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COVER NOTE

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To:	Ms Thérèse BLANCHET, Secretary-General of the Council of the European Union
No. Cion doc.:	SWD(2026) 616 final - Part 2/5
Subject:	COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT *Accompanying the documents* Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2003/87/EC and Decision (EU) 2015/1814 as regards driving competitiveness and cost-effective decarbonisation REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2003/87/EC as regards revised benchmark values for the heat and fuel benchmarks for the period from 2026 to 2030 REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Regulations (EU) 2015/757 and (EU) 2023/1805 to simplify and streamline monitoring, reporting and verification and to align with revisions of the EU Emissions Trading System

Delegations will find attached document SWD(2026) 616 final - Part 2/5.

Encl.: SWD(2026) 616 final - Part 2/5

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PART 2/5

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

Accompanying the documents

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2003/87/EC and Decision (EU) 2015/1814 as regards driving competitiveness and cost-effective decarbonisation

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2003/87/EC as regards revised benchmark values for the heat and fuel benchmarks for the period from 2026 to 2030

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Regulations (EU) 2015/757 and (EU) 2023/1805 to simplify and streamline monitoring, reporting and verification and to align with revisions of the EU Emissions Trading System

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ANNEX 1: PROCEDURAL INFORMATION

1. LEAD DG, DECIDE PLANNING/CWP REFERENCES

The Directorate-General (DG) for Climate Action has led the preparation of this initiative and the work on the Impact Assessment in the European Commission. The planning entry was approved in Decide Planning under the reference PLAN/2024/2770. It is included in the 2026 Commission Work Programme1 under the headline ambition A new plan for Europe's sustainable prosperity and competitiveness and the policy objective Climate.

2. ORGANISATION AND TIMING

The planned adoption date (Q3 2026) was included in the Commission Work Programme. The Open Public Consultation was online between 14 April 2025 and 08 July 2025.

An inter-service steering group (ISSG) was established in October 2024 to prepare this initiative. Its members were: SG, LS, AGRI, BUDG, COMM, COMP, CNECT, DEFIS, DGT, DIGIT, EAC, ECFIN, ECHO, EEAS, EMPL, ENER, ENV, ESTAT, FISMA, FPI, GROW, HOME, HR, IDEA, INTPA, JRC, JUST, MARE, MENA, MOVE, NEAR, OLAF, REFORM, REGIO, RTD, SANTE, TAXUD and TRADE. The ISSG met five times in the period from November 2024 until adoption. On 20 November 2024 it discussed the draft Call for Evidence, Stakeholder consultation strategy and questionnaires for the Open Public Consultations, on 10 March 2025 the aviation study inception report, on 3 July 2025 the measures assessed in the Impact Assessment draft, and on 28 January 2026 the policy options. The Interservice Consultation was launched on 19 June 2026 and closed on 1 July 2026.

3. CONSULTATION OF THE RSB

An upstream orientation meeting on the review of the EU ETS for maritime, aviation and stationary installations, and of the Market Stability Reserve was held in October 2025. A draft Evaluation and Impact Assessment were submitted to the Regulatory Scrutiny Board (RSB) on 23 March 2026. Following the RSB meeting on 15 April 2026, a positive opinion with comments was issued on 17 April 2026.

The RSB's recommendations for improvement have been addressed as presented below.

Evaluation:

1) What benefits and costs can be attributed to the EU ETS over the evaluation period? What is the cost pass-through and distribution of costs and benefits? With regards to energy intensive industries, how could the analysis, conclusions and lessons learned be strengthened regarding the carbon price signal to provide incentive(s) to decarbonise? What were marginal abatement costs and what carbon price levels were needed to incentivise decarbonisation in different sectors? How could the results of the evaluation be better used in the impact assessment, in particular for the design of the policy options?

- We have presented the findings on benefits and costs in more detail throughout the evaluation report, including insights for sectors in Appendix III, section 8.3.4.2., and downstream implications in terms of competitiveness and investment decisions in Appendix III, section 8.3.4.5.
- We have included an overview table of costs and benefits in Appendix IV.

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1 COM/2025/870 final

- The presentation of findings and conclusions in the Evaluation Report has been improved to enhance clarity.
- Section 4.1.1.1.2. has been improved with more detail on abatement costs of the main sectors, complementary support measures in place, and effects of exposure to the carbon price signal.
- The presentation and conclusions have been improved to strengthen clarity on the evaluation of carbon leakage prevention in Appendix III, section 8.3., and the analysis on suitability of coverage of sectors.
- The findings of the evaluation have been integrated in the problem definition (e.g. P1 and D2), measures and policy options in the impact assessment (e.g. on free allocation, Modernisation and Innovation Fund).

Impact assessment:

2) How could the definition of the problem[s] be strengthened and made clearer as regards the constraints stemming from the 2040 EU climate target? How can the specific objectives be formulated in SMART terms, better reflecting available evidence? How is cost-effectiveness defined and to which timeframe does it apply? How can the intervention logic and the causal link between the problems and policy options be improved? What is the most appropriate baseline scenario to assess the policy measures and options?

- We have strengthened the analysis on the marginal abatement costs for ETS1 sectors compared to the carbon price as a basis to quantify driver D1.
- We have included a general explanation of the Technological Readiness Levels of technologies assumed in the models, in addition to more information regarding the economic viability of needed technologies at current and expected price levels.
- The quantification of driver D1.2, D2 and D3 has been strengthened regarding the size of the financing gap, free allocation, the 20MW threshold, maritime and aviation.
- We have clarified that the impact assessment examines various trajectories reflecting a commensurate and cost-effective ETS-contribution to the overall 2040 target in the Climate Law, always starting from alignment between the EU ETS and the 2040 target.
- Annex 7 has been further developed to better reflect the assessment criteria in the definition of the objectives, with the objectives formulated as measurable to assess cost-effectiveness in the relevant period.
- We have clarified the causal link between the problems and policy options in the intervention logic and analysis throughout the report.
- We have clarified the explanations on the use of the baseline and the 85% scenario in the main report, as well as in Annex 4, section 2.2.
- We have clarified the choices made in deciding the appropriate baseline in section 5.1, including the justification for the exceptions to the legal default for free allocation provisions and IDB, as well as the MSR0 scenario in addition to the baseline for the MSR.

3) How can the report better present the rationale for packaging the measures into the policy options? How are the policy measures expected to interact with each other? How could the impacts of the policy options be modelled?

- We have clarified the approach to model the impacts of each policy measures and the effects of their interaction. A more detailed overview has been included in Section 7 of the main report to enhance the overview of the combined impact of the policy options.

- We have reinforced the qualitative and quantitative assessment of synergies and interactions between the IDB, free (conditional) allowances and indirect cost compensation.
- We have expanded on the interaction between the development of marginal abatement costs and complementary enabling conditions to clarify the development of overall investment needs, in addition to clarifying uncertainties in the Potencia model.

4) How to properly account for the costs and the benefits of the preferred option vis-à-vis the baseline? What are the administrative and the adjustment costs of the preferred option? What is the distribution of costs and benefits? How could the analyses of both competitiveness and affordability be improved? How could the report be clearer regarding the key assumptions, in particular related to technologies and investment behaviour? How do the analyses deal with the uncertainty of key assumptions?

- We have more clearly distinguished the costs and benefits stemming from the baseline from those incurred due to the policy options, for those topics where the baseline includes a continuation of the policy.
- Costs and benefits of the preferred option have been quantified in Annex 3 on an issue-by-issue basis to provide greater transparency in view of the preferred option being a collection of different components.
- Due to the heterogeneous nature and differences in the focus and level of detail of the quantitative analysis across different topics, as well as the dependence on future implementing measures (notably the design of future MRV requirements) in certain cases, it has not been possible to monetise the aggregated costs and benefits of the preferred option.
- For the analysis on competitiveness and affordability, we have included concrete references to the analysis of the 2040 climate target impact assessment and further developed the impact assessment of the IDB in these terms. In addition, the report further clarifies the complementary role of other policies which go beyond the remit of the EU ETS and will be assessed in more detail in those respective areas.
- Annex 4 has been updated with more information on key assumptions and preconditions (infrastructure, technology development) for the target to be reached.

5) How can the report become clearer and more accessible, considering that the main impact assessment report builds on the several sub-impact assessments provided in annexes? In this respect, ow can the report improve the logic of building the different policy options for the ETS review?

- We have reviewed and improved the clarify of the overall narrative in the main report, in addition to including bracketed references to more detailed information in the annexes where relevant.
- We have included a visual representation of the functioning of the EU ETS and its role within the relevant climate and energy policy framework.
- A description of the logic behind the combination of measures into three policy options, the key trade-offs between the options and the measures that drive their overall impact has been included in section 5.2. of the main report.

4. EVIDENCE, SOURCES AND QUALITY

This initiative builds upon evidence gathered in the Impact Assessment for the previous ETS revision[2] concluded in 2023, the Impact Assessment accompanying the 2040 Climate Target Communication and Proposal[3] and any relevant evidence compiled in other concurrent initiatives. It builds on emissions data and experiences from the implementation of the EU monitoring, reporting and verification systems. It makes use of modelling scenarios using PRIMES, GEM-E3 and POLES models, as described in Annex 4 on Modelling and analytical methods. In addition, it makes uses of several support contracts. Concerning the maritime and aviation sectors, sector-specific studies were carried out by Ricardo[4]. Further information on evidence, scenarios and sources is provided in Annexes 2 and 4.

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2 SWD(2021) 601

3 SWD(2024) 63

4 Ricardo (forthcoming). Support for the 2026 review of the ETS directive for maritime, report prepared for DG CLIMA, (forthcoming);
Ricardo et al., (2024). Supporting study for the implementation of the ETS Directive and MRV requirements for maritime transport", and more specifically "MRV maritime evaluation support" part (forthcoming):
Ricardo (forthcoming) Opportunities of the Green Transition for the EU Maritime Industry and Value Chain.
Ricardo (forthcoming). Support for the review by the Commission concerning the implementation of ICAO's CORSIA, and for Commission reports on certain types of flights, social impacts, and air connectivity of islands, remote territories and Iceland, prepared for DG CLIMA.

ANNEX 2: STAKEHOLDER CONSULTATION (SYNOPSIS REPORT)

1. INTRODUCTION

As part of the back-to-back evaluation and impact assessment to support the revision of the EU ETS Directive and the Market Stability Reserve (MSR) Decision, the Commission carried out a series of consultation activities[5]. The scope of the consultation consisted of an evaluation of the current framework and an impact assessment on a wide range of options for provisions subject to review. In particular, the main objective of the consultation was to gather stakeholder views on the aviation and maritime sectors, carbon leakage, carbon removals, municipal waste incineration (MWI), non-permanent carbon capture and use (CCU), thermal input thresholds, linking with other carbon markets, and the Market Stability Reserve. The consultation further examined the use of revenues and low-carbon support mechanisms. The Commission also looked for inputs on possible simplification measures.

The Commission organised an open public consultation (OPC) via an online survey. The OPC was open for 12 weeks, in line with the Better Regulation Guidelines, from 15 April to 8 July 2025. The questionnaire contained 61 questions, mainly multiple-choice questions but with the possibility to elaborate on the given response.

During the open public consultation period, position papers and feedback to the Call for evidence could also be submitted. In addition, targeted interviews were conducted to gather more detailed information from specific stakeholder groups.

The Commission engaged a contractor[6] to analyse the results of the online survey, feedback on the call for evidence and stakeholder interviews. The results are summarised below based on the report provided by the contractor.

The Commission also instructed contractors[7] to collect views and inputs on the implementation of MRVA rules for stationary installations and maritime operators through detailed questionnaires. The outcome of the study will be reflected in the MRVA related sections of evaluation report.

In addition, the Commission participated in multiple (virtual) bilateral and multilateral stakeholder meetings to discuss the revision of the ETS, including with companies and business associations across different sectors, trade unions, non-governmental organisations (NGOs) and public authorities of Member States. The Commission also participated in several virtual conferences in order to present the upcoming revision of the ETS and to invite stakeholders to participate in the public consultation. Finally, a joint meeting of the European Sustainable Shipping Forum sub-group on the implementation of MRV and ETS maritime (ESSF) and Climate Change Expert Group (CCEG Maritime) was held to collect insights and input on maritime-related topics from Member States and stakeholders.

In parallel, as part of the reality check exercise, the Commission also organised a targeted workshop on the EU ETS with over 50 representatives from stationary installations across the EU on 29 January 2026, which focused on experiences with practical implementation and

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5 The details of the public consultation can be found at: EU emissions trading system for maritime, aviation and stationary installations, and market stability reserve – review.

6 Ricardo. Service contract 090203/2024/924074/SER/CLIMA.B.1

7 Ricardo Nederland B.V; Viegand Maagøe A/S and SQ Consult.

identification of areas for simplification and streamlining of compliance processes and requirements.

Finally, the Commission organised a high-level stakeholder roundtable on the review of the EU ETS on 12 May 2026, bringing together close to 60 EU association and company representatives from more than 20 sectors covered under the EU ETS, civil society organisations and other relevant stakeholders such as auction platforms and market analysts, from different geographical areas across the EU. The Roundtable complemented the public consultation on the evaluation and the review of the EU Emissions Trading System and the Market Stability Reserve conducted in 2025, in view of the interim developments on the evaluation and review process, geopolitical events and guidance from the March 2026 European Council and the 2040 target amendment to the European Climate Law. The Roundtable gathered additional input on the policy priorities to guide the upcoming review of the EU ETS and the Market Stability Reserve (MSR) for the 2031-2040 period and the complementary instruments needed to make decarbonisation a driver of EU competitiveness and resilience. The Roundtable was also publicly web-streamed, with online observers invited to share positions in writing after the event.

2. METHODOLOGY FOR DATA PROCESSING

The questionnaire mainly consisted of closed questions presented as multiple-choice or multiple-answer questions[8]. The questionnaire also included several open-ended questions, mostly to elaborate on responses to closed questions, as well as some stand-alone open-ended questions. The results of all questions have been analysed quantitatively. For open-ended questions, key views raised by respondents were identified and grouped by theme, allowing the frequency of each issue to be assessed quantitatively.

In accordance with the Better Regulation Guidelines and Toolbox, sets of coordinated responses have been identified and analysed separately as campaigns. Campaigns were identified horizontally where respondents with key shared characteristics[9] submitted similar or identical answers across multiple questions in the questionnaire. A scoring method (R x Q = S) was applied that considered the combination of the number of respondents (R)[10] and the number of questions where similar or identical responses (Q) were submitted[11] with the

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8 Results for questions allowing multiple answers indicate the number of responses, which may exceed the total number of respondents.

9 Same stakeholder type, same sector within a stakeholder type, or stakeholders within the same stakeholder type all located in the same Member State.

10 With the threshold for (R) set at 4 or higher.

11 For open-ended questions, similarity was measured by exact, case-sensitive character overlap: a response was considered “repeated” if at least 30% of its characters matched another answer word-for-word. Groups were constructed iteratively, beginning with matching pairs and then expanding until stable clusters were formed. For closed questions, the assessment was merged with that of the open-ended questions as a correlation in coordinated responses was identified with most groups of respondents who coordinated responses to open-ended questions also having submitted coordinated responses to related closed question(s). For those closed questions, similarity was measured by a threshold of at least 80% of responses being identical.

threshold (S) defined as 50 or higher to ensure that strongly coordinated sets of responses throughout the questionnaire were transparently identified[12].

The analysis of the closed and open-ended responses identified 13 campaigns, mainly affecting the stationary installation section of the Impact Assessment. While these had a visible impact on the responses submitted to open-ended questions, they did not significantly affect the results of closed questions. In particular, the relative ranking of options was not altered.

Additional position papers or feedback on the Call for evidence could be submitted to the OPC. In total, 404 unique contributions were received (of which 377 as feedback to the Call for evidence and 27 directly submitted): each could include feedback, a position paper, or both. Altogether, these comprised 377 feedback responses and 323 papers. Based on a preliminary review and a selection, 372 papers and feedback were thoroughly analysed. These were processed via cataloguing, meaning data from each contribution was logged in a database to provide key themes, issues raised and author.

3. RESULTS OF THE OPEN PUBLIC CONSULTATION

3.1. Overview of participants

The online survey received a total of 540 responses. Respondents represented a wide geographic distribution: 478 responses originated from 23 Member States. The largest shares came from Belgium (113; 21%)[13], Germany (93; 17%), and France (77; 14%). 59 responses were submitted from outside the EU[14].

The majority of responses (411, 76%) were submitted by private sector stakeholders, including companies and businesses (233, 43%) and business associations (178; 33%), followed by NGOs (44; 8%), public authorities (37; 7%), EU citizens (10; 2%), environmental organisations (8; 1%), academic or research institutions (4; 1%) and trade unions (3; 1%)[15]. Within the company/business category, 84 out of 233 respondents (36%) were classified as SMEs.

In terms of the sectors represented, respondents most frequently identified with the waste management sector (133, 26%), followed by the energy sector (107; 21%) and other sectors not explicitly listed (103; 20%). Manufacturing industry sectors[16] combined represented 104 (20%) of respondents, maritime 29 (5.7%), and aviation 15 (2.9%).

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[12] This methodology allowed to identify stakeholders with coordinated responses ranging from large groups of respondents submitting similar responses to a targeted topic (f. ex. 25 local public authorities coordinating on questions on waste management), to smaller numbers of respondents submitting similar responses across multiple topics (f. ex 5 companies/businesses from the chemicals sector horizontally coordinating on different topics related to stationary installations in the impact assessment).

[13] This result is influenced by the fact that many business associations and NGOs are based in Belgium.

[14] In addition, 3 out of the 540 respondents did not specify the country of origin.

[15] In the further analysis of OPC results, the analysis per stakeholder type is focused on the private sector (companies/businesses and business associations) and NGOs, given the large share of respondents from these groups. Results for other stakeholder groups have to be interpreted with caution. For instance, the number of replies from trade unions, academic/research institutions or EU citizens is too low to draw representative conclusions, while public authorities encompass a diverse spectrum from different levels and policy areas, including local, regional and federal authorities. These stakeholder groups will therefore only be mentioned explicitly where relevant.

[16] Chemicals and fertilisers, other energy-intensive industry, steel, cement, glass and ceramics, non-ferrous metals.

3.2. Evaluation

3.2.1. Effectiveness

69% of respondents (216 out of 314) from a wide range of stakeholder groups (including the majority of companies/businesses, business associations and NGOs) considered the ETS Directive moderately (157; 50%) to very (59, 19%) effective in reducing GHG emissions. A further 23% (72) considered it slightly effective. Only 2% (7) believed it had not been effective at all, and 6% (19) indicated they did not know.

Current carbon leakage protection measures in non-CBAM sectors were considered moderately (138; 46%) to very (18; 6%) effective by more than half of respondents (154 out of 300), mainly from companies/businesses and business associations. Conversely, most NGO respondents as well as companies/businesses from non-eligible sectors considered current carbon leakage measures only slightly (60; 20%) or not (27; 9%) effective.

A broad majority from across stakeholder groups agreed that the MSR has so far been very (100 out of 282; 35%) to moderately (82; 29%) effective in addressing the surplus on the market, while only 10% (28) considered it slightly effective and 2% (5) not effective. However, looking at the future, mainly NGOs supported maintaining this role as a key feature to stabilise the carbon price signal. Companies/businesses and business associations on the other hand frequently questioned the future role of MSR intakes and the invalidation mechanism in view of expected future scarcity on the market and predominantly considered limiting excessive price volatility and ensuring liquidity on the market as the most important role for the MSR. Views were divided on the MSR's effectiveness so far in this regard. While 39% of respondents (110 out of 283), including most NGOs, considered the MSR moderately (88; 31%) to very (22; 8%) effective in improving the system's resilience to major shocks, 34% of respondents, mainly companies/businesses and business associations, considered it only slightly (55; 19%) or not (43; 15%) effective at all. Overall, the questions related to the MSR gathered high degrees of uncertainty (ranging from 24% to 32%), suggesting stakeholders were less familiar with the functioning of the MSR compared to the ETS.

3.2.2. Cost-efficiency

Overall, slightly more than half of respondents from a wide range of stakeholder groups view the ETS Directive as moderately (111 out of 291; 38%) to very (39; 13%) efficient in achieving its objectives in a cost-efficient manner. Conversely, 52 respondents (18%), including a majority of NGOs17, considered it not cost-efficient, while nearly a quarter of respondents considered it only slightly cost-efficient (67; 23%).

The largest share of respondents, including most NGOs, also considered the MSR Decision to be moderately (69 out of 276; 25%) to very efficient (38; 14%), compared to a smaller share, mainly companies/businesses and business associations, viewing it as slightly efficient (36; 13%) or not efficient (37; 13%). However, more than one third of respondents (35%) indicated they did not know. Similarly to previous questions on the MSR, these results indicate a higher degree of division between stakeholder types and a relatively lower degree of familiarity overall with the functioning of the MSR compared to the ETS.

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[17] While no specific open-field question was attached to this closed question, analysis of open-field responses throughout the OPC suggests this is mainly due to the perceived inefficiency of free allocation among the majority of NGO stakeholders.

3.2.3. Relevance and added value

Three quarters of respondents from a wide range of stakeholder groups considered that the needs/problems addressed by the ETS Directive continue to require action at EU level to a very large (138 out of 294, 47%) or large (81; 27%) extent, with a further 45 (15%) agreeing to some extent. Only small shares agreed to a small extent (11; 4%) or not at all (5; 2%), indicating strong support for ongoing EU-level action to reduce GHG emissions.

Similarly, a very broad majority of respondents from across all stakeholder groups perceived the EU ETS and MSR as having high (93 out of 298, 31%) or very high (86; 29%) added value in reducing GHG emissions in the EU, with a further 80 (27%) considering the added value moderate. Less than one tenth rated added value as low (11; 3%) or very low (17; 6%), suggesting strong support for the key role of the EU ETS and MSR in EU climate policy going forward.

3.2.4. Simplification and coherence

Several open-ended and closed questions in the evaluation invited stakeholders' views and suggestions on the coherence, administrative cost and simplification of the ETS Directive without negatively affecting the achievement of its objectives. The responses and suggestions provided were similar across these questions.

A majority of respondents across all stakeholder groups considered that improvements could be made to reduce the administrative burden and regulatory cost of the ETS Directive, with 84 out of 287 (29%) viewing it only slightly efficient and 77 (27%) not efficient in this respect, a view which was most strongly shared among SMEs. Conversely, one third of respondents (mainly from the energy and cleantech sectors) considered the administrative burden to be moderately (69; 24%) to very (17; 6%) efficient.

Respondents were encouraged to provide suggestions to improve administrative burden and support simplification without negatively affecting the achievement of its objectives. The most frequently raised suggestions (nearly half of responses), mainly from companies/businesses and business associations and specifically from SMEs, related to the simplification and harmonisation of MRV rules in combination with streamlined reporting practices and ensuring that guidance, tools and processes are timely in place before the implementation deadline. Concrete suggestions frequently raised included the use of standardized/harmonised digital tools, automated data collection and simplified compliance requirements for smaller emitters, a reduced frequency of submissions, harmonised templates, expanded and harmonised opt-out rules for smaller emitters, streamlining the audit cycles by only conducting a full on-site audit every three years with a simplified remote audit in the intervening years, simplifying reporting by providing pre-filled data based on past submissions where possible and simplifying the scope of emission data reporting. Specifically, several SMEs from the waste sector suggested to update MRV rules with regards to MWI installations.

In second place came the simplification and increased coherence of free allocation and benchmarking rules (around two fifths of responses). Concrete suggestions were however strongly divided between stakeholder groups, with companies/businesses and business associations mainly favouring simplified free allocation rules to reduce administrative burden and strengthen coherence with overall competitiveness aims, while NGOs favoured a replacement of free allocation by full auctioning as a means to reduce administrative burden, simplify the ETS Directive and strengthen coherence with the polluter pays principle.

The third frequently raised suggestion (around a quarter of responses), mainly by companies/businesses and business associations, related to improving coherence with other EU energy and climate legislation. This was confirmed by the results of a separate question on the perceived coherence of the ETS and MSR with other EU policies and international climate agreements, where views were divided with the largest share, including most companies/businesses and business associations, perceiving only some extent of coherence (110 out of 293; 38%), or no coherence at all (21; 7%), compared to large (63; 22%) or very large (21; 7%) extents of coherence (including most NGOs) . Suggestions for improving coherence focused on streamlining rules and reporting requirements with other EU energy and climate legislation (one third of responses), followed by stronger coherence with international frameworks for GHG emission reductions in the maritime and aviation sectors (a quarter of responses).

3.3. Impact assessment

3.3.1. Aviation

The consultation on the EU ETS highlighted that most respondents see the application of the EU to aviation as a necessary instrument for aligning the aviation sector with the EU's climate objectives, whereas a smaller share of respondents mostly comprised of industry stakeholders see it as a source of challenges. There is broad support for strengthening aviation's contribution to EU climate objectives. Stakeholders have diverging views on how best to reconcile environmental integrity with competitiveness, connectivity, and global coordination.

3.3.1.1. Perceived level of climate action by the aviation sector compared to climate commitments

Around half of respondents considered the aviation sector's current level of climate action insufficient to meet climate targets, with one quarter of respondents (48 out of 183, 26%) judging it not sufficient at all and another quarter (45, 25%) rating it as somewhat sufficient but unlikely to meet the Paris Agreement and European Climate Law targets. This perception was particularly strong among civil society organisations (NGOs and environmental organisations), but it was also widely shared by the majority of companies (80%), business associations (78%), and public authorities (80%) that responded to the question.

When asked about the main concerns regarding the sector's decarbonisation pace, these stakeholders pointed to the need for increased support for development and deployment of sustainable aviation fuels (SAF) (10 mentions) to address their current limited availability and high costs (14 mentions). Several of these stakeholders questioned the effectiveness of current policy instruments in tackling aviation emissions. In particular, they challenged the current EU ETS system for its low carbon prices and free allowances (8 mentions), as well as its limited scope to only intra-EEA flights (7 mentions). Additional concerns included the aviation sector being undertaxed relative to other sectors (5 mentions) and the current lack of commercial viability for zero-emission aircraft technologies such as hydrogen and electric planes (1 mention).

Only a small minority of stakeholders (16, 9%) considered current action sufficient, largely comprised of companies and business associations, namely airlines, aviation associations, one Original Equipment Manufacturer (OEM) and one SAF producer, citing the already established pledges and strategies to achieve net zero operations by 2050 as main argument against further action (4 mentions). For these stakeholders decarbonisation ambitions need to align with the industry's capacity to invest and compete globally (2 mentions).

3.3.1.2. Adequacy of the current EU ETS approach to international flights outside Europe

Nearly 40% of respondents considered that the current approach to international flights outside Europe does not adequately address emissions from these flights. This perception of inadequacy was unanimous among civil society organisations, and was also the majority view among companies, business associations, public authorities and respondents in the "Other" category, which criticised CORSIA for its voluntary participation, lack of emissions reduction targets, absence of an effective carbon price, and limited in-sector reductions (21 mentions). Due to CORSIA's shortcomings, stakeholders underlined how the limited scope of the EU ETS may lead to carbon leakage (4 mentions) and called for stronger EU leadership (2 mentions). Many argued that the EU ETS should be extended to cover all departing flights (20 mentions).

Among respondents in disagreement with the current approach, NGOs criticised CORSIA's lack of integrity because of the questionable quality of carbon offsets (10 mentions), and ICAO's slow and ineffective progress on delivering meaningful climate action (2 mentions). Conversely, companies and business associations emphasised the importance of prioritising a global approach by strengthening CORSIA rather than relying solely on unilateral EU measures (16 mentions), and raised concerns about extending the EU ETS, due to potential competitive disadvantages for carriers operating outside Europe and not subject to equivalent obligations (2 mentions).

29 respondents (15%), mostly from companies and business associations, argued that the current approach to international flights outside Europe is appropriate, highlighting that CORSIA is a suitable global mechanism to address emissions (9 mentions). In addition, they claimed that this approach preserves competitiveness and prevents market distortions (9 mentions), as a global approach through ICAO should be prioritised over unilateral EU action (7 mentions).

3.3.1.3. Stakeholder priorities on additional issues

Beyond the central debate on climate action and ETS–CORSIA interaction, stakeholders identified several priority areas requiring policy attention, in particular: the ETS support for SAF uptake; connectivity, competitiveness, and carbon leakage risks; emissions from private and business aviation, short-haul flights; and socio-economic impacts on outermost regions. Prioritisation results reflect varying degrees of support across stakeholder groups.

Business associations, companies, and public authorities mostly highlighted the importance of the ETS support for eligible fuels (92 ratings as top priority or high importance). Duration extension (15 mentions) and increased number of SAF allowances (10 mentions) were the main suggestions to enhance the support scheme. Many also called for redirecting ETS revenues to scale up SAF production (9 mentions) and increasing allowances to better reflect price differences between SAF and jet fuel (8 mentions). In relation to the latter, several proposals were put forward to particularly incentivise eSAF production and uptake.

Private sector stakeholders strongly emphasised connectivity, competitiveness, and carbon leakage concerns (68 ratings as top priority or high importance) stating that the ETS may divert traffic to non-EU hubs to avoid compliance—specifically due to the low price of CORSIA relative to the ETS—thus contributing to only shifting emissions outside the EU and disadvantaging EU carriers. Stakeholders asked for targeted tools to address leakage risk on specific routes, as a way to balance climate ambition with competitiveness and connectivity needs.

Civil society, instead, mostly prioritised tackling emissions from private and business jets (55 ratings as top priority or high importance), in order to ensure social fairness against their disproportionately high per-passenger emissions (8 mentions). In particular, stakeholders proposed various solutions to regulate emissions from private and business jets within (9 mentions) and beyond (6 mentions) the EU ETS. Similarly, flights of less than 1000 km were particularly challenged by NGOs and environmental organisations (55 ratings as top priority or high importance), which demanded a modal shift to rail for such short flights (10 mentions). While most respondents agreed on the stronger drive to decarbonise short-haul flights, one public authority highlighted the need to consider the specific local context, as these may play a key role in safeguarding regional cohesion.

3.3.2. Maritime

The consultation on the EU ETS as applied to maritime confirmed broad support for its success in driving decarbonisation, while also identifying opportunities to improve interaction with international measures, enhance competitiveness, include smaller vessels, and simplify the rules.

3.3.2.1. Coherence of the EU ETS with IMO NZF and avoiding significant double burden

Many stakeholders emphasized the importance of ensuring smooth coordination between the EU ETS and the upcoming IMO NZF, with some prioritising a global approach, and some calling for reducing or adjusting the EU ETS scope once IMO rules are in force. The most cited view was the need to avoid duplication, double burdens, or administrative costs from running parallel systems (75 mentions out of 107 responses), followed closely by the potential harmonisation between EU and IMO measures (70 mentions). Some stakeholders supported the phase-out of the EU ETS in favour of IMO rules (45 mentions). Other views included the importance of maintaining high environmental ambition and retaining EU ETS(15 mentions), concerns about competitive risks such as flagging out, carbon leakage, or investment diversion (8 mentions), imposing mutual recognition between EU ETS and potential IMO measures (6 mentions), importance of early engagement and support during phase-out (3 mentions), with stakeholders calling for temporary exemptions, regulatory clarity, and administrative alignment to ensure a smooth transition; and calls for differentiated, simplified, or sector-specific rules (2 mentions) aimed at reducing administrative and financial burdens while maintaining emissions coverage.

3.3.2.2. Effectiveness of the current measures in reducing risk of evasion

A total of 29 out of 184 respondents rather agreed (11%) or strongly agreed (4%) that the current measures are effective in preventing shipping companies from evading the requirements of the EU ETS Directive. A further 23 respondents expressed a neutral view (13%). Smaller shares of respondents rather disagreed or strongly disagreed (24;13%)). The largest group indicated do not know (108, 59%). Regarding specific suggestions, the most frequently mentioned view was the need for stronger monitoring and enforcement to prevent circumvention, including addressing rerouting, transshipment, and port call issues (11 mentions). Several stakeholders called for alignment with the IMO NZF and international harmonisation to maintain a level playing field (5 mentions), and enhanced coordination among authorities, including EU ports and third countries (5 mentions). Others highlighted the importance of stricter and proportionate penalties for non-compliance (4 mentions), use of digital tools and registries to improve tracking and transparency (3 mentions), and regular reviews and updates of ETS scope and measures (3 mentions). Additional suggestions included

clearer definitions of ports, transshipment, offshore, and exemptions to reduce loopholes (2 mentions) and exemptions or compensations for regions with unique logistical challenges (1 mention).

Extending the scope of the EU ETS maritime provisions to include smaller ships

When asked whether the scope of the EU ETS Maritime provisions should be extended to cover emissions from smaller ships (below 5,000 GT but not below 400 GT, including offshore ships), a total of 57 out of 189 respondents rather agreed (16%) or strongly agreed (14%). A further 30 respondents expressed a neutral view (16%). Smaller shares of respondents rather disagreed (23, 12%) or strongly disagreed (19, 10%). The largest group indicated do not know (60, 32%). As far as the proposed scope for the extension is concerned, the most frequently cited view was support for extending EU ETS Maritime to vessels between 400 and 5,000 GT (30 mentions). several stakeholders proposed phased or targeted inclusion of smaller ships (6 mentions) and highlighted the importance of consistency in scope with FuelEU Maritime, IMO NZF, and MARPOL Annex VI (2 mentions). Respondents emphasised both the need to ensure that revenues from extending the EU ETS to smaller vessels are reinvested in maritime decarbonisation (4 mentions) and the importance of simplified administration and reporting for smaller ships (3 mentions). Others raised calls for fair competition with road transport (3 mentions), support for including specific ship categories such as cruise ships, yachts, or offshore vessels (1 mention), and concerns about negative regional impacts, particularly in outermost regions or outermost regions (1 mention).

3.3.2.3. Effectiveness of EU ETS in addressing shipping challenges for islands and outermost regions

When asked whether the EU ETS are effectively reflecting the challenges faced by islands and remote territories, including outermost regions, 15 out of 179 (8%) respondents strongly agreed or rather agreed. A further 19 respondents expressed a neutral view (11%). Smaller shares of respondents rather disagreed or strongly disagreed (35, 20%). The largest group indicated do not know (110, 61%). On open ended question on connectivity, the most frequently cited concern was that the EU ETS would increase costs for ports in outermost regions and reduce competitiveness (17 mentions). Several stakeholders emphasised the need for tailored mitigation and differentiated treatment for islands and remote territories (11 mentions) and permanent compensation for special operating conditions, such as ice navigation (6 mentions). Other views included exemptions being inadequate for major islands and longer-term needs (5 mentions), priority access to sustainable fuels and complementary measures (3 mentions), administrative and compliance burdens for lifeline or ferry services (2 mentions), and reinvestment of ETS revenues to offset island-specific impacts (1 mention).When asked whether the administrative costs linked to the implementation of the ETS maritime provisions are proportionate and reasonable, 30 out of 186 respondents strongly agreed (2%) or rather agreed (14%). A further 19 respondents expressed a neutral view (10%). Smaller shares of respondents rather disagreed (36, 19%) or strongly disagreed (11, 6%). The largest group indicated do not know (90, 48%).

3.3.2.4. Stakeholder views on additional issues

When asked whether the administrative costs linked to the implementation of the ETS extension to maritime transport are proportionate and reasonable, 4 respondents strongly agreed (2%) and 26 respondents rather agreed (14%). A further 19 respondents expressed a neutral view (10%). Smaller shares of respondents rather disagreed (36, 19%) or strongly disagreed (11, 6%). The largest group indicated do not know (90, 49%). On suggested

improvements, the most frequent view (20 mentions) called for alignment of EU ETS rules with IMO NZF and FuelEU Maritime to avoid double regulation. Standardising data collection and reporting across EU MRV and IMO DCS was emphasised by 17 stakeholders, while 15 supported a single EU-level digital system for easier compliance. 10 stressed the need for clear, harmonised EU guidance to reduce interpretation risks. Some respondents requested simplified compliance for SMEs and smaller emitters, simplification by reducing procedural burdens, and administrative fees and verification costs to be reduced and standardised across Member States (each with 4 mentions).

When asked whether the ETS should further incentivise the uptake of renewable and low-carbon maritime fuels based on Well-to-Wake emissions, 87 out of 191 respondents strongly agreed (23%) or rather agreed (23%). A further 9 respondents expressed a neutral view (5%). Smaller shares of respondents rather disagreed or strongly disagreed (24, 13%). Other respondents indicated do not know (71, 37%). On suggested improvements, the most frequent suggestion (17 mentions) called for incentives based on full well-to-wake lifecycle emissions, excluding unsustainable biofuels. 12 stakeholders emphasised cost support for renewable fuels to compete with conventional options, while 11 stressed technology-neutral fuel incentives and alignment of EU ETS with FuelEU Maritime, RED III, and IMO frameworks. 7 respondents recommended reinvesting ETS revenues to de-risk clean fuel deployment and infrastructure. Other views included standardising sustainability certification (6 mentions), simplifying reporting (4 mentions), phased regulatory timing (2 mentions), targeted support for remote regions (1 mention), and boosting domestic renewable fuel production (1 mention).

3.3.3. Measures to address the risk of carbon leakage for emissions not covered by CBAM sectors

3.3.3.1. Free allocation

Asked on what basis free allocation should be provided beyond 2030 for sectors not covered by CBAM[18], an updated benchmark methodology (94 out of 437 responses; 22%) was the most frequently selected option, predominantly by companies/businesses and business associations from the energy, waste, cement and cleantech sectors. They argued for benchmarks better reflecting current performance levels versus outliers or projections, considering technological and economic constraints, EU-wide availability of enabling conditions, resources and technologies. This was followed by 83 responses (19%) supporting maintaining the current carbon leakage list as applied in Phase IV (2021–2030), mainly on the grounds that the carbon leakage risk of the sectors concerned has not substantially changed and in opposition to the possible introduction of conditionalities. This view was mainly supported by companies/businesses and business associations from manufacturing industry sectors. A further 72 responses (16%), mainly from companies/businesses and business associations from the energy, waste and cleantech sectors, supported an updated carbon leakage list. Very few provided details, with those who did mostly calling for trade intensity to be given more weight over emission intensity when calculating the carbon leakage indicator value. Finally, 59 responses (13%), mainly from companies/businesses and business associations in the energy sector as well as most NGOs, favoured making free allocation conditional on taking steps towards carbon neutrality. A further 83 (19%) clicked "other", providing very diverse input from which no representative conclusions could be drawn. 46 responses (11%) were uncertain.

[18] Respondents could indicate multiple responses.

In addition, several campaigns coordinated their responses on this question, showing a similar distribution of preferences which did not have a decisive impact on the overall results. Five campaigns by companies/businesses and business associations in different manufacturing industry sectors (29 respondents in total) advocated for keeping the current carbon leakage list, with two of those (9 respondents in total) also indicating that they support an update of the benchmark methodology, for similar reasons as indicated higher. Two campaigns, from the waste and cement sectors, (28 respondents in total) preferred both an updated carbon leakage list and an updated benchmark methodology. Three campaigns by NGOs and by companies/businesses from the waste-to-energy sector (20 respondents in total) advocated for conditionality in combination with an updated benchmark methodology, with the two NGO campaigns specifying a preference for phasing out free allocation. In terms of specific views provided, the waste sector campaigns all argued for a specific EU-wide waste-to-energy benchmark, separate from energy-sector benchmarks, to reflect the functional unit (tonnes) and prevent waste leakage.

3.3.3.2. Indirect cost compensation

Almost three quarters of respondents (175 out of 238, 74%) considered that indirect cost compensation will remain necessary after 2030 to address the risk of carbon leakage from carbon costs passed on in electricity prices (in sectors not covered by CBAM). Of these, 93 respondents (39%) supported harmonising the system at EU level, the main justification being to address competitive distortion among operators, and 26 respondents (11%) called for an extension to cover more sectors and sub-sectors, with some degree of overlap between the two[19]. These views were mainly shared by companies/businesses and business associations from sectors and sub-sectors currently not eligible for indirect cost compensation[20]. While few respondents justified their choice for harmonisation, the available answers seem to indicate different interpretations of harmonisation, with some focusing on geographical harmonisation (to all Member States) while others focused on regulatory harmonisation (same rules). Conversely, 50 respondents (21%), mainly from manufacturing industry sectors, favoured maintaining the current approach based on State aid. Only 12 respondents (5%), almost exclusively NGOs and environmental organisations, opposed continuing indirect cost compensation.

Furthermore, three campaigns by companies/businesses and business associations from the glass and ceramics, steel, and waste-to-energy sectors (32 respondents in total) were identified calling for harmonisation, one of which also called for an extension to all sectors, in addition to one further campaign (5 respondents in total) by companies/businesses in the agriculture sector advocating an extension specifically to their sector. One campaign (5 respondents in total) by companies/businesses from the manufacturing sector (chemicals and fertilisers) supported maintaining the current approach. Conversely, two NGO campaigns (15 respondents in total) preferred to phase out indirect cost compensation. These campaign responses did not have a decisive impact on the overall conclusion that a majority of respondents support the

[19] The overlap was due to respondents who selected 'other views' and specified multiple preferences in the related open-ended question. Out of the 57 respondents who selected 'other views', around 20 advocated for both harmonisation and sectoral extension.

[20] Including but not limited to the energy sector, subsets of the chemicals and fertilizers sector and cement sector, the glass and ceramics sector, the agriculture sector, and mining and building sectors.

continuation of indirect cost compensation, with most of those supporting harmonisation at EU-level.

3.3.4. Revenue use

Respondents clearly prioritised using future ETS1 auction revenues for industrial decarbonisation (ranked top 3 by more than 60% of respondents), followed by the development of renewable energy sources and clean energy systems, and the development and upscaling of clean technologies (each ranked top 3 by around 40% of respondents)[21]. Priorities however strongly diverged between stakeholder groups, with these responses mainly driven by companies/businesses and business association respondents, while most NGOs and environmental organisations prioritised energy efficiency, social support and just transition, as well as public transport, climate adaptation and international climate finance.

A broad majority of respondents from a wide range of stakeholder groups (except public authorities) agreed that transparency on how Member States use the ETS revenues is currently insufficient, with only 31 out of 288 (11%) respondents considering there is sufficient transparency, compared to 160 (55%) disagreeing and 97 (34%) neutral or uncertain. Respondents highlighted the need for better public access to data, including the use of digital platforms (40%), clearer and more frequent reporting by Member States on revenue use (26%), and improved accountability mechanisms to ensure revenues are used effectively (7%).

3.3.5. Industrial decarbonisation support

Respondents from across all stakeholder groups overwhelmingly supported the creation of an Industrial Decarbonisation Bank to assist industrial decarbonisation efforts (240 out of 288 respondents; 83%). Only a small minority (10 respondents, 4%) opposed the idea, while 38 respondents (13%) were uncertain. Furthermore, seven campaigns by companies/businesses and business associations from different sectors (61 responses in total) also supported the creation of an Industrial Decarbonisation Bank, further amplifying the outcome. Among the instruments considered most effective for supporting the business case for industrial decarbonisation, carbon contracts for difference were highlighted in almost half of responses, followed by grants (one out of five responses), tax credits (one out of ten responses) and fixed premia for specific products (one out of ten responses), with most respondents supporting a combination of such tools. Among campaign respondents, preferences were very similar, with most supporting a mix of tools including carbon contracts for difference, tax credits and/or grants.

The continuation of the Innovation Fund was also broadly supported, with almost three quarters of respondents from across all stakeholder groups strongly agreeing (132 out of 288 respondents; 46%) or rather agreeing (79; 27%). In contrast, only 6 respondents (2%) rather disagreed, and 2 respondents (1%) strongly disagreed, while 26 respondents (9%) were neutral, and 43 respondents (15%) did not know. In addition, four campaigns by companies/businesses and business associations from different sectors (39 respondents in total) also supported the continued need for the Innovation Fund, confirming the result of this question. The main arguments for the continued need for the Innovation Fund centred on its complementary role

[21] Respondents were asked to rank a range of possible future uses for ETS1 auction revenues. The options were ranked using a weighted average method, where higher ranks received higher weights (12 for Rank 1 down to 1 for Rank 12). For each option, the rank frequencies were multiplied by their weights, summed, and divided by the total number of responses. The resulting weighted average score reflects the overall prioritisation, with higher scores indicating stronger preference.

to other instruments (such as a future Decarbonisation Bank) by supporting early-stage, high-risk, breakthrough innovation, and its critical role in supporting decarbonisation in hard-to-abate sectors such as aviation, maritime and heavy industry. Suggestions for improvements included reducing administrative complexity, speeding up disbursement, more flexible eligibility criteria, supporting a wider range of technologies (including mature and market-ready solutions) and introducing dedicated windows for priority areas. The identified campaigns shared similar views, in addition to arguing for the inclusion of the waste sector in the scope of the Fund (waste-to-energy companies' campaign) and supporting national allocations under the Fund to ensure geographic balance (group of energy companies located in one Member State).

The continuation of the Modernisation Fund was also supported by a clear majority of respondents from across all stakeholder groups, with 73 out of 272 respondents (27%) strongly agreeing and 65 respondents (24%) rather agreeing, while only a minority rather disagreed (16 respondents, 6%) or strongly disagreed (4 respondents, 1%). Support was particularly strong among respondents located in eligible Member States and from the energy sector. The remaining respondents were neutral (35 respondents, 13%) or uncertain (79 respondents, 29%), with those respondents mainly located in non-eligible Member States. In addition, one campaign by energy sector companies located in a Member State covered by the Fund (5 respondents in total) also strongly supported the continuation of the Modernisation Fund, which did not affect the result of this question. When asked about the scope of the Fund, most respondents did not share specific views. Of those who did, nearly two thirds called for an extension of the scope, mainly to also cover industrial decarbonisation beyond energy efficiency and renewables, while the remaining third considered the current scope sufficient to address the decarbonisation challenges in lower-income Member States. Some of those respondents, all NGOs and environmental organisations, on the contrary specified that they would like some investments to be excluded from the scope of Fund, mostly gas, but also waste incineration, nuclear and/or forest biomass.

3.3.6. Market Stability Reserve (MSR)

Looking ahead to what the MSR should achieve to ensure the proper functioning of the EU ETS in the future, strengthening the MSR to prevent excessive EU ETS price volatility (96 out of 256 responses; 38%) and increasing market liquidity (66; 26%) were clearly indicated as the top 2 priorities by most respondents, mainly by companies/businesses and business associations. Conversely, 46 responses (18%), mostly NGOs and environmental organisations, prioritised to continue tackling the surplus in the market. Roughly one fifth were uncertain (47; 18%). In addition, several campaigns were identified, submitting responses along largely similar lines which did not affect the overall balance of preferences. One NGO campaign (10 respondents in total) preferred continued tackling of the market surplus, while four business/company campaigns (20 respondents in total) prioritised increasing market liquidity, of which one also called for preventing excessive price volatility, possibly through a price corridor or cap. Finally, one campaign by companies/businesses in the agriculture sector (5 respondents in total) called for a phase-out of the MSR.

Given their expectation that the ETS cap will fall to zero towards the end of Phase V of the EU ETS, respondents from companies/businesses and business associations predominantly expressed concerns about the predictability and volatility of future allowance prices. The potential changes to the MSR most frequently raised, mainly by companies/businesses and business associations, were to make the intake and/or release thresholds dynamic to reflect prevailing market conditions (67 out of 451 responses; 15%), to adjust the invalidation rule for

holdings in the reserve above 400 million allowances (57; 13%), and to shorten the response time through more frequent adjustments (45; 10%). In addition, out of the "other" responses (87; 19%), almost half also called for the cancellation of the invalidation rule, making this the top priority among respondents. Conversely, NGOs predominantly supported keeping the intake rate at 24% beyond 2030 (34; 8%) to continue tackling the surplus. Finally, 34 responses (7%) from across various stakeholder types called for a downward adjustment of fixed thresholds for MSR intake and/or release, while 14 (3%), all companies/businesses, supported an upward adjustment. Additionally, 22 (5%) of responses called for a buffer to the lower threshold to address potential threshold effects. The aforementioned campaigns did not have a substantial impact on the outcome of this question.

3.3.7. Carbon removals

A very broad majority of respondents (259 out of 313 respondents; 83%), including the majority of companies/businesses and business associations, supported the integration of permanent CRCF removal units in the EU ETS, arguing that this is essential to expand operators' options to achieve the long-term climate objective, to support the uptake of such technologies and to enhance liquidity in the market. Only a small minority of 38 respondents (12%), mainly NGOs and environmental organisations, opposed their integration, mainly on the grounds of the need to prioritise mitigation and due to associated environmental risks. In addition, seven campaigns by companies/businesses and business associations from various sectors (59 respondents in total) also strongly supported the integration of permanent removals, while two NGO campaigns (15 respondents in total) opposed their integration, reflecting the overall outcome on this question. A majority of respondents further indicated that complementary policies are needed (190 out of 285 respondents; 67%), while a smaller share, largely corresponding to the respondents not in favour of integrating CRCF removal units into the EU ETS, favoured alternative policies instead (44; 15%).

Conversely, integrating temporary CRCF removal units into the EU ETS proved very divisive, with a relative majority strongly or rather disagreeing (125 out of 308 respondents; 41%), including the strongest level of strong opposition (98; 32%) across all questions related to carbon removals, mainly citing unreliable quantification and risks to market stability, compared to those strongly or rather agreeing (117 out of 308 respondents, 38%), mainly citing lower costs and their ability to scale up more quickly, while many also acknowledged the need for strict criteria and a differentiated approach to quantification and use. Respondents on either side came from a very diverse range of sectors.

Looking more specifically into the modalities for integration of carbon removals into the EU ETS, support was strongest for allowing installations to deduct removals generated in their own activities from their compliance obligations (184 out of 300 respondents (61%) strongly or somewhat agreed, mainly companies/businesses and business associations from manufacturing industry sectors and the energy sector), closely followed by allowing operators to purchase CRCF removal units directly from removal suppliers to fulfil surrender obligations (172 out of 305 respondents (56%) strongly or somewhat agreed, mainly from the energy and waste management sectors, less frequently from the manufacturing industry). Support for acquiring and inserting CRCF removal units through a central agency was more limited, with a quarter of respondents, almost exclusively from companies/businesses and business associations engaged in carbon removal activities, strongly (19 out of 296; 6%) or somewhat (56; 19%) agreeing, while a larger share strongly (52; 18%) or somewhat (54; 18%) opposed, and the largest share was either neutral (62; 21%) or uncertain (53; 18%). This may indicate a substantial degree of uncertainty on this (rather technical) topic among stakeholders in general.

With regards to potential restrictions in relation to the integration of carbon removals into the EU ETS, a relative majority of respondents, from a diverse range of stakeholders, supported restrictions to the use of CRCF removal units (125 out of 299 respondents (42%) strongly or somewhat agreed, compared to 84 (28%) who strongly or somewhat disagreed). Asked about a slow phase in, the balance tipped in the other direction with a relative majority, from a diverse range of stakeholders, disagreeing (112 out of 300 respondents (37%) disagreed strongly or somewhat, mainly citing cost-effectiveness, compared to 88 (29%) who strongly or somewhat agreed, mainly citing the need to ensure market stability, environmental integrity, and a certain share of emission reductions before allowing offsets). The outcome was similar when asked whether there should be a limit on gross emissions by EU ETS installations, with 109 out of 297 respondents (37%) strongly or somewhat disagreeing compared to 86 (29%) strongly or somewhat agreeing. It is to be noted that for all three of these questions, around one third of respondents did not express strong views, selecting 'neutral' or 'do not know'.

3.3.8. CO2 transport

There was broad support for the extension of CO2 transport coverage under the ETS Directive from transport with the objective of storage to transport for any purpose, although there was a clear division between different types of stakeholders. A clear majority of respondents (192 out of 227 respondents; 85%) considered it important to extend coverage to ensure a level playing field for CCS and CCU, incentivise CCU market development and reduce infrastructure and monitoring costs where infrastructure is shared for both CCS and CCU purposes. This view was supported by almost all companies/business and business associations. By contrast, only 35 respondents (15%) opposed such a change, mainly out of safety concerns or considering this out of scope of the ETS. This view was almost exclusively supported by NGOs and environmental organisations. The campaign responses identified on this question did not affect the outcome, showing a similar distribution with eight campaigns (69 respondents in total) from companies/businesses and business associations from various sectors supporting the extension, versus one NGO campaign (10 respondents in total) opposing the extension.

3.3.9. CCU

There was clear support for an adjustment of surrender obligations, with restrictions or conditions, where emissions are captured and used in products without permanent storage (CCU). Most respondents (57%), including a majority of companies/businesses and business associations (mainly from the energy sector and manufacturing industry), strongly (84 out of 244; 34%) or somewhat (55; 23%) support an adjustment of surrender obligations where emissions are captured and used in products without permanent storage. The main reasons provided were to incentivise the use of CCU and recognise the potential climate benefits of CCU products compared to products using virgin carbon. Conversely, most NGOs and environmental organisations (strongly) disagreed (48; 20%) with this option, with potential risks of double pricing raised by those opposing – as well as by some respondents in favour – in addition to the complexity of monitoring, reporting and verifying virgin versus captured carbon streams and the ensuing risks for environmental integrity. A further 25 respondents (10%) were neutral and 32 (13%) were uncertain. However, there was broad agreement across all stakeholder groups in favour of introducing restrictions or conditions when adjusting surrender obligations for the capture and use of non-permanent carbon (e.g.: minimum emission savings, displacement of fossil carbon, avoiding double counting/pricing of the same emissions), with more than half in favour (130 out of 245 respondents; 53%) versus only a minority against (31; 13%). The campaign responses identified in addition showed similar

distributions, not affecting the outcome. While five campaigns by companies/businesses and business associations from across various sectors (47 respondents in total) (strongly) supported an adjustment to surrendering obligations for CCU, three campaigns by NGOs and companies/businesses from the agricultural sector (20 respondents in total) strongly disagreed.

By contrast, there was overall no clear agreement and more division between different stakeholder groups on moving the surrender obligation downstream for non-permanent products produced with captured CO_2. Two fifths of respondents, predominantly from companies/businesses and business associations from the manufacturing industry, strongly (55 out of 246 respondents; 22%) or somewhat (41; 17%) agreed, due to the incentivising effect for both CCU in upstream installations and for the use of CCU-based carbon in downstream products, as well as the avoidance of double counting risks. However, this option attracted higher levels of disagreement compared to the 'adjustment' option and these views came from a broader range of stakeholders (including many companies/businesses from the energy and waste sectors and most NGOs), with nearly one third opposing strongly (49; 20%) or somewhat (26; 10%), and similar levels of uncertainty (50; 20%) and neutral (25; 10%) views. Concerns mainly centred on the risk of undercounting emissions and undermining environmental integrity, due to the complex traceability of carbon throughout the value chain, and a perceived unfairness for downstream operators (notably in the waste sector) and, especially for CCU-based fuels, ensuring regulatory stability. Furthermore, four campaigns (21 respondents in total) by companies/businesses and business associations from the manufacturing industry strongly supported downstream accounting, while three campaigns (32 respondents in total) from a broader range of stakeholders, including NGOs, energy sector companies/businesses and agriculture sector companies/businesses, disagreed. Overall, this confirms the conclusion that there is no clear agreement and that there are strong divisions between stakeholders on this topic.

3.3.10. Municipal waste incineration (MWI) and other waste management processes

3.3.10.1. Municipal waste incineration (MWI)

More than half of respondents to this question, including a relative majority of companies/businesses and business associations (mainly from the manufacturing industry) and most NGOs and environmental organisations, supported the inclusion of municipal waste incineration (MWI) installations in the EU ETS, with 87 out of 266 respondents (33%) strongly agreeing and 49 respondents (18%) rather agreeing. Conversely, nearly one third of respondents, mainly from companies/businesses and business associations, strongly disagreed (69; 26%) or rather disagreed (10; 4%). Smaller shares of respondents were neutral (25 respondents, 9%) or uncertain (26 respondents, 10%).

The main arguments in support of MWI inclusion in the EU ETS were to incentivise recycling in line with the waste hierarchy (over one third of responses), to ensure a level playing field between sectors and maximise cost-effectiveness of emission reductions (nearly one third of responses), to incentivise CCU uptake and prevent emission leakage from CCU products (nearly one fifth of responses) and to exploit potential to generate removal credits from biogenic CO2 (nearly one tenth of responses).

At the same time, several respondents made their support conditional on addressing potential waste diversion to landfill. This was also one of the main arguments of respondents opposing the inclusion of MWI in the EU ETS, with two fifths in this group expressing concerns about the risk of landfill diversion. Further arguments opposing MWI inclusion were the expected impact and perceived lack of alternatives for customers, notably local authorities (one fifth of

responses), and operators' lack of control over waste generation (and composition), fixed price contracts and potential hindrance to investments in upgrading facilities (nearly one fifth of responses, combined).

While multiple campaigns were identified targeting the waste topic, those answers did not have a decisive impact on the outcome of this question that the majority of respondents supported including MWI installations in the EU ETS. Five campaigns by NGOs and companies/businesses and business associations from the manufacturing industry (30 respondents in total) (strongly) agreed with the inclusion of MWI in the EU ETS, while four campaigns by businesses/companies and business associations in the waste, energy and agriculture sectors, as well as by local public waste management authorities located in one Member State (57 respondents in total) (strongly) disagreed.

3.3.10.2. Installations for the incineration of hazardous waste

There was no clear agreement on the inclusion of installations for the incineration of hazardous waste in the EU ETS, with well over a third of respondents strongly (77 out of 249, 31%) or rather (16; 6%) disagreeing, compared to just over one third strongly (41 respondents, 17%) or rather (41; 17%) agreeing. The distribution of stakeholder groups also shifted compared to the question on the inclusion of MWI. While most NGOs and environmental organisations were also supportive of the inclusion of hazardous waste incineration, companies/businesses and business associations from the manufacturing industry tended more towards opposing the inclusion. Smaller shares were neutral (36 respondents, 14%) or uncertain (38 respondents, 15%).

The main arguments against the inclusion of hazardous waste incineration in the EU ETS were the public-service role in safely handling hazardous waste and potential risks to public health and safety, the lack of control over upstream waste generation and limited fuel-switch options due to the need for destruction at high temperatures. Arguments for the inclusion mainly focused on incentivising cleaner technologies and cleaner consumer choices, upholding the polluter pays principle by enhancing coherence and ensuring a level playing field between comparable incineration activities, as well as pointed out that many installations hold permits for both hazardous and municipal waste incineration.

Multiple campaigns coordinated responses to this question. Integrating these responses leads to a clearer outcome, with a majority opposing the inclusion of hazardous waste in the EU ETS (43% against versus 35% in favour, overall). Seven campaigns by companies/businesses and business associations mainly from the waste and waste-to-energy sectors, as well as local public waste management authorities (60 respondents in total) strongly opposed the inclusion, while three campaigns by NGOs and from the cement sector (21 respondents in total) strongly supported it. One campaign (22 respondents in total) by local waste-to-energy companies/businesses located in one Member State expressed conditional support for including installations with double hazardous and MWI activities, but not for installations exclusively incinerating hazardous waste.

3.3.10.3. Other waste management activities

Overall, relatively few stakeholders provided views on whether additional waste management activities should be included in the EU ETS if waste incineration was to be covered.

Stakeholders most frequently addressed the need for appropriate measures to avoid the diversion of waste to landfilling should municipal waste incineration be included in the EU ETS. Views were divided, however, on the preferred measures. Out of 161 respondents

addressing this concern, slightly more than half (83 responses; 51.5%) favoured stronger regulatory and fiscal policies, including strengthening the Landfill Directive, advancing landfill bans, or taxation, or generally called for an appropriate tool to be assessed in view of the complexities in terms of measurement and verification of methane emissions, while just below half (78 respondents; 48.5%) supported an inclusion of landfilling in the EU ETS. These responses include seven campaigns primarily by companies/businesses and business associations from the waste and waste-to-energy sectors (73 responses in total) advocating a holistic, sector-wide approach to EU ETS inclusion to ensure a level playing field, primarily for landfilling. Conversely, one campaign by local public waste management authorities located in one Member State (25 responses in total) strongly opposed the inclusion of landfills in the EU ETS on the grounds of already existing taxation.

Other waste management activities were mentioned much less frequently, with the majority of those responses opposing the inclusion of mechanical recycling, anaerobic digestion or composting on the grounds that these waste management processes should be incentivised in the waste hierarchy compared to either incineration or landfilling. Views on chemical recycling were more divided. Out of around 30 respondents, one third advocated for the inclusion of all chemical recycling processes in the EU ETS, one third only for the inclusion of recovery or conversion technologies such as pyrolysis and gasification on the grounds that those involve a substantial degree of fossil fuel use and emissions, and one third opposed any inclusion of chemical recycling processes on the grounds of supporting innovative recycling approaches in line with the waste hierarchy.

3.3.11. 20MW Threshold

A majority of respondents opposed lowering the installation capacity threshold to expand the pool of installations covered by the EU ETS. In total, 44% strongly (75 out of 245; 31%) or rather (33; 13%) disagreed, mainly companies/businesses and business associations. Conversely, 27% rather (37; 15%) or strongly (29; 12%) agreed, including most NGOs and environmental organisations. 15% (37 respondents) were neutral and 14% (34 respondents) were uncertain. In addition, four campaigns by companies/businesses and business associations in the manufacturing industry sector and one by local public waste management authorities (46 respondents in total) also opposed lowering the threshold, while two campaigns by NGOs in the waste sector and local waste-to-energy companies located in one Member State (27 respondents in total) supported it. These responses further amplify the results, leading to almost half of respondents (48%) opposing lowering the threshold.

3.3.12. Linking

A clear majority of respondents (221 out of 265; 83%), across all stakeholder groups, indicated that the EU should pursue further linking opportunities between the EU ETS and other emissions trading systems. Only a small share indicated that no further linking should be pursued (11 responses; 4%) or was uncertain (34 responses; 13%). The most frequently provided motivations[22] were to reduce the risk of carbon leakage (24% of responses), followed by improving the cost-effectiveness of emissions reductions through price convergence (20% of responses) and supporting liquidity in the market (19% of responses), and reinforcing EU leadership on global carbon pricing and climate change mitigation (13% of responses, mainly from NGOs).

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[22] Multiple options could be selected.

3.4. Position papers

A total of 404 contributions were submitted in the form of position papers and/or feedback on the Call for evidence. More than two thirds came from business associations (156; 39%) or companies/businesses (127; 31%), while NGOs accounted for one tenth (42; 10%). Remaining papers included positions from public authorities, academia, environmental organisation, trade unions and others. Most contributions (258; 64%) addressed one or more topics related to stationary installations. 28 contributions (7%) focused exclusively on aviation emissions, 64 (16%) focused solely on maritime emissions, while another 8 contributions (2%) covered both maritime and aviation emissions. Finally, 42 contributions (10%) focused on topics across all sectors. 6 contributions (1%) did not address any of these topics. The majority opinions put forward in the group of stakeholders that submitted position papers were overall aligned with the majority opinions put forward by all stakeholders in the OPC questionnaire.

3.4.1. Aviation

A total of 56 position papers were identified as being relevant to aviation, with 26 papers solely targeting the sector. Submissions came from a broad spectrum of organisations including, among others: business associations (36%), private companies (29%), NGOs (18%), public authorities (7%), and environmental organisations (5%). "Overall scope and adequacy" of CORSIA and ETS (43 papers), "Sustainable aviation fuels" (33 papers) and "Competitiveness, market distortion, and carbon leakage" (31 papers) were the most frequently addressed themes. Business associations, environmental organisations, and public authorities all agreed that ETS revenues should be better utilised to support aviation decarbonisation, despite expressing different objectives and framing on the topic. Different contributions across highlighted themes reflected the stakeholders' contrasting priorities. In particular, stakeholders were strongly divided on the suitability of ETS and CORSIA to contribute to the sector's decarbonisation. Business association and companies expressed strong reservations to expand the ETS scope covering extra-EEA flights, while environmental organisations and NGOs criticised the ETS for its limited geographical coverage. Similarly, business association and companies supported CORSIA as the primary global mechanism to address the sector's climate impact, while the latter questioned CORSIA's environmental credibility, especially citing concerns with its reliance on offsetting. Public authorities maintained a more balanced stance, while urging to retain ETS policy ambition to ensure environmental integrity.

3.4.2. Maritime

A total of 88 position papers were identified as being relevant to maritime and were reviewed, checking for issues and proposed measures related to the maritime sector. Stakeholders emphasised the need for alignment of EU maritime measures with international frameworks, particularly harmonising the EU ETS, FuelEU Maritime, and IMO NZF. Several proposed legislative updates, international coordination, and potential phase-out of the EU ETS upon IMO NZF adoption. Others called for mechanisms to prevent overlapping regulation, while some supported maintaining a strengthened EU ETS to drive global decarbonisation. To address evasion risks, some stakeholders recommended monitoring measures and adjustments to scope and thresholds. On vessel coverage, many supported lowering the EU ETS threshold to 400 GT, with calls for proportional MRV and clearer ship type definitions. Regarding fuels, stakeholders advocated using EU ETS revenues to bridge clean fuel cost gaps, harmonise reporting, and recognise life-cycle emissions. There was broad support for extending derogations for outermost and peripheral routes and targeted exemptions for specific vessel types. Simplification was commonly highlighted, with strong support for harmonised MRV

systems and reduced administrative burden. Clarification of the "shipping company" definition was also sought to streamline compliance. On biofuels, some stakeholders recommended limiting zero-rating to advanced and sustainable fuels. Finally, many called for allocating EU ETS revenues to accelerate GHG mitigation through investments in clean fuels, technologies, and fleet upgrades.

3.4.3. Measures to address carbon leakage

Carbon leakage was a widespread concern among stakeholders. Out of the 47 respondents commenting specifically on this topic, roughly four out of five, mainly companies and business associations, advocated maintaining and improving free allocation, particularly for sectors not covered by the CBAM. A minority (one fifth), mainly NGOs, called for a complete phase-out of free allocation to fully implement the “polluter pays” principle and accelerate decarbonisation. Harmonising ICCC across Member States received support, by 25.5%. The CBAM is widely regarded as a crucial instrument, though a minority, mainly companies, suggest amendments such as simplification and scope extension.

3.4.4. Revenue use

Respondents commenting on revenue use (103) mostly urged to ensure that ETS revenues are reinvested in decarbonisation efforts and industry support (65%). A common suggestion was to increase funding and improve access to instruments such as the Innovation Fund and the Modernisation Fund. Some, from across various stakeholder types, called for strengthening the transparency and accountability of Member States in how ETS revenues are spent (10%).

3.4.5. Market Stability Reserve (MSR)

Overall, stakeholders consider the MSR to be effective in stabilising the carbon price. However, three quarters of respondents (81) who commented on the MSR, mainly companies and business associations, called for measures to improve predictability, enhance market liquidity, reduce price volatility, and adapt to the declining allowance supply after 2030. Two main proposals emerged to address these challenges: stopping the invalidation of allowances and using allowances held in the MSR to finance industrial decarbonisation efforts.

3.4.6. New technologies

Almost all of the stakeholders who commented on the integration of carbon removals into the EU ETS (94), mainly companies and business associations, support the integration of permanent CDR, particularly CRCF-certified methods such as BECCS and DACCS. They often recommended applying a “like-for-like” principle to ensure that permanent emissions are offset by permanent removals. A phased or cautious approach to integration is also frequently suggested, combined with measures such as the involvement of an intermediary agency or the introduction of volume limits to avoid undermining emission reduction incentives.

Only a small fraction of position papers (34) commented on integration of CCU applications into the ETS. A large share of those (82.4%, 28 stakeholders) supported the integration. Where stakeholders supported adjustments for CCU (roughly one fifth of the 28 stakeholders), they call for clear accounting rules and preferential incentives over fossil feedstocks.

3.4.7. Potential expansion of the scope of the Directive

Many respondents (118) commented on the potential inclusion of MWI in the EU ETS, with most (63 respondents, 53%), mainly companies, business associations and NGOs, supporting the inclusion to incentivise recycling and emission reductions. On the other hand, a smaller minority (55 respondents, 47%), composed of business associations, companies and public

authorities, opposed MWI inclusion on the grounds of potential cost increases for citizens and municipalities, as well as the risk of distorting the waste hierarchy through increased landfilling or waste exports. Both sides recommended including landfilling to prevent waste diversion. 7 stakeholders (business associations, companies and public authorities) also suggested exempting hazardous waste incineration from the ETS.

3.4.8. 20MW threshold

The issue of lowering the 20 MW thermal input threshold for stationary installations attracted few comments (29), of whom two thirds (19), mainly business associations and companies, opposed on the grounds of the disproportionate administrative burden on smaller emitters, whereas one third (10), mostly NGOs, argued that lowering the threshold could encourage wider adoption of clean technologies and ensure consistency between ETS1 and ETS2.

3.5. Interviews

In addition to the open public consultation, stakeholder interviews were conducted to collect further evidence for use in both the evaluation and the impact assessment. The interview process enabled a range of stakeholders to provide more detailed input complementing and expanding on the questions in the OPC. All input and conclusions from the interviews were taken into consideration to inform and complement the quantitative and qualitative research throughout the evaluation and impact assessment.

In preparation for each interview, semi-structured questions were sent in advance to each stakeholder to allow for written input to be submitted. Stakeholders engaged constructively in the process providing detailed information that allowed for the interview to focus on the key issues that were identified. Over 50 interviews were conducted by the research team, with considerable efforts made to ensure that there was a balanced representation across sectors when discussing issues related to carbon leakage, the Market Stability Reserve and the options for best accounting for CCU use. In addition, technical experts were also consulted to discuss the more detailed design questions related to the topic of integrating carbon removals into the EU ETS and, given the potential expansion of the ETS scope to include waste activities, a considerable effort was made to interview a range of stakeholders from the waste sector to discuss the potential impact.

ANNEX 3: WHO IS AFFECTED BY THE INITIATIVE AND HOW?

1. PRACTICAL IMPLICATIONS OF THE INITIATIVE

The EU ETS is the European Union's main instrument for cost-effective emissions reductions. The preferred policy option identified in Section 8 of the main Impact Assessment report for the period 2031-2040 builds on the existing ETS framework, while introducing targeted adjustments to ensure that the system remains aligned with the EU's 2040 climate target and the pathway towards climate neutrality by 2050. The preferred option combines a series of policy measures identified for each thematic area, aimed at strengthening the environmental effectiveness of the system while maintaining proportionality, regulatory stability, and fairness across sectors.

The proposed reforms maintain the existing compliance framework of the EU ETS, while introducing new obligations and compliance actions on specific groups of operators and administrations during the 2031-2040 period.

Therefore, the preferred option introduces measures that are expected to affect transversely different stakeholders, including industry, SMEs and micro-enterprises, public authorities, and citizens.

1.1. Effects on regulated entities

1.1.1. Stationary installations

Installations already covered by the EU ETS (in sectors such as electricity and heat generation, steel, cement, chemicals, refining, pulp and paper, and other energy-intensive industries) remain the main regulated entities. The measures contained in the preferred option affect them in a number of ways:

- Due to the more gradual reductions in the **cap on emissions**, in line with a fair contribution of the EU ETS to the economy-wide target for 2040**,** the preferred option exhibits carbon prices that are lower compared to the baseline. Exposure to carbon costs therefore increases more slowly. However, the preferred option is still expected to result in an increasing carbon price signal over time. See Annex 8 – Part I on the emissions cap.
- The preferred option on **carbon removals** (a public purchasing programme) is expected to help contain carbon costs by releasing a predictable amount of additional allowances onto the market (170-330Mt subject to funding and availability of removal units), thereby stimulating carbon removal technology while retaining certainty over the impact on gross and net emissions. See Annex 8 – Part II on carbon removal.
- The revised **Market Stability Reserve (MSR)** parameters should ensure that installations face a stable, progressively increasing, carbon price signal driven primarily by supply and demand fundamentals. See Annex 8 – Part III on the MSR.
- The creation of the **Industrial Decarbonisation Bank (IDB)** is expected to improve the business case for investment in the decarbonisation technologies for the stationary industrial installations in the ETS. In practice, the IDB will provide a tangible support (notably in the form of Carbon Fixed Premium and Carbon Contracts for Difference) for projects focused on more mature technologies than those covered by the Innovation Fund. By ensuring the energy intensive industries (EIIs) remain on the net-zero

pathway, IDB will also help to limit rising carbon prices. See Annex 9 – Industrial Decarbonisation Bank.

- In **carbon leakage prevention**, the increased availability of free allocation compared to the baseline is expected to have a positive impact on installations. This improves their competitiveness and ability to transition to adapt to a low carbon economy. At the same time, the increased use of conditionality in the preferred option, in both free allocation and indirect cost compensation, implies a moderate increase in the administrative effort needed from the beneficiaries (as they would need to demonstrate decarbonisation investment). See Annex 12 – stationary installations.
- In the **waste sector**, the preferred option implies increased compliance costs related to the allowance surrender obligation for municipal waste incinerators brought into the scope of EU ETS, while compliance costs related to the MRV-system are already in place. On the other hand, the preferred option for **Carbon Capture and Utilisation (CCU)** will strengthen the business case for this technology by enabling emitters and users of captured carbon to avoid double counting when making use of CO_2 that is captured and stored non-permanently. See Annex 13 – new sectors and technologies, waste and CCU.

Overall, industries face an increase in certain compliance costs but gain from a more gradual decarbonisation trajectory and free allocation phase-out relative to the baseline, greater policy certainty, targeted innovation support, and a more level playing field for low-carbon investment.

1.1.2. Aviation and maritime transport

In **aviation,** the aircraft operators affected by the preferred option are already included in the EU ETS and remain the main regulated entities. The preferred option proposes the appropriate inclusion of a larger share of emissions (from all outgoing flights). Therefore, administrative costs will not increase for operators, as the amount of action varies, but the tools remain unchanged. Furthermore, the same pool of aircraft operators must comply with EU ETS and CORSIA resulting in low differences of administrative efforts. At the same time, the EU ETS would be extended to include private and business jets. Newly covered aircraft operators will benefit from considerable administrative simplification, and low activity operators already covered from further simplification, which would result in mitigated increased administrative costs. Furthermore, compliance costs are lower in the preferred option compared to the baseline and are mostly channelled back towards climate action.

Maritime transport operators already covered by the EU ETS, in particular shipping companies operating large vessels, remain the main regulated entities. All shipping companies will receive the opportunity of support for their decarbonisation efforts (in terms of fuels and technologies) by recycling part of the allowances back to them. From a competitiveness perspective, the preferred options strengthen anti-evasion provisions related to container transhipment, reducing incentives to relocate activities outside the EU and supporting the competitiveness and connectivity of EU ports, support a level playing field for operators of vessels involved in offshore activities. The administrative cost for shipping companies will be reduced by the simplification measures included under the preferred options aiming at aligning requirements across regulatory frameworks, reducing duplications and streamlining compliance processes. Furthermore, the obligations of shipping companies under EU ETS will be reduced by deducting emissions effectively priced by a global measure under IMO, once in place. At the same time the EU ETS would be extended to a limited share of smaller vessels, broadening the

regulatory coverage of the maritime sector to smaller ships. This will lead to exposure of more shipping companies to a carbon price signal under EU ETS, providing predictability for investment and operational planning. The extension of the EU ETS to some categories of smaller vessels leads to higher administrative costs for companies operating those vessels, linked to compliance with the MRV and ETS requirements. However, some of the additional costs are expected to be passed on to users of maritime transport, with limited indirect effects on trade and transport demand. Overall, the preferred option entails proportionate compliance costs while providing greater regulatory coherence, a gradual decarbonisation pathway and safeguards against competitive distortion

1.2. Effects on other stakeholders

1.2.1. SMEs

SMEs within the EU ETS scope will be subject to the same requirements as large organisations, although the ETS covers predominantly larger installations (due to thermal capacity thresholds) and larger firms, as measured by the traditional SME metrics of turnover and number of employees (see Annex 6: SME Check). SMEs regulated by the EU ETS can benefit from simplified rules for small emitters, such as standardised and simplified monitoring rules. Moreover, provisions on carbon leakage will be conceived to offer proportional treatment to SMEs: simplified forms of conditionality for free allocation or potential derogations for eligible SMEs. In addition, low emitters continue to benefit from technical guidance and simplified monitoring, reporting and verification rules. Micro-enterprises remain largely outside the ETS coverage.

SMEs that are not directly covered by EU ETS might be affected indirectly by carbon cost pass through, though this effect is moderated by the measures such as the more gradual reduction of the emissions cap and reform of the Market Stability Reserve. Furthermore, predictable carbon pricing and available innovation funding limit the negative impact on competitiveness. Indirect cost effects of scope expansion, such as changes in waste management or energy prices, are expected to be minimal. In the aviation sector, in most EU member states, large enterprises own the majority of aircraft operators, resulting in a small number of SMEs affected by the preferred option.

Maritime SMEs, with small market power, may experience limited cost pass-through possibility, but the gradual carbon price trajectory and access to maritime-relevant innovation support are expected to limit the impacts on competitiveness. Very small maritime operators are expected to remain largely outside the ETS scope, as the preferred option does not foresee the inclusion of any type of vessel below 400 gross tonnage. Any indirect effects, such as price changes along the supply chain, are expected to be minimal. While the IDB will mostly target large-scale industrial decarbonisation projects, it could also provide support to smaller projects, especially via the operation of administrative schemes that would offer simplified funding for smaller projects. Building on the experience of the Innovation Fund and national support schemes, a dedicated support for the SMEs could be operationalised under the IDB.

1.2.2. Public authorities

Public authorities at the EU, national, and local levels play a key role in implementation and oversight.

- National competent authorities will expand ETS administrative systems to include new operators (waste, CCU), to administer additional shipping companies and aircraft operators following extension to cover smaller vessels and business and private jets,

update permitting and MRV procedures, and oversee verification of climate-neutral investment plans for conditional free allocation

- EU institutions will update or develop harmonised MRV methodologies for the waste sector and CCU and, where necessary, for carbon removal, update registry infrastructure, and adapt MSR parameters.
- EU institutions will establish a purchasing programme for carbon removal.
- EU institutions will modify the rules for prevention of carbon leakage (allocation of free allowances and indirect cost compensation). National competent authorities will implement these rules. Reduction in administrative burden is expected since the carbon leakage list will not be updated for Phase V and the formula for determining free allocation will no longer include the carbon leakage exposure factor. However, the extension of conditionalities for free allocation under PO2 would introduce new administrative requirements.
- For the main policy options analysed, the funding mechanisms of the IDB will be developed on the EU level, so there should not be an additional effort for national authorities. In addition, IDB could have 'as-a-service' feature that enables Member States to channel State aid through IDB and thus reduces administrative burden of developing national support schemes.
- The beneficiary Member States are responsible for the implementation of the Modernisation Fund, and the appropriate legal and procedural structure is already in place.
- Waste disposal authorities, including local and regional authorities, may need to adjust waste management contracts as ETS compliance costs are incurred by waste incineration operators and passed on to waste disposal authorities.

1.2.3. Citizens

Citizens are indirectly affected because environmental, health, and economic aspects are at stake. The inclusion of municipal waste incineration (MWI) contributes to the reduction of air-pollutant emissions, especially in urban areas. This improvement is accelerated, compared to the baseline, due to carbon price signal incentivising waste reduction and diversion to recycling at source. From an economic point of view, citizens should be positively affected due to more limited cost pass through in electricity and industrial prices associated with the more gradual trajectory and decarbonisation investments facilitated by the Industrial Decarbonisation Bank. They may be negatively affected by the pass-through of costs associated with waste incineration, however this impact is expected to remain manageable. Citizens may benefit from increased employment compared to the baseline as new workplaces in decarbonised industrial installations can offset the workplaces lost in fossil-fuels based industries. In the long-term, the issue of employment is directly linked to the viability of industrial production in Europe. With this in mind, the preferred option aims to contribute to achieving the EU's climate neutrality objective, while striking the balance between maintaining carbon price exposure that increases gradually over time, and providing sufficient auction revenues for supporting industrial decarbonisation investments and mitigating distributional impacts.

In aviation, the effect of the preferred policy option on air travel and employment is expected to be limited but positive compared to the baseline. Without use of sustainable aviation fuels, aviation emissions in EEA countries are expected to increase. With support for the uptake of aviation fuels, citizens may benefit from improved air quality and creation of jobs.

In the maritime sector, the preferred policy option is expected to deliver a positive environmental and climate impact, primarily through the reduction of GHG and air pollutant emissions. These measures will contribute not only to climate mitigation objectives but also to improved air quality and thereby creating public health benefits for citizens particularly in coastal and port areas. Regarding economic impacts, further mitigating the transhipment relocation risks, the wider social impacts of possible transhipment relocation for EU ports and their hinterlands are likely to be reduced. The inclusion of some types of smaller vessels within the scope of the EU ETS may lead to limited indirect impacts on shipping costs and employment. However, these impacts are expected to remain negligible and are likely to be offset by efficiency gains and cost reductions stemming from the promotion of innovation and uptake of cleaned technologies including electrification.

2. SUMMARY OF COSTS AND BENEFITS

The preferred policy option consists of a combination of policy measures, identified in Section 8.1 of the main impact assessment report, which are considered to be the optimal choice, individually and collectively, for revising EU ETS.

Taken as a whole, the preferred option is designed to strengthen the environmental effectiveness of the system while maintaining proportionality, regulatory stability, and fairness across sectors, and safeguarding competitiveness.

A quantitative comparison of the costs and benefits of the policy options, per theme, is provided in Section 7.2 of the main report (on efficiency).

The tables below identify the key benefits and costs of the measures under the preferred option, and the affected stakeholders. They are presented at the level of individual measures in order to display the relationship between each measure and its cost/ benefit impacts transparently.

In line with the principle of proportionality and burden minimisation, the One in One out table is compiled, outlining the new administrative burden and the ones that have been removed. Finally, this section provides an overview of the key Sustainable Development Goals (SDGs) addressed by the proposed intervention.

2.1. Overview of benefits – preferred option

Overview of Benefits (total for all provisions) – Preferred Option		
Description	***Amount***	***Comments***
Environmental benefits (See Section 6.1 of impact assessment)		
GHG emissions reduction	Achieves 85% emission reduction by 2040 (~-62% by 2030 compared to 2005 levels) (6.1.1.1). The preferred option for **MSR** is expected to deliver a slightly lower cumulative emissions comparatively with other options whilst maintaining better economic performance (6.1.1.3) Regarding **carbon removal**, the preferred option is expected to lead to 175-330 MtCO2 removal through a public purchasing programme (6.1.1.2). Including emissions from municipal **waste incineration in the ETS** is expected to reduce cumulative emissions from municipal waste incineration by –53 MtCO2 or -22% over 2031-40 compared to the baseline (6.1.1.8). The **Modernisation Fund** is expected to continue delivering annual emission reductions of around 85 MtCO2e (6.1.1.4). Actual GHG emissions reductions will depend on what sectors Member States decide to spend their envelope. The **IDB** can deliver over 1,630 Mt of CO_2 abatement (over 10 years of operation of the awarded projects) and thus address large share of the emissions in the EII sectors.	Main beneficiary: society at large. Driven by declining emissions in line with ETS contribution to economy-wide climate target.

	In **aviation**, greater uptake of sustainable aviation fuel is expected to reduce emissions covered by ETS allowances by 131 MtCO2 (6.1.1.5). In **maritime**, extending the ETS scope to smaller vessels reduces cumulative emissions by around 5% over 2030-2050, compared to the baseline (6.1.1.6). Uptake of renewable fuels increases by 2-3% in 2040 and 5-6% in 2050 (6.2.3.5).	
Incentivising innovative forms of decarbonisation	The technologies of **Carbon Removal** (6.1.1.1) and **Carbon Capture and Utilisation** (6.1.1.9) are incentivised, thereby boosting the market for captured and/or stored CO2, reducing both GHG emissions reliance on virgin fossil-based fuel and feedstock. Industrial decarbonisation supported through the **IDB** deploying EUR 100 bn over 10 years to decarbonise industry at scale and facilitate modernising the EU economy — in addition to continuation of the existing Innovation Fund and targeted improvements to the Modernisation Fund (6.1.1.4). Greater uptake of sustainable propulsion technologies in **aviation** (6.1.1.5) and **maritime** (6.2.3.5).	Main beneficiary: society at large. Expands options for meeting emission reduction target, improves cost efficiency of abatement options and reducing the cost of climate action. Other beneficiaries include developers of climate technologies and sectors with hard-to-abate emissions.
Improved air quality and public health	Reductions in PM, NO_X, SO_2 from industry and waste. Achieved from: phase-out of **Modernisation Fund** support to fossil fuels and waste-to-energy (6.1.2.2). lower air pollution in the **maritime** sector, with social net present value of EUR 22 million (6.2.1.5). **waste** reduction, prevention and recycling (6.2.1.7).	Main beneficiaries: citizens, urban communities, coastal communities, islands.
Economic benefits		

More gradual decarbonisation trajectory for industry	The ETS cap declines more gently compared to the baseline, reducing carbon costs for industry.	
Greater stability in carbon market and lower compliance costs	Achieved through **MSR** reform, the preferred design option leads to a gradual and more stable EUA price evolution and a more liquid market, resulting in stable signal for investment and business planning certainty (6.2.1.2).	Main beneficiaries: ETS operators, investors. Driven by MSR reform which ensures smoother price trajectory.
Support to deployment of carbon removals and innovative mitigation technologies and markets.	Due to **carbon removal** integration through the public purchasing programme (6.2.1.1). Fostering permanent **carbon removals from biogenic emissions** in municipal waste incineration, supporting economy-wide decarbonisation (6.1.1.8.). Increased investment due to support of the **Industrial Decarbonisation Bank**, EUR 100bn with average direct leverage effect estimated at 45%[23] (6.2.3.3). Investment estimated at EUR 50-90 billion over 2031-2040 due to **conditional free allocation** (6.2.1.6) Improved business case for **carbon capture and utilisation** due to accounting change and inclusion of waste incineration (6.2.1.8, 6.2.3.7 & 6.2.3.8)	Main beneficiaries: ETS operators, consumers, industrial operators, developers of relevant technologies (e.g. carbon removal, e-fuel producers).
Reduction in carbon leakage rates	Less carbon leakage compared to baseline (6.2.3, Annex 12 Section 1.4.4.1). Increased free allocation of 42%-47% over 2031-2040 (Annex 12, Table 12).	Main beneficiaries: industries exposed to the risk of carbon leakage. Driven by more gradual cap tightening than baseline combined with investments facilitated by ETS revenues and conditionality in free allocation.

[23] Direct leverage effect is defined as IDB support divided by private investment expenditures

Circular economy incentive	Inclusion of **waste incineration** incentivising circular economy for materials, reducing GHG emissions from waste disposal, and generating recycled materials displacing more carbon-intensive virgin materials (6.1.2.5.).	
Improved functioning of internal market for waste	Level playing field between sectors, within sector and between Member States through harmonised carbon price signal (6.2.6.3.).	
Lower compliance costs in aviation	Compliance costs are significantly lower compared to the baseline (36% lower in 2035) due to narrower ETS scope (Annex 10, Table 13).	Main beneficiaries: aircraft operators, passengers.
Overall net benefit (maritime)	Maritime policy options are expected to yield a net benefit of EUR 7bn in the preferred option (7.2)	Analysis combining discounted benefits of emission savings against discounted abatement costs and administrative costs
Avoiding double pricing of GHG emissions priced upon implementation of the global measure CORSIA	Depends on the participation to CORSIA by third countries (6.1.1.5).	Main beneficiaries: aircraft operators operating international flights.
Avoiding of double pricing of GHG emissions priced under a global measure, once adopted, at IMO	Depends on emissions of each ship 6.2.1.5	Main beneficiaries: shipping companies that face payments at IMO and under EU ETS for emissions of their ships.
Decarbonisation support in maritime	Due to support mechanism for Sustainable Maritime Alternative Propulsion (SMAP) (6.2.1.5).	Shipping companies using sustainable fuels and propulsion technologies like wind and electricity
Increased economic activity in some port areas	Due to addressing the risk of relocation of container transhipment activity from EU to non-EU ports and	Local economies in port areas.

	ensuring a level playing field for vessels performing offshore activities (6.2.3.5).	
Increased auction revenues to public authorities	Higher auction revenues (+137% - 146 %) compared to baseline (Table 16 of main Impact Assessment, Annex 12, Table 21).	
Lower administration costs for public authorities (free allocation)	Due to not updating carbon leakage list for ETS Phase V (6.2.2.5).	
Employment	Sectoral employment gains occur in chemicals and non-metallic minerals sector, which also records the highest production increase by 2040. Across sectors and policy measures, the overall employment impact ranges from -0.56% to 1.76 (6.3.1.6) Creation of new employment opportunities in new removals market (6.3.1.2) and projects benefiting from the IDB support (6.3.1.3). Positive employment impact in aviation (6.3.1.4). Possible positive employment impact in ports and their hinterland and negligible employment impact concerning smaller vessels (6.3.1.5) Positive employment impact in waste due to increased recycling and circular economy activities (6.3.1.7)	Main beneficiaries: citizens, society at large Follows estimated increase in production
Distributional effects	Qualitative assessment	Compared to the baseline, lower income households are expected to benefit from a more gradual ramp-up of carbon prices and associated cost pass through, as well as positive economic and employment outcomes, but may on the other hand be affected by the new carbon price on waste disposal and associated cost pass through.

2.2. Overview of costs – preferred option

Separate cost overviews are provided for each topic.

ETS cap and Market Stability Reserve

- Measures regarding the ETS cap, its adjustment trajectory, and the adjustment of the Market Stability Reserve (MSR) are expected to reduce, not increase, costs compared to the baseline.
- The cap adjustment results in a gentler decarbonisation trajectory for stationary ETS installations and operators, which lowers costs (see tables below for aviation, maritime and waste sectors).
- The MSR adjustment is expected to ensure a steady increase in the price of ETS allowances, compared to other options that exhibit greater variability (6.2.1.2). It also maintains a greater reserve for potential activation during the 2030s and 2040s (Annex 8, Section 1.4.3). These attributes are expected to improve the functioning of the carbon market compared to continuing with Market Stability Reserve parameters closer to the baseline.

Carbon removal

- The preferred option (a public purchasing programme) has lower expected transaction costs for carbon removal operators compared to other options (direct integration of removals into the ETS) (6.2.2.1).
- By definition, the preferred option increases public costs related to carbon removal compared to the baseline (no carbon removal integration). However, these costs are necessary to deliver the measure's benefits, namely lower ETS allowance costs, additional mitigation options for the hardest emissions to abate and support to development of innovative technology.

II. Overview of costs – Preferred option						
	Citizens/Consumers		**Businesses**		**Administrations**	
	One-off	**Recurrent**	**One-off**	**Recurrent**	**One-off**	**Recurrent**
Direct adjustment costs	N/A	N/A	N/A	N/A	N/A	
Direct administrative costs	N/A	N/A	Cost of participating in public	Cost of participating in public purchasing	Cost of public purchasing programme: establishment (by public	The ultimate cost for stimulating CDR is the same among all options for integrating carbon removal.

				purchasing programme (6.2.2.1)	programme (6.2.2.1)	authorities) and participation (by operators) (6.2.2.1)	However, the preferred option requires public authorities finance the up-front cost of removals before recouping some of this through sale into the ETS market. The final fiscal cost of the purchasing programme is estimated to be EUR 3 bn (6.2.5.1).
	Direct regulatory fees and charges	N/A	N/A	N/A	N/A	N/A	N/A
	Direct enforcement costs	N/A	N/A	N/A	N/A	N/A	N/A
	Indirect costs	N/A	N/A	N/A	N/A	N/A	N/A

Instruments to support investment

- The Industrial Decarbonisation Bank (IDB) has no compliance costs for ETS installations but turns ETS resources into investment support for industry (6.2.1.3).

II. Overview of costs – Preferred option						
	Citizens/Consumers		**Businesses**		**Administrations**	
	One-off	**Recurrent**	**One-off**	**Recurrent**	**One-off**	**Recurrent**
Direct adjustment costs	N/A	N/A	N/A	N/A	N/A	N/A
Direct administrative costs	N/A	N/A	Participation costs (6.2.2.2)	Participation costs (6.2.2.2)	To public authorities, predominantly on the EU level, for organisation of calls (6.2.2.2).	

						Cost estimated to be similar to Modernisation Fund (0.13% of total envelope). For Modernisation Fund, the preferred option is expected to reduce administrative cost by reducing share of non-priority investments, which have higher administrative burden (6.2.5.2)	
	Direct regulatory fees and charges	N/A	N/A	N/A	N/A	N/A	N/A
	Direct enforcement costs	N/A	N/A	N/A	N/A	N/A	N/A
	Indirect costs	N/A	N/A	N/A	N/A	N/A	N/A

Aviation

II. Overview of costs – Preferred option						
	Citizens/Consumers		Businesses		Administrations	
	One-off	Recurrent	One-off	Recurrent	One-off	Recurrent
Direct adjustment costs	N/A	N/A	N/A	N/A	N/A	N/A
Direct administrative costs	N/A	N/A	N/A	Administrative effort associated with existing SAF support is prolonged (6.2.2.3).	N/A	Administrative effort is needed for deduction of CORSIA costs but can make use of existing reporting systems (6.2.2.3). Administrative effort associated with existing SAF support is prolonged (6.2.2.3).
Direct regulatory fees and charges	N/A	N/A	N/A	In the preferred option, ETS compliance costs are lower than in the baseline (6.2.1.4). Preferred option ensures no double pricing of ETS & CORSIA compliance costs (6.2.1.4).	N/A	Compared to baseline, administrative effort for operators, national and European authorities is lower (6.2.2.3). Member States may use national budgets to reduce SAF support once ETS support expires (6.2.5.3).
Direct enforcement costs	N/A	N/A	N/A	N/A	N/A	N/A
Indirect costs	N/A	N/A	N/A	N/A	N/A	N/A

Maritime

II. Overview of costs – Preferred option						
	Citizens/Consumers		**Businesses**		**Administrations**	
	One-off	**Recurrent**	**One-off**	**Recurrent**	**One-off**	**Recurrent**
Direct adjustment costs	N/A	N/A	N/A	N/A	N/A	N/A
Direct administrative costs	N/A	N/A	One-off MRV costs for smaller ships estimated at EUR 3 193 on average per vessel.	Potential MRV savings of 10%-20% of current MRV from simplification measures aimed at aligning requirements across different regulatory frameworks (6.2.2.4). Recurrent MRV costs for smaller ships estimated at EUR 3 690 on average, partly offset by eligibility for decarbonisation support.		ETS extension to smaller vessels estimated to increase public authority MRV and administrative cost by EUR 0.74m per year (6.2.5.4).
Direct regulatory fees and charges	N/A	N/A	N/A	Extension of ETS scope to smaller vessels increases shipping costs by EUR 1.2 bn in 2030, 1.8 billion in 2040 & 0.7 bn in 2050. (ETS costs, fuel costs, decarbonisation capex) (6.2.1.5). Extension of existing derogations reduces compliance costs compared to baseline by estimated EUR 546m in 2031 (6.2.1.5). Preferred option's IMO deduction lowers compliance costs compared to baseline.	N/A	Member States may face fiscal cost of sustainable maritime alternative propulsion (SMAP) following expiry of EU programme (6.2.5.4).

	Direct enforcement costs	N/A	N/A	N/A	N/A	N/A	N/A
	Indirect costs	N/A	N/A	N/A	N/A	N/A	N/A

Carbon leakage

II. Overview of costs – Preferred option							
		Citizens/Consumers		**Businesses**		**Administrations**	
		One-off	**Recurrent**	**One-off**	**Recurrent**	**One-off**	**Recurrent**
	Direct adjustment costs	N/A	N/A	Cost reduction due to avoiding carbon leakage list update (6.2.2.5).	Reduction in the cost of adjusting to free allocation phase-out compared to baseline (increased free allocation of 39% in 2031-2040) (Annex 12, Table 4).	N/A	Cost reduction due to simplification, including avoiding carbon leakage list update (6.2.5.5).
	Direct administrative costs	N/A	N/A	Costs related to the extension of free allocation conditionality. Estimated one-off cost of EUR 0.02 (<0.1%) per tonne CO2, or EUR 8m in total: derived using Standard Cost Model (Table 16 of main Impact Assessment, Annex 12, Section 1.4.2.2.1). Very little cost increase expected for conditionality related to indirect carbon cost (ICC) since existing State aid-based approach is maintained.			

	Direct regulatory fees and charges	N/A	N/A		N/A	N/A	N/A
	Direct enforcement costs	N/A	N/A	N/A	N/A	N/A	N/A
	Indirect costs	N/A	N/A	N/A	N/A	N/A	N/A

Waste

II. Overview of costs – Preferred option						
	Citizens/Consumers		**Businesses**		**Administrations**	
	One-off	**Recurrent**	**One-off**	**Recurrent**	**One-off**	**Recurrent**
Direct adjustment costs	N/A	N/A	N/A	N/A	N/A	N/A
Direct administrative costs	N/A	N/A	MRV cost already applies since 2024. Annual MRV costs of EUR 7.8 – 78 million depending on plant size (6.2.2.6). Cost is minimised by building on existing ETS and Industrial Emissions Directive processes and practices (Table 16 of main Impact Assessment, Annex 13, Section 1.6.2.1.1).			
Direct regulatory fees and charges	N/A	N/A	N/A	Carbon cost for municipal waste estimated at EUR 39-66 per tonne in 2031 (Annex 13, Section 1.3).	N/A	N/A

Direct enforcement costs	N/A	N/A	N/A	N/A	N/A	N/A
Indirect costs	N/A	Average annual household waste management fee increases in the order of 4.5%-8.8% or EUR 10-15 on annual basis, based on current experience and depending on waste prevention and collection policies applied (6.2.5.6.)	N/A	Cost passthrough to competent authorities projected to add 39-66% to gate fee if fully passed through (Annex 13, Section 1.3). Projected to foster increase in cost-mitigating actions: waste reduction (+10%-20%) and recycling (+16%-23%). (Annex 13, Section 1.6.2.1).	N/A	N/A

Carbon Capture and Utilisation

- The main effect of the preferred option reduces overall costs by providing more flexibility to operators.
- The proposal is to adopt hybrid downstream and midstream accounting, enabling operators who capture their CO2 emissions to pass the carbon cost down the supply chain to the eventual emitter, thereby adding flexibility compared to the baseline (upstream accounting with no opportunity to pass non-permanent carbon capture cost down the value chain).

II. Overview of costs – Preferred option						
	Citizens/Consumers		**Businesses**		**Administrations**	
	One-off	**Recurrent**	**One-off**	**Recurrent**	**One-off**	**Recurrent**
Direct adjustment costs	N/A	N/A	N/A	N/A	N/A	N/A
Direct administrative costs	N/A	N/A		Simplification for operators who capture CO2. Operators will be able to report CO2 as captured and transferred to another ETS installation, regardless of the subsequent purpose (6.2.2.7).	N/A	N/A

	Direct regulatory fees and charges	N/A	N/A	N/A	Opportunity to reduce carbon costs by replacing direct emissions with CCU. Increase in compliance costs for e-fuel producers, who become responsible for fossil CO2 used in their production (6.2.1.8).	N/A	N/A
	Direct enforcement costs	N/A	N/A	N/A	N/A	N/A	N/A
	Indirect costs	N/A	N/A	N/A	N/A	N/A	N/A

2.3. Application of the "one in, one out" approach – Preferred option

III. Application of the 'one in, one out' approach – Preferred option			
Type of burden	**One off** **(annualised total net present value over the relevant period)**	**Recurrent** **(nominal values)**	**Comments**
Businesses			
New administrative burdens (INs)	Moderate. Includes: EUR 8m EU-wide associated with free allocation conditionality. (Annex 12, Section 1.4.2.2.1) Waste incineration facility. (Annex 13, Section 1.7.2) Maritime: ETS extension to smaller vessels	Includes: Maritime: ETS extension to smaller vessels. Estimated at EUR 15m total cost (6.2.2.4)	Administrative effort associated with use of measures that are optional for operators: • New MRV requirements for CCU operators; • Reporting for removals certification
Removed administrative burdens (OUTs)	Simplification from discontinuing carbon-leakage risk updates – approx. EUR 27m savings based on 2015 cost calculations (SWD(2015)135) - (Annex 12, Section 1.3) Simplification and limited extension of derogations in maritime (6.2.2.4)	Simplification and limited extension of derogations in maritime (6.2.2.4) Lower administrative burden in aviation (6.2.2.3)	

Net administrative burdens*	Moderate	Moderate	Net increase mainly from new operator groups and conditionality requirement for free allocation
Adjustment costs **	Moderate	-	One-off system adjustments (permit updates, MRV digitalisation, registry onboarding)
Public authorities			
New administrative burdens (INs)	Moderate (registry updates, verification oversight)	Moderate (compliance monitoring, MRV verification)	Expansion of ETS coverage (MWIs, CCU, CDR); verification of free-allocation conditionality.
Removed administrative burdens (OUTs)	Minor	Minor	Fewer carbon leakage list review; harmonised verification guidance
Net administrative burdens*	Moderate	Moderate	Can be absorbed within existing ETS structures and systems
Total administrative burdens	Moderate overall increase	Moderate overall increase	New obligations offset partly by avoided costs for small emitters and simplifications

3. RELEVANT SUSTAINABLE DEVELOPMENT GOALS

IV. Overview of relevant Sustainable Development Goals – Preferred Option		
Relevant SDG	**Expected progress towards the goal**	**Comments**
SDG 13 – Climate Action	The revised ETS cap trajectory and inclusion of additional sectors (MWIs, CCU, removals) will contribute to the EU's economy-wide GHG reduction target for 2040, ensuring continued progress towards the EU's 2050 climate-neutrality target, which in turn contributes to SDG 13. The proposal also reduces the share of GHG emissions that are not subject to carbon pricing by expanding the EU ETS scope in shipping, maritime and waste. The extension of the scope of the EU ETS maritime sector with smaller ships and the new measures to better avoid the risk of carbon leakage incentivise shipowners and relevant operators to adopt cleaner technologies, alternative fuels, and energy-efficient practices. This supports Target 13.3 by strengthening institutional and industry capacity for mitigation and low-carbon transition. Similarly, the EU is appropriately bringing effective carbon pricing into a larger share of the hard to abate aviation sector, aligning with SDG 13).	Positive contribution is reinforced by improved market stability (MSR reform) and stronger investment incentives.
SDG 9 – Industry, Innovation and Infrastructure	Strengthened support instruments (notably Industrial Decarbonisation Bank), conditional free allocation (linked to verified climate-neutral investment plans), scope extension (to waste and removals), and account changes for CCU, drive large-scale deployment of low-carbon technologies and new infrastructure for CCU and CDR. Support mechanism for fuels and propulsion technologies in maritime helps companies to modernise their fleet and incentivises clean fuels and technology production in the EU. Similarly, support mechanism for sustainable aviation fuels incentivises clean fuels and technology production in the EU. Both support mechanisms are contributing directly to Target 9.4, which concerns the upgrading of infrastructure and industries to be sustainable and resource-efficient. The extension of the scope of maritime sector in the EU ETS to smaller ships incentivises the shipping industry to innovate and even upgrade its fleets to meet environmental and climate goals. Revenues generated through the ETS, alongside support from the EU Innovation Fund and other EU facilitating framework, enable Member States to finance research and deployment of breakthrough technologies, advancing	Strongly positive effect on industrial innovation. Transitional compliance costs may challenge some energy-intensive sectors, but these are mitigated by funding from auction revenues and innovation instruments.

	Target 9.b on supporting domestic technology development and industrial diversification. Together, these efforts help build a resilient and competitive sectors that foster sustainable industrialization, in fill alignment with Target 9.2, which aims to promote inclusive and sustainable industrial growth.	
SDG 7 – Affordable and Clean Energy	Continued carbon pricing across energy and industrial sectors and extension to waste-to-energy strengthens the competitiveness of renewable and low-carbon energy sources. Expected increase in power-sector decarbonisation supports progress towards affordable, clean energy. The proposal also helps expand the market for cleaner fuels in aviation and shipping.	Carbon costs may temporarily raise electricity prices; revenues can be used to support vulnerable consumers, electro-intensive industries and energy-efficiency measures.
SDG 11 – Sustainable Cities and Communities	Inclusion of municipal waste incineration installations reduces local air-pollutant emissions and promotes cleaner urban waste management.	Positive benefits for public health and air quality; implementation costs for municipalities can be offset by improved sorting and recycling incentives.
SDG 12 – Responsible Consumption and Production	ETS coverage of waste incineration and CCU processes encourages circular resource use and waste prevention, supporting responsible production and consumption patterns. The extension of the EU ETS scope to private and business jets, used by a very limited group of citizens, will encourage more responsible consumption within aviation; It will also bring in additional ETS revenues, ensuring aviation contributes to the EU decarbonisation. Similarly, the extension of the scope of the EU ETS to smaller maritime vessels will encourage more responsible consumption and production patterns within shipping. Furthermore, the EU ETS fosters transparency and accountability by requiring detailed and simplified emissions reporting, aligning with Target 12.6, which calls for shipping companies to adopt sustainable practices and integrate sustainability information into reporting cycles.	Positive effect may be constrained by limited short-term recycling capacity; accompanying waste policy measures will mitigate this.
SDG 8 – Decent Work	The transition towards climate-neutral industry and investments spurred notably via the Industrial Decarbonisation Bank support is expected to create skilled jobs in green technology sectors in all ETS sectors and in circular economy sectors.	Short-term adjustment costs may occur in carbon-intensive regions; Just Transition and

and Economic Growth		Innovation Funds provide mitigation.
SDG 3 – Good Health and Well-being	Reduced industrial and waste sector emissions, and incentives to reduce aviation and maritime emissions lead to improved air quality and lower exposure to harmful pollutants, benefiting public health. By encouraging the shipping sector to switch to sustainable fuels and adopt more efficient and innovative technologies, the ETS, including SMaP, contributes to lowering air pollution levels in coastal and port communities, directly advancing Target 3.9, which aims to improve health conditions by reducing illnesses and deaths from hazardous chemicals and air and water pollution. Additionally, improved air quality benefits vulnerable populations, including children and the elderly citizens, supporting the broader goal of ensuring healthy lives and promoting well-being for all ages	Health co-benefits complement environmental gains
SDG 14 – LIFE below Water	EU ETS supports SDG 14 as one of the main EU instruments for reducing greenhouse gas emissions, damage marine ecosystems through both global warming and ocean acidification. The EU ETS for maritime plays significant role in protecting our oceans by encouraging the shipping sector to operate in a more sustainable way according to the SDGs. Beyond reducing GHGs, the policy promotes cleaner fuels, energy efficiency and better practices that help reduce emissions and pollutants affecting marine life. This supports the goal of maintaining healthy and productive seas by limiting factors such as acidification and chemical contamination, which directly impact biodiversity. Moreover, by promoting the innovation and better environmental monitoring, the EU ETS helps improve how the way the shipping sector manages its environmental footprint, contributing to stronger scientific understanding and responsible stewardship of ocean resources. In this way, the maritime ETS supports the long-term maintenance of the shipping industry while safeguarding marine ecosystems, aligning closely with the broader aims of SDG 14.	Marine biodiversity and ecosystems' co-benefits complement environmental gains

ANNEX 4: MODELLING

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1. ANALYSIS OF FUTURE GHG EMISSIONS

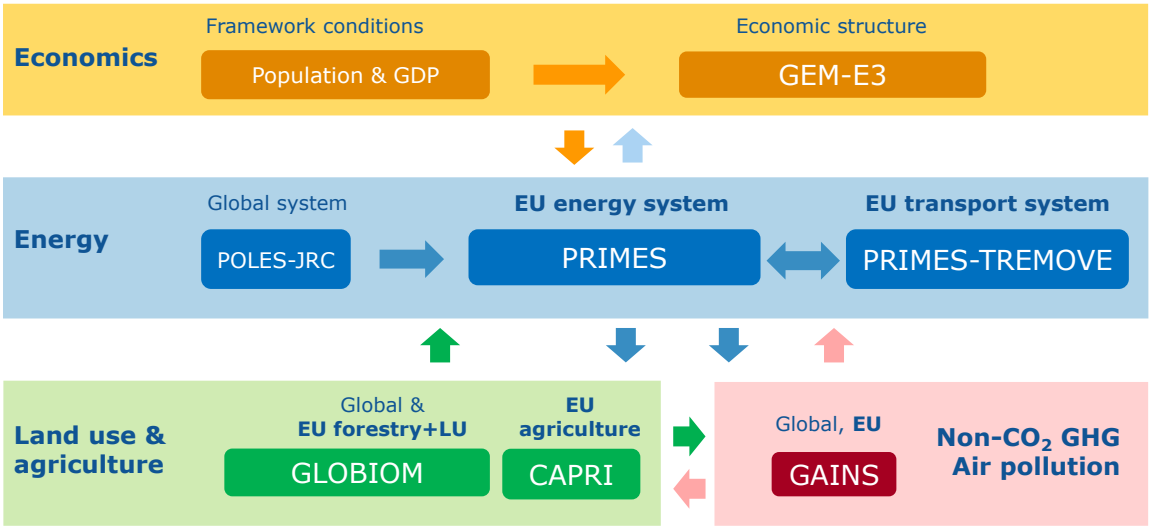
1.1. Models[24]

The projections for this Impact Assessment are performed with the help of state-of-the-art, computational models for energy and GHG system analysis, which follow an approach based on micro-economics, solve a price-driven market equilibrium, and integrate engineering and economic representations for all sectors. The models use peer-reviewed assumptions and detailed and up-to-date databases to produce projections per sector and per country. Calibration ensures continuity between historical data and projections.

1.1.1. Main modelling suite for GHG emissions

The modelling suite used for overarching climate target modelling which is being used for this Impact Assessment, (Figure 1) is common to the one used for the Commission's proposal for Long Term Strategy[25], the 2030 Climate Target Plan[26], and the EU Reference Scenario 2020[27] as well as for the most recent modelling exercises supporting the Fit for 55[28], the REPowerEU[29] and the 2040 Climate Target Plan[30] policy frameworks.

Figure 1: Main modelling suite used for GHG projections.



The modelling capacity consists of a series of interlinked models well known to the modelling community[31]. These are continuously improved with cutting-edge features. The models combine technical and economic methodologies assessing GHG pathways and associated

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[24] The model-based analysis is a technical exercise based on a number of assumptions that are shared across scenarios. Its results do not prejudge the future design of the post-2030 policy framework.

[25] In-depth analysis in support of the commission communication COM (2018) 773

[26] SWD (2020) 176 final

[27] European Commission, EU reference scenario 2020: energy, transport and GHG emissions: trends to 2050, Publications Office, 2021, DOI: 10.2833/3575

[28] COM (2021) 550 final

[29] SWD (2022) 230 final

[30] SWD (2024) 63 final

[31] See for instance Ringkjøb, H. K., et al. (2018). A review of modelling tools for energy and electricity systems with large shares of variable renewables. *Renewable and Sustainable Energy Reviews*, *96*, 440-459 and Angenendt, E., et al. (2018). Modelling and tools supporting the transition to a bioeconomy. *Bioeconomy: Shaping the Transition to a Sustainable, Biobased Economy*, 289-316.

system cost. It allows to project the evolution of all GHG net emissions from the EU economy up to 2050.

For the aviation sector specifically, the quantitative analysis of the impacts of each option and combinations relies on the values modelled under PRIMES and is based on modelling of the aviation sector using the AERO-MS model[32]. For this exercise, the latest updated version of the model has been used and aligned with fuel and carbon price projections from PRIMES. As a result, PRIMES (and consequently AERO-MS) outputs should be interpreted as internally consistent representations of possible energy system and aviation transport developments, with robustness assessed through comparison across scenarios.

Table 1: Overview of assumptions modelled using AERO-MS

Designation		87% decarbonisation context, 70% cost pass-through			
Scenario		Baseline (full scope)	PO1 (clean cut)	PO2 (departing flights, medium SAF support)	PO3 (departing flights, larger SAF support)
Decarbonisation context (whole EU economy)		87%			
PRIMES EU Reference scenario (used as basis and adjusted for aviation ETS policies)		87p_var3_v3			
Scope ETS for international aviation (extra-EEA flights)		All departing and arriving flight	Only departing flights	Only departing flights	None
ETS carbon price paid by airlines (extra EEA-flights)		ETS	ETS minus CORSIA	ETS minus CORSIA	n/a
ETS support mechanism - Duration		20mln SAF allowances until they run out **<2030**	Extended to 2035 by a **medium** amount	Extended to 2035 by a **larger** amount	20mln SAF allowances until they run out **<2030**
ETS support mechanism - Scope (flights covered by ETS)		All **intra**-EEA & **extra**-EEA flights	All **intra**-EEA & only **departing extra**-EEA flights	All **intra**-EEA & only **departing extra**-EEA flights	Only **intra**-EEA flights
ETS support mechanism - Support level (% of price differential between SAF and conventional fuel)	non-Part A biofuels (HEFA)	50%	30% in 2028-2029, 0% from 2030 on	30% in 2028-2029, 0% from 2030 on	50%
	Advanced biofuels (part A)	70%	50% until including 2034	50% until including 2035	70%
	RFNBOs (P2X)	95%	50% until including 2034	50% until including 2035	95%
	New SAF (elec / H2)	70%	50% until including 2034	50% until including 2035	70%
SAF volumes supported		Based on the RefuelEU aviation mandate			
Carbon cost pass-through rates (modelling assumption)		≈70% (as in 2021 IA)			
Fuel prices used		From PRIMES			
Years for modelling runs in AEROMS	2030	Yes	Yes	Yes	Yes
	2035	Yes	Yes	Yes	Yes
	2040	Yes	Yes	Yes	Yes

With respect to the specific impacts relevant for this exercise, the impact on activity between scenarios have been delivered by the AERO-MS model. The main sources of results variation in the scenarios examined come from fuel-related costs, including taxes and carbon (ETS, CORSIA) prices derived from PRIMES. Consequently, although there remains uncertainty around future price developments, the model-driven variables are internally consistent. Overall, scenario results indicate that possible impacts on activities exist but are barely relevant at these price levels and are more strongly associated with general fuel price variations than with the ETS price signal itself.

1.1.2. Modelling used for the current Impact Assessment

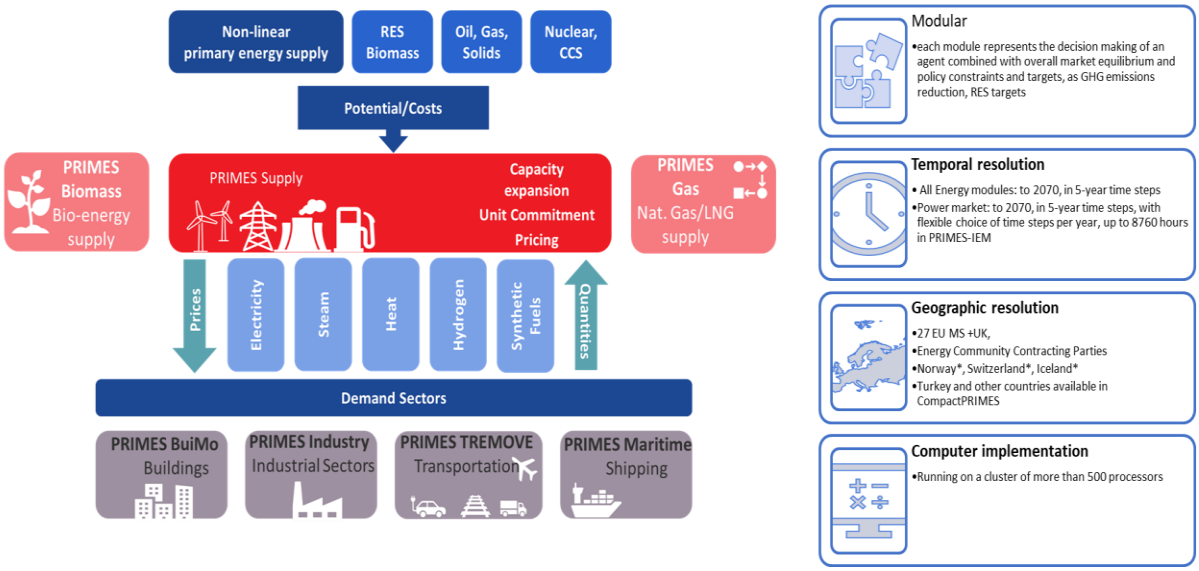
1.1.2.1. PRIMES

PRIMES supports detailed analysis of climate and energy policies, technology shifts, and the long-term economic effects of different policy and market pathways.

Analytical structure, assumptions, limitations.

[32] AERO-MS Fact Sheet available at https://web.jrc.ec.europa.eu/policy-model-inventory/explore/models/model-aero-ms-print/

Figure 2: PRIMES model structure.



Source: PRIMES

A series of research programs funded by the European Commission led to the development of the PRIMES model. The PRIMES (Price-Induced Market Equilibrium System) is a large-scale applied energy system model that provides detailed projections of energy demand, supply, prices and investment to the future, covering the entire energy system including emissions. The distinctive feature of PRIMES is the combination of behavioural modelling (following a micro-economic foundation) with engineering aspects, covering all energy sectors and markets. The model has a detailed representation of policy instruments related to energy markets and climate, including market drivers, standards, and targets by sector or overall (over the entire system). It handles multiple policy objectives, such as GHG emission reductions, energy efficiency and renewable energy targets, and also provides a pan-European simulation of internal markets for electricity and gas.

The PRIMES model currently covers all 27 EU Member States, UK and all 9 Energy Community Contracting Parties, as well as Iceland, Norway Switzerland and Turkey. The full suite of PRIMES model comprises the following models:

- *PRIMES-TREMOVE* transport model: recently enhanced to include linkage to synthetic fuels and hydrogen and to detailed spatial projections of transport activity and route assignment
- *PRIMES BuiMo* residential and services model: model with high resolution representation of the housing and office building stock, embedded in an economic-engineering model of multi-agent choice of building renovation, heating system and equipment/appliances by energy use
- *PRIMES-Industry model*: recently enhanced version of the very detailed industrial model that includes a high-resolution split of industrial consumption by sector and type of industrial process and now includes the possibility of using hydrogen and synthetic fuels directly, as well as extended possibilities of electrification and the possible emergence of non-fossil hydrocarbon feedstock in the chemicals
- *PRIMES Biomass supply model*: biomass supply model that includes land use constraints, many types of biomass and waste feedstock, sustainability regulation, and endogenous learning and industrial maturity of a large number of potential biomass to

biofuels conversion technologies; the model is linked with the IIASA models that handle LULUCF and forestry, as well as to the agricultural model CAPRI

- *PRIMES Electricity and Heat/Steam supply and market model*: The electricity and heat/steam market model of PRIMES includes three elements: hourly unit commitment model - with a pan-European market simulation over the grid constraints and detailed technical operation restrictions - the long-term power system expansion model, the costing and pricing electricity and grid model, the integration of heat supply and industrial steam supply with synchronised hourly operation
- *PRIMES Gas Supply and Market model*: a stand-alone model representing in detail the gas supply and infrastructure in the Eurasian and Middle East area and the internal European market of gas within an oligopoly model embedding engineering gas flow modelling
- *PRIMES new Fuels and storage model* covering Hydrogen, Synthetic fuels, Power-to-X, CO_2 capture from the air and biogenic, CCS/CCU and process-emissions modelling to enhance and perform sectoral integration aiming at simulating a zero-CO_2 system.
- *PRIMES Maritime model*: a module of PRIMES and PRIMES-TREMOVE transport model, including the developments in maritime transport activity, energy use in the maritime sector, the greenhouse gas emissions and air pollution emissions, as well as the associated costs.

The PRIMES model offers the possibility of handling market distortions, barriers to rational decisions, behaviours, as well as and market coordination issues and includes a complete accounting of costs (CAPEX and OPEX) and investment expenditure on infrastructure needs. PRIMES is designed to analyse complex interactions within the energy system in multiple agents – multiple markets framework.

PRIMES is well-placed to simulate medium and long-term transformations of the energy system (rather than short-term ones) and includes non-linear formulation of potentials by type (resources, sites, acceptability etc.) and technology learning.

The PRIMES model, with its ETS tool combines two essential characteristics required for the purpose of the analysis in this impact assessment: It combines a rigorous simulation of the ETS market functioning under different circumstances with the energy system model which allows the simulation of the developments driven by policies other than ETS. Being a vintage-engineering based model it includes the inertia of the energy system and has sufficient detail to capture the effects of the other multiple policies (Energy efficiency policies, RES policies, etc.) in combination with the ETS system. As the model covers all sectors of the economy from an energy and emissions perspective, as well as multiple technologies (including negative emission technologies) almost any extension or changes in the ETS system can be captured. PRIMES can provide information on and verify the effect of the possible implications of all interventions.

- Demand for allowances under different emissions reduction targets
- Different trajectories of ambition (also for different sectors and emissions scope) can be verified
- The compliance of an ETS price trajectory with alternative MSR designs
- The ETS price tool (ex post) can mimic different actor anticipation and foresight

- The PRIMES model can mimic the effect of complementary policy packages for each sector individually (measures on transport, energy efficiency policies, etc).

The PRIMES model is regularly used in EU impact assessments and for developing the EU Reference Scenario. Recent applications include the *EU Reference Scenario 2020* (European Commission, 2021)[33], which projects trends in energy, transport, and GHG emissions through 2050, updating the 2016 version (European Commission, 2016)[34]. PRIMES has been central to assessing key EU climate and energy policy packages, such as the *Fit-for-55* initiative, supporting the design of pathways to meet 2030 targets and achieve climate neutrality by 2050.

The model was also used in response to the recent energy crisis triggered by the Russian invasion of Ukraine, underpinning the *REPowerEU* plan to reduce dependence on Russian fossil fuels (European Commission, 2022) [35]. Most recently, in 2024, PRIMES supported the analysis behind the EU's 2040 climate target plan (European Commission, 2024). [36]

1.1.2.2. GEM-E3

GEM-E3 is a large-scale multi-sectoral hybrid CGE model designed to evaluate the effects of external shocks on the economy. The model provides a robust framework to capture the complex energy-economy-climate interactions and simulate the impact of climate damage or climate and energy policies on the performance of sectors, sectoral output, prices and bilateral trade, the competitiveness of regions and the welfare of communities. Results have a yearly time-steps up to 2030 and 5-year time steps until 2050/2100. The model has a global coverage, with 47 regions, where the G-20 countries, EU27 Member States, and major equipment manufacturing or energy exporting countries are represented individually, and countries are linked through bilateral trade. All countries are linked through endogenous bilateral trade transactions. The model explicitly represents 50 distinct economic activities, which are interlinked across the production and consumption value chain.

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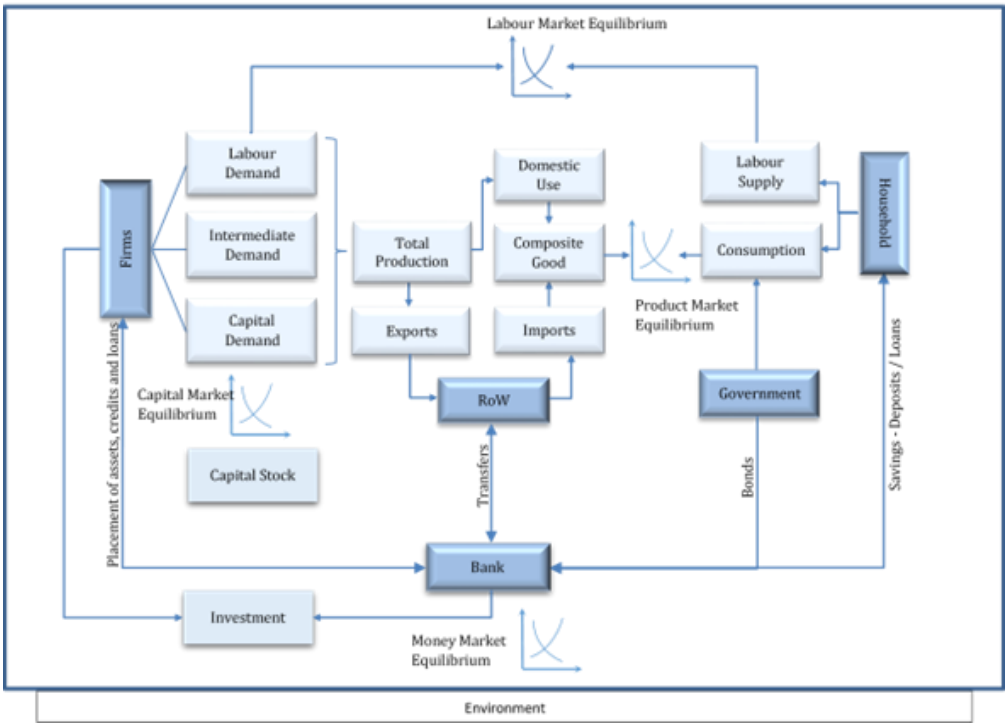
[33] European Commission 2021. European Commission, Directorate-General for Climate Action, Directorate-General for Energy, Directorate-General for Mobility and Transport, De Vita, A., Capros, P., Paroussos, L. et al. EU reference scenario 2020: energy, transport and GHG emissions: trends to 2050. Publications Office. https://data.europa.eu/doi/10.2833/35750

[34] European Commission 2016. European Commission, Directorate-General for Climate Action, Directorate-General for Energy, Directorate-General for Mobility and Transport, Zampara, M., Obersteiner, M., Evangelopoulou, S. et al. EU reference scenario 2016: energy, transport and GHG emissions: trends to 2050. Publications Office. https://data.europa.eu/doi/10.2833/001137

[35] European Commission 2022. Commission staff working document Implementing the RepowerEU action plan: Investment needs, hydrogen accelerator and achieving the bio-methane targets. Accompanying the document "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions REPowerEU Plan" SWD/2022/230 final

[36] European Commission 2024. Impact Assessment Report Part 1 Accompanying the document "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Securing our future Europe's 2040 climate target and path to climate neutrality by 2050, building a sustainable, just and prosperous society". SWD/2024/63 final

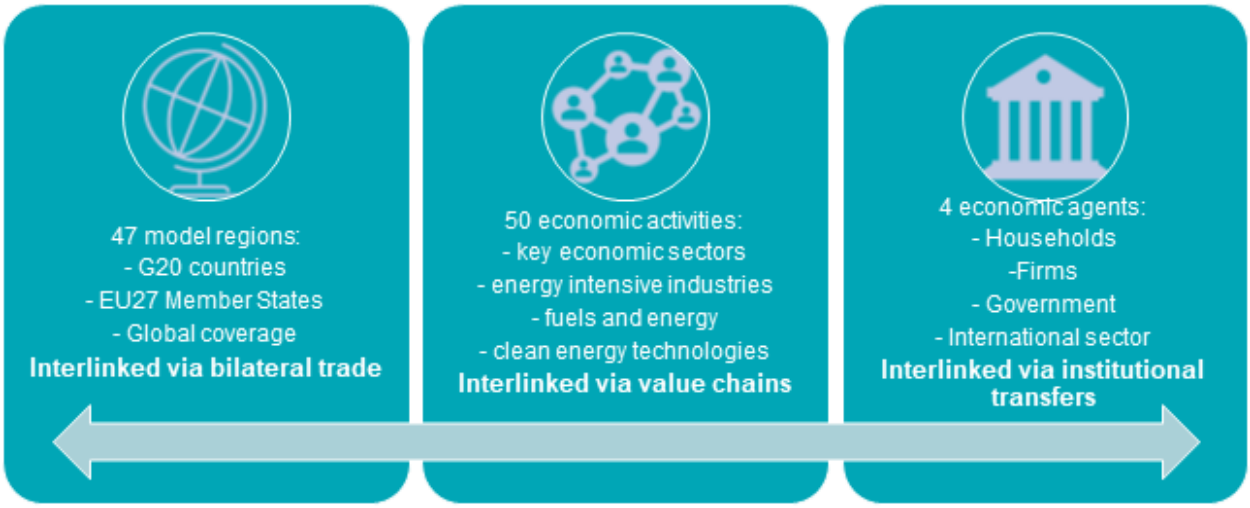
Figure 3: Schematic representation of the GEM-E3 model



Focus is placed on the representation of the energy system where specialised bottom-up modules for power generation, buildings and transport sectors have been developed. To this end, the model includes a detailed representation of the power generation system (12 power technologies) and a detailed transport module (private and public transport modes), while different technological options for energy use in buildings and industry are provided. The energy system representation includes an explicit representation of new technologies such as hydrogen, clean fuels, and bioenergy options. The GEM-E3 environment module covers all GHG emissions and a wide range of abatement options, as well as a thoroughly designed carbon market structure (e.g., grandfathering, auctioning, alternative recycling mechanisms). The model has been used extensively by the European Commission, governments and public institutions to assess the macroeconomic, distributional and employment implications of the transition to climate neutrality.

The model is based on advanced applied modelling techniques and has been further extended to allow the representation of semi-endogenous technical progress, endogenous formation of labour skills and human capital and a detailed bottom-up representation of the energy system (in particular transport and power generation), along with non-CO_2 emission abatement options and negative emissions technologies. It moves beyond the standard CGE framework as it is dynamic and features involuntary unemployment in the labour market and alternative macroeconomic closures supported by a detailed representation of the financial sector. The model is established on rigorous microeconomic theory; it is empirically estimated (substitution and trade elasticities) and is able to undertake long term analysis as opposed to econometric models that suffer from the Lucas critique. The model can be used both in a comparative and what if analysis frameworks and represents a closed and consistent accounting of resources.

Figure 4: GEM-E3 system dimensions



The model is calibrated to a wide range of datasets comprising of Input-Output tables, financial accounting matrices, institutional transactions, energy balances, GHG inventories, bilateral trade matrices, investment matrices and household budget surveys. The model has been calibrated to the latest statistics (GTAP 11, IEA, UN, ILO) while Eurostat statistics have been used for the EU. All countries in the model are linked through endogenous bilateral trade transactions identifying origin and destination. The substitution elasticities of the model are not derived from the general literature but are estimated according to its dimensions and functional forms using the latest available datasets. The model is recursive dynamic through the accumulation of capital via the decision for investments and through the accumulation of knowledge stocks via R&D and human capital development. Model regions are linked through endogenous bilateral trade following the Armington assumption of imperfect substitution across domestic and imported goods. The nested production functions are differentiated by sector and follow a CES structure. For the demand side, the model simulates consumer behaviour and maximises a Klein-Rubin utility function that results in a Linear Expenditure demand system subject to its disposable income not used for obliged consumption (subsistence minima consumption) and after allowing for the decision on savings. The representative household decides on the allocation of the income that is available for consumption over different consumption categories (COICOP), distinguishing between durable and non-durable goods. The model has been calibrated to the latest statistics (GTAP 11, IEA, UN, ILO) while Eurostat statistics have been used for the EU.

The key innovations of the model relate to the explicit representation of the financial sector, semi-endogenous dynamics based on R&D induced technical progress and knowledge spillovers, the representation of multiple households, unemployment in the labour market with a representation of five labour skill levels and endogenous formation of labour skills.

The model is written in structural form and can be used for the comparative analysis of alternative policy scenarios and the provision of insights on the distributional effects of long-term structural adjustments. In all simulation alternatives the model ensures that the economic system is always in general equilibrium. It extends beyond the static comparison of alternative policies.

The GEM-E3 model is written entirely in GAMS. The implementation of the model is split in two stages:

I. Calibration: At this stage the calculation of the model parameters is carried out so that the model replicates a single year (base year) data.

II. Scenario quantification: This stage entails model implementation that quantifies a reference and/or a counterfactual scenario.

GEM-E3 enables the analysis of the impacts of policy scenarios on key macro-economic variables. A wide range of policies and measures can be assessed under any given level of mitigation ambition, including those to support the deployment of renewable energy or industrial decarbonisation, e.g. via the recycling of carbon revenues, measures to support up-skilling and re-skilling of the labour force, or policies to avoid carbon leakage, such as the carbon border adjustment measure. The model can also be used to assess the impact of price shocks on the economy, e.g. fossil fuel price shocks.

They key variables represented in GEM-E3 include GDP and its components, employment by economic activity and by skill and unemployment rates, capital, interest rates and investment by country and sector, private and public consumption, bilateral trade flows, consumption matrices by product and investment matrix by ownership branch, GHG emissions by country, sector and fuel and detailed energy system projections (energy demand by sector and fuel, power generation mix, deployment of transport technologies, energy efficiency improvements).

GEM-E3 enables a thorough understanding and detailed identification of risks and opportunities of the low carbon transition and of the implementation of specific climate and energy policies by capturing:

- Direct impacts on each sector, e.g., how carbon prices and carbon border taxes will affect a sector's costs of production (considering carbon intensity) and thus its production levels (via domestic and international demand)
- Indirect impacts via value chain effects (e.g. changes in prices of intermediate products, of labour and capital inputs), technology costs, consumer preferences, material availability and costs
- Induced effects via economy feedback, prices, and income implications (e.g. overall drop of demand even for products not directly affected by carbon prices etc.)
- The impacts of financing requirements (capital-intensive process of mitigation) and different financing options
- Impacts on competitiveness
- Impacts on sectoral productivity, household incomes and prices due to climate damages

Table 2: Regional resolution of the GEM-E3 model

Country Code:	**Description:**		**Country Code:**	**Description:**
AUT	Austria		**USA**	USA
BEL	Belgium		**JPN**	Japan
BGR	Bulgaria		**CAN**	Canada
CYP	Cyprus		**BRA**	Brazil

CRO	Croatia		**CHN**	China
CZE	Czech Republic		**IND**	India
DEU	Germany		**KOR**	South Korea
DNK	Denmark		**IDN**	Indonesia
ESP	Spain		**MEX**	Mexico
EST	Estonia		**ARG**	Argentina
FIN	Finland		**TUR**	Turkey
FRA	France		**SAR**	Saudi Arabia
GBR	United Kingdom		**OCE**	Oceania
GRC	Greece		**RUS**	Russian federation
HUN	Hungary		**ARE**	United Arab Emirates
IRL	Ireland		**REP**	Rest of energy producing countries
ITA	Italy		**SAF**	South Africa
LTU	Lithuania		**REU**	Rest of Europe
LUX	Luxembourg		**ROW**	Rest of the World
MLT	Malta			
NLD	Netherlands			
POL	Poland			
PRT	Portugal			
SVK	Slovakia			
SVN	Slovenia			
SWE	Sweden			
ROU	Romania			

Table 3: Sectoral resolution of the GEM-E3 model

Code	Description	Code	Description	Code	Description
Industry		**Industry (continued)**		**Agriculture**	
IND01	Ferrous metals	**IND19**	Equipment for PV panels	**AGR01**	Agriculture
IND02	Non-ferrous metals	**IND20**	Equipment for CCS power technology	**Services**	
IND03	Fabricated Metal products	**IND21**	CO2 Capture	**SRV01**	Market Services
IND04	Chemical Products	**Energy**		**SRV02**	Non-Market Services
IND05	Basic pharmaceutical products	**ENE01**	Coal	**SRV03**	R&D
IND06	Rubber and plastic products	**ENE02**	Crude Oil	**Power Generation**	
IND07	Paper products, publishing	**ENE03**	Oil	**PGT01**	Coal fired
IND08	Non-metallic minerals	**ENE04**	Gas	**PGT02**	Oil fired
IND09	Computer, electronic and optical products	**ENE05**	Power Supply	**PGT03**	Gas fired
IND10	Other Equipment Goods	**ENE06**	Biomass Solid	**PGT04**	Nuclear
IND11	Transport equipment (excluding EV)	**ENE07**	Biofuels	**PGT05**	Biomass
IND12	Consumer Goods Industries	**ENE08**	Hydrogen	**PGT06**	Hydro electric
IND13	Construction	**ENE09**	Clean Gas	**PGT07**	Wind
IND14	Batteries	**Transport**		**PGT08**	PV
IND15	EV Transport Equipment	**TRA01**	Warehousing and support activities	**PGT09**	Geothermal
IND16	Advanced Electric Appliances	**TRA02**	Air transport	**PGT10**	CCS coal
IND17	Advanced Heating and Cooking Appliances	**TRA03**	Land transport	**PGT11**	CCS Gas
IND18	Equipment for wind power technology	**TRA04**	Water transport	**PGT12**	CCS Bio

Table 4: Data sources used in GEM-E3 model for the base year calibration

Data	Source
Economic activity (GDP/GRDP)	GTAP v11
Employment (per economic activity)	GTAP v11
GHG emissions (per GHG and economic activity)	GTAP v11
Energy consumption (per fuel and economic activity)	GTAP v11, IEA
Population	GTAP v11, ILO
Working age	GTAP v11, ILO
Labour force	GTAP v11, ILO
Unemployment rate	GTAP v11, ILO
Sectoral production per economic activity	GTAP v11
Bilateral trade	GTAP v11)
Input/Output tables	GTAP v11
Transport fleet (by mode, fuel, age, etc)	IEA
CAPEX for power generation technologies	IEA
Energy prices	IEA

1.1.2.3. POTEnCIA

POTEnCIA (the Policy Oriented Tool for Energy and Climate Change Impact Assessment) is an economic model designed to represent the supply of energy and all sectors of energy demand in the EU: industry, residential, services and agriculture, transport, and power and heat generation.

POTEnCIA has been used in the Annex on Cap setting as an alternative view to the PRIMES modelling underlying the Impact Assessment, distributing effort across sectors in a different way. It has also been used in the Annex on Removals to for different estimates of removals supply. It also provides estimates for economic estimates such as investment needs, allowing the impact assessment and Annex on the Cap to provide a range of such estimates.

We provide a short description here.

POTEnCIA represents each EU Member State individually with the option of addressing the EU27 energy system as a whole. It is designed to evaluate prospective or existing policies, generally by comparing scenarios that depict alternative energy and climate policy environments. To this end POTEnCIA:

- Realistically captures the adoption and use of new energy technologies under different policy conditions.

    - How? By simulating decision-making under imperfect foresight at a high level of techno-economic detail.

- Provides high temporal detail to assess rapid structural changes in the EU's energy system.
    - How? By combining a yearly simulation of demand-side investment with hourly resolution for the power sector.

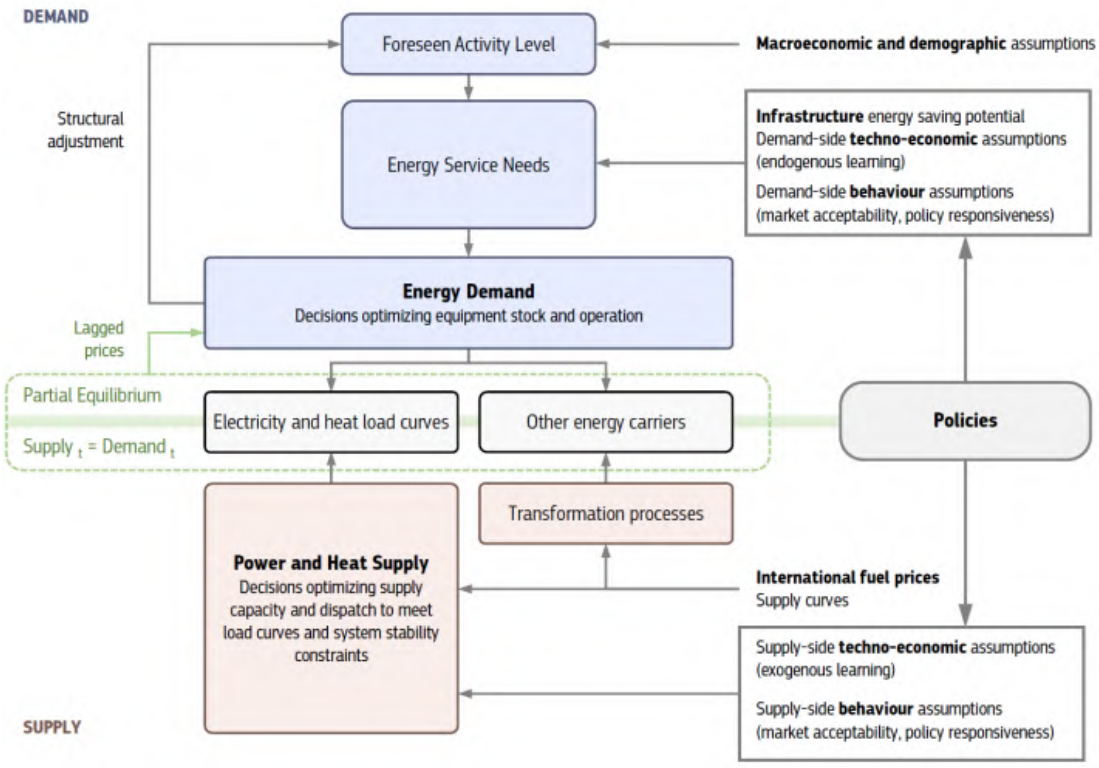
- Accurately represents the age and performance of installed energy equipment and enables the assessment of stranded asset risks and retrofitting or retirement strategies.
    - How? By tracking yearly equipment stock vintages for energy supply and demand.

These features enable the joint analysis of technology-focused policies as well as policies addressing the decision-making of energy users. Model outputs are provided in annual time steps for 2000-2050; historical conditions (2000-2021) are consistent with Eurostat and based on the Joint Research Centre's Integrated Database of the European Energy System (JRC-IDEES), which is publicly available and maintained in parallel to the POTEnCIA model.

The core modelling structure of POTEnCIA (detailed in a scientific article[37]) follows a recursive dynamic partial equilibrium approach, which successively optimises demand and supply across energy carriers in each year. This approach assumes that each demand sector requires a certain energy service to meet foreseen activity levels in a given year (such as tonnes of steel produced or mobility needs). This energy service is then met by optimising both the stock and use of energy-related equipment in each sector of energy supply and demand.

[37] JRC 2017, "POTEnCIA: A new EU-wide energy sector model", https://publications.jrc.ec.europa.eu/repository/handle/JRC106760

Figure 5: POTEnCIA model structure



1.2. Key Assumptions

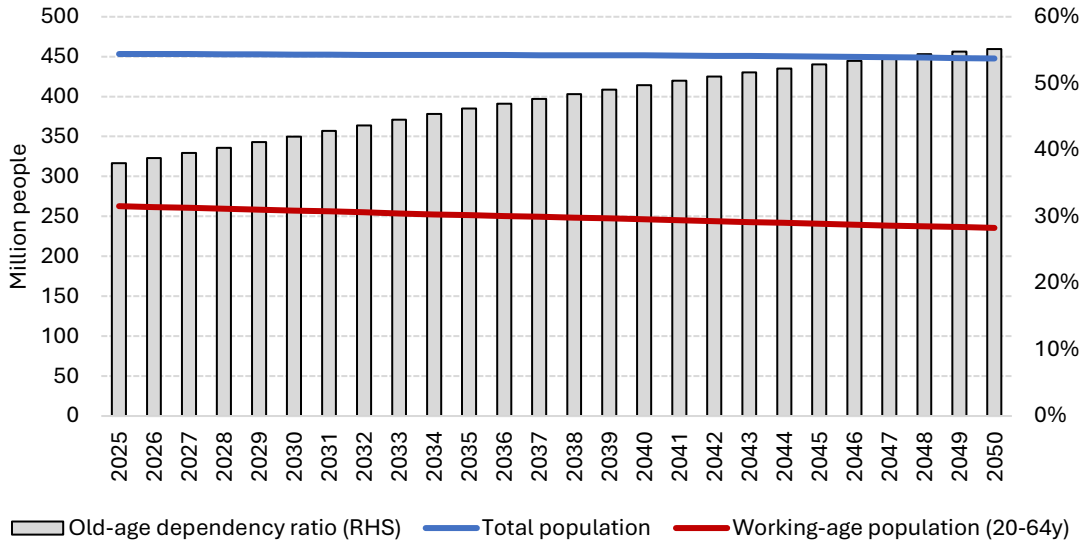
1.2.1. Economic Assumptions

The modelling work is based on socio-economic assumptions describing the expected evolution of the European society. Long-term projections on population dynamics and economic activity form part of the input to the model and are used to estimate transport activity, particularly relevant for this impact assessment.

Population projections rely on Eurostat's long-term projections (EUROPOP2023)[38]. The EU population is projected to remain broadly stable over the projection period to 2050. However, there is a noticeable trend towards the ageing of the population, with a 10% decline in the working-age population aged 20 to 64 between 2025 and 2050 and an increase in the old-age dependency ratio from 38% to 55.2%.

[38] EUROPOP2023 (proj_23n).

Figure 6: Population assumptions



Source: Eurostat

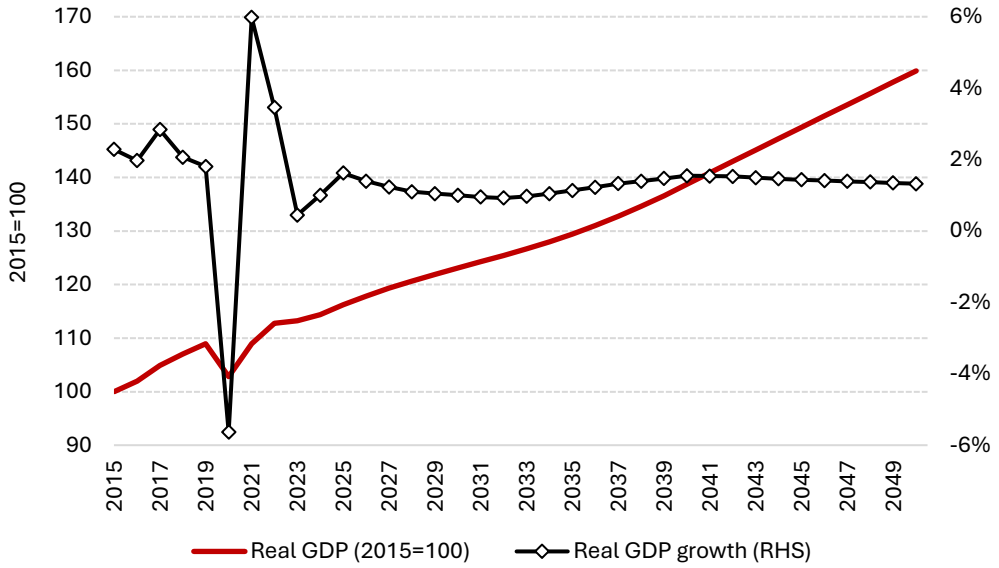
Economic projections have taken place in an unusually unstable context in the past few years, as the EU and world economies were hit first by the COVID pandemic and second by Russia's war of aggression against Ukraine, with the ensuing sharp increase in international energy prices. The GDP projections for 2025 rely on the Spring Forecast[39] of the Directorate General for Economic and Financial Affairs (DG ECFIN). From 2025 onwards, the GDP growth projections converge to those prepared by DG ECFIN for the 2024 Ageing Report[40]. At EU level, real GDP is projected to be 23% higher in 2030 than in 2015, 39% higher in 2040, and 60% higher in 2050 compared to 2015.

Projections on the sectoral composition of GDP were prepared using the GEM-E3 computable general economic model. It is projected that the EU economy will continue to become increasingly services-oriented, with the sector's share rising from close to 74% of total gross value added (GVA) in 2016-2020 to around 75% in 2040 and 76% in 2050.

[39] DG ECFIN, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_6782

[40] DG ECFIN, 2024 Ageing Report. Economic and budgetary projections for the EU Member States (2022-2070).

Figure 7: EU GDP (2015 = 100) and GDP growth (%)



Source: DG ECFIN

1.2.2. International energy prices assumptions

The assumptions for fuel prices trajectories take into account the market conditions for 2025 but there are large uncertainties for the long term. Main sources for post-2025 trajectories are the projections from the POLES model in the Global Energy and Climate Outlook 2023 and the World Energy Outlook from the International Energy Agency. The table below shows the oil prices assumptions of the baseline used in this impact assessment.

Table 5: Fossil fuel price assumptions

EUR2023	Oil price	Gas price (NCV)	Coal price
	EUR/boe	EUR/toe	EUR/toe
2025	76	394	172
2030	85	377	169
2035	94	344	161
2040	97	422	160
2045	105	412	165
2050	121	403	166

1.2.3. Technology assumptions

Modelling scenarios on the evolution of the energy system is highly dependent on the assumptions on the development of technologies - both in terms of performance and costs.

Continuing the approach adopted in the long-term strategy in 2018 and for the Reference Scenario 2020, the Commission consulted on the technology assumption with Member States and stakeholders in 2024. In particular, the technology database of the main model suite (PRIMES, PRIMES-TREMOVE, POTEnCIA, GAINS, GLOBIOM, and CAPRI) were discussed with Member State during a meeting of the Reference scenario expert group on 5 June 2024. They also benefited from a dedicated consultation workshop with stakeholders, held on 22 and 23 October 2024. The technology costs assumptions for energy technologies including for industry are published together with the impact assessment report for the ETS review.

The discount rates for investing in these technologies differ per sector and are published in the Reference Scenario 2020 report[41] for the PRIMES model.

1.2.3.1. International aviation carbon pricing

Specific to the aviation sector, the offset price of CORSIA (expressed in EUR23/tCO2) is projected to increase from 30 EUR/tCO2 in 2030 to 83 EUR/tCO2 in 2035. No projections are made for later years considering CORSIA's defined end date in 2035 (subject to the "special review" in 2032 determining if and how the scheme should be continued). It is equally worth noting that modelling includes flights operated by EU-based airline operators between two third countries outside the scope of application of the EU ETS and subject to CORSIA. In 2023, such flights represented approximately 5% of emissions covered by CORSIA. Based on available data, it is speculative to project the 2023 share to future years: beyond typical fluctuations in activity levels, network planning through aviation partnerships determines the dynamics of routes and slot allocation. For this reason, these flights were not taken into account when calculating CORSIA offsetting costs, which in turn would result in modelling presumably slightly underestimating such cost estimates.

International jet fuel prices expressed in (EUR23/boe) are projected to increase by 14% approximately from 85 EUR/boe in 2030 to 97 in 2040.

SAF options are used as computed in PRIMES[42], resulting in slightly higher post-2035 ETS compliance prices compared to the PRIMES 85% (20 EUR/tCO_2). This slight difference is thus not relevant to the SAF support mechanism because dedicated allowances are projected to be used up by 2035 at the latest. It is equally worth noting that further breakdowns per feedstock category and production processes are used based on the underlying assumptions on fuel production within PRIMES. Such finer granularity results in SAF prices' projected evolution differing from PRIMES overall assumptions when assessing the options of an extended support mechanism for SAF uptake (cross-ref to relevant section, currently 8). SAF uptake being represented in the models consistently with ReFuelEU Aviation mandates results in synthetic fuels' use starting in 2030 with production costs used as a proxy to today's inexistent market price and held constant over the time period of relevance to this exercise. SAF produced from RED Annex IX Part A via advanced conversion processes (Alcohol-to-Jet, and Fischer-Tropsch) are conversely projected to lower production costs while still more costly than HEFA in the same period. Production costs are based on EASA's ReFuelEU Aviation Annual

[41] EU reference scenario 2020 - Publications Office of the EU

[42] PRIMES 87p_var3_v3

Technical Report[289]. This choice is justified out of precaution when considering fuel options not in commercial production today. Assumptions are aligned with PRIMES with respect to EU domestic production vs imported volumes of SAF.

2. SCENARIOS

The specific objectives of this initiative are to identify and assess pathways towards climate neutrality in 2050 and an intermediate target for 2040[43].

2.1. Baseline Scenario

The Baseline scenario in this Impact Assessment is used as a counterfactual scenario – with the EU ETS as currently legislated: meeting the emissions reduction target in 2030, and post-2030 gross emissions under the EU ETS will reduce yearly as defined by the linear reduction factor. The scenario will be used as the comparison basis to analyse and assess the impacts of the alternative policy options compared to the unchanged policy setup for the EU ETS and broader EU climate goals (overall GHG emission reduction target, renewable and energy efficiency objectives).

The Baseline scenario was reproduced with the PRIMES model for the EU level and at member state level. GEM-E3 and POLES-Enerdata models integrate elements of the Baseline scenario produced with the PRIMES model, by aligning assumptions and scenario narrative. However, it was not possible in the modelling to reproduce fully the linear reduction factor of 4.4% until 2040. A scenario, called PRIMES-MAX, utilizes the technical potentially available. While the scenario provided technical information, it is not the key scenario to which economic data is compared, as the change in ambition level would dominate the differences between all other aspects of the policy options.

Table 6: Overview of the development of the baseline at the non-EU level

	Baseline / PRIMES MAX
The energy and climate policies that we will consider in non-EU countries impact the carbon leakage	Options: 1. Current policies in non-EU countries (suggested option) – legislated up until 2023 – e.g., China NDC not included. 2. nationally determined contributions (NDC) until 2030 and frozen policies after 2030. 3. NDC until 2030 and long-term strategy (LTS) afterwards.

At the EU level and in the context of the EU ETS revision impact assessment, the Baseline scenario can be summarised with the following points:

- *GHG scope :* Domestic countries + intra-EU aviation + 100% international intra-EU maritime + 50% international extra-EU MRV maritime + 50% international extra-EU aviation (incoming and outgoing).
- *EU ETS cap:* follows the EU ETS emissions reduction trajectory *as currently legislated.*

[43] The model-based analysis is a technical exercise based on a number of assumptions that are shared across scenarios. Its results do not prejudge the future design of the post-2030 policy framework.

- *EU ETS scope:* follows the EU ETS scope *as currently legislated, where the aviation scope from 2027 onwards is***:** domestic, intra-EEA flights and extra-EEA flights (outgoing and incoming).
- *Removals in EU ETS***:** Carbon removals (from BECCS or DACCS) do not contribute to the yearly decrease of emissions under the EU ETS.
- *CCU in EU ETS***:** Fossil CO_2 emissions captured from installation under ETS and used to produce synthetic fuels count as emissions under ETS.

The detailed overview of PRIMES Baseline scenario specifications is provided in Table 7.

Table 7: Overview of the development of the baseline at the EU level

	Baseline / PRIMES MAX
International fossil fuel prices (oil, gas, coal)	Assumptions as presented in section 1.2.2.
Technology assumptions, coal, nuclear, CCS capacities	Technology assumptions as presented in section 1.2.3. and capacities based on Member States' latest announced capacity developments, and information in final updated NECP[1], as well as information collected during bilateral meetings with Member States.
Population, GDP/ macroeconomics/ activity levels	Assumptions as presented in section 1.2.1.
2030	
EU ETS emissions reduction target / cap and scope	The cap follows the EU ETS emissions reduction trajectory as currently legislated. The EU ETS aviation scope **includes extra-EEA aviation from January 2027**. CO2 emissions from installation under EU ETS and used to produce e-fuels are accounted for under the EU ETS at the point where they are captured.
EU RES share in final energy consumption	Can deviate from the legislated target in 2030, driven by the GHG emissions reduction target.
Total GHGs emissions	As currently legislated.
Reduction in final energy consumption relative to the projection in the EU 2020 Reference scenario	Can deviate from the legislated target in 2030, driven by the GHG emissions reduction target.
2040	
EU ETS emissions reduction target / cap and scope	As currently legislated
EU RES share in final energy consumption	Post 2030, the RES share as observed in the scenario, is the result of implemented policies and scenario specifications.

Total GHGs emissions	The scenario does not assume the overall net GHG objective post-2030, the GHG emissions reduction observed, is the result of policies implemented and scenario specifications.
Reduction in final energy consumption	Post 2030, the reduction in final energy consumption as observed in the scenario, is the result of implemented policies and scenario specifications.
2050	
Total GHGs emissions without LULUCF	Achieve climate neutrality by 2050.
EU ETS Impact Assessment thematic policy measures	
EU ETS cap trajectory	In line with existing legislation (as amended by ETS 2023/959)
ETS2 cap trajectory	In line with existing legislation (as amended by ETS 2023/959)
Carbon Leakage	
Policy measures	In line with existing legislation (as amended by ETS 2023/959)
MSR EU ETS	
Policy measures	In line with existing legislation (ETS 2023/959)
Potential inclusion of permanent carbon removals	
Policy measures	Permanent removals excluded from the ETS (existing legislation (ETS 2023/959))
Potential inclusion of municipal waste incineration (MWI) and other waste management processes	
Policy measures	Waste management activities not included (in line with existing legislation (ETS 2023/959))
Carbon Capture and Use (CCU):	
Policy measures	Upstream accounting - Emitter pays for the carbon molecule

2.2. 85% Policy Scenario

The PRIMES85 scenario serves as a basis for the assessment of EU ETS policy options. The scenario aims at achieving 85% reduction of net GHGs in 2040 and climate neutrality in 2050. Main changes compared to the Baseline scenario at the EU level can be summarised with the following points:

- *GHG scope:* Domestic countries + intra-EU aviation + 100% international intra-EU maritime + 50% international extra-EU MRV maritime + outgoing extra-EEA aviation.
- *GHG emissions reduction ambition:* achieving 85% reduction of net GHGs in 2040 and climate neutrality in 2050.

- *EU ETS cap*: the scenario does not aim at following the EU ETS trajectories as in the Baseline scenario.
- *EU ETS scope*: domestic flights within EU-27 countries (except to and from outermost regions), intra-EEA flights (including non-domestic flights to and from outermost regions) plus departing flights to UK and Switzerland, outgoing extra-EEA aviation.

Table 8: Overview of the development of the policy scenario at the EU level

	Policy scenario
2040	
EU ETS emissions reduction target	The reduction of EU ETS emissions as observed in the scenario, is the result of implemented policy options and scenario specifications. The cap trajectory will be the subject of the policy option design.
EU RES share in final energy consumption	Post 2030, the RES share as observed in the scenario, is the result of implemented policies and scenario specifications.
Total GHGs emissions	Aims at achieving 85% reduction of net GHGs in 2040 and climate neutrality in 2050, considering the following net GHG scope: domestic countries + intra-EU aviation + outgoing extra-EEA aviation + 100% international intra-EU maritime + 50% international extra-EU MRV maritime.
Reduction in final energy consumption	Post 2030, the reduction in final energy consumption as observed in the scenario, is the result of implemented policies and scenario specifications.
2050	
Total GHGs emissions without LULUCF	Achieve climate neutrality by 2050 (assuming LULUCF net sink of 250-275 Mt).
Impact Assessment thematic policy measures	
EU ETS cap trajectory	To be defined based on policy option.
Carbon Leakage	
Policy measures	To be defined based on policy option.
MSR EU ETS	
Policy measures	To be defined based on policy option.
Potential inclusion of permanent carbon removals	
Policy measures	To be defined based on policy option.
Potential inclusion of municipal waste incineration (MWI) and other waste management processes	

Policy measures	To be defined based on policy option.
Carbon Capture and Use (CCU):	
Policy measures	To be defined based on policy option.

Here, the elements which can be varied per policy option are not necessarily modelled in PRIMES but handled in different models like GEM-E3 for carbon leakage, POLES for MSR, and various post-hoc analysis for the other options, using PRIMES results.

A version of this scenario attaining in 2035 an economy-wide GHG emissions level consistent with a pathway towards a 90% target in 2040, but thereafter consistent with an 85% target in 2040, has also been used.

2.3. Integration of different models

The key analytical approach followed in the impact assessment has been to use the PRIMES 85 scenario and using its outputs and variants to analyse policy options.

Data about energy use, investments, technology deployment and other key drivers generated in the PRIMES 85 run have been provided to the GEM-E3 model for macro-economic analysis. The GEM-E3 model then provides macro-economic indicators showing the sectorial impact of the different policy options for dealing with carbon leakage prevention (see Annex 12, section 1.3). Similar data has been provided to the POLES model to provide analysis of MSR measures, calibrated to specific PRIMES scenarios, but providing broader insights.

Other measures have been analysed through analysis of PRIMES results, including by varying removals amounts and costs, to represent different measures.

3. MODELLING FOR THE MARKET STABILITY RESERVE (POLES-ENERDATA)

The objective of this section is to present the methodology used for the quantitative modelling work, using the POLES-Enerdata model, to support the analysis of the Market Stability Reserve (MSR). POLES was selected for the MSR modelling exercise instead of PRIMES, POTEnCIA, or GEM-E3 because it is a comparatively lightweight model, enabling faster simulations of scenarios and sensitivity analyses. By contrast, PRIMES and POTEnCIA are substantially more complex and require much more time and resources produce results for a single variant, making them less suited for exploring a large number of sensitivities and variants. To ensure consistency with across the different models, the cap trajectory implemented in POLES was aligned with the cap derived from the PRIMES. Although the outputs generated by PRIMES and POTEnCIA are generally more detailed and are considered more robust, POLES nonetheless provides useful insights, particularly with regard to the relative impacts observed across the measures and policy options for the MSR.

3.1. Approach for MSR analysis

The quantitative analysis of the MSR is based on two successive phases. First, a measure-level analysis is undertaken, with the aim to define possible MSR designs that best support the system's stability and resilience to shocks. This measure-level analysis is based on a standard situation, referred to as the MSR core working assumption scenario (or MSR0 measure), which aims to represent one possible base trajectory for the future evolution of the EU emission reductions and of the EU ETS cap, as opposed to the legal default configuration which would lead to an over-constrained system by 2040. The core working assumption scenario definition (presented below) had to be set before the final version of the Policy scenario was ready and

was defined to be close enough to the final versions tested in the next phase of policy option-level analysis. Indeed, the calibration of the POLES-Enerdata model for the CWAS was based on the PRIMES scenario for a 90% economy-wide target available on 30 May 2025. Despite these, PRIMES results having been updated subsequently, POLES-Enerdata used the intermediate results in order to be able to deliver the MSR results for the measure-level analysis within the deadline set by the contract. However, the MSR analysis at the policy options level was done using the most recent PRIMES results available for the 90-85% target, on 31 March 2026.

Then, the obtained robust MSR designs were indeed incorporated as part of policy options. This phase allowed to fine-tune and validate the parameters of the MSR configuration, in the actual context of the final considered scenario.

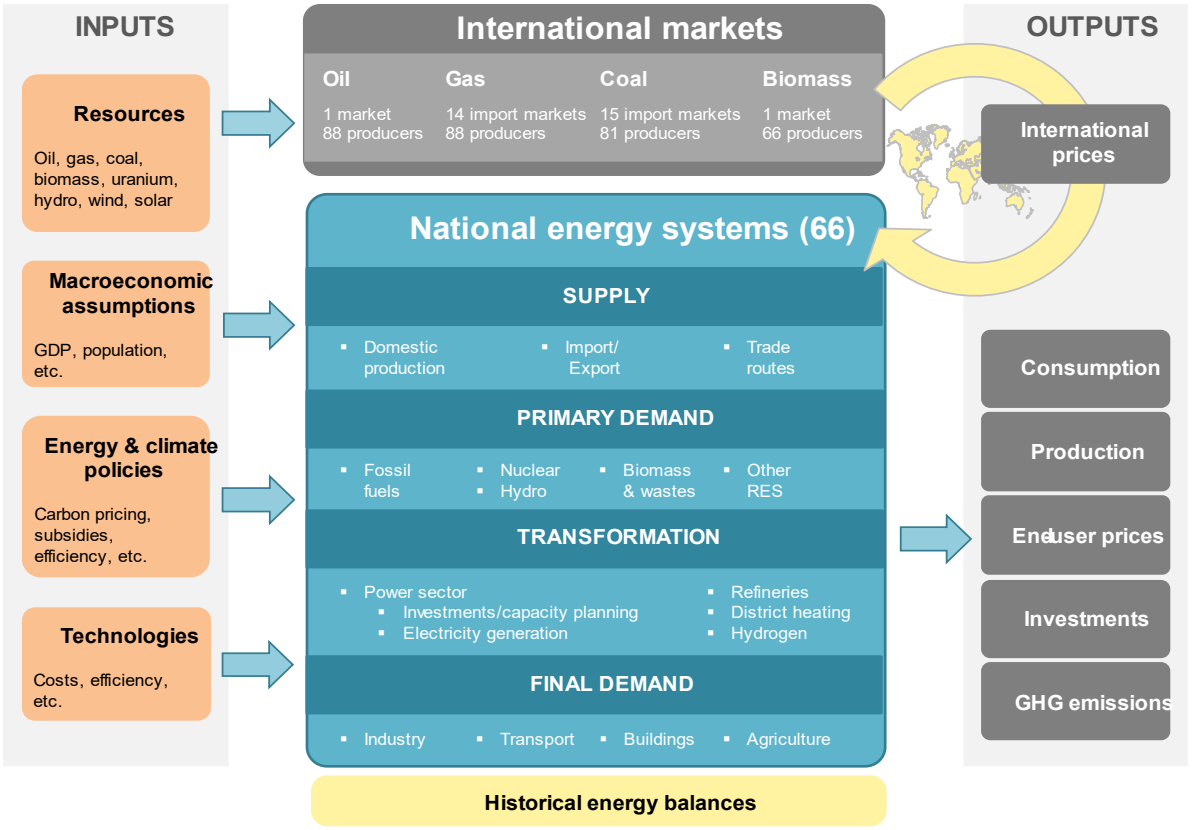
3.2. Presentation of the model

Enerdata used the POLES-Enerdata model to do this modelling task.

The POLES model has been initially (early 1990s) developed by IEPE (Institute for Economics and Energy Policy), now GAEL lab (Grenoble Applied Economics Lab). Today, it is co-developed by 3 entities: the GAEL lab, the Joint Research Centre of the European Commission in Sevilla, and Enerdata. Each entity has ownership of its own version of the model, which is not open-source. POLES-Enerdata is the version of the POLES model owned, maintained and operated by Enerdata. It is continuously updated, developed and used in the framework of numerous studies for public and private actors in the EU and globally.

The POLES-Enerdata (Prospective Outlook on Long-term Energy Systems) model is a recognised multi-issue energy model that relies on national energy balances combined with economic, policy and technological scenarios to withdraw energy production, consumption, and greenhouse gas (GHG) emission projections. The figure below shows the general structure of the model, with its main inputs, outputs and covered sectors.

Figure 8: POLES-Enerdata multi-issue energy model



Source: Enerdata

Enerdata co-develops and uses the internationally recognised POLES-Enerdata model to provide quantitative, scenario-based, empirical and objective analyses. Because the POLES-Enerdata model is used for many members of the energy sector (industry, governments, European Commission, etc.), it is very well adapted to forecast the effects of different energy-related engagements (demand-supply, GHG emissions limitations, promotion of renewables and energy efficiency, energy security issues, etc.). In addition, with its global coverage and the endogenous calculation of demand, supply and prices of numerous energies including oil, gas, and coal, the POLES-Enerdata model is very relevant to capture all the impacts of energy policies and climate change measures and to ensure that all the forecasts are coherent within the global environment.

The model is a world energy-economy partial equilibrium simulation model of the energy sector, with complete modelling from upstream production through to final user demand and greenhouse gas emissions. The simulation process uses dynamic year-by-year recursive modelling, with endogenous international energy prices and lagged adjustments of supply and demand by world region, which allows for describing full development pathways to 2050. The below figure presents the geographical coverage of the POLES-Enerdata model, with a global coverage including 66 countries or country aggregates. All EU Member States are covered individually.

Figure 9: POLES-Enerdata geographical coverage

66 countries/regions

Regions	Sub-regions	Countries	Country aggregates
North America		USA, Canada	
Europe	EU27	France, Italy, Germany, Austria, Belgium, Luxembourg, Denmark, Finland, Ireland, Netherlands, Sweden, Spain, Greece, Portugal, Hungary, Poland, Czechia, Slovakia, Slovenia, Malta, Cyprus, Croatia, Bulgaria, Romania	Baltic states
		United Kingdom, Iceland, Norway, Switzerland, Turkey	
			Rest of Europe
Japan – South Pacific		Japan, Australia, New Zealand	Rest of South Pacific
CIS		Russia, Ukraine	Rest of CIS
Latin America	Central America South America	Mexico Brazil, Argentina, Chile	Rest of Central America Rest of South America
Asia	South Asia South-East Asia	India China, South Korea, Indonesia, Malaysia, Thailand, Viet Nam	Rest of South Asia Rest South-East Asia
Africa / Middle East	North Africa Sub-Saharan Africa Middle-East	Egypt, South Africa Saudi Arabia, Iran	Rest of North Africa x2; Rest of Sub-Saharan Africa; Gulf countries; Rest of Middle East

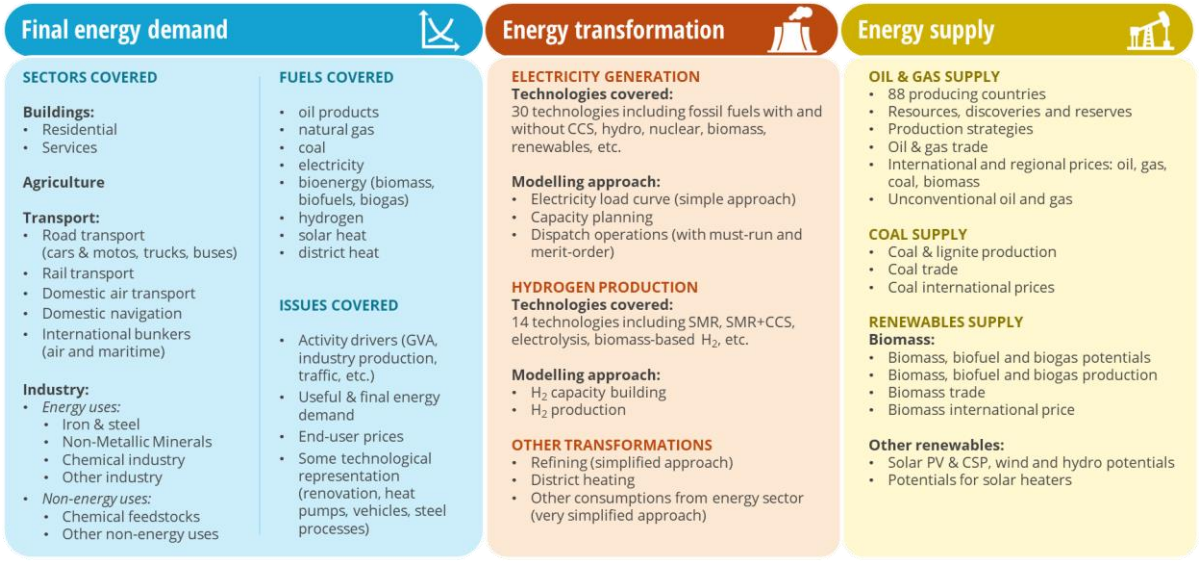
Source: Enerdata

The use of the POLES-Enerdata model combines a high degree of detail for key components of the energy system and a strong economic consistency, as all changes in these key components are influenced by relative price changes at the sectoral level. The model provides technological change through dynamic cumulative processes such as the incorporation of Two Factor Learning Curves, which combine the impacts of "learning by doing" and "learning by searching" on technologies' development. As price induced diffusion mechanisms (such as feed-in tariffs) can also be included in the simulations, the model allows for consideration of key drivers to future development of new energy technologies. One key aspect of the analysis of energy technology development with the POLES-Enerdata model is indeed that it relies on a framework of permanent inter-technology competition, with dynamically changing attributes for each technology.

The model provides a complete endogenous calculation from upstream activities (supply, prices of several energies including oil, gas and coal) to final user demand. POLES-Enerdata offers a mixed approach based on:

- a "top-down" modelling for sectorial demand, which is directly related to activity, prices and technologies through econometric equations; for each key economic sector energy consumption is distinguished between substitutable fuels and electricity; and
- a "bottom-up" approach for the power sector (explicit representation of each type of technology as well as their costs).

Figure 10: POLES-Enerdata main issues and topics covered



Source: Enerdata

Key features of the POLES-Enerdata model are summarized in the following:

- Long-term (up to 2050) simulation of world energy scenarios/projections and international energy markets;
- World energy supply scenarios by main producing country/region with consideration of reserve development and resource constraints (88 producing countries/regions);
- Outlook for energy prices at international, national and sectoral level;
- Disaggregation into 15 energy demand sectors, with over 40 technologies (power generation, buildings, transport);
- Detailed national/regional energy balances, integrating final energy demand, new and renewable energy technologies diffusion, electricity, hydrogen and Carbon Capture and Sequestration systems, fossil fuel supply, and uranium (66 consuming countries/regions);
- Full power generation system (and feedback effect on other energies);
- Impacts of energy prices and tax policies on regional energy systems;
- National greenhouse gas emissions and abatement strategies; costs of national and international GHG abatement scenarios with different regional targets/endowments and flexibility systems;
- CO_2 emissions Marginal Abatement Cost Curves and Emission Trading System analyses by region and/or sector, under different market configurations and trading rules;
- Technology diffusion under conditions of sectoral demand and inter-technology competition based on relative costs and merit orders; and
- Endogenous developments in energy technology, with impacts of public and private investment in R&D and cumulative learning experience. Induced technological change of climate policies.

The POLES model benefits from numerous references, including public study reports, mentions in official publications from the European Commission, project references and academic references. In particular, it has recently been used as part of a study supporting the European Commission's Impact Assessment on the 2040 Climate Target in 2024.

Furthermore, although the full documentation of Enerdata's version is not publicly available, the one from the EC-JRC's version is.[44] Both models are very similar in terms of core logic, and only a few recent developments on both sides have made them diverge on some aspects of the modelling.

3.3. Baseline scenario design

The Commission designed scenarios which were ran with the PRIMES model by Ricardo-E3M, which serve as bases for the present study.

These PRIMES-based scenarios include the baseline scenario, a "90% economy-wide scenario", and a "85% economy-wide scenario".

In the MSR measure-level analysis, the calibration of the POLES-Enerdata model for the core working assumption scenario was based on the "90% economy-wide scenario" available on 30 May 2025. In spite of these PRIMES results having been updated subsequently, intermediate results were used in order to be able to deliver the MSR results for the measure-level analysis within the deadline. For the policy option level analysis, the POLES-Enerdata baseline was based on the 90-85% var3 scenario sent by PRIMES on 15 December 2025.

The E3M team provided Enerdata with the GHG emissions for each consumption sectors and each EU ETS sector with a 5-year time step. Carbon prices trajectories were also provided for both the EU ETS and the ETS2 perimeters. The "90% economy-wide scenario" includes half of the emissions from extra-EU international aviation ("one way inclusion").

Enerdata reproduced this scenario within the POLES-Enerdata model by targeting the same GHG emissions evolution for 2030 and 2050, looking at: total emissions, ETS-level emissions, and some specific sectors (notably: power generation). The aim of this approach is to align the emission reduction effort sharing between the EU ETS and other instruments, captured as part of the PRIMES model through the explicit inclusion of national policies.

3.4. Adaptation of the baseline with MSR modelling

3.4.1. MSR methodology applied to the core working scenario

Based on the core working assumption scenario, Enerdata would run the POLES-Enerdata model with its added ETS optimisation module, which explicitly represents MSR operations, and whose parameters are presented in detail below.

One of the results from the optimisation module is an indexed EUA price trajectory, as the specificities of the EU ETS market are represented and a limited foresight of the market from actors is considered (which inherently differs from PRIMES). The model calculates the EUA price evolution, based on a supply-demand equilibrium. These modelling outputs should not be considered as actual forecasts, as the model cannot perfectly capture the broader policy mix and relies on simplified assumptions for the regulated entities' behaviors. The post-2040 period also has impacts on the output price trajectory due to a modelled actors' anticipation horizon. The price results should therefore be considered with caution, however the main trends

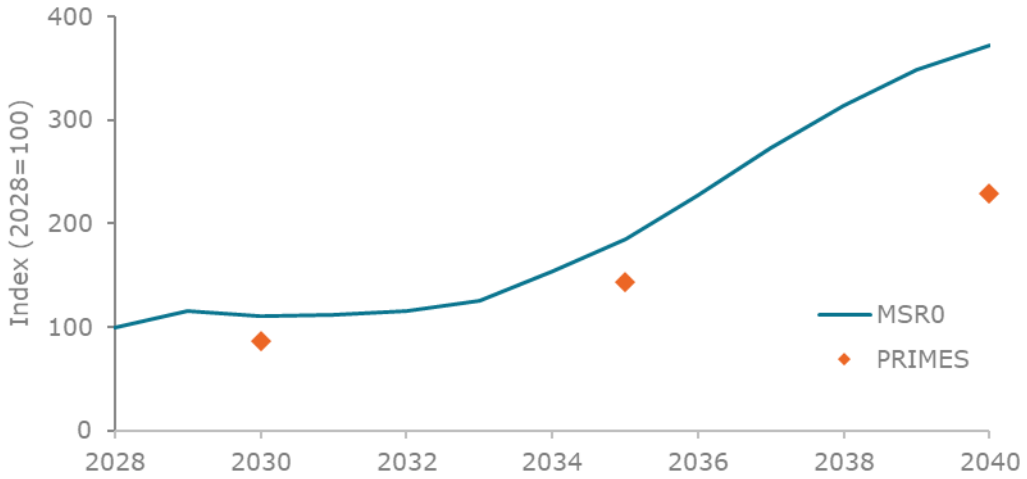
[44] Full documentation of the EC-JRC version of the POLES model can be found at: https://ec.europa.eu/jrc/en/publication/poles-jrc-model-documentation

observed, also validated with qualitative reasoning, are instructive and provide a very useful comparison framework for the different measures. All prices are provided as index considering 2028 as the base year.

As a result, a POLES-Enerdata core working assumption scenario is produced, consistent with the PRIMES 90% scenario (to which one-way extra-EU aviation is added to the ETS scope in 2027), and with the carbon price trajectory assessed with the MSR methodology. This scenario is taken as a basis for the different runs and sensitivities analysis envisioned as part of the quantitative measure-level assessment.

As shown on **Error! Reference source not found.**, the indexed price outlook in POLES-Enerdata is not aligned with the initial 90% scenario from PRIMES to which the CWAS was aligned. This difference is explained by the differing methodologies used: in PRIMES, the carbon value is an input of the model, and the ETS and MSR operations are not directly endogenously represented. PRIMES also uses a benchmark approach with foresight up to 2050. In POLES-Enerdata, the price is the output from an optimization, which explicitly accounts for the ETS and MSR operations, and which works with a limited rolling anticipation horizon. These elements are the key factors explaining the differences observed.

Figure 11: EUA price comparison between POLES-Enerdata & PRIMES - Core Working Assumption Scenario



Source: POLES-Enerdata, PRIMES.

Note: Primes prices are indexed with 2028 POLES-Enerdata for model comparison.

3.4.2. Modelling the removals

In POLES-Enerdata, removals (both BECCS and DACCS) are modelled in the following way: it is agreed that the volume of CO_2 captured can be considered as an exogenous hypothesis. The level of captured CO_2 of BECCS and DACCS provided by PRIMES are considered as added in the gross cap. The development of these technologies is set exogenously in the model, bypassing its usual endogenous equations. This solution allows us to take into account the BECCS and DACCS contributions in the market by adding removals without having to assume any explicit mechanism for how they are integrated into the system. Also, the level of removals will not depend on the sensitivities ulteriorly run. In both cases, removals are excluded from the EU ETS emission perimeter.

3.4.3. Market parameters

This section presents the different scopes and parameters considered in the modelling of the EU ETS market and the MSR and provide the default values of these parameters, some of which are then modified in the different scenarios run for the analysis.

3.4.3.1. Geographical perimeter covered for the EU ETS market:

The geographical perimeter within the EU ETS is the EU27, Norway, Iceland and Liechtenstein. Emissions can be assessed for both this "EEA" perimeter and the EU27 perimeter allowing us to follow the PRIMES figures.

3.4.3.2. Sectoral perimeter accounted in the EU ETS market

Emissions from electricity generation are assumed fully accounted for in the EU ETS market

- Emissions from the industrial sector, in particular
    - Emissions from manufacturing industry sectors such as chemicals, non-metallic minerals, steel, and other industries
    - Non-CO_2 emissions from industry: PFC from aluminium production & N2O from industry
    - Emissions from the hydrogen production sector
    - Emissions from the district heat production sector
- Emissions from the energy transformation sector.
    - Emissions from aviation (domestic & intra-EU since historically, extra-EU one-way starting 2027) and maritime (starting 2024) transport are considered exogenously in the modelling, with values based on the PRIMES 90% scenario. In the model, these aviation and maritime emissions are considered as an exogenous added demand for EU ETS allowances. The amount of allowances required for these sectors are therefore deducted from the EU ETS cap to reflect the contribution of these sectors in the EU ETS market.
    - This means that, for the purpose of MSR measure-level analyses, we assume that the aviation and maritime emissions will not be affected by the changes in the ETS price. In other words, we neglect the retroactions on aviation and maritime emissions through the price. This assumption enables to simplify the modelling work, also accounting for the fact that modelling price effects for mobility demand internationally is complex. Finally, some sensitivities to shocks will be studied as part of the measure analysis, some of which could simulate a different EUA demand from aviation and maritime.

3.4.3.3. Cap of emissions:

The cap taken into account is provided by the EU Commission for each year between 2023 and 2050. There is consideration of

- Industry EU ETS energy CO_2
- Industry EU ETS non energy CO_2
- Industry EU ETS non-CO_2
- Supply Side, that gather power, heat and hydrogen production sectors

- Intra EU international Aviation
- Domestic Aviation
- EU ETS Navigation
- 50% of international aviation outside the EU: “International aviation one way”

3.4.3.4. Banking from industrials:

A quantity of allowances is assumed historically banked by industrial actors. It is assumed that industrial actors will use these EUAs in the short term in a context of sustained ETS prices. In practice, it is assumed that 350 $MtCO_2$ is banked in end-2023 by industrials and they will release this quantity until 2030 with the same amount per year: 50$MtCO_2$/year. The model treats the “banked allowances” as a temporarily unavailable supply, to reproduce the reality of the market operations.

3.4.3.5. Hedging from the electricity sector:

Hedging behaviour from power actors is represented in the model. Hedging is a crucial strategy for electricity producers to manage and stabilise costs or revenues by locking in prices in advance. It is assumed that electricity producers apply this strategy within the EU ETS market.

In the modelling, the demand for EUA computed when representing compliance, i.e. the supply-demand equilibrium leading to the formation of the price, accounts for the hedging from power producers, assuming that the corresponding quantity of EUAs is not available for trade. Therefore, instead of calculating the EUA demand for a year N as [industry emissions (within the EU ETS scope) year N + Electricity production emissions year N + Aviation and maritime transport emissions], it is calculated as [industry emissions (within the EU ETS scope) year N + Electricity production emissions year N not already covered by past hedging + Electricity production emissions hedging need for future years + Aviation and maritime transport emissions]. It is assumed that the hedging needs are considered for the 3 years in advance (with partial coverage of future emissions). The aim for hedging at year N is to cover 80 % of emissions of year N+1, 50% of N+2 and 10% of N+3. These are default settings, adjusted with historical data, and are configurable.

Emissions projections of years N+1, N+2 and N+3 for calculating hedging are considered constant and equal to emissions in year N.

3.4.3.6. Actors’ foresight:

It is assumed that there is not a perfect but a limited foresight for actors assessing the constraint of the market. In this case, 8 years foresight is taken into account as it is a common hypothesis seen in the literature.

3.4.3.7. MSR specific parameters:

- Upper buffer: 1096 MtCO2 until 2030; 947 MtCO2 from 2031
- Upper threshold: 833 $MtCO_2$
- MSR intake:
  - If TNAC > Upper buffer:24% of TNAC until 2030 and 12% of TNAC from 2031
  - If Upper buffer > TNAC > Upper threshold: TNAC – Upper threshold
- Lower threshold: 400 $MtCO_2$

- MSR release: 100 $MtCO_2$
- Maximum volume in MSR reserve: no limitation until 2023, then 400 MtCO2 in 2024 and after because of the invalidation mechanism

3.5. Assessing the impact of the policy options on the functioning of the MSR

The policy options bring together sets of measures across all thematic areas of the project, and hence from a combined effort from all working groups. Three main scenarios are constructed in the PRIMES model to analyse results from the options on most thematic areas, although for the MSR aspects, the POLES-Enerdata is required.

The 3 policy options are indeed assessed quantitatively with the POLES-Enerdata model to quantify their impacts in terms of MSR. Similarly to the measure-level assessment, the model allows to simulate the EU energy systems, with an explicit representation of the EU ETS and its MSR design. The endogenous evolution of key indicators such as the ETS-covered emissions, the TNAC, the MSR operations and the EUA price evolution, for each considered policy option, are analysed in this section.

The 90-85% scenario from PRIMES, available on March 31st, 2026, is the starting point for the MSR option-level analysis. This scenario has been calibrated in the POLES-Enerdata model, to build upon the repartition of effort between ETS-covered emissions and other emissions calculated in PRIMES (exactly as the 90% scenario was used for the measures level assessment). In practice, the POLES-Enerdata scenario has been built by targeting the 90-85% scenario emissions provided by PRIMES for the ETS sectors (power generation and industry & other supply side) and non-ETS sectors as transports and buildings. Then, the different policy options are design incrementally to this reference case.

Using the 90-85% scenario for the policy option analysis was a compromise to ensure a timely delivery of results. Theoretically, it would have been needed to run the POLES-Enerdata model on the results of each PRIMES policy-option runs (incorporating the impacts from other thematic areas). However, given the delayed availability of results for policy option scenarios, it was decided to use only the 90% scenario for the MSR-focused analysis. The assumption is that the changes introduced in the other thematic areas have only a small impact on the MSR operations. In addition, the expected co-decision process to come at the EU level could lead to changes in the actual cap implemented. These changes are likely to have a magnitude as high (if not more) than what other thematic areas would induce in the model. Hence the choice to use a simple approach.

It should be noted that this 90-85% scenario differs somewhat from the 90% scenario, notably in that it assumes that non-carbon price efforts for electricity decarbonisation are greater in the 90-85% scenario. The impact on the POLES-Enerdata MSR optimisation is that prices are automatically lower for the same EU ETS market design. Therefore, the results of the level of measures analysis and the policy options analysis should not be compared in terms of carbon prices.

As with MSR assessment measures, the optimization of the EU ETS system price using MSR modelling is based on an equilibrium on stationary emissions that include the power, industry, and other supply-side sectors. Aviation, maritime transport, and removals are considered as an exogenous EUA demand in the POLES-Enerdata model.

The 3 main policy options studied here are defined below for the MSR part:

- Policy option 1 (PO1). For the MSR part, this policy option takes into account the MSR1 measure previously presented in the MSR annex Section 1.3.1.

- Policy option 2 (PO2). For the MSR part, this policy option takes into account the MSR3 measure previously presented in the MSR annex Section 1.3.1. The contribution from the waste sector to the EU ETS is considered as an exogenous demand in POLES-Enerdata.
- Policy option 3 (PO3). For the MSR part, this policy option takes into account the MSR3 measure previously presented in the MSR annex Section 1.3.1. The contribution from waste and landfills sectors to the EU ETS is considered as an exogenous demand in POLES-Enerdata.

PO2 envisages a net cap approach where removal credits must be purchased by market participants to offset their emissions, whereas the philosophy behind PO3 is a gross cap approach for participants, with an instrument (to be designed at a later stage by the European Commission) providing the market with the required amount of removals that develop in the 85% scenario.

The results of POLES-Enerdata are identical across these two scenarios, since the aviation and maritime transport sectors, BECCS and DACCS removals, and added waste and landfills are considered as additional exogenous demand on the market. Consequently, for POLES-Enerdata, the cap envisaged for optimising the MSR price on stationary installations (electricity + industry) is the same. This is why, in the section presenting the results, the TNAC, MSR and carbon price indicators are identical.

In theory, as removals could be modelled endogenously in the POLES-Enerdata model, a more in-depth analysis of PO2, considering endogenous development of BECCS and DACCS with their own production costs, would have been interesting and would have shown differences with PO3, as the marginal cost of the technology should have an impact on the EU ETS market price equilibrium.

ANNEX 5: COMPETITIVENESS CHECK

1. OVERVIEW OF IMPACTS ON COMPETITIVENESS

Competitiveness Check summary

Dimension of competitiveness	**Impact of the initiative (++ / + / 0 / – / — / n.a.)**	**References to sub-sections of the main report or annexes**
Cost and price competitiveness	+	Compared to baseline a combination of more gradual cap reduction, continued free allocation, carbon removal integration and reform of Market Stability Reserve promotes overall competitiveness and reduces the unit cost of production [6.2.3.1, 6.2.3.2, 6.2.3.6] Industrial Decarbonisation Bank supports investments in industrial decarbonisation and helps to limit the increase in the carbon price with positive impacts on costs and price competitiveness [6.2.3.3] Modernisation Fund supports lower income Member States improve their competitiveness through investments in modernising their energy systems and energy efficiency or electrification. [6.2.3.3] Moderate impact in aviation overall. Costs are passed through and incurred on the basis of equal treatment on routes. Avoidance of double-pricing of emissions through the deduction of CORSIA offsetting costs. Increased compliance costs for small operators of business jets. Enhanced market for sustainable aviation fuel due to extended support [6.1.1.5] Mixed impact in the maritime sector. Positive impact across the maritime sector, by supporting sustainable fuels and clean propulsion technologies, including for smaller vessels. Combined positive economic impact from action to address further the risk of evasion by containerships and offshore vessels as well as avoiding double payment in case emissions are priced under a future IMO mid-term measure. Increased compliance costs for smaller vessels [6.2.3.5] Inclusion of waste sector, combined with accounting change for carbon, capture and utilisation (CCU), can increase waste management costs in the short-term while promoting new opportunities for circular carbon products and biogenic carbon removals. [6.2.1.7, 6.2.1.8, 6.2.3.7] Modelling indicates higher sectoral employment compared to baseline for some industries. [6.3.1.6]
International competitiveness	+	Benefits to cost & price competitiveness above can be expected to improve international competitiveness. Economic modelling indicates higher exports and reduced imports in the preferred option compared to the baseline [Annex 12, Section 1.4.2.4].

Capacity to innovate	+	Positive impact expected due to a combination of financial support measures to specific innovations (e.g. Industrial Decarbonisation Bank calls, Sustainable Aviation and Marine Fuels and technologies) as well as market-based incentives promoting other innovations (e.g. CCU, carbon removal, waste) as well as enhanced energy-efficient solutions [6.2.3]
SME competitiveness	+	Entities affected by the preferred option are mainly larger enterprises. Fixed costs related to administrative effort affect SMEs disproportionately. Therefore, they will be particularly affected positively by simplification measures in aviation, maritime and waste [6.2.2.3, 6.2.2.4 & 6.2.4.4] and by the streamlining of free allocation [6.2.2.5]. On the other hand, they will be negatively affected by the expanded conditionality in free allocation [6.2.1.6], and extension of ETS maritime to smaller vessels [6.2.4.2]. Analysis in this impact assessment mostly assumes that operators with low emissions (e.g. small stationary installations, or small maritime vessels) are more likely to be SMEs than operators of larger installations, vessels or fleets. Annex 6 contains analysis using the standard definition of SME (related to corporate size).

2. SYNTHETIC ASSESSMENT

The preferred policy option is assessed as positive across all competitiveness dimensions. It strengthens the carbon-pricing framework while maintaining transitional safeguards for industry and providing clear incentives for investment in climate-neutral technologies.

2.1. Cost and price competitiveness

Macro-economic modelling (in Annex 12, Section 1.4.3.1) indicates that, compared to the baseline, the preferred option is expected to have a positive impact on GDP, industrial production and exports, as well as lowering unit costs of production.

The preferred option maintains cost stability for industrial operators by setting an emissions reduction trajectory that is more gradual compared to the the baseline, while still representing a fair contribution to the EU's economy-wide climate target for 2040. The resulting cap on emissions provides more emission space for industry, as well as it results in a higher free allocation budget available compared to the baseline. Through a reformed system of free allocation, firms in sectors exposed to international trade continue to receive transitional protection from carbon leakage, but part of the free allocation is made conditional on investments in decarbonistion. This approach keeps average compliance costs manageable, while improving the efficiency of support and supporting further investments in European industry. In addition, Industrial Decarbonisation Bank (IDB) will support the front-runner projects implementing industrial decarbonisation projects.

Modelling results indicates that unit production costs decrease relative to the baseline thanks to energy-efficiency gains and innovation uptake. Carbon-price predictability under the reformed MSR further limits volatility and allows operators to plan investments effectively.

In aviation, modelling results indicate a modest increase in demand and employment, and a decrease in prices compared to the baseline. There is no double-pricing of emissions, because airlines can deduct costs for CORSIA offsetting.

For maritime transport, positive effects are expected mainly from two measures; the support to shipping companies stemming from the recycling of part of the ETS revenues back to the maritime sector through the Sustainable Maritime Alternative Propulsion mechanism and from possible future cost savings for companies linked to the IMO deduction approach . Furthermore, lowering of the container transhipment incidence threshold is expected to further mitigate the risk of carbon leakage to non-EU ports and mitigate possible negative effects on e.g. employment and economic activity. Similar benefits apply when ensuring a level playing field for operators of offshore vessels active in EU waters, mitigating against evasive behaviour in this specialised sector. Limited economic impacts of expanding ETS scope to smaller vessels when considering the whole sector, though slightly more significant in some Member States.

2.2. International competitiveness

Model results show an increase in export volumes compared with the baseline, driven by productivity improvements and stronger technological positioning in low-carbon products. IDB support would help EU-based installations to apply decarbonisation technologies early on and secure technological leadership and position on the global markets. Continued free allocation for non-CBAM sectors preserves their global competitiveness during the transition and prevents any carbon leakage, while alignment with CBAM ensures coherence and fairness across sectors.

In aviation, the preferred option is expected to reduce passenger shift to non-EEA-based hubs, compared to the baseline. In addition, carbon leakage risks for tourism are expected to be low.

In maritime transport, the option to lower the container transhipment incidence threshold is expected to help further address the risk of evasion and the loss of container transhipment activity from EU ports to non-EU ports, where such loss might impact the surrounding EU economy. Addressing risk of evasion in the offshore maritime sector will not only ensure a level playing field between EU and non-EU offshore vessel operators but will also strengthen a sector that provides crucial support for the EU's energy and digital development. Similarly, the deduction of emissions priced under a possible future IMO mid-term measure from EU ETS will contribute towards level playing field for shipping companies operating to and from EU ports and non-EU ports.

2.3. Capacity to innovate

The preferred option maintains the capacity to innovate by supporting the business case for low-carbon innovation. This involves striking an appropriate balance between a strong price incentive (and therefore revenues to fund support measures), and a more gradual emissions reduction trajectory and measures to addresses the risk of carbon leakage.

For industry, linking free allocation to climate-neutral investment plans ensures that free allocation acts more effectively as an active driver of industrial transformation. This conditionality channels resources toward process innovation, electrification, and carbon-capture technologies, improving the EU's long-term productivity and technological leadership. Stable carbon-price expectations and expanded EU-level financing (IDB but also continuation of the Innovation Fund) reinforce these effects.

The preferred option also contains more specific measures that encourage innovation, including extended financial support for uptake of sustainable aviation fuel (SAF), and a dedicated decarbonisation support mechanism for maritime transport.

Furthermore, innovation capacity is also enhanced by the preferred option's proposed expansion of the EU ETS scope to include non-permanent CCU, waste incineration and carbon removal.

2.4. SME competitiveness

SMEs within scope face additional administrative requirements, notably on the preparation and period verification of proportionate investment plans to access free allocation, MRV reporting obligations, and possible supply chain implications of compliance. These burdens are administrative rather than cost-price in nature, and are mitigated by proportionality measures (maintained thresholds, simplified MRV), but do not amount to a net competitiveness loss or gain.

Annex 6 contains more detail summarising how this Impact Assessment has considered SMEs.

3. COMPETITIVE POSITION OF THE MOST AFFECTED SECTORS

3.1. Industry (stationary installations)

Overall, the industrial sector represented by large stationary installations represent the sectors most affected by the revision of the EU ETS.

Stakeholder consultations with industry highlighted the importance of continued free allocation and investment support to maintain their competitive position and support their decarbonisation efforts.

Quantitative analysis provided in Annex 12, section 1.4.2.4 provides insights into how alternative ETS design choices translate into heterogenous sectoral and macroeconomic impacts, relative to the baseline scenario by taking into consideration key drivers within scenario assumptions such as the different free allocation distributions across industry, as well as the different ETS coverage and cap stringency and alternative revenue recycling. Changes in the unit cost of production for selected sectors are presented in Tables 14 and 15 of Annex 12a. For example, chemical products, which receive the largest share of additional free allocations (compared to the baseline), exhibit the steepest decline in unit production costs under the policy measures. It is noteworthy that when free allocation is extended to both CBAM and non-CBAM sectors, ferrous metals sector becomes more competitive compared to cases when only non-CBAM sectors received free allocation. Production and exports respond heterogeneously across policy options relative to the baseline scenario, reflecting differences in free allocation, sectoral coverage, and revenue recycling (see Tables 16 -19 in Annex 12). Chemical products and non-metallic minerals, which experience reductions in unit production costs relative to the baseline, face higher domestic and external demand and therefore record higher levels of both production and exports across the policy options. Non-ferrous metals, chemical products, and non-metallic minerals display higher production and export levels due to improved competitiveness under PO2 scenarios. On the contrary, ferrous metals become competitive leading to higher production and exports only when free allocation is extended to both CBAM and non-CBAM sectors. Overall, the impact on production and export across policy measures and sectors relative to the baseline ranges from -0.56% to 1.61% for production and -1.09% to 4.63% for exports.

In all scenarios except those with alternative recycling schemes, an improvement in EU27 competitiveness is observed, reflected in higher exports. This outcome is driven by a higher allocation of free allowances to EU ETS sectors (e.g. PO1), reductions in labour and capital costs (e.g. PO2_50), and/or lower carbon prices required to meet the cap because of including waste emissions in the EU ETS (e.g. PO3). In the recycling scenarios, private consumption is the main driver of GDP growth, reflecting the lump-sum transfer of EU ETS revenues to households. In these cases, exports decline due to higher labour and capital costs, which arise from increased household demand and upward pressure on factor prices. In PO2 scenarios,

private consumption drops marginally as increasing electricity prices stemming from higher waste incineration, put pressure to the remaining disposable income.

The competitive position of electro-intensive industries remains supported by the continuation of the framework for compensation of indirect carbon costs (ICC). European Commission analysis has indicated that carbon costs accounted for up to 11% of industrial energy prices in the EU on average in 2025, with fuel costs, network charges and taxes each accounting for a larger share. As shown in Annex 12 (Section 1.4.2.1.2) the impact of indirect cost could diminish over time if the energy and industry sectors decarbonise and broader energy market reforms reduce the influence of carbon cost on electricity prices. On the other hand, ICC compensation may be needed at least in the short-term, and while direct emitting processes can benefit from free allocation. In order to ensure that ICC aid contributes to decarbonisation or other measures to reduce indirect carbon costs, the preferred option would amend the ETS Directive to add conditionality and reporting provisions.

3.2. Waste

By internalising the carbon footprint of waste disposal and promoting separate waste collection, sorting and material and carbon recovery and recycling, inclusion of municipal waste incineration is projected to foster the economic growth of the EU circular economy and recycling sector, with circular economy activities already representing around 1-2% of EU GDP [45] and generating almost 300 billion EUR in gross value added alongside 121.6 billion EUR in private investment in 2021[46] (2021).

It also offers considerable opportunities for biogenic carbon removal generation and enables the consideration of alternatives for how to account the emissions that are captured and used in non-permanent products, such as e-fuels and synthetic chemicals. Strengthening the recycling sector also delivers increased economic security, added value, employment, and long-term competitiveness potential for the EU economy by reducing reliance on imported virgin materials and price volatility, improving resource productivity, and strengthening innovation.

3.3. Aviation

The proposed changes to EU ETS affect the aviation industry in a number of different ways.

Demand is expected to increase compared to the baseline in both passenger and freight sectors (see Section 4 of Annex 10).

In terms of **operating costs** for airlines, the proposal is expected to increase fuel use (including Sustainable Aviation Fuel – SAF in line with the ReFuelEU Aviation mandate) due to increased demand and decrease in prices. Fuel use is expected to be 15% higher compared to the baseline.

However, **carbon costs as a percentage of total operating costs** are substantially lower than in the baseline, though they are expected to increase over time due to the application of CORSIA combined with EU ETS scope extension to departing flights (rising to 5.4% of operating costs by 2030, compared to 10.8% in the baseline).

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[45] OECD (2025). The Circular Economy in Cities and Regions of the European Union. Available at: https://www.oecd.org/en/publications/the-circular-economy-in-cities-and-regions-of-the-european-union_e09c21e2-en.html

[46] European Commission (2023) 306 final. Communication on a revised monitoring framework for the circular economy. Available at: https://www.europarl.europa.eu/RegData/docs_autres_institutions/commission_europeenne/com/2023/0306/COM_COM%282023%290306_EN.pdf

Regarding **competitive distortions,** for airlines with a higher proportion of flights on routes covered by the ETS, there is a risk that they are less able to cross-subsidise them from other routes. Several studies nevertheless argue that such cross-subsidisation is minimal. Also, the fact that SAF support is available for routes covered by the ETS channels more revenues back to the relevant airlines. Where the EU ETS applies to departing flights, airlines are also able to deduct any CORSIA offsetting costs.

3.4. Maritime

In relation to competitiveness impacts, the lowering of the container **transshipment** incidence threshold from 65 % to 50% should lead to the identification of additional "neighboring container transshipment ports", protecting the competitiveness of EU ports and helping avoid the negative impacts of relocation of container transshipment activities.

Amendments to relevant EU MRV and ETS elements to address the specific nature of offshore activities would ensure that all ships involved in offshore activities within EU Member States' territorial waters or Exclusive Economic Zones are subject to emissions regulation, regardless of their flag or port of origin. Consequently, it would promote a fairer and more level playing field for EU offshore shipping companies. However, it could slightly increase the administrative burden for both shipowners and regulators, due to the need for more detailed reporting and verification.

Additional compliance costs for smaller vessels are expected to be passed on to shippers and voyagers, which may have indirect impacts on **trade patterns and macroeconomic indicators**. Modelling of impacts of maritime policy options in GEM-E3 found that, for EU27 countries, GDP would drop by 0.001% in 2040 under both PO2 and PO3, which means that macroeconomic impacts are expected to be marginal on average. These effects are expected to be slightly more significant in FI, EL, SE, DK, due to higher dependency on transport provided by smaller vessels. Impacts on third countries are expected to be negligible, on average, with a drop in GDP estimated at 0.0003% in 2040.

4. OVERALL CONCLUSION

The competitiveness assessment finds that the preferred option delivers a balanced outcome.

Combined to the baseline, it delivers a generally positive economic outcome due to its more gradual pace of reduction (in line with the economy-wide 2040 target) and continuation of carbon leakage protection measures.

At the same time, it contains dedicated measures to enhance industrial competitiveness, encourage cost-effective decarbonisation, strengthen innovation capacity, and ensure that small operators are protected from disproportionate burdens.

ANNEX 6: THE SME TEST

1. OVERVIEW OF IMPACTS ON SMES

Relevance for SMEs
This initiative is relevant for SMEs, despite **most EU ETS installations belonging to large enterprises** (more than 250 employees and turnover larger than EUR 50 million, and/or balance sheet exceeding EUR 43 million)[47]. Based on corporate size (the standard definition of an SME) 88% of aviation operators covered by EU ETS belong to a large enterprise, and 74% of stationary installations. Since these are the largest firms, they represent an even larger share of employment and emissions. Apart from the corporate size measure, the EU ETS Directive, and measures considered in this Impact Assessment, also consider a more flexible treatment of small stationary installations and waste installations (typically as measured by thermal capacity), smaller ships (by gross tonnage), and aircraft operators (lower emissions). The maritime sector covered by EU ETS has a higher prevalence of SMEs with the previous impact assessment for the extension of the EU ETS to maritime transport finding that SMEs represents 95% of bulk carrier companies, 76% of oil tanker companies and 56% of containerships companies (European Commission, 2021), a share likely to be even higher for companies operating smaller vessels (between 400 and 5,000 GT). Using the number of vessels per company as a proxy of the company size, the recent report on the possible extension of the MRV Regulation to smaller vessels (European Commission, 2025) found that companies currently reporting under MRV are responsible for 2.6 vessels on average, compared to an average of 1.6 for companies managing smaller vessels.

(1) Identification of affected businesses and assessment of relevance
Are SMEs directly affected? *(Yes/No)* **In which sectors?**
As per Annex 3, Section 2.2.1, provisions are conceived to offer proportional treatment to smaller installations and operators. Above these thresholds, SMEs will be subject to the same policy provisions as other firms. In other words, employee numbers and turnover are not typically used as differentiating elements in EU ETS. However, the ETS framework provides simplified monitoring, reporting and verification rules for small emitters. Nevertheless, the potential impact on thousands of small installations is avoided through the proposal not to lower the 20 MW exemption threshold for stationary installations (see Annex 12, Section 2). Other ETS activities listed in Annex I of the Directive also include activity thresholds, preventing the inclusion in the ETS of the smallest installations. Furthermore, Member States have the possibility to request the opt-out of small emitters from the ETS under the provisions of Article 27 and 27a of the ETS Directive. Considering the high share of SMEs in the maritime transport sector, the implementation of the EU ETS in the sector has a direct impact on SMEs. However, very small maritime operators are expected to remain largely outside the ETS scope, as all policy options do not foresee the inclusion of any type of vessel below 400 gross tonnage.

[47] Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises (Text with EEA relevance) (notified under document number C(2003) 1422)

Estimated number of directly affected SMEs

The share of SMEs among firms covered by EU ETS was estimated using the Orbis database (a commercial database of corporate information). This was possible thanks to a dedicated mapping tool developed and maintained by the European Commission[48]. For this purpose, SMEs were defined as firms with fewer than 250 employees, and a turnover not exceeding EUR 50 million or a balance sheet not exceeding EUR 43 million.

Due to data limitations, this analysis was only possible for stationary installations and aircraft operators. Even in these sectors, the results should be interpreted with caution due to known caveats concerning the Orbis database. In particular, the database, which itself relies on national statistics, tends to underrepresent small firms. Also, the level of coverage varies across countries.

The shares of medium, small and micro enterprises in ETS are shown in **Error! Reference source not found.** below. It is not possible to give an absolute figure since only a subset of firms were identifiable in the database. For comparison, in 2024 the EU ETS covered 8,704 stationary installations (noting that an installation is not equivalent to a firm), 393 aircraft operators and 3,313 shipping companies.

Figure 1: Share of SMEs in firms covered by EU ETS that are identified in the Orbis database



It was not possible to include maritime and waste sector emissions in the Orbis analysis due to data limitations. However, for maritime, it is assumed that most of the entities responsible for the implementation of the ETS are SMEs. According to the previous impact assessment on the extension of the EU ETS to maritime transport, 76% of freight companies and 86% of passenger transport companies having fewer than 10 employees.

Each thematic annex considers how small emitters should be treated but uses metrics other than the employment and turnover dimensions related to the official definition of SMEs. (Annex 10 for aviation, Annex 11 for maritime, Annex 12 for stationary installations, Annex 13 for waste).

Estimated number of employees in directly affected SMEs

Macroeconomic modelling was used to assess employment impacts of the policy options considered. See Section 6.3.1. This concluded that all policy options should increase employment relative to the baseline when it comes to carbon leakage and aviation. In the maritime transport sector, the modelling did not indicate a large effect. Small operators may be negatively affected by lowering of the tonnage threshold bringing them into the scope of EU ETS. On the other hand, the economy of EU ports should be positively affected by measures to address transshipment relocation risks. However, this analysis is not specific to SMEs. According to the Orbis analysis for stationary installations, out of the identified 7,685 operators of stationary ETS installations and found that 26% of these were SMEs. Most of these were medium-sized enterprises (19%) rather than small (6%) or micro (2%). It also found that the ceramics sector had the highest proportion of SMEs, in particular micro and small enterprises. Across all sectors, SMEs

[48] European Commission, DG GROW Chief Economist Team (2025): EUTL-Orbis matching dataset.

accounted for 2% of emissions, 1% of employment and less than 1% of turnover of the identified ETS installations.
Are SMEs indirectly affected? *(Yes/No)* **In which sectors? What is the estimated number of indirectly affected SMEs and employees?**
Indirect effects from EU ETS predominantly consist of the passthrough of the carbon price to consumers. This is expected to be highest for consumers that are closest in the value chain to the priced carbon. The clearest examples of this are the indirect carbon cost faced by electro-intensive industries (specific compensation for this is addressed in Annex 12) and the impact of carbon pricing in the aviation and shipping sectors.

(2) Consultation of SME stakeholders
How has the input from the SME community been taken into consideration?
As per 6.2.4.4 of the Impact Assessment, SME stakeholders were represented by their sector associations in the stakeholder interviews and had the opportunity to submit their views within the OPC (where 36% of respondents in the company/business category were SMEs).
Are SMEs' views different from those of large businesses? *(Yes/No)*
SMEs have stronger views on administrative burden and regulatory costs of the ETS Directive (see Annex 2, point 2.2.4) than large businesses, and thus request reduced procedural burdens and reduction and standardization of administrative fees and verification costs across Member States. SMEs are also advocates for simplification and harmonisation of MRV rules, with several SMEs from the waste sector suggesting updating MRV rules with regards to MWI installations.

(3) Assessment of impacts on SMEs
What are the estimated direct costs for SMEs of the preferred policy option*?* (Fill in only if step 1 *flags direct impacts)*
Qualitative assessment
A net increase administrative costs is expected due to: - Preparation and verification of climate-neutral investment plans to access conditional free allocation (among operators already participating in existing administration related to free allocation) - MRV related to expansion of ETS scope: waste, maritime, CCU, carbon removal. However, a number of mitigating factors exist including the proposal not to lower the thresholds for ETS inclusion, i.e. the 20 MW threshold. The possibility for opting out small emitters under Articles 27 and 27a of the ETS Directive will be streamlined. In addition, the MRVA evaluation (see Annex 15, section 8.4) makes a number of recommendations for simplification, which will be addressed in the revision of the relevant secondary legislation. The possible extension of the ETS to smaller vessels would be expected to primarily affect SMEs. Most of these SMEs managing smaller vessels would be new to the MRV and ETS system and would need to set up and familiarise themselves with MRV and ETS processes. A key disadvantage

for SMEs is their more limited capacity to absorb additional administrative costs. While some administrative costs borne by shipping companies are dependent on fleet size, other costs are fixed. As such, administrative burden is likely to be higher for smaller businesses who do not benefit from significant economies of scale. SMEs in the maritime sector are expected to sell or buy allowances via intermediary traders mainly from the financial sector instead of participating directly in the primary or secondary markets. Another key disadvantage for SMEs is their limited ability to access financing for capital investments in low-carbon technologies (e.g., alternative propulsion systems or onboard carbon capture). This constraint may reduce the range of greenhouse gas abatement options available to them, potentially increasing their exposure to ETS-related costs in the short term.

Quantitative assessment

N/A

What are the estimated direct benefits/cost savings for SMEs of the preferred policy option?

Qualitative assessment

The main benefit to SMEs is the positive economic impact of the policy options compared to the baseline. However, there are no direct monetary benefits specific to SMEs.

The main indirect benefit is the continued exclusion of small combustion installations through the 20 MW threshold, which avoids new ETS obligations for thousands of small emitters. For covered SMEs, the design of simplified MRV templates and guidance reduces complexity and moderates administrative burden compared with large operators. For maritime, SMEs could benefit from the mechanism to support the uptake of sustainable renewable and low-carbon fuels and alternative propulsion technologies.

Quantitative assessment

N/A

What are the indirect impacts of this initiative on SMEs? *(Fill in only if step 1 flags indirect impacts)*

SMEs not directly covered by the ETS might be affected indirectly through changes in carbon cost passed through from suppliers of energy or emission-intensive products. Annex 12 analyses the macroeconomic impact of post-2030 options phaseout regarding carbon leakage prevention, including for small installations.

(4) Minimising negative impacts on SMEs

Are SMEs disproportionately affected compared to large companies? (*Yes/No)*

If yes, are there any specific subgroups of SMEs more exposed than others?

SMEs are not disproportionately affected since they are generally less exposed to the scope of the ETS.

SMEs covered by the EU ETS, operating in energy-intensive industrial sectors, face higher compliance effort relative to output, but these are not exacerbated by the options considered. Furthermore, the EU ETS contains a number of provisions aimed at small emitters which are retained in this initiative, such as the 20 MW exemption threshold, the possibility for Member States to exclude small installations subject to equivalent national measures, and simplified MRV templates and guidance.

Have mitigating measures been included in the preferred option/proposal? (Yes/No)

Yes. Key measures include:
- Maintaining the 20MW threshold
- Streamlined and simplified MRV requirements (benefitting mainly smaller operators), such as
  o The implementation of digital tools, such as the Commission reporting tool ERT
  o Streamline approval processes with national Competent Authorities, such as which type of modifications of the Monitoring Plan require approvals.
  o Changes of requirements for site visits
  o Relaxing monitoring accuracy requirements
  o Further simplifications for small installations (or small source streams), such as increase of standard or default values
- The simplification measures proposed in the maritime transport sector should help shipping companies exploit synergies across different regulatory frameworks, minimise undue burden, and ultimately reduce administrative compliance costs. According to conservative estimates, these measures have the potential to reduce current annual MRV compliance costs by 10% - 20%.

Contribution to the 35% burden reduction target for SMEs
Are there any administrative cost savings relevant for the 35% burden reduction target for SMEs?
N/A

ANNEX 7: PROBLEM DEFINITION, DETAILED BASELINE AND POLICY MEASURES

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1. PROBLEM DEFINITION

1.1. Problem drivers

Problem drivers associated with Problem 1:

- **D1 Residual emissions inconsistent with ETS cap trajectory**: The climate neutrality objective is at the heart of the European Green Deal and is a legally binding objective set out in the European Climate Law (ECL). The 2040 climate target is the EU's next intermediate step on the path to climate neutrality. In December 2025, the European Parliament and the Council reached agreement on amending the European Climate Law, introducing a binding intermediate climate target for 2040 of a 90% reduction in net greenhouse gas (GHG) emissions compared to 1990 levels. The agreement also sets out certain areas of flexibility to support the achievement of the 2040 target including on the contribution of high-quality international carbon credits to the target. However, there will still be residual emissions in industry, aviation and maritime that need to be abated in order to respect the carbon budget and target that are given by the cap trajectory.
- The following sub-driver has been identified:
    - D1.1 (P9+10) CO_2 generation is currently unavoidable for certain activities

      Certain activities do not currently have technological viable alternatives allowing them to continue without generating CO_2 emissions[49].
    - D1.2 (P1) Lack of funding mechanisms of sufficient duration and magnitude to support the business case for industrial decarbonisations and thus investments[50]. In this case, ETS risks leading to GHG emissions reductions mainly through a decrease in production levels rather than by a decrease in carbon emissions intensity of industrial activities.

      Today and in the near future, the carbon price signal and regulatory measures are perceived as not sufficient on their own to firmly enable the business case for investments in decarbonisation technologies for industries. In the absence of large (in terms of budget and duration) funding mechanism driven by the public sector, private investments alone will not deliver the industrial decarbonisation

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[49] We can distinguish three main cases:
- Industrial process emissions where the chemical reactions of the process generate CO_2, such as in the calcination of limestone (a carbonate) to produce clinker, which is the basis of cement. Emissions will need to be captured either for reuse in products (CCU) or to be permanently stored (CCS).
- Production of organic chemicals, which cannot be decarbonised because they are carbon-based. Fossil-derived feedstocks will need to be replaced with alternative sources of carbon (from biomass, recycling or captured carbon) to produce these chemicals, both to reduce process emissions in their production and at avoid fossil emissions from the use or end-of-life treatment of such products.
- Processes where fossil energy cannot currently be replaced by electricity (e.g. long-haul aviation or certain high-heat industrial processes) and will therefore continue to rely on the combustion of fuels. Where no alternative modes of transport (e.g. train instead of flight) or replacement products are possible (e.g. wood construction materials instead concrete or steel), fossil fuel combustion will need to be replaced with alternative fuels, such as renewable fuels of non-biological origin (RFNBOs).
- Processes where fossil energy cannot currently be replaced by electricity (e.g. long-haul aviation or certain high-heat industrial processes) and will therefore continue to rely on the combustion of fuels. Where no alternative modes of transport (e.g. train instead of flight) or replacement products are possible (e.g. wood construction materials instead concrete or steel), fossil fuel combustion will need to be replaced with alternative fuels, such as renewable fuels of non-biological origin (RFNBOs).

[50] In scenarios for reaching the 2040 climate target, investment needs are estimated at approximately EUR 30-50 billion annually between 2031 and 2040 for industry (around EUR 25-40 bn for energy-intensive industries).

at the scale and within the time needed for achieving climate neutrality by 2050. Different State aid support mechanism are addressing this problem on the national level but not sufficiently. Ideally, the funding mechanism needs to operate on the EU level to avoid the risk of fragmented investments amongst the Member States.

Lack of or delayed investments in industrial decarbonisation would put the decarbonisation pathway in peril and lead to EU industry falling behind global competitors who can be faster in adopting cleaner technologies. Beyond losing the current market shares, a technological lag could result in European industries being less adaptable to future disruptions and demands and on macro-economic level and make the EU lose out on opportunities for growth and leadership in nascent markets and emerging sectors of the economy.

In addition, there is lack of funding for the roll-out of mature low-carbon technologies in low-income Member States. These are usually more carbon-intensive, with energy mixes still largely relying on fossil fuel.

- D1.3 (P2) For some ETS activities, such as the refining of fuels or the production of bulk organic chemicals, the ETS requires the surrender of allowances only for the energy and process (scope 1) emissions and not for the carbon content of the chemicals, plastics, or fuels produced. However, under the current rules, CCU requires the payment for the emissions captured and embedded in any product that does not meet the permanence criteria. This situation leads to a lack of level playing field between the traditional petrochemicals and alternative chemicals and materials based on captured carbon.

  With the integration of waste incineration into the ETS, the embedded fossil feedstock in chemicals and materials would also be subject to carbon pricing at the point when that carbon is released from the product at the point incineration. However, without a change in the CCU rules, the emissions embedded in non-permanent products would be paid twice: once when captured (unless they meet the permanence requirement) and a second time at the end of life when incinerated. This leads to a double counting/pricing of emissions, which results an inefficient reduction of emissions.

- **D2: Lack of internalisation of the climate impact (insufficient carbon price signal).** The reason for putting a price on carbon emissions is to trigger a behavioural and investment change that should result in reduced emissions in line with the climate change mitigation pathway. The price signal of the EU ETS adds to the cost of activities that generate greenhouse gases, 'internalising' the harmful effect on the environment, known as 'negative externalities', in accordance with the 'polluter pays' principle. As shown in the Evaluation Report (see Annex 15, section 4.2.1.2), the ETS price has resulted in the internalisation of a significant share of the external climate costs, in particular for the power sector, reflecting the early phase out of free allocation the the cost pass-through to the electricity price. When the EU ETS does not cover certain activities, it does not play a role in the internalisation of their carbon cost. As a result, they may lack the incentive to reduce their emissions, unless other regulatory measures require the reductions (targets or prohibitions). In the case of municipal waste incineration, GHG emissions have continuously increased by approximately 300% since 1990. Despite being covered under the Effort Sharing Regulation since 2021, few Member States have implemented decarbonisation measures, and the sector is not on track to contribute to the Union's economy-wide decarbonisation targets in 2040 and 2050. Similarly, measures to address carbon leakage (assigning allowances free of

charge and allowing compensation for indirect emission costs) can also dampen the carbon price signal and reduce incentives to decarbonise, as approximately 80-90% of the verified emissions of industry have remained covered by free allocation during the first part of Phase IV of the EU ETS. This is confirmed by the findings of the evaluation, which indicates, based on literature review, that the effect of the EU ETS prices on carbon efficiency and emissions reduction is more pronounced for sectors transitioning away from free allocation and into auctioning. This suggests that when sectors bear the direct cost of their emissions, the incentives for them to reduce emissions is higher and that a 1% increase in ETS prices leads to an improvement of carbon efficiency by 0.04% and a decrease in emissions of 0.05% in regulated sectors[51] (see Annex 15, section 4.1.1.1.2.).

The following sub-drivers have been identified:

- D2.1 (P3) Free allocation and compensation for indirect carbon costs (ICC)dampen the carbon price signal.

  Free allocation to specific sectors is based on performance benchmarks and activity levels. Benchmarks are reduced incrementally to encourage companies in each sector to decarbonise and advance innovation. Installations that are below their benchmarks will receive more allowances than required for compliance, which can be monetised on the carbon market. Therefore, the use of benchmarks therefore incentivises innovation to lower emissions intensity production. Nevertheless, free allocation that covers a significant share of the emissions of the respective allocation dampens the carbon price signal to a degree. This factor, combined with high abatement costs for industrial sectors in the order hundreds of euro per tonne of abated CO_2 reduces the incentives for emission abatement in the respective sectors.

  While ICC compensation also dampens the price signal, electro-intensive industries cannot necessarily influence the associated emissions cost themselves since it is passed on indirectly through electricity bills. The pass through of this price signal can also disincentivise industrial electrification, especially when free allocation is available to non-electrified processes.

- D2.2 (P8) Current regulations exempt small installations under 20MW

  The thresholds for activities in Annex I, especially the 20 MW rated thermal input capacity for combustion of fuels, were established considering the relatively high compliance costs for smaller installations, such as monitoring, verification, registry fees, and administrative burden, which can outweigh the environmental benefits of participating in ETS.

  In 2027, the ETS2 applies and small emitters that are not under the EU ETS will pay the carbon costs of their fuel use. However, process emissions of small industry will not be covered. It is therefore legitimate to consider the environmental impact of those exclusions, the case for maintaining simple rules, and the administrative burden for all parties involved in the compliance cycle; operators, Member States and Commission.

[51] Jan Eric Hagendorna , Benjamin Hattemerb , Fotios Kalantzis, EIB, 2024.“A positive trade-off: Emissions reduction and costs under Phase IV of the Emissions Trading System”, https://www.eib.org/attachments/lucalli/20240297_economics_working_paper_2024_05_en.pdf

- D2.3 (P4) Lack of equivalent GHG pricing signal for maritime emissions in neighbouring non-EU countries leading to a possible risk of evasion (including via relocation of transhipment activities).

  Evasive behaviours could undermine the overall environmental integrity of the ETS as shipping companies engaged in such circumvention strategies would surrender fewer allowances, while not actually reducing their emissions. In some cases, these operational adjustments could also reduce the traffic and connectivity of certain EU ports (e.g. container transhipment hubs, offshore operations) leading to possibly broader negative wider macroeconomic implications. Due to the end of the phase-in approach in 2026 and the absence of any global measure, the risk of evasion is expected to remain in the short-term.

- D2.4 (P6/7/8) Limited scope of aviation and maritime

  For aviation, the EU ETS geographical scope is limited until January 2027 to only intra-EEA flights and departing flights to Switzerland and the UK. The internalisation of the climate impact is driven by the quality and implementation of international measures, or alternatively by applying an effective carbon price to the EU's fair share of these emissions.

  The aviation EU ETS also currently exempts certain operators as defined in Annex 1, (h) and (k) of the Directive with low aviation activity, however these exemptions cover mostly private or business jets, meaning there is currently no carbon price signal for those flights. The reason for these provisions is the compliance cost for monitoring, verification, and registry fees, which can outweigh the environmental benefits of participating in ETS. In 2027, the ETS2 will apply essentially covering citizens by EU ETS, this underlines the need for inclusion of private and business aviation who should pay their fair share. The administrative burden for all parties involved in the compliance cycle would be minimized by simplification measures.

  For maritime, small ships, including offshore vessels, with a gross tonnage between 400 and 4 999 gross tonnage, are not covered under the ETS and do not internalise the harmful effect of their EU-related emissions on the environment. As a result, they lack economic incentives to reduce their emissions.

- D2.4(P5) No coverage of waste emissions

  Emissions from waste management are subject to the national emission reduction targets under the Effort Sharing Regulation, with incineration (with/without energy recovery and landfilling being the main sources). Measures to reduce emissions and promote circularity vary widely between Member States, which results in an uneven application of the polluter pays principle and a limited progress towards emission reductions but also circularity.

- **D3: International carbon pricing measures in transport.** In terms of interaction between the implementation of the ETS and the implementation of global measures to reduce emissions from aviation , the following sub-driver has been identified:

  - D3.1 (P6) Possible non-implementation of CORSIA by third countries

    To address carbon emissions from international aviation, the EU has supported the creation and implementation of CORSIA. A key aspect for CORSIA to work is that third countries have to implement the scheme in their national laws

and have to apply it effectively[52], and whether the EU's fair share of aviation emissions is covered by an effective carbon price.

D3.2 (P7) Potential lack of coherence between the ETS implementation and the implementation of IMO mid-term measures in the future: In order to address GHG emissions from international maritime activities globally, the EU has actively supported the adoption of the revised IMO 2023 Strategy as well as of IMO mid-term measures, in particular the Net Zero Framework, which was agreed in April 2025 and for which the adoption decision has been adjourned until autumn 2026. This global measure would mark a significant step towards reducing the environmental impact of the shipping industry on a global scale and is a strong example of multilateralism at work. However the adoption of the IMO Net Zero Framework has been adjourned and there remains a number of uncertainties regarding its adoption and actual implementation. In the meantime, the EU ETS provides a stable and predictable regulatory framework to support the decarbonisation of shipping, e.g. by making renewable and low-carbon fuels or energy efficiency solutions more economically attractive, and ensures that maritime transport effectively contributes to EU's climate targets.

However, the combined implementation of a future IMO mid-term measure and EU ETS could also lead to some inefficiencies, including:

- Potential double pricing and double payment in case maritime emissions are subject to GHG pricing under both the ETS and a future IMO mid-term measure. The extent of the inefficiencies would depend on various factors such as the GHG price formation at global level, price scope, emissions covered, or timing.

Associated with Problem 2:

- **D4: Decreasing market size.** The decreasing market size can have a negative impact on trading. This is because a low market size entails the risk of thin or illiquid trading[53], which would in turn cause price volatility and uncertainty.

  The following sub-driver has been identified:

  - D4.1 (P10/11) Intrinsic functioning of the EU ETS: The design of the EU ETS as a cap-and-trade system to decrease EU emissions over time works on the principle that the cap is reduced annually in line with the EU's climate target. As the cap decreases, so does the supply of allowances to the EU carbon market. Therefore, as the cap approaches zero (or very low levels), the size of the market will also reduce over time. A smaller market size increases the risks of trading frictions.

1.2. Specific objectives

The general objectives set out above to address the identified problems can be broken down into a number of specific objectives.

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[52] The home country is responsible for ensuring that its airlines comply with CORSIA requirements. This is meant to be an obligation even if the country itself is not participating in CORSIA, as long as its airlines operate on routes covered by the scheme.

[53] Note that the concept of liquidity of the market, referring to the amount of allowances available for trading, should be differentiated from the concept of market tightness, which can occur regardless of the market size if the supply of allowances is very tight in relation to the demand of allowances (i.e. actual emissions).

For the **general objective O1.1 of incentivising emission reductions**, the following specific objectives have been identified:

- SO1.1.1 Enable investments in the decarbonisation technologies (both innovative ones and those ready for scale-up/roll-out) that currently do not yet have the business case (i.e. most of the technologies needed to address the emissions in the energy intensive industries, and in particular investments in mature decarbonisation technologies in carbon-intensive, low-income Member States). Those technologies need to address the 'hard to abate' emissions identified under D.1.1, for example, direct iron reduction for green steel, electrified steam and industrial heat production, electro-chemical processes, carbon capture in industry, renewable low-carbon marine and aviation fuels. To enable these investments the objective is to create the business case for private investment in the EU. with public funding instruments, or through recycling a part of ETS revenues in a simple and flexible way to provide appropriate investment certainty while minimising the administrative burden for the Commission, national competent authorities and private operators.
- SO1.1.2 Ensure full carbon price signal is applied to emissions sources which are currently not in the scope of the EU ETS but would be well suited for its coverage[54], and to sectors where currently dampened, to the degree possible while protecting against carbon leakage, maintaining territorial continuity and ensuring fulfilment of public service obligations;
- SO1.1.3 Address risk of carbon leakage: leakage is measured by estimating how much overall greenhouse gas emissions would be added to the atmosphere due to the shift of certain activities from the EU (region with stricter climate policies) to regions with weaker policies. To assess the risk of this leakage materialising, it is necessary to examine the role of free allocation for stationary installations in non-CBAM sectors as a continuation of measures to protect against carbon leakage due to carbon costs, as well as the case for making such support conditional on installations' investments in emissions reductions. Industries' exposure to carbon leakage is assessed based on two key criteria: trade and emissions intensity. For aviation, it is necessary to examine the risk of hub carbon leakage, i.e. carbon leakage which occurs through an airport hub, and if needed, ways to mitigate this risk. Annex 10 and the support study contain relevant case studies. For maritime, it is necessary to examine the risk evasion by containerships and the risk of relocation of container transhipment activities to neighbouring non-EU ports, as well as the risk of evasion in relation to offshore services provided by ships.

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[54] A sector is generally well suited for ETS coverage when several conditions are present. The core idea is that emissions can be measured reliably reduced effectively by the influence of the carbon price. Key characteristics include:

1. Monitoring, reporting, and verification (MRV) can be done accurately and at reasonable cost.
2. There are relatively few large emitters: ETSs work best when emissions come from a manageable number of regulated entities as administrative costs stay lower.
3. There are viable technological or operational alternatives: Firms need realistic pathways to reduce emissions in response to carbon prices.
4. Demand is not perfectly inelastic: Carbon pricing can influence production, investment, or consumption decisions. If firms and consumers cannot respond at all, the ETS has weaker effects.
5. The sector is economically significant: high-emitting sectors provide larger emissions reductions per unit of regulatory effort.
6. Leakage and competitiveness risks are manageable

For the general objective O1.2 reach a pre-set emissions reduction target provided by the 2040 policy package and with a net emissions calculation, the following specific objectives have been identified:

- SO1.2.1 Consider if carbon removals can be integrated in the ETS with sufficient environmental safeguards while preserving cost efficiency in achieving the ETS/EU climate objectives before 2040: to integrate removals in such a way that they counterbalance a certain number of emissions remaining in the system toward the ETS's contribution to the 2040 climate target, while the market keeps functioning well and avoiding that companies postpone or defer crucial emission reductions.
- SO1.2.2 Adjust ETS cap in line with pre-set climate target for 2040: The EU ETS sectors will contribute to the economy-wide emissions reductions in line with the intermediate 2040-target. The cap trajectory of the EU ETS therefore should be aligned with this intermediate target.

For the general objective of O1.3 ensuring effectiveness of EU climate action on international transport while avoiding duplicative pricing, the following specific objective has been identified:

- SO1.3.1 Ensure effective action on EU's fair share of aviation emissions in the period 2031-2040 and adjust the scope of application of the EU ETS, if needed to ensure effective carbon pricing of the EU's fair share of aviation emissions, taking into account other existing carbon pricing measures for international aviation.
- SO1.3.2 Preserve the effectiveness of the implementation of the EU ETS extension to maritime transport and maximise the regulatory efficiency of the EU ETS and IMO mid-term measures once adopted, notably by avoiding duplicative pricing of emissions leading to any significant double burden for shipping companies, while preserving the environmental integrity of the EU ETS, the EU climate goals and its international commitments.

For the **general objective O2.1 of ensuring efficient market functioning**, the following specific objectives have been identified:

- SO2.1.1 Increase size of the market until 2040: to achieve a higher liquidity to directly reduce the risk of market inefficiencies stemming from a small market size (see Problem 2 description).
- SO2.1.2 Adjust MSR parameters to ensure a healthy supply-demand balance[55] until 2040: in particular by designing the market stability reserve in such a way that (i) the

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[55] An MSR that ensures a healthy supply-demand balance out to 2040 would be one that:
- Ensures adequate liquidity (adequate allowance availability for compliance, hedging and banking) – Liquidity is assessed through several indicators: TNAC levels and trajectories in relation to the upper and lower thresholds and buffer zones; the evolution of the stock of allowances in the MSR indicating capacity for future interventions; the TNAC-to-emissions ratio spread which is a proxy for liquidity consistency relative to compliance needs; and the timing and volume of MSR releases.
- Maximises price predictability (stable signals for decarbonisation investment)– Rather than formal statistical volatility metrics, the assessment relies on graphical analysis of price trajectories and their evolution under baseline and shock scenarios.
- Enhances regulated entities' operational decision-making– assessed qualitatively based on market conditions that enable effective risk management, and mechanism predictability that supports credible price expectations.
- Strikes the right balance on cumulative emissions – assessed based on cumulative emissions, considering the trade-off between designs that release earlier and more forcefully raise cumulative emissions and designs that

rules for intakes and releases of allowances are adjusted to the cap trajectory (decreasing cap, but potentially at a different pace and with a wider scope), and (ii) the rule for invalidation of allowances is revised in view of the future market conditions, with the overall aim to ensure sufficient liquidity in the market; a secondary aim would be to ensure that liquidity is proportional to future demand, for a good balance of the market.

1.3. Baseline

The **ambition** of the system is determined by the continuation of the linear reduction factor established in Article 9 of the ETS Directive, of 4,4 % from 2028 onwards, which applies to all EU ETS sectors. In the current legislative framework, the system neither recognises the generation of carbon removals nor allows surrendering of carbon removals instead of allowances. The MSR continues to operate based on the surplus indicator defined as Total Number of Allowances in Circulation (TNAC) and its current parameters: intake rate of 24% (reverting to 12% as of 2031) of the TNAC when this is above 1096 million, intake rate of the difference between the TNAC and 833 million when the TNAC is between 833 million and 1 096 million; release of 100 million allowances when the TNAC falls below 400 million; the invalidation of allowances in the reserve above 400 million allowances.

The **cap trajectory** of the baseline is described in the below table:

Table 9: Baseline cap trajectory.

EEA	**Cap 2030 (Mt)**	**Cap 2035 (Mt)**	**Cap 2040 (Mt)**	LRF	Budget 2031-2040 (Mt)
Baseline	975	485	69	-4.4%	4436

The currently legislated cap trajectory and MSR design are the result of the latest revision of the ETS, which constituted an interim revision necessary to set the ETS in line with the increased 2030 ambition. While appropriate in the short term, continuing on this path is untenable in the long term and could lead to a vastly over-constrained system in the 2030s.

Strictly speaking, the baseline would reduce the cap to 69Mt by 2040 in its extended scope. However, taking all available technical options in the PRIMES modelling, the emissions would be some 147Mt in the EU scope and likely somewhat higher in the EEA scope, to reach some 150Mt (the 'Modelling Baseline' result).

This is significantly lower than the attained reductions and carbon budget in cost-effective scenario modelling which attains the 85% target for domestic economy-wide emissions reductions. As a result, economy-wide investments and costs will be higher in the baseline than the cost-effective case. In that sense, the baseline does not match the ETS trajectory appropriately to the cost-efficient domestic 2040 target. In addition, the technological risks that the reductions in the model will not be achieved are also higher, given the need to exhaust technical options, leaving little room for error.

The baseline scenario was also simulated for the **MSR** with the POLES-Enerdata model, using the legal default cap for the supply and the legal default emissions scenario from PRIMES for the demand. The modelling results show how the cap trajectory and MSR design could lead to a vastly over-constrained system in the 2030s. As a consequence, the ETS a price signal could

keep scarcity high reduce cumulative emissions but risk compromising market functioning if reserves become inaccessible.

- Performs best in a sensitivity analysis – measured based on (i) TNAC converging back to the no-shock trajectory; (ii) emissions converging back to the no-shock trajectory; (iii) TNAC-to-Emission ratio spread over 2027-2040; (iv) EUA price spread in 2040 (€2023/EUA).

have a steep increase in the period 2030-2032, after which prices stabilise until 2036 and then takes off again with steep increase until 2040. The analysis in Annex 8 further outlines that the legal default option the currently legislated is therefore not well suited to be used as a starting point in the MSR measure-level assessment. To that end an adjusted baseline is constructure that provides a more realistic evolution of market conditions.

In the baseline, in terms of **instruments to support investments** continuation of the Innovation Fund (IF) is assumed as already foreseen in the ETS Directive using existing instruments ('regular' grants and, to lesser extent, auctions and financial instruments) to address technology and early commercialisation risks across innovative decarbonisation technologies in ETS covered sectors, alongside the establishment of the Industrial Decarbonisation Bank (IDB) with a EUR 100 billion envelope as announced under the Clean Industrial Deal to address commercialisation risks for scale-up and roll-out of decarbonisation technologies in Energy Intensive Industries.

For **aviation**, the EU ETS would apply to departing and arriving flights from the EEA to around 90 countries from the start of 2027, if no amendment to the ETS Directive were adopted before surrender requirements for emissions released in 2027 are due. Currently, incoming flights from Switzerland and the UK are already exempted as those are covered by the Swiss and UK ETS respectively. Other incoming flights could also be exempted if this is considered optimal interaction. This is not assumed in the baseline, but it would reflect the EU's fair share of emissions while maintaining equal treatment of aircraft operators on routes, with the EU regulating departing flights, while other countries would be responsible for flights to the EEA. PO2 acts as such a variation. The ETS Directive reserves 20 million allowances from January 2024 until 31 December 2030 for covering up to 100% of the cost-difference for using eligible fuels on routes covered by the ETS carbon price (Article 3c(6)). Without action by the European Parliament and the Council, this support expires or runs out.

When accounting for the increasing use of SAF as mandated by ReFuelEU aviation and global SAF uptake projections by ICAO, in the baseline global[56] aviation CO_2 emissions should decrease to 590Mt CO_2 in 2040. Without accounting for the use of SAF, these emissions would increase from 690 Mt CO_2 in 2024 to 763Mt CO_2 in 2040. See table 2 in Annex 10. When looking at **out-of-sector abatement**, under the baseline in 2035, 28.5% of global international aviation emissions are covered by the EU ETS compliance obligation, and 10.4% by CORSIA offsets (see table 3 in the main body). In 2040, the baseline covers 26.1% of global international aviation emissions and CORSIA covers 0% (as it is set to end in 2035).

Regarding **economic impacts**, between 2023 and 2040, under the baseline demand increases across all market segments despite an increase in price for most segments (except cargo). Passenger demand for global international flights (those within Europe, as well as international flights outside Europe but not domestic flights outside Europe) increases: for first/ business class by 63%, for economy class by 49%, for low-cost by 30%, and for cargo by 43%. Average ticket prices are expected to increase between 2023 and 2040 under the baseline: for first/ business class by 20%, for economy class by 19%, for low-cost by 37%, and 0% (no change) for cargo. For other economic impacts of the baseline, including on the carbon cost as a share of the fuel cost or of total operating costs, risks of competitive distortions for airlines, risks of passenger shift and carbon leakage at airport hubs, or impacts on tourist destinations, please refer to the respective sections on the impacts of the policy options.

[56] Inside Europe: domestic and non-domestic and departing flights to Switzerland and the UK, outside Europe: non-domestic only.

Auction revenues from aviation in the baseline are estimated at EUR 24bn in 2035 and EUR 38bn in 2040[57]. Under the baseline, there would be no CORSIA costs. It is important to note that the ETS mobilises significant support for decarbonisation, including for aviation. Additional support is available under the **Innovation Fund**. The Innovation Fund has supported 68 projects related to decarbonising the transport sector with EUR 3.89 billion. Between 2020-2024, the Innovation Fund has awarded more than EUR 286 million to three projects producing sustainable aviation fuels, one focusing on synthetic aviation fuel production. As part of the 2024 Innovation Fund Call implementation, the Commission is awarding EUR 153 million to four eSAF projects. In addition, 11 aviation projects that scored above the Innovation Fund evaluation thresholds are awarded the STEP Seal. In 2025, the Commission opened another European Hydrogen Bank auction with a dedicated budget of EUR 300 million for the production of renewable hydrogen with off-takers in the aviation and maritime sectors. The Innovation Fund is funded through ETS revenues. In 2025, the Commission opened another European Hydrogen Bank auction with a dedicated budget of EUR 300 million for the production of renewable hydrogen with off-takers in the aviation and maritime sectors. The Innovation Fund is funded through ETS revenues.

For **maritime**, the ETS Directive applies to ships of or above 5 000 gross tonnage and surrendering of allowances is phased in gradually (40% of 2024 emissions, 70% of 2025 emissions and 100% of 2026 emissions). All emissions of voyages between EU ports, as well as emissions within EU ports are covered but only 50% of emissions of voyages between EU and non-EU ports. Temporary derogations apply in some specific cases until end of 2030, such as for certain ice-class ships, voyages between ports in outermost regions and ports within the same Member State, certain small islands, and some routes for which a public service obligation or contract has been declared. Methane and nitrous oxide emissions from maritime transport are covered under the EU ETS as from 2026 and emissions from large offshore vessels will be covered as from 2027. The Baseline contains also full application of FuelEU Regulation and other relevant EU and international legislation adopted to date.

The baseline contemplates the fulfilment of the IMO GHG 2023 Strategy by reflecting the key design elements of the IMO mid-term measure as agreed in April 2025 (IMO Net Zero Framework)[58].

Under the Baseline, tank-to-wake (TTW) **GHG emissions** from all large ships under the ETS scope follow a decreasing trajectory driven by regulatory pressures coming from current EU legislations, including the EU ETS and Fuel EU applied to the full extent and working together with IMO strategies and future policies. This trajectory leads to 20 MtCO2e of residual emissions by 2050. Emissions from smaller vessels (between 400 and 4 999 gross tonnage) represent, in absence of regulation, the majority of these residual emissions of shipping. While not covered by current EU or global climate policies to reduce shipping emissions, GHG emissions from smaller vessels slightly decrease over the period 2030-2050, mostly driven by energy efficiency improvements.

Beyond in-sector GHG emission reductions, the participation of maritime transport in the EU ETS may also lead **to out-of-sector abatement.** This would occur in the event that maritime emissions (subject to EU ETS) decrease at a slower pace than the overall ETS cap reduction trajectory, leading to a scenario where shipping companies would need to acquire more

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57 Using carbon pice projections as per PRIMES 87p_var3_v3

58 Reduction of the GHG intensity of fuels (GFI) by at least a "Base target" of 8% in 2030, 30% in 2035 and 65% in 2040 and a more ambitious "Direct compliance target" of 21% GFI reduction in 2030 and 43% in 2035.

allowances from other ETS sectors. Under the Baseline, such a situation occurs from 2025 to 2040.

The non continuation of the derogations for outermost regions, small islands and ice-class ships under the EU ETS would also contribute to incentivise emissions reductions in the sector and avoid delaying green investments in vessels and port infrastructures.

International maritime shipping is an important contributor to poor **air quality** in the EU due to emissions of PM2.5/PM10, NOx, SOx, CO and NMVOC. It has particularly large impacts in port cities and coastal locations and due to long-range transport of pollutants it also deteriorates inland air quality. The major impact of air quality degradation is on human health, with smaller impacts to other areas such as crops, ocean acidification or degradation of buildings. The effects of air pollution under the Baseline are estimated for the period 2030-2050 at 112,997 MEUR of total external damage costs, which aggregate health effects, crop loss, biodiversity loss and material damage, as per the Handbook of the external costs of transport.

The assessment of impacts on compliance costs includes payments under EU ETS, fuel costs, operating costs and capital expenditures from shipping companies. Under the Baseline, total shipping costs are expected to grow over the period 2030-2050 from 105 billion EUR to 163 billion EUR. Total cost increases are largely driven by higher fuel costs following the gradual uptake of more expensive low carbon and renewable fuels (reaching 7% of the energy mix in 2030, 63% in 2040 and 87% in 2050) and, to a lower extent, by growing capital expenditure also linked to decarbonisation measures within the maritime sector.

In terms of social impacts for maritime, the non-continuation of the derogations for outermost regions and small islands under the EU ETS would increase the cost of maritime journeys to and from these areas. Considering that maritime transport is the main mode for freight transport in these territories and often key for connectivity, higher transport costs could reduce the affordability and frequency of maritime connections, which could potentially affect essential supply chains and access to goods, services, and economic opportunities. Furthermore, increased travel costs could possibly undermine the competitiveness of these regions as tourist destinations and reduce the economic benefits derived from tourism.

For **stationary installations**, the baseline for **free allocation** for sectors not covered by CBAM results from the continuation of the current rules post-2030, based on the provisions set out in Article 10a of the ETS Directive. This does not correspond to the legal default, as the provisions of Article 10a of the ETS Directive apply only until 2030. However, assuming a baseline of continued free allocation post-2030 allows for a more meaningful analysis of the proposed measures. For the sectors covered by CBAM, free allocation is phased out up to 2034 in parallel with the gradual phase-on of CBAM. The quantity of allowances available for free allocation is based on 43% share of the baseline cap trajectory , resulting from the provision in Article 10 of the ETS Directive that 57% will be allocated via auctioning.

For small stationary installations, the **20MW threshold** continues to apply, together with the provisions on the exclusion of small installations subject to equivalent national measures, and of very small installations (Article 27 and 27a respectively).

Accounting of emissions that are captured in the EU ETS installations for utilisation in products, or **for CCU, takes place upstream**. This means emissions can only be deducted by the installations when captured and transferred to another installation if they are captured for permanent storage in accordance with Article 12(3a) of the ETS Directive or for permanent use in a product in accordance with Article 12(3b) of the ETS Directive.

Finally, installations for the **incineration of municipal or hazardous waste** are generally excluded from the full scope of the EU ETS (with co-incineration in industrial installations

under the EU ETS, however, fully covered in line with Commission Guidance Document 0[59]). Denmark, Sweden and Lithuania have installations for the incineration of municipal waste fully covered by the EU ETS[60]. Since 1 January 2024, installations for the incineration of municipal waste monitor and report their emissions under the EU ETS.

2. OVERVIEW OF POLICY MEASURES

Three policy options have been developed that ensure that the ETS contributes cost-effectively to the EU emissions reduction target in line with climate neutrality and the 2040 target and to addressing the EU's fair share of international emissions. The options differ in the degree of change that they entail to the current system. *Policy option 1 Aligning ambition and improving incentives* includes the measures that, overall, lead to least change compared to policies in place in 2026. *Policy option 2 Aligning ambition and extending scope and corresponding incentives* includes measures that introduce moderate innovations or changes to the system. *Policy option 3 Aligning ambition and extending scope and incentives comprehensively* alters most substantially how the system works. The policy measures selected for each topic area are described individually in Annexes 8 to 13 to this report, to enable different approaches to building policy options. While those annexes include an in-depth assessment of a wider range of measures, the measures presented in the main body of the reports are those selected for the three policy options because they were assessed as addressing the relevant specific objectives with the best environmental, economic, and social impacts. Concretely, the following measures were considered in terms of each specific objective:

2.1. Ambition

The **ambition** of the EU ETS is primarily defined by the domestic EU-wide target considering international credits for net emissions reductions. However, the ambition of the ETS will depend on whether and how removals will be integrated. The cap itself can be set at the level of the gross emissions objective, or the net emissions objective. This differs per policy option and will be explained below.

2.1.1. Cap

Annex 8 describes the measures for different trajectories towards the 2040 point target in more detail:

- CAP1: In this "Linear" measure, the cap follows a linear trajectory from 2030 to 2040 towards an 85% consistent target in 2040.
- CAP2: In this "Modelled/cost-effective" measure, towards an 85% consistent target, the cap linearly follows modelled estimates from the 2030 legal cap estimate to the 2035 modelled emissions estimate, and from 2035 to the 2040 modelled estimate.
- CAP3: In this "90 – 85 pathway" measure, until 2035 the cap follows a trajectory towards the estimated cost-effective contribution of the EU ETS to the 90% target and then flattens to move towards the estimated cost-effective contribution of the EU ETS to an 85% consistent target in 2040. This reflects the fact that international credits will start contributing to the EU-target from 2036. A specific economy-wide modelling run was performed for the estimate of the EU ETS contribution to such a trajectory, hence it ends at a slightly different end point.

- CAP4: An accelerated version of CAP3, comparable to a non-linear pathway towards the 90% target in the first five years, then flattening to be compatible with an 85% target in 2040.
- CAP5: Maintains the 4.4% LRF from the legal default as an LRF for net emissions until 2035, then aims at a target compatible with 90% domestic reductions in 2040.

CAP2 was included in all the policy options. As a result, the further modelling-based analysis examined in the impact assessment is based on the cost-effective trajectory. PRIMES was used to model the variants PO1, PO2 and PO3, and the cost-effective trajectory is the most optimal economy wide to reach an 85% target in this model.

The conclusions drawn on the basis of this modelling about other measures should however be robust to changes in ambition level, if it were decided to follow a more stringent trajectory over this period, either CAP3, CAP4, or a scenario in which fewer international credits were purchased and domestic reductions were more limited, such as CAP5.

2.1.2. Carbon removals

Regarding the inclusion of **removals** (P9), the measures explored vary across three key dimensions explained below. Other elements were fixed as design elements for all measures, including the inclusion of CCS-based permanent carbon removals certified under the CRCF (BioCCS and DACCS) generated inside or outside the EU ETS. Detailed descriptions on the measures are available in Annex 8 - Part II.

The assessment carried out in Annex 8 - Part II, concluded that CR1, CR3, and CR4 provide the best balance in terms of increasing the size of the market (SO2.1.1.) to ensure efficient market functioning (O2.1), at the lowest cost, while providing most certainty in reaching the pre-set emissions reduction target (O1.2)[61].

CR4 provides the lowest cost of compliance as it guarantees the gross emissions (matched only by CR3), thus is best at avoiding carbon leakage and increasing liquidity, with the smoothest market dynamics and without transaction cost for businesses, who operate in the ETS market as usual purchasing only conventional allowances. At the same time, net emissions are guaranteed (conditional on sufficient budget for the public authority), and abatement deterrence is only lower in CR5. While the most important downside of CR4 is the public cost, the apparent 'cost savings' for the regulator from CR1, CR2 and CR3 (notably from not having to invest into the purchase of removal units) entail risk transfers to the private sector that could materialize as higher costs for the regulator later on, e.g. if CDR technologies do not scale as required in time for target achievement, and especially if the regulator is left with little time to react to a CDR supply shortfall. And while CR4 would likely entail significant administrative costs for the regulator in e.g. the procurement of removal units, it seems possible that procurement methods such as reverse auctions could yield lower overall transaction costs than if purchases were done by individual regulated entities in the primary CDR market, and the administrative cost would need to be compared with the administrative cost of complementary support measures needed under CR1 and CR2 (e.g. CCfDs).

Compared to CR5, measure CR4 has the advantage of the predictability of the regulator in recouping some of the CDR purchase costs by auctioning allowances in the market. The higher fiscal cost of CR5 and higher carbon leakage risk resulting from the uncertainty in release of removal units seems, combined with the high fiscal cost, seems only acceptable if the priority is to pursue the option with lowest abatement deterrence. However, it should be considered if avoiding abatement deterrence will have, overall, a worse environmental impact than the loss

[61] SO1.2.1 is linked to P9, to consider if carbon removals can be integrated in the ETS as sub-objective of O1.2.

in public budget and increased carbon leakage risk, or the over dependence on biomass as alternative abatement option. Both CR4 and CR5 have an equally positive impact in providing a certain source of demand for CDR.

Regarding the measures with private sector integration of removals, the main choice appears to be between prioritising (a) achieving EU targets at the price of putting the risk from CDR technologies (e.g. under-delivery, price risk) on operators (net cap options CR1-CR2) or (b) ensuring the extra 'space' for residual emissions in the EU ETS to enable cost-efficient abatement while mitigating carbon leakage, at the risk that the EU doesn't ETS reaches its net contribution (gross cap option CR3). To avoid facing this choice and ensure both the environmental impact and protect the EU's competitiveness, removals would need to be financially supported outside the ETS in measures CR1-CR3. Although the net target achievement is certain, the abatement deterrence risk is highest among all options assessed in CR2. The abatement deterrence is lower in CR1 and CR3 as a result of the limit, which in turn leads to a loss of cost-effectiveness when the limit becomes binding. However, the limit is expected to be binding if at all, late in the period. All three options incentivise CDR only when price competitive with the ETS, so early incentivisation will depend on public support outside the ETS. CR3 will have a slightly lower incentivisation as ETS prices would lower in view of the increased cap.

CR4 is included in policy option 1 'Aligning ambition and improving incentives', as it allows the public authority to determine and manage the inflow of allowances in the system, leading to least changes for operators' engagement in the system (operators will not need to trade in removals or depend for their emissions space on these units) and ensuring the achievement of the EU ETS net target (achieving both O2.1 and O1.2). CR1 is considered for policy option 2 'Aligning ambition and extending scope and corresponding incentives', as it allows the use of removals within a limit on top of the cap, ensuring the net target is reached and abatement deterrence is lowest, while still allowing the increase of market size and liquidity (O2.1). Finally, CR3 is included in the 'Aligning ambition and extending scope and incentives comprehensively' option as it does not ensure the net target is reached, which is an essential objective of the system (O1.2) and it adds most complexity due to the cancellation of allowances for the removals used.

A very broad majority of respondents in the open public consultation (83%) supported the integration of permanent CRCF removal units in the EU ETS, arguing that this is essential to expand operators' options to achieve the long-term climate ambition, to support the uptake of such technologies and to enhance liquidity in the market. This assessment was corroborated in stakeholder interviews and position papers. The complete assessment is set out in Annex 8.

Table 10: Policy measures for carbon removals

Policy measure	**PO1**	**PO2**	**PO3**
CR0: No integration			
CR1 'Limited operator integration on top of the cap'		X	
CR2 'Unlimited operator integration on top of the cap'			
CR3 'Limited operator integration under the cap (one-in-one-out)			X
CR4 'Public authority integration through regular auctions under the cap'	X		

CR5 'Public authority integration through MSR on top of the cap'			

2.1.3. Market Stability Reserve (MSR)

For the policy options of the MSR a number of parameter changes have been determined based on the measure level analysis described in Annex 8. These parameters include the upper and lower threshold, the introduction of lower buffer, the intake and release rate, the invalidation mechanism as well some technical changes for the calculation of the TNAC.

For the policy options, a distinction is made between PO1 which applies the static parameter changes from the MSR1 level measure assessment while PO 2 and PO 3 applies dynamic parameters derived from MSR3 in the level measure assessment.

For PO1, the upper and lower threshold are respectively adjusted to 650 Mt and 310 Mt which remain static as from 2028. Furthermore, a lower buffer is introduced to address risk of a threshold effect close to the lower threshold. The intake rate is set at 24% constant over time and the release rate is maintained constant at 100 Mt and the invalidation mechanism is dropped after 2027 allowing more allowances to be held in the reserve. Some technical corrections are applied to the TNAC calculation.

For PO2 and PO2, the upper and lower thresholds are maintained at 833Mt and at 400 Mt in 2028 respectively. The options also include the introduction of the lower buffer, changing the intake rate at 12% from 2028 and dropping the invalidation mechanism from 2027 and the introduction of technical corrections for the TNAC calculation. Furthermore, the key parameters are adjusted and decrease with 4% as from 2028 to reflect the shrinking market of allowances.

For all PO regarding the MSR, it should be noted that greater number of allowances to remain in the MSR rather than invalidating them could provide an essential liquidity buffer to manage future market tightness in the mid-2030s and beyond. For this reason, the invalidation of allowances in the reserve should be stopped in the short term to allow for a larger number of allowances to remain in the reserve. This will increase the firepower of the Market Stability Reserve for future releases in the next decade to balance the market.

Table 11: Policy measures for MSR

	PO1	**PO2/PO3**
UB: upper buffer	Implied by UT and IR: $UB(y) = \frac{UT(y)}{1-IR(y)}$	
UT: upper threshold	650 Mt constant from 2028	833 Mt in 2028 Decreases at 4.0%/year after
IR: intake rate	24% constant	12% constant from 2028
LT: Lower threshold	310 Mt constant from 2028	400 Mt in 2028 Decreases at 4.0%/year after
LB: Lower buffer	Implied by LT and RR: $LB(y) = LT(y) - RR(y)$	
RR: Release rate	100 Mt constant	100 Mt in 2028 Decreases with 4.0%/ year after

	PO1	PO2/PO3
Invalidation mechanism	Dropped after 2027	
TNAC calculation	Technical correction for 2027 TNAC	

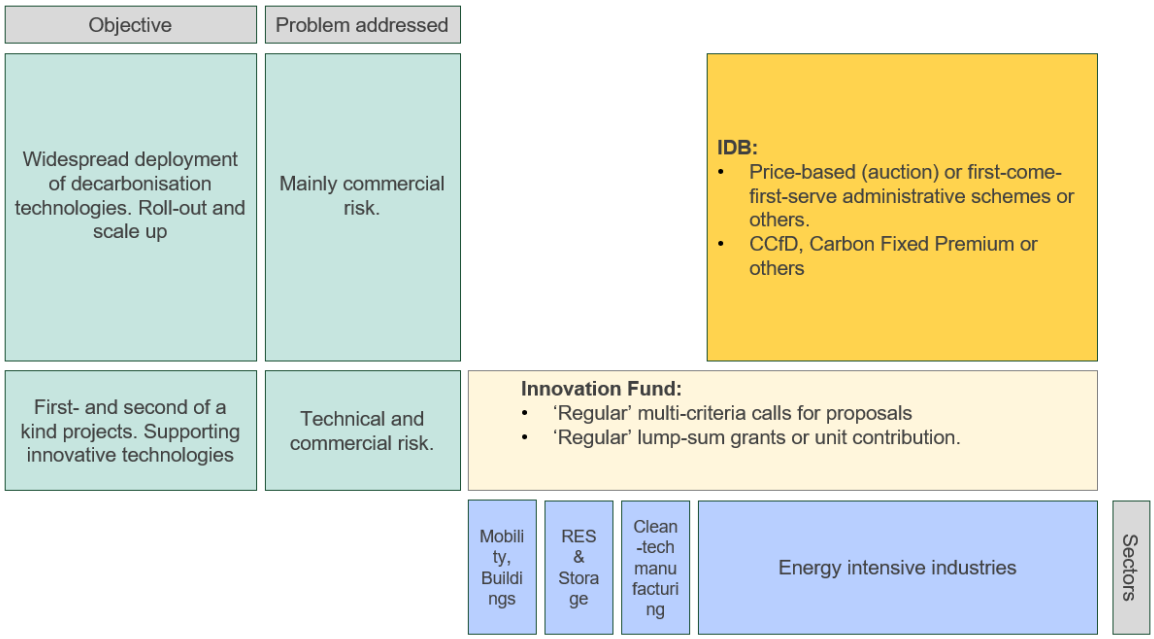
2.2. Instruments to support investments

2.2.1. Industrial Decarbonisation Bank

The Clean Industrial Deal announced the Industrial Decarbonisation Bank (IDB), with a budget of EUR 100 bn 'based on funds in the Innovation Fund, additional revenues resulting from parts of the ETS as well as the revision of InvestEU.' The objective of the IDB is to make a sizable impact on the industrial decarbonisation of the EIIs. Additionally, the Innovation Fund (IF) is set to be continued for the period 2031-40 using the existing instruments ('regular' grants and auctions[62]) and providing existing type of support ('classic grants' with lump sum payments or fixed premium linked to the low-carbon product output and, to smaller extent, financial instruments) to a board range of innovative decarbonisation technologies in all sectors covered by the EU ETS, including ETS 2.

The IDB should focus on addressing the scale-up and roll-out of decarbonisation technologies in the EIIs while the IF would continue to focus on addressing technical and early commercial risks of innovative technologies. The Bank will be placed within the governance of the future Competitiveness Fund. The different scopes of the IDB and IF are proposed in the figure below.

Figure 2: Scope of the Industrial Decarbonisation Bank and Innovation Fund



The policy measures assessed in this Impact Assessment, examine the possible approaches for allocating support through the IDB, the different forms that such support could take, and the mechanisms available to ensure geographical balance in its distribution.

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[62] IF can provide support via (1) 'regular' grants based on the evaluation of multiple award criteria and in form of the lump sum payments linked to reaching project's milestones as early as of Financial Close and (2) auctions based on the price-only competition and in the form of unit cost contribution as of Entry into Operation and (3) financial instruments.

Options on how the support should be allocated (allocation mechanism)

There is a number of allocation mechanisms that can be deployed, and in most of the cases these can be selected independently of type of support being provided. The options presented below reflect the most commonly used instruments, based on the experience from the Innovation Fund, and national support schemes for the industrial decarbonisation. These allocation mechanisms are not necessarily mutually exclusive, for example auctions may be designed as very similar to multicriteria processes (i.e. by including non-price criteria).

Table 12: Policy measures for IDB allocation mechanism

AM.1	Multi-criteria call for proposals
AM.2	Auctions
AM.3	First-in, first served administrative schemes

Measures on what form the support should take

Public support can take a number of forms and, in most cases, the choice of support can be made independently of the allocation mechanism. The options presented are not exhaustive but represent the most common types of support, reflecting the experience from the Innovation Fund and national support schemes for the industrial decarbonisation.

Table 13: Policy measures for IDB type of support

FS.1	Regular' grants covering the funding gap
FS.2	Carbon Fixed Premium (CFP)
FS.3	Carbon Contracts for Difference (CCfD)

Measures on ensuring geographical balance in IDB

The IDB design requires balancing between two partially conflicting objectives: directing EU-funding to the most cost-effective projects (typically low-risk, mature ones, located in the optimal locations of the EU); and, supporting industry decarbonisation across all Member States to ensure that all MS decarbonise their industrial base, benefit from spillover effects and, in the long-term no opportunities are missed (countries/regions that are not successful in the EU-level competition might be hampered by lack of administrative capacity/lack of innovation ecosystem rather than structural factors of their industry/economy). .

The Clean Industrial Deal highlights a fair geographical distribution of support needs to be ensured. Several options to achieve this balance:

Table 14: Policy measures for IDB geographical distribution

GB.1	EU-level competition, no geographical balance measures
GB.2	National allocations earmarked for MS
GB.3	Combing EU-level competition with national allocations

The measures are grouped into policy packages reflecting different degrees of change compared to the current ways to allocate the support provided under the Innovation Fund, with:

- PO1 replicating the current forms of support in the Innovation Fund,

- PO3 focusing primarily on novel forms of support that would work well with mature regulatory framework and strong carbon price signal and
- PO2 being a combination of the current and new ways of support.

Table 15: Policy measures for IDB in the policy options

Policy measure		PO1	PO2	PO3
How the support should be allocated (allocation mechanism)	AM1: Multi-criteria call for proposals	X		
	AM2: Auctions		X	X
	AM3: First-in, first served administrative schemes		X	
What form the support should take	FS1: Regular' grants covering the funding gap	X		
	FS2: Carbon Fixed Premium (CFP)		X	
	FS3: Carbon Contracts for Difference (CCfD)			X
Ensuring geographical balance in IDB	GB1: EU-level competition, no geographical balance measures	X		
	GB2: National allocations earmarked for MS	1.1.1.1		X
	GB3: Combing EU-level competition with national allocations	1.1.1.1	X	
Stable design elements across measures	• IDB budget of EUR 100 bn as announced in the Clean Industrial Deal • IDB scope on scale-up and roll-out of decarbonisation technologies in the EIIs • IF to be continued using the existing instruments ('regular' calls for proposals and 'regular' grants)			

2.2.2. Modernisation Fund

As evidenced in the evaluation on its operating rules, the Fund demonstrates a degree of relevance, effectiveness, efficiency and EU added value which warrant its continuation after 2030, in volumes comparable with current situation so as to continue supporting lower income Member States in reaching EU climate and energy objectives. All policy measures presented below therefore maintain the Funde.

Coherence of the Fund with EU climate and energy objectives, and in particular the 2050 carbon neutrality objective can however be better addressed through increased climate ambition of the Fund, through better targeting of investments. In this context, all measures presented open the scope of priority investments (PI) to technologies relevant for industrial decarbonation such as CCS and direct electrification of industry, while making support to gas and waste-to-energy ineligible under PI.

In addition, three different measures are explored, related to 1) the eligibility of investments involving gas and waste-to-energy; 2) the share dedicated to priority investments and 3) governance of the priority investment confirmation process.

The **Policy Option (PO1)** maintains the status quo with regards to the eligibility of gas and waste-to-energy as non-priority investments. It also brings the share of non-priority investments to 10% across all three pots of money making up the Fund, down from the current 10% or 20% depending on the pot. This simplifies the current set-up while also recognizing the low resort to non-priority investments on the side of Member States (de facto less than 10% of supported investments currently). In terms of governance, this option opens up the possibility for confirmation of priority investments by the European Investment Bank on a rolling basis, without cut-off date (without any link to the timing of Investment Committee meetings). The actual disbursement of funds to the Member States would however remain limited to two disbursements decisions per year.

The **Policy Option (PO2)** limits the eligibility of non-priority investments of gas to energy efficiency-type investments (fuel switch from coal/lignite to gas) while excluding gas infrastructure. In a similar vein, non-priority investments may only support waste-to-energy in the conditions of high efficiency co-generation of heat and power and would concern only residual, non-recyclable waste. Concomitantly, the share of NPI would be brought down to 5% across all pots of Modernisation Fund allowances. Governance would maintain its status quo.

The **Policy Option** (PO3) excludes any support to gas or waste-to-energy, including as non-priority investment. The share of non-priority investment is brought down to 0. Approval process of priority investments becomes more stringent through the Investment Committee acquiring a vetting power over them.

Table 16: Policy measures for Modernisation Fund

Policy measure		**PO1**	**PO2**	**PO3**
Eligibility of Gas / Waste-to-energy	GAS/WtE1: PI: Exclusion. NPI: status quo	X		
	GAS/WtE2: PI: Exclusion. NPI: Allowed under conditions	X		
	GAS/WtE3: PI/NPI: Exclusion		X	
Respective shares of Priority / Non-Priority Investments	PI/NPI0: NPI share = 10%	X		
	PI/NPI1: NPI share = 5%		X	
	PI/NPI2: No NPI			X
Governance of the confirmation process of PI investments	GOV0: on rolling basis	X		
	GOV1: Status quo (as in current MF)		X	
	GOV2: vetting by Investment Committee			X

Stable design elements across policy options	• MF is maintained; • The scope of priority investments is enlarged to include CCS and direct electrification for industry; • Gas and waste-to-energy are ineligible as priority investments; • Two disbursement decisions per year.

2.3. Aviation

The measures for aviation addressing the above problems and drivers are set out in Table 8 below and in more detail in Annex 10. In addition, there are several elements which apply in a uniform manner across all options. On geographic scope of the EU ETS, the Directive as in force since 2023 permanently exempts flights to and from around **75 Least Developed Countries and Small Island Developing States**[63]. This exemption is maintained across all measures. To ensure appropriate internalisation of the climate impacts (D2) of **private and business aviation**, all options include lowering the emissions threshold for all aircraft operators to 500t CO_2 to increase the reach of carbon pricing. This would bring the majority of **private and business aviation** into the ETS scope. All **private and business jet flights** departing EEA countries also come into the ETS. This element is accompanied by a **simplification** for monitoring, reporting and verification rules for all aviation small emitters limiting any increase in administrative effort for operators, Competent Authorities and the Commission (see Annex 10, section 7). In specific cases of **hub carbon leakage,** the ETS price would apply in both directions, on an equal-treatment-on-routes basis[64] to help level the playing field. In addition, the EU could provide "ETS-as-a-service" to interested third countries, which could receive a share of the revenues for climate purposes. However, this is not included in the modelling.

Policy Option 1 (PO1): The geographic scope of application of the EU ETS depends on the required assessment of CORSIA[65]. PO1 assumes this assessment is positive and States continue to effectively apply CORSIA. This assessment would be in line with SO1.3.1, ensuring effective action on the EU's fair share of international aviation emissions because departing flights would be covered by a meaningful carbon price. This means that the EU ETS carbon price would apply to flights within and between EEA States, as well as to departing flights to Switzerland and the UK. For countries that should be implementing CORSIA offsetting but are not doing so, the EU ETS would apply in both directions. CORSIA would apply to remaining flights between participating countries. Emissions between some countries would not be covered by a carbon price[66]. States would continue to apply CORSIA so that airlines offset emissions above the negotiated baseline[67] until 2035 when CORSIA is set to end. In advance of CORSIA's sunset clause, a new solution to ensure meaningful carbon pricing of international

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63 As defined by the United Nations, except for those States with a GDP per capita equal or exceeding Union average.

64 The EU ETS carbon price would apply to any airline flying on that route.

65 The Commission assessment checks whether CORSIA has been implemented in national law by third countries, and whether it has been strengthened. See detail in the Annex 10, section 5.

66 Both CORSIA and the EU ETS exempt flights involving Least Developed Countries and Small Island Developing States. From January 2027, CORSIA should become mandatory for flights between 34 countries (resulting in offsetting above the baseline). Unless they voluntarily participate, flights involving other countries are not covered by CORSIA. As of 2025 and the latest list applicable for 2026, 130 countries voluntarily participate in CORSIA, accounting for 51% of 2024 emissions from international aviation.

67 As of 2024, the CORSIA baseline is 85% of 2019 CO2 emissions, amounting to at least 516 million tonnes CO_2 of international aviation emissions each year that are not addressed by CORSIA. Source: ICAO, *CORSIA Central Registry (CCR): Information and Data for Transparency, Part II: Total CO2 emissions for 2019 Aggregated for all Aeroplane Operators on each State Pair*, 2022.

aviation emissions would need to be put into effect. The Commission would report on the application of CORSIA and changes in emissions coverage in its annual Carbon Market Report. On SAF support, in line with the unchanged ETS scope, support would expire at the end of 2030, and it would be allocated in the same manner as today (ETS Directive as in force since 2023). PO1 aviation measures require no adjustments to the ETS cap.

Policy Option 2 (PO2): Under PO2, the Commission assessment of CORSIA is negative: there would be exemption so that the EU ETS would not apply to flights arriving in the EEA from a country outside the EEA. The EU ETS would apply to departing flights from the EEA to less than about 90 destination countries[68]. Where the ETS carbon price applies and the country participates in CORSIA, airlines can deduct CORSIA offsetting costs to avoid double charging. This approach is in line with SO1.3.1, ensuring effective action on the EU's fair share of international aviation emissions because it ensures that departing flights are covered by a meaningful carbon price. The geographic scope is expected to result in increased ETS revenues, part of which would be used to extend support for SAF uplift by an additional amount of allowances[69]. In line with Objective SO1.1.1, enabling investments, this support is coupled with conditionalities such as having a longer term off-take contract agreement in place. PO2 would entail cap adjustments proportionate to the extension in scope of the ETS carbon price. To preserve the environmental integrity of the ETS, the deduction would be accompanied by the cancellation of an equivalent amount of EU ETS allowances.

Policy Option 3 (PO3): The geographic scope of application would be the same as under PO2, because larger geographic coverage would go beyond SO1.3.1 (ensuring effective action on the EU's fair share of international aviation emissions). The geographic scope is expected to result in increased ETS revenues, of which a larger part (compared to PO2) would be used to extend support for SAF uplift until the end of 2035, with the same conditionalities as in PO2. PO3 would entail the same cap adjustments as PO2.

Table 17: Policy measures for aviation

Review element	Policy measure	PO1	PO2	PO3
Geographic scope	AS1: clean cut	X		
	AS2: departing flights		X	X
Financial support for SAF uptake	SAF0: status quo	X		
	SAF1: medium extension		X	
	SAF2: larger extension			X
Design elements: stable across all options	Socially progressive: Private & business jets inclusion Automatic phase-in: Outermost Regions participation Automatic exemption: LDCs and SIDS exemption			

[68] The ETS would not apply if the destination is one of around 75 Least Developed Countries or Small Island Developing States (see footnote 15), countries where the ETS currently applies are not counted (EU27, EEA, flights to Switzerland).

[69] As foreseen by the ETS Directive Article 3c(6), penultimate paragraph.

2.4. Maritime

Regarding maritime, different measures are explored to address the various problems and drivers faced by the sector:

- LCF: support for emission reduction in the shipping sector and enable investments in line with the specific objective set in SO1.1.1.
- RE: Additional safeguards against the risk of evasion, linked to the specific objective defined in SO1.1.3:
- SI: Simplification, and targeted enhancement measures[70]
- DE: Derogations and exemptions for outermost regions, ice-class ships, small islands and transnational public service contract or obligation.
- IMO: Deduction from the ETS surrendering obligations of emissions priced under IMO GHG mid-term measures, to ensure coherence between the EU ETS and the IMO measure once adopted and implemented, in line with the specific objective set in SO1.3.2;
- MSS: Extension of the EU ETS to cover emissions from smaller ships (i.e. ships below 5 000 gross tonnage but not below 400 gross tonnage) in line with the specific objective SO1.1.2;

Different variants and combination of these measures are considered across the three policy options.

The policy option PO1 focuses on the introduction of **simplification and targeted enhancement measures** with the objective to lessen administrative burden and enhance the effectiveness and robustness in the implementation of the system, both for shipping companies and the administering authorities of Member States. These measures are particularly important for small and medium-sized enterprises (SMEs), which often face higher administrative and compliance costs relative to larger operators. These are the only significant changes in comparison to the Baseline. However, **no changes to the anti-evasion** measure would be introduced and the existing **scope of the ETS in terms of ship categories and sizes** would remain unchanged. In addition, **no additional support mechanism** for maritime from ETS revenues would be introduced at EU level, beyond the support already provided through the Innovation Fund. In line with the current legislation, derogations would stop as from 2031.

For **maritime**, the **policy option PO2** includes a **dedicated support mechanism** (SMAP) that would be introduced for vessels to contribute to close the gap between the costs of mitigation solutions and the costs of fossil fuels, therefore accelerating the decarbonisation of the sector (assuming that in total 50% of ETS revenues generated by the ETS extension to maritime are recycled in the sector through EU mechanisms and national schemes).

Further, the option PO2 would strengthen the existing **anti-evasion measure** by including more ports in the list of neighbouring container transhipment ports (through lowering the annual average transhipment share threshold from 65% to 50%). Moreover, elements of the legislation that are also relevant to offshore activities would be adjusted to ensure that all ships providing relevant offshore services in EU waters are subject to the ETS, independently of their flag or from where they come from or where they go to after concluding the activity.

The existing derogations (islands, OMR, PSO/PSCs, and ice class ships) would be extended for limited time. **The Simplifications and targeted enhancement measures** for shipping

[70] Policy measure SI1 applies horizontally across the different policy options.

companies and administrative authorities foreseen under policy option PO1 would be maintained also under PO2 .

The option PO2 would introduce a deduction for emissions that are both covered by the ETS and subject to regulation and pricing under a future IMO mid-term measure, once adopted. This deduction would apply in full as long as the carbon price set by the IMO mid-term measure stays above ETS prices. In the opposite case, a correction factor would apply to reduce proportionally the amount of emissions to be deducted from the ETS obligations. This approach prevents double payment for the same emissions, while ensuring that emissions excluded from the ETS are priced at a level at least equivalent to that of the ETS. To preserve the environmental integrity of the ETS, the deduction would be accompanied by the cancellation of an equivalent amount of allowances.

This policy option would also extend the ETS scope to emissions from **small ships categories emitting the most** among small ships with gross tonnage bigger than 400 gross tonnage but below 5 000 gross tonnage.

Option PO3 includes the same approach as in option PO2 in relation to the dedicated support mechanism (SMAP), the IMO deduction, simplification and targeted enhancements for shipping companies and administrative authorities, derogations and measures to address evasion risks. However, compared to PO2, this option considers extending the scope of the ETS to a larger fleet of small vessels, namely **all categories of small vessels** already covered under the EU maritime MRV, non-commercial yachts, and fishing vessels.

Table 18: Policy measures for maritime

Topic	Policy measure	PO1	PO2	PO3
Maritime - Support for emission reduction in the shipping sector	LCF0: No dedicated ETS support mechanism	**X**		
	LCF1: EU ETS support mechanism for Sustainable Maritime Alternative Propulsion (SMAP)		**X**	**X**
Maritime - Evasion Risk	RE0: Current measures on evasion	**X**		
	RE1: Revise the list of neighbouring container transshipment ports		**X**	**X**
	RE2: Ensure that offshore activities by ships operating in EU waters are covered, independently from their port of origin.		**X**	**X**
Simplification in Maritime	SI1: Simplification, and targeted enhancement measures	**X**	**X**	**X**
Maritime - Derogations	DE0: no extension of derogations	**X**		
	DE1: Extension of derogations for limited time		X	X
	IMO0: No IMO deduction	**X**		

Maritime – IMO deduction mechanism	IMO1: Deduction from the ETS surrendering obligations of emissions subject to pricing by IMO		**X**	**X**
Maritime - Smaller Ships	MSS0: The existing scope in terms of ship categories and sizes remains unchanged	**X**		
	MSS1: Targeted extension of the scope of the EU ETS to smaller ships by including ship categories emitting the most among small ship categories		**X**	
	MSS2: Extension of the scope of the EU ETS to all smaller vessels (from categories non-exempt from MRV, plus fishing vessels and non-commercial yachts)			**X**

The possibility to offer EU ETS as a service to third countries (e.g. candidate countries) is also considered. It could promote the adoption of consistent carbon pricing mechanisms in non-EU countries and help drive global climate action in the maritime sector, especially in the event an IMO market-based measure is not applied. However, the possibility to support a future IMO Fund with payments from selling of ETS allowances could not be analysed considering that the IMO adjourned its decision regarding the adoption of the IMO Net Zero Framework. This issue will need to be re-assessed once (and if) a Fund is established at IMO.

2.5. Stationary installations

2.5.1. Carbon leakage prevention measures for direct emissions

Establishing a carbon pricing mechanism brings the risk of carbon leakage, which occurs if industrial production relocates from the EU to jurisdictions with less stringent environmental standards. For ETS sectors outside of the scope of the CBAM regulation, the provision of **free allocation** (P3) remains the main tool to address this risk. Some of the carbon leakage measures analysed are primarily developed as improvements and simplifications to the current free allocation rules (CL1) or as an expansion of the current limited application of conditionality to all installations (CL2). The other measure (CL3) provides an alternative approach for carbon leakage, under which installations do not receive allowances for free, but rather must surrender allowances only for part of the reported emissions, which is set to progressively increase to a full surrender.

CL1 is included in PO1 ‘Aligning ambition and improving incentives’, as it provides continuity with the current free allocation system in addressing the risk of carbon leakage (SO1.1.3), while providing some simplification to reduce administrative burden and making the implementation of the free allocation more efficient. CL2 is part of the ’ Aligning ambition and extending scope and corresponding incentives’ option PO2 and it builds on CL1 (including thus all the simplification and improvements therein) . Under this measure, in order to ensure the better targeting of free allocation and to encourage investments in the decarbonisation of industry (addressing SO1.1.1), a gradually increasing share of free allocation is made conditional to installations demonstrating that the equivalent financial value of the received free allocation is invested in signficant emissions reduction measures. For the purposes of the assessment of the impacts of this measure, two different scenarios are assumed for the rate of complying with the conditionalities under CL2 – 90% (CL2_90) and respectively 50% (CL2_50). Additional variants for CL2 include adjustments to the rate of the phase-out of free allocation for sectors falling under the scope of the scope of the CBAM regulation, addressing the risk of remaining carbon leakage for those sectors. CL3, which is part of the ‘Aligning ambition and extending

scope and incentives comprehensively' option PO3, replaces free allocation with a partial non-surrender obligation that gradually increases to a full surrender obligation by 2034. This measure results a better carbon price signal (SO1.1.2) and it brings significant administrative simplification, as all the administrative processes related to applying and receiving free allocation are removed. However, this results in a less effective carbon leakage protection and does not provide incentives to reduce emissions.

Table 19: Policy measures for carbon leakage prevention

Policy measure	**PO1**	**PO2**	**PO3**
CL1: Improved current approach	X		
CL2: Conditional Free allocation for investments		X	
CL3: No free allocation and partial surrender of allowances until 2034			X

2.5.2. Carbon leakage prevention measures for indirect emissions

Compensation for indirect carbon costs (ICC) is encouraged under the ETS Directive as a way to address the risk of carbon leakage due to carbon costs passed on through electricity prices (SO1.1.3).

The Directive currently encourages provision of compensation to sectors at risk of carbon leakage due to ICC, as an alternative to free allocation (P3), which is justified due to the different nature of the risk. Carbon leakage risk from indirect emissions differs from the risk associated with direct emissions because: i) the carbon price is not paid directly by the industrial installations at risk but is passed on through their electricity bills; and ii) consumers of decarbonised electricity may face ICC due to the influence of fossil fuels on the marginal cost and wholesale price of electricity.

ICC compensation is currently provided voluntarily by Member States, subject to specific State aid rules[71]. This approach has several advantages. In particular, it gives Member States the flexibility to choose between ICC compensation and other uses of ETS revenues. However, an approach based purely on State aid can risk distorting the internal market, since an installation's entitlement to compensation depends on whether the Member States where it is located decides to grant this type of aid. For this reason, the 'Aligning ambition and extending scope and incentives comprehensively' package PO3 considers augmenting State aid with an EU-wide component, whereby some ICC compensation is provided on a harmonised basis.

In this context, it is important to underline that the decarbonisation of the EU's power sectors is advancing swiftly, which will have a dampening effect on carbon cost pass through even when electricity continues to be priced at the margin. The substantial growth of electricity production from renewable sources and the deployment of storage capacities will increasingly replace marginal generation by fossil fuel based power plants.

The policy options considered in this assessment are:

- ICC1 - a continuation of the current approach whereby the ETS Directive encourages Member States to provide ICC compensation, subject to rules elaborated in State aid

[71] Guidelines on certain State aid measures in the context of the system for greenhouse gas emission allowance trading post-2021 (2020/C 317/04)

guidelines. This option includes enhancing the current regime by strengthening the direction given by the ETS Directive in three ways:

i. making ICC compensation conditional on decarbonisation investment by beneficiaries. This is similar to option CL2 for free allocation and builds on conditionality requirements that are already in place in the current ICC State aid guidelines.

ii. enhancing verification and enforcement of the decarbonisation conditions.

iii. stating that the electricity production mix used for indirect emission benchmarks should take account of the role of fossil and non-fossil sources in the setting of electricity prices.

- ICC2 - harmonised ICC. In addition to the measures described in ICC1, this would consist of providing EU-level funding for ICC compensation by reserving 5% of auctioned allowances for this purpose. Member States would retain the right to provide a higher level of compensation up to the level permitted under State aid rules.

The extent to which each option exposes polluters to the full carbon price signal (SO1.1.2) or addresses the risk of carbon leakage (SO1.1.3) depends on the design of the compensation measures: such as aid intensity and sectoral eligibility. ICC1 would likely provide less support and greater exposure to the full carbon price than ICC2, simply because some Member States may not provide the maximum amount of State aid due to national budgetary priorities. Annex 12 assesses the implications of each option in greater detail.

Almost three quarters of respondents to the OPC, mainly companies/businesses and business associations, considered that indirect cost compensation will remain necessary after 2030 to address the risk of carbon leakage from carbon costs passed on in electricity prices (in sectors not covered by CBAM). Among this group, preferences differed, in order of frequency, between calls to harmonise the system at EU level, maintaining the current approach based on State aid and extending indirect cost compensation to cover more sectors and sub-sectors.

Table 20: Policy measures for indirect cost compensation

Policy measure	**PO1**	**PO2**	**PO3**
ICC1: Continue SA encouragement	X	X	
ICC2: Harmonised ICC (e.g. via IDB)			X

2.5.3. 20MW threshold

Regarding the possibility of lowering the **20 MW thermal input threshold** to cover smaller installations (P8), the measures under consideration reflect the review clause included in Article 30 (5)(b) of the ETS Directive, namely to consider the feasibility of lowering this threshold from 2031, thereby responding to problem driver D2 (specifically D2.2) related to insufficient carbon price signal. The measures considered were *T0: maintain the current 20 MW threshold* and *T1: lower the threshold* (e.g. by 5, 10, 15 or 20 MW).

A quantitative assessment was undertaken (see Annex 12) but should be considered tentative given the lack of sufficiently granular EU-level data collection relating to installations of this size[72]. The assessment found that approximately 227 $MtCO_2e$ of emissions (2021-2023

[72] The assessment used data collected in the context of the Medium Combustion Plant Directive, as discussed in Annex 12

average) from Annex I activities are not covered by EU ETS and could be brought into the EU ETS via lowering the threshold. However, 85% of these emissions will be covered by the introduction of ETS2 covering emissions from buildings, road transport and additional sectors. Of the remaining 33 MtCO2e, around 5 MtCO2e is excluded under Article 27 of the Directive (coverage by equivalent national measures), leaving 28 MtCO2e of predominantly process emissions.

Since the majority of emissions below 20 MW will in any case be covered by ETS2, the environmental case for lowering the threshold is marginal when compared to the administrative cost. The Commission services' assessment is therefore that it would be a contribution to simplification and better regulation not to address these emissions through inclusion in the EU ETS due to the high administrative cost involved which is considered disproportionate. For example, lowering the threshold to 10 MW would bring approximately 10 MtCO2e of annual emissions into the ETS, but would expand the EU ETS by more than 11,000 installations. This would more than double the number of stationary installations covered, in exchange for only marginal increase in emissions coverage.

This assessment was corroborated by the stakeholder consultation, where a majority of stakeholders across the OPC, position papers and interviews opposed lowering the threshold on the grounds that it would impose significant administrative and financial burdens on smaller operators, outweighing the potential climate benefits.

For these reasons, the option of lowering the threshold is discarded in all policy option packages, in favour of maintaining the existing threshold.

2.6. Waste

Regarding the EU ETS scope expansion to cover **waste management** emissions (P5), the measures under consideration mirror the review clause included in Article 30(7) of the ETS Directive. They correspond to progressing degrees of the possible expansion, in terms of waste management processes and their emissions so that the possibility of internalising the climate change impact of the waste management sector (D2.5) to advance further emissions reductions (O1.1) can be realised (cost-)effectively. The assessment of the measures addresses the environmental integrity, the alignment with the waste hierarchy, the feasibility of robust monitoring and reporting of emissions as well as internal market effects and potential distortions of competition– as prescribed in the review clause. Timewise, the expansion of the EU ETS to waste management regardless of the level was deemed not preferable prior to 2030 to ensure predictability and sufficient preparation time (considering the time for the co-decision process for the review and the time needed to implement its outcomes, particularly regarding monitoring and reporting rules).

The assessment found that W1 (‘EU ETS expansion to municipal waste incineration installations’) and W3 (‘EU ETS expansion to all waste incineration installations and landfills of non-hazardous waste’) would strike the right balance in terms of ensuring a full carbon price signal (SO1.1.2) in the waste management sector to incentivise further emission reductions (O1.1) and of increasing the size of the market (SO2.1.1) to ensure efficient market functioning (O2.1). PO1 'Aligning ambition and improving incentives' reflects the baseline with no inclusion of additional waste management processes in the EU ETS, instead mainly remaining under national emission reduction targets under the Effort Sharing Regulation. PO1 only implements some legal clarifications on the current scope. Co-incineration of waste would remain in the EU ETS and Member States would have the option to include their municipal waste-to-energy incineration installations in the scope of the system (cf. Denmark, Sweden and Lithuania already doing so).

PO2 'Aligning ambition and extending scope and corresponding incentives' reflects measure W1 as it expands the carbon price signal to a growing source of emissions – municipal waste incineration (MWI), both with and without energy recovery. Installations for incineration of municipal waste with energy recovery feed into the grid and district heating networks, where fossil fuel-based power installations are already subject to the EU ETS. To ensure the environmental integrity of this option and limit boundary and misclassification risks, emissions from all installations that predominantly incinerate municipal waste would be covered, consistent with the current MRV obligation for the sector. The cap estimate and GEM-E3 modelling integrates the cap increase by emissions estimates for the sector in PRIMES. In isolation, PO2 carries a risk of waste, in particular fossil waste streams, being diverted from incineration to landfills, depending on the effective enforcement and implementation of the waste policy framework, notably the Landfill Directive.

Finally, PO3 'Aligning ambition and extending scope and incentives comprehensively' reflects measure W3 as it expands the carbon price signal further to hazardous waste incineration (HWI) and to methane emissions associated with non-hazardous landfills. PO3 contributes to further overall emission reductions in the waste sector – primarily from methane – and addresses any residual risk of organic waste diversion from incineration to landfills. Conversely, PO3 has a more limited impact on fossil emission reductions and in isolation does not effectively address risks of diversion of fossil waste to landfills, which are ultimately subject to the enforcement and implementation of the waste policy framework. The cap estimate includes the emissions for the incineration sectors in the overall PRIMES modelling vis-a-vis the baseline. Emissions from landfilling could not be modelled in PRIMES as the model is constrained to CO2 emissions only, whereas landfill emissions are mainly driven by CH4. Landfill emissions have been separately modelled in GAINS. As a result, GAINS does not allow to separately model the disaggregated contribution of the carbon price to emissions reductions from non-hazardous landfilling under PO3.

The stakeholder consultation indicated broad support for the inclusion of municipal waste incineration installations in the EU ETS, with more than half of respondents to the OPC (51%), including companies/businesses and business associations as well as NGOs and environmental organisations, supporting an inclusion. Conversely, there was no agreement on a potential inclusion of hazardous waste incineration installations, with roughly equal shares in favour and against, although the latter was slightly larger. The consultation also highlighted that measures to address the risk of waste diversion to landfills would be important to ensure the robustness of the EU ETS expansion to waste incineration, whether through regulatory, fiscal or carbon pricing policies. The complete assessment is set out in Annex 13.

Table 21: Policy measures for waste

Policy measure	**PO1**	**PO2**	**PO3**
W0: No inclusion of additional waste management processes in the EU ETS.	X		
W1 Inclusion of the non-hazardous waste incineration installations in the EU ETS		X	
W2 Inclusion of all waste incineration installations in the EU ETS			
W3 Inclusion of all waste incineration installations and landfills of non-hazardous waste in the EU ETS			X
W4 Inclusion of all waste incineration installations, landfills of non-hazardous waste and chemical recycling processes in the EU ETS.			

W5 Inclusion of all waste incineration installations, landfills of non-hazardous waste and recycling processes in the EU ETS			
W6 Inclusion of all waste incineration installations, landfills of non-hazardous waste and recycling processes, as well as other waste management process (fermentation, composting and mechanical-biological treatment) in the EU ETS			

2.7. CCU

The recognition of non-permanent carbon reuse or **CCU (P2)** in ETS represents an accounting challenge, as emissions resulting from an ETS activity are captured and utilised in products that do not ensure their permanent storage to be then released in a different place and time. Therefore, the CCU measures are formulated around the different possible accounting options and assessed whether they ensure that emissions within the scope is effectively accounted, i.e. reported and the corresponding allowances surrendered, while avoiding the double counting or under-counting of emissions. In addition, the measures are assessed on whether they provide a level playing field or incentivise novel CCU products compared to their fossil-based equivalent.

As the carbon accounting in the EU ETS is dependent on the scope of the EU ETS coverage of waste incineration, the different policy measures need to reflect the inclusion or lack of it in the EU ETS. **CCU0** represents no change from the baseline, continuing the upstream accounting in the context of no inclusion of waste incineration in the EU ETS. Measure **CCU1** retains the current **upstream accounting system**¸ which means that the emitter pays for any captured emissions, unless they are permanently stored. However, unlike CCU0, CCU1 assumes that waste incineration has been included in the EU ETS. Measure **CCU2** moves the point of **accounting downstream,** which requires that the emissions contained in a CCU product are accounted at the point where they are finally emitted, which can be at the point of consumption for a product such as e-fuels or during the end-of-life treatment, such as when plastics or other materials are incinerated. Measure **CCU3** represents a hybrid accounting maintaining **the downstream accounting for most CCU products,** except for **e-fuels for which a midstream accounting** would be applied. This measure adapts the downstream accounting to the specificity of e-fuels, for which a developed regulatory framework and incentives[73] are already in place. Under CCU3, e-fuels producers or distributers would be required to account and pay for any fossil emissions embedded in the e-fuels, which allows to consider them as zero-rated fuels for the end user.

Table 22: Policy measures for CCU

Policy measure	**PO1**	**PO2**	**PO3**
CCU0:'Upstream accounting' with current waste scope	X		
CCU1: 'Upstream accounting' with MWI inclusion			
CCU2 'Downstream accounting'			
CCU3 'Midstream accounting'		X	X

[73] The Renewable Energy Directive (2018/2001), the ReFuelEU Aviation Regulation (2023/2405)