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FACTSHEET

CHINA AND THE EU – A COMPARISON OF TWO EMISSIONS TRADING SYSTEMS

While some similarities exist between the Chinese and European Union Emissions Trading Systems (ETSs), there are also numerous differences. This fact sheet provides an overview of their differences and focuses on potential options for future development of the Chinese national ETS, drawing on the EU experience.

Emissions trading: A market-driven solution for effective climate action

Climate protection and, consequently, greenhouse gas (GHG) reduction is one of the most important current global tasks. While many different climate protection measures are possible, emissions trading systems (ETSs) are growing in importance. Countries, federal states and other jurisdictions using an ETS now account for 58 per cent of global GDP; one third of the world's population lives in locations with an ETS in place. In total, 38 ETSs are in operation worldwide, while another 11 are under development and nine are under consideration (ICAP 2025). These ETSs and other carbon pricing mechanisms, such as carbon taxes and carbon offset mechanisms, cover about 24 per cent of global emissions (World Bank 2024). This reflects the expert consensus that carbon pricing mechanisms represent an effective and efficient instrument to achieve climate protection goals (Stechemesser et al. 2024). A key advantage of ETSs is that they can create an additional revenue stream for the implementing jurisdiction. In 2024, the global revenue from ETSs reached almost EUR 65 billion[1] (CNY 504.75 billion[2]). Between 2007 and 2024, they raised over EUR 345 billion (CNY 2,689.57 billion). Half of this revenue was allocated to fund climate and nature-related projects (ICAP 2025).

Alongside the United States of America and the Republic of India, the European Union (EU) and the People's Republic of China (hereinafter referred to as China) are two of the biggest emitters of GHG. Since both jurisdictions have ETSs in place, a comparison of the two trading systems can provide key insights on their distinct design features. The EU ETS is the world's most mature emissions trading system, having been introduced in 2005. Since then, it has evolved through different phases and was undergone several adjustments. This comparison refers to the EU ETS as it exists today while taking into account that both ETSs continue to evolve. It is important to bear in mind that the findings are limited by differences in policy design, political systems

1 The source refers to USD 70 billion; the average exchange rate in 2024 was around USD 1.08 to EUR 1.00 (Statista 2025). This rate has been consistently applied throughout the analysis to ensure comparability.

2 All currency conversions in this paper are based on a fixed average EUR/CNY exchange rate of 7.7875, calculated for the year 2024 (ECB 2025). This rate has been consistently applied throughout the analysis to ensure comparability.

and different stages of evolution. The Chinese national ETS was implemented in 2021. Several regional pilots that had been operating in China since 2013 provided experiences on how best to set up the national ETS. However, a comparison with the EU ETS can provide further useful indications on potential options for future development of the Chinese national ETS to increase its emissions reduction impact.

An ETS is a market-based policy instrument to combat climate change. Like other carbon pricing instruments, it alters the prices of goods and services in accordance with the polluter-pays principle (Baranzini et al. 2017). ETSs thereby ensure that producers adjust their decision calculus based on internalised external costs thus driving towards an economic optimum. In contrast to carbon taxes, which set a fixed price for emissions, an ETS creates incentives to reduce emissions where these are most cost-effective (IEA 2020) and, in case of a cap-and-trade system, provides certainty about the emission levels that are achieved.

NOTE ON CLIMATE TARGETS

By setting climate targets, countries provide the framework for emissions trading systems:

EU: The EU and all its member states have signed and ratified the Paris Agreement (United Treaty Collection 2025). Based on this, the EU has set itself the goal of becoming the first climate-neutral economy and society by 2050 (European Commission 2024a).

China: China, like the EU, has signed and ratified the Paris Agreement (United Treaty Collection 2025). Through its 'dual-carbon goal', China aims to peak CO_2 emissions before 2030 and achieve carbon neutrality by 2060 (The State Council 2021).

ETSs can either operate under a baseline-and-credit system like the Chinese national ETS or under a cap-and-trade system (Wiesweg 2011). The most common variant is the cap-and-trade (C&T) system; examples include the ETSs in the EU and in California. In these systems, a limit (cap) is set on the total amount of emissions allowed within the system or in clearly defined sectors of an economy. This amount of emissions is then translated into property rights in the form of emission allowances. These allowances are then allocated to the ETS participants. In a cap-and-trade system, the emissions cap is lowered in regular intervals to ensure the gradual reduction of emissions in line with the respective climate targets. Allowances are initially allocated to emitting entities using one of two mechanisms: allowances can either be allocated free of charge (known as "grandparenting") or auctioned off, with the latter option raising revenue for the regulating authority (Neuhoff, Martinez, Sato 2008). In the baseline-and-credit system, there is no cap on GHG emissions. Instead, firms earn emission reduction credits when their emissions are below their baselines, which are set by historical emissions or performance standards. In both cases, allowances and generated credits can be sold on the secondary market to other entities with higher marginal abatement costs or emissions than their original baseline-determined free allocation.

Comparing the Chinese and EU Emissions Trading Systems: Insights and impacts

When comparing the EU ETS with the Chinese national ETS, it is important to consider several differences between the two systems when interpreting their implementation and results. Key differences include the fact that ETS development started in China in 2013 with province-level pilot programmes, with the Chinese national ETS only starting operation in 2021. By contrast, the EU ETS has been in operation EU-wide since 2005. This study confines its analysis to a comparison between the Chinese national ETS, introduced in 2021, and the EU ETS in its current form. It excludes the provincial pilot programmes due to the limited scope of this analysis. Furthermore, China and the EU have very different historical, political, and economic backgrounds. The EU is a union of 27 member states with their own governments, while China has a one-party government. Subsequently, policy decision and implementation processes in the EU differ from those in China: the Chinese government has greater influence over domestic companies than the EU has over the companies in its member states. Another important difference is that China has more regulated financial, energy and electricity markets, limiting the potential for market participants to react directly to CO_2 price signals.

Covered emissions and sectors

While the EU ETS covers a number of GHGs across several sectors, the Chinese national ETS currently only covers direct CO_2 emissions from the energy sector. However, China decided to integrate the iron, steel, cement and aluminium industries into its ETS, covering direct CO_2 for all industries, as well as CF_4 and C_2F_6 for the aluminium industry. The final plan was published in the first half of 2025. Starting with a two-year introductory period (2024–2026), the MEE has begun to collect relevant emission data from the respective sectors, aiming to allocate the first round of emission allowances in 2025, covering emissions from 2024.

The EU ETS currently covers CO_2 emissions from the following sectors: (1) electricity and heat generation, (2) energy-intensive industry, (3) domestic aviation (flights within the EEA and flights from the EEA to the UK or Switzerland) and (4) maritime transport (50 per cent of emissions from voyages starting or ending outside of the EU and 100 per cent of voyages within the EU). In addition to CO_2 emissions, it covers N_2O emissions from the production of nitric acid, adipic acid, glyoxylic acid and glyoxal. It also covers PFCs from aluminium production as well as HFCs if they are a byproduct of ETS-covered industries.

From 2027 onwards, the EU ETS 2 will also cover the transport and buildings sectors as well as industrial and energy facilities not yet covered by the EU ETS due to their smaller size.

The inclusion of several sectors and GHG emissions increases the economic efficiency and potential for emissions reductions of an ETS. The EU ETS covered more sectors from the outset (energy sector and energy-intensive industry) than the Chinese national ETS (energy sector). In the second and third trading periods, the EU expanded its coverage to the domestic aviation (from 2013) and maritime transport sectors (from 2024). China is also extending its ETS towards certain energy-intensive industrial sectors (iron, steel, cement and aluminium) between 2024 and 2026. In this context, China could benefit from EU experience regarding administration and MRV modalities, though it can also draw on experience gained from Chinese provincial pilots. When integrating further sectors into an ETS, it is important to consider that pricing emissions in certain sectors can have more direct economic and social impacts for individuals. Measures to ensure social justice should be considered when extending the scope of an ETS, specifically for expansion to cover buildings, road transport and the agricultural sector, given the direct financial impact for citizens.

Allowance cap

While the EU ETS is characterised by its cap and explicitly defined linear reduction factors that reduce the cap on an annual basis, China has not yet introduced any cap to its ETS. The Chinese national ETS therefore does not provide for a binding reduction path. Instead, an increase of overall emissions within covered sectors is permissible. However, China aims to introduce stricter emissions reduction mechanisms to its national ETS in the future: according to the Chinese State Council, a 'dual-control' system focusing on both CO_2 emission intensity and total emissions is planned for implementation during the 2026–2030 period, indicating a transition towards stricter emission controls by 2030 (State Council of The People's Republic of China 2024).

According to Vollebergh and Corjan (2020), the cap in the EU ETS ensures a "credible and binding reduction of emissions within the ETS sectors", while price volatility can be reduced by introducing mechanisms like an MSR. However, it is important to have sufficient and reliable data on current emissions of firms in order to set an adequate cap. The Chinese pilot phase was, therefore, an important initial step to compile enough information (Narassimhan et al. 2018).

Allowance allocation

In the EU ETS, auctioning is the default allocation method for allowances for the energy sector. However, free allocation based on performance benchmarks (10 per cent of best-performing EU installations) still plays a role for industries under threat of carbon leakage. The EU significantly revised allowance allocation over the different phases to pass on the CO_2 price signal to market participants. Free allocation in the energy sector was abolished in 2013, meaning that electricity generators are now required to purchase 100 per cent of their EUAs on the primary or secondary market. However, most energy-intensive industry actors at risk of carbon leakage currently still receive the majority of their allowances for free. In return, they need to provide proof of certain environmental performance and decarbonisation measures, such as submitting decarbonisation plans and implementing efficiency measures. This free allocation for industries at risk of carbon leakage will be phased out gradually from 2026–2034 while the EU CBAM puts an equivalent carbon price on imports.

In contrast, in the Chinese national ETS, the primary market only consists of free allocation using output-based benchmarking. Therefore, only those companies exceeding the benchmark have to pay an actual carbon price on the secondary market.

In summary, free allocation continues to play a far more prominent role in the Chinese national ETS compared to the EU ETS. This entails several potential drawbacks: according to Weishaar et al. (2022), free allocation distorts the carbon market by suppressing the carbon price, preventing actual price signals that would incentivise emissions reductions from reaching companies, and even leading to windfall profits. On top of this, China misses out on state revenue.

Price development

The price of allowances in the EU has fluctuated: while the average annual price was between EUR 4.30 and EUR 7.60 (CNY 33.49 and CNY 59.19) from 2012 to 2017, prices peaked at over EUR 100 (CNY 778.75) for a short period in 2023. In April 2025, the price was around EUR 66 (CNY 513.98) (Sandberg 2025).

In 2023, the price in the Chinese national ETS averaged CNY 79.42 (EUR 10.2) per tonne. In April 2024, it exceeded CNY 100 (EUR 12.84) per tonne for the first time. The price level in the EU ETS still exceeds that in the Chinese national ETS by a wide margin. Therefore, the EU ETS currently provides stronger incentives for emissions reduction than the Chinese national ETS. However, the price development in the Chinese national ETS over recent years, combined with the government's announcement of its plans to introduce a cap accompanied by auctioning, suggest that the prices in the Chinese national ETS have the potential to increase significantly in the future.

Revenue

In the EU, the revenue generated from auctioning ETS allowances goes to national budgets, the Innovation Fund and the Modernisation Fund (see info box). Since 2013, the cumulative revenue generated by the EU ETS exceeds EUR 200 billion (CNY 1,557.5 billion). In 2023, auctions raised EUR 43.6 billion (CNY 339.5 billion), of which EUR 33 billion (CNY 257.0 billion) was distributed to EU member states. Germany, for instance, received EUR 7.7 billion (CNY 60.0 billion). In terms of the use of these funds, up until June 2023, member states were required to invest at least 50 per cent in climate-related and energy-related projects. As of mid-2023, all revenues must be put towards such green projects.

In contrast, the Chinese national ETS has not implemented an auctioning mechanism to allocate allowances, and so does not generate revenues for the state. At present, auctioning only exists on the regional level, as the Shenzhen and Beijing regional pilots have introduced partial auctioning. Beijing's ETS has generated total revenue of CNY 277.7 million (EUR 35.7 million) since its inception, including revenue of CNY 163.16 million (EUR 21.0 million) in 2023. These revenues are allocated to the respective city treasury.

INFO BOX: THE EU MODERNISATION AND INNOVATION FUNDS

The EU Innovation Fund is a financial mechanism to support the commercial demonstration of innovative low-carbon technologies in the EU. It is financed through revenues generated by the auctioning of 530 million allowances under the EU ETS. The Innovation Fund targets projects involving renewable energy, energy-intensive industries, carbon capture and storage and energy storage across all EU member states. By focusing on breakthrough technologies with significant emission reduction potential, it supports both scalability and market uptake. Its structure ensures that ETS revenues are reinvested into transformative solutions.

The EU Modernisation Fund is a financial mechanism to specifically support ten lower-income EU member states in transitioning to GHG neutrality. It is funded by 2 per cent of allowances auctioned under the EU ETS, directly linking climate investment to carbon pricing. The Modernisation Fund prioritises investments in renewable energy, grid upgrades and infrastructure modernisation.

Market stability mechanism

While the EU has established the Market Stability Reserve in 2018 in order to react to high price volatility, China has currently only implemented corresponding mechanisms at the regional pilot scale. Due to the low prices in the Chinese national ETS and the fact that only very few companies are required to pay this CO_2 price on the secondary market, there has been no need to implement market stability mechanisms so far.

A key challenge for emissions trading systems is that, in contrast to other markets, the number of allowances on the market is determined by regulation or law, which prevents the free adjustment of supply to unexpected changes in demand (European Commission 2024a). Hence, there is an increased probability of exogenous shocks leading to price volatility. Market stability mechanisms aim to address this shortcoming. Another option to tackle price volatility is the introduction of price floors and ceilings to set minimum and maximum levels for allowance prices.

Carbon leakage

To prevent carbon leakage, both the EU and China initially introduced free allocation. In 2026, the EU CBAM will enter into the definitive period and thus increase the steering effect of the CO_2 price for industries at risk of carbon leakage. The CBAM will impose a levy on certain products from carbon-intensive industries imported into the EU. In parallel with this, the free allocation of ETS allowances for those industries will be phased out. Products subject to this new policy are specified in the EU's high-carbon leakage list (EU 2019/708 2019). The CBAM may impact Chinese exporters of iron, steel, aluminium, fertiliser and cement. If goods are already covered with an effective CO_2 price in China, importers will be able to deduct this from the CBAM certificates they need to purchase. China has not introduced any further carbon leakage measures to date.

Monitoring, reporting and verification (MRV)

Both the EU and China have MRV systems in place. An annual compliance cycle exists in the EU ETS, while the Chinese national ETS requires covered installations to develop an authorised monitoring plan including installation information such as activities, emission sources and monitoring methods. In China, the MEE and the provincial and municipal ecology and environmental departments engage third-party verifiers to verify companies' emissions reports. In the EU, third-party auditors also verify emissions in the EU ETS before final oversight by the competent national authorities in each EU member state.

Effects on emission reduction

While it is hard to prove causal effects of an ETS on emission reduction due to various other policies and economic effects, significant emission reductions are evident in the EU ETS, especially for sectors not in receipt of free allocations. Between 2005 and 2023, emissions covered by the EU ETS fell by 47 per cent (European Commission 2024b). For China, most studies investigating carbon pricing effects on emissions reduction to date focused on the regional pilots. Thus, it is difficult to determine the extent to which the Chinese national ETS contributes to emission reduction – especially as total emissions in China have continued to rise (see figure 1). However, there is some evidence of a decrease in emission intensity: according to the Progress Report on China's National Carbon Market, the emission intensity of national thermal power generation decreased by 2.4 per cent between 2018 and 2023, with the emission intensity of electricity generation falling by 8.9 per cent (MEE 2024). Huang et al. (2022) concluded that the Chinese national ETS has great potential to reduce carbon emissions. However, compared to the EU ETS, the steering effect of its CO_2 price might be small as the regulated electricity price and dispatch limits the possibility of market participants to react directly to price signals (ICAP et al. 2024).

Potential options for future development of the Chinese national ETS

Options for the future scope of the Chinese national ETS

The EU ETS has been an effective instrument to reduce GHG emissions across all covered sectors, achieving the biggest impact in the energy sector. Furthermore, in some sectors, the EU ETS covers several other GHGs in addition to CO_2.

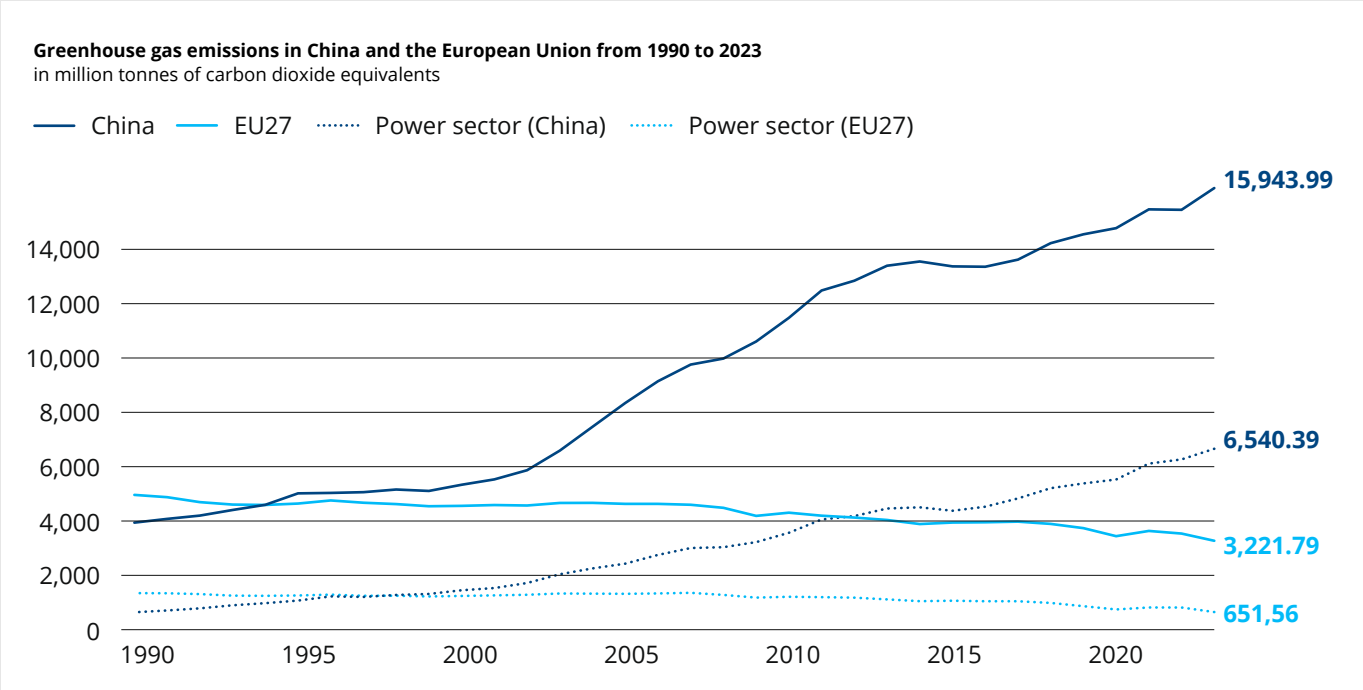

Figure 1: Greenhouse gas emissions in China and the European Union from 1990 to 2023. Own figure based on Crippa et al. (2024).

There is potential for China to reduce its emissions, and thus achieve its climate targets, by extending its national ETS coverage to further sectors and GHGs. The decision to integrate the iron, steel, cement and aluminium industries, covering direct CO_2 for all industries as well as CF_4, and C_2F_6 for aluminium production, is a first step in this direction.

Looking to the future, China could prepare steps to further expand its national ETS to domestic aviation, maritime transport and, potentially, the buildings and road transport sectors – as the EU did.

Regarding the integration of further GHGs into the Chinese national ETS, particular consideration should be given to methane (CH_4) and nitrous oxide (N_2O). CH_4 is 25 to 28 times more damaging to the climate than CO_2 and China is its biggest emitter, accounting for 14 per cent of total global emissions. N_2O is a long-lived GHG roughly 270 times more powerful than CO_2 and is responsible for approximately 10 per cent of net global warming (UNEP and FAO 2024). N_2O emissions in China increased by 140 per cent from 1978 to 2015 – a growth rate 1.8 times greater than the rest of the world. These GHGs should therefore be afforded specific consideration. One possible approach may be to start by integrating CH_4 and N_2O into selected sectors already covered by the Chinese national ETS with suitable MRV and compliance conditions before expanding to other ETS-covered sectors. Another approach could be to integrate CH_4 and N_2O emissions from the outset for potential newly covered sectors, such as maritime transport. In the EU, for instance, the ETS will also cover CH_4 and N_2O emissions in the maritime transport sector from 2026.

Options at a glance:

- Expand the Chinese national ETS to further sectors such as domestic aviation, maritime transport and, potentially, the buildings and road transport sectors.
- If the Chinese national ETS expands to the maritime transport sector, CH_4 and N_2O emissions should be included from the outset.

Options for the future design of the Chinese national ETS

Setting a cap on emission allowances, and thereby transitioning from intensity-based allocation towards a cap-and-trade system, could significantly increase the efficacy of the Chinese national ETS (Karplus 2021). The cap could be accompanied by a linear reduction factor (LRF) mechanism to ensure an annual cap decrease. China could also derive its cap and the LRF from its own climate targets, as in the EU. This has two advantages: firstly, it ensures a binding emission reduction path in line with China's climate targets. Secondly, it contributes to increased planning security for industrial sectors with long-term investments, such as cement, steel and aluminium, as it provides a predictable emissions reduction pathway and reliably increases the long-term competitiveness of low-emission technologies (ICAP et al. 2024). While China is planning to introduce a centralised cap, the timeline and scope remain unclear. For the CO_2 price signal to develop and to increase the overall efficiency of the Chinese national ETS, China should also consider further deregulation of its power sector.

Moreover, China may wish to consider transitioning to an auction mechanism. There are two reasons to introduce auctioning. Firstly, it would increase the efficiency of allowance distribution and very likely strengthen the effect of the Chinese national ETS on emissions reduction. According to IEA analyses, introducing a 17.5 per cent share of auctioned allowances in 2030, increasing to a 25 per cent share by 2035, could double China's electricity-related emissions reductions by 2035. This would save an additional 840 million tonnes of CO_2 while retaining the same benchmark tightening (IEA 2024; IEA 2022). Secondly, as the transformation towards carbon neutrality requires high

levels of investment, introducing auctioning would generate state revenues which could then be used to finance climate programmes, support investments or fund programmes to mitigate the economic and social impact of high carbon prices. In the EU, for example, revenues from the EU ETS must be used for energy-related and climate-related purposes and to address social hardship that arose through carbon prices since 2023. The EU Modernisation Fund and Social Climate Fund could serve as models for a Chinese approach. Zao, Wang and Cai (2022) found that carbon pricing without some form of revenue recycling increases income inequality in China. The Chinese national ETS has substantial potential to generate state revenue. In the IEA scenario mentioned above, the introduction of partial auctioning (25 per cent by 2035) would result in an annual revenue stream of around USD 39 billion (CNY 260 billion / EUR 33.38 billion) (ibid.).

Another driver of emissions reduction and ETS efficacy is ensuring an effective allowance price. While low prices impede investments in clean technologies, high prices can place an excessive financial burden on citizens and companies. If China decides to transition to a cap-and-trade system and further liberalise its power market, an MSR mechanism similar to that in the EU could help to decrease price volatility. However, given China's regulated power sector and the limited flexibility in price formation, a more suitable option could be to introduce auctioning in combination with a defined price corridor. The minimum and maximum price would have to be carefully chosen to avoid jeopardising the emission reductions set by the cap.

Options at a glance:

- Transition to a cap-and-trade system and introduce an LRF mechanism in line with Chinese climate targets.
- Further deregulate the power sector to develop the CO_2 price signal.
- Introduce auctioning to increase emissions reductions and generate state revenue.
- Implement an allowance price corridor that is high enough to reach climate goals but not so high that it places an undue burden on companies and citizens.

This factsheet provides a brief overview of the comparison between the EU ETS and the Chinese national ETS. The detailed study **"Different approaches, similar effects? A comparative study of the Chinese and European Union Emissions Trading Systems"** can be found here:

Click here

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