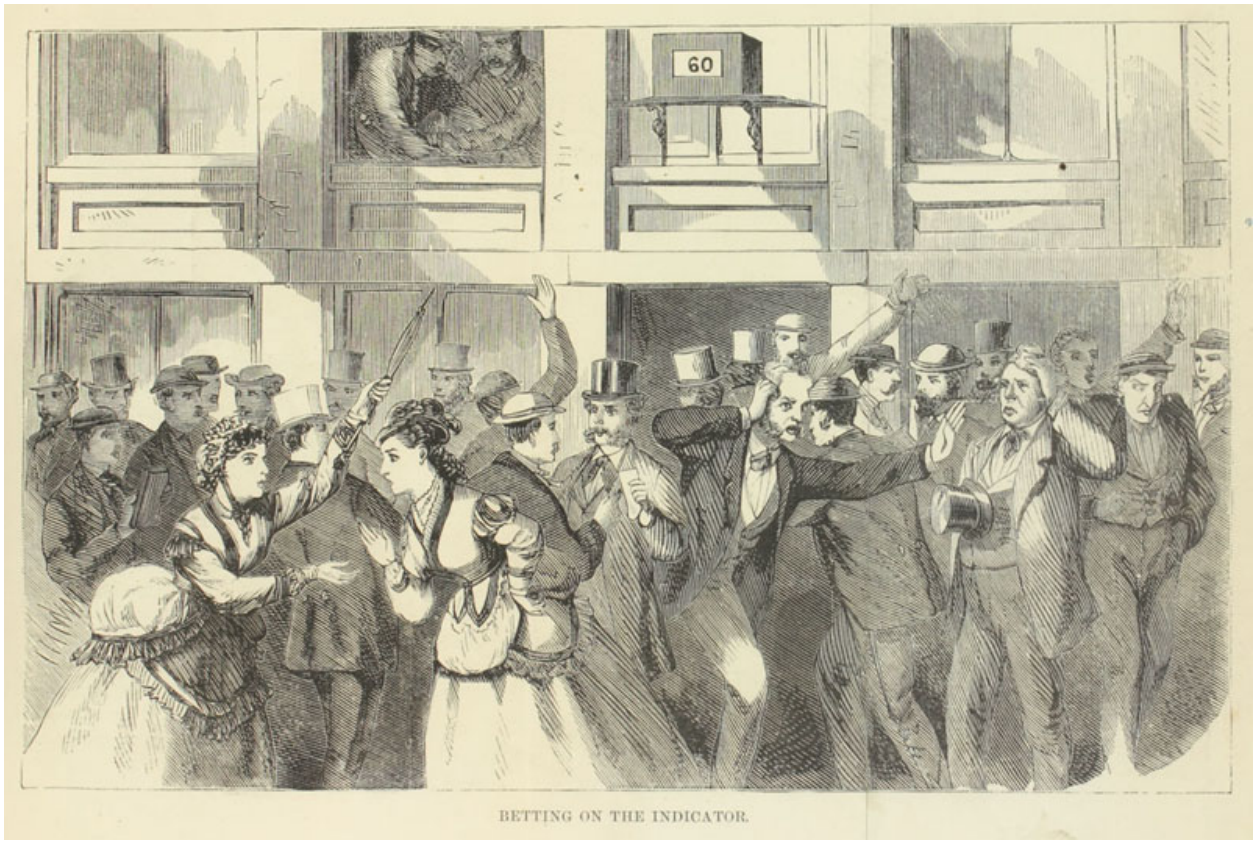
2022 State of the EU ETS Report



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This Paper has been the subject of stakeholder consultations, including a workshop convened by the authors with stakeholders including NGOs, think tanks, academia, policy makers, market participants and representatives of industry.

A grant to produce this report was provided by the French Ministry of Ecological and Solidary Transition. The authors thank them for their continued support for this report.

The European Roundtable on Climate Change and Sustainable Transition (ERCST) is a Brussels-based think-tank incorporated as non-profit organisation under Belgian law. ERCST provides rigorous intellectual analysis of EU and international climate change developments and policies, by using the experience and research of its staff, as well input from stakeholders who participate in its activities. ERCST provides original ideas and research into European and international debates on climate change policy. It represents its own views and strives to ensure in a very strict way its independence and integrity.

BloombergNEF (BNEF) is a strategic research provider covering global commodity markets and the disruptive technologies driving the transition to a low-carbon economy. Our expert coverage assesses pathways for the power, transport, industry, buildings and agriculture sectors to adapt to the energy transition. We help commodity trading, corporate strategy, finance and policy professionals navigate change and generate opportunities.

The Wegener Center for Climate and Global Change is an interdisciplinary, internationally oriented institute of the University of Graz, which serves as a core research center for pooling the competences of the University in the areas of climate change and the related issues in climate physics, meteorology, and economics. An evidence-based approach to the transformation of energy systems, innovative analytical modelling concepts, and the design of energy and climate policies are focal points of current research activities.

EcoAct is an international advisory consultancy and project developer created in 2005, which joined the Atos Group in 2020. EcoAct works with clients to meet the demands of climate change. We work with many large and complex multinational organisations to offer solutions to their sustainability challenges.

2022 State of the EU ETS Report

Table of Contents

List of Figures

List of Tables

List of Abbreviations

CA	Corresponding adjustment (under Article 6)
CBAM	Carbon Border Adjustment Mechanism
CCU	Carbon capture and utilization
Commission	European Commission
COP26	The 26th UN Climate Change Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CRC-M	Carbon Removal Certification Mechanism
EEA	European Economic Area
EEX	European Energy Exchange
EGD	European Green Deal
ESMA	European Securities and Markets Authority
ETS	Emissions Trading System
EUA	EU emission allowances
GHG	Greenhouse gas
GST	Global stocktake (of the Paris Agreement)
IMF	International Monetary Fund
IMO	International Maritime Organization
KPI	Key Performance Indicator
LRF	Linear Reduction Factor
MSR	Market Stability Reserve
NIMs	National Implementation Measures
OMGE	Overall Mitigation in Global Emissions
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SOP	Share of proceeds
TNAC	Total number of allowances in circulation
UKA	UK emission allowances

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Key Takeaways

- This report marks the beginning of Phase 4 of the European Union's Emissions Trading System (EU ETS), which started in 2021 and is marked by debates in line with a new climate ambition target. The European Climate Law is providing a new reality to become net zero by 2050. However, the EU ETS debate may not be as visible as in the past since other elements of the Fit for 55 package such as the CBAM, have become the focus of attention. ERCST would argue that the focus must remain on the EU ETS.
- The year 2021 was not only marked by a period of completing secondary legislation coming from the revision of the EU ETS Directive in 2018 but has also brought a proposal from the Commission to revise the current framework. The new rules are expected to apply from 2023, pending the success or failure of the upcoming negotiation process between the European Parliament and Council.
- While some elements are still at stake, Phase 4 of the EU ETS is the first one without UK installations. The need to achieve a worldwide climate compromise and the recent discussions in international forums (i.e., COP 26) has showed the need to further envisage the role of the EU ETS and international carbon markets, aiming for potential links under Article 6 of the Paris Agreement.
- In 2021, ahead of the Commission proposal to revise the EU ETS Directive, presented in July 2021, the stakeholder community looked optimistic about the possibilities of the EU ETS embracing the climate goal. Nevertheless, the annual market sentiment survey shows some questioning of the role of the EU ETS in some areas. Still, stakeholders consider the EU ETS as the pillar of the EU climate policy and as one of the best, if not *the* best, of the instruments to drive decarbonisation.
- Following the previous year's reports, this report shows the dynamics of emissions in different sectors. Estimates based on preliminary data indicate a 9.1% increase of total emissions in 2021 compared to 2020. Still, the dip in emissions caused by lower economic activity due to the COVID-19 crisis in 2020 had not yet been overcome in 2021.
- We cannot disregard that last year the EU was impacted by an unprecedent increase in energy prices. The discussion has also been revolved around the relationship between the energy and the carbon market and the increased high volatility of carbon prices. The role of speculators and the different treatment of compliance entitles, for which the EU ETS is a compromise to achieve efficient decarbonisation rather than an opportunity to obtain profits, has raised questions about the current provisions to address excessive market price fluctuations, and the need to include these considerations in the EU ETS review.
- Finally, some see this as the time to start exploring the role of the EU ETS post 2030.

1. Background

This "State of the EU ETS" Report is an independent effort which is not intended to duplicate or replace mandated work undertaken by the Commission. It focuses on identifying issues and assessing the performance of the EU ETS at the time when the report is produced.

This report is intended as a "snapshot", providing policymakers and stakeholders with an overview of how the EU ETS is doing by April of each year, based on previous year data. Within the constraints posed by the availability of publicly accessible data, the Report tries to assess the question of whether the EU ETS is "fit for purpose".

As background, following the completion of the review of the EU ETS in early 2018[1] many stakeholders assumed that the EU ETS was "fit for purpose" until 2030. However, much has happened since then. The European Green Deal (EGD)[2] and the endorsement of the climate neutrality objective by the European Council[3] in late 2019 has put us on a very different path. Subsequently, the European Climate Law was passed, which provides the legal basis for the EU's economy and society to reduce (net) Greenhouse Gas (GHG) emissions by 55% (vs 1990) by 2030 and achieve (net) climate neutrality by 2050.

Today, we are in the middle of a new review process, not only for the EU ETS, but for all climate and energy policies as part of the "Fit for 55" package, which was adopted by the Commission on July 14th, 2021[4]. The European Parliament and Council are currently defining their own positions, which are expected to be adopted before the summer. The negotiations between the EU institutions, so-called "trilogues"[5], on the final form of the revised EU ETS are expected to begin in September under the Czech Republic Presidency of the EU Council.

The aim is to have the revised EU ETS in place in 2023, the year of the first global stocktake of the Paris Agreement (GST). The global stocktake is a process envisioned in Article 14 of the Agreement and aims to assess the collective progress of countries towards achieving the goals set out in the Paris Agreement[6].

Article 30(3) of the EU ETS Directive mandates the Commission to report to the European Parliament and to the Council in the context of each global stocktake agreed under the Paris Agreement about the need for additional Union policies and measures to achieve the full implementation of the Paris Agreement by Member States[7].

As part of the Fit for 55 Package, the Commission set out a new target for the sectors covered by the EU ETS: reducing emissions by 61% (vs 2005 levels) by 2030, compared to the previous target of 43%. To achieve this new target, a tightening of current ETS parameters is envisioned, including a lowering of the cap and a reduction in the provision of free allowances. In addition to these measures, the Commission has proposed the so-called "ETS 2", which would introduce an ETS for road transport and buildings starting in 2026. This proposal has led to a heated debate in the European Parliament and Council where opinions

[1] Directive (EU) 2018/410. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0410&from=EN (Accessed on 12 April 2022).

[2] European Commission (2019). The European Green Deal. COM (2019) 640 final. Available at: https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf (Accessed on 12 April 2022).

[3] European Council (2019). European Council meeting (12 December 2019) – Conclusions EUCO 29/19. Available at: https://www.consilium.europa.eu/media/41768/12-euco-final-conclusions-en.pdf (Accessed on 12 April 2022).

[4] European Commission (2021). 'Fit for 55': delivering the EU's Climate Target on the way to climate neutrality. COM (2021) 550 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0550&from=EN (Accessed on 12 April 2022)

[5] Trilogues are "informal tripartite meetings on legislative proposals between representatives of the Parliament, the Council and the Commission. Their purpose is to reach a provisional agreement on a text acceptable to both the Council and the Parliament". European Parliament. (n.d.). "Interinstitutional negotiations". Available at: https://www.europarl.europa.eu/olp/en/interinstitutional-negotiations (Accessed on 13 April 2022)

[6] UNFCCC (n.d.) "Global Stocktake". Available at: https://unfccc.int/topics/global-stocktake (Accessed on April 11, 2022)

[7] Directive (EU) 2003/87. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32003L0087 (Accessed on 13 April 2022)

continue to be divided. Chapter 4 will provide a detailed overview of the different elements of the "Fit for 55" package as they apply to the EU ETS.

Moreover, in 2020 the measures put in place to address COVID-19 and the developments in Ukraine have impacted the EU ETS and Europe has experienced a dramatic increase in both carbon and energy prices. The Commission published the 'Energy Prices Toolbox' in October[8] outlining available measures to address prices. This will be discussed in Chapter 6.

2021 is also a year marked by the 26th UN Climate Change Conference of the Parties (COP26) in Glasgow, which was postponed from November 2020 to November 2021 due to the Covid-19 pandemic. The results of the COP26 negotiations emphasized continued global agreement to keep global warming as close as possible to no more than 1.5°C above pre-industrial levels, as well as an agreement on the Article 6 Rulebook. This could sway the EU to take a more internationalist approach for the EU ETS.

Finally, the EU ETS does not exist in a vacuum. It should not be compared to an ideal world, but to real options that are available to address climate change.

The EU ETS and EU climate policy are put in place to decarbonize the EU while ensuring that the outcome is a prosperous and industrial Europe. The EU ETS operates in a highly interconnected environment and is affected by climate change and other policies at different levels: global, EU, EU Member State, and sub-national jurisdictions. It must live with that reality and respond to it.

2. An EU ETS "fit for purpose"

To assess whether the EU ETS is "fit for purpose", we first need to identify the parameters which measure its success. Simply put, "what do we expect the EU ETS to deliver?". Indicators have emerged gradually, as experience is gained with these mechanisms, both in the EU, but also around the world. Experience from other, non-carbon, markets may also provide benchmarks for success. Nevertheless, some of these assessments will have a level of subjectivity and judgement (sometimes political) attached to them.

In this context, we need to remind ourselves that Article 1 of the EU ETS Directive[9] outlines its broad objectives:

> *"This Directive establishes a scheme for greenhouse gas emission allowance trading within the Community in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner. This Directive also provides for the reductions of greenhouse gas emissions to be increased so as to contribute to the levels of reductions that are considered scientifically necessary to avoid dangerous climate change."*

Some objectives are clearly enunciated and identified, while some stakeholders may see other objectives as implicit. The direct deliverables assessed by this report include:

1. **Environmental delivery**. Does it deliver against absolute environmental targets?
2. **Socio-economic delivery.** Does it deliver macro-economic efficiency and cost effectiveness for compliance? Does it provide effective, and proportional, protection against the risk of carbon leakage? Is it a driver for change? Does it ensure a just transition?
3. **Market functioning**. The ETS, which is a regulatory market, should only be the instrument of choice if it functions well and leads to good price discovery.

Over time, other deliverables or indicators have come to be "expected" or "understood". Some have come to equate the good functioning of the EU ETS, wrongfully in our view, with the delivery of a "right price"

[8] European Commission (2021): Tackling rising energy prices: a toolbox for action and support. COM (2021) 660 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2021%3A660%3AFIN&qid=1634215984101 (Accessed on 11 April 2022).

[9] Directive (EU) 2003/87. Available at : https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02003L0087-20180408&qid=1587648079332&from=EN (Accessed on 13 April 2022)

which could incentivize certain technologies or approaches. This report will not judge the success or failure of the EU ETS based on price levels. The EU ETS needs to be technologically neutral, and not an instrument to increase prices and revenue.

Long-term competitiveness

One indicator not explicitly mentioned is the expectation that the EU ETS will contribute to a long-term (competitive) advantage for Europe. This has become more explicit with the EGD, which was presented by the Commission as Europe's "New Growth Strategy", aimed at transforming the EU into a fair and prosperous society.

The main issue is perceived to be the magnitude and source of upfront investments that need to be made in order to put Europe firmly on a new path of sustainable and inclusive growth, as well as the question of how to manage the transition.

Some stakeholders see the EU ETS as a key instrument of economic and social engineering that will help accelerate the transition to a low-carbon economy by:

- Providing a price signal to accelerate economic transition, as well as change societal values, behaviour and systems;
- Addressing the socio-economic impacts associated with the transition to a low-GHG economy;
- Contributing to the creation of a market for low-carbon products.

Some of the objectives can be considered as being more explicit, as they are clearly captured in the EU ETS Directive by the legislators. They encourage investments in low-carbon technologies, help address socio-economic impacts, and facilitate a "Just Transition".

For these objectives, the inputs are clear and KPIs can be developed, e.g., in terms of the amount of investment leveraged; new jobs created; retraining of workers, etc. The others could be considered as being less "mature" and transparent in the policy debate, and KPIs more difficult to develop.

Promote carbon pricing

The EU ETS has become a pioneer in promoting carbon markets as a tool for addressing climate change. Many studies, including the Annual ICAP Status Report[10] and the annual State and Trends of Carbon Pricing report from the World Bank[11], show that carbon pricing is spreading across the world. Some other actors, for instance the International Monetary Fund (IMF), are calling for an international carbon price floor[12]. The internationalization of the EU ETS, including in linking it with other markets, as well as the use of Article 6 of the Paris Agreement for offsets, need to be considered as part of the vision during the transition period.

The EU is using multiple approaches to promote the use of carbon markets around the world. Firstly, through "leading by example" and persuasive climate diplomacy, resulting in other jurisdictions taking inspiration from the EU ETS. Secondly, the EU is able to leverage climate ambition or the use of carbon markets as a condition in free trade agreements or its accession process. Lastly, the EU can use a "stick" approach in its interaction with other countries to persuade them to adopt more ambitious climate policies and/or carbon pricing mechanisms. The proposed use of a Carbon Border Adjustment Mechanism (CBAM) is a move in this direction.

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[10] ICAP (2022). "Emissions Trading Worldwide: 2022 ICAP Status Report". Available at: https://icapcarbonaction.com/en/icap-status-report-2021 (Accessed on 11 April 2022)

[11] World Bank (2021). "State and Trends of Carbon Pricing 2021". Available at: http://hdl.handle.net/10986/33809 (Accessed on 11 April 2021)

[12] Parry, I. Black, S. Roaf, J. (2021). "Proposal for an International Carbon Price Floor Among Large Emitters". IMF. Available at: https://www.imf.org/en/Publications/staff-climate-notes/Issues/2021/06/15/Proposal-for-an-International-Carbon-Price-Floor-Among-Large-Emitters-460468 (Accessed on 11 April 2022).

3. Phase 3: a comprehensive analysis

3.1. The recovery Phase of the EU ETS

Phase 2 (2008-12) of the EU ETS was known for the low carbon prices it delivered. In particular, the 2009 European Union Allowances (EUA) price crash brought to light structural issues that prevented the EU ETS from coping with economic shocks and from providing a good price discovery given the regulatory nature of the EU ETS.

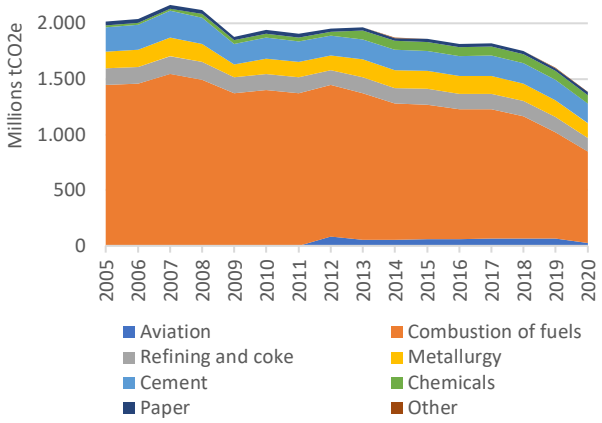
A series of reforms were implemented in Phase 3 (2012-2020) to make the EU ETS fit for delivering a price signal that was aligned with the EU's long-term emission reduction goal. The surplus of allowances accumulated due to overlapping policies and the economic downturn was addressed through the backloading of auctioned allowances, and the progressive reduction of free allocation.

In addition, a new mechanism – the Market Stability Reserve (MSR) – was implemented to improve the EU ETS' resilience to demand shocks. Finally, the revision of the EU ETS Directive for Phase 4, adopted in 2018, set a new 2030 target aligned with the Paris Agreement. Subsequently, the announcement of the EGD increased confidence in the EU's climate ambition for 2050 and signalled the EU's willingness to design the EU ETS accordingly.

3.2. Climate delivery

Phase 3 of the EU ETS met the emission reduction targets. The target of a 21% reduction of GHGs in 2020 compared to 2005 levels had already been achieved in 2014. Based on EUTL data from the European Environmental Agency (EEA)[13], CO_2 emissions of all stationary installations[14] fell by 29% over Phase 3 or 20% excluding 2020, which can be considered an outlier due to the COVID-19 pandemic. This reduction was driven to a large extent by combustion installations whose emissions decreased by 38% over Phase 3, while emissions from other stationary installations decreased by 9%.

Figure 1: Time series of verified emissions by ETS sector.



Source: Ecoact based on EEA data.

The combustion sector not only includes electric utilities, but also combustion plants of other sectors where they exceed the 20 MW participation threshold[15]. Emissions of other sectors in Figure 1 therefore correspond to process emissions only.

[13] To reflect changes in scope between trading periods (i.e., addition of new countries and sectors except for aviation), the data was re-treated to derive a time-series for stationary installations starting from 2005 consistent with the scope of the third trading period. See EEA's background note for details available at https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1 (accessed on 12 April 2022).

[14] The information on the type of activity of the entities covered by the EU ETS is based on the EUTL classification (which differs from UNFCCC nomenclature for GHG emission source categories or NACE codes).

[15] The scope of the EU ETS includes all combustion installations exceeding 20 MW and all installations where activities listed in Annex I of the ETS Directive are carried out (EU, 2003). The combustion sector therefore includes electricity production (up to 54% of installations according to euets.info data) but also other economic activities using boilers, burners, turbines, heaters, furnaces, incinerators, calciners, kilns, ovens, dryers, engines, fuel cells, chemical looping combustion units, flares, and thermal or catalytic post-combustion units falling over the 20 MW participation threshold.

Additionally, the potential mis-categorization of emissions in the EUTL data (e.g., combined heat and power emissions not included in industrial sectors) is not accounted for here.

Over Phase 3, the rate of decrease of emissions turned out to be more than twice as high as the LRF, with an average decrease of 5% per annum (6.4% in combustion, 1.3% in other stationary installations). The largest annual decrease of emissions took place from 2019 to 2020 because of the impact of COVID-19 on economic activity, with a decrease of 11% in stationary installations' emissions. Furthermore, emissions from aviation decreased by 63% as air travel almost halted during the pandemic.

Overall, several signs demonstrate the start of the decarbonization over Phase 3. The carbon intensity of combustion plants decreased by about 30% from 2013 to 2019 due to an increased share of renewable energy in the power mix and fuel switching opportunities.[16] In other installations of most sectors, carbon intensity improvements were modest but consistent over the period.[17]

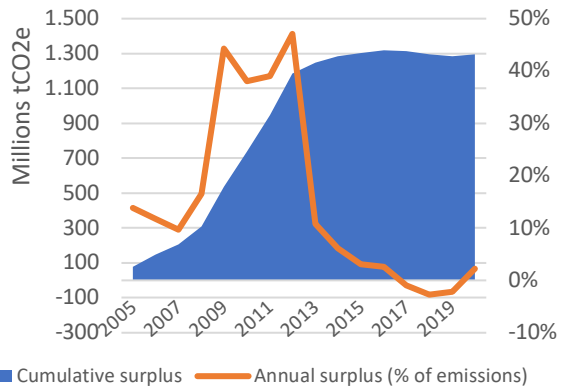
One matter is important to note: most of the reductions in Phase 3 were achieved in the power sector, and while the EU ETS played a guiding role, it is generally accepted that it was not the driving factor. this decarbonization is largely due to other policies and measures as well as a significant level of subsidies received by the power sector. This, coupled with the low carbon prices, made it possible for the power sector to move aggressively away from fossil fuel generation.

3.3. Economic delivery

3.3.1. Key figures

The second Phase of the EU ETS was characterized by an accumulation of allowances due to the structural shortcomings already identified. Supply-curbing measures implemented over Phase 3 and the phase-down of free allocation resulted in a stabilization of the cumulative allowance surplus (Figure 2). Since 2017, the manufacturing sector experiences a yearly allowance deficit of between 2% and 3% of total emissions.

Figure 2: Annual and cumulative allowance surplus, all stationary installations except combustion.



Source: Ecoact based on EEA data.

While Figure 2 provides a macroeconomic view of the balance between free allocation and verified emissions, breaking down these volumes by sector uncovers important heterogeneity. As Table 1 shows, combustion installations experienced an allowance deficit of up to 85% of annual emissions, counting from 2013, in 2020, mainly due to the power sector transition to full auctioning. Regarding process emissions (i.e., stationary installations other than combustion), the aggregate deficit experienced since 2017 was mainly driven by the refining of mineral oil, production of coke, as well as cement and chemical industries to a smaller extent. On the other hand, metallurgy and paper process installations had a positive allowance balance throughout Phase 3.

Differences in allowance balances can be explained by the data's high level of aggregation and differences in the origin of emissions between economic sectors, e.g., if metallurgy has a large share of combustion

[16] See details in LMDI analysis in section 7.

[17] Details in section 6.

installations, the allowance balance of metallurgy's process emissions would appear large by comparison to a sector whose emissions mainly originate from process installations.

Table 1 provides a static overview of sectors' allowance balances, but it does not account for allowance banking. Banking gives the option to account holders to save unused emission allowances for use in future trading periods. Indeed, since 2013, allowances delivered can be used in any further trading period, according to Article 13 of Directive 2003/87/CE.

Table 2, therefore, tries to quantify the actual allowance deficit when considering banking. It results in the number of emissions exceeding installations' total allowance holdings, i.e., yearly free allocation plus the accumulated bank, if any, which can be interpreted as the number of allowances purchased on the secondary market. In aggregate, the banking flexibility enabled stationary installations of most sectors except for combustion to keep a positive allowance balance during Phase 3. In other words, process installations could have relied on the aggregate accumulated bank to cover emissions, without a need to purchase allowances on the secondary market. By contrast, combustion installations, and process installations of the refining and coke[7] sectors would have had to purchase allowances in the market due to a lack of reserves since 2013.

Table 1: Yearly allowance surplus (green) and deficit (red) in Phase 3 by ETS sector, in percentage of the sector's verified emissions.

		2013	2014	2015	2016	2017	2018	2019	2020
Combustion of fuels	All Sectors	-73%	-74%	-78%	-80%	-83%	-84%	-84%	-85%
Process emissions	Refining and coke	-17%	-16%	-20%	-22%	-22%	-22%	-23%	-19%
	Metallurgy	26%	22%	20%	21%	17%	15%	18%	26%
	Cement	16%	4%	4%	3%	-2%	-6%	-5%	-1%
	Chemicals	11%	9%	2%	2%	-2%	-1%	-2%	-2%
	Paper	19%	20%	16%	12%	7%	6%	6%	9%
	Other	40%	32%	18%	8%	0%	-7%	8%	18%
All stationary installations exc. combustion		**11%**	**6%**	**3%**	**3%**	**-1%**	**-3%**	**-2%**	**2%**
Aviation		**-40%**	**-41%**	**-44%**	**-49%**	**-49%**	**-55%**	**-56%**	**21%**
Total		**-47%**	**-48%**	**-51%**	**-52%**	**-55%**	**-55%**	**-53%**	**-49%**

Source: Ecoact based on EEA data.

Sectors based on the EU ETS classification. Metallurgy: metal ore roasting or sintering, production of pig iron or steel, production or processing of ferrous & non-ferrous metals, production of primary & secondary aluminum ; cement: production of cement clinker, lime or calcination of dolomite/magnesite, ceramics, mineral wool ; chemicals: production of nitric acid, adipic acid, glyoxal and glyoxylic acid, ammonia, bulk chemicals, soda ash and sodium bicarbonate, production of carbon black, hydrogen or synthesis gas ; paper: production of gypsum or plasterboard, pulp, paper or cardboard ; other: capture of greenhouse gases, activity opted-in under Art. 24.

Table 2: Estimated purchases of allowances in Phase 3 by ETS sector taking into account allowance banking since 2013, in percentage of sector's verified emissions.

		2013	2014	2015	2016	2017	2018	2019	2020
Combustion of fuels	All Sectors	-73%	-74%	-78%	-80%	-83%	-84%	-84%	-85%
Process emissions	Refining and coke	-17%	-16%	-20%	-22%	-22%	-22%	-23%	-19%
	Metallurgy	0%	0%	0%	0%	0%	0%	0%	0%
	Cement	0%	0%	0%	0%	0%	0%	0%	0%
	Chemicals	0%	0%	0%	0%	0%	0%	0%	0%
	Paper	0%	0%	0%	0%	0%	0%	0%	0%
	Other	0%	0%	0%	0%	0%	0%	0%	0%
All stationary installations exc. combustion		**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Aviation		**-40%**	**-41%**	**-44%**	**-49%**	**-49%**	**-55%**	**-56%**	**0%**
Total		**-47%**	**-48%**	**-51%**	**-52%**	**-55%**	**-55%**	**-53%**	**-49%**

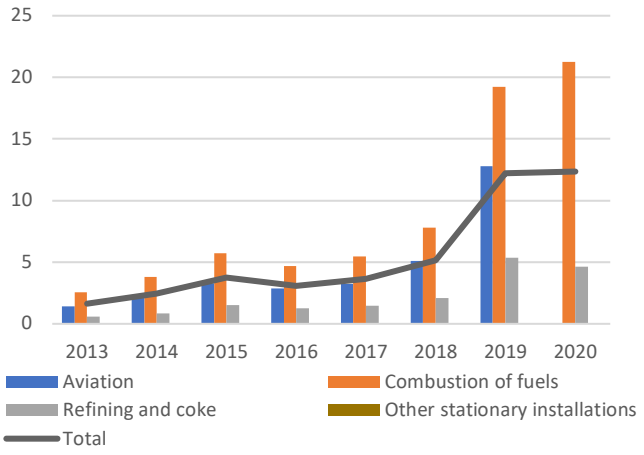
Source: Ecoact based on EEA data.

The annual bank is calculated as the positive difference between annual free allocation and emissions, plus the bank of the preceding year. As the bank cannot be negative, it is assumed that when there is no allowance left to cover emissions, the sector has to purchase permit in the market.

These results assume that banked allowances remained in account holders' hands over the years, which may not be the case in practice as part of the allowances in circulation are in the hands of the banking sectors and other financial players for hedging purposes. These results should rather be seen as an indication that the banking flexibility can be effective to smooth carbon costs over time.

Having estimated the aggregate need of allowance purchases of installations, Figure 3 quantifies the carbon cost paid in €/tCO_2e. It does so by dividing the product of estimated permit purchases and the yearly average EUA price by the sector's aggregate emissions. The carbon cost should not be interpreted as the carbon *price signal*, i.e., the EUA market price. The price signal provides the same abatement incentive to every installation despite the amount of free allocation received.

Figure 3: Cost of greenhouse gas emissions (€/tCO2e).



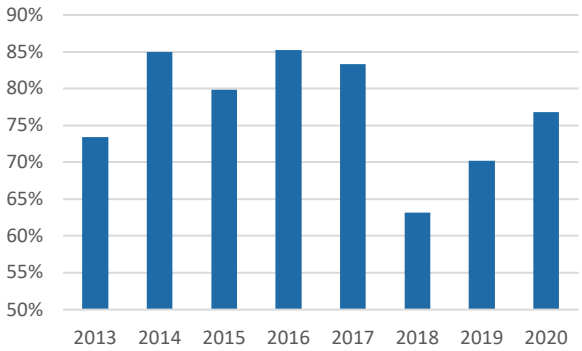
Source: Ecoact based on EEA data.

Figure 3 also shows that, as a whole, the effective carbon cost has increased more than sevenfold from 2013 to 2020, due to the phase down of free allocation coupled with increasing EUA prices. This trend has been mainly driven by the scarcity of allowances in aviation, combustion installations, and process installations in the refining and coke sectors. Process emissions in other manufacturing sectors could have been almost entirely covered by free allowances (Table 1), hence the effect of carbon cost is negligeable for these sectors.

3.3.2. Auction revenues

Consistent with the carbon price increase in Phase 3, Member State revenues from the auctioning of EUA rose from €3.1 billion in 2013 to 14.4€ billion in 2020 in the EU-27 (Figure 5). Based on annual reporting, it is estimated that 75% of total revenues (€56.5 billion) was used for climate and energy purposes during Phase 3 and 72% in 2020[19]. Although it remains well above the 50% required in the legislation, the share of revenues earmarked for climate and energy purposes has varied without showing a constant trend since 2013, with a low of 63% in 2018 (Figure 4).[20]

Figure 4: Share of auction revenues earmarked for climate purposes[18], 2013-2020, EU-27.



Source: Ecoact based on Staff Working Document accompanying EU Climate Action Progress Report (2021).

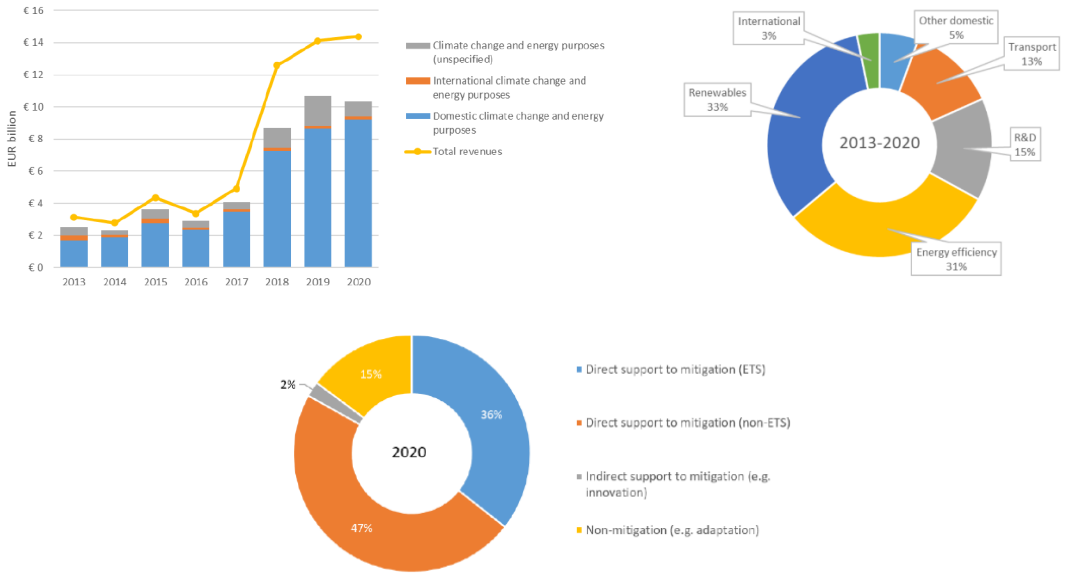
[18] Only revenues that are earmarked on climate and energy purposes are considered, therefore this chart in not representative of the total domestic spending on climate and energy. In some Member States, auction revenues can be pooled in the general budget and spent on climate issues, and other sources of income can also finance climate policies.

[19] European Commission (2021). EU Climate Action Progress Report 2021. COM(2021) 960. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0960 (Accessed on 19 April 2022)

[20] It should be stressed that only a portion of auction revenues is earmarked for climate and energy purposes, however, since a quarter of it goes to the general budget of Member States.

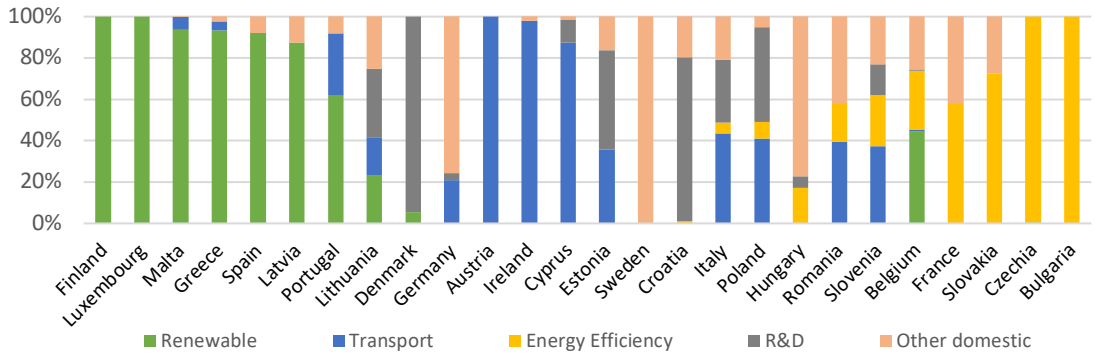
In 2021, Member States reported on the type of support used domestically for the first time.[21] In 2020, most of the reported revenues were spent on direct support (Figure 5), i.e., on the installation of technologies that reduce emissions. In particular the development of renewable energy to meet the EU's targets, measures to encourage a shift to low-emission and public forms of transport, and energy efficiency measures were the main beneficiaries of auction revenues. Interestingly, around 60% of the EU ETS revenues was spent in non-ETS sectors.

Figure 5: Auctioning revenues and reported usage (€ bn), 2013-2020, EU-27.



Source: EU Climate Action Progress Report (2021).

Figure 6: Self-reported use of ETS auctioning revenues spent on climate change and energy in 2020.



Source: Ecoact based on Reportnet dataflows.

[21] As per Article 5 of the Implementing Regulation (EU) 2020/1208. Commission Implementing Regulation (EU) 2020/1208 of 7 August 2020 on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) 2018/1999 of the European Parliament and of the Council and repealing Commission Implementing Regulation (EU) No 749/2014 (Text with EEA relevance).

By looking at the numbers more closely (Figure 6), it is possible to identify some trends among Member States on how they used auctioning revenues in 2020. Particularly countries from Northern and Southern Europe used them mainly to develop renewable energy to meet the EU's target, while Central and Eastern European Member States gave preference to encouraging a shift to low-emission and public forms of transport. Countries from Eastern Europe invested in energy efficiency measures. An important share goes to other domestic GHG reduction measures, especially among some of the biggest countries in the EU, such as Germany, France, and Italy, which use, respectively, 75%, 42% and 20% of these revenues for those policies.

3.4. Resilience of the EU ETS

Phase 3 of the EU ETS succeeded in restoring the scarcity of allowances in the market, which, as expected, impacted the carbon price. It was also the phase of a major structural change, the Market Stability Reserve (MSR), implemented in 2019 to (i) address the existing surplus of allowances and (ii) improves the system's resilience to major shocks. The MSR operates by altering the total number of allowances in circulation (TNAC) according to pre-defined rules and by cancelling allowances when the TNAC exceeds a specified threshold.

There is little history to evaluate the impact of the MSR on environmental and economic outcomes of the EU ETS, yet its implementation evidently coincided with a strong increase in EUA prices. The role played by the MSR in the recent price rise is not clear, however. No correlation has yet been found[22] between the TNAC and EUA prices.[23]

Some, who equate high prices with success of the EU ETS, would argue that the MSR's support function can be perceived as a success as prices remained high during the COVID-19 pandemic. The recent escalation in prices (+50% between October 2021 and February 2022) creates doubts about the success of the EU ETS to incentive effective decarbonisation.

Several studies have raised concerns about the MSR's ability to bring stability to the market. First, the MSR's action is based on past TNAC volumes, which has been criticized as being contrary to the forward-looking nature of the EU ETS. For instance, the decision to bank allowances for hedging purposes can result in the MSR cancelling allowances, further reinforcing allowance scarcity and triggering price spikes.[24] Secondly, the cancellation mechanism has been pointed out as a potential factor in creating short-term price volatility as it creates uncertainty around the future cap on emissions.

4. Regulatory developments

4.1. EU developments

4.1.1. Secondary legislation for Phase 4 of the EU ETS

Having started in 2018, work on the secondary legislation to implement the provisions in Phase 4 of the EU ETS has continued in 2021. Except for the exclusion of incoming flights from the UK from the scope of the EU ETS, developments have been mainly focused on setting the conditions for the update of free allocation for the 1st sub-period (2021-2025) of the EU ETS, following the submission of data by Member States. The indicative timeline of secondary legislation is presented in Figure 7.

[22] EU ETS: The Market Stability Reserve should focus on carbon prices, not allowance volumes. Energypost. June 16, 2020. S.Quemin & M. Pahle.

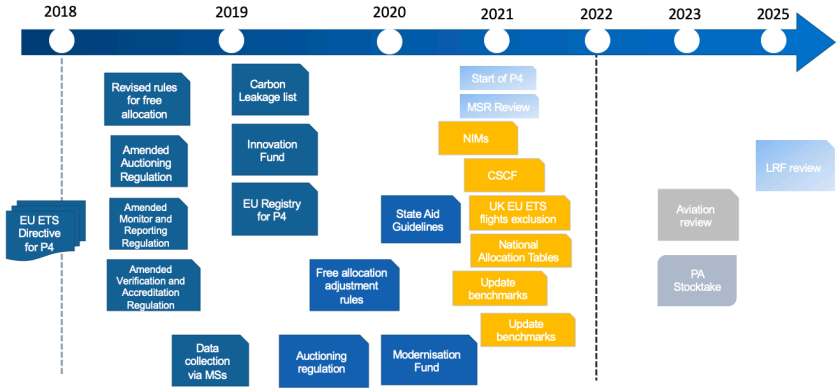
[23] Other factors such as hedging and speculation could have played an equally important role in driving prices.

[24] The TNAC is computed based on the difference between past volumes of allowances freely allocated or sold (supply), and emissions plus allowances in the MSR (demand). It therefore does not represent the balance of the market, which also depends on anticipation of future prices and hedging behaviors.

On 25 February 2021, the Commission adopted the Decision concerning National Implementation Measures (NIMs).[25] The NIMs Decision outlines the treatment of installations under the EU ETS.

Member States were required to submit their NIMs to the Commission over the period 2014-2018, comprising a list of installations on their territory covered by the Directive 2003/87/EC.

Figure 7: Timeline of the secondary legislation related to the EU ETS.



Source: ERCST (2022).

The NIMs included information on production activity, transfers of heat and gases, electricity production and emissions at sub-installation level. The NIMs were used by the Commission to calculate the benchmark values which are used to determine the level of free allocation.

On 12 March 2021, the Commission adopted the Implementing Regulation determining the revised benchmark values for free allocation of emission allowances, for the period 2021 to 2025.[26]

On 31 May 2021, the Commission adopted its Decision on the Cross Sectoral Correction Factor (CSCF)[27]. The CSCF adjusts the free allocation of emission allowances if demand from industry exceeds the free allocation quota under the EU ETS Directive.

For each year in the allocation period from 2021 to 2025, the CSCF will be 100%, thus the CSCF will not reduce the level of free allocation further.

The publication of the National Allocation Tables (NATs)[28] on 29 June 2021 was the last stage of the legislative process for the update of the benchmarks in the first subperiod of the EU ETS. Using the revised benchmark values, the NATS determine the list of installations under the EU ETS eligible to receive free allocation and the level of free allocation provided to them for each year in the period 2021-2025.

[25] Commission Decision (EU) 2021/355 of 25 February 2021 concerning national implementation measures for the transitional free allocation of greenhouse gas emission allowances in accordance with Article 11(3) of Directive 2003/87/EC of the European Parliament and of the Council (notified under document C(2021) 1215). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021D0355&rid=17 (Accessed on 11 April 2022)

[26] 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. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0447&qid=1617870888213&from=en (Accessed on 13 April 2022)

[27] Commission Implementing Decision (EU) 2021/927 of 31 May 2021 determining the uniform cross-sectoral correction factor for the adjustment of free allocations of emission allowances for the period 2021 to 2025 (notified under document C(2021) 3745). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021D0927 (Accessed on 11 April 2022)

[28] European Commission (2021). Commission Decision of 29 June 2021 instructing the Central Administrator of the European Union Transaction Log to enter the national allocation tables of Belgium, Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland and Sweden into the European Union Transaction Log. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.C_.2021.302.01.0001.01.ENG&toc=OJ%3AC%3A2021%3A302%3AFULL (Accessed on 11 April 2021).

Finally, the last piece of EU ETS secondary legislation adopted in 2021 is the Delegated Regulation on the exclusion of incoming flights from the United Kingdom from the scope of the EU ETS.[29] It exempts departing flights from the UK to the European Economic Area (EEA) based on Article 25 of the EU ETS Directive.[30]

No secondary legislation or modification of the Article 29a of the EU ETS Directive to address excessive price fluctuations has taken place in 2021, this being a potential element to consider under the current energy crisis and its impact on carbon prices.

4.1.2. Fit for 55

On July 14, 2021, as part of the Fit for 55 package, the Commission published its legislative proposal for the MSR review.[31] The European Climate Law[32] sets the overall EU intermediary target of reducing GHG emissions by 55% by 2030 (versus 1990 levels) to reach net zero by 2050.

In the case of the EU ETS, this will mean an increase from the current target of -43% to - 61% for EU ETS installations by 2030 (versus 2005 levels). To reach this target, the Commission is moving from a Linear Reduction Factor (LRF) of 2.2% to 4.2% from 2024 onward. In addition to this, the Commission proposes a one-off removal of 117 million allowances (a so-called "rebase") in 2024.

The increased target is also reflected in the proposed adjustment of the maximum benchmark update rate from 1.6% to 2.5%, starting in 2026. The ETS revision has also launched a debate on the future of free allocation, a tool which is currently used to address the risk of carbon leakage.

According to several projections, free allocation could run out by the end of this decade, meaning that the CSCF may kick in. In the EGD, the Commission announced that, should differences in the levels of climate ambition persist worldwide, it would propose a CBAM, to ensure that the price of imports more accurately reflects their CO_2 content. Consequently, the Fit for 55 Package included a proposal for an EU CBAM. For the sectors covered by the CBAM[33], the Commission is proposing a phase out of free allocation by 2035, with a 10% annual reduction.

Moreover, allowances otherwise allocated for free to industry sectors covered by the CBAM are to be used to increase the size of the Innovation Fund from 450 to 650 million allowances. The Modernisation Fund would also increase to up to 2.5% of the cap.

The Commission is furthermore proposing to exempt the submission of CO_2 allowances for emissions which are permanently chemically bound in a product. It is devising a Carbon Removal Certification Mechanism (CRC-M) by 2023. The CRC-M is meant to incentivize the removal of CO_2 and the development of Carbon Capture and Utilization (CCU) technologies.

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[29] Commission Delegated Regulation (EU) 2021/1416 of 17 June 2021 amending Directive 2003/87/EC of the European Parliament and of the Council as regards the exclusion of incoming flights from the United Kingdom from the Union emissions trading system. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R1416 (Accessed on 11 April 2022).

[30] European Commission (2021). Frequently Asked Questions. The impact of Brexit on the EU Emissions Trading System for aviation. September 2021. Available at: https://ec.europa.eu/clima/system/files/2021-09/policy_transport_aviation_faq_aviation_brexit_en.pdf (Accessed on 11 April 2022).

[31] European Commission (2021). Proposal for a 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. Available at: https://ec.europa.eu/info/sites/default/files/revision-eu-ets_with-annex_en_0.pdf (Accessed on 11 April 2022).

[32] Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R1119 (Accessed on 11 April 2022).

[33] The list of sectors under the CBAM, as proposed by the Commission, are iron and steel, cement, fertiliser, aluminium and electricity generation. European Commission (2021). Proposal for a Regulation of the European Parliament and the Council establishing a Carbon Border Adjustment Mechanism. COM (2021) 564 final. Available at https://eur-lex.europa.eu/resource.html?uri=cellar:a95a4441-e558-11eb-a1a5-01aa75ed71a1.0001.02/DOC_1&format=PDF (Accessed on 13 April 2022)

With respect to the MSR, the Commission has proposed to extend the current parameters until 2030, with a doubled 24% intake rate of allowances moving into the MSR until then. The change of the intake rate mechanism to mitigate threshold effects is applicable when the total number of allowances in circulation is close to the upper threshold of 833 million but below 1096 million. In addition, the proposal calls for a cancellation (invalidation of allowances) when the allowances in the MSR are above a threshold of 400 million, instead of above the total number of allowances auctioned during the previous year. Additionally, the MSR will now include the supply and demand from aviation and maritime transport sectors.

As part of the Fit for 55 package, the Commission proposed amendments to the EU ETS Directive with regards to the contribution of aviation to the EU emission reduction target. The Commission foresees a progressive phase-out of the free allowances distributed to aircraft operators from 2024 to 2026 (by 25%, 50% and 75% respectively) and a complete phase-out from 2027 onwards.

The Commission also proposes to apply the same LRF as for stationary installations (4.2% instead of 2.2%) and to rebase the total number of allowances on active aircraft operators in 2023.

The scope of the EU ETS would remain unchanged, i.e., it would cover intra-EEA flights in addition to flights from the UK and Switzerland. These flights would be exempted from the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)[34], whose voluntary phase began in 2021.

One of the most controversial points coming from the Commission proposal to revise the EU ETS is the potential extension of carbon pricing to new sectors, with a particular focus on maritime, road transport and buildings.

EU maritime transport CO_2 emissions currently account for around 4% of the EU's CO_2 emissions[35]. For the maritime sector, the Commission is proposing that CO_2 emissions from large EU ships (above 5000 gross tonnages[36]) be covered under the current EU ETS starting with a phase-in period[37].

EU road transport and building emissions currently account for 30% of the EU's GHG emissions. For the road transport and building sector, the Commission is proposing upstream emissions to be covered under an independent ETS starting in 2026 with a 5.15% LRF.

In contrast, the outlook for the extension to road transport and buildings is still less certain and the decision will depend on the negotiations between the European Parliament and Council. Such an ETS extension would almost double the ETS GHG emissions coverage, which would pass from 45% to around 80%.

4.2. International carbon price developments

4.2.1. Brexit implications for the EU ETS

The UK ETS was put in place starting in 2021, as part of the EU-UK trade and cooperation agreement. The practical implications of Brexit for the EU ETS mainly concern the aviation sector due to the split between the EU and UK ETS registries. Since flights departing from the UK to the EEA fall under the scope of the EU ETS after Brexit (see Chapter 4.1.1), all aircraft operators previously administered by the UK needed to migrate to a participating state under the EU ETS in 2021.

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[34] CORSIA is a global market-based measure for aviation emissions put in place by the International Civil Aviation Organization (ICAO) since 2016. Aviation benefits (n.d.). "CORSIA explained". Available at https://aviationbenefits.org/environmental-efficiency/climate-action/offsetting-emissions-corsia/corsia/corsia-explained/ (Accessed on 12 April 2022).

[35] DG CLIMA (2021). Fit for 55 Package Delivering our 2030 climate target. Revision of the EU Emissions Trading System. 12th EU ETS Compliance Conference. Slide 14. Available at: https://ec.europa.eu/clima/system/files/2021-12/20211124_p1_en.pdf (Accessed 13 April 2022)

[36] Ships covered by Regulation (EU) 2015/757 performing voyages with the purpose of transporting passengers or cargo for commercial purposes.

[37] The phase-in period will start in 2023, where shipping companies will be required to report their 20% of verified emissions: respectively, 45% for 2024, 70% for 2025, and 100% for 2026 and after.

4.2.2. Linking with other emissions trading systems

Swiss ETS

The linking agreement between Switzerland and the EU entered into force in January 2020. The Swiss ETS counts 51 stationary installations and 3 aviation operators. Their verified emissions amounted to 5.5 billion tCO_2e in 2020. As of September, of the same year, the linking has enabled the physical transfer of allowances between the two systems. These transfers take place twice a month, at pre-defined dates.

Market data relative to the 2020 trading year was first published in the 2021 Carbon Market Report. Table 3 shows that stationary installations covered under either system hardly made use of allowances from the other system for compliance. Aircraft operators used the linking flexibility to a larger extent. More than 2% of EU ETS aviation emissions were covered by Swiss aviation allowances, while Swiss aircraft operators used EU aviation allowances for more than 40% of their emissions.

Table 3: Breakdown of allowances used by EU and Swiss ETS installations for compliance in 2020.

		Allowances used for compliance in 2020 (% of total)				
		EU ETS general allowances	EU ETS aviation allowances	Swiss general allowances	Swiss aviation allowances	CER
EU ETS	Stationary installations	99.99%		**0.01%**		
	Aviation operators	48.2%	49.4%	0%	**2.3%**	
Swiss ETS	Stationary installations	**0.2%**		97.6%		2.2%
	Aviation operators	0.1%	**40.5%**	0%	57.5%	1.9%

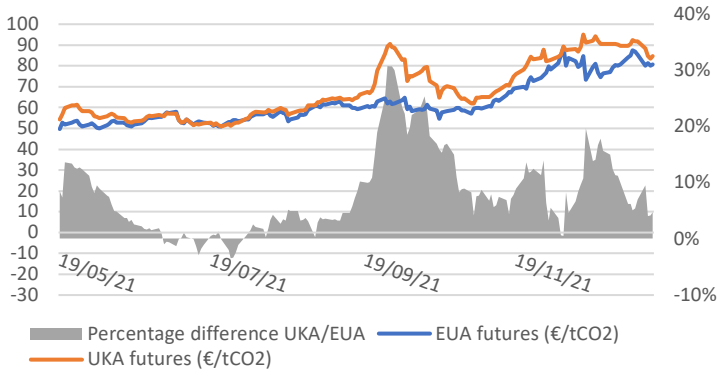
Source: Ecoact elaborations on the Commission's Carbon Market Report (October, 2021).

Reading note: Stationary installations covered under the Swiss ETS used 0.2% of EU ETS allowances to cover their emissions.

UK ETS

Although the post-Brexit trade deal agreed to give "serious consideration" to linking the EU and UK ETS, there is no sign of negotiations to date. The absence of an agreement linking the EU and the UK ETS may put UK industry at a competitive disadvantage vis-à-vis the EU due to higher UK allowance (UKA) prices. Figure 8 shows that prices have been on average 8% higher in the UK ETS than in the EU ETS since May 2021, with peaks at 30% difference UKA/EUA.

Figure 8: Historical evolution of UK and EU allowance futures.



Source: Ecoact based on Ember data (exchange rate: 1.20 EUR/GBP).

Possible explanations for this divergence include the UK's low gas storage capacity and issues related to utilities switching over from the EU to the UK allowance system.[38] Some regulated actors also point to a lack of liquidity of the UK market which may impact EU-UK linking discussions and signal the danger of low liquidity in any market, including in the EU ETS in the future.

4.2.3. Article 6 of the Paris Agreement

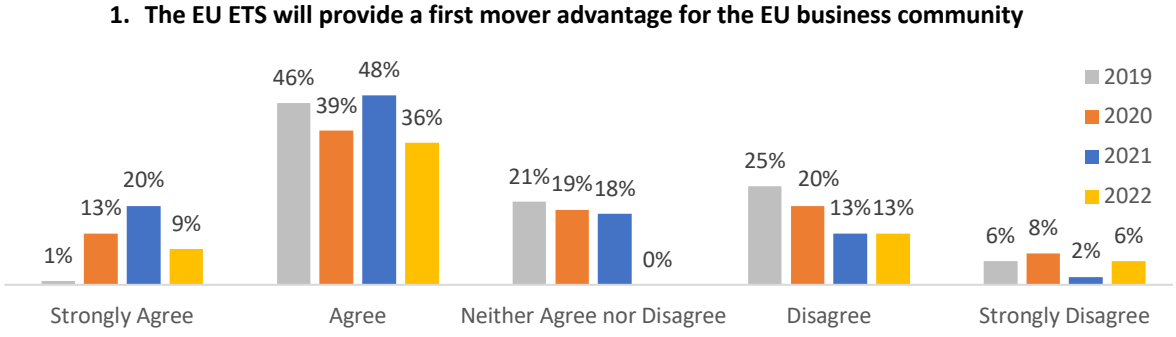
In November 2021, the COP26 agreed on the Glasgow Climate Pact. One important element is the Article 6 Rulebook. The "progressive view", led by the EU largely prevailed in negotiations. Additional clarity was also provided with respect to the relationship between Art 6 and voluntary markets. The impact of completing the Article 6 Rulebook in Glasgow on the EU ETS could affect a number of areas.

One area is providing certainty in accounting for linking different ETS, providing some impetus for linking. Another area is that of international offsets in the EU ETS, especially those coming from Art 6.4. The EU has previously severed the link between the EU ETS and international carbon markets based on concerns regarding environmental credibility. Since the EU succeeded in achieving its "asks" in the Article 6 negotiations, there is a not unreasonable expectation that the re-establishment of the EU ETS link with international markets under Article 6 will be at least examined. However, so far, this topic seems to be still taboo in the current EU ETS review.

5. Market Sentiment Survey

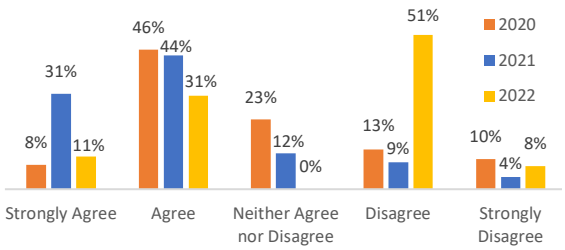
Historically, market sentiment has played an important role, some may say more so than fundamentals, in shaping the behaviour of the EU ETS. Sentiment driven by regulation continues to play an important role until all climate-related commitments are solidly enshrined in law. For the fifth year, this Report carried out a Market Sentiment Survey which reached out to stakeholders whom the authors believe are "players & opinion makers" in the EU ETS. The sample includes experts, policymakers, industrial and utility operators, traders, and civil society and is not intended to be statistically representative.

Figure 9: Market Sentiment Survey - Results

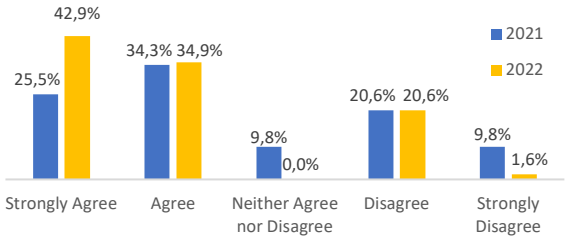


[38] ESMA (2022). Emission allowances and associated derivates. Final report. 28 March. Available at: https://www.esma.europa.eu/sites/default/files/library/esma70-445-38_final_report_on_emission_allowances_and_associated_derivatives.pdf (Accessed on 13 April 2022).

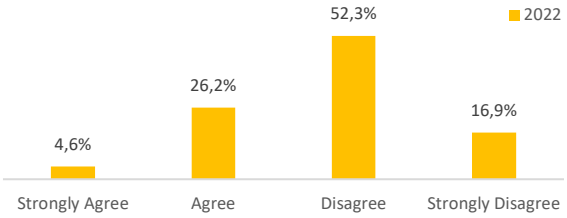
2. The EU ETS in its present form can drive EU decarbonisation post 2030



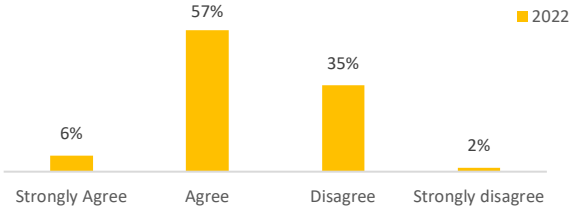
3. Significant changes are needed in the upcoming ETS review in order to make it 'fit for purpose'



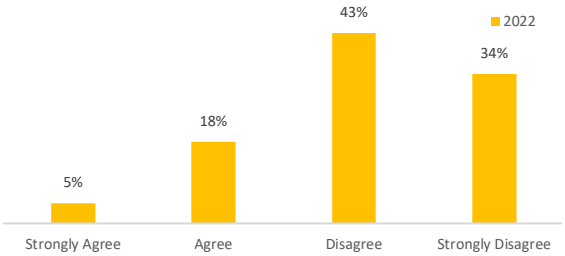
4. The current proposal for ETS review by the Commission adequately addresses concerns raised by stakeholders



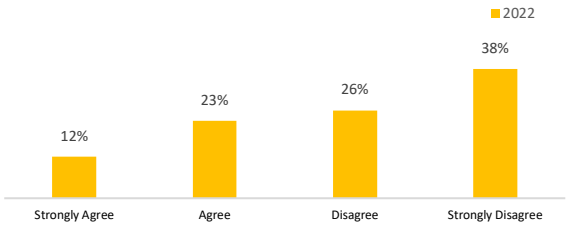
5. Does the EU ETS, as proposed in the Fit for 55 Package, will drive technological innovation?



6. The present EU ETS governance allows to respond to market dynamics



7. The combination of EU ETS and CBAM proposals for the EU will address competitiveness and carbon leakage concerns



Compared to 2020, it can be said that, for 2021, one third (Figure 9.1) of the sample agree that the EU ETS is capable of providing a first-mover advantage for the EU business community, specifically in terms of leading to changes in behaviour, production, and investment towards a net zero economy. While 2021 was an optimistic year, ahead of the publication of the Commission proposal in June to revise the EU ETS Directive, the confidence of stakeholders has diminished in 2022.

Nevertheless, stakeholders are split into two groups with opposite thoughts when it comes to whether the EU ETS is a driver for EU decarbonization post-2030 in terms of providing the economy with clear price signals (Figure 9.2). This is a significant change from the previous year's results, specifically in the level of disagreement, which surged from 9% to 51% in one year.[39]

[39] It may be that this development has been driven by the rapid increase in carbon prices as well as concerns over speculation within the EU ETS.

At the same time, the number of correspondents thinking it is necessary for the EU ETS to be changed in order to become 'fit for purpose' (Figure 9.3) increased from 59% to 78%, with the majority of these respondents agreeing strongly.

Moving on to this year's new questions, the surveyed stakeholders are again split when it comes to views on whether the Commission's current proposal for ETS adequately addresses concerns raised by stakeholders[40] (Figure 9.4).

Nevertheless, it must be highlighted that more than half of the respondents (63%) consider that the EU ETS, as proposed in the Fit for 55 Package, will drive technological innovation (Figure 9.5). It was important to raise this question as several stakeholders have questioned the EU ETS's ability to send sufficiently credible medium- to long-term signals to drive innovation.

The present overall EU ETS governance (Figure 9.6) is not acknowledged to be appropriate to respond to market dynamics by three quarters of involved stakeholders, who are not confident that instruments such as Article 29a of the EU ETS Directive (in its current form) are suited, in terms of timing as well as the decision-making processes, to the ultimate goal of balancing timely and effective intervention with regulatory transparency and predictability.

Respondents disagree (64%) that the combination of EU ETS and CBAM proposals, in the form of phasing out free allocation between 2026 and 2035 for CBAM sectors with a review clause after three years from its entry into force, will address competitiveness concerns and carbon leakage risks (Figure 9.7).

In conclusion, it is possible to say that, overall, stakeholders hold different and often opposite views on how the legislative process of the EU ETS should move forwards based on its status. However, they still consider the EU ETS as providing an advantage for the EU business community in its move towards a net zero economy. The results show that following the issuance of the Commission proposal the optimism on the EU ETS has slightly decreased - still the potential of the EU ETS continues to be recognized. This is another important evolution from 2020 as it might be considered as an indicator of further changes needed on the EU ETS Directive under the upcoming negotiation process.

6. Environmental delivery

The EU ETS needs to be seen as an instrument which delivers price discovery for EUAs within the scarcity created by the cap on GHG emissions. If the EU ETS is to be considered successful, the environmental delivery, or delivery against the cap, is key.

However, this delivery must be seen as multi-faceted. The EU ETS needs to be examined for its delivery in the trading period, as set out by the Directive, as well as its contribution to the achievement of the long-term climate change objectives. This is a more subjective objective as the best speed is a matter to political judgement and technological development.

6.1. Delivery against Phase 4 target

In July 2021, the Commission published the "Fit for 55" package introducing the target of achieving climate neutrality by 2050 and at least a 55% net reduction of GHG emissions by 2030. The proposed revision of the EU ETS Directive is intended to tighten the cap for emissions from combustion[41] and from industrial

[40] The concerns raised by stakeholders under the ongoing EU ETS revision include impact on low-income households, distributional concerns between Member States, carbon leakage risk, industrial competitiveness, use of revenues, energy efficiency, delayed decarbonisation in the industrial sector, deployment of innovative climate-neutral technologies, coverage, emission reduction, regulatory uncertainty and transparency, price volatility, the potential role of speculation, etc.

[41] Combustion of fuels" is the labeling of activity 20 in the EUTL. The remaining activities are summarized under "industry".

sectors as indicated in Figure 10(a)[42]. Figure 10(b) shows the change in balance between purchased and freely allocated allowances.

The main elements of the proposed reform which impact stringencies in Phase 4 are the following:

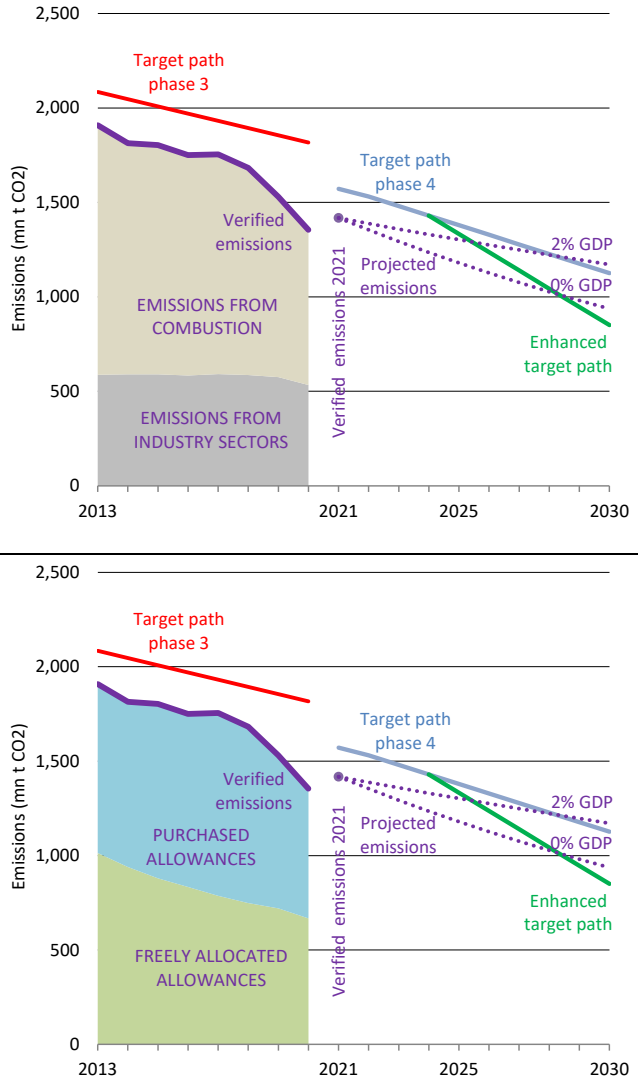
- **A more ambitious emissions target** path for the EU ETS: it should reduce emissions by 61% compared to 2005 with an enhanced LRF of 4.2%.
- **A more responsive MSR**: it should react faster to the TNAC in the system by increasing the intake rate and allowing for cancelling of allowances.
- **A gradual phaseout of free allowances** in accordance with the CBAM is supposed to put a levy on the embedded carbon content of high carbon imports.

Emissions from industry remained almost stable, compared to emissions from power combustion and heat, which sharply declined particularly towards the end of Phase 3. This decline reflects the fuel switching that took place and the impacts related to the response to COVID-19.

At the beginning of Phase 4, one can make the following initial comments (Figure 10):

- Projected emissions based on a Gross Domestic Product (GDP) growth between 0% and 2% per year might soon hit the target path in Phase 4.

Figure 10: Projected emissions and target paths for Phase 4 in the combustions and industry sectors (a) and in the allowance allocation methods (b).



Source: Wegener Center based on EUTL (2022), EEA (2022), European Commission (2021).

- Until 2021 emission reductions in the EU ETS were mainly driven by the combustion sector.
- An increasing scarcity of free allocation emerged, which will particularly affect the industry sectors.

EU ETS in phase 3 and year 2021

The year 2021 is important due to two major events: the UK ETS implementation after Brexit and the economic rebound after the COVID-19 shock in 2020. Moreover, the surplus that existed in the market has continued to decrease.

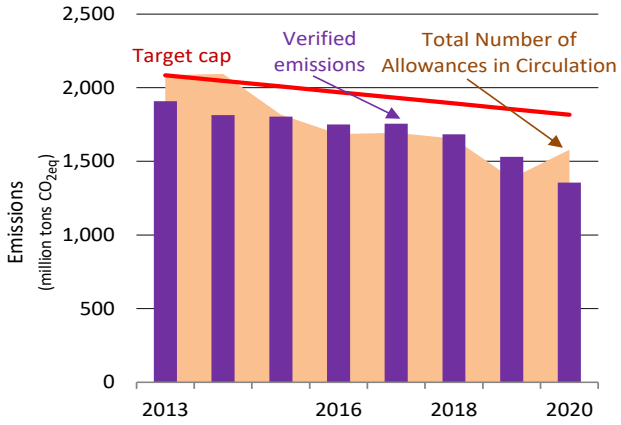
[42] Pre-2021 data includes emissions from UK installations while data for 2021 does not.

EU ETS emissions reached 1,352 $MtCO_2$ in 2021, erasing most of the reductions observed in 2020. Emissions are back to 2019 levels. This is largely explained by the fast economic recovery in Europe.

The features of Phase 3 of the EU ETS, that are relevant as far as the environmental delivery of EU ETS is concerned, are: target cap, demand for allowances (i.e., verified emissions), and supply of allowances, as they constitute the foundation of the EU ETS carbon market.

The annual cap started from 2,084 million in 2013 and was reduced by 1.74% (32 Mt/year), resulting in a cap of 1,816 Mt in 2020.

Figure 11: Total number of allowances in circulation (TNAC) and EU carbon price.



Source: Wegener Center based on EUTL (2022), EEA (2022), Trading Economics.

Preliminary data for 2021 and sector dynamics

For this sectoral analysis the data used does not include UK emissions.

Estimates based on preliminary data, as published by the European Commission in April 2022, indicate a 9.1% increase of total emissions in 2021 compared to 2020, which resulted from a 10.8% growth of emissions from combustion and a 6.2% rise from industry. The dip in emissions caused by lower economic activity because of the COVID-19 crisis in 2020 was not yet compensated in 2021[43]. In addition, since the beginning of Phase 3 industrial emissions remained stable, whereas combustion exhibits a pronounced reduction after 2018. Refineries, steel, and cement clinker represent about two thirds of industrial emissions. The COVID-19 crisis had a larger effect on the steel sector Compared to the beginning of Phase 3, emissions from refineries and steel decreased by about 10%.

Market stringency and liquidity

Figure 11 shows that at the beginning of Phase 3 the TNAC was equivalent to the value of the target cap while at the end of Phase 3 in 2020 it again surpassed the volume of verified emissions. Between 2014 and 2016, 900 million tonnes were withdrawn from auction through backloading.

It is also necessary to point out that the composition of the TNAC is important to evaluate the real liquidity available in the market.[44] This would require assessment of hedging and the percentage of allowances which are in the hands of other market actors. This kind of analysis goes beyond the scope of this paper.

[43] GHG emissions from operators covered by the EU ETS fell by 13.3% in 2020 compared to 2019 levels. Source: DG CLIMA (2021): Emissions trading: greenhouse gas emissions reduced by 13.3% in 2020. 15 April. News article. Available at: https://ec.europa.eu/clima/news-your-voice/news/emissions-trading-greenhouse-gas-emissions-reduced-133-2020-2021-04-15_en (Accessed on 15 April 2022).

[44] Köppl, A., S. Schleicher, J.-Y. Caneill (2022). What is Driving the EU ETS Carbon Price? Austrian Institute of Economic Research. Available at: https://www.wifo.ac.at/jart/prj3/wifo/resources/person_dokument/person_dokument.jart?publikationsid=69454&mime_type=application/pdf (Accessed on 15 April)

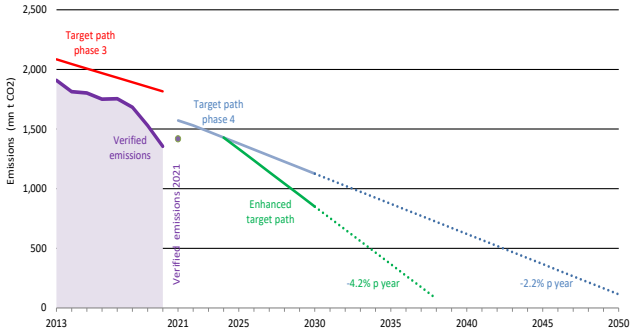
6.2. Delivery against EU long-term domestic environmental commitments

To what extent does a trading period target lead the EU to deliver on its longer-term goals and commitments and what is the best pathway? The 2050 Roadmap and the 2019 Commission's communication entitled "Clean Planet for All"[45] were the main documents that referred to intermediate

GHG reduction targets for the EU. The EGD[46] and the endorsement of climate neutrality by 2050 show the 2030 targets as well as carbon neutrality by 2050.

Figure 12 shows two possible scenarios from 2030 onward for the EU ETS. The most ambitious one points to a zero-emission target before 2040, while the other one suggests that net zero emissions will be achieved in 2050.

Figure 12: Possible long-term target paths for EU ETS after 2030.



Source: Wegener Center based on EUTL (2022), EEA (2022), European Commission (2021).

At this point, one can only raise some of the questions that will require attention: What LRF will need to be considered after 2030? Will it be in the range between -2.2% and -4.2%? Should we have "zero emissions" as an EU ETS endgame?

7. Socio-economic delivery

The EU ETS has been presented as and is considered by many to be the main component of EU climate change policy. Its stated goal is to "promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner"[47]. This creates the expectation that the EU ETS will drive decarbonisation in a socially fair manner while ensuring the competitiveness of the EU industry. This chapter looks at whether the EU ETS delivers in this respect.

The most important and pressing question is if the current market signal will lead to an efficient and sustainable decarbonization - what is the right market signal if the EU is to remain an industrial society?

This connects right away to EU ETS price levels and the speed at which EUA prices increase. There are concerns that if the CO2 price increases too rapidly, it will reduce emissions by decreasing or eliminating industrial activity, instead of through decarbonization. Expressed in a different way, a short-term high carbon price (and emissions reduction) may undermine a sustainable transition.

As part of the drive towards decarbonization, one other indicator of the socio-economic impact of the EU ETS is the total cost incurred by the installations covered by the EU ETS to meet the cap. These costs, both direct and indirect, are also an indicator of the risk of carbon leakage, as they can lead to a loss in competitiveness for covered sectors and installations, compared to operators in jurisdictions with less

[45] European Commission (2018). A Clean Planet for all A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy. COM/2018/773 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018DC0773 (Accessed on 19 April 2022).

[46] European Commission (2019). The European Green Deal. COM (2019) 640 final. 11 December. Available at: https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf (Accessed on 15 April 2022)

[47] Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814. Recital 1.

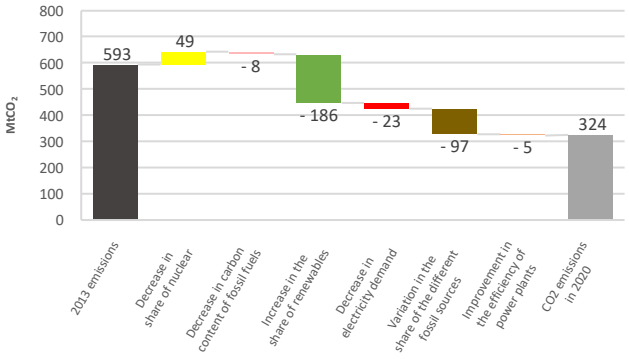
stringent or no carbon constraints. In this context, providing protection against the risk of carbon leakage in key sectors is another area where the EU ETS provisions must deliver.

7.1. Is the EU ETS a driver for change?

Focus on the power sector

Disentangling the causal effect of the EU allowance price on emission reductions in the power sector is a difficult task as multiple factors interact: policy planning, energy prices and macroeconomic conditions. Ex-post studies have shown that the bulk of emission reductions over Phase 2 were driven by the economic recession, with the the carbon price signal[48] playing a role but not the central role. No econometric study focuses on Phase 3, however, where auctioning was the default allocation method and prices rose significantly.

Figure 13: Drivers of GHG emissions variations in the power sector in the EU (2013-2020).

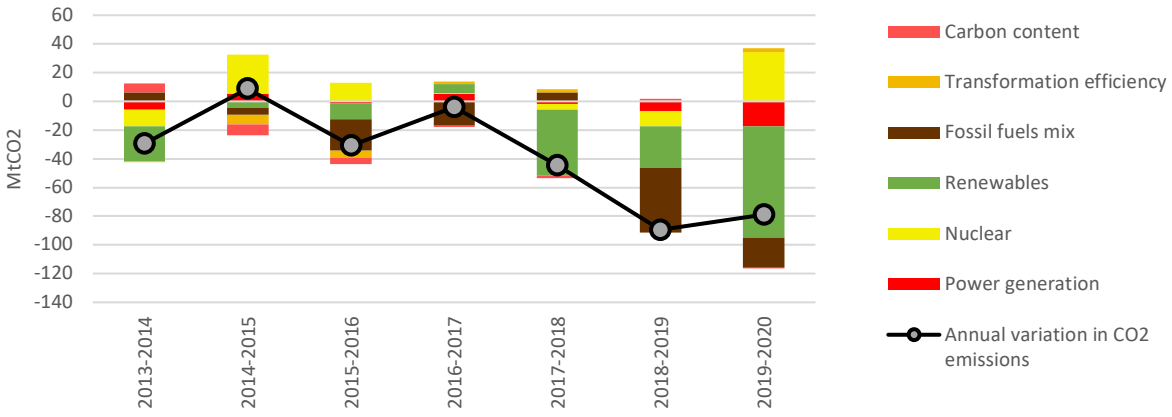


Source: Ecoact elaborations on I4CE methodology. Data: Eurostat.

Assuming a Kaya-like[49] decomposition of GHG emissions in the power sector, Figure 13 shows that of the 270 $MtCO_2e$ reduced over the period, the penetration of renewable energy in the electricity mix was the main driver of emissions reductions in the EU ETS power sector, with a total contribution of 186 $MtCO_2e$ (69 % of the total). Variations in the mix of thermal production means switching from more to less carbon-intensive energy sources, also resulted in a decrease of 97 $MtCO_2e$ (36% of the total decrease).

Figure 14 breaks down the overall picture of annual drivers of variation in emissions in the power sector. The deployment of renewable energy in power production has intensified since 2017. However, the decrease in emissions has recently been counter-balanced by the decrease in nuclear production.

Figure 14: Annual drivers of emissions variations in the power sector in the EU (2003-2020).



Ecoact elaborations on I4CE methodology. Data: Eurostat.

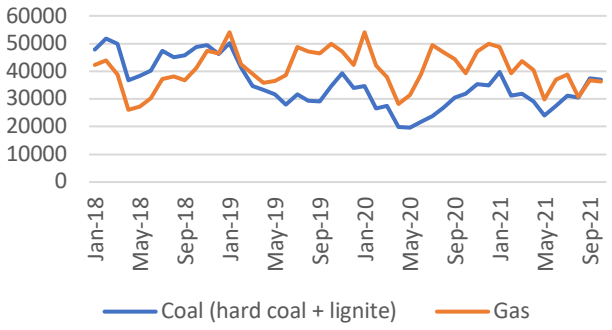
[48] On the CO2 Emissions Determinants During the EU ETS Phases I and II: A Plant-level Analysis Merging the EUTL and Platts Power Data. B. Chèze et al (2020). The Energy Journal.

49 The "Kaya identity" is a simple mathematical framework, introduced in 1995, to assess the main factors governing global CO2 emissions (Kaya, 1995): [1.1] F=P∗(G/P)∗(E/G)∗(F/E) in which F, global CO2 emissions; P, global population growth; G, global gross domestic product; E, global energy consumption. (P.H.M. Feron, in Absorption-Based Post-combustion Capture of Carbon Dioxide, 2016)

Changes in the fossil fuels mix have increasingly contributed to the mitigation of emissions. This result is consistent with the coal-to-gas switch observed since late 2018 (Figure 15). The trend has reversed in late 2021 as lower Russian gas flows heightened competition for supplies to fill storage.

If we consider Figure 16, showing the electricity sources by type, renewables (without hydro power) now have the highest share in electricity generation in the EU.

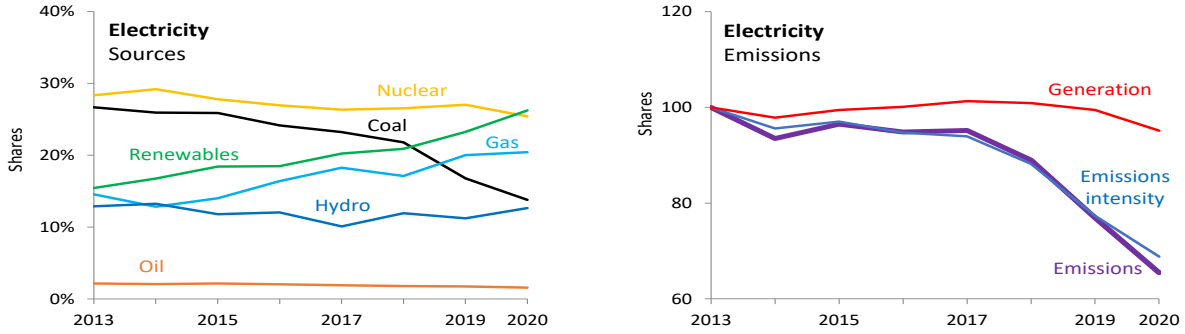
Figure 15: Coal and gas-fired power generation in the EU27 plus the UK since January 2018.



Source: Ecoact elaboration on Ember data.

Additionally, as far as fossil fuel power plants are concerned, coal is declining, whereas gas use is expanding. Nuclear has slightly declined and hydro power has slightly increased. The consequences are that CO_2 emissions have declined by about one third in Phase 3, as far as the power sector is concerned. Challenges now will be how to continue to reduce emissions while maintaining secure network functioning as renewables increase in the coming years.

Figure 16: Structure and emissions from power generation.



Source: BP (2021).

7.2. Social impacts

In 2021 the EU energy crisis resulted in record electricity prices. Observers have been quick to blame the EU ETS and the high carbon prices for this spike. While largely the product of a combination of demand and supply factors, studies have shown that the ETS did contribute but not anywhere to the extent claimed by some.

The European Commission estimates that "the effect of the gas price increase on the electricity price is nine times bigger than the effect of the carbon price increase"[50], while the Spanish Central Bank attributes 20% of 2021 price developments to ETS prices.[51] Other analyses such as the one from Ember[52] show that the

[50] European Commission (2021). Tackling rising energy prices: a toolbox for action and support. COM (2021) 660 final. (pp. 2).

[51] Source: Pacce & Co (2021): Recent developments in Spanish retail electricity prices: The role played by the Cost of CO2 emission allowances and higher gas prices. Banco de España. Pp.5. Available at: at: https://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesSeriadas/DocumentosOcasionales/21/Files/do2120e.pdf (Accessed on 12 April 2022).

[52] Moore, C. (2021): European Electricity Review 2022. 1 February. Available at: https://ember-climate.org/insights/research/european-electricity-review-2022/ (Accessed on 12 April 2022).

increase in the price of emitting a tonne of carbon (in the EU-ETS) equates to 10% of the increase in gas generation costs in 2021.

The energy price thus has an impact on the carbon price and on society. The social implications of the low-carbon transition may take different forms: 1) systemic, where it affects the economic structure as a whole; 2) regional[53]; 3) sectoral, when creating winners and losers among companies and workers; and 4) distributional when impacting the most disadvantaged households. Equity should be seen as an integral part in the transition to a low-carbon society.

The EU ETS aims to address social impacts in different ways, mitigating carbon leakage risks and providing funding instruments such as the Modernisation Fund[54]. The Just Transition Mechanism also needs to be mentioned as it provides compensation for specific regions in the transition.

Operational in January 2021, the Modernisation Fund aims to support decarbonisation in Central and Eastern Member States. In 2021, two disbursement decisions were made:

- In the first biannual disbursement cycle[55], six multiannual schemes were confirmed in Hungary, Poland and Czechia for a total volume of EUR 304 million. The schemes include investments in renewable energy, energy efficiency, smart grids, and developing power grids and energy communities.
- In the second biannual disbursement decision[56], twenty multiannual schemes were confirmed in Czechia, Estonia, Croatia, Lithuania, Hungary, Poland, Romania and Slovakia. The schemes include investments in new renewable energy sources, public sector buildings, public transport, electricity generation, energy efficiency, district heating, network stabilization, cogeneration, use of alternative fuels, digitization of heating, and energy storage.

Still, some challenges remain, including measuring social impact in different areas, including transport poverty, access to infrastructure, regional income inequality, the level of EU/National/Regional Technical Assistance (TA) strategies, technical innovation and funding in hard-to-abate sectors, employment re-skilling strategies and additional investments to support the transition to a decarbonised economy.

7.3. Industrial decarbonization

Emissions intensities in industrial production

Data showing carbon intensity of production is challenging to obtain, as it is not always publicly available for independent researchers – and when it is available, it is often at aggregated levels. In previous editions of this report, intensity data was shown for those (limited number of) sectors whose sectoral associations made it available. Although it is rather difficult to harmonize activities in the EUTL with STS and PRODCOM codes, some rather robust results are emerging.[57]

[53] For instance, certain energy-intensive sectors and regions in the EU will have an irreversible decline in economic output and employment level with a relevant number of Impacted actors in need of state support: regions, companies, workers, etc.

[54] Commission Implementing Regulation (EU) 2020/1001 of 9 July 2020 laying down detailed rules for the application of Directive 2003/87/EC of the European Parliament and of the Council as regards the operation of the Modernisation Fund supporting investments to modernise the energy systems and to improve energy efficiency of certain Member States.

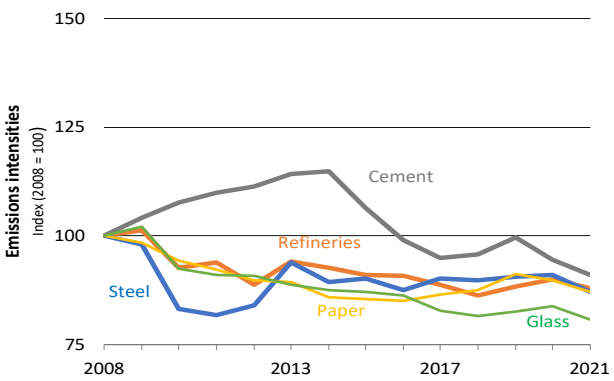
[55] Commission Decision C (2021) 5802 of 28 July 2021 on disbursement of the revenues of the Modernisation Fund under Directive 2003/87/EC of the European Parliament and of the Council and Annex.

[56] Commission Decision C (2021) 9135 final of 6 December 2021 on disbursement of revenues of the Modernisation Fund under Directive 2003/87/EC of the European Parliament and of the Council and Annex.

[57] In the case of the refining sector, the years 2012-2013 are "abnormal" and starting in this year would overestimate the intensity improvements made by the sector.

To understand emissions profiles in Figure 17, the dynamics of emissions intensities shown needs to be examined. Industrial sectors exhibit declining emission intensities. The sharp decline of emissions in steel production reflects the impact of investments into electric furnaces. Cement clinker decreased its emissions intensity by almost 20%.

Figure 17: Emissions intensities in selected industry sectors.[58]

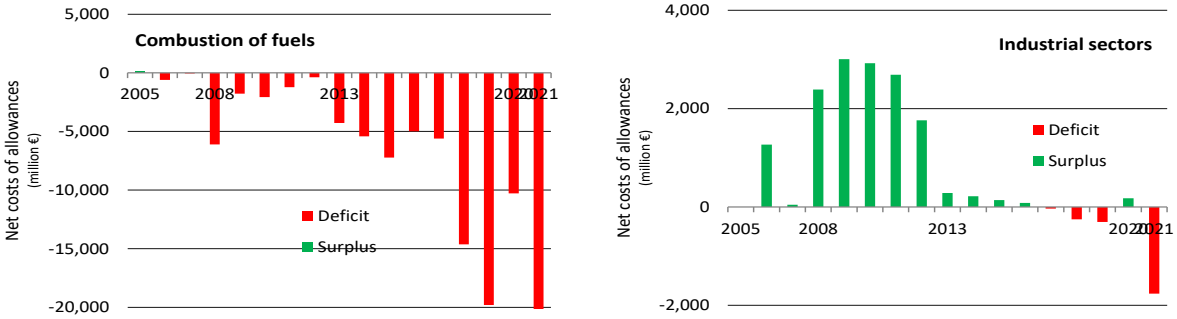


Source: Wegener Center based on EUROSTAT STS and PRODCOM data.

Balance of allowances

Figure 18 shows the net costs of allowance purchases and the distinction between the combustion sector[59], largely represented by the generation of electricity and heat, and industry, as defined by EU ETL activity codes.

Figure 18: Net costs of allowances.



Source: Wegener Center based on EUTL (2022), EEA (2022).

There were net costs for the combustion sector which faced costs of up to EUR 20 billion in 2019 and 2021. Industrial installations, in turn, were shielded by surpluses that decreased during Phase 3, while in 2021 purchases reached close to EUR 2 billion.

Figure 19 provides insights into the costs hard-to-abate industries (HTA) faced for three activities, that comprise about two thirds of emissions from industry.

Refining started in Phase 3 with a slight surplus but turned into a deficit that amounts to about 160 million tonnes. The substantial surplus steel has accumulated in Phase 2 decreased in Phase 3[60]. Cement clinker has started to reduce its surplus in 2021 (Figure 19).

Incentives for innovation and transformation are driven by the costs of being involved in the EU ETS. These concern the direct costs, for purchasing allowances that in turn depend both on the allocation of free

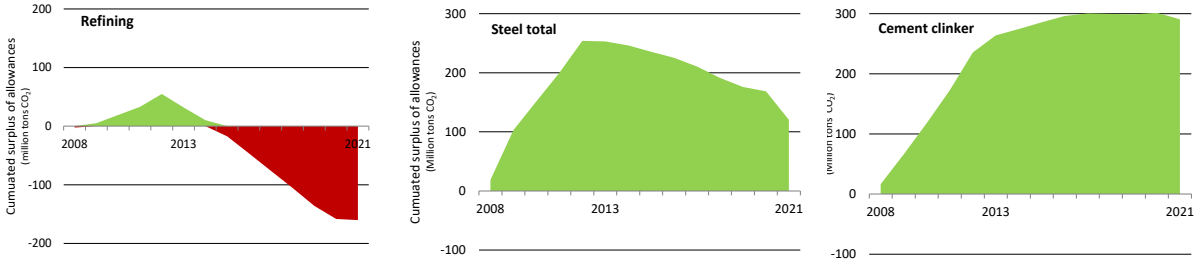
[58] The chemical sector is not represented in this figure due to its different nature and variation in the number of installations experienced since 2013. To avoid wrong comparability across sectors the findings of the chemical sector are not included in this chapter.

[59] Combustion of fuels" is the labeling of activity 20 in the EUTL. The remaining activities are summarized under "industry".

[60] It is important to highlight that in EUTL data, steel installations receive free allocation for their waste gases that are transferred to power plants; these emissions are reported as power installations. This free allocation provided to steel where emissions are reported as power installation shall show a lower level of free allocation that the one presented in this report.

allowances and the EUA price, and the indirect costs via energy and materials that are also part of the EU ETS.

Figure 19: Cumulative balance of allowances.



Source: Wegener Center based on EUTL[61] (2022), EEA (2022).

7.4. Innovation

The ambitious EU climate targets, which call for achieving climate neutrality by 2050 and cutting GHG emissions by at least 55% by 2030 give the EU ETS a key role. In addition to the use of auctioning revenues, new instruments linked to the EU ETS, such as the Innovation Fund, are expected to enhance the incentives for innovation.

The challenge for innovation can be evaluated foremost by looking at the HTA industries, such as steel, cement, and refineries.

There are several reasons[62], these industries may be of key relevance for achieving the EU climate targets there is high demand for their products and there are unavoidable process emissions, particularly in the production of steel and cement.

If there are any adjustments to the EU ETS it will not be sufficient to look just at the emissions of products, such as steel and cement, but at the whole value chain, e.g., the required functionalities in buildings and transport. Carbon recycling may become a viable option that requires cross-sectoral cooperation in industry and new infrastructure for energy, above all for hydrogen.

Switching the wording from decarbonization to carbon management (carbon recycling), encouraging integrated solutions along the whole value chain, and additional funding, are just some of the new approaches instruments needed to support the transition of HTA industries.

A major step for incentivizing and enabling these transitions is the start of the Innovation Fund, which is endowed with 450 million allowances (EUR 30 billion at current EUA prices).

The projects funded with EUR 1 billion under the first call for large-scale projects aim to drive innovation, such as steel from renewable hydrogen, and capturing, storing, and reusing CO_2. These projects demonstrate that value chains with carbon capture, utilisation, and storage (CCUS) are essential for transforming the hard-to-abate industries. These projects would not become viable just from a higher EUA price because of the technological and financial risks involved.

The empirical economic literature has investigated the impact of the EU ETS on innovation by looking at indicators in comparable regulated and unregulated installations. Studies show that, in Phase 1 and 2, the

[62] Lang, R.W., S.P. Schleicher (2022). Steps towards a roadmap for hard-to-abate industries – From linear to circular designs. Wegener Center at the University of Graz.

EU ETS caused regulated plants to increase investment in pollution abatement technologies, all the more when they are integrated – i.e., transforming the production process – rather than end-of-pipe (e.g., CCS).[63]

Adoption of low-carbon technologies[64], in turn led to a decrease in the carbon intensity of production of regulated plants. A single empirical study focusing on Phase 3 of the EU ETS shows that investment in low-carbon technologies has accelerated since Phase 2. The EU ETS caused regulated firms to invest, on average, 38% more than comparable unregulated firms.[65]

Focusing on economic indicators, such as value added, employment, or fixed assets, empirical studies also find that EU ETS firms performed better than unregulated ones over Phase 1 and 2.[66] This result points towards a validation of the Porter hypothesis, i.e., well-designed environmental regulation can stimulate innovation and efficiency, leading to increased productivity and economic performance beyond environmental benefits.[67] However, there is no study focused on Phase 3.

7.5. Carbon Leakage

Carbon leakage results from reaction to the costs imposed by asymmetrical climate policies. In general carbon leakage can be seen as emerging from relocation of production, investment or impact on exports. The costs are direct (cost of allowances to cover emissions) or indirect (cost of energy)

Carbon leakage has been traditionally addressed through free allocation, but given the increased scarcity of free allocation, new means are currently examined, especially the proposed CBAM

Direct costs

To detect carbon leakage, the econometric literature contains several studies which look at firm-level or sector-level economic indicators, signs of investment leakage, or trade patterns to and from the EU. They find no evidence of carbon leakage in Phase 1 and 2. No empirical analysis has, however, been conducted under the current carbon and energy price situation.

Scarcity of EUAs can be seen as surrogate representation of the risk of carbon leakage. Figure 18 shows the scarcity for industrial sectors. Carbon leakage, given the increasing scarcity and EUA price, represents an increasing risk. What free allocation does and what CBAM is meant to do is address the risk of carbon leakage ex-ante, not dealing whit it ex-post. The CSCF was applied in Phase 3 and is expected to be applied in the second Phase 4.

By contrast, ex-ante studies based on computable general or partial equilibrium models find that that up to one quarter of the emission reductions induced by a unilateral policy are counteracted by an increase of emissions elsewhere.

Particularly, for trade-exposed and carbon-intensive industries such as steel, clinker, aluminium and oil refining, leakage rates are much higher, even at prices below EUR 100/tCO_2[68]. An assessment of the effect

[63] Colmer et al (2020) focus on the French manufacturing sector during Phase 1 and 2. They use a difference-in-difference approach by comparing plants of the same operating establishment running thermal installations above the EU ETS participation threshold to those running installations below the threshold, controlling for systematic differences between regulated and unregulated plants.

[64] Calel (2020) finds that directed technological change has increased faster in British regulated companies, measured by R&D spending and low-carbon patenting.

[65] Georger (2021) uses a fixed effect regression approach, based on self-reported investment and economic data from 2011 to 2016.

[66] Dechezleprêtre et al (2018) find a large and statistically significant increase in revenue and fixed assets of regulated firms from 2005 to 2014. They also find the EU ETS did not have a negative impact on the number of employees and profit.

[67] Rosendahl et al (2020) find that the EU ETS had a large positive effect on the value added and productivity of regulated Norwegian plants in Phase 2.

[68] Partnership for Market Readiness, 2015

of the EU ETS on the ferro-alloy and silicon industry conducted by ERCST[69] also shows that direct costs have increased significantly since 2018, consistent with carbon price levels and the phase down of free allocation due to more ambitious benchmarks. This study finds that free allocation could largely mitigate direct costs in Phase 4, provided that the CSCF is not triggered.

Indirect costs

Indirect costs refer to the compliance costs passed through by electric utilities to their customers via electricity prices. Pass-through rates were estimated to be around 76% in 2018,[70] meaning that the direct costs of the EU ETS borne by electricity producers are to a large extent reflected in energy prices.

State aid to mitigate the indirect costs of the EU ETS in energy-intensive industries (Table 4) was authorized by the EU Commission and, available in 15 Member States as of 2020. In 2021, the Commission approved two new schemes in Czechia and Italy.

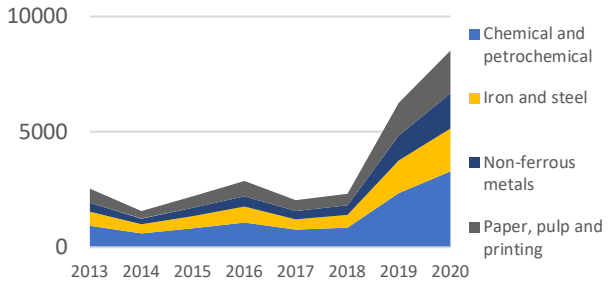
Consistent with rising carbon prices, the total amount paid out by Member States in 2020[71] for costs incurred in 2019 reached EUR 1,358 million, more than double the amount in 2019.

Table 4: Indirect carbon cost compensation paid out by EU Member States and the UK in 2020.

Member State	Compensation paid out in 2020 for indirect costs incurred in 2019 (million €)	% of auction revenues spent on indirect cost compensation
Denmark	546	17.4 %
Belgium	119.4	30.9 %
Netherlands	110.1	25.3 %
Greece	42.2	8.3 %
Lithuania	0.66	0.7 %
Slovakia	4	4.1 %
France	266.4	37.4 %
Finland	74.6	34.3 %
Spain	61	5 %
Luxembourg	10.6	63 %
Poland	76.6	3 %
Romania	NA	NA

Source: 2021 Climate Action Progress Report.

Figure 20: High-end estimation of indirect costs for four sectors exposed to carbon leakage due to indirect emission costs (million euros).



Source: Ecoact (2022) based on Eurostat data.

An ERCST assessment of the effect of indirect costs on the ferro-alloys and silicon industry shows that indirect costs after compensation are considerably higher than direct costs and could jeopardize the sectors' competitiveness and financial viability. This is mainly because the compensation provided by Member States covers a smaller share of indirect costs than the share free allocation covers for direct costs. Additionally, an outlook assessment shows that despite measures in place to limit the risk of carbon leakage, indirect costs will rise to unmanageable levels by the end of Phase 4, leading to carbon leakage.

[69] ERCST (2021): Study on the impacts of the (revised) EU ETS on the ferro-alloys and silicon industry. Final Report for Euroalliages. [Unpublished]

[70] Li & Roques (2020) – Working Paper

[71] This is the most recent year for which electricity consumption data is available.

Figure 20 tries to quantify indirect costs for the four main sectors exposed to carbon leakage as determined in the 2012 State aid guidelines.[72] Indirect costs were in the range of EUR 2-3 billion from 2013 to 2018, and almost quadrupled to over EUR 8 billion in 2020, due to higher carbon prices[73].

These figures should not be seen as an estimation of State aid paid out to industrial sectors. Instead, this is rather a rough high-end estimation of the indirect costs these sectors face. Indeed, it does not account for specific electricity contract arrangements that some installations might have, for the fact that some installations generate their own electricity, or for the fact that some sectors can (partially) pass-through these costs as well.

8. Market functioning

8.1. Market functioning trackers

The role of a market is to provide good price discovery and therefore market functioning is essential. Good market functioning includes liquidity in the secondary market and active participation in auctions. It also needs to ensure transparency, access to relevant data and ease of access to the market.

This report looks at eight key performance indicators (KPIs) to evaluate whether the EU ETS is functioning optimally, or if there is room for improvement. While the indicators are useful by themselves, it is crucial to put them into context with historical developments and market sentiment. This provides a true picture of how well the market is operating, and if it is improving or getting worse compared to previous years.

Table 5: Market functioning tracker.

Indicator	2019/2020	2020/2021
Volume		
Open interest		
Auction participation		
Auction coverage		
Auction versus spot spread		
Cost of carry		
Ask-bid spread		
Volatility		

Source: BloombergNEF. Note: Green indicates improving, red worsening, amber stable.

Overall, the EU ETS had a good year in 2021, despite the ongoing COVID-19 pandemic. Most of the KPIs remained at similar levels to last year's report. Ongoing reforms have continued to tighten supply, bringing scarcity to the market. This has resulted in a carbon price above €95 per ton. However, this price is no longer high enough to drive coal-to-gas fuel switching due to a surge in natural gas prices in Europe. Consequently, increased coal burn in the power sector has driven higher demand for carbon allowances and pushed up emissions as well as prices.

Utilities remained the largest group of companies with compliance obligations in 2021, although financial investors are becoming increasingly interested in the market. This has brought additional demand and liquidity to the carbon market and is another reason that the price has risen so rapidly. Finally, industrials are also paying more attention to their carbon exposure and preparing for future allowance scarcity, as the amount of free allowances is set to dwindle towards 2030. The rising carbon price stresses the need for industrials to make carbon a strategic consideration.

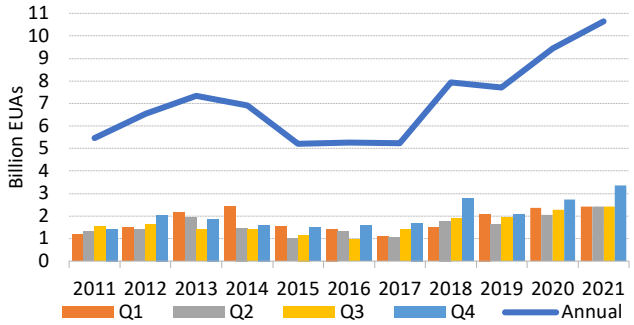
[72] European Commission (2012). Guidelines on certain State aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012XC0605(01)&from=EN (Accessed on 17 April 2022).

[73] It should be stressed that Eurostat data covers the entire industrial sectors and not only those covered under the EU ETS and deemed at risk of carbon leakage.

8.1.1. Volume

Traded volume is crucial when determining liquidity. A liquid market allows market participants to open and close positions (get in and out of the market) whenever they want. Liquidity in the market also permits participants to be active without unduly affecting the market and enables them to be confident that the future is priced at its true value.

Figure 21: Traded EUA volumes.



Source: ICE, EEX, BloombergNEF.

In 2021, there was a 13% year-on-year increase in total traded volume compared to 2020. Traded volumes reached a record 3.37 billion EUAs in Q4 2021. Volumes were bolstered by emissions rebounding from pandemic lows, as high emissions from the power sector boosted EUA demand, and growth in participation from speculative investors.

More futures contracts changed hands in the second half of 2021 than in the first half, likely due to bullish developments in the EU's climate policies and increased confidence from speculators.

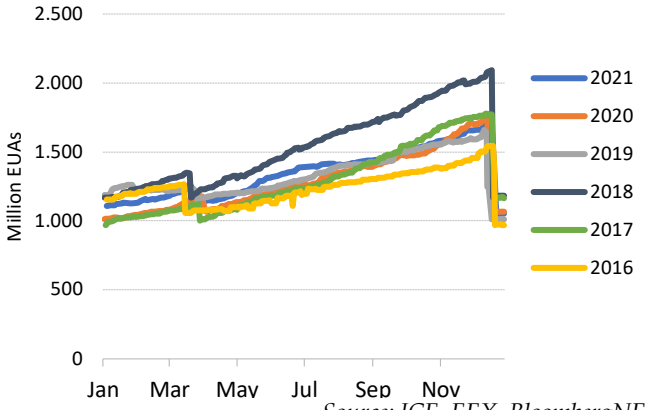
8.1.2. Open interest

Open interest denotes the total number of outstanding contracts that are held by market participants at the end of each day. In other words, it measures contracts that have been bought or sold without completion of the transaction by subsequent sale or purchase, or by making or taking actual delivery of the financial instrument or physical commodity.

Open interest measures activity levels in the futures market. Generally, the higherthe open interest, the more a particular contract is traded and hence the higher the level of liquidity.

Open interest was higher in 2021 than in 2020 across January to October. This trend reversed in November, and 2021 open interest was lower than 2020 for the rest of the year. 2021's open interest remained consistent with levels seen since 2019, following an exceptional year in 2018 when the carbon price shot up. High gas prices hindering coal-to-gas fuel switching and recovery from the COVID-19 pandemic likely contributed to higher open interest last year.

Figure 22: Aggregate open interest seasonality.



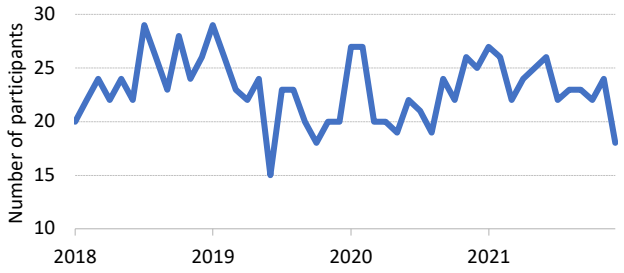
Source: ICE, EEX, BloombergNEF.

8.1.3. Auction participation

This KPI counts the number of participants in daily auctions on the European Energy Exchange (EEX). Auction participation measures how many participants are bidding into auction, thus reflecting interest in primary supply.

Participation stayed relatively flat in 2021, with an average of 23.2 participants per auction. There were fewer participants in auctions in the second half of the year, with an average of 22 participants per auction compared to 25 in first half of 2021.

Figure 23: Monthly average auction participation.



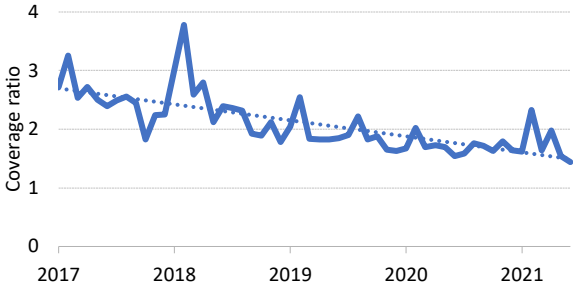
Source: EEX.

8.1.4. Auction coverage

The auction coverage ratio reflects the total number of bids in an auction divided by the number of available EUAs. This indicator tells us what actual auction demand is when compared to supply on the primary market.

The coverage ratio continued its steady downward trend in 2021, with an average ratio of 1.72 compared to 1.79 in 2020. The average cover ratio being below 2 may give reason for concern if the trend continues. It could allow some market participants to exercise market power or game auctions in the future.

Figure 24: EU ETS auction coverage ratio.



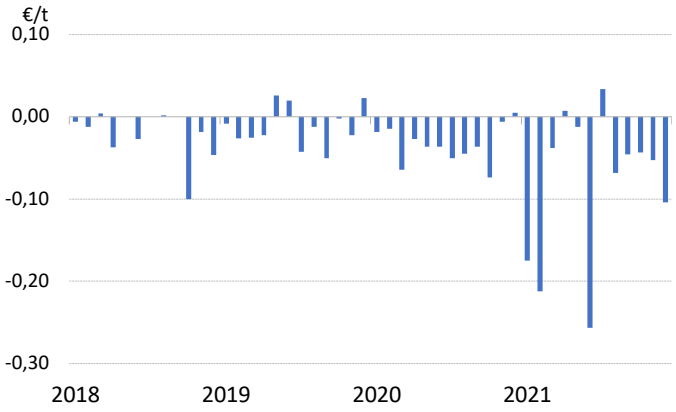
Source: BloombergNEF

8.1.5. Auction-spot differential

The auction-spot differential KPI measures the difference in the EUA price between auctions and the secondary market. A low absolute difference is preferable, as a high difference could indicate an ability of market participants, particularly speculators, to exercise market power.

The auction-spot differential dropped in 2021, reaching a low of - €0.26 in June. Whilst this may a cause for concern, the effect is limited because the EUA price is also significantly higher this year. For example, an auction-spot differential of €0.26 per ton at a carbon price of €5 per ton could be reason to worry, but it is much less dramatic relative to an EUA price of €50 per ton.

Figure 25: Monthly average difference between auction and spot price.



Source: EEX, BloombergNEF.

The decrease could be an expression of lower risk as it indicates less difference in the price the bidder is willing to pay, and the price sellers expects to receive. The year-on-year difference is so marginal that no clear conclusion can be drawn from the change.

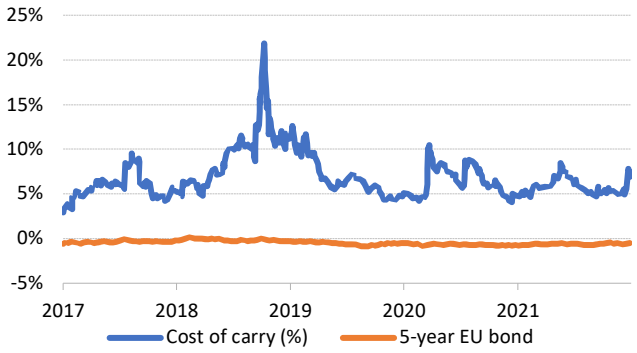
8.1.6. Cost of carry

Cost of carry can be used as an indicator of how market players expect the price to move in the future. It shows the difference between the price on the spot market and futures with delivery in the future, and

therefore tells us the premium the marketplaces on future contracts. The cost of carry went down by less than 1% in 2021, meaning market players put a smaller premium on future price developments.

A lower cost of carry does not necessarily reflect lower price expectations for the future, rather that spot contracts are valued higher in comparison. This reflects elevated gas prices and limited cheap emissions abatement opportunities in the carbon market in 2021.

Figure 26: Cost of carry – EUA versus AAA EU 5-year bonds.



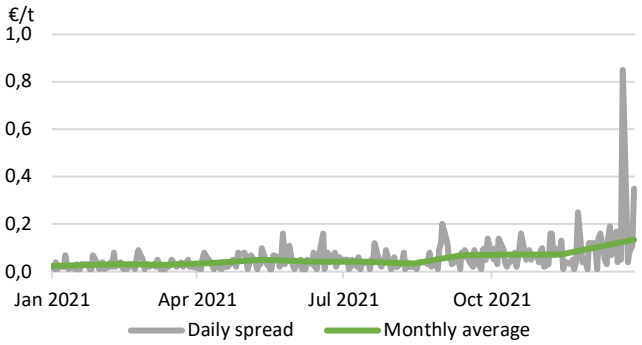
Source: ICE.

8.1.7. Ask-bid spread

This KPI shows the difference between the lowest ask price and the highest bid price in the market at market close. The average ask-bid increased significantly in 2021, with a monthly average of 0.05 compared to 0.02 in 2020.

The wider ask-bid spread can signal fewer bid or ask prices, which suggests a risk of reduced liquidity in the market. The increase is also an expression of higher risk, as it indicates a growing difference between the price the bidder is willing to pay, and the price sellers expect to receive. However, the year-on-year difference relative to the allowance price is not large enough for a clear conclusion to be drawn from the change.

Figure 27: Ask-bid spread on ICE.

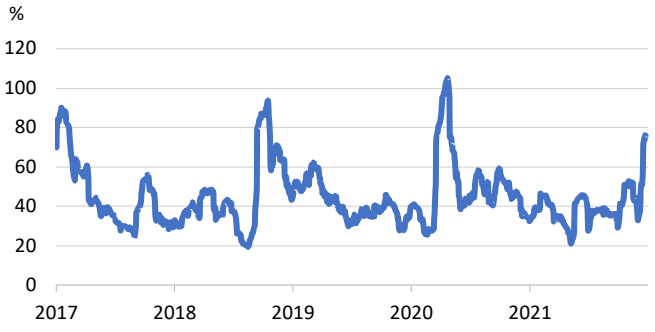


Source: ICE, BloombergNEF

8.1.8. Volatility

In addition to the ask-bid price, volatility is another measure of risk in the market. This metric represents how much prices move around the mean price. High volatility is not positive for compliance entities as utilities and industrials need to be able to trust in a price signal if they are going to base long-term investments on it. By contrast, high volatility may be positive for traders and other financials seeking to profit from price changes.

Figure 28: Volatility.



Source: BloombergNEF

Volatility increased further in 2021. A tight power market – because of coal and nuclear phase-outs – combined with a tight carbon market made EUAs more event-driven than ever before. News updates that influenced the carbon price included nuclear power plant outages, compliance entities struggling to meet their EUA obligations, and supply uncertainties in the gas market.

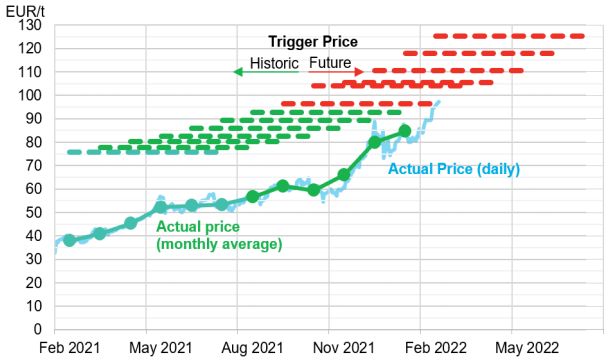
A higher degree of volatility is always expected in the EU ETS, as it is a smaller market and does not respond only to fundamentals. The increased volatility could be a concern for compliance entities, but an opportunity for speculators in the market.

8.1.9. Article 29, EU ETS Directive

The current cost containment mechanism for the EU ETS is laid out in Article 29a of the ETS Directive and states: "If, for more than six consecutive months, the allowance price is more than three times the average price of allowances during the two preceding years on the European carbon market, the Commission shall immediately convene a meeting of the Committee established by Article 9 of Decision No 280/2004/EC.[74]"

Despite the rapidly rising carbon price, the cost containment mechanism was not triggered in 2021, and it will not be triggered in the first half of 2022 either. This has prompted discussion around reforming the mechanism in order to make it more responsive to drastic price increases, or to address this issue by limiting speculative trading. The European Securities and Markets Authority (ESMA) commenced an investigation into speculation in the EU ETS last year. Its findings were published in March 2022[75]. The Report's analysis did not find any current major deficiencies in the functioning of the EU carbon market based on the data available , but set a policy recommendations to improve market transparency and monitoring.

Figure 29: EU ETS Article 29a cost containment mechanism trigger prices for each six-month period.

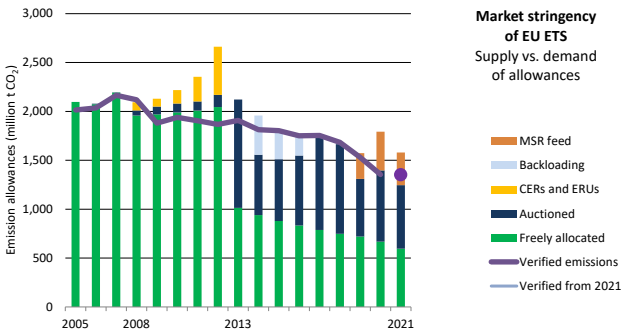


8.2. Supply-demand balance and evolution of TNAC

The legacy of the design flaws during phase 2 of the EU ETS resulted in a significant surplus of allowances being built-up in the market at the start of phase 3. Indeed, the 2008-09 financial crisis led to a significant decrease in demand for EUAs, which was not mirrored by changing supply due to the inflexibility of auctioning and method of grandfathering free allowances. Total supply was even higher than the cap due to the influx of international credits.

The number of EUAs in circulation reached almost 2.1 billion at its peak in 2013, which was more than one year's worth of market supply. To address this issue, the EU first

Figure 30: Supply and demand of EUAs and TNAC.



Source: Wegener Center based on EUTL (2022), EEA (2022), European Commission (2021).

[74] 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 and amending Council Directive 96/61/EC. OJ L 275, 25.10.2003, p. 32–46.

[75] ESMA (2022): "Emission allowances and associated derivates". Final report. 28 March. Available at: https://www.esma.europa.eu/press-news/esma-news/esma-publishes-its-final-report-eu-carbon-market (Accessed on 7 April 2022).

'backloaded' the auctioning of 900 million allowances between 2014 and 2016, as a temporary measure, and subsequently introduced the MSR, which started operating in 2019.

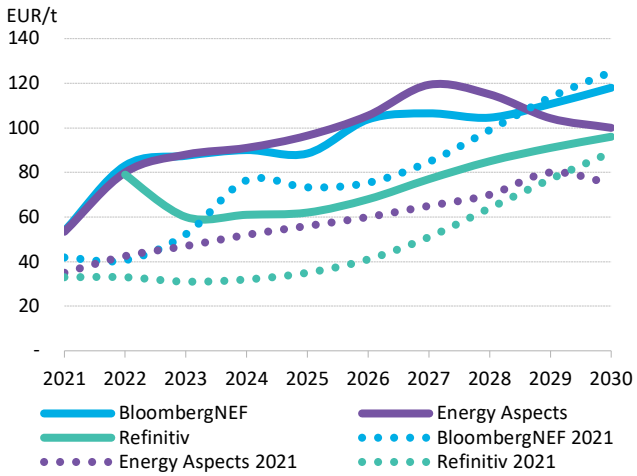
As a result, the total number of allowances in circulation (TNAC), an indicator for the surplus which is published each year by the Commission in May has been decreasing over the course of Phase 3. In 2020, the sharp decrease in verified emissions, combined with a considerable increase of supply due to the UK auctioning allowances for both 2019 and 2020, resulted in supply again being higher than demand. That was despite the intake of 354 million EUAs by the MSR, as can be seen in Figure 30. It is estimated that the TNAC rose by 194Mt in 2021, to 1579Mt.

8.3. Price forecasts

If the aim of this report is to keep track of changes that have an impact on the EU ETS, it is interesting to follow how the perception of the market changes over time. To do that, we can evaluate price forecasts from different analysts.

Figure 31 shows 2021 and 2022 forecasts collected from various analysts. The 2022 updates show a strong consensus that the carbon price will continue to trend upwards. Details of the 'Fit for 55' climate package to accompany the EU's more ambitious emissions reductions target in light of the European Green Deal mean that mid-decade forecasts have increased significantly from last year, although the 2030 prices have only slightly been revised upwards.
While the forecasts collected may vary from year to year and methodologies may change, they give an impression of market sentiment. All three 2022 forecasts expect the carbon price to rise, illustrating that undersupply is expected throughout Phase 4. The magnitude of that increase varies amongst the forecasts, but all of them reach at least €90 per ton at some point.

Figure 31: EUA price forecasts.



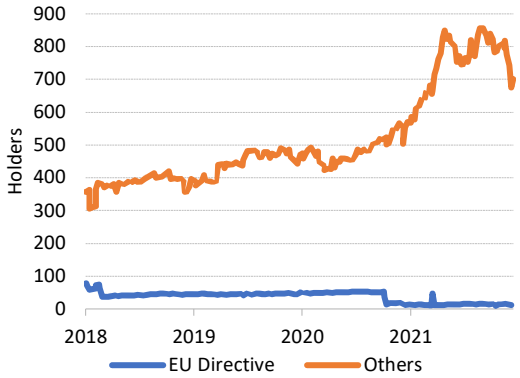
Source: BloombergNEF, Energy Aspects, Refinitiv. Note: Prices are in real 2021 € per metric ton.

8.4. Market participation

The average number of entities invested in EUA futures and not regulated under the EU ETS Directive increased by 67% in 2021 compared to 2020, to 730. Speculators can increase volatility and create price spikes if they trade opportunistically. They can also bring stability to prices if they have a longer investment horizon (beyond one year) and invest from a fundamentals perspective.

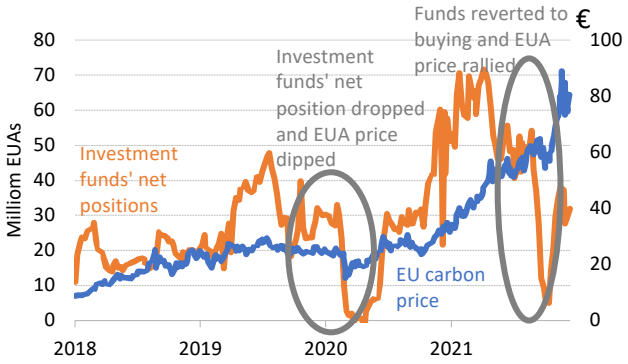
EUA price movements have often aligned with changes in the positions of investment funds (Figure 33). This suggests that speculators can move the market, particularly when there is a lack of liquidity. When the carbon market is trading on thin volumes, low-volume trades can cause large price movements.

Figure 32: Net position holders.



Source: ICE, EEX, BloombergNEF. Note: Data is from Commitment of Traders (CoT) database.

Figure 33: Investment funds' net positions.



Source: ICE, EEX, BloombergNEF. Note: Data is from Commitment of traders (CoT) database.

EUA price movements across 2018-2021 generally aligned with changes in the positions of investment funds. This suggests that speculators can move the market, especially when the market trades on thin volumes. The carbon price moved upwards in 2021 with some retreats, and these retracements are most likely associated with some financials taking profit as the price shot up.