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Carbon markets: Could COP29 be a tipping point for global emissions trading?

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Key takeaways

- Carbon markets have developed in two main ways since inception in the 1990s: as policy-led compliance carbon markets and as market-led voluntary carbon markets. The two are becoming more intertwined, but overall remain fragmented.
- A global carbon trading framework is needed to improve market functionality and climate outcomes. Progress on implementing Article 6 of the Paris Agreement, the main such framework, at COP29 in November 2024 is a positive signal.
- Beside progress on Article 6, market participants should watch for design changes in existing market frameworks, political commitments to climate targets, alignment between national compliance markets, advancement in climate technologies and standardisation of carbon market contracts.

Introduction

Carbon markets are a market-based approach to reduce greenhouse gas (GHG) emissions by assigning a price to a ton of CO_2, or its equivalent in other GHGs. The concept gained global prominence in 1997 with the Kyoto Protocol treaty, which initiated carbon trading between countries.[1] This is now being replaced by Article 6 of the 2015 Paris Agreement, which governs both the trade in extra emissions reduction credits between countries (Article 6.2) and the global trade in carbon credits produced by private projects (Article 6.4).[2]

There are two main types of carbon markets: *compliance carbon markets* that are primarily policy-led emissions trading systems (ETS) and voluntary carbon markets (VCM) that trade carbon offsets, and to a lesser extent, carbon insets.[3] Carbon taxes are also a policy-led pricing mechanism often used alongside ETS (see Figure 1).[4] In 2023, compliance markets were valued at **$950 billion**, overshadowing the VCM, which saw its value drop to **$720 million** from its 2021 peak of $2 billion.[5]

1 Aruna Chandrasekhar and Joe Goodman, *Timeline: The 60-year history of carbon offsets*, Carbon Brief, 25 September 2023, https://interactive.carbonbrief.org/carbon-offsets-2023/timeline.html; UNFCCC, *The Clean Development Mechanism*, https://cdm.unfccc.int/index.html.

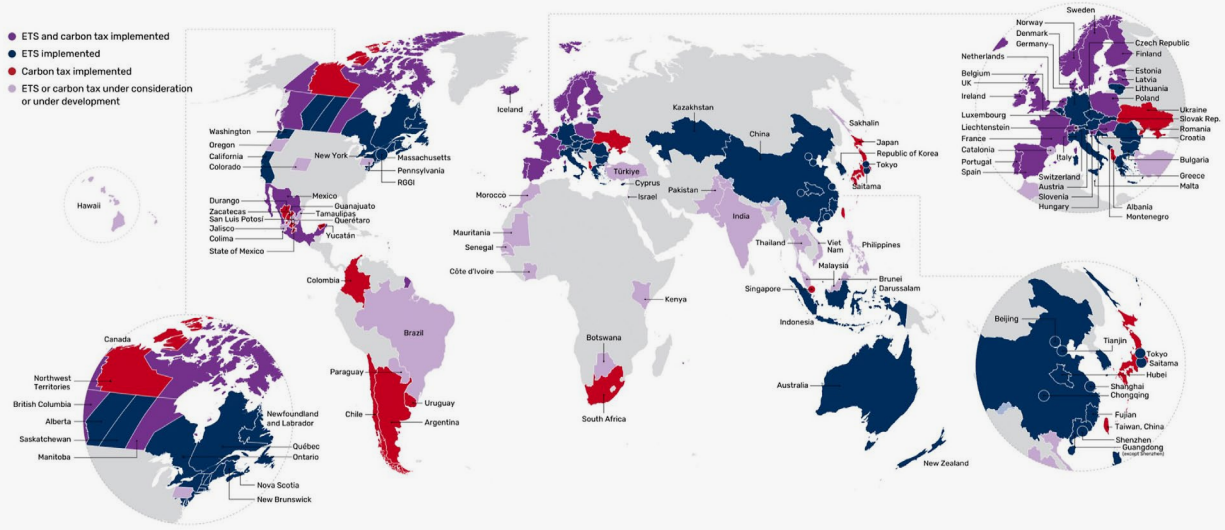
2 Carbon Market Watch, *Carbon Markets 101*, February 2024, https://tinyurl.com/yc43wfpp.

3 Carbon insets are the reduction or removal of carbon emissions within a company's own value chain (scope 3 emissions). Insets are not traded, but rather negotiated and priced between buyers and suppliers bilaterally, so their 'market' size is difficult to estimate. Insets are particularly relevant for companies with major scope 3 emissions.

4 Carbon taxes typically rely on a fixed price per unit of emissions, while ETS relies on a floating price set by the market. Carbon taxes are beyond the scope of this study, as it focuses specifically on global emissions trading.

5 Forest Trends' Ecosystem Marketplace, *State of the Voluntary Carbon Market 2024*. Washington DC: Forest Trends Association, 2024; Susanna Twidale, *Global carbon markets value hit record $949 bln last year - LSEG*, Reuters, 12 February 2024, https://tinyurl.com/5ydnj9a9.

Figure 1. Map of carbon taxes and ETS per country: both implemented (dark purple), ETS implemented (blue), carbon tax implemented (red), either considered (light purple), 2024.[6]



A tale of two markets

The development of the main carbon markets can be seen through two economic theory lenses. *Institutional economics* shows ETS as a product of deliberate design, while *spontaneous order* shows how voluntary markets emerged from decentralised actions by individual actors.[7] The lenses help explain the distinct evolution of the markets and the challenges to their intertwining.

Institutional economics focuses on how formal and informal institutions enable and constrain economic behaviour. ETS are the result of government action to address market failures—specifically, the negative externalities of GHG emissions, which companies do not internalise as a cost.[8] Under ETS, emission allowances function as property rights over the right to pollute.[9] By setting a cap on these, governments create scarcity in emission rights, forcing companies to internalise the social cost of pollution. In theory, institutions ensure the carbon market operates efficiently by setting, monitoring and enforcing the rules, facilitating trades and reducing transaction costs.[10] However, institutional frameworks do not necessarily result in the most efficient outcomes due to technological lock-in, sunk costs and non-rational or uninformed behaviour.[11] They are also path dependent, where past decisions shape future outcomes.

6 World Bank, *State and Trends of Carbon Pricing*, Washington, DC: World Bank, 2024, DOI: 10.1596/978-1-4648- 2127-1, License: Creative Commons Attribution CC BY 3.0 IGO, p. 21.
7 Douglas North, *Institutions, Institutional Change, and Economic Performance*, Cambridge University Press, 1990; Friedrich Hayek, *Law, Legislation and Liberty. Vol. 1: Rules and Order*, Routledge, 1973.
8 Thomas Helbling, *Externalities: Prices Do Not Capture All Costs*, Finance & Development Article, International Monetary Fund, https://www.imf.org/external/pubs/ft/fandd/basics/38-externalities.htm.
9 Harold Demsetz, Toward a Theory of Property Rights. *The American Economic Review*, 57(2), 347–359, 1967, https://www.jstor.org/stable/1821637.
10 Robert Stavins, Transaction Costs and Tradeable Permits. *Journal of Environmental Economics and Management*, 29(2), 133–148, 1995, https://doi.org/10.1006/jeem.1995.1036.
11 Geoffrey Hodgson, *Economics and Institutions: A Manifesto for a Modern Institutional Economics*, University of Pennsylvania Press, 1988; Geoffrey Hodgson, *Institutional Economics: Old Problems and New Directions*, Cambridge University Press, 2004.

Spontaneous order describes how complex systems emerge from the decentralised actions of individual actors.[12] VCM developed as companies sought to reduce their carbon footprints without regulatory oversight. This demand gave rise to a market for credits, driving the creation of emission reduction and avoidance projects. The unregulated response of project developers to match demand created quality and validity concerns for the credits generated by the projects. Standards organisations like Verra and the Gold Standard emerged to validate these projects, but the VCM's unregulated nature retains these risks. The VCM is evolving based on feedback from participants, rather than the directed design of policymakers, which resembles the self-regulating nature of spontaneous order.

Carbon markets in 2024

The two evolution paths have created a complex market landscape.[13] Compliance markets are covering new jurisdictions and sectors every year, and carbon prices are trending upwards. This growth is unevenly distributed, resulting in a fragmented market limited to national and subnational scales, with the EU ETS being an exception. Voluntary markets remain relatively marginal in size, but offer differentiated credits that companies cannot acquire under ETS.

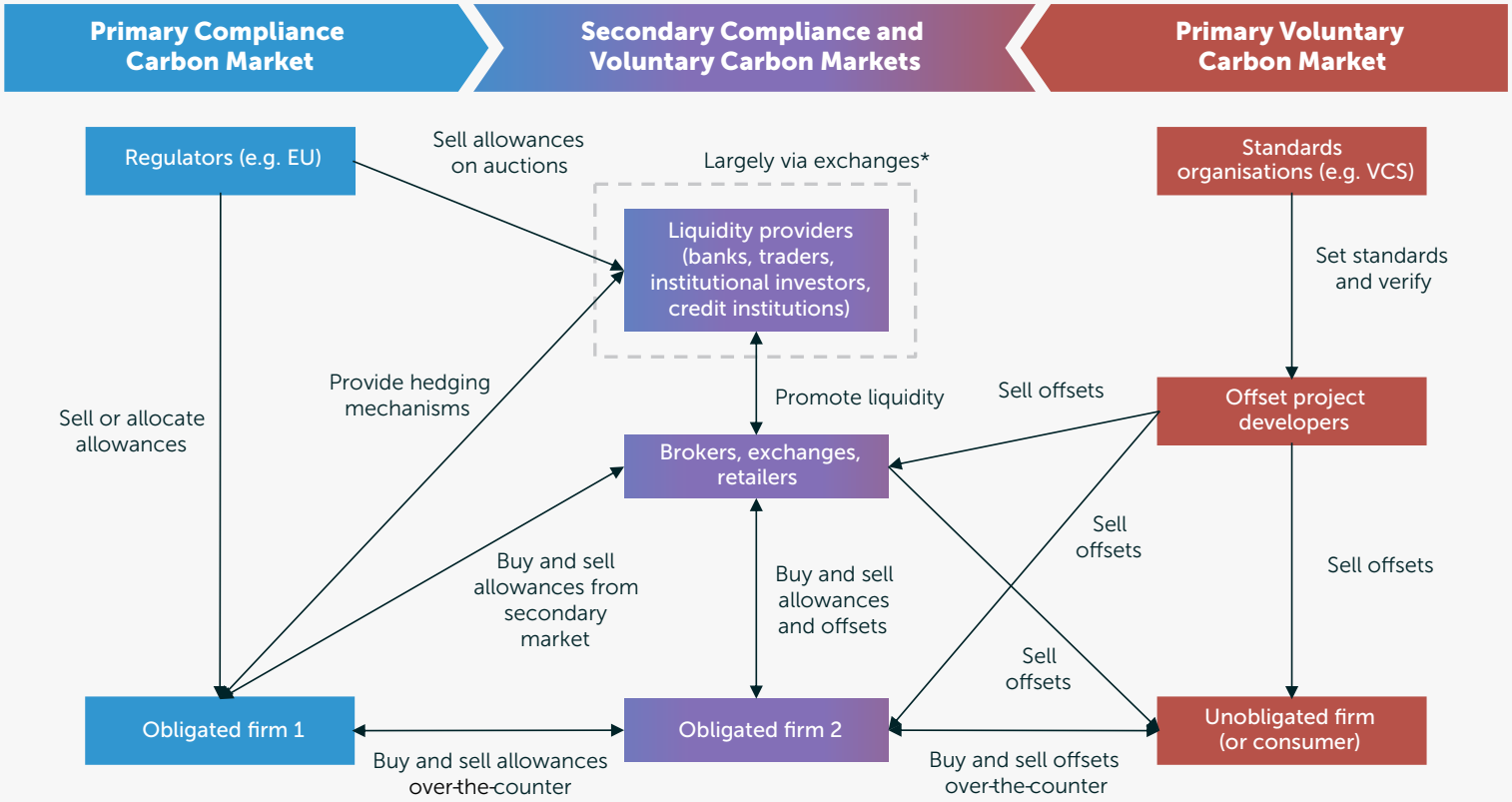
Distinguishing carbon compliance and voluntary credits

A carbon credit is the unit of CO_2 or its GHG equivalent that gets priced by the market. In compliance markets, a credit typically refers to an *allowance* that a polluter receives or must acquire to cover their emissions. In the voluntary market, a credit refers to a unit of emissions *offset* (or *inset*) by carbon reduction, removal or avoidance elsewhere. As shown in Figure 2, both markets feature primary and secondary markets. In the primary, polluters receive their allowances or buy them from auctions alongside investment firms and credit institutions (under ETS), or customers buy their offsets spot or as forward contracts from a project (under VCM). In the secondary, credits under both ETS and VCM are traded on the cash market and as derivatives contracts.

12 Friedrich Hayek, *Law, Legislation and Liberty. Vol. 1: Rules and Order*, Routledge, 1973.

13 For detailed market insight: The World Bank's annual *State and Trends of Carbon Pricing* report provides an annual overview of global carbon pricing trends, Forest Trends Association's *State of the Voluntary Carbon Market* provides this for the VCM, and the European Securities and Markets Authority now provides an annual report on the *EU carbon markets*, the world's largest carbon market.

Figure 2. Simplified schematic overviews of primary and secondary compliance and voluntary markets.[14]



Note: This is a **simplified illustration** of key market participants and interactions. Other participants include emissions reporting agencies, independent verification firms and carbon registries.
* For example, for the EU ETS, this takes place via ICE Endex and EEX exchanges, for California ETS via ICE and for China ETS via the Shanghai Environment and Energy Exchange.
Visual source: Erasmus Commodity & Trade Centre, 2024.

14 Erasmus Commodity & Trade Centre, 2024, based on Hitendra Varsani and Rohit Gupta, *Introducing the Carbon Market Age*, MSCI, 8 June 2022, https://www.msci.com/www/blog-posts/introducing-the-carbon-market/03227158119 and Silvia Favasuli and Vandana Sebastian, *Voluntary carbon markets: how they work, how they're priced and who's involved*, S&P Global, 10 June 2021, https://tinyurl.com/2p86y53k.

State of compliance markets

Compliance markets now cover 24% of global GHG emissions and there are 36 ETS and 39 carbon taxes in operation, each with unique sectoral coverage, rules and resulting carbon prices.[15] In 2024, ETS prices range from $0.41 to $70 per ton, with only the EU ETS price situated in the 2030 price range of $63–127 needed to limit temperature rises below 2°C.[16] Among the major systems, the EU ETS traded with an average price of $90 in 2023, and $70 in the first 9 months of 2024, China's ETS maintains its price under $10 to lower costs for its power generation sector, and California's ETS averaged a price of $30 in 2023.[17] This shows the global variance in approaches and resulting fragmentation. The EU Carbon Border Adjustment Mechanism (CBAM) will tax select imports based on their carbon intensity from 2026, in part to prevent companies relocating to regions with weaker emissions policies. This is driving some foreign ETS to align with the EU, as importers obligated under CBAM will pay the going EU ETS price minus the ETS price in the country of origin, so origin countries can capture some of the earnings themselves.

Spotlight on EU ETS

The EU regards the ETS as its *"main tool in addressing emissions reductions"*. It is the most developed system globally, accounting for 87% of global ETS trading volume, and the most liquid carbon market.[18] In the primary market, power generation, heavy industry, aviation (within the EU), and, as of 2024, shipping companies buy or receive emissions trading allowances (EUAs). The new, separate ETS2 starting in 2027 will cover smaller industries and fuel supply for construction and road transport. While the two systems are separate, market experts expect that the EU will eventually merge them, covering 85% of the EU's total emissions. Inclusion of agriculture, with a further 10% of emissions, is under consideration, but would not occur before 2030. Almost 20 years into its functionality, changes to the EU ETS are causing new market fundamentals, technicals and sentiments, particularly with the changes to EUA supply.

15 World Bank, *State and Trends of Carbon Pricing*, pp.18, 22.

16 World Bank, *State and Trends of Carbon Pricing*, p. 25; *State and Trends of Carbon Pricing Dashboard*, World Bank Group, retrieved 28 October 2024, https://carbonpricingdashboard.worldbank.org/compliance/price;

17 ESMA Market Report, *EU carbon markets 2024*, European Securities and Markets Authority, 7 October 2024, https://www.esma.europa.eu/sites/default/files/2024-10/ESMA50-43599798-10379_Carbon_markets_report_2024.pdf; International Carbon Action Partnership, USA - *California Cap-and-Trade Program*, https://tinyurl.com/y7zcvjh4.

18 ICE, *ICE Environmental Contracts Traded the Equivalent of $1 Trillion in Notional Value for the Third Consecutive Year*, 22 April, 2024, https://tinyurl.com/mpdmk2kf; European Council, *Fit for 55*, https://tinyurl.com/msm4akjh.

Diminishing supply of EUAs

Supply in the EU ETS is largely determined by EU policy. It faced oversupply of credits in early 2010s, leading to structurally low EUA prices. In 2015, the EU introduced the Market Stability Reserve, a mechanism that began to reduce the oversupply, helping prices recover from 2019 onward (see Figure 3). In 2018–2022, 52% of EUAs were allocated for free, primarily to heavy industry, while 48% were auctioned.[19] With the roll out of CBAM, free allocations should be eliminated by 2034. Reductions in EUA supply will accelerate under the EU's "Fit for 55" package, from 1.74% annually (2013–2020) to 4.3% per year in 2024–2027 and 4.4% in 2028–2030.[20] After 2025 the market supply of EUAs will be further reduced, as some allocations were frontloaded to reduce energy prices during the 2022 energy crisis. With this trajectory, new supply of EUAs should be close to zero by 2040.

In the primary market, 10 companies buy 90% of auctioned volumes, and most obligated parties buy their allowances from financial intermediaries, which account for 73% of the trade value on the secondary market.[21] While speculation from the likes of hedge funds does not significantly shape long-term carbon prices in the EU, it does impact short-term fluctuations.[22] 90% of secondary trading is on the Dutch ICE Endex and German EEX exchanges, with futures contracts making up 99% of these trades.[23] Due to different reporting requirements for obligated sectors, the December futures contract is the most liquid, and March and June contracts follow.

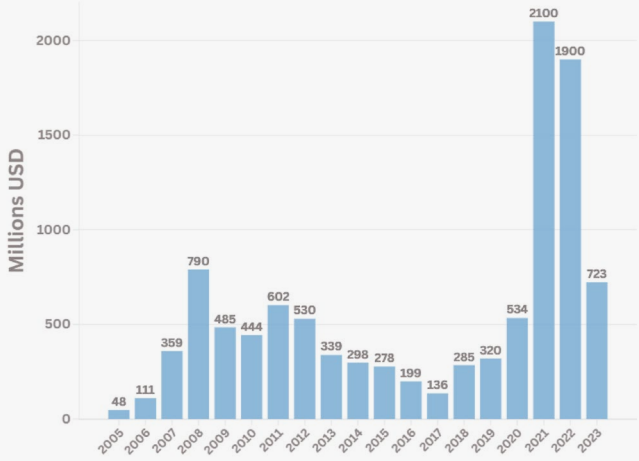
Figure 3. Carbon prices in USD per ton of CO2e in select ETS between 2017 and early 2024.[24]

19 European Securities and Markets Authority, *Emission allowances and associated derivatives*, 28 March 2022, https://tinyurl.com/yc7fc76h, p. 11.
20 European Commission, *EU ETS emissions cap*, https://tinyurl.com/ryb85zxw; European Council, *Fit for 55: reform of the EU emissions trading system*, https://tinyurl.com/3hbv7yj7.
21 ESMA Market Report, *EU carbon markets 2024*.
22 ECB Economic Bulletin Issue 3/2022, *The role of speculation during the recent increase in EU emissions allowance prices*, European Central Bank, 2022, https://tinyurl.com/y93m2pc7.
23 ESMA Market Report, *EU carbon markets 2024*.
24 World Bank, *State and Trends of Carbon Pricing*, p 27.

State of voluntary markets

VCM trading volume dropped 56% in 2023 from 2022, but 2023 volume broadly reflects the market's growth trajectory in the last 20 years (see Figure 4). The average price was around $6.50 per ton in 2023, though prices vary based on factors like project type, geography, and additional benefits. Exchanges have launched futures contracts, but there is limited interest in standardised contracts, in part because many market participants prefer customised credits that align with their specific objectives.[25] For instance, Google, Microsoft and Meta recently bought large volumes of such customised offset credits. While the terms of these deals are not revealed, a similar transaction had offsets priced at $50 per ton in 2023.[26]

Figure 4. VCM market size in million USD value of traded carbon credits, pre-2005 to 2023.[27]



The line between compliance and voluntary participation is becoming blurred. Some compliance markets now allow voluntary credits to partially meet obligations, while others mandate the purchase of offsets. In China, the recently relaunched CCER program allows for trading in offsets alongside its ETS.[28] In Japan, voluntary credits can be traded in the ETS until 2026.[29] Under the aviation scheme CORSIA, airlines have to purchase carbon offsets.[30] To trade under Article 6.4, credits will need to align with its standards requirements. Participation in frameworks like CORSIA or Article 6.4 adds value to credits as the frameworks provide credibility, though this increases the diversity of available credits and does not guarantee market interest in them.[31]

25 ISDA, *Role of Derivatives in Carbon Markets*, September 2021, https://tinyurl.com/92vmj9ds.
26 Gabriel Araujo, *Google buys carbon removal credits from Brazil startup, joining Microsoft*, Reuters, 19 September 2024, https://tinyurl.com/5atzxr9x.
27 Adapted from Forest Trends' Ecosystem Marketplace, *State of the Voluntary Carbon Market 2024*, p. 4.
28 Yi Wu, *Understanding the Relaunched China Certified Emission Reduction (CCER) Program: Potential Opportunities for Foreign Companies*, China Briefing, 3 May 2024, https://tinyurl.com/z2p4b5wd.
29 World Bank, *State and Trends of Carbon Pricing*, p. 18.
30 Carbon Market Watch, *Carbon Markets* 101, p. 7.
31 ICE, *Suspension of the Dec24 CORSIA Eligible Emissions Units (2024-2026) Futures Expiry*, 25 July 2024, https://www.ice.com/publicdocs/circulars/24107.pdf; Bassam Fattouh and Andrea Maino, *Article 6 and voluntary carbon markets*, Oxford Energy Forum, Issue 132, June 2022, https://tinyurl.com/yd5adbpk, p. 54.

Article 6 and other key developments

Article 6 can link the different carbon markets. Under Article 6.2, 69 bilateral agreements have already been signed. Switzerland and Thailand finalised the first Article 6.2 transfer of allowances in early 2024, though further negotiations at COP29 aim to formalise this process.[32] While market experts expected limited progress on Article 6.4, a long-awaited agreement on standards was unexpectedly reached on COP29's first day.[33] This breakthrough in Article 6.4 implementation could expedite the recognition of qualified VCM credits in international compliance frameworks under Article 6.2 and foster the creation of a new premium class of VCM credits. Crediting of these, however, will likely not occur before 2026. Alongside progress on Article 6.4, market participants should monitor:

- **Market design:** The EU, often considered the global frontrunner in ETS design, has yet to finalise its market structure.[34] Sectoral coverage is set to expand with the launch of ETS2 by 2027, free allocations are to be phased out by 2034, and the issuance of EUAs will end by 2040. Similar developments are underway in other key jurisdictions. The evolution of market designs in the EU, select US states, Japan and China will shape the trajectory for other countries to follow.
- **Political commitments:** In response to the 2022 energy crisis, the EU increased EUA supply to reduce carbon prices and lower power generation costs. Although this was a reaction to a systemic shock, factors like discontent over the inflationary impact of carbon pricing and a slowdown in industrial activity could hinder policy consistency. To signal confidence in the market for market participants, maintaining policy follow-through is as crucial as establishing initial market design.
- **Mutual recognition:** Many large emitters like the US, India and Russia have no or minimal carbon markets in place. As new ETS and hybrid frameworks develop globally, mutual recognition of standards is vital for cross-border trading. An example of this is CORSIA, where credits under VCM can be delivered into a compliance framework.
- **Technological progress:** Advances in emissions reduction and removal technologies, such as direct air capture, could significantly alter the carbon price signal and the price thresholds necessary to accelerate decarbonisation.
- **Standardisation of contracts:** Standardising contract terms within and across markets would improve tradeability and increase market liquidity.[35] The integration of voluntary credits into ETS frameworks in Singapore, Japan, and China, as well as the introduction of futures contracts in compliance and voluntary markets, offer early indicators of key market developments.

32 Eklavya Gupte, *Switzerland, Thailand conclude first Article 6.2 deal in landmark move for carbon markets*, S&P Global, 8 January 2024, https://tinyurl.com/32ctbpxt.

33 Ajit Niranjan, *Critics say approval of 'climate credits' rules on day one of Cop29 was rushed*, The Guardian, 11 November, 2024, https://tinyurl.com/545t6zd7.

34 Carbon Trading Chronicles, *EU Carbon market: Scenarios and unknowns for 2040*, Vertis Environmental Finance, November 2023, https://open.spotify.com/episode/3i4snYYnG6SSJlZzqfSegt?si=881050f1dba941d6.

35 Liam van Son, et al., *CommodipHy: The commodification of ammonia and the role of Rotterdam as a global pricing centre.* Research Report, Erasmus Commodity & Trade Centre, 2023. Supported by the Resilient Delta initiative. https://www.eur.nl/en/erasmusctc/media/2023-03-commodiphy-research-report-march-2023.

Strategic outlook and knowledge gaps

This paper illustrates how compliance and voluntary carbon markets have evolved along different trajectories—the former shaped by institutional design, and the latter by spontaneous order. Both continue to develop and increasingly intersect, establishing path dependencies over time. While the compliance market remains dominant, the voluntary market is likely to retain its current role and may even be integrated further into future policy frameworks. Even the EU, which until now has created no room for VCM credits in its market design, is working on a legal framework to include carbon removals to offset unavoidable emissions in the EU.[36]

Progress on climate action—and by extension, carbon market design—is becoming more challenging in a geopolitically fragmented world with weak multilateral frameworks.[37] At both national and supranational levels, such as in the EU, climate policies are clashing with policies to preserve economic competitiveness and geopolitical primacy. Climate-focused industrial policies like the European Green Deal are driving the development of transition technologies, but hard-to-abate industries risk losing their competitiveness if carbon prices are not applied consistently among key producing countries. The US, for instance, boosted its transition spending with the Inflation Reduction Act, but even under the Biden Administration, both US oil and gas production continued to increase.[38] These are tensions that policymakers and carbon markets will need to navigate in the years to come.

Addressing the following unknowns would aid the understanding of future market development:

- **Tipping points:** Key developments like an agreement on Article 6.4 implementation or coverage of new sectors under ETS can tip markets into new path dependencies. As compliance and voluntary markets evolve, what are the tipping points that can lock carbon markets into fundamentally new structures?
- **Price convergence:** Price convergence typically occurs in commodity markets as they mature, and provides more price transparency and market liquidity. Looking at carbon as a commodity, to what extent is it desirable and possible for carbon prices to converge between different ETS and between compliance markets and VCM? What would be the impact of these convergences?
- **Emissions in capital expenditure (CAPEX) decisions:** One way to internalise the cost of emissions is by incorporating previously unaccounted for costs of extraction and production into polluters' CAPEX decisions. To support this, financial disclosure regulations need to account for externalities, or alternatively, treat carbon as an asset on the balance sheet. So how can the inclusion of carbon (and by proxy, other GHGs) in CAPEX decisions encourage decarbonisation in high-emission sectors?

36 European Union, *Carbon removals*, https://www.consilium.europa.eu/en/policies/carbon-removals/.
37 Molly Lemiere, Experts: *What are the biggest geopolitical risks to climate action in 2024?*, Carbon Brief, 20 May 2024, https://www.carbonbrief.org/experts-what-are-the-biggest-geopolitical-risks-to-climate-action-in-2024/
38 Valerie Thomas, *Under both Trump and Biden-Harris, US oil and gas production surged to record highs, despite very different energy goals*, The Conversation, 9 September 2024, https://tinyurl.com/pdje3e7p.

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