



Korea Study Tour on ETS Design and Implementation

Summary Report

Overview

As concern about climate change grows and countries commit to more ambitious GHG emission reduction targets including the 2030 NDCs¹ and net-zero goals, there is a rising and critical need for cost-effective climate policies. As such, emissions trading systems (ETSs), which encourage emission reductions to take place where they are cheapest, enable the generation of valuable climate finance to support investment in decarbonisation technologies and can ensure compliance with targets, are gaining increasing momentum, especially in Asia. Following Korea's and China's implementation of a national ETS, Indonesia, India, Vietnam, Thailand, Japan, and Malaysia have begun or are considering developing ETSs. This uptake has been further accelerated by the introduction of the EU's Carbon Border Adjustment Mechanism, which encourages the EU's trading partners to adopt increasingly ambitious climate policies.

The Asia Society Policy Institute (ASPI) organized a study tour to Korea to enable participants from Asian countries that are introducing ETSs to learn about detailed and practical implementation aspects of the Korean Emission Trading System (K-ETS), the first national ETS in East Asia, to support the successful implementation of ETS in their countries. It also aimed to encourage 'champions' who can play an influential role in their countries in promoting ETS development, and to encourage the development of consistent and harmonized ETSs in Asia that reflect best practice and which can play a central role in achieving national GHG emission reduction targets cost-effectively, while protecting the international competitiveness of covered entities.

The study tour took place from November 29th to December 2nd 2022 in Seoul, Sejong and Osong. Meetings and events covered each of the K-ETS's key systems and design elements; as well as the role of an ETS in achieving national GHG emission reduction targets and the compliance, trading and GHG emission reduction strategies of entities. Speakers included officials responsible for the K-ETS, leading K-ETS experts and industry representatives. Participants had the opportunity to discuss detailed experiences, challenges, and solutions for successful and practical ETS implementation in their own countries. There were 12 in-person participants including officials and experts from Indonesia, Vietnam, Thailand, Malaysia, Japan and India, who are directly involved in the design and implementation of ETSs in their own countries. Around 30 additional ETS stakeholders from China and other Asia countries took part in virtual sessions.

¹ Nationally Determined Contributions

Summary

Policy development and introduction

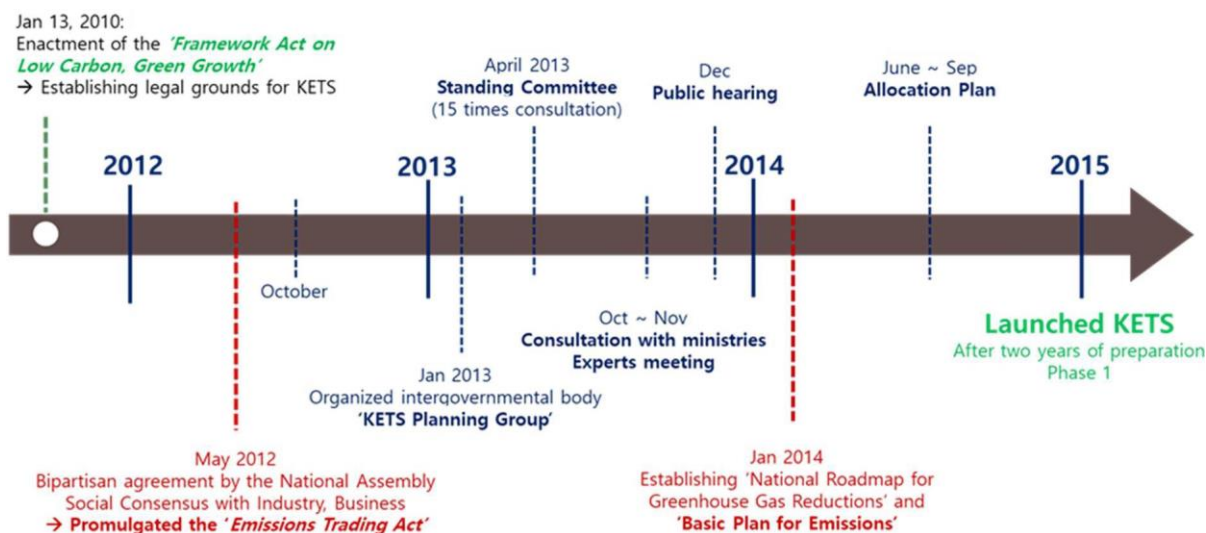
Countries implementing emerging ETSs will need to do so quickly and efficiently to enable cost-effective achievement of GHG emission reduction targets. Fortunately, there is now a growing body of reference ETSs to study, especially the K-ETS, which is the front runner for ETS implementation in Asia. The Asian experience is especially valuable given the specific ETS context in Asia, including the role of coal in the energy mix, the importance of energy intensive industry sectors and more tightly controlled power markets.

Lessons from the successful and smooth introduction of the K-ETS can be summarized as follows:

- First, establish a robust legal framework at the initial stage of development. In Korea, the 'Framework Act on Low Carbon Green Growth' was enacted in 2010 to provide a legal basis for the implementation of the ETS. The 'Act on the Allocation and Trading of Greenhouse Gas Emission Permits' and the 'Enforcement Decree of the Act on the Allocation and Trading of Greenhouse Gas Emission Permits' were then passed into law in 2012, laying the legal groundwork for the ETS. The key details of the K-ETS were then laid out in the Master Plan, which establishes the overall design, and the Allocation Plan, which provides details on cap-setting, allowance allocation and other relevant aspects. These plans were developed and published prior to each implementation phase.
- Second, develop a robust monitoring, reporting and verification (MRV) system at an early stage. The Target Management System (TMS), which imposed GHG emission reduction and energy consumption targets on entities, was introduced as a preparatory step for the K-ETS and required entities to apply robust MRV systems for energy and emissions data that would be needed for the ETS.²
- Third, build strong political will and leadership in the early stages of ETS development. To avoid roll-back resulting from changes in personnel and administrations, Korea institutionalized climate policies – including the ETS – and the processes for managing and updating policies over time. Industry buy-in was achieved by framing the ETS as a long-term business opportunity, working closely with the business community, listening to industry concerns and reflecting these concerns in the policy design. Gaining the support across government ministries was likewise important, and progress continues to require diverse and targeted methods. This coordination was facilitated by the Green Growth Committee directly under the Prime Minister's Office which gave representation to all relevant ministries and departments and enabled effective decision-making and approvals. An overview of the timeline during a critical part of the K-ETS policymaking process is shown in Figure 1.

² The TMS still applies to smaller emitters, whilst larger emitters that were covered by the TMS are now covered by the K-ETS.

Figure 1. Timeline during K-ETS policymaking process

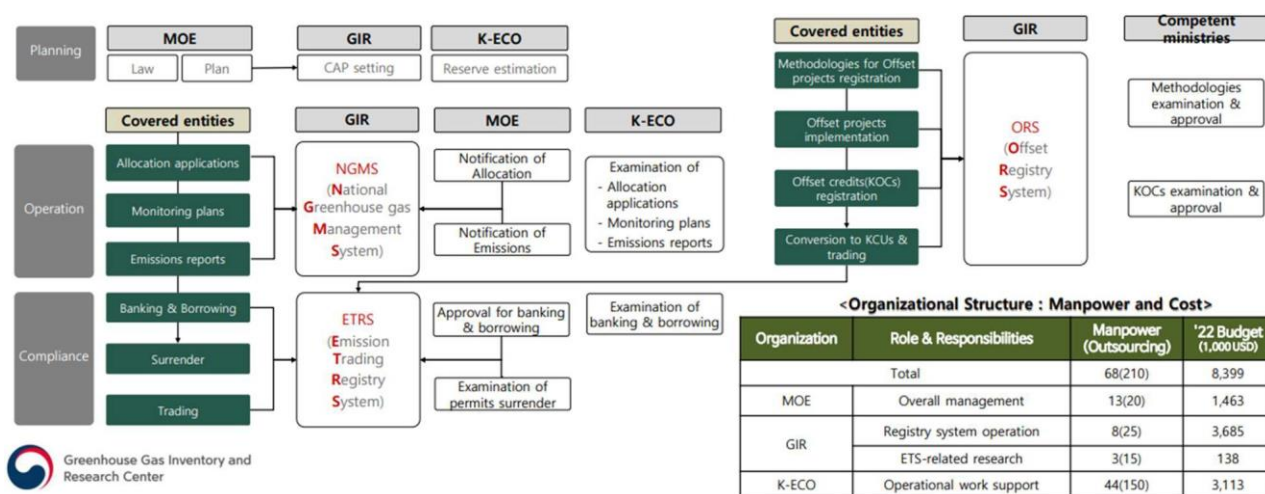


Source: “Political will does matter: Policymaking of Korea's ETS and Major Challenges”, Kim Sang-Hyup, at ASPI meeting “Dialogue Facility on ETS Development in Asia Policymaking Processes”, September 2020

- Fourth, establish key institutions to implement the ETS. In Korea, these institutions support the Ministry of Environment (MoE) which has overall management responsibility.³ These include (a) the Greenhouse Gas Inventory & Research Center (GIR), specifically set up to support K-ETS implementation including cap-setting, IT systems, and policy research and modelling; (b) Korea Environment Corporation (K-ECO) which examines the allocation applications, monitoring plans and emissions reports; (c) the National Institute of Environmental Research (NIER) which oversees the verification system including undertaking accreditation of verification bodies; and (d) the Korea Exchange (KRX) which operates the systems for trading and auctioning of allowances. GIR, K-ECO and NIER all operate under MoE. Figure 2 shows core parts of the K-ETS organization structure.

³ Establishing the plans and legislative framework, reviewing allocations, certifying emissions, etc.

Figure 2. K-ETS organizational structure



Source: “Recent Status and Changes of Korean ETS”, Dr. Hyung-Wook Choi, ASPI meeting “Dialogue Facility on Roadmap for Developing an Effective ETS to Achieve National GHG Emission Reduction Target”, April 2022

- Finally, ensure a soft landing of the system and sufficient stakeholder engagement. The success of the carbon market is dependent on covered entities' active participation and support. A soft landing without significant financial burdens in the initial stage as well as extensive communications allowed compliance entities to embrace the new policies. The K-ETS began with 100% free allocation in the first phase before introducing regular allowance auctions in Phase II. Furthermore, Phases I and II have been limited to three years each, to allow more frequent revision in the early stages, with Phase III increasing to five years. Like other ETSs, the system has evolved over time as experience has been gained, participants have become acquainted with the policy and improvements have been identified and implemented.

Cap setting

An ETS will be especially useful in assisting achievement of national emission reduction targets if its cap-setting is directly linked to the national targets. This is the case in Korea, with the following method used in Phase III:

1. Calculate the national sectoral GHG emission targets for Phase III (2021-2025).
2. Calculate the ETS emissions coverage out of total sectoral emissions for the cap-setting base years (2017-2019).

Sectoral ETS emissions coverage (2017-2019) = Sectoral emissions of ETS entities (2017-2019) / total sectoral emissions (2017-2019).

3. Calculate the sectoral ETS cap for Phase III (2021-2025).

Sectoral ETS cap (2021-2025) = national sectoral emission targets (2021-2025) × Sectoral ETS emissions coverage (2017-2019).

4. Calculate the overall ETS cap for Phase III (2021-2025) by summing the cap for each sector.

It will be important to maintain the linkage of the ETS cap with the national emission targets, particularly Korea’s revised 2030 NDC which will require a 40% reduction in GHG emissions by

2030 compared to 2018. This will be addressed as part of the Allocation Plan for Phase IV of the K-ETS (2026-2030). This step is expected to bring a significant tightening in the cap and increase in carbon prices. MoE's approach for addressing industry's concerns regarding such developments includes:

- Early disclosure of future cap to give participants as much time as possible to prepare. The publication of the Allocation Plan for Phase IV has been brought forward to end of 2023 to support this longer adjustment period.
- Introducing flexibility for businesses that have already significantly reduced their carbon emissions, such as removing the prohibition on carrying over excess allowances to the following year.
- Using the proceeds from ETS auctioning to financially support businesses in their investments to reduce GHG emissions.

Allocation system and carbon leakage prevention

The allocation method is a key factor in inducing companies to make investment decisions on GHG reductions. Out of the methods for free allocation, benchmark (BM)-based allocation rewards companies with low emissions intensity, while grandfathering (GF) rewards companies with high historic emissions. Therefore, BM-based allocation is generally regarded as a superior method than GF in terms of fairness.

Under the K-ETS the coverage of BM-based allocation has expanded over the phases, and now (in Phase III) covers 12 sectors including oil refineries, cement, aviation, power generation, co-generators with LNG for households, co-generators with coal for industry, sewage treatment plants, steel, petrochemicals, buildings, paper and wood.

Some key takeaways from the K-ETS experience of BM include:

- Use BM-based allocation as the only free allocation method if possible, and ensure key details are specified in the ETS legislation. It becomes problematic if the ETS legislation does not specify the type and key details of free allocation, as this can lead to time-consuming debates about different approaches. GF is not recommended, as it does not reward early investments in GHG mitigation and low carbon technology.
- Develop BM values for products associated with significant emissions. Product BMs can be successfully developed even for complex industrial sectors. Alternatives include making virtual products based on proxies such as energy input⁴.
- Determine the level of the BM value in a practical way, while seeking to be as ambitious as possible. In the K-ETS the weighted average GHG emissions intensity was used in Phases I to III, partly to enable consistency with the GF method that has been available as an alternative. However, from Phase IV, it is planned to use more ambitious levels such as based on BAT (best available techniques). This will provide a stronger incentive for companies to reduce their GHG emissions.
- Design the MRV system to reflect the boundaries of BM products from the beginning of the ETS. Several technical challenges can arise if emissions data is not developed at the level of the BM product from the beginning. It will be time consuming to make changes to the MRV system and could delay introduction of BM-based allocation.

⁴ See the following ASPI issue paper for more details: <https://asiasociety.org/policy-institute/developing-effective-benchmark-based-allocation-industrial-sectors-case-korean-ets>

- Adopt a consistent and coordinated approach in the process of consulting with industry sectors and developing BM-based allocation methodology. It may be difficult to successfully introduce BMs if different principles are applied to each sector for setting BM boundaries and BM values or if consultations with industry sectors are undertaken in an inconsistent and uncoordinated way.

In parallel with these developments, the K-ETS continues to increase the share of auctioning, to strengthen the carbon price signal and increase the amount of revenue available to support investment in emission reduction projects. Regular allowance auctions were introduced in Phase II (at 3% of total allocation, for sectors not at risk of carbon leakage), with the first taking place in January 2019. In Phase III, the amount of auctioning increased to 10% of total allocation. Sectors determined as ‘carbon leakage’ sectors, for which 100% free allocation applies, are assessed based on trade intensity and carbon intensity, with the approach similar to the EU ETS.

MRVA systems

The development of the MRVA system in the K-ETS learned from best practices of the EU ETS and built on systems from the pre-existing TMS.

Data quality is ensured by Korea Environment Corporation (KECO), which reviews and assesses the entities’ monitoring plans and annual emission reports, and NIER, which is in charge of accreditation and supervision of verification bodies. Some good practices include:

- Solid and integrated MRVA systems. Before submitting to MoE, the emission reports are verified by third-party bodies as well as by KECO. Through these processes, data issues are identified and remedied. Verification bodies are subject to a rigorous accreditation process, with ongoing oversight by NIER, including surveillance checks twice a year (on-site checks during the first half and in-office checks during the second half).
- Strong capacity building. The National Institute of Environmental Human Resources Development (NIEHRD), under MoE, provides training and education workshops for verifiers each year, with mandatory attendance at least once every two years to maintain qualification. In addition, verification bodies are obliged to provide training for their verifiers (e.g. quarterly seminars to discuss monitoring plans, emissions reports, and relevant policies; Q&A pages providing solutions on key issues; and on-the-job training with trainees conducting audits for a year under the mentorship of senior auditors), which are checked by NIER’s assessment process. In order to ensure their experts’ capacity as accreditors, NIER also organizes annual workshops.
- Strict evaluation of verifiers. To ensure that verifiers are sufficiently competent, the verification bodies have a witness-based evaluation system where verifiers are evaluated annually by witness auditors and given feedback to improve their skills. Those failing to meet the requirements have their contracts cancelled. Customer satisfaction surveys are also carried out, with highly regarded / evaluated verifiers continuing on and lowly evaluated ones not.
- Regulation of verification pay. Verification work is demanding, and talent will be lost without a sufficient level of pay. Minimum fees for verification work are specified.

In addition, Korea’s recent efforts in its accreditation system received international recognition. NIER has completed mutual recognition agreements with the International Accreditation Forum (IAF) and Asia-Pacific Accreditation Cooperation (APAC) for the accreditation of verification bodies. This further strengthens data quality by aligning the MRVA system with international best practice, meaning stricter and wider requirements in data reporting, and ensures the

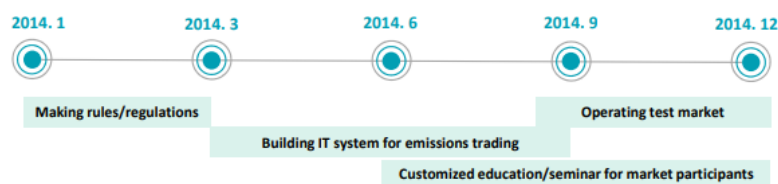
equivalence with other systems essential to cross-national connection of ETSs and beneficial for reporting under the EU CBAM.

ETS law and regulations in Korea have been revised to be consistent with these international standards, including the re-delegation of authority for the designation/management of verification bodies from MoE to NIER, application of international standards to assessment criteria for verification bodies, and separate operation of accreditation and designation schemes for verification bodies.

Trading and auctioning systems

At the early stage of K-ETS development, the Korea Exchange (KRX) was selected to develop and operate the emission trading system as it is best suited to complete the relevant tasks including launching and operating the carbon market; confirming the market activities (trades, matching, deductions, settlement, processing of non-payment, etc); investigating abnormal / unfair trading and examination of trading organizations; and developing rules and regulations for emission trading and dispute resolution among market participants.

KRX developed the trading system in one year. Trading rules/regulations and IT systems were developed step by step, then tested. In the meantime, training and education on the system for market participants was conducted. The system was launched in January 2015, with key elements of the preparation timeline shown below.



Given that entities had limited trading experience, some features were specifically designed to control risks in the market's early stages, such as:

- 100% initial margin (upfront payment), which is higher than other security markets;
- t+0 settlement (other stocks t+2, futures and options t+1); and
- Only two banks are allowed to be used for settlement.

In addition, since covered entities' main business is outside the carbon market and there is a relatively limited number of transactions, the trading hours of the exchange market are relatively short at three hours (9am-12pm).

To activate the market, which is the biggest challenge for KRX, several developments are ongoing and scheduled to happen by end of Phase III, including:

- More market makers. Market makers help to increase liquidity by buying and selling specified amounts of allowances at a given frequency. Initially, two government-owned banks took this role, later joined by five securities firms. The number of market makers is expected to rise further. Financial institutions' proprietary trading limits will also be increased.
- Third party participation. Private participation (non-entities) in the market is expected by the end of Phase III. As unexpected events may occur, every significant risk factor must be carefully assessed, including any related to speculative flows. Certain investors may be subject to position limits.

- Derivatives Products. The introduction of derivatives products has been announced, to provide risk management solutions, such as hedging prices by locking in future transaction prices.

Some key features of the K-ETS auctioning system include:

- Dutch auction. This design is to maximize the transactions. With this system successful bids will be made in order of the highest price among the effective bid prices until the quantity reaches the bid quantity on that day. Thus, there can be many successful bids.
- Lower price limit. There is a floor price to prevent the bidder from proposing extremely low prices, with the price set based on the results of a market stability judgement (the calculation formula is confidential).
- Bid limit. To prevent a company with strong purchasing power monopolizing the carbon market there is a purchase limit of 15% of the bid quantity.

ETS and power market interactions

The power sector is the biggest emitter in almost all jurisdictions and therefore the interaction between power markets and the ETS is a critical topic. Carbon pricing has two intended impacts on electricity markets:

- Fuel switching in power generation via the wholesale market. Reflecting ETS carbon costs in power station dispatch decisions will drive fuel switching away from coal and towards renewables and low-carbon fuels.
- Lowered electricity consumption by end users via the retail market. Passing through carbon costs to electricity prices will provide the mechanism to reduce end-user electricity demand, and hence the level of electricity generation.

The K-ETS experience provides insight into how an ETS could work to support power sector decarbonisation in Asia. In response to slow changes in Korea's power sector energy mix away from coal and the need to reach more ambitious 2030 GHG emission reduction targets, an 'Environmental Merit Order' (EMO) system was introduced in January 2022. This enables the carbon cost to be included in the determination of the dispatch order of power stations, which is based on ranking power stations in order of cost. This provides a key mechanism for driving the switch away from coal power. Carbon costs are also now passed through to retail electricity prices, though the level of pass-through is still subject to a limit and not a full pass-through. Stronger political will is needed to achieve full pass-through given the potential resistance from electricity end users, while also considering ways of compensating vulnerable stakeholder groups for higher energy prices, for example from recycled auction revenue.

One of the remaining issues now is that the actual carbon cost is not significant enough to drive fuel switching. To further strengthen the carbon price signal, the auctioning share for the power sector would need to increase significantly above the current level of 10%, which can be feasible when full cost pass-through to retail prices is enabled. Modelling results were presented that demonstrated the benefit of full auctioning for the power sector in driving the shift away from coal, even at modest carbon price levels. At higher future prices the impacts will be even more significant. Such higher prices will result from the revision of K-ETS cap-setting in line with the more ambitious 2030 GHG emission reduction targets.

Currently allocation for Korea's power sector is mainly free, based on coal and gas benchmarks, with benchmark levels designed to gradually disadvantage coal until a switch to a unified benchmark for coal and gas expected in 2024, according to the Phase III allocation plan. Such a unified benchmark will be an important element of any remaining free allocation to further

disadvantage coal power, while also guarding against windfall gains for gas-fired power generators.

With the current limit on pass-through of carbon costs to retail electricity prices, indirect emissions allocation remains necessary for electricity end users to drive emissions reductions. However, when there is full pass-through, this practice should be removed.

Case studies on K-ETS compliance and GHG emission reductions

Companies covered by the K-ETS from the power, steel, chemical, and other industries represented in the presentations in this study tour currently see the K-ETS as an opportunity rather than a compliance burden, although they expect compliance will become much more challenging in Phase IV. Short-term and long-term strategies are developed based on carbon price expectations, and measures for emission reduction or compliance are summarized below:

Internal options (in the boundary)

- Process change
- Fuel switching
- Recycling of waste gas/heat
- Hardware management (energy efficiency, renewable energy and GHG abatement)
 - High-end technology facility/equipment/machinery
 - Low-end technology facility/equipment/machinery
- Software management (human and system)
 - Organizational change
 - GHG/Energy management system
 - Carbon asset management
- Reducing production volume

External options (out of the boundary)

- Domestic offset projects
- Overseas offset projects
- Collaboration and partnership with supply-chain partners
- Relocation of production

Study tour details

The K-ETS, as Asia's front-runner ETS, has now gained substantial implementation experience since it was introduced in 2015. In late November and early December 2022, a study tour with ETS developers from Indonesia, India, Vietnam, Thailand, Japan, and Malaysia met with leading experts and officials from K-ETS authorities and related organizations to learn about this experience.

For the first session, the study group traveled to Sejong to visit the **Ministry of Environment (MoE)**, which oversees the K-ETS. Min-Jee Kim and Chang-Hwan Lee, Deputy Directors from MoE, welcomed the delegation and gave a presentation on the K-ETS and its role in achieving Korea's GHG emission reduction targets. Valuable experience and insights were also shared during the following Q&A and discussion session, including important aspects for developing the system and effective decision-making frameworks that allow for smooth cooperation among ministries.



The study tour traveled to Osong to visit the **Greenhouse Gas Inventory & Research Center (GIR)**. As one of the key supporting organizations for K-ETS, GIR assists in the system's cap setting; manages the national emission inventory; and operates the supporting IT systems, namely, National GHG Management System (NGMS), Emission Trading Registry System (ETRS), and Offset Registry System (ORS). Hyung-Wook Choi, Director of GHG Inventory Management, and Sung-Woo Lee, Associate Researcher, presented an overview of GIR's planning and operational support activities. Su-Yeoung Lee, Deputy Director of GHG Inventory Management,

introduced, presented and demonstrated the IT systems.

The remaining sessions of the study tour were held in meeting venues in Central Seoul.



Two experts from **Korea Environment Corporation (K-ECO)** gave presentations at the start of day two. K-ECO, another key institution supporting K-ETS, is highly involved in the allocation and MRVA systems. Ki-Yoen Ha, Manager of the Allowance Allocation

Team, and Jin-Kyung Jung, Assistant Manager of Emission Assessment Team presented on the K-ETS allocation system and carbon leakage prevention, and the K-ETS monitoring and reporting system, respectively. Dong-Hyeok Kwon from BNZ Partners, who led major studies to support the MoE in the development of K-ETS benchmark-based allocation, also shared details on the K-ETS allocation system.

Jae-Hyun Lim, and Seok-Won Lee, from **National Institute of Environmental Research (NIER)**, the K-ETS authority that oversees the verification and accreditation system, and

Korean Foundation for Quality (KFQ), one of the top verification bodies in Korea, provided a detailed introduction to the internationally recognized verification and accreditation systems.



The study topics then focused on trading and auction systems as well as carbon market performance on day three. Jae-Sik Sohn, the Head of ESG Team from **Korea Exchange (KRX)**, gave a comprehensive presentation on K-ETS's auctioning and trading systems. The advanced systems operated by KRX attracted much interest

from participants, with various questions answered and discussed. Hyun-Shin Park from **Ecoeye**, a leading consultancy on carbon trading in Korea, provided a thorough introduction to the carbon market, including market analysis and forecasts, as well as a demonstration of the trading platforms.

Professor Seung Jick Yoo from **Sookmyung Women's University** presented insightful observations on cap-setting and the interactions between the ETS and the power market. With vivid explanations of how the ETS can assist power sector decarbonisation, participants gained an in-depth understanding of the mechanism and the significance of enabling efficient interactions between an ETS and the power market.



The final day was dedicated to case studies and roundtable discussions. Representatives from the power (**Korea Western Power**), steel (**Korea Iron & Steel Association**), and chemical (**LOTTE Corporation**) sectors shared their experience in compliance and GHG emission reduction. Later, C.J. Park from **Zero Carbon** presented more case studies from a variety of businesses, including POSCO, TaeguTec, SsangYong C&E, Korea South-East Power, and Isu Chemical. Finally, the study tour concluded with a roundtable discussion of roadmaps

and action plans for establishing ETS in Asian countries, including a recap of the lessons learned and remaining challenges and solutions, as well as Mr. Ritchie's closing remarks.