

# The Road to Net-Zero is Paved with Good Intentions

Carbonomics: Regulated Markets And Beyond

Part Two

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By Maria Belen Ahumada



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Adopted in 1997, the Kyoto Protocol set the basis for the development of a carbon market with the goal of limiting and reducing GHG emissions of industrialised countries and economies, in accordance with agreed targets by each member. The creation and regulation of this market was thought as an instrument to facilitate signatories to comply with emission targets ('Parties' assigned amount'), or global ceilings for greenhouse gas emissions.

The Kyoto Protocol was the building stone of Carbon Markets as it created market-based mechanisms upon which the trade of emissions permits would revolve: a) Emissions Trading Scheme (ETS), b) Joint Implementation Project (JI) and c) Clean Development Mechanism Project (CDM). ETSs are the markets, and the JI and the CDM Projects feed them. These three mechanisms are intended to be additional means to national measures (ranging from taxes, subsidies, and educational programs) through which signatories should abide to fulfil their commitments. "Carbon Markets" comprises a compulsory carbon market (CCM) and a voluntary carbon market (VCM). The mechanisms created by the Kyoto Protocol feed the CCM and the VCM.

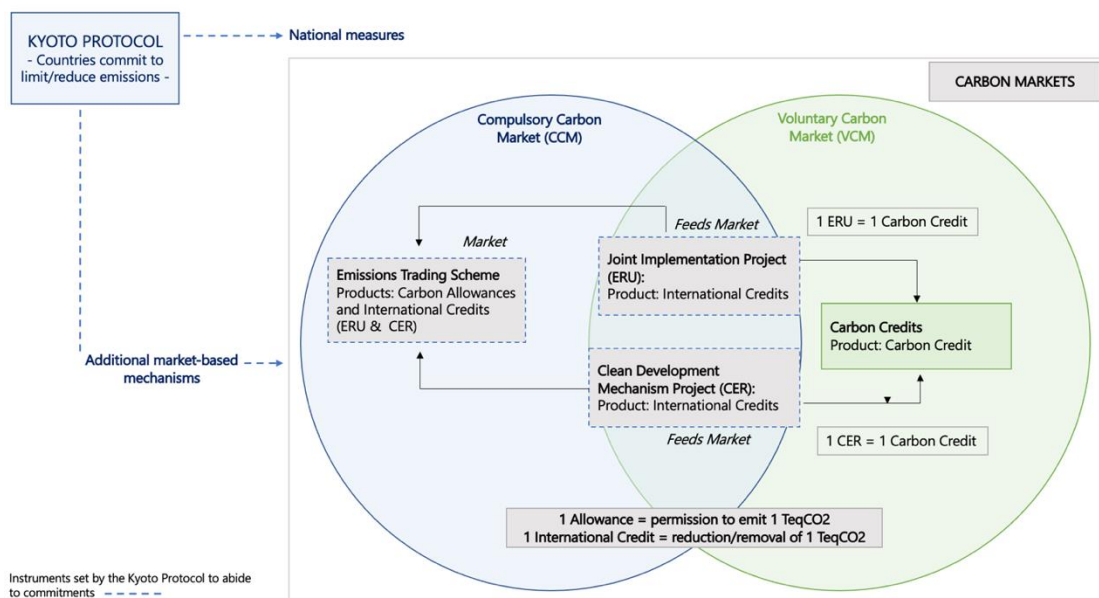


Figure 1: Kyoto Protocol mechanisms and Carbon Markets (Source: Arabesque S-Ray)

The JI Project offers industrialised countries the possibility of reducing their GHG emissions by financing projects in other industrialised countries (Emission Reduction Units). The CDM, on the other hand, allows industrialised countries to finance projects in developing countries, therefore reducing emissions at a lower cost (Certified Emissions Reduction). The ERUs and CERs created by these mechanisms are translated into International Credits, financial instruments that represent a tonne of CO<sub>2</sub> removed/reduced from the atmosphere as a result of an emission reduction project. Through the purchase of International Credits, the JI and the CDM Projects are an alternative to buying allowances. GHG allowances (better known as 'carbon' allowances) - or emissions permit- are issued by governments in line with their emissions reduction targets. One allowance is equivalent to a permission to emit 1 tonne of carbon dioxide equivalent.

The trading of allowances and international credits allows companies subject to emissions constraints to determine what the least-cost option is for them to meet a fixed emissions target set by the government. The price of these products is determined by the market through supply and demand dynamics. Since carbon dioxide is the principal greenhouse gas, people speak simply of trading in carbon.

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## Compulsory Carbon Market

The Emission Trading Schemes (ETs)

The CCM is regulated by signatories of the Kyoto Protocol and allows for the purchase/sell of multiple emissions trading units: GHG allowances, removal units on the basis of land use, land-use change and forestry (LULUCF) activities, emissions reduction units, and Certified Emissions Reductions. CER and ERU are referred to as International Credits. Each unit equals to one tonne of Co<sub>2</sub>. It is compulsory because the entities subject to this regulated carbon market are obliged to emit in line with an assigned number of allowances (or permits to emit carbon emissions) allocated under the Kyoto Protocol to each government. The entities subject to these compulsory markets are normally the heaviest GHG emitters in each jurisdiction. Each year, participating companies and entities subject to an ETS declare their emissions and can buy (sell) emission deficit (emission surplus). Compliant parties could also choose to keep the allowance surplus for next periods.



Compulsory markets are articulated through Emissions Trading Schemes (ETS), either in the form of 'cap -andtrade' <sup>29</sup> or 'baseline-and-credit' <sup>30</sup>.

Carbon allowances and international credits (assets traded in the ETS) have value because there is a limited supply of these. As such, it allows for the redistribution of efforts between participants in a more efficient way so that emissions reductions take place in areas where it costs less.

By April 2021, there were 29 ETS initiatives (including those implemented, scheduled and under consideration), covering 38 national jurisdictions and 29 subnational jurisdictions. According to the World Bank, in 2021 these initiatives cover 8.73 GtCO<sub>2</sub>e, representing 16.1% of global GHG emissions<sup>31</sup>. The price of carbon in ETS differs per jurisdiction, ranging from 1 USD/tCO<sub>2</sub>e in Kazakhstan, through to an average 60 USD/tCO<sub>2</sub>e in the EU as of June 2021<sup>32</sup>. Moreover, the total value of global carbon markets grew c.20% in 2020, reaching €229 billion<sup>33</sup>.

The EU ETS is the first and biggest ETS open to international investors, with government revenues of US\$16,011 million in 2020. China launched its own ETS in July 2021, generating US\$ 32 million turnover on its first trading day. Having displaced the European Union in terms of volume, the Chinese ETS will probably remain the largest globally, although access to international investors is not expected for the next 1-2 years.

Size aside, government intervention in the energy market might remain as one of the main differences between the EU ETS and the Chinese ETS. When it comes to enabling the clean energy transition, public policy and market forces need to work together to make sure that the price of the most emission-intensive energy sources is unattractive enough to discourage demand<sup>34</sup>. In contrast with some European jurisdictions, where these two forces found the way to complement each other, there is no good example in Asia of a liberalised market structure.

Given the relevance of the EU ETS (first and biggest ETS open to international investor), the following section will delve deeper into it

**Carbon allowances and international credits have value because there is a limited supply of these. It allows for the redistribution of efforts between participants in a more efficient way**



## The European Union Emissions Trading System (EU ETS)

Introduced in 2005, the EU ETS represents the central pillar of the EU climate change policy towards climate neutrality by 2050. The ETS is organised in trading periods (or phases), of which four are already defined and more may follow. The scheme is currently on its fourth phase, running from 2021 through 2030. The jurisdictional scope of this ETS encompasses the EU, Norway, Iceland, and Lichtenstein, covering 39% of total EU GHG emissions (4,429 MtCO<sub>2</sub>e, year 2015).

The EU ETS represents c.90% of global emissions trading value and accounts for most of the record high global traded volume of 10.3 Gt of carbon. It is noteworthy that over 8 billion emission allowances were traded in the EU ETS in 2020, c.20% more than in 2019<sup>35</sup>.

To avoid the undermining of government initiatives in reducing GHG emissions, trading of international credits (resulting from the CDM and JI Projects) has been gradually phased out of the EU ETS. International credits are believed to undermine government initiatives because of the price difference between allowances and these credits. EU policy-makers can interfere in setting the price of a carbon allowances, but they have limited power in defining the price of international credits (see Voluntary Carbon Market section).

Phase out of international credits in the EU ETS:

- Since phase 3 of the EU ETS (2013-2020), CERs and ERUs were no longer compliance units within the EU ETS and had to be exchanged for EU ETS emission allowances.
- Since phase 4 of the EU ETS (2021-2030), the EU stopped allowing the use of international credits in EU ETS for compliance purposes.

### Sectors Covered

Participation in the EU ETS is mandatory for the biggest emitters of greenhouse gases<sup>36</sup> (compliant entities). The EU ETS covers emitters from the stationary installations (industry and power sector) and commercial aviation sectors from the jurisdictions under scope. Total emissions units allocated to stationary installations in 2021 are 1,572 MtCO<sub>2</sub>e, and 38 MtCO<sub>2</sub>e for the Aviation sector<sup>37</sup>. Limits to GHG emissions are applied to national production of compliant entities



# Market Structure

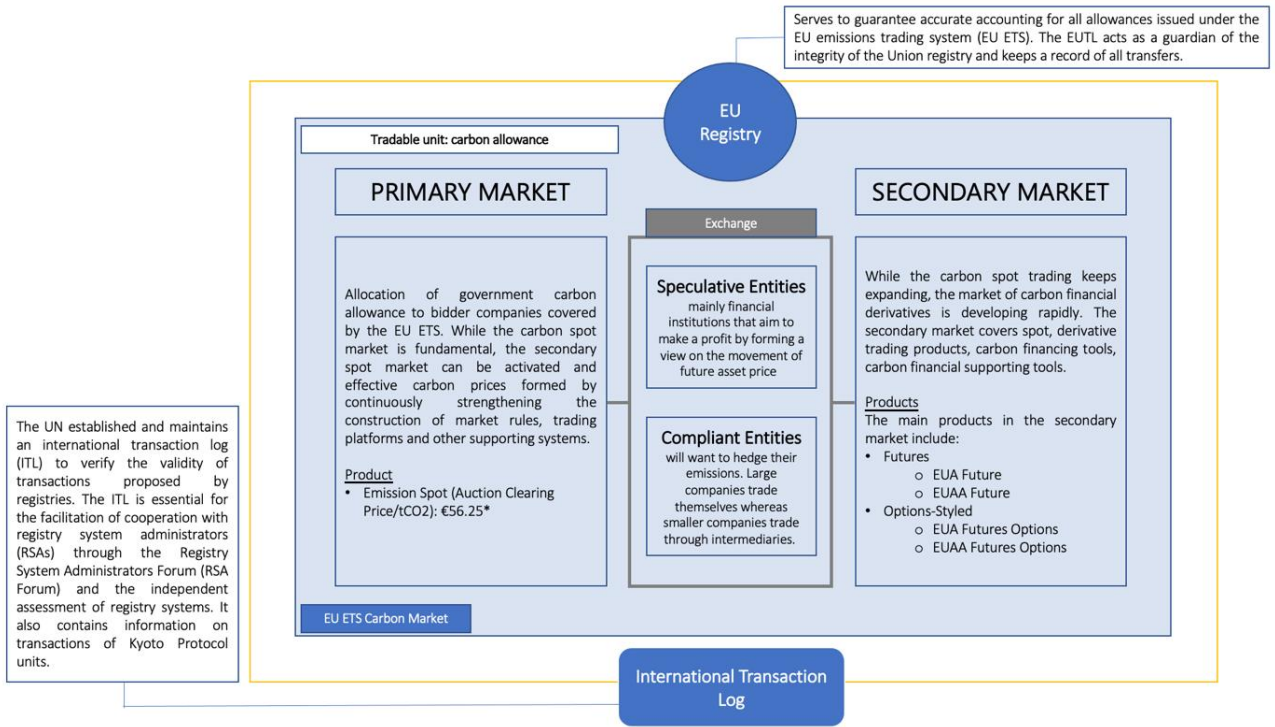


Figure 2: Structure of the EU Compulsory Market (EU ETS) (Source: Arabesque S-Ray)

The following table describes the main carbon products in the secondary market 2:

Symbol	Product	Description	Contract	Price €/tCO2
C	EUA Future	Monthly contract against EU Allowance	Sep-21	54.14
ECP	EUA Daily Future	Daily contract against EU Allowance	Daily	55.33
EFO	European (EUA) Futures Option	Option on the December EUA Futures Contract of the relevant year	Sep-21	54.14
CEU	EUAA Futures	Monthly contract against EU Aviation Allowance	Sep-21	54.12

Figure 3: Main EU carbon products in the secondary market (Source: Arabesque S-Ray)

## Carbon Price in the EU

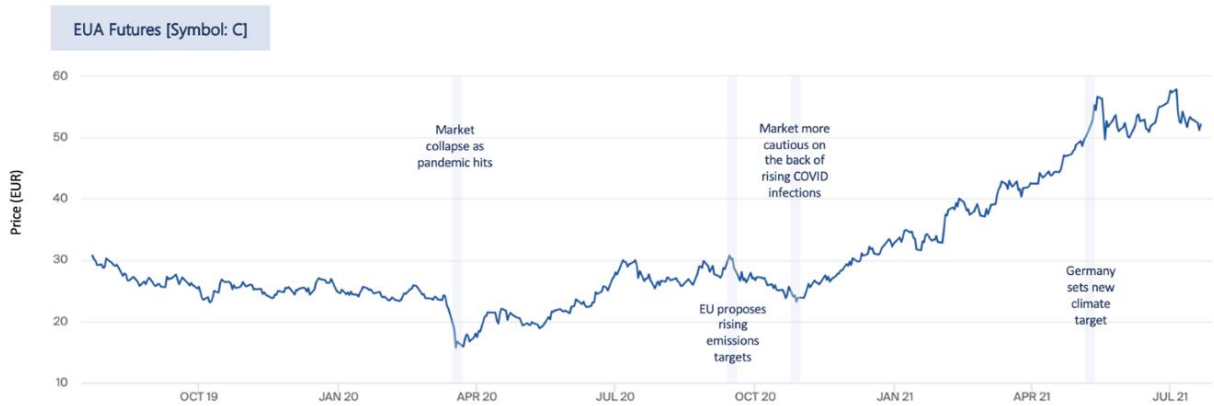


Figure 4: Evolution of European Union Allowance Price (Source: ICE; Financial Times; Arabesque S-Ray)

The European Union Allowance Futures (EUA Futures) is the reference price for carbon. The EUA Futures August Contract sat at €50.73 on 22 July 2021. This implies a year-to-date change of +50.8% and a year-on-year change of +83%. The graph above shows how market forces and government policies can come together to shape price.

The drop of the carbon price in March 2020 is an example of how market forces influence the price of carbon. With the hit of COVID-19 and the decrease of economic activity, the energy demand decreased too, exerting a downward pressure on EU carbon allowances price (1 allowance = permission to emit 1 TqCO<sub>2</sub>). Conversely, carbon prices suffered a hit again in November 2020 as the market became more cautious on the back of rising COVID-19 infections.

Public policies also have an impact on the price of carbon. Prices soared in September 2020 and May 2021 as the EU and the German government pushed their targets for cutting emissions, with the EU Emissions Trading Scheme rallying from near €30 a tonne in December 2020 to €55 a tonne in late July 2021.



# Carbonomics: Supply & Demand Dynamics

## Supply – Market-based Mechanisms (ETS)

### I. Cap

The cap is the maximum absolute quantity of GHGs which may be emitted by covered entities of a specific jurisdiction to ensure the emission reduction target is met and that it corresponds to the number of allowances put in circulation over a trading period. A common EU-wide cap applies for the entire EU ETS. In 2020, the cap was set at 1,88 billion allowances.

During the phase 4 of the EU ETS (2021-2030), the cap for both stationary installations and aviation will decrease by a linear reduction factor of 2.2% per year.

The graph below shows the cap reduction following the increase of the linear reduction factor to 2.2% as of 2021, while also visualising the role of the Market Stability Reserve (MSR) feed and the backloading contributions to the MSR (more on MSR below).

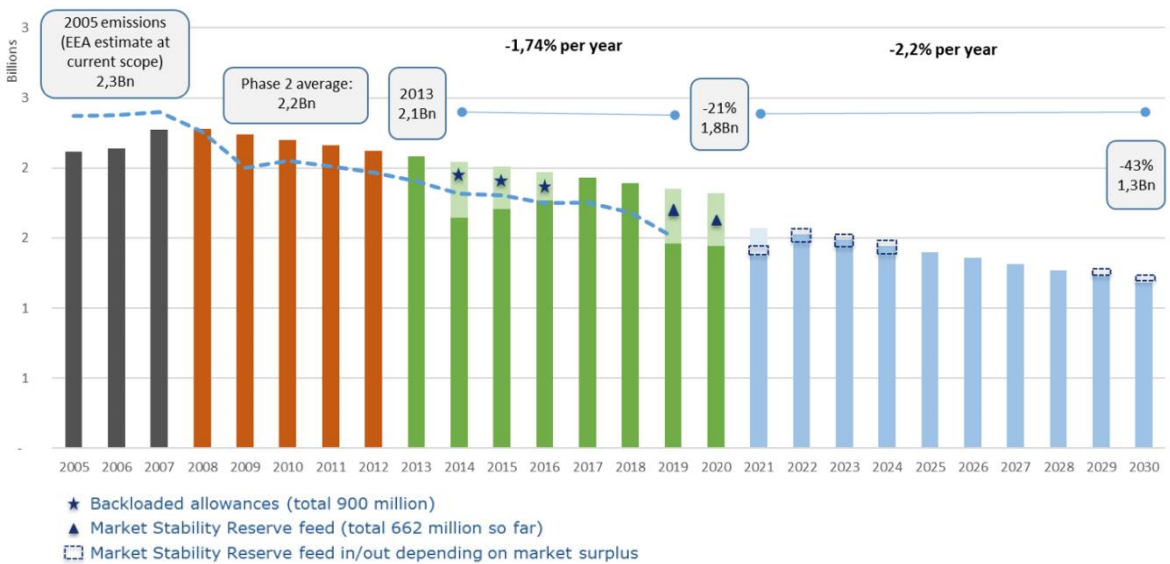


Figure 5: EU ETS - Cap and Market Stability Reserve (Source: European Commission)





The graph above illustrates the evolution of the EU ETS Cap from 2005 through 2030, set by the four different ETS phases. The distinct colours of the bars stand for each EU ETS phase: we are currently on the 4th phase, which extends from 2021 through 2030.

Backloading allowances refers to the action of temporarily discontinuing emission allowances due to a surplus on the back of oversupply of carbon units (for instance, because of the drop in consumption associated to economic crisis). This is done to avoid the drop in carbon prices as a lower price would not deter companies enough in reducing emissions.

Finally, entered into force in January 2019, the Market Stability Reserve (MSR) is a mechanism to increase the price and robustness of carbon emissions by adjusting the auction supply. Whether the MSR adds or removes allowances from circulation will depend on whether the amount in circulation is above or below a predefined threshold (upper threshold: 833 million allowances; lower threshold: 400 million allowances).

## *II. Allowances put in Circulation*

Carbon allowances are a policy-based emission reduction tool. Each year, a fixed number of allowances are issued based on the number of emission units allocated to each country pursuant to the Kyoto Protocol. Each year, these 'permissions to emit' are distributed to companies and entities subject to the ETS scheme. Companies should hold enough allowances to cover their emissions. Whenever companies' emissions exceed the number of allocated allowances, the regulated carbon market allows for the possibility of buying extra allowances from a counterparty. Conversely, for those companies that on any given year emit less than the allowances allocated, they can either save them for next year or sell them.

Emission allowances under the cap are distributed via a combination of free allocation and auctioning. The industry and aviation sectors receive a free allocation based on EU-wide benchmarks and historical activity data. In phase 3, about 43% of the total quantity of available allowances was allocated for free, while the share of allowances auctioned by Member States amounted to 57%.

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### *II.I. Auction*

Governments sell carbon allowances to the best bidders through the allowance auction process. Businesses covered by the EU Emissions Trading System (EU ETS) must buy an increasing proportion of allowances through auctions. In phase 3, auctioning was the default allocation method. Revenues from the auctioning of EU allowances exceeded EUR 14 billion in 2019 alone, and EUR 7.9 billion for the first six months of 2020.

In 2013, c.808 million allowances were auctioned, decreasing by 26% to c. 594 million in 2019. Allowances bid by the aviation sector decreased over time, ranging from c.2% in 2013 to 5% in 2019 of total auctioned allowances.

**Revenues from the auctioning of ETS allowances exceeded EUR 14 billion in 2019 alone, and EUR 7.9 billion for the first six months of 2020**

### *II.II. Free Allocation*

Although in phase 3 auctioning was the default allocation method, a substantial number of allowances was allocated for free to industrial installations and the aviation sector to address the risk of carbon leakage, a situation where companies transfer production to third countries with laxer constraints on GHG emissions, which may lead to an increase in their total emissions. The amount of free allocation also depends on emission and/or trade intensity.

The total number of allowances available for free allocation declines annually. In 2013, free allowances for the industry sector amounted to c. 133 million, decreasing by almost 5x to c.23 million in 2019. On the other hand, the free allocation to the aviation sector in 2019 amounted to slightly over 32.4 million allowances.



### III. Market Stability Reserve (MSR)

The Market Stability Reserve (MSR) is an automatic adjustment mechanism that alters auction volumes when the Total Number of Allowances in Circulation (TNAC) – a measure of allowance surplus – is above or below predefined triggers<sup>38</sup>.

The MSR was created in 2015 to increase the flexibility of the auction supply of emission allowances. In 2018, the surplus was 1.65 billion allowances, while in 2019 it reached a significantly lower level of 1.385 billion allowances. The introduction of this tool has resulted in higher and more robust carbon prices, which helped to ensure a year-on-year total emissions reduction of 9% in 2019, with a 14.9% reduction in electricity and heat production and a 1.9% reduction in industry<sup>39</sup>.

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#### Supply – National Measures

##### I. Tax

Characterised as a ‘national measure’ under the Kyoto Protocol (as opposed to ‘additional market-based mechanisms like the ETS), fiscal policies are one of the main tools that governments may consider when aiming to interfere in the price of emissions. Instead of setting a cap to the total amount of emissions (as within the EU ETS), fiscal policies set the cost of emitting. This policy results in emissions reductions from those who can afford it. For more information on how Tax can shape the price of emissions, stay tuned for the upcoming piece on Carbon Tax.



## Demand – Forecast of Total Emissions

Compliant Entities (EU ETS)	Sector	Installation Count	Allocated Allowances (A)	Verified Emissions (V)	Emissions-to-cap (A-V)
<div style="border: 1px solid black; padding: 5px;"> <div style="background-color: #e0e0e0; padding: 2px;">Enel</div> <div style="background-color: #006633; color: white; padding: 2px;">Enel</div> <div style="padding: 2px;">Vattenfall</div> <div style="padding: 2px;">Endesa</div> <div style="padding: 2px;">Statoil</div> <div style="padding: 2px;">Gas Natural Fenosa</div> <div style="padding: 2px;">RWE</div> <div style="padding: 2px;">...</div> </div>	Power & Heat	A stationary technical unit where one or more activities under the scope of the EU ETS and any other directly associated activities which could have an effect on emissions and pollution	<b>Supply of carbon emissions:</b> - Auctioned - Free allocation	<b>Demand of carbon emissions:</b> - Energy consumption - Source of energy	<b>Emissions surplus (deficit)</b>

Figure 6: Forecasting total emissions across compliant entities under the EU ETS

When it comes to emissions' demand, it is important to look at compliant companies and what is driving their emissions. Ultimately, the amount of GHG emission will be determined by their cost structure: how much energy do they need to produce goods and services and what will the source of energy be? The choice of the energy source will be determined by the cost: what is the profit margin of generating electricity from gas as opposed to generating it from coal? If coal prices are lower than gas prices, companies might choose to generate energy from coal. This will result in higher levels of GHG emissions for the same output of energy, which will increase the demand for carbon emission units. Other things equal, for a higher demand of these units, there will be an upward pressure in price.

The price of gas is of relevance for the companies bounded by the EU ETS scheme as a vast number of heavy emitters in the EU are companies operating in the power & heat sector. By analysing the cost structure of these companies, it can be determined the way in which the power will be dispatched. If coal is cheaper than gas, coal might be the source of energy. Thus, for the same amount of energy output it can be forecasted a higher amount of GHG emissions.

### 1. Getting to a Price Estimate of Companies' Emissions

Putting a price to total forecast emissions will result in an estimate of a future carbon price. This is done by having a look at the futures market, more specifically, the price at which compliant companies are hedging their future emissions.



## Trading off emissions, is this really working?

Whilst the idea of decoupling energy consumption and GHG emissions from economic growth through carbon trading is encouraging. Among others, carbon 'socioeconomic' leakage is the risk that increased costs due to climate policies in one territory, such as the EU, could incentive companies to transfer their production to other countries that have laxer measures to cut GHG emissions. The European Commission has limited the direct emission costs to protect the competitive position of the Union. Indirect emission costs have also been limited for certain EU sectors. Moreover, sectors largely exposed to the risk of carbon leakage are mostly exempted from the phase out of free allocation of allowances.

At the same time, the industry has profited from cheaper international offsets (see Figure 1). As the price of these credits is oftentimes cheaper than the price of emission allowances, companies opt for these products to emit at a lower cost.

**The European Commission has limited the direct emission costs to protect the competitive position of the Union. Indirect emission costs have also been limited for certain EU sectors**

### Voluntary Carbon Market

Even though the focus of this piece is set in the regulated carbon market (CCM), some aspects of the non-regulated carbon market are worth addressing given its relevance and the interconnectivity between both markets.





## I. Some Remarks

- Market: The Voluntary Carbon Market (VCM) provides opportunities for companies to fund mitigation action outside their value chain. The VCM also provides a potentially valuable private financing route to help protect and enhance important natural habitats and natural carbon stores, such as forests, wetlands and mangroves, and to support the development of new low carbon technologies (CDM and JI Projects).
- Size: According to Mark Carney,<sup>40</sup> the size of the market could be valued at \$100 billion by 2030, up from about \$300 million in 2018, with demand growing rapidly as scores of companies and countries set net-zero targets. As discussed above, the size of the regulated market hit EUR 229 billion in 2020.
- Products: there are two types of carbon credits: the Voluntary Emissions Reduction (VER) and the Verified Emissions Reduction (CER). The main difference is that the latter is certified by a third party regulating the CER. CERs (or international credits) can be traded in the regulated market, but VERs can only be exchanged over-the-counter.
- Carbon Offset Price: As of June 2021, prices in the VCM sat at a \$3-5/tCO<sub>2</sub>e weighted average. Low prices are in part due to an excess of supply in relation to demand, with credits being created at low costs<sup>41</sup>.
- Credit exposure: Another differentiating factor is the credit exposure. The credit risks specific to carbon financial transactions also include the default risk of CER.
- Regulation: Given the lack of regulation, the market is less transparent and observes higher liquidity constraints, which is fundamental for price discovery. Price risk management becomes almost impossible. The lack of regulation also hinders the quality standardisation of carbon credits.
- Not a commodity-like asset: unlike carbon allowances, carbon offsets are not considered to be a commodity as they are not fully fungible – the heterogeneity amongst carbon credits adds some complexity to their trading.



## Regulated or not, carbon credits are already being traded

The Taskforce on Scaling Voluntary Carbon Markets, launched by former Bank of England Governor Mark Carney and Standard Chartered Chief Executive Officer Bill Winters, is moving forward with the objective of regulating the VCM. One of the main aim is the standardisation of the quality of carbon credits, which is required for its trading to start in 2022.

But some entities are already trading carbon offsets outside of the ETS scheme on the promise to procure and deliver quality certified credits (endorsed by the Taskforce on Scaling Voluntary Carbon Markets) to their counterparties in the future. For a premium, bidders are accessing these credits in the market, as opposed to from brokers or project developers<sup>42</sup>.

**One of the main objectives is the standardisation of the quality of carbon credits, which is required for its trading to start in 2022**

## COP 26

As the world increases its efforts in limiting and reducing GHG emissions, the 26th UN Climate Change Conference of the Parties (COP26) will probably further guide signatory parties on how to further direct the systems of carbon pricing. Decisions at COP26 are translated into commitments by participating countries. These commitments give shape to policies, which in turn have an impact in the supply of carbon emissions, as seen above.

According to Wood Mackenzie, the summit will suppose a further shift towards lower forms of energy like renewable energy, storage, electric vehicles and hydrogen. Demand for metals shall also follow the same shift, increasing the demand for lithium and copper. Conversely, demand for fossil fuels will remain under pressure. With the right price, these shifts shall ultimately push emitters towards sources of energy that emit less greenhouse gases to the environment<sup>43</sup>.



## References

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29. An aggregate cap of emissions is distributed in the form of allowance permits amongst compliant parties.
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31. [https://carbonpricingdashboard.worldbank.org/map\\_data](https://carbonpricingdashboard.worldbank.org/map_data)
32. Europe carbon prices expected to rise to 2030-industry survey, Reuters, 14 June 2021, <https://www.reuters.com/business/sustainable-business/europe-carbon-prices-expected-rise-2030-industry-survey-2021-06-14/>.
33. Source: Refinitiv.
34. Even though Europe is a good benchmark of governments and market forces working together, there have been divergences within this territory: on the one hand, the UK has combined public policy and market force during financial collapse of 2008, a period after which there was a big oversupply of carbon exerting downward pressure to the price. Therefore, the UK government introduced a support system to the price which avoided for coal to become an attractive source of energy. Germany, on the other hand, did not intervene in the energy market, which caused the marginalisation of gas, the least intensive source of energy within the non-renewable sources.
35. Source: Refinitiv. <https://www.refinitiv.com/en/resources/special-report/global-carbon-market-report>
36. GHG Emissions Covered by the EU ETS: 1) carbon dioxide (CO<sub>2</sub>) from: electricity and heat generation, energy-intensive industry sectors including oil refineries, steel works, and production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals; commercial aviation within the European Economic Area; 2) nitrous oxide (N<sub>2</sub>O) from production of nitric, adipic and glyoxylic acids and glyoxal; 3) perfluorocarbons (PFCs) from production of aluminium.
37. According to the latest report from the European Commission on the EU Carbon Market, the year 2019 observed a significant decrease (-9.1%) of emissions from stationary installations compared to 2018. The decrease was mainly driven by the power sector (-15%), as coal (emissions -19%) was replaced by electricity from renewables and gas-fired power production. The aviation sector, on the other hand, grew its emissions, marking a slight increase of 1% compared to 2018.
38. More information on the MSR system in this [icap report](#).
39. The COVID-19 crisis led to a significant short-term dip in the carbon price in March/April 2020. In spite of that, the carbon price signal remained stable at around EUR 2411 on average between January 2019 and the end of June 2020. At the start of phase 3 in 2013, the EU ETS was characterised by a large structural imbalance between the supply and demand of allowances, equaling 2.1 billion allowances.
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