August 23, 2023

European Union Emissions Trading System (EU ETS)

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The European Union (EU) launched the European Union Emissions Trading System (EU ETS) in 2005 and has revised it several times, currently entering its fourth phase. Additionally, the European Commission (EC) proposed a system revision in July 2021 as part of the Fit for 55 packages, and the EU adopted this revision in May 2023.

1. Overview of climate change policies

The EU has established a greenhouse gas emissions reduction target of -55% compared to 1990 levels by 2030. This target encompasses the EU ETS sectors, which cover large-scale emissions from power generation, iron and steel, chemicals, and cement, and the non-EU ETS sectors, including transport, building, and agriculture. The EU has set specific reduction targets for the non-EU ETS sectors for each member country.

EU has positioned carbon pricing in the EU ETS as the primary policy in its climate change policy. At the same time, it is advancing initiatives for emissions reduction in the entire EU by setting targets for introducing renewable energy and energy efficiency.

Table 1 EU's 2030 targets

Greenhouse gas emissions	-55% compared to 1990 ● EUETS sectors: -61% compared to 2005 ● Non-EU ETS sectors: -40% compared to 2005 reduction within the EU only
Renewable energy	Share in final energy consumption of 42.5% (target for the entire EU)
Energy efficiency	11.7% reduction compared to 2020 BAU

(Source) made by The Institute of Energy Economics, Japan (IEEJ) from European Commission materials.

2. System design of emissions trading

2.1. An overall of the system[2]

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[2] Refer to the attached System Overview Table regarding the more detailed system.

The EU ETS, which plays a significant role in the EU's climate change policies, contributes to achieving the emissions reduction targets of the entire EU by setting caps (emission upper limits) for the target sectors and lowering the emission upper limits in stages. Targeting emissions arising from the burning of fossil fuels and emissions for the use of fossil fuels in industrial processes, the EU ETS covers approximately 40% of the EU's greenhouse gas emissions. European Commission distributed half of the emission rights (European Union Allowance, EUA) by auction, but the free allocation using the product benchmark centered on industrial sectors remains. In 2026, due to the introduction of the Carbon Border Adjustment Mechanism (CBAM), the free allocation for emissions from the production processes within the EU region of products covered by CBAM will be reduced, but this does not mean that the free allocation will eliminate in 2035.

The EU will establish an emissions trading system for buildings and road transport, known as 'ETS 2', in 2027. While the existing ETS addresses direct and process emissions, ETS 2 will require suppliers to purchase and surrender EUA equal to their emissions from selling petroleum products and natural gas. To prevent double regulation, the EU excludes the power generation and industrial sectors covered by the EU ETS from the scope of ETS 2.

Figure 1 shows the trends since the system started in 2005 in emissions from facilities covered by EU ETS, the amount of allocation, surrender, and use of the offset credits (CERs and ERUs (both international credits based on the Kyoto Protocol)). The free allocation amount was more significant than the emissions from 2009 to 2012, and Many of the operators covered by EU ETS had used many inexpensive offset credits. Thus, they have many unused EUA in their account. From 2014 onward, the European Commission has reduced the allocation supply to the market (backloading, the market stability reserve). However, approximately 1.1 billion t-CO_2 of the EUA that became this unused surplus remains.

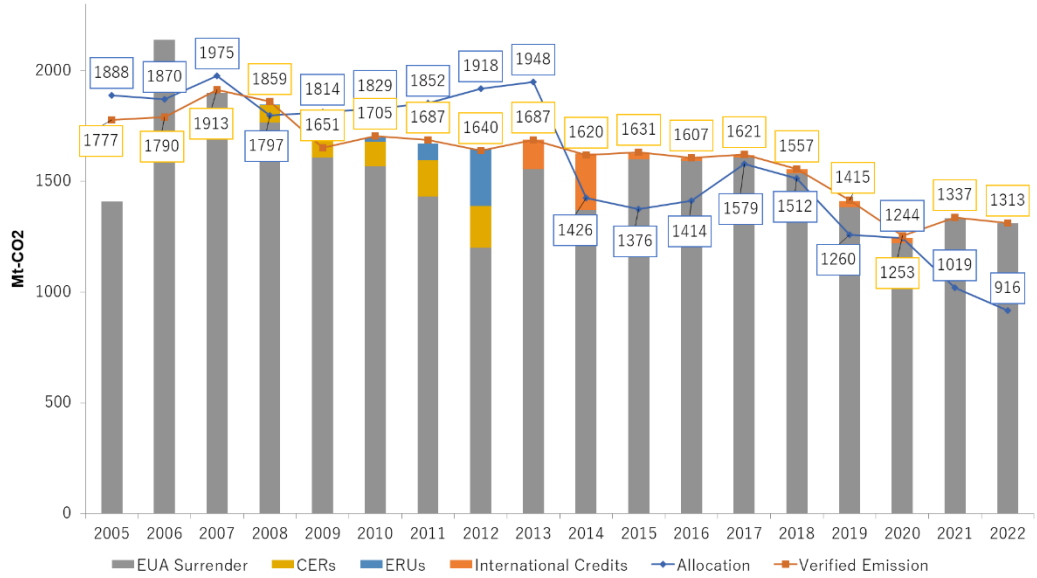

Figure 1: Trends of allocation, verified emission, EUA, and offset credits in the EU ETS sectors

(Source) EUTL and the European Environment Agency (EEA)

Next, Figure 2 shows the trends in the EUA price since the system started. In 2005, the EUA price was about 20 euros/t-CO_2 to 30 euros/t-CO_2, but in 2007, the final year of the first phase, it was clear that the allocation by the European Commission and its member states had exceeded the actual emissions. Therefore, the price plunged. The second phase started in 2008, and initially, the price was at the level of about 30 euros/t-CO_2 because the allocation was tighter than in the first phase, but production activities within the EU region declined due to the bankruptcy of Lehman Brothers. Thus, emissions also decreased, and as a result, it fell to 15 euros/t-CO_2 and fell to the level of five euros/t-CO_2 or less in 2013.

Subsequently, the EUA price has been rising because of the 2018 ETS Directive revision and the rules restricting the EUA supply to the market from 2019 (the Market Stability Reserve, MSR) were implemented. Moreover, in 2021, the EU decided to strengthen the emissions reduction targets of the entire EU for 2030, and the price rose to a level exceeding 60 euros/t-CO_2 due to the release of the Fit for 55 policy package. In addition, speculation that the invasion of Ukraine by Russia will lead to a switch from gas-fired power generation to coal-fired power generation has caused the EUA price to rise to a level exceeding 100 euros/t-CO_2 temporarily.

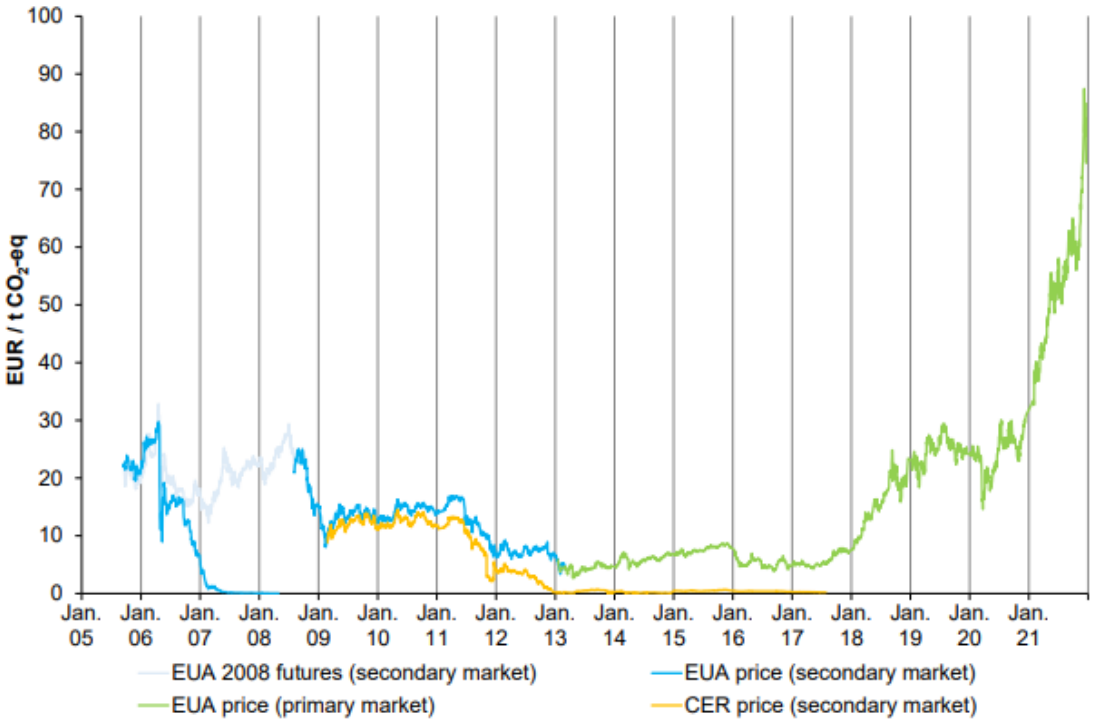

Figure 2: Trends in the EUA price

(Source) Cited from EEA (2022), Trends and projections in the EU ETS in 2022, pp. 31

2.2. Allocation

From 2005 to 2012, free allocations were grandfathering based on actual emissions in the past and allocations by auctions, but from 2013, this was changed to free allocations to industrial sectors using the product benchmark and auction to the electricity sector.

For free allocations to industrial sectors, the European Commission sets the average value of each sector's top 10% efficiency as the benchmark value, and they decide the amount of free allocation amount by incorporating the fluctuations in the number of production activities every year and correction factors. As shown in Figure 3, the member countries calculate the amount of the free allocation using a benchmark incorporating the efficiency improvement rate in the number of equipment activities covered by ETS inside their country. Furthermore, from 2026 onward, emissions from produce products covered by CBAM in facilities covered by the system, a CBAM factor will be added to exclude them from the free allocation. The Commission checks the results reported by the Member States against the results to see if the carbon leakage sector list covers the facility in question if the total free allocation does not exceed the emission cap and, if necessary if the free allocation is adjusted. Then, after this correction, the provisional free allocation amount concerning the facilities covered by the system is decided, but the actual percentage amount rises or falls depending on the number of production activities every year.

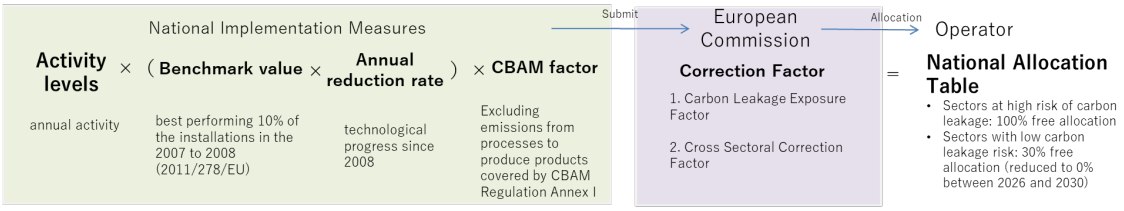

Figure 3: Summary of the calculation formula for the free allocation using the benchmark method

Source: ETS Directive

The European Commission allocates EUA to each member country based on past emissions. These EUA sales occur on the EU common auction platform or individual country platforms. The European Energy Exchange (EEX) conducts these auctions almost daily. In 2021, auction sales of EUA generated 30 billion euros in revenue (averaging 53 euros/t-CO_2). A portion of this revenue, disproportionately favoring Eastern European countries, contributed to the state revenues of member countries. Poland topped the list in 2021, earning 5.5 billion euros, followed by Germany with 5 billion euros. Some of these revenues also funded the Innovation Fund, supporting technology development and demonstration projects within the EU. Moreover, the EU plans to procure 20 billion euros for REPowerEU through EUA auctions in 2023, enhancing the ETS's role as a significant funding source.

2.3. Offset credits

In the EU ETS, offset credits using CDM and JI based on the Kyoto Protocol were usable until 2012. The European Commission purchased them from 2013 to 2020. They were switched to the EUA and became usable with EU ETS. However, appropriating all emissions with offset credits was prohibited and limited to only some of the emissions. However, from 2021 onward, offset credits became prohibited in principle.

2.4. MRV

Operators with facilities covered by EU ETS must implement third-person verification per the guidance of the European Commission, report their emissions by the end of March every year, and surrender the same amount of EUA at the end of April. Supposing they cannot surrender by the end of April, they are required to submit an improvement report and the EUA for the shortfall by the end of June, and in the case that they cannot do that, they will be subject to penalty. From 2024, entities must surrender EUA by the end of September, as the deadline is changing.

Figure 4 shows the EU ETS compliance cycle. The operators prepare and receive approval for a monitoring plan in advance, measure their emissions based on the plan, obtain reasonable verification results from a third-person, and surrender the same amount of EUA. The European Commission has prepared the related rules and guidance, and the operators that carry out the verification verify the

operators' emissions based on them.

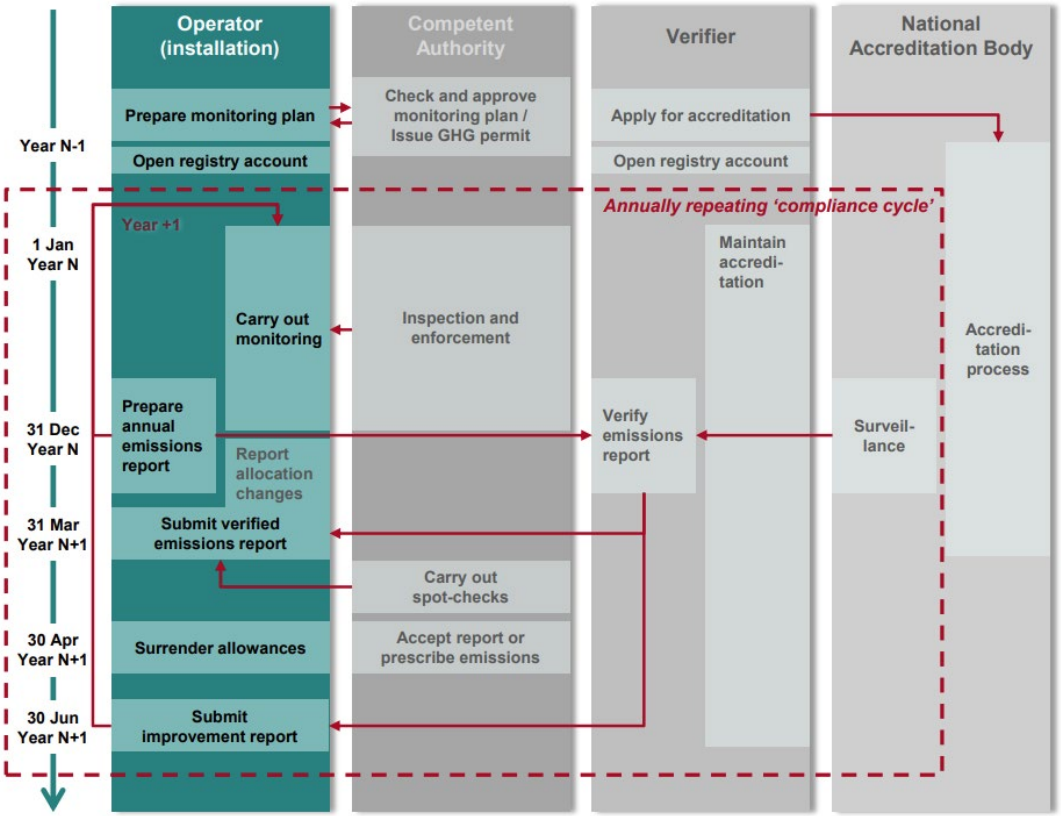

Figure 4: The compliance cycle of the EU ETS

Source: Cited from the European Commission (2022), Quick guide for verifiers, pp. 2

2.5. Relations with other policies

The EU ETS coexists with each country's energy and carbon taxes in the EU region, but many countries impose only one burden. For example, after introducing a CO_2 tax in 1991, Sweden exempted operators under the EU ETS from this tax from 2005, following the Energy Taxation Directive. In contrast, the Netherlands extended its general fuel tax in 2021 to include industrial sectors previously exempt, taxing them if they fail to meet specific efficiency standards. This change has led to the possibility of a double burden in the Netherlands, combining the general fuel tax with the EU ETS.

In June, Germany recently announced the introduction of Carbon Contracts for Difference (CCfDs) referencing the EUA price for the domestic industrial sectors. CCfDs subsidize the difference between the additional cost burden necessary for new production processes and the EUA price to advance the decarbonization of equipment covered by EU ETS. However, in the case that the EUA price exceeds the cost burden, the operators will have to make a payment to the government.

3. Implications for GX ETS

The EU ETS, established in 2005, serves as a reference for the design of Japan's GX ETS, set to launch in 2024. It is crucial to evaluate and learn from the EU ETS's trial-and-error experience to adapt GX ETS effectively to Japan.

First, we consider the allocation. Initially, the EU ETS used free allocations based on past emissions through the grandfathering. However, actual emissions after 2008 differed significantly from the initial allocation plan, leading to an excessive surplus of EUA. This discrepancy highlights the challenges of allocations in emissions trading systems. Therefore, Japan needs to refine the allocation plan's preparation and implementation, considering changes in free allocations based on operational status and actual production activities, as evidenced by subsequent revisions in the EU system.

Next, the EU transitioned to the allocation plans by the benchmark in 2013. However, finalizing a consensus with industrial sectors took seven years, emphasizing the need for preparation. Japan's GX ETS should consider sector-specific evaluations using the benchmark. While the Act on Rationalizing Energy Use offers a benchmark system, its compatibility with the GX ETS remains uncertain, potentially necessitating adjustments.

Lastly, we address price fluctuations. Prices in the EU ETS varied dramatically, from 3 euros/t-CO_2 to 100 euros/t-CO_2. Surplus allocations contributed to low prices, while the Market Stability Reserve (MSR) and the overall system design influenced high prices. Japan must proactively integrate measures, such as setting price caps and reserve prices and adjusting market emission rights supplies, to stabilize the GX ETS pricing.

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Overview of the EU ETS

Overview	Name	EU Emissions Trading System (EU ETS)
	Governing laws	Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms. Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community. Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community. Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814 *Directive (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system*
	Overview	The emissions trading system is mainly responsible for reducing the greenhouse gas emissions of the EU. It covers approximately 40% of CO_2 emissions within the EU region. (When ETS 2 is started, approximately 80%)
	Recent trends	The ETS Directive was revised at the end of 2022 and will be enforced from 2024 onward. Anticipating that the EUA demand and supply will tighten in the future, the EUA price has risen to a level exceeding 100 euros/t-CO_2.
	Background to introduction	In 1997, the introduction of a common carbon tax failed, and instead of that, it was decided in 2003 to introduce the EU ETS to achieve the targets of the Kyoto Protocol, and the system was started in 2005.
	Implementation period	• First phase: 2005 to 2007 • Second phase: 2008 to 2012 (for the aviation sector, 2012 onward) • Third phase: 2013 to 2020 • Fourth phase: 2021 to 2030

		• Amended fourth phase: 2024 to 2030 (maritime transport from 2024, ETS 2 from 2027)
Target	Unit	Each piece of equipment (ETS 2 is for each energy operator)
	Coverage requirements	Facilities/equipment for which annual emissions exceed 25,000 t-CO_2 (small-scale facilities (educational institutions, hospitals) can opt-out at the discretion of the member countries even if they exceed 25,000 t-CO_2) • Burning facilities: burning facilities, oil refineries, and coke ovens that have heat input exceeding 20MW. • Industrial facilities: 258 sectors and subsectors, including iron and steel, aluminum manufacturing, nonferrous metals, chemicals, glass, cement, ceramics, paper and pulp • Transport: airlines operating flights which take off or land at airports within the EU region (from 2012) • Maritime transport: emissions of sea journeys from within the EU region to outside the EU region (50%), sea journeys from outside the EU region to within the EU region (50%), sea journeys from within the EU region to within the EU region (100%), and time anchored in port within the EU region. • Operators supplying fuel to the following sectors (basically, identical to the operators that pay energy tax and carbon tax in each member country) ➢ Heat supply using CHP to the civilian and household sectors. ➢ Road transport (excluding agricultural vehicles on paved roads) • CCS: capture, transportation, and underground storage
	Covered gases	CO_2, N_2O, PFC
	Emission point (direct or indirect)	Direct emissions (ETS 2 is for emissions based on the carbon content of the fuel)
	Coverage (emissions of sectors covered by the regulations (or total amount of emission quota) and the coverage ratio (emission quota total amount/ total emissions of the country))	Approximately 40% of the CO_2 emissions within the EU region (approximately 1.3 billion t-CO_2): 2021 ETS 2: approximately 40% planned
	Handling of supplied/purchased	In the case that heat is supplied from facilities covered by the ETS to other facilities covered by the ETS, calculated as the emissions of heat consumption facilities.

	heat	In the case that heat is supplied from facilities covered by the ETS to facilities not covered by the ETS, calculated as the emissions of heat supply facilities
Target-setting method	Objectives and targets	• 20% reduction of GHG emissions in the entire EU in 2020 compared to 1990. • 21% reduction compared to 2005 in the EU ETS sectors (in the aviation sector, 95% of the average CO_2 emissions from 2004 to 2006) • Emissions cap ➢ Third phase: the amount obtained by decreasing 1.74% each year from the average value of the allocated amounts in the second phase (2,039,152,882 t-CO_2) until 2020 (1.843 billion t-CO_2) ➢ Fourth phase: the amount obtained by decreasing the emissions of the third phase by 2.2% every year. ➢ Amended the fourth phase (ETS): decreased by 4.3% every year from 2024 to 2027 and 4.4% every year from 2028 to 2030. Lower the emissions cap to 90 million t-CO_2 in 2024 and 27 million t-CO_2 in 2026. In 2024, the maritime transport sector will be added so that the upper limit will be raised to 78 million t-CO_2 ➢ Amended fourth phase (ETS 2): 43% down compared to 2005
	Allocation methods	• Power generation sector: auctions (however, some free allocation to Eastern European countries with conditions) • Industrial sectors in which there is a danger of carbon leakage: all free allocation with conditions. ➢ In the case the sector begins to be covered by CBAM, the free allocation for emissions about the production of products covered by CBAM in the covered activities will be reduced in stages from 2026. ✧ 2026: -2.5%, 2027: -5%, 2028: -10%, 2029: -22.5%, 2030: -48.5%, 2031: -61%, 2032: -73.5%, 2033: -86%, 2034: 100% ➢ In facilities covered by the system, implementation of countermeasures based on the results of the energy audit based on the Energy Efficiency Directive (EED), Article 8 is obligatory (however, alternative measures converted into GHGs are also allowed) ✧ In addition, in the case of non-implementation of the energy audit and non-preparation of a carbon-neutral plan concerning the bottom 20% of companies in terms of poor efficiency, the free allocation is reduced by 20%. ➢ A preliminary decision is made about the free allocations after the member countries implement the NIM (National Implementation Measures) based on the EU common benchmarks for each product and the cross-sectoral correction factors (CSCFs) that the European Commission has applied. The actual free allocation amount is decided by incorporating the amount of production activities every year.

		• Industrial sectors in which the danger of carbon leakage is low: some free allocations (30% in 2021 and 0% in 2029), transition to auctions in stages. • In countries with many emissions from district heat supply equipment, in addition to a free allocation of 30%, an additional free allocation of 30% (on the condition of implementation of a CN plan + energy audit results) • 5% of the total allocation until 2030 as the new entrant reserve • Transport sector (aviation sector): concerning the average of the total CO_2 emissions from the aviation sector from 2004 to 2006, free allocations (82%), auctions (15%), and the new entrant reserve (3%), and the ratio of auctions will be raised in stages from 2024 onward. • Maritime transport sector: as a general rule, all auctions. However, EUA is to be surrendered for 40% of emissions in 2024, 70% of emissions in 2025, and 100% of emissions from 2026 onward. • ETS 2: in principle, all auctions
Flexibility measures	Banking and borrowing	• From 2008 onward, banking is allowed, and borrowing is prohibited
	Utilization of other credits	• Fourth phase onward: use prohibited
	Other mitigation measures and leakage countermeasures	• Free allocation to industrial sectors in which there is a possibility of carbon leakage. • Member countries can pay compensation for the increase in indirect costs due to the rise in electricity prices caused by ETS.
	Price countermeasures (setting of a price cap and reserve price, the market surveillance mechanism)	• When the price rises rapidly, urgent auctions supply the EUA to the market. ➢ When the price of the EUA in the past six months became 2.4 times the average price of the past two years, the EUA was released from MSR to the market through 75 million tons of auctions. ➢ The European Commission announces whether or not the release conditions have been met at the start of every month. Furthermore, it announces the price level that meets the conditions for the following month. ➢ After a release to the market, it does not carry out any additional releases for 12 months. • Using MSR, surplus EUA is absorbed by reducing the auction volume while surveilling market demand and supply.
	Penal provisions	€100/t-CO_2 (however, incorporate the inflation rate)
Market	Trends in the prices (trading price and	As of March 2023: approximately 100 euros/t-CO_2 EUA auction volume: approximately 700 million t-CO_2 annually (common auction platform,

	auction price), auction volume, market trading volume, breakdown of the market trading participants)	total for Germany and Poland) Market participants: companies and financial institutions possessing equipment covered by ETS
	Distribution volume	11.164 billion t-CO_2 annually (annual total trading volume of EUA spot and each delivery month futures trading of ICE and EEX)
	Trading format	Spot (following day account settlement), futures (each delivery month), negotiated trading, OTC
	Links to other systems (status of consideration)	Linked to the Swiss ETS from 2019
Reporting method	Registry, methods of MRV	Registry: the accounts of the participants are managed with the Union Registry, and transfers among participants are recorded with the EUTL (EU Transaction Log) MRV: Third-person accreditation is implemented following the guidance of the European Commission, and then the emissions are reported by the end of March every year, and the same amount of EUA is surrendered by the end of April (this will change to the end of September from 2024 onward)
Other	Effect (reduction effect and impact on the economy, etc.)	
	Uses for auction revenue	Distribution to member countries (88%): However, at least 50% of the auction revenue is limited to use for policies related to climate change. Cohesion and growth of member countries (10%): distribution to low-income countries Consideration for low-income countries (2%): consideration for Eastern European countries
	Compliance cost	The average cost paid by operators for MRV every year is €59,207, or €0.16 per ton, in the EU ETS compliance cycle (12 months of emissions monitoring + six-month compliance period) (DG CLIMA (2016) "Evaluation of EU ETS Monitoring, Reporting and Verification Administration Costs")

(Source) made by The Institute of Energy Economics, Japan (IEEJ) from Directive 2003/87/EC.