). Increased price expectations – induced by a more quickly declining cap in Phase IV of EU ETS1 – incentivise an increase in banking of allowances, which in turn increases the intake of the MSR and may thus lead to a further cancellation of allowances. This tightening of the cap then provides further upward pressure on prices. In its present configuration, the MSR interprets a surge in banking activity as consistently indicative of reduced demand, without considering that this uptick in banking might be prompted by the rational anticipation of a future increase in demand (Pahle et al., 2023). Additionally, Pahle et al. (2023) also point to challenges regarding market functioning and price formation in a decreasing ETS market more widely and not only in relation to the MSR. Referring more generally to the modelling of non-renewable resources, they discuss the possibility that price dynamics may exhibit growing unpredictability and volatility as EUAs (as a non-renewable resource) are nearing their depletion. This phenomenon would not be attributable to uncertainty in the market but to randomness in the stochastic processes of trading in the market (Bouleau, 2012).

The previously mentioned effect of the cap being endogenous is also pointed out by Bruninx et al. (2020) in a formal modelling. Specifically, they analyse the updated EU ETS1 parameters following the 2018 EU ETS reform relying on a long-term investment model (2017-2061) which captures the interactions between the power and the industry sector with the EU ETS and its Market Stability Reserve (MSR). They show that a complementarity between the increase in the linear reduction factor (LRF) and the cancellation policy of the MSR exists (Osorio et al., 2021). The two parameters are linked by a **self-reinforcing feedback effect**, leading to a tighter cap in the long run. Increasing the LRF to lower the supply of EUAs and thereby increasing the costs to meet the cap reduction in the future. This, in turn, leads to banking behaviour of market participants today, which increases the TNAC and ultimately leads to the MSR absorbing and cancelling additional EUAs from the EU ETS market. Furthermore, they show that the behaviour of the MSR is strongly dependent on complementary policies (e.g., renewable energy targets,

nuclear use, and coal phase-outs) (see discussion on anticipated demand shocks above) and cost developments of future abatement technologies for the energy and industry sector. Together with the feedback effect between LRF and the cancellation policy of the MSR, this leads to the emission cap being subject to a **high degree of uncertainty**. Holding EU ETS and MSR parameters fixed, they find cancellations by the MSR in the wide range between 5.6 to 17,8 $GtCO_2$ dependent on the demand trajectory.

Furthermore, the results by Bruninx et al. (2020) illustrate the role of the MSR as a **key feature of the EU ETS1 market** significantly shaping the supply of allowances and the long-term cap. They estimate that a larger share of the cumulative emission reduction from the 2018 reform is due to the cancellation policy of the MSR (about 60 %) as compared to the increase in the LRF (from 1.74% to 2.2% after 2020) (about 40 %).

Heijmans (2023) more broadly compare a price-based (e.g., California ETS) and a quantity-based (e.g., MSR in EU ETS or liquidity provisions in Korea ETS) mechanism for adjustable allowance supply also relying on an analytical model. They investigate the effects of an increasing interest rate for both types of policies – which is of high relevance given the recent rises in interest rates also in the EU. The results of Heijmans (2023) indicate that **price measures unambiguously stabilize prices** as compared to a reference scenario with no adjustable allowance supply. But **quantity measures may destabilize allowance prices**. The reason for this destabilizing tendency is that an increase in the interest rate raises the price of emissions in the future relative to the price today. This stimulates the demand for emissions now, which supresses the allowance price and reduces banking[23]. In turn, a reduction in banking causes an increase in supply (from the MSR) in the next period under a quantity measure. The increase in supply pushes allowance prices even further down, enforcing the downward pressure on prices. Thus, the phenomenon observed by Heijmans (2023) differs from the one described by Bruninx et al. (2020) which describe an upward spiral of carbon prices due to the increased banking behaviour of market participants.

Key policy options from the literature

Bruninx et al. (2020) discuss whether an explicit **strengthening of the LRF** (beyond the increase in the LRF in the 2018 EU ETS reform) would not have been a better alternative than the introduction of the Market Stability Reserve (MSR), given the uncertainty about the future emissions cap introduced by the MSR (feedback effect with LRF, interaction with complementary policies). A higher LRF would be associated with a definite reduction path, that would send a clear message about the envisioned level of emission reduction to the power sector and energy-intensive industry.

Borghesi et al. (2023) conclude that the current MSR design lacks an economic rationale for the quantity-based approach with the TNAC as an imperfect indicator and that the introduction of the MSR with its reforms have led the EU ETS1 system to become increasingly complex. The complexity of the system, in turn, may affect effective price formation and market functioning more broadly. They argue that a **price-based price control mechanism** could be a more direct and simpler instrument which could also reduce uncertainty in the market about the long run cap and provide market participants with better planning certainty. Furthermore, they argue that a simplification of the system might also have a positive effect on public understanding and support for the EU ETS system. In addition to the previous points, Borghesi et al. (2023) furthermore discuss that introducing a price-based measure to control

[23] See Section 2.4 "(De)stabilizing price stabilization" in Heijmans (2023) for further detail.

prices would eliminate potential barriers for future linking opportunities with other ETS systems, that rely on a price-based price control mechanism.

Based on modelling results, also Heijmans (2023) argues that policymakers should implement a **price-based measure**. They would thereby avert the potential disturbances associated with a quantity-based measure. The reason for this is based on his findings that quantity measures lead to higher price volatility when the source of variation is an anticipated change and not an external shock to demand.

There are many different potential design options for a **price-based measure.** Flachsland et al. (2020) as well argue for a price-based measure, by proposing the introduction of a **price floor**. This price floor could either be a complement or a substitution to the MSR. The main reasons for the introduction of a price floor to them are the political nature of the allowance price and associated uncertainty about the credibility of the measure, potential myopia of participants in the market, and the rebound effects from policy interactions as also discussed by others (Gerlagh et al., 2021; Perino et al., 2022). They argue that the main benefit from a price floor would be the enhanced long-term investment certainty even if policy or market distortions would occur. Furthermore, a price floor could avert quickly rising carbon prices from ineffectively low prices and lack of abatement in previous periods. The option to introduce a price floor is widely discussed in the literature (e.g., 2020; Hepburn et al., 2016). Hepburn et al. (2016) proposed the introduction of either a price floor or a price corridor (symmetric instrument, see below) instead of the MSR, as the price-based design options consistently led to lower price volatility. Practically, a price floor could be implemented by an auction reserve price (Fischer, Reins, Burtraw, Langlet, Lofgren, Mehling, Weishaar, Zetterberg, Asselt, et al., 2020; Hepburn et al., 2016).

In addition to the introduction of a price floor, a **price ceiling** is also discussed in the literature. Referring to the general debate, Borghesi et al. (2023) mention that the legal foundation for the introduction of a price ceiling could be a reform of Article 29a of the EU ETS Directive. One option would be to make the price-change trigger in Article 29a more responsive to price increases (price ceiling only), while maintaining the MSR. However, they also mention that this would lead to an incoherent setting and reference to the proposal by Willner & Perino (2022) to introduce a symmetric **price corridor**.

Willner & Perino (2022) discuss the option of introducing a **price-based control mechanism that is symmetric (price corridor)** and also satisfies the conditions of continuity, predictability, synchronism, and adjustability. Their proposal entails a mechanism that adjusts the number of auctioned allowances up- and downwards in case of price changes above or below a pre-defined threshold. The price band is not defined in absolute but in relative terms as the inflation corrected rate in price change between the average auction price of the previous quarter compared to the average auction price in the corresponding quarter in the last year (annual rolling reference quarters). As a threshold value, they propose price changes above and below (+/-) 20% to trigger the mechanism. The size of the intervention would be dependent on the so-called 'base rate' as a second control parameter. The base rate would be a factor value (e.g., 5%) that is multiplied with the current annual planned cap. By making the size of the intervention proportionate to the cap in a given year, the mechanism would automatically adapt to the shrinking market size. The allowances released into or absorbed from the market would be added into the MSR with a pre-defined holding capacity. As the interventions of the mechanism would be linked to the MSR pool of allowances, it would be ensured that the overall cap is not exceeded.

However, Borghesi et al. (2023) also point-out to the **legal challenges** that may be associated with the introduction of a **price-based control mechanism** in the context of the EU legislation.

A price-based price control mechanism would in practice likely be founded on Art. 192 TFEU. It encompasses two distinct cases: the ordinary legislative procedure with qualified majority voting (Art. 192(1) TFEU) and the special legislative procedure necessitating unanimous voting in the Council of the European Union (Art. 192(2) TFEU). The special legislative procedure represents a strong political barrier. To avoid this barrier, a price-based measure should be designed to fall within the scope of the ordinary legislative procedure. The special legislative procedure, which has to date not been tested in practice, would apply to provisions that are primarily of a fiscal nature (Art. 192(2)(a) TFEU) or significantly affect a Member State's choice between different energy sources and the general structure of its energy supply (Art. 192(2)(c) TFEU).

Given the importance of the legal argumentation around price-based price control mechanisms, the next section summarises the state of the literature in a separate legal excursus.

4.2 Excursus: Legal perspective on price interventions to ensure Market Stability in the EU ETS

From the outset of the EU ETS, concern about an imbalance in supply and demand of EU ETS allowances (EUAs) and the resulting price extremes and volatility in the carbon market has prompted proposals to intervene in the market and manage or control the carbon price. The EU ETS1 to date relies on quantity-based indicators for price control in the Market Stability Reserve (MSR). However, since the beginning also the option of a price-based control mechanism was discussed, for instance through a carbon price floor. While such discretionary price management mechanisms have been recommended as a way to ensure a more predictable price signal for greenhouse gas (GHG) emissions and thus greater market stability, they also have elicited substantial debate in both policy and academic circles.

Much of this discussion has focused on the economic and environmental implications of price management mechanisms in the EU ETS, although a key question relates to the legal admissibility of such a policy intervention under EU law, including, in particular, the implications for the legal form and required legislative process. To date, the academic literature addressing these legal questions is limited, and while affirming potential risks, generally supports the admissibility of price management mechanisms under the EU ETS.

This legal excursus surveys the scholarly contributions that have shaped this debate in recent years, with a final section venturing a synthesis of arguments and areas of convergence and disagreement in the academic literature. It extends the legal perspective from the literature on the issue of market stability and the functioning of MSRs presented from an economic perspective in Section 4.1.

Scholarly analysis of the legal questions arising from the implementation of a discretionary price management mechanism – such as a carbon price floor – in the EU ETS has been comparatively scarce to date. Fischer et al. (2020, p. 4) report that officials in the European Commission have voiced concerns about price-based approaches, as these could qualify as being "primarily of a fiscal nature" and therefore require unanimity voting in the Council, "an insurmountable political hurdle", yet "never commissioned formal analysis of this legal question". Most academic literature on carbon price floors and other price management mechanisms focuses on the economic case for such interventions and assesses different options for their implementation as well as relevant case studies based on emissions trading systems outside the EU (Böhringer & Fischer, 2023; Edenhofer et al., 2017; Newbery et al., 2019; Wood & Jotzo, 2011).

In this literature, the legal implications of such interventions are either ignored or merely acknowledged as potentially relevant without further analysis. In a policy brief released in 2017, for instance, Edenhofer et al. (2017) discuss options for the introduction of a carbon price floor,

but aside from acknowledging a need to clarify the legal feasibility of certain options and unilateral implementation, they do not address legal aspects in greater depth. Similarly, a policy brief issued by Flachsland et al. in 2018 and subsequently published as a journal article in 2020 cites forthcoming research affirming the legal admissibility of a carbon price floor in the EU ETS, but does not itself venture an in-depth legal analysis (Flachsland et al., 2018, 2020b).

A survey of the relevant legal literature – defined here as literature that expressly aims to provide analysis of the legal questions raised by a price management mechanism in the EU ETS, and has at least one or more co-authors with formal legal training – reveals only a very limited number of publications, including, in chronological order, a 2015 book chapter authored by Stefan E. Weishaar, a professor of Law and Economics at Groningen University (Weishaar, 2015); a 2016 report authored by Matthieu Wemaëre and Pierre Bernheim (2016), two attorneys based in Paris, a Master's thesis by Tatu Hocksell submitted in 2018 to the Faculty of Law of the University of Helsinki (Hocksell, 2018), a 2020 journal article co-authored by a group of economists and lawyers (Fischer, Reins, Burtraw, Langlet, Lofgren, Mehling, Weishaar, Zetterberg, Asselt, et al., 2020) and a policy brief by an interdisciplinary team of authors including a lawyer (Perino et al., 2021). The central arguments of each will be briefly summarized below.

Weishaar (2015)

In his contribution to a volume of conference proceedings, Weishaar (2015) analyzes potential obstacles to linking of the EU ETS to other emissions trading systems that contain discretionary price management mechanisms, arguing that asymmetries in this particular design feature can lead to undesirable outcomes if allowance transfers are allowed across systems. This prompts him to address "the question whether the tax law qualification of reserve price auctioning constitutes a legal bar preventing the EU ETS from being linked to a scheme that employs reserve price auctioning.

Reviewing experiences in several foreign emissions trading systems, Weishaar highlights a joint ruling by a Californian Court concluding that the reserve price auction in that State's emissions trading system constituted a "regulatory fee" rather than a "tax."[24] In the absence of a formal definition of fees and taxes under European Union law, Weishaar argues that allowances confer a benefit – the ability to emit greenhouse gases – and their sale at auction with a reserve price thus entails a "requited payment" and should constitute a fee rather than a tax under established international definitions. He does, however, caution that the European Court of Justice (ECJ) ruled that the EU ETS "constitutes a market-based instrument and not a duty, tax, fee or charge on fuel load" in the context of a challenge against inclusion of international aviation in its scope.[25]

Still, based on his interim conclusion that an auction reserve price is closer to a fee than a tax, Weishaar proceeds to analyze Article 192 of the Treaty on the Functioning of the European Union (TFEU), and notably its second paragraph, which stipulates a derogation from the ordinary legislative process by requiring that environmental measures "primarily of a fiscal nature" be adopted by the Council acting unanimously. To determine whether fees fall under

[24] See Superior Court of California, Sacramento County, in California Chamber of Commerce et al. v California Air Resources Board et al., Case No. 34-2012-80001313, and Morning Star Packing Co. et al. v. California Air Resources Board et al., Case No. 34-2013-80001464, 28 August 2013, available on the Internet at <https://climatecasechart.com/wp-content/uploads/case-documents/2013/20131112_docket-34-2012-80001313_decision.pdf>.

[25] See ECJ, Case C-366/10, Air Transport Association of America and Others (2001), ECR I-13755

this derogation, Weishaar dissects the terms "primarily" and "fiscal nature" based on textual and teleological interpretation, and with a view to prior literature.

Regarding the term "primarily", Weishaar recalls the difficult history of failed attempts to pass environmental taxes under this provision, and leans towards an interpretation that does not merely focus on the predominance of the fiscal aspect, but also considers the revenue implications in order to better protect the sovereignty concerns of Member States.

As for the term "fiscal nature", Weishaar begins by stating that different language versions of the TFEU support either a narrow interpretation of that is limited to taxes only, or a broad interpretation that also includes fees. He then reviews existing literature on Article 192(2) TFEU and the arguments provided for either interpretation. According to its proponents, a narrow interpretation of Article 192(2) TFEU can be justified by the fact that it constitutes a derogation from the ordinary legislative procedure, suggesting that a narrow interpretation would be better aligned with the "effet utile" of EU law. Other supporters of a narrow interpretation argue that an interpretation that includes fees would lead to inconsistencies between environmental fees and fees in other policy areas, where fees can be adopted with a qualified majority. As a final argument for a narrow interpretation, the literature has highlighted the fact that non-tax levies are more specific and hence less intrusive in the Member States sovereignty than tax measures.

Weishaar goes on to cite a view supporting a broader interpretation of "fiscal nature" to include fees in addition to taxes. This view holds that the object and purpose of Article 192(2) TFEU is to safeguard the financial autonomy of Member States, so that the budgetary impact of the measure has to be considered. Because both fees and taxes have budgetary relevance, a differentiation between the two types of measures would not be "expedient".

Summarizing this discussion, Weishaar concludes that it remains "unclear how reserve price auctioning would be qualified under EU tax law." Despite this uncertainty, Weishaar argues that, in practical terms, a legislative initiative would be measured against its center of gravity, with some discretion afforded to legislators, and even if new legislation or an amendment to existing legislation were to ultimately require unanimity, failure to pass that legislation would not threaten the existing EU ETS framework, making the decision to proceed with an auction reserve price primarily one of political will rather than legal concerns.

Wemaëre & Bernheim (2016)

The legal study by Wemaëre & Bernheim commissioned by the think tank The Shift Project and published in 2016 evaluates a French government proposal to introduce a "soft price collar" under the EU ETS to reduce market volatility due to adverse expectations of future emissions and improve predictability of the carbon price (Wemaëre & Bernheim, 2016).

While they acknowledge that the EU ETS is primarily a quantity-based mechanism, Wemaëre & Bernheim draw attention to various elements of the EU ETS Directive[26] that recognize the importance of the carbon price signal to achieve its objectives, such as the preamble and Article 29a allowing for measures in the event of excessive price fluctuations. Likewise, Article 10(4) broadly empowers the Commission to adopt delegated acts for the management of EUA

[26] Directive 2003/87/EC of 13 October 2003 of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC [2003] OJ L275/32.

auctions, and Article 7(6) of the Auctioning Regulation,[27] in turn, enables the auction platform to cancel an auction under certain conditions when the clearing price is significantly under the carbon price revealed in the secondary market.

With the EU already having exercised its competence by establishing the EU ETS and adopting the Auctioning Regulation, a price corridor should ideally be introduced at the EU level in accordance with the subsidiarity principle and Article 2(2) TFEU, although this does not, Wemaëre & Bernheim argue, preclude Member States from introducing complementary measures at the national level provided these do not undermine achievement of the objectives of the EU ETS. In their view, the price corridor would require an amendment to the Auctioning Regulation based on the same empowerment that underlies that delegated act, Article 10(4) of the EU ETS Directive, using the Comitology procedure.[28] As for the voting requirement in the Climate Change Committee, they argue that congruence of forms and procedures requires that the decision to be taken by a qualified majority as provided for by Article 192(1) TFEU unless it relates to an area in which unanimity is required pursuant to Article 192(2) TFEU.

On this question, Wemaëre & Bernheim contend that the derogations of the ordinary legislative procedure set out in Article 192(2) TFEU have to be interpreted narrowly. They argue that a price corridor would not be a measure "primarily of a fiscal nature" because it would not lead to a mandatory levy. Instead, it can be more accurately classified as a transaction whereby EUAs – a financial instrument pursuant to the MiFID II Directive[29] – are sold by Member States in exercise of their auctioning rights conferred by Article 10(2) of the EU ETS Directive. The price paid by buyers affords them a title they can transfer in subsequent transactions. Furthermore, depending on supply and demand during the auctioning window, the floor price in a price corridor might not even directly impact the market price if it is below the auction reserve price.

Further, Wemaëre & Bernheim contend that a price corridor would not constitute a measure "significantly affecting a Member State's choice between different energy sources and the general structure of its energy supply", another condition that would trigger the unanimity requirement in Article 192(2) TFEU. They base this conclusion on the assumption that existing climate commitments entered by the EU already "imply a transformation of the economy" that will impact the general structure of the energy supply of all Member States, and further argue that – depending on the floor price – a price corridor on its own would not necessarily be causally responsible for changes in the structure of the energy supply. Overall, while a final determination would only be feasible on a case-by-case basis, they express doubt that a Member State could successfully invoke Article 192(2) as the legal basis for implementation of a price corridor, as it would have to demonstrate that the measure simultaneously affects its choices between different energy sources and the general structure of its energy supply.

In conclusion, Wemaëre & Bernheim find that a price corridor "should not be regarded as a provision primarily of a fiscal nature" and that its introduction "would not involve a requalification of the EU ETS as a fiscal instrument at the EU level." They concede some litigation

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[27] Commission Regulation (EU) No 1031/2010 of 12 November 2010 on the timing, administration and other aspects of auctioning of greenhouse gas emission allowances pursuant to Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowances trading within the Community [2010] OJ L302/1.

[28] Commission Delegated Regulation (EU) 2023/2830 of 17 October 2023 supplementing Directive 2003/87/EC of the European Parliament and of the Council by laying down rules on the timing, administration and other aspects of auctioning of greenhouse gas emission allowances.

[29] Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU [2014] OJ L173/349.

risk remains if one or several Member States can prove that the floor level significantly impacts their choices between different energy sources and the general structure of their energy supply, but add that the length of litigation before the ECJ only introduces uncertainty for 3 to 5 years after its adoption; what is more, they voice their expectation that the discussion in the Council would likely "be more political than legal."

Hocksell (2018)

Hocksell's Master's thesis on the "Legal limitations in the establishment of a carbon price floor in the European Union" presents an examination of the legal barriers to implementing a discretionary price-based mechanism, such as a carbon price floor and a corridor, within the EU ETS (Hocksell, 2018). Hocksell focuses on the legal limitations of a carbon price floor, evaluating these from various angles, including EU law, international law (including the free trade disciplines administered by the World Trade Organization), and the legal systems of Member States. Specifically, he identifies three research questions: 1) the legislative procedure for implementing an EU-wide carbon price floor, 2) options for regional implementation of a carbon price floor, including boundaries imposed by existing EU legislation; and 3) opportunities to use enhanced cooperation for implementation of a carbon price floor. His legal analysis is preceded by a general introduction to the climate challenge and an overview of EU climate policy and the EU ETS.

Hocksell begins his analysis by acknowledging that a carbon price floor would "alter the very nature of the existing EU ETS as a quantity-based market instrument" and introduce elements of a price-based system, in which "the carbon price is decided politically rather than by market forces." He then considers different methods to implement a carbon price floor, notably a tax imposed in addition to the allowance price (carbon price support rate or top-up tax, drawing on the example of the UK Carbon Price Support) and the introduction of a minimum price at auction (drawing on the example of the California auction reserve price). His legal analysis of these options is structured along a distinction between EU-wide and national or regional approaches, with a significant portion of the latter focused on the ability of Member States to engage in enhanced cooperation under Article 20 of the Treaty on European Union.

For harmonized initiatives at the EU level, he observes that a harmonized carbon price support rate introduced on top of the EUA market price would require entirely new legislation because it exceeds the scope of the EU ETS Directive and the Auctioning Regulation. As such, it "would, by definition, fall under the category of a provision of primarily fiscal nature, as it is explicitly a tax", therefore necessitating unanimity in the Council (Hocksell, 2018, p. 34).

Regarding an auction reserve price introduced at the European level, however, he concurs with Wemaëre & Bernheim (2016) that it could be implemented at an EU-wide level by amending the EU ETS Directive and Auctioning Regulation. Drawing on the understanding applied by the ECJ in Air Transport Association of America and Others,[30] which opined that the EU ETS is not a tax because the amount is not fixed and it is not collected for the purpose of public revenue, Hocksell concludes that an auction reserve price would not be "primarily of a fiscal nature" because it neither is intended to primarily raise revenue, nor – more importantly – is fixed since the carbon price could still fall below the reserve price in the secondary market.

Hocksell also addresses the question of whether an auction reserve price could significantly affect a Member State's choice between different energy sources and the general structure of its energy supply, referencing the challenge Poland raised against the Market Stability

[30] ECJ, Case C-366/10, supra, note 2.

Reserve (MSR). On this question, he cites the argument used by the ECJ that the MSR was "designed merely as a supplement or a correction of the ETS", which in turn justified use of the ordinary legislative procedure and obviated the need to assess the alleged effects of the contested decision on the Polish energy mix.[31] Hocksell goes on to concede, however, that the ECJ observed in the same judgment that the "ETS was designed as a quantitative instrument", which might make this reasoning less applicable to an auction reserve price. Like Wemaëre & Bernheim, (2016) he therefore summarizes that a "definitive conclusion cannot be drawn from the case" whether a discretionary price management mechanism would have a significant impact on a Member State's choice between energy sources.

Turning to national measures, Hocksell cites the examples of a national carbon price floor in the United Kingdom as well as a policy proposal discussed at the time in the Netherlands, but also observes the lack of operational efforts at a price-based mechanism covering two or more countries. According to his analysis, an auction reserve price cannot be implemented regionally as the auctioning rules are harmonized at the EU level, and a national or regional auction reserve price would hamper the internal market and affect the free movement of goods and capital.

As evidenced by the precedent of a UK Carbon Price Support, by contrast, a carbon price support rate could be adopted by two or more Member States since the resulting tax would only affect domestic entities and not contravene the prohibition of protectionist taxation measures under Article 110 TFEU or secondary legislation. Such a national carbon price support rate could be implemented by signing a Memorandum of Understanding (MoU) between the respective Member States, or by using the mechanism of enhanced cooperation set out in Article 20 TEU, which would offer greater legal certainty. Enhanced cooperation would, however, require at least nine Member States to agree on a joint system, and the arrangement would require approval by the European Commission and the European Parliament, creating legal uncertainty.

Fischer et al. (2020)

In an article in the Columbia Journal of European Law, Fischer et al. (2020) present an examination of the economic rationale and legal implications of an auction reserve price under the EU ETS. Authored by a group of economists and lawyers, the article – which had previously been published in a working paper version Fischer et al (2019) – starts out with a first section on the economic case for an auction reserve price, including discussion of the economic differences between an auction reserve price and a tax, before a second section outlines the fundamental parameters of legislative action in the EU relevant to implementation of an auction reserve price in the EU ETS.

The third section then addresses the legal scope for introduction of an auction reserve price, revisiting the questions already raised by Weishaar (2015), Wemaëre & Bernheim (2016) and Hocksell (2018) on interpretation of Article 192(2) TFEU and notably its criteria of "primarily of a fiscal nature" and "measures significantly affecting a Member State's Choice between different energy sources and the general structure of its energy supply." A fourth section, finally, sets out considerations for the design of an auction reserve price policy.

In their discussion of the differences between an auction reserve price and a tax, the authors highlight that former should rarely, if at all, bind unless the market is experiencing deeper structural problems. Further, like Wemaëre & Bernheim (2016) and Hocksell (2018), they argue

[31] ECJ, Case C-5/16, Republic of Poland v. European Parliament and Council of the European Union (2018), ECLI:EU:C:2018:483.

that an auction reserve price does not constitute a minimum price in the market because the price for allowances in the secondary market can fall under the auction reserve price Fischer (2020, p. 10). These arguments also inform the later analysis of Article 192(2) TFEU and its conditions for derogation from the ordinary legislative procedure normally prescribed for environmental measures under Article 192(1) TFEU. . These arguments also inform the later analysis of Article 192(2) TFEU and its conditions for derogation from the ordinary legislative procedure normally prescribed for environmental measures under Article 192(1) TFEU.

In their attempt to interpret the wording "primarily of a fiscal nature", the authors – in keeping with Weishaar (2015) – point to the different language version of the TFEU, which are all equally authentic and preclude a uniform and consistent definition of fiscal measures. Instead, they draw on the same functional definition referenced by the other sources discussed in this literature review and first developed by the Organisation for Economic Co-operation and Development (OECD), according to which taxes are "compulsory and unrequited payments to the general government or a supranational authority" with the general aim to raise revenues (Organisation for Economic Co-operation and Development, 2021). Invoking the arguments already presented by Weishaar (2015), such as consistency with EU legal practice regarding requited charges and fees in other areas and the reduced intrusiveness in national sovereignty, Fischer et al. (2020) favour a narrow interpretation of "fiscal nature" in Article 192(2) to exclude fees.

Even if an auction reserve price were considered to be fiscal in nature, they argue that it would not be "primarily" fiscal in nature because its purpose is not to increase or reduce revenue, nor would it have a predictable bearing on the revenue volumes generated through allowance auctions. Overall, Fischer et al. (2020) concede that "considerable uncertainty remains about the exact definition of 'primarily of a fiscal nature'" in the literature, but then point to the ECJ judgment in *Air Transport Association of America and Others*[32] stating that the EU ETS is "a market-based measure and not a duty, tax, fee or charge." They further reference the argument first presented by Wemaëre & Bernheim (2016) that allowances are subject to financial market legislation and afford buyers a title that can be transferred to other market participants to underscore the nonfiscal nature of the EU ETS.

Because an auction reserve price would form an intrinsic part of the EU ETS and thus has to be viewed as "inseparably linked … to the underlying nonfiscal instrument", Fischer et al. (2020) conclude that the auction reserve price would be nonfiscal in nature as a measure aimed at stabilizing the EU ETS and rendering it "more effective toward its purpose of cost-effectively reducing greenhouse gas emissions and combating climate change." Its impacts on revenue generation would be unclear, moreover, and with the majority of EUA auctioning revenue earmarked for climate and energy purposes, it would also not significantly affect Member State budgets. Finally, referencing the earlier discussion of differences between a tax and auction reserve price, the authors underscore that an auction reserve price does not constitute a mandatory levy since market participants are not required to purchase allowances at auction and have robust secondary markets as a source of supply, nor does it fix the price, because the price will still be determined by supply and demand forces in the market adopted.

Regarding the second relevant trigger of unanimity in Article 192(2) TFEU, "measures significantly affecting a Member State's choice between different energy sources and the general structure of its energy supply", Fischer et al. (2020) – like Hocksell (2018) – reference the

[32] ECJ, Case C-366/10, supra, note 2.

ECJ decision in Poland v. European Parliament and Council of the European Union[33] to support a strict interpretation of the terms in that provision.[34] They also point out that both the Renewable Energy Directive[35] and the EU ETS Directive have important ramifications for the energy supply structure of Member States, yet were passed with qualified majority voting.

Citing Wemaëre & Bernheim (2016), however, they acknowledge that this line of reasoning would fall short if it served to circumvent the qualification contained in Article 192(2) TFEU, a concern reflected in the aforementioned ECJ decision when the Court declared that "the legal basis for a measure must be determined having regard to its own aim and content and not to the legal basis used for the adoption of other EU measures that might, in certain cases, display similar characteristics."[36] They consider, but reject the suggestion by Wemaëre & Bernheim (2016) that an auction reserve price be set at a level that will not by itself trigger fuel switching in the power sector. As support for their rejection, Fischer et al. (2020) again turn to the ECJ decision in the foregoing case, where the Court held "assumptions as to the likely impact" of a measure to be "by their nature … speculative and … in no way objective factors amenable to judicial review", arguing instead that such review be limited to the "aim and content of that act."[37]

Finally, Fischer et al. (2020) turn their attention to the inclusion of "significantly" in the wording of Article 192(2)(c) TFEU, and affirm a lack of case law and scholarly discussion on this particular criterion. They find no interpretative guidance in the historical evolution of the provision, and instead again revert to the ECJ decision in *Poland v. European Parliament and Council of the European Union*, which observed that Article 192(2)(c) TFEU "can form the legal basis of an EU measure only if it follows from the aim and content of that measure that the primary outcome sought by that measure is significantly to affect a Member State's choice between different energy sources and the general structure of the energy supply of that Member State."[38] Since that clearly is not the case with an auction reserve price – which would have much the same proposed effect on the EU ETS as that intended by the MSR, namely "supporting but not forming prices" – Fischer et al. (2020) conclude that a legal challenge against an auction reserve price could be similarly rebutted like the Polish challenge against the MSR.

Perino et al. (2021)

Finally, a policy brief authored by Perino and a team of authors including one lawyer (Perino et al., 2021) contains a short section offering the latest legal analysis published on the topic of discretionary price management mechanisms, focusing on the admissibility of a proposed "price-based flexibility mechanism" outlined in the policy brief: a Price Stability Reserve. Like the other sources surveyed in this literature review, this section focuses on Article 192(2) TFEU and ways to "avert the burden of unanimity in the Council" required if this provision's derogations from the ordinary legislative procedure is triggered (Perino et al., 2021, p. 6).

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[33] ECJ, Case C-5/16, supra, note 8.

[34] Cf. The Court's observation that "a broad interpretation of point (c) of the first subparagraph of Article 192(2) TFEU would risk having the effect of making recourse to the special legislative procedure, which the Treaty FEU intended as an exception, into the general rule. That conclusion is irreconcilable with the Court's case-law, according to which provisions that are exceptions to principles must be interpreted strictly." Ibid., para. 35.

[35] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (2018) OJ L328/82.

[36] ECJ, Case C-5/16, supra, note 8, para. 49.

[37] ECJ, Case C-5/16, supra, note 8, paras. 41-42.

[38] ECJ, Case C-5/16, supra, note 8, para. 46.

Perino et al. (2021) begin by examining the first condition triggering the special legislative procedure, that of "primarily of a fiscal nature" in Article 192(2)(a) TFEU. Reiterating the arguments already presented in Weishaar (2015) and taken up by the subsequent literature, they emphasize the nature of this provision as an "exception to the principle" of the ordinary legislative procedure as justification for a narrow interpretation of "primarily of a fiscal nature". While they concede that the exact scope of "fiscal nature" remains difficult to establish, Perino et al. (2021) propose that a price-based flexibility mechanism would, in any case, not be "primarily" a fiscal measure just because it (also) generates revenue. They go on to caution that the stated aim of such an intervention should thus be the stabilization of the EU ETS as a whole, and not the achievement of revenues as such, with market forces continuing to determine the price of allowances. Lastly, Perino et al. (2021) cite the ECJ decision in *Air Transport Association of America and Others*[39] to argue that a price-based flexibility mechanism "should not restructure the EU ETS in a way … that it constitutes an obligatory levy in favour of the public authorities."

In the last part of the section addressing legal aspects of a price-based flexibility mechanism, Perino et al. (2021) dissect the third exception to the ordinary legislative procedure specified in Article 192(2)(c) TFEU, which applies to measures "significantly affecting a Member State's choice between different energy sources and the general structure of its energy supply." Here, Perino et al. (2021) draw on the recent ECJ decision in *Poland v. European Parliament and Council of the European Union* and the Court's interpretation therein that, in order for a measure to trigger this derogation, the primary outcome it seeks has to be a significant effect on the aforementioned choice of Member States, as determined by objective factors amenable to judicial review, including the aim and content of that measure.[40] Perino et al. (2021) conclude by recommending that the design of a price-based flexibility mechanism consider the conclusions of the Court in that decision, where it held that the MSR does not constitute such a measure because its aim is to remedy existing imbalances with quantitative mechanisms, and its content does not call for a direct intervention to set the price of allowances.

What this section does not go on to discuss, however, is whether the proposed Price stability Reserve premised on the price of allowances rather than the total number of allowances in circulation would still meet the latter criterion of avoiding a direct intervention to set the price of allowances. More important, therefore, seems the Court's other requirement that "the primary outcome sought by" the measure in question be "significantly to affect a Member State's choice between different energy sources and the general structure of the energy supply of that Member State",[41] which, as Fischer et al. (2020) also highlight, would not be the intention of a discretionary price management mechanism aimed at remedying existing imbalances with quantitative mechanisms – a policy objective such a mechanism would share with the MSR upheld by the ECJ in said decision.

Key Takeaways

As the preceding literature review has shown, the legal admissibility of discretionary price management mechanisms in the EU ETS – such as an auction reserve floor price or a carbon price support rate – remains shrouded in legal uncertainty. While recent case law by the ECJ in *Air Transport Association of America and Others* and *Poland v. European Parliament and*

[39] ECJ, Case C-366/10, supra, note 2.

[40] ECJ, Case C-5/16, supra, note 8, para. 46 et seq.

[41] Ibid.

Council of the European Union has helped shed light on the interpretation of Article 192(2) TFEU and the classification of the EU ETS, it offers no conclusive determination of the legal procedure that would apply to the adoption of a carbon price floor.

Scholarly assessments diverge with regard to the price management mechanisms under analysis and the level of implementation. In the case of an auction reserve price introduced at the EU level, all sources reviewed here favour a narrow interpretation of the wording "primarily of a fiscal nature" in Article 192(2)(a) TFEU that excludes such a reserve price from the unanimity requirement in that provision, either because the auction reserve price is closer to a requited fee in nature than an unrequited tax, or because it is altogether different from a fiscal measure as the carbon price remains subject to the dynamics of demand and supply in the secondary market and is thus not fixed.

As for the criterion "significantly affecting a Member State's choice between different energy sources and the general structure of its energy supply", the literature generally acknowledges a residual risk for an auction reserve price and need to evaluate the specific circumstances in affected Member State claiming such an impact. The most recent journal article draws on the ruling in *Poland v. European Parliament and Council of the European Union* to conclude that an auction reserve price – which is not *primarily* aimed at influencing the choice between different energy sources and general structure of the energy supply in Member States – is unlikely to trigger this criterion for unanimity in the Council.

Overall, the relevant literature tends to thus support the legal admissibility of an auction reserve price introduced at the EU level (as opposed to a hard price floor, see below), with several sources describing an amendment to the Auctioning Regulation adopted by qualified majority vote as the appropriate process. An auction reserve price set at a level that will not substantially impact the choice between different energy sources and general structure of the energy supply is recommended by one source as a way to reduce the risk of triggering the unanimous voting requirement, but the same recommendation is rejected by another more recent source based on the latest relevant case law of the ECJ.

The most recent assessment, evaluating a Price Stability Reserve premised on allowance prices rather than a particular quantity threshold, reiterates the foregoing arguments invoked in support of an auction reserve price and concludes that such a price-based flexibility mechanism could also be introduced without the unanimity requirement of Article 192(2) TFEU, although it cautions that the Price Stability Reserve should aim at stabilizing the EU ETS and let prices continue to be determined by market forces.

Finally, the studies reviewed here that examine the legal admissibility of a hard price floor in the form of a carbon price support rate or top-up price seem to conclude that such an intervention, if introduced at the EU level, would require unanimity in the Council as a fiscal measure. As such, the legal assessment of a hard price floor differs markedly from that of an auction reserve price, as discussed two paragraphs earlier (see above). Implemented at a national or regional level by one or more Member States, by contrast, such a hard carbon price floor is not seen as raising legal concerns, as evidenced by the established precedent of the Carbon Price Support introduced in the UK. By the same token, however, an auction reserve price at the national level is considered inadmissible, given that the EU has already exercised its competence to set out a regulatory framework for EUA auctioning, thereby precluding measures at the level of the Member States that would risk undermining or fragmenting this harmonized framework.

What the literature reviewed in this section does not address is the legal admissibility of a price ceiling or corridor, which could see rising political interest in coming years if the price of EUAs continue to increase and prompt growing concerns about the associated costs for emitters

and consumers. Even though a price ceiling (or the upper bound of a price corridor) could result in a fixed price should scarcity in the EU ETS prompt the market price of allowances to reach the ceiling (or upper bound of the price corridor), it is unlikely to be considered a fiscal measure that would prompt the unanimity requirement of Article 192(2) TFEU. The reason for that is as follows: an upper limit to the price would not levy a compulsory unrequited payment to the general government or to a supranational authority, as a tax is commonly defined, but would rather limit the cost imposed under the EU ETS and the market-based price discovery it provides. What is more, a price ceiling would limit, rather than increase, any generated revenue, further lowering the probability that it would be considered a fiscal measure. Unlike a price floor (or the lower bound of a price corridor), therefore, a price ceiling (or upper bound of a price corridor) should face no legal challenge regarding the ordinary legislative procedure.

4.3 Integration of Carbon Dioxide Removals (CDR)

A key motivation for the discussion of negative emissions (or carbon dioxide removal, CDR) in the context of emissions trading in the literature is the scientific consensus that without deployment of carbon dioxide removal (CDR) the Paris Climate Goal cannot be achieved. According to the Intergovernmental Panel on Climate Change (IPCC), the deployment of CDR "is unavoidable if net zero CO_2 or GHG emissions are to be achieved", to counterbalance hard-to-abate residual emissions (IPCC, 2022b). The remaining carbon budget for limiting global warming to 1.5 degrees Celsius will probably be exhausted before 2030 and carbon debt[42] generated thereafter will need to be compensated by net-negative emissions (Bednar et al., 2021).

Different technologies for negative emissions are discussed in the literature, which differ substantially in terms of scalability, costs, and degree of permanence (storage duration) (Table 4-1). CDR methods are often grouped into **"nature-based" methods** (with often a lower degree of permanence, also known as "Carbon Farming" in the EU policy context) and **"technological" methods** (often with a higher degree of permanence).[43] In the context of a future EU policy framework for negative emissions, it needs to be decided which of these CDR technologies will be recognized (e.g., via an integration into the EU ETS).[44]

[42] Bednar et al. define carbon debt as CO_2 emissions that overshoot the remaining carbon budget.

[43] However, this definition is contested (see, in particular, Bellamy & Osaka, 2020): First, not all methods can easily be grouped into one of the two categories, since natural climate solutions are not a self-evident category but delimited by people. Second, the categorization is criticized to implicitly frame the natural methods as the more desirable ones than the ones perceived as artificial, with potential negative consequences for public support. For this reason, Smith et al. (2023) differentiate between (1) **conventional CDR on land** (Methods that both capture and store carbon in the land reservoir, which are well-established practices and already deployed at scale (TRL 8–9), and widely reported by countries as part of their Land Use, Land Use Change and Forestry (LULUCF) activities. This includes the methods afforestation/reforestation; soil carbon in croplands and grasslands; peatland and wetland restoration; agroforestry; improved forest management; and durable Harvested Wood Products); and (2) **novel CDR** (This includes all other methods, storing captured carbon in the lithosphere (geological formations), ocean or products. These methods are generally at a TRL below 8–9 and are currently deployed at smaller scales. In contrast to conventional CDR on land, which involves a more regular exchange with the short-term carbon cycle, storage in geological reservoirs is usually intended to be maintained over a longer period of time. Examples include BECCS; Direct Air Carbon Capture and Storage (DACCS); biochar; and ocean alkalinisation.)

[44] A provisional agreement on the EU carbon removals certification framework was reached in February 2024, after work on this overview was completed.

Table 4-1 Global potentials, in gigatonnes of CO_2 per year (estimate for 2050), and costs, in dollars of today's purchasing power per ton of CO_2, of relevant CDR technologies

Technology	Potentials	Costs	Storage duration
Afforestation/reforestation	0.5 - 10	0 - 50	Decades to centuries
BECCS	0.5 - 11	100 - 200	Millenia
Ocean alkalinization	1 - 100	14 - 500	Centuries
Enhanced weathering	2 - 4	50 - 200	Centuries
Biochar	0.3-6.6	30 - 120	Centuries
Modified patterns of agriculture	2 - 5	0 - 100	Years to decades
DACCS	5 - 40	100 - 300	Millennia

Storage time for different CO_2 removal technologies is given by the half-life. Source: Edenhofer et al. (2023).

Following Smith et al. (2023) and in line with the definition of the IPCC (2023)[45], in the following we adopt the definition of CDR based on three principles:

- Principle 1: The CO_2 captured must come from the atmosphere, not from fossil sources.
- Principle 2: The subsequent storage must be durable, such that CO_2 is not soon reintroduced to the atmosphere (see discussion below).
- Principle 3: The removal must be a result of human intervention, additional to Earth's natural processes.

These principles mean that some forms of carbon capture and utilization (CCU) could also be counted as CDR in principle, as long as they result in durable storage. This excludes, however, short-term storage such as synthetic fuels.

While there is agreement that a distinction should be made between durability and non-durability and that only durable negative emissions qualify as CDR, the key debate in the literature on which technological and nature-based solutions are defined as CDR is on the definition of the term "durable". Definitions range from a few decades (2023), over more than 100 years (see discussion in IPCC, 2023), to up to up to 1,000 years or more (Meyer-Ohlendorf, 2023). However, there is agreement that technologies like the production of synthetic fuels does not qualify as CDR, since the principle of durability (Principle 2) is violated (Smith et al., 2023).

Even within the realm of different types of CDR, the storage duration varies significantly, from decades to centuries (afforestation/reforestation) to millennia (BECCS and DACCS, see Table 4-1). **In terms of a carbon accounting perspective, different types of CDR are therefore not equivalent. For non-permanent removals to be equivalent accounting wise (for the overall carbon budget) to permanent removals, there would need to be a credible long-term commitment to a perpetual removal of the leaking emissions from past removals** (Kalkuhl et al., 2022).

The approach taken by this study is therefore to make the distinction between different storage durations of (durable) CDR technologies explicit by differentiating between "permanent" and "non-permanent" CDR (see Table 4-2). While the exact cut-off point in terms of storage duration

[45] In an information note on removal activities under the Article 6.4 mechanism and with reference to the Sixth Assessment Report (AR6), the IPCC (2023) defines carbon dioxide removals (CDR) as "anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products."

between permanent and non-permanent removals is still to be discussed, the clustering in Table 4-2 shows that the economic value of one tonne of carbon dioxide removed from the atmosphere depends on the degree of permanence of this removal. A related and significant issue is that there is **doubt whether the storage duration of land-based CDR can be measured with a high degree of accuracy at all** (Wells et al., 2023).

Table 4-2 Typology of carbon dioxide removals and indicative examples.

	Technology-based	**Nature-based**
Permanent	E.g. DACCS, BECCS	(E.g. Peatland and wetland restoration)
Non-permanent		E.g. Durable harvested wood products (storage in wood in construction)

Note: The mapping of different CDR technologies to the typology is preliminary, since the definition of the minimum storage duration for CDR to be classified as permanent is still under discussion. Source: Technopolis Group, PIK & E3-Modelling, 2023, based on Smith et al. (2023).

Regarding the **European Union's regulatory framework on CDR**, negative emissions technologies like BECCS and DACCS are currently not recognized by the EU-ETS. CCS, on the other hand, is recognized as an alternative to submitting allowances for regulated entities. However, this may be regarded not as a negative emission technology, but as a strategy to mitigate emissions. Similarly, the ETS revision asserts that no obligation of surrendering allowances exists for (permanent) carbon dioxide capture, utilization and storage (CCUS), namely for "greenhouse gases which are considered to have been captured and utilised in such a way that they have become permanently chemically bound in a product so that they do not enter the atmosphere under normal use, including any normal activity taking place after the end of the life of the product" (Art. 12, 3b). The Commission will adopt delegated acts detailing the requirements for considering that greenhouse gases have become permanently chemically bound.

There are **two review clauses in the revised EU ETS Directive regarding carbon dioxide removals and non-permanent CCU**. First, regarding permanent CDR, in Article 30 (5a) of the revision of the ETS Directive, the Commission is asked to explore by 31 July 2026 how **negative emissions that can safely and "permanently" be stored** could be "covered by emissions trading" – without replacing emissions reductions.[46] Second, Article 30 (5c) establishes that the **strict permanence approach of CCU and upstream accounting of emissions shall be reviewed** and, in particular, it shall be assessed whether double counting is effectively avoided, given that the ETS may cover waste incineration in the future.[47]

Other than the ETS review clauses, the EU addresses negative emissions also in its **broader climate policy framework**. For example, the EU Climate Law adopts the 2030 EU climate target

[46] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02003L0087-20230605#M15-65

[47] Article 30 (5c) states that the Commission shall report, by 31July 2026, "whether all greenhouse gas emissions covered by this Directive are effectively accounted for, and whether double counting is effectively avoided; in particular, it shall assess the accounting of the greenhouse gas emissions which are considered to have been captured and utilised in a product in a manner other than that referred to in Article 12(3b)."
Some non-permanent CCU products like chemicals, plastics, renewable fuels of non-biological origin ('RFNBOs') might return to the ETS and rules would be needed to avoid double counting. Recital 97 points to the importance of waste incineration regarding the upstream accounting of non-permanent CCU: "Until all stages of the life of a product in which captured carbon is used are subject to carbon pricing, in particular at the stage of waste incineration, reliance on accounting for emissions at the point of their release from products into the atmosphere would result in emissions being undercounted."

as a *net* target (including sinks) – while capping the contribution of removals to 225 Mt CO_2e (Schenuit & Geden, 2023). Moreover, the LULUCF regulation allows for flexibilities of up to 280 Mt of CDR that can be used to meet ESR targets (Schenuit & Geden, 2023). The revised LULUCF Regulation also establishes a new target of achieving 310 Mt CO_2e net removals by 2030 (Smith et al., 2023). Finally, using revenues from EU emissions trading, the EU Innovation Fund is currently the main tool to support the development of novel CDR methods in the EU, complemented by funding through the EU's research and innovation programme Horizon Europe (Smith et al., 2023).

The review of the literature has shown that the bulk of the studies discussed the general pros and cons of CDR, but relatively little regarding the concrete integration negative emissions in the EU ETS, other than regarding the distinction of non-permanent and permanent removals.[48] Specifically, on CCU(s), several studies show its general potential (see, e.g. IEA, 2019, 2023), but otherwise little information is available in relation to an integration in the EU ETS.

While there is agreement on the importance of negative emissions in principle to counterbalance hard-to-abate residual emissions, strongly differing views exist in the literature on the ranking of challenges regarding CDR in the context of emissions trading, as well as corresponding policy options.

Key challenges

Bednar et al. (2021) view the **financing of negative emissions** as a fundamental challenge. They argue that using economic policy instruments to incentivize a global transformation towards a net-negative carbon economy would imply large-scale public subsidy for carbon removal (i.e. a negative carbon price for removal credits), imposing an "excessive fiscal burden" from 2050 onwards. Moreover, forcing future generations to pay for carbon debt accrued earlier poses severe challenges for **intergenerational equity**. Once the carbon budget is exhausted, the authors argue that carbon prices from emissions trading no longer reflects the price of a non-renewable resource. Instead, revenues from carbon pricing after the depletion of the budget should be invested at the market interest rate to finance net carbon removal later in the century. This would amount to an intertemporal financial transfer that ensures resources generated today from pricing an already depleted resource would not benefit public budgets in the near-term, but transferred to the future to repay the carbon debt accrued.

Edenhofer et al. (2023) agree that financing negative emissions will be very costly, with a back-of-the-envelope calculation indicating that **up to three percent of global GDP** may have to be spent on CDR after 2050. Second, a key challenge is how to manage **non-permanent removals**, i.e., removals with shorter lifespans than the lifetime of carbon dioxide in the atmosphere (such as afforestation/reforestation, see Table 4-1). The releases from non-permanent removals need to be compensated by further removal projects at a matching rate, which implies that some seemingly cheap options in the land sector may become very expensive in the long run (see also Kalkuhl et al., 2022). The management of this carbon debt thus implies both a financial risk for society, as well as the risk of violating climate targets. Third, Edenhofer et al. (2023) point out **concerns about additionality and general-equilibrium effects in the land sector**. Even under a perfect monitoring, reporting and verification scheme, land-intensive carbon removals – such

[48] In addition to the type of removals to be included, other relevant questions regarding the integration of removals in the ETS include the volume of removals to be brought in, the rules on removal certificates (e.g. perfect fungibility with conventional EUAs, indirect inclusion e.g. via a purchase of an actor like the Commission that purchase CDR and issue new EUAs based on them, etc.), the timing of an integration of removals, as well as limits to the sectors or the fraction of overall emissions that can be covered by CDR.

as a comprehensive deployment of BECCS – may lead to land-change induced emission releases at other locations.[49]

Meyer-Ohlendorf (2023) sees major risks in the **lack of a robust definition** of the term carbon removal, in particular with regards to the condition of permanence. The Commission's proposal on the Carbon Removals Certification Framework (CRCF) does not exclude removals with short-term storage, which does not adequately address the global warming effect of CO_2 (carbon dioxide remains in the atmosphere for more than 1,000 years). Meyer-Ohlendorf sees a risk that permanent and non-permanent removals will be framed as equivalent, although they do not have the same climate value. Pursuing (short-term) **land-based CDR is risky** for several reasons: Biomass-based non-permanent removals risk growing the "carbon bubble" that may burst when the climate gets hotter and tipping points in the Earth's climate system are set in motion; the accounting of nature-based carbon removals is challenging and issues of additionality and baselines have led to over-crediting and fraudulent certification in the past; and carbon removals in the land sector often result in the intensification of agricultural land use and the planting of monocultures in forestry. Meyer-Ohlendorf also sees **risk of a potential full interchangeability of removals and emissions reductions** in the EU policy framework. This may lead to replacing emissions reductions with removals, particularly since the EU has not yet set a separate climate target for the volume of removals. A delay of emissions reductions may lead to a lock-in of too high emission levels and a risk of earth feedback. Moreover, even removals with permanent storage face problems such as leakage risks[50], demand of clean energy, or land use.

Burke and Gambhir (2022) argue that the discussion of integrating CDR in emissions trading and using carbon markets as the main lever for supporting the deployment of negative emissions carries three risks. First, in line with Meyer-Ohlendorf (2023), the authors argue that treating emissions removals and emissions reductions as entirely fungible allows for an **undesirable substitution of mitigation with CDR**. This would imply risks of moral hazard, by relying on CDR to remove emissions later in the century and the possibility of temperature overshoots at the expense of short-term mitigation. Such a mitigation deterrence would signify an unjustifiable transfer of risk from the present to the future. Compared to mitigation, there are also concerns about the long-term durability and overall net additionality of negative emissions. Second, carbon markets alone may lead to a prioritisation of low-cost negative emissions technologies like nature-based solutions, and thus provide an **insufficient demand pull** to deploy currently more expensive CDR technologies at commercial scales. Third, fully integrating CDR (including low-cost nature-based solutions) in carbon markets too early and without additional safeguards could exert **downward pressure on emissions prices**.

In addition to the need for an upscale of negative emissions, Rickels et al. (2022) frame the potential inclusion of negative emissions in the EU ETS as an opportunity to **address challenges to market stability** from potential future CO_2 price spikes and volatility, which may jeopardize the political acceptance and support for emissions trading. Their proposal for a Carbon Central Bank (CCB) is thus inspired primarily by addressing challenges to market stability (see previous section 4.1), in particular an active carbon price management on the path to a net-negative emissions trading system.

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[49] For example, an afforestation project may available agricultural land and therefore lead to an increase of deforestation elsewhere.

[50] Evidence on long-term leakage from carbon capture and storage (CCS) pilot plants is still scarce. However, studies suggest that not all captured carbon is stored permanently due to geochemical interactions enhanced by the pressure and temperature of a storage site (Gholami et al., 2021).

Key policy options

Broadly speaking, the literature can be divided in two camps, one supporting an integration of CDR in carbon markets to provide liquidity and support an upscaling of CDR, and one that is sceptical about an (early) integration and emphasizes the importance of complementing policy options. Moreover, the mandate of an institution like a Carbon Central Bank (CCB) emerges in multiple papers but the objective and the scope of such a governance body is defined differently.

Rickels et al. (2022) envision a **Carbon Central Bank (CCB) with an active institutional mandate** that would issue carbon removal certificates (CRC) to support a (dynamic) price cap (price corridor). The policy of the carbon central bank could include a price and emissions reduction path in which the CCB itself decides when to intervene. By issuing CRCs, the CCB's measures would result in net emissions remaining unchanged. To support the upscale of removals while preserving incentives for abatement, procurement would work via technology-specific tenders that feed into a CRC reserve. Unlike an unconditional integration of carbon removals into the EU ETS, an upfront removal procurement with a conditional supply at a later stage via the reserve allows for a separation of the timing of carbon removal measures and the corresponding issuance of CRCs from the release of CRCs in the EU ETS. According to the authors, this would avoid a (too) early subsidized full integration of CRCs in the EU ETS, which could undermine the incentives for learning-by-doing in the abatement sector.

Bednar et al. (2021) put forward the idea of introducing **carbon removal obligations (CROs)** into emission markets. The idea is that revenues from carbon pricing would be partially retained and transferred over generations to finance (future) net CDR in the style of a nuclear decommissioning trust. Emitters would decide in each trading period what fraction of their emissions to compensate for by allowances and how much carbon debt (the amount by which emission caps are exceeded by net emissions) to generate for compensation in the future.[51] This would allow total emissions to exceed the cap in any given year, accompanied by an intertemporal trade of carbon debt. Inherent risks, such as the risk of default by carbon debtors, would be addressed by pricing atmospheric CO_2 storage through interest on carbon debt and a chain of legal liabilities: A centralised institution (e.g., the European Central Bank) would issue the carbon debt, to which commercial banks would be held liable in case of insolvent debtors. Since negative emissions do not have to be delivered immediately, CROs act as loans to finance development and form a business case for CDR suppliers. According to modelling conducted by Bednar et al., interest payments for CROs would induce substantially more-ambitious near-term decarbonization that is complemented by earlier and less-aggressive deployment of CDR.

Edenhofer et al. (2023) identify four tasks for a CDR governance within the EU institutional framework: Managing the net cap, financing R&D and early deployment of removal technologies, certifying carbon removals and managing the liability of non-permanent removals. They propose several new institutions to deal with these challenges. The management of the cap should be delegated to an independent body with a narrow mandate, the **European Carbon Central Bank (ECCB)**. The ECCB would set the net cap jointly with the European Commission and would procure carbon removal certificates via reverse auctions. Non-permanent removals are a liability for the bank and future net negative emissions

[51] Note that the timing of carrying out actual emissions reductions projects proposed by Bednar et al. is the reverse of the proposal of a Carbon Central Bank in the spirit of Rickels et al. (2022). While the Carbon Central Bank would procure projects today and release certificates into the EU ETS later, Bednar et al. propose issuing certificates today and use the revenues (plus interest) to finance actual projects later.

will need to be financed. The ECCB would thus need credible access to public funds. The ECCB would receive an explicit mandate to manage the liability of non-permanent removals, which requires a sophisticated risk and liability management. The authors also suggest two other new institutions: While an integration of CDR into the EU ETS would lead to significant welfare gains, in the short run a separate CDR quantity target could make sense to scale up innovation. A Green Leap Innovation Authority (GLIA) would be responsible for the promotion of CDR technologies. A Carbon Removal Certification Authority (CRCA) would be established to carry out independent certification of all relevant CDR technologies.

Meyer-Ohlendorf (2023) discusses some drawbacks of a Carbon Central Bank as proposed by Edenhofer et al. (2023) or Rickels et al. (2022). He argues that from the point of view of democratic legitimacy, only legislators should take far-reaching decisions such as the amount of the EU's residual emissions. Moreover, the constant renewal of non-permanent removals is a more complex task than the storage of nuclear waste and liability regimes. It would be an "unprecedented active and constant management of a complex and dynamic system for millennia" and may turn out to be "impossible". Meyer-Ohlendorf therefore proposes a robust definition of carbon removals, with a clear **focus on permanent removals** and specifically the technologies Direct Air Capture and Storage (DACCS) and enhanced weathering (EW). Moreover, inspired by a legislative proposal for the introduction of a Removal Trading Scheme in California, he discusses the introduction of a **separate EU Removal Trading Scheme**, which would obligate covered entities to remove and store specific minimum amounts of carbon.[52] In California, the obligation for emitting entities would gradually increase over time (starting from 1% in 2030 and moving to 100% by 2045).[53] The removal obligation would provide an economic incentive for the scale-up of removal technologies to meet the ensured demand.

In order to avoid the potential pitfalls of integrating negative emissions in carbon markets, Burke and Gambhir (2022) propose a **multi-pronged and intertemporal policy and governance framework.** This includes, a) separate accounting targets for CDR and conventional emissions abatement; b) removing perfect fungibility between CDR permits and carbon market permits – this would mitigate risks to environmental integrity (e.g. permanence, additionality) and address downward pressure on prices and undesired substitution of mitigation efforts resulting from unrestricted linking; and c) promoting a wide range of innovation and technology-specific mechanisms to drive currently expensive, yet highly scalable technological CDR down the cost curve.

La Hoz Theuer et al. (2021) discuss four different options of including removals in emissions trading, from completely separated to fully integrated. The first proposed model, **disconnected markets**, features a removal market that is completely separated from the allowance market (EU ETS). Opportunities of this solution are separate incentives for emission reductions under the ETS from the incentives for removals, as well as a potential contribution of the ETS to the incentivization of negative emissions through the carbon price and revenue use. Constraints include that there is no possibility to compensate for residual emissions in the ETS, implying that

[52] The removal obligation could be allocated primarily based on historical emissions or the carbon debt of the covered entities, thus implementing the polluter-pays-principle. However, this would risk putting additional costs on entities covered at a time when these are already under stress to reduce their emissions to near zero.

[53] In California, the Carbon Dioxide Removal Market Development Act (SB-308) targets installations subject to the California ETS. These "emitting entities" would need to buy removals corresponding to 1% of emissions in 2030, increasing to 100% by 2045. The scheme targets permanent removals ("durable carbon sequestration methods"), meaning a method of carbon sequestration that can reasonably be projected to retain a large majority of the carbon atoms out of the atmosphere for 1,000 years and for which the responsible entity provides a guarantee period of at least 100 years. The legislation has been approved by the Senate, but not by the second chamber yet (i.e., it is not yet law).

the cap would likely need to stay positive, as well as a reduced market liquidity in the ETS as the number of market players shrinks. The second model, **connected through government**, features a quantity of removals flowing into the ETS market that is controlled by government. Opportunities of this solution include a control by the government over both the quantity and the way removals are used (e.g. reserves, free allocation, in auctions), as well as a compensation avenue for residual emissions within the ETS. Constraints are the potential impacts on the ETS market price, as well as potential high costs for the government (which are lower if the removals are auctioned). The third model, **connected with restrictions**, is characterised by a direct connection of allowance and removal markets through transactions between ETS entities and removers, while allowing the government to place qualitative and quantitative limits on the transactions between the two markets. Advantages are that the control over the quantity and the way removals are used remains with the government, an improved price discovery as the cap approaches zero, and an improved fiscal balance for the government (relative to the no-auctioning scenario of the 'connected through government' option). Drawbacks are that incentives to deplore removals are limited in case of price differentials (although the government could provide additional support, e.g. via CCfDs), as well as potential impacts on the market price (as for the option 'connected through government'). The fourth model, **integrated markets**, features emitters and removers as part of the same single market. There would thus be no limitation on the number of removal certificates that can be used in the ETS. A main opportunity compared to the integrated markets model is that the direct integration of removers into the ETS may make the market more liquid and reduce concerns of market power as the ETS cap approaches zero. The main drawback is a lack of government control over the decarbonisation pathways within ETS and the risk of a high-carbon lock-in. This option also offers limited options to incentivize negative emissions technologies in case of price differentials.

4.4 Distributional aspects, auctioning, redistribution, support for the vulnerable

A key element of the Fit-for-55 package is the expansion of EU emissions trading to emissions from buildings, road transport, and other sectors. For this purpose, a second emissions trading will be established (EU ETS2). The EU ETS2 is planned to start its operation in 2027. Distributors that supply fuels are the entities that will have to surrender allowances in EU ETS2.

Emissions trading has distributional effects, as the costs borne by producers of energy and industrial goods (EU ETS1) and fuel suppliers (EU ETS2) can be passed on to EU citizens through price increases in goods and services. The effects can be regressive, as not all people spend the same share of their income on carbon-intensive goods. The distributional effects of carbon pricing are felt disproportionately by lower groups, as they often spend a larger share on goods subject to emissions trading (i.e. electricity and heating fuels) (Klenert et al., 2018). Therefore, the distributional effects of the implementation of the EU-ETS2 are a highly relevant issue for the EU from the perspective of social fairness and likely also political acceptance.

Policy decisions regarding the scope of sectors covered by emission trading systems must consider the implications of the distribution between Member States, that is the potentially disproportionate effect carbon pricing might have over low-income EU countries, particularly those who have poorer populations; and within them, referring to the effect between different household income deciles. The EU, however, does not have the competence to address distributional issues within Member States, which will have to consider a variety of measures when addressing distributional implications within their jurisdictions. Furthermore, the analysis of the potential regressive effect will also have to consider the scope of the different sectors of the economy affected by these policies (i.e. heating, electricity, transport, fuels, etc).

References can be found in the literature pointing towards the regressive effect carbon pricing can have between Member States (See Feindt et al., 2021; Landis et al., 2021), in which some countries will find a given carbon price more burdensome that others, as the carbon cost will constitute a higher share of their national expenditure (Fredriksson & Zachmann, 2021) Within countries, additional abatement through expanding the sectors subjected to carbon pricing, might have distributional effects, unevenly impacting citizens and households. Under the ETS, carbon pricing will target emission-intensive goods and services (i.e. petrol, heating fuels, etc), making them more expensive compared to others with lower carbon content. This will result in an uneven impact across households, especially on poorer ones that typically spend a larger share of their income on energy goods, because their consumption will become relatively more costly (See Borghesi & Ferrari, 2022; Görlach et al., 2022; Goulder et al., 2019).

Finally, the discussion should be framed within the **context of public acceptability and societal support for environmental measures**, linking the success and the effectiveness of carbon pricing to how the public perceives the appropriateness of the tax and how it is communicated in terms of the impacts of the revenue, **as well as how it is recycled and used to offset adverse effects from increased prices**. In the case of the ETS2, several provision may postpone or cushion price impact on consumers: Firstly, it will be possible to delay the application of the cap and surrendering obligations for a year if gas or oil wholesale prices are exceptionally high in comparison to historical trends[54], and secondly, the allowance price will be 'soft capped' until 2030 at 45€/t (in 2020 prices, i.e. adjusted for inflation). As a mitigation strategy for the distributional effects brought about by the ETS2, a dedicated Social Climate Fund (SCF)[55] was established to support and finance temporary direct income support for vulnerable households, as well as support measures and investment for vulnerable groups that reduce emission in the road transport and building sectors (i.e. decarbonisation of buildings, integration of energy from renewable sources, low-emission mobility, and transport, etc)[56].

Key challenges

Pahle (2023) argues that a delayed implementation of the EU ETS2 and a (soft) capped price may bear the risk that the 2030 climate targets might not be achieved. The risk largely depends on how comprehensive and effective overlapping policies and regulation at the EU and Member State level will be. He further emphasizes that the SCF plays a key role in addressing social fairness challenges, but going forward two main design choices might give rise to challenges. First, the share of direct income support (37,5%) might be too high, given the funding needs for green investments and the fact that such investments can reduce the vulnerability of households. Second and related, it is not yet clear how proper targeting of support measures can be ensured and effectively implemented. That is, if funds are distributed broadly and not channelled explicitly to vulnerable households (e.g. by setting corresponding eligibly criteria), attaining social balancing can only be partially accomplished.

Görlach et al. (2022) provide an analysis of the policy framework devised by the European Commission regarding the implementation of the EU ETS2. They find that a **uniform EU-wide carbon price will have implication between Member States and within them.** For example, an uncompensated ETS2 carbon price would be slightly regressive for households across the EU (not grouped by Member States). They frame the challenge of implementing the ETS2 in terms of solidarity and fairness of the price signals and the political credibility that will bring about

[54] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0568

[55] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0568

[56] https://climate.ec.europa.eu/eu-action/european-green-deal/delivering-european-green-deal/social-climate-fund_en

societal acceptance. Specifically, they focus on the Social Climate Fund (SCF) design options and how it will interact with other policies and EU regulations at a Member State level. Its current framework entails Member States will submit a Social Climate Plan (SCP) detailing the measures and investments for which funding is being requested, further to a five-step approval procedure. They argue that this design would **constrain the Member States' accessibility to funds and place a higher administrative burden for Member States in need of financial support**.

Görlach et al. (2022) identify three challenging areas of the SCF design that need to be further considered: firstly framed in the context of the institutional structure and general governance in light of distributional implications, they analyse whether the **SCF should be established at EU level or at a Member-State level**, evaluating the issue of who should receive compensation, who should be responsible for compensating, and who should control the spending against design options that range from extreme cooperation, in which compensation is handled at EU level, to extreme subsidiarity, whereby EU members are sorely responsible for compensating. Additionally, they look at the **interaction between the ETS2 and the Effort Sharing Regulation (ESR),** arguing that the ETS2 could potentially shift the distribution of emissions reduction away from the ESR targets, affecting ESR certificates (annual emission allocations- AEAs) and ETS2 certificates trade, potentially skewing a fair effort-sharing between EU members. The authors argue the interaction between the two systems will create uncertainties in three dimensions: firstly, the impact assessment does not include an analysis of AEAs trade[57], and considering the limited present trade, governments may prefer national mitigation measures over trading AEAs. Secondly, the carbon pricing scenarios considered by the Commission have been contested by different studies (See Abrell, Kosch, et al., 2022; Pietzcker et al., 2021), resulting in uncertainty about the ETS2 price, given its dependence on various exogenous factors (i.e. behaviour of financial actors, price elasticities, etc); thirdly, the allocation of revenue does not foresee an automatic adjustment in response to changing ETS2 prices, resulting on a disparity between the SCF share of funds available for redistribution between and within Member States, which could equate to less funds available to support low and vulnerable households, contributing to a regressive effect.

Finally, the authors discuss the **financial volume of the SCF**, particularly the total auction revenue and spending criteria needed to ensure a fair compensation for low-income household and high-energy consumers from lower incomes. They claim that **at the EU level, the impact of the ETS2 will be slightly regressive,** and whilst mitigating strategies might put low-income households in a better position, a carbon price might still negatively impact high-intensity energy consumers (i.e. Bulgaria, Hungary, Poland, and Romania), situating them at risk of experiencing energy poverty.

Beiser-McGrat and Bernauer (2019) provide an international focus, comparing Germany and the U.S. through a survey procedure using a conjoint choice experiment embedded in representative surveys from each country. They seek to identify whether revenue recycling or specific forms thereof increase the public support for carbon taxation. They argue that the **theoretical literature lacks an exhaustive assessment of the impacts of revenue recycling to mitigate the negative effects for political feasibility in light of increasing the burden of carbon taxation and considering international level playing field concerns**. They claim that revenue recycling forms that generate benefits that are immediate and experienced directly by citizens are likely to increase political trust and support for carbon taxes (see Klenert et al., 2018).

[57] European Commission (2021): Speeding up European climate action towards a green, fair and prosperous future. EU climate action progress report. https://ec.europa.eu/clima/system/files/2021-11/policy_strategies_progress_com_2021_960_en.pdf

Similarly, Fairbrother et al. (2019) found based on data from 23 European nations that political trust conditions how Europeans' beliefs about climate change inform their support for carbon pricing. Beiser-McGrat and Bernauer's results point towards three challenges that need to be addressed by policymakers: firstly, **the level of carbon taxation directly affects support level, in varying extents across different countries**. For example, in the U.S a $30/t burden maintains support, but significant opposition can be found from $50/t onwards. In contrast, in Germany the opposition starts at $20/t onwards. Similarly, regarding the effects of revenue recycling, they argue that **some measures can maintain support even at relatively high levels of carbon taxation**, for example, funding for infrastructure and renewable energy generation, as well as support for low-income households and tax rebates maintain full majority (supports remain at $70 tax in the U.S but only until $50 in Germany). Conversely, reducing deficit or income tax and retraining programmes have shown not to significantly improve support for taxation. In a similar line, their results point towards citizens preferring carbon taxation policies that **do not grant exemptions to firms**, **both domestic and foreign**; moreover, taxing these firms significantly increases the support for a carbon tax. Lastly, the authors highlight the critical relevance of an international level playing field as **citizens were found to be very responsive to national policies implemented in other countries**, especially for the case of Germany and the EU, its citizens showcase a more positive response if other European countries, particularly industrialised countries, also adopt high carbon tax measures.

Borghesi and Ferrari (2022) argue that achieving carbon neutrality requires stringent climate policies for jurisdictions with emissions trading systems. In their view, an extension of carbon pricing mechanisms coupled with the current energy crisis risks exacerbating inequalities within Member States. They claim the viability of carbon policies depend on the distributional effects and how the population perceives the impacts brought about by them. They highlight that **Member States should adjust the destination of revenues to address specific national challenges and priorities**. However, for these measures to be effective, they need to be communicated to the public in a transparent manner (see Carattini et al., 2017), with a clear indication of the use and destination of such revenues. According to the authors, the Fit for 55 package presents an important challenge as it foresees that Member States will spend 100% of their ETS revenues on climate-related activities. They refer to the literature that argues for an impact in low- and middle- income households (Feindt et al., 2021), but they conclude that the evidence is still mixed.

Feindt et al. (2021) analyse the aggregated tax burden for 23 EU Member States, examining how a European carbon price will affect citizens. Their findings indicate that **at a national level, the distributional implications of a carbon price before recycling are mainly neutral, even progressive** in some cases. However, when **analysed at an aggregated EU-level, the impact is shown to be regressive**. Drivers for this are highlighted in relation to the high average carbon tax burdens in some low-income countries located mainly in Eastern Europe (i.e. Bulgaria, Poland and Romania). The average carbon burden in Bulgaria is 4.3% and 3.8% in Poland, compared with Germany, Italy, and France, which pay on average less than 1.4% in taxes. They support their claims with literature (see Mooij et al. (2012); Peters (2012)) that indicates that taxes on fuels are generally more progressive than those imposed on energy consumption, heating and electricity. Therefore, they argue for considering the regressive effect in the different characteristics between countries, rather than within them.

Klenert et al. (2018) propose an international approach looking at the effectiveness of carbon pricing measures in the light of distributional fairness, revenue salience and political trust and stability. They argue that **tax systems are not optimal, and therefore policymakers need to identify in which ways carbon pricing can contribute to reduce inefficiencies in the system.** They review four challenges: firstly, they find that political, economic, and cultural beliefs

influence the public willingness' to pay a carbon price, in line with Beiser-McGrath and Bernauer (2019). Secondly, they refer to ignorance about the Pigouvian effect for carbon pricing, whereby **citizens often ignore the possibility of a behavioural change due to an environmental tax, and instead focus on the potential to create change with the revenue raised**. Thirdly, the labelling of the carbon price has been shown to have influence in people's attitudes towards measures. Finally, the salience of the revenue recycling mechanism, understood as how **citizens report different levels of acceptability for various measures** (i.e. uniform lump sums transfer), varies within jurisdictions. Given the variety of mechanisms available, policymakers face the challenge of balancing the economic effectiveness of the measures against the distributional fairness implications in the light of public acceptability.

Key policy options

The literature largely concurs on the regressive effect that the ETS2 might have across the EU / between Member States (Feindt et al., 2021; Gore et al., 2022; Görlach et al., 2022). Revenue recycling has been described as the prime mechanism for increasing public acceptability for carbon pricing, indicating the importance of the association of costs and benefits in the use of revenues and its communication (i.e. funding of renewable projects, infrastructure, low-income support programmes, etc). It is not, however, a 'silver bullet' as policymakers face the challenge of balancing economic effectiveness and distributional fairness through different recycling mechanisms. There are different alternatives proposed in the literature regarding how to best offset the effects of carbon pricing, with an emphasis on the impact for low-income member states and particularly vulnerable households.

Feindt et al. (2021) show that even **whilst national redistribution can have a progressive EU effect, a European-wide approach for revenue redistribution would yield more benefits for low-income households affected by carbon pricing.** The authors propose two indicators that policymakers must keep in mind to offset the regressive effect of the EU-ETS: tax burden at a national level and compensation for households that are most severely affected. Their results suggest that a **European carbon tax displays a regressive pattern for the lowest income households,** they simulate three distributional schemes with equal-per-capita (EPC) mechanisms within the context of the Just Transition Fund, rather than within the scope of the SCF. Their findings suggest the implementation of two alternative models: firstly, one based on national carbon tax revenues being recycled to households within each country (i.e. persons in one country received the same transfers, which differs between countries); and secondly, one in which the t**otal European revenue is recycled EPC (i.e. each person in the EU receives the same transfer).** Finally, they claim that targeted transfers will directly offset tax incidence in the most vulnerable, being considered as the most desirable option, **as they find that relatively small monetary targeted transfers have the potential to offset the regressive patterns (less than 7% of the total EU-ETS revenues).**

Borghesi and Ferrari (2022) identify ETS allowances as a crucial tool to increase revenues to be used for distributional purposes. They propose that social acceptability for high carbon prices can be increased if harnessed by clearly devoting and **earmarking a higher share of ETS revenue to social expenditures related to environmental measures**. The use of the revenue from the ETS provides options for policymakers in how to allocate and spend it: if allocated to the jurisdiction's budget, it can be fed directly into the general budget, increasing the availability for spending without an identified end-use. Alternatively, it can be earmarked or designated specifically for a purpose, which has shown to increase the support for carbon pricing by associating costs with benefits**.** Most emission trading systems choose to earmark revenues and target it towards environmental measures, and some of them incorporate payments to support low-income communities. In order to improve the communication of the revenue destination,

the authors suggest **community and stakeholder engagement, as well as specific policy programmes design linking the funding of projects to ETS revenues**. Regarding the F55, they indicate its impact assessment claims that though EU ETS2 effects can be mildly regressive, **revenue recycling can in theory help resolve the distributional issues**. They highlight that the establishment of the Social Climate Fund is an opportunity to counterbalance the possible income loss experienced by low- and middle- income households.

Pahle (2023) proposes to put in place measures and processes to evaluate and further refine regulation for the share of **direct income support and effective targeting of vulnerable households**. This should be informed by new metrics and research that will determine the (perceived) fair redistribution of revenues. In that regard, communicating the purpose of carbon pricing as a policy tool and compensations measures also seem essential.

Results provided by Beiser-McGrath and Bernauer (2019) indicate that recycling can increase support for carbon pricing. **They warn that revenue recycling should not be used as a 'silver bullet'** in increasing public support, and that even though providing information on revenue usage positively influences individual preferences and acceptance over carbon pricing mechanisms, this is however **capped at the higher end of a carbon tax ($50-70/t), with a high level of variability between industrialised countries.** As such, solely providing information on revenue usage might not be enough to cause a positive and prolonged effect, without the consideration of other measures.

Görlach et al. (2022) highlight three main design options for the application of the ETS2. Firstly, they propose a moderate approach for strengthening the implementation of the SCF through a "Social Climate Mechanism", whereby revenues from the ETS2 remain entirely with Member States, frontloading the fund at a national level through existing funds. This would require a leaner decision-making on spending from Member States and less supervision from the Commission, which would allow for more alignment with national priorities. In order to mitigate economic differences between Member States, they suggest including an element of solidarity, for example applying the allocation rules of the Effort Sharing Regulation. Regarding the challenge of operationalising the ETS2, their results point towards the importance and cost-effectiveness of trade between Member States. If AEAs trade is not operationalised, they envision a reduced welfare capability and overshoot of emission reduction targets. Finally, regarding the price uncertainty and the revenue allocation of the ETS2, they propose in line with the solidarity principle, **that the revenue should be adjusted in response to the price, ensuring that on a per-capita basis, higher income Member States share a higher share of the abatement costs**. To do so, they evaluate fixing the share of total revenues allocated to the SCF in a rule-based manner, to avoid Member States negotiations; allocating the revenue to Member States according to their ESR emissions targets, in line with the distributional principle of the ESR, notwithstanding the price of the ETS2, and setting a price corridor mechanism to reduce uncertainty for Member States.

Klenert et al. (2018) find that from a political perspective, **policymakers should avoid triggering a solution aversion effect when designing revenue recycling mechanisms**, which is understood as citizens' tendency to be less trusting of environmental problems whose policy solutions challenge underlying ideological views. Secondly, regarding the Pigouvian effect, policymakers can decide between **earmarking** revenues (i.e. green investments or transfer for low-income groups) or to assign them to the general budget. The former has been shown to have greater acceptability (see Baranzini & Carattini (2017)), whereas the latter has shown to have the opposite effect (see Bristow et al. (2010); Baranzini et al. (2014). Thirdly, concerning the issue of aversion, strategies like relabelling an environmental tax as a 'fee' have shown to increase acceptability (see Kallbekken et al.,(2011)). Finally, they evaluate the salience of the revenue recycling mechanisms, showing that **carbon tax revenues should not be used for only**

one purpose, as policymakers have the option to select a combination of approaches that suits their constituencies and national circumstances. For example, if political distrust or preferences over climate policies are major obstacles, green spending or lump-sum transfer are preferable because of their visibility and their progressive effect, but if distributional concerns are the greatest obstacle to higher carbon pricing, direct transfer to low-income households might outperform other recycling mechanisms. Similarly, they find that focusing on earmarking revenues might be the best option if the main obstacle to carbon pricing is that citizens are unconvinced of environmental benefits. All these design options need to be framed under a good **communication strategy** that explains the distributional consequences to citizens, as well as the benefits and effects of the recycling mechanisms chosen by policymakers.

4.5 Industry, free allocation and CBAM

Industry is increasingly driving the EU ETS, with this trend set to continue beyond 2030 as the previously emissions-intensive electricity sector decarbonises and some hard to abate residual emissions in industry remain, for example in the cement sector. The scholarly debate focuses on (1) **carbon leakage risks**[58] **and corresponding policy instruments**, as well as (2) **complementary policies** to support the industrial transition towards cleaner production technologies, in particular (Carbon) Contracts for Difference.[59] This section focusses on the literature on carbon leakage risks and the implementation of CBAM.

There is a long scholarly debate about **carbon leakage risks for industry**, in particular in the emissions-intensive trade-exposed (EITE) sectors. Carbon leakage risk arises as a result of regional climate policies and a resulting landscape of divergent carbon prices with limited geographical coverage (Böhringer et al., 2022). Historically, the issue of carbon leakage has been handled through **free allocation of allowances** (output-based allocation, OBA). Ex-post studies have not found evidence for substantial leakage (Branger et al., 2017; Naegele & Zaklan, 2019), and modelling confirms the effectiveness of free allocation against leakage (Böhringer et al., 2017). However, with the gradual phase-out of free allocation decided in the recent revision of the EU ETS Directive in combination with an increased EUA price, leakage risks may increase.[60]

In parallel to phasing out free allocation, the EU's **Carbon Border Adjustment Mechanism (CBAM)** is set to become a complementary tool to internalise carbon costs and address

[58] In this study, in line with the academic literature on carbon leakage, we define carbon leakage as an "increase in foreign emissions that is caused by the introduction of domestic regulation" (Fowlie & Reguant, 2018). In practice, one of the main channels for carbon leakage – and a focus of much of the literature reviewed in this section – are policy-induced increases in operating costs in the implementing jurisdiction, which can cause industrial production (and associated emissions) to move to jurisdictions outside the reach of the regulation via trade flows. In the longer run, investment may also shift toward foreign production, due to differences in the returns on capital associated with carbon pricing, and possibly leading to the relocation of existing or planned production capacity. This channel is known as the *trade channel* or *competitiveness channel* of carbon leakage (Cosbey et al., 2019; Fowlie & Reguant, 2018).

[59] Industrial policies such as Contracts for Difference (CfDs) or Carbon Contracts for Difference (CCfDs) are discussed in the academic literature as a tool for de-risking such investments from political and market uncertainty by offering assurance about the future trajectory of carbon prices, and allowing governments to set carbon prices above current levels (Richstein & Neuhoff, 2022). The revised EU ETS Directive allows for support of CfDs, CCfDs and fixed premium contracts via the Innovation Fund.

[60] Free emissions allowances are to be phased out by 2034 for CBAM sectors (going from 2.5% in 2026 to 100% in 2034). Moreover, free allocation of emissions allowances for stationary installations will be conditional on energy audits, investment in techniques to increase energy efficiency and for certain installations, climate neutrality plans. Transitional free allocations were agreed as a measure to help incentivise investment to decarbonise specific areas, such as district heating installations, contributing to address societal aspects related to high energy prices.

leakage.[61] The literature distinguishes between two main forms of border carbon adjustments (BCAs), one that covers only imports (as implemented in the EU with CBAM) and one with export rebates (also known as a symmetric BCA). While the symmetric BCA also shields exporters from leakage risks, it is highly controversial in terms of WTO compatibility (Böhringer et al., 2022; Mehling, van Asselt, et al., 2019).

A relatively new third policy option to mitigate leakage risk that is increasingly discussed in the literature is the **combination of free allocation with a consumption tax** (also known as "climate excise contribution", see Böhringer et al., 2021; Grubb et al., 2022). Such a climate excise contribution would be implemented as a charge on the weight of carbon-intensive basic materials embedded in a product that is charged for products consumed in the EU (both for production and for imports). This weight is multiplied by a domestic carbon price and a default emissions factor, thus linking the consumption charge to the EU ETS. The charge covers the value chain of carbon-intensive products, and it is waived for exports.

Key challenges

Several studies focus on carbon leakage risks and challenges related to the practical implementation of carbon border adjustments and the CBAM limited to imports that was decided in the EU. Others focus on the opportunities that CBAM may offer in terms of international carbon pricing.

While free allocation (or output-based allocation / output-based rebates) has been widely used in the past to address leakage risks and will continue in the EU until 2034, there is agreement in the literature that there are some significant **drawbacks of output-based allocation**. Since free allocation works as an implicit production subsidy, a key disadvantage is that it leads to an "excessive" domestic consumption of EITE goods (Böhringer et al., 2021). Moreover, carbon costs are not sufficiently passed on to consumers and users of EITE products, implying that the incentives to conserve emissions are weakened and low-carbon substitutes are disadvantaged (Böhringer et al., 2022). Grubb et al. (2022) acknowledge that free allocation negates economic incentive for efficient material use. This raises the overall cost for a given mitigation goal, since efficient materials use and substitution of high- by low-carbon materials are potentially major and low-cost ways to cut industrial emissions (IPCC, 2022a). Grubb et al. also mention foregone auction revenues as a key drawback of free allocation. This transfer also creates major incentives for industry to lobby in favour of generous allocations.

Border carbon adjustments have long been proposed in the scholarly debate as a solution to the drawbacks of free allocation. However, the introduction of BCAs is limited by legal constraints, in particular **incompatibilities with international trade law**. Although the details are complex, there are two relatively simple founding principles (Grubb et al., 2022). First, such measures should not discriminate between imported and domestically produced products (i.e., national treatment). Second, a measure should not discriminate between trading partners (i.e., most-favoured nation treatment). In practice, compatibility constraints with WTO law mean that **export rebates** for ETS-regulated firms within a symmetric BCA would likely be disqualified as a **prohibited subsidy** (Böhringer et al., 2022; Grubb et al., 2022). The challenge

[61] The CBAM will become operational from October 2023 onwards, initially with reporting obligations only. Until 2034, the CBAM will apply only to the proportion of emissions that does not benefit from free allowances under the EU ETS for the sectors covered by the CBAM (cement, aluminium, fertilisers, electric energy production, hydrogen, iron and steel, as well as some precursors and a limited number of downstream products). As of 2026, the amount of free allocation is reduced and determined by a 'CBAM factor' (90% in 2028, then rapidly declining to zero by 2034). To reflect the political importance of the carbon leakage risks, the impact of CBAM on the risk of carbon leakage will be reviewed every two years after 2028. A dedicated assessment of carbon leakage risks for exporters is also foreseen before the end of the transitional period of the CBAM regulation (see Article 30a).

for an import-only border adjustment like the EU's CBAM is that import adjustments alone may exacerbate rather than mitigate the negative effects of regional emissions pricing for EITE industries that import a large share of border-adjusted embodied carbon and export a large share of their production (Böhringer et al., 2022).

In their review of the literature on border carbon adjustments, Böhringer et al. (2022) discuss some of the **practical implementation constraints of border carbon adjustments** that are **relevant for the EU's CBAM**. First, **indirect emissions** make up the majority of embodied emissions for most EITE goods that are globally traded. At the same time, addressing the carbon embodied in the supply chain becomes more challenging from a WTO point of view. Second, **calculating the embodied emissions** (the content of goods produced in foreign jurisdictions) is challenging. It requires individual data with credible third-party verification, which seems prohibitively expensive (or infeasible) for indirect emissions. The corresponding strategy (which the EU has also applied for the CBAM) is to calculate a **default emissions rate** and allow an importer to reduce the CBAM liability if actual emissions are lower. However, this gives an incentive for **resource shuffling** (or 'reshuffling emissions'), i.e., avoiding border charges by simply selling products made with low-carbon footprints to the EU, and leaving the higher-carbon production for consumption in other markets. This is particularly relevant for products with a high share of indirect emissions, such as aluminium. Third, it is an open question **how far down the supply chains** a border adjustment should go. There is a trade-off between avoiding costly complexity, and avoiding carbon leakage through higher-value-added goods that use EITE.

Based on the concerns over carbon leakage for exports and along the value chain raised in the literature on BCAs, Stede et al. (2021) **quantify carbon leakage risks for EU exporters and EU manufacturers**. The authors examine carbon leakage risks of an import-only BCA with limited coverage of the value chain, similar to the CBAM introduced in the EU. In addition to exporters, they look explicitly at implications of a border carbon adjustment substituting free allowance allocation for the (downstream) manufacturing sector (i.e., components and final products). The empirical basis of the paper is the PRODCOM database of production and trade, which contains data for around 2,000 commodity groups with a material content of more than 50% of cement steel, aluminium, or plastics. Stede et al. cover the materials cement, steel, aluminium, plastics, pulp and paper and calculate embodied emissions of each of these materials – and associated product-level price increases – in around 4400 manufacturing commodity groups. Assuming a moderate carbon price of 30 EUR/tonne, as well as full cost pass-through along the value chain, the authors estimate possible **carbon leakage risks**[62] **for around 10% of EU exports and 5% of all domestic manufacturing sales in the EU**. Stede et al. also show that a consumption tax with continued free allocation (climate excise contribution) would generate higher revenues than an import-only BCA, namely around 20 billion euros in the EU.

The introduction of carbon border adjustment mechanisms is also discussed in the context of its **international dimension and equity implications**. Some authors believe that the introduction of BCAs such as CBAM may lead to greater cooperation, as other nations could adopt carbon pricing to avoid tariffs (Böhringer et al., 2022). However, import adjustments on embodied

[62] To quantify carbon leakage risks, Stede et al. use the indicator that was used to assess carbon leakage risk under the EU ETS until 2020 for primary material producers, namely the ratio of carbon costs relative to gross value added. In line with the threshold defined in the EU ETS Directive until 2020, product categories are considered potentially at risk of carbon leakage, where carbon costs relative to GVA exceeds 5%. The authors also take into account the second indicator under the EU ETS Directive, namely a trade intensity (value of imports and exports, divided by the EU market size) of at least 10%.

carbon have a **strong burden-shifting effect**: If richer, industrialized countries like the EU implement CBAs, these are likely to shift some of the burden of emissions pricing to poorer, developing countries. Consequently, these could be perceived as unfair by developing countries (Grubb et al., 2022). As the reaction of China and other large non-OECD countries such as India, Indonesia and Thailand to the EU's CBAM indicates, border adjustment may lead to other countries reducing their voluntary commitments under the Paris Agreement, which would **undermine the strategic value of BCA as a sanctioning instrument** (Böhringer et al., 2022).

In their paper on implementation choices and the global implications of CBAM, Delbecke and Vis (2023) take a more optimistic view at the **opportunities CBAM may offer in encouraging the uptake of international carbon pricing**, as well as additional leeway the EU may gain on **shaping voluntary carbon markets**. The authors note that the CBAM liability refers to a carbon price "effectively paid" and not compensated for in a direct or indirect way, which suggests the focus will only be on explicit carbon pricing rather than implicit. This gives importers a choice to either allow the embedded carbon to be accounted for by CBAM certificates, or to introduce other forms of effective carbon pricing paid in the country of origin of the goods. Consequently, the potential for a reduced CBAM liability may encourage the use of carbon pricing in other jurisdictions. Delbecke and Vis cite the **experience from the Clean Development mechanism (CDM)**: While CDM certificates had a detrimental effect on the carbon price in Europe, the experience considerably widened understanding of market-based mechanisms. Thereby, the use of CDMs encouraged the establishment of carbon pricing in several countries, some of which (such as China) are now developing nation-wide carbon pricing systems.

Key policy options

The focus of the literature has shifted from theoretical appeal of (symmetric) carbon border adjustments to challenges of practical implementation. While the limits of import only BCAs are well-known, there is relatively little evidence in the literature on how to address these.

Regarding the **equity concerns** of an introduction of CBAM described above, some of the literature suggest to address these by **returning the revenue from carbon import adjustments to paying countries or using it for technology transfer and international climate finance** (Böhringer et al., 2022). While Grubb et al. (2022) suggest similar measures, the authors argue that the political will is missing, as exemplified by the EU's CBAM, where revenues are proposed to be utilised for domestic purposes only.

A key policy option proposed for example by Böhringer et al. (2022) and Grubb et al. (2022) is the introduction of a **consumption tax with continued free allocation (climate excise contribution)**. The idea is to create a 'behind-the-border' approach that mimics full BCAs with uniform benchmarks. Advantages of this policy include (1) It uses free allocation for addressing leakage concerns, while sending "corrected price signals to the consumers; (2) it avoids discriminating between domestic and foreign products based on their carbon intensity and is thus "undoubtedly WTO compatible" (Böhringer et al., 2022; Ismer & Haussner, 2016); (3) compared to the EU's CBAM, it effectively rebates exports, as these are exempt from the consumption tax; (4) the scheme is a straightforward extension of existing EU ETS regulation and can be anchored in the ETS law as an environmental regulation with qualified majority; (5) There are also no extra administrative costs in determining the consumption taxes as long as benchmarks for the output-based allocation rates are already set. However, a major downside is that the excise does not provide any incentives for an implementation of international carbon pricing since it does not directly influence production or policy decisions beyond the border. Moreover, an unresolved question is what to do when the domestic benchmarks become very low. In that case, both the rebates and the corresponding consumption taxes lose importance,

whereas the burden of higher-cost low-carbon production remains. Moreover, it is unclear how to continue free allocation in a context of net-zero, where fewer (and eventually no)

Delbeke and Vis (2023) provide some concrete **policy options** that could be considered for the development of **CBAM secondary legislation**. Most importantly, according to the authors, CBAM represents an opportunity to support voluntary carbon markets (VCMs), including strengthening their environmental integrity. In their view, the EU could consider making payments for some VCM credits, or those of the Article 6.4 mechanism, qualify as payments eligible for reductions of CBAM liability. If this were done, they consider it would offer the EU greater **influence in discussions on issues related to VCMs and the ongoing negotiations in the UNFCCC on Article 6.4 of the Paris Agreement**. The authors also offer some practical suggestions for developing the secondary legislation relating to CBAM. Overall, the authors recommend establishing **simple mechanisms for administering reductions of CBAM l**iability that are both environmentally robust and non-arbitrary. This would mean going for a transparent, standardized, and pragmatic approach. Moreover, they consider that there is a need to **explain in detail what is meant by a carbon price defined as a monetary amount "effectively paid in the country of origin of the goods**" (e.g. whether the carbon pricing needs to be regulatory or not). Regarding the **minimum requirements for alternative investments in other forms of explicit carbon pricing** that the importer may invest in (instead of buying CBAM certificates), they consider that different implementation options would be (a) allowing only pricing that is part of a system that ensures an absolute cap and/or quantifiable reduction in emissions; (b) minimum standards for VCM initiatives; (c) a price level approach that would set a minimum price and make only carbon pricing paid above that threshold admissible to reduce the EU's CBAM liability. The authors also suggest that the EU may also support **finance available for the climate transition** globally by making CBAM liability reductions conditional upon there being EU recognition of eligible offset projects, focussing on additional cutting-edge projects (e.g. in renewable energies, hydrogen or high-performance batteries). They propose that the use of **Article 6.4 mechanism credits could be limited to projects of the highest environmental integrity**, which may help to stimulate the development of carbon pricing globally (similar to the Kyoto Protocol's CDM). Finally, some implicit carbon pricing may potentially be recognised in the context of bilateral agreements. However, this would require large amounts of data from third countries, and objective criteria would need to be established.

4.6 International dimension

The core of international issues around emissions trading focuses on defining the international aspect of the ETS, and the interaction between international trade and an EU ETS expansion into other sectors by addressing the implications of competitive disadvantage across industries in the EU, as well as the implications that might lead to carbon leakage scenarios, by the means of displacing industrial activity to a country with weaker emissions regulations. The literature divide policy suggestions in two broad topics: linking the EU ETS with emissions trading systems outside the EU and the issues of integrating the aviation and the maritime sectors.

4.6.1 EU ETS vis-á-vis international carbon pricing systems (including international linking)

Key policy challenges

Verde and Borghesi (2022) highlight that there are **divergences between the ambitions of different emissions trading systems**. Further to multilateral linkages, a unilateral proposal involving Australia was conceived in 2015. The authors consider that, whilst the linkage would have lowered compliance costs in Australia and helped the EU reduce allowance surplus in Europe, it would have appeared to weaken the ambition of the Australian system and would

have undermined the integrity of the EU ETS, leading to artificially low prices for allowances and negatively affecting incentives for decarbonisation. They claim that based on experience, linkage of systems can take several years to be operationalised and is vulnerable to political changes within jurisdictions.

Woerman (2023) argues that the current global state of carbon markets is far from efficient. In some jurisdictions, different sectors of the economy are covered by **separate existing or proposed pricing or trading programs** (see Perino, Ritz, et al., 2022). The fragmentation presents a challenge for improving cost-effectiveness and coordination to achieve greater environmental stringency at lower total costs. The expected cost savings in linking carbon markets stems from differences in marginal abatement costs, however linking markets with different emissions reduction opportunities will create a revenue transfer that is viewed as politically challenging. Firstly, **establishing links between trading programmes has required significant negotiations between jurisdictions to harmonise the design of the programmes**. The time and resources spent on the process can be accounted as fixed costs of linking. Moreover, the efficiency gains achieved by linking systems might come with associated costs (i.e. ceding control over domestic allowances prices). Secondly, they suggest that whilst linking might reduce overall abatement costs, it might have **negative economic impacts on different actors across jurisdictions and potentially exacerbate allowance price volatility**. Furthermore, from an environmental perspective, a broader market is likely to reduce leakage, but linking could increase it if allowance prices rise, or alter incentives for setting caps, encouraging jurisdictions to set higher emission caps to achieve lower prices and export more allowances.

Mehling et al. (2019) look at the feasibility of linking market-based mechanisms to reduce emissions, understood as the formal recognition by a GHG mitigation programme in one jurisdiction (i.e. regional, national, or sub-national) of emission reductions undertaken in another jurisdiction for the purpose of complying with the first jurisdiction's mitigation policy. They suggest the analysis of the implication of linkages between all types of policy instruments (i.e. trading systems, taxes, and performance standards) but raise **concern over the distributional impacts that will be felt on each jurisdiction**, by the way of imposing the price to final consumers. They find that **linkage can reduce the autonomy of each of the linking jurisdictions**, which can incentivise parties to set less ambitious national targets, to create a cheap surplus to allow their firms to sell into a linked market. Moreover, linking can create **issues around over counting** (reducing effectiveness of the system) **or under counting** (unduly pressuring industry) of allowances.

Key policy options

Verde and Borghesi (2022) believe that the EU emission reduction targets set for 2030 and 2050 and the prospects of increasing abatement costs, together with other measures for costs containment, could lead to an international use of emissions credits in the EU ETS. They propose four channels through which this outcome could materialise: firstly, **replication**, that is the design and implementation of an ETS based on the EU model; secondly, the **CBAM** could create incentives for industries outside the EU depending on design options; thirdly, the linkage of the EU ETS to the emission crediting mechanisms under **Article 6.4 of the Paris Agreement**, whereby countries can use the credits corresponding to each mechanism towards their own NDC, and finally, the **direct linkage** of the EU ETS to other emission trading schemes elsewhere, based on lessons learned from the failed attempt to link to Australia and the success with Switzerland.

Woerman (2023) argues that to improve the cost-effectiveness of the current disaggregated systems, an alignment through bilateral or multilateral linking is needed. They claim that **linking with an exchange rate** between the benchmark regimes of autarky (i.e. no linking) and

traditional one-to-one trading (i.e. linking without an exchange rate), yields grater abatement. As a result, it is socially optimal to use an **allowance exchange rate that trades off the cost-effectiveness of equating marginal costs in favour of moving the linked system closer to the efficient level of total abatement**. The efficiency gains achieved by linking may come with associated costs of administering leakages. Linking might also provide an incentive to introduce companion policies, such as technology support policies aimed at reducing local demand for allowances, and to increase allowance exports alongside associated governmental revenues. The decision to link different emissions trading schemes with 'exchange rates' (i.e. an allowance in one jurisdiction is equal to more allowances in another region) may represent a **value judgement of policy makers regarding the environmental integrity of emissions reductions. Without** the adequate attention to implementation, linkages can **undermine the environmental integrity of the system** through the transfers that happen between jurisdictions with different carbon targets.

Findings from Mehling et al. (2019) support the premise of **linkage between political jurisdictions with relatively similar carbon prices to reduce the distributional impacts between jurisdictions** (i.e Quebec and California), arguing that they can drive political benefit by the means of building momentum for climate policy through a multi-lateral approach. Linkages can also create administrative economies of scale by sharing best practices and sharing administrative and oversight costs. They argue that for maximum economic benefit, policymakers should support **linkages between cap-and-trade and carbon tax systems** in which companies in the ETS are allowed to sell allowances to companies who must pay tax, allowing the purchasing company to reduce the level of tax paid corresponding to the amount of allowances purchased. Regarding the **implementation of ETS linkage**, robust accounting methods are needed to avoid double-counting and ensure correct accounting for the timing (also known as vintage) of emissions. The authors suggest the inclusion of a clear mandate in Article 6.2 to provide the robust accounting guidance required to promote the fungibility of units. Guidance should give attention to the different types of GHG targets (absolute vs relative), a single common metric for Internationally Transferred Mitigation Outcomes (ITMOs) such as CO_2e, or how to account for multiple metrics (i.e. installation of renewable power). Uniform guidance can increase the consistency and transparency to encourage voluntary cooperation.

4.6.2 Future ETS application and relationship with CORSIA

Key challenges

Scheelhaase et al. (2021) note that the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) under the International Civil Aviation Organization (ICAO) is less ambitious in its environmental objectives than the EU ETS for aviation. CORSIA was conceptualised under ICAO's goal to cap CO_2 emissions only above a significant baseline and through Resolution A41-22[63], a phased implementation was adopted, ostensibly to accommodate the special circumstances and respective capabilities of States, and to minimise market distortion. The Pilot Phase ran from 2021 to 2023, in which the baseline for offsetting requirements of international aviation was set at 2019 levels[64]; a First Phase is expected to begin January 1st of 2024 and run into 2026, and a Second Phase, from 2027 to 2035. The difference between the Phases is that the participation of the States in the scheme moves from being voluntary (Pilot and First Phase) to 'mandatory' (Second Phase). In 2027, CORSIA should apply to all big States although ICAO cannot enforce this, covering

[63] https://www.icao.int/environmental-protection/CORSIA/Documents/Resolution_A41-22_CORSIA.pdf

[64] https://www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-FAQs.aspx

international flights (including those travelling from and to states that did not volunteer on early phases). Unlike the EU ETS, ICAO's scheme has a governance system where only the State where an airline is based is meant to be responsible for enforcement, and no other State is supposed to undertake enforcement. This differs from the EU ETS, where equal treatment on routes has been ensured for over a decade. Scheelhaase et al. note that CORSIA and the EU ETS overlap on international routes within the EEA and between EEA, Switzerland and the UK. They argue that the **EU might have to tighten CORSIA's regulations to gain consistency with the more ambitious European climate objectives or, if not legally possible, two parallel systems will have to be maintained:** one system would be a strengthened EU ETS consistent with the EU climate objectives for EEA flights within Europe, and a second system aligned with CORSIA for flights to and from non-European countries**. If a reduced scope regime of the EU ETS is maintained, routings via non-EEA hubs will have a competitive advantage over routings via EEA hubs,** which are fully or partly subjected to the environmentally stronger EU ETS. If the EU ETS expands to full scope (including extra-EEA routes), it is suggested that routings via non-EEA hubs will show a tendency for competitive advantage the geographically closer the non-EEA hub is to the EEA point of departure.

Key policy options

Scheelhaase et al. (2021) recommend linkage or co-existence with CORSIA, which the author considers may be achieved by restricting the EU ETS to domestic flights within the EEA against a much stricter share of auctioning, or by applying the EU ETS as an international levy on international intra-EEA routes to emissions up to CORSIA baseline levels. They evaluate options, in line with the Impact Assessment (IA) report[65] included in the proposal that seeks to amend the EU ETS with respect to CO_2 emissions resulting from aviation activities, for the future relationship between the EU ETS for aviation and CORSIA. Of the options mentions, they propose a continuation of the current EU ETS scope (intra-EEA/EFTA) but without implementation of CORSIA, or implementation of CORSIA on routes to/from third countries. Alternatively, CORSIA would be implemented as planned by ICAO on international routes and EU ETS would be applied only for EEA domestic flights only. They suggest that to achieve the highest possible environmental effect even on routes which will be subject to CORSIA, this could be targeted by a commitment from the EC carriers to make use of higher quality offsets only. Finally, they refer to the inclusion of non-CO_2 emissions, indicating that the ETS should include a path towards mandatory inclusion (i.e. NO_X, H_2O, SO_X, aerosols, contrails, and contrail cirrus).

4.6.3 Linkage with any future international maritime shipping offsetting scheme

Key challenges

Christodoulou and Cullinane (2023) discuss the case of the inclusion of shipping in the ETS. The rationale for the adoption of an ETS for the maritime industry is to design a market-based measure (MBM) whereby the quantity of global shipping emissions would be determined through the function of a global cap on GHG emissions, which would be reduced year-on-year; and the purchase price of emissions allowances that all vessels above a certain deadweight tonnage would need to surrender to cover their emissions. They proposed this should be framed in the context of a global application and, thereby, facilitate a 'level playing field' for competition within the sector. **The inclusion of shipping to the EU ETS raises the issues of carbon leakage**, For example, shipping companies may have greater incentives to engage in maritime trades in other geographical regions in preference to the EU, in order to avoid

[65] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=SWD:2021:603:FIN

compliance with the regional ETS system. Alternatively, they might decide to use neighbouring ports outside of the geographical coverage of the ETS. Their research finds that companies would only avoid complying if it were in their financial interest not to engage with the ETS, which would be the case only if compliance costs were more expensive than the sum of all the extra costs involved in the deviation to an alternative port. In other words, for such deviation to be economically justified, the price of each emissions allowance unit would have to be much higher than both the current and historical price of emissions allowances within the EU ETS. Finally, the geographical coverage of a regional ETS for maritime transport needs to consider how to achieve an optimal environmental outcome and reduce the risk of carbon leakage.

Key policy options

Christodoulou and Cullinane (2023) suggest that if the ETS is extended to shipping, it is essential that a sector-dedicated fund created to ensure the recycling of the revenues return directly to the sector and are targeted towards its decarbonisation. This earmarking could help fund the ongoing investment in cleaner fuels from vessel companies (i.e. hydrogen and ammonia). Furthermore, a regional ETS for shipping could potentially be combined with other EU policies, such as the FuelEU Maritime Directive of the EC that proposes a carbon content reduction for vessel of 5000 GT, from 2025 onwards.

4.7 Scope of covered emissions and linking ETS1 with ETS2

At present, the EU ETS1 encompasses around 40% of the greenhouse gas emissions within its realm. This coverage spans over multiple areas: the generation of electricity and heat, as well as energy-intensive industrial sectors including but not limited to oil refineries, steel, iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids, and bulk organic chemicals. Moreover, even aviation within the European Economic Area finds itself included in this framework.

With the decision to establish EU ETS2 in the context of the Fit-for-55 program (Chapter IVa of the revised ETS Directive[66]), the reach of emissions trading in the EU will rise significantly. Together EU ETS1 and EU ETS2, which is planned to become operational in 2027, approximately 75% of EU emissions will be subject to carbon pricing. The scope of EU ETS2 involves the extension of emission coverage to the domains of buildings, road transport and remaining industry fuel combustion. As not foreseen by the policy, with 10% of the EU's GHG emissions, the agricultural sector represents a significant source of emissions within the EU emission balance (Mielcarek-Bocheńska & Rzeźnik, 2021), while not being regulated through the ETS. In this section, we discuss both the challenges and benefits of extending the EU ETS to the buildings and transport sector as well as to the agricultural sector and outline policy options to address these challenges.

In addition to the discussion on general scope of emissions, also the issue of linking the domestic EU ETS systems may be an option to extend the scope of the single system. In principle, the expansion of the EU ETS to cover a larger scope of emissions is paramount to establish the EU ETS as an effective and efficient mechanism to induce a net zero emission path (Böhringer et al., 2014). However, linking ETS systems is intricate and bears challenges that must be considered.

[66] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32023L0959

Key challenges

Expanding the scope of the EU ETS is capable of reducing mitigation costs by inducing partial or even full convergence in carbon prices, i.e., in marginal abatement costs, across the different ETSs (Jaffe & Stavins, 2007, 2008). Furthermore, it would create a more homogenous pricing regime across EU countries avoiding spatial and sectoral distortions arising from differentiated pricing. Lastly, it provides further clarity about the stringency of climate regulation in the newly covered sectors, since the ETS provides a quantitative regulation of total emissions as well as a path for allowance reductions, i.e., projected future emission reductions. This specifies the extent and timeframe in which emission reductions are achieved (Pollitt & Dolphin, 2022).

However, there are several challenges emerging through the expansion of carbon markets that must be addressed. Firstly, there are certain effects to consider on the price dynamics, e.g., the expanded ETS' allowance price can respond differently to new information such as fuel prices (Pollitt & Dolphin, 2022). In their article, Edenhofer et al. emphasize the requirement to extend the EU ETS to other sectors only if those have been made 'allowance-market ready'. In particular, extending the ETS to other sectors can have significant distributional and competitiveness implications. Since mitigation and abatement are comparably costly, as being the case in the buildings and transport sector, an extension to these sectors could drive up emission prices substantially. This would entail negative effects on the competitiveness of industries under the ETS, amplifying carbon leakage risks, and possibly lead to job displacement. Moreover, regarding distributional issues, the resulting increases in prices would represent a burden for households, affecting low-income households disproportionally. Additionally, the extension might lead to different increases in the economywide average prices across EU Member States, due to the variation in the composition of the economy. This might complicate a harmonized EU wide response to the challenge of price increases driven by the extension and leave room for political dissent across Member States (Pollitt & Dolphin, 2022). While the agricultural sector is largely regulated on a EU-level through the Common Agricultural Policy (CAP), another point arises by possible interactions with existing national level policies in the transport and building sector, which must be considered. The effectiveness of environmental standards, taxes, or subsidies are likely to be rendered by the integration of the sectors into the EU ETS, making it difficult to predict possible mid- to long term effects (Pollitt & Dolphin, 2022).

Compared to the transport and buildings sector, an extension of the ETS to the agricultural sector poses particular challenges. Despite the potential of emission reductions within the agricultural sector with abatement costs of about 40€/t CO_2e, in 2008, the European Union Emission Trading System directive emphasized to not include the agricultural sector in the EU ETS. The reason is that many of the abovementioned challenges are aggravated in the context of the agricultural sector. Grosjean et al. (2018) identify three major intricacies: transaction costs, carbon leakage and distributional issues. Regulating emissions in the agricultural sector can cause indispensable transaction costs due to the difficulty of monitoring emissions. According to research and the IPPC greenhouse gas inventory, agricultural emissions origin from seven main sources comprising livestock, fertilizers, pesticides, films, machinery, agricultural tilling, and agricultural irrigation. Thus, while carbon emissions in the sectors of transport and buildings can be measured through an upstream system, pricing energy carriers that enter the respective sectors, emissions in farming occur from a range of different point sources which are dependent on weather and other factors and are highly heterogeneous across farms. Thus, monitoring emissions of farms would entail prohibitively high transaction costs. As a second barrier to the inclusion of agriculture within the EU ETS, there is a strong competition within the international market for food products with little ability for farmers to

pass-through costs. This could lead to a carbon leakage, giving higher market shares to non-European producers who are not bound by the EU ETS. Lastly, the distributional concern also affects farmers directly. Apart from raising distributional concerns due to increasing economy wide prices, an extension of the ETS to the agricultural sector would affect farms differently due to their heterogeneity. For instance, farms that engage in highly emission-intensive activities like cattle farming might appear more exposed to increases in costs and are disproportionately affected by such a policy. Hence, extending the ETS to the agricultural sector would not only entail the same challenges as for the transport and building sector, but would also pose the barriers of high transaction costs in monitoring and measuring, strong tendency to carbon leakage due to intense competition within the sector, and distributional aspects that not only concern the general rise in prices, but also the differing effect of the policy on producers.

Key policy options

To avoid and alleviate these adverse effects, Edenhofer et al. (2021) suggested the establishment of a transitional period with two separate ETS, i.e., introducing a new ETS for the sectors building and transport. Yet, during the transitional period carbon prices within the two systems are likely to diverge substantially due to the different marginal abatement costs in the sectors, which would create new distributional concerns given the varying financial burdens from carbon pricing in the sectors. Linking the sectors in the form of a carbon price balancer could alleviate this concern. The authors advocate for a price balancer in the form of a restriction of the volume of tradable allowances, which should be set depending on the market price difference in both systems. Additionally, there exist the challenge to credibly commit to the convergence of prices within the two systems at a certain point in the future, which is, however, necessary to merge the systems in a pre-planned manner. Edenhofer et al. (2021) suggest a carbon price stabilizer given by price corridors that determine the future price paths within the two systems in the given range. This would credibly ensure price convergence and reduce price uncertainty for firms.

If despite the suggested measures, the extension of the EU ETS will lead to an increase in the price of carbon, Pollit et al. (2022) suggest allocating allowances more than proportionally to lower income Member States to alleviate distributional concerns between Member States. To tackle within country distributional aspects, the authors advocate for a redistribution of the revenues of the EU ETS via per-household payments, or per-meter payments.

Lastly, to address the challenge of interactions with other policies Edenhofer et al. (2021) calls to directly link national environmental policies like subsidies or even environmental standards to carbon pricing, e.g., increase the subsidy for low-emission solutions when the price for emission certificates is low and vice versa.

Thus, expanding the coverage of the EU ETS by linking it with the separate ETS for buildings and transport has the potential to lead to substantial efficiency gains. However, its political process must be thoroughly considered, taking various aspects and unintended effects into account, while adjusting for those with additional measures.

Due to the higher barriers of the extension to the agricultural sector, compared with an extension to transport and buildings, Grosjean et al. (2018) suggest various measures to alleviate these concerns. Firstly, to reduce transaction costs, in an initial stage, only the largest agricultural producers should be included into the ETS, initiating a learning process on how to best integrate the agricultural sector. At later stages, additional farms could be phased into the ETS once practical means of monitoring and reporting emissions have been established. Verschuuren (2022) highlights the option to restrict the participation of the agricultural sector in the ETS to the provision of carbon offsets, as it has been the case in the Australian carbon

market. According to the authors, this policy solution could enhance emission reduction practices such as soil sequestration, beef cattle herd management and beef cattle feed methods. As a consequence, participation in the ETS became voluntarily, inducing only those farms to join, who have sufficiently low transaction costs to verify their offsetting activities. Thereby, also the distributional concern of disproportionate distribution of effort and costs could be alleviated. However, Grosjean et al. (2018) underline the adverse signals that might arise from this solution as the respective subsidies would decrease the price of carbon-intensive food products leading to an increase in demand and subsequently larger emissions. They argue that although introducing a compliance policy by making participation for farms within the agricultural sector mandatory is likely to lead to higher risks of adverse distributional impacts and carbon leakage, policymakers could grandfather allowances and thereby mitigate these negative side effects, making compliant participation feasible.

Thus, there has been a reason for the hesitation within the political debate to extend the ETS to the agricultural sector, since its practical implementation faces severe barriers that policymakers need to account and adjust for. Therefore, policymakers face the options to either aiming at integrating the agricultural in the ETS and having to handle the abovementioned unintended consequences, or use other means to regulate carbon emissions within this sector, such as incentivizing emission reductions through the CAP (Grosjean et al., 2018).

4.8 Role of financial actors

The role of financial actors in the EU ETS market has been highly debated due to concerns about their adverse impact (Colla et al., 2012; UBA, 2022). Their activities have emerged an intricate aspect in the realm of emissions allowance markets. Intermediaries aid trading and compliance, while speculators, aiming at greening their portfolios, might cause adverse effects on the functioning of the market. Particularly, in the light of the regulatory design of the market, concerns about market instability and excessive speculation persist. Monitoring and assessing these effects are paramount to assure a well-functioning market.

Quemin and Pahle (2023) provide first elements of a toolbox to disentangle the influence of financial actors on the EU ETS. They emphasize that these actors can have detrimental effects, but also provide important services to the market. Financial actors comprise financial intermediaries like banks, brokers or investment firms and speculators such as pension funds or retail investors. They can be contrasted with compliance actors, who are represented by firms regulated through the EU ETS, using the carbon future market to hedge against risks and securing prices (Quemin & Trotignon, 2021).

The vast majority of financial trading takes place in the futures market, where buyers and sellers commit to trade allowances at a given price in a certain point in the future. Within this market, demand from the compliance actors exists for long futures positions (buyer) to hedge against risks. Financial intermediaries are instrumental to the well-functioning of the market since they meet this demand being willing to take complementary short positions (seller) (Schopp & Neuhoff, 2013; Tietjen et al., 2021). Apart from this, there are other beneficial impacts of financial actors on the carbon market such as bolstering market liquidity, facilitating risk transfer, reducing transaction costs, and enhancing price discovery (Germain et al., 2004).

Key challenges

Despite these benefits, there is evidence on potentially adverse effects of financial actors on carbon markets (Demiralay et al., 2022; Friedrich et al., 2020). Quemin and Pahle (2023) apply a nuanced perspective, acknowledging the potential pitfalls of financial trading. The risks of excessive speculation, market destabilization through heightened price volatility, bubbles, and

even manipulation are acknowledged (e.g. De Perthuis & Trotignon, 2014). In particular, the increased engagement of private retail investors following the so called 'buy-and-hold' strategy. They take long positions in the futures market reducing the supply of allowances, which contributes to liquidity shortages within the market (Quemin & Pahle, 2023). While not yet being regarded as problematic, the issue could become more pressing in the future as the share of these investments becomes relatively larger in a market with a decreasing trend in allowance supply (ESMA, 2022). This bears the risk of a lack of trust in the price-building process may and harm the ETS in its functioning as a regulatory instrument. This is aggravated by the design of the Market Stability Reserve (MSR), which has the potential to weaken price signals and increase the volatility in the market by encouraging the activities of noise traders and reducing the regulating function of rational traders (Perino, 2022). Moreover, the cancellations of the MSR might lead to anticipated demand reductions having adverse effects. The corresponding expectations of fewer cancellations of permits can drive down prices and increase emissions (Gerlagh et al., 2021).

Key policy options

Several regulatory approaches suggested to address the challenges introduced by the activities of financial actors to carbon markets. For instance, Quemin and Pahle (2023) propose options in three fields: (1) improvement of data availability and quality, in particular to link trading activities in the primary and secondary market; (2) based on that improvements of the tools to establish tolerance thresholds for speculation to inform potential implementation of holding limits; and (3) an integrated governance approach that jointly considers the market's environmental and financial dimensions is crucial in both cases, which may warrant the creation of a dedicated agency. Regarding concrete mechanisms to regulate the market, Jeszke and Lizak (2021) suggest the reassignment from cancellations of allowances, the implementation of a 'twin-mechanism', which is implemented in the UK ETS and represents a short-term measure to regulate allowance prices, blocking access to the EU ETS market for entities that are not installations or compliance actors, and the introduction of a tax levied on market turnovers for entities that are not an EU ETS compliance entity. Perino et al. (2022) advocates for the use of price-based cap adjustments in the form of soft price collars or real upward-sloping supply curves, which would support the self-stabilizing abilities of the allowance market. Several regulatory approaches suggested to address the challenges introduced by the activities of financial actors to carbon markets.

In a report on the influence of financial actors on the EU ETS, the European Securities and Markets Authority (ESMA) acknowledges many of these regulatory approaches and underscores several recommendations for addressing the challenges mentioned above (Cludius et al., 2022). However, in contrast to Jeszke and Lizak (2021), they do not regard the exclusion of certain financial actors or the implementation of position limits (limit to shares or derivatives that can be held) as a viable mechanism to stabilize the market since this would also curtail the beneficial actions of financial actors, e.g., fostering market liquidity and price formation. Instead, in line with Quemin and Pahle (2023), the implementation of a market authority, which could provide centralized data, impede manipulation and provide cross-market monitoring, is acknowledge in its potential to stabilize the market, despite its probable distortions it might pose. Additionally, they call for a clear definition of market speculation differentiating it from risk reducing activities, which should be complemented with mechanisms that increase transparency in the detail and granularity in reporting on market participants, transactions, and owners within the Union Registry reporting. Moreover, instead of using financial market regulation as stabilizing mechanisms, the ESMA recommends rendering the ETS architecture through adjustments of the MSR. In this context, they suggest the reduction of the trigger levels dynamically with the CAP. Furthermore, the ESMA agrees with Jeszke and Lizak

(2021) to strengthen Article 29a, which is the only price-based stability element, releasing an additional 100 million allowances if prices more than triple during a certain period. Particularly, the implementation of price corridors could represent a feasible complement to the current price-based measure leaving less price uncertainty for speculations. On the downside, within the price-corridors price volatility can still take place and the corridors might not be in line with the reduction targets.

Nevertheless, the ESMA regards fostering transparency on the market, the establishment of a market authority, and the strengthening of existing and implementation of new price-based instruments as the most promising regulatory approaches to curb the negative effects emerging from speculative activities of financial actors.

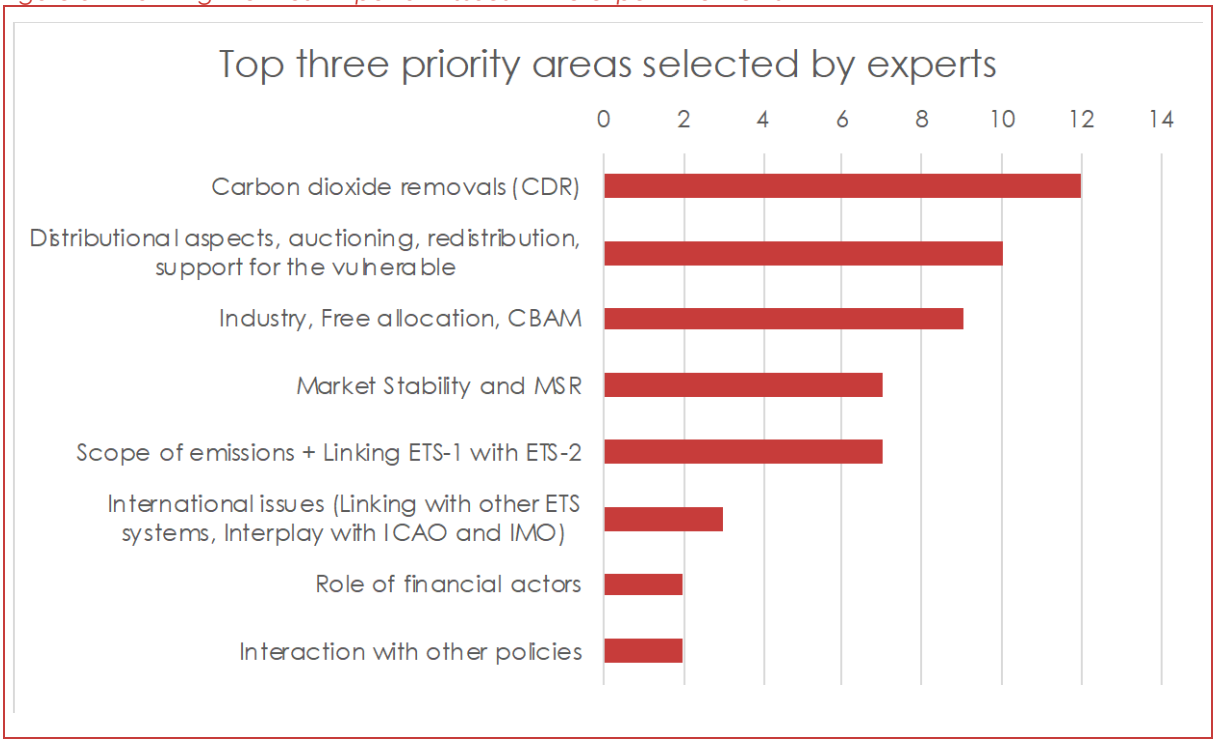
5 Interviews and stakeholder survey: Reporting of findings

This section of the report synthesises the main findings from the consultation activities, i.e., expert interviews, stakeholder interviews and stakeholder survey. The next section provides an overview of the most important issues, while sections 5.2 to 5.8 discuss the findings in detail.

5.1 Issues of relevance to experts and stakeholders

Figure 5-1 graphs the most important issues raised in the expert interviews. Carbon dioxide removals (CDR) emerges as the main topic (named by 12 out of the 17 experts as one of the main challenges), followed by distributional aspects, issues related to industry, market stability, as well as the scope of emissions and linking ETS1 and ETS2. International issues, the role of financial actors and interactions with other policies were discussed to a lesser extent.

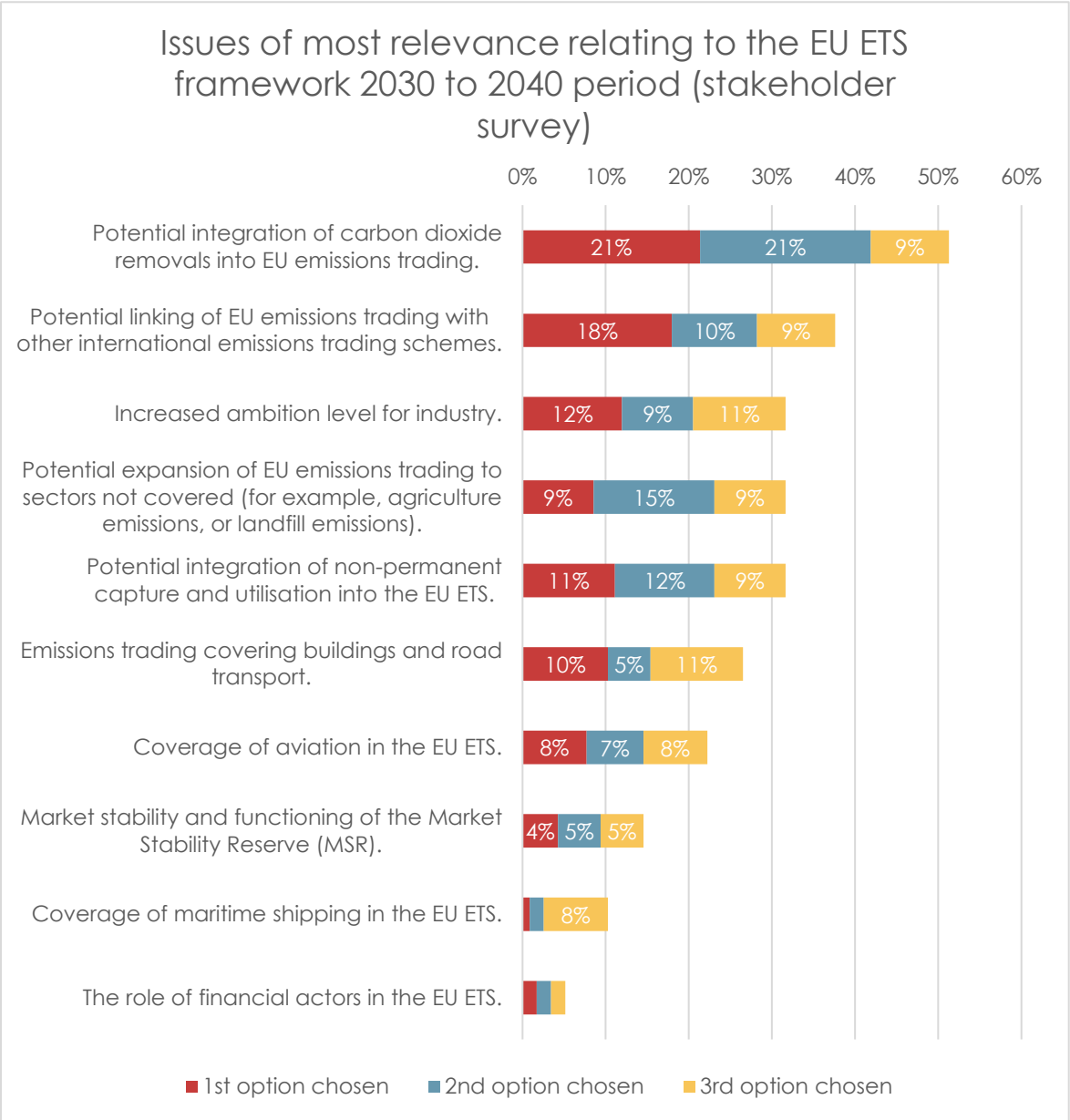
Figure 5-1 Ranking the most important issues in the expert interviews



This graph aggregates the most important challenges raised in the different expert interviews to "priority areas". It displays how often a particular issue was named as one of the three most important challenges (frequencies). Source: Technopolis Group, PIK & E3-Modelling, 2023

The stakeholder survey asked respondents to identify up to three issues from a predefined list of issues relating to the EU ETS framework 2030 to 2040 that they thought were most relevant. (The predefined list was informed by the literature review, expert and stakeholder interviews). Figure 5-2 shows the proportion of stakeholder survey respondents who selected each of the issues as their first, second and third choices.

Figure 5-2 Ranking the most important issues in the stakeholder survey

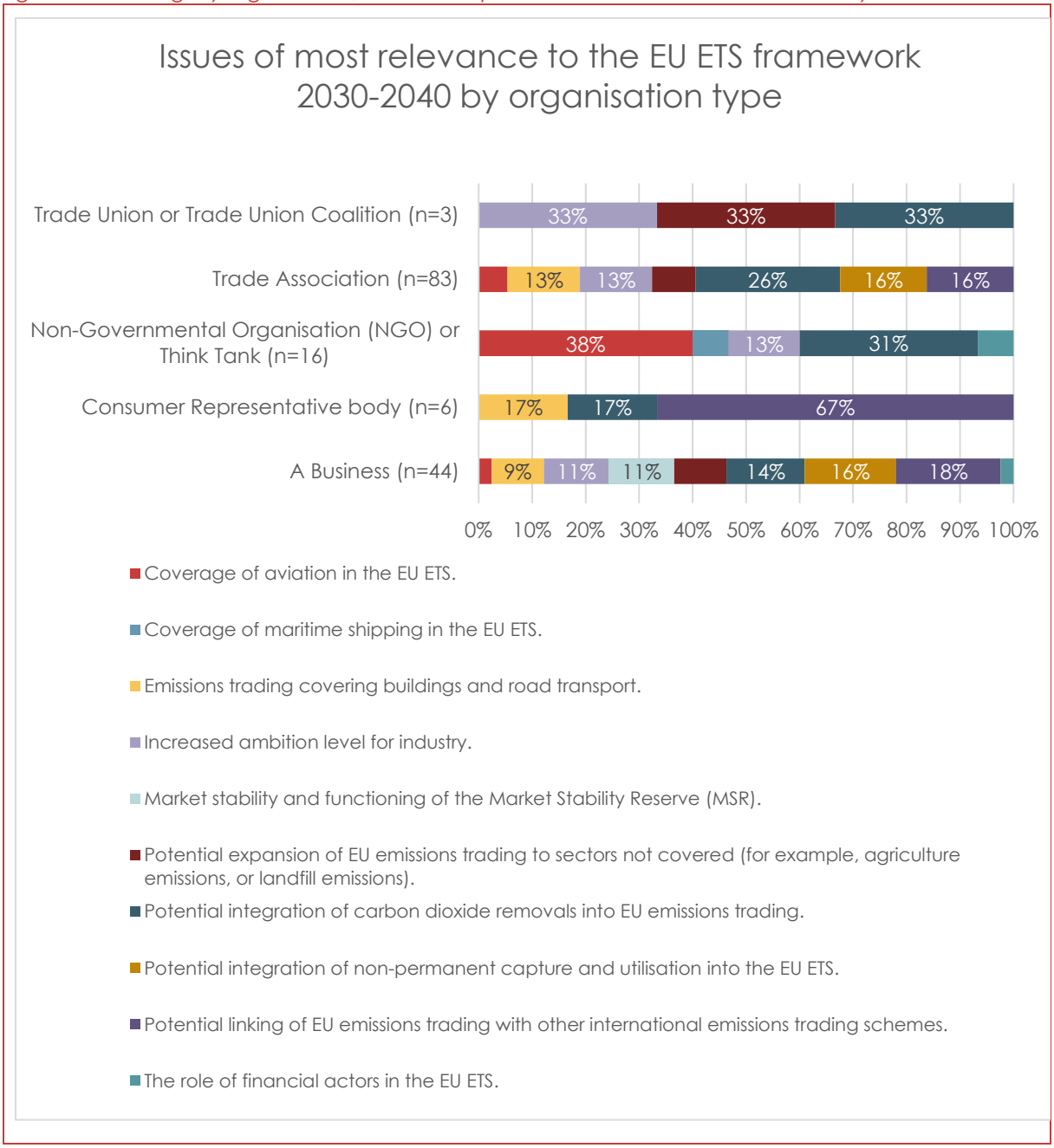


Survey question: *Which of the following issues relating to the EU ETS framework in the medium to long run (2030 to 2040 period) do you think are most relevant? Please select up to three and rank them in order of importance.* This graph shows the % of the total sample (n=117) answering this question who selected each option as their first, second or third most important option. Source: Technopolis Group, PIK & E3-Modelling, 2023

Figure 5-3 shows the issue relating to the EU ETS framework 2030-3040 identified as **most** important by stakeholders by their organisation type. This shows that there was a range of views within each organisation type. For NGOs, issues of most relevance were frequently 'coverage of aviation' and 'emissions trading covering buildings and road transport'. For consumer representative bodies, 'potential linking of EU emissions trading with other international emissions trading schemes' was most frequently selected. This is perhaps not an obvious finding and it should be borne in mind that a relatively small number (six) of consumer representative

bodies participated in the survey. As stated previously, it is also unclear exactly what the nature of these organisations was as they also said they represented/engaged with specific sectors.

Figure 5-3 Ranking, by organisation, the most important issues in the stakeholder survey

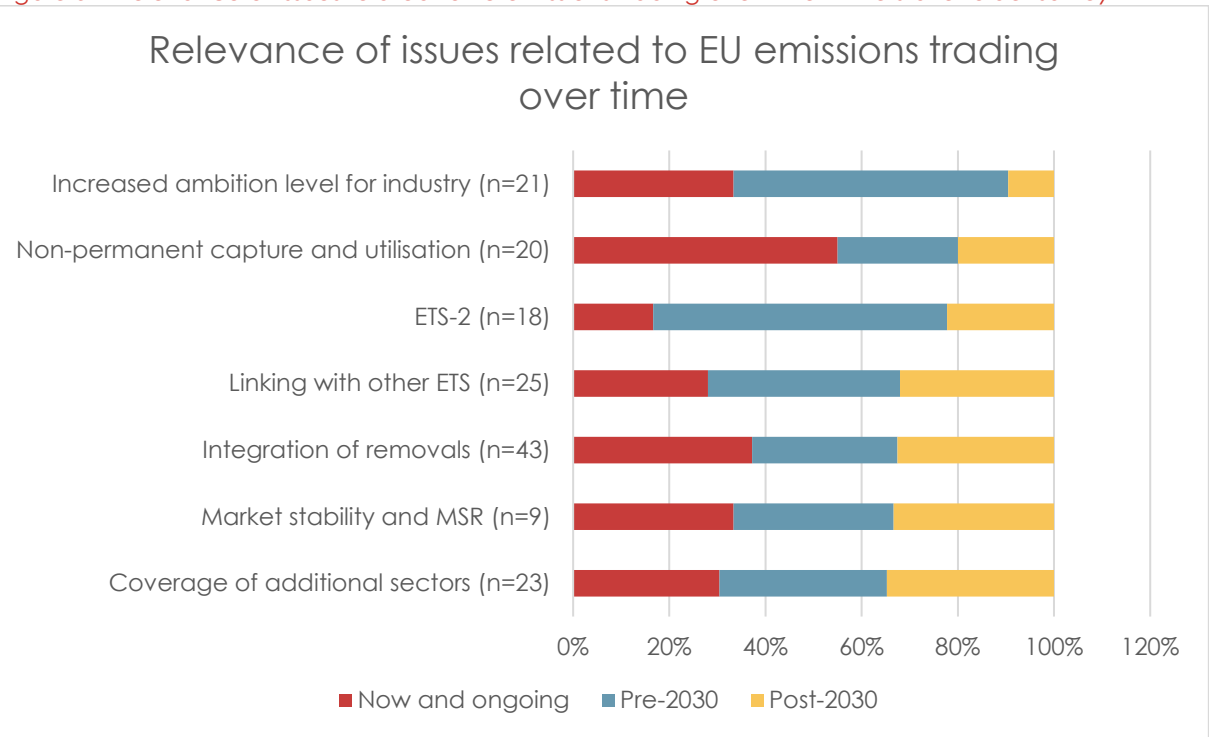


Survey question: *Which of the following issues relating to the EU ETS framework in the medium to long run (2030 to 2040 period) do you think are most relevant?* This graph shows the % of the total sample (n=110). Data based upon first choice, most relevant issues only, by organisation type. Source: Technopolis Group, PIK & E3-Modelling, 2023

Figure 5-4 graphs the relevance of the issues related to EU emissions trading over time, according to participants of the stakeholder survey. According to these stakeholders, the most relevant issue from now on and prior to 2030 is the increased ambition level of industry. For non-permanent capture and utilisation as well as challenges related to the introduction of ETS2,

almost 4 out of 5 respondents also see these issues as relevant now and prior to 2030 (with a particularly high share of pre-2030 relevance for ETS2). For the other issues (linking with other ETS, integration of removals, market stability and MSR and coverage of additional sectors), around one in three respondents sees these issues as more relevant after 2030.

Figure 5-4 Relevance of issues related to EU emissions trading over time in the stakeholder survey



Source: Technopolis Group, PIK & E3-Modelling, 2023

5.2 Market stability and design of the Market Stability Reserve (MSR)

Table 5-1 Market stability: Key risks and challenges and policy options identified in the interviews

	Key challenges	Key policy options
Expert interviews	**Market stability (political economy context):** • Perspective coverage of residual emissions to ensure long run market stability • Deterred market functioning due to price hikes and associated political pushback • Complicated design and uncertainty from MSR could lower confidence and trust in ETS **Market stability reserve (MSR):** • Endogenous cap: Anticipated demand shocks from complementary policies could lead to 'Green paradox' • Endogenous cap: Prone to price hicks due to banking behaviour of market participants (reinforcing feedback under expected scarcity of allowances) • Risk of ad hoc policy interventions in case of high carbon prices • Cyclical nature and time lag of MSR reaction to price changes • Uncertainty about cap • Effects of cancellations: Decreasing liquidity in the market until the end of the 2020s • Misalignment between MSR thresholds and market environment (altered hedging demand) (short to medium run challenge)	**Market stability (political economy context):** • Carbon Central Bank • Simpler MSR design (supporting trust and confidence) **Market stability reserve (MSR):** • Carbon price floor • Carbon price ceiling (from literature only) • Carbon price corridor • Price-responsive allowance supply • Adjust upper/lower MSR thresholds (proportional to declining cap) • End cancellation of allowances in MSR • Flexible and less cyclical price control mechanism (not further specified)
Stakeholder interviews	• -	• Carbon price corridor

Market stability and the role of the Market Stability Reserve (MSR) emerged as one of the key issues in the expert interviews. In addition to being chosen by 7 out of the 17 expert interviewees as one of the top three issues to be discussed in the interview, it was touched upon in various facets in other interviews as well. Market stability was discussed mainly on two levels: a) more widely in terms of a **political economy setting** for the EU ETS (trust, confidence, and political stability) and b) narrower in terms of **the functioning and design of the MSR and alternative price-control mechanisms**. Levels a) and b) are interlinked since the ETS is a politically created market, and thus the (non)functioning of the MSR may have political ramifications that could affect the ETS more broadly.

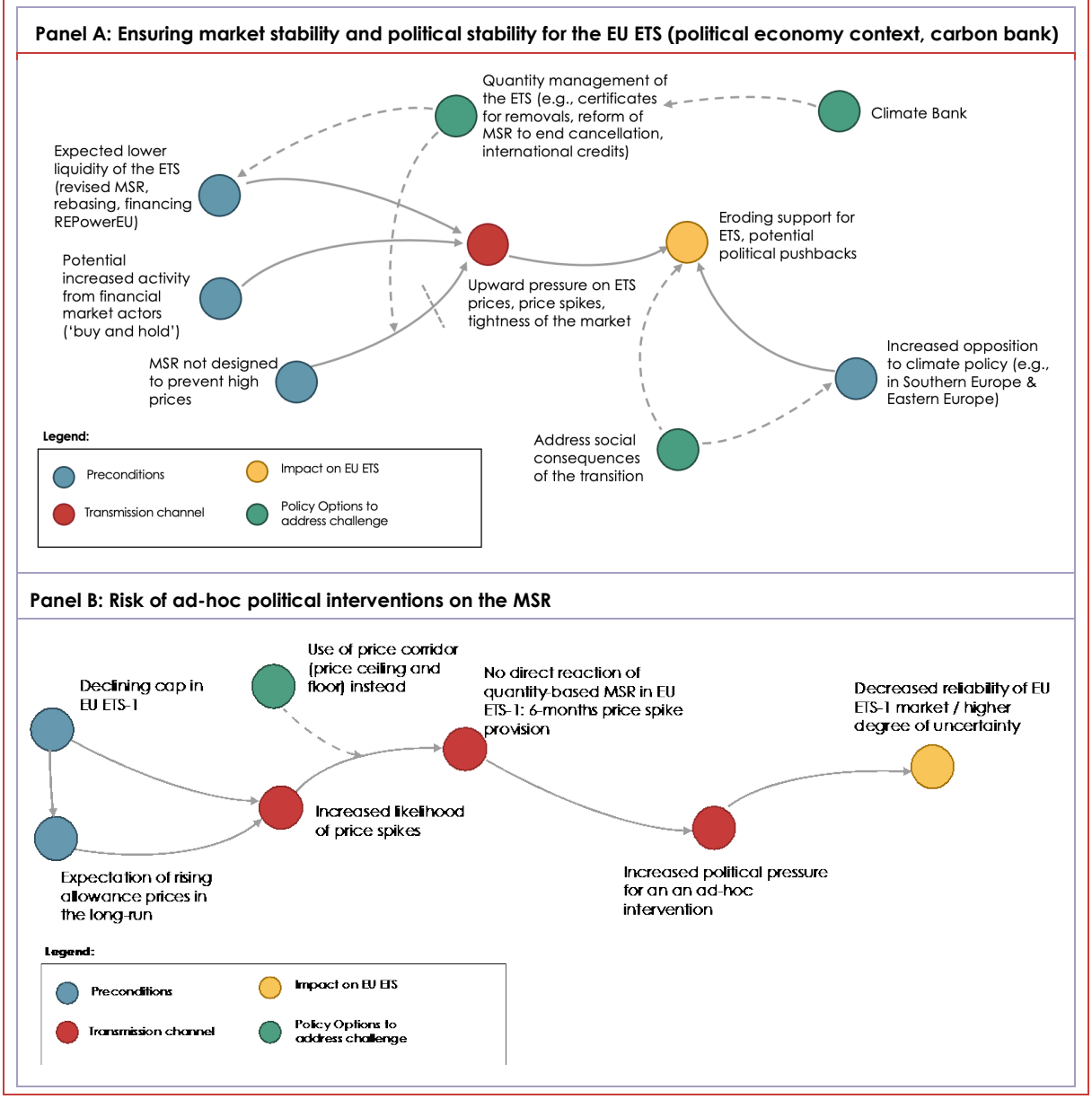
Market stability was identified by the experts as core to the functioning of the EU ETS framework and as being **strongly interrelated with other issues** also discussed in the interviews. This includes the link between market stability and the integration of **carbon dioxide removals (CDR)** for providing an alternative source of supply to the ETS system in the medium to long run. And **linking between ETS1 and ETS2** and the **integration of other sectors** to extend the size of the shrinking system to avoid it being susceptible to growing unpredictability and volatility when allowances near their depletion.

In the stakeholder interviews, market stability and the role of the Market Stability Reserve (MSR) was only discussed in terms of **price uncertainty and volatility. Particularly, in relation to the EU**

ETS2. Market stability and the functioning of the Market Stability Reserve was chosen by a small proportion of stakeholder survey respondents (15%, n=17) as one of the top three most relevant issues relating to the EU ETS framework 2030-2040 (see Figure 5-2). This was selected predominantly by businesses and trade associations, from a range of sectors. Two trade associations answered a follow question to say they anticipated this would have a negative impact upon the organisations or people they represent. There was a spread of views as to when stakeholder survey respondents thought this issue would become relevant. A third (n=3) chose pre-2030, a third said 'from now on an ongoing basis' and a third selected 2030-2035.

Figure 5-5 illustrates a selection of challenges and policy options mentioned in the interviews regrading market stability. While some of the interviewees placed the issue of market stability in a wider political economy setting (Panel A), other focussed a bit more narrowly on the scope of the MSR (Panel B).

Figure 5-5 Perspectives on challenges to market stability



Note: The effects of policy options are visualised by dashed arrows. The dashed line in the middle of an arrow indicates that the respective transmission channel is addressed by a policy option. Source: Technopolis Group, PIK & E3-Modelling, 2023.

Key challenges

Market stability in the political economy context of the EU ETS

First, focus is on the challenges to market stability raised in the **political economy context** of the EU ETS. This perspective was raised dominantly in three of the expert interviews. For all three interviewees, the inherent risk of the system is related to deterred market functioning, price spikes, and associated political pushback on the ETS system, when long run market stability is not ensured.

One expert interviewee pointed out specifically the relevance of **trust and confidence** in the EU ETS system as key parameters to its future viability and success, and that the current **complicated MSR design** might undermine trust and confidence.

Another expert raised that the current MSR design leads to much **lower liquidity** in the market at the end of the decade (2028/29) which would likely induce **price spikes and associated political pushback**. Furthermore, this interviewee pointed out that there is a strong link between political economic viability of the ETS system and use of revenues to address distributional consequences and need for innovation funding.

The third interviewee approached market stability in a political economic sense from the perspective of **covering residual emissions** in the medium to long-term future through alternative sources of allowance supply. To this interviewee, the market integrity depends on the coverage of residual emissions by CDR. The main challenge would be to manage expectations by market participants, as the level of expected residual emissions in the system would be largely determined by expectations of prices (and availability) of CDR. While mentioning market stability less prominently, the perspective that CDR will be highly relevant as providing additional liquidity to the carbon market in the medium to long run was raised in a set of other expert interviewees as well (see Section 5.3).

Role and functioning of the Market Stability Reserve (MSR)

Secondly, focus is on the challenges to market stability regarding the **role and functioning of the MSR** in EU ETS1. Challenges largely echo the arguments raised in the academic literature on the design of the MSR. Expert interviewees reiterated that the introduction of the MSR was an important policy decision to address the historical emissions surplus in the EU ETS1 market. But there are doubts that the MSR will be able to address the challenges for market stability in a rapidly changing EU ETS1 market, dominated by a scarce supply of allowances.

In total, five experts raised the concern that the current design of the MSR in ETS1 will not work well in the environment of the market in the medium run future. One interviewee said that the MSR addresses the waterbed effect in principle but the interaction with **overlapping policies** (e.g., coal phase-out, Carbon Contracts for Difference) could still lead to unintended consequences. An anticipation of overlapping policies could lead to a decline in prices and a rise in cumulative emissions ('**green paradox**'). In addition, two other experts pointed out that the endogenous cap may also be prone to **price hikes due to banking behaviour of market participants**. In a similar vein, another expert specifically identified the cyclical nature of MSR and the **time lag to respond to price shocks**, which are more likely in a tighter market, as a key challenge for the current design.

Regarding the aforementioned issue of trust and confidence in the system, one expert interviewee identified the **risk of ad hoc policy interventions** in times of high carbon prices as the biggest challenge related to the design of the MSR in the coming years and post-2030. In contrast, a pre-defined type of intervention would not undermine the trust and confidence in the system. In addition, two experts also pointed out the **uncertainty about the long run cap** introduced by the MSR as reducing transparency in the market.

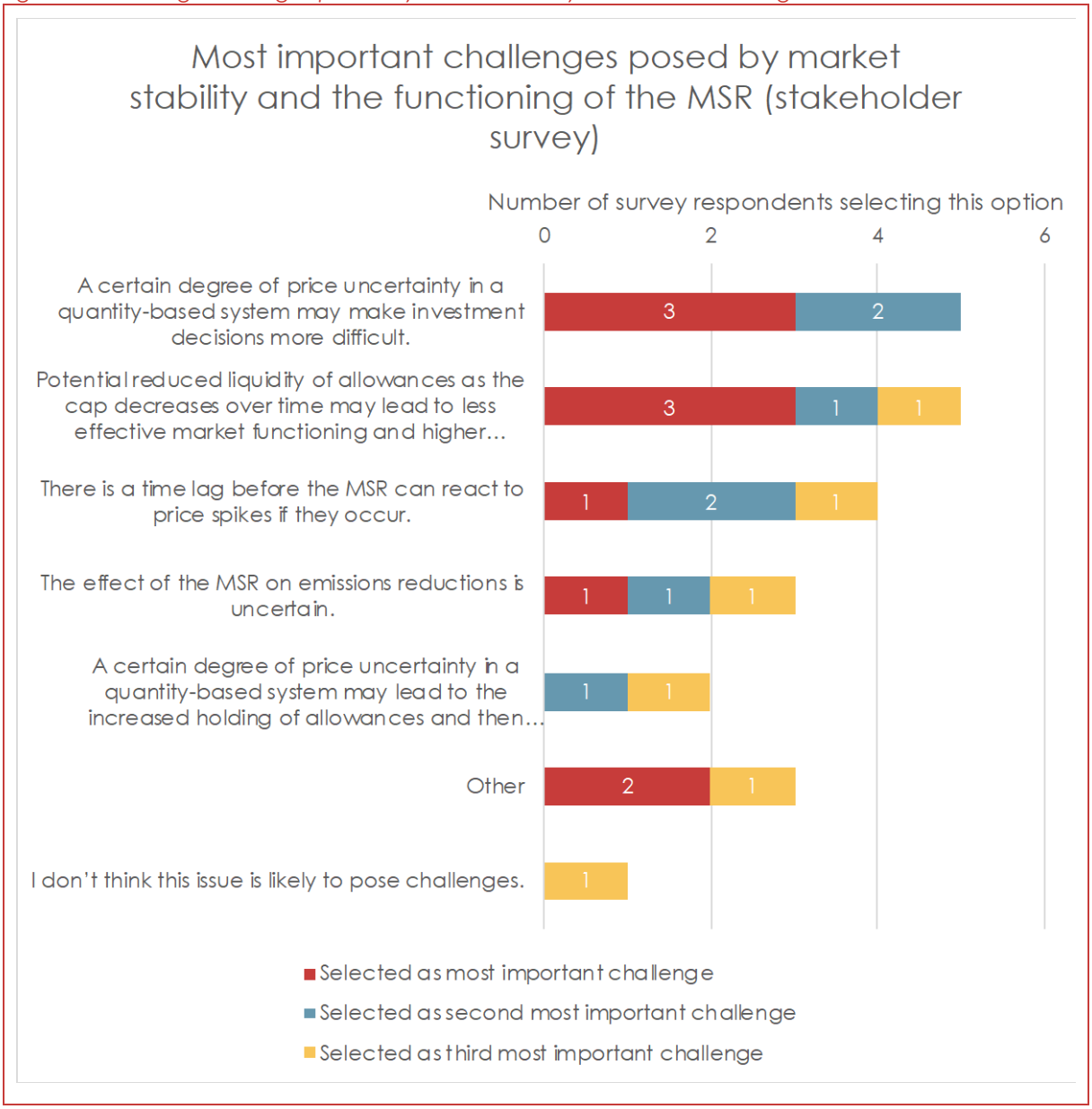
Although the arguments brought forward by the individual experts differed slightly, the **interaction between the design of the MSR and the scarcity of supply of allowances** under a rapidly decreasing cap in ETS1 emerged as the overarching challenge for market stability in the context of the MSR.

Only one stakeholder discussed market stability during the interviews briefly. This stakeholder was concerned about price volatility and its corresponding consumer impact. Furthermore, three stakeholders of different types noted that it is difficult to predict the future ETS2 price level and if/how the price containment mechanism of the MSR in ETS2 will affect prices in practice. Stakeholder survey respondents (businesses and trade associations) most frequently selected

challenges relating to price uncertainty as most important as shown in Figure 5-6. They saw both of the following as important challenges:

- A certain degree of price uncertainty in a quantity-based system may make investment decisions more difficult.
- Potential reduced liquidity of allowances as the cap decreases over time may lead to less effective market functioning and higher market volatility.

Figure 5-6 Ranking challenges posed by market stability and the functioning of the MSR



Survey question: *What challenges, if any, do you think this issue 'Market stability and the functioning of the MSR' could pose during the 2030-2040 period? Please select up to three challenges and rank them in order of importance (n=10)*. Source: Technopolis Group, PIK & E3-Modelling, 2023

Key policy options

Market stability in the political economy context of the EU ETS

To address challenges to market stability raised in the political economy context of the EU ETS, corresponding policy options were discussed by the expert interviewees. Due to the overarching nature of the challenges, the introduction of a (European) **Carbon Central Bank (CCB)** was proposed by one interviewee and mentioned as one policy option among others by another. The mandate of such a central administrative body would for both interviewees involve managing and supplying the carbon market by providing it with carbon removals and potentially international credits (see Section 5.3 for a detailed discussion). Furthermore, one expert mentioned that a central governing body could combine different functions for market stability. Yet, it was also pointed out by the same interviewee that the CCB should never perform a direct price regulation but pursue structured interventions. This would shield the ETS from being regarded as a tax (special legislative procedure, see legal challenges described in Section 4.1). The other interviewee mentioned to envision a narrow mandate for a potential CCB. The reason being the risk of politization in case of a broad mandate for a potential CCB.

To tackle the challenges related to trust and confidence in the system, it was proposed by one expert to introduce a **simpler and more predictable price-based price control mechanism** (see argumentation regarding alternative options to the current MSR design below).

Role and functioning of the Market Stability Reserve (MSR)

Six experts discussed reform options for the Market Stability Reserve (MSR). Their proposals for policy options differ in terms of the scope of changes compared to the current MSR design. Three experts proposed to move away from a quantity-based price control mechanism and instead introduce a price-based price control instrument. Specifically, two of the three experts proposed to introduce a **price corridor** (including a price floor and a price ceiling) where allowances would be released from the MSR or held back depending based on the price level. According to the two experts, a price corridor would reduce uncertainty regarding investment decisions, as prices will only fluctuate within the bounds of the corridor. One of the two experts furthermore mentioned, that a price corridor could enable the possibility of linking the EU ETS to other ETS systems internationally due to a better match with other price-based price control mechanisms internationally. Linking with the EU ETS with the current quantity-based MSR design might be seen as very risky politically in other jurisdictions, as the carbon price can fluctuate freely. The other expert pointed out that a price corridor could have the disadvantage that the cap is no longer fixed. In the expert's view, however, the advantage of limiting the price increase outweighs the disadvantages of a possible softening of the cap. Additionally, in the stakeholder interviews, one stakeholder also suggested introducing a **carbon price corridor** system to provide security against extremely high prices and protect the acceptability of the ETS.

The third expert interviewee, who proposed the introduction of a price-based mechanism, advocated the introduction of a **carbon price floor**. According to this expert, a carbon price floor would boost the confidence in the EU ETS system and change the expectations of the market participants, even if never triggered. In practice, a carbon price floor could be implemented as an auction reserve price, as it is implemented for the Western Climate Initiative ETS (California and Quebec). The same expert also proposed the introduction of a price-responsive allowance supply.

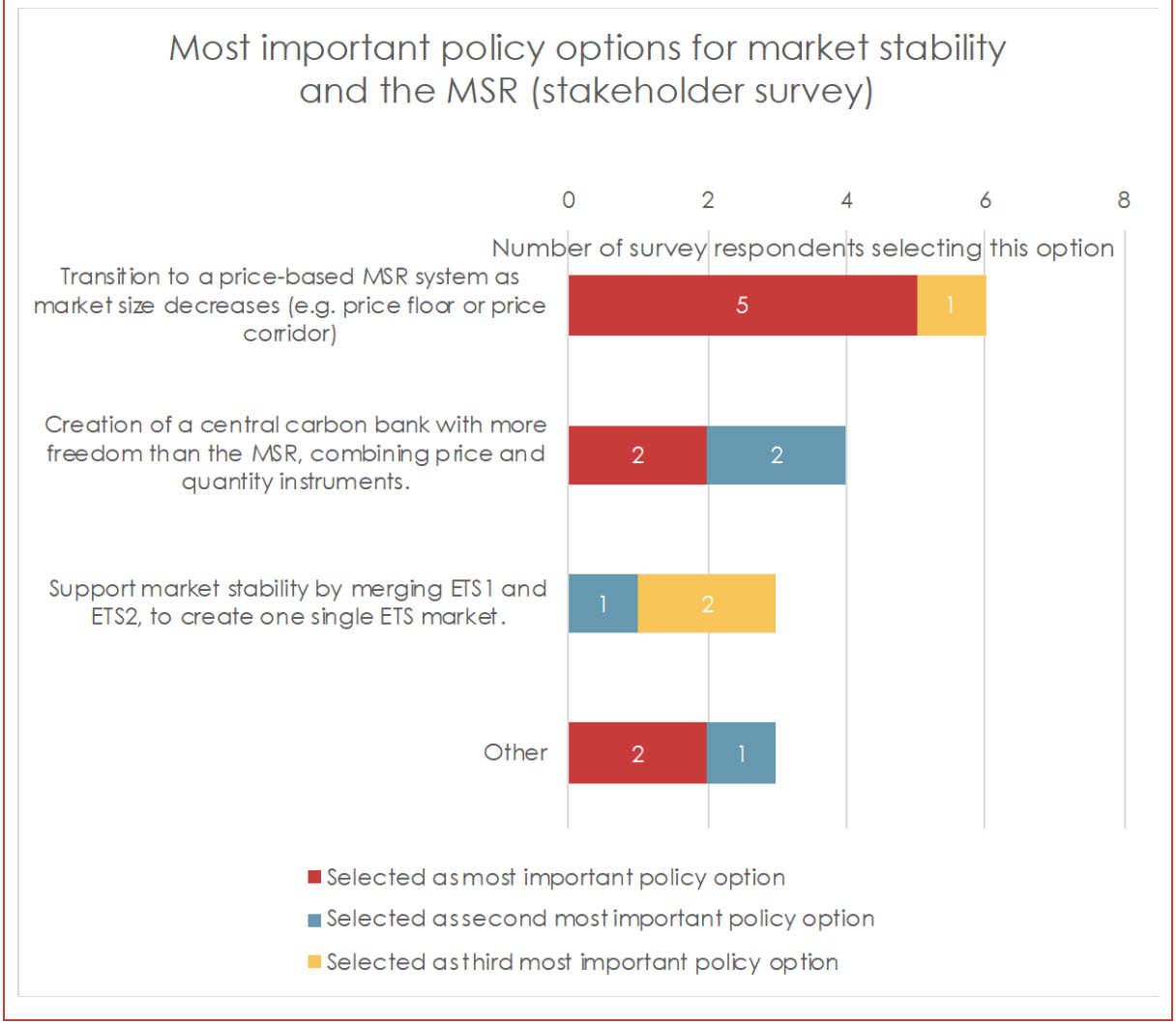
Besides the experts that called for a price-based mechanism for the MSR, one interviewee, called for the introduction of a **more flexible mechanism that is less cyclical** as the current MSR design without further specifying how such a design would look in practice. In addition, one

expert mentioned the option to **end the cancellation of allowances** in the MSR in anticipation of future scarcity of allowances.

In contrast to the other experts, a sixth expert proposed an incremental update of the current quantity-based MSR design to address the misalignment between the upper and lower thresholds in the MSR and the altered market environment (lower cap, altered hedging demand). The proposal of the expert was to make the **upper/lower thresholds proportional to the decreasing cap** starting in 2026. Additionally, the share of allowances that are auctioned could be factored in additionally to account for the higher hedging demand from the phase-out of free allocation. Also, the expert mentioned that the TNAC calculation should be amended to recognize the historic net demand from aviation (around 190 million allowances pre-2023).

Stakeholder survey respondents (businesses and trade associations) most frequently selected as important policy options two already mentioned: 'transition to a price-based MSR system as market size decreases'; and 'creation of a central carbon bank with more freedom than the MSR, combining price and quantity instruments' (as shown in Figure 5-7). A small number (n=3) also selected 'support market stability by merging ETS1 and ETS2 to create one single ETS market'. One NGO survey respondent specifically suggested that the MSR intake rate set for 24% until 2030 is either maintained or strengthened, and the cancellation clause be made more stringent by permanently removing excess units in the MST above 400 million allowances.

Figure 5-7 Ranking policy options related to market stability and the functioning of the MSR



Survey question: *Which of the following policy options do you think are most important to mitigate challenges and/or support opportunities that could arise from this issue/development [Market stability and the functioning of the MSR] in the 2030-2040 period? Please select up to three policy options and rank them in order of importance(n=9).* Source: Technopolis Group, PIK & E3-Modelling, 2023

5.3 Integration of Carbon Dioxide Removals (CDR)

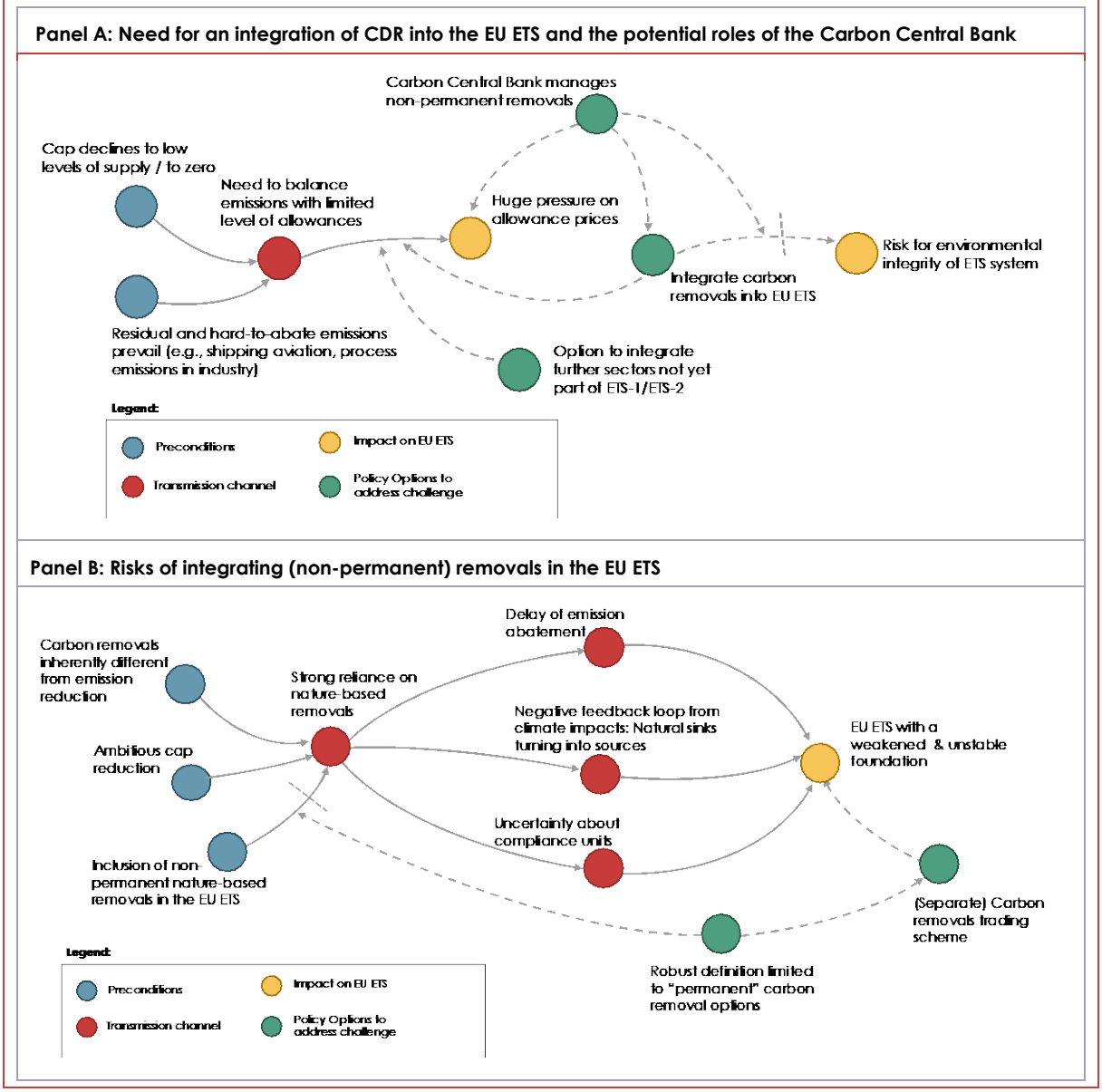
Table 5-2 CDR: Key challenges and policy options identified in the interviews

	Key challenges	Key policy options
Expert interviews	• Challenge of financing negative emissions • Opportunity to ensure price stability (Upward pressure on ETS prices due to limited allowance supply) • Concerns about environmental integrity of non-permanent removals • Complexity of managing non-permanent removals, now and in the distant future • Risk of substitution of mitigation with negative emissions (mitigation deterrence) • Additionality concerns	• Carbon Central Bank (to manage non-permanent removals, address price volatility, …) • Early regulatory framework for removals (supporting investment) • Separate emissions target for mitigation (residual emissions) and negative emissions • Robust MRV system to secure additionality • Exclude non-permanent removals (robust definition of permanence) • Carbon Removals Trading Scheme
Stakeholder interviews	• Environmental integrity of EU ETS • Complexity of removals • Permanence of nature-based solutions • Robustness of certification • Threats to biodiversity from intensified land-use	• Full integration into EU ETS vs. separate from EU ETS • Distinct target for removals (based on residual emissions) • Carbon Central Bank

Carbon Dioxide Removals and their potential integration emerged as a key issue in the expert interviews, and to a lesser degree also the stakeholder interviews. Negative emissions were chosen by 12 out of 17 expert interviewees as one of the top three issues to be discussed in the interviews and discussed in three additional interviews, making it the experts' number one priority. While there was a general agreement that CDR will be necessary to move towards a net-negative economy, there were different positions on the practical implementation. This includes a debate on a) whether CDR should be included in the (existing) EU ETS or whether new policy instruments would be necessary; b) the type of CDR technologies that should be eligible; and c) whether a new institution like a Carbon Central Bank would be necessary.

Figure 5-8 shows two perspectives on CDR that emerged from the interviews. While derived from individual interviews they illustrate varying perspectives. In Panel A, a more optimistic view of a potential integration of carbon removals within the EU ETS and policy is presented. Panel B describes risk of integrating (non-permanent) removals into the EU ETS.

Figure 5-8 Perspectives on the integration of CDR

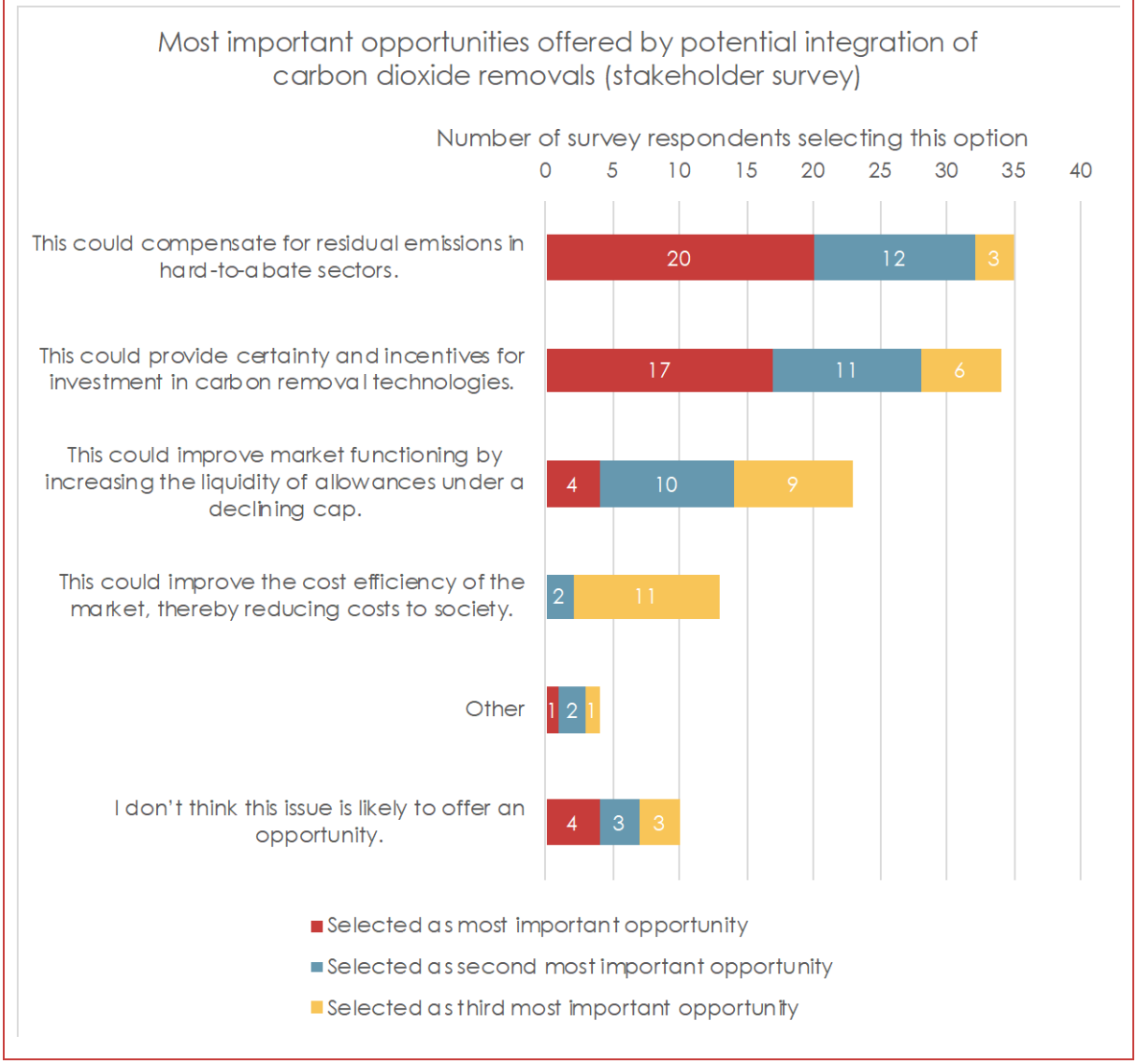


Note: The effects of policy options are visualised by dashed arrows. The dashed line in the middle of an arrow indicates that the respective transmission channel is addressed by a policy option. Source: Technopolis Group, PIK & E3-Modelling, 2023.

'Potential integration of carbon dioxide removals into EU emissions trading' was the issue most frequently selected as one of the top three most relevant issues relating to the EU ETS framework 2030-2040 by stakeholder survey respondents. About half selected this (51%, n=60) (see Figure 5-2). This is contributed to by the relatively high number of respondents (n=14) representing or engaged with the negative emissions sector. However, this issue was also selected frequently by respondents representing/engaged with the cement, chemicals, electricity generation and oil and/or gas sectors. This issue was selected by all organisation types. All of those (n=14 industry trade associations) who answered follow up questions on this issue thought it would have a positive impact upon the organisations or people they represent. The reasons for this are likely to be the potential opportunities it offers as shown in Figure 5-9. In particular, in terms of 'compensating for residual emissions in hard to abate sectors' as selected by high proportions of those in the cement, chemicals, electricity generation and oil and/or gas

sectors. In addition, also offering 'certainty and incentives for investment in carbon removal technologies' as selected by high proportions of those in the negative emissions sector. About two thirds of survey respondents (67%, n=29) thought this issue would become relevant pre-2030, with the remainder indicating post 2030 or 2035.

Figure 5-9 Ranking opportunities of an integration of CDR



Survey question: *What potential opportunities, if any, do you think this issue could offer during the 2030-2040 period? Please select up to three opportunities and rank them in order of importance. (n=46).*
Source: Technopolis Group, PIK & E3-Modelling, 2023

The more specific issue 'Potential integration of non-permanent capture and utilisation into the EU ETS' was also selected as one of the top three most relevant issues relating to the EU ETS framework 2030-2040 by about a third of stakeholder survey respondents (32%, n=37) (see Figure 5-2). Respondents selecting this issue included reasonable numbers from the cement, chemicals, electricity generation, negative emissions and waste sectors. This issue was not selected by NGOs but was by all other organisation types. Similarly to the wider carbon removals issue, the majority of those (11 out of 13 industry trade associations) who answered follow up questions on this issue thought it would have a positive impact upon the organisations

or people they represent. The opportunities presented by this issue as selected by stakeholder survey respondents are shown in Figure 5-9. The opportunity for 'captured/recycled carbon to provide a sustainable carbon feedstock' was most frequently selected as important, including particularly by those in the chemicals industry. Survey respondents, particularly those in the cement and waste sectors, also relatively frequently selected that non-permanent capture and utilisation was an opportunity because 'carbon capture and geological storage is not always an option in their sectors'. One survey respondent elaborated that CCU remains vital for many EU cement kilns are landlocked and not located next to CO_2 storage sites. About three quarters of survey respondents (76%, n=16) thought this issue would become relevant pre-2030.

Key challenges

In line with the literature, three key motivations for the support of negative emissions technologies and their potential integration in the EU ETS emerged from the expert interviews: First, CDR could **cover residual emissions** from hard-to-abate sectors and is needed for moving towards a net-negative economy (as also identified by stakeholder survey respondents from certain sectors as detailed in the previous section). One stakeholder survey respondent commented that an assessment of negative emissions is needed in order to estimate which types of removals are needed and for what purpose. Second, a potentially huge **pressure on allowance prices** is expected as the EU ETS faces increasing scarcity of remaining emissions already in the coming years, but gradually increasing and becoming even more relevant and urgent in the period after 2030. Integrating CDR in the EU ETS would provide **additional liquidity** and may help to prevent excessively high prices and/or price volatility. This was also identified by stakeholder survey respondents as shown in Figure 5-9. Third, the need to provide **investment certainty** to potential investors in removals was also discussed during the expert interviews.

A concern over a potential **mitigation deterrence** or substitution of mitigation efforts with removals was expressed by several experts, as well as the majority of stakeholder interviewees and some stakeholder survey respondents including businesses, NGOs and trade associations (Figure 5-9). This could threaten the integrity of the EU ETS by encouraging the misconception that removals are a substitute for emissions reductions. There was significant concern among stakeholders that an inclusion of removals will reduce the incentive for abatement by flooding the market with removal certificates.

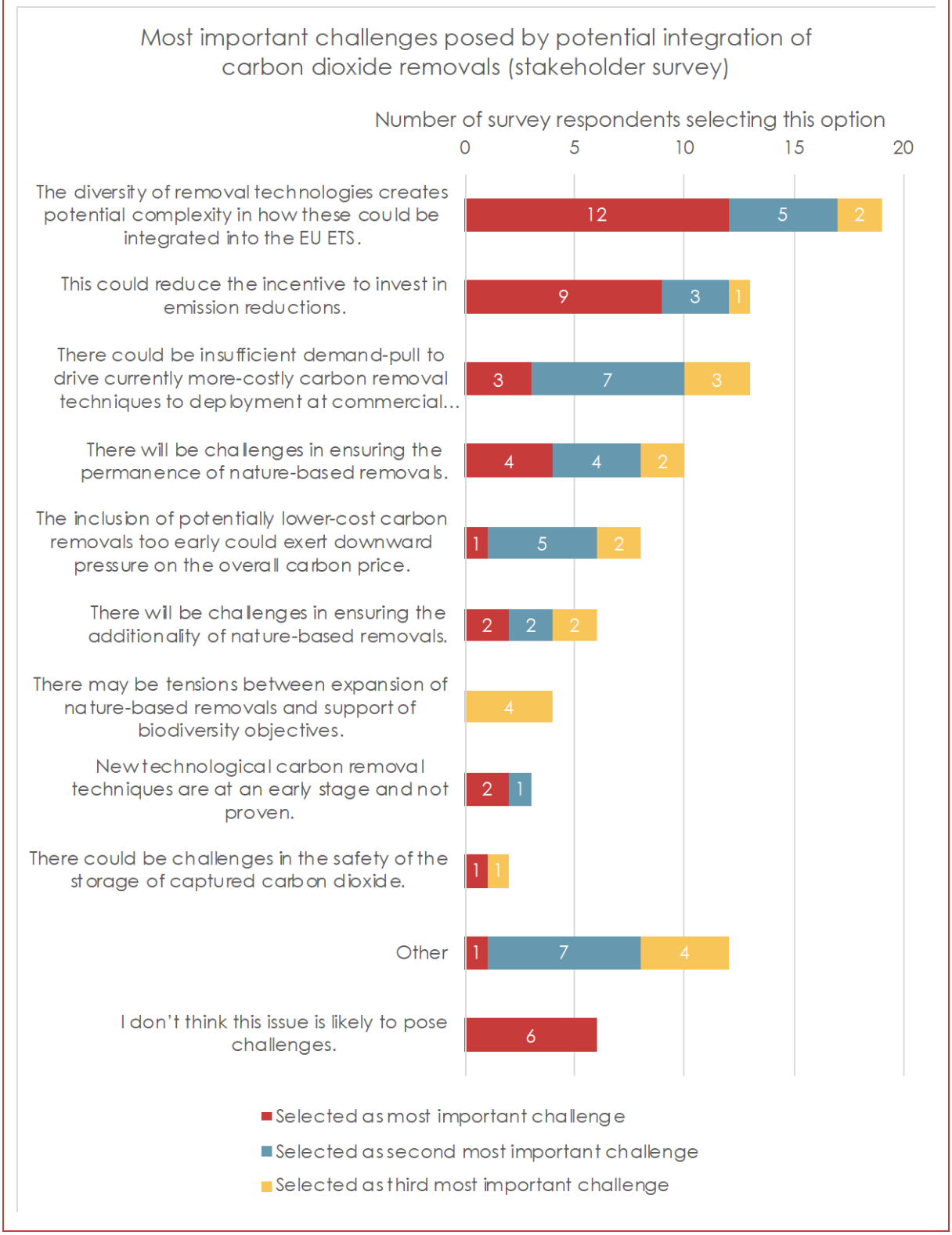
A key question discussed in the majority of expert interviews was the question of **permanent vs. non-permanent removals.** The complexity of integrating the diversity of removal techniques was also the most frequently selected challenge to potential integration into the EU ETS by stakeholder survey respondents (n=19 businesses and trade associations) as shown in Figure 5-10. Non-permanent removals were seen by interviewees as a threat to the environmental integrity of the EU ETS and a renewal over centuries to millennia would need to be ensured (see discussion of the Carbon Central Bank in the policy options). It was also pointed out that many seemingly low-cost non-permanent removals actually have very high societal costs once the non-permanence is adequately priced. One expert was in favour of excluding non-permanent removals altogether because of the inherent risks of supporting such solutions. Almost all stakeholders acknowledged the complexity of removals to pose a significant challenge and there was concern over the permanence of nature-based removals in particular (for example, in the wake of forest fires), as well as threats to biodiversity. In their consideration of the most important challenges in integrating non-permanent capture and utilisation, stakeholder survey respondents most frequently (n=9) selected that this may lead to delayed rather than avoided emissions (see Figure 5-11). However, the same number of stakeholder survey respondents (n=9 trade associations/businesses) felt that this would not pose challenges. One stakeholder survey

respondent also elaborated that CCU products involve substitution of 'virgin' CO_2 in generating the product and so substitution is involved, not just delay of emissions.

The need for a **robust MRV system** was discussed both by experts and stakeholders. An MRV system would be necessary to address concerns of additionality, as well as to ensure permanence of removals. Furthermore, it was raised that the measurement of nature-based removals involves high degrees of uncertainty, which would be integrated into a system that is so far built on a high degree of certainty in the measurement of emissions. Such an MRV system would be necessary to guarantee the **environmental integrity** of EU emissions trading.

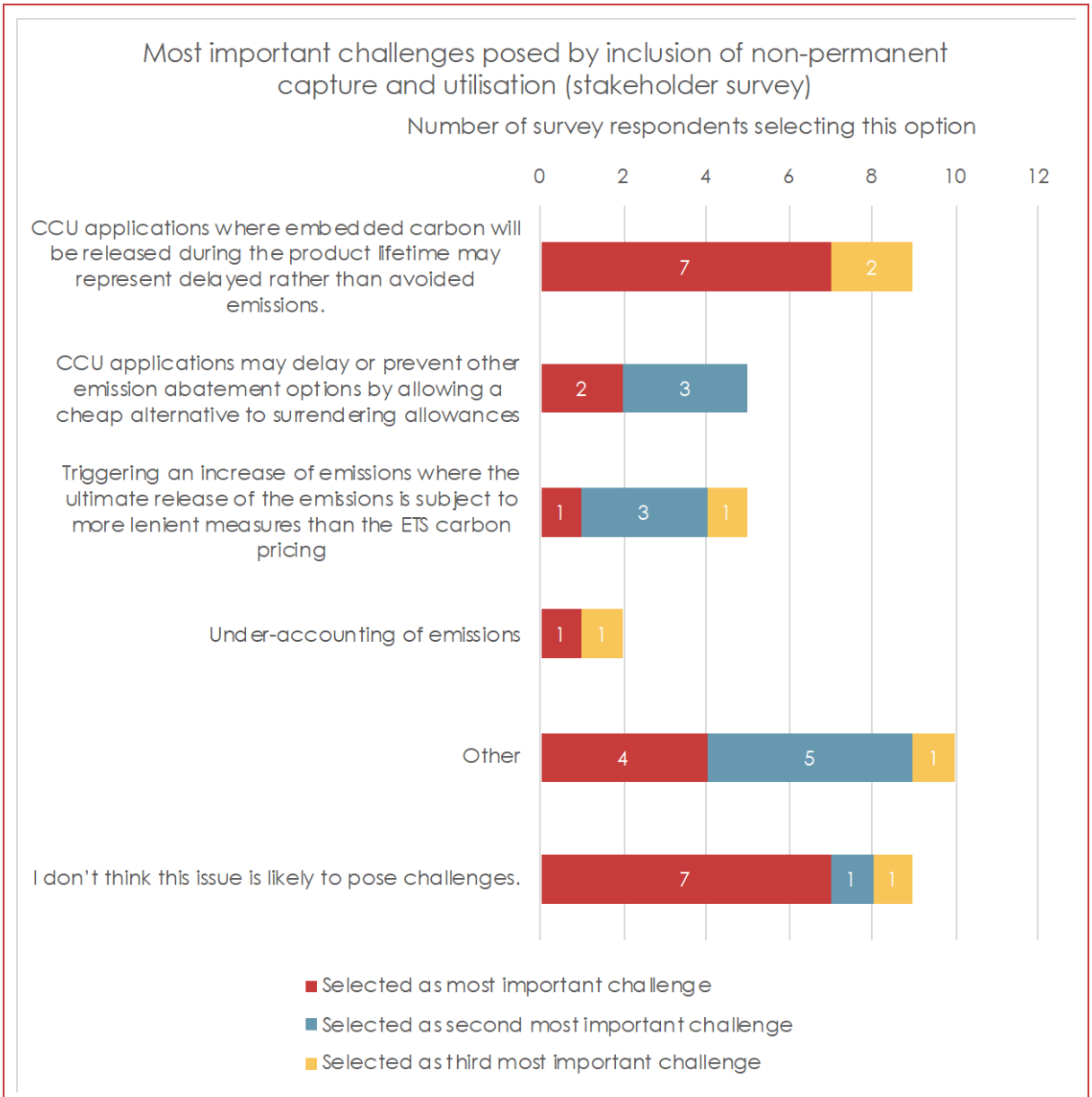
Stakeholder survey respondents (n=13 businesses and trade associations from a range of sectors and an NGO) also often selected 'there could be insufficient demand pull to drive more costly carbon removal techniques to deployment at commercial scales' as a challenge in potential integration of these into EU ETS. One survey respondent made a specific comment that a low ETS carbon price could hinder and delay the development of carbon removals if integrated as the current price is insufficient to finance these. Another survey respondent argued that there is a risk that market involvement could shift the impetus from quality to price with the cheapest allowable removals developed first in order to deliver emissions reductions cost effectively.

Figure 5-10 Ranking challenges of an integration of CDR into EU emissions trading



Survey question: *What challenges, if any, do you think this issue 'Potential integration of carbon dioxide removals into EU emissions trading' could pose during the 2030-2040 period? Please select up to three challenges and rank them in order of importance. (n=41).* Source: Technopolis Group, PIK & E3-Modelling, 2023

Figure 5-11 Ranking challenges of an integration of non-permanent capture and utilisation into the EU ETS



Survey question: *What challenges, if any, do you think this issue 'Potential integration of non-permanent capture and utilisation into the EU ETS ' could pose during the 2030-2040 period? Please select up to three challenges and rank them in order of importance (n=22).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

Key policy options

A relatively wide range of policy options was discussed, particularly during the expert interviews. In general, it can be said that policy options for carbon removals are less well understood than challenges related to CDR, a finding that also emerged from the literature review.

Several experts stressed that an **early regulatory framework** would help to form "political expectations" and thus aid investment into CDR. Regarding the timing of a regulatory framework for carbon removals, all experts but one agreed that such a framework should be

planned and prepared soon (before 2030), because of an increasingly tight cap and the need for managing market expectations and creating an investment framework.

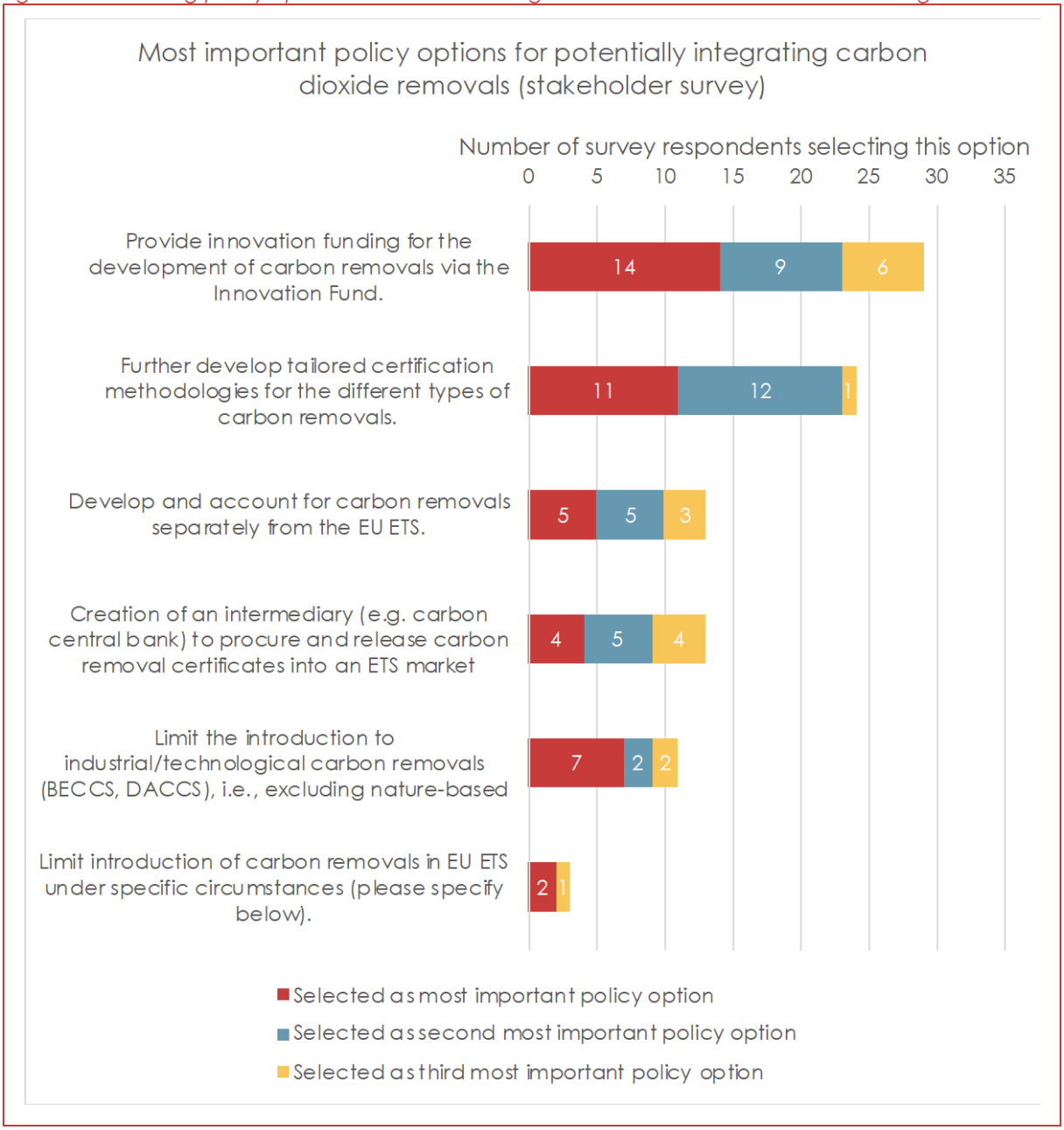
At least in the long term, most experts saw the **integration of negative emissions into the EU ETS** as a good idea in principle. The stakeholders were more divided, with a slight majority (four out of seven that discussed this topic) in favour of a separate ETS. Several experts stated that advantages of an integration include providing provide additional liquidity to the EU ETS, as well as increasing cost-effectiveness.

However, the **best way to integrate CDR and the scope of applicable solutions** was very much debated. One expert advocated for an exclusion of non-permanent removals. A stakeholder survey respondent argued that land based removals should only be used to counterbalance the agriculture, forestry and other land use sectors. Several experts suggested a **separate emissions target** for mitigation (residual emissions) and negative emissions. The majority of stakeholder interviewees and some stakeholder survey respondents were also in favour of a distinct target for negative emissions. One expert suggested a separate **Carbon Removals Trading Scheme**, which would be a separate market for carbon removals. This policy option is inspired from a legislative proposal in California, where such a scheme is proposed (see section 4.2).

Several experts stated that **additional institutions or policy instruments** may be necessary to support upscale of negative emissions technologies. One policy instrument that was discussed widely (albeit with a varying scope) is a **Carbon Central Bank**. Specifically, the scope of the mandate (narrow vs. broad) is under discussion. A Carbon Central Bank could theoretically have two goals, namely 1) ensuring price stability and 2) addressing the issue of non-permanence by an infinite management of the carbon cycle for non-permanent removals (see literature review in section 4.2).

Finally, some experts discussed the issue of **financing negative emissions**. The "inconvenient truth" was mentioned that in the future, instead of possessing a revenue-generating device (EU ETS), a continuous inflow of money would be needed to finance removals. According to these interviewees, society would eventually have to cover the costs, for example in the form of taxation or a levy. The need for funding was also highlighted by stakeholder survey respondents. They most frequently selected (n=29) 'provide innovation funding for the development of carbon removals via the Innovation Fund' as one of their top three most important policy options for potential integration of carbon dioxide removals. This and other policy options selected by stakeholder survey respondents are shown in Figure 5-12. The next most frequently selected policy option (n=24) was 'Further develop tailored methodologies for the different types of carbon removals'.

Figure 5-12 Ranking policy options related to an integration of CDR into EU emissions trading

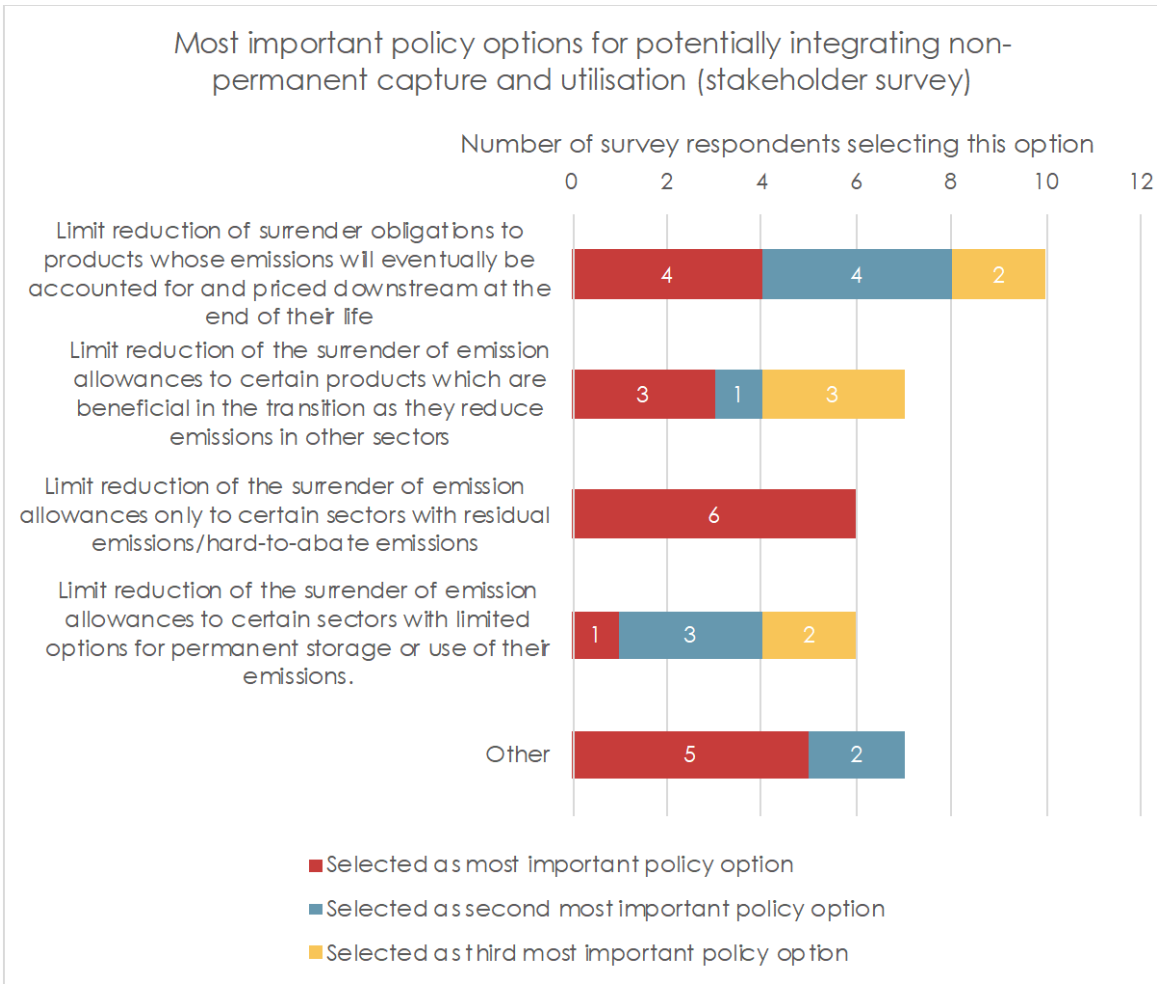


Survey question: *Which of the following policy options do you think are most important to mitigate challenges and/or support opportunities that could arise from this issue/development [Potential integration of carbon dioxide removals into EU emissions trading] in the 2030-2040 period? Please select up to three policy options and rank them in order of importance. (n=44)*. Source: Technopolis Group, PIK & E3-Modelling, 2023.

Stakeholder survey respondents were also given policy options to consider in relation to how reduction of the surrender of emission allowances under potential integration of non-permanent capture and utilisation might be limited. The results are shown in Figure 5-13. There was quite a spread of responses with 'limit reduction of surrender obligations to products whose emissions will eventually be accounted for and priced downstream at the end of their life' being most frequently selected (n=10 including those from the cement, chemicals, electricity generation, heating and negative emissions sectors) as one of the top three most important policy options. The most frequently selected option (n=6) as the *most* important policy option

was 'limit reduction of the surrender of emission allowances to certain sectors with limited options for permanent storage or use of their emissions'. This was selected by representatives of the cement, chemicals and waste sectors. One stakeholder survey respondent also commented that: policymakers must properly design the inclusion of non-permanent CCU applications so that 1) no CO_2 is left unaccounted for, 2) no CO_2 is double counted and 3) all actors along the chain (emitters, users) find an incentive in taking part in the chain (with regards to accounting of the CO_2 and financial gain from the final product).

Figure 5-13 Ranking policy options related to an integration of non-permanent capture and utilisation into EU emissions trading



Survey question: *Which of the following policy options do you think are most important to mitigate challenges and/or support opportunities that could arise from this issue/development [Potential integration of non-permanent capture and utilisation into EU emissions trading] in the 2030-2040 period? Please select up to three policy options and rank them in order of importance (n=19).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

5.4 Distributional aspects, auctioning, redistribution, support for the vulnerable

Table 5-3 Distributional implications: Key challenges and policy options identified in the interviews

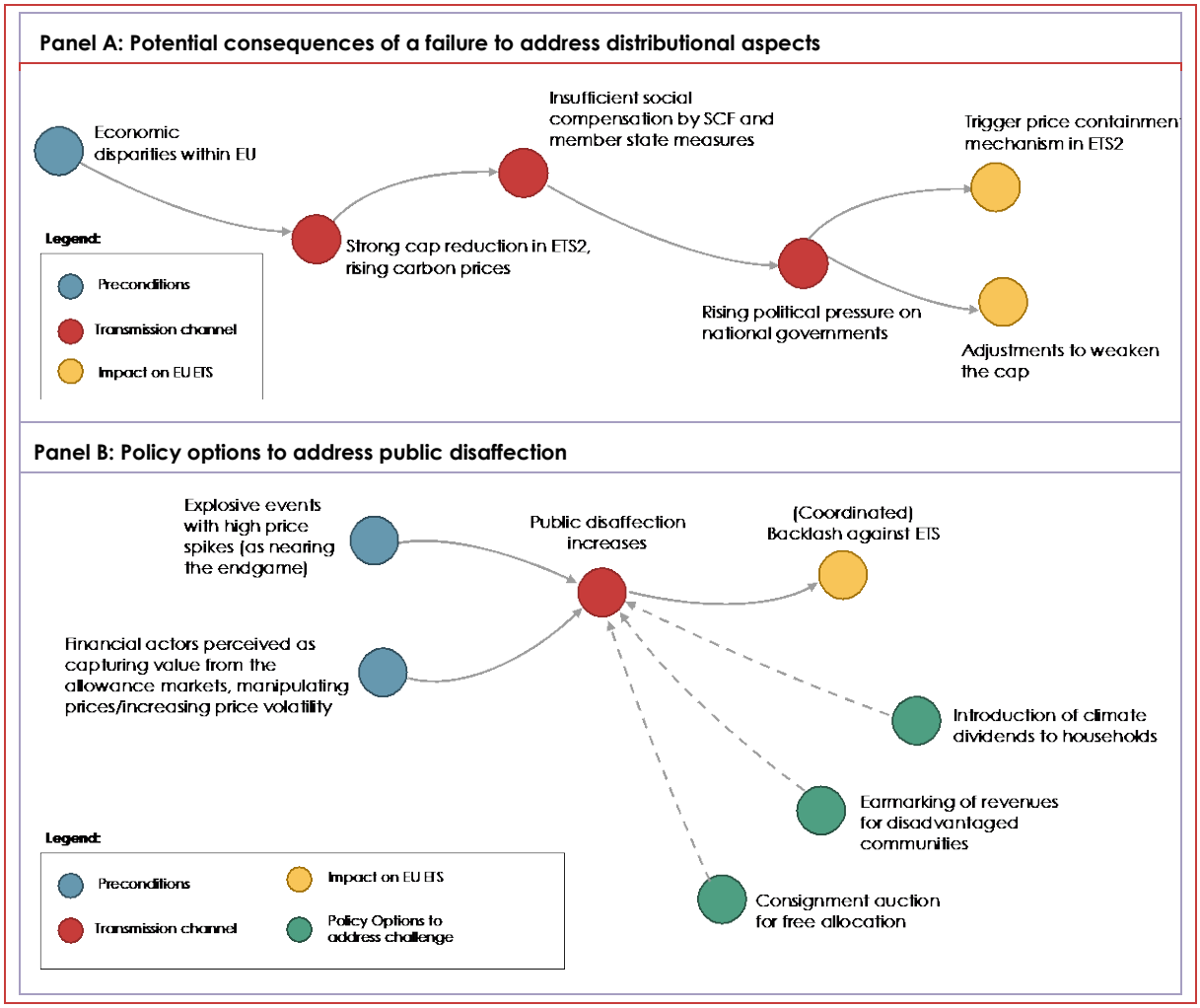
	Key challenges	Key policy options
Expert interviews	• Failure to address distributional aspects as (the) major political risk • Economic disparities within EU • (Soft) 45€ price threshold (in 2020 prices, i.e. adjusted for inflation) implies additional measures may have to be taken	• Per-capita redistribution • Targeted support for the vulnerable (earmarking of revenues for disadvantaged communities) • Early policy response to address (anticipate) distributional issues • Importance of communication • Need for complementary policies • Divergence of policies across MS
Stakeholder interviews	• Impact of emissions trading on prices paid by consumers • Effect of price increases on low-income households and related challenges to public/political acceptance of the ETS • Effects of price containment mechanism in ETS2	• Importance of complementary policies • Increase of funds for the SCF • Earmarking to support transition for low- and middle-income groups • Greater transparency, monitoring and enforcement of revenue spending by Member States

Distributional aspects were the second most discussed topic in the expert interviews, with 10 out of 17 experts mentioning it as one of the three key issues and a major political risk for EU emissions trading – several experts framing it even as the most critical challenge to the EU ETS. One key concern was that distributional implications could trigger market interventions by politicians once prices start rising in the ETS (especially in the ETS2), thus challenging the environmental integrity of EU emissions trading; the prospect of a more fundamental opposition as a result of a failure to address distributional aspects was also raised.

Distributional aspects was also a topic very much discussed in the stakeholder interviews, with a focus on the impact of emissions trading on prices paid by consumers and redistributive policies. In addition, about a quarter of stakeholder survey respondents (26%, n=31) selected 'emissions trading covering buildings and road transport' as one of their top three most relevant issues relating to the EU ETS framework 2030-2040 (see Figure 5-2). Half of the survey respondents (n=5: 4 trade associations and 1 other) who answered follow up questions expected a positive impact of ETS2 upon the organisations or people they represent. Most of the remainder expected a negative impact (n=4, 3 trade associations and one trade union/coalition) and one anticipated a neutral impact (n=1 chemicals trade association). Over half of survey respondents thought this issue would become relevant pre-2030.

Figure 5-14 graphs how rising carbon prices may lead to threats for the environmental integrity of the EU ETS, if distributional implications are not adequately accounted for (Panel A). It also shows potential policy options to address (future) public disaffection (Panel B).

Figure 5-14 Perspective on the potential consequences for the EU ETS of distributional implications of ETS2



Note: The effects of policy options are visualised by dashed arrows. Source: Technopolis Group, PIK & E3-Modelling, 2023.

Key challenges

The majority of experts that viewed distributional issues as a key issue saw the "**spectre of public disaffection**" as a major political risk or even the most critical challenge for the EU ETS. Underlying these concerns are the **regressive effects of carbon pricing** that may be exacerbated by rising prices, putting the social sustainability of the EU ETS at risk. In line with the expert interviews, several stakeholders pointed out that fuel price increases may particularly affect low income households. This would pose a challenge the overall public/political acceptance of the ETS, carrying the risk of **political interventions**[67] (in particular as the ETS may be perceived by consumers as a tax). The risk of coordinated protests and a **backlash against emissions trading** altogether was also raised by some experts, in particular since the opposition to climate policy is growing in several EU countries. In combination with changing political

[67] The energy price spikes of 2022 were named as an example why high carbon prices will politically not be sustainable: In these cases, massive subsidies where put in place in some Member States to shield people from the effects of energy price increases. In the case of such an intervention to counter price increases from the EU ETS, this would weaken the incentives of carbon pricing.

majorities, perceptions may shift to a view that the ETS2 cannot be afforded, which may undermine the system altogether.

Several experts mentioned **economic disparities within the EU** as an important factor affecting the seriousness of distributional concerns and the need for corresponding policy options. Since per capita income is several times larger in richer Member States than in less affluent countries, the distributional impacts of uniform carbon pricing across Member States will be very high. In particular, the ETS2 links markets that were previously unconnected (such as housing markets in different European capitals), implying that increasing demand for allowances e.g. in Germany will drive up costs in Hungary. One interviewee pointed out that heating, fuel and housing costs are an (even) more politically sensitive topic in poorer countries.

Several experts raised the challenge of implementing the **soft 45€ price threshold** (in 2020 prices, i.e. adjusted for inflation) of ETS2[68]**.** There is a **trade-off** in principle for policymakers **between a carbon price high enough to generate significant mitigation in the ESR sectors, without creating distributional problems**. In that sense, distributional challenges are partly mitigated by the price-buffering containment elements in the ETS2. However, in the absence of additional policies, the soft cap of 45€ is well below the 175 to 350€/tCO_2 that might be necessary to achieve the 2030 climate targets (Abrell, Bilici, et al., 2022).[69] One expert pointed out that prices of 200-500 euros per tonne were "politically not sustainable".

In the absence of high enough carbon prices, **additional policies would be necessary** to ensure that climate targets are met. One expert raised the concern that with the price cap mechanism currently in place (i.e., an automatic release of a fixed number of allowances from the MSR of ETS2), there is a **risk of failing to contain ETS2 prices at the levels that were promised** before. On the other hand, if the 45€ target was to be taken seriously, political pressure may make a release of higher quantities of allowances in ETS2 necessary and the **emission targets may not be met** (the ETS2 would then resemble more of a tax).

The **level of political responsibility (national governments vs. the EU)** to address distributional challenges was also discussed by several experts. While one expert acknowledged that there were elements of a European process due to the 'social climate plan'[70] that Member States need to submit to the Commission, it was pointed out the Social Climate Fund mainly targets differences between Member States, whereas it is up to the Member States to tackle their own social question. This implies that policy instruments like per-capita dividends will be decided by Member States and there may potentially be large differences in measures between countries, while a harmonisation of redistributive approaches across MS would be important. For example, one expert pointed out that only a few countries currently earmark revenues (see also Borghesi & Albert, 2023).

Figure 5-15 shows the number of stakeholder survey respondents who selected specific predefined challenges potentially posed by 'emissions trading covering buildings and road transport' as their top three most important challenges. These include concern about regressive

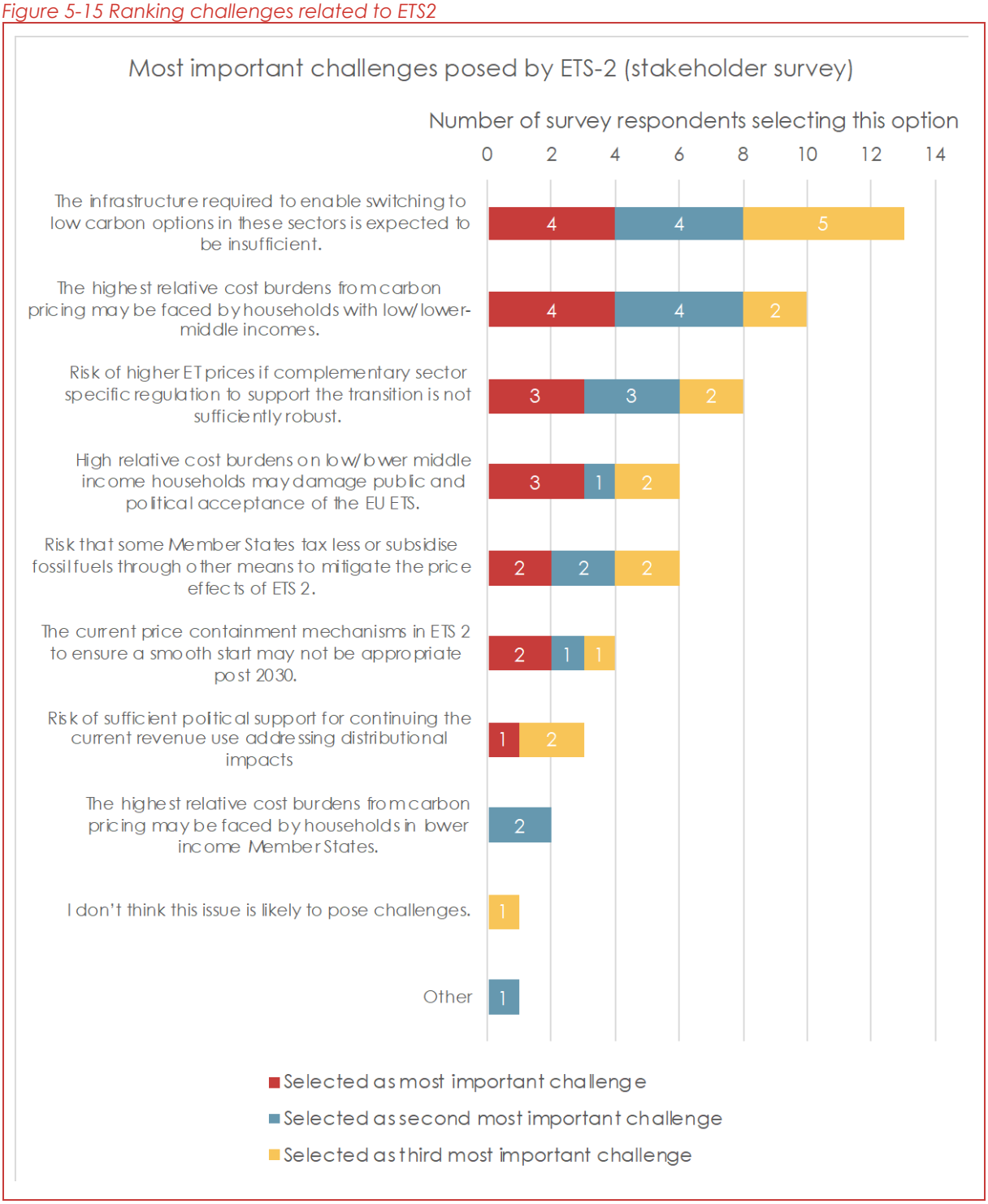
[68] The Provisional Agreement on ETS2 foresees that 20 million allowances will be released from the MSR of ETS2 where the average price of allowances exceeds a price of EUR 45 during a period of two consecutive months (Art. 30h). ETS2 covers about 1,000 million tons of CO_2 emissions p.a.

[69] The price range indicated by Abrell et al. (2022) ignores the effect of complementary policies that are in place across the EU. This means that the actual ETS2 market price might be lower than a price from models where these complementary policies are not modelled.

[70] The social climate plan contains the measures and investments Member Sates intend to undertake (existing or new measures) to cushion the impacts of the new emission trading system on vulnerable households, micro-enterprises and transport users (see Art. 3 of https://data.consilium.europa.eu/doc/document/ST-6207-2023-INIT/en/pdf).

effects, the risk of high prices and risk to the political acceptance of the EU ETS, as mentioned by expert and stakeholder interviewees. However, the most frequently selected challenge was distinct: 'the infrastructure required to enable switching to low carbon options in these sectors is expected to be insufficient'.

Figure 5-15 Ranking challenges related to ETS2



Survey question: *What challenges, if any, do you think this issue by 'Emissions trading covering buildings and road transport' could pose during the 2030-2040 period? Please select up to three challenges and rank them in order of importance (n=19).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

Key policy options

Regarding policy options, there was a consensus among experts and stakeholders that **negative social consequences need to be anticipated and addressed with (part of) ETS revenues**. However, there were different opinions on the type of policies to be implemented and the relative prioritization of direct income support (e.g., per-capita rebates) vis-à-vis a use of revenues for specific climate investments.

Both a group of experts and in particular a number of stakeholders referred to the need for **strong complementary policies, both to mitigate the risk of high carbon prices for consumers and to deliver emissions reductions**. Examples of such policies include performance standards, regulation and fiscal incentives. Additional measures would also be needed if the 45€ (in 2020 prices, i.e. adjusted for inflation) price trigger of the MSR in ETS2 is to be reached. Support mechanisms for households affected by the ETS2 were also seen as necessary from an economic point of view due to inefficient capital markets and a lack of capacity of consumers to take rational and fully informed decisions.

Several experts mentioned the **Social Climate Fund** as a very important policy instrument that should be taken forward. One expert said that investment subsidies in the Social Climate Fund would not be sufficient to address inequity in decarbonisation, and that there was a need for more direct support for poorer households. A few stakeholders also proposed an increase in overall funds for the SCF to address current perceived insufficiency of funding allocated. One stakeholder suggested that revenues to the SCF should be in proportion to the price trajectory of ETS 2 rather than fixed, to ensure there is sufficient resource to support targeted relief measures and to address the potential disproportionate burden on the most vulnerable households and lower income Member States. It was also put forward to allocate parts of ETS1 revenues to the SCF, given the ETS 1 price burden from the power sector is partially borne by households. In a similar vein, one expert suggested to start the spending on the Social Climate Fund already now (using money from ETS1). This would both improve the commitment to implementing ETS2 (thus avoiding a potential problem of time inconsistency in policies), as well as be desirable from a communication point of view.

One proposal that around half of experts discussed was the potential introduction of a **climate dividend** (per-capita rebate) to households. This is a policy measure that is already in place in Florida ("climate credit") and may support public acceptance of carbon pricing. To address disparities between Member States, one expert suggested that relative cost burden in relation to household income per Member State should determine the volume of the relief measures. However, two experts pointed out that while a climate dividend may address distributional inequalities on average, the variability between households with a similar income (e.g., in the 1st decile) implies that within a decile, there will be some large winners, while others will still be losers. For example, due to disparities in fuel costs for commuting within an income group, per-head reimbursements cannot fully address inequality caused by very high carbon prices. On the other hand, should per-capita rebates be fine-tuned too much, towards targeted subsidies, then the incentives from carbon pricing would be lost. Another challenge from a political economy point of view is that Member States typically do not tend to support the EU providing direct funds to citizens, which means such a measure may have to be taken on a national level. A stakeholder survey respondent noted other options for distribution of a climate dividend. These were: rewarding people who live low-emission lives, by choice or by circumstance, or providing funds for consumers to choose low-carbon products and services.

The **earmarking of revenues for disadvantaged communities** was discussed both by a number of experts and by stakeholders. One reasoning given was that poorer households needed more direct support than the SCF, such as a direct redistribution to energy poor households. Some

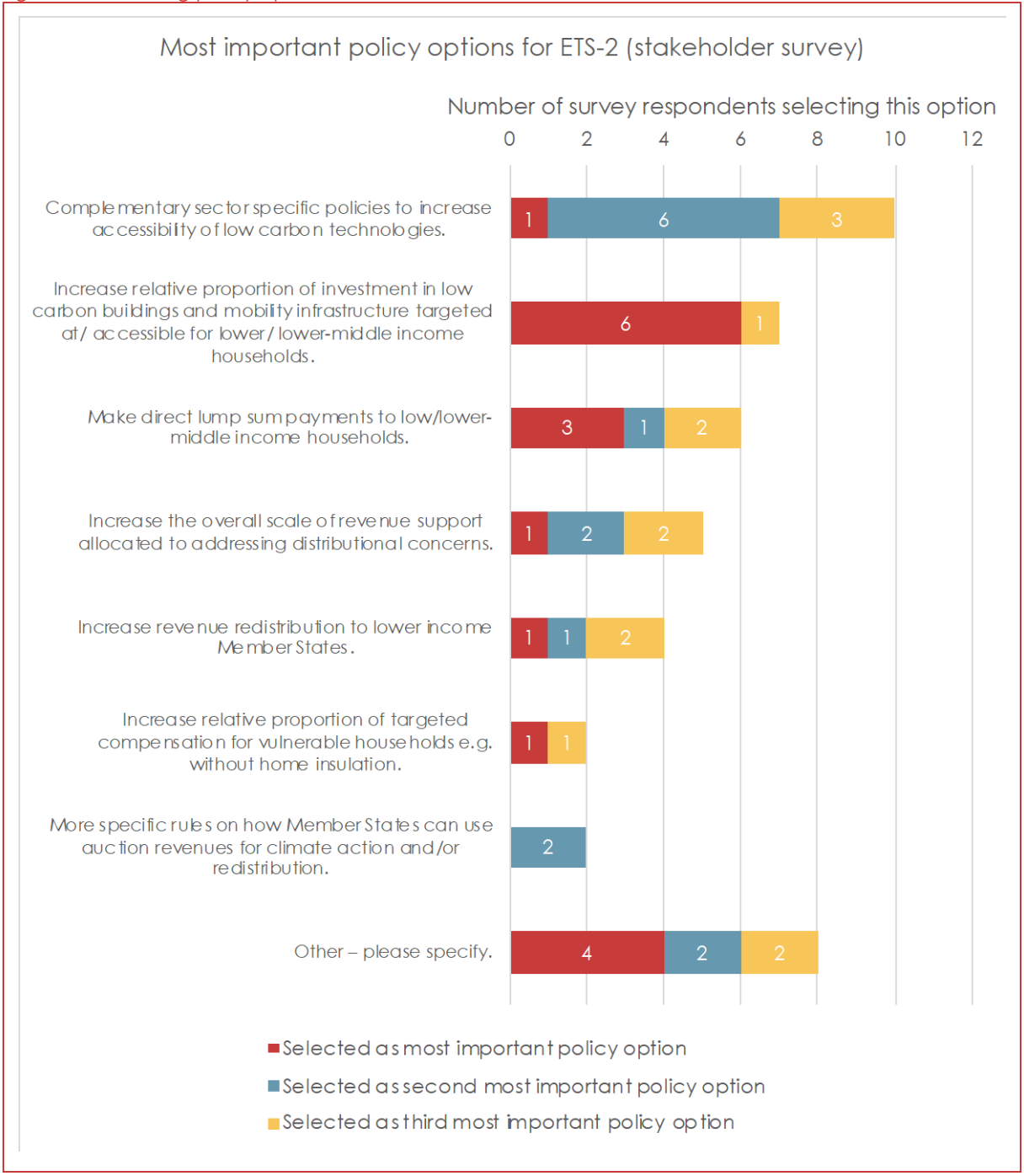
stakeholders suggested to introduce a system to require Member States to use revenues to help low- and middle-income groups transition to low carbon heating and transport, including investment in public transport/infrastructure to address distributional impacts. This could include innovative schemes such as social leasing electric car schemes to support low/middle income consumers, rather than e.g. purchase incentives on electric cars, which are more likely to be used by more affluent consumers. Earmarking revenues towards investments in disadvantaged communities would also allow to increase the price of EU-ETS over time: For example, one stakeholder suggested that once buildings occupied by the most vulnerable/energy poor have been renovated, higher prices could be allowed to stimulate renovation work amongst those who can afford to invest.

One expert raised the concern of an inconvenient truth, namely that there would be a **peak revenue** from carbon pricing as with the decreasing cap, gradually less allowances will be available for auctioning. Some stakeholders also noted that insufficient revenue is anticipated to be allocated to ensure a just transition or to support the transition to clean heat at home and clean transport.

Several experts noted that the **communication** side is very important, and that the EU has traditionally not been very good at this. One expert even said that communication is the most important policy option and that there was an educational gap rather than a regulatory gap at the moment. It was also raised that other jurisdictions (such as California) are much more successful with their communication efforts. There were also stakeholder calls for greater transparency, monitoring and enforcement of revenue spending by Member States. One expert noted that a communicational challenge was that with the introduction of ETS2, a price ceiling of 45€ (in 2020 prices, i.e. adjusted for inflation) is communicated, but that the soft cap is not actually implemented as a hard price ceiling.

Figure 5-16 shows the number of stakeholder survey respondents who selected each of a number of predefined policy options to mitigate challenges that could arise from the issue 'emissions trading covering buildings and road transport'. These cover similar policy options to those already discussed by expert and stakeholder interviewees. The most popular policy option overall was 'complementary sector specific policies to increase accessibility of low carbon technologies'. The policy option chosen most often as the most important policy option was 'Increase relative proportion of investment in low carbon buildings and mobility infrastructure targeted at/accessible for lower/lower-middle income households'. This was selected particularly by business respondents.

Figure 5-16 Ranking policy options related to ETS2



Survey question: *Which of the following policy options do you think are most important to mitigate challenges and/or support opportunities that could arise from this issue/development [Emissions trading covering buildings and road transport] in the 2030-2040 period? Please select up to three policy options and rank them in order of importance (n=17).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

5.5 Industry, free allocation and CBAM

Table 5-4 Industry, free allocation and CBAM: Key challenges and policy options identified in the interviews

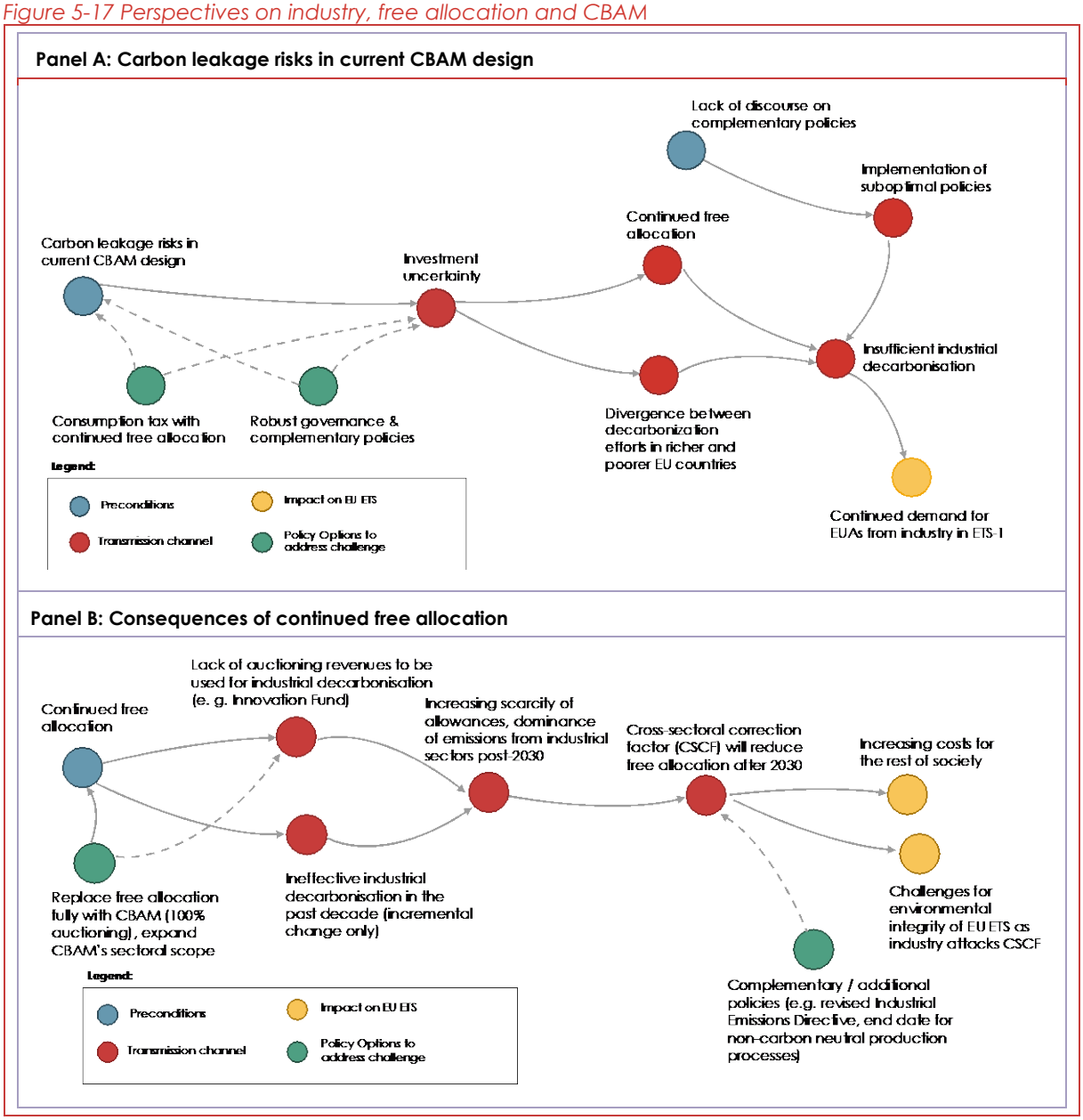
	Key challenges	Key policy options
Expert interviews	• Increasing carbon leakage risks due to rising price and phase-out of free allocation • Leakage risks not addressed by CBAM: (1) Exports; (2) Down the value chain (manufactured goods); (3) Resource shuffling / indirect emissions from electricity • Pressure on political decision-makers from industry (political economy) • Risk of continued free allocation as a result of political pressure	• No agreement on ideal policy for leakage protection • Climate contribution / consumer tax in combination with continued free allocation as an alternative to CBAM • Need for complementary policy instruments / regulatory framework for industrial decarbonisation • Policies for industrial decarbonisation (e.g. CCfDs, Revision of Industrial Emissions Directive, …)
Stakeholder interviews	• Scale and speed of industrial decarbonisation • Carbon leakage risks not addressed by CBAM (exports, downstream products) • Need for greater clarity on implementation of CBAM	• Importance of additional policies complementary to EU ETS

Issues around industrial decarbonisation, free allocation and CBAM were mentioned by more than half of experts (10 out of 17) as one of the key challenges for EU emissions trading. In terms of challenges, there was a concern shared by most experts and stakeholders about (1) the speed and the implications of the required industrial transition, and (2) leakage risks for exporters and downstream products even in the sectors currently covered by CBAM. As a result, a key risk for the political market stability of the EU ETS would be increasing pressure from industry on political decision-makers (political economy). Policy options can be divided into two groups, one addressing leakage risks (free allocation, CBAM or a climate contribution / consumption tax in combination with free allocation), others relating to supporting industrial transition. While most experts and stakeholders agreed complementary policies to support the industrial transition were necessary, there were different opinions and less clarity about the best way forward in terms of carbon leakage protection. The issues discussed above were mostly shared by a comparatively smaller group of six stakeholders.

'Increased ambition level for industry' was selected by about a third of stakeholder survey respondents (32%, n=37) as one of the top three most relevant issues relating to the EU ETS framework 2030-2040 (see Figure 5-2). This was selected by a range of organisation types including businesses, NGOs, trade associations and trade unions/coalitions. Respondents selecting this issue also represented or were engaged with a wide range of sectors. The majority of survey respondents (90%, n=19) who thought this issue would become relevant pre-2030.

Figure 5-17 illustrates two contrasting perspectives on free allocation and leakage risks in the EU ETS derived from individual interviews. Panel A shows potential results from carbon leakage risks under the current CBAM design and proposes a climate contribution as the central alternative policy instrument. In Panel B, potential negative consequences of a continued free allocation are depicted.

Figure 5-17 Perspectives on industry, free allocation and CBAM



Note: The effects of policy options are visualised by dashed arrows. Source: Technopolis Group, PIK & E3-Modelling, 2023.

Key challenges

Several experts mentioned the **speed and scale of the required industrial transition**: With the linear reduction factor now above 4%, industry would now move from an era of incremental change (efficiency gains) and familiar technologies towards a technology switch by fundamentally changing production processes. This would also require stranding existing assets, which is only feasible if an alternative exists. This view was shared by some stakeholders, who expressed concerns over the pace of technological advancement and if breakthrough technologies would be developed enough to allow for further abatement of emissions.

According to the expert interviewees, so far there has been no (or very limited) carbon leakage, because (a) ETS prices had been low, and (b) free allocation was quite generous. However, it was pointed out that **carbon leakage will become a relevant issue** in the future, as

prices have risen already, and further price increases may happen in the next years. Different types of carbon leakage may occur, namely (1) Closure of existing plants, (2) Shift of market shares (decrease production in EU, increase abroad), (3) Investment leakage for new installations.

With the introduction of CBAM for some selected sectors in 2027 and a corresponding phase-out of free allocation, a key question is how CBAM will fare in comparison to free allocation in terms of carbon leakage protection. Several experts and stakeholders mentioned **two main carbon leakage risks under CBAM, namely leakage risks for European exporters, as well as products down the value chain** (which are not covered by CBAM) that are sold domestically. In terms of exports, the concern is straightforward in the sense that exports are not covered by the CBAM. A coverage of exports would be difficult to implement in the current CBAM design for legal reasons (WTO concerns about a potential export subsidy). Regarding the coverage of the value chain, one expert stated that CBAM has been limited to a certain number of product categories because of the difficulty of gathering data on carbon intensity and issues with trustworthiness of an MRV system. Several stakeholders voiced concerns about carbon leakage along the value chain and confirmed the complexity involved in carbon accounting (e.g. measuring embedded emissions) even with the current scope of the CBAM. A third carbon leakage concern that was mentioned was **resource shuffling**: Since importers may deviate from the pre-defined benchmarks for carbon intensity of imported goods, there is a risk for example that aluminium produced with renewable electricity would be shipped to EU, while aluminium from coal-based electricity would be shipped to other markets. One stakeholder survey respondent (a steel business) noted a specific technical challenge described as follows. One of the mechanisms to set the value for embodied CO_2 for imported goods is based on the performance of the worst twenty per cent in the Benchmark curves. As industry invests in low carbon technologies, this value will decrease. This will have an impact after 2035 and will need to be addressed.

As a result of the pressure on an accelerated decommissioning of assets and the carbon leakage risks under CBAM, several experts mentioned the challenge of an **increasing pressure from industry on political decision-makers**. From a political economy point of view, industry has a strong influence on policies (similar to unions). The probability of such an industry pushback was seen as high, as prices in the EU ETS rise and the availability of emissions allowances decreases. Several experts predicted that this would become an important political debate, characterised by a lot of (political) pressure.

As a result of this political pressure, some experts pointed out that review clauses for CBAM may be triggered, thus making the envisaged phase-out of free allocation by 2035 increasingly incredible. In case CBAM is not adjusted, there is therefore a **risk of a continued free allocation for industry**. This would imply a continued ineffectiveness in supporting and incentivising industrial decarbonisation, and also result in a lack of revenues from auctioning that could be used to support industrial decarbonisation. A second potential result brought up by two experts was the **risk of a divergence in decarbonization efforts between richer and poorer EU countries**. While some richer EU countries could afford supporting their industry, for example by financing instruments like Carbon Contracts for Differences (CCfDs), others would not have the necessary funds. The less affluent Member States would then be at a greater risk of a de-industrialisation.

Three stakeholders expressed **need for greater clarity** around the CBAM to help manage the expectations of market participants to allow industry to adjust their own strategies. In particular, stakeholders wanted clarity around sector coverage, if indirect emissions will be covered, how exports will be treated, coverage of refinery products (particularly concerning the difficulties with benchmarking refinery products), as well as the exact timing of ending free allowances. One trade association survey respondent noted a specific challenge: if the CBAM does not

apply to the full value chain, there is a risk of circumvention leading to increased imports of finished goods, further reducing the market share and the added value of EU installations, which is counterproductive to global climate action.

In terms of the **international dimension of CBAM**, one expert and some stakeholders mentioned that that **pressure from third countries** may become a major risk for the implementation of CBAM. In particular, CBAM would risk a challenge of WTO rules. On the other hand, one expert acknowledged that CBAM would offer the opportunity to become a **catalyst for global carbon pricing** in countries like Turkey.

Two stakeholders expressed concerns over **double taxing if systems are not properly linked**. One stakeholder mentioned North Sea assets (Norway and UK) as being at risk of overtaxing should systems remain unlinked. The stakeholder also noted that electricity is traded in anonymised contracts, meaning that electricity which has paid the carbon price in the UK may be double taxed.

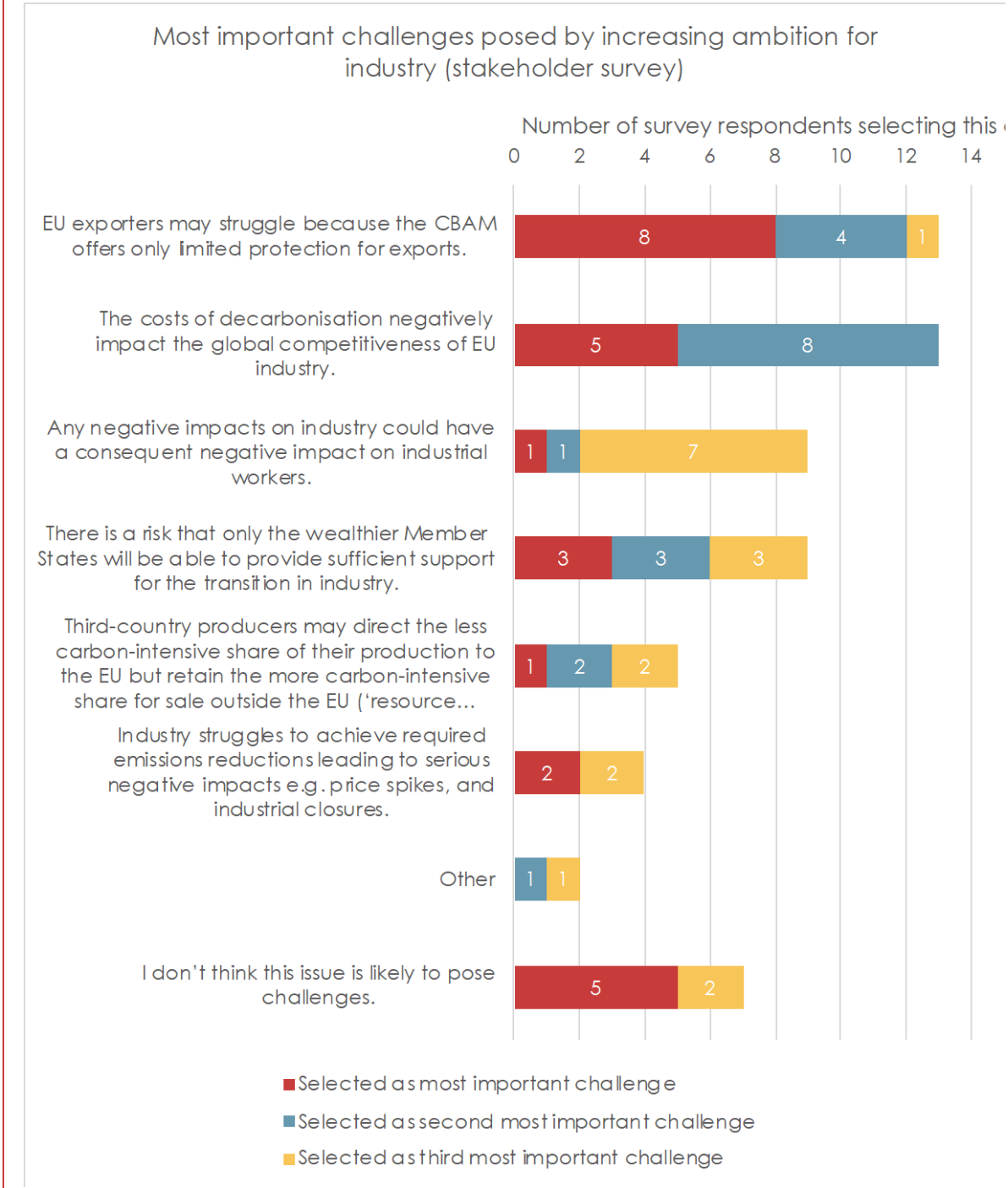
Figure 5-18 shows the number of stakeholder survey respondents who selected specific predefined challenges potentially posed by the 'increased ambition level for industry' as their top three most important challenges. The two most frequently selected challenges reflect those already discussed by stakeholders and experts:

- EU exporters may struggle because the CBAM offers only limited protection for exports. This challenge was selected by organisations representing a range of sectors. This included four out of five organisations representing the chemical sector who selected this as the most important challenge arising from this issue.
- The costs of decarbonisation negatively impact the global competitiveness of EU industry.

Survey respondents also identified that any negative impacts on industry could also have a consequent negative impact upon industrial workers.

A reasonable number of NGOs (n=6) indicated that they did not think this issue would pose any challenges, one business and one trade union respondent also gave this view.

Figure 5-18 Ranking challenges related to an Increased ambition level for industry



Survey question: *What challenges, if any, do you think this issue 'Increased ambition level for industry' could pose during the 2030-2040 period? Please select up to three challenges and rank them in order of importance (n=25).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

Key policy options

Policy options can broadly be divided into two categories: First, policies addressing carbon leakage risks. Second, policies supporting an industrial transition.

Regarding **carbon leakage risks**, there was no overall agreement about the best policy to address these. in line with the literature on carbon border adjustments, **three basic policy options** were raised in the expert interviews: (1) Free allocation; (2) CBAM; (3) A consumer tax for carbon-intensive goods in combination with free allocation (also called climate contribution). Regarding **free allocation**, one expert mentioned that these cannot continue indefinitely. Other stakeholders mentioned the significant drawbacks of free allocation mentioned above in terms of a lack of incentives for industrial decarbonisation, as well as a lack of revenues from auctioning. One expert suggested that **CBAM** could be expanded to more sectors such as chemicals and plastics (also mentioned by a stakeholder survey respondent), which however would not address the remaining leakage risks for exports and along the value chain. Moreover, another expert mentioned a trade-off between avoiding leakage risks and increased administrative costs, which makes it unclear how far down the value chain CBAM could cover. If CBAM cannot be extended to exports, it was also mentioned that it may make sense to continue providing free allocation to level the playing field for the share of exports. Third, a **consumer tax / climate excise contribution** (see discussion in the literature review in section 4.5) would address leakage risks via a continuation of free allocation, as it covers the value chain of carbon-intensive products and is waived for exports. It would also raise additional revenues to finance the low-carbon transition. Some stakeholders added that additional tools on top of CBAM to address carbon leakage risks should be considered (such as an export-adjusted mechanism). One NGO survey respondent argued for replacing CBAM with export rebates to directly enable the removal of free allowances and increase international pressure and incentives for greater emissions reductions.

In terms of industrial transition, several experts and stakeholders raised the **importance of complementary policies for industrial decarbonisation**. One instruments that was mentioned prominently were (**carbon) contracts for difference (CCfDs**). A key advantage of CCfDs was the link to the ETS allowance price. In addition to supporting the transition of industries towards cleaner production processes, one stakeholder mentioned that these could also help to (partly) addressing leakage risks. However, significant revenues from carbon pricing may be needed to finance these. Two experts remarked that a lot of policies were put forward in terms of industrial decarbonisation, but it remained unclear which would be the most important ones and whether these would be on the scale needed. Further policy options put forward by experts and stakeholders were the revised Industrial Emissions Directive (IED), encouraging circularity and recycling, as well as an increase in the size and scope of Innovation Fund. One expert also mentioned the importance of a more holistic overall **regulatory framework**. Citing the experience from the power sector, it was argued that a set of detailed regulatory elements and complementary policies are necessary to allow for the transition to climate neutrality. To achieve this, a discussion of the detailed implementation of complementing instruments would be necessary (instead of ideological discussions on "ETS-only" versus "need for additional (complementing) instruments").

In terms of the international dimension, one expert stressed the need for an **EU-wide approach** on supporting the industrial transition to address a potential divergence between Member states, as opposed to the current state of play, where policies vary a lot nationally. Stakeholders also mentioned to consider **linking to other carbon markets to** avoid some of the challenges around double-counting with CBAM.

Figure 5-19 shows the number of stakeholder survey respondents who selected each of a number of predefined policy options to mitigate challenges that could arise from the issue 'increased ambition level for industry'. The most frequently selected options related to support for industrial decarbonisation. The highest priority option amongst stakeholder was 'greater funds and/or tax incentives to support industrial decarbonisation'. Closely following

this was 'creation of economic structures to increase the security of low carbon investments (e.g. carbon contracts for difference schemes)'.

Some other policy options selected by survey respondents which were not otherwise mentioned by expert or stakeholder interviewees were:

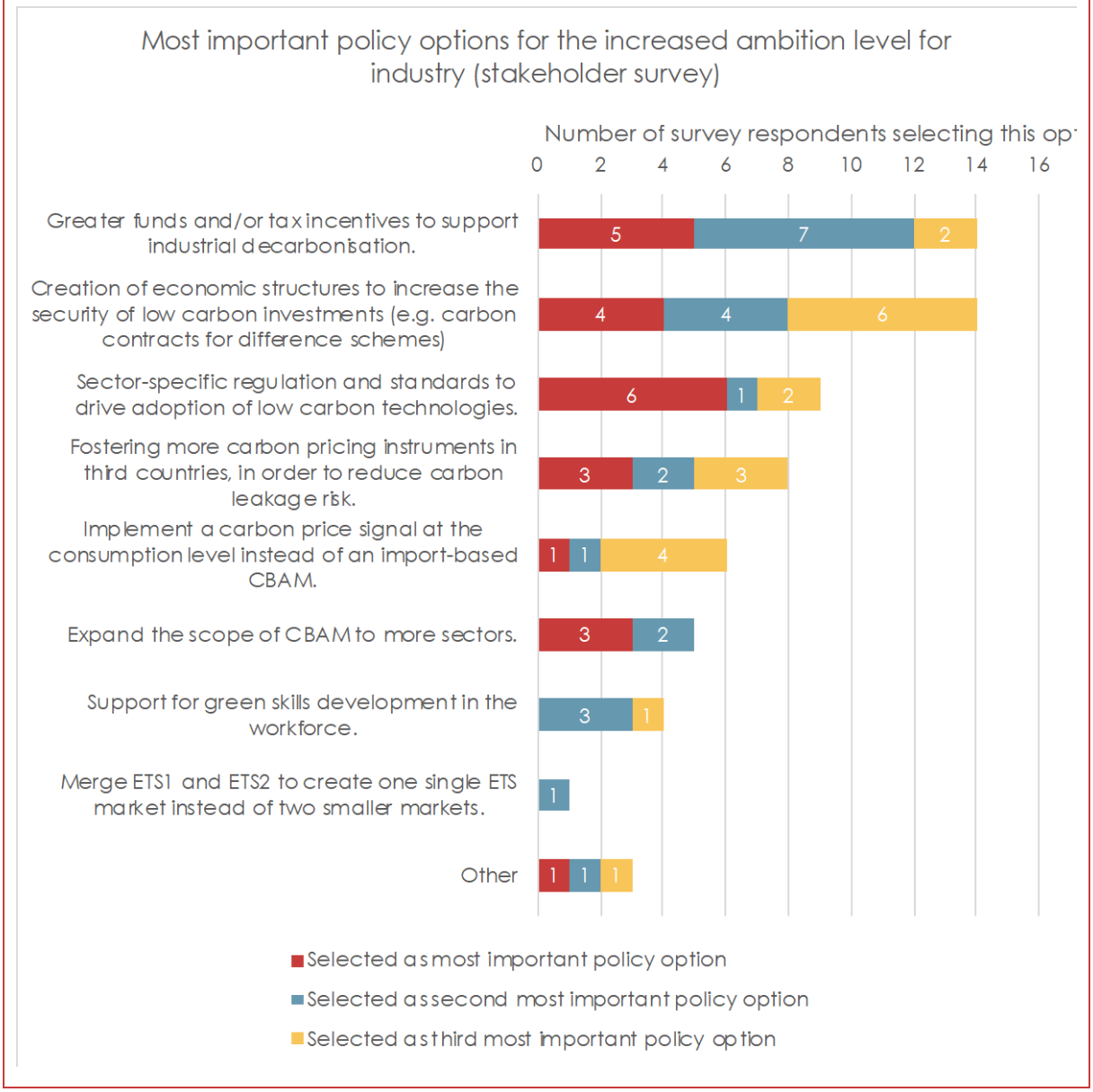
- Fostering more carbon price instruments in third countries, in order to reduce carbon leakage risk.
- Support for green skills development in the workforce.
- Merge ETS1 and ETS2 to create one single ETS market (only selected by one stakeholder).

There was some difference by organisation type in the policy option as selected as most important. NGO survey respondents were most likely to select 'sector specific regulation and standards to drive the adoption of low carbon technologies'. Businesses were most likely to select 'creation of economic structures to increase the security of low carbon investments (e.g. carbon contracts for difference schemes)'. Trade associations were most likely to select 'greater funds and/or tax incentives to support industrial decarbonisation'.

Some survey respondents made some specific individual suggestions:

- A trade association argued for a distinction to be made for process emissions because CO_2 captured from process emissions can reduce reliance on fossil fuels in many applications.
- Anti-circumvention measures for CBAM (G).
- It is suggested the CBAM proposal for imported products is extended with a solution for low-carbon exports, based on objective criteria (i.e. product benchmarks) to drive EU producers to reduce the carbon footprint of all their products, independently of whether they are consumed domestically or exported. (J)

Figure 5-19 Ranking policy options related to an Increased ambition level for industry



Survey question: *Which of the following policy options do you think are most important to mitigate challenges and/or support opportunities that could arise from this issue/development [Increased ambition level for industry] in the 2030-2040 period? Please select up to three policy options and rank them in order of importance (n=18).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

5.6 International dimension

Table 5-5 International dimension: Key challenges and policy options identified in the interviews

	Key challenges	Key policy options
Expert interviews	**International linking:** • Varying structural features of ETS systems • Gradual integration of neighbouring countries through linking **Aviation & maritime shipping:** • Global schemes for aviation and maritime shipping should not undermine the stringency of the EU ETS1	**International linking:** • Address structural differences (e.g. MSR design) • Linking via allowance exchange rate **Aviation & maritime shipping:** • -
Stakeholder interviews	**International linking:** • - **Aviation:** • CORSIA: Lack of ambition and uncertainty about reliability of credits (limited environmental integrity) • Factor in non-CO_2 effects • Carbon leakage risk **Maritime shipping:** • Limited coverage of emissions • Low price elasticity of demand • Carbon leakage	**International linking:** • - **Aviation:** • Apply EU ETS1 pricing also for extra-EU flights • Strengthening CORSIA system (no direct authority for EU) **Maritime shipping:** • Extension of emission coverage (smaller ships, full coverage of extra-EU voyages) • Cover black carbon emissions • Continue periodic review of developments at IMO level • Use revenues for innovation in shipping, fuels, support ocean biodiversity

International issues for the EU ETS include the potential impacts of linking the EU ETS to other emission trading systems, developments under the UNFCCC and the Paris Agreement, and developments concerning international aviation (UNFCCC and ICAO) and the maritime sector (UNFCCC and IMO). The updated ETS Directive foresees an analysis of potential linkages, as well as a review of the EU ETS Directive considering international developments and efforts under the Paris Agreement.

In the expert interviews, linking with other carbon markets was discussed by one expert as a main priority and by several other experts in interaction with other issues. None of the expert interviews discussed the interaction with aviation and maritime shipping. In contrast, some of the stakeholders discussed the interaction with aviation and maritime transport due to their background, but not international linking with ETS markets in other jurisdictions.

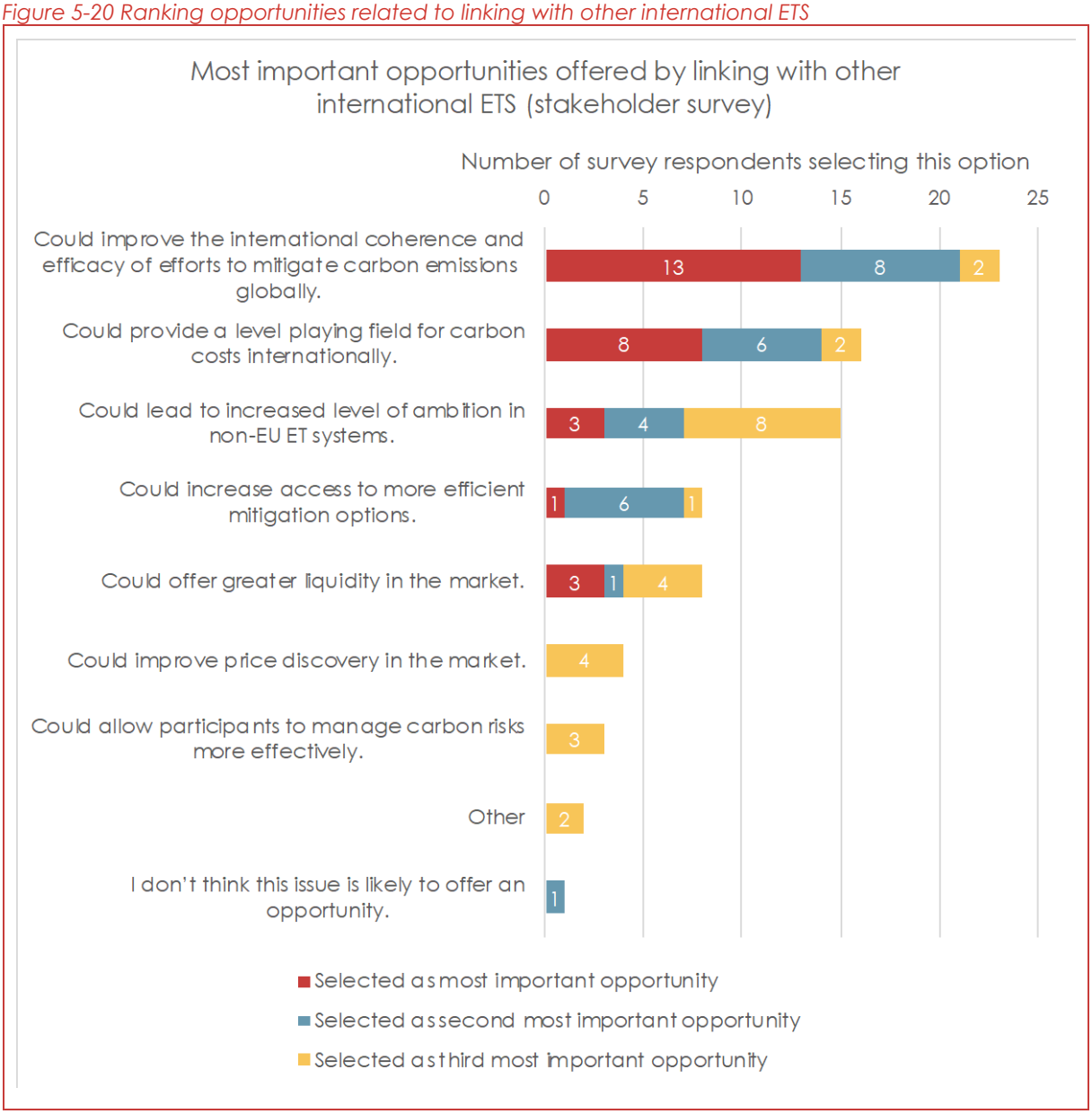
5.6.1 EU ETS vis-á-vis international carbon pricing systems (including international linking)

Regarding international linking between the EU ETS and other extra-EU ETS markets, the experts mentioned at a high level that linking should always be considered an option and reviewed by the EU. At the same time, they also pointed out several difficulties related to international linking in practice.

'Potential linking of EU emissions trading with other international emissions trading schemes' was selected by more than a third of stakeholder survey respondents (38%, n=44) as one of the top three most relevant issues relating to the EU ETS framework 2030-2040 (see Figure 5-2).

Respondents from all organisation types and across a wide range of sectors selected this issue as important, but relatively few NGOs (n=2) selected it. Most of those (8 out of 10) who answered follow up questions on this issue anticipated that this issue would have a positive impact upon the organisations or people they represent. Figure 5-20 shows the number of stakeholder survey respondents who selected specific predefined opportunities potentially offered by 'linking of EU ETS with other international emissions trading schemes' as their top three most important opportunities. The most frequently selected opportunity was 'could improve the international coherence and efficacy of efforts to mitigate carbon emissions globally'.

Figure 5-20 Ranking opportunities related to linking with other international ETS



Survey question: *What potential opportunities, if any, do you think this issue could offer during the 2030-2040 period? Please select up to three opportunities and rank them in order of importance. Please select up to three opportunities and rank them in order of importance (n=28).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

Key challenges

The key underlying challenge for linking the EU ETS and different ETS markets relates to different ETS design. This was reflected in the selection of this challenge most frequently by stakeholder survey respondents as shown in Figure 5-21. One expert argued that the main barrier for international linking were technicalities rather than political trust. ETS systems worldwide have **varying structural features** that prevent linking from being regarded as a realistic linking option at this stage. The coupling with nature-based carbon removals in the California ETS, as well as the different target setting in the Chinese ETS compared to the EU ETS1 are examples of varying market designs that complicate linking. At the same time, another interviewee identified the design of the MSR in the EU ETS1 as a quantity-based price control mechanism as a potential barrier, e.g. to a link to the California ETS, which follows a price-based price control mechanism.

A third expert pointed out that the only ETS that currently would provide a good interface for linking with the EU ETS was the UK ETS. The same expert also stressed that the EU should continue to develop solutions that would allow for **gradual integration of neighbouring countries** and linkage with the systems being developed in the neighbouring countries of the EU, i.e. Ukraine, Moldova, and the Western Balkans.

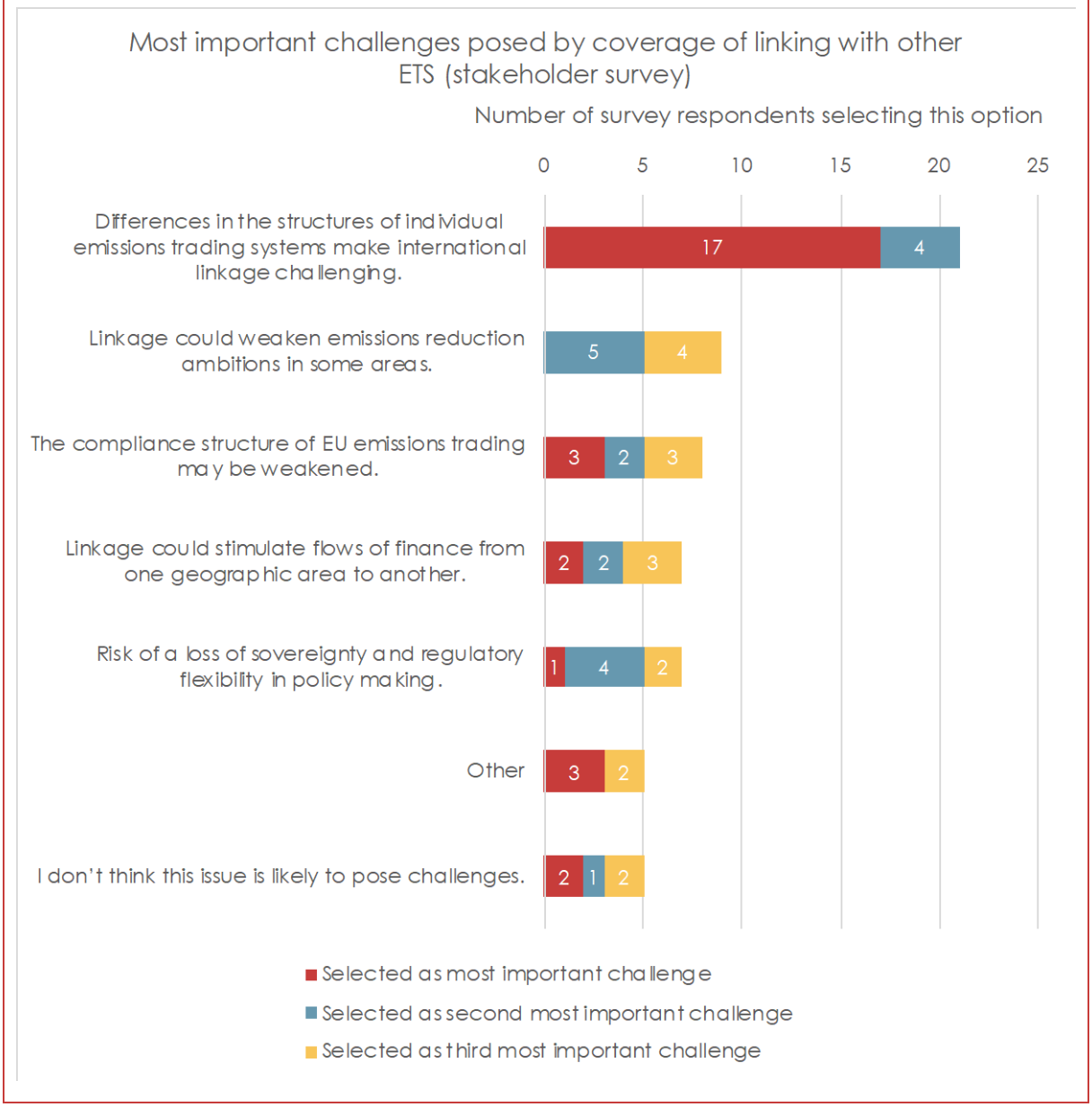
Another respondent felt that past literature has typically focused on full integration of the various ETS markets. Full integration requires program design to be aligned and administrative aspects to be synchronized. Therefore, full linkage is difficult to implement in practice. The challenge for the future should therefore be to explore how similar the initial conditions of the different ETS markets need to be in order to link them internationally. As an option to link without full integration the same expert proposed to explore options to link carbon markets via an exchange rate (see policy options below).

In addition to the aspects above, international linking was also mentioned in relation to other issues. This includes especially the introduction of CBAM, where one interviewee mentioned that CBAM might function as an accelerator for an international carbon price and thus also for linking of carbon markets. However, with regard to CBAM, other experts interviewed also mentioned that there is a risk that international partners will not accept CBAM. Focusing on the nexus with market stability, one expert felt that linking to other larger ETS markets (e.g., the Chinese ETS) would not provide much benefit if the other system, like the EU ETS, is already sufficiently large to not be subject to high price volatility. In relation to carbon removals, one expert briefly mentioned the possibility of integrating removal credits from third countries.

Stakeholder survey respondents selected some other pre-defined challenges as shown in Figure 5-21 including:

- Linkage could weaken emissions reduction ambitions in some areas.
- The compliance structure of EU emissions trading could be weakened.
- Linkage could stimulate flows of finance from one geographic area to another.
- Risk of a loss of sovereignty and regulatory flexibility in policy making.

Figure 5-21 Ranking challenges related to linking with other international ETS



Survey question: *What challenges, if any, do you think this issue 'Potential linking of EU emissions trading with other international emissions trading schemes' could pose during the 2030-2040 period? Please select up to three challenges and rank them in order of importance (n=28).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

Key policy options

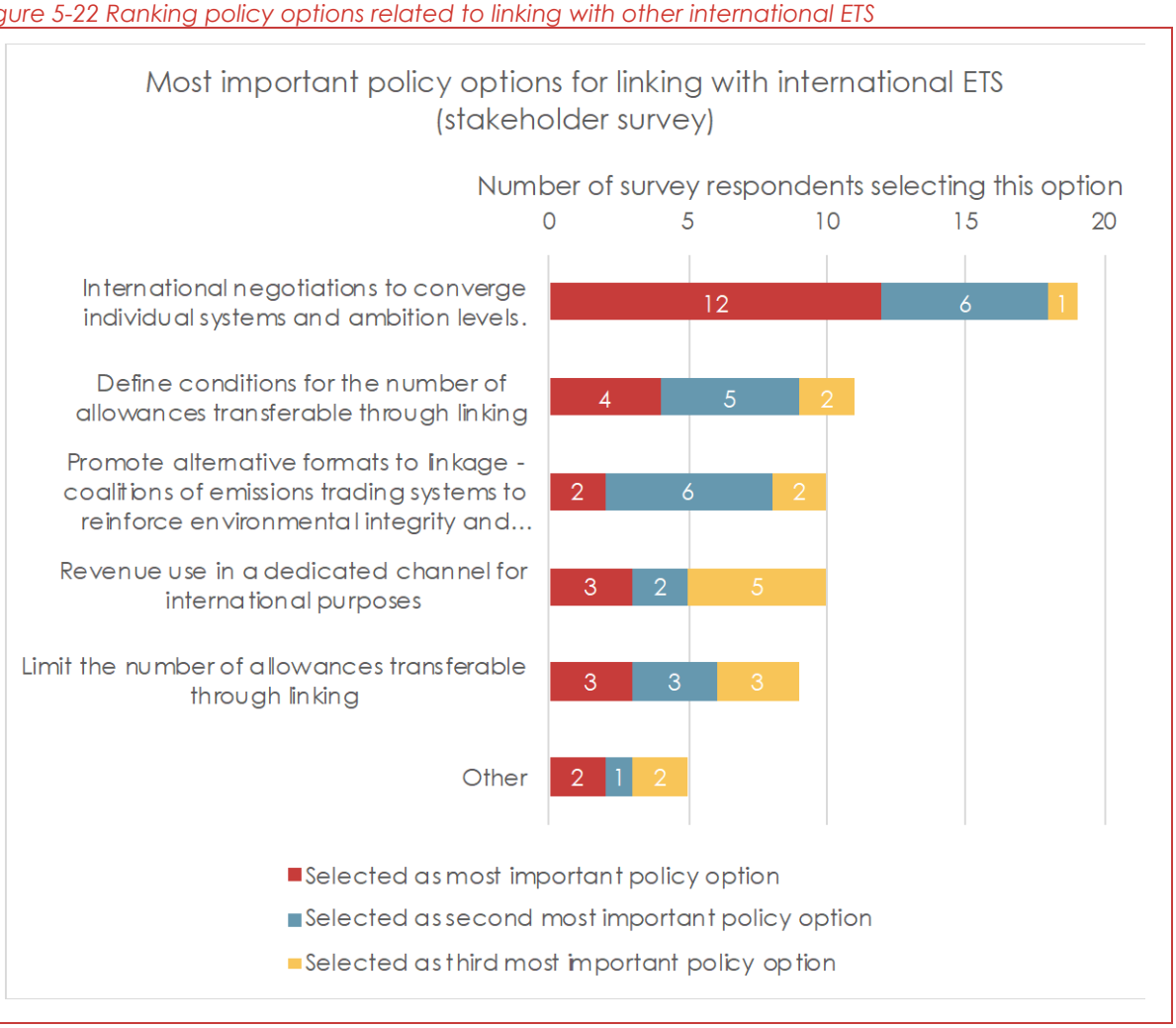
Policy options for international linking were only discussed by one expert explicitly. However, implicitly, **addressing varying structural features** (e.g., MSR design) between the EU ETS and other ETS markets would be an option if linking would be a high priority for the EU.

The expert, who discussed international linkage in detail, suggested moving away from the narrow perspective of full integration and instead also considering linking carbon markets with different design characteristics through an **allowance exchange rate**. The allowance exchange rate would be equal to the ratio of marginal costs or prices in the two ETS markets. The purpose of the link, according to the expert, could be to improve the environmental and

economic outcome (the same argument as for full integration), while avoiding the need to match the structural design of the systems perfectly. The exchange rate for allowances would be set in the politically plausible range between 1:1 trading (no difference in the face value of allowances from two systems) and the autarkic price ratio.

Figure 5-22 shows the number of stakeholder survey respondents who selected each of a number of predefined policy options to mitigate challenges that could arise from the issue 'linking EU emissions trading with other international emissions trading schemes'. The most frequently selected policy option was 'international negotiations to converage individual systems and ambition levels'. This responds to the key challenge identified by experts and stakeholders of the different designs of different emissions trading schemes.

Figure 5-22 Ranking policy options related to linking with other international ETS



Survey question: *Which of the following policy options do you think are most important to mitigate challenges and/or support opportunities that could arise from this issue/development [Linking EU emissions trading with other international emissions trading schemes] in the 2030-2040 period? Please select up to three policy options and rank them in order of importance. (n=26).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

5.6.2 *Future ETS coverage of aviation and the relationship with CORSIA*

The interplay between the EU ETS1 and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) as a market-based measure developed and adopted by the

International Civil Aviation Organisation (ICAO) was discussed in detail only in the stakeholder interviews. One of the expert interviewees mentioned that for both aviation and maritime shipping, it is vital that these schemes do **not undermine the stringency of the EU ETS1**.

Key challenges

Three stakeholders discussed opportunities and challenges around aviation. The inclusion of aviation is a key opportunity to curb aviation emissions for a sector where current international measures are not ambitious enough to meet international climate objectives. 'Coverage of aviation in the EU ETS' was selected by a about a fifth of stakeholder survey respondents (22%, n=26) as one of the top three most relevant issues relating to the EU ETS framework 2030-2040 (see Figure 5-2). A high proportion of these were NGOs (42%, n=10), with most of the rest being businesses or trade associations. Unsurprisingly, all five respondents from/representing/engaged with the aviation sector identified this issue as relevant. In terms of timing, most survey respondents (82%, n=9) thought coverage of aviation was already an issue.

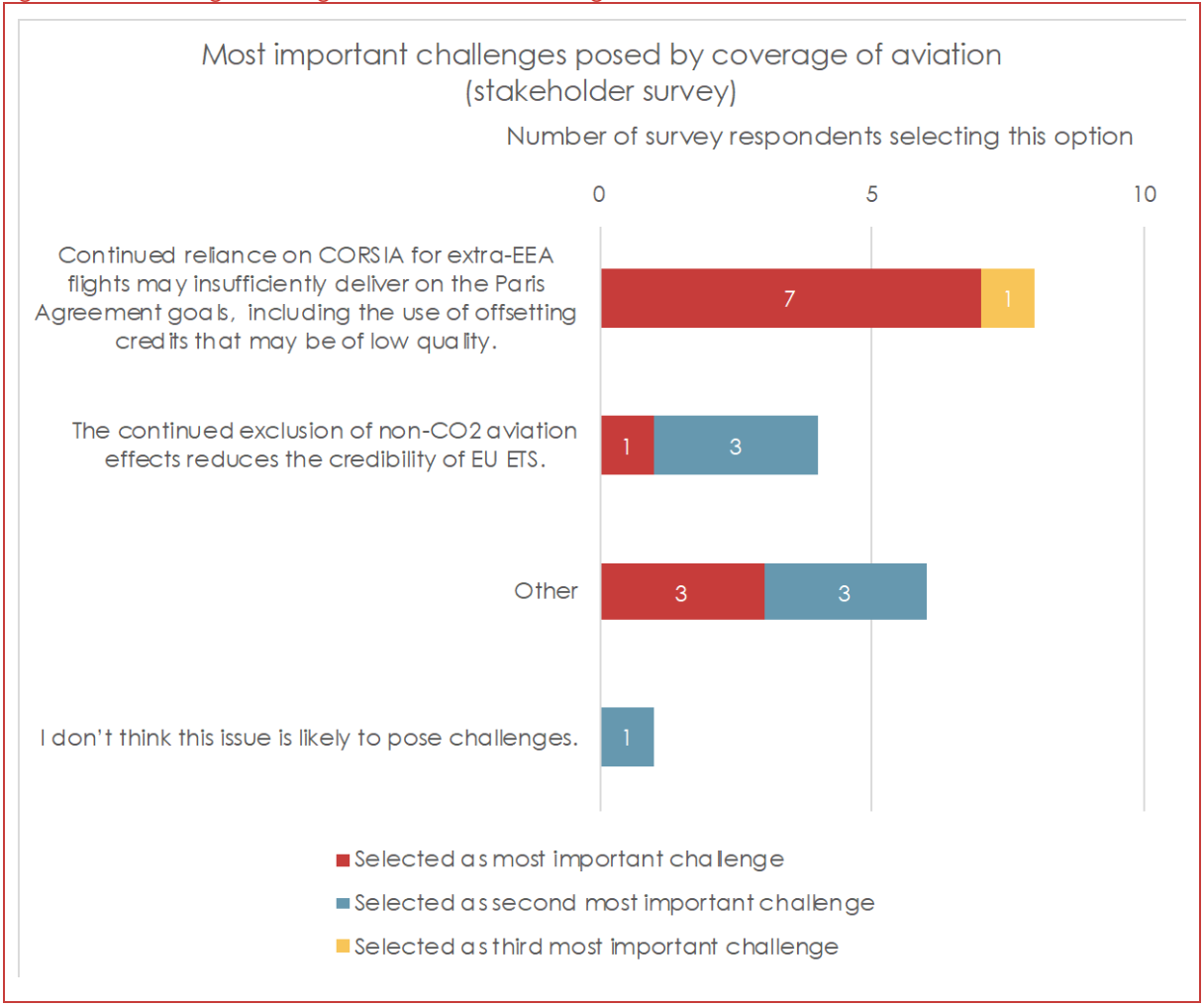
Three challenges were discussed. Firstly, stakeholder interviewees were concerned about carbon leakage, as fuelling flights outside the EU would be relatively easy (tankering). However, the EU has implemented **anti-tankering provisions in its ReFuelEU Aviation Initiative**.[71]

Secondly, the EU is currently relying on **CORSIA for reducing CO_2 emissions from extra-European flights**. This is perceived as being highly problematic due to CORSIA's reliance on offsetting credits, which were seen as being of low standard and uncertain permanence (i.e., limited environmental integrity). This was also identified most frequently as the most important challenge in terms of coverage of aviation in the EU ETS by stakeholder survey respondents (all NGOs except for one business) as shown in Figure 5-23. Particular issues with reliance on CORSIA were elaborated by some survey respondents:

- One NGO noted that an extension of the derogation for extra EEA flights would have the consequence of maintaining the average carbon price paid by major airlines at a low level.
- Another NGO noted that the new CORSIA baseline to calculate emission reduction has been set at 85% of the 2019 emissions level, therefore covering only 22% of emissions in 2030.
- Another NGO stated that CORSIA severely lacks ambition and does not have international support.

[71] The ReFuelEU Aviation regulation sets minimum obligations for all fuel suppliers to gradually increase the share of advanced biofuels and synthetic aviation fuels. It includes anti-tankering provisions, namely the obligation for aircraft operators to ensure that the yearly quantity of aviation fuel uplifted at a given EU airport is at least 90% of the yearly aviation fuel required (Regulation (EU) 2023/2405, with date of application 1 January 2025). The anti-tankering provisions are expected to almost entirely mitigate the risk of tankering and associated carbon leakage risks (T&E, 2022).

Figure 5-23 Ranking challenges related to a coverage of aviation



Survey question: *What challenges, if any, do you think this issue 'Coverage of aviation' could pose during the 2030-2040 period? (n=11).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

Thirdly, challenges around the **non-CO_2 effects from aviation** (e.g. ozone production or contrail cirrus formation, effects in double magnitude to CO_2-related effects) were discussed by stakeholder interviewees. Some NGO stakeholder survey respondents (n=4) also identified this as a challenge (see Figure 5-23). One NGO noted that these emissions are responsible for two thirds of aviation's climate impact. One NGO stakeholder survey respondent noted a specific challenge within this to develop a reporting mechanism rooted in a methodology shared by all stakeholders of the aviation sector that will ensure transparency of the reporting and ensure that the data reflect the actual warming impact of these emissions. The Commission is working with European Union Aviation Safety Agency (EASA) on a project financed by the European Parliament, which explores the possibility of setting up a European body for jet fuel standards that can also limit certain components in aviation fuel that are judged to contribute to non-CO_2 impacts (aromatics etc.).

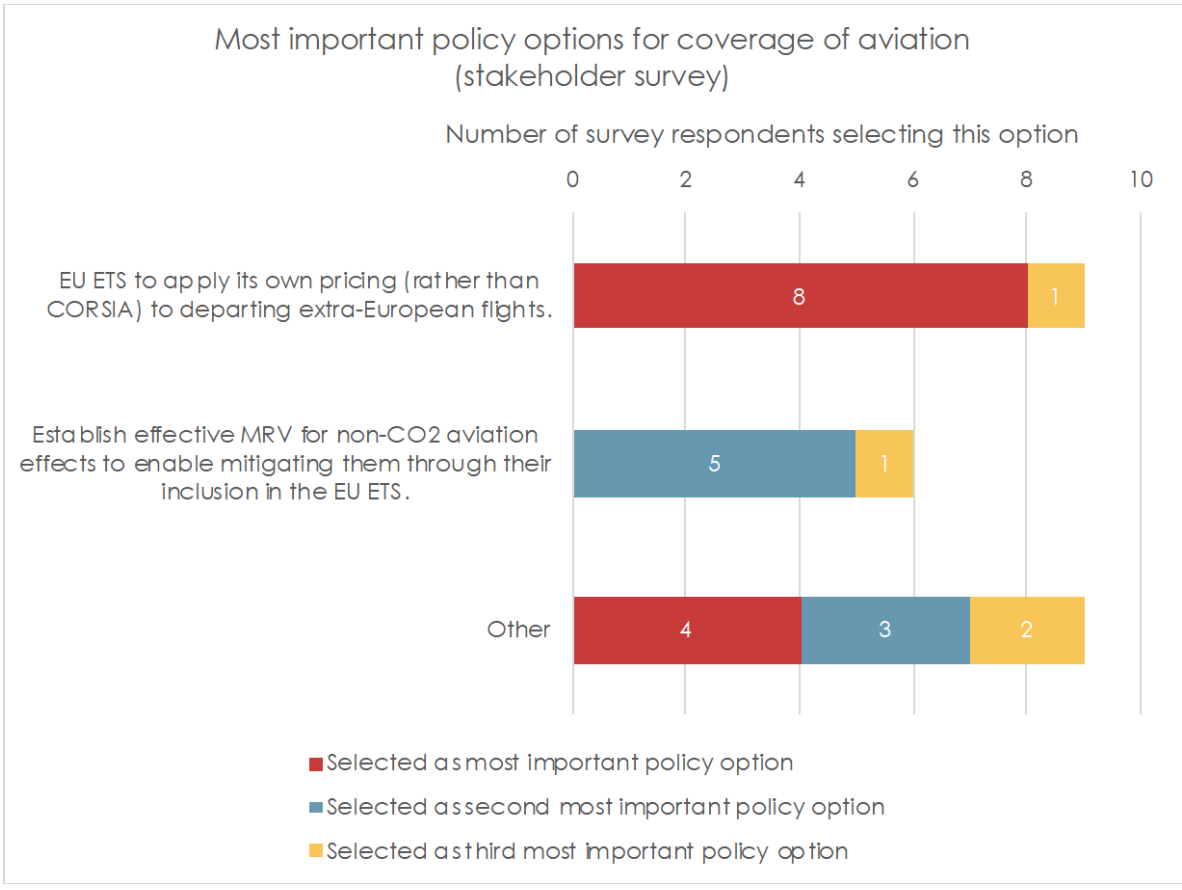
Key policy options

While stakeholder interviewees agreed that there should be an **international approach to address emissions from aviation and carbon leakage**, there were differing expectations. Two stakeholders (out of 14 interviewees) preferred supplementing CORSIA for **extra-European flights** and applying a **separate pricing tied to the EU ETS1** (first for all flights departing from the

EU, followed by an application to all flights). It was suggested this revenue could be used for the Innovation Fund which could support the development of clean technologies for aviation and fuels. The third stakeholder preferred **strengthening the existing CORSIA system** to avoid competitive challenges for European companies.

Stakeholder survey respondents (n=7) most frequently selected 'EU ETS to apply its own pricing (rather than CORSIA) to departing extra-EEA flights' as the most important policy option as shown in Figure 5-24. These respondents were predominantly NGOs (n=5) but also included two businesses (one in aviation and one in negative emissions including CCU). One NGO stakeholder survey respondent made points that leaving CORSIA could be a sign of international leadership on carbon pricing. It could also generally create international momentum towards regional carbon pricing policies and move away from CORSIA. However, in contrast, two airline survey respondents made specific comments that CORSIA should be prioritised.

Figure 5-24 Ranking policy options related to a coverage of aviation



Survey question: *Which of the following policy options do you think are most important to mitigate challenges and/or support opportunities that could arise from this issue/development [Coverage of aviation in the EU ETS] in the 2030-2040 period? (n=12).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

A final suggestion by stakeholder interviewees was to **price non-CO_2 warming effects under the EU ETS** after the MRV for non-CO_2 effects (such as nitrogen oxides and contrails) is established. This was also selected as the second most important policy option by stakeholder survey respondents (see Figure 5-24). One NGO stakeholder survey respondent made a specific

argument that the inclusion of non-CO_2 in the ETS at a later stage should strive to convert the reported data into a CO_2 equivalent reflecting the non- CO_2 climate warming effect and lead to effective pricing and mitigation. They argued it should occur with 100% auctioning and full pricing from the onset.

Other specific suggestions from stakeholder survey respondents were:

- One NGO argued for a cap to the interoperability between the general EU ETS and ETS aviation which currently allows operators to purchase allowances for their excess CO_2 emissions on the general ETS.
- One NGO suggested the Commission could also consider operating additional rebasing of total allowances on the ETS aviation and the general EU ETS.
- One NGO argued that the EU ETS insufficiently promotes the use of the most sustainable aviation fuels. Presently, all sustainable aviation fuels and biofuels receive a zero-emission factor under the MRV regulation, indirectly subsidising operators regardless of the kind of biofuels they use in terms of origin, type and feedstock. They argued the ETS should be reformed to apply differentiated percentages and reward utilisation of the most sustainable fuels such as synthetic kerosene.

5.6.3 Linkage with any future international maritime shipping offsetting scheme

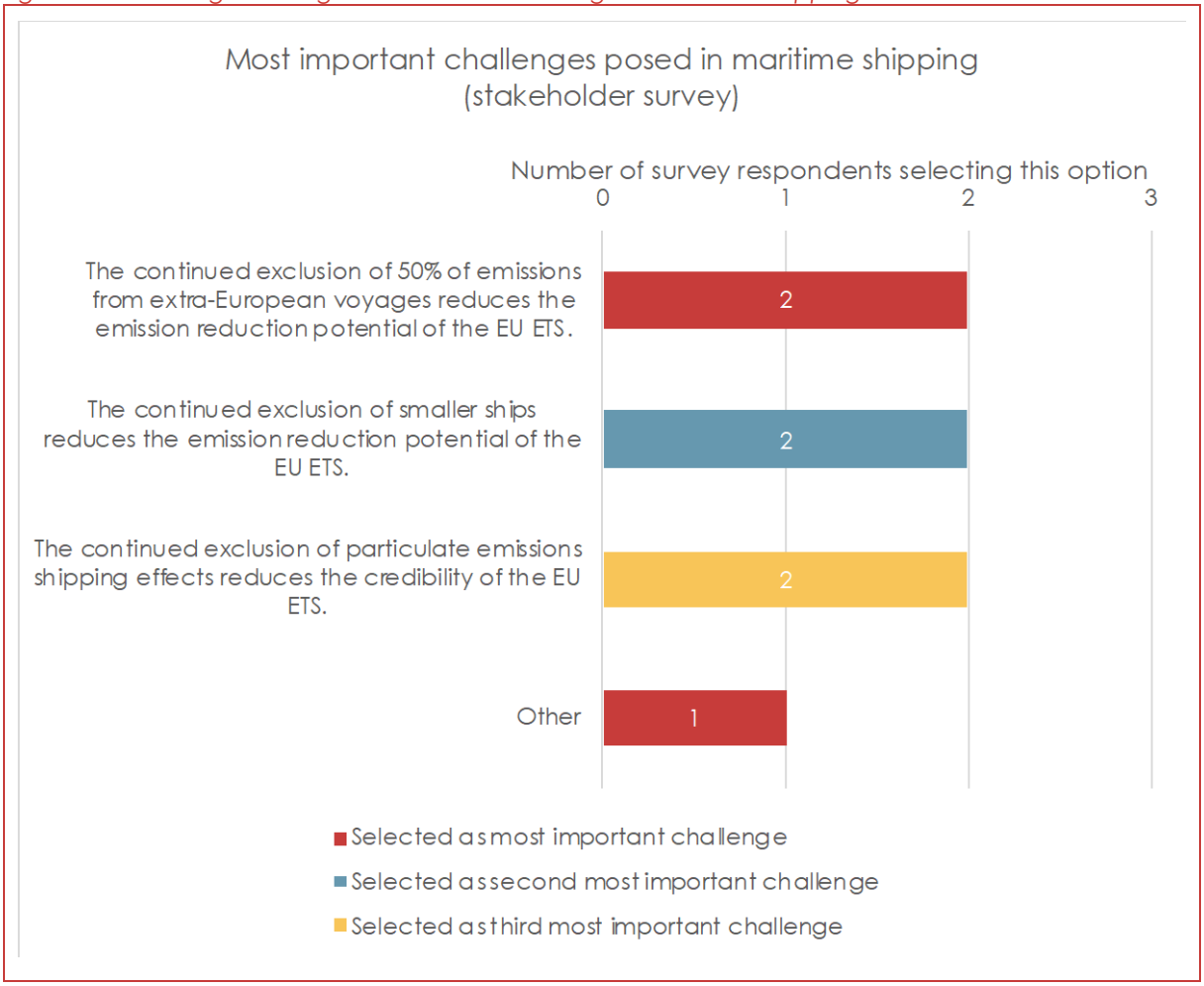
Three interviewees discussed challenges and opportunities associated with linking the EU ETS with any future international maritime shipping offsetting scheme. 'Coverage of maritime shipping in the EU ETS' was selected by a small minority of stakeholder survey respondents (10%, n=12) as one of the top three most relevant issues relating to the EU ETS framework 2030-2040 (see Figure 5-2). These included a mix of organisation types: trade associations (n=6); businesses (n=2); NGOs (n=2); and two were unspecified. Two of these respondents represented logistics and two represented road transport but others covered a range of sectors including cement (n=2), ceramics (n=1) and paper/pulp/cardboard (1). Of four respondents who answered follow up questions about coverage of maritime transport in the EU ETS, two thought this issue would be relevant pre-2030, one in 2030-2035, and one post 2040.

Key challenges

Stakeholder interviewees from the group of NGOs acknowledged that the inclusion of shipping emissions is a good step forward. However, they viewed the **limited coverage of emissions** as a challenge. This was also identified as a challenge by stakeholder survey respondents[72] in specific ways as shown in Figure 5-25. The most important challenge of this type identified by survey respondents was the continued exclusion of 50% of extra-European voyages. This was followed by the exclusion of smaller ships, and then finally the exclusion of particulate emissions. One business stakeholder also noted a particular challenge in extending emissions trading to maritime transport that it appears to burden Finland particularly compared to other EU countries, as Finland's exports rely heavily on maritime transport. In addition, this stakeholder noted that the ETS creates a disadvantage on ships designed for northern icy conditions.

[72] Three stakeholder survey respondents (a business, a logistics trade organisation and one unspecified organisation type) answered follow up questions on maritime shipping.

Figure 5-25 Ranking challenges related to a coverage of maritime shipping



Survey question: *What challenges, if any, do you think this issue 'Coverage of maritime shipping in the EU ETS' could pose during the 2030-2040 period? (n=3)*. Source: Technopolis Group, PIK & E3-Modelling, 2023.

A further challenge that was identified by the stakeholders was the **low price elasticity of demand for international shipping activities**. Thus, pricing international shipping together with other types of emissions in EU ETS1 would likely only have a limited direct effect on shipping emissions.

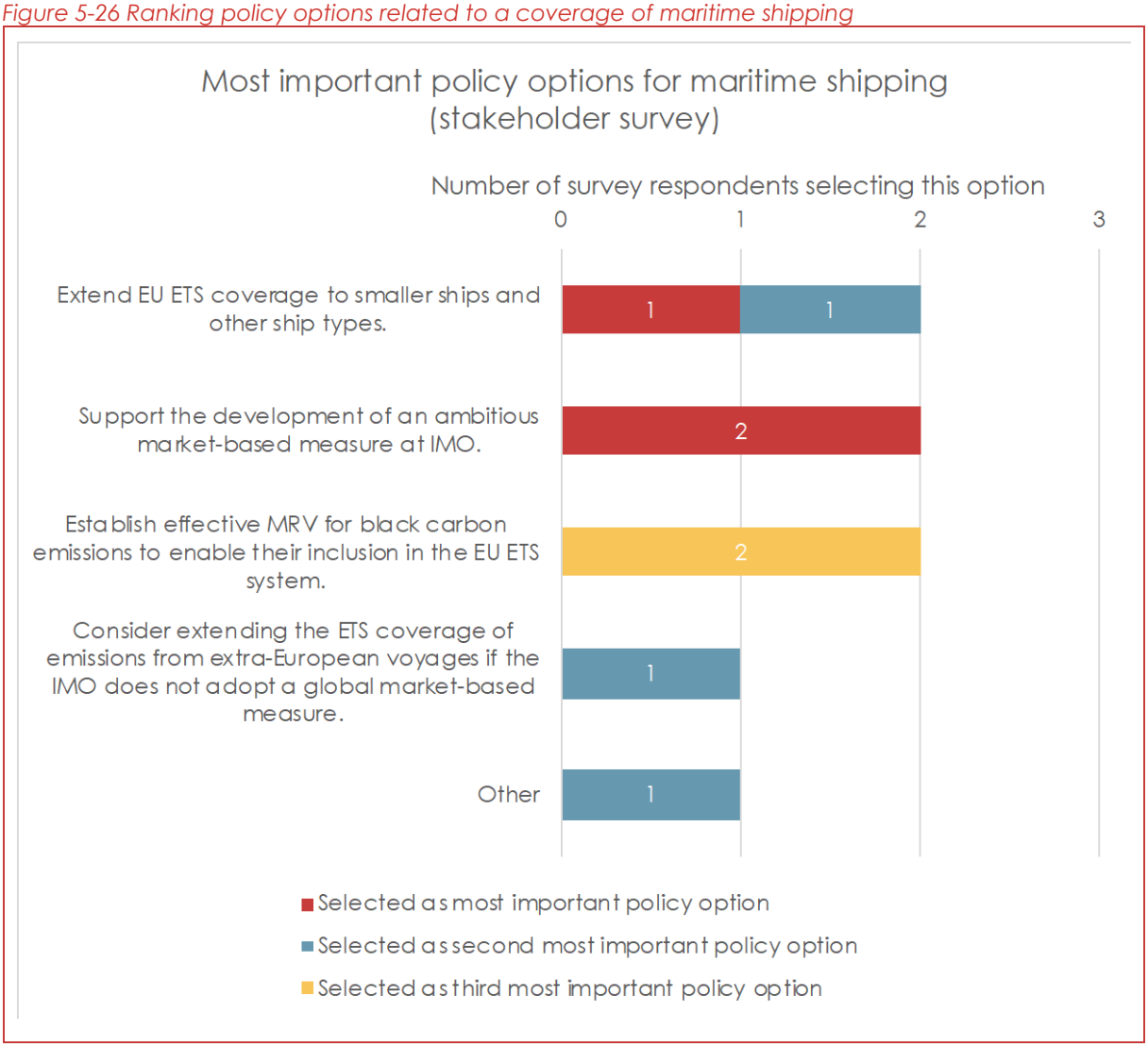
The risk of **carbon leakage** was cited as another challenge, as shipping companies could refuel their vessels outside the EU. Accordingly, from the perspective of industry stakeholders, a **global approach** would have been the better option. On the other hand, they also acknowledged that a global approach probably would not be ready by 2030 and that there is a need for ambitious reductions in emissions. Carbon pricing should not simply become another surcharge to be passed on to customers without real change in the behaviour of shipping companies.

Key policy options

To address the limited coverage of emissions, stakeholder interviewees advocated for a **more stringent incorporation of shipping emissions in the EU ETS1**, by proposing the inclusion of smaller ships in the scope of the EU ETS1 (currently limited to those above 5,000 gross tonnage, MRV for general and offshore ships with 400-5,000 gross tonnage starting in 2025). Furthermore, they also called for **covering all emissions associated with voyages to and from Europe** (under the current rules coverage will be limited to 50%). These policy options were also identified as

important by the small number of stakeholder survey respondents (n=3, a trade association, a business and an unspecified organisation type) who answered follow up questions on maritime shipping as shown in Figure 5-26. However, the first preference of two survey respondents from/representing/engaged with the logistics sector was to support the development of an ambitious market-based measure at IMO.

Figure 5-26 Ranking policy options related to a coverage of maritime shipping



Survey question: *Which of the following policy options do you think are most important to mitigate challenges and/or support opportunities that could arise from this issue/development [Coverage of maritime shipping in the EU ETS] in the 2030-2040 period? (n=3)*. Source: Technopolis Group, PIK & E3-Modelling, 2023.

In addition, stakeholder interviewees emphasise the possibility of **including black carbon emissions from shipping** in the EU ETS. The global warming potential (GWP) of black carbon emissions from shipping, especially over a shorter period of time such as 20 years instead of the default measure of 100 years, would better reflect the significant short-term warming impacts of shipping emissions. This was also identified as an important policy option by two stakeholder survey respondents (Figure 5-26).

Stakeholders also mentioned the **periodic review of the EU ETS** regarding international developments as an important feature to revise the system in case an ambitious international system by the IMO would be agreed.

In terms of **revenue use**, it was mentioned that revenue support for freight shipping companies is still necessary for research and innovation (alternative fuels, cleaner ships, infrastructure). Additionally, ETS revenues could also be used to e.g. supporting biodiversity in the ocean.

5.7 Scope of covered emissions and linking of EU ETS1 with EU ETS2

Table 5-6 Scope of covered emissions and linking of EU ETS1 with EU ETS2: Key challenges and policy options identified in the interviews

	Key challenges	Key policy options
Expert interviews	**Linking of EU ETS1 with EU ETS2:** • Separate systems: Lack of economic efficiency • Separate systems: Smaller more volatile systems • Linking: Differences in marginal abatement costs • Linking: Asymmetry of actors on the market (challenges in price formation) **Agricultural emissions:** • Emissions in agriculture need to be addressed (argument in favour of inclusion) • Carbon pricing for agricultural emissions might risk competitiveness of EU agricultural sector and social acceptance (increased food prices)	**Linking of EU ETS1 with EU ETS2:** • Instrument to create price convergence • Limited linking (e.g., one-way linking) as an alternative to full integration **Agricultural emissions:** • -
Stakeholder interviews	**Linking of EU ETS1 with EU ETS2:** • - **Agricultural emissions:** • (Not specific)	**Linking of EU ETS1 with EU ETS2:** • - **Agricultural emissions:** • -

Linking of EU ETS1 with EU ETS2

Of the 17 experts interviewed, seven identified linking EU ETS1 and EU ETS2 as a key issue for the EU ETS post-2030 and discussed it in the interviews. Of the seven experts, six were clearly in favour of linking EU ETS1 and EU ETS2 in the medium to long run. The other interviewee was also in favour to consider linking, but more prominently mentioned the option of limited linking (e.g., one-way linking).

The starting point for respondents to consider linking EU ETS1 and EU ETS2 is the agreement to introduce EU ETS2 for buildings and road transport as part of the recent revision of the EU ETS Directive. Given the novelty of this decision, there has been little targeted research on the linking possibilities of EU ETS1 and EU ETS2, so compared to the presentation in the expert interviews, the topic is discussed less prominently in the literature review above.

Key challenges

Challenges arising without linking

There are two main lines of argumentation put forward by the experts interviewed as a rationale for linking EU ETS1 and EU ETS2 in the post-2030 period. Both lines of argument also pose a challenge to the EU ETS as a whole. The first argument is the **equalisation of marginal**

abatement costs. The overall EU ETS system should aim to have a uniform price at some point in the future to ensure **economic efficiency**. Keeping EU ETS1 and EU ETS2 running in parallel could lead to different carbon prices, indicating that the most cost-effective abatement path would not be taken, which would imply higher costs for society. Of the seven experts interviewed who discussed linking EU ETS1 and EU ETS2, five made this argument.

The second challenge relates to the size of the EU ETS systems and is linked to market stability. This argument was raised by three of the seven experts. Small ETS systems are **more volatile**. Due to the decreasing cap in both systems, the number of allowances available might become too low at some point in the future to create efficient markets. This is especially true for EU ETS1, where the cap is expected to approach zero around 2040 and thus earlier than for ETS2. Linking EU ETS1 and EU ETS2 would mitigate this effect by **creating a single larger market**. One of the three experts also pointed out that signs of inefficient markets and a shortage of allowances would already become visible 5-7 years before a market expires. This means that the issue would become very relevant in the 2030s.

Challenges for linking EU ETS1 and EU ETS2

While there are challenges related to the lack of linking between the two EU ETS systems, the path to linking is also associated with challenges. Overall, the experts were clearly in favour of linking EU ETS1 and EU ETS2 in the medium to long run. Yet, they envision differing challenges that were in part also subject to discussion on how emissions trading for the buildings and road transport sector should be set up.

One of the experts mentioned that the marginal abatement costs diverged strongly between sectors and that it is therefore a good approach to start the extension of emissions trading to buildings and road transport in a separate system (EU ETS2). At the same time, the expert sees the challenge that persisting **differences in marginal abatement costs** will continue to make linking difficult in the future and that a convergence of abatement costs in the sectors is needed. Although potential cost savings increase with greater differences in abatement costs between systems[73], the expert expressed concern that linking systems with too large price discrepancies could create significant disruptions for the affected sectors.

Another challenge that was raised in one expert interview and also discussed briefly in one of the stakeholder interviews is the **asymmetry of the actors** in the EU ETS1 and the EU ETS2 market. The expert pointed out that the investment behaviour of households and industry differs and that there is a risk that households do not use their relatively favourable mitigation options (e.g., in the buildings sector) due to unobserved transaction costs and lack of information, which could lead to mitigation measures having to be implemented in the industrial sector instead. This was summarised by the expert as potential **challenges to effective price formation** in a linked EU ETS market. Similarly, another expert raised the issue that there is concern from industry actors that linking EU ETS1 and EU ETS2 may lead to higher price pressure in the EU ETS1 sectors.

Besides these challenges, two experts also focused on further benefits associated with linking EU ETS1 and EU ETS2. The first expert mentioned two aspects, namely the greater **simplicity of the system** and that **international linking** would be complicated by having multiple carbon markets in the EU. The second expert mentioned that linking would help maintaining the EU ETS, and carbon pricing more broadly, as the EU's **main emissions reduction instrument** also in the medium to long run future.

[73] See for example Verde et al. (2020): Linking Emissions Trading Systems with Different Levels of Environmental Ambition, https://cadmus.eui.eu/bitstream/handle/1814/69141/PB_2020_40_FSR.pdf?sequence=1&isAllowed=y.

Key policy options

As linking EU-ETS1 and EU-ETS2 can be considered a policy option in itself, the focus of the interviews was less on the policy options. Several interviewees mentioned that the linkage would require **price convergence** between the two systems. However, most experts shared detailed views on how this could be implemented in practice. However, one expert mentioned that the use of a price corridor in both systems could be an option to bridge price differences., with the price corridors partially overlapping at a certain point in time when the linkage is planned, Another expert pointed out that an option to be considered for linking EU ETS1 and EU ETS2 could also be a **limited linking** (e.g., one-way linking and not full integration).

Several experts however mentioned insights regarding timing. One expert said that the linking of EU ETS1 and EU ETS2 should ideally take place from **EU ETS Phase V (after 2030)**. Three other interviewees, on the other hand, were of the opinion that linking should already be considered in the next ETS review cycle to prepare the measure in good time and to inform the market, but should only be implemented in practice in the **mid-2030s**. Arguments in favour of this timeline were the time needed for price convergence and the ability to collect sufficient knowledge about EU ETS2 and the behaviour of the market before linking.

Scope of covered emissions (Agricultural emissions)

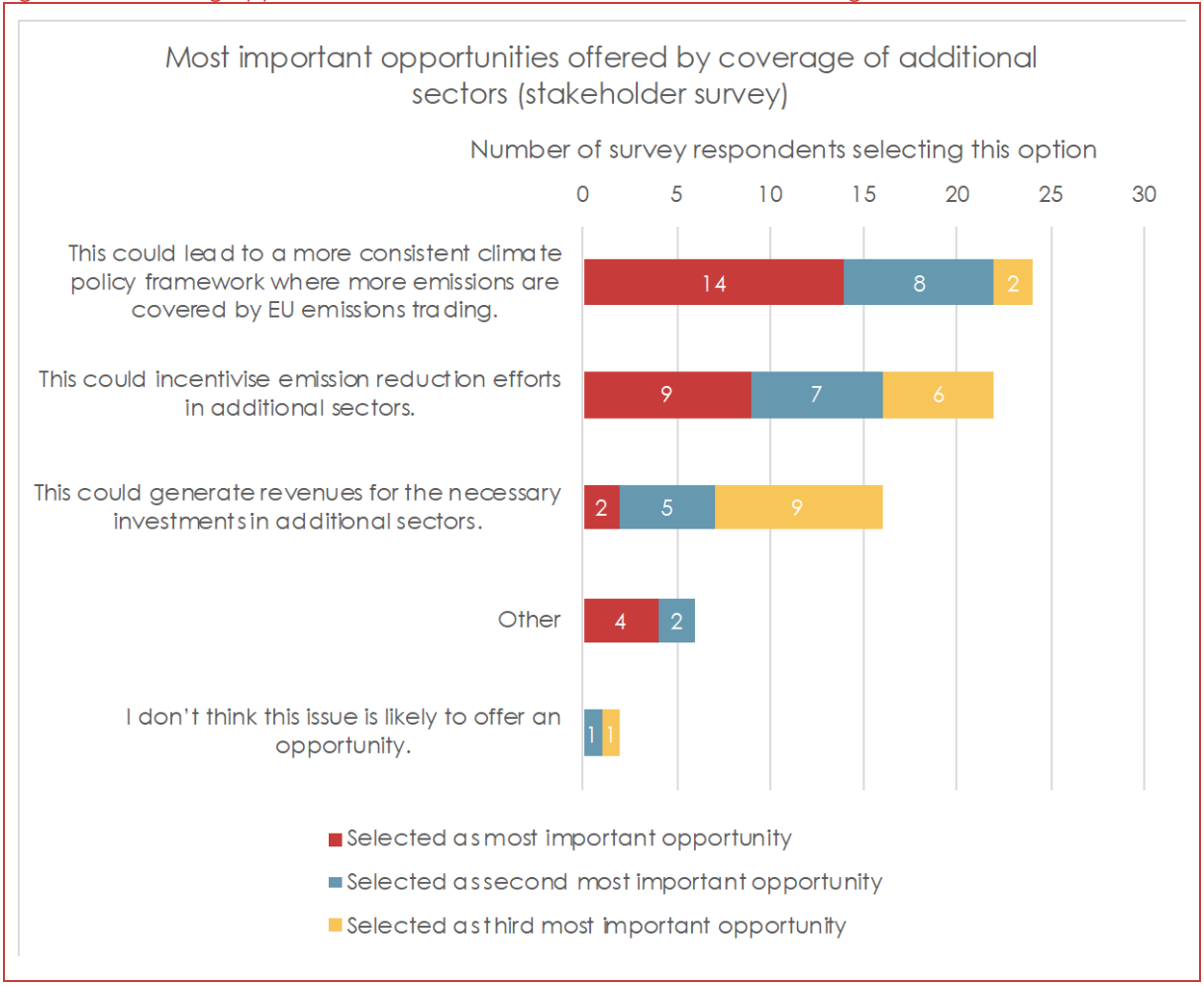
The issue of expanding the scope of emissions covered by EU emissions trading was not one of the top priorities for most of the experts and stakeholders interviewed. It was discussed by a comparatively small number two experts and mentioned only briefly in two stakeholder interviews. The discussions in the interviews focused on the potential inclusion of **agricultural emissions** in the EU ETS. So far, agricultural emissions are not included in the EU ETS. Agricultural emissions fall under the scope of the Effort Sharing Regulation (ESR) and complementary measures to incentivize emission abatement from agricultural soils and livestock are governed mainly by the EU's Common Agricultural Policy (CAP).

About a third of stakeholder survey respondents (32%, n=37) selected 'Potential expansion of EU emissions trading to sectors not covered (for example, agricultural emissions or landfill emissions)' as one of the top three most relevant issues relating to the EU ETS framework 2030-2040 (see Figure 5-2). This was selected by all organisation types but with a higher proportion of businesses from across a wide range of sectors (not specifically waste or agriculture) than other organisation types. Of those who answered a question (n=7) on the anticipated impact this would have on the people or organisations they represented, most (n=5 trade associations) thought this would be positive, with only two (1 trade association, 1 consumer representative body) who thought this would be negative. The timing at which respondents thought this issue would be relevant varied.

Stakeholder survey respondents selected the most important opportunities offered by potential expansion to sectors not covered as shown in Figure 5-27. The most frequently selected opportunity was for 'a more consistent climate policy framework', closely followed by 'this could incentivise emission reduction efforts in additional sectors'. One stakeholder survey respondent made a specific argument that: the expansion of the EU ETS to additional sectors should rely on a comprehensive assessment of costs and benefits, considering all interlinked EU targets in climate, energy, and environmental policies (i.e. environmental services, circular economy, waste management, landfill reduction, etc), while targeting high-emissions sectors.

One waste sector trade association stakeholder survey respondent commented that they did not see any challenges in including landfill emissions in the EU ETS and that experience in other countries has shown that this is an effective way of limiting excessive landfilling.

Figure 5-27 Ranking opportunities related to an increased sectoral coverage of the EU ETS



Survey question: *What potential opportunities, if any, do you think this issue could offer during the 2030-2040 period? Please select up to three opportunities and rank them in order of importance. (n=29).* Source: Technopolis Group, PIK & E3-Modelling, 2023.

Key challenges

The two experts who discussed the issue of including agricultural emissions in the EU ETS system took **opposite positions**. One expert was in favour of including agricultural emissions in the EU ETS, the other expert was against an inclusion of agricultural emissions. The argument of the expert in favour of inclusion mainly related to the **volume of emissions** associated with agricultural emissions. With the introduction of EU-ETS2 for emissions from buildings and road transport, the expert argued that agricultural emissions would be the logical next step to expand the system. Moreover, agricultural emissions have a large enough emissions volume to be considered relevant for inclusion. The second expert, on the other hand, sees multiple challenges associated with the inclusion of emissions from agriculture and therefore argued against it. The arguments included that carbon pricing for agricultural emissions would lead to a **reduction in the competitiveness** of the EU agricultural sector and run counter to the logic of the EU CAP. Furthermore, the expert saw the risk of the ETS system losing **social acceptance** due to rising food prices as one of the biggest challenges related to the inclusion of agricultural emissions.

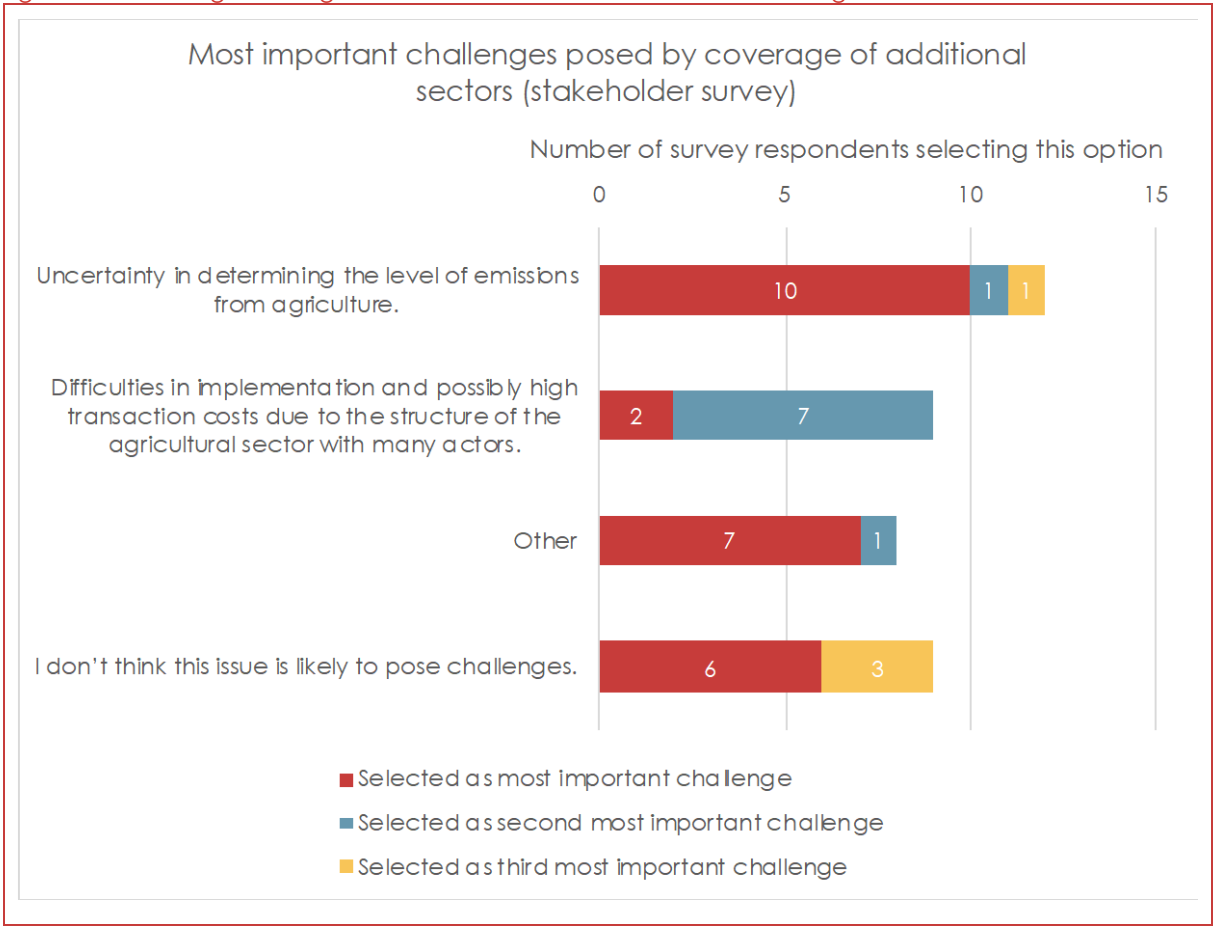
The two stakeholder interviewees that mentioned the scope of emissions in their interviews also related to the consideration of agricultural emissions. One NGO stakeholder interviewee

mentioned that they would like to see exploration of the possibility of including non-CO_2 emissions in the ETS. A stakeholder survey respondent (trade association) also commented on this and said that in addition to market-based approaches, other effective mechanisms and policy instruments could be considered in a first phase, such as the European Methane Regulation. The other stakeholder mentioned that if the ETS should be expanded to include agriculture, there would need to be sector-specific policies to promote the restoration of biodiversity.

Stakeholder survey respondents selected two important challenges for extending the EU ETS to agriculture as shown in Figure 5-28:

- Uncertainty in determining the level of emissions from agriculture.
- Difficulties in implementation and possibly high transaction costs due to the structure of the agricultural sector with many actors.

Figure 5-28 Ranking challenges related to an increased sectoral coverage of the EU ETS



Survey question: *What challenges, if any, do you think this issue 'Potential expansion of EU emissions trading to sectors not covered (for example, agricultural emissions or landfill emissions' could pose during the 2030-2040 period? Please select up to three challenges and rank them in order of importance. (n=25).*
Source: Technopolis Group, PIK & E3-Modelling, 2023.

Key policy options

Due to the limited discussion of the topic in the interviews, no policy options were discussed. Only the expert interviewee who spoke out against the inclusion of agricultural emissions in the EU ETS system argued that any instrument introduced to drive down agricultural emissions

should be complemented by redistributive policies and a completely revised EU's Common Agricultural Policy. However, these options fall outside the system boundaries of the EU ETS as a policy instrument.

In the stakeholder survey, respondents were asked to select their most important policy options in relation to 'Potential expansion of EU emissions trading to sectors not covered (for example, agricultural emissions or landfill emissions'. The two predefined options given were: integrate further emissions into an existing ETS' or 'create separate ETS for further sectors'. The overall preference was to 'integrate further emissions into an existing ETS' with no clear distinctions by stakeholder type.

5.8 Role of financial actors

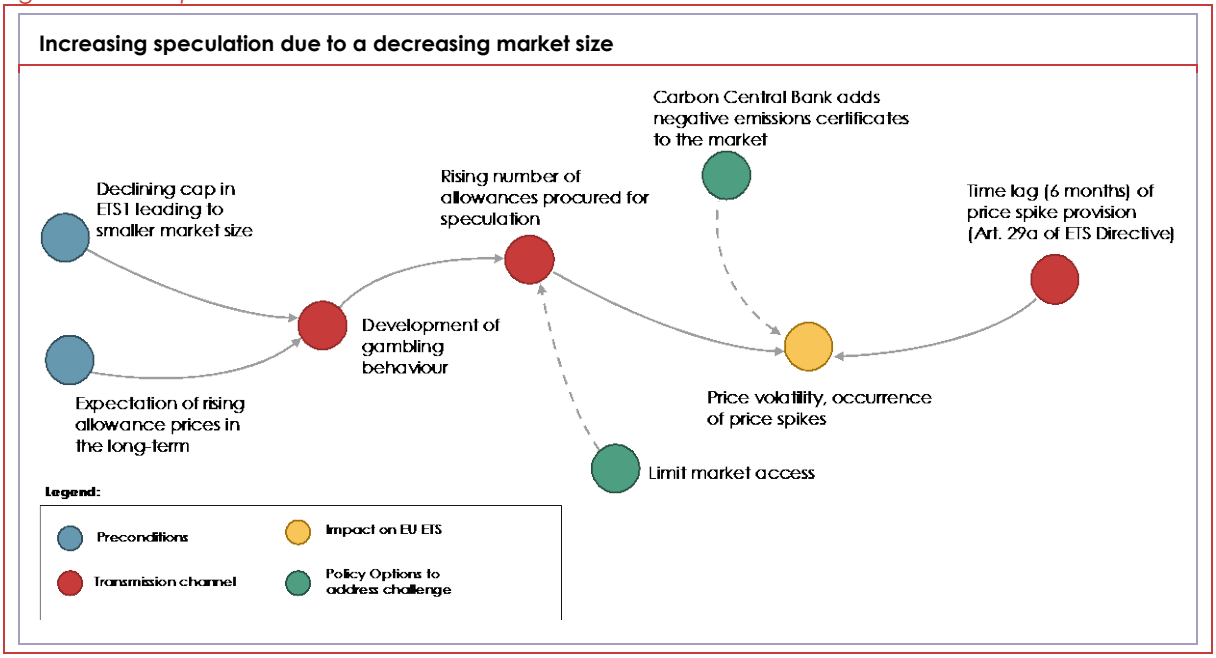
Table 5-7 Financial actors: Key challenges and policy options identified in the interviews

	Key challenges	**Key policy options**
Expert interviews	• Financial actors fulfil a range of (positive) market functions • Increasing speculative activity due to decreasing market size in the future	• Carbon Central Bank • Limit access to the allowances markets • Other options such as holding limits
Stakeholder interviews	Not discussed	Not discussed

The role of financial experts was discussed in five expert interviews, with two experts naming it as a key challenge. The issue was not raised in the stakeholder interviews. In line with the literature, several experts acknowledged the important functions of financial actors (e.g., providing liquidity to the market, allowing market participants to hedge their risks). However, the risk of increasing speculation was also mentioned, as the overall market size shrinks on the way towards 2040. Figure 5-29 summarizes this challenge and potential policy options, discussed in more detail below.

A small minority of stakeholder survey respondents (5%, n=6) of different organisational types selected 'the role of financial actors' as one of the top three most relevant issues relating to the EU ETS framework 2030-2040 (see Figure 5-2). Similarly to the experts, two of these stakeholders identified financial actors as helping provide liquidity to the market. They also identified their role in acting as essential intermediaries for many compliance entities.

Figure 5-29 Perspective on the role of financial actors



Note: The effects of policy options are visualised by dashed arrows. Source: Technopolis Group, PIK & E3-Modelling, 2023.

Key challenges

Three experts elaborated on the **role of financial actors in carbon markets**. These participants already fulfil several important market functions, including providing liquidity, acting as counterparts for the hedging behaviour of market participants, aiding the price formation on the ETS market (e.g. via their foresight analysis), acting as market intermediaries (for example for smaller industrial installations). As free allocations are reduced, financial actors can also support industrial companies in their increased demand for risk management and hedging. In the future, they could also provide financing for the development of removal technologies. Overall, it was agreed that financial actors bring more value to the market than the problems they create.

Regarding the **current involvement** of financial actors in the EU ETS, one interviewee noted that the economic and financial recession and financial crisis at the beginning of the EU ETS lead to a retreat of financial actors. The current re-entering of relatively large players was due to (a) holding permits a hedging strategy, and (b) the opportunities of EUAs as a new asset class. Their involvement in the EU ETS is currently. However, an issue was that there is currently no sufficient oversight in place.

Two experts agreed on a potential **future gambling / speculation** of financial actors was an important threat to the stability of the EU ETS. Speculation will be increasingly possible due to the shrinking overall size of the allowances market. Moreover, there may be an incentive to buy EUAs and put them in a portfolio, since it is highly likely that value of EUAs will increase over the course of a few years (particularly in the absence of fundamental changes to the market design). One stakeholder survey respondent (an aviation business) also identified a challenge such that there may be an increase in speculation, reducing market liquidity and effective market functioning as market size decreases.

One expert mentioned that the **current price spike provision acts with a significant time lag** of six months. The Fit-for-55 reform to Art. 29a in the ETS directive foresees that if the average allowance price of the previous six months is more than 2.4 times the average price of the

preceding two years, 75 million EUAs are released from the MSR. However, it remains to be seen whether this mechanism is sufficient and how additional provisions may be implemented.

Key policy options

One instrument that was mentioned to address speculative behaviour was the introduction of **Carbon Central Bank** (see also section 4.2). This institution could provide liquidity and counter speculation more immediately than the currently foreseen price stability mechanism by "printing" allowances and pushing them into the market. In contrast to monetary markets, however, this institution would not have an interest rate to steer the policy goal. Moreover, a situation like with CDMs should be avoided, which entered the market and stayed there for a long time.

Other policy options mentioned were **limiting access** to the allowances market, as well as **holding limits**, **declarations of beneficial interests** (introducing transparency on whether a trader is e.g. a subsidiary of another firm), and **limits on the ability purchase allowances in any given auction**.

One stakeholder survey respondent each selected the following policy options as important in relation to the role of financial actors in the EU ETS:

- Establish a single supervisory authority to control the participation of financial actors in the market (similar to the Carbon Central Bank mentioned by experts).
- Introduction of compliance costs for transactions.
- Data availability and monitoring to be improved to monitor trading and detect potential abnormal episodes.
- Introduction of holding limits for financial actors (as also mentioned by experts).

6 Synthesis of findings

In this section, we provide a first pass of some overall findings about the type, depth and comprehensiveness of the views and arguments provided in the reviewed literature and the interviews conducted with experts and stakeholders. We also synthesize the main findings regarding the substantial insights on challenges and policy options in the form of bullet points, as well as in analytical tables.

Overall, there is a very significant overlap between challenges and policy options identified in the literature, and those discussed in the expert interviews. At the same time, assessments and key priorities vary across the literature and between experts and stakeholders; in particular, there are often opposing views on policy options.

Overall findings are:

1. Scope: Several challenges and options fall not just within the scope of the ETS, but also relate to the broader policy mix. For example, the challenges related to distributional impacts (households) and industry decarbonization are (partly) addressed by funds linked to the ETS (Social Climate Fund, Innovation Fund, Modernisation Fund), but to a considerable extent also by separate policies on the EU and Member State level (e.g., green industrial policies).
2. Interlinkage: Many of the challenges and policy options to address these challenges are interrelated. For example, options to ensure market stability could also rely on options to regulate financial actors, on options for the use of revenue, or on options on the scope (integration of additional sectors). This begs the question to which extent interactions need and should be considered (in contrast to one policy per challenge), and correspondingly whether a deeper integration of existing policies and new options would be desirable. It also points to the question of coherence with the wider climate policy framework.
3. Relationship between opportunities and policy options: In the interviews, experts and stakeholders primarily elicited challenges and then identified policy options to address them. Opportunities also came up, but mainly in the sense of exploiting potential synergetic effects on other challenges. For example, it was frequently stated that including removals in the ETS would address the challenge of residual emissions in the industry sector. However, it was also stated that this option offers the opportunities to (a) manage market stability (price, declining liquidity) and (b) scale up investments in negative emission technologies. This further underlines the importance of considering interlinkages and being clear about the scope and objectives of different policy options.
4. Implementation of main options seems underexplored: While the interviews provided substantial material on challenges and general options (the 'what?' aspect), relatively little information came up regarding their implementation and important design considerations (the 'how?' aspect). For example, it was frequently mentioned that the MSR requires reform and that linking ETS1 and ETS2 is important, but no well thought through proposals for implementation seem to exist. Likewise, the idea of a Carbon Central Bank to manage integration of removals was brought up several times, but important aspects of implementation (e.g. specific mandate) seem largely unexplored. There is even disagreement in the literature and among interviewees on the basic question of the main goal of such an organisation (supporting price stability vs. managing the scale-up of negative emissions and the integration of CDR in the

EU ETS). Probably because of that, different interviewees seem have different understandings about the mandate and actual role of a Carbon Central Bank.

5. Economic market stability and political market stability**:** In the interviews, in addition to (economic) market stability, *political* market stability emerged as a central issue to frame the view on challenges/opportunities and policy options for EU emissions trading. In our understanding, political market stability has two dimensions: First, it includes market participants' trust and confidence in how the EU ETS functions and is governed, or more colloquially if it is "fit for purpose". From this perspective, a stable regulatory framework is needed that anticipates future challenges to the EU ETS and – in conjunction with economic market stability – creates a robust investment framework that allows investments into scaling up CDR or investment into climate-neutral production processes for (basic materials) industry. Second, there is a more fundamental dimension in the sense of overall political support for the EU ETS by the relevant political actors (including the EU Commission, national governments etc.). In simple words, political instability means that the purpose itself is challenged. While political support seems high at the moment, distributional challenges or political pressure from industry may turn into an existential threat for the environmental integrity of the EU ETS in the future.

6.1 Key challenges from the literature, expert and stakeholder surveys

This section lists the most important risks and challenges identified from the literature, as well as expert and stakeholder interviews. These risks and challenges are first grouped by issue (market stability, CDR, distributional challenges etc.). In a second step, the key challenges are then condensed and analysed in a table format.

The most important risks and challenges (listed by issue) include:

Market stability

- **Market stability in the political economy context** of the EU ETS:
  - Coverage of future residual emissions to ensure long-run market stability
  - Deterred market functioning due to price hikes and associated political pushback
  - Lower confidence and trust in the EU ETS system through complicated design and uncertainty from MSR
- **Partly endogenous cap in EU ETS** due to the introduction of **MSR:**
  - Green paradox: Potentially higher cumulative emissions as a result of an anticipation of overlapping climate policies (see discussion of Gerlagh et al. (2021) in section 4.1)
  - Increased banking behaviour leading to price-increasing feedback loop
- **Higher carbon price uncertainty and therefore lower investment certainty** due to uncertainty in long-run cap introduced by the MSR (cap becomes endogenous)

Integration of Carbon Dioxide Removals (CDR)

- Agreement among most stakeholders that the potential **integration of negative emissions** is an important issue. Support for upscaling and cost-reduction via innovation is needed. Different opinions on:
  - The type of emissions eligible (permanent vs. non-permanent) – important criteria include Environmental integrity of EU ETS, Complexity and costs of long-term management of non-permanent removals, Robustness of certification / permanence of nature-based solutions, Threats to biodiversity from intensified land-use

  - The challenge of mitigation deterrence (risk of substituting mitigation with removals)
  - The instruments for supporting negative emissions: Full integration into EU ETS (e.g. via carbon central bank), limited integration with ceilings for specific technologies, separate emissions trading for negative emissions, carbon removal obligations (CROs)), as main instruments mentioned.
- **Financing negative emissions will require considerable revenues in the second half of the century** (accumulated carbon debt), while revenues from EU ETS will be decline (and are currently spent for other purposes)

Distributional challenges

- Economic disparities in the EU and an increasing carbon price in transport and buildings (ETS2) will lead to **significant distributional challenges**
  - If left unaddressed, distributional concerns may ultimately lead to a backlash against emissions trading as a whole
- Trade-off between a high carbon price triggering significant mitigation in the ESR sectors and avoiding distributional problems
  - Concerns over mechanism to support soft ETS2 price cap of 45€ (in 2020 prices, i.e. adjusted for inflation)
  - Additional policies will be needed

Industry, free allocation and CBAM:

- Possible **carbon leakage risks under the EU's CBAM**, as it does not address leakage risks for EU exporters and for manufactured products that use carbon-intensive materials as inputs
- Increasing **pressure from industry on political decision-makers** (political economy) due to
  - (1) Speed and scale (e.g. stranded assets) of the **required industrial transition**
  - (2) **Significant carbon leakage risks remaining for sectors covered by the CBAM** for exporters, as well as downstream products sold within Europe
- Opportunities for CBAM to **encourage the uptake of international carbon pricing** vs. international **equity concerns** due to a burden-shifting effect of CBAM

International dimension

- **Varying structural features of ETS systems** act as the main barrier to the feasibility of international linking
- **Gradual integration of neighbouring countries** of the EU should be further developed
- CORSIA and any scheme for international shipping (once established) should not undermine the stringency of the EU ETS1
- Expansion of coverage for aviation and maritime shipping emissions as a challenge to achieve emissions reductions in these sectors
- Risk of carbon leakage for maritime shipping (tankering) if no global approach is achieved

Scope of emissions, including linking EU ETS1 and EU ETS2

- **Challenges for EU ETS1 and EU ETS2 as separate systems:** (1) Might lead to taking an economically inefficient abatement path in the medium to long run, (2) the smaller the two systems become under a declining cap, the more volatile they are (for EU ETS1 scarcity might become visible already mid-2030)

- **Challenges to linking EU ETS1 and EU ETS2:** (1) Potentially very different price levels of ETS1 and ETS2, (2) asymmetry of actors between the two systems (might affect price formation, risk of non-rational actors)
- **Carbon pricing for agricultural emissions** might risk competitiveness of EU agricultural sector and social acceptance (increased food prices)

Role of financial actors

- Increasing risk for **speculation** on an upward trend in the allowances price ('buy-and-hold' strategy) as the supply of allowances decreases over time (overall market size shrinks) and the overall cap approaches zero
  - Significant time lag of six months of current price spike provision for the MSR (Art. 29a)

Overarching risks and challenges

- A cluster of challenges related to **political robustness**
  - Distributional impacts on households (also in light of decreasing revenues)
  - Industry push-back (in light of CBAM, competitiveness concerns, lack of sufficient investments)
  - These challenges may be exacerbated by market instability and high prices
  - Corresponding pressure on political decision-makers may be responded to by making concession regarding the environmental effectiveness or integrity of the EU ETS.

Table 6-1 gives an overview and more detailed explanation of the key challenges identified from the literature and stakeholder interviews.

Table 6-1 Key risks and challenges identified from the literature and the expert interviews

Risk/Challenge	Explanation
1 **Compatibility of MSR-1 design with tighter cap**	• Market environment (altered hedging demand/lower cap) and MSR-1 thresholds will need to be aligned • Literature: MSR-1 potentially interacting with market behaviour: – MSR-1 cutting into banking behaviour of market participants – MSR could impact prices in case of anticipated demand shocks from complementary policies ('Green paradox') • Risk of ad hoc policy interventions in case of high carbon prices – Article 29a reacts with delay – Cyclical nature and time lag of MSR-1 reaction to market – MSR reinforcing feedback under expected EUA scarcity
2 **CDR needed mid to long term, but question of whether it should be integrated in ETS**	• CDR needed to compensate residual emissions in industry but currently not allowed in ETS1, so far only certification framework on the way • Integration of CDR could potentially harm the functioning of ETS1 – Risk of including non-permanent CDR (integrity) – Mitigation deterrence (integrity) – Risk of creating incompatible system (coherence) • Management of carbon debt for non-permanent CDR: Need for credible long-term commitment to a perpetual renewal (infinite management of the carbon cycle)

Risk/Challenge	Explanation
	– Seemingly cheap options in the land sector may become very expensive in the long run – Financial risk for society • Importance of early regulatory framework for supporting investment
3 **Distributional aspects will gain relevance with increasing carbon prices**	• Currently unclear how well policies like the Social Climate Fund or national policies could tackle distributional effects from potentially high carbon prices once the ETS2 is in place • Effective redistribution policies would need to address (…) – Economic disparities in countries, esp. low-income households (no EU mandate for social policy) – Economic disparities between countries • Price stabilization mechanism in ETS1 and ETS2 could turn out to not be effective in preventing high prices – ETS2 soft price cap could nurture false expectations
4 **Fast decarbonization of industry while preventing industrial emigration / carbon leakage**	• Required scale and speed of industrial decarbonization could be too high to be delivered solely through ETS1 • Increasing carbon leakage risks due to rising price and phase-out of free allocation (to the extent that leakage risks are not addressed by CBAM) • Some carbon leakage risks not addressed by CBAM (exports, downstream products, indirect emissions, resource shuffling), coupled with unclarity on CBAM rules
5 **Barriers to international linking***	• International linking complex due to varying structural features of ETS systems and different ambition levels (carbon prices) • Integration with aviation and maritime shipping could undermine environmental integrity of ETS1
6 **Barriers to intra-EU linking and broadening of scope***	Linking ETS1 and ETS2: • ETS1 price might converge to higher level, reinforcing industry challenges • Many overlapping national policies for ETS2 to be considered • Asymmetry of actors on the market could impair efficient price formation Extended emissions trading to agricultural emissions: • Political risk arising from increased food prices and potentially lower competitiveness of EU agricultural sector (carbon leakage) • Difficult monitoring of agricultural emissions
7 **Risk that financial actors could distort ETS prices**	Increased engagement of private retail investors with 'buy-and-hold' strategy could impair market functioning: • Risk of reducing EUA market liquidity further (feedback effect with MSR) • Risk of cornering the market • Risk of a lack of trust in the price-building process
8 **Political market stability may come under threat**	• Political support for ETS1& ETS2 and their ambitious emission reduction paths may be at risk due to increasing pressure by (…) – industry, if carbon prices rise strongly, while CBAM and complementary policies do not effectively address carbon leakage risks

Risk/Challenge	Explanation
	– consumers, if prices in ETS2 rise strongly, translating into much higher costs for heating and transport

* Challenges arise from the pressure / necessity to act to prevent fragmentation and economic inefficiency. Source: Technopolis Group, PIK & E3-Modelling, 2023.

6.2 Key policy options discussed by experts and stakeholders

This section discusses key policy options discussed in the literature and in expert and stakeholder interviews. As in the first section, we first list the key policy options by issue. In a second step, we link back key policy options to the challenges that these address in the form of a table.

Key policy options discussed in the literature and in expert and stakeholder interviews include:

- **Market stability – Political economy context:**
  - Carbon Central Bank (different ideas for scope of mandate discussed)
  - Simpler/changed MSR design (supporting trust and confidence)
- **Market stability – MSR reform options**:
  - Introduction of a price-based price control mechanism: (a) Price floor – either as a complement or a substitution to the MSR; (b) Price ceiling – price-change trigger in Article 29a more responsive to price increases; (c) Price collar (absolute, relative) – absolute collar or collar based in relative price change rules; (d) legal challenge to not fall under the special legislative procedure of Art. 192(2) TFEU)
  - Price responsive allowance supply
  - Incremental adjustment to current MSR thresholds (make upper/lower thresholds proportional to declining cap)
  - End cancellations of allowances in MSR (needed as liquidity in the end of the decade, lower uncertainty about total cap)
- **Carbon Dioxide Removals (CDR)**: Large variety of proposals that range from full integration into EU ETS to a complete separation of removals from EU ETS
  - Carbon Central Bank (to manage non-permanent removals, address price volatility, …)
  - Separate EU Removal Trading Scheme for emitters (obligate covered entities to remove and store specific minimum amounts of carbon (proportional to emissions); obligation increases over time)
  - Introduce a carbon removal obligation into the EU ETS (retain and transfer revenues over generations to finance (future) net CDR in the style of a nuclear decommissioning trust)
  - Early regulatory framework for removals (supporting investment)
  - Separate emissions target for mitigation (residual emissions) and negative emissions
  - Robust MRV system to secure additionality
  - Exclusion of non-permanent removals (robust definition of permanence)
- **Industry, free allocation and CBAM**
  - (Extended) CBAM (exports, sectors, coverage of the value chain)
  - Consumption tax in combination with free allocation (climate contribution, see section 4.5)

  - Potential of CBAM secondary legislation to influence development of VCMs and ongoing negotiations in on Article 6.4 of the Paris Agreement
  - Complementary regulatory framework for industrial decarbonisation
  - CCfDs
  - Revision of Industrial Emissions Directive
  - Enhanced circularity and recycling
- **International dimension**
  - Address structural differences in ETS system as an option to increase the ability to link internationally (e.g., MSR design)
  - Linking via allowance exchange rate as an alternative to full integration
  - Aviation: Apply EU ETS1 pricing also for extra-EU flights, alternative strengthen CORSIA (outside of EU jurisdiction)
  - Maritime shipping: Extension of emission coverage, monitor international developments, use revenues for innovation
- **Distributional challenges**:
  - Per-capita redistribution (climate dividend)
  - Targeted support for the vulnerable (earmarking of revenues for disadvantaged communities / support transition for low- and middle-income groups)
  - Importance of communication
  - Policies at EU level vs. Member States level
  - Importance of policies complementary to EU ETS
- **Scope of emissions, including linking EU ETS1 and EU ETS2:**
  - Linking represents a policy option in itself
  - Limited linking (e.g., one-way linking) as an alternative to full integration
- **Financial actors**:
  - Carbon Central Bank managing price spikes by introducing negative emissions
  - New market authority that could provide centralized data, impede manipulation and provide cross-market monitoring
  - Use of price-based cap adjustments (e.g. soft price collars)
  - Clear definition of market speculation (differentiating it from risk reducing activities), complemented by mechanisms that increase market transparency
  - Resignment from cancellations of allowances
  - Limiting access to the allowances market for entities that are not installations or compliance actors
  - Implementation of a 'twin-mechanism' (as in UK ETS)
  - Introduction of a tax levied on market turnovers for entities that are not an EU ETS compliance entity
  - Further measures like Holding limits, Declarations of beneficial interests (introducing transparency on whether a trader is e.g. a subsidiary of another firm), Limits on the ability to purchase allowances in any given auction

Table 6-2 gives an overview of some of the most important reform options, gives some details on their potential implementation, and links these implementation options back to the challenges from Table 6-1.

Table 6-2 Key policy options and link to the challenges they address, from expert and stakeholder interviews

Option	Potential Implementation	Addressed challenges*
Reform market stability mechanism	**Reforming the MSR** • Price-responsive allowance supply • Adjust upper/lower MSR thresholds proportional to declining cap • End MSR cancellation of allowances **Alternative / complement market stability mechanism** • Price control mechanism (floor, ceiling, corridor / reserve auction price)	1 **Future-proofing the MSR design** 2 Include and control CDR for additional stability/liquidity 5 Harmonize stability mechanism with other ETS to facilitate linking 6 Potential control over ETS1&2 price convergence 7 Reduce potential for detrimental speculation about MSR-induced price uncertainty 8 **Prevent substantial price increases**
CDR integration	• Establish a Carbon Central Bank to govern CDR • Fast integration of selected CDR options into ETS (e.g. only permanent CDR or only technical CDR) • Limited integration of CDR into ETS market – Integrated markets but with transaction limits – Regulator as intermediary buyer – Separate CDR support first and integrate later (separate ETS, carbon removal obligations)	1 **Potential to increase supply in case of market instability** 2 **Hard to abate emissions in industry can be covered by CDR** 4 **Faster scale-up through financing of CDR technologies** 8 Additional supply to contain prices in case they become politically unacceptable
Redistribution of cost/revenues from carbon pricing	• Increase of funds for the SCF • Per-capita redistribution of carbon revenues • Targeted support for the vulnerable (earmarking of revenues for disadvantaged communities) • Complementary social policies • Greater transparency, monitoring and enforcement of revenue spending by Member States	1 Dampen high ETS2 prices through complementary policy 3 **Redistributing cost/revenues can improve distributional impacts between and within countries** 8 **Complementary social policies can potentially dampen political pressure**

Option	Potential Implementation	Addressed challenges*
Industrial decarbonization policies	**Complementary policies** • CCfDs • Revision of IED • Expansion of Innovation Fund **Improving CBAM** • More clarity on implementation • Expand CBAM to more sectors • Foster international carbon prices • Continue free allocation for exports **Alternatives to CBAM** • Consumer tax in combination with continued free allocation	1 Dampen high ETS1 prices through complementary policy 4 **Need to speed up industrial decarbonization & effectively address carbon leakage risks** 5 Avoid double taxation of through international linking 8 **Reduce political pressure from industrial stakeholders**
Mechanisms to facilitate international linking	• Use an allowance exchange rate to link to other ETS or VCM • Extend and strengthen current linkage / scope – Apply ETS1 pricing also for extra-EU flights – Strengthen CORSIA system – Extension of shipping emission coverage – Continue periodic review of developments at IMO level – Cover black carbon emissions	1 **Increase market stability through higher liquidity** 4 **Reduce competitiveness concerns by creating a level playing field** 5 **Need to link internationally** 7 A larger linked system is more robust against detrimental speculation 8 Strengthen international cooperation; use of international credits likely to contain prices
Linking, harmonization and scope extension	• Full integration of ETS1 and ETS2 • Limited linking of ETS1 and ETS2 – One-way linking – Carbon price stabilizer for convergence phase • Linking national policies to carbon prices • ETS-3 / scope extension to agriculture	1 **Increase market stability through higher liquidity** 3 Average carbon price for heating/transport would likely be lower after linking 6 **Need to link, harmonize and extend scope** 7 A larger linked system is more robust against detrimental speculation
Measures to contain detrimental financial trading	• Limit access to the allowances markets • Holding limits	1 **Contain risk that financial traders distort market stability**

Option	Potential Implementation	Addressed challenges*
	• Improved market monitoring	7 **Contain risk that financial traders distort ETS prices** 8 Assure that financial trading can be properly diagnosed (to counter false claims)

*__Bold__ = Challenge to be directly addressed by a policy, emerging from literature or expert interviews. Not bold = Additional challenge that could be addressed indirectly by a policy. Source: Technopolis Group, PIK & E3-Modelling, 2023.

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Appendix A Expert interview guide

Step	Interview question [optional questions in grey]
Step 0: **Overall perspective**	• In your opinion, is European emissions trading **fit for climate neutrality**, or do you see **needs for a fundamental reform** of the ETS design? Please consider both EU ETS1 and ETS2. – Have aspects of this reform need been addressed in the recent Fit-for-55 review or do they still need to be addressed? – (Explanation: Focus of the study is the post-2030 period, not currently implemented reforms)
Step 1: **Identification of challenges**	• These are the issues/developments shown on slide 3, which are the most important ones (ranking)? • In your opinion, what are the relevant **challenges** related to the further development of the EU ETS in the 2030-2040 period and **why**? Can you please name the **three most relevant challenges** and rank them according to their relevance? • For each of these challenges, can you provide a **reasoning** for your assessment and specify: – Why exactly (**mechanism**)? – Please link this to the analytical framework shown in the beginning: Under **which conditions/developments** would challenge arise (**supply, demand, scope, interactions**)? • For each of these challenges, can you please **rate on a scale** from 1-10 on the following scales (again providing a reasoning for your assessment): – The **"Likelihood of occurrence"** (0- Very unlikely, 10- Highly likely) – **"Impact on EU ETS"** (0- No impact, 10 – Very high impact) • [*(In case not yet mentioned)* What about other challenges in key areas of emissions trading (Market Stability Reserve, International issues (maritime and aviation), scope of emissions/removals)?]
Step 2: **Reflection on challenges** (Jointly for all challenges)	For the challenges you ranked as most relevant, could you please elaborate on the following questions: • [*(If not covered under Step 1 already)* How do the different challenges affect the **functioning of the ETS market?** / Which of the following functioning criteria would be affected?] – … [List of functioning criteria] • Are there **other developments** that may **moderate or counter** the challenge (i.e., are there **interlinkages** between challenges)?
Step 3: **Identification of policy options**	• Regarding the challenges we just discussed, what are the most important **policy options / policy mix** to address/mitigate some of these challenges • [*(If not brought up by interviewee):* Which challenge(s) do the policy option address and how (**justification**)?]

Step	Interview question [optional questions in grey]
	• For each of these policy options, can you please rate on a **scale** from 1-10: – "Capacity to **address important challenges**" (0- very low, 10- very high) – "**Degree of coherence**" (advantages dominate disadvantages, low risk, easy to integrate into existing system) (0- low degree of coherence, 10 – high degree of coherence)
Step 4: Reflection on policy options (Jointly for all policy options)	Guiding questions for discussion of Step 3 / integrated discussion of policy options *[Interviewer to choose some of these questions depending on discussion]*: • What would be the **advantages/disadvantages** of the policy options? – What would be the **risks** inherent to the policy options? • Are there **interlinkages** between policy options? – What would be a suitable **policy mix / policy framework** to address the most relevant challenges? • Would the policy options be **coherent with the existing design** of the EU ETS?
Conclusion	• [What do you think are the most relevant **publications/real world examples** related to the challenge?] • Is there anything we have not discussed yet that you would like to mention? – [Potentially ask if the methodology presented in the beginning appeared as coherent to the interviewee, limit to those where we know that they have conducted similar scoping exercises] • Who do you think we should definitely interview too? • [Mention workshop/potential invite]

Appendix B Expert interview summaries

B.1 Benjamin Görlach

Interviewee	Institution	Date of interview	Main areas of expertise
Benjamin Görlach	Ecologic Institute	2023-03-27	ETS general / Market Stability (Reserve) / International issues / Industry, carbon leakage and CBAM / Distributional aspects / Interactions with other policies / ETS 2

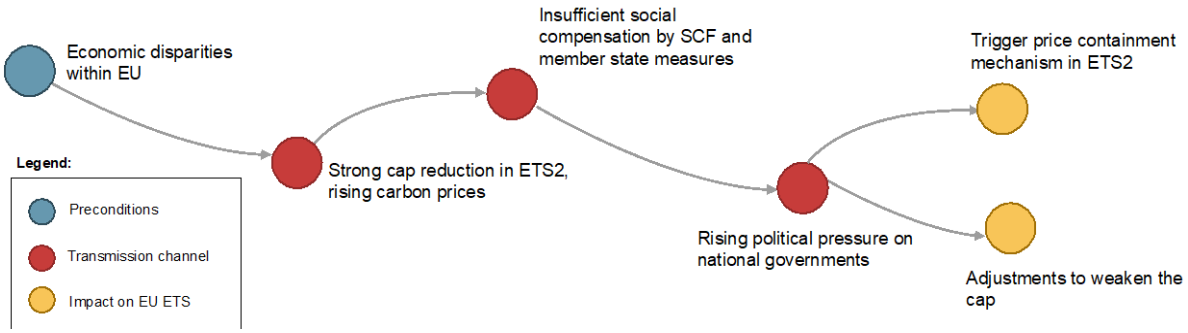
Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges

1st Priority: Distributional aspects – Tangible problem/large protests

- Differences in distribution *across* Europe especially important → transfer of funds from richer countries to less affluent ones
- Failure to address distributional aspects as major political risk ("make-or-break")
  - Risk of political interventions
- Likelihood of major protests has become smaller after energy price shocks in 2022 and related systems in place
- Impact: Partly mitigated by the price-buffering containment elements in the ETS2
- Moderating effects: Packages for buildings renovation, heat pumps etc. are already in place, as well as strategies to roll them out to put alternatives in place that the ETS2 can incentivise (positive scenario)
  - Success of ETS2 hinges on what happens in these areas

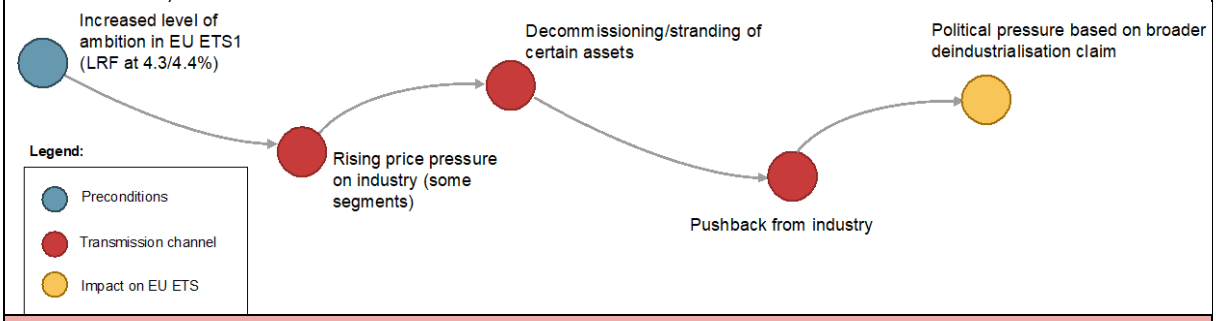
Visual summary:



2nd Priority: Industry – Pushback to ETS based on deindustrialization claim

- Currently foreseen reduction rates of 5% will require stranding assets
- This will only be politically feasible if an alternative exists
- Likelihood of pushback driven by premature/accelerated decommissioning of assets
- Impact: Probably less interference in ETS1 b/c it is more mature, ETS2 has price-buffering containment but risk for intervention / undermining is higher

Visual summary:



3rd Priority: Removals – Integration of carbon removals

- Likelihood: Negative emissions will affect the ETS and be included in the ETS with a "very high likelihood" => Dominating backstop technology will be carbon removals
  - But more relevant around 2040 (impact and likelihood increasing over time)
- Impact: Highly uncertain, but potentially large impact
  - Changes of the type of technologies accepted into the market (or no longer accepted, as with offsets in the past) may imply high volatility (of the price / in the market for removals?)
  - Permanency of removal as the key question
  - Will become essential part of the market functioning rather than a add on

Part 2: Policy options addressing key challenges

Key policy options

1st Priority: Distributional aspects - Tangible problem/large protests

- **Social Climate Fund** addresses distributional area (both material dimension and communication side)
  - Funds should be used in a **targeted** way to reduce exposure in the future - but unclear how this will be transferred into concrete policy options
  - Elements of a **European process** due to social plans Member States have to submit
  - **Communication** side is also important – EU has traditionally not been very good at communicating to its citizens

2nd Priority: Industry – Pushback to ETS based on deindustrialization claim

- **Industry**: Rather **too many ideas** than too few
  - CCfDs, Innovation Fund, Net-zero industry Act, free allocation contingent on energy savings programmes, CBAM => Whole range of new incentives and disincentives
  - Question: Is it going to be enough on the **scale** needed? (not only pilot installations, but we need investments for all
  - Importance to allocate funds in an efficient way

Part 3: Additional relevant points from the interview

- ETS is part of a **policy package** – carrots (policy package) and stick (price)

- Role of "companion polices" especially relevant for ETS2 due to barriers like access to information, access to finance, ageing population that need to renovate homes, grid externality effects

- **Linking** will likely remain marginal (small markets like Canada and Ukraine)
  - US: Carbon price at federal level in the US seems close to impossible
  - China: Not much hope for a linking between the EU ETS and Chinese ETS in the foreseeable future
  - Linking is about political trust
- Most relevant development on international stage is the **push for industrial polices** (subsidy race, e.g. Inflations Reduction Act)
  - Innovation Fund as EU's first attempt to channel investments
  - Implication ETS: Makes penalizing through ETS possible, but risk that money ends up at projects that have best lobbying power

B.2 Dallas Burtraw

Interviewee	Institution	Date of interview	Main areas of expertise
Dallas Burtraw	RFF	2023-04-18	Market Stability, International Issues, Interactions with other policies

Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges
1st Priority: Market stability – Political economy and overlapping policies

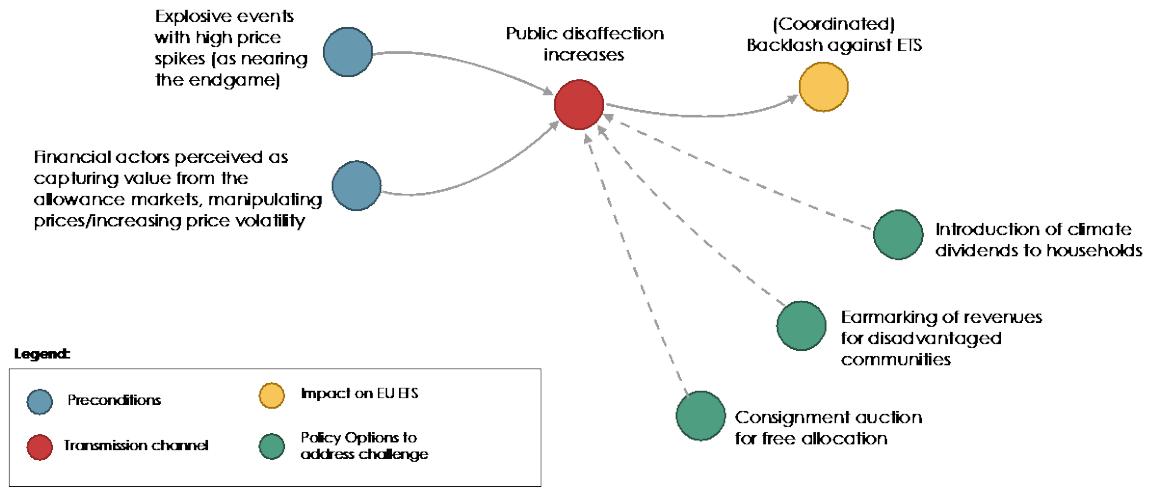
• Political economy setting of the ETS: **Trust & confidence** are key parameters
  – MSR has boosted overall confidence in the ETS
• **Transparency and simplicity** are key features of good ETS programme design
 	
Challenge 1: Political economy
• MSR is **complicated** and hard to understand
  – E.g., hard to predict the number of allowances cancelled and a corresponding future price development
• MSR reduces transparency and is unnecessarily complicated
• This reduces trust and confidence in the EU ETS
 	
Challenge 2: Overlapping policies
• Although the MSR does address the waterbed effect in principle, the interaction with overlapping policies could still lead to **unintended consequences**
• Some papers suggest that energy efficiency investments today could lead to an increase of cumulative emissions in the future because they reduce the cancellation / invalidation of allowances (e.g. Gerlagh et al. 2021, Economic Policy)
  – Over the long term, there could be more emissions (not less) as a result of overlapping policies reducing emissions in the future
• Complementary policies often play a key role in driving emissions reductions
  – Adequately **addressing the waterbed effect** is key

2nd Priority: Distributional aspects and revenue use – Spectre of public disaffection + use of auction proceeds

• Key challenge: Spectre of **public disaffection**
• Until now, there have only been uncoordinated protests in different European countries
• Worry: Any MS individually has too much to lose to repeat the mistakes of Brexit, but **coordinated protests** could be a problem in the future
  – Similar experience in the US
  ◦ Opposition to early cap-and-trade programmes
  ◦ Support to financial industry to repair the economy after 2009 engendered a huge amount of political disaffection

- Likelihood: Not very relevant today, but potentially **explosive situations may arise in the future**
  - Potential scenario: winter with disrupted fuel and energy supply, intense competition for the few remaining allowances in circulation and corresponding price spikes, leading to a large political backlash
  - Could happen in any given year, as the ETS approaches the end game
- **Negative public perceptions about financial actors** in the market may exacerbate public disaffection
  - E.g., financial actors capturing the value from the allowance markets, potentially churning the market and increasing price volatility

Visual summary of 2nd priority and corresponding policy options:



3rd Priority: Linkage – Linking carbon markets with different programme features

- Past literature typically focussed on full integration of different programmes (and related necessary administrative and programme design features)
- Challenge / Open question: How similar do different (state-level) ETS need to be to be linked?
  - E.g., can a programme with an MSR link with one without?
- Challenge: How can markets be linked that have very different initial conditions? (see discussion of policy option below)

Part 2: Policy options addressing key challenges

Key policy options

1st Priority: Market stability – Political economy and overlapping policies

- **Policy option 1: Carbon price floor**
- Very much called for, could be **accommodated within MSR** (not disruptive)
- Goal: Boosting confidence in the programme and the longevity of the programme
- Price floor could be implemented as **reserve price** in the auction => minimal acceptable bid in the auction

- Price floor has an effect on prices even if it is not triggered => Having a price floor changes expectations, even if it never comes into play (Salant et al. 2022, European Economic Review)
  - Existence of a price floor, even if never triggered, may **increase the equilibrium price** in the market
  - Reason: The price floor changes the distribution of future possible outcomes

Policy option 2: Price-responsive allowance supply

- Idea: Prices and quantities are simultaneously determined in the allowance auction
- Price-responsive allowance supply **preserves the roles for technology and energy policies** that are expected to lower costs over time, thus helping to **resolve the waterbed effect** (Burtraw et al. 2022, JAERE)

2nd Priority: Distributional aspects and revenue use – Spectre of public disaffection + use of auction proceeds

Policy option 1: Introduction of climate dividends to households

- Should make programme more popular (polls show people like the idea), although it would not make the ETS resilient to political attack
- Only a share of the ETS revenue should be directly returned to households
- **Case study California**: Only a portion is given back, the share associated with utility bills (programme is called "**climate credit**")
  - Climate credits come up every six month on the bill to avoid a rebound effect (if it came back every month, people would think their electricity got cheaper); in order to encourage co-investment in electrification, an alternative approach is to marry the credit to additional subsidies as an option for households
  - For five months, people see a higher bill (hopefully inducing a behavioural response); on month 6, there is a credit
  - Anecdotal evidence: Contributes to making the whole system more popular
  - Credits constitute around 17-18% of total asset value that is created in the programme

Policy option 2: Earmarking of revenues for disadvantaged communities

- Inspiration: **Justice40** Initiative by President Biden
  - Idea: 40% of all spending or other regulations around climate and the environment should go to the benefit of disadvantaged communities
- Builds on similar movements and statutory requirements in California, Washington State and New York

Policy option 3: Consignment auction for free allocation

  - **Idea**: Allowance cannot be used for compliance until it has been consigned to an auction; the appliance entity receives back from that auction the revenue from the sale of that allowance and they can turn around and bid into the very same auction to buy back the same allowance (see Khezr and McKenzie 2018, JEEM)
- **Goal**: Introduce an element of **transparency** for the asset value that is given away for free via **free allocation**; administratively easy to implement (Burtraw and NcCormack 2017, Energy Policy)

- Outside the firm: Transparent accounting of revenue / the value that has been given to the firm
- Within the firm: Ensure that firms adequately recognise the opportunity cost of their emissions when they receive free allowances (use of allowance as equivalent to a fuel purchase decision makes cost very salient to firm management)

- There may be provisions for non-competitive bids, guaranteeing a company that receives free allocation to win (a share of its allocation) at whatever the winning bid is
- Consignment auctions may **(positively) affect potential public disaffection** by making the programme much more open
- Consignment auctions would also be a way to **establish the credibility of the phase-out** by making the process of free allocation very transparent

3rd Priority: Linkage – Linking carbon markets with different programme features

- Idea of **linking carbon markets with different initial conditions** developed by Woerman (2023, JEEM)
  - Either **linking different jurisdictions or linking different sectors**
- Idea: Compliance value of allowance varies between jurisdictions (e.g. 1:1 vs. 2:1 – similar to the idea of an exchange rate), but **allowances can flow freely**
- Plausible **range of exchange rates**: Exchange rate between autarky and one for one exchange of allowances
  - Exchange autarky would be the ratio of the marginal costs or prices in the two markets
  - Full integration would be a one for one exchange rate
- In this range, there are **gains from trade in both jurisdictions/sectors** (improved economic outcomes) and **lower aggregate emissions**
  - The range thus describes the political economy range in which linking could occur
- Option: This linking could be envisaged for **ETS1 and ETS2** (two systems within one jurisdiction)
  - Maximize efficiency and guarantee the maximal environmental outcome, while preserving some sector specific safeguards
- (Open) questions: Where do investments / financial flows go? Does value from one jurisdiction (sector) flow into another jurisdiction (sector)?

Part 3: Additional relevant points from the interview

Financial actors

- **Financial actors** bring more **value** to the market than the problems they create
  - ETS programme design needs to reign in some of the (perceived) negative effects
- Policy options include **holding limits**, **declaration of beneficial interests** (e.g. subsidiary of another firm), and **limits on the ability purchase allowances** in any given auction

B.3 Florian Rothenberg

Interviewee	Institution	Date of interview	Main areas of expertise
Florian Rothenberg	Independent Commodity Intelligence Services (ICIS)	2023-07-06	ETS general, Market stability and market stability reserve, scope of emissions, Industry, carbon leakage and CBAM

Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges

1st Priority: Challenges to market stability and functioning/parameters of Market Stability Reserve (MSR)

→ **Challenge:** The MSR thresholds of ETS1 have been stable since 2015/16 and no longer reflect the same ETS market environment (decreasing cap, changing market composition). Misalignment in order of magnitude between market and MSR thresholds. This misalignment will become more apparent in the coming years already. "Low hanging fruit"-challenge, as it is relatively simple to address this by re-aligning the MSR thresholds.

- **Relevant developments:**
- Power sector will have a lower hedging volume.
  - Emissions from the power sector: Expected to be only about one third of emissions in 2030 compared to a few years ago (250 million vs. 750 million)
  - Clearly a lower hedging demand
- Increased hedging need from CBAM sectors (phase out of free allocation) but at the same time also emissions reductions in industry due to declining cap
  - ICIS projections indicate that these effects will largely cancel each other out leading to a flat or only slightly increasing hedging demand from the industry sector
- Aviation/maritime shipping → Higher liquidity need
- Declining cap: MSR thresholds were set based on a cap that was more than twice as high as the cap to be expected in 2030 → Order of magnitude of the thresholds does not match with the size of the market

- **Take-away:** It is difficult to determine the actual liquidity needs of the market, as the market can adjust to a certain extent. But at a certain point there might be a breaking point with increased misalignment of market (decreasing size) and MSR thresholds (stable).

2nd Priority: Integration of carbon removals

→ **Challenge:** It is clear that net zero emissions will not be reached without carbon removals. There is the need to integrate them into the ETS system to ensure continued supply of allowances to cover remaining emissions.

- In practice, the long-term carbon price in many carbon models are the discounted prices of Direct Air Capture (DAC) → Carbon removals act as the backstop technology
- A precondition for the integration into the ETS is that permanence is reliably ensured (MRV system etc.)

- Least cost option for processes where CCS is not feasible or economically viable (e.g., small glass plant with relatively low levels of emissions); in such as case, reliance on carbon removals would represent the least cost option
- Sees no issue with integrating carbon removals as soon as possible (given that the permanence is ensured)
- As long as prices for DAC are as high as they are projected at the moment, there is no interference with carbon removals delaying abatement
- Integration of Bioenergy with Carbon Capture and Storage (BECCS) may be a different story because cheaper than other technical carbon removals

3rd Priority: Market efficiency, linking across different sectors with ETS1 and ETS2

- Reasoning why linking of ETS1 and ETS2 is sensible is two-fold:
- **Small systems are more volatile:** The smaller an ETS system becomes (declining cap in both ETS1 and ETS2) the more susceptible it becomes to price volatility. Linking ETS1 and ETS2 would mitigate this effect.
- **Least cost abatement option (Economic efficiency):** You want to have least cost emissions reductions. Why would you try to capture/abate options in ETS1 while there are low hanging fruits in the building sector?
- One problem for linking might be the asymmetry of the actors in both markets. Investment behaviour is different between households and industry.
  - E.g. households may not use their low-hanging fruits in the buildings sector and then still the investments have to happen industry
  - Because the actors are so asymmetric, there might be challenges in price formation
- The expectation of market participants is that the two ETS systems will be linked at some point anyway → Announcing a pathway for the linking in the medium-run (review clause 2031) would reduce the uncertainty in the market

Part 2: Policy options addressing key challenges

Key policy options

1st Priority: Challenges to market stability and functioning/parameters of Market Stability Reserve (MSR)

- Argues for an alignment of the MSR threshold with the declining cap:
  - **Upper/lower thresholds:** Needs to be aligned with the trajectory of the shrinking system. Range needs to be tightened.
    - **Proposal:** Maintain the current upper/lower thresholds until 2025 and then make them proportion to the decreasing cap (To some degree arbitrary but reflects a past rationale for setting the original thresholds)
    - An option could also be to additionally factor in the share of allowances that are auctioned in determining the update for the lower/upper thresholds → Reasoning: Less free allocation could mean more hedging/liquidity demand (no certainty for free allocation for the auctioned share). Thus, the decrease of thresholds should be slower than the decline in the cap.
  - **Withdrawal rates:** Not so relevant to him. The upper/lower thresholds are more relevant.
  - **TNAC calculation methodology:** Aviation adjustment done in FF55 reform. But the historic net demand of EUAs (pre 2023) by airlines (around 190m allowances) is not

reflected in the TNAC and therefore the indicator does not fully reflect the actual available allowances.
2nd Priority: Market efficiency, linking across different sectors with ETS1 and ETS2 (Two-fold challenge with 3rd Priority: Integration of carbon removals)
• There are very elaborate papers on the topic of how to integrate carbon removals → The design option would need to enable the installations in the ETS to use the carbon credits to surrender their obligation. • Beyond this, the interviewee has to date no clear preference for the 'how' of integrating carbon removals - but it is important that this happens one way or another.
3rd Priority: Integration of carbon removals (Two-fold challenge with 2nd Priority: Linking ETS1/2)
• (See notes on challenge above)

Part 3: Additional relevant points from the interview

The interviewee provided reasoning why the other issues/developments were considered less relevant by him:

- **Distributional aspects:** The ETS revenues and the instruments (e.g., Social Climate Fund) are there. More a political decision within the Member States than a policy consideration within the boundaries of the EU ETS system.
- **Role of financial actors:** Option is that financial actors aid the carbon market. Functions include:
  - Providing liquidity to the market
  - Acting as market intermediaries for e.g. smaller industrial installations
  - Important actors for the price formation on the ETS market: Engage in foresight analysis informed by their independent research into market conditions, shaping their perspective on the appropriate valuation of EUAs
  - Can buy allowances at times when there is no demand from industry and thereby stabilise the market prices
- **International linking of ETS systems:** Rather an issue for international climate and foreign policy.
- **Industry-related considerations/CBAM:**
  - Does not expect industry emissions to dominate ETS1 -> industry will need to decarbonise quickly under the increased level of ambition
  - Aviation and maritime shipping will be the sectors that have a very high share of emissions in 2030
  - Carbon leakage: Relevant issue but broader discussion than ETS as a policy instrument; what we observe at the moment is an energy leakage and not so much carbon leakage.
  - Energy costs already provide a disincentive for production in the EU, ETS has limited power to affect overall costs of production
  - Thus, rather an overarching energy and industry policy perspective is needed where ETS is one element

B.4Ingo Ramming

Interviewee	Institution	Date of interview	Main areas of expertise
Ingo Ramming	BBVA	2023-07-11	ETS general, Industry, carbon leakage and CBAM, Role of financial actors

Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges
1st Priority: Challenge of industrial decarbonisation while preventing de-industrialisation (most important)
• → **Challenge:** European industry is facing multiple challenges, among others the jump in energy prices and higher carbon costs. This creates the **risk of de-industrialisation** for some sectors of industry. • Interaction between ETS1 and industry (two sides): – Carbon price acts as a **cost factor** that incentivizes changes in industrial production systems – **Revenues** from ETS can be used to finance the transition of industry (e.g., CCfDs) • Support for industry is needed. – Sees the **risk of divergence in industrial activity in Europe** -> richer EU countries can afford supporting their industry (e.g., CCfDs in Germany) while others cannot; existing differences in industrial economic efficiency could be intensified leading to de-industrialisation taking place especially in less affluent Member States – Implies the need for an EU-wide approach in supporting the industrial transition (today very much dependent on national policies) • CBAM -> Good starting point but needs to be further developed – Free allowances cannot continue given the declining cap; – Risk: CBAM works as a shield for imports, but exports are not covered – Hopes that CBAM will become a catalyst for global carbon pricing (e.g. Turkey), huge diplomatic effort will be required. • **Likelihood of occurrence:** Industrial decarbonisation is a requirement to achieve the EU's net zero-targets. Carbon leakage is a real risk. Measures like CCfDs need to be implemented to support the transition of industry and avoid de-industrialisation, even more with increased subsidies in other countries (e.g., US, China, …). • **Impact on EU ETS:** We need to make the decarbonisation an environmental and economic success. If we can demonstrate, it is possible to decarbonise an industrial region, our industry will be successful, and other countries want to follow (catalysts for the global low carbon transition). Vice versa, we risk companies leaving the EU ("de-industrialisation") and – more importantly – threaten global climate policy ambition (threat to the economic development).
2nd Priority: Design of the MSR and altered hedging behaviour
• **-> Challenge:** MSR is geared towards low prices and surplus but with its cyclical design cannot respond well to price shocks that are more likely to occur in a tighter market • **MSR design**

- MSR was the most important policy initiative during the last years.
- Purpose of the MSR was to reduce the structural surplus => Mission will be accomplished over the next few years, review the MSR and its purpose in the ETS framework
- MSR was designed to reduce the surplus and re-create a carbon price signal and not to provide price stability in an increasingly tight market

- Price stability will also be affected by a change in market structure and hedging behaviour, as the ETS1 will become less power-centric in the coming years.
  - This leads to highly professionalised power companies hedging less, already happening due to increased shares of renewables

3rd Priority: Maintaining a liquid and efficiently functioning market (linking ETS1 and ETS2 / integration of carbon removals)

Linking of ETS1/ETS2

- Need for combining the systems post-2030 because otherwise each of them gets too small -> Number of available allowances in ETS1 and ETS2 will become too low to create efficient markets
- Linking of the two systems would ensure "a critical mass" of allowances (market needs to be liquid to function)
- Timing: Linking ETS1/ETS2 → Ideally from the start of Phase 5

- **Role of carbon removals**
- Introducing carbon removals will add liquidity to the system
- Removals need to be included in time → Chance for projects and technologies to evolve
- Linking outside of Europe if possible → Provide international incentives, likely cheaper
- Timing: Include removals in Phase 5

- **Other aspects**
- It would be desirable to link internationally with aviation and maritime transport systems, but – at the moment - unlikely given the significant differences between the systems (e.g. CORSIA credits trade for USD 2 to 5).

Part 2: Policy options addressing key challenges

Key policy options

1st Priority: Challenge of industrial decarbonisation while preventing de-industrialisation (most important)

- (See section on challenges above)

2nd Priority: Design of the MSR and altered hedging behaviour

- Options for an MSR reform could be (depends on the policy target):
  - Complete abandonment of the MSR -> Under the declining ceiling, it is less likely that a structural surplus could build up again (the original purpose is not applicable anymore)
  - Introduction of a more "flexible" mechanism that is less cyclical as the current MSR design (not further specified)

- Introduce a governing body such as a carbon central bank
  - Would need a lot of trust in the institution
  - Could cover the integration and supply of carbon removals as well (as mentioned in the literature proposing such a bank)
  - Uncertain if a carbon central bank would be the right option; one of multiple options

3rd Priority: Maintaining a liquid and efficiently functioning market (linking ETS1 and ETS2 / integration of carbon removals)

- (See section on challenges above)

Part 3: Additional relevant points from the interview

- The role of financial actors in carbon markets was discussed briefly. Key points involved:
- Financial actors are needed to bridge spot supply and hedging behaviour of market participants
- With the reduction in free allocation, many industrial companies will need to start risk management and hedging -> financial actors can provide support
- Financing of carbon removals → Financial actors are forward-looking and can provide financing for the development of removal technologies

B.5István Bart

Interviewee	Institution	Date of interview	Main areas of expertise
István Bart	Environmental Defense Fund/ENERGIAKLUB	2023-07-13	ETS general, International issues, Distributional aspects / revenue use, ETS2

Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges

Introduction and reasoning for choice of challenges

- The key thing to note is that the **EU ETS is more suitable for some sectors than others**:
  - Industry is a suitable entity because emitters have control over investments and production decisions.
  - It is not clear that the same is true for the ETS2 sectors housing and transport.
  - Furthermore, it does not make sense for the EU ETS to merge markets that are not competing with each other. The housing market in Budapest do not compete with the Berlin housing market, so them trading EU ETS allowances doesn't have the same logic as with industrial sectors.
- The **Effort Sharing Regulation** also looks at the ETS2 sectors, but does not enforce compliance from Member States, and that cannot be allowed from an environmental perspective. Therefore, the commission imposing a hard cap on emissions is welcome, From this perspective, the ETS2 is good step forward.
- However, **ETS2 implementation may expose the ETS system to political risks**
  - May be seen as a tax by consumers, as it directly impacts their fuel and housing costs.
  - Price rises (whether due to the ETS or not) on these goods may expose the ETS to greater scrutiny – particularly in poorer countries, where heating, fuel and housing costs are more politically pertinent subjects.
- Under ESR, countries have different demands on them in terms of decarbonisation – e.g. Germany has to reduce its allowances by 50%, whereas Hungary only needs to do so by about 10% => Effort Sharing Regulation allows for differentiation of mitigation effort
  - If these markets are connected, **demand for allowances from Germany will increase allowances cost in Hungary** because the markets are being connected, even if the housing or transport markets in the two countries are otherwise not linked.

1st Priority: Distributional aspects

Current investment subsidies via **Social Climate Fund are not sufficient** to address inequity in decarbonisation.

For instance, in housing:

- Investment support is not helpful for all types of households, **poorer households need more direct financial support**.
- For poorer homes there are concerns:
  - Case of Hungary: Wood/lignite burning communities in rural areas – it would be beneficial to promote them burning gas

- Some houses value less than the cost of retrofitting – for instance is it not worth retrofitting homes in places that are undergoing depopulations
- Some houses aren't going to be able to obtain private sector finance to support retrofit – the house isn't in good enough condition

- For middle class homes, investment support to transition is more appropriate
- Concerned that **some aspects of the EU ETS will be undermined by Member States price controls**,
  - Especially where the states are involved in delivering fuel/energy (e.g. energy price cap in Hungary, state-owned energy companies in Poland)

2nd Priority: Integration of agricultural and land use emissions (link to carbon removals via land use)

- As emissions go down, the agricultural and land-use emissions will become ever more important as they make up a larger proportion of overall emissions
- There is a lot of uncertainty and questions on how you monitor and calculate removals and emissions from land use (uncertainty is several orders of magnitude higher than for emissions currently covered by the EU ETS)
  - We need much better data measurements of how you monitor and measure emissions from farming and land use

3rd Priority: Linking of ETS1/ETS2 & other systems

- **Linking of ETS 1 and ETS 2 has been long seen as holy grail, can ensure the system is large enough:**
- There isn't as much benefit to linking to other systems (e.g. Chinese ETS) if other system is already sufficiently large enough.
- There is a concern from industry that linking of ETS1 and ETS2 may lead to higher price pressure in ETS1.
- There should be some convergence of prices in both systems (ETS1/ETS2)
- One option that could be explored is linking the system in a limited way (e.g., one way linking)
- Should be considered in the next review cycle, but may not need to come in until 2037

Part 2: Policy options addressing key challenges

Key policy options

1st Priority: Distributional aspects

Using the ETS2 as a redistribution mechanism:

- One option is to use funds for **direct redistribution to energy poor household** to shield from negative distributional impacts of ETS2 carbon pricing
  - Would help the EU ETS to stand a stance against political challenges by having a positive public perception(see notes above)
  - However, Member States do not tend to support EU providing direct funds to citizens
  - You could follow the example of Canada: Distribute revenues equally amongst citizens

B.6 Karsten Neuhoff / Jörn Richstein (Joint interview)

Interviewee	Institution	Date of interview	Main areas of expertise
Karsten Neuhoff, Jörn Richstein	DIW Berlin	2023-04-25	Industry, carbon leakage and CBAM; Interactions with other policies; Market stability

Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges

1st Priority: Industry, carbon leakage and CBAM – Investment uncertainty and carbon leakage risks under current CBAM design

- Fundamental problem with current CBAM design: Entails significant **carbon leakage risks** and leads to **Investment uncertainty** for the basic materials sector
- Three reasons carbon leakage
  - **1) Products down the value chain not protected** by the current CBAM design
    - Difficulty of gathering data on carbon intensity and issues with trustworthiness of MRV system => CBAM has been limited to a certain number of product categories
  - **2) Exports not covered** by the current system rules
    - Very difficult to solve in current CBAM design for legal / WTO reasons
  - **3) Resource shuffling** concerns
    - How do you assign carbon intensities to products (e.g. electricity-based, grid-based, …) => Opens the scope for false claims on the import sheet
- => Competitive disadvantage for EU producers compared to producers in foreign countries
- Challenge for decarbonisation in Europe: With the current framework, we will not have a successful industrial decarbonisation b/c **no investment certainty** that low-carbon investment will repay

Two potential scenarios to address carbon leakage risks:

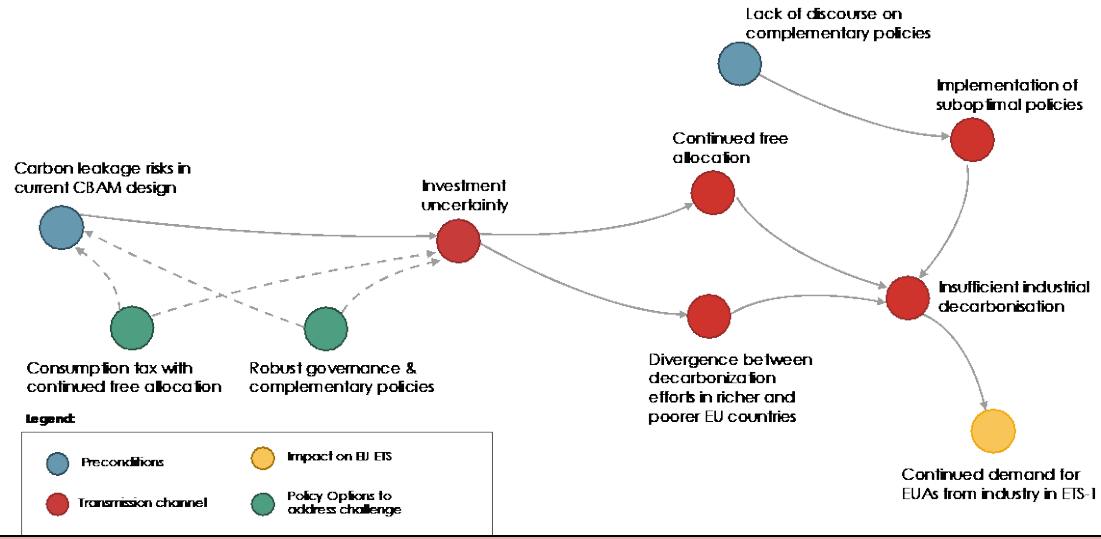
- **<u>Scenario a) Continued free allocation</u>**
- Envisaged **phase-out of free allocation by 2035 will be increasingly incredible** due to carbon leakage risks under current CBAM design => review clauses can be triggered
- Continued free allocation would imply a) continued **ineffectiveness of ETS for the industrial** transition, b) a **lack of an investment framework** for clean technologies, c) **lack of incentives on the demand side** (missing incentives for material efficiency and material substitution), and d) **lack of revenues** from auctioning to support cleaner technologies (lack of financing)
- **Likelihood** continued free allocation for industry if CBAM is not adjusted: **Very high**
  - Intervention in energy markets after gas prices last year, since high prices were not politically acceptable (despite this price increase being triggered by an external event, the war in Ukraine)
  - Political backlash likely to be much larger in the case of ETS, as it is an internally decided policy

- **<u>Scenario b) Divergence between decarbonization efforts in richer and poorer EU countries</u>**
- **Some countries** that have the resources, like Germany and France, may pursue an industrial **decarbonisation by financing instruments like carbon contracts for differences (CCfDs)**, while many **other countries will not have the resources** to decarbonise
  - This will lead to a divergence between richer and poorer countries
  - With reduced demand for primary materials production due to material efficiency and recycling, countries that fail to decarbonise now risk to be the ones that will have to shut down the primary production of these materials
- Currently, state aid rules rule out a carbon leakage protection with CCfDs
  - Risk that richer MS will try to weaken state aid rules to adjust their CFD mechanisms and create an uneven playing field

2nd Priority: Interaction with other policies – Need for complementary policies

- Under the current regulatory framework, the **carbon price alone is unlikely to achieve the necessary emissions reductions** in key sectors such as basic materials industry or buildings
  - Learning from power sector: A set of detailed **regulatory elements and complementary policies** are necessary to allow for the transition to climate neutrality
  - This learning holds for industry as well, whether for circularity or for clean production processes and the corresponding infrastructure
- There is a continued debate on "ETS-only" versus "need for additional (complementing) instruments"
- Instead, a discussion of the detailed **implementation of complementing instruments** would be necessary
- Risk without such a discourse: Policymakers have to use political windows to push through individual instruments that they are already familiar with, which are not the best option

Visual summary of 1st and 2nd priority and corresponding policy options:



3rd Priority: Distributional aspects – Communication of price ceiling in ETS2 and distributional impacts of carbon pricing

- Price ceiling of **45 euros (in 2020 prices, i.e. adjusted for inflation)** is communicated, but it is actually **not implemented as a price ceiling** (no hard price ceiling)

- Without accompanying policies, there is a risk of **failing to contain prices at the levels that were promised** before
  - **Additional measures** will be needed to reach the 45 euros
- The Social Climate Fund mainly targets differences between Member States, whereas it is up to the Member States to tackle their own social question
  - Instruments like per-capita dividends will be decided by Member States
- **Per-head reimbursements cannot fully address inequality in buildings**, since poorer households disproportionately live in worsely insulated households
- If carbon prices alone should support the scale of retrofit investments needed, very high prices would be needed
- **Driving retrofits by carbon prices alone would raise serious distributional challenges**

Part 2: Policy options addressing key challenges

Key policy options

1st Priority: Industry, carbon leakage and CBAM – Investment uncertainty and carbon leakage risks under current CBAM design

Main policy option: Climate contribution / excise charge

- **Charge on the weight of basic materials embedded in a product** for products consumed in the EU
- **Linked with the EU ETS**, as its level depends on the market prices of emission allowances and product benchmarks
  - Can be anchored in ETS law as an environmental regulation with qualified majority
- The charge **covers the value chain** of carbon-intensive products, it is **waived for exports**
- **Raises additional revenues** to finance low-carbon transition, while continuing free allocation to ensure robust carbon leakage protection
- See e.g. Brzeziński and Śniegocki (2020), https://climatestrategies.org/wp-content/uploads/2021/03/CFMP-Climate-Contribution-Policy-Brief.pdf; Grubb et al. (2022), https://doi.org/10.1146/annurev-environ-120820-053625

2nd Priority: Interaction with other policies – Need for complementary policies

Policy option: Developing a **robust governance structure for complementary policies**

- For the use of regulatory instruments / complementary policies that require clear management over time, a strong governance structure is needed
  - Example of such a governance structure: German climate change law, which has clear transformational targets
- Governance and a set of **additional policy instruments** are needed as a **complement to CBAM** to provide a credible framework for the future

Part 3: Additional relevant points from the interview

Negative emissions and carbon central bank

Land-based negative emissions

- Currently: Negative emissions are mostly from **land use and land use change projects**
  - Not an area where carbon pricing was an efficient tool in the past
  - Regulations are far more suitable to unlock this potential

- Support of new practices in land/land use change: **Difficult to imagine for a centralised European institution like a carbon central bank (CCB) to take up this task**
  - Currently: European funding for the rural level is typically channelled through Member States
  - Only exception where European funding is directly competitively allocated at a European scale is the Innovation Funds
    - Works for new technologies and large European companies
    - Anything related to the rural areas goes through regional funds where the priority areas are defined nationally
- => **Without national engagement** (which determines transformation strategy at the local level), **the concept of the CCB will probably not work**
  - Land-based/rural processes are decentralised because **local ownership is needed for their success of transformation processes**
    - Not only target an individual farmer, but also the community around them, in order to scale up on a project basis (adjustment of practices)
  - Carbon central bank is a theoretical concept, disconnected from global experience on climate cooperation
- Better than CCB: Build on **EU's regional funds**
  - Even some innovative agricultural practices are partially supported by regional funds
  - Institutions that work should be further developed

DACCS

- Negative emissions as a way for people to buy out world with constrained resources
- Negative emissions technologies like DACCS should not be the basis of the instruments we use right now
  - Reason: the capacity of the political process to deal with complex process difficulties is very small, as can be seen from the German discussion on heating buildings with hydrogen
  - Instead, a norm of climate neutrality is needed that implies certain behaviour and certain actions, which applies to the whole society (both rich and poor)
- However, an exploration of negative emissions technologies and practices that might be valuable in the mid term is important

B.7 Knut Einer Rosendahl

Interviewee	Institution	Date of interview	Main areas of expertise
Knut Einar Rosendahl	Norwegian University of Life Sciences	2023-04-11	Market Stability (Reserve) / International issues / Industry, carbon leakage and CBAM

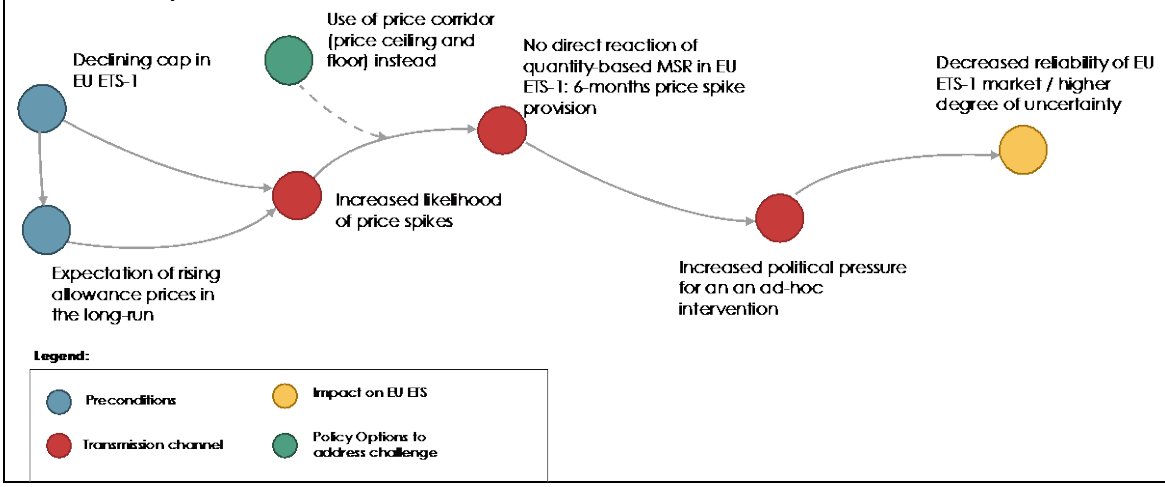
Part 1: Identification and description of key challenges

Description and reasoning for choice of key challenges
1st Priority: Industry – Carbon leakage will become a real risk in the coming decade
• Carbon leakage thus far not big problem since a) prices were low, b) free allocation was quite generous • Will become a relevant issue in the future with already higher prices and potential further price increases in the next years • Sectors at risk: Emissions-intensive and trade-exposed (EITE) • **Different types of leakage** may occur: – 1) Closure of existing plants – 2) Shift of market shares (decrease production in EU, increase abroad) – 3) Investment leakage for new installations • Politics perspective: Industry has a strong influence on policies (as have unions) • **Likelihood of occurrence: Very high** (8-9/10) (Scenario: carbon prices rise to a level where leakage becomes a viable risk) • **Impact on EU ETS: Will not affect overall cap** - question is rather about the measures that will be used to address leakage risk
2nd Priority: Removals – Integration of carbon removals
• Integration of removals: Way to stimulate negative emissions and make it more politically feasible to reach net-zero for EU ETS1 sectors (energy/industry) around 2040 • Negative emissions: Should be dealt with in a similar way as positive emissions => **integrate into the EU ETS** • Several **advantages** of including negative emissions in ETS – 1) Cost-effectiveness argument (economic argument): Future price for negative emissions may be similar to mitigation options (cost efficiency) – 2) Provide incentives for investment into negative emissions technologies by providing certainty for investors that there will be a market in the future ◦ Important to provide certainty about inclusion already now – 3) Some emissions will be unavoidable – need for negative emissions – 4) Including negative emissions will increase (price) stability • **Likelihood of occurrence: Rather high** • **Impact on EU ETS: Overall impact is limited** in the near-to-medium term, since the amount of negative emissions will not be huge (since these will need to be stored), but can provide some contribution in the longer term

3rd Priority: Market stability – Rising prices and risk of ad-hoc political interventions

- MSR was historically very important to reduce large share of surplus allowances and lift price
  - MSR helped to avoid price collapse during COVID => Market knew that MSR would have absorbed excess allowances if situation was to last for a long time
- MSR is a quantity-based mechanism => **Risk** from market perspective: **Future price level is unknown**
- Prices may become very high, prompting policymakers to release additional allowances to stabilize prices
  - MSR increases the risk of an ad-hoc political intervention, rather than with a pre-defined rule/instrument
  - This makes the market development more unpredictable/uncertain
- **Scenario: Price spike occurs + policymakers will intervene**
  - Likelihood of occurrence (up to 2040): 5/10
  - Impact on EU ETS: Depends on amount of extra allowances issued

Visual summary:



Part 2: Identification and description of policy options for key challenges

Key policy options

1st Priority: Industry – Carbon leakage will become a real risk in the coming decade

- Leakage protection: Difficult to know what is the best policy here (no quick fix)
- Important to further work on this issue => **various policy options** discussed in literature
  - Free allocation
  - CBAM
  - Consumer tax (in combination with free allocation)
- Free allocation works like a combination of high CO_2 price and subsidy
  - Incentive to reduce emissions intensity, but not output
  - Not ideal, b/c you want production of emission intensive goods to go down to reduce emissions (but not to move abroad)
- CBAM does not stimulate production, but reduce supply of foreign goods

- From that perspective, better option than free allocation
- Difficulties: Export (free allocation protects exporters, import-only CBAM does not)
- Indirect emissions from electricity: No solution found yet

2nd Priority: Removals – Integration of carbon removals

- Good idea to integrate negative emissions, but importance to ensure a) **additionality**, b) **permanence**
  - Should be limited to technologies with negative emissions that ensure permanence over a long timespan (e.g. direct air capture or BECCS with bioenergy harvested in a sustainable/renewable manner)
  - Nature-based solutions like reforestation: Additionality questionable, difficult to implement into an ETS => permanence cannot be ensured

3rd Priority: Market stability – Rising prices and risk of ad-hoc political interventions

- Since the ETS price is already quite high today, it is better to have a **price-based mechanism** ("price band" / price ceiling and price floor), where allowances are released or held back depending on the price level
  - Advantage: Show investors where price is heading => gives market participants more security
  - Potential disadvantage: Target is not reached if additional allowances (beyond e.g. MSR instrument) are released into the market:
    - May not be too bad in the medium term, since climate neutrality target by 2050, but net-zero target of ETS1 already by 2040
    - Limiting increase of prices outweighs disadvantages in terms of potentially weakening the cap

Part 3: Additional relevant points from the interview

- Overall cap (2040): Consistent with net-zero ambition, but **challenges on supply and demand side**
  - Supply: May turn out very difficult to go to zero by 2040 => high prices => policy makers may intervene
    - Example voices in the recent energy crisis: Release more allowances to let price go down
  - Demand side: Marginal abatement costs in the different sectors very important for political feasibility of reduction targets:
    - Right now: Price not too high, but open question what will happen once we approach zero and harder-to-abate sectors
    - Support scheme for new green technologies needed (e.g., green hydrogen, carbon capture)
- **Linking ETS1 and ETS2** would be good for efficiency reasons
  - Distributional concerns regarding ETS2 sectors (buildings/transport): Preferable to compensate households in another way than keeping CO_2 price at a too low level
  - **"Cap and dividend"** approach: redistribution of income to households
    - Either per-capita rebate or progressive (overall effect will be progressive either way)
- **International linking** not very important
  - Linkage makes sense for small European countries (e.g., Norway, Switzerland)

- Not sure about the benefit of linkages like with other large systems internationally (e.g. China ETS)

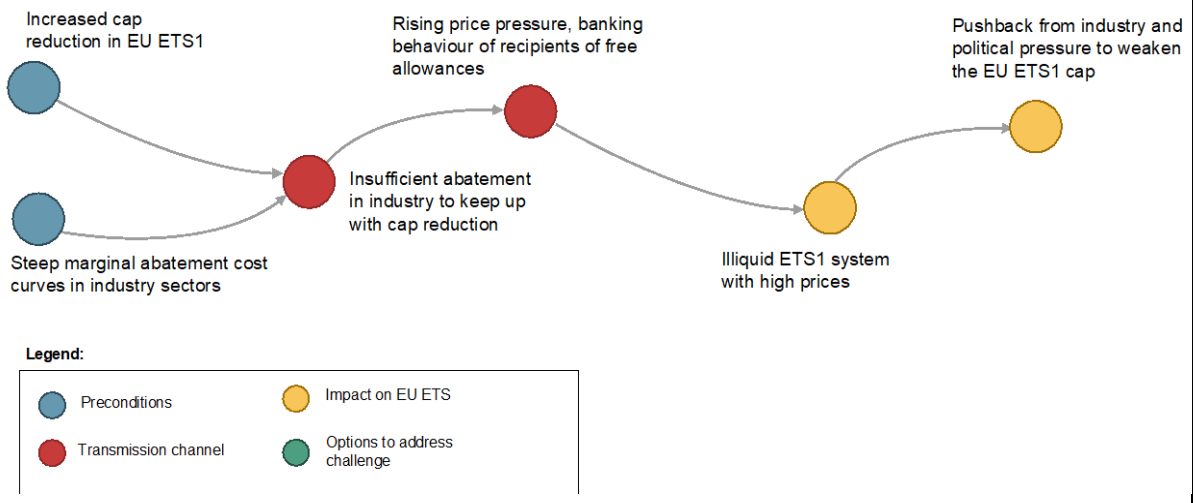
B.8 Luca Taschini

Interviewee	Institution	Date of interview	Main areas of expertise
Luca Taschini	University of Edinburgh	2023-04-12	Market Stability (Reserve) / International issues

Part 1: Identification and description of key challenges

Description and reasoning for choice of key challenges
1st Priority: Industry – Pushback to ETS due to political pressure from industry
• Absent disruptive production technologies coupled with limited availability of Negative Emission Technologies, might result in potentially low availability of sellers in the EU ETS1 system after 2030 (due to progressive reduction in free allocation and higher costs of for abatement of hard-to-abate industries) – Companies that receive allowances permits will have an incentive to hoard allowance permits. => very little trade/transactions, b/c willingness to trade is low and industry is sitting on historic permits => thin market => possible volatile and high prices in such a scenario ◦ Holders of permits will not be willing to trade b/c industry is holding the permits, but not reducing emissions at sufficient scale and speed ◦ Key question: Is between now and 2030 enough time invest in tech that significantly reduce emissions? – MSR will not help, b/c it is mainly about taking permits out of the system ◦ Even if the ones absorbed are given back into the system, the possible dumping effect on prices will be relatively small • This thin market system (and increased price) might lead to significant pushback / pressure from industry • Scenario: Pushback from industry • Likelihood of occurrence: Depends on the timescale considered – Currently not yet at point were price is prohibitively expensive: Likelihood low – If price doubles (to around 200 euros): Likelihood of strong pushback almost certain • Impact: "Could weaken or put at life risk" the ETS, because countries dependent on these industries are receptive to industry demands – Example car industry: Opposition of Italy and Germany towards phase-out of combustion engine • Timing: Based on endpoint for EU ETS1 in 2039, an effect will be seen in prices already around years before => Around 2030, we will likely already see an effect

Visual summary:



2nd Priority: Distributional aspects – Pushback from households against carbon prices

- ETS2 covers sectors characterised by high level of frictions and extremely inelastic product demands => sectors were not included in EU ETS1 for a good reason
  - E.g. transport: Marginal abatement cost curve is almost vertical => Going from 0 reduction to 1 reduction is already very costly
- Depending on the cost-pass through to households, substantial pushback can be expected in ETS2 / from households (although the behaviour of entities in ETS2 is unclear at this point)
- Taking the reactions of industry (see Priority 1) and households together, the pushback for EU emissions trading and the associated political pressure will likely be politically extremely relevant.

3rd Priority: Role of financial actors – Need to be monitored

- Beginning of the ETS: There was an economic and financial recession and financial crisis => Retreat of financial actors
- Now: Relatively large players re-entering the market, two motivations
  - Holding permits a hedging strategy
  - EUAs as new asset class (trade if seen as an opportunity)
- At the moment hold only half million of allowances → no high share
- Issue: Currently no sufficient oversight in place
- Market share of financial actors could become higher but manageable if the regulator reacts with sufficient oversight and introduces compliance costs

Part 2: Identification and description of policy options for key challenges

Key policy options

1st Priority: Industry – Pushback to ETS due to political pressure from industry

- Policy option: Devise an exit strategy, b/c there is an endpoint in the system
- Radical solution: Transition from cap system towards a system that works more like a fixed price, namely a **tax**

- Reasoning: A price signal must be kept (even if the ETS approaches the endgame / may not work as before)

2nd Priority: Distributional aspects – Pushback from households against carbon prices

- Revenues from auctioning of allowances (or a tax) are collected by the regulator => These **revenues** can be **redistributed**
  - Example British Columbia [reducing personal income taxes and corporate taxes by a an amount roughly equal to carbon tax]
  - Revenue use is under control of regulator => Distributional issues should be anticipated and dealt with within the Social Climate Fund as much as possible

Part 3: Additional relevant points from the interview

- Historically: Significant reduction of emissions in the energy sector, no changes in other sectors, especially industry
  - Very ambitious targets: There is a huge **gap between the goals and the historic development**
  - Especially ambitious for industrial sector – would need higher prices to push industries towards decarbonising
- Market stability: MSR of ETS1 design creates a "**vicious circle**": The larger the banking activity of market participants, the more allowances will be taken out of the system (increasing banking demand)

B.9 Nils Meyer-Ohlendorf

Interviewee	Institution	Date of interview	Main areas of expertise
Nils Meyer-Ohlendorf	Ecologic Institute	2023-07-20	ETS general, Carbon removals

Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges
1st Priority: Integration of carbon removals
Carbon removals: • **Starting point:** Emissions reductions and carbon removals are inherently different and not equivalent, carbon removals always the second-best option to emission abatement. • **Challenge:** Considers the integration of carbon removals in the EU's climate policy framework as a pivotal point for the further development of EU climate policy ("a watershed in climate policy making"). The main risk is that the EU may rely heavily on nature-based carbon removals with low permanence to meet its climate targets: – Nature-based removals with low permanence could undermine the climate policy ambition of the EU by delaying further emission abatement. – Nature-based removals with low permanence entail the liability to perpetually renew them in the future (Sisyphus problem); considering the costs associated with this liability, nature-based solutions are not as cheap as they seem. – With the escalating impacts of the climate crisis, natural sinks could turn into emission sources (exacerbates the uncertainty inherent to nature-based carbon removals in the medium- to long-run future) ◦ Already relevant today. Example of California ETS: Forest Carbon Buffer Pool (credit pool to address potential reversal of nature-based removals from forest projects) at risk from wild fires. • → **Take away:** Integration of non-permanent removals into the EU ETS would mean "building the ETS on sand" • **Robust definition at the core of the issue:** Robust definition of carbon removals needed - Only carbon removals with "permanent" storage (e.g., 1000yrs, 20% of the carbon not in the atmosphere) and solid MRV should be considered as relevant credits for compliance markets. **Interaction with EU ETS:** • Integration of removals with solid case for their permanence (e.g., DACCS) into the EU ETS as a good idea in principle • (In combination with the above) Integration of non-permanent carbon removals would create a compliance unit that significantly differs from the allowances in the system -> Uncertainty in the measurement, no permanence (see bullet point on robust definition above) • Only use BECCS if it is based on waste biomass (negative environmental impacts of large-scale use of BECCS, avoid wrong incentives for intensive land use and biomass demand). • Yet permanent removals will only be a small part of the solution due to the difficulties in scaling the technologies (Costs, availability of renewable energy etc.)

- The main question in relation to the EU ETS should remain: "How can we help the sectors subject to carbon pricing to face the challenge of an increased level of ambition and deliver emission abatement"
- Allow use of removal credits only for installations that are included in the ETS today -> addresses the risk that removals are used for other purposes where abatement solutions are available

Timeline for 2040 EU climate target:

- Integration of carbon removals
  - Commission proposal for climate target for 2040 will be published March 2024
  - Legislation for climate target for 2040 target early 2025
  - Climate policy package to implement the 2040 target will follow
  - Carbon removals should be part of the policy package

Part 2: Policy options addressing key challenges

Key policy options
1st Priority: Integration of carbon removals
• **General:** Many potential solutions are discussed, and it is important to explore all potential avenues for further policy developments and map their pros/cons • Options for the practical integration of carbon removals in the EU's climate policy instruments involve: – Integration into EU ETS (various options, e.g., full or partial integration limited to certain types of removals) (not discussed in detail) – Carbon Central Bank as governing body that procures carbon removals and releases them into the compliance market (not discussed in detail) – Setup of a Carbon Removals Trading Scheme (Similar to the SB-308 Carbon Dioxide Removal Market Development Act proposal in California, approved by the Senate, but not the second chamber, not yet law) (discussed in detail as the interviewee considers it a highly interesting proposal that can inform the EU approach) **Carbon Removals Trading Scheme:** • Interesting proposal for the setup of a <u>separate</u> market for carbon removals • Carbon removals would not be part of the EU ETS market: – In the California proposal, entities covered under the California ETS will be obliged to purchase negative emissions credits in the removals trading scheme. – Gradually increasing obligation under SB 308: Starting in 2030, California ETS installations are required to generate removals equivalent to 1% of their emissions in that period via the removals trading scheme. This obligation gradually escalates over time, reaching 100% removals (for the then remaining emissions) by the year 2045. • Proposal for the Carbon Removals Trading Scheme in California relies on a solid definition: – Durable carbon sequestration method are methods "that can reasonably be projected to retain a large majority of the carbon atoms out of the atmosphere for 1,000 years and for which the responsible entity provides a guarantee period of at least 100 years"

- To avoid scarcity of permanent removals, the proposal (besides purchasing permanent removals directly) also involves the option for a two-phase negative emissions credits:
  - 1st phase: An installation can opt for purchasing up to 50% of the credits they need to buy as non-permanent removals. Buying non-permanent carbon removal credits comes with the legally binding liability to buy permanent carbon removals credits after a guarantee period associated with the non-permanent credit expires.
  - 2nd phase: Purchase of the permanent carbon removals credit (following the definition above)
- The 1% (min. 0,5% permanent carbon removals) obligation in 2030 is still a very large amount considering the availability of permanent carbon removals today.
- Consequently, setting a target within this range serves as a strong economic incentive for further innovation and the scale-up of permanent carbon removal solutions.
  - Supporting the innovation and scale-up of permanent removals is essential -> need to go net negative in the second half of the 21st century

Part 3: Additional relevant points from the interview

- For further details: https://www.ecologic.eu/de/19290

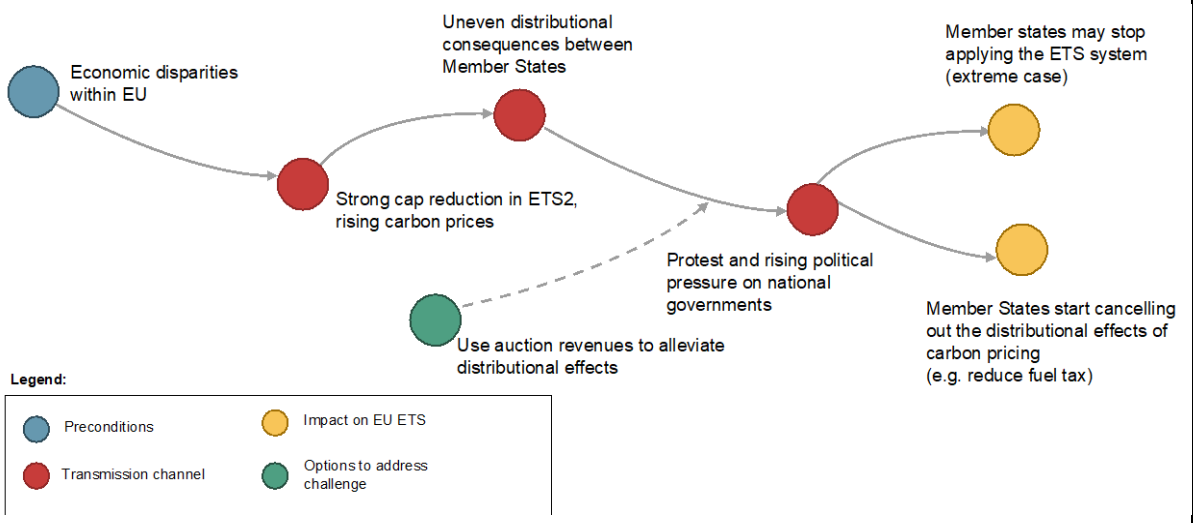
B.10 Philippe Quirion

Interviewee	Institution	Date of interview	Main areas of expertise
Philippe Quirion	CNRS, CIRED	2023-04-05	Industry, carbon leakage and CBAM / Industry, carbon leakage and CBAM / ETS 2

Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges
1st Priority: Distributional aspects – Economic disparities between EU Member States may lead to a carbon pricing too low to drive significant mitigation
• Per capita income varies by a factor of five between Member States like Denmark and less affluent countries => Distributional impacts of uniform carbon pricing will be very high • Challenge: Can a price be high enough to generate significant mitigation without creating distributional problems? • A high price would have very strong distributional consequences, especially in the poorest Member States. – This would be seen as unfair and may lead to protests, – Some Member States may then stop applying the measure, or subsidize fossil fuel prices, trying to cancel the economic effect of carbon pricing • A low price for fossil fuels could then lead to missing targets (because not sufficiently high to drive mitigation efforts) • Increased fossil fuel consumption can in turn lead to a cycle of even higher carbon prices in the ETS system. • **=> Challenge:** Price either too low to trigger mitigation or too high to be socially acceptable • Difference between a high carbon price vs. energy price spikes of 2022? – Price spikes were not caused by decisions of elected governments, but external factors (people cannot go after Putin for high prices) – Massive subsidies in some Member States to shield people from the effects of energy price increases

Visual summary:



2nd Priority: Industry – Risk of carbon leakage for exporters or along the value chain

- Two groups within CBAM (covering only imports) that are at risk of carbon leakage:
  - 1) Exporters,
  - 2) Production further down the value chain
- Free allocation should not co-exist with CBAM for a given source of emissions
- If no CBAM for exports, it may make sense to still provide free allocation to level the playing field for the share of exports
- Question how far to go down along value chain to avoid leakage risks
  - Without coverage: Potential incentive to relocate production outside of the EU
  - => Trade-off: Providing leakage protection vs. administrative costs
- Further risk: Resource shuffling
  - Aluminium produced with e.g. hydroelectricity shipped to EU, and coal produced aluminium shipped to other markets => Does not help climate
  - Policy option: Use common benchmarks

(3rd Priority: Removals – Integration of negative emissions into the EU ETS system)

- (Not discussed in detail)

Part 2: Policy options addressing key challenges

Key policy options

1st Priority: – Economic disparities between EU Member States may lead to a carbon pricing too low to drive significant mitigation

- a) Mitigate the negative distributional effects of carbon pricing on households
- Auctioning revenue can be used to mitigate distributional effects
- But: Not easy to identify the potential losers of carbon pricing => Variability between households with a similar income (e.g. disparities in fuel costs for commuting)
  - Studies explain only part of the variability
  - Most determinants not observable

- **Per-capita redistribution**: Makes people better off on average in 1st decile, but within the decile there will be some large winners, while others will still be losers (variability within 1st decile)
  - If such a per-capita rebate is fine-tuned by introducing **targeted subsidies**, the incentives from carbon pricing (e.g. for buying a smaller car) are cancelled
- b) Addressing carbon price that is too low to drive mitigation
- Need for **complementary policies**
  - E.g. **Public procurement** for buildings b/c embedded emissions alone will not be incentive to switch
    - Cost of cement very small part of costs – even if carbon price doubles, people may prefer to go on with what they know
  - Alternative: **Performance standards**

2nd Priority: Industry – Risk of carbon leakage for exporters or along the value chain

- Use continued free allocation for share of exports
- Use common benchmarks to avoid resource shuffling under CBAM

Implementation of a price corridor (relates to Priority 2 and 3 -> planning certainty for investment decisions)

- Stabilization of price expectations is important – certainty about emissions trajectory on paper, but difficult for companies to make decisions
- At least in the early years, the ETS did not have an effect on emissions in basic materials industry (steel, cement)
- Heavy industry: Radical technological changes needed, with high risks
  - Face uncertain carbon price + other uncertainties (e.g., price of final products or fossil fuels)
  - Will not be enough to get the required investments in a couple of emissions-intensive industrial sectors
  - Emissions per tonne of steel or cement has basically been flat (until a few years ago)
- MSR is very complex + not able to stabilize allowance price => A **price corridor** would be more adapted to stabilize expectations

B.11 Robert Jeszke

Interviewee	Institution	Date of interview	Main areas of expertise
Robert Jeszke	CAKE/KOBiZE	2023-08-09	ETS general, scope of emissions, distributional aspects and revenue use, ETS2, interactions with other policies

Part 1: Identification and description of key challenges

Description and reasoning for choice of key challenges

1st Priority: Distributional aspects

- Views the distributional consequences of higher carbon prices and the implementation of the ETS2 as the **most crucial challenge**; this applies for post-2030 but also in the coming years already, especially once ETS2 is implemented
- Need for maintaining the social balance -> Crucial element of the success of the ETS system and the overall climate policy framework
- Higher carbon prices and increased coverage will cause higher costs for households leading to risks of energy poverty or transport exclusion
  - The high share of solid fuels use for heating in Poland exacerbates the impact compared to other countries in the EU (in 2021 approx. 75% of solid fossil fuel consumption in households in the EU-27 was attributed to Poland).
  - Also: high share of district heating in Poland -> consumers cannot directly influence the way the fuel is used
- Challenge: The more ambitious the EU will get in terms of emissions reductions, the more and the sooner **money will need to be spent to address distributional consequences** of carbon pricing
- Expects hindering factors (e.g., availability and/or investment costs for heat pumps) to risk delaying the transition and thereby maintaining carbon emissions, which in turn leads to higher carbon prices and increased distributional pressure

2nd Priority: Scope of emissions and linking of ETS1 and ETS2

Agricultural emissions

- ETS system should not be extended (i.e. by introducing a carbon price) to agricultural emissions due to steep abatement costs in ETS and strong social implications of increased food prices induced by carbon pricing, leading to EU food production drop and contributing to the "carbon leakage"
  - Could lead to a significant reduction in the competitiveness of the agricultural sector and undermine food security in the EU
  - Could risk the social acceptance of the ETS system
  - Would likely lead to higher food imports which would counteract the general idea of subsidising agricultural production in the EU
  - Any instrument introduced to drive down agricultural emissions should be complemented by redistributive policies and a completely revised EU's Common Agricultural Policy (CAP)

Linking of ETS1 and ETS2

- Linking of ETS1 and ETS2 will create a bigger market and thereby mitigate the lack of allowances in the medium-term
- If ETS1 were to reach a cap of zero by around 2040 (or even some years after), the scarcity of allowances in the market will become visible 5-7 yrs. before (before 2040s)
- While the further extension of the EU ETS to other sectors brings efficiency and consumption growth benefits at the EU level, it also increases prices in the newly included sectors.
- On the one hand, sectors will pay for their emissions in the EU ETS, which affects the decline of exports in some economies and may negatively affect poverty rates. On the other hand, revenues from the sale of allowances will go to the budget and may be used to compensate households. (see 1st Priority).
- Linking would also lead to better economic efficiency as in long term the marginal abatement costs in the combined systems are lower than in the ETS2 alone.
- The macroeconomic impact of linking ETS1 and ETS2 varies significantly across regions.
- Linking would aid at maintaining ETS and carbon pricing as the EU's main emissions reduction mechanism

Carbon removals

- It will be virtually impossible to achieve the EU's net-zero target in 2050 without the widespread use of carbon removals technologies
- In the long-run carbon removals will provide additional supply to the market
- Removals as safety valves that prevent excessive carbon prices
- Carbon bank as potential governing body to release removals into the market

3rd Priority: International linking in interaction with the implementation of CBAM

CBAM

- Introduction of CBAM is linked to a key question on an even higher level -> How does the EU want to interface with economies that approach decarbonisation in a different way? (e.g. US subsidizing green tech scale-up, no carbon pricing on a federal level)
- CBAM does not cover export share and products down the value chain thus target should be to get agreements with partners that deliver on the neutrality objective, i.e. resulting with international agreements (CORSIA case); opening discussion on ways to linking with other carbon pricing mechanisms.

Linking with other ETS systems

- UK ETS -> currently the only ETS that would provide a good interface with EU ETS for linking
- Need to work out solutions enabling the progressive integration of neighbouring states and form of linking with the systems being developed in the EU's associated countries, i.e. Ukraine, Moldova, the Western Balkans.

Part 2: Identification and description of policy options for key challenges

Key policy options

1st Priority: Distributional aspects

- The **relative cost burden in relation to household income per Member State should determine the volume of the relief measures**

- Low-income households typically spend a higher proportion of their income on energy and essential goods, making them more vulnerable to rising energy prices resulting from carbon pricing

- Fit for 55 framework (innovation fund, modernisation fund, social climate fund) a good starting point for the 2030 time horizon, which needs to be further developed for the period 2030-2040
  - Need to strictly monitor the spending of these funds
  - Innovation fund: Focus more on technologies that can benefit across all EU Member States (e.g. not only funding for offshore wind and taking into account countries specificities - national/regional slots)
- Focus on sectoral and regional levels -> burden sharing within the EU for the regions and sectors that are most impacted by the transition

2nd Priority: Scope of emissions and linking of ETS1 and ETS2

- No carbon pricing in agricultural emissions (rather reform of CAP and integration with ETS through removals)
- Linking of ETS1 and ETS2 in the medium-term
- Supply market with carbon removals
- (See bullet points in challenge section for more detail)

3rd Priority: International linking in interaction with the implementation of CBAM

- CBAM should also apply to the export of EU goods (not just the import of goods into the EU customs territory), involving compensating for the costs resulting from the EU ETS, which ensures fair competition for EU goods on markets outside the EU.
- Work on sectoral agreements with partners that deliver on the neutrality objective and opening discussion on ways to linking with other carbon pricing mechanisms.
- Need to work out solutions enabling the progressive integration of neighbouring states and form of linking with the systems being developed in the EU's associated countries, i.e. Ukraine, Moldova, the Western Balkans.

Part 3: Additional relevant points from the interview

- **General:** ETS framework fine until 2025 or maybe until 2030 but will need to substantial reform to afterwards to reflect increased ambition (challenges described above deduced from this perspective)
- **MSR und scarce supply of allowances -> carbon bank as a potential governance system**
  - Sees no need for MSR beyond 2040 -> MSR is only sucking up allowances from the market and thereby increasing the ETS prices (not aligned with politically agreed targets)
  - There will likely be a need to stabilize the price on the upper end -> Carbon Bank idea as an interesting solution
  - Carbon Bank could replace MSR -> the higher the prices the more negative emissions could be issued by the Carbon Bank to moderate prices
  - Governing body would need to have representatives of the Member States

B.12 Sam van den Plas / Agnese Ruggiero / (Sabine Frank) (Joint interview)

Interviewee	Institution	Date of interview	Main areas of expertise
Sam Van den plas / Agnese Ruggiero / (Sabine Frank)	Carbon Market Watch	2023-04-19	Industry, carbon leakage and CBAM / Carbon removals / Distributional aspects and revenues / Interactions with other policies

Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges

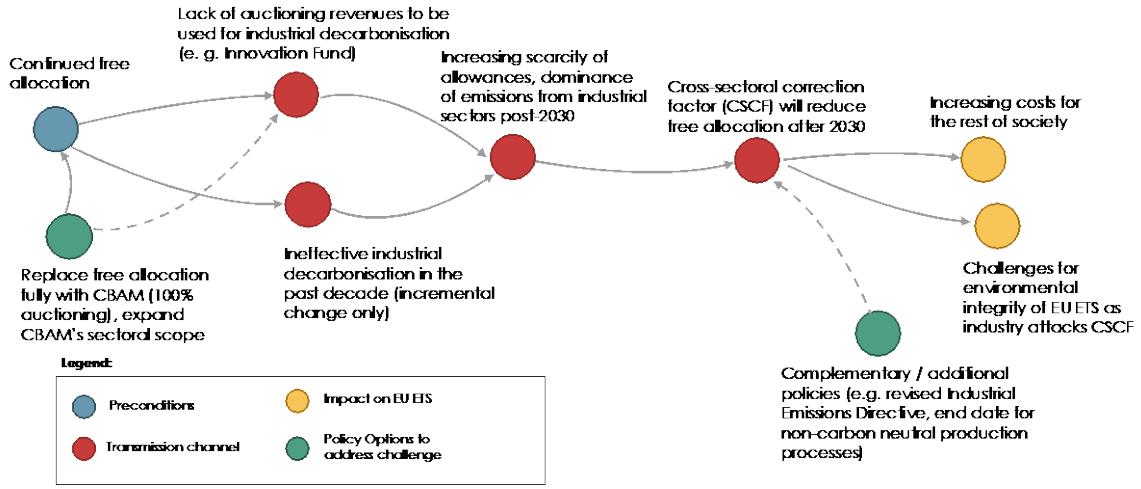
1st Priority: Industry – Lack of revenue due to free allocation + deferral of retiring carbon-intensive assets

- Free allocation problematic for two reasons
  - 1) Has not proven effective in supporting and incentivising industrial decarbonisation
    - Gap between theoretical linear reduction factor vs. what has (not) been achieved in energy-intensive sectors in reality
    - Need for industry assets to move into radical technological change instead of the incremental one that we saw over the past decade
  - 2) Leads to a lack of auctioning revenues to be used for industrial decarbonisation
    - Free auctioning diminishes the resources of the Innovation Fund (which could have been much larger)
  - => One of the main shortcomings of Fit for 55 reform that free allocation is continued and will continue after 2030 (Phase IV)
- Increasing dominance of emissions from industrial sectors post-2030 => many modelling scenarios will show tension between amount of free allowances and the overall cap in the system
  - Cross-sectoral correction factor (CSCF) keeps free allocation in line with the cap => will become very high if nothing else changes
  - Importance of CSCF to maintain the integrity of the ETS
- Concern: Already quite some pressure on application of CSCF (Industrial stakeholders argue that CSCF should not penalise them) => There have been proposals to not apply CSCF
  - Importance of CSCF to maintain environmental integrity of EU ETS
  - Phase-out of free allowances agreed for certain sectors => Risk that revision in 2028 could change that
- Need to retire highly emitting infrastructure in energy intensive industries – end date needed to be an end date for the last blast furnace running on coal before 2040
  - Debate in Germany on phase-out of coal and lignite in power sector, but discussion not yet advanced for heavy industries
- Risk: Deferral of retiring of carbon-intensive assets leading to increasing scarcity of allowances
  - Some (limited) evidence on management of portfolios that there are "cash cow" assets which are written off without any major refurbishment plans (e.g. BCG's Growth Share Matrix)

- Problem exacerbated by free allocation of allowances
- Potential consequence: Scarcity of allowances in the future – these assets make life harder for everybody else

- Likelihood (of deferral): Very high
  - Current pace of free allocation reductions not keeping track with the cap and linear reduction factors
  - CSCF will crash into free allocation at some point after 2030
- Impact: Will drive up costs for everybody else / rest of society

Visual summary:

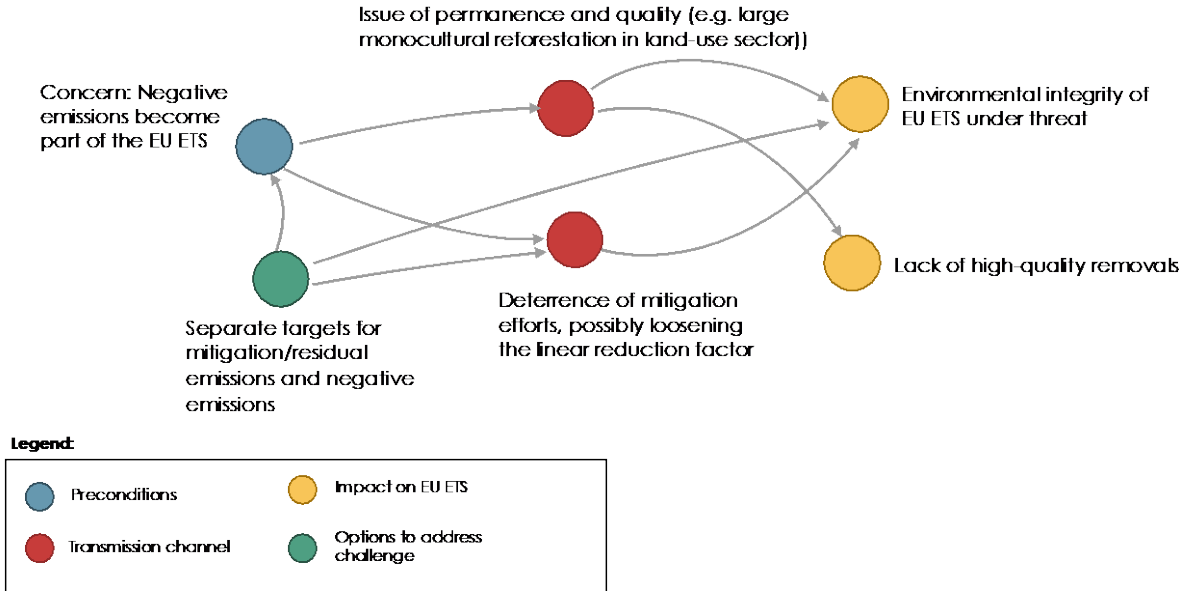


2nd Priority: Removals – Risk of inclusion within ETS, challenge of incentivising high quality removals

- Negative emissions currently not part of the EU ETS – concern that negative emissions may be included into the EU ETS (work on EU Commission proposal of carbon certification framework)
- Opposition to trading negative emissions against ongoing emissions by sectors currently under the ETS for two reasons:
  - 1) Issue of permanence and quality (e.g. land-use sector)
    - Quality issues: Risk of large monocultural reforestation if all negative emissions allowed
  - 2) Mitigation deterrence / potentially deflating the cap
    - Including a reliance on unproven and unscaled carbon removal technologies would give a reason to inflate the cap for other sectors (i.e., loosening the linear reduction factor)
- => Greatest priority is to incentivise high quality removals
  - Having removals as offsets within the ETS would be problematic
- If only negative emissions are included where the environmental integrity is guaranteed, these will come at a very high price
  - Highly questionable whether a carbon market is suitable for delivering those emissions
- Residual emissions: Need to be defined clearly / delineate what it is (if possible at sectoral level) => Risk: Everybody wants to be residual

- Market not necessarily suitable to pool the residual emissions with removals
- Not many sectors would qualify as residual (e.g., a gas plant is not residual, also parts of industrial emissions are not residual)

-
- **Visual summary:**



3rd Priority: Distributional aspects – use of revenues

- A lot of progress has been made towards earmarking of revenues => Goal should be reinforcing this (either on MS level or European centralisation of revenues)
  - Investment in renewables and energy savings, including Just transition aspects, impacts of ETS2 on vulnerable households
  - Increase societal acceptance
  - Avoid impression revenues serve to prop up national budgets
- Taking ETS revenues to European budget from MSR was unfortunate
- Inconvenient truth: There will be a peak revenue => Ultimately there will be less allowances auctioned
  - Need to make best use of resources of next 5-10 years

Part 2: Policy options addressing key challenges

Key policy options

1st Priority: Industry – Lack of revenue due to free allocation + deferral of retiring carbon-intensive assets

- Importance of **complementary / additional policies** and measures to avoid an application of the CSCF => ETS needs to be put into context of broader climate governance
  - Revised Industrial Emissions Directive (IDE) has enormous potential
    - IED has pollution at source as a main principle => values for emission limits and GHG standards will create a predictable pathway for energy intensive sectors
  - Circularity options, more recycling

- Policy option **100% auctioning**: Replace free allowances with CBAM entirely
  - Use of auction revenues as a key funding source for industrial decarbonisation
  - It would be more productive to have full auctioning and then use revenues in a targeted manner to help support industries to decarbonise, bring technologies to maturity in a timely manner etc.
- **CBAM** is an alternative to carbon leakage protection => include more sectors
  - Chemicals (with a large share of imported emissions) and plastics could be included with the review before 2026 (the end of the transitional period)
  - Some of the chemical companies would be interested in being included under the CBAM
- CDR should not be recognised as a discount for non-European producers on the CBAM certificate purchase
  - CDR would not spur industrial decarbonisation and emissions reduction for trading partners
  - CDM was extremely detrimental to the ETS system => CDR should not be recognised as a climate measure
- Critique of **ETS benchmarks**: Rewards based on 10% best performance, which is not a breakthrough carbon free technology
  - Update of the benchmarks very mild
  - Next revision needs to go from shielding / competitiveness aspects to rewarding best performance

2nd Priority: Removals – Risk of inclusion within ETS, challenge of incentivising high quality removals

- Proposed policy option: **Separate targets** for mitigation / residual emissions and negative emissions
  - Limited number of sectors subject to a sufficiently high carbon price signal combined with complementary policies and instruments
- Enormous question: How do you select **the residual emissions**?
  - A) By policymakers: Involves picking winners and losers within two decades - very difficult exercise
  - B) Better: let industry compete for residual emissions while they are under a cap
- **Limited supply of additional allowances** within the ETS: There are reasons to call for an end of the ETS, but risky political strategy as it is currently not clear what the alternative would be
  - An alternative policy would also need to govern residual emissions and create space for removals on top
  - Option to move towards a tax, and having a separate target for removals
- => Question of how incentivisation of high-quality removals should happen needs further work – one option is to use ETS auctioning revenues to support dedicated research, development and deployment of high-quality removals

3rd Priority: Distributional aspects – use of revenues

- **Smart use of auction revenues**: Includes funding for renewable energy, industrial clean breakthrough technologies
  - A lot of this is available under the **Innovation Fund**, which could deserve further expansion and better targeting

- Current spending possibilities include indirect cost compensation for electro intensive industries, which has questionable climate effects

- Priority for revenues: Anything that will help to drive carbon emissions down in sectors which need additional support in combination with ensuring that there is a society wide fair and just transition
  - Revenue distribution to support people who already have a problem paying bills and do not have the resources to invest in cleaner alternatives

B.13 Simone Borghesi

Interviewee	Institution	Date of interview	Main areas of expertise
Simone Borghesi	EUI	2023-04-17	Market Stability (Reserve) / International issues / Distributional aspects

Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges
1st Priority: Distributional effects – Risk of EU emissions trading losing credibility

• Prices will keep rising due to decreasing cap/rising ambitions, creating **regressive issues** (regressive effects of carbon pricing)
• This puts the social sustainability of carbon pricing at risk
• Challenge: We might end up with a **movement like the yellow vests**
  – This would put at risk the whole architecture of the ETS
• **Likelihood** of a) regressive distributional effects occurring: 7/10; b) protests: 6/10
  – Likelihood of protests lower because they can be avoided
  – But it is uncertain whether that will actually be done effectively
• **Impact** of a) regressive effects on ETS: 2/10 (regressivity does not change functioning of ETS); b): protests on ETS: 8/10 (protest + losing credibility could be really disruptive)
• **Political risk**: Despite political decision on ETS2 (successful trialogue negotiations), changing political majorities may question this / **undermine the envisioned system**
  – In the coming years perception may shift to a view that ETS2 "cannot be afforded"

2nd Priority: Linking ETS1 + ETS2 – Distortions from merging systems with diverging prices

• **Equalisation of marginal abatement costs**: Should aim at having a **unique price** at some point for economic efficiency reasons
• Timing: Not too far in the future – climate neutrality 2050 not very far into the future either
• Challenge: If ETS1 and ETS2 are linked too fast, two consequences may occur:
  – 1) Price in ETS2 has to rise very fast
  ◦ ETS2 can have a larger impact on vulnerable families (=> mirror challenge of distributional aspects)
  – 2) Price of ETS1 may be falling due to linking
  ◦ Not the right direction => Internalisation of huge externalities require prices that keep increasing
• Likelihood of occurrence (linking to happen): In the short run 2/10, in the medium term 5/10
  – Not completely clear that ETS2 will be implemented in the end" [see discussion above]
• Impact of linking: 6/10
  – ETS1 is robust enough to resist the potential for drastically falling prices
  – MSR will support the price level

3rd Priority: Integration of carbon removals
• Positive and negative challenge at the same time

- Positive: We will **need carbon removals for the hard-to-abate sectors** in the few years
- "Negative": **Integrity risk** – the methodology applied has the potential to lower the credibility of the whole system
  - If something goes wrong with offsets, this will backfire and lower the credibility of ETS1
  - CDM: Was one of the drivers of low prices
  - => It took two decades to have a credible ETS system
- **Risk for substituting mitigation efforts with removals**
  - Risk: If we know we can rely on removals, then more emitters will try to rely on removals
  - Ambiguity of terminology: Even some of the experts on the topic are not fully aware of some of the differences in the way projects are run
- At future COP, a shift towards technology-based solutions may be an upcoming topic
  - False impression: Continue polluting because the technology will save us
- **Likelihood**: 8 (concerning the risk that many credits enter the market that may be "hot air")
- **Impact**: 8 (b/c of credibility issues)

4th Priority: Market Stability Reserve – Introducing a price corridor

- MSR has worked very well in the short run (past) - but not the best way to proceed in the medium term
- With reliance on quantity-based mechanism (MSR), the EU ETS is in isolation regarding to other emissions trading systems
- Undesirable effects of MSR: Affecting operators' expectations (increase banking behaviour)
- MSR is designed very complex – price corridor would be a simpler way

Part 2: Policy options addressing key challenges

Key policy options

1st Priority: Distributional effects – Risk of EU emissions trading losing credibility

- Risks of rising prices and public concern can be mitigated => Revenues are raised, tools exist to address negative aspects
  - Volume of Social Climate Fund and auction revenues from ETS1 taken together are substantial
- Addressing the negative impacts will not happen automatically
- Most important policy option: Improve **communication** of the policy message
  - Importance of communication: There is rather an educational gap than a regulatory gap at the moment
    - Many people in the general public do not understand the system well and do not believe it works
    - Sometimes reasonable concerns, sometimes due to a lack of understanding
  - Other jurisdictions are much more successful with their communication efforts (e.g. California – written on school buses, in hospitals)
- Second policy option: **Earmarking of revenues**
  - Earmarking of revenues - currently only done by a few countries (some do not do it at all)

- **Harmonisation** of redistributive approaches would be important
  - Would be a first example of harmonised fiscal policies / Potential first step towards harmonisation of fiscal policies more generally, in the area of environmental issues
- **Spending on Social Climate Fund should already start now** / be anticipated, using money from ETS1
  - Challenges are already real (e.g. rising energy crisis)
  - Would lead to 1) positive communicational effects; 2) binds our hand to implementing ETS2 (will be needed to raise the necessary revenues)
  - Examples Ontario, Australia, UK: Delinking from other ETSs as examples of changes in a jurisdiction's policy with respect to what was previously agreed (time inconsistency) => exemplify importance of committing strongly to what has been decided politically

2nd Priority: Linking ETS1 + ETS2 – Distortions from merging systems with diverging prices

- [See discussion above]

3rd Priority: Integration of carbon removals

- Pre-requisite: Create a **registry** on the activities of carbon removals => an MRV that is reliable
  - Policy requirement rather than a policy option
- For "nature-based solutions": Create consortia of players to **increase bargaining power of small players**
  - Especially important for developing countries: Small players often do not understand the benefits of removals, play the game with big players etc.
  - Asymmetric bargaining power causes price of removals to be very low
  - Currently no real market - just bilateral negotiations
    - Low price of removals reduces incentive of carbon reduction

4th Priority: Market Stability Reserve – Introducing a price corridor

- Move from quantity-based mechanism to price-based mechanism => **Price corridor**
- Two key advantage of price corridor:
  - 1) Reduces uncertainty => Price will range within some limits
    - Uncertainty is a big enemy of investments
  - 2) Corridor will increase the possibility of linking with other ETS
    - Main obstacle to linking is loss of sovereignty => Risk to merge with another system that fluctuates very much in terms of price
    - If price corridor partly overlaps with other one, there is a stricter corridor for safe linking

Part 3: Additional relevant points from the interview

- €45 "political price cap" in ETS2: Not a problem, but good to have it
  - German approach to ETS2 with a price floor and price cap that increases over time makes sense
  - Increasing price corridor: Converges towards ETS1
  - Ideally: Price corridor for ETS2 could be implemented into ETS1 as well
    - Two advantages: 1) Linking, 2) Introduction of price corridor in ETS1

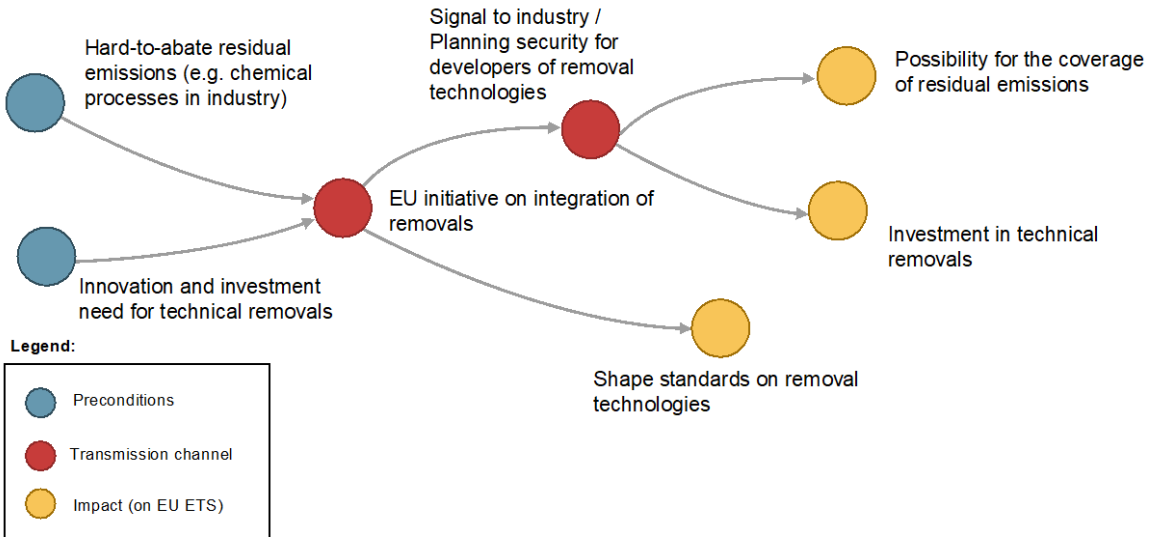
B.14 Sonja Peterson

Interviewee	Institution	Date of interview	Main areas of expertise
Sonja Peterson	Kiel Institute for the World Economy (IfW Kiel)	2023-04-06	ETS general; International issues; Industry, carbon leakage and CBAM

Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges
1st Priority: Inclusion of carbon removals in EU emissions trading
• Negative emissions are needed for climate neutrality • Twin challenge: – **Removals can address:** Residual emissions in emissions trading that still have to be covered (e.g. chemical processes in industry) – **Removals need:** Negative emissions technologies need to be upscaled/developed; investment need • Technologies: Nature-based solutions (improving peatlands, growing forests) are important, but will not be sufficient for climate neutrality objective alone – Other technologies will be needed that also entail risks e.g. in terms of permanency of removal, safety of storage => Europe could have a role in managing these risks by setting standards • Timing: Including negative emissions in ETS will take time, but need rules by ~2030 – Important that processes are already starting at MS level (e.g. Germany) and EU level **Assessment for scenario:** • Likelihood: 8 (will happen one way or the other) • Impact on EU ETS: 8 (cover residual emissions)

Visual summary:



2nd Priority: Development of ETS2 (along different dimensions)

Priority 2.1 – Merging ETS1 and ETS2

- Good to start with separate system for ETS2, but eventual merging important for economic efficiency
  - More efficient to start with emissions reductions quickly in ETS1, later ETS2
- Policy proposal: Gather some experience with ETS2, then merge in the 2030s

Assessment for scenario:

- Likelihood of occurrence: 7
- Impact on EU ETS: 6

Priority 2.2 – The ETS2 implicit target price of 45€/tonne CO_2e from the mechanism is not aligned with the shadow costs of the ESR targets

- Challenge: Shadow costs of ESR targets are much higher than the ETS price (likely a few 100 euros to reach 2030 targets)
- Implicit price target[74] from the price containment mechanism of the MSR in ETS2 of 45€/ton CO_2e does not match the higher shadow costs (even lower than price of the German emissions trading price for transport and buildings)
- From the implicit price target a wedge between ETS1 and ETS2 may prevail, which hinders merging (see priority 2.1 above)
- Two possible scenarios:
  - If the €45 target is taken seriously, political pressure may make higher quantities of allowances in ETS2 necessary (it would then amount to a tax) and the emission targets may not be met

[74] The Provisional Agreement on ETS2 foresees that 20 million allowances will be released from the MSR of ETS2 where the average price of allowances exceeds a price of EUR 45 during a period of two consecutive months (Art. 30h). ETS2 coverage of about 1,000 million tons of CO_2 emissions p.a.

- If the planned quantities of additional allowances released by the MSR of ETS2 are to be maintained, the price will probably rise to far more than €45

Assessment for scenario:

- Likelihood of occurrence: 6
- Impact on EU ETS: 8

3rd Priority: Decarbonisation of industry without major carbon leakage

- Challenge: Leaving era of incremental change (efficiency gains) and familiar technologies towards a technology switch (fundamentally changing production processes)
- Justified fear of carbon leakage in a setting where firms operate in international markets
  - No (or very limited) leakage in the past, but will change once we move to climate neutrality
- CBAM: Good idea, but unclear how well it will work
  - Will probably do a good job to level the playing field within the EU, but not on international markets

Part 2: Policy options addressing key challenges

Key policy options

Overarching: Carbon Central Bank

- Supports idea of **Carbon Central Bank**
- Target would have to be defined (like inflation target for ECB)
- Would have more freedom than a rules-based system like the MSR
- Could **combine price and quantity instruments** (theoretical and practical evidence supports this)
- Could also oversee the **integration of negative emissions**
- Although support mechanisms are needed (especially ETS2 sectors and industry), important not to implement too many small instruments ("micro-steering")
  - Role of the EU vs. national governments in these support mechanisms remains unclear

2nd Priority: Development of ETS2

- **Interaction ETS2 and Effort Sharing Regulation** not very clear
  - National targets: Not under national control once traded
- **Support mechanism for ETS2** necessary
  - Consumers: Inefficient capital markets, consumers do not have capacity to take rational/fully informed decisions, problem of paying for heating system needs to be avoided

3rd Priority: Decarbonisation of industry without major carbon leakage

- **Contracts for difference** as one policy option to decarbonise industry
  - Unclear whether it is an over-subsidisation
  - Good that it would be linked to carbon pricing

Part 3: Additional relevant points from the interview

- ETS has now become the credible **lead instrument** of EU climate policy
  - Positive from efficiency + effectivity perspective
- Ranking of other issues/developments:
  - Market stability: Not the first challenge
  - Distributional issues: Are important, but this is a much more general issue not only related to climate policy and should thus also be addressed more generally. Still, it makes sense to address the distributional issues of carbon pricing.
  - Linking internationally: Less important, international linking of the EU ETS with the US is unlikely to happen

B.15 Anonymous interviewee

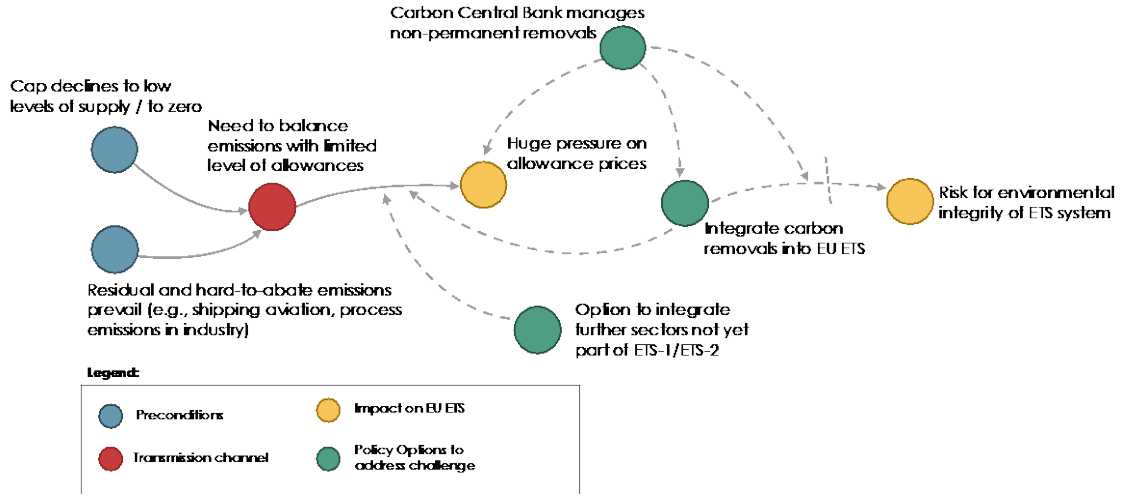
Interviewee	Institution	Date of interview	Main areas of expertise
Anonymous interviewee	-	-	-

Part 1: Description and summary of key challenges

Description and reasoning for choice of key challenges
1st Priority: Integration of removals – Risks for environmental integrity

• Integration of carbon removals key to be able to manage the system
• Reason: 1) Cap is going to decline; 2) Existing emissions will not go down to zero (shipping aviation, process emissions in industry)
  – By 2035: Power sector will be decarbonised, but industrial emissions will remain (combustion, but also process emissions, where a reduction will be expensive)
  – Huge pressure on prices
  – Solutions for industry have either not yet been found or are so expensive that industry would price themselves out of the market
• => This transformation will have to be managed
• Timing is crucial: Policy response will have to be timely (before 2030) due to a) the increasingly tight cap, and b) management of expectation of market actors
  – Expectations of industry: Need to start early - otherwise industry will not make investments (if there is no option for emitting in the future)
• One option for managing these issues: Expand EU emissions trading to have more flexibility in the system
  – Negative emissions
  – Add further sectors not part of ETS1 + ETS2
• => Need to balance the remaining emissions with carbon removals
• Potential threat to environmental integrity of the ETS: There are permanent solutions and non-permanent solutions
• Easy option would be to give access to only permanent solutions
  – DAC, BECCS, further solutions that can bind carbon in the geosphere
  – Potentially also biochar where you can have a high survival rate of the carbon in the biotope
• More complicated for nature-based solutions that are already viable today and established on voluntary carbon market because they are non-permanent
• Impact: Risk for environmental integrity needs to be controlled by a central body/regulator [see discussion of carbon bank for non-permanent removals below]

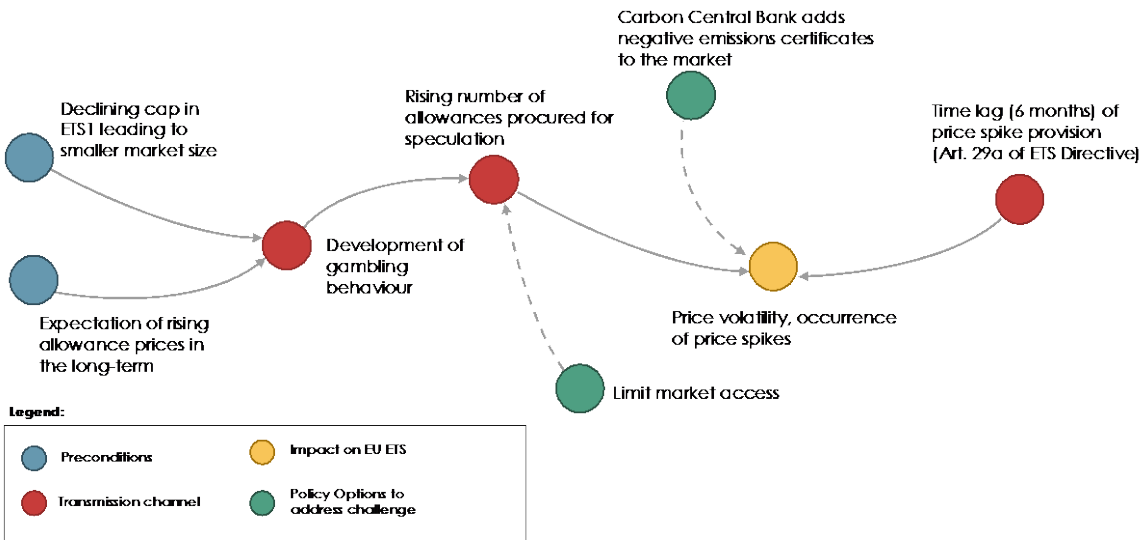
Visual summary of 1st priority and corresponding policy options:



2nd Priority: Role of financial actors – Increasing speculation due to a decreasing market size

- Price expectations in the ETS1 over time => There are risks in the system (the way it is built)
- Market size of ETS is declining => risk that people are starting to gamble by buying up remaining allowances
  - Risk is worse than for cryptocurrencies, where mining is happening continuously, so you don't know how much is coming onto the market
  - The ETS, on the other hand, has a restricted number of allowances and is therefore prone to speculative behaviour
- Potential explanations why speculation is not already happening could be 1) political mistrust that policy stays on track; 2) fear that the EU would start acting to counter speculation
- Likelihood of gambling to happen at some point in the coming years is quite high
  - Money is abundantly available and people are willing to speculate
- Impact would be huge
  - The amount of money that is going into cryptocurrencies could probably wreck the entire ETS
- One will have to evaluate if the mechanism to address price spikes in the ETS according to Article 29a (price spikes) is sufficient and how additional provisions may be implemented
  - Fit-for-55 reform to Art. 29a: EUA price of the previous six months > 2,4 times the average of the two preceding years → 75 million EUAs released from the MSR
  - Thus, currently the price spike provision works with a significant time lag
- Plan B will need to be ready (and implemented in the legislation) before speculation kicks in
  - After financial crisis and inflow of CDMs, it took several years to get the MSR up and running
  - Important to *anticipate* development (and have it in legislation), allowing to react quickly
- Use early adoption of regulation and supply of allowances as a means to prevent/respond to gambling behaviour, not limit access to the carbon markets

Visual summary of 2nd priority and corresponding policy options:



3rd Priority: Use of revenues – Decrease of available revenues to fund the transition

- Financial revenue of ETS1 will go down dramatically
- This revenue has been a major source of income for transition (industry, but also other parts of society)
- Social Climate Fund: Very important – will have to be taken forward
- Make sure still sufficient money will go to decarbonization, particularly in industry
  - Decarbonization more difficult for industry than it was for energy
  - Energy infrastructure was already very old – industry assets are more modern => will require financing facilities
- Shipping and aviation: Will also need revenue sources

Part 2: Policy options addressing key challenges

Key policy options

1st Priority: Integration of removals – Risks for environmental integrity

- Key policy option: **Carbon bank for non-permanent removals**
  - Idea: managing non-permanent carbon credits in a centralised institution
  - Possibility to guard the system, avoid creating infinite liabilities for the public
- Management of non-permanence: Carbon bank issues additional allowances into the market. Every time one certificate expires, it is replaced with the next one => Quasi-permanence
  - Carbon bank would procure the negative emissions for the markets
- Additional emissions allowances in the future would be backed up by negative emissions
- Central bank could have two functions; 1) addressing removals [as discussed above] 2) addressing speculation / avoiding (excessive) price volatility in the carbon market
  - How it would work exactly still needs to be determined (e.g. is the bank allowed to create allowances and push them into the market in order to calm a heated market?)

- Dealing with supply of allowances was traditionally more the role of the Commission, but the carbon bank could be more similar to how the European Central Bank operates
- Creating a carbon bank would be an expansion of the current governance structure, going beyond MRV focus

- Financing still has to be decided
  - Easiest option: Whole society (e.g. via taxation / a separate levy)

2nd Priority: Role of financial actors – Increasing speculation due to a decreasing market size

- Current situation: Price spike provision (according to Art. 29a in the ETS Directive) already built into the system, but designed with significant time lag
- Option 1: Allow someone to **print allowances** and push them into the market (like carbon central bank) more immediately
  - Avoid situation like CDM: Entered the market, but stayed for a long time
  - Difference to monetary markets: Do not have an interest rate to steer
- Option 2: **Limit access** to the market
  - Was discussed during this round of reform, but did not materialise

Part 3: Additional relevant points from the interview

- In certain areas ETS will have to be developed – other areas are more optional
  - Agriculture non-CO_2 emissions: One area that should be introduced to the EU ETS
  - General approach to extension of scope: The smaller emissions in a certain area/sector not yet included become, the less relevant their inclusion in an ETS

- **Priority #4 MSR**: Feed-in rate of MSR of 24% will make market tight very quickly

- **Priority #5 Interplay with market-based approaches for international aviation and maritime shipping**: Make sure there is not a possibility of undermining ETS in its stringency

- **Priority #6 Linking**: Should always be considered and looked at (e.g. Chinese system, California, Australia + New Zealand), but is not going to be easy: Systems abroad have some structural features that will make it difficult to link it up with the ETS
  - California: Link to nature-based carbon removals => system is not watertight
  - China: Targets are very different - will make straight linking very difficult
    - Would have to persuade Chinese to come closer to the type of cap setting we have in Europe
- Main barrier for international linking is technicalities rather than political trust; in the end thoroughly implemented technicalities determine political trust
  - Certain things need to be in line: 1) Monitoring, reporting + verification (MRV) needs to be at the same standard, 2) Relationship with credits that come from outside into the system (CDR or CDM-like credits), 3) Running time of the ETS (For how long does it give certainty?) 4) Stringency in terms of the cap
  - Key question for linking: Is the system stable? (trust between countries is less important)
    - China: Can quickly change system from one day to the other (not long negotiation process as e.g. in Europe)

- **Priority #7 Industry**: Free allocation + CBAM: Important for the politics of the system => Political economy: Industry will always say it needs support
  - Process emissions are the real issue; industry with large share of process emissions take a cynical view to leave EU by 2035 if the right measures are not implemented
  - Will be very important political debate and a lot of pressure
  - This challenge is less important than other issues, but cannot be neglected
- Interplay with CBAM: Question whether CBAM will work - we don't know, because it will not be introduced until 2027
  - Currently, only the framework for CBAM is decided, but not all the technical details
  - Industry will exercise pressure with carbon leakage claim and we do not yet know fully whether that will happen (depending on how well CBAM will work) – e.g. treatment of exports
- Pressure from third countries as major risk for implementation of CBAM
  - Two failures in the past: 1) Inclusion of international aviation in the EU ETS, 2) Fuel Quality Directive extended into producing countries (stopped by Canada)
  - High risk that international partners will not accept CBAM

Appendix C Stakeholder interview guide

Step	Interview question [optional questions in grey]
Step 0: **Overall perspective** (10 minutes)	• In your opinion, is European emissions trading **fit for climate neutrality**, or do you see **needs for a fundamental reform** of the ETS design? Please consider both EU ETS1 and ETS2. – Have aspects of this reform need been addressed in the recent Fit-for-55 review or do they still need to be addressed? – (Explanation: Focus of the study is the post-2030 period, not currently implemented reforms)
Step 1: **Identification of challenges** (15 minutes)	• These are the issues/developments shown on slide 3, which are the most important ones (ranking)? • In your opinion/(*For stakeholders representing specific interests*) For your members/the organisations/people that you represent, what are the relevant **challenges** related to the further development of the EU ETS in the 2030-2040 period and **why**? Can you please name up to **three most relevant challenges** and rank them according to their relevance? • For each of these challenges, can you provide a **reasoning** for your assessment and specify: – Why exactly (**mechanism**)? – Please link this to the analytical framework shown in the beginning: Under **which conditions/developments** would challenge arise (**supply, demand, scope, interactions**)?
Step 2: **Identification of policy options** (15 minutes)	• Regarding the challenges we just discussed, what are the most important policy options / policy mix to address/mitigate some of these challenges • What would be the **advantages/disadvantages** of the policy options? • What would be a suitable **policy mix / policy framework** to address the most relevant challenges? • Would the policy options be **coherent with the existing design** of the EU ETS?
Step 3: Wider stakeholder survey (15 minutes)	We will be seeking to gather wider stakeholder feedback via a survey. This will follow a similar structure to this interview but be much quicker to complete. We have an initial approach and would really appreciate your thoughts on this please. • Do you suggest any changes to the topics we've discussed today or the way this has been presented to facilitate the participation of other organisations? Was there anything in particular that you found difficult to answer? Why? • This is the format of the survey itself and suggested response options. Do you have any suggestions for changes? Would you mind submitting a response and letting us know if you have any suggested changes before we distribute more widely? Or can you suggest an organisation or two that might be willing to test this out for us? • This is the list of organisations with a similar focus/interest to yours that we intend to ask to input and distribute the survey. Is there anyone else you would suggest adding? Would you be able to help distribute please? Discuss and agree options: email invite, newsletter mention, social media posts. • This is the email we intend to send to invite participation. Do you have any suggestions to improve this to encourage participation please? (To be shared after interview if time is limited.)

Step	Interview question [optional questions in grey]
Conclusion	• Is there anything we have not discussed yet that you would like to mention? Thank respondent for their input.

Appendix D Stakeholder interview summaries

D.1 Industry associations

D.1.1 CEFIC

Interviewee	Institution	Date of interview
Nicola Rega	European Chemical Industry Council (CEFIC)	2023-05-24

Overall perspective on EU ETS

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• Expectation that the cap will deliver => But overarching question should rather be if emissions reduction at any cost is what we want. • If one extrapolates LRF of ETS1, cap of ETS1 will reach zero around 2040. • For the energy sector, there are good prospects that emissions will fall to zero. • But for industry the situation is more difficult; need more incentives and good enabling conditions for the transition to be feasible and economically viable (create a business case for investments). • Pathways studies → Industry sector not at net-zero by 2040.

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: Industry-related considerations
• **Emphasis on the role of enabling conditions/infrastructure for industry to be able to deliver emissions reduction.** • Infrastructure readiness concerns have not been sufficiently addressed in the past. • With the ETS1 cap tightening there is an increased need to address enabling conditions. • Environmental conditions for the energy system matter a lot for industry actors. • Expectation: Energy system transformation (e.g. electricity grid expansion/connectedness, rate of deployment for renewables) does not keep pace with the tightening of the EU ETS1; delay effects especially for large infrastructure projects. • Increasing dominance of industry emissions in EU ETS1 • If transition in industry is slower than the cap reduction this will lead to increasing prices in ETS1.
2nd Priority: Sectoral scope of emissions / carbon removals
• (Discussed with a link to industry) • Removals have to be part of the picture one way or the other. • Ideal world => Industry installation reduces emissions to technical limit and then compensates residual emissions with removals.

• In reality, cap of ETS1 goes down quicker than technology/investments in industry evolve => Have a removals 'buffer' to support industry, might also be an issue on a decade or so (early/mid 2030s). • Good rational to keep the boundaries of the removals system European to ensure strong MRV and reliability of the credits from removals (high quality important; Avoid a renewed influx of CDMs into the EU ETS, as has happened in the past) • Also a dimension of investment/value creation in this => Keep in Europe. • Keep investment signal from ETS and use removals as a 'release valve' for too unreasonable price pressure.
3rd Priority: Linking with EU ETS2 (but also international linking)
• Linking ETS1 and ETS2: Sectors have different abatement costs => Merging of industry emissions with e.g. road transport emissions would exercise additional pressure on the abatement of industry emissions (steep abatement cost curves in road transport) • International linking: Price difference as a hindering factor; different jurisdictions apply different tools, the US have gone a different path at the federal level than the EU

Policy options identified

Key policy options
1st Priority: Industry-related considerations
• Focus development of enabling conditions (e.g. energy grid) • US managed to build a business case in a way industry understands, catalyst for investments leading to emissions reduction • Create demand for low-carbon products in EU. • Incentivize the recycling of carbon (upstream treatment of CCU)
2nd Priority: Sectoral scope of emissions / carbon removals
• -
3rd Priority: Linking with EU ETS2 (but also international linking)
• -

D.1.2 CEMBUREAU

Interviewee	Institution	Date of interview
Rob van der Meer (Industrial Policy Director), Vagner Maringolo (Sustainable Construction Manager)	European Cement Association (CEMBUREAU)	2023-05-24

Overall perspective on EU ETS

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• Cement industry plans to become carbon neutral by 2050 => The combination of EU ETS and CBAM will deliver the necessary incentives/regulatory environment to decarbonise. • Cap of ETS1 will reach zero by 2040 => To date, high degree of uncertainty what the Commission plans for the time when cap approaches zero (CDR coming in, linking, other measures?) • Cement industry => hard-to-abate emissions => will not be carbon-neutral by 2040. • Cap will deliver but for cement industry only viable when CBAM is also in place => Strong short-term challenge that CBAM is implemented in 2026 only • Cement imports into the EU are rising strongly at the moment, they expect this rise in imports to increase even further. • Strong effect on competitiveness in the short-run until the CBAM is implemented and will provide a level playing field. Level of free allowances not enough support. • CBAM in 2026 might be coming in `too late` for the cement industry • From their view the EU ETS has a low predictability of the legislation => Every half a year a major change, which affects planning certainty for the industry.

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: Industry-related considerations/Interaction between EU ETS and CBAM
• **EU ETS and CBAM** • Interplay of the two instruments is suitable to create a level playing field. • CBAM implementation in 2026 too late (see comments above in overall perspective) • **Overarching challenge for industry transformation => Lagging action problem for energy infrastructure and renewable energy supply** • Name 4 pillars needed for the decarbonisation of the cement industry – Sector specific technology: Yes, available in 2030-2040, few years ago major doubts but now clear that it will be feasible from a sector-specific technology perspective to reach net-zero in 2050 – Infrastructure (enabling condition): Renewables and hydrogen infrastructure, infrastructure that enables the use of the technologies. Fear a lack of enabling infrastructure will hinder the transition of the industry.

- Public acceptance and policy framewerok: New types of cement => Is the market accepting it?; Acceptance issue for geological storage of CO_2; Willingness to pay. Various dimensions with uncertainty.
- Renewable electricity supply: Have doubts that enough renewable electricity will be available.

- → Environmental/enabling conditions need to be addressed.

- **EUAs price => „market failure“:** Carbon prices are lower than where they should be if every actor on the market was rational and long-term oriented.
- Everyone was betting on hydrogen in the past few years, this is now coming to a more balanced and realistic long-term outlook
- Unclear why, but people in the market do not believe in a rapid carbon price increase

- **Short-term challenges:**
- New benchmarking approach with „best in class“ not sensible => adds an additional burden besides economic pricing of carbon by penalizing the level of free allocation, significant change to the EU ETS as a market based-instrument.
- Lack of low-carbon cement market uptake: Price signal of the ETS currently not strong enough to market update of carbon reduced cement, low carbon cement 10% more costly in production.

2nd Priority: Role of carbon removals (scope of emissions)

- Have a position paper on carbon removals published that addresses various aspects related to the cement production: https://cembureau.eu/media/glkpjvwv/230308-cembureau-position-on-carbon-removals.pdf. Main points involve:
  - CCS + use of biogenic CO_2 (e.g. combustion of biomass waste) => recognize as carbon removal
  - Enhanced carbonation relying on biogenic CO_2/DAC => recognize as a carbon removal
  - Natural carbonation from carbon neutral cement => recognize as a carbon removal
  - CCU: Downstream accounting instead of the current upstream logic
  - Clarify definition of permanence for emissions embedded in products (what does “permanently chemically bound in a product” mean?)

- It is clear that there will be residual emissions in cement industry and that carbon as material will be needed in other industries, but it is unclear how these two will be connected. Situation is at the moment very unclear to them.
- Look at the whole lifecycle of emissions from products involving cement
  -

3rd Priority: Societal reactions to the increasing carbon prices

- CO_2 costs must be applied in full.
- Cement costs will double or even more => Cost for concrete +10-15%, cost of construction: +1-2% (Price effect on the construction market will be marginal)
- Low carbon cement → Will cost the same due to higher production costs.

• => Carbon pricing will have an effect in many areas of the economy, thus still important to consider.

Policy options identified

Key policy options
1st Priority: Industry-related considerations/Interaction between EU ETS and CBAM
• Environmental/enabling conditions need to be addressed. This concerns mainly the build-out of the energy infrastructure, supply of enough renewable energy. • CBAM coming too late from their perspective
2nd Priority: Role of carbon removals (scope of emissions)
• See summary of points from position paper on removals above.
3rd Priority: Societal reactions to the increasing carbon prices
• -

D.1.3 CLECAT

Interviewee	Institution	Date of interview
Nicolette van der Jagt, Quentin Donnadille	CLECAT	21 June 2023

Overall perspective on EU ETS

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• They are interested in ETS specifically in relation to ETS2 for road transport, coverage of aviation in ETS 1 and new legislation for inclusion of maritime shipping, as these relate to their stakeholders. Overall they welcome the use of market based measures to help reduce emissions in a cost effective manner. This is provided that revenues are being properly used. • There is a concern with ETS 2 and shipping that fuel suppliers will pass the costs on rather than reduce emissions. This means transport will become much more expensive. Wider reforms are needed to support the transition to zero emissions vehicles. This could include CO_2 standards and also demand side policy such as positive fiscal incentives such as purchase subsidies or other fiscal reforms. ETS2 on its own will not be sufficient.
Summary of any identified needs for reform
• There is a need for additional policies as in the Fit for 55 package and CO_2 standards for HDVs and fiscal reforms/incentives to support the transition to zero emissions vehicles. ETS 2 will not be sufficient alone.

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: ETS 2
• As stated in the introduction section, a challenge will be that fuel suppliers may just pass costs onto consumers rather than reducing emissions. It is hard to predict what exactly will happen in terms of the price. Whilst there is a form of cost cap, it's reliant on the release of allowances, so it's difficult to know what this will mean ultimately in terms of the price. If there are external shocks or the market is distorted for some reason, it's hard to know what will happen. • There is also a potential challenge now where individual Member States introduce road charging schemes based on CO_2 emissions e.g. Germany, Denmark, including for the purpose of reducing air pollution and emissions within towns. This means you end up with duplication of carbon pricing with the ETS and you have different costs in different countries. Duplication of costs together with decarbonisation costs means there are potentially considerable cost pressures on road transport companies. • Another challenge is how the revenues are used, whether sufficient is invested in the road transport sector. This will depend upon individual Member States. There is also a challenge with a potential time lag in revenues being collected and invested.
2nd Priority: Coverage of maritime and aviation
• **Maritime shipping**

- It is very hard now to calculate what the impact of ETS is going to be on costs in maritime. This is more complex than in the road transport sector, there are more parameters to consider in how costs will be distributed.
- The interaction between the EU's approach and the IMO is key. The better solution would be to have a global solution but it needs to be ambitious. A global approach probably won't be ready by 2030.
- Some of the larger container carriers and other shipping companies have been making announcements of decarbonisation plans and investments in cleaner ships and technologies. Container carriers have made record high profits during Covid (half-a-trillion dollars over the Covid three years) but we have seen them using these profits in seeking to grow their market share and buy other companies rather than in decarbonisation policies. According to Sea-Intelligence the annual cost of shipping's compliance with the EU ETS could exceed $10 billion a year. CLECAT has noted that the shipping industry seems focussed on raising yet more money from its customers to fund this up front through carbon levies and other market-based measures. Carbon pricing should not become simply another surcharge to be passed on to customers without real change in the behaviour of shipping companies. Therefore CLECAT wants to see carriers step up their investment in low- and zero-emissions vessels, fuel, and related infrastructure before shippers and forwarders start paying those higher prices.

- **Aviation.** International measures may not be ambitious enough to meet international climate objectives. If the ETS is extended, there will be commercial challenges because it is a competitive sector. Air freight is already expensive.

3rd Priority: CBAM

- They support CBAM as a principle but there are some technical difficulties with implementation. Their members are the representatives of the importers to the EU. If the importer is not EU based, they'll be obliged to use a customs agent/representative who will also have the liability for declarations in case of wrong declarations for CBAM. The customs agent can choose not to take this responsibility but they have to tell the importer. The customs agent will be responsible for the accuracy of the information on the CO_2 emissions per product. The calculation is extremely complex and different from footprinting from transport. In particular, logistics' service providers/customs agents are not in a position to obtain (much less verify) complex information and calculation/claim of embedded emissions of a specific product manufactured by a party in a third country, nor assume major reporting obligations that they could then become liable for. There are thousands of products to consider, so it's very complex. There could be wrong information. This complexity and difficulty could undermine the effectiveness of the CBAM and EU ETS.
- It's possible that trading partners may bring a case against the EC. There could be legal challenges.

Policy options identified

Key policy options

1st Priority: ETS 2: Use of revenues for road transport decarbonisation

- Complementary policies such as CO_2 standards and fiscal reforms/incentives are also needed for the transition to zero emissions vehicles. The cost of zero emissions vehicles needs to be reduced, as well as ETS carbon prices increasing, for the transition to occur.
- It is important that revenues come back to the road transport sector (which is already struggling) to support the transition. They would like some revenues to be earmarked for the road transport sector, as the current expectation is that more will be invested in rail.

They would like to see clearer policy on how Member States can use revenues, mandates on how they use funds. It would be better at EU level, but they recognise there is an expectation of flexibility for Member States. They think proof should be required of how revenues have been spent i.e. good monitoring. • There should be one single instrument for carbon pricing (the EU ETS framework) and not any duplicating national carbon pricing schemes.
2nd Priority: Maritime & aviation
• **Maritime** • Keep the periodic review of the EU ETS so it can be revised if an ambitious global approach is agreed. • Revenue support for freight shipping companies is still necessary – in particular in research and innovation, but ETS should not be used as a simple pass on to the customers without efforts to decarbonisation at a faster pace. ETS revenues could be split between e.g. supporting biodiversity in the ocean and investment in cleaner ships and/or related infrastructure and production of renewable/alternative fuels. • **Aviation.** They would prefer a strengthening of CORSIA i.e. international measures to avoid competitive difficulties for European companies.
3rd Priority: CBAM
• It's too early to say what the mitigations are as the system is being developed now.

D.1.4 Eurelectric

Interviewee	Institution	Date of interview
Ioana Petch	Eurelectric	07 June 2023

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• Eurelectric members have always supported EU ETS as an important policy, that helps deliver Net Zero targets • It is important to note the EU ETS has already been reformed to deliver on the fit for 55 package. Starting a New Reform now before seeing the impact of the recently approved changes is probably to early. They suggest it might be better to allow for the implementation of new reforms, before designing the next set of changes. • In particular they note it is important to see the impact of the higher linear reduction factor - by 2040. The EU run out of allowances in the system and that is one of the questions raised. • The Agreement with fit for 55 package was fairly positive and aligned with expectations and they do not have concerns with the final review, and Eurelectric view it is fairly positive. • There is one point that is raising particular concern – that Is the potential role of carbon removals. The EU should assess the potential integration of Carbon Removals carefully. Eurelectric would advise caution when expanding markets, including risks and benefits of expansions need to be considered. • Overall they view that the current functioning of the EU ETS is working quite well, so every addition must be made carefully.
Summary of any identified needs for reform
• Negative emissions – Important that any integration targets are in hard to abate sectors and relevant certifications in place • There may be a deeper consideration of linkage with other systems in CBAM and preventing double taxation in places like the UK, in particular when considering electricity interconnection. • Innovation fund may need to increase further in value to manage scope • May need more time to work out kinks in the most recent reform.

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: Negative emissions
• When thinking it must be noted that negative emissions/removals should be complementary • The EU need to abate first, and negative emissions should be complementary to that aim and not replace abatement or reduction efforts. • The role for carbon removals should be in the hard to abate sectors. Removals for some sectors are clearly needed

- The risk they see is at some point there should be particular integration, there is a risk if the certification of removals is not fully developed and approved. Thinking about sustainable carbon cycles, Certifications, targets for removals and sustainable carbon management system, these are meant to come soon, and will be important to provide
- We need to abate first before thinking about negative emissions/removals should be complementary, they should not replace abatement or reduction efforts, we see a role for them in hard to abate sector.
- For some sectors removals will be needed.
- Risk we see at some point should there be a particular integration, this stage the certification of removals is not approved, sustainable carbon cycles, certifications, targets for removals and sustainable carbon management system is meant to come soon, clarify and create a sector – the system needs to be accounted verified and functioning correctly and considering additionality and baselines. The certification framework is needed, prior to any integration. .

2nd Priority: CBAM & Linkage to other trading systems

- They are ore one of the sectors that supports CBAM. We want something that clearly prevents carbon leakage.
- They are happy with current proposals for CBAM – but are waiting to see how it will be implemented.
- Overall, it seems harder then expected. The reporting obligation is starting in October, but there isn't clarity of visibility on how it is being implemented.
- Overall, there hasn't had clarity on what happens next in a lot of the practical matters of implementation.
- There are specifically concerns around how to measure embedded emissions properly.
- Eurelectric are represented in the CBAM expert group – but its still not moving as fast as they'd like. It's still not clear how it's going to develop. This makes it a substantial challenge.
- They highlighted several practical issues:
  - What will be included and how will they be included
  - We would support some transitional period during any phase in or phase out
  - There is particular concern in the electricity sector with the link to UK ETS.
- In linking to other states EU ETS:
  - North Sea energy assets (UK and Norway) Very important the EU electricity system. A risk energy assets may be double taxed or overtaxed if systems aren't linked
  - It is subject to CBAM because their UK ETS system was not linked, but it has a very important sector.
  - It is important to note that electricity is traded in anonymised contracts, you sell that electricity on the wholesale market, but when the electricity has paid the carbon price in the UK. That share of electricity will be double taxed.
  - Balkans may have similar issues to the UK, though issues around current interconnector capacity.
  - On CBAM – They regret that hydrogen carriers (ammonia), are not on equal footing with hydrogen on the CBAM. They'd like to see them placed on an equal footing.

3rd Priority: Innovation Fund
• The envelope for the innovation fund is an issue. • The financing mechanism for the fund has increased with the revised ETS, and that is very positive, yet a lot of new sectors and lots of new projects that need financing have been included. • Fund is oversubscribed, and the share of funding received for particular types of investment is not sufficient. An issue that the power sector is ready and committed to invest, but EU innovation fund is not matching the challenge. • EU money should not fund entirely all these projects – but there is a contribution •

Policy options identified

Key policy options
1st Option: Negative emissions
• Negative emissions/carbon removals should primarily be focused on hard to abate sectors and there needs to be assurance that certification frameworks are in place will in advance of implementation.
3rd Option: Innovation Fund
• Size of Innovation Fund should increase with its scope. Should the ambition be higher this fund should be adjusted accordingly, prioritising the technologies that are the most efficient in terms of decarbonisation, in terms of taking advantages of opportunities to decarbonise faster.

Additional relevant points from the interview

• There are still lots of questions about how exactly the nearer term plans (up to 2030) are going to be implemented, hence it is hard to be too specific about post 2030. Greater certainty would be very helpful for businesses and investors because investment decisions made now may mean putting in place an operation in 2026 that is still operating in 2040.

D.1.5 EuroACE

Interviewee	Institution	Date of interview
Adrian Joyce, Remi Collombet	EuroACE	29.06.23

Overall perspective on EU ETS

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• General view that the ETS was poorly conceived at the outset because of the massive amounts of free allowances granted to industry. This had a negative impact on the chances of success of the ETS and meant that the price per ton of CO_2 was depressed for a very long time. It is only recently where the price has risen to 80-100 Euros where it is having an impact. A better approach is now in place but it is much more complex than originally with the introduction of the Market Stability Reserve mechanism and other instruments. • On ETS2, paying more for energy does mean you will be motivated to renovate your buildings. Several studies have shown that in the building sector, the price per ton has to be in excess of 250 Euros to incite actions towards energy renovation. An example of this is a local regulation in New York whereby energy renovation in the commercial sector has been incentivised through a scheme whereby emissions beyond a certain threshold after a certain date will be charged at 265 dollars per ton. ETS 2 is expected to start at 25 Euro per ton, with a ceiling of 45 euro per ton for the future. So they don't expect this to incite increased willingness to renovate, but it will push up energy prices and increase energy poverty amongst the vulnerable. The SCF is supposed to mitigate that but in its final format, the amount allocated has been dramatically reduced compared to the known need to mitigate the vulnerability of those in energy poverty. Therefore there is the risk of major social unrest moving forward. • Another challenge is that there is no binding requirement for either ETS 1 or 2 revenues to be used for climate mitigation. Most countries have put the revenues into general budgets and it gets lost. As a result any research trying to track how ETS revenues are being spent is usually very difficult. There is guidance (not a requirement) that 50% is spent on climate actions, but trying to define what those are within Member States is complex. Their view is that all revenues should go to climate actions and a significant proportion to the renovation of buildings to stop energy waste in buildings. We consume 40% of all primary energy for operating our buildings and 50% if you include the construction phase. Financing is needed in the sector to make the building sector's contribution to the climate and energy goals of the EU.
Summary of any identified needs for reform
• Higher price for ETS 2 to stimulate energy renovation **after** all worst performing buildings are renovated to avoid social unrest (see more detail on this below). • 100% earmarking of ETS revenues for climate action, including for building renovation.

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: Implementation of ETS 2

Initial comments (as above):

- On ETS2, paying more for energy does mean you should be motivated to renovate your buildings. However, in reality, several studies have shown that in the buildings sector, the price per ton has to be in excess of 250 Euros to incite actions towards energy renovation. An example of this is a local regulation in New York whereby energy renovation in the commercial sector has been incentivised through a scheme whereby emissions beyond a certain threshold after a certain date will be charged at 265 dollars per ton. ETS 2 is expected to start at 25 euro per ton, with a ceiling of 45 euro per ton for the future. So they don't expect this to incite increased willingness to renovate, but it will push up energy prices and increase energy poverty amongst the vulnerable. The SCF is supposed to mitigate that but in its final format, the amount allocated has been dramatically reduced compared to the known need to mitigate the vulnerability of those in energy poverty. Therefore, there is the risk of major social unrest moving forward.
- Another challenge is that there is no binding requirement for either ETS 1 or 2 revenues to be used for climate mitigation. Most countries have put the revenues into general budgets and it gets lost. As a result, any research trying to track how ETS revenues are being spent is usually very difficult. There is guidance (not a requirement) that 50% is spent on climate actions, but trying to define what those are within Member States is complex. It is not socially acceptable to have this tax and then not use the tax for the same purpose, particularly for ETS 2. This type of flat carbon taxation is not necessarily in line with calls for climate and social justice, it's not helping public acceptance of the transition.

In addition:

- Recent experience of the energy price crisis has shown that when energy prices are becoming unacceptable, governments have applied massive subsidies. The latest figures are about €800 billion, a very high share of GDP, has been paid out to people and burned on fossil fuels. So, it's hard to believe that governments will let ETS 2 prices rise significantly. Governments have elections in mind, whilst they can't control the ETS 2, they can call for compensation and negate the whole purpose whereby you end up with an extra administrative process where you have to collect tax just to give it back.
- They have some experience in recent months that ETS 2 is being used to diminish the level of ambition in other sectoral regulation. With stakeholders making the argument that you don't need specific regulation on buildings because you have ETS 2. In this way, ETS 2 could be counterproductive.

Policy options identified

Key policy options
1st Priority: Implementation of ETS 2
• Their view is that all revenues should go to climate actions and a significant proportion to the renovation of buildings to stop energy waste in buildings. Financing is needed in the sector to make the building sector's contribution to the climate and energy goals of the EU. There are some good examples of where ETS revenues have been well spent e.g. Czech Republic has an ongoing programme that is already running for 12 years. This continuity has ensured that properties across the entire geographical area have received funding for renovations.
• Energy renovation will lower energy consumption (demand) which helps regulate the price of energy and shield consumers from price fluctuations. Undertaking energy renovation, which with current technologies can achieve up to 80% savings, could lead to a roughly 30% reduction in the overall energy demand in the EU. Focus should be on

energy efficiency measures that reduce the energy demand for heating, hot water, and cooling because they're the biggest chunk of energy consumption in buildings.

- ETS 2 prices should rise to the level needed to stimulate action by the well-off once the more vulnerable energy poor have been given the energy renovations needed. So, renovation programmes should focus first on the buildings occupied by the most vulnerable in society and the most energy poor in society. This is instead of giving revenues directly to people because that just encourages consumption (as in the case of recent energy subsidies).
- The energy renovation rate needs to be about 3% per year (currently about 0.2% which would take about 500 years to have an impact). About 30% of the stock is occupied by energy poor people, so at 3% per year, it would take 10 years to address that segment. So, it's probably mid 2030s when you've addressed the part of the stock occupied by the vulnerable and energy poor. Then you could begin to put up the carbon price to stimulate the market for those who can afford to pay.
- It's really important to have monitoring mechanisms in place that allow for monitoring and evaluation of the effectiveness of this policy instrument, which has not been in place to date.

Additional relevant points from the interview

- The ETS level of ambition was insufficient, faster phase out of free allowances is needed for an effective ETS 1 and to achieve climate goals.
- The EU should be leaders in establishing a global mechanism for carbon accounting. This would then negate the need for a CBAM. The CBAM is a really complex piece of legislation to put into force. There is a risk of conflict with WTO rules.
- ETS 1 revenues should not be going to industrialists but to climate actions to reduce and help mitigate climate change.

D.1.6 *The European Shipowners Association (ESCA)*

Interviewee	Institution	Date of interview
Fanny Lossy	ECSA	01/06/23

Overall perspective on EU ETS

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• The Fit For 55 reforms have only just brought the maritime sector into the EU ETS. The ETS is still a novelty for Shipowners. As such it's a time of transition and difficulty to understand where the difficulties will be post-2030, when the shipowners associations are currently preparing for the monitoring year in 2024 and pricing in 2025. As such there's still immediate practical issues to deal with before we can understand the long term impacts. • Two concerns that are significant though are: – Trying to prevent overburdening of monitoring – by aligning EU and IMO system – Ensuring ETS's interaction doesn't create a modal backshift where disparity in EU ETS 2 and ETS 1 make higher emitting road transit based logistics cheaper than more carbon efficient shipping.
Summary of any identified needs for reform
• In development of monitoring system – and potential linking with the IMO system, consider a report once system where shipowners would submit monitoring and verification information in a single way, and if possible a single system. • Need to understand impacts that emerge during 2025-30 • Ensure that EU ETS doesn't lead to 'modal backshift (excessive use of road transport, where maritime transport would be more efficient)

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: Maritime monitoring system
• In 2026, the Commission will have to look at a number of issues to see if the inclusion of shipping in the ETS sector needs to be revised and the scope to be broadened, so It is difficult to think about the issues of Maritime's issue with the ETS because at the same time we know that IMO is working on a number of measures for the decarbonization of shipping. That is taken into account in the review clause of ETS where there should be consideration of the international Maritime system. • Any IMO ETS or decarbonisation plan will need to be taken into account to make sure that the system are aligned and that you have one set of rules would apply to shipping. • Any Global level IMO system will likely be very different to an EU ETS system. There is a review clause in the ETS directive that provides that there should be some alignment. The Commission will need to look into the IMO system as it develops and see how the EU ETS can be aligned to that. •
2nd The inclusion of shipping and modal backshift
• Shipping is quite different from land based emissions – For one shipping emits in Europe and outside of Europe for voyages connecting Europe with other ports, so it is a learning

curve for everyone at the moment. ECSA would expect that there are going to be more challenges that emerge throughout the implementation over the next several years.

- Shipping and aviation are set to be included in ETS 1, but road transport is kicking off later and in ETS 2 - So trucks and will have a different carbon price and it's kicking off later than the inclusion of shipping within the ETS.
- So one of the questions that shipowners have had, is what the impact of a separate ETS for Road Transport including logistics, trucks, will have on the maritime sector – there is a fear that there will be a modal backshift. Some might decide that once goods arrive in Europe you load everything on truck and then the trucks are going to move the goods for you in Europe because the Carbon price not going to be the same. While we know that shipping is more efficient in terms of emissions than trucks at the moment.
- And looked at by the Commission in 2026 to see how the inclusion of shipping should be modified so the inclusion of more emissions within the EU ETS scope, they also will look at some issues, for example, of including smaller vessels when now it's only larger vessels currently.
- The EU ETS is covering the large vessels, those of more than 500 gross tonnage. These will be monitored in 2024 and pay for allowances in 2025. There is a revision clause in 2026 to look at also including smaller vessels, vessels between 400GT and 500GT.
- The position of ECSA is that on condition that a level playing field is maintained, and there isn't any market distortion, lowering the threshold should be 'fine.
- On that topic, market distortion should be avoided. it's important that the EU look at what happens in the next several years, in particular what is good in the initial inclusion of shipping it the EU ETS and any distortions or negative impacts it creates.

3rd Technologies to support Shipping decarbonisation

- The shipping industry is committed to decarbonising it's operation. There is a clear opportunity, the challenge is the technology is not ready yet and there is a lack of clean fuels on the markets for the maritime sector. This is a major concern when we start buying and surrendering allowances in 2025.
- On one end there is an ask on the shipping companies to decarbonize their vessels and their operation. On the other end, there are not those clean fuels on the market at the commercially available price. To the decarbonize entirely, a fleet or operation, a shipping company actually have to be able to access these types of clean fuels .
- This is why ECSA welcome the fact that the Innovation Fund now takes into account that shipping is included the ETS and foresees that part of the Fund will go to the decarbonization of shipping and the maritime sector at large for the next five years. And we think this is needed if we want to decarbonized shipping efficiently.
- All the sectors included in the ETS are paying into those ETS revenues and 25% of that money is going to the Innovation Fund. So it's a lot of money. Then the Commission and its executive agency are launching calls for proposals.
- ECSA believe that more money should be put on innovation and research for shipping, but also deployment of the new technology and that can also cover infrastructure in the ports and trying to bridge the gap between conventional fuels and cleaner fuels.
- The backbone of the shipping industry is SMEs and the resources required, in terms of administration to access the innovation fund, and the current price gap between conventional fuels and cleaner fuels is already making decisions to change fuel difficult, however, investing in a vessel that uses methanol, ammonia, hydrogen, etc, or any other

fuel is made prohibitive because one knows it can be difficult to find these fuels at ports that a vessel may be calling at.

- Further innovation funding is focused on horizontal technology that's theoretically could apply to shipping and but won't apply to shipping next year. They will apply to shipping in the next 5 to 10 years. So again, that would help land based installation decarbonize faster, rather than shipping.
- Further the current sectors that have been using the innovation fund for decades are more experienced with applying for these opportunities. There is concern for how much this experience will allow existing sectors to accumulate more of the fund, and how much Maritime technologies will be able to access the fund.

Policy options
Policy option 1 : Alignment of the EU ETS and IMO system
• As the IMO system develops, there should be as close linkage as possible between the IMO and EU ETS Monitoring, Reporting and verification system. Otherwise there would 'double' the burden in terms of administrative time needed to comply with requirements.
Policy option 2: Innovation Fund to cover deployment of clean fuel port infrastructure.
• The innovation fund should consider how to best serve maritime sector, as a new entrant into the fund, it may be needed to consider how they are not disadvantaged by incumbents' experience in responding to calls • The innovation fund, to support maritime decarbonisation, should be expanded support development and deployment of clean infrastructure to support innovative technologies/ alternative fuels in order to make them viable alternative to conventional fuel
Policy option 3: Access to other EU Structural funds
• There are several funds that could be expanded/targeted to deal with the infrastructure challenges around maritime. The Vision fund, and the connecting Europe facility. These actually can cover clean port infrastructure, but shipping is not really eligible and prioritised. It could also provide support to expanded to support the decarbonisation of vessels.

D.1.7 Fuels Europe

Interviewee	Institution	Date of interview
Jean-Pierre Debruxelles	Fuels Europe	07 June 2023

Overall perspective on EU ETS

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• They have always supported the idea of a market based instrument such as this ex ante cap and trade system because according to economic theory, this is the most cost effective tool to address a climate goal. However, if other areas of the world do not have the same level of ambition, then there are a number of issues to be addressed, particularly protecting the global competitiveness of EU businesses. There is a delicate equilibrium between incentivising decarbonisation through a market based instrument such as ETS and considering social concerns in terms of citizens, consumers of goods, taxpayers and workers (as jobs will be lost if industry becomes uncompetitive). • They query why the sectors covered by ETS 1 are expected to reach net zero by 2040 (assumption based on parameters in place in EU ETS today) but other sectors not until 2050. • This (trajectory to net zero by 2040) also raises a question about how the liquidity of the market will be maintained. Carbon removals, BECCS & DACCS, are expected to be needed. In this way, the level of ambition of the system and the scope are linked. • They argue that a market based system should be effective in achieving its climate goals but revisions over time with adjustment mechanisms/market interventions can overcomplicate the functioning. Long term projections of the carbon price signal are needed to secure investment and provide the incentive to decarbonise. There is a danger if the EU ETS does not provide the right signal and stability of the framework for investors to invest.
Summary of any identified needs for reform
• Whilst supporting the ETS structure, there is an ongoing concern also to ensure that business competitiveness is preserved. • Carbon removals are expected to be needed to maintain the liquidity of the market within the current level of ambition set for the EU ETS. • Recommend prioritising the simplicity and certainty of the market based system to ensure investment in decarbonisation.

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: Implementation of ETS 2
• They expect ETS 2 to be very complex to implement because of the flow streams that need to be monitored, the interaction between ETS 1 and ETS 2 and because of certain exemptions to the rules. • They expect the current expected level of the cap to be very challenging to deliver in the anticipated timeframe available.

• There is a question about how/if the carbon price adjustment mechanism will work in practice to avoid prices rising beyond 45 EUR/ton. • Before considering whether to link ETS 1 and 2, the EC will need to consider whether ETS 2 is working in practice and what needs to be corrected including whether the cap will need to be adjusted. They would advise caution. Merging would only make sense when abatement costs in the affected sectors are in the same order of magnitude to avoid a shock to the economy. This would cause a lack of liquidity in one market and the risk of carbon leakage in the other.
2nd Priority: Scope of ETS
• Carbon removals. They would like to see carbon removals (BECCS and DACCS) considered for inclusion as early as possible with an impact assessment to increase the liquidity of the market given the current level of ambition. • Coverage of aviation and maritime shipping. They advise that the first step should be to work with the ICAO and IMO and agree an international approach before integrating this into the EU ETS. Otherwise there will be a carbon leakage challenge because it is so easy to fuel your ship/flight outside the EU.
3rd Priority: Implementation of CBAM
• There are still a number of uncertainties as there will be a review step in 2025 with the Commission addressing a number of design elements. For example, consideration of indirect emissions, coverage of different refinery products, exact timing of the ending of free allowances. They identify three challenges: • 1. Risk of carbon leakage in relation to goods imported to the EU. • 2. Risk of carbon leakage for EU exported products (not currently covered by CBAM), currently a significant proportion of their members' businesses. • 3. There is a high level of complexity in creating a benchmark system for the refinery system (compared to other sectors e.g. glass, paper).

Policy options identified

Key policy options
1st Priority: Implementation of ETS 2
• Given the challenging expected cap of the ETS 2, other policies will be required to deliver this. Many of these are defined in the impact assessment but they don't yet know whether they will be implemented. • Monitoring of ETS 2 implementation.
2nd Priority: ETS Scope
• They would like to see carbon removals (BECCS and DACCS) considered for inclusion as early as possible with an impact assessment to increase the liquidity of the market given the current level of ambition. • They advise that the first step should be to work with the ICAO and IMO and agree an international approach before integrating aviation/maritime shipping into the EU ETS. Otherwise there will be a carbon leakage challenge because it is so easy to fuel your ship/flight outside the EU.
3rd Priority: CBAM

- To address the risk of carbon leakage via goods imported to the EU, there needs to be protection against carbon leakage which is sufficient to cover the much higher cost of decarbonisation, not just the EU ETS carbon price. i.e. additional tools on top of CBAM.
- There will also need to be protection against the risk of carbon leakage on EU exported products via an export adjustment mechanism.
- A suitable and robust methodology for benchmarking refinery products needs to be developed for use in adjustment mechanisms.
- These are the general principles that they think are important for policy options. They cannot yet be more specific about policy options. Their individual members would probably all have different suggestions.

Additional relevant points from the interview

- There are still lots of questions about how exactly the nearer term plans (up to 2030) are going to be implemented, hence it is hard to be too specific about post 2030. Greater certainty would be very helpful for businesses and investors because investment decisions made now may mean putting in place an operation in 2026 that is still operating in 2040.

D.1.8 Negative Emissions Platform

Interviewee	Institution	Date of interview
Two interviews with members, representatives of Negative Emissions Platform also present. **1st Interview:** Louis Uzor, Climeworks (DAC); Elodie Vignon, neustark (BECCS, geological storage and storage in recycled concrete); Johan Börje, Stockholm Exergi (Municipal energy company, BECCS plant operation); Venna von Lepel, Novocarbo (Biochar Carbon Removal, BCR). **2nd Interview:** Vikrum Aiyer, Heirloom (DAC); Sebastian Manhart, Carbonfuture (Removals marketplace); Hanna Ojanen, Carbo Culture (Biochar).	Members of the Negative Emissions Platform	2023-05-23

Overall perspective on EU ETS

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• Interviewees view the EU ETS system from the perspective of carbon removals. • ETS1 follows a trajectory where the cap reaches zero around 2040 if current level of ambition is maintained. • Several participants pointed out that the coverage of residual emissions is not yet sufficiently addressed by the current EU ETS (and wider EU climate policy) framework. • For the ETS this has implications for the time when cap approaches zero and hard-to-abate residual emissions represent a larger share of the emissions in the market. The interviewees state that residual emissions also currently covered by the EU ETS must be compensated for by carbon removals in the 2030s. • Interviewees see the need for carbon removals to move to compliance markets and that only removals with a high degree of permanence should be allowed into the system (majority of opinions, difference between short- and long-term carbon cycles pointed out, there is a strong need to define what "permanent" means). • The Commission should be clear in their ambition to integrate carbon removals into the policy framework.
Summary of any identified needs for reform
• See above

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: Focus on interaction between ETS and carbon removals (Sectoral scope incl. carbon removals & expansion to other sectors)
• There was consensus among the participants that, in the period following 2030, the integration of removals into the climate policy framework is crucial. • Regarding the EU ETS as an instrument, several participants shared their viewpoint that emission abatement and emission removal should be treated as separate issues. They emphasized that the primary purpose of the EU ETS is to facilitate emission reductions and

that incorporating removals (e.g. crediting via Art. 24a of the ETS directive) would introduce additional complexity to the system.

- To encourage the further development of removal technologies, the participants propose establishing a distinct target for removals, separate from the targets associated with ETS/ESR for emission reduction (not a net target but single gross targets). They argue that having a specific removals target provides certainty for planning and investment for market participants, complementing the support needed to foster innovation in removal technologies.
- The participants stress that only when both conditions (target + innovation support) are met, it becomes feasible to scale up industrial carbon removal projects in time to integrate with or compensate for residual emissions by the 2030s.
- Moreover, participants assert that conducting a bottom-up analysis to identify and classify residual emissions covered by the EU ETS system (and in sectors not covered) is essential.
- A bottom-up analysis of which activities may qualify as residual emissions would aid in target setting and help prevent the misconception that removals can serve as a viable substitute for emission reductions in sectors where abatement solutions are or will be available and economically viable.
- The task of establishing the anticipated level of residual emissions poses a challenge that will influence expectations and price formation within the EU ETS.

Policy options identified

Key policy options
1st Priority: Focus on interaction between ETS and carbon removals (Sectoral scope incl. carbon removals & expansion to other sectors)
• The participants emphasized the importance of establishing separate target setting for removals, which should be independent of the level of ambition set for emission reductions within the ETS system. • They also brought up the idea of an independent regulatory body that could effectively manage the risks associated with liability and permanence of removals (as suggested in the Edenhofer et al. 2023 paper). • This independent body would be responsible for managing a portfolio of removals and integrating them into the EU ETS as a unified entity. • This approach, according to some of the participants, may facilitate improved and flexible governance of the inclusion of removals. Additionally, this organization may overtake responsibilities in reliable monitoring, reporting, and verification (MRV) for removals, also acting as a supervisory authority in this capacity.

Additional relevant points from the interview

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D.2 Trade unions & consumer organisations

D.2.1 BEUC

Interviewee	Institution	Date of interview
Dimitri Vergne	BEUC	24 May 2023

Overall perspective on EU ETS

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• This topic is relatively new to them because ETS has become much more relevant to consumer interests with the development of ETS 2 focused on road transport and buildings, whereas ETS 1 has had a much less direct impact on consumers. • They are supportive of any policy working towards the EU's net zero objectives but are concerned with not harming consumers, especially low and middle income consumers, in the transition.
Summary of any identified needs for reform
• -

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: ETS 2.
• They had reservations about ETS 2 because of the potential impact of increased prices on consumers and concern that demand is inelastic in mobility and heating because considerable investment is required to switch to low carbon options. • The continued concern is to protect people from high price fluctuations. • Main challenge is to ensure revenues are used to support a just transition. • Anticipates that the 72 billion currently allocated to the Social Climate Fund will be insufficient. • Concern that there will be a time delay between introduction of ETS 2 with pricing impacts and development of the infrastructure needed to facilitate low carbon switching by consumers (e.g. building of new public transport, insulation of all housing stock).
2nd Priority: Extension of ETS to other sectors
• No position yet on extension of ETS to other sectors. But for example, if it was extended to agriculture, there would still need to be accompanying sector specific policies to promote restoration of biodiversity etc. • They cover carbon removals from the perspective of arguing for the banning of claims on carbon neutral products/greenwashing. They don't have a specific position yet, but would be very cautious about integrating carbon removals too early into the ETS before there are very strong quality checks. Quality checks need to cover both the extent to which emissions are absorbed but also any adverse effects on biodiversity. Would also need to consider how this interacts with direct emissions reductions trajectories as well.
3rd Priority: Market stability (particularly for ETS 2)

- They have a concern about price volatility and the potential impact of this upon consumers. The experience of ETS 1 shows it is difficult to predict price movement. Whilst there is a price ceiling mechanism of 45 EUR per ton for ETS 2, this can only be achieved via the MSR and nothing guarantees this because there is no actual price corridor system.

Policy options identified

Key policy options
1st Priority: ETS 2.
• **Revenue redistribution under ETS 2** • All revenues should be recycled. Revenues should be earmarked for investment in infrastructure to support low/middle income consumers to switch to low carbon transport and heating options, as well as lump sum payments to consumers. This could include innovative schemes such as social leasing electric car schemes which support low/middle income consumers, rather than e.g. purchase incentives on electric cars which are more likely to be used by more affluent consumers. There is also a need for investment in non-physical infrastructure e.g. training/certifying insulation installers. • There should not be any cross subsidisation of industry via e.g. the Innovation Fund unless it is very consumer focused. So they would remove the current allocation of some ETS 2 revenues to the Innovation Fund. Use of ETS revenues should also be additional, i.e. not replace anything already existing at Member State level. To support this, they suggest 150% earmarking of revenues so that Member States need to find additional funds to comply. Some ETS 1 revenues could also be fed into the SCF because ETS 1 does also have an impact upon consumer prices either directly or where industries are supplying more consumer facing industries and through electricity costs. • Overall, there will be a need for greater investment than that currently allocated to the SCF. • They support lump sum payments directly to consumers because they expect there to be a time delay between when carbon pricing is applied and the infrastructural changes required for consumers to switch to low carbon technologies. • They would like to see a greater proportion of the SCF allocated directly to consumers and less left to the discretion of Member States. They would also like to see more specificity in what kind of investments can be made by Member States using these revenues/stricter rules on this. They would also therefore like greater scrutiny of use of SCF revenues including perhaps by green NGOs, charities, consumer groups etc. • It is also very important that there are other policy measures supporting emissions reductions and the transition i.e. sector specific legislation. Fit for 55 has addressed this to an extent, but there is more that could be done. For example, looking at options for manufacturing lighter electric cars with smaller ranges to make them more affordable.
2nd Priority: Extension of ETS to other sectors
• **Extension to other sectors** • In any extension to new sectors, it will be important again to ensure there are other supporting sector specific policies/regulation. Price signals are not sufficient on their own. • They would be very cautious about integrating carbon removals too early into the ETS before there are very strong quality checks. Quality checks need to cover both extent to which emissions are absorbed but also any adverse effects on biodiversity. The current carbon removals certification scheme being developed is voluntary, not mandatory, so would expect this to need to be strengthened. There is a need for further studies looking into this.

3rd Priority: Market stability (particularly for ETS 2)
• **To address price volatility:** • They suggest the introduction of a price corridor system would provide security against very high prices and therefore protect overall acceptance of the ETS.

Additional relevant points from the interview

- There also needs to be consideration of **how the ETS interacts with other national and international taxation measures and price signals**. For example, fossil fuel subsidies are not consistent. There also needs to be further consideration of the Energy Taxation Directive.

D.3 NGOs

D.3.1 Climate Action Network (CAN) Europe

Interviewee	Institution	Date of interview
Klaus Rohrig	CAN	5 June 2023

Overall perspective on EU ETS

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• The level of ambition is insufficient. Supply needs to be tightened further. The contribution of the EU ETS to the EU's overall climate target needs to be constantly re-assessed in light of the Paris Agreement objectives, IPCC remaining carbon budgets, European Climate Law and greenhouse gas budgets for the ETS sectors 2030-2040. There needs to be a proper, clear assessment of targets including consideration of the consequences of inadequate action and what the EU's fair/equitable share of global budgets would be. CAN does not yet have a position on the ETS target for 2040 but there is a need for further adjustment and strengthening of the linear reduction factor. • There should be mid-term reviews at 5 year intervals, including one at 2035, to enable adjustments, rather than the current 10 year policy cycle. • They would welcome exploration of inclusion of non-CO_2 emissions in the EU ETS.
Summary of any identified needs for reform
• Higher level of ambition including potential rebasing and strengthening of the linear reduction factor. • Mid-term/5 yearly reviews. • Exploration of options for inclusion of non-CO_2 emissions in the EU ETS.

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: Overall ambition level of ETS
• (As described above)
2nd Priority: Distributional concerns
• They expect that **distributional concerns** will continue to be important post 2030 in terms of impacts upon citizens and workers, particularly low and middle income groups. This is particularly relevant to ETS 2, but also ETS 1. Also the risk with increased ambition (which they argue for - see previous comments) is that this further increases prices with potentially significant impacts for citizens. This also then may cause a political backlash against the EU and Member States. • Low/middle income households may not have the investment capital to transition to cleaner technologies, may be locked into dirty technologies and face a financial burden/be pushed into poverty. So there is a high risk it becomes a very regressive design. • They also have a concern about global equity (see policy options). • They see a need for a better consideration of poverty related measures linking to impact of ETS.

3rd Priority: Linking removal certificates to the EU ETS
• They are **very sceptical about linking removal certificates to the EU ETS** (1 or 2). They have a concern about the robustness of the certification system. There is a concern that the market would be flooded by these and reduce the incentive for emissions reductions action. • They are concerned about the permanence of nature based removals and a lack of equivalence between the potential short term nature of this and the long term impact of equivalent carbon emissions. This leads to a risk of a paper based system that looks effective but in reality is limiting emissions reductions. There is considerable uncertainty about nature based removals especially with increased climate impacts e.g. forest fires. • They see the need to strengthen nature based removals but separately from the ETS. • They are interested in exploring the scaled potential of eg DACCS but given the infancy of the technology, they don't want to rely on this type of technology. So protection of nature is a higher priority. They are also concerned about the focus on CCS and it being applied to processes which could be substituted e.g. in steel, it's not necessarily needed. Overall in energy intensive industries, they see a relatively small need for CCS and a risk of overstating the role of this.

Policy options identified

Key policy options
1st Priority: Overall ambition level of ETS
• Strengthen overall ambition of ETS.
2nd Priority: Distributional concerns
• **To address distributional concerns**, there needs to be a policy architecture/governance system that ensures Member States use revenues from allowance auctioning for investments that help low and middle income groups transition to low carbon heating, transport etc. This includes investment in public transport, rail deployment etc. This is particularly relevant to ETS 2, but also ETS 1. All auction revenue should go to climate investments, but some should specifically target low and middle income households. • Also from a distributional perspective, they propose setting a specific target for international climate finance from ETS revenues, for example, 15%. They also suggest having other specific sub-targets, e.g. for public transport investment. Maybe also direct income support but would prefer something like the Social Climate Fund which allows for low/middle income groups to tap into financial resources for investment in the transition e.g. for clean heat at home, clean transport. • They would like greater transparency on the governing, monitoring and enforcement of revenue spending. They would like Member States to declare and report their ETS revenue spending in greater detail and a mechanism for the EC to react if a Member State fails to show the revenue has been used for climate investments or support of low income households. • They see a need for greater funds than currently allocated to the SCF over time. The SCF alone cannot tackle poverty across the EU, broader social measures are needed probably beyond climate policy.
3rd Priority: Linking removal certificates to the EU ETS
• **On carbon removals:**

- They advise continuing with the clear separation of removals activity from the ETS and obligations on Member States to ensure the highest possible pressure on reducing emissions.
- There needs to be a separate framework for restoration of ecosystems, rewetting of wetlands, etc.
- They see a small role for CCS but there is a risk that the need for this is overstated with energy intensive industries.

Additional relevant points from the interview

- **Linkage with other policies is important.** ETS will only deliver emissions reductions if also supported by other policies e.g. sectoral standards and regulation. There is concern that too much focus on the price signal only will exacerbate the regressive impact of ETS.
- The ambition level of ETS 1 is not sufficiently strong to drive down emissions, there needs to be supporting industrial policy to support emissions reductions through regulation and setting standards e.g. Industrial Emissions directive, circular economy package.
- Other policies e.g. ESR also ensure Member State ownership of reductions in sectors covered by ETS.

D.3.2 *IETA (International Emissions Trading Association)*

Interviewee	Institution	Date of interview
Julia Michalak, Svea Nyberg	International Emissions Trading Association (IETA)	2023-05-23

Overall perspective on EU ETS

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• Following the EU ETS review the cap will reach 0 by 2040. However, at that point residual emissions under the EU ETS and the current scope of the ESR will persist. • The policy framework must integrate negative emissions to compensate for residual emissions in order to reach net-zero target by 2050. • Overall, the recent EU ETS reform is paving the way for necessary rise of ambition and regulatory changes required to reach net zero by 2050.
Summary of any identified needs for reform
• Not yet clarity on some sectors e.g. agriculture. • Clarity up to 2030 but not beyond.

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: Implementation of ETS 2
• Market size of ETS 2 will be of a similar in size to ETS 1. This means there will be a significant expansion of carbon pricing mechanism in the EU which IETA supports. It has proven difficult to tackle emissions in the ETS 2 sectors, so introducing a cap is a bold but needed step to achieve the emission reductions needed. • It is difficult to predict the behaviour of the ETS 2 market. The role of the price containment mechanism in ETS 2 will be of relevance. The MSR is designed differently than for the ETS 1, it includes a price trigger. • Linking of ETS 1 and ETS 2: different types of activities and actors covered by the two systems. • Role of complementary policies post-2030 period (e.g. ban on combustion engines for road transport emissions)
2nd Priority: Industrial related considerations/Implementation of CBAM
• Industrial related considerations & role of CBAM: Key unknown factor for industrial emissions post-2030 is whether technologies will be developed enough and market-ready to allow for further abatement. This aspect is key in determining the volume of residual emissions from industry. Policy options for sectors with hard-to-abate emissions will have to be developed. • Market function/rational behaviour of actors in the ETS market: an interaction with the CBAM regulation. Need to clarify how exports will be treated.
3rd Priority: Carbon removals & expansion to other sectors
• Role of carbon removals: Ambiguity in terms of the interoperability of the two systems (emissions and removals). Have general but also technical concerns about the

interoperability. Focus should remain on reducing emissions, removals could be available or to a limited extent and/or to certain sectors. This could be a done via a political decision or automatic rules. • Monitoring, transparency, and reliability via a strong MRV system will be of high relevance.

Policy options identified

Key policy options
1st Priority: Implementation of ETS 2
• Complementary policies are needed for ETS2 sectors to mitigate the risk of high carbon prices, although price ceiling mitigate the increase in first years. • If the ceiling does not continue after 2030, other measures may be considered.
2nd Priority: Industrial related considerations/Implementation of CBAM
• Need to identify where the residual emissions will remain. Also identify where funding is needed for technologies dealing with residual emissions. Integration of removals is needed. • Financial support mechanisms e.g the Innovation Fund. We now have dedicated programmes for specific technologies, we may need more of them. Contracts for Difference is also an option. • Linking with other ETS is the preferred solution to CL risk. Although unlikely this will happen in the next decade. • Apply different rules for most challenged sectors.
3rd Priority: Carbon removals & expansion to other sectors
• Could separate different types of removals (tech/nature based). • May also need removal rules to be looked at differently for different Member States as in ESR, as well as for different industries.

Additional relevant points from the interview

• Role of financial actors was mentioned as a fourth priority but not discussed in detail during the interview.

D.3.3 Transport & Environment

Interviewee	Institution	Date of interview
Chiara Corradi (ETS expert, Climate team), Jacob Armstrong (Shipping expert), Roman Mauroschat (Aviation expert)	Transport and Environment (T&E)	2023-05-25

Overall perspective on EU ETS

Description and reasoning for choice of key challenges
Overall perspective: is the EU ETS fit for purpose
• All questions were answered by the interviewees with a particular emphasis on transport emissions (road transport -> ETS2, aviation/maritime shipping --> ETS1). • **ETS2** – Regarding the ETS2, the interviewees view the concurrent implementation of the ETS2 while retaining the ESR goals as an appropriate approach. By maintaining the ESR goals, Member States are compelled to take actions that prevent excessive price surges within the ETS2. – The combination of the ESR goals and the ETS2 mechanism establishes the ETS2 as a backstop when insufficient mitigation is achieved in the transport and buildings sector in the Member States. • **ETS1 (aviation/maritime shipping)** – Regarding the ETS1, the interviewees acknowledged that the instrument's design is fundamentally sound but requires adjustments in terms of level of ambition and scope of emissions. – The interviewees emphasized the need that from their view the level of ambition should be enhanced. With the latest reform the LRF was increased but is not yet sufficient to be 1.5-degrees target compatible (70% emissions reduction instead of 62% until 2030). – Different concerns and challenges related to the scope of emissions were raised by the interviewees (see challenges for aviation and maritime shipping for details).

Challenges/opportunities identified

Description and reasoning for choice of key challenges
1st Priority: Implementation of ETS 2
• The interviewees highlighted that increasing price levels in ETS2 may lead to distributional issues for citizens, particularly affecting low-income households and citizen in lower-income Member States. This poses a challenge to the acceptance of the ETS2 system overall. • Weak regulatory actions by Member States for transport emissions may lead to inadequate emission reductions in the coming years and thus higher prices in ETS2. • They see the risk that the environmental integrity of ETS2 may be compromised by a fixed (not increasing over time) soft price cap of 45€/ton associated with releasing additional allowances.

- Potential merging of ETS1 and ETS2 in the future:
  - The interviewees view merging of the two systems as a risk due to differences in abatement costs (road transport with steep abatement cost curve).
  - Furthermore, an overarching ETS instrument, from the perspective of the interviewees, risks that national targets may be dropped in the future.
  - Carbon market instruments cannot remove non-market barriers, so complementary regulatory measures and targets are needed.

2nd Priority: Aviation coverage / Linkage with CORSIA

- According to the interviewees, the primary challenge identified related to the coverage of aviation emissions is the EU's current reliance on the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) by ICAO for extra-European flights, where most aviation emissions take place (around 60%).
- The interviewees perceive CORSIA as highly problematic due to its heavy reliance on offsetting credits that are of low standard, have uncertain permanence and are too cheap due to the oversupply of the market.
- From the perspective of the interviewees, the EU should move away from CORSIA for extra-European flights and fully apply its own pricing relying on the EU ETS1 (at least be extended to all departing flights and then move to all flights).
- Including emissions in the ETS1 would generate additional revenue that might be used for the Innovation Fund, which in turn could be used to support the development of clean technologies for aviation and fuels.
- The interviewees note that from their perspective, not all Sustainable Aviation Fuels (SAFs) should be zero rated under the ETS because they have different levels of sustainability, regarding their impact on the environment and life cycle emissions reductions. Only synthetic kerosene should remain zero rated.
- Regarding the significant share of non-CO_2 effects from aviation (e.g. ozone production or contrail cirrus formation, effects in similar magnitude to CO_2-related effects), the interviewees argue for these additional warming effects to also be priced under the EU ETS after the MRV for non-CO_2 effects is established.

3rd Priority: International shipping coverage/Linkage with international maritime system

- The interviewees advocate for a more stringent incorporation of shipping emissions in the EU ETS1.
- They propose the inclusion of smaller ships (currently limited to those above 5,000 gross tonnage, MRV for general and offshore ships with 400-5,000 gross tonnage starting in 2025) and the coverage of all emissions associated with voyages to and from Europe (currently limited to 50% of emissions related to an extra-European voyage).
- Non-CO_2 greenhouse gas emissions from shipping are to be included in the EU ETS from 2026. For short-lived non-CO_2 emissions (e.g. methane), the interviewees advocate considering a global warming potential (GWP) measure for a 20-year period instead of the default 100-year measure. This would better reflect the significant short-term warming impacts of ship emissions and create pressure to reduce them.
- Besides the respondents take the position that not included particles emissions with a global warming potential, like black carbon, should also be included in the EU ETS mechanism.
- A challenge to address shipping emissions will be the low price elasticity of demand for international shipping activities. Pricing it together with other types of activities under the

EU ETS1 likely to have a limited effect on shipping emissions to decline in the short- to medium run.

Policy options identified

Key policy options
1st Priority: Implementation of ETS 2
• The interviewees raised the following points regarding policy options for ETS2: – To reflect inflation and an increasing level of ambition, the EU ETS2 MSR price cap should incorporate an escalating price path over time, such as an increase of 10 Euros per year. – Addressing the disproportionate burden on the most vulnerable households and lower-income Member states, the Social Climate Fund should have endowments in proportion to the price trajectory of ETS2, rather than having fixed endowments. This adjustment would ensure that the fund has sufficient resources to support targeted relief measures. Furthermore, revenues from ETS1 might be utilized to finance the Social Climate Fund. Such an allocation of auction revenues from ETS1 is seen as reasonable by the interviewees due to the ETS1 price burden for the power sector partially borne by households. – Establishing a link between the ESR targets and ETS2, Member states that surpass their ESR targets should receive a premium, for instance by receiving additional revenues from ETS2. – Excessive carbon price cost pass-through to households: Measures should be implemented to ensure that not more than 100% of the carbon price signal from ETS2 is passed-through to households (Monitoring process to avoid windfall profits of energy companies).
2nd Priority: Aviation coverage / Linkage with CORSIA
• See notes on challenges: Coverage of extra-European flights by the EU ETS1, consideration of non-CO_2 effects.
3rd Priority:
• See notes on challenges: Expansion of application, the expansion of geographical scope, and the inclusion of black carbon emissions.

Additional relevant points from the interview

- **Carbon removals (Briefly discussed)**
- Interviewees expressed their scepticism that removals should be embedded in the framework of the EU ETS.
- They have the perspective that removals are not equivalent to emission abatement and that integrating removals could undermine the environmental integrity of the ETS2 (short-/long-term carbon cycles) as well as the ambition to mitigate emissions.
- Removals should be considered separately.

Appendix E Stakeholder survey questions

Survey introduction

Stakeholders are invited to share their views on the future challenges and policy options for emissions trading in the EU after 2030 in a study commissioned by the European Commission (EC), DG CLIMA. **This is an important opportunity for you to feed in the perspective of your organisation and those you represent.**

The study is being undertaken on behalf of the EC by the public policy consultancy, Technopolis Group, together with the Potsdam Institute for Climate Impact Research (PIK) and E3-Modelling.

The survey takes about 15 minutes to complete.

The information collected will be analysed to understand the perspectives of different types of stakeholder organisations. This analysis will be fed into a wider report for the EC to consider in the development of future options for the EU emissions trading framework after 2030. The report is expected to be published. Survey analysis will present aggregated, anonymised stakeholder views, not those of individual organisations. No personal data is being requested.

Please make sure that your answers focus on emissions trading and the 2030-2040 period.

Survey questionnaire:

1. Please enter the name of your organisation.

This is optional. It is to help us understand the perspectives provided and may be shared with DG CLIMA. If you prefer to answer the survey anonymously, please leave this blank.

2. Please select the option below that best describes your organisation:

- Trade association
- Business
- Non-Governmental Organisation (NGO) or Think tank
- Consumer representative body
- Trade union or trade union coalition
- Other (please specify)

3. If your organisation is engaged with or represents a specific sector/industry, please indicate its main focus below.

- Electricity generation
- Chemicals
- Cement
- Steel
- Non-ferrous metals

- Ceramics
- Glass
- Paper, pulp, cardboard
- Refinery products
- Road transport
- Logistics
- Maritime transport
- Aviation
- Buildings
- Negative emissions
- We are not a specific sector
- Other (please specify)

4. Please select the option that best describes the geographical scale of your organisation:

- Global
- EU
- Some EU Member States
- National
- Regional/local
- Other (please specify)

5. In the previous question, you indicated your organisation is national, regional or local in scale. Please indicate in which EU or EEA-EFTA member state your organisation is based?

- List of EU Member States.

6. Could you please indicate what role you have at your organisation:

- Senior Executive (e.g. Chair, Managing Director, CEO)
- Policy specialist (e.g. Policy officer, Policy director, Policy manager)
- Researcher (e.g. Fellow, Analyst)
- Other (please specify)

7. Please select the option that best describes the level of knowledge that you have in relation to the EU emissions trading framework (covering ETS 1 and ETS 2)?

- No or very limited knowledge of the EU ETS
- Limited/some knowledge of the EU ETS
- Detailed knowledge of the EU ETS

8. Which of the following issues relating to the EU ETS framework in the medium to long run (2030-2040 period) do you think are most relevant? Please select up to three issues and rank them in order of importance where 1 is most important. If you have difficulty responding to these questions or wish to express a perspective that does not fit the survey structure, please select 'other'. There is also an open text box at the end of the survey for any other comments and an option to upload other documents. You will then be asked some follow up questions about the issues you have selected.
   - Predetermined list of options

For each issue/development selected, the following questions will be asked focusing on one issue/development at a time, and then beginning again for the next issue/development:

9. *Industry/consumer stakeholders only* – Please can you rate this issue [..] in terms of its anticipated impact on the organisations or people that you represent in the 2030-2040 period? (-5 is very negative impact, 0 is neutral impact, 5 is very positive impact).

10. What potential **opportunities**, if any, do you think this issue […] could offer during the 2030-2040 period? Please select up to three opportunities and rank them in order of importance where 1 is most important.
    - Predetermined list of options: This list of opportunities will include the positive reasons currently listed in the second column of Table 1. In addition, it will always include an option 'I don't think this issue/development is likely to offer an opportunity plus an 'other' option.

11. What **challenges**, if any, do you think this issue […] could pose during the 2030-2040 period? Please select up to three challenges and rank them in order of importance where 1 is most important.
    - This list of challenges will include those currently listed in the second column … In addition, it will always include an option 'I don't think this issue/development is likely to pose challenges' plus an 'other' option.

12. Which of the following **policy options** do you think are most important to mitigate challenges and/or support opportunities that could arise from this issue/development [..] in the 2030-2040 period?
    - Please select up to three policy options and rank them in order of importance where 1 is most important.
    - Predetermined list of options

13. When do you think this issue [..] will become relevant?
- Pre-2030
- 2030-2035
- 2035-2040
- Post-2040
- From now and on an ongoing basis

- Don't know

14. Do you have any other comments to make about the EU ETS in the 2030-2040 period? Open question.

15. If you have a document you wish to upload to support or elaborate your response (e.g. a journal article, position paper, policy brief), please upload the file here. Please provide an explanation in the text box above as to why you think this is relevant for EU emissions trading after 2030.

Please contact Barbara Hansen Duncan, Barbara.hansenduncan@technopolis-group.com if you have any files which you wish to submit that are not supported here.

Many thanks for your time.

Table 7-1 Content for survey response options

Q8. Issues	Q10&11. Why relevant/important?	Q12. Policy options to address challenges
Emissions trading covering buildings and road transport	Opportunities: ET could continue to deliver emissions reductions in road transport and buildings efficiently. ET could ensure a level playing field between electricity and fossil fuels in the necessary decarbonisation of energy demand ET revenues could continue to support low/lower-middle income households affected by ETS 2 driven price rises. ET revenues could continue to be used to fund climate action and related investments. ETS 2 could replace the Effort Sharing Regulation as a compliance mechanism for the climate target. ETS 2 could function as a backstop for possible post 2030 targets under the Effort Sharing Regulation. Other – please specify. Challenges: The highest relative cost burdens from carbon pricing may be faced by households with low/lower-middle incomes. The highest relative cost burdens from carbon pricing may be faced by households in lower income Member States. The infrastructure required to enable switching to low carbon options in these sectors is expected to be insufficient. High relative cost burdens on low/lower middle income households may damage public and political acceptance of the EU ETS. Risk that some Member States tax less or subsidise fossil fuels through other means to mitigate the price effects of ETS 2. Risk of sufficient political support for continuing the current revenue use addressing distributional impacts Risk of higher ET prices if complementary sector specific regulation to support the transition is not sufficiently robust. The current price containment mechanisms in ETS 2 to ensure a smooth start may not be appropriate post 2030. Other – please specify.	Increase relative proportion of investment in low carbon buildings and mobility infrastructure targeted at/ accessible for lower/ lower-middle income households. Increase relative proportion of targeted compensation for vulnerable households e.g. without home insulation. Make direct lump sum payments to low/lower-middle income households. Increase the overall scale of revenue support allocated to addressing distributional concerns. Increase revenue redistribution to lower income Member States. Complementary sector specific policies to increase accessibility of low carbon technologies. More specific rules on how Member States can use auction revenues for climate action and/or redistribution. Other – please specify.

Q8. Issues	Q10&11. Why relevant/important?	Q12. Policy options to address challenges
Potential linking of EU emissions trading with other international emissions trading schemes	Opportunities: Could improve the international coherence and efficacy of efforts to mitigate carbon emissions globally. Could lead to increased level of ambition in non-EU ET systems. Could increase access to more (efficient) mitigation options. Could offer greater liquidity in the market. Could improve price discovery in the market. Could allow participants to manage carbon risks more effectively. Could provide a level playing field for carbon costs internationally. Other – please specify. Challenges: Risk of a loss of sovereignty and regulatory flexibility in policy making. The compliance structure of EU emissions trading may be weakened. Differences in structures of individual emissions trading systems make international linkage challenging. Linkage could stimulate flows of finance from one geographic area to another. Linkage could weaken emissions reductions ambitions in some areas. Other – please specify.	International negotiations to converge individual systems and ambition levels. Limit the amount of allowances transferable through linking Promote alternative formats to linkage - coalitions of emissions trading systems to reinforce environmental integrity and international dimension of carbon pricing Revenue use in a dedicated channel for international purposes Define conditions for (the amount of) allowances transferable through linking Other – please specify.
Potential integration of carbon dioxide removals into EU emissions trading	Opportunities: This could compensate for residual emissions in hard to abate sectors. This could improve market functioning by increasing liquidity of allowances under a declining cap. This could improve the cost efficiency of the market, thereby reducing costs to society.	Further develop tailored certification methodologies for the different types of carbon removals. Provide innovation funding for the development of carbon removals via the Innovation Fund. Creation of an intermediary (e.g. carbon central bank) to procure and release carbon removal certificates into an ETS market

Q8. Issues	Q10&11. Why relevant/important?	Q12. Policy options to address challenges
	This could provide certainty and incentives for investment in carbon removal technologies. Other – please specify. Challenges: This could reduce the incentive to invest in emission reductions. The diversity of removal technologies creates potential complexity in how these could be integrated into the EU ETS. There will be challenges in ensuring the additionality of nature-based removals. There will be challenges in ensuring the permanence of nature-based removals. There could be challenges in the safety of the storage of captured carbon dioxide. New technological carbon removal techniques are at an early stage and not proven. There could be insufficient demand pull to drive currently more-costly carbon removal techniques to deployment at commercial scales. Inclusion of potentially lower-cost carbon removals too early could exert downward pressure on the overall carbon price. There may be tensions between expansion of nature-based removals and support of biodiversity objectives. Other – please specify.	Limit introduction of carbon removals in EU ETS under specific circumstances (please specify below). Develop and account for carbon removals separately from the EU ETS. Limit the introduction to industrial/technological carbon removals (BECCS, DACCS), i.e., excluding nature-based Other – please specify.
Potential integration of non-permanent capture and utilisation into the EU ETS	Opportunities: CCS (carbon capture and geological storage) is not always an option in my sector e.g. because of the distance to storage sites Carbon storage in products is limited to a narrow range of products and is not an option my sector Captured/recycled carbon can provide a sustainable carbon feedstock for some sectors e.g. chemicals which otherwise would be derived from fossil sources. Challenges:	Limit reduction of the surrender of emission allowances only to certain sectors with residual emissions/hard to abate emissions Limit reduction of the surrender of emission allowances to certain sectors with limited options for permanent storage or use of their emissions. Limit reduction of the surrender of emission allowances to certain products which are beneficial in the transition as they reduce emissions in other sectors Limit reduction of surrender obligations to products whose emissions will eventually be accounted for and priced downstream at the end of their life

Q8. Issues	Q10&11. Why relevant/important?	Q12. Policy options to address challenges
	CCU applications where embedded carbon will be released during the product life-time may represent delayed rather than avoided emissions. CCU applications may delay or prevent other emission abatement options by allowing a cheap alternative to surrendering allowances Under-accounting of emissions Triggering increase of emissions where the ultimate release of the emissions is subject to more lenient measures than the ETS carbon pricing	
Potential expansion of EU emissions trading to sectors not covered (for example, agriculture emissions, or landfill emissions)	Opportunities: This could lead to a more consistent climate policy framework where more emissions are covered by EU emissions trading. This could incentivise emission reduction efforts in additional sectors This could generate revenues for the necessary investments in additional sectors Other – please specify. Challenges: Uncertainty in determining the level of emissions from agriculture. Difficulties in implementation and possibly high transaction costs due to the structure of the agricultural sector with many actors. Other – please specify.	Create separate ETS for further sectors. Integrate further emissions into an existing ETS. Other – please specify..
Increased ambition level for industry	Opportunities: This could support emissions reductions efforts and innovation in industry by strengthening the carbon price signal. CBAM could raise the competitiveness within the EU internal market of industries investing in decarbonisation CBAM could encourage emissions reductions amongst countries exporting goods included in the EU ETS to the EU. CBAM could prevent carbon leakage ensuring equal treatment between imports and EU-production.	Expand the scope of CBAM to more sectors. Creation of economic structures to increase security of low carbon investments (e.g. carbon contracts for difference schemes) Sector specific regulation and standards to drive adoption of low carbon technologies. Greater funds and/or tax incentives to support industrial decarbonisation. Support for green skills development in the workforce.

Q8. Issues	Q10&11. Why relevant/important?	Q12. Policy options to address challenges
	EU net zero industrial policy could support green jobs and green innovation Other – please specify. Challenges: EU exporters may struggle because the CBAM offers only limited protection for exports. The costs of decarbonisation negatively impact the global competitiveness of EU industry. Any negative impacts on industry could have a consequent negative impact on industrial workers. Third country producers may direct the less carbon-intensive share of their production to the EU but retain the more carbon-intensive share for sale outside the EU ('resource shuffling'). There is a risk that only the wealthier Member States will be able to provide sufficient support for the transition in industry. Industry struggles to achieve required emissions reductions leading to serious negative impacts e.g. price spikes, industrial closures. Other – please specify.	Fostering more carbon pricing instruments in third countries, in order to reduce carbon leakage risk. Implement a carbon price signal at consumption level instead of an import based CBAM. Merge ETS1 and ETS2 to create one single ETS market instead of two smaller markets. Other – please specify.
Market stability and functioning of the Market Stability Reserve (MSR)	Opportunities: The MSR can provide investor certainty by operating as a rules-based system. The system is based on an estimate of hedging demand, which gets regularly reviewed. The MSR helps to manage market liquidity. Other – please specify. Challenges: Potential reduced liquidity of allowances as the cap decreases over time may lead to less effective market functioning and higher market volatility.	Transition to a price-based MSR system as market size decreases (e.g. price floor or price corridor) Creation of a central carbon bank with more freedom than the MSR, combining price and quantity instruments. Continue with current rule-based quantity-based MSR approach. Support market stability by merging ETS1 and ETS2, to create one single ETS market. Other – please specify.

Q8. Issues	Q10&11. Why relevant/important?	Q12. Policy options to address challenges
	A certain degree of price uncertainty in a quantity-based system may make investment decisions more difficult. A certain degree of price uncertainty in a quantity-based system may lead to increased holding of allowances and then more allowances being invalidated. There is a time lag before the MSR can react to price spikes if they occur. The effect of the MSR on emissions reductions is uncertain. Other – please specify.	
The role of financial actors in the EU ETS	Opportunities: They act as essential intermediaries for many compliance entities. They help provide liquidity and, therefore predictability in secondary markets. ETS compliance entities buying carbon futures (derivatives) from banks for hedging can finance the allowances upon expiry of the futures contract. Other – please specify. Challenges: As market size decreases, there may be an increase in speculation, reducing market liquidity and effective market functioning. Other – please specify.	Data availability and monitoring to be improved to monitor trading and detect potential abnormal episodes. Establish a single supervisory authority to control the participation of financial actors in the market. Introduction of compliance costs for transactions. Introduction of holding limits for financial actors. Other – please specify.
Coverage of aviation in the EU ETS	Opportunities: ETS could continue to incentivise emissions reductions efficiently in aviation within the EEA, and departing flights to Switzerland and the UK. Continued alignment with CORSIA could facilitate continued global cooperation to cover international aviation emissions. Other – please specify. Challenges:	EU ETS to apply its own pricing (rather than CORSIA) to departing extra-European flights. Establish effective MRV for non-CO2 aviation effects to enable mitigating them through their inclusion in the EU ETS. Other – please specify.

Q8. Issues	Q10&11. Why relevant/important?	Q12. Policy options to address challenges
	Continued reliance on CORSIA for extra-EEA flights may insufficiently deliver on the Paris Agreement goals, including the use of offsetting credits that may be of low quality. Continued exclusion of non-CO2 aviation effects reduces credibility of EU ETS. Other – please specify.	
Coverage of maritime shipping in the EU ETS	Opportunities: ETS could continue to efficiently incentivise emissions reductions of the maritime sector within the EEA. Continued exclusion of 50% of emissions from extra-European voyages prevents evasive practices and allows third countries to decide on appropriate action in respect of the other share of emissions. Other – please specify. Challenges: Continued exclusion of 50% of emissions from extra-European voyages reduces emission reduction potential of the EU ETS. Continued exclusion of smaller ships reduces emission reduction potential of the EU ETS. Continued exclusion of particulate emissions shipping effects reduces credibility of the EU ETS. Other – please specify.	Consider extending the ETS coverage of emissions from extra-European voyages if the IMO does not adopt a global market-based measure. Support the development of an ambitious market-based measure at IMO. Extend EU ETS coverage to smaller ships and other ship types. Establish effective MRV for black carbon emissions to enable their inclusion in the EU ETS system. Extend the EU ETS coverage to particulate emissions from shipping activities (e.g. black carbon). Other – please specify.

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