Briefing on the Europe-China Workshop on Carbon Markets, with coverage of the EU CBAM and carbon asset management

WORKSHOP SUMMARY

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Kevin Tu is the project manager with the overall responsibility for the design and preparation of the briefing report, and Sophie Wei, Zhou Yang, Isadora Wang and Marianna Morra-Skryabina are responsible for drafting session 2.1 China's carbon market, session 2.2 EU ETS, session 3 Different perspectives on the EU CBAM, and session 4 Carbon asset management, respectively.

Preface

Dear reader,

The world faces disruptions from multiple crises, including but not necessarily limited to climate change, COVID-19 pandemic, the Russian war against Ukraine, and the European energy crisis. Given that humanity cannot simply escape this confluence of polycrisis of global scope and importance, we should at least seek to channel it in a more positive direction instead of letting it continue in a vicious circle.

Human-induced climate change is the largest, most pervasive threat to the natural environment and human society the world has ever experienced. The world's top economies and largest carbon emitters should work together to tackle the climate crisis. Therefore, EU-China cooperation on climate change is imperative.

Against the above backdrop, Agora, the Shanghai Institutes for International Studies (SIIS) and the Energy Investment Professional Committee of the Investment Association of China (IAC) co-organized a workshop on 9 November 2022, convening carbon pricing experts across the globe to discuss the future of carbon pricing in Europe, China, and beyond. It included an exchange of perspectives regarding the planned EU Carbon Border Adjustment Mechanism (CBAM) and its role in global climate and trade. Further discussions included a recap on the first performance cycle and the prospect of China's national carbon market, the coordination between carbon and power markets, corporate carbon assets management in Europe, and its implications for China's policymaking and corporate climate action.

This briefing report is intended to inform the international community, especially policymakers, about key perspectives and take-home messages emerging from the workshop as well as some recent development in these fields. It aims to improve public awareness on carbon pricing and related issues, and also makes political viable recommendations in support of Europe-China collaboration on climate change.

We hope you find the report helpful and would welcome your feedback.

Yours,

Markus Steigenberger
Managing Director, Agora Energiewende

Key findings at a glance:

1	**Carbon markets represent a major point of contact between the EU and China, and both parties should promote experience sharing and lesson learning in this regard.** As accuracy and transparency of emissions data is the basis of a well-functioning carbon market, data quality is key for effective carbon pricing regimes across the world.
2	**Despite concerns in China that the EU Carbon Border Adjustment Mechanism (CBAM) could be protectionism-oriented, its design suggests that the tool will primarily protect European energy-intensive industry from carbon leakage.** Carbon prices or regulations are likely to become increasingly embedded in international trade for energy-intensive basic materials. Both European and Chinese industry will need to promote green technologies to stay competitive.
3	**Carbon asset management becomes a key component of corporate sustainability practices in an increasingly carbon-constrained world.** Many Chinese companies are voluntarily disclosing carbon emissions. Meanwhile, China has established a basis for stricter environmental disclosure and enforcement measures that would require effective carbon asset management practices by companies.

Content

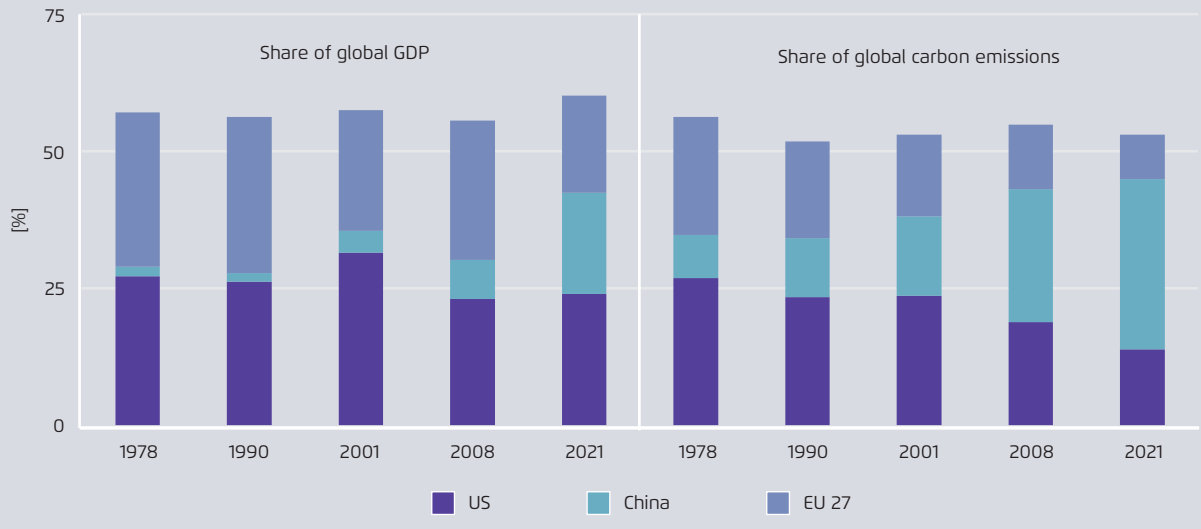
1 Introduction

Given its potential to reduce emissions at lower economic costs than alternative mitigation policies, carbon pricing is central to both the policy debate and international collaboration between Europe and China. The EU Emissions Trading System (ETS) – the world's largest in terms of revenues generated – is in its fourth phase and has recently been reformed in line with the EU's revised 2030 climate targets. China's ETS, which was largely inspired by the EU, kicked off in the form of regional pilot ETS in early 2010s. China officially launched its national ETS in 2021, which is the world's largest carbon ETS in terms of emissions covered.

The EU CBAM was introduced by the European Commission in December 2019 to counter the risk of what is known as "carbon leakage," which refers to the risk that companies covered by an ETS that face higher carbon pricing signals may simply shift production and emissions offshore. In the context of rising trade tensions, there are concerns over the EU CBAM in other parts of the world, including in China, which makes bilateral dialogue and exchange imperative.

To achieve their respective net-zero targets, the EU and China are expected to impose an increasingly stringent regulatory regime to enable decarbonization. As enterprises operating in both economies are going to face rising carbon pricing signals, carbon asset management becomes a key component of corporate sustainability practices in an increasingly carbon-constrained world.

Share of global GDP and carbon emissions by major economy — Figure 1



World Bank online data, BP Statistical of World Energy (2022)

2 Carbon Markets

2.1 China's Carbon Market

Brief history and Status quo of China's Carbon Market

Regional Pilot Carbon Markets

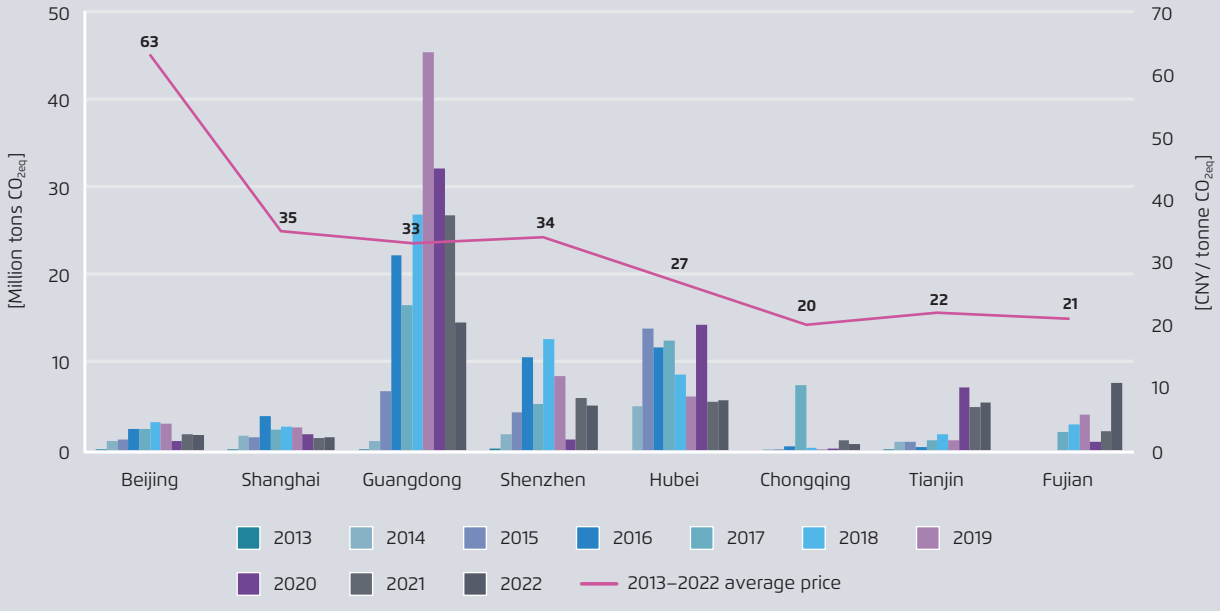
China's carbon emission trading originated from Clean Development Mechanism (CDM), which was developed under *United Nations Framework Convention on Climate Change* (UNFCCC) and the Kyoto Protocol. In 2011, the National Development and Reform Commission (NDRC) approved pilot ETS plan in seven Chinese provinces and municipalities to begin in 2013–2014: Beijing, Tianjin, Shanghai, Chongqing, Hubei, Guangdong and Shenzhen, followed by Fujian province in 2016. The eight pilot ETS cover 3 242 emitters in more than 20 industries and 35–60% of regional aggregate greenhouse gas (GHG) emissions. The total trading volume from 2013 to 2022 was 424 million tonnes with an average CO_2 price of CNY 32.88 (EUR 4.44)/tonne.[1] Compared with other international markets, the pilot markets' volume is relatively low, with daily volume at only 10–20 thousand tonnes. Among all pilots, Guangdong has the highest trading volume: 193 million tonnes during 2013–2022, 45% of the total volume of all pilot ETS and 18 times of the volume in Chongqing, the lowest regional market. The average market liquidity[2] is extremely low, around 5%. Shenzhen has the highest rate at 14%.

Different market intervention mechanisms have been applied across pilot ETS, such as 2–10% market stability reserve, auctions, and volatility controls. All pilots allow 5–8% of allowances to be offset with

1 Exchange rate at the time of writing EUR 1.00=CNY 7.41

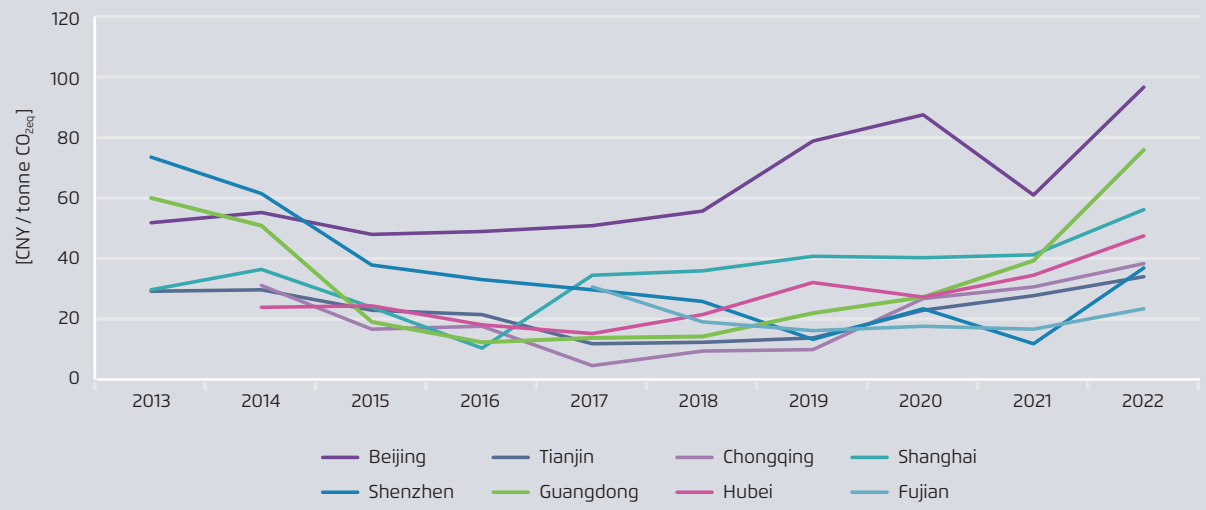
2 Market liquidity: transaction volume divided by market volume

Trading volume and average price of China's pilot ETS — Figure 2



Wind Technology Information, Ltd. (2023)

Annual Average Carbon Price in China Pilot ETS Figure 3



Wind Technology Information, Ltd. (2023)

China Certified Emission Reductions (CCERs), China's voluntary carbon market. Carbon price trajectories in all pilots generally trended downward from 2013 to 2017, and started to rebound after 2017, when the National Development and Reform Commission's official announcement of the upcoming launch of a national ETS reinforced public confidence in carbon markets.

National ETS in China

After September 2020, when China announced its pledge to peak CO_2 emissions before 2030 and achieve carbon neutrality by 2060 – known in Chinese as the *dual carbon* goals – the Chinese Ministry of Ecology and Environment (MEE) accelerated the launch of national ETS. Based on experience and lessons in the eight regional pilot markets, China's national ETS officially came into operation on 16 July 2021. It is an intensity-based system with ex-post adjustment to the cap taking into consideration actual production levels. The ETS initially only regulates the power industry, though it is expected to subsequently expand to other energy-intensive sectors such as petrochemical, chemical, building materials, steel, paper, non-ferrous metals and domestic aviation.

Challenges of China's National ETS

Almost one decade after the first pilot ETS launched in Shenzhen city in 2013, the eight pilot regional markets continue to operate in parallel with the national ETS. This trend will continue in the near term until sectors and entities covered by reginal pilots are gradually integrated into national ETS.

The following challenges are expected to suppress the potential of China's national carbon markets:

- **Lack of absolute cap:** Although the cap set for power industry was estimated to be about 4 500 $MtCO_2$ for 2019 and 2020 respectively, the intensity-based national market has no long-term target on absolute cap setting.
- **Inadequate MRV:** In terms of measurement, reporting, and verification (MRV), China presently has insufficient GHG emission monitoring capacity, and there have been reports of data fraud in reporting and verification.

A snapshot of China's national ETS — Table 1

Item	Note
De facto cap	Bottom-up estimation, about 4500 $MtCO_2$/year for 2019 and 2020 each*
Type of GHGs covered	CO_2
Percentage of national emissions covered	About 45% (2019, 2020)**
Sectors and entities covered	2162 entities from power sector (2020 and 2021)
Threshold	Annual emission higher than 26000 tCO_2 in any year between 2013–2019
Allowance Allocation Method	100% free allocation, benchmarks method
Offsets	Up to 5% of emissions could be offset by CCER
Participants	Currently only compliance entities
Carbon prices	Starting price was set at CNY 48.00 (EUR 6.48)/tonne, average price was CNY 46.61 (EUR 6.29) /tonne in 2021, and CNY 58.07 (EUR 7.84)/tonne in 2022***
Cumulative transaction volume	408 million tonnes (16 July 2021–30 Dec. 2022)****
Cumulative transaction value	CNY 18.14 billion (EUR 2.54 billion) (16 July 2021–30 Dec. 2022)
Market liquidity	5% (16 July 2021–30 Dec. 2022)*****

Sophie Wei (2023)
* International Carbon Action Partnership (ICAP), "China National ETS", retrieved on 20 December 2022 at China National ETS, International Carbon Action Partnership (icapcarbonaction.com); ** BP, "Statistical Review if World Energy 2021", July 2021, at Full report – Statistical Review of World Energy 2021 (bp.com); *** Wind: CEA 2021 average daily closing price; **** Cneeex https://www.cneeex.com/c/2021-12-31/491811.shtml; https://www.cneeex.com/c/2022-1230/493617.shtml; ***** Market liquidity during 16 July 2021–30 December 2022 = cumulative transaction value 408 $MtCO_2$/two years' CEA in total (4500*2)

- **Lack of allowance auction mechanism:** China has yet to set a timeline for introducing auctions to the national market, which limits the number of trading participants and exacerbates the short supply of emissions allowance in the secondary market. The oversupply of free allowances in the primary market is also one reason for the "under-supply" in the secondary market.
- **Imbalanced compliance rate:** among the 2162 covered entities, 121 did not comply in 2021. The compliance rate varies greatly from region to region. Although the national overall compliance rate measured against entities was 94.4%, there are 48.3% of China's regions have a lower compliance rate than that. Large companies with surplus quotas are reluctant to sell allowances, while small companies find it hard to buy allowances from secondary market.[3]
- **Low carbon price transparency:** The government, rather than the market, plays the decisive role in setting carbon prices, and the process for setting intensity quotas and allowance allocation lacks transparency. The carbon price does not reflect the marginal social cost of emissions reduction. Instead, short-term policy decisions mean most

3 Zhang Zhongxiang, keynote speech at Europe-China Workshop on Carbon Markets on 9 Nov 2022, retrieved on 20 Dec 2022 at http://news.tju.edu.cn/info/1014/63300.htm

trading is compliance-driven, which causes high price volatility especially right before or after the compliance deadline.

→ **Market volume and liquidity:** China's ETS covers the largest national emission in the world, however the market transaction volume is only 179 $MtCO_2$ in 2021, 2% of the total emission covered in 2019 and 2020[4]. The market liquidity of 2021-2022 is around 5%, which is very low compared with 80% of the EU ETS spot market in 2020.

4 The 2021 ETS covers two years' carbon allowance, 2019 and 2020 in total.

Outlook for China's carbon markets

In October 2021, China's central government announced a framework for "1+N" carbon peaking and carbon neutrality policies, in which the "1" stands for the overall national plan and the "n" stands for individual sector plans. The central government's policy confirmed that the carbon ETS would be an important policy instrument to achieve China's climate target of peaking carbon emission before 2030 and achieving carbon neutrality before 2060. The framework also confirmed the intention to strengthen the national ETS and expand its scope to cover more sectors.

An absolute cap would better ensure an emission reduction trajectory. Currently the national ETS is intensity-based, and does not impose an absolute cap

Challenges of China's Carbon Markets — Table 2

Indicators	Regional Pilot ETS	National ETS
Cap	Top-down, bottom-up, lenient caps	Top-down, no specific long-term target, lenient cap
Emission verification	MRV incomplete, and not yet capable of managing transactions in detail	MRV mechanism needs to be further improved
Allowance auction	Auction ratio is low, below 5%	100% free allocation, no timeline for auction
Compliance rate	Severity of penalties to guarantee compliance is very low	Company compliance rate lower than emissions compliance rate; regional imbalance
Legislation & guideline	Most pilots are based on local administrative orders, legal binding force is weak	The regulations of the MEE and the NDRC have relatively low legal binding force compared with those from State Council
Market participants	Compliance entities, agencies, individuals	Only compliance entities
Government intervention	Level of intervention too mild and inefficient	MEE has not specified necessary triggers and specifics of the intervention mechanism
Offset mechanism	Surplus CCER supply in market	CCER projects registration suspended in 2017, no specific timeline for reinstatement yet
Carbon price	Very low carbon price, high volatility	Distorted price signal, high volatility
Market volume	Relatively low with significant regional disparity	Relatively low, 179 $MtCO_2$
Market liquidity	Very low market liquidity, around 5%	Very low market liquidity, only 2%

Sophie Wei (2023)

to the system. Though the intensity-based approach could encourage energy efficiency in coal power generation, the absence of an absolute cap still brings substantial uncertainty related to specific level and timing of peaking carbon emission before 2030.

The national ETS would benefit from a stronger legal foundation. China's national ETS is based on ministerial level regulations, which in China have inadequate political and legal force. Higher-level legislation should be introduced by the State Council to strengthen the legal basis of national ETS.

The national ETS will likely expand to cover more sectors. During the 14th Five-Year Plan (FYP) period, cement, aluminium and steel industries, which are all covered by EU CBAM, should be prioritized for coverage expansion. If so, the national ETS coverage would rise from 45% currently to 70% of China's national carbon emissions.[5]

MRV needs improvement. Data quality is the basis of any efficient and credible carbon market. China has realized the importance of further improving its MRV mechanism and avoid data fraud at all levels. Severe penalties for intentional fraud are essential to deterring such behaviour.

Regional pilot ETS should be gradually merged with the national ETS. In the long-run, sectors covered by regional ETS should gradually be integrated into the national ETS. Policy makers should guarantee a smooth transition of the carbon allowances in each market and give clear policy signals to market participants during the transition.

Offsets need development along with reinstatement of CCERs. In March 2017, NDRC suspended applications for CCER project filing to solve two problems: to narrow down the big gap between supply and demand-market demand by then was much smaller than the market supply, and to standardize the CCER projects which frauds had been found in certain applications. However, after six years of digestion, the existing CCER amount in market has almost been consumed and CCER price has seen fast growth recently. The market calls for more CCER supply. In this background, the Beijing municipal government's 14th Five-Year Plan includes plans to build a national level voluntary emission reduction management and trading center in Beijing before 2025. Wang Naixiang, the chairman of Beijing Green Exchange announced in February 2023 that a unified national CCER registration and trading system has been developed in Beijing and is pending inspection and acceptance. The reinstatement of CCERs is expected to happen in the near future. This would help further develop the offset system of the national ETS.[6]

2.2 EU Emissions Trading System (EU ETS)

Development of the EU ETS

Launched in 2005, the EU ETS has grown to become the world's largest carbon market in terms of traded volume. Even after China kicked off its national carbon market in 2021, the EU ETS still ranks the first in terms of revenue generated. Across 27 EU member states, Iceland, Liechtenstein, Norway, the power sector in Northern Ireland, and a link with the ETS of Switzerland in 2020, the EU ETS covers approximately 10 000 companies, representing around 40 percent of the total emissions of the EU.[7] As of May 2023, the sectors covered by the EU ETS include electricity and heat generation, oil refining, energy-intensive industrial

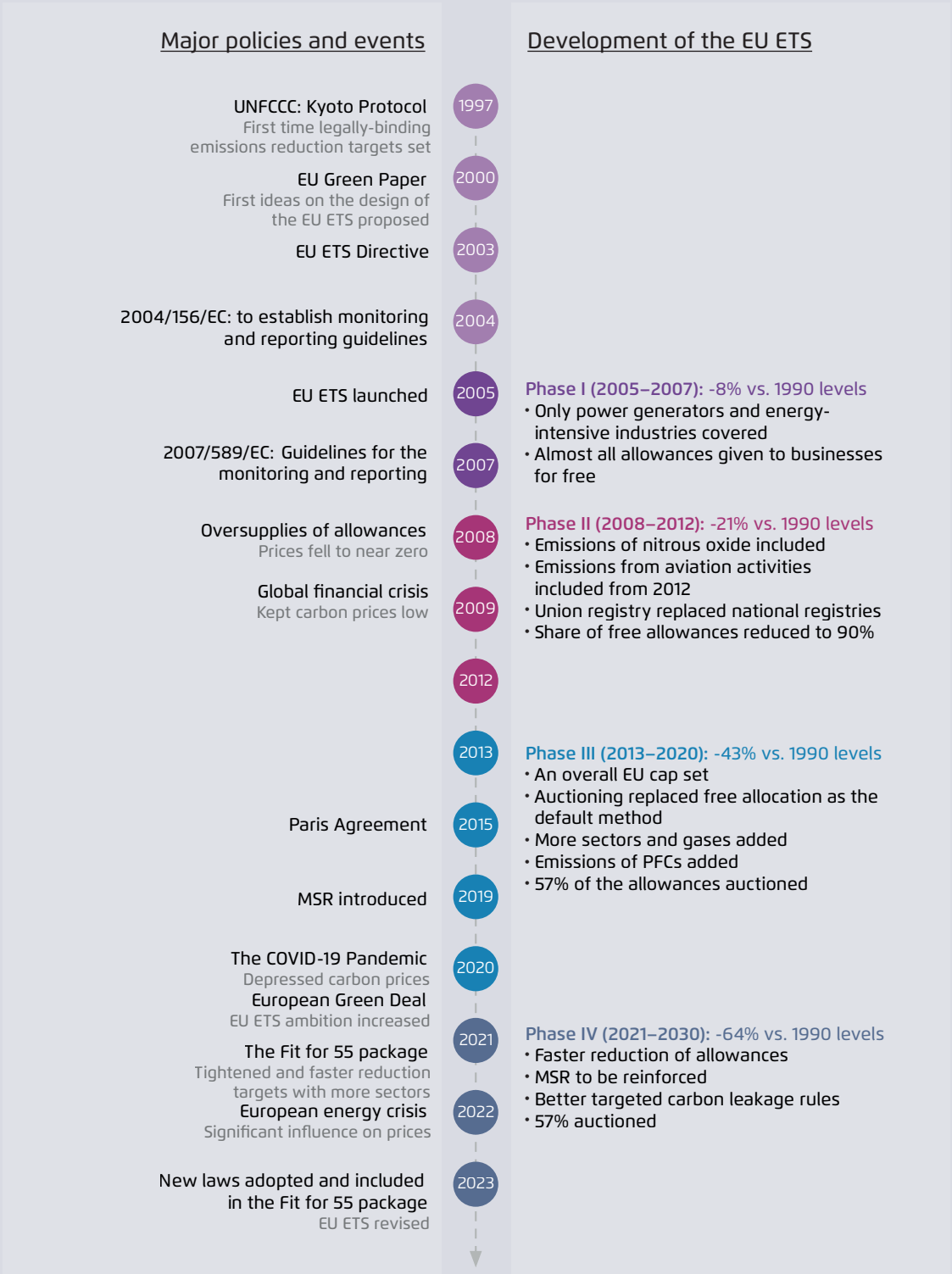
5 Zhang Zhongxiang, keynote speech at Europe-China Workshop on Carbon Markets on 9 Nov 2022, retrieved on 20 Dec 2022 at http://news.tju.edu.cn/info/1014/63300.htm

6 Sina news, https://finance.sina.com.cn/jjxw/2023-02-07/doc-imyevxkr6230055.shtml, retrieved on 29 March 2023.

7 Infographic - Fit for 55: reform of the EU emissions trading system https://www.consilium.europa.eu/en/infographics/fit-for-55-eu-emissions-trading-system/

Development of EU ETS and major policies and events

Figure 4



The European Commission (2023)

sectors, commercial aviation, as well as maritime transport which was newly added in the latest revision on ETS reform by the European Union. The revision also includes a separate emissions trading system for all fossil fuel emissions not covered by the existing EU ETS, namely those used for energy consumption in buildings, road transport and light industry; this is the so-called "EU ETS 2". Combined with the ETS 1, it will ensure that virtually all fossil fuel use in Europe is covered by some form of carbon pricing.

As the EU ETS entered its fourth phase, the ETS framework has been constantly improved and revised as the carbon market grew and as the EU has updated its climate targets. The most recent updated target for the emissions reductions covered by the ETS is raised from 43% to 62% by 2030, which aligns with the EU's emissions reduction target of achieving a 55% reduction by 2030 and achieving climate neutrality by 2050. Figure 4 displays a timeline of the four phases of EU ETS, with key policies and milestone events.

Emissions cap and allowances

Setting a cap on emissions and tradable allowances are the core elements behind the EU ETS. The cap-and-trade mechanism makes the EU ETS an effective tool to ensure a politically desirable emissions reduction trajectory. By 2020, the sectors covered by EU ETS achieved emission reductions of 41 percent compared to 2005 levels, over-shooting the 21 percent target set in 2008 for phase 3. The emissions cap for EU ETS sectors for 2030 has recently been revised to -63% compared to 1990 emissions. As a consequence, EU carbon prices have risen to average between 80–100 EUR/tCO_2 (approximately 620–790 RMB/tCO_2) during the first half of 2023.

During the first two phases (2005–2012), the EU ETS adopted a bottom-up approach to set an EU-wide cap through national allocation plans (NAPs). The NAPs required the participant countries to submit their national caps and the plans to allocate the allowances for the coming period. The national caps were reviewed and approved by the European Commission. The approved national caps would be summed up by the Commission to establish an overall cap for the market. The total quantity of allowances of a member state and the allowances allocations were based on the country's historic emissions, the potential of emissions reduction by sector, and the legal obligation to comply with the EU climate target and the Kyoto Protocol.

The designers of the ETS designed the pilot phase (2005–2007) as a learning-by-doing exercise that allowed governments to test the effectiveness and efficiency of the NAPs and the owners of covered entities to understand the rules. The pilot phase revealed a number of problems, some of which contributed to over-allocation of allowances and an allowance price crash in the pilot phase.

1. The bottom-up methodology of calculating and allocating the allowances failed to create incentives to reduce emissions. Covered entities would report a higher level of historical emissions and underestimate their emissions reduction potential to avoid high carbon prices.
2. The criteria of NAPS in Annex III of the Directive lacked quantitative descriptions and uniform rules, leading to uncertainties around emissions baseline data and the different projections of business-as-usual scenario of different sectors and countries.[8]
3. Most of the allowances were allocated for free, further amplifying the oversupply issue and disincentivizing emissions reductions. Free allowances resulted in significant windfall revenues for industries over-supplied with emission allowances.
4. The reduction burdens allocated to non-trading sectors in some national allocation plans were disproportionately high to meet their Kyoto targets. However, reduction measures in the non-trading sectors were often poorly described by the member states.

8 Directive 2003/87/EC, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32003L0087

The second phase of the EU ETS (2008-2012) brought about more specific guidelines and more accurate data for setting allocations baselines. However, the second phase still suffered from a weak emissions budget and overallocation of allowances by EU member states. About 10 percent allowances were auctioned in the second phase. The introduction of the Joint Implementation (JI) and the Clean Development Mechanism (CDM) in this phase provided opportunities for member states to take advantage of imported emission credits instead of focusing on domestic reductions. The decentralized approach of NAPs and free allocations were widely criticized for creating market distortions by independent organizations and experts.

The third trading phase of the ETS (2013-2020) included a common EU-wide cap for the entire EU ETS, using a linear emissions reduction factor of 1.74 percent per year. The 2013 cap was set on the basis of the average annual allowances issued in 2008-2012. Instead of free allowances based on historical emissions baselines, starting with Phase 3 the majority of allowances were subject to auctioning. The share of allowances auctioned rose from less than 10 percent during phase 2 to 57 percent in phase 3 (see figure 5).

For Phase 4, to ensure consistent and faster emissions reductions, the European Council approved a revision of new annual emissions reductions factors. The original reduction factor was set at 2.2 percent in 2018[9] In June 2022, the Council agreed to strengthen the annual reduction rate to 4.2 percent[10]. Later in December 2022, the Council and the European Parliament strengthened the rate again, to 4.3 percent

9 EU Emissions Trading System reform: Council approves new rules for the period 2021 to 2030 https://www.consilium.europa.eu/en/press/press-releases/2018/02/27/eu-emissions-trading-system-reform-council-approves-new-rules-for-the-period-2021-to-2030/

10 Fit for 55 package: Council reaches general approaches relating to emissions reductions and their social impacts, https://www.consilium.europa.eu/en/press/press-releases/2022/06/29/fit-for-55-council-reaches-general-approaches-relating-to-emissions-reductions-and-removals-and-their-social-impacts/

Allowances in the EU ETS (All countries, stationary installations and aviation) Figure 5

European Environment Agency (2022)

from 2024–2027 and 4.4 from 2028–2030[11]. The consequence is that the EU ETS 1 emissions cap will be 63% below 1990 emissions levels.

New free allocations rules were adopted from phase 3. To reduce the risk of carbon leakage, the ETS allowance system provides a proportion of free allowances to manufacturing industries facing competition from companies with production outside the EU without comparable emissions constraints. The calculation of free allocations would apply harmonised best available emissions technology benchmarks for the installations based on their historic output. Instead of NAPs, Phase 3 required member states to submit National Implementation Measures (NIMs), which include a list of installations covered by the EU ETS in their territory and preliminary annual number of free emission allowances calculated on the basis of the EU-wide harmonised rules for free allocation[12].

In addition to the reform of cap setting and allowances allocation, during Phase 3 the EU ETS introduced some measures to resolve the surplus of allowances. The short-term measure "back-loading" implemented in 2014 addressed the imbalance at the beginning of phase 3 by postponing the allowance auctions of 900 million allowances from 2014–2016 to 2019–2020. The back-loading measure effectively reduced the supply of allowances in the market and stabilized the carbon price in the short term.

In 2015, the EC introduced a longer-term solution to the allowance oversupply problem in the form of market stability reserve (MSR), which come into force in 2019. This was introduced to the severe economic recession experienced by the EU in the early 2010s due to the global financial and Eurozone crises. The MSR is intended to stabilize supply and demand for credits by holding excess allowances from distorting the market, depressing allowance prices, or causing price volatility. The MSR transferred unallocated allowances, including the 900 million allowances that were back-loaded, to the reserve. Every year by May 15, the European Commission publishes the volume of allowances to be placed in the reserve, or to be released from the reserve. From 2023, the MSR will be strengthened by increasing the percentage of total allowances put in the reserve if the threshold is exceeded. The MSR greatly improved the functioning of the EU ETS, effectively strengthening the incentive to reduce emissions. Since the MSR's introduction, the EU carbon price has risen to reflect tighter supply of allowances compared to demand, from around 5EUR/tCO_2 in 2015 to 20–25EURt/CO_2 between 2018–2020. The price has now risen to between 80–100 EUR/tCO_2 in 2023.

Phase 4 of the EU ETS began in 2021 and extends until 2030. According to recently agreed reforms in December of 2022, a rebasing of the EU ETS cap of more than 100 million allowances will take place in 2024, coupled with an increase in the linear reduction factor of the cap to -4.3 percent per year from 2024–2027 and -4.4 percent from 2028–2030[13]. The consequence is that by 2030 the EU ETS emissions cap will be 63% below 1990 emissions levels. For phase 4, the share of allowances auctioned will be increased, as several energy-intensive industries, such as steel, cement, aluminium, hydrogen, ammonia and fertiliser will see their free allocation decline progressively from 2026 until 2034, as these sectors are moved into the Carbon Border Adjustment Mechanism instead.

11 'Fit for 55': Council and Parliament reach provisional deal on EU emissions trading system and the Social Climate Fund, https://www.consilium.europa.eu/en/press/press-releases/2022/12/18/fit-for-55-council-and-parliament-reach-provisional-deal-on-eu-emissions-trading-system-and-the-social-climate-fund/

12 2011/278/EU, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32011D0278

13 'Fit for 55': Council and Parliament reach provisional deal on EU emissions trading system and the Social Climate Fund, https://www.consilium.europa.eu/en/press/press-releases/2022/12/18/fit-for-55-council-and-parliament-reach-provisional-deal-on-eu-emissions-trading-system-and-the-social-climate-fund/

Carbon price drivers in each phase of the EU ETS

The EU ETS prices have experienced significant fluctuations over the years. After the global financial crisis, EU ETS prices fell €30 in 2008 to €2.75 in April 2013. The prices gradually recovered through the phase 3 until the beginning of the coronavirus pandemic, when they dropped sharply in March 2020 by more than 40 percent compared to the pre-COVID levels. The prices rebounded fast and climbed to record highs. As of February 2023, the carbon prices exceeded €100.

As the EU ETS has evolved, varying factors have influenced carbon prices. In a regulatory market, market design and the methodology of total volume setting and allocation is the most important price determinant. In the first two phases, the decentralised method of cap setting and free allocation caused overestimates of emissions, resulting in oversupply of total allowances, which led to price crash to nearly zero in the first phase. With the improvement of the EU ETS framework, market prices have become more resistant to policy changes and resulted in a stronger and more consistent price signal in the recent years. Since the start of phase four in 2021, the total emission allocation will follow a faster reduction rate and the MSR will be further strengthened to limit the volume of allowances in circulation. The tighter emission cap was one of the major drivers of the elevated carbon prices in 2021. Apart from the internal structural factors described above, political decisions, economic growth, energy market conditions, weather, and international relations have all influenced carbon prices to various degrees.

Increasing carbon prices closely coincide with the ambition of climate policies. In 2020 and 2021, despite the pandemic-induced recession, more countries continued to introduce or strengthen targets for achieving net-zero carbon emissions. More ambitious global climate goals increased investor confidence in decarbonization, pushing the carbon prices upward. Outside the EU ETS, record carbon prices in other carbon markets, such as in the linked California and Québec markets, the Regional Greenhouse Gas Initiative (RGGI), and the New Zealand ETS, contributed to rising market pricing expectations in the EU.

Economic activity has a relatively direct impact on the carbon market's volatility. The EU ETS experienced two major global economic recessions – the 2008 financial crisis and the COVID-19 recession. Both substantially dented industrial output and lowered demand for carbon allowances, leading to sharp drops in short-term carbon prices. The downward trend of carbon prices resulting from the financial crisis lasted longer than the 2020 coronavirus-induced interval of low prices. While allowance demand rebounded strongly in 2021, the supply of energy recovered slowly, leading to higher prices of natural gas. When the owners of power and heat plants switched to cheaper coal, which is more carbon intensive than natural gas, this drove up the demand for carbon allowances and prices rose accordingly.

2.3 Comparison of China's national ETS with the EU ETS

EU ETS is a multi-level system which has been established and improved over nearly two decades of practice. By comparison, Chinese national ETS is still in its initial stages. Any comparison of the two markets must account for the different phases of their development. Although China's National ETS covers the largest carbon emission in the world, its trading volume however is only 0.2% of the EU ETS. Trading volume is an important indicator of market maturity. China could benefit from the experiences and lessons of EU ETS in many aspects especially carbon market design and development.

Similarities of the two markets:

- → Both use a bottom-up mechanism for cap setting in the beginning.
- → Benefitting from the experience of MRV mechanism in EU ETS, China has applied a similar MRV process as a basis for allowance allocation.

Differences of the two markets Table 3

	China National ETS	EU ETS
Cap setting	Intensity based cap without specific cap	An EU-wide cap has been adopted with a linear reduction factor since phase 3
Allocation	100% free allocation for power sector, no timeline for auction	Auctioning is the default method of allocating allowances as of phase 3 of the EU ETS. The share of allowances to be auctioned increased steadily to 57% by the end of phase 3.
Sectors and gases covered	Currently only covered CO_2 emission from power sector with other seven sectors in future coverage plan: petrochemical, chemical, building materials, steel, paper, non-ferrous metals, and domestic aviation.	CO_2 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; → Shipping, starting from 2024. Methane and N_2O from shipping will be included in the 'MRV' regulation from 2024 and in the EU ETS from 2026. N_2O from production of nitric, adipic and glyoxylic acids and glyoxal; PFCs from production of aluminium. EU ETS2 for the buildings, road transport and additional sectors (mainly small industry) from 2027
Emissions allowance products	Spot trading of carbon emission allowance	Spot, futures and options trading
Development process	China's national ETS develops in parallel with eight regional pilot markets, though the national market has higher priority. The eight pilot markets will gradually integrate into national ETS.	EU ETS develops and evolves as an integrated market, which has expanded and been linked to some trading systems beyond EU member states.

Sophie Wei & Yang Zhou (2023)

Implications of the EU ETS for China's national ETS

Based on the experiences and lessons of the EU ETS and China's national circumstances, and drawing on the insights from Agora the following suggestions may help improve China's national ETS.

1. Set an absolute cap on the total quantity of emission allowances with a clear cap reduction roadmap for shorter term (2030) and longer term (2060) to drive emissions reductions in support of China's dual carbon goal.

The current intensity-based cap setting in China's ETS uses an administratively-set benchmark for each industry, considering both historical emission data as well as industry average emission levels, which depends on technology level. Tightening the benchmark affects allowance allocation directly and thus would incentivize less advanced facilities to improve their efficiency, leading to GHG emissions reduction. However, the intensity-based benchmark system has questionable emission reduction efficacy. Compared with a fixed cap with reduction trajectory and rising auction rate, the intensity-base cap with 100% free allocation fails to send a clear price signal to the market. Once national emissions peak before 2030, an absolute cap would be indispensable for achieving carbon neutrality before 2060. The lessons from the first two phases of the EU ETS indicate that a bottom-up approach without harmonized rules would fail to create effective price signal and to reflect the market scarcity. An EU-wide cap with a fixed reduction rate set from the third phase ensures a continuous downward trajectory of emissions from the covered sectors. The rising auction rate in allowance allocation, starting from 5% in phase 1 to 10% in phase 2 and 57% in phase 3 and phase 4 respectively, also helps in driving carbon price of EU ETS higher and making emissions abatement more effective.

2. Improve the accuracy and transparency of emissions data, as the basis for effective and functional carbon market.

China's system of MRV gives an important role to the elemental carbon in power generation emission reporting, and this directly affects allowance allocation. Power generators are required to carry out monthly elemental carbon content measurement by qualified third-party inspectors, using daily samples of ash from coal combustion. However, in practice many power generators lack this reporting. This is due to lack of knowledge of the rules, insufficient capacity to carry out the complex collection of combustion ash, or difficulty identifying local third-party inspectors. Without such reporting, power generators apply a default value for elemental carbon that is about 20–30% higher than the measured ones. This significant discrepancy has pushed some compliance entities and their consulting agencies to risk data fraud.

In the first phase of the EU ETS, installations often over-reported historical emissions and under-estimated their reduction potential, leading to over-supply of allowances in the market. Data quality and transparency of the EU ETS has been largely improved with the implementation of Monitoring and Reporting Regulation (MRR) and Accreditation and Verification Regulation (AVR). Lack of uniform regulations on monitoring and reporting of carbon emissions and independent verification would lead to misreporting of data, and violates the polluter-pays principle.

Looking ahead, reliable MRV is essential for China's national ETS to build links with other international carbon markets and reduce the cost for exporters complying with the EU CBAM or similar regulations. For industries whose emission measurements are complex and data acquisitions are difficult, a carbon tax may be introduced by the Chinese government to complement the carbon market to ensure effective emissions reduction across sectors.

3. Expand the coverage of China's national ETS beyond the power sector.

Currently China's national ETS only covers the power sector, which accounts for about 45% of the nation's annual emissions. This coverage level resembles that of Phase 1 of the EU ETS, which covered 50% of emissions. However, the composition of industries was more diverse under the EU ETS from the outset, which included power and heating, steel, petrochemicals, ceramics, glass, cement, other construction materials, and paper. The EU ETS had an equivalent of around 8 000 compliance entities as emitters from different industries, versus 2 162 in China, all from power sector.

A wider variety of participants would greatly improve the vitality of the market. China could consider to enlarge the coverage of the national ETS by referring to the principles applied in Europe. In the beginning of the EU ETS, power sectors and some energy-intensive industries were covered because of their volume of emissions and data accessibility. For China, in addition to emission volume and data accessibility, the industries to be covered by the EU CBAM should also be given priority. As a result, iron and steel as well as cement should be targeted in next step of China's ETS development. These industries account for around a quarter of China's national emissions and have relative standardized production procedure. They are also covered in EU CBAM, which highlights the benefit of including them in the ETS sooner rather than later.

3 Different perspectives on the EU CBAM

3.1 Latest development of CBAM and the EU perspective

In December 2019, 14 years after the inception of the EU ETS, the European Commission adopted its Communication on the European Green Deal, envisaging the proposal for a carbon border adjustment mechanism (CBAM). CBAM is an important element for the EU to achieve its ambitious goal of reducing greenhouse gas (GHG) emissions by at least 55% over 1990 levels by 2030, in line with the European Climate Law.

The EU CBAM has been conceived to help phase out free emission allowances in EU ETS and build a lever playfield for EU domestic products and imported goods. CBAM is designed to work in parallel with the EU ETS and reflect the functions on imported goods as the EU ETS does for domestic production. Its objective is to gradually replace the free allocation of EU ETS allowances in sectors at risk of carbon leakage – a situation where one jurisdiction's climate policies lead to an increase in emissions elsewhere through relocation of production to non-EU countries or increased imports of carbon-intensive products.[14]

> "It has not been announced as a policy that is aimed at encouraging other countries to adopt the same policies. Officially it is conceived as a policy to reduce leakage and thereby enable carbon pricing in the European Union."
>
> **Aaron Cosbey**
> **Small World Sustainability**
> **At the Europe-China Workshop on Carbon Markets on 9 November 2022**

The CBAM targets imports of upstream basic materials in carbon-intensive industries and clean energy carriers. The costs the CBAM imposes on imported goods will be based on their embedded carbon emissions, the explicit carbon costs already paid for in their country of origin and corresponding carbon prices in the EU ETS.

The CBAM regulation was first proposed by the EU Commission on 14 July 2021, targeting direct emissions in iron and steel, cement, aluminium, fertiliser, and electricity generation. It was to become fully operational in 2026.

On 17 May 2022, the European Parliament's Committee on Environment, Public Health and Food Safety (ENVI) voted for the adoption of a CBAM. The ENVI position on the CBAM tried to broaden the scope to organic chemicals, hydrogen, and polymers. It also extended to indirect emissions caused by electricity used, and brings forward the implementation time to 2025. Other than those, the ENVI version pointed out the need for a centralised EU CBAM authority and expressed the need to support least-developed-countries (LDCs) to decarbonise their manufacturing industries with CBAM revenues.

The ENVI version raised extensive concerns among European industries. Some believe it sets unrealistic timetables for CBAM and ETS free allowance phase-out and adds disproportionate regulatory strain on European businesses. Business Europe, the advocate of European national business federations, said that CBAM as proposed by the ENVI committee would make European producers and employees all along the value chain suffer by rushing from free allocation of emission allowances within the ETS to CBAM, placing a disproportionate burden on industry, and making the benchmarks unrealistically stringent.

14 Aaron Cosbey (2022); European Council (2022)

On 22 June 2022, the European Parliament adopted a carbon legislation package with a slightly less far-reaching version of the CBAM. The scope was extended to cover indirect emissions and a wider range of products (organic chemicals, plastics, hydrogen, and ammonia), but postponed the phase-in to 2027, with the CBAM to take full effect in 2034.

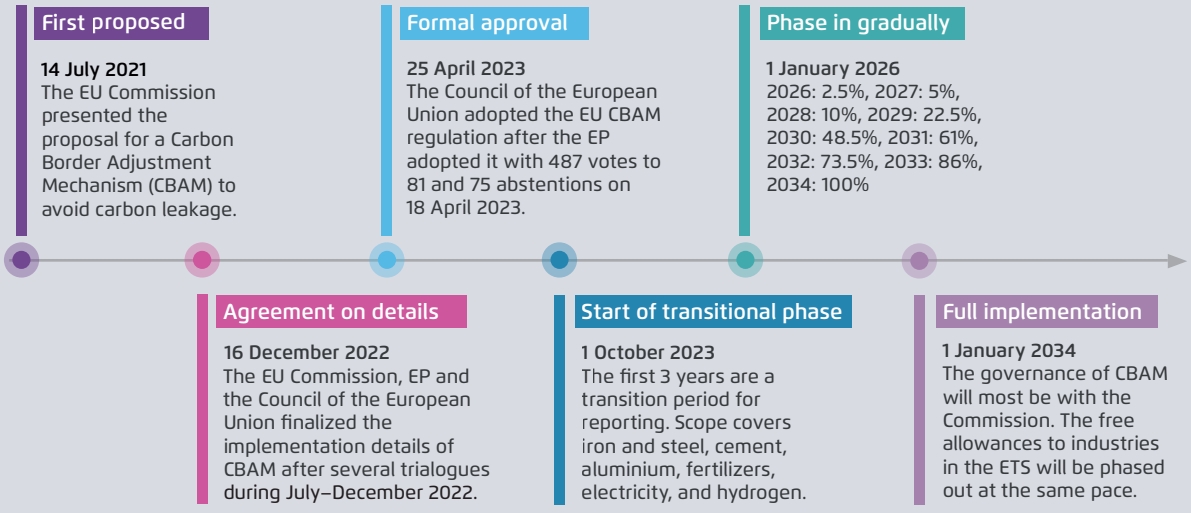
The EU legislative procedure gives the same weight to the European Parliament and the Council of the European Union (the Council). The vast majority of European laws are adopted jointly by the three of these institutions. While the European Parliament and the Commission focus on the collective good of the EU, the interest of individual member states is represented by the Council, which is made up of representatives of the member states. As the executive arm of the EU, the Commission is the only EU institution initiating laws. Thus, the trialogue among the three bodies will decide the final shape of the instrument.

Four trialogue meetings on the detailed deal of CBAM were held on 11 July, 4 October, 8 November and 13 December 2022. After the fourth meeting, the co-legislators reached a provisional agreement and decided to extend the scope to hydrogen, indirect emissions under certain conditions, certain precursors, and indirect emissions and some downstream products such as screws and bolts and similar articles of iron or steel. There will be a transition period of three years from 2023 to 2025, with a requirement for exporters reporting greenhouse gas footprint. On 1 January 2026, CBAM fees will phase in gradually, in parallel with the phase out of EU ETS free allowances, until the instrument comes to full effect in 2034 (Figure 6). After the European Parliament and Council formally approve the CBAM, the EU Commission will incorporate the CBAM into legislation.

On 9 February 2023, the EP ENVI voted to adopt the agreement on establishing the CBAM, signalling EP's official approval of the CBAM details after the trialogues. On 18 April 2023, with 487 votes to 81 and 75 abstentions, the EP adopted the rules of the CBAM, which was subsequently adopted by the Council of the EU on 25 April 2023. The vote in the Council is the last step of the decision-making procedure related to the CBAM.

CBAM timeline

Figure 6



European Union (2023) and European Parliament (2022 and 2023)

3.2 CBAM implications for China: perspectives from the Shanghai workshop

The EU is China's second largest trading partner, and China's exports to the EU account for 15% of its total exports of goods. The EU CBAM will have an immediate impact on China's iron and steel and aluminium exports, which account for about 3% of the total goods import from China. Therefore, only a small portion of China's export are subject to the EU CBAM, implying a relatively small impact on China's trade and economy in the short term.

As of May 2023, exporters to the EU have about five months to prepare for the reporting of emissions data and will face costs for embedded carbon emissions accounting and later certification. If actual emissions data are not available, a default emission value will be used to determine the CBAM charges, based on the average emissions intensity for the country of export for the class of goods in the EU database. If the specific average emissions intensity is absent in EU database, the CBAM will likely apply a punitive default value equal to the average of the 10% most emissions-intensive producers in the EU.

Experts at the workshop discussed concerns outside the EU that the basic design of CBAM appeared to imply using carbon pricing as the main policy instrument to prevent carbon leakage, though the bloc's trading partners may find it difficult to accept whether carbon pricing is the only measure that could effectively promote carbon abatement. In China, for example, the carbon market exists alongside other policy instruments such as the "dual controls" on total energy consumption and energy intensity. In the US, there is no national carbon market and thus no nationwide carbon pricing to reflect manufacturers' emissions abatement efforts. Experts from the EU noted that, while carbon prices in third countries are the only way to get an explicit reduction in the EU carbon price charged under CBAM, the EU's CBAM regulation does also allow for non carbon pricing policies to be taken into account indirectly. This is because the CBAM will be based on real emissions of the products crossing the border. Thus, if a regulation or non carbon pricing policy leads to a reduction in emissions, these will be reflected by a lower CBAM charge.

> "CBAM represents a trend and it has been taken seriously by the world. It means carbon as a new factor needs to be considered in international trade and national competition."
>
> **Wu Bixuan**
> **Hiways Law Firm**
> **At the Europe-China Workshop on Carbon Markets on 9 November 2022**

Though the EU CBAM was not designed to promote the establishment of carbon markets in other economies, its development has raised growing interest in adopting a similar carbon trading systems among the EU's trading partners, as well as in equivalent Border Carbon Adjustments (BCA). With its implementation, the EU CBAM does have the potential to encourage other carbon markets to reach a carbon price that is as close to EU level as possible, in order to narrow CBAM-related charges. However, it remains to be seen if higher carbon prices are the most efficient tools for other economies to decarbonize their energy economies, given vastly different national circumstances across the globe.

As EU, China, the US and many of EU's trading partners are members of the World Trade Organization (WTO), it is crucial for CBAM to be compatible with WTO rules. Depending on the design, there is a significant risk that CBAM might be perceived as disguised form of trade protectionism. At the meeting of the WTO Committee on Trade and Environment (CTE) on 15 March 2023, China proposed to use the Committee as a platform and suggested members start with discussions on the European Union's CBAM at

the June CTE meeting. The EU has insisted that its CBAM must be WTO compatible and non-discriminatory against third countries – that it should discriminate only on the basis of carbon content of products, an exemption that appears to be legal under article 20[15] of the GATT. The EU notes for instance that it is raising carbon costs equally for both domestic and importing producers of the CBAM products and that these products reflect a small fraction of global trade.

From the Chinese perspective, the long-term effect signalled by the EU CBAM is more worrisome than the short-term impact. It is feared that CBAM could easily spread to cover more indirect emissions or downstream, processed products or more sectors in the future. From the EU's perspective, the approved CBAM regulation forsees only that the EU ETS products exposed to risks of carbon leakage would be included in the CBAM. This means that some additional basic energy intensive materials, such as brick, glass, pulp and paper, and basic chemicals might be included in future. However, the schemes designers are highly aware of the complexities and additional administrative burden of an unnecessarily broad CBAM scope. In any event, the EU could not extent CBAM to products that did not face risks of carbon leakage and CO_2 costs under the EU ETS while still maintaining the WTO compatibility of the mechanism.

Not surprisingly, CBAM is widely regarded as a starting point of taking carbon emissions into consideration in international trade. When carmakers worldwide start to demand green steel products for the manufacturing of low-carbon vehicles, developing economies are expected to face more obstacles to cope with as they have fewer resources and lower capacity than the EU to decouple their economic growth from fossil fuel consumption.

15 https://www.wto.org/english/docs_e/legal_e/gatt47.pdf

3.3 Prospects of EU CBAM and its implications for EU-China climate collaboration

CBAM sets a phase-out time for coal-based blast furnaces in the EU by 2034[16], when free carbon emission allowances will completely phase out and CBAM fully phase in. This deadline sends a strong signal to the global steel industry to accelerate its low-carbon transformation. As of early 2023, announcements by EU steel companies of new low-carbon steelmaking capacity by 2030 are roughly equivalent to 70% of the blast furnaces that will reach the end-of-life by that time.

As for other industries in the EU, not all are fully supportive of the ETS and CBAM reforms. Given that the CBAM means that EU manufacturers will now begin to pay for all domestic carbon costs, some industry representatives claim that the removal of free allowances will be disadvantageous to their sectors and pose challenges for exports. For example, in November 2022, the European Aluminium, the industry association representing the aluminium value chain in Europe, warned against immediate inclusion of indirect emissions in EU CBAM. The association is now opposing the principles that an emission-intensive precursor such as alumina should automatically be included in Annex I (CN code product scope) of the Regulation.[17]

Focusing on the future shape of the EU CBAM

Once the EU CBAM is launched, it will serve as a reference for other energy-intensive industrial sectors that are enjoying free CO_2 emission allowances in the EU. The performance of the CBAM will have a direct influence on whether and when the EU will phase out free allowances in all sectors covered by the EU ETS, replaced with the CBAM.

16 Wido Witecka (2022)

17 European Aluminium (2022)

Throughout the legislative process of enacting the EU CBAM, a window of opportunity was always available for EU's trading partners, especially China, to provide input into the development of the CBAM and help shape it into an instrument that benefits both global decarbonization and international trade. Following the conclusion of the legislative process of the CBAM, in-depth bilateral and multi-lateral discussions are still necessary for trading partner countries to better understand the CBAM. Exchanges with key partners also provide a channel for expressing concerns. Given the present global trade tensions and Russia's war against Ukraine, there is an urgent need to enhance mutual trust on trade- and climate-related issues.

In the past, organisations including Agora have contributed to international dialogues to improve the development of China's ETS through online events and people-to-people visits. Looking ahead, more in-depth Europe-China dialogues on EU CBAM should be organized to deepen mutual understanding and improve political trust.

Near-term impacts

As mentioned in the previous section, the carbon price in the country of origin is an important factor in deciding the CBAM price. Ideally, whether and how this cost could be recognised at the EU gate should be negotiated between the EU and its trading partners, based on mutually-recognized technical standards. For example, the China Iron and Steel Association and Baowu Group have jointly launched the Environmental Product Declaration (EPD) platform for steel on 19 May 2022; the platform aims to adopt international carbon footprint standards for Chinese steel products based on life-cycle assessments. Collaboration is needed for the EU and China to harmonise their emission accounting approaches and data accreditation – not only in the steel sector, but in all sectors covered by the EU CBAM.

Given the remote likelihood of the world adopting a uniform, global carbon pricing system, unilateral measures to address carbon leakage such as the EU CBAM are increasingly likely and legitimate, from the perspective of upgrading global climate ambition. The best outcomes in terms of climate and trade will entail continuous research and multilateral dialogues on carbon abatement and the CBAM. Mutual understanding of CBAM-related strengths, weaknesses, opportunities and threats may serve as a building block for effective international climate cooperation.

China is a hybrid superpower economy and a beneficiary of globalisation,[18] and its response to the EU CBAM is crucial for both trade and climate relations. On the one hand, the CBAM imposes additional cost to primary goods exports to the EU that are covered in the scheme. On the other hand, the CBAM is also expected to incentivize relevant Chinese companies to improve their carbon emission accounting, which in turn will help them better prepare for domestic carbon trading. There is still potential for the EU and China to continue the dialogue on a mutually acceptable mechanism to better manage carbon leakage risks. Against the backdrop of growing sentiment against globalization, it is vitally important that the EU and China continue to promote international collaboration on climate mitigation and adaptation, aiming to repair political trust and minimize bilateral friction to the extent possible.

Like the EU, China is also faced with the risk of carbon leakage. Although China is not likely to introduce its own CBAM in the near future, it is natural to start considering carbon leakage countermeasures once the carbon price in China starts to rise and the coverage of China's ETS expands over time.

More broadly, EU-China climate diplomacy goes beyond carbon markets and the CBAM. It is also closely related to advancing low-carbon technology, developing green product standards, and promoting the renewable-oriented energy transition. Climate change impacts are not limited by national borders, multilateralism and solidarity are urgently needed to achieve humanity's shared ambition to address climate change and prevent its worst consequences.

18 Benoit & Tu (2020)

4 Carbon Asset Management

4.1 Brief theory of carbon asset management

Given the rising global awareness of climate change, more and more businesses are committing to net-zero targets and adhering to the goals of Paris Climate Agreement. According to some estimates, 20% of the world's 2 000 largest public companies have committed to achieve net zero by 2050[19]. Though corporate emissions continue to rise at an alarming rate, the corporate climate commitment trend presents a unique opportunity to drive corporate climate actions in both developing and developed countries.

Carbon asset management is a key strategy for curbing climate change on the corporate level across all sectors. Challenges remain in the design, evaluation and implementation of these strategies. Current strategies lack systematic theoretical approaches to an effective carbon asset management. They also lack consistent criteria, methods and assessment approaches, as well as a common understanding of net zero. Emissions management approaches also suffer from the absence of common definitions of carbon assets, classification standards, and carbon costs calculation methods. Frameworks for disclosing climate risks are often patchy, and companies provide only partial and incomplete information about their climate impact and carbon footprint.

As a result, most companies lack comprehensive carbon reduction strategies that could promote effective carbon asset management. Carbon risks are not systematically assessed and included in the corporate financial statements and other basic documents[20]. Financial statements rarely make it clear whether the company is truly transitioning to low carbon.

In the past, financial accounting and auditing standards did not require disclosure of climate risks. This approach is changing, with carbon accounting being actively integrated into international financial standards accounting principles. The International Financial Reporting Standards (IFRS) Foundation and US GAAP now both state that climate related matters should be reflected in corporate financial statement. In March 2022, the IFRS Foundation published its first draft climate-related disclosure requirements, providing an internationally recognised sustainability and climate related accounting disclosures standards[21].

As illustrated in Figure 7, carbon asset management may include building blocks such as:

→ controls and auditing,
→ carbon trading,
→ carbon finance,
→ carbon risks and GHG disclosure,
→ emissions reduction policies and
→ clearly defined net-zero targets.

19 Zhou, Lihuan and Hayden Higgins. "Investors: Sustainable Finance Demands More than Just Cutting Carbon." June 8, 2022. World Resources Institute. Accessed on 19 December 2022 at https://www.wri.org/insights/paris-agreement-aligned-investments.

20 Zhang, Caiping, Timothy O. Randhir, Ying, Zhanga. January 2018. "Theory and practice of enterprise carbon asset management from the perspective of low-carbon transformation." Carbon Management. https://www.researchgate.net/publication/322648866_Theory_and_practice_of_enterprise_carbon_asset_management_from_the_perspective_of_low-carbon_transformation

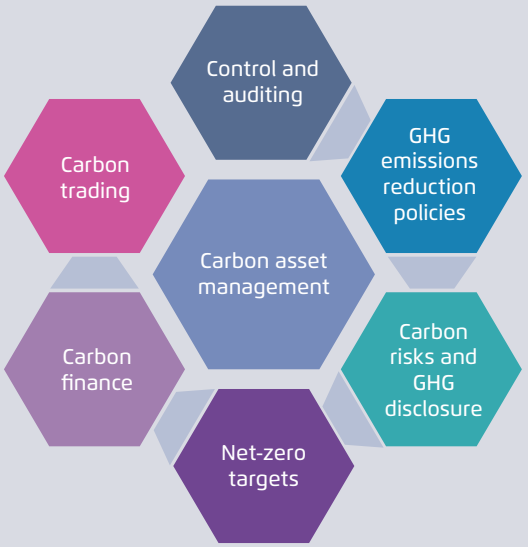
21 [Draft] IFRS S2 Climate-related Disclosures. IFRS. 31 March 2022. Accessed on 22 February 2023 at https://www.ifrs.org/content/dam/ifrs/project/climate-related-disclosures/issb-exposure-draft-2022-2-climate-related-disclosures.pdf

There are a number of financial indicators for characterizing carbon asset management and low-carbon investment. These include the carbon fund turnover ratio, the carbon emissions rate, the carbon turnover ratio, carbon technology transformation efficiency, fixed carbon asset profitability. These and other metrics are being integrated into financial accounting practices.

Examples of financial metrics applied in carbon asset management:

- → **Carbon Fund Turnover** = (carbon revenues) / (carbon fund) * 100%
- → **Carbon Emissions Ratio** = (carbon emissions) / (carbon material) * 100%
- → **Carbon Trading Rate** = (carbon trading revenues) / (carbon allowance) * 100%
- → **Carbon Fixed Assets Profitability** = (net profit) / (fixed carbon assets) * 100%

Major building blocks of carbon asset management — Figure 7



Marianna Morra-Skryabina (2023)

- → **Carbon Technology Transformation Efficiency** = (intangible carbon assets) / (carbon technology input) * 100% [22]

Target setting

Firstly, effective carbon asset management requires that companies set the right targets, and use the best science available to inform these targets. Before setting the target, each company needs to know the size of its carbon footprint. This practice could be based on the GHG Protocol Corporate Standard, which provides an internationally consistent approach for companies to measure their emissions.

Some companies set science-based targets that represent their share of the global carbon budget [23]. Companies can choose various calculation methods, including the SBTi (Science Based Targets Initiative) Corporate Net-Zero Standard [24]. The SBTi is a global body enabling businesses to set ambitious emissions reductions targets in line with the latest climate science. It is focused on accelerating companies across the world to halve emissions before 2030 and achieve net-zero emissions before 2050.

Types of carbon assets and their classification

In general, all assets can be broken down into **tangible** and **intangible** assets. The goal is to trace emissions of greenhouse gases throughout the whole product lifecycle, from raw materials production to process-

22 Zhang, Caiping, Timothy O. Randhir, Ying, Zhanga. January 2018. "Theory and practice of enterprise carbon asset management from the perspective of low-carbon transformation." Carbon Management. https://www.researchgate.net/publication/322648866_Theory_and_practice_of_enterprise_carbon_asset_management_from_the_perspective_of_low-carbon_transformation

23 Target Setting tool. Science Based Targets. December 2021, accessed on 11 January 2023 at https://science-basedtargets.org/resources/?tab=develop#resource

24 SBTi Corporate Net-Zero Standard (Guidance). Science Based Targets. October 2021, accessed on 11 January 2023 at https://sciencebasedtargets.org/resources/files/Net-Zero-Standard-Criteria.pdf

ing, sales and waste management. Various stages of lifecycle produce **direct** and **indirect** emissions. According to the Greenhouse Gas Protocol—Enterprise Measurement and Reporting Principle, carbon emissions can be broken down into three categories:

- → Scope 1 covers direct emissions from owned or controlled sources;
- → Scope 2 covers indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the reporting company;
- → Scope 3 includes all other indirect emissions that occur in a company's value chain[25].

To unify emissions metrics, the international Financial Stability Board (FSB) launched a Task Force on Climate-related Financial Disclosures (TCFD). The final version presented in 2017 stated that investors face immense climate change losses which could leave large amounts of fossil assets as stranded[26] . Inventory obsolescence is another potential issue, when the inventory could no longer be sold at an initial cost due to such factors as rising carbon prices[27].

Sustainable investment is becoming mainstream, and investors and shareholders are becoming more aware of climate change and demand more accountability and transparency from the companies in terms of the climate risks and carbon emissions. The Principles for Responsible Investment (PRI[28]) now represent a larger share of investment in general. The CFA Institute defines **carbon** as an **emerging asset class**. With the development of emissions trading in various countries, carbon emissions trading is becoming more liquid and carbon itself is becoming an investable asset class[29].

Better transparency and disclosure are the keys to implementing net-zero policies and achieving a low-carbon energy transition. Disclosure essentially shows if the company is effectively implementing energy transition or continuing business as usual. Providing meaningful quantitative data is both key to promoting change and accelerating the low carbon transition within the company while ensuring auditors and the public can accurately credit corporate efforts and do not perceive corporate commitments as greenwashing.

Effective carbon management requires more than just cutting emissions, but also includes such aspects as promoting a just transition, and building resilience and climate adaptation. Incorporating these aspects requires a more comprehensive and holistic approach to energy transition.

4.2 Carbon asset management methods and common practices: Perspective from the Shanghai workshop.

Following China's dual carbon pledge announced in September 2020, various funds and institutions in China proposed low-carbon transformation and

25 Read, Simon. "What is the difference between Scope 1, 2 and 3 emissions, and what are companies doing to cut all three?" September 20, 2022. World Economic Forum, accessed on 9 January 2023 at https://www.weforum.org/agenda/2022/09/scope-emissions-climate-greenhouse-business/

26 Stranded Assets definition, Terms List, Carbon Tracker Initiative, accessed on 15 January 2023 at https://carbontracker.org/resources/terms-list/#stranded-assets

27 The PRI (Principles for Responsible Investment) Podcast – Carbon Accounting: integrating climate risks to financial reporting, accessed on 10 January 2023 at https://carbontracker.org/podcast-carbon-accounting-integrating-climate-risks-to-financial-reporting/

28 Annual Report 2022, Principles for Responsible Investment, accessed on 5 January 2023 at https://www.unpri.org/annual-report-2022/

29 Azlen, Mike, Child, Alex and Glen Gostlow. "Carbon as an Emerging Asset Class." CFA Institute. 5 October 2020, accessed on 12 January 2023 at https://www.cfainstitute.org/en/research/industry-research/case-study-carbon-as-emerging-asset-class

carbon asset management initiatives. At present, carbon asset management in China is integrated into various corporate environmental, social and governance (ESG) frameworks. However, environmental reporting standards by Chinese companies are at an early stage of development and are highly fragmented.

> "The carbon emission data of an enterprise is the cornerstone of carbon market development[...] ."
>
> **Xiao Yonghui**
> **SPIC Deputy General Manager**
> **At the Europe-China Workshop on Carbon Markets on 9 November 2022**

In 2022, China Enterprise Reform and Development Society (CERDS), a think tank backed by China's State Council, issued the country's first ESG disclosure guideline that covers all companies and industries[30]. The guidance is based on international ESG priorities, but also takes Chinese context into account. It was developed in collaboration with Chinese companies and relies on Chinese legislation and policies. Compliance with the guidance is currently voluntary and only serves as a starting point of ESG accounting implementation by Chinese companies.

The guideline follows the Measures for the Administration of Legal Disclosure of Enterprise Environmental Information, issued by China's Ministry of Ecology and Environment in December 2021 and in effect from February 2022 [31]. According to the document, environmental disclosure is obligatory for companies with high environmental impacts, including thermal power generators, metallurgical companies, and other heavy industry. It is worth noting that only listed companies with certain environmental violation records are obligated to disclose carbon emissions data.

In the absence of a mandatory reporting, most Chinese companies lack motivation toward carbon asset management[32]. Chinese companies have to transform from 'high investment, high emissions' models to 'low investment, low emissions' models, which represents a significant shift in business approaches.

A representative example of Chinese corporate climate commitment is illustrated by the 2020 announcement by the China National Petroleum Corporation (CNPC), of China's oil majors, that it will achieve carbon peaking by 2025 and reduce carbon emissions to 'near zero' (近零) around 2050. This pledge does not provide a strict deadline and 'near zero' gives the company a lot of flexibility. Moreover, CNPC plans to 'decarbonise' mainly by substantially increasing the share of natural gas production, including coal bed methane, to about 55% of output by 2025 while decreasing the share of crude oil production [33]. The report briefly mentions the importance of using 'green sources' of energy without elaborating whether these include hydro, wind, solar or biomass, or stating any clear goals as to how much they should

30 China Enterprise Reform and Development Society, 16 February 2022, accessed at https://www.cerds.cn/site/content/8237.html

31 Ministry of Ecology and Environment of the People's Republic of China. 26 November 2021. Accessed at https://www.mee.gov.cn/xxgk2018/xxgk/xxgk02/202112/t20211221_964837.html

32 Zhang, Caiping, Timothy O. Randhir, Ying, Zhanga. January 2018. "Theory and practice of enterprise carbon asset management from the perspective of low-carbon transformation." Carbon Management, accessed on 19 December 2022 at https://www.researchgate.net/publication/322648866_Theory_and_practice_of_enterprise_carbon_asset_management_from_the_perspective_of_low-carbon_transformation

33 CNPC Corporate Sustainability Report (2020), China National Petroleum Corporation official website, accessed on 7 January 2023 at http://csr.cnpc.com.cn/cnpccsr/xhtml/PageAssets/2020csr_en.pdf

account for. The company also emphasizes carbon capture, utilization, and storage (CCUS)[34].

CNPC's publicly listed subsidiary – PetroChina, which holds the corporation's most attractive assets – introduced a carbon asset management system by formulating a series of management regulations and policies. PetroChina was one of the first to join China's carbon emission rights trading. It also published its first ESG report in May 2020, in which it disclosed its GHG emissions for 2019, albeit only Scope 1 and 2 emissions[35]. Scope 3 reporting was absent, as well as in subsequent ESG reports for 2020 and 2021[36]. PetroChina did report additional wind and solar installed capacities that substituted for oil and gas investment. The report also mentions methane emissions control initiative, methane emissions data and plans to set methane emissions targets. The company plans for new energy – meaning wind, solar and geothermal –to represent only about half of the company's production capacity by 2050[37].

Another example of Chinese corporate climate commitments comes from the Baoshan Iron and Steel Corporation, the Shanghai-listed subsidiary of the world's largest steelmaker China Baowu Group. In

> "In the long run, the only way to promote international sustainable development is to accelerate the transformation of the energy use structure to low carbon and improve carbon asset management."
>
> **Xiao Yonghui**
> **SPIC Deputy General Manager**
> **At the Europe-China Workshop on Carbon Markets on 9 November 2022**

2021, Baosteel announced an action plan to achieve carbon peaking in 2023, reduce carbon emissions per metric ton of crude steel by 30% from 2020 to 2035, and achieve carbon neutrality by 2050. The companies 2023 and 2050 targets are more ambitious than China's national goal of carbon peaking by 2030 and carbon neutrality by 2060. The corporation has introduced a carbon emissions tracking evaluation system and has regularly published climate action reports since 2004. However, the corporation also only reports Scopes 1 and 2 emissions[38]. The corporate decarbonisation path includes the steps to promote renewables development and reducing energy intensity of its products.

In sum, major Chinese players are setting more ambitious targets than proposed by the government, but they need to raise ambition in achieving them. There is still work to be done in terms of disclosure, implementation process, integrating low carbon policies into corporate strategy and financial accounting practices.

As the Chinese public and ordinary consumers become increasingly conscious of carbon footprints and climate risks embodied in the products they buy, more small- and medium-sized companies are

34 CNPC Corporate Sustainability Report (2020), China National Petroleum Corporation official website, accessed on 7 January 2023 at http://csr.cnpc.com.cn/cnpccsr/xhtml/PageAssets/2020csr_en.pdf

35 It should be noted that PetroChina is listed on several foreign stock exchanges, including Hong Kong. Chinese companies listed on Hong Kong and other overseas stock exchanges are subject to much more stringent environmental regulation and obligatory disclosure.

36 PetroChina 2021 Environmental, Social and Governance Report, PetroChina official website, accessed on 5 January 2023 at http://www.petrochina.com.cn/petrochina/xhtml/images/shyhj/2021esgen.pdf

37 PetroChina 2022 Interim Report, PetroChina official website, accessed on 5 January 2023 at http://www.petrochina.com.cn/ptr/rdxx/202209/59dc02dbef6349789ffa241de299907e/files/bebb9c8b0246482583c6bb2fa73e7fbf.pdf

38 Baosteel Climate Action Report [气候行动报告], Baosteel Company Ltd., June 2022, available at https://res.baowugroup.com/attach/2022/06/24/41eb7f023c464e5da4e00f853a01b15c.pdf

expected to develop corporate carbon asset strategies. Therefore, it is important to have clear and transparent unified practices for carbon accounting and carbon asset management.

4.3 Concluding implications for the corporate energy transition in China

The low-carbon transformation is a long and complicated process, for countries as well as companies. For the latter, the transformation depends on integrating carbon asset management into corporate strategy, and integrating carbon accounting into financial statements and risk management. To improve long-term economic performance and viability, corporations need to be transparent about their climate risks and implement effective carbon asset management systems.

Climate risks and carbon emissions have a major impact on corporate sustainability, production and operation. Therefore, to strengthen carbon asset management, Chinese companies should not only report Scope 1 and 2 emissions, but also Scope 3 emissions. New products constantly appear on the market that claim to be 'green' or 'sustainable', but these labels presently suffer from insufficient verification – both in China and internationally. Thus, both Chinese companies and their international counterparts face this problem. Solutions to this deficiency will depend on international collaboration on MRV and green labelling standards.

Summary and Recommendations from the workshop:

- → An effective carbon management system is key to decreasing corporate carbon emissions. Despite the growing number of companies announcing net zero targets, many enterprises still overlook the importance of effective carbon management.
- → Companies should adopt carbon asset management as early as possible because it helps to avoid problems such as 'obsolete' or non-performing assets. It could also improve international competitiveness against the backdrop of CBAM or similar initiatives.
- → Corporates need to systematically integrate carbon emissions assessment into financial and strategy planning, actively engage with carbon asset management metrics and practices, and develop science-based carbon targets and budgets, which should include strategies for phasing out fossil fuels.
- → The corporate world should further upgrade its climate ambition in support of fulfilling the goals of the Paris Agreement.
- → Last but not least, international cooperation and exchange should be strengthened by government institutions, but also on the corporate level and among financial institutions to promote effective and unified carbon management standards across the globe.

5 Conclusions and summary

The EU and China are linked by an enduring relationship. The EU and China are two of the world's three largest economies and carbon emitters. The EU is now China's second largest trading partner, and vice-versa. Both sides have a long-term interest to work together on a number of bilateral, regional and global issues in which they play a crucial role. Europe and China have to be part of global solutions to planet-scale problems – exemplified by the urgent need to mitigate climate change. Against this backdrop, Agora, SIIS and the Energy Investment Professional Committee of the IAC co-organized a workshop on 9 November 2022 in discussion of carbon markets, the EU CBAM and corporate asset management.

During the workshop, discussants acknowledged that the international order has become more confrontational because of rising US-China tensions and the Russian-Ukrainian War. While ongoing geopolitical tensions are likely to hinder international cooperation, the EU and China should strive to maintain bilateral collaboration on at least climate change and energy transition for the sake of safeguarding the global commons. Without such cooperation, it may be impossible for the world to achieve Paris Agreement goals and avoid the worst consequences of climate change.

In particular, because carbon market represents a major point of contact between the EU and China, the two parties should continue to promote experience sharing and lesson learning. In addition, while the EU CBAM risks creating tensions with the EU's trading partners in the short term, it also has the potential to accelerate the corporate energy transition beyond the EU in the longer term. Last but not least, carbon asset management is becoming a key component of corporate sustainability practices in an increasingly carbon-constrained world.

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