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PART 1/4

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

Accompanying the document

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and Regulation (EU) 2015/757

{COM(2021) 551 final} - {SEC(2021) 551 final} - {SWD(2021) 557 final} - {SWD(2021) 602 final}

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GLOSSARY

Term or acronym	Meaning or definition
Biofuels	Biofuels are liquid or gaseous transport fuels such as biodiesel and bioethanol which are made from biomass.
Biofuels (conventional)	Biofuels are produced from food and feed crops.
Biofuels (advanced)	Biofuels produced from a positive list of feedstock (mostly wastes and residues) set out in Part A of Annex IX of Directive (EU) 2018/2001.
CAPRI	Common Agricultural Policy Regionalised Impact model: a global multi-country agricultural sector model, supporting decision making related to the Common Agricultural Policy and environmental policy.
CBAM	Carbon border adjustment mechanism
CCFD	Carbon contract for difference
CCS	Carbon Capture and Storage: a set of technologies aimed at capturing, transporting, and storing CO_2 emitted from power plants and industrial facilities. The goal of CCS is to prevent CO_2 from reaching the atmosphere, by storing it in suitable underground geological formations.
CCU	Carbon Capture and Utilisation: the process of capturing carbon dioxide (CO_2) to be recycled for further usage.
CEF	Connecting Europe Facility: an EU funding instrument to promote growth, jobs and competitiveness through targeted infrastructure investment at European level.
CGE	Computable General Equilibrium: a family of economic models.
CHP	Combined Heat and Power: a combined heat and power unit is an installation in which energy released from fuel combustion is partly used for generating electrical energy and partly for supplying heat for various purposes.
CLEF	Carbon leakage exposure factor: a factor that determines how much free allocation a sector or sub-sector may obtain. It depends on whether the sector or sub-sector is deemed to be at risk of carbon leakage or not.
CLI	Carbon leakage indicator: a number that indicates to which extent a sector or subsector is deemed to be at risk of carbon leakage. It is calculated by multiplying the trade intensity with the emission intensity.
CO_2-eq	Carbon dioxide-equivalent: a measure used to compare quantities of different greenhouse gases in a common unit on the basis of their global warming potential over a given time period.
COP	Conference of the Parties: decision-making body of the United Nations Framework Convention on Climate Change (see UNFCCC)
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation

COVID-19	Coronavirus disease: a global pandemic caused by a coronavirus unknown before the outbreak began in Wuhan, China, in December 2019.
CSCF	Cross-sectoral correction factor: a factor by which free allocation of emission allowances is reduced in a uniform manner across all industry sectors, if the demand for free allocation exceeds the total amount of available free allowances
CTP	2030 Climate Target Plan
DG ECFIN	Directorate General Economic and Financial Affairs
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortisation
EEA	European Economic Area
EED	Energy Efficiency Directive: Directive 2012/27/EU and amending Directive 2018/2002/EU
E-fuels	Liquid fuels produced on the basis of hydrogen obtained from electricity via electrolysis
EIB	European Investment Bank
EPBD	Energy Performance of Buildings Directive
ERDF	European Regional Development Fund
ESR	Effort Sharing Regulation: Regulation 2018/842/EU
ETD	Energy Taxation Directive: Directive 2003/96/EC
ETS	Emissions Trading System
EU, EU-27	European Union with 27 Member States since 1 February 2020
EU-28	European Union with 28 Member States from 1 July 2013 to 31 January 2020
EUA	European Union allowance: the tradable unit under the EU ETS, giving the holder the right to emit one tonne of CO_2-eq
EUTL	European Union Transaction Log: central transaction log, run by the European Commission, which checks, records and authorises all transactions between accounts in the Union Registry (see also EU ETS, NIMs)
GAINS	Greenhouse gas and Air Pollution Information and Simulation model
GDP	Gross Domestic Product
GEM-E3	General Equilibrium Model for Energy Economy Environment interactions: a computable general equilibrium model, version operated by E3Modelling, a company
GHG	Greenhouse gas

GLOBIOM	Global Biosphere Management Model: a model for land use of agriculture, bioenergy, and forestry.
GT	Gross Tonnage
GW	Gigawatt
GWh	Gigawatt hours
IA	Impact assessment
ICAO	International Civil Aviation Organisation
IEA	International Energy Agency
IF	Innovation fund
IMO	International Maritime Organization
JRC	Joint Research Centre of the European Commission
JRC-GEM-E3	General Equilibrium Model for Energy Economy Environment interactions: a computable general equilibrium model, version operated by the JRC
LDC	Least developed countries
LRF	Linear Reduction Factor: a factor by which the overall emissions cap of the ETS is reduced yearly
LULUCF	Land Use, Land-Use Change, and Forestry
MACC	Marginal abatement cost curve
MMF	Multiannual Financial Framework
MRV	Monitoring, reporting and verification
MS	EU Member State(s)
MSR	Market stability reserve
$MtCO_2$	Million tonnes of CO_2
MW	Megawatt
MWh	Megawatt hours
NACE	Statistical classification of economic activities in the European Community (from the French nomenclature statistique des activités économiques dans la Communauté européenne)
NECP	National Energy And Climate Plan
NIMs	National implementation measures, submitted under Article 11 of the ETS Directive
NPV	Net Present Value

OPC	Open Public Consultation
PRIMES	Price-Induced Market Equilibrium System: an energy system model for the European Union.
PRIMES-TREMOVE	Model for the transport sector, integrated in the PRIMES model.
RED / RED II	Renewable Energy Directives 2009/28/EC and 2018/2001/EU (recast)
RES	Renewable Energy Sources
SIDS	Small island developing states
SME	Small and Medium-sized Enterprise
SMSS	Sustainable and Smart Mobility Strategy
SWD	Staff working document
TEN-E	Trans-European Networks for Energy
TNAC	Total number of allowances in circulation
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value Added Tax

1 INTRODUCTION: POLITICAL AND LEGAL CONTEXT

1.1 Context of the initiative

The European Green Deal[1] aims to transform the EU into a fairer and more prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases by 2050 and where economic growth is decoupled from resource use. The climate neutrality objective has been endorsed by the European Council[2] and Parliament[3] and is laid down in a legally binding manner in the politically agreed European Climate Law[4]. The European Green Deal also aims to protect, conserve and enhance the EU's natural capital, and protect the health and well-being of citizens from environment-related risks and impacts. At the same time, this transition must be just and inclusive.

The necessity and value of the European Green Deal have only grown in light of the very severe effects of the COVID-19 pandemic on our health and economic well-being. Unprecedented near term investments are needed to overcome the negative impact of the COVID-19 crisis on jobs, incomes and businesses, including in the sectors covered by the EU Emissions Trading System (ETS).

With the Communication on stepping up Europe's 2030 climate ambition – the 2030 Climate Target Plan[5] (2030 CTP) the Commission has proposed an EU-wide, economy-wide net greenhouse gas emissions (GHG) reduction target by 2030 compared to 1990 of at least 55% that will set the Union onto the path to climate neutrality. The December 2020 European Council confirmed this ambition level[6] and the political agreement on the European Climate Law in April 2021 ensures that it is legally binding. The Union has updated its Nationally Determined Contribution[7] and called upon all other parties of the Paris Agreement to come forward with their own ambitious targets and policies.

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[1] COM(2019)650 final.
[2] European Council conclusions, 12 December 2019.
[3] European Parliament resolution of 14 March 2019 on climate change and resolution of 28 November 2019 on the 2019 UN Climate Change Conference in Madrid, Spain (COP 25).
[4] COM (2020)80 final; Council letter to EP on Climate Law agreement: https://data.consilium.europa.eu/doc/document/ST-8440-2021-INIT/en/pdf
[5] COM (2020) 562 final.
[6] European Council meeting (10 and 11 December 2020) – Conclusions; EUCO 22/20.
[7] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/European%20Union%20First/EU_NDC_Submission_December%202020.pdf

In line with the policy conclusions (see Annex 14), the Commission is reviewing all relevant climate and energy policies. This includes increasing the environmental contribution of the ETS in a manner commensurate with the overall target. The ETS is a cap-and-trade system that limits emissions from approximately 10000 energy intensive installations (power stations & industrial plants) and around 500 airlines[8]. The ETS covers 41% of the EU's greenhouse gas emissions.[9] The 2030 CTP indicates that increasing the EU's 2030 climate ambition requires a strengthened cap of the existing EU ETS, while its impact assessment provided estimates what this could mean.

Reducing maritime transport emissions is part of the EU economy-wide reduction commitment under the Paris Agreement. The co-legislators expressed in Regulation (EU) 2018/842 and the ETS Directive that all sectors of the economy should contribute to the reduction of greenhouse gas emissions. The ETS Directive also states that action from the International Maritime Organisation (IMO) or the Union should start from 2023, including preparatory work on adoption and implementation and due consideration being given by all stakeholders. The 2030 CTP states that the EU should include at least intra-EU maritime transport in the Emissions Trading System.

Furthermore, the impact assessment accompanying the 2030 CTP[10] has assessed carefully the possibility of reinforcing and expanding emissions trading as a tool to achieve greenhouse gas emission reductions at the EU level in an economically efficient manner. The 2030 CTP is clear that an expansion of emissions trading could include emissions from road transport and buildings, and that the Commission would look into covering all emissions of fossil fuel combustion[11]. The expansion could be developed as an upstream system and would need to appropriately address the relation to entities whose emissions from fuel combustion are covered by the existing downstream ETS. The CTP pointed to the benefit of transitional arrangements or a pilot period before gradually integrating the new sectors into the existing system.

The December 2020 European Council invited the Commission to consider exploring the ways to strengthen the ETS, in particular carbon pricing policies, while preserving its

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[8] The ETS has been established by Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community, Official Journal L 275, 25.10.2003, p. 32–46.

[9] This percentage is based on the current EU 2020 and 2030 climate target scope, which includes all international aviation, excludes the international maritime sector and keeps LULUCF separate.

[10] SWD(2020) 176 final

[11] In addition to building and road transport emissions, this would include emissions from small non-ETS industries, fuel use in agriculture and non-electric railway.

integrity and taking into account the need to address distributional concerns and energy poverty. The European Council also invited the Commission to consider proposing measures that enable energy-intensive industries to develop and deploy innovative climate-neutral technologies while maintaining their industrial competitiveness.[12]

The European Parliament called on the Commission to rapidly review the ETS Directive to make it fit for purpose for the increased GHG targets, and welcomed the inclusion of the maritime sector in the ETS, and stressed that the EU should defend a high level of ambition for its GHG reductions. In general, it supported the idea of market-based measures as one of the tools to achieve climate objectives. However, the Parliament rejected an inclusion of road transport into EU emissions trading[13].

This impact assessment also includes the first review of the Market Stability Reserve (MSR). This review is foreseen by the legislation currently in force and has to take place within three years of the date of its start of operation on 1 January 2019. The MSR was established by Decision (EU) 2015/1814 ('MSR Decision') and amended by Directive (EU) 2018/410 to ensure the appropriate reduction of the large structural imbalance between the supply and demand of allowances which characterised the early phase 3 of the ETS, which ran from 2013 to 2020, and to improve the system's resilience to major shocks by adjusting the supply of allowances to be auctioned.

Aviation is already included in the ETS, though currently under some different rules, and with its scope currently restricted to intra-EU flights under the time-limited "stop the clock" derogation under Regulation (EU) 2017/2392, also under revision in 2021. The European Parliament and Council have set out very specific requirements to assess and make a proposal, as appropriate, relating to implementing the carbon offsetting and reduction scheme for international aviation (CORSIA) and to review the cost pass through 'with a view to increasing auctioning' taking into account other transport forms. Therefore a separate impact assessment is considering how aviation should (a) contribute to the EU's 2030 climate objectives and ambition through the ETS and any appropriate amendment, including through increasing the level of allowances auctioned under the system; (b) how the EU should implement CORSIA set up under the auspices of ICAO, in a manner consistent with the EU's 2030 climate objectives and ambition.

This impact assessment is coherent with the remainder of the 2030 climate, energy and transport framework, notably the impacts assessments related to the Effort Sharing

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[12] European Council conclusions, 10-12 December 2020.
[13] European Parliament resolution of 15 January 2020 on the European Green Deal (P9_TA(2020)0005)

Regulation (ESR); the Land Use, Land Use Change and Forestry (LULUCF) Regulation; CO_2 Emissions Performance Standards for Cars and Vans; the Renewable Energy Directive (RED II); the Energy Efficiency Directive (EED)[14]; and, at a later stage, the Energy Performance of Buildings Directive (EPBD). Other relevant initiatives include the revision of the Energy Taxation Directive; the Zero Pollution Action Plan and the revision of the Industrial Emissions Directive, where the Commission will examine options to achieve maximum synergies between the zero pollution and the decarbonisation goals; initiatives on mobility, such as those on transport fuels (FuelEU maritime initiative and ReFuelEU aviation initiative) and a proposal for a Carbon Border Adjustment Mechanism (CBAM). To ensure coherence, this impact assessment covers relevant interactions of the ETS revision with other policies, such as the complementarity between extending emission trading and the EED.

The EU budget plays an increasingly important role in the EU meeting its climate commitments. At least 30% of the expenditures under the Multiannual Financial Framework 2021-2027 (MFF) and at least 37% of national expenditures under the NextGenerationEU Recovery Instrument have to support climate objectives.

The European Council, the European Parliament and the Commission agreed in an inter-institutional agreement of 16 December 2020 to introduce over the MFF period new own resources that are sufficient to cover the repayment of the Recovery Instrument. The Commission committed to table by summer this year proposals for new own resources based on the revision of the Emissions Trading System, including its possible extension to maritime and reducing the allowances allocated for free to airlines, for a new Carbon Border Adjustment Mechanism and for a new digital levy, with a view to their introduction at the latest by 1 January 2023.

1.2 Current policies and progress achieved

The ETS started in 2005 and operates in all EU countries plus Iceland, Liechtenstein and Norway. Its third trading phase ran from 2013 until the end of 2020 (phase 3). During that period the cap on emissions was reduced by 1.74% per year to achieve a total emission reduction target of 21% compared to 2005 by 2020. In reality, emissions remained well below the cap, which means that the EU has surpassed its 2020 target and actual emissions from stationary sources (power and industry) have declined by around 35% between 2005 and 2019.

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[14] Directive 2012/27/EU as amended by Directive 2018/2002

The fourth trading phase started on 1 January 2021 and is currently meant to run until the end of 2030 (phase 4). The revised rules governing this phase were finalised in March 2018 with the adoption of Directive (EU) 2018/410 amending Directive 2003/87/EC (ETS Directive).

The 2018 revision included a contribution by the ETS to the EU's 2030 economy-wide emissions reduction target of the time (at least -40% compared with 1990) of -43% compared to 2005. This meant that the cap on emissions had to decline at a faster rate than 1.74%. The reduction rate, or 'linear reduction factor', was revised accordingly and is now set to decline by 2.2% every year starting in 2021.

From 2009 to phase 3, a large surplus of allowances built up in the EU ETS. To address this surplus, a Market Stability Reserve (MSR) was created in 2015, and strengthened in the 2018 ETS revision. The MSR can reduce the total number of allowances in circulation (TNAC) by absorbing a part of the auction volumes, or increase the TNAC by releasing additional allowances for auctioning. The MSR absorbs or releases allowances if the TNAC is outside of a predefined range. If the TNAC is above a predefined upper threshold (833 million allowances), 24% (the intake rate) of the TNAC is removed from the volumes to be auctioned, and added to the MSR instead. If the TNAC is below a predefined lower threshold (400 million allowances), 100 million allowances are released from the MSR and auctioned. The strengthened MSR also has an invalidation rule - from 2023, allowances held in the MSR exceeding the previous year's auction volume will no longer be valid. The MSR began operating in 2019, and has already reduced the surplus to below 1.6 billion allowances.

The existence of the MSR also means that the ETS is now better equipped to handle the impacts of complementary policies, such as renewable energy policies or coal phase outs. Coal phase outs were driven in some cases by national policies and in other cases by lack of competitiveness of coal, in itself mainly driven by carbon prices. These policies reduced demand for ETS allowances and thereby had the undesired effect of increasing the surplus pushing the carbon price down. Today, if complementary policies have the effect of reducing demand for allowances, then the surplus is gradually absorbed by the MSR[15].

The reaction of the market to these 2018 reforms has been notable. In 2019, with carbon prices increasing from around EUR 6 at the beginning of 2018 to around EUR 25/tCO_2, these emissions saw a further drop of almost 9% year on year. In 2020, carbon prices

[15] SWD/2014/017 final

remained relatively stable despite estimated large emission reductions caused by the COVID-19 lockdown, sending a meaningful price signal both in the short term and in the long term. In the short term, coal-fired power plants have been and are being replaced by lower emissions technologies, including through an impressive development of renewable energies. In the long term perspective, the carbon price is now a more important element in the investment decisions of installations covered by the ETS.

A more ambitious ETS comes with a potentially increased risk of carbon leakage, either because production is transferred from the EU to other countries with lower ambition for emission reduction, or because EU products are replaced by more carbon-intensive imports. The 2018 revision targeted leakage protection better to the most exposed sectors, in a renewed carbon leakage protection framework, consisting of partial free allocation and allowing Member States (MS) to compensate higher electricity costs caused by the ETS under certain conditions ('indirect cost compensation').[16]

The ETS Directive also includes solidarity provisions, such as the redistribution of 10% of the auctioned allowances to the 16 lower income MS. In addition, a Modernisation Fund was set up to support the 10 lowest income MS to invest in their energy systems' modernisation, just transition and energy efficiency.

An Innovation Fund, moreover, is open to all MS. It supports investments in breakthrough low-carbon technologies, which despite the increased carbon price remain too expensive to compete with existing technologies, such as materials substitution and circular approaches, by contributing to de-risk their initial deployment in the market.

Sectors outside the ETS are presently covered by the Effort Sharing Regulation (ESR) which establishes an overall EU-wide greenhouse gas emission reductions target of -30% compared to 2005, as well as binding annual targets for individual MS to be achieved by 2030. The ESR covers among others the road transport and buildings sectors and therefore, in order to reach their national reduction targets, MS have to put in place climate and energy policies applicable to those sectors, including the possibility of pricing instruments at national level. These sectors have to contribute to the overall objective. Contrary to the ETS, the sectors covered by the ESR are not subject to an EU-wide carbon price signal.

As far as maritime transport is concerned, the ESR only covers emissions from domestic maritime transport. Since 2015, however the EU has legislation on monitoring, reporting

[16] Communication from the Commission. Guidelines on certain State aid measures in the context of the system for greenhouse gas emission allowance trading post 2021. OJ C 317/5, 25.9.2020.

and verification of emissions from maritime transport more broadly ('EU Maritime MRV Regulation')[17]. The IMO adopted its GHG reduction strategy in 2018.

2 PROBLEM DEFINITION

This section defines the problems, describes their underlying causes and looks at their expected evolution if the current regulatory framework remains untouched. The problems can be divided in three types: first, those associated with the increased climate target and the need to strengthen the existing ETS in a commensurate way (these are addressed in Sections 2.1 – 2.3); second, the issue of the stronger challenges faced by certain sectors to contribute sufficiently to the achievement of the increased target (described in Section 2.4); and third, those related to distributional and innovation aspects following both the required strengthening of the existing ETS and the possible expansion of emissions trading to additional sectors (in Section 2.5).

2.1 Current ETS legislation is not optimal for a balanced path towards a - 55% 2030 target

Higher 2030 climate ambition is needed to ensure the EU is set on a gradual and balanced trajectory to reach climate neutrality by 2050. If the legislation remains unchanged, sectors currently covered by the ETS would, according to the EU Reference Scenario 2020[18], together achieve a 2030 emission reduction of -51% compared to 2005 (see also Section 5.1). Even though this would mean outperforming the legislated contribution of -43%[19] referred to above, this would still be an insufficient contribution to an overall target of -55% compared to 1990. The policy scenarios that achieve around 55% reductions project a cost-effective contribution of the sectors currently covered by the ETS in the range of -62-63% compared to 2005. This problem was also recognised by stakeholders responding to the public consultation. As regards to the sustainability criteria for biomass under the Renewable Energy Directive 2018/2001 (RED II), there is coherence through the amended EU ETS Monitoring and Reporting Regulation (MRR – Commission Implementing Regulation (EU) 2018/2066 amended by Commission

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[17] Regulation (EU) 2015/757 on the monitoring, reporting and verification of CO_2 emissions from maritime transport, OJ L 123, 19.5.2015, p. 55–76

[18] The EU Reference Scenario projects the combined impacts currently adopted EU and Member State climate, energy and transport legislation. For more details see Section 5.1.

[19] The ETS cap only determines the maximum amount of emissions for the covered sectors. It is possible that the covered sectors emit less than the cap, for instance as a result of policies fostering the development of renewable power generation, energy efficiency or the circular economy.

Implementing Regulation (EU) 2020/2085), hence it is not further assessed in this initiative.

However, increasing the ambition is not as simple as lowering the cap on ETS allowances. A reduced amount of allowances available to the market affects other pillars of the ETS and the carbon price. It also impacts core principles such as the need for market stability, the protection against the risk of carbon leakage and the carefully balanced distributional effects between MS. These problems are described in the following paragraphs.

2.2 Continued risk of supply/demand imbalances of the carbon market and the review of the Market Stability Reserve

The MSR's main objective is to tackle the surplus of allowances in the carbon market, thus ensuring the delivery by the ETS of the necessary investment signal to reduce CO_2 emissions in a cost-effective manner. The MSR was also meant to make the ETS more resilient to the risk of supply-demand imbalances, so as to enable the market to function in an orderly manner.

In the coming decade the importance of the MSR is undiminished as part of the allowance surplus built up in the past still exists (approximately 1.578 billion allowances) and the risk of demand and supply shocks remains very real.

Article 3 of the MSR Decision[20] tasks the Commission with reviewing the functioning of the MSR before 1 January 2022, on the basis of an analysis of the orderly functioning of the European carbon market. The review must pay particular attention to the MSR's numerical parameters (its upper and lower threshold, and its intake rate) and to the invalidation rule; it must assess the impact of the reserve on growth, jobs, the Union's industrial competitiveness and the risk of carbon leakage.

On top of the results of the review, other elements may trigger a need for changes to the functioning of the MSR. The changes to the cap to increase ambition for 2030, as well as the impact of unknown external factors such as Covid-19 or national measures such as coal phase-outs, raise the question whether the basic rules of the MSR remain fit to continue tackling structural supply-demand imbalances throughout the decade.

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[20] Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and amending Directive 2003/87/EC, OJ L 264 9.10.2015, p. 1

For these reasons, both a backward- and a forward-looking assessment are necessary to determine whether the MSR's design needs to be amended in order for it to continue to meet its objectives. The MSR can be considered as fairly recently in operation, [21] having started operation on 1 January 2019. Nevertheless, as part of the review, the Commission has carried out a study of the first two years of its functioning and of the expected performance of the MSR in years to come. The full outcome of the review is presented in Annexes 7 and 8.

The review of the MSR showed that it has fully achieved its objectives, since it began operating in January 2019, by reducing the historical surplus[22] and in general providing confidence to the market[23] that it can deal with unexpected events such as the recent demand shock related to Covid-19. Moreover, the MSR has so far functioned in a stable and predictable manner[24]. Also at least 70% of respondents to the open public consultation (OPC) agreed that the MSR has worked well in the past (while only 4% disagreed).

The analysis showed that the MSR's objectives of surplus reduction and market stabilisation not only remain valid, but should be adapted to the new policy and market conditions (set out in Annex 8), updated behaviour by market participants and in particular hedging needs (Annex 8, Section 24), and probable economic shocks (Annex 8, Section 22). All of these elements may ultimately result in decreasing needs for allowances in the future. The MSR thresholds and intake rate may be adjusted to ensure an optimal level of market liquidity, avoiding future surpluses and deficits of allowances. At the same time, if the MSR reduces the surplus too quickly, or does not fulfil a liquidity need, this could create uncertainty and significant price volatility on the market. The future evolution of these market conditions is also very uncertain.

The analysis outlined some points for improvement. One point is the need to improve the way the total number of allowances in circulation is calculated, by including net demand

[21] The changes adopted through Directive 410/2018 revising the EU ETS for the period from 2021 to 2030 will only be implemented as from 1 January 2021, while the Market Stability Reserve entered into operation in 2019. Therefore, while a full evaluation was not possible, a first analysis of the functioning of the reserve is included in the IA.
[22] See Annex 7, Section 20.4.
[23] See Annex 7.
[24] See Annex 7.

from the aviation sector,[25] which is not taken into account at the moment. The MSR should also take into account the maritime sector if it will be included in the EU ETS.

The analysis highlighted the possible existence of a threshold effect.[26] Each year the MSR either absorbs 24% of the TNAC or nothing at all, depending on whether the TNAC is above or below the upper threshold. In years when the TNAC is very close to the threshold, this can cause significant uncertainty on the market.[27]

Another possible cause for market uncertainty is the invalidation of allowances up to the auctioning level of the previous year. This level is uncertain, as it depends on the operation of the MSR itself.[28]

Finally, the analysis found[29] that if the MSR parameters are not adjusted appropriately and in a timely manner, the surplus could increase significantly in the coming years. Indeed, after 2023, the 24% intake rate reverts to only 12%. This lower rate would not be enough to reduce the surplus in an optimal manner in coming years.

2.3 There is potential for a higher risk of carbon leakage due to EU's increased climate ambition

Increased ambition requires lowering the ETS cap, which leads to a reduced overall amount of allowances. This in turn raises important questions as to the continued suitability of the carbon leakage protection framework currently included in the ETS Directive. A lower cap indeed means that fewer allowances may be available for free allocation. Moreover, the carbon price is expected to rise as a result of a reduced cap. Both developments could lead to higher compliance costs and an increased risk of carbon leakage. This impact assessment will therefore assess the effects of ETS strengthening in line with the -55% target on the risk of carbon leakage.

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[25] See Annex 7, 20.5.1.

[26] See Annex 7, 21.

[27] As an illustration for the threshold effect, if the TNAC is 834 million allowances, slightly higher than the upper threshold of 833 million, then according to the MSR rules, 24% of the TNAC is put in the MSR. However, if the TNAC is just below the threshold, at 832 million allowances, then the TNAC is not reduced at all.

[28] The MSR reduces the TNAC by reducing future auction volumes. For example, the level of auction volumes in year X is influenced by the MSR operations corresponding to the TNAC levels of years X-1 and X-2. The levels of the TNAC in years X-1 and X-2 depend also on the verified emissions of those years, which are by definition uncertain. Therefore, if an external event (such as COVID-19) reduces emissions significantly in X-2, this could result in a significantly higher TNAC, and a higher reduction of auction volumes in year X.

[29] See Annex 7, Section 21.

In this context, it is also important to analyse how the carbon leakage protection framework could strengthen incentives to reduce emissions, e.g. through investments in low-carbon technologies (see also Section 2.5.1), whereby it is important to recall that the power sector does not receive free allocation.

This impact assessment does not address the question whether and how a Carbon Border Adjustment Mechanism (CBAM) can be an effective alternative, as this is part of a separate impact assessment accompanying a separate legal proposal. However, impacts of a CBAM will be considered for the assessment of ETS policy options on the framework to address the risk of carbon leakage.

2.4 Sectors not covered by emissions trading face stronger challenges to contribute sufficiently to reduce emissions reductions

The impact assessment accompanying the 2030 CTP found that emissions in certain sectors, including buildings and road transport, in the absence of additional measures, would not decrease as much as required to be on a path to achieve an economy-wide 55% reduction in emissions. In fact, in road and maritime transport, emissions today are higher than in 1990. It also found that while a significant overachievement of emission reductions of 8 % points is projected for the current ETS sectors (see Section 2.1), effort sharing sectors are projected to decrease emissions by 31% compared to 2005[30], which is slightly better than the -30% EU ambition level of current ESR legislation.

This indicates that the current policy framework is more effective in reducing emissions in current ETS sectors and that it is warranted to focus the policy debate on the need for additional EU instruments in the ESR sectors. These sectors are subject to regulatory measures but generally not subject to a carbon price and may therefore not be sufficiently incentivised to reduce their emissions. The general analysis concerning this problem has been carried out already in the impact assessment for the 2030 CTP[31].

The modelling for that impact assessment showed that over-reliance on strengthened regulatory policies would lead to higher burdens on economic operators and more significant investment challenges. On the other hand, focusing more (or only) on economic incentives would imply overly high carbon prices, and carbon pricing alone will not allow overcoming persisting market failures and non-market barriers.

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[30] SWD/2020/176 final, Section 6.7, confirmed by the new EU Reference Scenario 2020.
[31] SWD/2020/176 final, Section 6.7

The optimal policy mix should thus combine strengthened economic incentives, such as carbon pricing, to take action with updated regulatory policies notably concerning renewables, energy efficiency and sectoral policies such as CO_2 and cars, and possibly enhanced ESR incentivising national policies across sectors, and an enabling framework (e.g. R&D policies and financial support).

2.4.1 Minimal contribution of the maritime sector to emissions reductions

As highlighted in the 2030 Communication, climate action in the maritime transport sector is urgently needed. While the sector plays an essential role in the EU economy[32] and is one of the most energy-efficient modes of transport, it emits 3-4% of all EU CO_2 emissions (around 144 million tonnes of CO_2[33] in 2018) and its emissions are projected to grow quickly if mitigation measures are not swiftly introduced. Since 1990, CO_2 emissions from fuel sold in the EU for international navigation have grown by around 36%[34], contrary to domestic navigation emissions that have decreased by 26% over the same period[35]. Today, CO_2 emissions from international navigation represent close to 90% of all EU navigation emissions and according to projections, these could grow by around 14% between 2015 and 2030 and 34% between 2015 and 2050[36] in a business-as-usual scenario. Such a future growth would off-set the emissions reduction achieved in the sector since 2008.

There are different reasons for this expected increase in international navigation emissions. The single most important element is the foreseen increase in the demand of maritime transport services to cater for the demand for additional primary resources and containerised goods in Europe. This is aggravated by a range of barriers to the decarbonisation of the maritime transport sector. These barriers will need to be addressed by dedicated measures in order to achieve the full greenhouse gas emissions reductions potential of the sector.

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[32] Maritime transports 75% of EU's external trade, 36% of intra-EU trade flows and more than 400 million passengers each year at EU ports

[33] CO_2 emissions from maritime transport as reported under Regulation (EU) 2015/757 and including emissions from intra-EEA and extra-EEA voyages as well as emissions occurring at EEA berth.

[34] EU GHG inventory to UNFCCC, 1 A 3 d I, CO_2 equivalent, EU 27, 2018 vs 1990 emissions

[35] Domestic navigation emissions are covered under the Effort Sharing Regulation, statistics from the EU GHG inventory to UNFCCC, CO_2 equivalent, 2018 vs 1990

[36] Revised REF2020 scenario, PRIMES modelling, navigation

Part of these barriers are market-related and cover issues such as the problem of split incentives[37], the difficulty to access finance, the duration of vessel ownership or the long lifespan of ships. A number of these barriers explain why shipping companies are not sufficiently investing in readily available cost-effective energy efficient measures, despite energy costs accounting for 60-70% of their overall operating costs. Other barriers are more technology related. For instance, the majority of stakeholders[38] indicated that the current lack of viable solutions, and in particular the lack of market-ready renewable and low-carbon fuels, is a key barrier.

On top of these technological and market barriers, the deployment of low-carbon solutions is also slowed down by a range of economic barriers. Maritime transport is a sector where the "polluter-pays" principle is not applied and where the price of transport does not reflect the impact it has on climate and the environment. It is also a sector that relies on heavy fuel oil, at significantly cheaper costs than fuel used in other sectors, and where maritime bunker fuels benefit from a tax exemption under the Energy Taxation Directive. In this context, applying carbon pricing to maritime transport emissions would create a clear price signal that would make energy efficiency investments more cost-effective and that would reduce the price differential between alternative fuels and traditional maritime fuels and hence support their deployment.

The majority of stakeholders displayed positive views regarding the ability of carbon pricing to respond to the barriers to decarbonisation in the maritime sector, in particular when considering the possible use of revenues. However, views were more mixed as to whether carbon pricing could address the issue of split incentives.

Maritime transport lacks a strong enabling regulatory framework to ensure its fair contribution to the emission reductions needed in line with the increased EU climate objectives and Paris commitments, in particular when compared to the collective contribution expected from all ETS sectors.

At the global level, efforts to limit international maritime emissions through the International Maritime Organisation (IMO) are under way. In 2011, the IMO adopted a new regulatory framework on Energy efficiency. Since then, the IMO adopted in April 2018 an initial strategy on reduction of greenhouse gas emissions from ships, albeit without support from all States. It sets a greenhouse gas emission reduction objective of

[37] Some cost-effective solutions are not being implemented in some shipping industries because the maritime transport actor (e.g., the shipowner) making the investment in a solution does not always capture the benefit (e.g. fuel saving) of the investment.

[38] Targeted stakeholders' consultation – enablers and barriers to decarbonisation of maritime transport

at least 50% by 2050 compared to 2008 levels coupled with a vision for the full decarbonisation of the sector as soon as possible in this century. It also sets an objective to reduce carbon intensity, as an average across international shipping, by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008. In November 2020, the IMO approved a technical and operational measure for existing ships with a view to implement the IMO Strategy and complement existing energy efficiency policies. While the recent progress achieved is welcome and provides a framework to make existing ships more energy efficient, these measures will not be sufficient to decarbonise international shipping in line with the IMO objective of 50% emission reductions by 2050 (from 2008 levels) and following a pathway consistent with the Paris agreement objectives.

At the EU level, the current regulatory framework to address maritime GHG emissions is limited. At present, only domestic navigation emissions are covered by mitigation measures at EU level (through the Effort Sharing Regulation) and international shipping remains the only means of transportation not included in the European Union's commitment to reduce greenhouse gas emissions. The current regulation focuses solely on the monitoring, reporting and verification of emissions from ships regardless of their flag, covering emissions in EEA ports[39], intra-EEA voyages and extra-EEA voyages[40], in line with the first step of the strategy set out by the Commission in 2013 to integrate progressively emissions from maritime transport into EU climate policy.

Given this situation, the European Commission undertook the commitment to propose a basket of EU measures to increase the contribution of maritime transport to the EU climate efforts, along with the measures agreed at global level within the IMO. This basket of measures is necessary because different policies are needed to address the various technological, market and regulatory barriers that hinder the decarbonisation of the sector.

The basket of measures is defined in the Sustainable and Smart Mobility Strategy as the combination of carbon pricing, research and development and sustainable fuels policies (regulatory and infrastructure development). In practice, it covers the ETS extension to maritime transport in line with the Climate Target Plan and it includes the launch of the FuelEU Maritime initiative to boost the demand for sustainable alternative fuels and accelerate the transition to new technologies. It also covers the review of existing

[39] Including emissions arising from ships at berth or moving within a port

[40] all incoming voyages from the last non-EEA port to the first EEA port of call and all outgoing voyages from a EEA port to the next non-EEA port of call

directives dealing with energy taxation, alternative fuel infrastructures or renewable energy.

2.4.2 Limited contribution of road transport and challenges to realise the contribution of buildings to the emission reductions needed for the 55% target

Direct emissions in the building sector, which mainly stem from heating, have decreased significantly compared to 1990 but increased from 2014 to 2018 by 3%, currently amounting to around 12% of EU GHG emissions[41]. However, according to the impact assessment for the 2030 CTP, the measures implemented in MS aimed at building renovation do not always reflect the full energy savings potential of the building stock. The energy efficiency level and deployment of renewable heating and cooling solutions with the existing 2030 climate and energy legislative framework are well below what is necessary to reach the higher greenhouse gas ambition. In the policy scenarios in the impact assessment accompanying the 2030 CTP that achieve around 55% GHG reductions below 1990, buildings' GHG emissions reduce through carbon pricing and/or energy policies by 60% between 2015 and 2030 through increased energy efficiency and stepping up of fuel switching, indicating a similar mitigation potential as stationary ETS sectors. Under current policies, emissions would only reduce by 33%.

Road transport is a particular challenge. Road transport emissions have increased compared to 1990, and by 6% from 2014 to 2018, amounting currently to around 20% of all EU GHG emissions. Within the 55% GHG reduction, road transport is projected to reduce its emissions less than buildings, by 23 to 25% in 2030 compared to 2015.

In both sectors, current EU policies focus on regulatory approaches and provide limited economic incentives to achieve the necessary emission reduction levels. Explicit carbon pricing at national level in these sectors is often absent or limited. In addition, the Impact Assessment accompanying the 2030 CTP found that the energy investments from households to achieve the higher ambition in both sectors would be higher in a regulatory-only approach (REG) than with a policy mix including carbon pricing.

At the same time, already now, the ETS directly or indirectly covers part of their emissions, resulting in an uneven playing field within the buildings sector and to a much lesser extent in the transport sector.

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[41] If the indirect emissions of buildings stemming from electricity and centralised heat consumption are included, buildings are responsible for 36% of energy-related GHG emissions.

In fact, the ETS covers around 30% of direct and indirect buildings emissions related to heating via fossil-fuel district heating, electric heating and electricity use of heat pumps, while the rest is covered by the ESR[42]. If compared to all direct and indirect energy-related GHG emissions of buildings, the existing ETS covers more than half.

Similarly, the ETS already indirectly covers some road transport emissions via electric vehicles (related emissions below 0.1%[43]), as well as electrified rail (around 80% of rail[44]), while fossil fuelled road transport and non-electrified rail are covered by the ESR. However, this uneven playing field is less of an issue than that between fossil fuel and electricity use for buildings heating, as on average road transport already implicitly pays a significant carbon price due to energy taxation, even though there are large national disparities in the levels of fossil fuel taxation.

Other emissions of fossil fuel combustion concern firstly small industrial installations, secondly CO_2 emissions from agriculture and thirdly small sources like non-electrified railways. These have decreased in the past and currently represent around 5% of EU GHG emissions. Within the overall 55% GHG reduction, other fossil fuel combustion is projected to reduce its emissions less than buildings but more than road transport, by around 40% in 2030 compared to 2015. For small industry, there is already currently the requirement for equivalent measures in order to remain excluded from the existing ETS.

The impact assessment accompanying the 2030 CTP examined the possibility of using carbon pricing as an additional tool to achieve greenhouse gas emission reductions at the EU level in these and other sectors. In line with the 2030 CTP, this impact assessment needs to examine further whether and how emissions from buildings and road transport or all emissions from fossil fuel combustion could be addressed efficiently by including them in European emissions trading, taking into consideration already existing measures, such as energy savings obligations under Article 7 of the EED or CO_2 standards for vehicles. This impact assessment does not examine the possible setting of minimum carbon content elements for excise duties in the revised EU Energy Taxation Directive, which is addressed in the impact assessment for that initiative.

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[42] ETS coverage of heating emissions in low-income Member States is with around 40% significantly above EU average, with ETS even exceeding ESR shares in Bulgaria, Czechia, Estonia and Latvia. Other Member States with higher ETS shares are Cyprus, Denmark, Finland, Greece and Sweden. See ICF et al. (2020): Possible extension of the EU Emissions Trading System (ETS) to cover emissions from the use of fossil fuels in particular in the road transport and the buildings sector, under DG CLIMA Framework Contract.

[43] ICF et al. (2020).

[44] Electrification of the Transport System, Expert group report, DG RTD 2017.

2.5 Reaching the -55% target will require increased investment and greater capacity to address the distribution of impacts of emissions reduction measures, while funds will remain limited

2.5.1 Need for faster investment in low-carbon technologies

The Impact Assessment accompanying the 2030 CTP shows that the increased contribution of current ETS sectors to the 2030 objective is expected to induce, over time, a strengthened carbon price signal, providing the necessary operational and investment incentive for operators to reduce their GHG emissions in line with the revised overall cap.

That Impact Assessment also identifies extra annual energy-related investment needs of EUR 350 billion in the period of 2021-2030 compared to the previous period of 2011-2020, of which the majority for buildings and road transport. Compared to the EUR 260 billion additional investments needed 2021 to 2030 to achieve the prior 2030 climate and energy targets, this figure represents an increase of around EUR 90 billion per year.

The energy sector has already decarbonised to a significant extent due to a combination of a strong ETS carbon price signal coupled with regulatory policies and public support for the deployment of renewable energy technologies. Also for industry, emissions have been decreasing, but to a smaller extent, even though many technological pathways for decarbonisation are available. These include use of green hydrogen and increased electrification (which however require a significant increase of clean energy available), as well as low-carbon circular production processes.[45]

In fact, in recent years, a substantial number of industrial break-through technologies and innovative renewable technologies have been identified and researched that are crucial to achieve deep decarbonisation. However, few have been scaled beyond the pilot phase, at best. The prime reason is that the current abatement costs for most technologies that achieve deep decarbonisation are substantially above current and even projected ETS prices. Market signals have been softened by free allocation to avoid the risk of carbon leakage. There remains a substantial uncertainty on breakthrough technologies costs, and the first investments may face higher abatement costs. At the same time, the uncertainty over a sustained trend towards increased carbon prices over longer periods may also reduce the commercial viability and bankability (willingness by third parties to finance) of such projects. The Impact Assessment accompanying the Innovation Fund delegated

[45] EEA (2020) Quantification methodology for, and analysis of, the decarbonisation benefits of sectoral circular economy actions, p.93-95

regulation published in 2019[46], as well as academic literature[47] converge on the conclusion that at the current levels, the carbon price on its own is not expected to trigger sufficient investment in many important breakthrough technologies in industry and energy (e.g. CCS, low-carbon technologies for cement, green hydrogen-based steel making, geothermal, recycling and circular economy solutions) as well as in the appropriate infrastructure, without further support.

Complementary policies to bridge the so-called 'valley of death' and bring innovative low-carbon technologies to market can thus be justified because of the need to lower costs through innovation, including economies of scale and uncertainty as regards carbon price developments over the next decade(s) and associated investment risks.

The Innovation Fund, set up as part of the 2018 revision of the ETS Directive, is one of the EU's prime instruments to bring such technologies closer to the market, complemented by multiple other instruments focusing on earlier research phases or on less innovative technologies[48]. In this Impact Assessment, key features of the Innovation Fund are being assessed in the light of the revised 2030 objective and the goal to achieve climate neutrality by 2050. These elements mainly concern its size and the level of support to projects, as both have a major effect on the required scale and pace of the deployment of innovative low-carbon technologies that are eligible in the Innovation Fund. Currently, the Innovation Fund is expected to mobilise around EUR 22.5 billion in the period 2020-2030 (assuming a carbon price of EUR 50/tonne) coming from the monetisation of ETS allowances. The first call for proposals of EUR 1 billion received 311 projects from all MS requesting almost 22 times the available budget.[49] This illustrates the appetite of companies to invest in clean tech projects all across Europe and the very high investment needs. This aspect is analysed together with the level and modalities of support that projects can receive in Annex 11.

2.5.2 Need to address the distribution of impacts of emissions reduction measures

The effects of raising the contribution of the ETS towards a higher emissions reduction target will not be felt equally across the EU. Some MS will be more affected than others.

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[46] https://ec.europa.eu/clima/sites/clima/files/innovation-fund/swd_2019_85_en.pdf

[47] https://www.iddri.org/sites/default/files/PDF/Publications/Catalogue%20Iddri/Etude/201910-ST0619-CCfDs_0.pdf

[48] The EU makes funding available for green innovation via various support instruments, such as Horizon 2020 and Horizon Europe, European Innovation Accelerator and others. The green and digital transition is also an element strongly present in the Recovery and Resilience Plans of Member States.

[49] https://ec.europa.eu/clima/news/first-innovation-fund-call-large-scale-projects-311-applications-eur-1-billion-eu-funding-clean_en

Increasing the contribution to achieve the revised target will require investments in the energy systems and the greening of industrial processes in MS where modernisation needs are already the highest. Furthermore, there are distributional concerns within MS, as low-income households across the EU will bear a relatively higher burden notably in terms of heating fuel expenses compared to wealthier households. At the same time, there will be also positive social impacts, like an improvement concerning health issues linked with air pollution. Hence, there are likely to be different distributional issues that emerge if the EU emissions trading is expanded to new sectors.

The Modernisation Fund, set up as part of the 2018 revision of the ETS Directive, supports investments in modernising the power sector and wider energy systems, boosting energy efficiency, and facilitating a just transition in coal-dependent regions in 10 lower-income MS. Its initial size is 2% of the ETS cap equivalent to some 275 million allowances.[50] The current size of the Modernisation Fund is analysed together with defining the types of investments that it can finance in Annex 12, its distributional implications between MS are addressed in Annex 13.

The review will therefore need to address the solidarity provisions currently in place and the role of the Modernisation Fund in this respect, also taking into account that as new sectors are possibly covered by EU emissions trading, not only distributional challenges but also revenues may increase. The ETS review needs also to take into account and is relevant for the Commission's forthcoming proposal for an ETS-based own resource.

3 WHY SHOULD THE EU ACT?

3.1 Legal basis

Articles 191, 192 and 193 of the Treaty on the Functioning of the European Union[51] empower the EU to act to preserve, protect, and improve the quality of the environment; protect human health; and promote measures at the international level to deal with regional or worldwide environmental problems. The legal basis of this initiative is in Article 192(1), as this initiative is action being taken to combat climate change and to serve the other environmental objectives specified in Article 191.

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[50] This was de facto more than doubled to around 643 million allowances thanks to the choice of five Member States to transfer their solidarity allowances to this funding instrument. https://ec.europa.eu/clima/policies/budget/modernisation-fund_en

[51] Treaty on the Functioning of the European Union, OJ C 326, 26/10/2012, p.1–390.

The ETS has been operating on this legal basis since 2003. The European Parliament and Council agreed upon all amendments to the ETS Directive on this legal basis.

3.2 Subsidiarity: Necessity of EU action

Climate change is a trans-boundary problem and both international and EU action can effectively complement and reinforce regional, national and local action. Increasing the 2030 target for EU GHG reductions will impact many sectors across the EU economy and coordinated action at the EU level is therefore indispensable and has a much bigger chance of leading to the necessary transformation, acting as a strong driver for cost-effective change and upward convergence. Furthermore, many of the policy elements assessed in this initiative have an important internal market dimension, in particular the options related to the carbon leakage protection and the low-carbon funding mechanisms. EU action can also inspire and pave the way for the development of market based measures at global level, e.g. as regards the maritime transport within IMO.

3.3 Subsidiarity: Added value of EU action

As a carbon market, the ETS incentivises emission reductions to be made by the most cost-effective solutions first across the activities it covers, achieving greater efficiency by virtue of its scale. Implementing a similar measure nationally would result in smaller, fragmented carbon markets, risking distortions of competition and likely lead to higher overall abatement costs. The same logic holds for the extension of carbon pricing to new sectors.

4 OBJECTIVES: WHAT IS TO BE ACHIEVED?

4.1 General objectives

The general objective of this initiative is to revise the ETS Directive in a manner commensurate with the 2030 climate ambition to reach at least 55% net greenhouse gas emission reductions by 2030 below 1990 levels and with a gradual and balanced trajectory towards climate neutrality by 2050, in a cost-effective and coherent way while taking into account the need for a just transition and the need for all sectors to contribute to the EU climate efforts.

4.2 Specific objectives

- Strengthening the ETS in its current scope
- Reviewing the Market Stability Reserve in line with the corresponding legal obligation and examine possible amendments to its design, to fulfil the legal objectives in the MSR decision and to address any issues that may be raised in the context of the MSR review.

The objectives of the MSR, as they are set in the MSR decision, are to

- Tackle historical supply-demand imbalances, and
- make the ETS more resilient to supply-demand imbalances

In addition, the mechanism must preserve regulatory stability and ensure long-term predictability.

- Ensuring continued effective protection for the sectors exposed to a significant risk of carbon leakage while incentivising the uptake of low-carbon technologies
- Ensuring that the maritime transport and other sectors contributes cost-effectively to the emission reductions needed in line with EU targets and Paris Agreement commitments by notably considering the inclusion of at least intra-EEA emissions of the maritime sector and possibly of emissions from other sectors such as buildings and road transport into EU emissions trading while ensuring synergies with complementary other policies targeting those sectors.
- Addressing the distributional and social effects of this transition, by reviewing, as appropriate, the use of auctioning revenues and the size and functioning of the low-carbon funding mechanisms

4.3 Intervention logic

Figure 1 shows the intervention logic of this impact assessment, from the general problem and problem drivers to the objectives. The policy options described in Section 5 are defined to address these objectives.

Figure 1: Intervention logic of the EU ETS revision

5 WHAT ARE THE AVAILABLE POLICY OPTIONS?

5.1 What is the baseline from which options are assessed?

The baseline for this initiative is the continuation of the Emissions Trading System covering power, centralised heat and industry in its current design as most recently amended by Directive (EU) 2018/410. The ETS cap trajectory for phase 4 (2021-2030) is reduced with a Linear Reduction Factor of 2.2% to achieve -43% GHG emission reduction by 2030 (compared to 2005). Under current legislation the Market Stability Reserve would gradually absorb the existing surplus allowances and invalidate them from 2023 onwards.

The risk of carbon leakage continues to be addressed through granting free allowances based on updated benchmarks. The auctioning revenues are distributed to MS. Before that the current solidarity mechanisms are applied and 450 million allowances are auctioned to finance the Innovation Fund.

The ETS coverage of buildings-related emissions remains limited to emissions related to fossil fuel-based district heating, electric heating and electricity use of heat pumps and its share is projected to remain stable at around 30% of total emissions related to buildings heating, cooling and cooking. The ETS coverage of transport-related emissions would remain focused on aviation. The ETS coverage of emissions related to electric vehicles and electrified rail would slightly increase but remain a small component of road transport emissions.

The new EU Reference Scenario 2020 (REF) published alongside the Fit for 55 package provides a model-based baseline projecting the impacts of the ETS and all other current policies and their interaction.

REF includes all EU climate legislation that implements the ‘at least 40% GHG reduction target’. Beyond the ETS, these are the Effort Sharing Regulation[52], currently covering non-ETS sectors such as non-electric direct heating of buildings, fossil fuel use in road and rail transport, domestic navigation, small emitters from the industry sector, agriculture and waste, and the LULUCF Regulation, covering emissions and removals from land use, land use change and forestry[53].

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[52] Regulation (EU) 2018/842
[53] Regulation (EU) 2018/841

In respect of energy, REF includes the Energy Efficiency Directive and the Renewable Energy Directive[54] as well as other key policies covered in the Energy Union and the "Clean Energy for All Europeans" package, including internal electricity market policy[55]. This includes the Regulation on the Governance of the Energy Union and Climate Action and its integrated National Energy and Climate Plans (NECPs). These are key instruments to achieve ESR, EED and renewable energy sources (RES) targets, covering, for the first period, the years 2021-2030 and allowing an update in the years 2023/2024.

The updated modelled baseline also includes relevant adopted national policies (as well as the national contributions contained in the NECPs) to achieve the EU level targets on renewable energy and energy efficiency. Draft MS specific REF results have been consulted with MS. Unlike the baseline used for the Impact Assessment for the Climate Target Plan, this updated baseline does not assume that the EU-level energy efficiency target is achieved. Based on modelling national policies, REF confirms a 3% gap to the at least 32.5% energy efficiency target for final energy use and a 1% overachievement of the target of at least 32% of renewable energy share in the energy mix[56].

On transport, the baseline includes measures from the three "Mobility Packages" published[57] in 2017-2018. Key measures include CO_2 standards for cars and vans[58], CO_2 standards for heavy duty vehicles[59], the Alternative Fuels Infrastructure Directive[60] and the Clean Vehicles Directive[61]. For maritime transport, the baseline reflects the Energy Efficiency Design Index (EEDI) and the Ship Energy Efficiency Management Plan (SEEMP) adopted by the IMO, as well as IMO MARPOL Annex VI rules as regards the reduction of nitrogen and sulphur oxides emissions. However, it does not include the short-term measures recently agreed at IMO that are not yet adopted and still under development.

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[54] Directive (EU) 2018/2001

[55] The adopted regulation on the electricity market design is reflected to the extent possible. However, the modelling work undertaken is not detailed enough to draw conclusion on the adequacy of specific elements of the current market design. Such issues will require further analysis in a dedicated study.

[56] COM(2020) 564 estimated based on NECP commitment aggregation a gap to the energy efficiency target between 2.8 and 3.1 percentage points and an overachievement of the renewables target between 1.1 and 1.7 percentage points.

[57] See for links to the different policy initiatives: https://ec.europa.eu/transport/modes/road/news/2018-05-17-europe-on-the-move-3_en

[58] Regulation (EU) 2019/631

[59] Regulation (EU) 2019/1242

[60] Directive 2014//94/EU

[61] Directive (EU) 2019/1161

In other sectors, the F-gas Regulation, the circular economy and waste legislation, notably including the Landfill Directive, the Nitrate Directive as well as the Common Agricultural Policy are worth highlighting in particular.

The impact of these combined measures is projected in REF with the use of the PRIMES (energy system and CO_2) – CAPRI (agriculture) – GAINS (non-CO_2) – GLOBIOM (LULUCF) modelling tools. This allows seeing economy-wide interactions for all sectors that emit and absorb emissions in a coherent manner. It builds on economic assumptions underpinning the Commission/DG ECFIN’s Ageing Report 2021 which include impacts of the COVID-19 crisis. The extent of economic impacts of COVID-19 and their longer-term consequences, as well as the necessary assumptions on the development of international fuel prices and technology costs belong to the main sources of modelling uncertainty. For a description of the models and assumptions used and an overview of key results see Annex 4, Section 8.

The ETS contributes in relative terms more than proportionally to the projected total intra-EU GHG emission reductions in the baseline. With the existing ETS and MSR framework and the described other policies, the current ETS sectors are projected to achieve 51% emission reductions in 2030 compared to 2005[62], an overachievement of the 2030 ETS target by 8 percentage points.

At sectoral level, under current policies the power sector is projected to reduce emissions in 2030 by 60% compared to 2005, industrial combustion by 44%, district heating by 42%, industrial processes by 32% and the transformation sectors by 36%. Intra-EU aviation emissions are projected to increase by 12% compared to 2005, while intra-EU maritime emissions would decrease by 5%.

5.2 Description of the policy options

5.2.1 Overview of policy options and policy scenarios used for the analysis

The following table provides an initial overview of the policy options which are further described in this section and retained for assessment in Section 6. The discarded policy options are described in Section 5.3:

[62] Aviation emissions are included in this figure in the intra-EU “stop the clock” scope. For comparison, the Climate Target Plan baseline projected a 54% reduction in 2030.

Table 1: Overview of policy options assessed

	ETS strengthening	Extension maritime	Extension buildings and road transport/ all fossil fuels
Baseline	ETS as legislated, partly assessed in -55% context (**MSR0+, IF0**)	Existing IMO measures but no new EU or global mitigation measures for maritime emissions	**EXT0** no extension
Core options	**AMB1** ETS 2030 ambition with LRF update in 2026 without rebasing **AMB2** ETS 2030 ambition with LRF update in 2024 without (AMB2a) or with rebasing (AMB2b,c) **AMB3** ETS 2030 ambition with LRF update with rebasing in 2026 (AMB3c as central variant)	**MAR1** Inclusion of maritime emissions in existing ETS **MAR2** A separate ETS for maritime **MAR3** Alternative carbon pricing policy option: levy on ship GHG emissions **MAR4** Extension of the ETS to maritime emissions in combination with standards	**EXT1** A separate EU-wide upstream ETS for buildings and road transport **EXT2** A separate EU-wide upstream ETS for all emissions from the combustion of fossil fuels not covered by the ETS
Other policy options	**MSR1** Update current parameter values **MSR2** More dynamic parameters **MSR3** Addition of short term response mechanism **CL1** More targeted free allocation with tiered approach **CL2** More targeted free allocation with strengthened benchmarks **IF1** Increase Innovation Fund to 550 million allowances **IF2** Increase the Innovation Fund to 700 million allowances	**MEXTRA100** Cover 100% of emissions from intra-EEA voyages, 100% of extra-EEA voyages (incoming and outgoing) and all emissions at berth in the EEA **MEXTRA50** Cover 100% of emissions from intra-EEA journeys, 50% of all incoming and outgoing extra-EEA voyages and all emissions at berth in the EEA **MINTRA** Cover 100% of emissions from intra-EEA journeys and all emissions at berth in the EEA	**ELINK1** Review in order to determine whether the integration is feasible and desirable **ELINK2** One or two-way flexibility with existing ETS that could increase over time to eventually lead to full integration with the current system

The following stylised general policy scenarios which achieve -55% net emission reductions compared to 1990 and represent in a coherent way a mix of climate, energy and other policies have been used to support the assessment of the outlined policy options:

- MIX, representing a policy mix of carbon price signal extension, strong intensification of energy and transport policies and increased energy taxation. With its uniform carbon price it can represent two separate ETS with caps set reflecting cost-effective contributions for each of the two ETS segments (similar incentive as one extended ETS),
- MIX-CP, representing a more carbon price driven policy mix with other policy drivers of the MIX scenario at a lower intensity. It illustrates a revision of the

EED and RED but limited to a lower intensification of current policies in addition to the carbon price signal applied to new sectors. Unlike MIX, this scenario allows to separate carbon price signals of existing and new ETS. The relative split of ambition in GHG reductions between existing ETS and new ETS remains, however, close in MIX-CP to the MIX scenario, leading to differentiated carbon prices between existing and new ETS.

These scenarios build on REF, further develop the policy scenarios modelled for the 2030 CTP and have been elaborated based on the same set of modelling tools. MIX and MIX-CP are two updated core scenarios used for assessing the climate and energy related Fit for 55 package initiatives, e.g. the Effort Sharing Regulation and the Energy Efficiency Directive. For a detailed description of the scenarios, see Annex 4, Section 8.5. The MIX scenario has also been the starting point for analysing the maritime transport extension and other options with the PRIMES maritime module.

These policy scenarios also serve to further assess impacts of the ETS revision. In policy terms, the MIX scenario broadly represents a policy mix envisaged in the 2030 CTP and is often used as central scenario for further analysis in this impact assessment. MIX-CP represents for the sectors covered by the new ETS a less balanced policy mix, requiring a stronger role of the new ETS to achieve the -55% 2030 target.

The Vivid EU ETS model[63] was used for the MSR analysis, focusing directly on the interaction between MSR dynamics and market equilibrium within the EU ETS; this model provided also some indications of the direction of carbon prices in the existing ETS in the analysis period if carbon pricing were the key driver of additional emission reductions (on carbon price impacts in existing and new ETS sectors see also Sections 6.1.2.1.2 and 6.3.2.1). Although the modelling approach was different, some of the assumptions of the MSR model were based on results of the REF and MIX scenarios described above. The differences between the model used for the MSR, and the models referred to here, as well as the assumptions of the model and general guidelines for interpreting the results are set out in Annex 4, section 9.1.

The ETS carbon price in REF which only reflects currently adopted policies averages at €29 for the period 2021 to 2030 and €30 for the period 2026 to 2030. Currently observed carbon market prices already respond to the increased GHG target and vary between €40 and €55. Future carbon prices are by nature uncertain and impacted by policy choices and market developments. The policy scenarios modelled project for the period 2026 to 2030

[63] See Annex 4, Section 9.1.

average carbon price ranges between €45 and €70, with projected carbon prices in the year 2030 ranging between €50 and €85. This is broadly in line with external analyses, for which the average of price forecasts for 2030 is €71, with a large range between €42 and €89[64], all prices recalculated in $€_{2020}$.

For the assessment of some impacts, e.g. on auctioning revenues, a carbon price *assumption* over the period 2021 to 2030 reflecting the -55% policy context is necessary. The following rounded central carbon price assumptions are used, derived on the basis of current ETS carbon market prices, the average of short-term forecasts of different carbon market analysts of April 2021 and the abovementioned modelled -55% scenarios for 2030[65]:

- €50 as average for the whole period 2021 to 2030,
- €55 as average for the period 2026 to 2030,
- €45 as average for the period 2021 to 2025 (all values expressed in $€_{2020}$).

5.2.2 Strengthening of the existing ETS (power and industry installations)

Strengthening of the existing ETS entails a number of elements: a tighter emission cap, a review of the Market Stability reserve, an improved framework against the risk of carbon leakages and a review of the Innovation Fund. There are different policy options for each of these elements which are described below and then first assessed separately. In Section 7.1.2 possible packages of these options are assessed. The Modernisation Fund and other elements addressing distributional concerns are covered separately in Section 5.2.5.

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64 Summarised in Carbon Pulse Daily of 8 April 2021: POLL: Big boost for EU carbon price forecasts as several analysts see EUAs topping €100 this decade. See also section 7.3 of ERCST, Wegener Center, BloombergNEFand Ecoact: 2021 State of the EU ETS Report, April 2021, and ICIS: European carbon market to shift gear, February 2021. All these publications use nominal carbon prices (not deflated).

65 Market analysts average: €43 for 2021 and €53 for 2025 (Carbon Pulse Daily poll of 8 April 2021). Average of MIX and MIX-CP in 2025 for existing ETS €37, in 2030 for existing and new ETS €53, for new ETS €71, Vivid existing EU ETS model average €56 for 2025 and €77 for 2030.

5.2.2.1 Strengthening of the ETS target/cap

The ETS cap on emissions determines the ambition level of the ETS. Decreasing linearly by an annual amount, the cap trajectory is referred to as the linear reduction factor (LRF), currently set at 2.2% per year[66].

To determine an ETS ambition in line with the 2030-target of -55% requires lowering the ETS cap. This in turn impacts the distribution of ETS building blocks and the protection against the risk of carbon leakage. A revised ETS ambition (cap) depends strongly on the 2030 EU wide ambition but also on the following elements:

1. Scope of ETS sector emissions: The current ETS scope includes stationary (power and industry sector) installations and intra EU aviation. For the analysis, this current scope is assumed during the 2021-30 period, so without any extension to new sectors[67].

2. Ambition distribution between the existing ETS and non-ETS sectors: The following analysis is based on the cost-effective reduction potential in the sectors covered by the existing ETS compared to the non-ETS sectors[68].

3. Starting year of cap changes: The year from when a new cap trajectory should be applied for the first time to reach the 2030 ETS cap impacts the overall ETS ambition. The later the new cap trajectory is applied for the same 2030 ambition, the steeper it needs to be. To note that for the same 2030 cap (ambition), a later start of a new trajectory results in a lower overall ambition, because the sum of the yearly caps for the entire phase 4 (2021-30) is lower[69].

4. Possible rebasing: the ETS cap decreases linearly by an annual amount. The LRF is applied to the cap of the previous year. Currently, the cap is higher than real emissions, because over the past decade real emissions have reduced faster than the cap. To better align the cap (historically set up) with the current emission

[66] The LRF is applied from the mid-point of the period from 2008 to 2012 and is calculated for the ETS emission and sector scope (i.e. stationary power and industry sector and intra EU aviation) based on the cost-effective ambition result for this scope from the -55% modelling scenarios. The LRF is then applied to the ETS cap reference.

[67] Options to extend emissions trading to maritime transport are analysed in Sections 5.2.3.1, 6.2 and Annex 6, Section 18. In terms of emissions and increase of ETS cap and free allocation, the impact of including maritime into the existing ETS would depend on the maritime scope applied.

[68] See Section 6.7 of the Impact Assessment accompanying the 2030 Communication for further discussion.

[69] The cumulative cap is an indicator of the overall emission ambition over the period 2021-30.

profile, it is possible to have a one-off reduction of the cap ("rebasing"), from where a new LRF would apply, an option already indicated in the 2030 CTP. This would lead to a lower LRF.

Regarding the geographical scope, the ETS scope applies to EU MS and EEA countries. Up to 2020, the UK was a full ETS member and from 2021 the ETS cap was updated to account for the UK's withdrawal from the EU and the Northern Ireland protocol[70,71].

The first element is to determine the contribution of the current ETS sectors (including intra-EU aviation) to the increased 2030 target of -55%. An analysis conducted in the IA accompanying the 2030 CTP[72] determined a cost-effective ETS ambition level of between -63% and -64% as compared to 2005. The modelling refinement based on the EU Reference Scenario 2020 resulted in a similar ambition level ranging between -62% and -63%. The MIX scenario which is considered as best reflecting the 2030 CTP results in -62%. Therefore, an ETS cost-effective ambition of -62% with current coverage as compared to 2005 is assumed for the quantification of all of the following options.

Different trajectory approaches can be used to reach the 2030 cap. The following options are assessed:

Option 1: ETS 2030 ambition with LRF update in 2026 without rebasing (*AMB1*)

The current ETS phase 4 framework is maintained for the period 2021-2025, with a 2.2% LRF, and as of 2026 an LRF of 6.24% applies. Applying a revised LRF as of 2026 accommodates the existing ETS phase 4 free allocation implementation that has two defined periods (2021-25; 2026-30).

Option 2: ETS 2030 ambition with LRF update in 2024 with/without rebasing (**AMB2**)

Taking into account the proposal timeline and subsequent legislative process, 2024 is assumed to be the earliest possible start date for a modified cap. Therefore, the current ETS phase 4 framework is maintained for the period 2021-2023, with a 2.2% LRF and in 2024 the cap trajectory is updated by:

- A linear trajectory with a LRF of 5.09%– *AMB2a*.

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[70] Commission Decision on the Union-wide quantity of allowances to be issued under the EU Emissions Trading System for 2021 (C(2020) 7704 final)
[71] Northern Ireland installations producing electricity are within the ETS scope
[72] Refer to table 26 on *ETS scope extension and projected ambition levels in ETS and ESR for different sectoral coverages*

- Emissions are adjusted downwards to better reflect the emission profile. The rebasing reference is the difference of ETS verified emissions to the annual cap for the period 2013-2019, on average 163 million EU allowances (EUAs) below the ETS annual cap, and a new LRF of 3.90% then applies – *AMB2b*
- Apply a 4,22% LRF from 2021, though delaying its implementation which results de facto in a rebasing correction of 119 million EUAs in 2024 – AMB2c

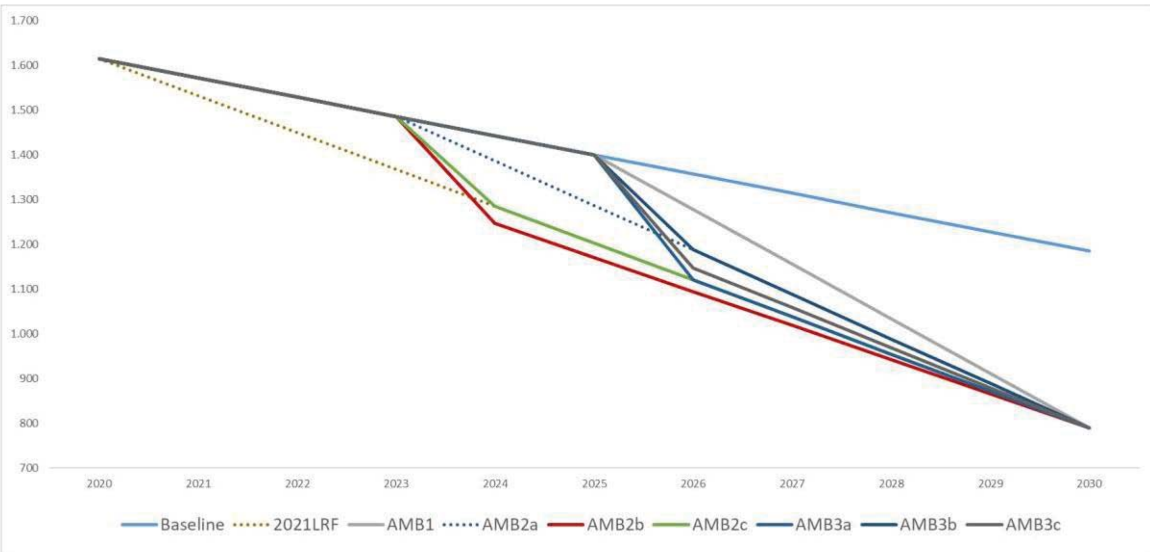
Option 3: ETS 2030 ambition with LRF update with rebasing in 2026 (**AMB3**)

The current ETS phase 4 framework is maintained for the period 2021-2025, with a 2.2% LRF. In 2026, a new LRF applies and the base year reference is adjusted downwards to better reflect the emission profile.

In terms of rebasing, i.e. the adjusted reference from where to apply the new LRF, there are different references to consider:

- Apply a LRF from an early starting year, though delaying its implementation which results de facto in a rebasing correction in the year it starts applying – AMB3a (2021 base; 4,22% LRF and 198 million EUAs rebase); AMB3b (2024 base; 5,09% LRF and 113 million EUAs rebase)
- Emissions are adjusted downwards by the difference of ETS verified emissions to the annual cap for the period 2013-2019163 million – AMB3c. Deducting this amount in 2026 would lead to new LRF of 4.57%.

Figure 2: ETS cap under the different options



Generally speaking, cap options including rebasing are favoured by NGOs and clean energy/technology/service providers. Industry stakeholders rather tend to support options based on an increased LRF, to avoid big step-changes that are considered to impact predictability in terms of price and free allocation. This was also confirmed by the OPC survey (see Annex 2 for a comprehensive overview on the results of the stakeholder consultation). The majority of respondents from all stakeholder groups indicated that the increase of the LRF is the most relevant factor to strengthen the ETS ambition. While a one-off cap reduction in combination with increasing the LRF was also found important by a wide range of stakeholder groups (including NGOs, environmental organisations, academic/research institutions, EU citizens and public authorities), this was not the case for the private sector, notably not for the manufacturing sector.

5.2.2.2 Market Stability Reserve

The main purpose of the MSR is to reduce the surplus of allowances in the ETS and therefore the rules on when and how the MSR absorbs allowances are crucial to its functioning. Currently, allowances are put in the reserve if the total number of allowances in circulation (TNAC) is above a predefined upper threshold (833 million allowances) and are released from the reserve, if the TNAC is below a predefined lower threshold (below 400 million allowances). These thresholds are based on an assessment of how much liquidity the market needs to function well, which crucially depends on the need for installations to manage their carbon price risks through 'hedging' part of their need for allowances in advance.

If the TNAC is above 833 million, then 24% of it is placed in the reserve (the 'intake rate'). The 24% intake rate is lowered to 12% after 2023. If the TNAC is lower than 400 million, then 100 million allowances (the release amount) are released from the MSR and put on the market (auctioned) immediately. The MSR also features an invalidation mechanism: after 2023, allowances held in the reserve above the total number of allowances auctioned during the previous year would be invalidated.

While the MSR has wide support across stakeholder groups, there was no consensus about the future changes of the MSR. Overall, civil society, including NGOs and EU citizens, expressed relatively more support for a strengthening of the parameters of the MSR than the private sector[73].

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[73] As regards the thresholds, 46% of respondents to the OPC, including the majority of private sector respondents, public authorities and trade unions, considered that they should not be changed, compared to 37% that thought the thresholds should be decreased, including the majority of NGOs, environmental organisations and parts of the private sector (in particular the energy sector). A minority of 18% respondents from different stakeholder groups considered that the thresholds should be increased. There was also no agreement about maintaining, increasing or decreasing the intake rate. The private sector and trade unions preferred to keep the intake rate as per the current regulation at 12% beyond 2023 (followed by the option to keep it at 24%), while NGOs' and environmental organisations' preferred option was to increase the intake rate above 24%. Finally, a minority of respondents (11%) pointed to

Possible options for these fundamental MSR design elements are presented and combined in three policy options, which are summarised in the table below:

Table 2: Summary of the MSR options

	MSR0+[74] ***MSR as legislated + aviation***	**MSR1** ***Update current parameter values (from 2024) + aviation***	**MSR2** ***More dynamic parameters (starting from 2024) + aviation***	**MSR3** ***MSR2 with addition of short term response mechanism (from 2024) + aviation***
Intake[75]	12% of TNAC	24% of TNAC	33% of TNAC minus upper threshold[76]	33% of TNAC minus upper threshold
Injections[77]	100m	100m	25% of lower threshold	25% of lower threshold
Upper threshold	833m	700m	700m in 2024, declines with cap after 2025	700m, either fixed or declining with cap after 2025
Lower threshold	400m	400m	400m in 2024, declines with cap after 2025	400m, either fixed or declining with cap after 2025

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the need for the MSR to be able to react faster to address unexpected demand or supply shocks, while 12% of respondents considered that a carbon price floor would also be necessary. There was support across stakeholder groups for maintaining the invalidation rule: the majority (63%) of respondents suggest that the invalidation rule should remain in place, either unreservedly (38%) or with an amendment (25%). 27% of respondents were instead in favour of abolishing the invalidation rule, including parts of the private sector (in particular the manufacturing sector). Participants at the two MSR expert workshops organised by Vivid Economics as part of the MSR review study also generally supported keeping the thresholds in line with future hedging needs, including aviation in the TNAC calculation, removing the dependency of the invalidation rule on past auction volumes, and updating the intake rate, in particular in order to remove the threshold effect.

[74] In particular for the MSR, the performance of the current MSR as legislated was assessed in option MSR0+. In order to render all options comparable, aviation was considered as included in the calculation of the TNAC in all options.

[75] For example, for a given TNAC of 1 000 allowances, the intake for MSR0+ would be 12% * 1 000 = 120 million allowances, for MSR1 24% * 1 000 = 240 million allowances, and for MSR2 and MSR3, 33% * (1 000 – 833) = 55.11 million allowances.

[76] In this case, if the TNAC is above the upper threshold, 33% of the difference between the calculated TNAC and the upper threshold would be put in the MSR. This option is different from MSR1, where simply 24% of the TNAC is put in reserve if the TNAC is above the upper threshold.

[77] In this case, if the TNAC is below the lower threshold, the amount shown on the line « injections » is « released » by being auctioned o during the next 12 months. For MSR0+ and MSR1, if the TNAC were lower than 400 million allowances, 100 million allowances would be released from the MSR and auctioned in the next 12 months. For MSR2 and MSR3, if the lower threshold were 360 million allowances and if the TNAC were lower than 360 million allowances, then 25% of 360 million, or 90 million would be released from the MSR and auctioned during the next 12 months.

	MSR0+[74] ***MSR as legislated + aviation***	**MSR1** ***Update current parameter values (from 2024) + aviation***	**MSR2** ***More dynamic parameters (starting from 2024) + aviation***	**MSR3** ***MSR2 with addition of short term response mechanism (from 2024) + aviation***
Invalidation mechanism[78]	Invalidate excess above prior year auction volume	Invalidate excess above prior year auction volume	Invalidate allowances up to the level of the lower threshold	Invalidate allowances up to the level of the lower threshold
Auction reserve price[79]	-	-	-	25€ in 2025, increasing by 3% year-on-year in real terms

The updated levels of the thresholds are based on estimates of future hedging needs, which are expected to change over time, for example because the reduction of free allocation increases the carbon price risk of industrial installations. The assessment of future hedging needs is presented in Annex 8, Section 24.

MSR1 simply updates the values of the parameters (threshold, intake rate) based on this analysis.

MSR2 adjusts the thresholds such that they remain a constant share of the cap. This links the thresholds to the main supply parameter in the ETS: as the cap is lowered, so are the MSR thresholds. This option calculates intakes as a proportion of the TNAC in excess of the upper threshold. The intake rate is set at 33% of the difference between the surplus and the upper threshold. This means that with an upper threshold of 700 million allowances, a TNAC of 800 million allowances would result in the MSR taking in 33 million allowances the following year.

This option invalidates allowances held in excess of the MSR lower threshold, decoupling invalidation from auction volumes. This change is proposed because there is

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[78] For example, if there were 2 billion allowances in the reserve, and the auction volume of the previous year were 500 million allowances, while the lower threshold were 400 million allowances, for MSR 0+ and MSR1, 1.5 billion allowances would be invalidated, and 500 million allowances would remain in the reserve. For MSR2 and MSR3, 1.6 billion allowances would be invalidated, and 400 million allowances would remain in the reserve.

[79] An auction reserve prices means that, if the clearing price of an auction of allowances does not reach the auction reserve price, then the auction is cancelled. In that case, the corresponding volume of allowances to be auctioned would be added to the MSR, thereby quickly decreasing the supply of allowances to the market.

no clear rationale to let the invalidation volume be determined by the auction volumes in the previous year, especially since these auction volumes are themselves influenced by the MSR's intakes or releases.

Option MSR3 introduces an auction reserve price, as an additional short-term response mechanism. The MSR in its current structure is not meant to address short term volatility and disturbances. In particular when carbon prices were low, different groups of stakeholders have asked the Commission to look into the possible implementation of a carbon price floor. Under this option, on top of the changes brought by MSR1 or MSR2, a minimum price level would be set at a fixed or dynamic level. If the clearing price of an auction does not reach this level, the auction is cancelled, and the auction volume would be added to the MSR instead. The level of this price would be set at 25 euros to begin with, with annual increases of 3%.

5.2.2.3 Framework to address the risk of carbon leakage

The level of free allocation granted to a stationary installation to address the risk of carbon leakage is the result of a calculation which takes into consideration the relevant benchmark values, the historic activity level of the installations, the carbon leakage exposure factor (CLEF) and the cross-sectoral correction factor (CSCF). The value used for the CLEF depends on if a sector is deemed to be at risk of carbon leakage or not. The CSCF is a factor which, if applied, reduces free allocation in a uniform manner across all sectors (see Annex 9 for more details). The free allocation rules were updated as a result of the previous review of the ETS Directive and are applicable for phase 4. However, a more ambitious emission reduction target implies that these rules may need to be updated. The options analysed in this impact assessment include:

Baseline CL0: The baseline relies on the current post-2020 free allocation rules combined with an overall GHG emission reduction target of -55% compared to 1990. This baseline was chosen to compare the impacts of options to modify the framework to address the risk of carbon leakage. Different cap trajectories were considered to reflect the ETS contribution to the overall -55% emission reduction objective (see Section 5.2.1.1).

Option CL1: More targeted free allocation with tiered approach

Considering that the overall number of free allowances is limited, in particular in view of the increased level of ambition of EU climate policies, policy option CL1 aims at better targeting free allocation to those sectors at higher risk of carbon leakage. The current ETS legislation foresees only two groups with respect to the risk of carbon leakage. A sector or subsector is deemed to be at risk if the carbon leakage indicator, defined as the trade intensity multiplied by the emission intensity, exceeds a value of 0.2. Otherwise, the concerned sector or sub-sector is not deemed to be at risk except if other, more detailed criteria are met. The assessment of sectors or subsectors against these more detailed criteria resulted in significant additional work and protracted discussions. In practice, the impact of the distinction between sectors at risk of carbon leakage and sectors not at risk is limited, as around 94% of the emissions from industrial installations originate from sectors at risk.[80]

A total of 63 sectors and subsectors is deemed to be at risk of carbon leakage in phase 4. This approach does not take into account that there are significant differences in the trade and emissions intensities between industry sectors deemed to be at risk, as can be seen from the large variations in the values of the carbon leakage indicator ranging from 0.2 to more than 20 (see Annex 9). In order to better target free allocation,[90] tiers with carbon leakage indicator thresholds and more differentiated carbon leakage exposure factors could be introduced. This was already contemplated in the 2015 impact assessment for the revision of the ETS Directive. Under this option, three tiers are considered.

The tiered approach is assessed from 2026 onwards, as free allocation for the period from 2021 to 2025 will be granted in 2021 based on the current ETS Directive. The free allocation at benchmark level (i.e. the carbon leakage exposure factors) for sectors at medium risk was chosen at an intermediate level of the current legislation which applies 30% (no risk) and 100% (risk) of the relevant benchmark levels. The thresholds were chosen in order to allow for a reasonable differentiation between sectors. Sectors with a carbon leakage indicator of more than 2 would represent approximately 72% of the emissions, while sectors with a factor of more than 1 would represent approximately 91%. A threshold of 1 was discarded, as it would only provide a marginally improved differentiation compared to the current threshold of 0.2 for which the concerned sectors represent 94% of the emissions.

Table 3: Tiered approach assessed

Baseline		**Tiered approach**	
Risk categories and thresholds	**Carbon leakage exposure factor (CLEF)**	**Risk categories and thresholds**	**Carbon leakage exposure factor (CLEF)**
No risk: CLI ≤ 0.2	30% (1)	No risk: CLI ≤ 0.2	30% (1)

[80] European Court of Auditors, The EU's Emissions Trading System: free allocation of allowances needed better targeting, 2020.

<table>
<tr><td rowspan="2">Risk:
CLI > 0.2</td><td rowspan="2">100%</td><td>Medium risk:
0.2 < CLI ≤ 2</td><td>60%</td></tr>
<tr><td>High risk:
CLI > 2</td><td>100%</td></tr>
<tr><td colspan="4">NB: CLI = carbon leakage indicator.
(1) Declining from 30% in 2026 to 0% in 2030, as in the current ETS Directive.</td></tr>
</table>

Option CL2: More targeted free allocation with strengthened benchmarks

More targeted free allocation could also be achieved by addressing another element of the allocation formula: the benchmarks. The present rules for the benchmark value updates foresee an annual reduction within the range between 0.2% and 1.6%, compared to phase 3 values which were based on the average performance of the 10% most efficient installations in 2007/2008. This approach avoids abrupt changes of benchmark values, but does not fully reflect the technological progress. For the update of the benchmark values for the period from 2021 to 2025, the maximum update rate has been applied for 31 out of 54 benchmarks. For a number of benchmarks, the average emission factor of the 10% most efficient installations in 2016/2017 is already lower than the updated benchmark values for the period from 2021 to 2025.[81]

An increase of the maximum annual update rate from 1.6% to 2.5%[82] would better reflect the actual emissions of the different sectors, while also reduce the total free allocation. A maximum update rate of 2.5% would also better align free allocation with the need to decarbonise industry in view of reaching zero emissions by 2050, as it is close to a linear trajectory to zero in 2050.

A **design element** which can be changed for options CL1 and CL2 is to make free allocation conditional on decarbonisation efforts. Such conditionality provisions could be similar to the ones that were recently introduced with the revised state aid rules for indirect cost compensation.[16] The conditionality of free allocation is assessed in Annex 9.

Another **design element** which can be changed for options CL1 and CL2 is the broadening of the scope of free allocation. Ongoing and future technological

[81] Commission Implementing Regulation (EU) 2021/447 of 12 March 2021 determining revised benchmark values for free allocation of emission allowances for the period from 2021 to 2025 pursuant to Article 10a(2) of Directive 2003/87/EC of the European Parliament and of the Council. OJ L 87/29, 15.3.2021.

[82] For the period from 2026 to 2030, the application of a maximum annual update rate of 2.5% would lead to a reduction of the benchmark values of 50% compared to phase 3 values, while a maximum annual update rate of 1.6% would instead lead to a reduction of 32% compared to phase 3 values.

developments to reduce GHG emissions might lead to situations where installations would partly or completely lose their free allocation when decarbonising their production activities. In such cases, the free allocation regime could lead to unequal treatment of industrial installations and effectively act as a barrier to the use of decarbonisation techniques such as green hydrogen and the electrification of industrial processes. Possibilities to broaden the scope of free allocation are assessed in Annex 9.

The framework to address the risk of carbon leakage due to indirect carbon costs is assessed in Annex 9.

The Commission will also present a proposal for a Carbon Border Adjustment Mechanism (CBAM). Depending on the options chosen, CBAM may replace free allocation in the selected sectors. The impact of CBAM as well as the transition between CBAM and free allocation is presented in the CBAM impact assessment. This impact assessment presents options for free allocation that would apply for sectors outside CBAM, or until the entry into force of CBAM for selected sectors.

A large majority of replies to the OPC, around 80%, were in favour of amending the current carbon leakage framework, while 20% preferred to keep it as it is. However, opinions on the modification options were divided. The introduction of other measures to further incentivise GHG reductions received comparatively highest support (31%). On the other hand, the introduction of conditionality (14%) or of a tiered approach (17%) as well as the replacement of the current carbon leakage framework with a CBAM for selected sectors (18%) each were favoured by less than 20% of the replies. Preferred options varied by stakeholder type. Both NGOs' and private sector respondents' most selected option was the introduction of other measures to further incentivise GHG reductions, however, for NGOs followed by all of the other amending or replacing options, while for the private sector followed by the option to maintain the current carbon leakage framework without changes. Among trade unions, the introduction of other measures or no changes received the most support. This outcome of the OPC survey is also in line with the positions expressed by social partners from both the employer and employee side in a meeting with the Commission. For other stakeholder groups, including academic/research institutes, EU citizens, and environmental organisations, the replacement of free allocation with a CBAM for selected sectors was the most selected option.

Regarding possible changes to benchmark-based allocation, stakeholders were divided whether a modified method to determine benchmark values should be introduced to ensure faster incorporation of innovation and technological progress. This option obtained support from a wide range of stakeholder groups but not from the private sector.

5.2.2.4 Improving support for low-carbon investment and innovation through the existing Innovation Fund

The current ETS Directive sets the size of the Innovation Fund at 325 million allowances from the free allocation share, 75 million allowances from the auction share, 50 million allowances from the MSR and the leftovers from the NER300 programme, to a total size of over 450 million allowances.

The main policy options analysed for the Innovation Fund concern increasing its size while keeping its sourcing the same in terms of proportions, complemented with changes to certain design elements improving its functioning. 83% of OPC respondents from a wide range of stakeholder groups argued that the size of the Innovation Fund should be increased.

Option IF0: Baseline

No change to current Innovation Fund size, as well as main design elements (funding rate stays at maximum 60% of the additional cost of the innovation technology and not of the total financial gap to the market price). With a carbon price of EUR 50, the total size of the Innovation Fund for the period 2021-2030 amounts to EUR 22.5 billion.

The first call for large scale projects was significantly oversubscribed (over 20 times the available budget) with projects across all sectors, technologies, and MS. The Innovation Fund is running two calls per year (one for large-scale and one for small-scale projects) of total value around EUR 1.3 billion. By 2026 it will have run around 12 calls for around EUR 7.5 billion. Assuming an average grant size of EUR 100 million, by 2026 the IF may be expected to have financed around 75 clean tech projects covering a good mix of first-of-a-kind commercial projects across all sectors (based on the applications to the first call[83]).

Option IF1: Increasing the size of the Innovation Fund to 550 million allowances

Increasing the size of the Innovation Fund to 550 million allowances is expected to generate EUR 27.5 billion (with a EUR 50 carbon price which takes into account the increased carbon price as a result of the reduced cap). The additional 100 million allowances would come from the extension of the scope of emissions trading. The increase can be implemented once the revision of the ETS Directive is concluded, the required implementing legislation is put in place, and the allowances are monetized. This would allow running call for projects with the additional amounts in the second half of the decade, and may also require increasing the size of the actual calls. The monetization of the additional allowances would need to take place with due care for the stability of the carbon market. The increase of the size can be combined with the enhancement of the functioning of the instrument via an increased funding rate combined with additional instruments. Administrative capacity will need to be strengthened accordingly.

Option IF2: Further increasing the size of the Innovation Fund to 700 million allowances

Increasing the size of the Innovation Fund to 700 million allowances is expected to generate EUR 35 billion with a EUR 50 carbon price. The additional 250 million allowances can come mostly from the extension of the ETS (200 million) and from free allocation (50 million). Out of the 83% respondents to the OPC in favour of an increase of the Innovation Fund, 45% indicated that it should be increased by using more allowances from the auction share, while 9% indicated that the allowances should come from free allocation. The same considerations as for Option IF1 are valid to an even greater extent. However, the management of such a significantly increased programme would require significantly reinforced administrative capacity.

A **design element** which can be changed across all options is the **funding rate** of the Innovation Fund which can be increased to ensure a full coverage of the financial gap that would speed up the deployment of innovative technologies. This can be done with a direct increase of the percentage, possibly coupled with introduction of complementary **carbon contracts for difference (CCfDs)**[84]. CCfDs are similar to the support to renewables auctions: they are long term contracts with a public counterpart paying the difference between an agreed CO_2 strike price and the actual CO_2 price in the ETS and thus minimise the required amount of funding and optimise the use of the available resources. The producer of the low-carbon product would effectively benefit from a guaranteed carbon price for a certain limited period of time. The extra funding required needs to be assessed against potential benefits, such as the use of competitive tendering

[84] The relevance of these possible changes to design elements was confirmed by the results of the OPC. 74% of respondents argued for the maximum funding rate to be increased, 55% highlighting the need to allow better risk-sharing for risky and complex projects and 19%, including the majority of NGOs indicating that it should only be increased in case of competitive bidding (e.g. CCfDs). 88% of respondents from a wide range of stakeholder groups were in favour of introducing such additional supporting instruments to support full market deployment of low-carbon products through the Innovation Fund.

processes, the reduction of regulatory risk for the investor, the reduction of financing costs (enhanced bankability), the creation of a one-stop shop, and build-in reduction of support with increasing carbon prices (see Annex 11 for more analysis).

5.2.3 Extension of emissions trading to maritime transport and alternatives

5.2.3.1 Architectural options

Following the 2030 CTP, this impact assessment looks at the options detailed below as regards the extension of emissions trading to maritime transport. All options are based on maritime emissions linked to the EEA (i.e. route-based scope), regardless of the nationality of the ship or where the company has been registered in order to avoid evasion through reflagging of ships and distortion of competition. In addition, they reflect the impact of the FuelEU Maritime initiative by considering higher shares of renewable and low-carbon fuels, in line with the MIX scenario.

Option 1: Inclusion of maritime transport emissions in the existing ETS (**MAR1**)

This policy option would extend the ETS to cover maritime transport emissions. It would work by setting a cap on GHG emissions from the maritime sector and creating new emission rights in the Union registry. Regulated entities from the maritime sector would then need to acquire and surrender emission allowances for each tonne of reported GHG emissions. The amount of allowances to be surrendered would be derived from the emissions data coming from the EU maritime transport monitoring, reporting and verification (MRV) system. The system could allow both maritime regulated entities and ETS operators to purchase and surrender the same type of allowances, or alternatively, it could only give that flexibility to maritime operators (similar to what was done initially for aviation in the ETS).

Option 2: A separate ETS for maritime transport (**MAR2**)

Under this option, maritime transport emissions would be capped and included under a separate emissions trading system, not part of the existing ETS. A new market would be designed for the maritime allowances and exist in parallel to the existing ETS. The amount of allowances to be surrendered would be derived from the EU maritime MRV system. Regulated entities would only be able to trade maritime allowances amongst themselves as no out-of-sector emission reductions would be rewarded, unlike in MAR1. All emission reductions would happen in the maritime sector. In the future, a possible linkage of the separate maritime ETS with the ETS could be envisaged if desirable, following the same linking options as envisaged for the ETS extension to other sectors than maritime transport.

Option 3: Alternative carbon pricing option: levy on ship GHG emissions (**MAR3**)

This measure would impose a levy on maritime emissions reported by eligible entities as part of the EU maritime MRV system. As opposed to the maritime fuel tax option assessed under the revision of the Energy Tax Directive 2003/96/EC, the levy on ship GHG emissions would be applied to ship operators/owners based on their reported annual emissions and not on the quantity of fuel bunkered in EU ports. It would therefore take the form of an annual payment. The levy rate could be reviewed regularly (e.g. up to yearly adjustments) and gradually increased to send an appropriate price signal and accelerate the uptake of mitigation measures in the sector. A levy on CO_2 emissions is one of the market-based-measures contemplated by some market actors at global level, as an alternative to cap-and-trade system.

Option 4: Extension of the ETS to maritime emissions in combination with standards (**MAR4**)

This policy option considers complementing the extension of the ETS to maritime as described in MAR1 with an **operational carbon intensity standard**, whereby vessels calling at EEA ports would be obliged to meet a certain level of carbon intensity to be defined in the legislation (expressed as the amount of GHG emissions per transport work and defined for every ship size and type). By mandating a certain level of carbon intensity improvements, such a standard would complement the price signal coming from the ETS, while leaving it to shipping companies to decide which measures to implement to achieve the standard. It would thereby contribute to further accelerate the implementation of mitigation measures in the maritime sector, such as energy efficiency improvements or the uptake of renewable or low-carbon fuels. A similar standard is being discussed at IMO for ships of 5,000 gross tonnage and above based on a new operational carbon intensity indicator.

5.2.3.2 Key common design variants for all maritime transport options

The effectiveness and efficiency of the identified policy options are highly dependent on the following key design elements (see Annex 6 for further details).

(a) Options for the maritime geographical scope

The geographical scope is defined by the starting and finishing point of the covered ship movements (based on the first and last port of call within or outside the EEA, as detailed in Annex 6) and thus defines the level of emissions covered. In line with the 2030 Communication calling for the coverage of at least intra-EU voyages, there are a variety of options in terms of the ship movements linked to the EEA that could be covered:

- ***Option 1***: Cover 100% of emissions from intra-EEA voyages, 100% of extra-EEA voyages (incoming and outgoing) and all emissions at EEA berth (**MEXTRA100**) – *follows the same scope as the EU maritime transport MRV Regulation*;
- ***Option 2***: Cover 100% of emissions from intra-EEA voyages, 50% of all incoming and outgoing extra-EEA voyages (one of the options considered in UNFCCC, or 100% of all incoming extra-EEA voyages, or 100% of all outgoing extra-EEA voyages) and all emissions at EEA berth (**MEXTRA50**);
- ***Option 3***: Cover 100% of emissions from intra-EEA voyages and all emissions at EEA berth (**MINTRA**) – *similar to the scope of aviation in the ETS under the time-limited derogation that is currently being applied and in line with the minimum scope foreseen in the 2030 CTP.*

It should be noted that emissions from intra-EEA voyages include both emissions from domestic voyages (that depart and arrive in the same MS) as well as emissions from voyages between two distinct MS. Domestic emissions are covered by the Effort Sharing Regulation (ESR) and represent around 10% of the sum of domestic and international navigation emissions reported in the EU GHG inventory. A substantial part of these emissions would not be covered by the proposed policy options. These uncovered emissions would typically include emissions from various ship types involved in domestic navigation such as inland waterway vessels or small ferries, motor boats or workboats not covered under the EU maritime transport MRV regulation.

(b) Regulated entities and ships

The companies liable under the EU maritime transport MRV regulation would be the regulated entity held accountable to comply with the legislation. These companies are defined as the legal entities owning the ship and any other organisation or person which has assumed the responsibility for the operation of the ship from the shipowner, such as the manager or the bareboat charterer. These companies would also be the ones that have agreed to take over all the duties and responsibilities imposed by the International Management Code for the Safe Operation of Ships and for Pollution Prevention. This is in line with the new definition of companies proposed by the European Commission in its proposal to amend the EU maritime transport MRV regulation[85]. In addition, implementing the policy at company level instead of ship level would considerably

[85] Proposal for amending Regulation (EU) 2015/757 in order to take appropriate account of the global data collection system for ship fuel oil consumption data, COM(2019) 38 final, 2019/0017 (COD)

reduce the number of entities involved in each policy option (from around 12.000 to 1.600).

In terms of regulated ships, all options would apply the scope of the EU maritime transport MRV regulation that excludes ships below 5.000 gross tonnage[86] and exempts specific ship categories such as warships, naval auxiliaries, fishing vessels or government ships used for non-commercial purposes. It also excludes inland waterway transport and all voyages for purposes other than transporting cargo or passengers for commercial reasons.

(c) Type of greenhouse gas emissions

All policy options should progressively cover the broader range of GHG emissions. While CO_2 emissions are the primary GHG emitted through maritime transport activities, other GHGs, such as methane and nitrous oxide are getting increasingly important, notably in view of the increasing uptake of LNG[87]. Due to the EU maritime transport MRV Regulation currently being limited to CO_2 emissions, other GHGs would have to be included in a later phase once the monitoring approaches and emission factors of these gases have been agreed. A similar approach is taken in the FuelEU maritime initiative, which envisages including other non-CO_2 greenhouse gases, in particular methane and nitrous oxide.

(d) Phase-in period with a gradual coverage of maritime emissions

To ensure a smooth transition, a phase-in period of e.g. 3 years could be envisaged where regulated entities would only be obliged to purchase allowances (or pay a levy in case of MAR3) for a portion of their emissions, gradually rising to 100%. This transition period could help market actors get acquainted with the new system. In the targeted stakeholders' consultation, the majority of stakeholders expressed the need for a transition period for the maritime sector with some arguing that the maritime sector is complex and requires time to adapt.

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[86] By limiting the monitoring requirements to ships above 5.000 gross tonnage, the Regulation covers around 90% of all CO_2 emissions, whilst only including around 55% of all ships calling into EEA ports.

[87] CO_2 emissions cover 98% of current GHG shipping emissions, According to the 4th IMO GHG study, methane emissions from ships have increased by more than 150% from 2012 to 2018, largely due to a surge in the number of LNG ships. Such a trend could have a significant climate impact as over a 100-year period methane the global warming potential of methane is 28 times higher than of CO_2.

5.2.3.3 Design elements specific to maritime ETS options (MAR1, MAR2, MAR4)

a) Method for cap setting

The emission cap for ETS allowances for maritime transport can be determined using historical maritime transport emissions. Historical maritime emissions could be based on the reporting years 2018-2019, on the basis of the data collected under the EU maritime transport MRV system while taking into account the impact of the UK's withdrawal from the EU.

In addition, a trajectory from current emission levels to the target level in future years will need to be constructed so that a linear reduction factor for the cap can be set for each year. In this assessment, we consider that the number of allowances allocated to maritime emissions should be reduced in line with the same linear reduction factor applicable to stationary installations and aviation, in a manner commensurate with the 2030 climate ambition and with a long-term trajectory towards climate neutrality by 2050. This would ensure that maritime transport contributes to the EU climate efforts in line with the collective ETS emission reduction objective, which applies to all ETS sectors.

b) Allocation of allowances

Maritime allowances could be auctioned, which is the basic principle for allocation in the ETS, as it is generally considered to be the most economically efficient system[88]. It also eliminates possible windfall profits and puts new entrants on the same competitive footing as existing operators. Moreover, the application of the flag neutrality principle would already virtually eliminate the risk of competitive distortion between ships/companies and therefore no free allowance allocation is needed to safeguard a level playing field. Auctioning could also raise revenues to support climate action and other purposes (see Section 5.2.4.3). Free allocation of maritime allowances will thus not be analysed under this impact assessment.

c) Simplified measures

Some simplification could be thought for the regulated entities responsible for small amounts of emissions, including specific exemption rules or exclusion criteria subject to equivalent measures (see Annex 6).

5.2.4 Extension of emissions trading to the buildings and road transport sectors or to all combustion fuels outside the existing ETS

5.2.4.1 Scope options

The 2030 CTP announced that a further expansion of emissions trading could be envisaged but left open if the scope would cover emissions from road transport and buildings or all emissions of fossil fuel combustion. As the existing ETS has shown, the development of a new market requires setting up functioning monitoring, reporting and verification and can benefit from transitional arrangements or a pilot period before being gradually integrated into the existing system, as indicated in the 2030 CTP. In light of these considerations, an immediate extension of the existing ETS as well as a downstream approach have been discarded (see Sections 5.3.3.1 and 5.3.3.2) and this impact assessment looks at the options detailed below as regards the scope of a separate EU-wide emissions trading.

***Baseline*:** No expansion of emissions trading (**EXT0**).

Fossil fuel emissions from road transport, direct heating of buildings and other sectors would be regulated only by the ESR and EU and MS sector specific legislation with MS deciding if their policy instruments include carbon pricing.

Option 1: A separate EU-wide upstream emissions trading system for buildings and road transport (**EXT1**)

Under this option direct CO_2 emissions from buildings and road transport are included under a new emissions trading system which is distinct from the existing ETS. This would cover around a third of EU GHG emissions in 2030. The new ETS and the existing ETS run in parallel at least until 2030.

***Option 2**:* A separate EU-wide upstream emissions trading system for all emissions from the combustion of fossil fuels not covered by the ETS (**EXT2**)

Under this option, all GHG emissions from the combustion of fossil fuels not covered by the existing ETS would be covered by a new emissions trading system, covering in addition to EXT1 small non-ETS industries, fossil fuel use in agriculture and forestry and off-road machinery, non-electric railway, and the military sector. The new emissions trading system and the current ETS would run in parallel at least until 2030.

This approach for a separate emissions trading system for buildings and road transport (or all combustion of fossil fuels) is supported by the results of the OPC, where respondents, including the majority of NGOs and private sector respondents and trade unions clearly preferred a separate EU-wide system among the presented policy options. The majority of the responses, including from NGOs, private sector respondents and trade unions, expressed a negative view on the integration of new sectors into the current ETS. Only less than one-third of responses, including the majority of EU citizens and academic/research institutions, saw an integration favourable. 18% of responses referred to "other" (positive or negative) effects, with half of them arguing against the introduction of emission trading for new sectors and the other half being open to consider an extension as an option, generally either after a careful assessment of the impacts and a trial period or in a separate temporary or permanent ETS. In the OPC and beyond, several stakeholders also expressed more general scepticism with regard to the extension of emissions trading to buildings and road transport, even if in a separate system. Such concerns were, for instance, expressed in a meeting between the Commission and social partners from both the employer and employee side, who pointed in particular to the impact of rising heating or transport fuel prices on consumers.

Only very few MS participated in the OPC survey, while some MS responded with a position paper. Overall, MS' views on the extension of emissions trading to the buildings and road transport sectors (or all combustion of fossil fuels) were mixed with some MS in favour, some against and several MS stressing the need for a thorough impact assessment. Also in the European Parliament, views of the political groups differ. The Parliament supported as of early 2020 market-based measures, expressed reservations and asked for further analysis on the ETS inclusion of buildings, while rejecting the setting-up of a separate ETS system or direct ETS inclusion for the transport sector[89].

5.2.4.2 Linking options with the existing ETS

For EXT1 and EXT2 options, the possible linking or merging of the existing ETS with the new ETS could happen in different ways.

Option 1: As part of a general review clause at the end of phase 4 (in 2030) of the existing ETS, determine whether and under which conditions the merging of the two systems could happen (**ELINK1**). This would be justified by the need for a sufficient period to understand the functioning of the new market.

Option 2: Provisions for development of one-way or two-way flexibility with existing ETS that could increase over time to eventually lead to full integration with the current system (**ELINK2**).

[89] European Parliament resolution of 15 January 2020 on the European Green Deal (P9_TA(2020)0005)

For both linking options a new type of allowance is created, as currently for aviation. If and when the systems are linked, one would need to determine to what extent the allowances of one system can be used for compliance in the other system.

In the OPC, most respondents (46%), including the majority of NGOs, private sector respondents and trade unions, indicated that both systems should stay independent. Only 19% of respondents, including the majority of EU citizens, argued in favour of two-way flexibilities between the two systems to increase cost-efficiency considerations. Further 33%, including most of academic institutions, gave various replies, in particular stressing the need for a thorough impact assessment before integrating the two systems.

As regards the question whether a gradual integration of the two systems should already be foreseen in the ETS revision, views were divided. 45% of respondents, including the vast majority of NGOs, environmental organisations and trade unions and almost half of private sector respondents (in particular from the manufacturing sector), replied that the risks associated with an integration are too high and that the legislation should not pursue such a step. However, 43% of respondents, including the majority of academic/research institutions, public authorities and EU citizens as well as the slight majority of private sector respondents (in particular from the energy sector), were open to a possible gradual integration. These respondents preferred to foresee a review to determine whether and when integration is desirable (26%) over a fixed date for such an integration (17%).

5.2.4.3 Design elements on the possible ETS extensions

The environmental effectiveness and practicability of the policy options depends on some key design elements which are set out below. Technical details on the design elements and their impacts are analysed in Annex 5.

a) Cap setting and linear reduction factor

Extension of emissions trading through a separate ETS will require to set a cap for those sectors. The later the system starts to apply, the higher its cap trajectory referred to as the linear reduction factor (LRF) will have to be to achieve the necessary ambition reduction by 2030, therefore a cap with LRF should apply as soon practically feasible.

The cap and LRF for the separate ETS would be set in line with cost-effective emission reductions in 2030 resulting from a mix of carbon pricing and other policies in the sectors concerned. Applying a LRF from 2026 would deliver a clear signal about the trajectory needed for emissions reductions in the new sectors. A consistent LRF with a trajectory starting from ESR ambition levels in 2024 is for EXT1 5.15%, corresponding to 5.43% if compared to 2025, the year for which MRV based emissions would be available. The corresponding EXT2 LRF would be 5.14% compared to the ESR ambition level for 2024, corresponding to 5.42% compared to 2025.

For further analysis of cap setting and the LRF see Annex 5, Section 10.

b) Regulated entities

When designing an emissions trading system, the point at which regulation applies is a key element. Emissions considered under the new system under EXT1 and EXT2 are combustion emissions from fossil fuels. As already indicated in the 2030 CTP and its impact assessment, an upstream system lowers significantly the number of participants, thus limiting participant transaction costs and administrative costs. While a downstream design would present advantages in terms of direct citizen involvement, its complexity and the heavy administration needed have led to discard this option (see also Section 5.3.3.2 and Annex 5, Section 12).

In the upstream system the act triggering a compliance obligation is not the emission of GHG but the releasing on the market of fuels for combustion in the sectors concerned. Emissions would be determined indirectly via the fuel quantities put on the market. To the extent possible and subject to further analysis, the existing ETS system of standardised fuel emission factors per energy content would be applied. The precise point for regulation to apply would be identified in terms of technical feasibility, the ability to pass-on the ETS related carbon costs to the consumers, and the administrative costs.

The system of excise duty of Council Directive (EU) 2020/262[90], with the necessary adaptations, is a useful anchor to identify the regulated entities in the new system, as this Directive has already set a robust control system for quantities of fuels released for consumption for the purposes of paying excise duties.

In the case of oil, there is a European harmonized excise duty system operated through the existence of tax warehouses. As tax warehouse operators already have in place an MRV system for tax reasons, regulation can be set at their level. For gas, the point of regulation considered most appropriate are the fuel suppliers that supply directly the end-users. In most MS gas suppliers are the entities obliged to pay the excise duty.

With respect to coal, the market is complex and less regulated than the markets for oil and gas. Not all coal products necessarily pass through an excise duty point and where they do practices are not harmonised at EU level. There are many and often small end suppliers of coal, which makes it challenging to regulate coal supplies in a manner that limits administrative burden and minimises the risk of fraud. The excise duty

[90] Council Directive (EU) 2020/262 of 19 December 2019 laying down the general arrangements for excise duty (OJ L 058 27.2.2020, p. 4).

infrastructure could also play a role in identifying the regulated entities and monitoring of the end use of coal. In most MS that do apply excise duty to coal, the seller to the final customer is the excise duty payer, but there are exceptions[91]. The excise duty payers are subject to registration in accordance with Directive 2003/96/EC on energy taxation. For any cases not covered by these options, or if several persons are jointly and severally liable for payment of the same excise duty, the MS should be able to designate the regulated entities in accordance with their national law.

Additionally, it should be recalled in this respect that at the European level coal plays only a small role in heating and small industry and is been phased out, whereas in some MS coal still plays a considerable role.

If the level of regulation is set at tax warehouses for oil (about 7.000), regional and local suppliers for gas (about 1.400), and for coal (about 3.000) there would be 11.400[92] regulated entities under the new ETS. This compares with 9.200 to 9.500 regulated entities in the existing ETS (11.000 before UK's withdrawal from the EU).

When establishing the point of regulation for the different fuel types, it has to be kept in mind that the model needs to fit the different EU MS.

Annex 5, Section 12 contains further analysis on the regulated entities.

c) Allocation method and auction starting phase

The method of allocation in the new ETS under option **EXT1** would be auctioning, as the risk of carbon leakage in the transport and building sectors is small or zero[93].

Under option **EXT2** there would be the need for a limited quantity of free allocation or another compensation mechanism in order to address the risk of carbon leakage due to

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[91] In Czechia, France, Croatia, Italy, Latvia and Slovakia the supplier to end-consumer of coal is the party that pays the tax whereas in Germany, Ireland and Spain the first supplier of coal is appointed as the responsible party for paying the tax. In the vast majority of countries multiple entities can be liable for paying the tax depending, amongst others, on the moment when the coal duty/tax becomes chargeable. This includes parties such as tax warehouse owners, producers, importers, suppliers, traders, consumers or the tax representative of one of these parties.

[92] Sources: ICF et al. (2020); CEER, Enstog, Eurostat.

.[93] The road transport sector has no significant competitive pressure from outside the EU, except some tank tourism in limited border regions. For the buildings sector, competitive pressure is not relevant.

competitiveness impacts on small industry which is currently excluded from the ETS Directive if under a certain size or under Art. 27 and 27a[94].

The compliance cycle would be identical to the existing ETS, with an obligation to surrender allowances equal to the emissions from the regulated entities during the preceding calendar year by 30 April each year at the latest.

In order to ensure a smooth start of the system and taking into account the need for regulated entities to hedge or bank allowances in order to mitigate their liquidity risk under the new system, auctions of the ETS in the first year would start with a higher volume than the cap of the first year[95]. This front-loading of auctioning volume would be deducted from auctioning volumes in future years to preserve environmental integrity. For further analysis see Annex 5, Section 11.

d) Market Stability Mechanism

In order to avoid the risk of significant market imbalances (whether a surplus or a deficit of allowances) and a resulting too weak or too strong price signal, a rules-based market stability instrument similar to the MSR for the existing ETS system could be introduced. This is important for market participants as it helps manage market expectations about future market supply and may mitigate excessive price movements linked to market fundamentals. It is thus suggested to use the same instrument as in the current ETS with features adapted to the new sectors.

A certain quantity of allowances should be placed in the reserve at the start of its operation. In addition, a provision allowing to react to excessive price fluctuations would be necessary in order to contribute further to market stability[96]. These elements are further detailed in Annex 5 Section 11.

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[94] In some sectors only plants above a certain size are included. Furthermore, Articles 27 and 27a of the Directive were added because transaction costs for MRV were considered too high for small installations compared to larger emitters in the EU ETS. By introducing the option to opt out these small installations, the articles aimed to improve the cost-effectiveness of the system for these installations.

[95] Similar to the start of phase3 of the EU ETS when "early auctions" took place to allow regulated entities to purchase allowances at the time they sell their output (often on a forward basis for some sectors) to mitigate the risk of price fluctuations.

[96] A provision which would make it possible to adapt the supply if the price evolution does not correspond to changing market fundamentals.

5.2.5 *Using ETS revenues to address distributional aspects between Member States*

A strengthening and possible extension of the ETS will generate significant revenues (see Section 6.3.2 and Annex 13 for an overview), and the use of these revenues is an important element of the policy debate, notably as a tool to address distributional impacts between MS.

The discussion on use of ETS revenues is linked with the discussions on using ETS auction revenues as an EU own resource. According to the inter-institutional agreement of 16 December 2020 between the European Parliament, the Council and the Commission, the Commission will propose a new own resource based on the ETS for repayment of the borrowings for the NextGenerationEU Recovery and Resilience Facility, of which 37% are allocated to support the green transition.

In this impact assessment therefore no assumptions are taken on which amount of auctioning revenues will be available for which purpose. The assessment assumes that the allowances needed for the Innovation and Modernisation Funds and other solidarity provisions are not affected by the own resource needs. 53% of respondents to the OPC argued for an increase in the Modernisation Fund, with further 4% indicating that the size of the Modernisation Fund should remain unchanged in terms of the absolute amount. 36% of respondents replied that the Modernisation Fund should remain at a 2% cap. The table below describes the needs and current instruments provided by the ETS Directive for the period 2021-2030 to address distributional aspects, which have to be considered for the development of options on the use of revenues.

Table 4: Needs and instruments to address distributional aspects

Need	Instruments
With a strengthened ETS cap the adequacy of existing *solidarity and support provisions* need to be assessed Moreover, some MS are questioning the overall distribution of auction revenues in the existing ETS more	Solidarity redistribution provision consisting of the redistribution of 10% of the auctioned allowances to 16 low income MS (around 5% of the current overall cap or around 700 million allowances over the 2021-30 period) Modernisation Fund (2% of the overall cap or around 275 million allowances over the 2021-30 period)[97]

[97] In addition, Member States had the possibility to transfer own Article 10c and solidarity allowances to the Modernisation Fund, and five of the beneficiaries (CZ, HR, LT, RO and SK) took advantage of this option, leading to a total size of the Modernisation Fund of 643 million allowances amounting to more than EUR 25 billion (at EUR 40 carbon price). These transfers are not "additional" revenue for those Member States.

generally, and are requesting a bigger role of the support and solidarity mechanisms in addressing that.	The MSR intake until 2025 is only based on the 90% regular auctioning shares, exempting the 10% solidarity shares. Article 10c derogation applies to 10 low income MS[69] that can opt to give free allocation (of up to 40% of their regular auction volume) to investments in power generation for the modernisation of the energy sector (totaling about 630 million allowances over the 2021-30 period)
In the perspective of a possible transitionary ETS system for new sectors with specific distributional characteristics, the need for solidarity and support mechanisms should be assessed.	By definition, no solidarity and support mechanisms exist today. The potential new sectors have very different characteristics: • If the shipping sector were to be brought into the existing ETS, this would add the question if existing mechanisms are adequate for this sector. • For the buildings sector, the availability of finance for renovations is an issue, and more so the risk of energy poor and low income households. The possibility of ETS revenues contributing to addressing at least the latter needs to be borne in mind. • For the road transport sector, there could also be a need for specific solidarity mechanisms. While the lowest income groups might partly have no or small cars, they also use less fuel efficient second hand cars. Some households are capable of switching to zero emission vehicles, hence there may be a need for measures supporting the competitive supply of zero carbon vehicles and adequate charging infrastructure, also in rural areas. In addition, support measures could be envisaged that encourage a shift to public forms of transport.

Annex 13 further analyses mechanisms for the distribution of ETS revenues between MS in the existing ETS and illustrations for the use of revenues of a new ETS based on existing mechanisms to address distributional impacts between MS.

5.3 Discarded policy options in the context of this impact assessment

5.3.1 Discarded options to strengthen of the existing ETS (power and industry installations)

Strengthening options that go beyond the -62% (compared to 2005) cost-effective emission reduction are discarded since it would require an increased emission reduction burden to ETS sectors which is expected to result in unbalanced distribution of efforts between sectors.

This approach is also supported by the results of the OPC. In fact, only about 10% of respondents, mainly NGOs, environmental organisations and EU citizens, argued for a higher contribution of the current ETS sectors beyond what their potential for cost-effective emission reductions would indicate. About 40% of respondents from a wide range of stakeholder groups indicated that the current ETS sectors should increase their contribution in line with the new target and based on cost-efficiency considerations (another 40%, mainly from the private sector, replied "other", with many respondents agreeing with the cost-efficiency principle but arguing for a thorough impact assessment). About 10% of respondents, mainly from the private sector, argued for a lower contribution.

The strengthening options starting earlier than 2024 are discarded in view of the legislative process required for the revision. Similarly, an update later than 2026, though possible to achieve the -62% ETS ambition, would translate into a steeper LRF update and a less gradual transition. Additionally, the assessment of strengthening options starting in 2026 with rebasing has been limited to AMB3c because other options (AMB3a and AMB3b) are considered to fall under the analysis interval.

Also an increase of the current 57% auction share independently from possible adaptations to the initiative on a Carbon Border Adjustment Mechanism (see Section 6.1.2.2.5) is discarded. While some stakeholders, including the majority of EU citizens and academic/research institutes, argued for an increase in the auction share, many private sector respondents preferred the continuation of the current auction share of 57%. Initial assessment, presented in Annex 9, Section 25, for the example of an increase to 70%, demonstrates that such increase would have disproportionate effects on the risk of carbon leakage and more specifically the ability to avoid a cross-sectoral correction factor, which may be triggered between 2 and 5 years earlier and lead to a 20% to 31% lower free allocation budget compared to the baseline.

5.3.2 Discarded maritime options in the context of this impact assessment

Two maritime policy options have been discarded, namely the use of a "baseline and credit" system and the establishment of "GHG Emission Control Areas". The option of taxing bunker fuels sold at EU ports has not been considered as it is assessed in the impact assessment accompanying the revision of the Energy Taxation Directive.

5.3.2.1 Baseline and credit system

This measure would set an operational carbon intensity baseline for each ship type and size. Any improvements below the baseline would be certified as tradable credits. The baseline-and-credit system is similar to the ETS in a way that it allows for emission reductions to happen where it is the cheapest. However, given that this policy option relies on a metric based on carbon intensity and that it includes a buy-out option, it does not provide certainty in terms of absolute GHG emissions reduction. It provides a clear emission intensity reduction pathway.

This option would require significant effort for development and implementation due to its complexity. Some of the preparation steps would include calculation of the emission pathways for each ship type and size, establishment of a trading system as well as issuance and trade supervision of credits. This would result in increased cost and administrative burden, which would undermine its implementation feasibility, its cost-effectiveness and acceptability.

5.3.2.2 GHG Emission Control Areas

This measure would expand the scope of Emission Control Areas (ECAs) by including a carbon intensity requirement. The legal feasibility of such an option is weak as it would require a decision at IMO. However, emission restrictions can also be introduced by the EU in its territorial waters, which then may or may not be formalised by the IMO as part of the ECAs.

Current legislation only allows for specific control of NOx and SOx, and it would therefore require amendments to include carbon intensity standards. The environmental impact of such a measure would highly depend on the share of GHG emissions covered under the ECAs and it would require additional monitoring efforts to track the carbon intensity of ships in the selected areas. For all these reasons, this measure has been discarded in the context of this impact assessment.

5.3.3 Discarded options for the extension of emissions trading to buildings and transport or all fossil fuels

5.3.3.1 Expansion of emissions trading through the existing ETS

The Impact Assessment underpinning the 2030 CTP included an analysis of the option to expand emissions trading through inclusion in the existing ETS. The 2030 CTP is clear that the development of a new carbon market can benefit from transitional arrangements or a pilot period before being gradually integrated into the existing ETS. The extension to buildings and transport or all fossil fuels requires an upstream approach to regulated entities and the set-up of a new system for monitoring, reporting and verification. Therefore, the extension of emissions trading to the new sectors needs to start with a separate EU emissions trading system with, depending on the assessment of the linking options ELINK1 to ELINK2, the possibility to merge this new ETS with the existing one at some point in time.

This approach is founded on the potential impacts on the sectors already covered by the existing ETS and differences in abatement costs among sectors, in investment cycles, implementation and administrative challenges, as well as in the cost-effective sectoral potentials for decarbonisation and the related reduction path for greenhouse gas emissions.

As described in Section 5.2.3.1, the approach to start with a separate emissions trading system for the new sectors is also supported by the majority of stakeholders responding to the OPC.

5.3.3.2 Downstream approach

A downstream design of the ETS extension as in the existing ETS would obligate directly the many million individual house and car owners and small companies[98]. It would present advantages of citizen empowerment and a direct demand side price signal. However it would increase very significantly the number of regulated entities in comparison to the existing ETS. This increase is not administratively practicable and is not an efficient option due to the high transaction costs that would derive from the large number entities and private persons that would be regulated, both for the regulator and for the participants. For further details see Annex 5 Section 12.

5.3.3.3 The creation of separate systems for road transport and for buildings

This option would assume that two new ETS would be created, one for road transport and one for the buildings sector, in addition to the existing ETS. Despite the fact that some design elements could be shared under both new systems, from an economic perspective this option has been discarded from the beginning due to the reduction of the cost-effectiveness potential in creating two new different and non-integrated markets. Other problems related to the functioning of the market, such as active participation, the market power of some entities, or related to social impacts can be more pronounced in a smaller market[99].

5.3.3.4 A high upstream approach for one ETS covering all fossil fuels

This option would assume that the existing ETS is replaced with a new EU wide-all-fossil-fuels upstream emissions trading system. This would mean a complete overhaul of

[98] 195 million households in EU-27 (2019, source: Eurostat), 237 million passenger cars in EU 27 (2018, source: Eurostat), 29 million Light duty vehicles and 6 million trucks (2018, source ACEA)
[99] ICF et al. (2020).

the ETS, which has proven to work well. Therefore a very high upstream regulation for all sectors, including those included in the existing ETS, has been discarded from the beginning in the 2030 CTP Impact Assessment.

6 WHAT ARE THE IMPACTS OF THE POLICY OPTIONS?

6.1 Strengthening of the existing ETS (power and industry installations)

This section assesses the impacts of an increased ambition of the current EU ETS (power and industry installations) in line with the -55% target and goes on to assess the impacts on the related aspects: the Market Stability Reserve, the auction share, the Innovation Fund, and the provisions to address the risk of carbon leakage. For some of the latter analyses, the increased ambition is taken as starting point.

6.1.1 Environmental impacts

6.1.1.1 Strengthening of the EU ETS target/cap

The environmental performance of the ETS in terms of reduced emissions is primarily determined by its cap on the total number of allowances. This determines the limit on emissions allowed, corresponding to allowances, to ensure the emission reduction foreseen is achieved.

As described in Section 5.2.1.1 the cap strengthening options are set proportional to the MIX scenario's cost-effective emission reduction opportunities of ETS sectors (where power sector reduces more and industry less) of -62% in 2030 (compared to 2005). This is in line with the overall -55% target (compared to 1990), and determines the cap figure in 2030 (same 2030 cap in all options). Compared to REF, this implies an additional reduction of 11% over the period 2021 to 2030 (-17% for 2026-30), while emissions between 2013 and 2019 decreased by 16%. The impacts for individual MS are analysed in Annex 13. Comprehensive MS scenario data is presented in a separately published technical note[100].

Cap options that include rebasing of the cap generally lead to a lower total amount of allowances than the options based only on a change of the LRF.

[100] See the "Technical Note on the Results of the "Fit for 55" core scenarios for the EU Member States"

Regarding the strengthening options, each option reflects a different trajectory to reach the 2030 outcome. The environmental impact is assessed by:

1. Cumulative cap - is an indicator of the overall environmental impact and the smoothness of the cap trajectory over the period 2021-30. It allows comparing the environment impact balance over time of the options with different years for LRF change, with or without rebasing and different LRF levels
2. Average relative deviation between the cap and the projected emissions under the MIX scenario (before MSR application) compared to the baseline cap/emission difference – this is an indicator for the alignment of the ETS cap with the projected emissions[101]. The lower the relative deviation the higher the cap/emission alignment (see ection 6.1.1.2 for further details on market surplus)

Table 5: Overview of existing ETS cap options with cumulative budget and average delta to emissions

		Baseline	**AMB1**	**AMB2a**	**AMB2b**	**AMB2c**	**AMB3c**
LRF	2021-23	2,20%	2,20%	2,20%	2,20%	2,20%	2,20%
	2024-25	2,20%	2,20%	5,09%	3,90%	4,22%	2,20%
	2026-30	2,20%	6,24%	5,09%	3,90%	4,22%	4,57%
Rebase	Y/N		no	no	yes	yes	yes
	How big		no	no	163	119	163
1) Total cap (2021-30) - EU27+EEA							
		13781	12596	12201	11712	11845	12270
(2) Average relative deviation difference between the cap and projected emissions per year compared to the baseline difference							
			-30%	-40%	-53%	-50%	-39%

Option AMB1, though the LRF increase is highest, has the highest cumulative cap, i.e. lower overall environmental impact, because the LRF update is applied only in 2026 without rebasing. This is also reflected in a higher value of indicator (2) on the cap to emissions relative deviation.

For options AMB2a and AMB3c the cumulative cap indicator results in a similar 2021-30 total cap, and similar relative deviation of cap to projected emissions.

[101] Projected emissions based on PRIMES-GAINS

Option AMB2b and AMB2c have a similar 2021-30 total cap, and similar delta of cap to projected emissions, i.e. a bigger alignment to projected emissions.

In addition to GHG emissions, many installations covered by the ETS, which remain within the scope of the Industrial Emissions Directive, also emit a significant amount of other air pollutants (e.g. NO_X, SO_X and dust). In general, it is expected that the decarbonisation of industry and power generation will also lead to further emission reductions of those air pollutants,[102] with the corresponding positive effect on air quality, and consequently on health and well-being.

For example, GAINS modelling indicates that 2030 sulfur dioxide (SO_2) emissions compared to 2015 decrease by 57% in REF and 69% in MIX[103]. The modelling also projects in 2030 13% less use of biomass as fuel in MIX compared to REF, and 2% less than in 2020, mitigating conflicts with objectives for sustainable land/forest use and biodiversity. It is thus expected that the strengthened ETS target/cap will overall contribute to the zero pollution ambition of the EU Green Deal. In this respect, the ETS and the Industrial Emissions Directive will reinforce one another to reduce emission of GHGs and other air pollutants.

6.1.1.2 Market Stability Reserve

The environmental effects of the MSR are determined by how it functions in terms of eliminating the historical surplus, and thus making the ETS more resilient in relation to supply-demand imbalances.

In addition to the direct impacts on emission reductions, a more stable and stronger carbon price signal should also allow the ETS to better support the achievement of the EU wide 2030 targets for renewable energy and energy efficiency.

The analysis has shown that, for a given cap pathway, the choice of the MSR option does not influence emissions in a significant manner, since in the model, companies optimise their behaviour in the long term, looking at the cap level in 2030, which is the same for all options (see Figure 4: in Section 6.1.2.1.2 below). Emissions under MSR2 are slightly

[102] Wood, Wider environmental impacts of industry decarbonisation, 2021; Vandyck et al., Air quality co-benefits for human health and agriculture counterbalance costs to meet Paris Agreement pledges, Nature Communications 2018, vol. 9, p. 493 ff.

[103] For Member State results see the "Technical Note on the Results of the "Fit for 55" core scenarios for the EU Member States".

lower relative to MSR0+ and MSR1. Under the MSR0+ and MSR1, 2030 emissions reach 1,013 $MtCO2_e$ and 1,003 $MtCO2_e$ respectively. This compares to 2030 emissions of 968 $MtCO2_e$ under MSR2. However, it should be noted that these emissions projections are not directly comparable to those from energy system models which optimise for the entire energy system. The key insight from these numerical projections is that MSR intakes play a minor but positive role in reducing emissions further under the EU ETS.

6.1.1.3 Framework to address the risk of carbon leakage

The environmental outcome of the ETS in terms of GHG emissions in the EU is determined by its overall cap and is in principle independent of the level of free allocation. The risk of carbon leakage occurs when a reduction in domestic production is replaced by more emissions intensive production in other jurisdictions. This is important to consider since it may appear that the carbon price has reduced emissions. However, if production has simply moved to a jurisdiction with less stringent environmental regulation, emissions could fall in the European Economic Area but increase overall.

An effective carbon leakage protection mitigates the risk that more ambitious EU emission reductions are offset by emission increases outside the EU. A strengthened cap in the ETS Directive could affect the protection against the risk of carbon leakage by triggering the cross-sectoral correction factor (CSCF). The impact of the tiered approach (option CL1) and the strengthened benchmarks (option CL2) on the triggering of the CSCF is assessed in Section 6.1.2.2.4. .

Options CL1 and CL2 provide also some incentives to reduce emissions in the EU by exposing some sectors to higher carbon costs.

6.1.1.4 Innovation Fund

The IF was set decided with a clear objective of funding the commercial demonstration of innovative low-carbon technologies, aiming to bring to the market industrial solutions to decarbonise Europe and support its transition to climate neutrality.

The 311 projects submitted under the Innovation Fund's first call for proposals promise to reduce around 1.2 Gt of CO_2 emissions in their lifetime. Option IF1 and even more so IF2 would enable more of the projects which cannot be funded by the current size of the Innovation Fund to receive support and can help materialise a higher share of the GHG emissions that the applicant projects can realise[104].

Further analysis of the applications[105] shows the main technological pathways employed in the eligible sectors are in line with the long-term decarbonisation strategies of the sectors and can contribute significantly to EU transition to climate neutrality. The Innovation Fund is able to support a very wide variety of clean tech solutions, reducing emissions in multiple sectors in a synergistic and cross-cutting manner. More analysis is available in Annex 11.

6.1.2 Economic impacts

The transition to a climate-neutral economy will be transformative. This initiative expects to have a direct impact by steering investment and growth in the ETS sectors towards sustainable products and processes. The Impact Assessment accompanying the 2030 CTP found that by 2030 the investment stimulus and the use of carbon pricing revenue for the reduction of distortionary taxes or green investment can stimulate GDP growth by up to 0.5%, but highlighted the asymmetric challenges and opportunities associated with structural change. For high-emitting activities, the cost of emitting and cost of transformation may be higher[106].

The economic impacts of the cap options cannot be dissociated from the MSR options because it is the combination of both that will determine the market balance and resulting price signal. In the same way, the competitiveness assessment of sectoral impacts on energy intensive sectors are primarily driven by the carbon leakage protection options. Therefore, in this section the economic impacts are divided in two assessments: market balance and competitiveness.

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[104] Deployment of innovative technologies for decarbonisation will generally also have a positive direct impact on air emissions, particularly of NOx and SOx. Reduction of atmospheric pollutant emissions limits their deposition in water bodies and soils and in this way reduces risks associated with the contamination of water and soil deriving from conventional technologies. See Wood (2021).

[105] https://ec.europa.eu/clima/sites/clima/files/innovation-fund/large-scale_call_statistics_en.pdf

[106] SWD(2020)176, Section 6.4.2

6.1.2.1 Market balance

In this section we assess the impacts of different MSR options combined with different cap options on the total number of allowances in circulation, the carbon price, price stability and revenues. We explore the performance of alternative MSR options under the central cap option AMB2a (LRF that will take effect in 2024). This cap option was selected because it is central in terms of cumulative cap outcome, but also because the final outcomes with different cap options are quite similar in terms of outcomes in 2030, emissions and modelled price trends. The outcomes were also tested against a range of shocks (see Annex 8, Section 22), for other cap options (AMB1, AMB2b) and for several policy sensitivities, including more extreme cap scenarios (see Annex 8, Section 23).

Details on the modelling approach and assumptions used, as well as guidance on interpreting the modelling results are provided in Annex 4, Section 9.1. It is important to note that the modelling outputs are not intended to be used as forecasts for prices and emissions. However, when combined with qualitative and quantitative insights, they can provide useful indications of the direction and size of impact.

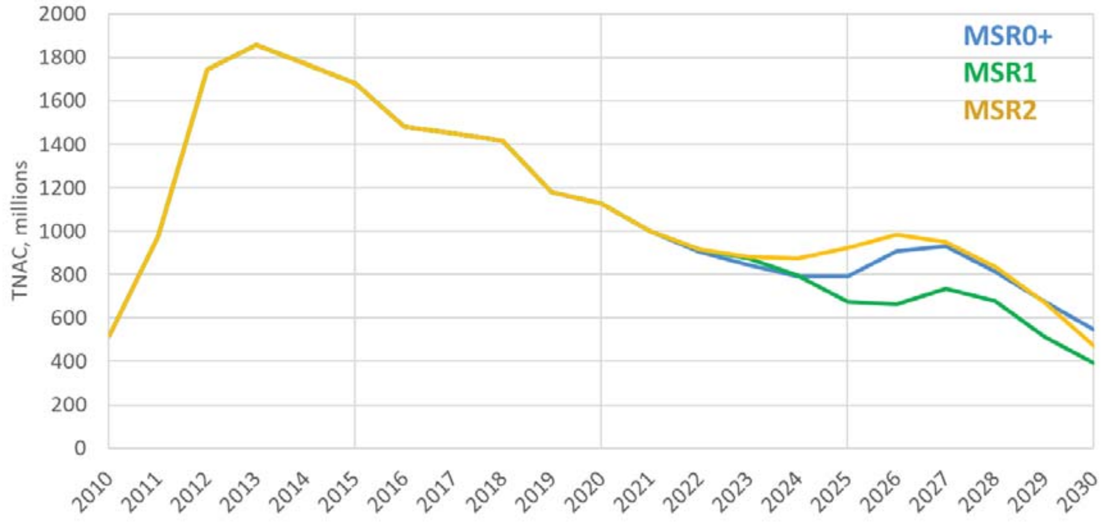
Consistent with recent price developments, modelled behaviour suggests that the expectation of substantially enhanced ambition in the EU ETS increases short term price expectations. These increased prices, alongside the economic shock accompanying COVID-19, contribute to substantial hedging over Phase 4 of the EU ETS.

6.1.2.1.1 *Market surplus (TNAC) and MSR dynamics*

With the central cap scenario, the TNAC diverges across MSR designs in the middle of this decade, before trending towards a level of 450 million in 2030. However, the TNAC trend is uncertain in the near term as the speed of economic recovery and industrial activity following the COVID-19 impact remains unclear. In the modelling analysis, TNAC lies above 800 million before 2025 across all MSR options, resulting in continuous MSR intakes during this period. The evolution of TNAC over time is jointly determined by annual supply of allowances and the emissions pathway. A more stringent MSR removes a larger supply of allowances through intakes (downward effect on TNAC), with a secondary effect of lowering annual emissions by encouraging expectations of future scarcity in the market (upward effect on TNAC). On balance, the first effect dominates the second. The pathway for TNAC under respective MSR options is shown below.

A comparison of the MSR options must also take into account the levels of the thresholds retained, in particular of the upper threshold, and the evolution of the TNAC in relation to that upper threshold. For instance, for similar TNAC outcomes, an option with an upper threshold of 833 million could be more effective than an option with a lower threshold, in particular taking into account the uncertainties in terms of future liquidity needs of the market (including hedging needs, as set out in Annex 8, Section 24)

Figure 3: TNAC under different MSR options with central cap scenario AMB2a



Source: Vivid Economics

Over the period of 2021-30, cumulative MSR intakes under MSR1 and MSR2 are 1.5 and 1.6 billion respectively, compared to 1.2 billion under MSR0+. The volume of intakes under MSR1 is greater than MSR0+ because of the higher intake rate. By contrast, MSR2 results in larger MSR intakes, as the TNAC is higher.

MSR0+ is not able to reduce the TNAC sufficiently, due to its lower intake rate. The TNAC remains above the upper threshold until the end of the period.

The ability of MSR1 to reduce TNAC relatively quickly comes at the expense of a threshold effect, when TNAC dips below the intake threshold. The threshold effect occurs when the volume of MSR intakes drops suddenly, which is the result of calculating intakes as a fixed percentage of the TNAC and of having a fixed upper threshold. The threshold effect is visible as a jump in auction volumes and a kink in the TNAC pathway. In the given scenario for MSR1, this occurs in 2027/28. The presence of such a threshold effect can introduce uncertainty to market participants, who face ambiguity about the short-term auction supply as TNAC approaches the upper threshold. The realisation of TNAC being right above or below the threshold can represent a sizeable shock to annual auction volumes, resulting in sharp changes in prices.

By contrast, MSR2 is able to avoid the threshold effect. This is because intakes under option 2 are calculated as a percentage of the difference between TNAC and the intake threshold, resulting in smaller intakes as TNAC approaches the intake threshold.

MSR3 should result in a similar market surplus to MSR2. MSR3 follows the design of MSR2, with the only difference being the introduction of an auction reserve price. In all cases explored in the modelling analysis, the price under MSR2 does not fall below the auction reserve price.

Invalidation

Across all options, the vast majority of allowances that are placed into the MSR eventually get invalidated:

- MSR0+, as currently legislated, invalidates allowances within the MSR in excess of the prior year auction volume.
- MSR1 follows this invalidation mechanism, resulting in a similar downward trend in the stock of allowances held in the MSR.
- MSR2 and MSR3 however, invalidate allowances in excess of the lower threshold, and do not completely remove the MSR stock. As a result, the residual MSR stock under MSR2 and MSR3 remains at around 400 million allowances, which are available for injections in the case of supply shortages. Across all MSR options, modelling shows releases would only take place in the 2030s with a cumulative size of 400 to 500 million allowances. This is relatively small when compared to the cumulative MSR invalidations that range from 3 billion under MSR0+ to 3.5 billion under MSR2.

The precise design of the invalidation mechanism is not consequential to market outcomes in 2021-30, given that almost all allowances placed in the MSR are invalidated. Given the constrained foresight of market actors assumed in the analysis, as long as there are no significant volumes of release from the MSR in the 2020s or 2030s, the market's forecast of the future supply of allowances is independent of the timing in which allowances get invalidated within the MSR. What matters to market participants is the supply of allowances in the medium term, which is more influenced by MSR intakes rather than releases. The presence of the invalidation mechanism remains important as a guarantee that allowances stored in the MSR will not be released back into future auctions in large volumes.

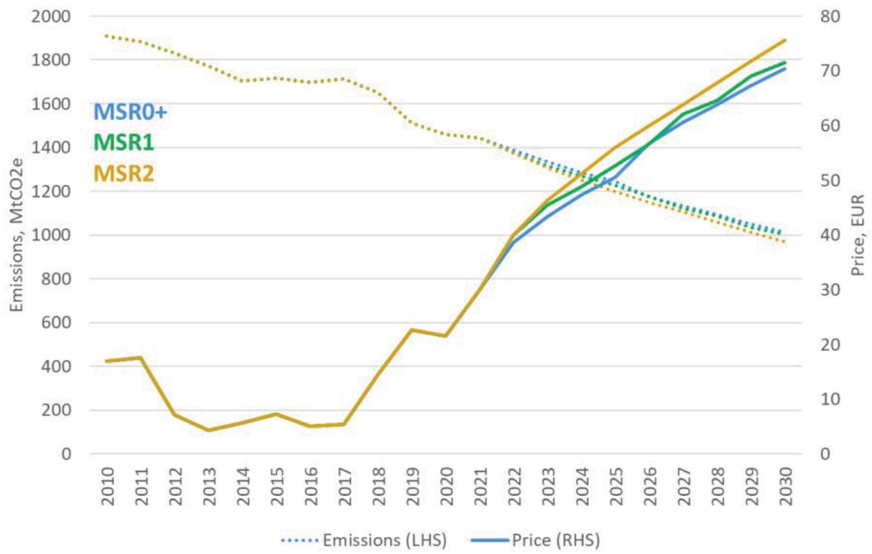
6.1.2.1.2 *Stylised impact on carbon prices from different options*

This section assesses how different MSR options combined with cap scenarios, can impact the carbon prices. As indicated, the modelling outputs are not intended to be used as forecasts for prices and emissions. In particular the modelling focuses on carbon prices as adjustment variable and does not well cover the overall policy mix. Moreover, the expectations of firms on the future supply of allowances (even past the 2030 horizon) plays a big role in the model, in terms of emissions, hedging and carbon prices (see also

Annex 4 Section 9.1). However, when combined with qualitative and quantitative insights, the model can provide useful indications of the direction and size of impact.

Other models discussed in this Impact Assessment (see Sections 5.1 and 8) have provided different carbon price values. The MIX and MIX-CP -55% policy scenarios of the PRIMES energy system model, which both assume a parallel strengthening of renewable energy and energy efficiency policies, albeit less strong in MIX-CP, as well as foresight of market actors on future emission reduction requirements, project for the existing ETS an increase of carbon prices in 2030 from €30 in REF to €48 and €52.5 (in constant 2015 prices), and see stronger increases only after 2030. The characteristics of the Vivid ETS MSR model used here are set out in Annex 4, Section 9.1. A key difference is the way other policies are modelled. The results of both models for 2030 fall within the very broad range of 2030 carbon price projections of carbon market analysts for 2030[107].

Figure 4: Stylised representation of emissions and carbon prices across different MSR scenarios for the central cap option AMB2a.



Note: Prices are presented in constant 2015 prices.

Source: Vivid Economics

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[107] Carbon Pulse Daily of 8 April 2021: POLL: Big boost for EU carbon price forecasts as several analysts see EUAs topping €100 this decade; ICIS: European carbon market to shift gear, February 2021.

With the central scenario AMB2a, modelled prices are the highest under MSR2, because MSR2 leads to the highest intakes into the MSR, which then affects the scarcity expectations of market participants. Prices are lowest under MSR0+, i.e. ca 7 % lower than in MSR2 scenario. MSR1 sees higher prices than MSR0+ in the first half of this decade driven by larger intakes and therefore tighter supply. However, as intakes under MSR1 come to an end earlier than under MSR0+, their price paths converge towards 2030.

Modelling outcomes under MSR3 are the same as MSR2, though the inclusion of short-term responses should mitigate short run price volatility. The inclusion of an auction reserve price under MSR3 simply introduces a lower bound to the range of prices in the market. In the assumed policy environment, this lower bound is not breached throughout the time horizon in the absence of large shocks (see sensitivity analysis in Annex 8, Section 22).

Modelling indicates that the increase in EU ETS ambition through changes to the cap is a much more significant driver of the price trajectory than the MSR.

The variation in prices under different cap scenarios is small, as less stringent cap scenarios face higher intakes to the MSR during 2021-2030. For instance, with MSR0+, differences in adjusted supply across cap variations become even smaller, leading to less price variation. Caps which are initially less stringent, such as AMB1, have a higher surplus of allowances in earlier periods due to greater annual supply. This increases the TNAC during 2021-2030, which subsequently increases intakes into the MSR, reducing auctioned allowances and the effective cap. This leads to similar price outcomes across the different caps.

6.1.2.1.3 *Price volatility*

The smooth price paths depicted in the graph above is a result of modelling assumptions and the annual reporting period in the model. In practice, shocks will introduce short term volatility within time spans of weeks or months. These short-term shocks are not captured through the quantitative model deployed for this Impact Assessment. This section examines how the MSR can influence price stability in the short term, while Annex 7, Section 22 discusses the MSR in response to longer term, structural shocks.

In the context of MSR design, clear and predictable intakes will help reduce supply side uncertainty.

As noted in the previous section, both the MSR0+ and MSR1 are prone to a threshold effect[108], depending on the level of TNAC. This represents a major source of uncertainty to market participants as TNAC approaches the upper threshold, a very plausible case for the decade 2021-30. Prices may become volatile as market expectations regarding the level of TNAC swings back and forth depending on forecasted emissions, as the precise number of TNAC will be influential to allowance supply.

Predictability is one of the main advantages for the intake design proposed for MSR2. Intakes under MSR2 are proportional to the difference between TNAC and the upper threshold, resulting in a smooth response function. This will prevent the price volatility associated with the threshold effect as in the case of the baseline and option 1. At the same time, option MSR2 may be more complex and more difficult to understand by market participants, thereby contributing negatively to price volatility.

In order for MSR1 and MSR2 to contribute to price stability, they should not reduce the surplus to an unreasonable extent and thus provide sufficient market liquidity. For the market to operate effectively, the TNAC needs to be high enough to allow for hedging as well as efficient banking to spread out intertemporal abatement costs. Therefore, the MSR thresholds play an important role in ensuring that the TNAC stays at a reasonable range. The analysis showed that the intake threshold analysed in MSR1 and MSR2, starting at 700 million in 2024, sits within the range of the estimated amount of market surplus required for hedging between 2025 and 2030. At the same time, the MSR0+ threshold of 833 million could also be appropriate in the first part of the decade, providing additional liquidity and reassurance to the market, by avoiding short-term situations in which the liquidity would be too tight.

MSR3 may provide additional stability by constraining market expectations regarding potential extreme price outcomes. The introduction of an auction reserve price would create a floor on market price expectations, which would reduce uncertainty in the event of downside shocks, such as a negative demand shock. At the same time, this option could introduce speculation opportunities and volatility in the case the carbon price is close to the price floor.

6.1.2.1.4 *Auction revenues*

Auction revenues for the existing ETS were conservatively estimated using reference carbon prices in line with Section 5.2.1, and the auction volumes after the application of

[108] If TNAC is just above the intake threshold, the MSR will remove over 100 million allowances from subsequent auctions, compared to zero intakes if TNAC is just below the intake threshold

the MSR that resulted from the Vivid EU ETS model (see Annex 13). Under MSR1 and MSR2, the cumulative auction revenues at the end of 2030 are lower than the baseline due to larger reductions in auction volume.

The size of auction revenues is jointly determined by the volume of auctions and the EUA price. Due to larger intakes under MSR1 and MSR2 as compared to MSR0+, cumulative auction volumes are 3% lower with MSR1, and 6% lower with MSR2, relative to MSR0+ between 2021 and 2030. As a result, compared against the baseline, auction revenues are 4% lower in MSR1 and 6% lower in MSR2.

6.1.2.2 Competitiveness

6.1.2.2.1 *Strengthening of the EU ETS target/cap*

Even though all cap options achieve the 2030 target, they each have an impact on the overall amount of allowances and therefore different impacts the risk of carbon leakage. The risk of carbon leakage in turn affects competitiveness of EU firms, with potential impacts on growth and jobs. If international competitors do not need to comply with equally stringent carbon regulation, the carbon price creates a differential in production costs. As a result, domestic firms are competing in markets (through imports or exports) where foreign producers may not face an equivalent carbon price. This potential loss of competitiveness can cause firms to reduce their production or investments into productive capacity, with implications for local growth and employment. The evidence on the existence of carbon leakage in scientific literature is summarised in the CBAM IA.

This section investigates the impact of options on the framework to address the risk of carbon leakage, on the compliance costs at sector level and the possibilities to pass on these compliance costs to consumers. This analysis is supplemented by a qualitative assessment on incentives for innovation which will determine carbon costs in the long-term.

The analysis carried out in the context of the 2030 Climate Target Plan included detailed modelling of economic impacts, including sectoral impacts, which indicated that without increased global action, increasing climate ambition in the EU typically results in a negative impact for the energy-intensive sectors. Impacts are significantly limited with free allocation. Sectoral production can be positively impacted if the climate policy and any associated carbon revenues are seen as boosting investment and economic development[109]. None of the modelling assumed any additional measures to protect against the risk of carbon leakage.

Compliance costs depend on the carbon price, the level of free allocation, and the amount of emissions released during production. The carbon price is not directly impacted by the modalities for the distribution of free allocation, as the total amount of allowances available (the cap) has been fixed in advance (see Section 5.2.3.1 on the strengthening of ETS target) and is not affected by the modalities of allocation (auctioning or free allocation).

The compliance costs borne by sectors are ultimately dependent on their ability to pass through carbon costs to their customers. The ETS Directive already recognises this fact emphasising that the level of carbon leakage risk faced by sectors depends on the extent to which it is possible for these sectors to pass through their costs without losing market share. A general understanding is that carbon-intensive sectors are able to pass through at least a part of the carbon costs, but it remains to date difficult to quantify the exact rate of costs passed through per sectors or products.

At the same time, it is reasonable to assume that climate policies will become more stringent in other countries over time, which could lead to increased, or at least stable, cost pass-through rates for some products. As the number of allowances will decrease over the next decade, it is likely that industries will face increased compliance costs after 2020 but this will ultimately depend on the ability to increase carbon efficiency in production, and the ability to pass on carbon costs, e.g. through more specialised products. Considering that a share of carbon costs is likely to be passed through, it can effectively limit carbon cost increases for industrial sectors. In some cases, additional carbon costs may be more than fully offset by increases in product prices.

For the free allocation element, the more stringent the cap update, i.e. lower total cap for the period 2021-30, the lower the total volume available for free allocation. Table 6 provides the overview of the cap update options with the resulting free allocation budget, where the reference allowance distribution is the current legislative framework with 57% auction share, 3% free allocation buffer and existing fund size framework. The calculation of the year when the CSCF is triggered and of its average value in the period from 2026 to 2030 is described in Annex 4.

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[109] SWD (2020), Section 6.4.2, Table 16 and Annex 9.5.3, Table 49

Table 6: Impacts of the cap trajectory options on free allocation

	Baseline	AMB1	AMB2a	AMB2b	AMB2c	AMB3c
Total cap (2021-30) - EU-27+EEA	13 781	12 596	12 201	11 712	11 845	12 270
Free Allocation (excluding amount earmarked for Innovation Fund)	5601	5091	4921	4711	4768	4951
Free allocation buffer (3%)	413	378	366	351	355	368
Delta to baseline for total free allocation	-	-9%	-12%	-16%	-15%	-11%
Year when CSCF is triggered	-	2030	2029	2028	2028	2029
Average CSCF for the period 2026-30	100%	94%	88%	79%	82%	89%

Option AMB1 (new LRF from 2026, no rebasing) would trigger the application of the cross-sectoral correction factor (CSCF) in 2030 while Option AMB2c (new LRF from 2024, rebasing by 117 million allowances in 2024) will likely do so from 2028 onwards. For the period 2026 to 2030, the average CSCF would be 94% for AMB1 (that means that free allocation amounts would be reduced by 6%) and 82% for AMB2c. The use of the CSCF will reduce the amount of free allocation across all industry sectors, independent of the degree to which they are actually at risk of carbon leakage.

In order to assess the economic impacts of the strengthened emission cap, the estimated free allocation was subsequently compared with the projected emissions for 10 ETS sectors which together receive more than 85% of the total free allocation (i.e. cement, lime, refineries, iron and steel, fertilisers, ceramics, non-ferrous metals, chemicals, pulp and paper, glass). For each of the sectors, a yearly improvement in the greenhouse gas efficiencies ranging from 1% to 2% was assumed. The potential carbon costs were then calculated by multiplying the assumed EU allowance price with the difference between projected emissions and free allocation (see Annex 4). Table 7 shows selected economic impacts of the options for strengthening the EU ETS Target on these 10 ETS sectors. The table only shows carbon costs and does not include investment and operating costs needed to abate emissions.

Potential carbon costs range from EUR 38 to 52 billion, depending on the cap trajectory, as compared to costs of EUR 18 billion in the baseline scenario. This translates into carbon costs in the range of 1.8% to 2.5% per value added for the different cap trajectories, while the carbon costs in the baseline scenario would amount to around 0.9% per value added. The cost increase from the baseline scenario to AMB1 is in the order of

EUR 20 billion and is mostly due to the projected carbon price increase. The cap scenario AMB2b with the highest cumulated cap reduction would increase carbon costs to EUR 34 billion due to increased carbon prices and reduced free allocation. Under the described assumptions, the increase in the EUA price will likely have a bigger influence on the carbon costs than the reduced free allocation.

Table 7: Economic impacts of different cap trajectory options for 10 ETS sectors

Impact	Unit	Cap trajectory option					
		Baseline	**AMB 1**	**AMB 2a**	**AMB 2b**	**AMB 2c**	**AMB 3c**
Cumulated free allocation for the period 2021-30	million EUAs	4892	4757	4598	4401	4455	4626
Cumulated projected emissions for the period 2021-30	million t CO_2 equivalents	5706	5706	5706	5706	5706	5706
Difference between emissions and free allocation	million EUAs	813	948	1108	1305	1251	1080
	% of emissions	14%	17%	19%	23%	22%	19%
Net direct carbon costs	EUR billion NPV 2021-2030 (2015 prices)	18	38	45	53	50	43
	% of value added	0.88%	1.8%	2.1%	2.5%	2.4%	2.1%
	% of production value	0.17%	0.34%	0.40%	0.47%	0.45%	0.39%
	% of EBITDA	1.8%	3.7%	4.3%	5.0%	4.8%	4.2%
NB: The figures only refer to 10 ETS sectors: cement, lime, refineries, iron and steel, fertilisers, ceramics, non-ferrous metals, chemicals, pulp and paper, glass.							

6.1.2.2.2 *Market Stability Reserve*

As regards in particular the MSR, there are two expected channels by which the cap setting and the MSR option chosen, and thereby the total number of allowances in circulation, may affect competitiveness:

• Volatility: by reducing price volatility, which reduces uncertainty for the longer term;

• Carbon prices: by contributing to increasing prices, which increases production cost for emitters.

Direct estimates of the MSR's impact on competitiveness and growth through reducing volatility are currently limited. Venmans (2016) found that allowance price volatility was seen as an incentive for abatement investment by some but a disincentive by others.[110] This means that it is difficult to predict the effect that the MSR will have on competitiveness through the volatility channel without more study on behavioural responses of firms.

Given their largely comparable and limited impact on price levels (see Section 6.1.2.1.2 above), the different MSR options will have minimal differences in terms of carbon leakage and competitiveness. Given the lack of adverse impacts on competitiveness and leakage so far from the EU ETS price in general, the small levels of price rise driven by the various MSR options are unlikely to bring significant negative competitiveness impacts. With regards to the price level, the stringency of cap is much more consequential than the MSR design.

The design of MSR2 and MSR3 may able to improve the predictability of the occurrence of intakes as compared to the baseline and MSR1, representing a minor advantage for competitiveness. As intakes are more predictable and continuous throughout the time horizon, MSR2 and MSR3 can reduce uncertainty on the supply side (see Section 6.1.2.1.1). The exact impact on competitiveness has not been quantified in the literature. However, the magnitude of such an impact is likely much smaller than that of the expected increase in prices and the phasing out of free allocations that may accompany the introduction of a CBAM.

6.1.2.2.3 *Framework to address the risk of carbon leakage*

As shown in Section 6.1.2.2.1, the options for the cap trajectory and the auction share likely mean that the cross-sectoral correction factor (CSCF) will be applied, whereby free allocation is adjusted downwards in a uniform manner across all sectors. To reduce the likelihood or the extent to which the CSCF would need to be applied, the tiered approach (CL1) aims at better targeting free allocation to ensure that the sectors at highest risk of carbon leakage continue to receive free allocation at 100% of the benchmark level. Table 8 shows that the tiered approach avoids the application of the CSCF for most of the cap trajectories (compare with Table 6).

[110] Venmans, F. (2016) - "The effect of allocation above emissions and price uncertainty on abatement investments under the EU ETS", Journal of Cleaner Production

Table 8: Impacts of a tiered approach from 2026 onwards on free allocation for different cap trajectory options

	Baseline (CL0)	AMB1 and CL1	AMB2a and CL1	AMB2b and CL1	AMB2c and CL1	AMB3c and CL1
Year when CSCF is triggered	-	-	-	2029	2030	-
Average CSCF for the period 2026-30	100%	100%	100%	92%	94%	100%

Strengthening the benchmark values by increasing the maximum update rate (CL2) also aims at better targeting free allocation. Table 9 shows that this approach does not avoid the application of the CSCF for most cap trajectories, but that the average CSCF applied is around 7% higher compared to the cap trajectories without strengthened benchmark values (compare with Table 6).

Table 9: Impacts of strengthened benchmarks from 2026 onwards on free allocation for different cap trajectory options

	Baseline (CL0)	AMB1 and CL2	AMB2a and CL2	AMB2b and CL2	AMB2c and CL2	AMB3c and CL2
Year when CSCF is triggered	-	-	2030	2029	2029	2030
Average CSCF for the period 2026-30	100%	100%	95%	86%	88%	96%

Table 10 below provides figures for the projected cumulated emissions and free allocation over the period 2021 to 2030 for the most important industry sectors. The cumulated free allocation was estimated for the two cap trajectory options AMB1 and AMB2b, in combination with the tiered approach (option CL1) or the strengthened benchmarks (option CL2).

As can be seen from the average CSCF, both the tiered approach and the strengthened benchmarks reduce the extent to which the CSCF would need to be applied. In the case of the cap trajectory AMB1, the application of the CSCF could be avoided.

Table 10: Projected cumulated emissions and free allocation over the period 2021 to 2030 per industry sector for cap trajectory options AMB1 and AMB2b in combination with a tiered approach (option CL1) or strengthened benchmarks (option CL2)

	Option						
	All options	**AMB1 and CL0**	**AMB1 and CL1**	**AMB1 and CL2**	**AMB2b and CL0**	**AMB2b and CL1**	**AMB2b and CL2**
Average CSCF for the period 2026–2030	**NA**	**94%**	**100%**	**100%**	**79%**	**92%**	**86%**
Sector	**Projected cumulated emissions in million t**	**Cumulated free allocation in million EUAs from 2021 to 2030**					
Cement	1079	903	929	929	834	891	864
Lime	238	158	131	145	146	127	137
Refineries	1014	764	786	784	708	754	731
Iron and Steel	1609	1440	1481	1457	1332	1420	1358
Fertilizers	286	263	271	261	243	260	244
Ceramics	61	44	36	40	41	35	38
Non-ferrous metals	163	139	114	137	128	111	128
Chemicals	891	703	583	683	651	565	639
Pulp and Paper	209	233	194	209	216	189	197
Glass	156	109	91	110	101	88	103
Other sectors	ND	712	641	661	661	622	624
Total	ND	5469	5259	5417	5062	5062	5062
NB: ND = not determined.							

In terms of total free allocation, two cases can be distinguished. In the case of the cap trajectory AMB1, the total free allocation is reduced both by the tiered approach and the strengthened benchmarks. This is, first, because the total amount available for free allocation determined by the minimum auction share is not exceeded and, second, because the tiered approach reduces free allocation for sectors that are not deemed to be at highest risk (e.g. chemicals, pulp and paper, other sectors) or because the strengthened benchmarks reduce free allocation for sectors where high benchmark update rates were applied for the period of 2021 to 2025 (e.g. pulp and paper, other sectors). However, in the case of cap trajectory AMB2b, the tiered approach and the strengthened benchmarks do not affect the total free allocation, as the total amount available for free allocation is determined by the minimum auction share. Therefore, the overall carbon costs remain unchanged by the application of the CL options, while sectoral impacts differ.

Both the tiered approach and the strengthened benchmarks lead to a redistribution of free allocation between sectors. A sector with less free allocation will face increased carbon costs while a sector with more free allocation will face reduced carbon costs. In the case of the tiered approach, free allocation is more focused on sectors at highest risk of carbon leakage (i.e. cement, refineries, iron and steel, fertilizers) while it decreases for sectors at medium risk (i.e. lime, ceramics, non-ferrous metals, chemicals, glass, other sectors).

In the case of strengthened benchmarks, a similar tendency can be observed, although it is generally less pronounced. Depending on the sector, free allocation increases (i.e. for cement, refineries, iron and steel), remains roughly constant (i.e. for fertilizers, non-ferrous metals, glass) or decreases (i.e. for lime, ceramics, chemicals, pulp and paper, other sectors), reflecting the sectors' emissions efficiency improvements. Free allocation would be reduced most in those sectors where emission intensities from the best installations are furthest below the existing benchmark values, either because benchmark values were historically set at too high values or because of improvements in emissions intensity. The option thus better reflects the actual emission intensity improvements of different sectors and reduces the risk of granting free allocation above the emission levels to sectors in which an important share of the installations is operating below current benchmark levels.

Implementing the tiered approach (option CL1) would imply revising the list of sectors deemed to be at risk of carbon leakage and to implement a more complex methodology in which different levels of risk can be identified. If the analysis is kept at a quantitative level based on the current carbon leakage indicator (based on the trade and emissions intensity of the sector), this additional burden would be limited. The strengthened benchmarks (option CL2) would not imply any additional administrative burden compared to the baseline. Under the current legislation, the benchmark values to be applied during the period from 2026 to 2030 will be based on data for the years 2021 and 2022. Changing the maximum update rate that can be applied to a benchmark will not impact the level of complexity of the exercise, only its possible final result.

To conclude, the likelihood or the extent to which a CSCF would need to be applied would be reduced by option CL1 and, to a lesser, but still significant extent, by option CL2. This is particularly relevant for cap scenarios with rebasing. In cases where there is no shortage of free allowances, options CL1 and CL2 reduce the total amount of free allocation. However, this should not substantially increase the risk of carbon leakage as the most exposed sectors maintain their free allocation in option CL1 or experience a lower reduction under option CL2 as the revised benchmarks better reflect the actual performance of the installations. In addition, some positive economic impacts from additional auctioning revenues could be expected. Both the tiered approach and the strengthened benchmarks lead to a redistribution of free allocation between sectors whereby the available free allocation is better targeted to sectors at highest risk of carbon leakage.

6.1.2.2.4 *Improving support for low-carbon investment and innovation through the existing Innovation Fund*

The Innovation Fund will further incentivise innovation and research in sustainable technology, products and processes and carbon removals solutions, including possibly in new sectors included in the ETS. The ETS Innovation Fund can already now support production, use and storage of zero-emission fuels in buildings and transport as well as other activities relevant for these sectors, such as substitute products (e.g. innovative wood construction instead of bricks and cement).

In the existing ETS, 450 million allowances are used for the Innovation Fund of which 325 million allowances are taken from the total amount available for free allocation. Under option IF1, the latter amount would not change and therefore the application of the CSCF will not be affected in comparison to the baseline. Under option IF2, additional 50 million allowances from the free allocation budget are earmarked for the Innovation Fund. This leads to a small increase of the impact of the CSCF (before applying CL1 or CL2, see Table 11 below in comparison to Table 6 above). Out of the 83% respondents to the OPC in favour of an increase of the Innovation Fund, 45% indicated that it should be increased by using more allowances from the auction share, while 9% indicated that the allowances should come from free allocation.

Table 11: Impacts of a further increase of the Innovation Fund (option IF2) from 2026 onwards on free allocation for different cap trajectory options

	Baseline	AMB1 and IF2	AMB2a and IF2	AMB2b and IF2	AMB2c and IF2	AMB3c and IF2
Delta to baseline for total free allocation	-	-10%	-13%	-17%	-16%	-12%
Year when CSCF is triggered	-	2030	2029	2028	2028	2029
Average CSCF for the period 2026-30	100%	93%	86%	78%	80%	87%

Both options IF1 and IF2 will enable more projects to be funded that will bring emission reductions, improve the competitiveness of the companies behind them, make them global leaders in exporting clean tech solutions and create clusters of low-carbon innovation all across Europe with the associated economic and employment benefits. The negative effects of the increased likelihood of triggering the CSCF in option IF2 may be offset by these positive effects and the increased resilience of companies that invest in clean tech solutions.

6.1.2.2.5 *Carbon Border Adjustment Mechanism (CBAM)*

The assessment of a CBAM as a measure to address the risk of carbon leakage is part of a separate impact assessment accompanying a separate legal proposal. That impact assessment covers the selection of sectors for the CBAM, its design and the modelling of related impacts. The introduction of a CBAM is likely to have an impact on the existing framework to address the risk of carbon leakage and in particular on free allocation. This is because both free allocation and the CBAM share the same objective: to prevent the risk of carbon leakage. They are therefore alternative measures.

Depending on the actual design of the CBAM, two cases can be distinguished.

In the first case, a CBAM option is chosen that does not affect free allocation (e.g. CBAM IA option 6: consumption charge). In this case, no changes to the free allocation mechanism are necessary.

Alternatively, a CBAM is established for selected sectors whereby importers pay for the embedded emissions in the imported products and free allocation is gradually reduced for these sectors (e.g. during a transitional period) until free allocation is completely abandoned (i.e. all options in the CBAM IA based on a notional ETS or import tax). If such an option is chosen and gradually phased in, the reduction of free allocation should mirror the pace of increase of the CBAM charges, in order to ensure that an adequate level of carbon leakage protection is maintained and at the same time no double protection occurs.

As free allocation is reduced, the question arises whether, when and by how much the minimum auction share in the ETS Directive should increase, because the selected sectors will need to buy their allowances on the market. If the auction share in the ETS Directive is kept unchanged, it means that the same amount of free allocation remains available to a smaller number of sectors. An obvious response to the reduced entitlements to free allocation would therefore be to increase the auction share corresponding to the reduction of free allocation of the CBAM sectors. In such a case there should be no impact on the likelihood and the extent of the CSCF.

If, for example, iron and steel, cement and fertilisers were covered by the CBAM, the impact on the quantities of allowances allocated for free would be significant, as these three sectors are expected to receive more than 45% of the total free allocation in the period from 2021 to 2025.

The sectors falling under the CBAM would need to buy additional allowances compared to the current situation. Not allocating these allowances to the auction share could result in increasing scarcity and carbon prices in the short-term, depending on when unused free allocation (if any) would be auctioned. If the auction share were increased to incorporate all the free allowances destined for the three aforementioned sectors (i.e. iron and steel, cement, fertilisers), the auction share is estimated to increase from 57% to 77%.

6.1.3 Social impacts of strengthening the ETS

6.1.3.1 Impacts on employment

The macro-economic analysis conducted as part of the Impact Assessment accompanying the 2030 CTP concluded that the impact of an increase in climate ambition to -55% on aggregate employment would be relatively limited, ranging between -0.26% and +0.45%. The employment impacts are positive if carbon pricing revenues are recycled to lower other taxes or to support green investment[111].

A strengthening of the ETS as in options AMB1 to AMB3 and MSR1 to MSR2 is hence expected to have small effect on the employment as a whole. However significant shifts in the sectoral composition of employment and associated job changes that workers will have to go through are expected over the next decade, which would generate challenges for the labour force and potential mismatches between skills available and the skills requirements. These have been analysed in the Impact Assessment underpinning the 2030 CTP based on scenarios which assumed either global action with mitigation efforts that are compatible with the achievement of the 1.5°C target or “fragmented action” only assuming the implementation of Nationally Determined Contributions under the Paris Agreement as of 2018.

Employment in the coal sector, in particular, is expected to be around 50% below baseline by 2030. While this is not consequential in terms of total employment at the EU level, it has significant implications for some regions and local communities. Employment in the gas sector is expected to fall significantly as well, though less severely than for coal.

[111] SWD(2020)176, Section 6.5.1

Table 12: Impacts of 55% GHG reduction on EU sectoral employment in existing ETS sectors (deviation from baseline in 2030, in percent)

Employment vs. baseline, 2030	**Fragmented action**	**Global action**
Coal	-49.1 | -48.3	-47.1 | -46.3
Gas	-11.2 | -8.5	-7.9 | -5.8
Electricity supply including renewables	2.8 | 3.3	5.7 | 6.6
Ferrous metals	-4.1 | 0.1	2.2 | 7.0
Non-ferrous metals	-2.2 | -0.1	3.6 | 6.3
Chemical products	-0.8 | -0.1	0.6 | 1.4
Paper products	-0.4 | 0.1	0.0 | 0.7
Non-metallic minerals	-2.1 | 0.3	-0.1 | 2.7

Source: SWD(2020)176, JRC-GEM-E3 model

Conversely, electricity supply is likely to gain most significantly from a higher level of climate ambition by 2030, through increased green employment. The electrification of the economy and the switch to renewables, which tend to be relatively labour intensive, are naturally expected to generate higher employment in the sector.

For the industrial sector the direction of the impact depends on the extent of climate action in other parts of the world as well as on the carbon leakage protection framework. Therefore a just transition is an important aspect. The ETS recognises the asymmetric distribution of its impacts on certain regions and MS with lower GDP.

The transformation is likely to affect education and vocational training systems as re-skilling can enable impacted regions to capitalise on all possible new opportunities in sustainable technology development, products and processes through the transformation of their labour forces. For example, through Cohesion Policy and the Just Transition Mechanism, investments in renewable energy technologies are expected to be deployed across the EU, including in coal regions. In addition, investments from the Just Transition Mechanism will compensate the negative impacts of the transition for the territories identified in the Territorial Just Transition plans. ETS auctioning revenues could further contribute to mitigating social impacts.

It can be expected that differences of sectoral employment impacts across different options for strengthening of the ETS target and reviewing the MSR are limited.

The described macroeconomic modelling results assume that industry at risk of carbon leakage receives free allocation. Under a more targeted free allocation (options CL1 and CL2), the carbon costs for the sectors that receive less free allocation will be higher unless they can pass on the costs in the product price (less international competition). If there is no possibility to pass on costs in the product price, market shares could be reduced, which could lead to employment losses. However, since the reason for the lower allocation to some sectors would be the ability to pass on costs, this should limit the employment effects.

Overall, it is expected that the impact of the options to modify the framework to address the risk of carbon leakage are less pronounced than the impacts induced by the strengthened cap.

6.1.3.2 Other social impacts

This initiative also addresses the increasing concern of European citizens, and particularly younger generations, that urgent action is needed on climate change to ensure the wellbeing of future generations.

This initiative is likely to contribute to positive health impacts, reducing avoidable healthcare costs and mortality by reducing air pollution caused by fossil fuels and high-emission industrial processes, such as carcinogens and particulate matter. 2030 health damages in MIX are EUR 17.6 to 35.2 billion per year lower compared to REF.

6.2 Extension of emissions trading or alternatives for the maritime emissions

This section considers the four main policy options described in Section 5.2.3.1, which include the extension of the ETS to maritime transport (MAR1), a separate sectoral ETS (MAR2), a levy on ship GHG emissions (MAR3) and the extension of the ETS to maritime in combination with standards (MAR4). A summary of the policy options analysed is included in Annex 6.

For the purpose of this assessment, a comprehensive set of tools has been used ranging from specialised datasets and dedicated modelling tools such as the PRIMES-Maritime module and the GEM-E3 economic model. Details of this assessment are given in Annex 10 and details on the methodology used for the assessment of impacts is explained in Annex 4.

6.2.1 Environmental impacts

This chapter aims to assess how the different policy options can reduce the negative impact of maritime transport on climate change, air quality and marine biodiversity.

6.2.1.1 Changes in emissions of GHG

In the baseline scenario, GHG emissions from international navigation are expected to grow by around 14% between 2015-2030 and by 34% between 2015-2050, wiping out the positive effect of technical and operational energy efficiency measures and practices put in place since 2008. It would also make the increased EU climate objectives harder to achieve as it requires stepping up EU actions in all sectors, as highlighted in the 2030 communication.

In this context, the four policy options considered in this impact assessment have been developed in a way to ensure a reduction of GHG emissions commensurate with the increased climate effort expected in the ETS[112]. Depending on the policy option, the reduction in GHG emissions would either come from mitigation measures implemented in the maritime sector itself, or from the purchase of general ETS allowances (out-of-sector abatement). The impact of policy options in terms of absolute GHG emissions reduction will highly depend on the selected **geographical scope**. In principle, the broader the geographical coverage, the higher the climate impact ought to be. This, however, should be tempered by the fact that the geographical scope can also have an effect on the effective implementation of carbon pricing measures (e.g. risk of evasion).

The table below shows the level of **CO_2 emission reductions** that would be triggered in 2030, assuming different combinations of policy options and geographical scope. The first group of columns provides information about the maritime CO_2 emissions covered by carbon pricing. It includes information about the absolute level of CO_2 emissions projected in 2030 in the baseline scenario and in each option, the emissions cap, the expected in-sector abatements induced by the price signal and other policies and the expected demand for out-of-sector allowances. The second column shows how the maritime emissions not covered by carbon pricing would change in 2030 as a result of other policies. The last column shows the total amount of in-sector and out-of-sector abatements that would originate from the considered maritime policies in 2030.

All the in-sector emission reductions take into account the impact of the FuelEU Maritime initiative, in line with the MIX assumptions. However, reductions related to on-shore power requirements are not quantified in this chapter as well as reductions coming from future IMO short-term measures yet to be adopted.

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[112] In MAR1, MAR2 and MAR4, the emissions cap is subject to the same linear reduction factor as for stationary installations and aviation. In the mid- and long-term, the cap follows a trajectory until 2050 in view to reduce the maritime emissions in a way compatible with the climate neutrality objective. The model assumes a similar level of emission reductions in MAR3.

Table 13. CO_2 emission reductions from maritime policy options and scopes in 2030

Policy option	Maritime emissions covered by carbon pricing					Other maritime emissions	Total emission reductions
	2030 BAU emissions (REF) *$MtCO_2$*	*2030 Projected Emissions* *$MtCO_2$*	*2030 Emissions cap* *$MtCO_2$*	In-sector reductions vs baseline *$MtCO_2$*	Demand for out of sector allowances *M EUA*	In-sector emission reductions vs baseline *$MtCO_2$*	In-sector and out of sector emission reductions *$MtCO_2$*
Scope:	**MINTRA** (emissions from at-berth and intra-EEA voyages)						
MAR1	46	*41*	*26*	5	15	11	30
MAR2	46	*26*	*26*	19	0	15	34
MAR3	46	*min 26*	*n/a*	*up to* 19	0	15	34
MAR4	46	*40*	*26*	6	14	13	32
Scope:	**MEXTRA50** (emissions from at-berth, intra-EEA and half of extra-EEA voyages)						
MAR1	*92*	*81*	*53*	11	28	6	45
MAR2	*92*	*53*	*53*	39	0	8	47
MAR3	*92*	*min 60*	*n/a*	*up to* 39	0	8	*up to* 47
MAR4	*92*	*79*	*53*	13	26	7	46
Scope:	**MEXTRA100** (emissions from at-berth, intra-EEA and extra-EEA voyages)						
MAR1	*138*	*120*	*79*	18	41	n/a	59
MAR2	*138*	*79*	*79*	59	0	n/a	59
MAR3	*138*	*min 79*	*n/a*	*up to* 59	0	n/a	*up to* 59
MAR4	*138*	*117*	*79*	21	38	n/a	59

Note: numbers are rounded

Source: PRIMES Maritime module

In **MAR1**, the extension of the ETS to the maritime sector would result in a total reduction of 59 Mt of CO_2 emissions in 2030 for the largest geographical scope (MEXTRA100), 45 Mt for the intermediate one (MEXTRA50), and 30 Mt for intra-EU voyages and at-berth emissions (MINTRA). That would be equivalent to reducing the total maritime emissions from the baseline by 22% to 43%. A significant share of these reductions (up to 69%) is associated with out-of-sector abatements, assuming a carbon price in the range of EUR 45[113]. The demand for general ETS allowances in 2030 is therefore estimated at between 15 and 41 Mt CO_2 depending on the selected geographical

[113] Lower band of the carbon price assumptions from the MIX scenario

scope. The in-sector abatements would primarily come from the increased use of alternative fuels promoted through the FuelEU Maritime initiative[114], with the ETS price signal contributing to this growth. In the short-term, MAR1 applied to MEXTRA100 would roughly trigger one third of the reductions in the sector and the two thirds outside. Higher ETS prices would further accelerate the implementation of mitigation measures in the sector.

In **MAR4**, the combination of carbon pricing with a carbon intensity standard would result in a total of 59 Mt of CO_2 emission reductions in 2030 for MEXTRA100, 46 Mt for MEXTRA50, and 32 Mt for MINTRA when compared to the baseline. Following the same logic as in MAR1, companies would be expected to purchase a significant amount of general ETS allowances in 2030 (between 14 and 38 million EUA depending on the selected geographical scope). The operational carbon intensity standard, as modelled in this impact assessment[115], would modestly increase the level of in-sector abatements expected by 2030.

In **MAR2**, the separate maritime ETS would lead to total emission reductions in 2030 of 59 Mt for MEXTRA100, 47 Mt for MEXTRA50, and 34 Mt for MINTRA. All abatement of emissions would take place in the maritime sector as shipping companies would not be able to purchase allowances from other sectors. In **MAR3**, the emissions levy could result in similar emissions reductions because the price signal is assumed to be comparable to the one observed in the separate maritime ETS. However, the level of projected emission reductions would be much more uncertain compared to the other policy options where maritime emissions would be capped.

As shown by these results, the geographical coverage has a very strong influence on the mitigation impact of each policy option. Extending the geographical coverage beyond intra-EEA emissions to MEXTRA50 would increase the total amount of emission reductions by 50% while covering all maritime emissions would increase it by around 97%.

The geographical scope would also have a strong effect on the type of covered shipping activities. As shown in the figure below, a measure focusing on MINTRA would cover

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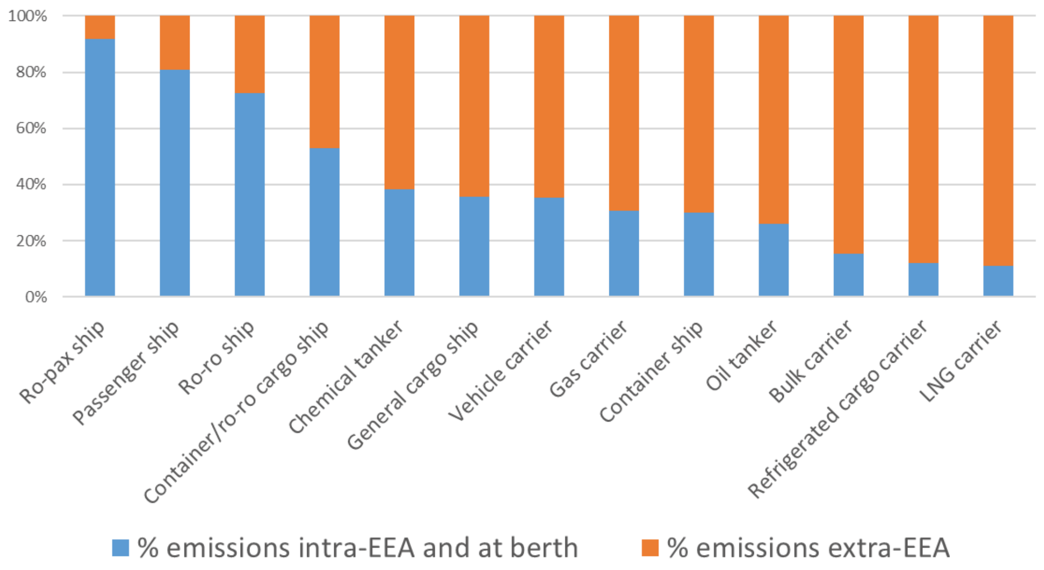
[114] The MIX scenario assumes that renewable and low-carbon fuels would represent around 8-9% of the maritime energy mix in 2030. The impacts of the FuelEU Maritime initiative are described in a separate impact assessment.

[115] The model obliges the modelled fleet to improve its operational carbon intensity by at least 40% in 2030 compared to 2008 levels and to follow a linear trajectory over the period 2030-2050 to reach the operational carbon intensity improvements observed in 2050 in MIX.

most of the short-sea shipping emissions, whereas addressing extra-EEA emissions would significantly increase the proportion of emissions coming from deep-sea shipping.

Figure 5: Distribution of intra-EEA and at-berth emissions vs extra-EEA emissions per ship type



Source: THETIS-MRV data 2018 and 2019, based on EEA (including EU28)

Changes in GHG emissions also depend on the **type of GHG emissions covered**. While CO_2 emissions represent around 98% of all maritime GHG emissions, non-CO_2 emissions have been growing over the past years. The model shows that in all policy options (MINTRA scope), the share of non-CO_2 emissions would represent around 3.5% to 4% of all GHG emissions by 2050. This projection is mostly related to higher levels of methane slippage, as a result of a larger uptake of decarbonised gaseous fuels. However, this high share of non-CO_2 emissions would be reduced substantially if significant progress were achieved on methane slip control.

Changes in emissions of **black carbon** are also important as the fuel burned in shipping engines can result in atmospheric black carbon and surface deposition that can accelerate the melting of ice and snow, in particular in the arctic region. According to the model, all policy options would result in a reduction of black carbon emissions of at least 7% in 2030 compared to the baseline.

6.2.1.2 Impacts on air pollution

Shipping emissions can impact air quality in coastal areas but also on land, as emissions from ships are transported in the atmosphere over hundreds of kilometres. All policy options are expected to have a positive impact on public health compared to the baseline as ships would emit less **air pollutants**. These decreases are driven by the uptake of fuels with lower emission factors, the use of cleaner energy sources at berth and energy efficiency improvements. The table below shows the level of maritime air pollutant emissions reduction that would be achieved in 2030 compared to the baseline, assuming different policy option applied to the intermediary geographical scope (MEXTRA50).

Table 14: Reduction of air pollutant emissions by 2030 for different maritime policies (scope MEXTRA50)

	Air emission reduction by 2030 compared to REF (%) – Scope MEXTRA50				
	NOx	*CO*	NMVOC	PM10	SOX
MAR1	-7%	-6%	-7%	-7%	-8%
MAR2	-10%	-6%	-9%	-10%	-10%
MAR3	-10%	-6%	-9%	-10%	-10%
MAR4	-8%	-7%	-8%	-9%	-10%

Source: PRIMES Maritime module

6.2.1.3 Use of energy

In terms of **energy efficiency**, all policy options are expected to boost the uptake of energy efficiency measures as the cheapest available in-sector abatement measures. The analysis carried out in the fourth IMO Greenhouse Gas Study confirms that energy efficiency measures such as speed reduction, hull coating, wind power, propeller improvements, improved auxiliary systems or main engines have much lower abatement costs than other options such as the use of alternative fuels. As an example, it estimates the cost to reduce one tonne of CO_2 based on speed reduction at around 14 EUR/t-CO_2 while a reduction of one tonne of CO_2 based on the use of alternative fuel at between 213 to 343 EUR/t-CO_2 in 2030.

The following table illustrates the energy efficiency improvements expected in the model from the different policy options, assuming a MINTRA geographical scope.

All scenarios show that energy efficiency improvements are expected to take place compared to the baseline. By 2030, the model indicates that MAR1 applied to all intra-EEA emissions would increase the average energy efficiency of freight vessels by 6.9% compared to 2020 (8% when applied to MEXTRA50). In MAR4, the combination of carbon pricing policies with an operational standard would make freight vessels 8.1% more energy efficient in 2030 compared to 2020 considering a MINTRA scope (9.2% if applied to MEXTRA50). In MAR2, the requirement to achieve in-sector emission reductions would lead to slightly higher energy efficiency improvements estimated at 8.8% for MINTRA (similar trends could possibly observed in MAR3).

Table 15: Average energy efficiency (energy consumption per tonne-km) improvements of freight vessels

	Average energy efficiency improvements (energy consumption per tonne-km) of freight vessels – index 100= 2020 levels – MINTRA scope	
	2020	2030
Baseline	100	97
MAR1	100	93
MAR2	100	91
MAR3	100	up to 91
MAR4	100	92

Source: PRIMES Maritime module

These levels of energy efficiency improvement come in particular from the purchase of more energy efficient vessels. In the next decade, new ships are expected to be at least 15%-25% more energy efficient through improved machinery and electricity systems (including hybridisation) and the use of waste heat recovery[116]. However, the relatively slow replacement rate of vessels and their long lifetimes explain why the average energy efficiency improvement of the entire fleet is not so pronounced until 2030. In addition, the model also considers operational energy efficiency improvement such as speed reduction. In the feedback received from stakeholders, most market actors confirmed the potential to further improve the energy efficiency of the sector, which varies for different ship sizes and types and which are not all captured in the model.

In terms of the **use of renewables and low-carbon fuels**, all policy options are expected to reinforce the aims of the FuelEU Maritime initiative. In particular, carbon pricing would make the switch to sustainable alternative fuels more affordable by supporting energy efficiency improvements, resulting in less fuel to be purchased by shipping companies. It would also help bridge the price gap between conventional and alternative fuels (to an extent which would depend on the level of the carbon price). By 2030, MAR1 would have limited contribution to achieving the goals of the FuelEU maritime initiative in terms of uptake of alternative fuels as an ETS price in the range EUR 45/tCO_2 would improve the cost competitiveness of alternative fuels compared to fossil fuels but it would not be sufficient to bridge the whole price gap. However, in the long-term, MAR1 would further accelerate the demand for alternative fuels. MAR4 would have a positive effect on the short-term as companies would be able to fulfil their

[116] UNEP Emissions Gap Report 2020

operational carbon intensity requirement by notably purchasing more alternative fuels. MAR2 and possibly MAR3 would lead to a more rapid uptake of alternative fuels (representing more than 19% of the fuel mix by 2030) as a result of higher carbon prices.

6.2.1.4 Risk of evasion

As for other sectors, it is necessary to assess the risk of evasion linked to each maritime policy option. In practice, market actors could decide to reduce their exposure to carbon price by:

a) adding a new port call outside the EEA in a journey to minimise the amount of emissions in the ETS scope (Evasive port calls);
b) unloading goods in a non-EEA port and loading it into another ship to reach the final destination (Transhipment);
c) shifting demand to other transport modes, although there would be no leakage if these other modes are covered by the ETS;
d) using ships below the threshold defined in the EU maritime MRV regulation (smaller vessels);
e) assigning their best performing vessels to EU related voyages while keeping the less performing ones for non-EEA trade routes (fleet optimisation).

This would reduce the effectiveness of the policy options in reducing GHG emissions and would shift carbon emissions to other geographical areas or other transport modes. The risk of carbon leakage depends on practical feasibility, the carbon price level and the geographical scope.

(a) Evasive port calls

Evasion becomes lucrative when the cost of compliance exceeds the costs associated with the evasive port call (i.e. additional port, fuel, operational, administrative and opportunity[117] costs). As compliance costs increase proportionally to the carbon price, the risk of evasion can be characterized by a ‘turning point price’ that represents the carbon price above which the evasion could become profitable from an economic point of view. The decision to add an evasive port call also depends on other aspects such as its practical feasibility (e.g. additional time to the incoming/outgoing leg particularly in relation to certain commodities, e.g. perishable goods).

Figure 6 below estimates that with a carbon price of EUR 60 per tCO_2, the share of voyages tempted to evade is between 0.1% and 10%.

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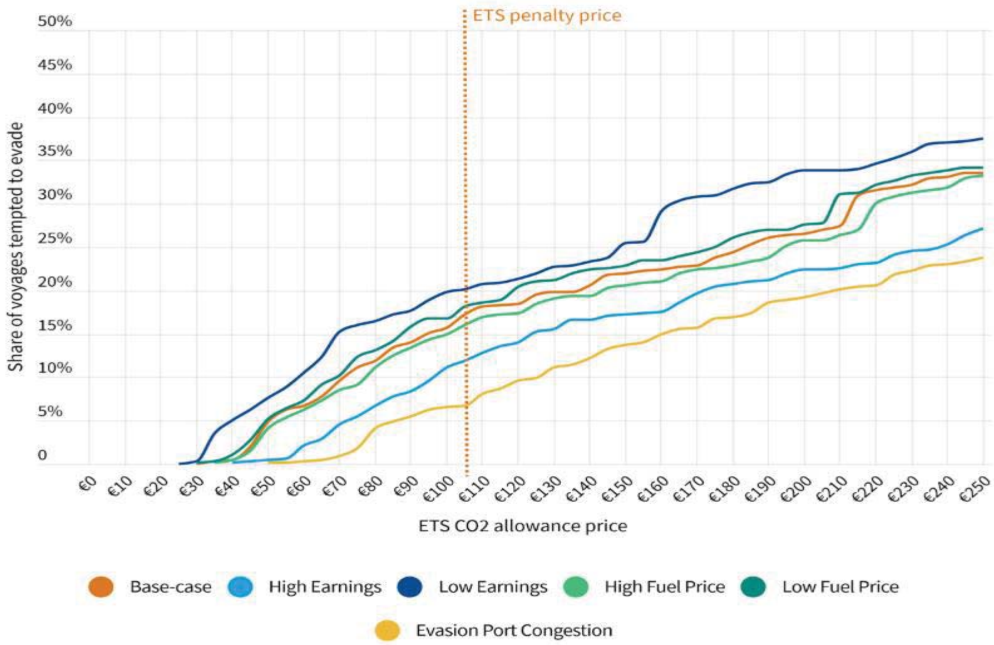
[117] revenue lost from the evaded journeys

The EU maritime transport MRV regulation already requires ships to load or unload cargo in order for the stop to fall under the port call definition. This stringent definition represents an important additional barrier to evasion and could be strengthened to further mitigate the risk.

Figure 6: Share of voyages tempted to evade for different ETS price (considering that all intra-EEA and half of extra-EEA voyages are covered by the carbon price)[118]



Source: T&E, 2020

Case studies building on a recent T&E (2020) study[119] (Annex 10) analysed the risk of evasion for three major EU seaports in close proximity to a non-EEA port: Greece (Piraeus), Spain (Algeciras) and the Netherlands (Rotterdam). They considered three types of ships: container ships, bulk carriers and oil tankers, due to their high level of activity in extra-EEA shipping relative to other vessel types. For container ships, opportunity costs increase more significantly in relation to their size than for bulk carriers and oil tankers. Large containers are thus less likely to evade. For bulk carriers and oil tankers, the larger vessels have lower turning point prices and therefore have higher risk

[118] ETS penalties are paid by the operators who fail to comply with their obligation to surrender allowances under the ETS

[119] https://www.transportenvironment.org/sites/te/files/publications/ETS_shipping_study.pdf

of evasion. Longer routes present a higher risk of evasion due to higher fuel and operational costs making the additional costs of evasion lower in comparison.

The options with the highest carbon price (MAR2 and MAR3) present the highest risk of evasion. In the mid- to long-term, higher ETS prices are likely to increase the risk as shown in the figure below (considering option MAR1 with MEXTRA50 scope). At an ETS price of around EUR 100/tCO_2, the risk of evasion would concern 20% of the voyages that could be tempted to evade if third country climate policies stay the same.

In terms of geographical scope, the risk of evasion would be the highest in case extra-EEA voyages are covered. Under the MEXTRA50 scope, the risk of evasion is zero at EUR 30/tCO_2, but at EUR 50/tCO_2 it concerns 4.8% of all voyages, representing 8.2% of the emissions covered. Under the MEXTRA100 scope, 6.7% of all voyages would be tempted to evade at EUR 30/tCO_2.

In addition, the risk of evasion could increase if the cost of compliance from other EU initiatives would add to carbon costs.

The risk of evasion would be cancelled if the main departure or arrival countries outside the EEA would apply similar carbon pricing policies.

Additional measures to limit the risk of evasion might be considered after the proposed measures enter into force, based on the monitoring for evasive port calls practices. Such a monitoring could rely on vessel tracking information (AIS data) and maritime freight statistics.

(b) Transhipment

To evade EU measures, transhipment activities could be relocated to nearby ports outside the EEA. Transhipment is a competitive sector where hubs compete for the traffic related to a specific region or market. Shipping companies already use nearby alternative competing transhipment hubs and could be tempted to increase transhipment activities in those ports, should these appear more competitive.

Delocalisation of transhipment activities could particularly impact voyages from container vessels. For other types of vessels, transhipment is uncommon and setting up a transhipment for the sole purpose of evasion is unlikely. Adding an additional port call with transhipment will significantly increase the cost of the voyage (e.g. cargo handling, delays in deliveries, additional charter, logistic and administrative costs, etc.) and increase the voyage length.

The practical feasibility of changing transhipment hub depends on a range of important factors, including port location, proximity to primary routes, cities and ports, berth availability, draft constraints, transit time, cost, frequency and service quality. The financial attractiveness of changing transhipment port is at present largely linked to the port fees, and to a much smaller extent to fuel, operating and opportunity costs (as very minimal deviation from the original route would be required). For the two ports analysed in the case study (Annex 10), Algeciras and Tanger Med, a significant difference in transhipment costs already exists. Competition for transhipment activities is currently strong between the two ports. However, the risk of changing transhipment port in favour of Tanger Med as an evasive behaviour might increase if the gap between the costs of transhipment between the two ports is exacerbated due to the carbon price, in particular for MAR2 and MAR3.

None of the geographical options would exclude the risk of transhipment relocation. The longer the voyages, the higher the risk is in terms of delocalisation of transhipment activities, MEXTRA100 therefore being more at risk of evasion than MEXTRA50. Impact on the amount of emissions evading the scope will be smaller for MINTRA.

The risk of transhipment has been highlighted by ports (e.g. port of Algeciras), port associations and World Shipping Council in the OPC, as well as for North Sea ports in relation to competition from UK ports. This risk would be strongly limited if equivalent measures were to be adopted in neighbouring countries. The UK has adopted legal requirements for ships that call at UK ports to report their greenhouse gas emissions[120] and the UK's sixth Carbon Budget will incorporate the UK's share of international aviation and shipping emissions. However, at the time of this analysis, the UK has not yet decided to include shipping emissions in its national Emissions Trading System[121].

(c) Modal shift

The increased cost of shipping resulting from carbon pricing could cause a shift from maritime transport to other modes of transport such as road or rail. However, modal shift would only occur if there is no similar carbon pricing applied to road transport as the majority of railway activities are already covered by the ETS. Road transport under the MIX scenario will be subject to a number of decarbonisation policies fostering the use of more sustainable modes of transport. Risk of modal shift under MAR1 is therefore considered inexistent. Options for initiatives are detailed in the Smart and Sustainable Mobility Strategy[122]. In addition, modal shift would only concern intra-EEA maritime

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120 https://www.legislation.gov.uk/uksi/2018/1388

121 https://www.legislation.gov.uk/uksi/2020/1265/made

122 Accompanying document to the Smart and Sustainable Mobility Strategy: COM(2020) 789

transport activities as deep-sea shipping is less likely to compete with other modes of transport. Annex 10 provides a detailed analysis of the risk of modal shift.

(d) Smaller vessels

For all policy options, market operators could decide to operate ships below 5.000 gross tonnage to evade carbon pricing. This risk may occur in specific shipping sectors where the use of smaller vessels is common and where the gain in efficiency related to the use of larger vessels would be less than the compliance costs. This aspect is further developed in the next chapter about economic impacts. The risk would be higher, in relative terms, for MINTRA than for MEXTRA scopes and the options MAR2 and MAR3 with a higher carbon price will create a higher incentive to use ships under the threshold. It should be noted that, if there were deliberate evasion of this type, the Council and European Parliament could lower the relevant thresholds.

(e) Fleet optimisation

The risk of seeing companies optimising their fleet by assigning their best performing vessels to EEA related voyages and keeping the less performant ones for other trade routes may occur for deep-sea ships having no fixed routing, such as trampers. The risk is considered to be limited as companies would not directly evade carbon pricing. In addition, the implementation of such a strategy might be more difficult to put in place when ships are chartered, which characterises the tramp shipping industry. However, the risk would still be higher for MAR2 and MAR3 (higher carbon prices) as well as for MAR4 as it includes mandatory carbon intensity requirements. Fleet optimisation would decrease the total emissions emitted in the geographical scope and increase emissions outside the scope. The adoption of global measures such as the technical and operational carbon intensity foreseen to be adopted at IMO or equivalent carbon pricing measures outside the EEA would reduce this risk.

6.2.1.5 Impacts on ecosystems and biodiversity

The impacts of ship emissions on ecosystems and biodiversity are highly site-specific but can cause damage through acidification and eutrophication. Ship movements can also negatively affect natural habitats and certain species. In addition, climate change can produce changes in water temperature, increasing CO_2 levels and decreasing pH, changes in nutrients and dissolved oxygen due to changes in circulation and stratification, extreme weather events and sea level rise.

By reducing GHG emissions and the release of air pollutants, all the proposed policy options are expected to contribute to reducing the negative impacts of shipping activities on ecosystems and biodiversity. Carbon pricing would also encourage the further deployment of slow steaming practices that can reduce underwater noise and reduce negative impacts on habitats. The positive impact of each policy option on maritime ecosystems and biodiversity is expected to be proportional to the level of in-sector abatement triggered, meaning that more benefits would come from MAR2 and MAR3 where the purchase of EUA from other sectors is not an option.

6.2.2 Economic impacts

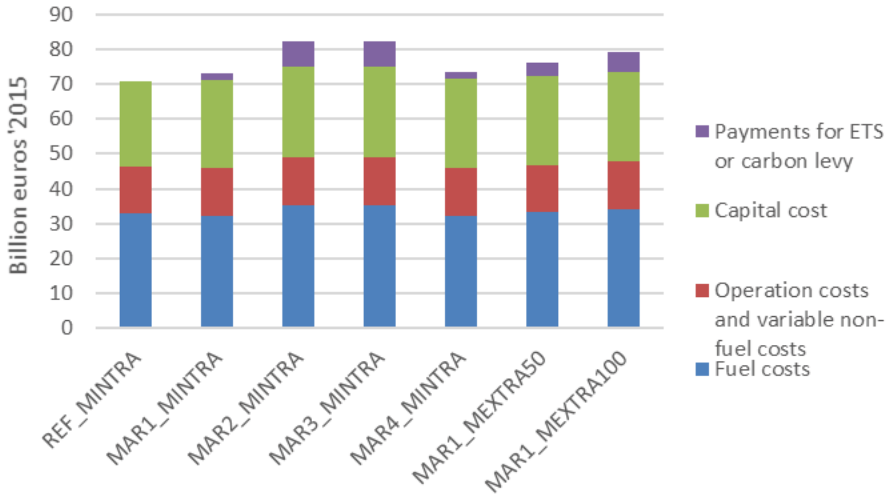
6.2.2.1 Direct economic impacts

In all policy scenarios, **maritime transport activity** is expected to grow in the long-term although not as much as in the reference scenario, which does not reflect the transformation of the EU economy towards climate neutrality and the lower dependence on oil imports. By 2030, the policy options are projected to have a minor impact on total shipping activities in comparison to the baseline (e.g. from -0.8% for MAR1 to around -1.2% for MAR2 and MAR3 in 2030 when applied to intra-EEA emissions). A broader geographical scope would also lead to higher impacts (e.g. -0.9% for MAR1 with MEXTRA50 and -1.1% for MAR1 with MEXTRA100). In addition, short sea shipping is expected to be slightly more affected than deep-sea shipping as carbon pricing would result in higher relative costs.

In terms of direct costs, all policy options would incur some additional direct costs for regulated entities in the form of ETS/carbon levy payments, as well as additional capital, fuel, operational and administrative costs, partially compensated by fuels saving. However, from a society perspective the ETS/carbon levy payments do not represent a net cost, as there are corresponding auctioning or tax revenues (see Section 6.3.2.3). When looking at the additional costs, it is important to keep in mind that the sector currently benefits from a wide range of tax exemptions and reductions that are de facto forms of fossil fuel support. A detailed analysis is carried out in the impact assessment accompanying the revision of the Energy Taxation Directive.

The graph below shows how costs are likely to vary considering different policy options and different geographical scope.

Figure 7: Costs breakdown in 2030 for different maritime policy options and scope (billion EUR 2015)



Source: PRIMES Maritime module

MAR1 would increase the total direct costs for users by 3% in 2030 if applied to intra-EEA emissions. This cost increase can be explained by the estimated ETS payment that would represent an amount of around EUR 1.9 billion[123]. The slightly higher fuel costs coming from the use of more expensive renewable and low-carbon fuels (as induced by the FuelEU Maritime initiative) would be compensated by the fuel savings expected in 2030. In this scenario, the short-sea shipping industry would be more impacted than the deep-sea shipping sector as they mostly perform intra-EEA voyages. If applied to MEXTRA50, MAR1 would become 7% more expensive than the baseline, mainly due to increased ETS payments amounting to around EUR 3.7 billion. It would also mean a bigger contribution from the deep-sea shipping sector. Finally, if all emissions were covered under MAR1, the measure would be 12% more expensive compared to a business as usual scenario and the ETS payment would peak to around EUR 5.5 billion. **MAR4** would result in similar outcomes. Fuel costs would be comparable as more energy efficiency improvements would be implemented together with a slight increased use of alternative fuels.

When applied to intra-EEA emissions in 2030, **MAR2** would substantially increase the total costs by around 16%. This increase is mainly due to higher operational costs linked to the closed ETS. Regulated entities would pay high carbon prices estimated at around EUR 268 per tonne of CO_2, which would represent an overall amount of EUR 7 billion in

[123] For MAR1 and MAR4 assumption based on the lower band of EU ETS carbon price ranges in the policy scenarios represented by MIX (Section 5.2.1). For MAR2 and MAR3, result of the modelling.

2030 reflecting the abatement costs of the various measures that would have to be implemented in the sector to stay below the emissions cap (same cap as in MAR1 and MAR4 but with no flexibility). The increase in total costs would also come from the use of more expensive alternative fuels. Similar impacts are assumed for **MAR3** as the levy option would have to apply comparable carbon prices to generate sufficient emission reductions, although without any guarantee.

In terms of **compliance costs predictability**, MAR3 stands out for having the highest certainty because the costs per unit of emissions would be specified in the regulation, unlike the costs of the ETS allowances which would be subject to market fluctuations. However, the certainty linked to MAR3 would depend on whether the levy is adjusted regularly or not. In contrast, MAR2 could have fluctuating ETS prices. MAR1 and MAR4 would be less exposed to such a risk as the Market Stability Reserve has the ability to reduce price volatility and because maritime emissions would only represent a small share of the overall ETS market.

In the **long-term**, all policy options are expected to lead to an increase in total costs of approximatively 16-20% by 2050 as a result of the high penetration of renewable and low-carbon fuels, which implies higher fuels costs and higher capital costs. At the same time, carbon pricing in the maritime sector would lead to progressive energy efficiency improvements, in particular, in the time horizon after 2030, which would contribute to reducing the fuel costs.

In terms of **external costs**, all policy options would generate important economic savings as they would lead to substantial air pollutant reduction. Depending on the selected policy option and scope, external costs savings are estimated at around EUR 345 to 540 million in 2030 relative to the baseline and at over EUR 13.7 billion over the period 2020-2050 in terms of Net Present Value (e.g. up to EUR 18.1 billion for MAR1 when applied to MEXTRA100). These estimates aggregate health effects, crop loss, biodiversity loss and material damage.

6.2.2.2 Impacts on Administrative Burden

All policy options will create administrative tasks for the regulated entities, the national public authorities involved and the European Commission (see also costs estimations in Annex 3).

Administrative burden on regulated entities

For regulated entities, administrative burden will be very limited as a monitoring, reporting and verification system for CO_2 emissions is already in place. All policy options would rely on data coming from this MRV system, therefore MRV activities would not generate any substantial additional administrative burden. Regulated entities have already incurred one-off costs for the preparation of monitoring plans, the development of IT systems and the establishment of MRV procedures. Since 2019, companies submit every year to the Commission and to the relevant Flag State authority an emissions report, which has been verified by an independent accredited verifier. The costs of MRV compliance were estimated at about 6.700 EUR per ship per year (Faber & Schep, 2016). The only additional MRV costs that would be induced by the policy options would relate to the preparation of emissions reports at company level but this task could be supported by the IT system behind the EU maritime MRV system (THETIS-MRV). It could automatically aggregate all relevant data at company level.

For the ETS based policy options, there would also be a one off costs to open a registry account or become familiarised with the requirements of the system. Annual costs would include costs linked to the purchase and surrender of allowances, keeping records or supporting requests from competent authorities. Experience from the ETS shows that these activities generate much less administrative burden than the monitoring, reporting and verification of emissions. Non-MRV costs are estimated to represent around 10%[124] of the MRV costs.

In MAR3, the carbon levy would imply some set-up costs but the annual levy payment would be part of the overall tax management system of companies and is likely to represent marginal costs.

Option MAR4 would require additional verification activities to validate the attainment of the carbon intensity reduction target, but these could be part of the verification process under the EU maritime transport MRV system.

- The case of SMEs

Unlike other sectors already covered by the ETS, SMEs represent the significant majority of enterprises in the shipping sector, with 76% of freight companies and 86% of passenger transport companies having fewer than 10 employees. By limiting the scope of the measure to ships above 5.000 gross tonnage, it would reduce the number of ships covered by at least 44% and exclude around 95% of maritime transport SMEs. For the remaining covered SMEs, impacts will be proportionally higher than for bigger

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[124] This share is consistent with a survey in the UK (BEIS, 2016), which indicates that non-MRV administrative costs represent around 5% of total ongoing administrative costs for stationary installations and 10% for small emitters. Moreover, non-MRV costs for aviation represent around 7% of ongoing administrative costs (European Commission, 2014).

companies due to a lack of economies of scale and SMEs are likely to rely on intermediaries to help them fulfil their obligations.

Responses to the targeted stakeholder consultation suggest that SMEs might be more exposed to unfair competition on a global scale, in particular under ETS options, due to SME's limited administrative capacity and know-how to deal with an ETS.

Administrative burden on public authorities

MRV related costs will be the same under all options. Public authorities will have to ensure that regulated entities are capable of monitoring and reporting emissions, they will also have to review the amount of emissions reported by regulated entities, based on information verified by independent accredited verifiers. This is estimated to entail relatively limited additional costs. The European Maritime Safety Agency (EMSA) could potentially assist MS competent authorities in this task with their expertise on MRV data and related IT tools (e.g. by facilitating the exchange of information, developing guidelines and criteria). This would increase costs to EMSA, but reduce costs and improve efficiency for MS. Since 2018, EMSA is successfully running the IT tool (THETIS-MRV) that supports the implementation of the EU Maritime MRV regulation.

Under the ETS options (MAR1, MAR2 and MAR4), the main additional administrative costs will stem from the administration of the registry, compliance and enforcement. Such processes can build on the ones existing under the ETS and thus the incurred administrative costs will be very limited. The establishment of a fully separate ETS (MAR2) would however lead to some additional costs if not build upon existing tools. In terms of enforcement, the surrendering of required allowances will be registered electronically in the registry and the system will allow for a rapid identification of non-compliant companies. In case of non-compliance, public authorities will have to recover non-surrendered allowances and ensure that non-compliant regulated entities are held liable for the payment of an excess emissions penalty.

An estimation of the cumulated ETS costs for national authorities is provided in the table below based on previous ETS experience.

Table 16: Estimated administrative costs for all competent national authorities

ETS administrative costs for all competent authorities	
One-off costs (costs per period) (million euros)	0.5 – 1.5
Annual costs (million euros)	0.5 – 6.4

Source: Ricardo, 2021

MAR3 would also require the setting up of a new mechanism but which would be simpler compared to an ETS registry. The carbon levy could for instance be implemented as an annual single transaction based on EU maritime transport MRV data and collected based on existing tax systems at national level. However, depending on how the levy is redistributed, there might be a need to set up and manage a new tax registration system for those shipping companies whose business is registered in one MS but have ships registered in another MS. This could result in additional set up and monitoring costs.

Costs for compliance checks and enforcement will impact national authorities of the 22 Port States, but these will be very limited. For MAR4, Port State Control officers will check the availability of Documents of Compliance certifying that carbon intensity requirements are met. Verifying the availability of certificates is a routine activity for Port State Control officers. There is an opportunity to use of electronic certificates that could remove the need for a physical check in its entirety, a possibility already being discussed for the revision of the Port State Control and Flag State Directives.

The various EMSA tools in support of enforcement activities (THETIS, THETIS-EU, RuleCheck and the EMSA Academy) and EMSA's expertise in this field, could support the correct implementation and enforcement at national and EU level. During visits to MS, EMSA could also provide assistance to monitor the implementation of the carbon pricing policy, organise workshops to share experience and lessons learnt.

For the European Commission, the main additional administrative costs would come from the update of the IT system behind the EU maritime transport MRV Regulation, the transposition and conformity checks of national legislation, the administering of the EU registry (MAR1 and MAR4) or the creation of a separate registry for the maritime system (MAR2). It could also include the development of delegated or implementing acts (e.g. operational carbon intensity thresholds per ship type and size in MAR4).

6.2.2.3 Impact on revenues for Member States/Union

The level of revenues varies across the policy options and according to the geographical scope. An ETS which covers 50% extra-EEA emissions generates a higher level of revenues than one that covers only intra-EEA voyages as it covers more emissions.

The table below presents the additional revenues that could be generated at EU level in 2030 (as estimated in the PRIMES Maritime module). It considers different policy options and geographical scope as well as the fact that purchasing ETS allowances from other sectors does not generate additional revenues.

In the case of a levy, revenues are expected to be distributed at MS level, which will decide on the revenue use.

The discussion on use of ETS maritime revenues is linked with the discussions on using ETS auction revenues as an EU own resource.

Table 17: Additional revenues generated by policy options (billion Euro 2015)

	ETS or levy additional revenues in 2030 (billion EUR 2015)	**Assumptions in terms of ETS or levy price in 2030 (EUR/tCO_2))[125]**
MAR1 –MINTRA	1.2 b EUR	*45,5*
MAR1 _MEXTRA50	2.4 b EUR	*45,5*
MAR1 –MEXTRA100	3.6 b EUR	*45,5*
MAR2 and MAR3_MINTRA	7 b EUR	*268*
MAR4 –MINTRA	1.2 b EUR	*45,5*

Source: PRIMES Maritime module

6.2.2.4 Impacts on the European internal market and trade

As detailed in Annex 10, no significant impacts are expected as regards the level playing field. Due to the flag neutrality imbedded in all options, EU shipping operators would not be put in a disadvantaged position compared to non-EU shipping operators. However, threshold effects may occur between ships right below and above the 5.000 GT threshold, particularly for general cargo ships and chemical tankers. By retaining the 5.000 GT threshold, the competition effects between shipping and other transport modes, in particular road, is being limited, as smaller ships are typically more exposed to such modal shift.

As also recognised in the impact assessment accompanying the revision of the Energy Taxation Directive, the current exemption of the maritime sector from the energy taxation represents de facto fossil fuel support, which is not in line with the objectives of the European Green Deal. This creates a fragmentation of the transport internal market and distorts the level playing field across the different transport modes and the involved sectors of the economy. A carbon price on the maritime sector will aim at ensuring a level playing field among various transport sectors and improve the functioning of the internal market by addressing unfair competition.

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[125] For MAR1 and MAR4, based on the lower band of carbon price ranges in the policy scenarios represented by MIX.

Table 18: Description of possible economic impacts from a maritime carbon pricing policy

Impacts	Description
1) Transport costs	Maritime carbon pricing would lead to increased running costs for shippers in the form of increased voyage costs (e.g. purchase of ETS allowances, use of more expensive fuels) or capital costs (e.g. investments in new vessels or technologies). At the same time, the adoption of GHG mitigation measures and the possible use of revenues can contribute to reduce these costs. In the mid- to long-term, higher ship running costs are expected to lead to higher freight rates.
2) Transport choices	Higher transport costs may change shippers' modal, route, and port selection (detailed in the carbon evasion section 6.2.1.4).
3) Import prices	An increase in transport costs, if substantial, may increase import prices of goods, since transport costs are a component of commodities' market price. However, this increase in import prices is generally not proportional to increase in transport costs given that import prices depend on several other factors, such as the share of maritime transport costs in product prices and the ability of importers to transfer costs to the consumers.
4) International trade	If substantial, the changes in import prices of goods may trigger changes in trade flows. States may trade more with geographically closer producing/consuming States and trade less with more remotely located trade partners. Another possible impact is the increase in consumption of domestic products in place of imports. Moreover, fossil fuels reduction as a result of implementing the policy options will positively impact the trade balance.

Impact on trade

Due to its central role in enabling economic activity, applying a carbon price to shipping would affect the whole spectrum of economic agents: raw material suppliers, manufacturers and service providers, the shipping industry, retailers and eventually consumers. The ultimate impact on these agents will depend on the relative levels of costs, the savings generated by the policy measures in the long-term and investment choices. The direct change in ship running costs resulting from the selected policy would be expected in turn to impact on freight rates, depending on the ability to pass these additional costs or savings through the maritime supply chain, as described in the table below. Final consumers will only bear the portion of any cost variation that is passed-through by manufacturers and retailers.

An analysis of ten relevant commodities for European trade (detailed methodology in Annex 10) suggests that an open ETS covering 50% of extra-EEA emissions (option

MAR1 with MEXTRA50 scope) would have relatively small impacts on prices, even by 2050.

Even in the case of full cost pass-through, prices of commodities such as iron ore and cereals would rise by less than 2% by 2050. Goods such as crude oil, organic chemicals or perishable goods would largely be unaffected by an increase in shipping costs. Furthermore, the change in price is not expected to be noticeable by consumers to the extent to drive significant changes in their behaviour. Effects on demand is therefore projected to be very limited, with some of the largest likely potential long-term effects being shown for iron and steel and organic chemicals.

The table below presents a summary of the impacts on price and demand for each selected commodity by 2030 and 2050.

Table 19: Summary table of impacts on commodity price and demand from open ETS (MAR1)

Commodity	Change in price (%)		Change in demand (%)	
	2030	2050	2030	2050
Crude oil	0.2%	0.6%	0.0%	-0.1%
Refined petroleum products	0.5%	0.1 to 1.3%	0.0 to -0.4%	-0.1 to -1.0%
Natural gas	0.4 to 0.5%	0.5 to 1.3%	0.0%	-0.1%
Iron ore	0.3 to 0.7%	0.8 to 1.8%	-0.1 to -0.2%	-0.2 to -0.4%
Iron and steel	0.3 to 0.4%	0.6 to 1.1%	-0.1 to -0.6%	-0.4 to -1.5%
Cereals	0.3 to 0.6%	0.8 to 1.6%	0.0 to -0.2%	0.0 to -0.5%
Perishable goods	0.0 to 0.4%	0.0 to 1.0%	0.0 to -0.3%	0.0 to -0.8%
Office and IT equipment	0.2 to 0.4%	0.4 to 1.0%	-0.1 to -0.4%	-0.3 to -1.0%
Motor vehicles	0.0 to 0.4%	0.0 to 0.9%	0.0 to -0.1%	0.0 to -0.3%
Organic chemicals	0.0 to 0.3%	0.0 to 0.6%	0.0 to -1.0%	0.0 to -2.4%

Source: Ricardo analysis, GEM-E3, 2021

Note: A number of factors, including complex supply-chain relationships as well as supply and demand factors influence the price of commodities. Political and economic uncertainties arising from the withdrawal of the UK and the COVID-19 pandemic may also have strong implications for the assumptions underlying this analysis, including consumption levels, the market share of producers, and ability of producers to pass through costs onto consumers or the next step in the supply chain.

- **Global perspective**

The majority of the main global trade partners have a significant share of their export and import trade flows with the EU, but only those where the main export products have a low economic value to weight ratio (i.e. Russia, China, India) may be significantly affected by the measures (see Annex 10 for figures). Some third countries are more vulnerable to increases in maritime transport costs, as the Small Islands Developing Countries and Least Developed Countries, and could be relatively more impacted by increased transport costs with the EU. Their already lower connectivity makes them already pay comparatively higher premiums in terms of shipping costs. Moreover, they are more likely to export lower value products to the EU. Furthermore, some goods imported to or exported from these countries could be transhipped in EU ports on their route, leading to a price increase for non-EU voyages[126] if those are covered under the measure. The more costly the measures (MAR2, MAR3) and the broader the scope (MEXTRA50 and MEXTRA100), the more likely the impacts will be on trade flows.

In contrast, third countries could benefit from the energy efficiency improvements induced by carbon pricing, should these vessels operate globally and not only in the EEA. The global shipping sector would also benefit from an EU context supporting innovation, in particular if part of the revenues are used for that purpose. Some neighbouring countries could also benefit from the EU initiative if evasion is taking place (e.g. Morocco, Russia).

When it comes to global measures, a political economic analysis (see in Annex 10) suggests that countries are more likely to agree on a global Market Based Measure once a regional measure is implemented. Some countries could however see benefits for their competitiveness if carbon pricing is only impacting the EU economy, but this is less likely to happen in a context where major economies are committing to long term net zero GHG emissions goals (e.g. Japan, China, Korea, the US, Canada, New Zealand).

The compatibility of an EU measure with a potential global measure is difficult to assess at this stage as no decision on such a global measure will be taken before 2023[127]. Divergences may come from the different regulated entities, policy objectives and levels of stringencies. Once an IMO measure is adopted, the EU measure should be reassessed.

It should also be mentioned that some international partners and stakeholders criticised the intention of the EU to implement a regional market based mechanism claiming that it would cause a negative impact on the global maritime decarbonisation discussion.

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[126] World Shipping Council communicated in the OPC that in a 2015 study, it was estimated that 12% of the containers passing in EU ports were in transit.
[127] as per the IMO Initial GHG Reduction Strategy

6.2.3 *Social impacts*

6.2.3.1 Impacts on employment

It is estimated that the EU shipping industry supported a total of 2 million jobs in 2018, both through its supply chain and through expenditure of workers (ECSA, 2020). In terms of direct jobs, the shipping sector employed 685,000 people in 2018 in various sub-sectors across the EU. This includes 365,000 jobs (53%) in freight transport (including towing and dredging), 255,000 jobs (37%) in passenger transport, plus a small number of jobs in service and offshore support vessels; renting and leasing. The split of land to sea is 17% - 83%.

Two types of impacts can be distinguished on jobs: the direct impact on employment and the indirect impact, related to changes of skills and knowledge of employees.

It is expected that all options could lead to an increase in employment in the wider shipping sector associated with the development of **abatement technologies, new sources of energy, digitalization and increased energy efficiency of shipping**. A closed ETS (MAR2) has the potential to increase jobs particularly in the shipping sector as this option focuses on in-sector emissions reductions and therefore could result in greater or more rapid innovation in the sector. MAR 4 requires carbon intensity reductions and is therefore likely to further encourage innovation in the sector. Revenues generated by the different options will support this tendency as long as revenues are spent in maritime decarbonisation. An extra-EEA scope will have more actors incentivised to innovate thus making it more likely to generate a larger impact on the jobs market.

Employment in European **ports and distribution hubs** is expected to rise along with an expected growth in trading activities[128]. However, if carbon evasion occurs, it could lead to a decreased level of shipping activities in certain ports and distribution hubs and lead to a potential reduction in employment. This could potentially have wider reaching impacts on the whole supply chain and the local community in which the port is located.

All policy options have little or no effect on the employment in the **commodity sectors** which rely on shipping for trade. The impact on employment largely follows the pattern of production in these sectors. The impact on jobs takes into account the direct effects

[128] UNCTAD Review of Maritime Transport 2020

from increasing transportation costs (i.e. higher prices for the goods transported) but also the indirect effects (higher production costs for industries which face higher costs of intermediate inputs) and induced effects (changes in final demand due to changes in income). The net impact of MAR1 applied on MEXTRA50 (including the FuelEU Maritime initiative) is negative but very small (2,500 fewer jobs in 2030 and 10,000 fewer jobs in 2050 at the EU level). Sectors will be impacted differently, with e.g. negative impacts on fossil fuel companies in 2050 and positive impacts for others (see Annex 10). However, the small negative effects on certain commodity sectors will be compensated by the overall positive impacts on employment in the broader maritime sector associated with the increase in innovation and more energy efficient technologies.

In the longer term, as new technologies and alternative (low/zero carbon) fuels become more prevalent, some **job requirements** will change and seafarers noticeably will require adequate trainings (this was also highlighted in the public consultation). Such changes will be linked to an increased digitalisation of the sector (e. g. smart routing) which will increase the demand for information systems jobs in the shipping sector. However, impacts on job requirements due to fuel changes would be primarily driven by the FuelEU Maritime initiative.

6.2.3.2 Impact on vulnerable households

Certain goods that rely on sea transport, for example fuels used for road transport, can make up a considerable proportion of household expenditure and variations in the price of these commodities can therefore have direct impacts on the disposable income of households. Changes in transportation costs could potentially affect household disposable incomes both through the supply (commodity prices) and the demand channels (employment and wages). The impact is differentiated by household income class depending on the consumption pattern and sources of income of each class. The estimated overall impact on welfare[129] is negative but small (EUR 77 million at the EU level in 2030, see detailed figures in Annex 10). When the effect is normalised to the income of each household class then the lowest income households seem to have a higher welfare loss than the average by 2050. However, the welfare loss for the low income decile is still marginal (around 0.015% of their income in 2050). This impact is based on MAR1 MEXTRA50, which also include the effect of the FuelEU Maritime initiative.

[129] Measured using hicksian equivalent variation which is a monetised welfare indicator and shows how much money must be given to the consumer to reach the new state of welfare. A positive number indicates a welfare improving effect.

While the impact on vulnerable households is estimated to be minimal, they could also potentially benefit from the generated revenues.

6.3 Extension of emissions trading to buildings and road transport/ all fossil fuels

This section analyses the environmental, economic and social impacts of the policy options for a further extension of the scope of the EU emissions trading beyond maritime transport as set out in Section 5.2.4 with a view to achieving the overall increase of ambition of GHG emission reductions for 2030. This includes administrative feasibility and related costs and synergies and coherence with related policies.

6.3.1 Environmental impacts

6.3.1.1 Impacts of option EXT1: Extension to buildings and road transport

Buildings and transport represent the bulk of fossil fuel CO_2 emissions covered by the ESR, with emissions of around 1.2 Gton[130]. To achieve EU-wide -55% GHG emission reductions compared to 1990, the two sectors are projected to achieve with the inclusion in an emissions trading system and in the context of a policy mix a reduction of -43% by 2030 compared to the 2005 level[131]. This compares to a reduction of -34% in the baseline scenario which is without changes to the legislative framework, and would thus ensure a further emission reduction by almost 10 percentage points. All MS would see additional emission reductions (see Annex 13 Section 47 for an overview table of projected emission reductions for all MS).

For comparison, under an extended ETS that would include current stationary sectors, intra-EU aviation and road transport and buildings, these sectors would need to reduce by 55% compared to 2005 by 2030. In the context of the modelled policy mix, the two new sectors would contribute one third of the absolute emission reductions between 2020 and 2030 of all sectors subject to EU carbon pricing to achieve the EU’s 2030 GHG target, with the other two thirds of the reduction falling upon the sectors in the existing ETS.

Covering the new sectors under an emissions trading system would provide for increased certainty in delivering these GHG emissions reductions, since the cap sets a limit on the emissions that economic operators can account for by surrendering allowances, with any

[130] Average 2016-18 emissions; See also Annex 5 Section 10.
[131] Results of the MIX scenario. In MIX-CP emission reductions are with -42% similar.

excess rendering them liable to high fines. Such certainty is not possible through other types of measures such as taxation. With buildings and road transport CO_2 emissions included in an ETS, around three quarters of the current total GHG emissions would be covered by EU-wide caps. Considering the evolution of emissions, the share of total emissions covered by emissions trading would be more than two thirds by 2030, twice as much as the existing ETS alone[132].

In an upstream system, it is important that the CO_2 price signal is passed on to the end-consumers of the fuels to create the right incentives for them to reduce emissions. As further analysed in Annex 5, Section 12.2, it seems very likely that this will be the case. End-consumers would thus have an additional economic incentive to reduce their direct emissions. This incentive is likely to counter possible rebound effects on emissions from efficiency improvements and the resulting cost reductions. It is likely to rise the lower the emission reductions through other measures are. It would also help in diffusing decarbonisation technologies more quickly, because the carbon price would reduce the payback time for energy efficiency or renewable energy investments in proportion to the increase in the fuel price resulting from adding the carbon price.

The environmental impact in MS also depends on the additionality to national measures under the ESR and to national carbon pricing measures, i.e. whether those MS that have carbon taxation will reduce/abolish them with the introduction of an EU wide carbon pricing system. In this context, the introduction of carbon pricing could foster additional supportive measures[133]. In 2020, only seven MS had explicit national carbon pricing instruments for buildings and transportation fuels in place: Denmark, Finland, France, Ireland, Portugal, Slovenia and Sweden. Prices range from 19 EUR/tCO_2 in Slovenia to around 115 EUR/tCO_2 in Sweden. The German national emissions trading system started in January 2021, with fixed increasing carbon prices initially starting from 25 EUR/tCO_2. The relative price impact, and therefore environmental impact will moreover be higher in MS where the existing level of other taxes on fossil fuels is low. Germany has indicated its interest to have its system replaced by an EU-wide system.

6.3.1.1.1 *Specific considerations for the buildings/ heating sector*

Examples of building technologies, which could be implemented profitably at carbon prices in the range of the PRIMES modelling results[134] are early replacement of boiler

[132] The exact percentage depends on if and how maritime transport would be also included.
[133] CERRE, Feasibility and impacts of EU ETS scope extension, December 2020.
[134] 2030 carbon price of EUR_{2015} 48 in MIX and EUR 80 in MIX-CP. Both scenarios include a mix of policies.

and other heating or cooling technical building systems, integrated heating and domestic hot water, insulation solutions, water heater replacements, ground source electric heat pumps for the commercial sector, biomass heating or electric heat pumps in the residential sector.

Even though demand for heating fuel is very inelastic to fuel prices in the short term, in the longer term household energy demand has been more price elastic, meaning that demand responds to a carbon price with elasticity values ranging from 0.23 to 0.5 in the EU and its MS[135].

Tackling other market barriers and failures in this sector, for instance due to split incentives, lack of access to finance, and lack of information, e.g. through the EED and EPBD revision, as well as the measures that would be encouraged by the Renovation Wave initiative (see also Section 6.3.5.2), could lead to a greater responsiveness to pricing but are not reflected in the elasticities. The IA accompanying the 2030 CTP has shown that adding carbon pricing for emissions from buildings to an unchanged current policy mix would deliver a ten percentage points higher reduction in emissions by 2030[136].

6.3.1.1.2 *Specific considerations for the road transport sector*

For the transport sector as well, it is important to emphasise that an emissions trading system should be considered only as a complementary measure to other transport policies: given the prevalence of a variety of market failures in the transport system, a mix of instruments will be required to help transform the sector. The most important instrument for tackling these issues are CO_2 emission standards for vehicles, for which the revision is the object of a parallel IA, which indicates that strengthened standards as of 2030 could deliver alone around 40 to 50% of the additional emission reductions in road transport in 2030[137]. The remaining reduction is delivered by all the other policies in the MIX scenario, including carbon pricing and regulatory measures to increase the market uptake of renewable and low carbon fuels. The CO_2 standards could usefully be complemented by pricing incentives which impact the fuel use in the entire vehicle stock (existing and new vehicles) and could increase the demand for more fuel-efficient vehicles (see also Section 6.3.5.2). Increasing the level of the CO_2 standards will contribute to increasing emission reductions and thus lower the carbon price required to

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[135] ICF et al. (2020).

[136] Comparing the carbon pricing focused scenario CPRICE, with 2030 carbon prices of EUR_{2015} 60, with the baseline scenario used in that IA.

[137] Amendment of the Regulation setting CO2 emission standards for cars and vans.

achieve the emission cap for the new ETS sectors set as described in Section 5.2.4.3. And lower CO_2 standard levels will contribute to increase the carbon price to achieve that cap.

Such pricing incentives could in addition support fuel shift towards low-carbon fuels, modal shift, as well as operational efficiency improvements, for all road transport. The carbon price would shorten the payback time on investments in more efficient vehicles and thus increase the incentive to switch to zero-emissions vehicles. Such changes and the removal of market barriers cannot be incentivised by either carbon pricing alone or standards alone.

Based on historical data, price elasticities (or how demand responds to a carbon price) in transport have been estimated to lie between 0.17 on average in the short term and 0.34 in the long term[138]. This would lead to reductions of around 1-3% of the fuel demand for the estimated carbon prices predicted up to 2030. The long-term elasticity of freight transport is higher than for passenger transport.

However, if policies tackling market failures and barriers are in place and transport decarbonisation is tackled in a holistic approach, emissions could be more responsive to pricing than predicted, implying that elasticity based estimates of emission reductions are on the conservative side. Furthermore, the elasticity based impact estimates could be too low in a situation where the system is close to a transition to electrification, where, if price expectations help convince a segment of the market to move to zero emission vehicles, the market introduction of these vehicles could be sped up. In this medium to long term, electrification of the road transport system would lead to inclusion of part of the sector into the existing ETS by default.

Examples of transport technologies which could be implemented profitably at carbon prices in the range of the modelling results are improved aerodynamics, engine efficiency, tyre resistance, reducing the weight of vehicles, more blending of biofuels as well as to a certain extent the switch to electric vehicles[139].

6.3.1.2 Impacts of option EXT2: Extension to all fossil fuel combustion

For an emission scope of all fossil fuels outside of the existing ETS (except maritime transport), current CO_2 emissions are around 1.4 Gton and the modelled level of reduction of emissions by 2030 compared to 2005 is in MIX also -43%. Two main sectors would be added to the scope of emissions under option EXT1: small emitters

[138] ICF et al (2020).

[139] Results from bottom-up modelling by ICF et al. (2020), using carbon prices between €30 and €90.

from the industry sector (around 60% of the emissions added to the scope compared to EXT1[140]) and off-road vehicles and machinery in agriculture, forestry and construction. Fugitive emissions[141] would remain in the scope of the ESR.

Reductions compared to modelled emissions in 2025 would be over 24% in 2030, making the speed of reduction in the second half of the decade roughly comparable to that expected from the road transport and buildings sector put together.

In the agricultural and forestry sector mitigation options such as biofuels are available, however with qualifications: for instance, in the case of agriculture and forestry tractors electrification has not yet achieved any significant market penetration due to the high investment costs and a limited offer. In the non-ETS industry, most emissions are caused by gas-generated heat generation for which electric heat is not always a possible alternative for these companies[142]. PRIMES results might overestimate the reductions, as the separation of small emitters in the modelling is difficult. Other analyses[143] find mitigation costs quickly exceeding €100/tCO_2, and higher than for EXT1.

6.3.1.3 Linking options

Neither ELINK1 nor ELINK2 would change the overall environmental outcome if existing and new ETS are looked at together. Abatement potentials analysis[144] indicates that if the current EU ETS and the new ETS for road transport and buildings were to be linked from the start as in ELINK2, and if cost-effective mitigation potentials turned out to be more difficult to realise in new ETS sectors, allowances would flow from the former to the latter.

6.3.2 Economic impacts

The general economic impacts of increased ETS and ESR ambition and various scenarios were assessed in Section 6.4 of the IA accompanying the 2030 CTP. The extension of emissions trading to the new sectors can assist in incentivising the cheapest reductions across MS, improving cost-effectiveness in these sectors[145].

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140 Sources : PRIMES. ICF et. al. (2020).

141 Fugitive emissions are emissions of gases or vapors from pressurized equipment due to leaks and other unintended or irregular releases of gases, mostly from industrial activities.

142 ICF et.al. (2020).

143 ICIS: Carbon Market Spotlight. Discussing sector extension options for the EU ETS. March 2021

144 ICF et. al. (2020).

145 The Effort Sharing Regulation Impact Assessment includes an analysis of sectoral energy system costs of the whole Fit for 55 package per Member State group including also the transport and building sector.

Introducing carbon pricing of fossil fuel use can contribute to significant savings of fossil fuel imports (of around €83 billion over the period 2021 to 2030) notably in transport but also buildings[146]. It also contributes to improvements of energy security by reducing the energy dependency ratio (e.g. for 2030 from 54.5% in REF to 52.9% in MIX-CP). Strengthening other policies in the mix improves this further (2030 in MIX: 52.5%).

6.3.2.1 Option EXT1: Extension to buildings and road transport

6.3.2.1.1 *Impact on investment*

Carbon pricing increases energy costs for consumers but at the same time raises revenues which can be used for reinvestments, for stimulating climate action and to address social or distributional impacts of carbon pricing. The annual revenues could be large, and, once the new ETS is operational, significantly higher than in the existing ETS (see Annex 13), as all the allowances in the new ETS would be auctioned.

The IA for the 2030 CTP[147] recognised that there is an investment challenge linked to the higher climate ambition in particular in the residential and tertiary buildings sectors irrespective of the scenario concerned. It found that the additional investments needed in the MIX scenario to meet the higher ambition targets compared to baseline would remain skewed towards the demand side, dominated by residential investment. In order to achieve the additional level of private and public investment, EU wide around EUR 40bn for residential and around EUR 15bn for tertiary would need to be mobilised annually. The bulk of the increase is required to improve thermal efficiency of buildings and to reduce share of fossil fuels in heating, with substantial additional investment also in office buildings in the tertiary sector for similar purposes.

Concerning the residential sector specifically, additional investment will be required so that total investment expenditures as a percentage of household consumption are likely to rise. Table 20 below gives an estimate of rises in annual capital cost as a percentage of consumption between Reference, and the MIX and MIX-CP policy scenarios. These estimates cover cumulative impacts of ETS extension and other policies, e.g. strengthened energy efficiency and renewable energy policies. The expenditure rises are provided as an average characterising different groups of MS: those with a GDP per capita below 60% of the EU average, those with a GDP per capita between 60% and 100% of the EU average, and those with a GDP per capita above the EU average.

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[146] See SWD(2020)376, Section 6.4.1.4, comparing results of the carbon price driven CPRICE scenario, with similar 2030 carbon prices as MIX-CP, with BSL.

[147] See Sections 6.4.1.3 and 9.5.2.2.

The table shows that residential investment expenditures are expected to increase in 2030 in the EU by 0.4 to 0.7 percentage points of household income compared to baseline. In a more carbon price driven policy setting, investment expenditures increase less strongly than in a more balanced policy mix[148], while fuel expenditures show the opposite picture (see below Section 6.3.3.1.1). Investment increases in MIX are well above EU average in MS with a GDP per capita below 60% of the EU average. However, large fuel expenditure reductions would be realised as well, if such investment expenditures, in housing stock renovation and energy efficient equipment, would take place.

Table 20: Annual residential sector capital costs as a percentage of household consumption in 2030, percentage point difference compared to Reference

Annual residential sector capital costs		**All households**	**Lower income Households**
EU	**MIX**	0.71%	1.43%
	MIX-CP	0.38%	0.70%
MS < 60% GDP/Capita	**MIX**	0.97%	1.99%
	MIX-CP	0.81%	1.62%
MS between 60-100% GDP/Capita	**MIX**	0.81%	1.92%
	MIX-CP	0.25%	0.48%
MS > 100% GDP/Capita	**MIX**	0.62%	1.14%
	MIX-CP	0.36%	0.62%

Source: PRIMES.

With regards to road transport, the Sustainable and Smart Mobility Strategy (SSMS) and the IA accompanying the 2030 CTP have recognised the central importance which investments aimed at boosting demand for zero- and low-emission vehicles and at accelerating the rollout of recharging and refueling infrastructure for these vehicles will play in achieving the goal of decarbonising significantly road transport by 2030.

For example, the SSMS estimated that by 2030, 30 million zero-emission vehicles could be on the road in the EU and require 3 million publicly accessible charging points (of which 2 million to be added between 2025 and 2030) together with the development of

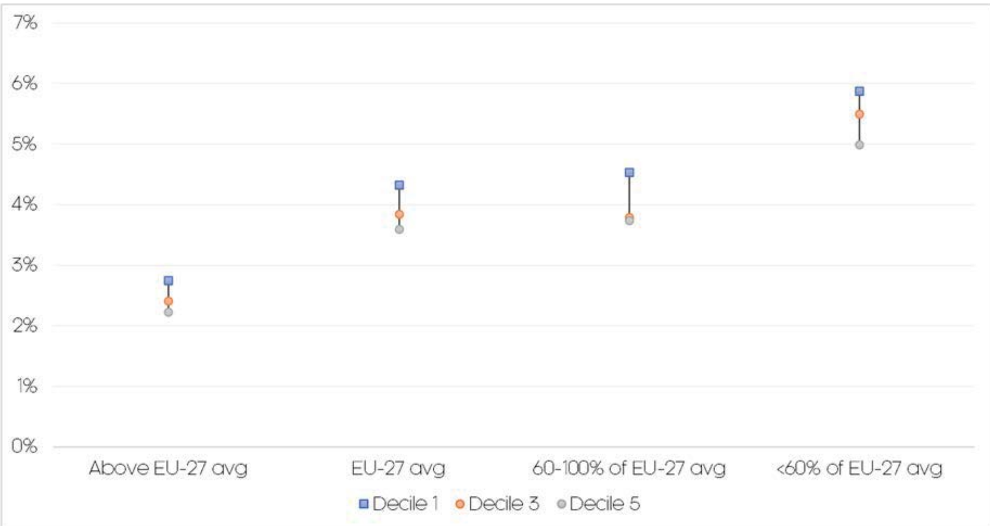
[148] As the Impact Assessment accompanying the 2030 CTP has shown, investment expenditures increase most strongly in a -55% policy scenario without extended carbon pricing.

home charging. The investment required for the installation of this number of public charging points, a (which should include equipment, installation and grid upgrades), also tackled by the revision of Directive 2014/94/EU on the deployment of alternative fuels infrastructure, and for home charging should be significant[149].

6.3.2.1.2 *Impact on fuel costs, consumers and economic actors*

The introduction of a carbon price would increase end-consumer prices for fossil fuels (household heating and cooling expenditure and gasoline for vehicles) to a different degree depending on the carbon price levels and on the underlying relative level of existing other taxes on fossil fuels.

Figure 8: Share of Household fossil fuel energy expenditure in total final consumption expenditure in EU-27 countries grouped by GDP per capita (above EU-27 avg, 60-100% of EU-27 avg, <60% of EU-27 avg), and country group averages, in Decile 1, 3 and 5, %



Source: ICF et al. (2020) (forthcoming) assessment for the European Commission – Potential extension of the EU ETS. Data is for the latest available year for all the countries (oldest year: 2010, latest year: 2015). Split into country groups by GDP/capita, within group ordered by share of expenditure in total final consumption expenditure in Middle class households (Decile 5), largest to smallest. Fossil fuel expenditure is without *carbon pricing.*

The impact of this increase in fuel prices on fuel costs is projected to be mitigated by an overall decrease in the demand for fossil fuels. In addition, the relative increase in fuel costs has also to be considered in relation to the current share of fossil fuel costs in

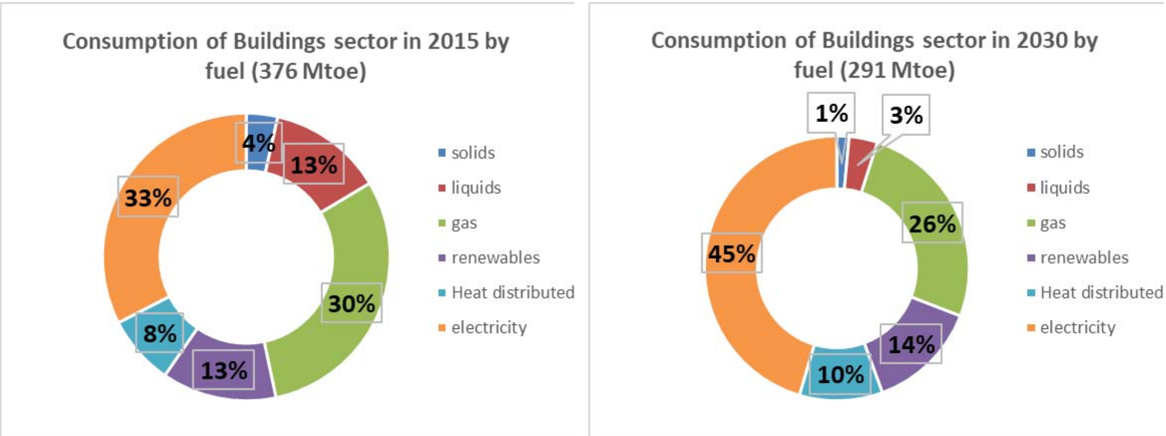
[149] See also T&E RechargeEU, Jan. 2020. ICCT working paper 2019-14. The SSMS also targets 1000 public hydrogen refuelling stations by 2025.

household expenditure which differs between MS and household groups, as shown in Figure 8.

In the buildings sector, the impact will be larger for households that use coal for heating, and even more so in lower income MS that have relatively cheap and low taxed coal available.

With the introduction of a carbon price, coal end user prices would increase significantly (see Section 6.3.3.2) in the low income MS concerned. However, at EU level the share of coal in the overall mix of fuels used for heating is relatively small even though the share of relative emissions are higher (see Figure 9) so that targeted measures could be taken to ease the transition for the consumers concerned and support cleaner systems such as (geothermal) heat pumps.

Figure 9: Energy consumption of the residential sector by fuel (EU-27)



Source: PRIMES, MIX scenario

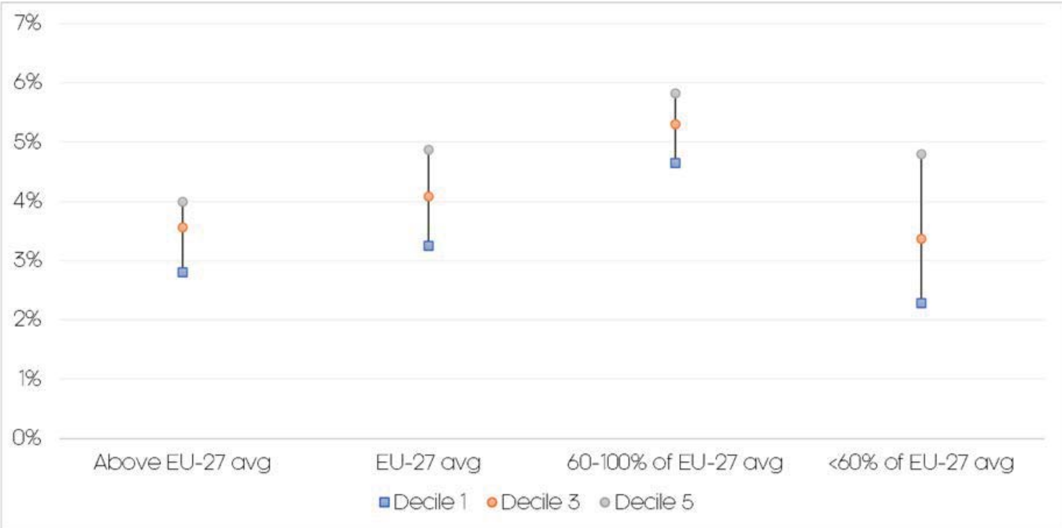
By contrast, at a similar level of carbon price the impacts on consumer prices for natural gas and for heating oil are much lower than for coal, because end user prices are generally higher also in lower income MS (see

Figure 11 and Figure 12 in Section 6.2.3.1 for the impacts on end consumer prices).

In the road transport sector, the impact on consumer prices (see Section 6.3.3.1 for more detail) and therefore on fuel costs will be largest in those MS which currently apply the lowest excise duties on diesel and on petrol, but the situation is more contrasted than for the buildings sector as several lower income MS apply high taxes on petrol and diesel. Clearly, the cost efficiency of the ETS at achieving additional emissions abatements might be limited by the current heterogeneity of the national fuel tax landscape (see also Annex 5, Section 16.4).

In addition, the initial share of transport fuel costs within total final consumption expenditure tend to be the higher at least for medium income households, and clearly lowest for the poorer households (Decile 1)[150]. Largely explained by this, an increase in transport fuel costs would have the relatively largest impact for medium income households, while the relative increase in transport fuel expenditure (at the expense of other types of expenditure) is also notable for most countries' lower-middle class households (see Figure 10).

Figure 10: Share of Household transport fuel expenditure in total final consumption expenditure in EU-27 countries grouped by GDP per capita (above EU-27 avg, 60-100% of EU-27 avg, <60% of EU-27 avg), and country group averages, in Decile 1, 3 and 5, %)



Source: ICF et al. (2020). Fossil fuel expenditure is without carbon pricing.

Another impact for consumer choice is that covering building emissions with a new ETS would correct to some degree the current absence of a level playing field in terms of carbon pricing of domestic fossil-fuelled heating systems with district heating and electric heating already now covered by the ETS. The latter amount to around 30% of EU direct and indirect heating emissions, with significantly higher shares in a number of MS. Covering road transport emissions with the new ETS would also correct the absence of a level playing field between fossil-fuelled road transport and electric vehicles and electrified rail, which is already covered by the existing ETS.

[150] ICF et. al.

A carbon price of around 48€ as in MIX for 2030[151] would increase fuel prices by 11 ct/l (petrol) to 13 ct/l (diesel) which seems unlikely to drive much refuelling and tank tourism out of the EU. It can be safely assumed that transport companies already exploit existing fuel price differentials with countries neighbouring the EU, and that the fuel price increase from the carbon price would not change the situation in any significant way[152].

6.3.2.1.3 *Impact on the business of regulated entities*

As described in Section 5.2.4.3, the extension of emissions trading to the new sectors would be an upstream system, whereby the compliance obligation concerns the act of releasing on the market fossil fuels for combustion in the sectors concerned. Therefore the regulated entities would not be the emitters and would pass on the carbon cost to the individual emitters, but would also bear the compliance costs.

In order to acquire the correct number of allowances, the regulated entities must estimate the fuel volumes they will supply. They will need to manage their carbon allowance needs and may need to trade allowances if they have a surplus or shortage. They may need to call upon advisors such as corporate banks to provide them with advice and services to manage their carbon needs and to hedge against the risk of rising prices. This would come at a cost.[153] There are also costs for regulated entities associated with the monitoring and reporting of fuel quantities (see Section 6.3.4). The question arises whether there is a need to provide some kind of exemptions for small entities. This question is especially pertinent with respect to the regulation of coal, as there are many, sometimes very small coal suppliers which until now are hardly regulated.

Excluding small entities from the new ETS may seem advantageous in terms of limiting burden and impact for the entities concerned; however, this advantage would have to be weighed against the resulting environmental impact. Also, a system with de minimis thresholds such as the one used for the ETS does not seem appropriate in the case of the fuel-supply based new ETS. In the case of the new ETS, there is a risk that such de minimis approach would trigger avoidance of the rules by organising businesses such that they remain under the thresholds. Alternative mechanisms to reduce the burden can be considered, such as facilitating the access by small entities to auctions for example by allowing them to form business groups that can bid on their behalf in auctions.

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[151] In MIX-CP with less stringent complementary policies the 2030 carbon price for new ETS sectors is EUR_{2015} 80.

[152] ICF et. al. (2020).

[153] See in relation to the German domestic emissions trading system: IW-Gutachten, Nationaler Emissionshandel für Verkehr und Wärme.

6.3.2.2 Option EXT2: Extension of emissions trading to all fossil fuel combustion

The economic impacts of EXT1 apply also for EXT2. Annual ETS revenues for the period 2026 to 2030 could also be significant (see Annex 13) and higher than under EXT1, depending on the extent of provisions against the risk of carbon leakage for small industry. As mentioned in Section 6.3.1.2, in this option around 60% of the emissions added to the scope of EXT1 would come from small industry.

Small emitters from the industry which fall under the scope of the ETS Directive could and have largely been opted out subject to measures that should achieve an equivalent contribution to emission reductions as if they would have under the EU ETS. The reason for such exclusion was that administrative costs for full MRV[154] were found to be too high for these emitters compared to the carbon price for the emissions. Another reason for these SMEs was that for some sectors international competitiveness is of high concern, and the additional administrative complexity and costs which would arise at all levels (local, national and EU) if carbon leakage measures are required could make equivalent policy approaches more efficient[155].

A reason for including the small industry as in EXT2 could be if the equivalent measures were to deliver insufficient reduction in emissions. However, the monitoring under the ETS Directive for the opted-out installations subject to equivalent measures under Art. 27 suggests that these measures deliver emission reductions as intended[156]. In addition, where there is a risk of carbon leakage for SMEs, a framework for compensation would need to be considered (see Section 6.3.4) which is likely to generate additional administrative complexity and costs in view of the large number of these small or very small emitters.

6.3.2.3 Linking options

According to the abovementioned considerations on the differences in emission abatement potentials between sectors, and if complementary policies were not as effective as assumed in MIX, prices in the new ETS could be quite different and potentially higher than in the existing ETS. This is illustrated by MIX-CP where the 2030 carbon prices are EUR_{2015} 52.5 in the current ETS and 80 in the new ETS sectors.

[154] Articles 27 and 27a of the ETS Directive allow for simplified MRV.
[155] Umweltbundesamt et al.; Evaluation of the EU ETS Directive, 09/2015.
[156] An estimate gives emissions reduction between the average of 2008-2010 and 2018 of around 18%.

Allowing for allowances to flow from the new ETS to the existing ETS as in ELINK2 could contain the abatement costs, but it could put pressure on industrial sectors.

A full linking of the two systems as in option ELINK1, , could allow limiting the risk of high prices in the new ETS and the same GHG reductions could be achieved at lower cost as without linking[157]. However, conversely, linking the systems could increase the risks for the current EU ETS. Linking the systems gradually, once the price in the new system has stabilised, could mitigate these risks.

6.3.3 Social impacts

6.3.3.1 Impact on employment

The macro-economic analysis conducted as part of the Impact Assessment accompanying the 2030 CTP concluded that the impact of an increas if climate ambition to -55% on aggregate employment would be relatively limited. The employment impacts is positive if carbon pricing revenues are recycled to either lower other taxes or to support energy efficiency investment[158].

An extension of emissions trading in both EXT1 and EXT2 options is hence expected to have small effect on the employment as a whole. However significant shifts in the sectoral composition of employment and associated job changes that workers will have to go through are expected over the next decade, which would generate challenges for the labour force and potential mismatches between skills available and the skills requirements. These have been analysed in the Impact Assessment underpinning the 2030 CTP. Oil and gas supply belong to the sectors with significant projected employment decreases.

Table 21: Impacts of 55% reduction on EU sectoral employment related to buildings, transport and other fossil fuel use (deviation from baseline across scenarios, in percent)

Employment vs. baseline, 2030	**Fragmented action**	**Global action**
Oil	-5.2 | -3.1	-7.9 | -5.7
Gas	-11.2 | -8.5	-7.9 | -5.8
Construction	0.3 | 0.6	-0.1 | 0.4

157 ICF et al. (2020).

158 SWD(2020)176, Section 6.4.2

Other equipment goods	-0.3 | 0.4	2.0 | 2.8
Transport (land)	-0.5 | 0.0	-0.7 | 0.1
Market services	-0.3 | 0.1	-1.4 | -0.7

Source: SWD(2020)176, JRC-GEM-E3 model (see scenario explanation in Section 6.1.3.1)

Sectors that are likely to gain most significantly include construction, notably through more green employment. The need for measures to increase the energy efficiency and decarbonise heating of buildings triggers higher employment in construction and often also in the equipment goods industry. Employment in land transport is either stable or could slightly decrease. Market services, by far the largest provider of jobs in the EU, would be affected relatively little.

6.3.3.2 Impact on lower-income and vulnerable households

6.3.3.2.1 *Option EXT1: Extension of emissions trading to buildings and road transport*

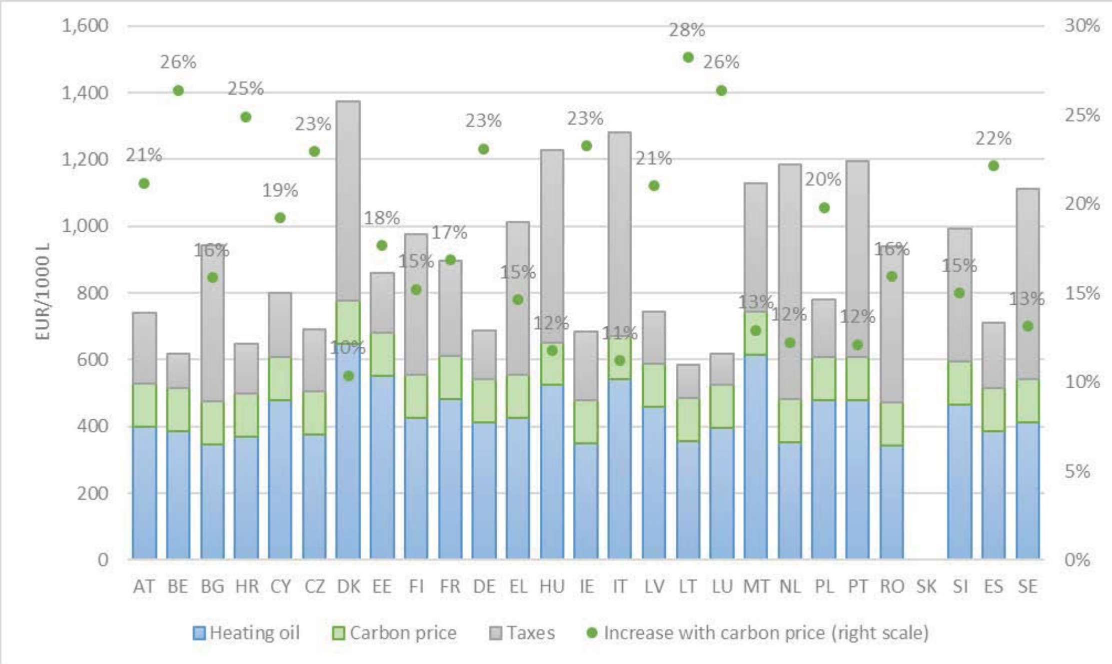
Energy costs and expenditure on transports represents an important share of total final expenditure of lower to middle-class households, even in rich countries. The introduction of emissions trading in road transport and buildings will increase the price of energy and therefore the energy costs for households, independently from their income. According to Eurostat data on consumption expenditure[159], energy expenditures rise with income, but as a share of disposable income, energy expenditures decline with higher incomes.

This means that an emissions trading system for buildings will not affect households equally, but would likely have a regressive impact on disposable income, as low income households tend to spend a greater proportion of their income on heating[160]. In addition, the introduction of a harmonised carbon price will have a very different impact on consumer prices in MS depending on the existing level of taxes on the fuels concerned, as pre-tax prices of fossil fuels are comparable across MS.

[159] ICF et al. (2020); Eurostat Structure of consumption expenditure by income quintile and COICOP consumption purpose. https://ec.europa.eu/eurostat/web/products-datasets/product?code=hbs_str_t223

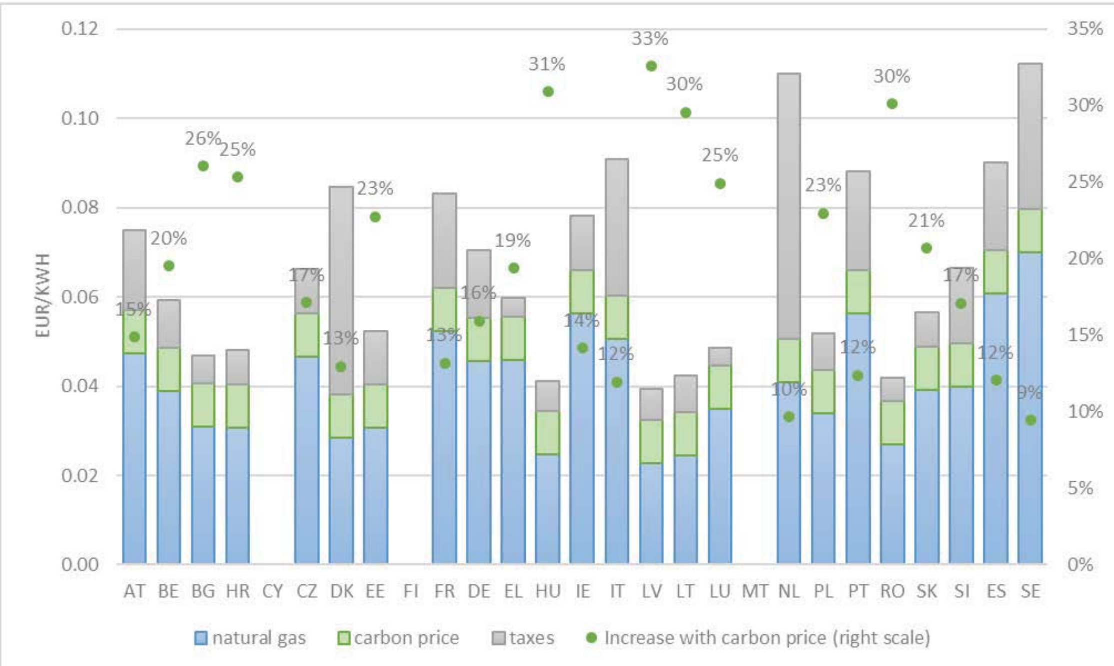
[160] ICF et al. (2020).

Figure 11: Impact of carbon price on consumer prices per Member State – heating oil)



Source: Oil Price Bulletin, EU Commission. Average June 2020 –May 2021 pre-tax prices and taxes and assuming a carbon price of EUR 48 /tonne CO_2. Percentages mentioned in Figures 11 and 12 represent the increase in consumers prices due to the extended emissions trading

Figure 12: Impact of carbon price on consumer prices per Member State – natural gas)



Source: Eurostat, Note: CY, MT and FI do not report natural gas prices in the household sector. 2020 prices assuming a carbon price of EUR 48 /tonne CO_2.

With regards to coal, as it is very little taxed the impact on consumer prices of a EUR 48 carbon price would be comparatively much larger than for natural gas or heating oil with an EU average impact estimated at 52% and up to nearly 100% in few Member States.

For the residential sector specifically, energy poverty issues are of special importance to investigate. For this it is important to see how the described fuel price increases translate into increased fuel expenditures for different household groups, which depends on the investments made to reduce fuel use. Figure 8 in Section 6.3.2.1.2 has shown based on statistical data that the impact on the lowest income decile is more significant than on the third decile and fifth decile. Table 22 below gives an estimate of rises in fuel expenditures as a percentage of household consumption expenditures between Reference and the MIX and MIX-CP policy scenarios. These estimates cover cumulative impacts of emissions trading and other policies, e.g. the revision of the energy taxation directive. The expenditure changes are estimated for low, medium and high income groups as defined according to modelling, and provided for three GDP groups of MS: those with a GDP per capita below 60% of the EU average, those with a GDP per capita between 60% and 100% of the EU average, and those with a GDP per capita above the EU average. The figures between the income groups are not necessarily comparable, as the high, medium and low income groups are defined relative to the average income of a MS. Note that there are therefore uncertainties involved in the aggregation within the groups.

Table 22: Fuel expenditure only as a percentage of household overall consumption expenditure in 2030 compared to Reference

Fuel Expenditures only		Lower income Households	Medium income households	High income households	All households
EU	MIX	-0.27%	-0.11%	-0.04%	-0.12%
	MIX-CP	0.07%	0.05%	0.07%	0.06%
MS < 60% GDP/Capita	MIX	0.15%	0.08%	0.15%	0.12%
	MIX-CP	0.62%	0.30%	0.28%	0.36%
MS between 60-100% GDP/Capita	MIX	-0.42%	-0.14%	-0.07%	-0.18%
	MIX-CP	-0.09%	-0.02%	0.01%	-0.02%
MS > 100% GDP/Capita	MIX	-0.29%	-0.13%	-0.07%	-0.14%
	MIX-CP	0.04%	0.04%	0.04%	0.04%

Source: PRIMES.

Overall fuel expenditures as percentage of income remain near stable. In the more ETS driven policy scenario (MIX-CP), they are projected to increase EU-wide on average by 0.06 percentage point. In the more balanced policy scenario (MIX), fuel expenditures as percentage of income are likely to drop by 0.12 percentage point. This means that there can be fuel expenditure savings despite the price increases, under the condition that the cost-effective investments to achieve -55% emission reductions (see above Section 6.3.2.1.1) are realised and hence less fossil fuels are used.

As Table 20 in that section also shows that in a cost-effective policy mix the investment expenditure increases for lower income households would be across all MS income groups over double of the average household. If these investments are realised, then on average for lower income households (drop of 0.27 percentage points in MIX) the picture looks better than for the average household. For the low-income Member State group the share of fuel expenditures in household consumption expenditures rises across all income groups, by around 0.12 to 0.36 percentage points on average and by 0.15 to 0.62 percentage points for low-income households.

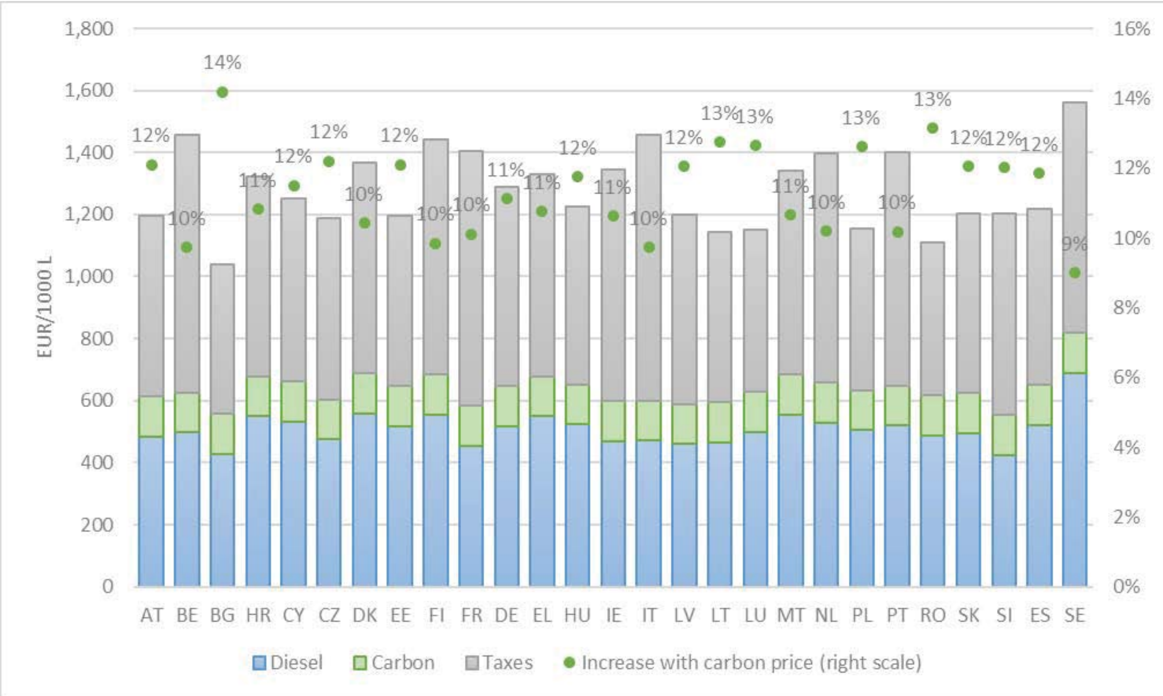
According to the modelling results, the general key challenge in the residential sector is hence to ensure that the necessary energy efficiency, refurbishment and renewable energy investments (see Table 20 in Section 6.3.2.1.1 above) take place including in lower-income households. Taking this into account, the challenge of fuel price increases remains limited and focused on lower-income households in low-income MS.

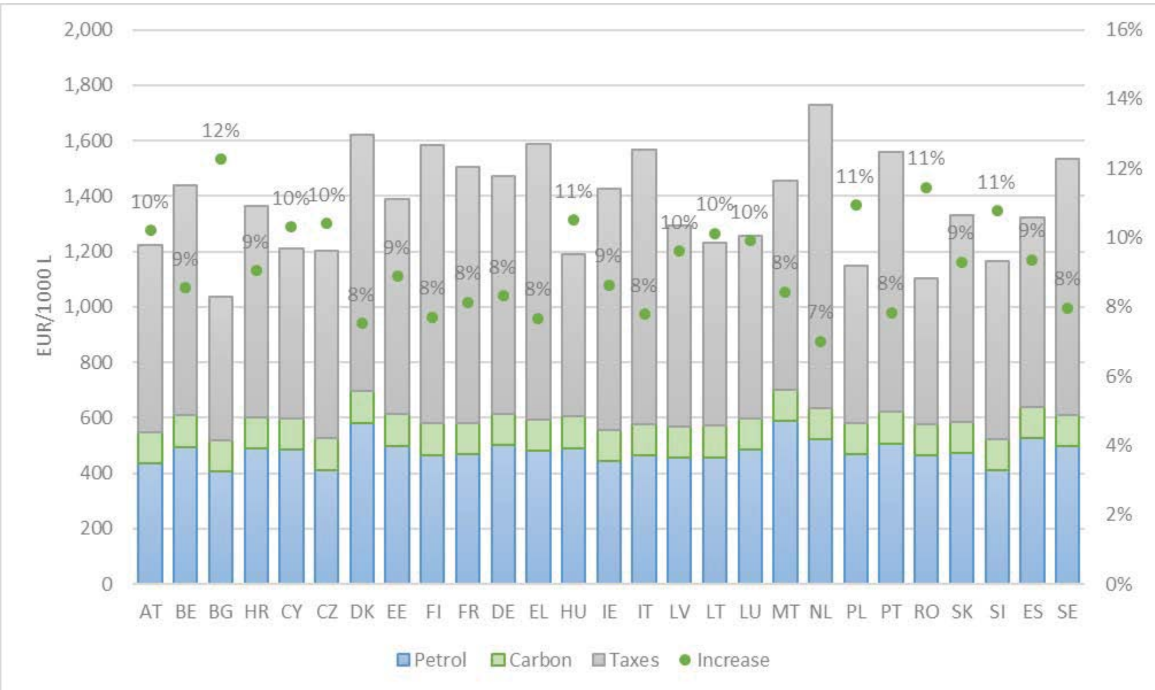
In the case of house heating energy expenses, there is a large variance across countries due to the initial share of natural gas in households' energy mix.

Road transport impacts are mixed – typically it is the 'lower-middle' and 'middle' parts of the household income classes where the proportion of spending on transport is highest (because the lowest income households do not have access to a private vehicle)[161].

[161] ICF et al. (2020).

Figure 13: Impact of carbon price on consumer prices per Member State – (diesel and petrol for road transport)





Source: Oil Price Bulletin, EU Commission. Average June 2020 –May 2021 pre-tax prices and taxes and assuming a carbon price of EUR 48 /tonne CO_2

Revenues from the auctioning of allowances can be used through different redistributive mechanisms as compensation to the regulated entities and the consumers (reduction in income tax, employer's social security contributions and VAT), invest in energy efficiency or in renewables, or other options. Also rules mitigating excessive short term price increases could be considered (see Annex 5, Section 11).

The social impacts could be mitigated with a multi-faceted policy approach at EU and national levels. At EU level, the initiatives include the Energy Poverty Observatory[162] which supports MS' efforts in alleviating and monitoring energy poverty; the Recovery and Resilience Facility[163] has earmarked significant expenditure for climate investment and the green transition; and the European Pillar of Social Rights action plan aims for a socially fair and just green transition for all Europeans. At national level, the NECPs submitted by the MS pursuant to the Governance Regulation[164] give a detailed overview of existing policies tackling energy poverty. Mitigation policies and measures at national level can be of the following types: aim at improving the energy situation of households by financing improvements in energy efficiency; provide financial assistance to reduce energy bills; provide advice view energy audits; introduce measures such as protection against disconnection for vulnerable households.

The Impact Assessment for the Revision of the Energy Taxation Directive can provide further insight, as it has considered the impacts on households per income decile in selected countries. While initial impacts can be mildly regressive, the impact assessment shows that revenue recycling can, in theory, fully resolve the distributional issues which arise, confirming a similar result obtained in the IA accompanying the 2030 CTP.

6.3.3.2.2 *Option EXT2:* Extension of emissions trading to all fossil fuel:

In addition to the impacts explained above under EXT1, EXT2 would cover more sectors, such as agriculture. It can therefore have a larger impact on rural areas.

6.3.3.3 Other social impacts

In the EU heating of buildings is a main sectoral source of fine particles with a diameter of 2.5 µg or less (PM2.5), while road transport is the main sector producing NO_x emissions[165]. These pollutants have significant adverse effects on human health and can cause respiratory and cardio-vascular diseases, among others. They are also at the root of premature deaths. An ETS extension as under EXT1 and EXT2 likely contributes to

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162 C(2020)9600 Commission recommendation on energy poverty, October 2020.
163 Regulation (EU) 2021/241.
164 Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action.
165 European Environment Agency: Air quality in Europe – 2020 Report. EEA Report No.9/2020.

positive health impacts due to overall reduced air pollution from fossil fuel use. For example, in 2030 premature deaths and life years lost due to PM2.5 emissions are around 8% lower in MIX than in REF[166]. This typically benefits lower-income and vulnerable households more as they are more affected by air pollution[167].

6.3.4 Administrative impacts

Extending emissions trading to the road transport and building sectors or to all fossil fuels, implies setting up a completely new system alongside the existing ETS, with another type of compliance companies (fuel suppliers rather than final emitters). This brings challenges from a regulatory and administrative point of view, as well as costs for the public sector and for the regulated entities. For both options EXT1 and EXT2, one-time administrative costs, regularly occurring administrative costs and cost for disclosure and sanctioning can be identified due to the establishments of a new ETS system. Lessons learnt form the experience of existing ETS can be taken into account and existing infrastructure (such as the Registry) can be used. Additionally, at least for oil and gas, entities that could be regulated under the new ETS are already regulated for other policy purposes, and therefore there could be room to use the already existing corresponding infrastructure also for the purposes of meeting their obligations under the new ETS.

Extension of emissions trading to the road transport and building sectors or to all fossil fuels will require to put in place and design a robust and feasible system for Monitoring, Reporting and Verification (MRV) of emissions. The monitoring and reporting rules that would be adopted for the upstream regulated entities would in principle not be more complex as compared to the existing ETS system. This is because in the new sectors, only sales of largely standardised fuels for combustion purposes would be monitored. As the Impact Assessment accompanying the 2030 CTP articulates, the calculation of emissions will continue to rely on emission factors. To the extent possible and subject to further analysis, the existing ETS system of standardised fuel emission factors per energy content would be applied.

Provisions related to auctioning, to the use of the Union Registry and to enforcement and compliance measures will also need to be put in place. The infrastructure of the existing

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[166] Annex 3 of the Effort Sharing Regulation impact assessment (SWD(2021)611) analyses benefits per Member State groups.

[167] EEA: Unequal exposure and unequal impacts: social vulnerability to air pollution, noise and extreme temperatures in Europe, EEA Report No 22/2018.

ETS, even if used to a certain extent, will need adaptations and reinforcement. Because the ETS regulatory framework has proven to work well and in light of the fact that a future linking and/or merging of the two systems is a possibility, it is appropriate to design the regulatory framework for the new ETS along the same lines and make it as compatible as possible with that of the existing ETS (Registry, MRV rules, auctioning rules, compliance cycle).

In the case of option EXT2, a framework on free allocation or alternative compensatory measures would need to be considered in addition, because of the risk of carbon leakage at the level of the end-consumers of the fuel.

Secondly, an extension to new sectors will create cost related to the setting in place and the operating of the system for regulated entities and for the competent authorities, including in terms of human resources and IT infrastructure. For regulated entities, participation in the system will at least trigger costs related to obtaining the GHG permit, open and maintain registry account(s), comply with the MRV rules (preparing and updating the monitoring plan, implementing its procedures, monitoring and reporting, verification fees charged by the independent verifier), and purchasing and surrendering allowances. Administrative costs include fees for the use of the registry, which are different across MS[168].

Public competent authorities will have at least costs related to the preparation, implementation and running of the system, and the establishment of a compliance system. Non-recurring costs to implement the system can also be foreseen as setup registry accounts and processes. It can also be foreseen recurrent costs as the helpdesk function, approval of permits, monitoring plans, review verification statement, registry handling and other costs as preparing guidance documents, translations, meetings, website updates. The number of regulated entities administered by each MS, the administrative structure and the allocation of responsibilities among the different levels of administration can also entail different costs among MS.

Both under option EXT1 and EXT2, as the system would be based on volumes of fuel supplied, the new MRV system would share more similarities with the MRV applicable to aviation both in terms of costs and obligations. Under option EXT2, free allocation for small industry would increase administrative costs for public authorities as well as for small industry.

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[168] https://ec.europa.eu/clima/policies/ets/registry_en#tab-0-1

Both for EXT 1 and EXT2, it is expected that administrative burden will be moderate in the case of oil and gas, and high in the case of coal, due to the specificities of the supply chains. Further details, together with an illustrative cost estimate for coal under EXT1 are presented in Annex 5, Section 12.3.

As mentioned in Section 5.2.2.3, the point of regulation needs to fit the different EU MS. In particular with respect to gas and coal where there is no EU harmonised excise duty system, it could be considered to propose in EU legislation a default point of regulation while allowing MS to deviate from this if there are justified reasons. Where relevant, this could allow the MS to limit the administrative impacts, both on the side of the public authorities and/or the regulated entities.

In setting an upstream system, complexities related to the tracking of fuel over the supply chain and boundaries issues can arise, together with the risk of double burden and loopholes. Double burden may occur when an ETS operator surrenders allowances to comply with ETS obligations and pays a carbon price on fuel used as a result of obligations under the new ETS. For instance, an industrial installation covered by the existing ETS that pays a carbon price for the reported emissions downstream and also pays a carbon price for the fuel purchased at the point of sale. There is therefore a double coverage of fuel being supplied to installations already covered by the ETS. This may require compensation regimes as *ex-ante* exemptions to the fuels suppliers or *ex-post* compensation of the downstream regulated entity when double burden occurs and carbon price is payed twice.

Loopholes would lead to evasion of the carbon price (for example non-ETS gas consumers in a large industrial zone connected to the TSO that do not purchase their gas from a supplier). Loopholes and double burden requires the fuel supplier to differentiate on the intended use and destination of the fuel, and in particular if, when combusted, the fuel will incur with a compliance obligation. This is also linked with the monitoring, reporting and verification design for these sectors.

As regards the different linking options there would be little differences as regards administrative impacts.

Finally, difficulties related to implementation can also be identified in the interactions between the energy efficiency obligation schemes[169] under the Energy Efficiency Directive (EED) and the possible extension of emissions trading to buildings as in option EXT1. Both instruments would to some extent rely on the same regulated entities, the energy suppliers. Indeed, not only energy suppliers might be regulated under both schemes, but also the obligated entities under the energy savings obligation schemes might be defined differently among the different MS[170]. Article 7a of the EED establishes that MS shall designate obligated parties among energy distributors, retail energy sales companies and transport fuel distributors or transport fuel retailers operating in their territory. Annex 5 provides for more details on regulated entities.

6.3.5 Coherence with other elements of the regulatory framework

The vast majority of respondents to the OPC, from a broad range of stakeholder groups, endorsed the maintenance of the Effort Sharing Regulation and the deployment of other sector-specific policies when extending the use of emissions trading to emissions from buildings, road transport or all fossil fuel combustion. CO_2 standards for cars and vans, transport policies, policies addressing energy efficiency of buildings and renewable energy policies as well as, to a lesser degree, energy taxation.

6.3.5.1 Interactions with the Effort Sharing Regulation

Emissions from road transport, buildings and other fossil fuel combustion are already covered by the Effort Sharing Regulation (ESR). If the ESR continues to cover these sectors, European carbon pricing via the ETS could possibly be seen as a double regulation. However, while EU-wide carbon pricing has shown to provide important incentives for cost-effective emissions reductions, it has been deemed that a continued accountability and action by MS for national emission reductions in these sectors incentivised by national targets under the ESR would not lead to inefficiencies, but rather lead to important synergies (for a detailed analysis of double coverage, see Section 6.1.6 of the impact assessment for the ESR review). This view has also been voiced by a large number of stakeholders in the public consultation on the ESR.

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[169] Under articles 7 and 7a of the Energy Efficiency Directive, amended by Directive 2018/2002, MS must set up an energy efficiency obligation scheme, which requires energy companies to achieve yearly energy savings of 1.5% of annual sales to final consumers.

[170] Most MS have chosen to obligate energy suppliers. However, in Denmark and Italy distribution companies are obligated, in Portugal the obligation is held by a non-profit private entity with a public function.

Different sectors covered by the ESR are already affected by a range of regulatory EU measures covering one or several sectors (see also following subsections). EU-wide carbon pricing through extended emissions trading can be seen as additional measure in the policy mix, contributing to achieving the enhanced ESR targets in a subset of the ESR sectors in a consistent way. The additional economic emission reduction incentives would cover around 50% (EXT1) or around 60% (EXT2) of ESR emissions, with a cap consistent with the cost-effective contributions of those sectors. Thus there is no distortion of the contributions of ESR sectors not covered by EU-wide carbon pricing.

Moreover, national measures that address non-price barriers or make alternative solutions available can make carbon pricing work better. Together with other measures discussed in the following subsections, this increases the credibility that a new ETS starting by the middle of the decade can deliver meaningful reductions in line with -55%.

The interactions between the ETS extension and ESR are assessed in more detail in the Impact Assessment of the ESR review. On the administrative implications of a possible parallel coverage of emissions see also Annex 5, Section 16.1.

6.3.5.2 Interaction between EXT1 and the other regulatory framework

There are clear complementarities between option EXT1 and the existing regulatory framework applying to **buildings**, notably the Energy Performance of Buildings Directive, the Energy Efficiency Directive, the Renewable Energy Directive, the Ecodesign Directive and the Energy Labelling Regulation (for a detailed analysis see Annex 5, Section 16.2). In line with a net 55% emission reduction target, the 2030 CTP anticipated that the actions in the Renovation Wave Communication and its goal of doubling the renovation rate will contribute to reduce buildings' greenhouse gas emissions by 60% as compared to 2015. Specifically, the EED, EPBD and RED II, which are all being reviewed and strengthened to contribute to increased GHG reduction ambition by 2030 will help to overcome market failures that impede emissions abatement that cannot be overcome by a price signal alone.

A higher price signal for heating or cooling of buildings will in principle support the objectives of the analysed Directives. Carbon prices at an adequate level can be effective in incentivising the switch towards low-carbon heating, achieving increased renewables ambition and in ensuring a level playing field between energy carriers.

An ETS extension and its higher costs for fossil building heating would result in an additional economic incentive for increased EE ambition and the energy efficiency measures promoted by the EPBD and the EED, provided that the carbon price signal is sufficiently high. The measures would likely become more cost-effective and have a shorter payback period, while the ETS would address potential rebound effects of energy efficiency improvements. Combined with sector specific EE policies and financing tools, an ETS would support achieving higher renovation rates and deeper renovations, notably concerning the improvement in heating installations and their replacements and the market diffusion of minimum energy performance requirements for buildings.

The ETS cap setting outlined in Section 5.2.4.3 reflects these complementarities, with an ambition level reflecting the combination of current legislation with such a strengthened policy mix. It would hence provide the additional carbon price incentive necessary to achieve the GHG objective while fostering the energy related objectives.

The new MFF, the Recovery and Resilience Facility, Cohesion Policy and in eligible regions also the Just Transition Fund may help to fund structural investments to mitigate the analysed negative social impacts of the ETS in terms of higher energy prices on vulnerable groups, by promoting energy efficiency investments that help these groups who may lack the capital to reduce their energy demand[171]. In the Renovation Wave the need for financial assistance for energy efficiency investments specifically addressing low-income citizens is recognized as essential to achieve the targeted level of renovations.

One element in which there are some more complex interactions is between EED Art. 7 and the new ETS. For the period 2021-2030, MS are currently required to achieve cumulative end-use energy savings equivalent to new annual savings of at least 0,8 % of final energy consumption, with an increase consistent with -55% GHG reductions envisaged in the EED review. MS must achieve the required cumulative end-use energy savings by establishing an energy efficiency obligation scheme, adopting alternative policy measures, or a combination of both. Details on measures adopted by MS under this scheme and interactions or overlaps that might occur regarding energy efficiency obligation schemes (including White Certificates) or other policy measures under Art. 7 is provided in Annex 5, Section 16.2.

There are clear complementarities between option EXT1 and the existing regulatory framework applying to **road transport**, mainly the CO_2 performance standards, the Eurovignette Directive, Renewable Energy Directive and the Energy Taxation Directive. Some of those complementarities have already been highlighted in Section 6.3.1.1. The individual measures are analysed in Annex 5, Section 16.3.

As the CO_2 performance standards have generally been effective at lowering emissions in the transport sector, and the responsiveness of the sector to price changes is limited, the

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[171] ICF et al. (2020).

ETS inclusion of road transport would not (and could not) replace the existing policies which have been and will be key to drive the development of zero carbon technologies for cars and vans. The two policy instruments are complementary. The CO_2 performance standards address the supply on the market of more fuel efficient vehicles and set requirements on vehicle manufacturers with regards to their fleets of new vehicles. The proposed future standards will ensure a significant increase in the supply of new zero emission vehicles over time[172]. The Alternative Fuel Infrastructure Directive has and will be instrumental to drive the deployment of recharging infrastructure.

The ETS coverage concerns the fuel use in the entire vehicle stock (existing and new vehicles) and captures real-life emissions. It could increase the demand for more fuel-efficient vehicles, facilitating the achievement of increased ambition under the CO_2 standards for cars and vans. It could address possible rebound effects, whereby customers drive more as their vehicles become more efficient due to lower usage costs[173].

In the OPC, CO_2-standards for cars and vans were mentioned most frequently as 'very important' by 64% of respondents (and as 'important' by another 23% of respondents) as regards to other policies that should be deployed when extending emissions trading to emissions from buildings, road transport or all fossil fuel combustion.

The Eurovignette Directive, predominantly concerned with charging for use of road infrastructure, implements the user pays principle in addition to the polluter pays principle. The proposal for a revised Eurovignette Directive (including differentiated infrastructure charges based on CO_2 emissions for heavy-duty vehicles) and the upstream ETS would not overlap since the objective of the variation of the infrastructure charge is not to capture the external costs of CO_2 emissions. It cannot be linked to a CO_2 price or the cost of emissions. An ETS would be a more targeted tool as it imposes a carbon price per actual ton emitted and on all roads, whereas a CO_2-adjusted road charge would provide an additional incentive to the deployment of low- and zero-emission heavy-duty vehicles.

As regards to the review of the Renewable Energy Directive 2018/2001 (RED II), an increase in supply of renewable energy for transport could lead to a lower carbon price. The ETS would set economic incentives that can contribute to the development of renewable and low-carbon fuels, contributing to the achievement of the renewable energy

[172] Impact Assessment on the cars & vans CO2 standards.

[173] ICCT, op. cit, p. 5; CE Delft, Analysis of the options to include transport and the built environment in the EU ETS (2014), p. 60.

transport targets and of the hydrogen strategy. The reporting and monitoring methodology for the energy content of transport fuels established under RED II for the fuel suppliers are potentially complementary to the ETS inclusion.

The Energy Taxation Directive lays down minimal tax rates for motor fuels, heating fuels and electricity. These minimum tax rates, above which MS can establish their respective rates, have remained unchanged since 2003. Extending the use of emissions trading is complementary to the revised ETD with its focus on the energy content and improved coherence between energy carriers and sectors. Removing many exemptions as envisaged could help in improving a level playing field between fossil fuels versus electricity in heating enabling further renewable uptake and electrification. The new ETS would address the carbon content and give a carbon price signal on top of the ETD levels.

6.3.5.3 Interaction between EXT2 and the other regulatory framework.

Many interactions of EXT2 with the other regulatory framework are similar of those of EXT1 analysed in the prior section. Several additional particularities can be identified, with the individual measures being analysed in Annex 5, Section 16.5.

One issue is that, if small industrial installations currently excluded from being subject to the ETS, would be subject to a carbon price, they would pay a different and possibly higher carbon price than larger competitors in the same sector which are subject to the ETS having access to free allowances. There would therefore be the need for a mechanism to tackle risk of carbon leakage for those small industrial installations.

Regarding the Renewable Energy Directive, in case all fossil fuels were included in an ETS, all sectors would have an incentive to use more biofuels to avoid the carbon price, driving up the demand for biofuels in all sectors outside the scope of the existing ETS plus transport and housing.

In the case of all fossil fuel covered under an ETS, the increase of the fuel price would be more palpable for the uses specified in Article 8 of the Energy Taxation Directive, which establishes derogations in the form of significantly reduced tax rates for motor fuels in certain uses, as they start from a much lower base. Regarding the EU Agricultural Policy, the partial exemption specified in Article 8 of the Energy Taxation Directive for diesel and kerosene might need to be revised.

7 HOW DO THE OPTIONS COMPARE?

7.1 Strengthening of the existing ETS (power and industry installations)

7.1.1 Summary comparison of effectiveness and efficiency/key impacts of individual options

Key differences between the individual options to strengthen the existing ETS are summarised in the following tables. The baseline option sets the comparison reference for the different options, noting that its ambition is not in line with the cost-effective 2030 ambition.

7.1.1.1 Strengthening of the ETS target/cap

Table 23: Comparing key impacts of the ETS ambition strengthening options[174]

Key impacts	AMB1	AMB2a	AMB2c	AMB3c
Environmental impacts				
Cumulative cap - Trajectory smoothness over 2021-30 period – balance of environment impact over time	+ Steeper LRF change	++ Earlier trajectory change	++ Balanced between LRF change and rebase	+ Smaller rebase with steeper LRF
Difference between the cap and projected emissions– indicator to balance between environment impact and flexibility for emission variations[175]	+ 50% below baseline, risking to create big allowances surplus	++ 70% below baseline, though still ensuring some flexibility	+ 90% below baseline, allowing for limited variations to projected emissions	++ similar to AMB2a
Economic impacts				
Market balance – implications to market liquidity	(assessed below in the MSR table)			
Competitiveness - Risk of triggering CSCF with CL0	0 Limited risk of triggering CSCF	- CSCF risk in 2029	-- CSCF risk in 2028	- CSCF risk in 2029

[174] The baseline option while not being in line with the cost-effective 2030 ambition sets the comparison reference

[175] Comparison to 2013-19 average emission delta to cap of 163 million allowances per year, where Baseline delta is significantly above the 2013-19 reference.

7.1.1.2 Market Stability Reserve

Table 24: Comparing key impacts of the MSR options

Key impacts compared to MSR0+		MSR1 *Update current parameter values*	MSR2 *More dynamic parameters*	MSR3 *MSR2 with addition of short term response mechanism*
Environmental impacts				
Impact on emissions		0/+	0/+ Emissions under MSR2 are slightly lower than in MSR0+ and MSR1, however the differences are not significant	0/+
Economic impacts				
Market balance across cap scenarios[176]	AMB1	+	--	--
	AMB2a	+	-	-
	AMB2b	--	0	0
	AMB2c	0/-	0/+	0/+
Reduction of the market surplus over a reasonable time horizon		+/- Reduces TNAC the fastest in the near term due to larger intakes between 2024-2026, maintaining the downward pressure on annual allowance supply However, TNAC reduction may be too steep with the tighter cap scenarios	- TNAC is above the upper threshold throughout the period for all cap scenario	- May be able to reduce the TNAC slightly more than MSR2, but this reduction is uncertain, because it only occurs if the carbon price is below the set threshold.
Ensuring market resilience		+ Strong reduction of any surplus due to demand shocks	++ Avoids the threshold effect, because intakes are smaller as the TNAC approaches the intake threshold. Better adapted to	+ Avoids the threshold effect like MSR2, however challenges in finding an appropriate threshold for a carbon price

[176] The impact of cap scenarios AMB1 and AMB2b in conjunction with the MSR options is assessed in Annex 8, Section 23.1, and the impact of cap scenario AMB2c in Annex 8, Section 23.2,

		decreasing cap over the medium term	floor risk destabilising the market Opportunities for speculation if carbon price were to approach price floor
Carbon price signal	+ Positive impact in terms of signalling future scarcity to the market; prices are marginally higher under MSR1 and MSR2, driven by larger intakes	+ Also positive impact in terms of signalling. Prices are marginally higher under MSR1 and MSR2, driven by larger intakes in the reserve	+ Option provides a threshold in the unlikely event the carbon price would drop significantly May act as an insurance for low-carbon investments
Price volatility	-- Threshold effect may still induce price volatility.	++ Reduces price volatility that is due to the threshold effect	0/+ Could reduce uncertainty in the event of downside shocks, but potential of volatility when the carbon price is just above the threshold
Competitiveness, growth and jobs	0	+ May improve the predictability of the occurrence of intakes as compared MSR1.	0/+ Slight advantage as ensuring a stable carbon price in the unlikely event the carbon price drops to the threshold
Auction revenues	-	-	Uncertain impact, since when in operation it would reduce auction volumes but also ensure a price level
Predictability, complexity and transparency	+ Simple formula that has proven its worth	+ No threshold effect when the TNAC is close to the upper threshold, but formula is more complex	-- Even more complex mechanism; it cannot be predicted when the price threshold would operate

7.1.1.3 Framework to address the risk of carbon leakage

Table 25: Comparison of options to address the risk of carbon leakage

Key impacts	Options	
	Option CL1: Tiered approach	Option CL2: Strengthened benchmarks
Environmental impacts		
Provide protection against the risk of carbon leakage	++ Better targets free allocation to sectors at highest risk Long-term protection against risk of carbon leakage by incentivising emission reductions	++ Better targets free allocation based on actual GHG emission intensities Long-term protection against risk of carbon leakage by incentivising emission reductions
Incentives for low-carbon technologies	+ Provides incentives for the deployment of technologies with a relatively short payback time	+ Provides incentives for the deployment of technologies with a relatively short payback time
Economic impacts		
Costs for ETS installations	0 Reduces carbon costs for sectors at highest risk of carbon leakage Increases carbon costs for sectors at medium risk of carbon leakage	0 Reduces carbon costs for sectors where the GHG efficiency of the best performing installations is above the benchmark levels Increases carbon costs for sectors where the GHG efficiency of the best performing installations is below the benchmark levels
Administrative burden	- Tiered approach needs a revision of the list of the sectors deemed to be at risk of carbon leakage	0 Strengthened benchmarks use the established mechanism for free allocation

7.1.1.4 Improving support for low-carbon investment and innovation through the existing Innovation Fund

Table 26: Comparison of options to increase the Innovation Fund

Key impacts		
	Option IF 1: Increase to 550 million allowances	Option IF 2: Increase to 700 million allowances
More innovative clean tech projects financed	+ A moderate increase of the funding available (around EUR 5 billion) allows funding around 50 additional projects (assuming 100 million average grant size)	++ A strong increase of the funding available (around EUR 12.5 billion) allows funding around 125 additional projects (assuming 100 million average grant size)
More effective support to innovative clean tech projects	++ The circa EUR 5 billion added to the initial remaining IF resources: - can be effectively absorbed in 4 or 5 calls to be run as of 2026 - can finance complementary mechanism (CCfDs) but only as pilot	+ The circa EUR 12.5 billion added to the initial remaining IF resources: - cannot be effectively absorbed in 4 or 5 calls to be run as of 2026 as these calls need to be very big - can further finance more comprehensive CCfDs

Administrative burden	++ The additional administrative burden of running slightly bigger calls as of 2026 can be manageable or easy to address.	- Risk of administrative challenges due to significantly bigger calls
Improve the competitiveness of EU industry	+ More companies can get funding and become global clean tech leaders	+ Even more companies can get funding and become global clean tech leaders Slightly decreases the amount of free allowances, thereby increasing the possible need to apply the CSCF

7.1.2 Comparing packages of options

The different options assessed individually in the previous section interact with each other. To get a better idea of possible combinations, four policy packages are developed and compared in this section.

Table 27: Consistent policy packages to strengthen the existing ETS

Component	Package			
	1	2	3	4
Strengthening of the ETS Target/Cap	**AMB1** [new LRF from 2026, no rebasing]	**AMB2a** [new LRF from 2024, no rebasing]	**AMB2c** [new LRF from 2024, rebasing]	**AMB3c** [new LRF from 2026, rebasing]
Market Stability Reserve	**MSR1**	**MSR1**	**Combination of MSR parameters**	**Combination of MSR parameters**
Framework to address the risk of carbon leakage	**CL1** [tiered approach]	**CL1** [tiered approach]	**CL2** [strengthened benchmarks]	**CL2** [strengthened benchmarks]
Improving support for low-carbon investment and innovation through the Innovation Fund	**IF 2** [increase to 700 million EUAs]	**IF 2** [increase to 700 million EUAs]	**IF 1** [increase to 550 million EUAs]	**IF 1** [increase to 550 million EUAs]

The packages are internally consistent. Logical pairings were sought, while filtering out some combinations that cannot realistically be combined. For instance, an increased auction share combined with the environmentally most stringent cap scenario leads to a very high carbon leakage risk; conversely, a less stringent cap such as AMB1 should not be combined with the MSR2 option because the surplus would increase instead of decrease. On the other hand, the presented packages are not the only ones possible: there is room to compile different combinations.

All four packages reach the cost-effective environmental ambition of -62% in 2030, but the cap trajectories differ in two ways: is there a rebasing and how early is the current cap trajectory amended. The answers to these two questions inform the available policy choices for the other four elements of the package: MSR, auctioning share, carbon leakage framework and Innovation Fund. As a general rule, the more rebasing and the earlier the action, the lower the total amount of free allowances available and the higher the positive environmental impact over the period to 2030. By contrast, action by 2026 only and without rebasing means that more allowances can be used to address carbon leakage risks and distributional concerns.

In **Package 1,** the AMB1 scenario is based on an LRF-only approach starting in 2026 only. The resulting underlying cumulative cap over the period 2021 to 2030 is 1185 million ton (8.6%) lower than the current ETS cap, but higher than for the other scenarios (up to 750 million ton if compared to AMB2c). This means more allowances are, in principle, available for auctioning and for free allocation compared to other cap strengthening options. No cross-sectoral correction factor (CSCF) will be triggered, and combining AMB1 with option CL1 (the tiered approach to free allocation) means that space is freed up to increase the amount of allowances for auctioning and to transfer extra free allowances to the Innovation Fund (IF2). In terms of market stability, a less ambitious cap scenario increases the risk of a surplus building up, making the case for a stronger 24% intake rate (MSR1).

In **Package 2** the AMB2a scenario combines an LRF-only scenario with early action: there is no rebasing and an LRF of 5.09% applies as of 2024. This leads to a cumulative cap that is about 400 million allowances lower than under Package 1. In terms of carbon leakage risks, the combination of AMB2a with CL1 avoids triggering the CSCF. In terms of the MSR, there is no strong need for fundamental changes to its design. The increase of the intake rate as per MSR1 is sufficient to address a possible increase of the surplus. At the same time, in order to allow for gradual changes with the aim of protecting the EU industry, using the smoother MSR2 option and allowing an initially higher TNAC is not excluded as a possibility. The size of the cumulative cap and the more focused carbon leakage protection measure should also provide space to increase the Innovation Fund contribution of the current ETS.

Package 3 contains the more stringent cap option: AMB2c combines rebasing with early action, leading to a cumulative cap that is around 750 million allowances smaller than in Package 1 and 350 million allowances lower than in Package 2. In such a scenario, where the cap is very close to actual emissions, there is no space to increase the Innovation Fund contribution of the existing ETS. Even without these options, the triggering of the CSCF cannot be avoided. Option CL2 would however partly balance the rebasing of around 119 million allowances and manage to keep the impact of the CSCF modest, triggering it only as of 2029 and with an average value of 0.88 for the period 2026-2030.

There is a likelihood of the surplus dropping very rapidly. Hence, a conservative intake rate, and additional protection against the threshold effect is needed. Sufficient market liquidity must be ensured, possibly by keeping the current upper threshold of 833 million, but combined with more frequent MSR reviews assessing this threshold. A combination of the parameters[177] presented in MSR options MSR0+, MSR1 and MSR2 could provide the best mix of controlling the TNAC, avoiding price volatility and ensuring sufficient market liquidity. Such a combination could behave better than both MSR1 and MSR2 in terms of TNAC reduction, all the while keeping the benefits of MSR2 in terms of avoiding threshold effects and price volatility.

Package 4 is based on a cap option that combines rebasing in 2026 with a relatively high LRF after that (AMB3c). In terms of cumulative cap, this option is comparable to Package 2 (i.e. 425 million allowances more than in Package 3 or 1,5 billion lower than the current ETS), but with stronger efforts post 2026 to compensate for the later start. Option CL2 is sufficient to maintain an adequate level of leakage protection (small CSCF in 2030, with an average value of 0.96 for the period 2026–2030), in case the IF contribution of the current ETS is not increased. Again, MSR options can be combined.[197] With a cap that is only adapted in 2026, it is important to adjust the MSR intake rate to 24%. At the same time, a smoother intake rate like in MSR2 could be applied when the TNAC is lower, in order to avoid threshold effects. Again, keeping the current upper threshold of 833 million could provide sufficient market liquidity, especially in conjunction with more frequent MSR reviews.

7.1.3 Coherence

The ETS is a well-established cornerstone of the EU's policy to combat climate change and its key tool for reducing greenhouse gas emissions cost-effectively. With its focus on markets and economic emission reduction incentives, it is coherent with other EU policies which primarily address non-price barriers. Increasing the environmental contribution of the ETS does not change its technology-neutral character, allowing it to continue to run alongside sector-specific policies. The Market Stability Reserve will continue to enhance policy synergies by mitigating supply/demand imbalances regardless of their origin, for instance by reducing the impact that complementary and overlapping policies in the area of renewables or energy efficiency can have on the carbon market.

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[177] Such a combination, with an upper threshold of 833 million allowances, and a more aggressive variable intake rate that is a mix of MSR1 and MSR2, was assessed in Annex 8, Section 23.3.

As ambition increases and the carbon price signal is reinforced, the ETS's funding instruments become more relevant to address the impacts and needs of those impacted. The strengthened Innovation Fund remains coherent with other EU-wide funding mechanisms as well as with State aid rules, preventing overcompensation on the one hand, but providing higher, and more targeted, support to address the innovation challenge.

In terms of carbon leakage, coherence with the parallel proposal for a CBAM is ensured through the principle that an effective level of protection against the risk of carbon leakage is safeguarded. In practice, if a CBAM is proposed for selected sectors and the proposal determines that the installations in these sectors lose their right to free allocation, then the relevant ETS legislation would enable such a decision.

7.1.4 Proportionality

All options analysed for the strengthening of the existing ETS are based on the already existing instrument, the ETS Directive. The initiative is limited to ETS adjustment needs that are triggered by the increased emissions reduction target of at least 55%.

The instrument of emissions trading ensures that additional costs for industry due to the increased level of ambition of the EU's climate policies are expected to be kept to a minimum, given that the ETS incentivises emissions reduction by operators with the lowest abatement costs. Moreover, the use of the existing instruments minimises any additional administrative costs.

To conclude, all options analysed for the strengthening of the existing ETS are considered proportional as they do not go beyond what is necessary to achieve the objectives.

7.2 **Extension of emissions trading or alternatives for maritime emissions**

7.2.1 Effectiveness and efficiency

All maritime policy options would ensure that the maritime transport sector contributes to the emission reductions needed to achieve the 55% ambition. The main differences among the different options is summarised in the table below.

Table 28: Comparison of maritime policy options

Key impacts	MAR1	MAR2	MAR3	MAR4
Environmental impacts				
Absolute GHG abatements vs BSL by 2030	All policy options would result in similar total CO_2 emission reduction, in line with the common level of ambition in the ETS (same linear reduction factor). MINTRA: 30-34 $MtCO_2$ MEXTRA50: 45-47 $MtCO_2$ MEXTRA100: 59 $MtCO_2$			
Emission reductions certainty	High certainty (emissions cap)	High certainty (emissions cap)	Lower certainty (no emissions cap)	High certainty (emissions cap)
Origin of GHG emission reductions	Mostly out-of-sector reductions	In-sector abatements only	In-sector abatements only	Mostly out-of-sector reductions
Risk of carbon evasion by 2030	MINTRA: low MEXTRA50: low MEXTRA100: medium	MINTRA: high MEXTRA50: high MEXTRA100: very high	MINTRA: high MEXTRA50: high MEXTRA100: very high	MINTRA: low MEXTRA50: low MEXTRA100: medium
Economic impacts				
Social Net Present Value[178] compared to BSL for the period 2020-2050	MINTRA: EUR 113 billion MEXTRA50: EUR101 billion MEXTRA100: EUR78 billion	MINTRA:EUR 94 billion	MINTRA: EUR 94 billion	MINTRA: EUR119 billion

[178] Assumptions: NPV estimations based on annualised capital costs; a social discount rate of 4%; GHG and air quality external costs based on Handbook of external costs 2019; carbon value from the Handbook of external costs 2019, ETS or tax payments are excluded as they are a transfer between agents (i.e. from industry to authorities) from the societal perspective, administrative costs are not included.

Increased costs vs BSL by 2030 & **CO_2 price**	MINTRA: +3% MEXTRA50: +7% MEXTRA100: +12% 45.5EUR/tCO_2	MINTRA: +16% 268EUR/tCO_2	MINTRA:+16 % 268EUR/tCO2	MINTRA: +4% 45.5EUR/tCO2
Additional Auction revenues in 2030	MINTRA:EUR 1.2 billion MEXTRA50: EUR 2.4 billion MEXTRA100: EUR 3.6 billion	MINTRA: EUR 7 billion	MINTRA: EUR 7 billion	MINTRA50: EUR 1.2 billion
Proportionality				
Admin costs compared to BSL	Regulated entities: low Public authorities: moderate	Regulated entities: low Public authorities: moderate	Regulated entities: low Public authorities: low to moderate	Regulated entities: low Public authorities: moderately high

7.2.1.1 Environmental effectiveness and impacts

When applied to the same geographical scope, the four policy options are expected to result in **comparable environmental impacts** as they were designed to ensure CO_2 emission reductions in line with what is projected under the revised ETS cap (similar linear reduction factor). However, the levy on CO_2 emissions (MAR3) provides less **certainty** as regards the achievement of these reductions as it does not cap emissions contrary to the other policy options (MAR1, MAR2 and MAR4).

The policy options would lead to **emission reductions in different sectors and activities**. An open ETS (MAR1 and MAR4) would lead to the implementation of mitigation measures in the maritime transport sector, as well as in other ETS sectors when abatement costs are cheaper through the purchase of ETS allowances. The separate ETS (MAR2) and the levy option (MAR3) would only drive emission reductions in the maritime sector itself.

The single most important factor influencing GHG emission reductions is the **geographical scope**. The absolute level of CO_2 emission reductions compared to the baseline by 2030 would vary from around 30 MtCO_2 to 59 MtCO_2 depending on the voyages covered. This, of course, needs to be read in conjunction with the analysis on the possible risk of evasion, which show that a broader geographical coverage tend to amplify that risk. In addition, the risk of evasion is higher in the policy options where carbon prices are the highest, such as the separate ETS (MAR2) or the levy (MAR3).

7.2.1.2 Economic effectiveness and efficiency

For all policy options, the social Net Present Value calculated as the difference between the societal costs and the benefits of each option over the period 2020-2050 is positive. This means that they would bring added value to the society and that their benefits in the form of e.g. GHG emission reduction, better air quality, energy savings and external costs savings would outweigh their costs in the long term.

In terms of cost-effectiveness, the separate ETS option (MAR2) and the levy (MAR3) would result in close to six times more expensive CO_2 abatement costs in 2030 than the two other options based on the ETS extension (MAR1 and MAR4). This is because they would only target mitigation measures in the maritime sector that are estimated to be more expensive than in other ETS sectors.

In terms of compliance costs, the policy options would incur additional direct costs for regulated entities in the form of ETS/carbon levy payments, additional capital costs, additional fuel and operational costs, partially compensated by fuels saving. These direct costs are estimated to be significantly higher in MAR2 and MAR3 compared to MAR1 and MAR4. However, from a society perspective, the ETS/carbon levy payments do not represent a net cost, as they are offset by the corresponding auctioning or tax revenues. Moreover, these additional costs would only have a very limited impact on the prices of commodities in the long-term, which are expected to increase by less than 0.2 to 0.7% by 2030. In terms of macroeconomic impacts, policy options produce non-sizeable impacts on GDP. Sector-wise, only the supply chain of fossil fuels is likely to be somewhat impacted. These will be partially offset by an increase in production of alternative fuels by 2050.

All policy options would also raise additional revenues. MAR2 and MAR3 would lead to the highest additional revenues in 2030 as they induce a much higher carbon price and don’t allow the purchase of general ETS allowances.

7.2.2 Coherence

All policy options are coherent with the objectives of the European Green Deal, which aims to ensure effective carbon pricing throughout the economy, including in transport where price must reflects the impact it has on the environment and on health. They are also coherent with the assessment underpinning the 2030 Climate Target Plan and the Sustainable and Smart Mobility Strategy.

The four options would fit well with the basket of measures on maritime transport announced in the European Green Deal. All policy options can work in full synergy with the FuelEU maritime initiative as carbon pricing will reduce the price gap between sustainable low carbon alternative fuels and traditional fossil fuels, and it will trigger energy efficiency improvements that will make the switch to alternative fuels more affordable by reducing the overall fuel consumption. In addition, revenues could be used to progress innovation and accelerate the deployment of zero-emission vessels, as shown by proposals submitted under the existing Innovation Fund. However, while carbon pricing has the ability to greatly facilitate the uptake of renewable and low-carbon fuels depending on the carbon price and the use of revenues, there is also a need to address all the non-pricing problems that hamper the deployment of renewable and low-carbon fuels. This is the ambition of the FuelEU Maritime initiative, which aims at creating a predictable demand for these fuels in order to stimulate the process of their selection and deployment, as well as the gradual technological improvement of yet immature solutions. In this context, the two measures would complement each other and carbon prices (e.g. in MAR2 and MAR3) would contribute to further accelerate the uptake of renewable and low-carbon fuels by making them more economically viable.

The taxation of maritime bunker fuel as considered in the impact assessment of the ETD revision could also complement a carbon pricing policy applied to maritime transport. Taken together, these two policies would reinforce the carbon price signal and the economic attractiveness of mitigation measures such as the implementation of energy efficiency measures or the switch to renewable and low-carbon fuels. In addition, the fuel tax could help change the behaviour of market actors not directly targeted by the proposed policy options such as fuel suppliers, ports or companies operating ships below 5.000 gross tonnage. It is also worth noting that the envisaged tax on maritime bunker fuel would not apply to bunker fuel sold for extra-EU voyages and that in itself it would lead to a much smaller carbon price signal in comparison to the four policy options considered in this impact assessment.

All policy options are also fully consistent with existing EU legislation such as the EU maritime transport MRV framework. As regards the interaction with the Effort Sharing Regulation (ESR), it would be beneficial if MS would continue implementing national measures under the ESR to reduce emissions from domestic navigation as a substantial part of these emissions would not be covered under the considered policy options. These national measures have the potential to play a key role in supporting the uptake of zero-emission vessels and innovative technologies, which are likely to be first implemented and demonstrated on small vessels involved in domestic navigation.

In terms of coherence with action at global level, notably at the International Maritime Organization (IMO), it is estimated that all policy options have the ability to positively contribute to the objectives of the initial IMO GHG reduction strategy to be revised by 2023.

While discussions around a possible global carbon pricing mechanism started in 2006 at IMO, there is still no consensus on the nature of such a measure and if there would be an agreement to implement such a mechanism, it would likely take place in the period from 2023 to 2030. Since all policy options considered in this assessment have already been reflected at IMO through different submissions, in theory, any of them could be further considered and implemented by the IMO in the future. Would a similar measure be adopted, then it will be necessary to ensure that no regulatory conflict is happening between the EU and the IMO measure. Divergences may come from the different regulated entities, policy objectives and levels of stringencies. Would the IMO adopt a different instrument then the compatibility would need to be assessed. It should also be noted that there are precedents of IMO following the EU action with global measures. The adoption of an EU measure may therefore increase the likelihood of a decision at the IMO. As regards MAR4, there is a possible risk of double regulation with the IMO framework, depending on what would be agreed at IMO in terms of operational carbon intensity measure and depending on how the measure is designed at EU level.

As regards the geographical scope, all options are legally feasible and coherent with EU law. Results from the OPC show that 76% of respondents support a broad scope including both intra-EEA and extra-EEA voyages as opposed to intra-EEA only (MINTRA). If extra-EU voyages are included, 65% prefer to cover 100% of all incoming and outgoing voyages (MEXTRA100). However, according to some stakeholders, the coverage of emissions from extra-EEA voyages could pose some political challenges at international level.

7.2.3 Proportionality

Based on the analysis carried out in this impact assessment, all policy options would result in low administrative costs for regulated entities as they already monitor, report and verify their CO_2 emissions in line with the EU maritime transport MRV regulation, which has been designed from the start as a first step to carbon pricing. In addition, all policy options would continue excluding the maritime transport SMEs operating ships below the size threshold of 5.000 gross tonnage.

Other compliance activities such as the purchase and surrendering of allowances would only add limited administrative costs.

As regards public authorities, all policy options are considered proportional as the additional administrative costs on public authorities to implement and enforce the policy measure would depend to a strong extent on the number of regulated entities, which would be limited to a maximum of 1.600 entities in total. For public authorities, MAR1 and MAR2 would result in moderate additional administrative burden to e.g. check aggregated MRV data, manage registries or implement enforcement actions. More costs would be associated with MAR4 as it would also require public authorities to develop standards and check compliance. On the contrary, MAR3 would lead to lower costs, in particular if authorities can rely on existing tax collection systems.

7.3 **Extension of emissions trading to buildings and road transport or all fuels**

7.3.1 Effectiveness and efficiency

7.3.1.1 Environmental impacts

Both options **EXT1** (extension to the buildings and transport sectors) and **EXT2** (extension to all fossil fuel combustion not yet covered by the ETS) ensure that the sectors concerned contribute to the emission reductions needed in line with EU targets and Paris Agreement commitments while ensuring synergies with complementary other policies targeting these sectors. They both imply that a significantly increased share of total GHG emissions would be covered by an EU-wide cap and trading system. As a result, both options provide for an increased certainty in delivering the overall GHG emission reductions.

Under option **EXT2**, the share of current total GHG emissions that would be covered by an EU-wide cap would be slightly higher than in option EXT1 (about 6 percentage points).

Options **EXT1** and **EXT2** are expected to deliver a similar reduction in emissions of GHG in the sectors concerned by 2030 compared to 2005, which would be almost 10 percentage points higher than the projected reduction of -34% in the baseline.

7.3.1.2 Economic impacts

For both options **EXT1** and **EXT2**, extending emissions trading to the new sectors would assist in incentivising cost-effective emission reductions in the sectors concerned, even though the incentive may differ according to MS due to the current heterogeneity of the fuel tax landscape.

Under option **EXT1**, considering relatively low price elasticities in these sectors, carbon pricing would work in concert with other policies such as EE and RES policies and CO_2 standards for vehicles, with the carbon price and the reallocation of resources stemming therefrom helping to realise the significant investments needed for a quicker diffusion of decarbonisation technologies.

This could be complemented under options **EXT1** and **EXT2** with a contribution of the new ETS sectors to the Innovation Fund as in option IF1 (using 100 million allowances from the new ETS cap) to foster the availability of such technologies on the market. Already under the current Innovation Fund there is significant interest from projects related to clean transport, from projects providing clean tech solutions in renewable heating and cooling of buildings and the call for small-scale projects is putting further emphasis on projects providing carbon neutrality solutions for buildings or construction products substituting carbon intensive ones. IF1 allows to make more resources available for such projects without a need to explicitly change its current scope, Option IF2 (using among others 200 million allowances from the new ETS) would allow for a broader coverage and bigger amounts, which would then not be available for other purposes.

Under option **EXT2,** for small emitters in the industry, the costs of inclusion in an emissions trading, as opposed to applying equivalent measures in some cases as under EXT0 and EXT1, may outweigh the benefits. SMEs with similar activities but of a different size may be covered by a different regime (the ETS or the new ETS) with potentially a different carbon price.

Both options **EXT1** and **EXT2** would affect individual spending on transport and heating fuels in the short or medium term, until the investments to reduce fossil fuel use have taken effect. Hence social acceptability for the measure, in particular by households who have difficulties to afford those investments, will be challenging. However, the revenue raised should be enough to address the social and distributional concerns alongside other revenue allocation (see Annex 13).

Table 29: Comparison of key impacts of ETS extension options EXT1 and EXT2

Key impacts	EXT1	EXT2
Environmental impacts		
Emission reductions	++ -43% by 2030 in MIX compared to -34% in REF	++ -43% by 2030 in MIX compared to -34% REF
Contribution to the -55% ambition by 2030	+/++ Higher certainty in delivering target: emissions covered by cap and trade would be two thirds by 2030, twice as much as the existing ETS alone	++ Higher certainty in delivering 2030 target: higher coverage vs EXT1 (about 6 percentage points)
Economic impacts		
Incentivise cost-effective emission reductions	++ Carbon price reduces payback time for energy efficiency investments The building sector responds better to the carbon price than road transport.	+ Limited mitigation options in agriculture/forestry vs EXT1 Equivalent measures work for small industry opted-out from ETS
Auction revenue	++ Revenue can help mitigate social impacts and accelerate the decarbonisation of the sectors concerned	++ Revenue can help mitigate social impacts and accelerate the decarbonisation of the sectors concerned
Competitiveness/ SME impact	0 Almost zero risk of carbon leakage in buildings and transport	0/- Some firms in small industry and agriculture might be negatively impacted

Other impacts		
Social impacts	- Impact of carbon price on poorer households can be mitigated by redistribution	- Impact of carbon price on poorer households can be mitigated by redistribution
Complementarity with other existing measures	+ Clear complementarities between EXT1 and existing regulatory framework	+ Complementarities in EXT2 comparable to EXT1
Additional administrative burden	- Regulated entities: moderate Administrative authorities: moderate	- - Regulated entities: moderate to high, depends how free allocation for small industry is organised Administrative authorities: high, because of the complexity involved with the free allocation for small industry

With regard to the two linking options analysis of current abatement potentials indicates that if the existing ETS and the new ETS for road transport and buildings are linked, and if cost-effective mitigation potentials turn out to be more difficult to realise in new ETS sectors, allowances would flow from the former to the latter. This could limit prices in the new ETS, but also increase the price in the existing ETS.

7.3.2 Coherence

The new emissions trading regime would work in parallel with existing policies applying to the sectors concerned (see analysis in Section 6.2.5 and in Annex 5). This is coherent due to the above described complementarities, as both under option **EXT1** and **EXT2**, the additional economic incentives provided by the extension of emissions trading to new sectors will, on their own, not be sufficient to reduce emissions in these sectors to the required levels. The more effective the regulatory measures on energy efficiency, vehicle emission performance and the enabling investments are, and the faster the sector decarbonises, the lower the carbon price generated by the new ETS will be.

The new regime under option **EXT2** would also capture the combustion of fossil fuels in certain cases where a significantly reduced tax rate currently applies under the Energy Taxation Directive (for example motor fuels in agriculture). The relative increase of the fuel price by the carbon price would be felt more in these cases.

An extended use of emissions trading would improve the overall policy mix. It would allow targeted strengthening of regulatory measures needed to achieve the enhanced climate ambition but would not replace other policies. Conversely a decision not to apply emissions trading to buildings and transport would require a further strengthening of regulatory measures, notably in the field of renewable energy and energy efficiency.

7.3.3 Proportionality

In all options, the new emissions trading system would be organised as an upstream system, thus avoiding that regulation falls upon the numerous end-users of fuel. The number of regulated entities can be expected to be broadly the same in **EXT1** and **EXT2**. They lead to similar impacts in terms of monitoring, reporting and verification. Both in **EXT1** and **EXT2**, regulated entities would to a considerable extent be able to build their monitoring system required for the new emissions trading system on the monitoring mechanisms that are in place for taxation purposes. In both **EXT1** and **EXT2**, regulated entities would need to distinguish fuels that go to entities already covered by the ETS (e.g. gas to industry) to avoid a double coverage by a carbon price which would otherwise require compensation mechanism.

In the case of **EXT1,** the regulated entities will need to know the end-use of the fuel (i.e. is it used in the buildings and road transport sector) which they normally know for taxation purposes or because they are in contact with the end customer. MS would be able to identify relatively easily the entities to be regulated since these would be known for taxation purposes, at least in the case of oil and often gas and to a varying degree for coal, depending on the MS's national taxation regime. MS would need to prepare, implement and run the system, manage the registry, verify compliance by the regulated entities with their obligations under the new system and enforce compliance where necessary.

In the case of **EXT2**, considerable additional burden can be expected stemming from the fact that free allocation measures would need to be foreseen for small industry for reasons of level playing field and to avoid carbon leakage. Any such compensation mechanisms for small industry risk being complex.

8 PREFERRED OPTION

When proposing its updated 2030 greenhouse gas emissions reduction target of at least 55%[179], the European Commission also described the actions across all sectors of the economy that would complement national efforts to achieve the increased ambition. A number of impact assessments have been prepared to support the envisaged revisions of key legislative instruments.

[179] Communication on Stepping up Europe's 2030 climate ambition - Com(2020)562

Against this background, this Impact Assessment has analysed the various options through which a revision of the EU Emissions Trading System could effectively and efficiently contribute to the delivery of the updated target as part of a wider "Fit for 55" policy package.

Methodological Approach

Drawing conclusions about preferred options from this analysis requires tackling two methodological issues.

First, as often the case in impact assessment analysis, ranking options may not be straightforward as it may not be possible to compare options through a single metric and no option may clearly dominate the others across relevant criteria. Ranking then requires an implicit weighting of the different criteria that can only be justifiably established at the political level. In such cases, an impact assessment should wean out as many inferior options as possible while transparently provide the information required for political decision-making.

Secondly, the "Fit for 55" package involves a high number of initiatives underpinned by individual impact assessments. Therefore, there is a need to ensure coherence between the preferred options of various impact assessments.

Policy interactions

Given the complex interdependence across policy tools and the interplay with the previous methodological issue outlined above, no simultaneous determination of a preferred policy package is thus possible. A sequential approach was therefore necessary.

First, the common economic assessment[180,181] underpinning the "Communication on Stepping up Europe's 2030 climate ambition" looked at the feasibility of achieving a higher climate target and provided insights into the efforts that individual sectors would have to make. It could not, however, discuss precise sectoral ambitions or detailed policy tools. Rather, it looked at a range of possible pathways/scenarios to explore the delivery of the increased climate ambition. It noted particular benefits in deploying a broad mix of policy instruments, including strengthened carbon pricing and increased regulatory policy ambition.

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[180] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020SC0176
[181] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020SC0331

An update of the pathway/scenario focusing on a combination of extended use of carbon pricing and medium intensification of regulatory measures in the economy, while also reflecting the COVID-19 pandemic and the National Energy and Climate Plans, confirmed these findings.

Taking this pathway and the Communication on Stepping up Europe's 2030 climate ambition as central reference, individual impact assessments for all "Fit for 55" initiatives were then developed with a view to provide the required evidence base for the final step of detailing an effective, efficient and coherent "Fit for 55" package.

At the aggregate level, these impact assessments provide considerable reassurances about the policy indications adopted by the Commission in the Communication on Stepping up Europe's 2030 climate ambition. This concerns notably a stronger and more comprehensive role of carbon pricing, energy efficiency and renewable energy policies, the land sector, and the instruments supporting sustainable mobility and transport. These would be complemented by a carbon border adjustment mechanism and phasing out of free allowances. This would allow to continue to address the risk of carbon leakage in an efficient manner. It would also preserve the full scope of the Effort Sharing Regulation for achieving the increased climate target.

Various elements of the analyses also suggest that parts of the revenues of a strengthened and extended ETS should be used to counter any undesirable distributional impacts such a package would entail (between and within MS). While the best way to do this is still to be determined, this would seem a superior alternative to foregoing the relevant measures altogether or simply disregarding the uneven nature of their distributional impacts. Under both these alternatives, the eventual success of any package proposed would be at risk.

Preferred policy options

Preliminarily assuming this fact and the analysis above as the framework for the aggregate "Fit for 55" package, the specific analysis carried out in this impact assessment comes to the main following conclusions and would suggest the following preferred policy options for the revision of the EU Emissions Trading System:

1. **Increased ambition of the existing ETS and MSR**

In line with a coherent approach across policies, the 2030 ambition should reflect the cost-effective contribution of the sectors as part of a policy mix. Based on the updated MIX -55% policy scenario for current ETS sectors this contribution is calculated as -62% in 2030 compared to 2005. Power and industry would continue to provide their cost-effective higher emission reduction contribution compared to other sectors. Many stakeholders support the strengthening of the existing ETS to increase its ambition in line with the new 2030 target and based on cost-efficiency considerations. The separately assessed amendments of the ETS Directive concerning the aviation sector would ensure a proportionate aviation contribution.

Each of the four **ambition (sub-)options** retained to achieve this -62% reduction involves either a change of the annual Linear Reduction Factor or a combination with a possible one-off change in the cap. Any of these options would be effective and efficient to achieve the 2030 objective, but differ e.g. in terms of impacts on emission reductions over the period and free allocation volumes. Stakeholders generally recognised the importance of adjusting the linear reduction factor, while some stakeholders also highlighted the importance of a combination with a one-off reduction of the cap. The choice between the different ETS ambition strengthening options and related packages with other options, e.g. how the Market Stability Reserve is further developed in this context, remains therefore a political one. The MSR operation has wide support across stakeholder groups, while there is no consensus about the necessary changes to its parameters.

2. Auction share and addressing the risk of carbon leakage

A tightened ETS cap reduces the available allowances to be auctioned or allocated for free. In this context, an increase of the auction share and corresponding further reduction of the free allowances share seems only conceivable if the Carbon Border Adjustment Mechanism would effectively protect the industry sectors concerned so that free allocation for these sectors could be gradually phased out.

In addition, a more targeted approach to free allocation, where it still applies, is needed in the form of strengthened benchmarks (and conditionality elements) which provides a fairer and more transparent distribution of free allocation than a higher cut for all sectors by the cross-sectoral correction factor. This was also supported by a wide range of stakeholders, even if not by all parts of the private sector.

3. Increased Innovation Fund

An increase of the Innovation Fund has clear advantages in terms of strengthening competitiveness, innovation and environmental effectiveness to provide the low carbon solutions needed for further decarbonisation post-2030 and would generally be welcomed by stakeholders. However, the selected amount and its sourcing is ultimately a political choice, which is linked with the decisions on existing ETS ambition and/or with the decision on whether or not to extend emissions trading to new sectors.

4. ETS extension to maritime transport

In line with the Climate Target Plan, the preferred option of extending the ETS to maritime transport emissions (MAR1) has clear advantages as it would ensure that the sector contributes cost-effectively to the EU climate efforts. In addition, it would ensure that the price of maritime transport reflects the impact it has on climate. It would also correspond to stakeholders' preferred policy option out of the proposed options. The ETS extension to maritime transport could cover emissions from all intra-EEA voyages (MINTRA) or, depending on political choices, could also extend further, to include half of the emissions from extra-EEA voyages (MEXTRA50). This includes emissions from at-berth operations. This **extension** would build on data coming from the EU maritime transport MRV system which would be accounted in both the ETS cap reference emissions and trajectory/LRF design (see Annex 6, Section 18.1). All new emissions allowances would be auctioned in line with the default method for allocating allowances in the ETS and would take the form of general ETS allowances. To ensure a smooth transition, a phase-in period could be introduced where companies would only have to purchase allowances for a portion of their emissions, gradually rising to 100% over 3 years. As only around 45 or 90 million tons of CO_2 would be added to the existing ETS depending on the selected geographical scope, the impact on the other sectors covered would remain limited. MAR1 would also result in limited administrative costs.

In terms of **coherence**, this approach and the FuelEU maritime initiative are complementary as carbon pricing facilitates the uptake of renewable and low-carbon fuels as well as other emission reductions. It would also be compatible with the future operational and technical standards being developed at the International Maritime Organization (IMO) for existing ships, without a risk of double regulation. The need for further operational and technical standards at EU level would need to be considered in the future taking into account the effectiveness of these global measures.

5. **New ETS for buildings and transport**

Emissions trading could be **extended to buildings and road transport,** as additional economic incentives and a more level playing field are needed to ensure achieving the cost-effective reductions of these sectors to the -55% target. A majority of academic stakeholders and EU citizens support an ETS extension, while the majority of private sector actors, trade unions and NGOs are sceptical.

The main benefit of this extension scope compared to an extension to all fossil fuel combustion is economic efficiency, notably as buildings and road transport are not or at very low risk of carbon leakage. For including small industry and agriculture fuels, creating a new carbon leakage risk protection regime would be administratively complex due to the numerous SME's concerned. Both extension scopes score high on environmental effectiveness, with slight additional advantages for an extension to all fossil fuel combustion as the share of emissions covered by an EU-wide cap would be higher. At least for a transitional period, the extension should take the form of a separate ETS to make the required new upstream MRV system work and avoid an uncertain price risk for existing ETS sectors, as also preferred by the majority of stakeholders and notably private sector actors.

The ambition level, emissions cap and trajectory for the new ETS would be set **coherently** in line with the cost-effective emission reductions of buildings and road transport, which amount to approximately 43% emission reductions compared to 2005, using a combination of carbon pricing and by strengthening the existing regulatory framework. This is notably consistent with the preferred option for the ambition level of energy efficiency targets under the Energy Efficiency Directive. An increase in buildings renovation rate to be driven by the EPBD revision is also taken into account. Full auctioning of allowances would be justified as there is no or very limited risk of carbon leakage for these sectors, and would generate significant revenues to help financing investment needs or to address social and distributional impacts, which might arise due to an increase in fuel prices having an impact on low-income households. Support measures to promote energy efficiency, such as the strengthening of Article 7 by obliging MS to address vulnerable, energy poor, or low-income households, would be necessary to avoid excessive distributional effects, via inter alia directing part of the revenues from carbon pricing on buildings to energy efficiency improvements for energy poor households. A market stabilisation mechanism similar to the one in the existing ETS would be established.

By providing the additional economic incentives (through carbon pricing) necessary to achieving the cost-effective emission reductions in buildings and transport, the new ETS would **complement** the Effort Sharing Regulation in the current scope, which maintains incentives for national action. The strengthening of other sectoral legislative initiatives that contribute to reducing emissions in those sectors, in particular CO_2 standards for cars, the Energy Efficiency Directive, the Energy Performance in Buildings Directive the Renewable Energy Directive will also take into account the ETS extension. Additional administrative costs could be limited by using, where possible, existing structures used for the Directive laying down the general arrangements for excise duty and the Energy Taxation Directive. In turn, additional energy savings would be enhanced by the new ETS, with its potential link to energy savings under Article 7 of the EED.

6. Solidarity mechanisms

Existing mechanisms in the ETS help in addressing distributional impacts between and within MS. These include the 10% solidarity share of auctioning revenues redistributed to lower income MS and the use of some allowances to feed an investment and solidarity fund (the Modernisation Fund) for the lowest-income MS. These mechanisms could be further developed, without prejudice to an ETS contribution to Own Resources. Mechanisms using revenues from auctioning could also help compensate the social impacts of the extended application of emissions trading.

Well-designed energy efficiency programmes funded by some of the ETS revenues could help addressing these social issues. Thus, MS could be required to systematically spend revenues (or a specific share of revenues) from EU ETS auctioning for energy efficiency improvement measures.

Action to address skills, financing mechanisms, consumer empowerment, split incentives and the alleviation of energy poverty under the Energy Efficiency Directive could complement the approach to distributional impacts of the EU ETS.

8.1 REFIT (simplification and improved efficiency)

The ETS legislation has consistently favoured approaches to minimise the regulatory burden for both economic operators and administrations. In particular, installations with low emissions benefit from the possibility for MS to exclude them from the ETS if they are subject to national measures leading to an equivalent contribution to emission reductions.

9 HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

The Commission will continue to monitor and evaluate the functioning of the ETS in its annual Carbon Market Report, as foreseen under Article 10(5) of the ETS Directive. This covers also the impacts of the current revision of the ETS.

Furthermore, evaluation of progress on the application of the ETS Directive is regulated in the current Article 21, which requires MS to submit to the Commission an annual report paying particular attention to issues including the allocation of allowances, operation of the Registry, application of monitoring and reporting, verification and accreditation and issues relating to compliance.

The measures above (namely the Commission's annual Carbon Market Report and Member States annual report) shall also apply to the sectors to which emissions trading is extended. The MRV data obtained through the regulation of the new sectors will be a key source for information for the Commission to evaluate progress in the sectors concerned.

With respect to maritime transport, the Commission will notably rely on data collected through the EU maritime transport MRV system and analysis from the annual report on CO_2 emissions from maritime transport, which provides aggregated and explained results. With respect to the possible extension to buildings and transport, the Commission will rely on data collected through the new MRV system for these sectors, while comparing them also with the corresponding GHG inventory data for these sectors.

The integrated governance and monitoring process under the Regulation on the Governance of the Energy Union and Climate action is also expected to make sure that climate and energy-related actions at European, as well as regional, national and local level, including the ETS, contribute to the EU climate neutrality and Energy Union's objectives.

Additionally, the Commission regularly carries out studies on various pertinent aspects of EU climate policy. Such examples in the past years are the studies on evidence or lack of evidence for the occurrence of carbon leakage and studies evaluating the application and effectiveness of free allocation[182]. This approach will also continue throughout phase 4.

Several market analysts regularly closely follow various aspects of the carbon market and its functioning and the Commission will continue to monitor this work. Also, through regular contacts with stakeholders, the Commission is alert to their views and concerns about the functioning of the ETS. ETS-related matters are discussed in a dedicated forum, the Climate Change Expert Group (CCEG) which brings together MS Competent Authorities, stakeholders (industry associations and NGOs) and the Commission. In its different formations, the CCEG discusses the implementation of free allocation, auctioning and issues related to the functioning of the union registry.

In addition, the ETS Compliance forum provides the Competent Authorities of all ETS countries (the 27 MS, Norway, Iceland and Liechtenstein) with a platform for sharing information, learning and experience, leading to effective implementation of the ETS. The forum executes targeted events, such as the Compliance Forum Conference, organized annually and aimed at sharing experiences and facilitating dialogue amongst MS Competent Authorities, as well as Task Forces dedicated to specific topics and training events. National Accreditation Bodies and verifiers are sometimes invited to participate to the activities of the ETS Compliance forum, where relevant.

Furthermore, the Technical Working Group on ETS Monitoring, Reporting, Verification and Accreditation (MRVA) brings together representatives of MS Competent Authorities to share experiences and suggestions concerning effective and efficient implementation of Commission Implementing Regulation (EU) No 2018/2066[183] and Commission

182 https://ec.europa.eu/clima/policies/ets/allowances/leakage_en#tab-0-2

183 Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 601/2012. OJ L 334, 31.12.2018, p. 1.

Implementing Regulation (EU) No. 2018/2067[184] and to discuss potential updates and improvements of the ETS MRVA Regulations.

[184] Commission Implementing Regulation (EU) 2018/2067 of 19 December 2018 on the verification of data and on the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council. OJ L 334, 31.12.2018, p. 94.

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