

Government Publication Registration Number

11-1480906-000007-10

2022 KOREAN EMISSIONS TRADING SYSTEM REPORT



Ministry of Environment

Greenhouse Gas Inventory and Research Center

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Notes for Readers

- ① This report contains the results of the first compliance year of 2021 of Phase III (Jan. 2021 to Aug. 2022) for the Korean Emissions Trading System (K-ETS). It analyzes the allocation, trading, and surrender of emission permits for covered entities designated in accordance with Articles 8 and 9 of the Act on the Allocation and Trading of Greenhouse-Gas Emission Permits.
- ② This report is based on Greenhouse gas (GHG) emissions and emission permits data provided by the NGMS, ETRS, ORS, and KRX:
 - NGMS (National GHGs Management System) : a database for the GHG and Energy Target Management System and the K-ETS that collects and manages all data related to the emission activities of business entities, such as emissions reports, implementation plans, performance reports, application forms for allocation, and monitoring plans (<http://ngms.gir.go.kr>)
 - ETRS (Emissions Trading Registry System) : a computerized system for the registration and management of data related to the allocation, trading, banking, borrowing of emission permits, certified GHG emissions and etc. (<http://etrs.gir.go.kr>)
 - ORS (Offset Registry System) : a computerized system for the registration and management of data related to external offset projects such as methodologies for the reduction, absorption, or removal of GHGs and certified reductions (<http://ors.gir.go.kr>)
 - KRX (Korea Exchange) : an emission permit Exchange designated in accordance with Article 22 of the Act
- ③ All numbers in this report are rounded, so some sums and totals may not match.
- ④ This report uses CO₂ equivalent ton (tCO₂eq.) based on the global warming potential (GWP) by GHGs as the unit for the allocation and surrender of emission permits, and it is marked as t (ton), kt (thousand ton), and Mt (million ton). However, abbreviations (KAU, KCU, and KOC) are used when describing transactions for emission permits.

- 1 KAU, 1 KCU, 1 KOC : 1tCO₂eq.
- KAU (Korean Allowance Unit) : emission permits allocated to covered entities in accordance with Article 12 of the Act
- KCU (Korean Credit Unit) : emission permits converted from KOCs in accordance with Article 29 of the Act
- KOC (Korean Offset Credit) : certified reductions from external offset projects obtained by the reduction, absorption, or removal of GHGs outside the scope of business operations monitored by the K-ETS in compliance with international standards, in accordance with Article 30 of the Act (※ For ease of use, KOCs will also be referred to as one of the emission permits in the text)

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Summary**1) Overview of the K-ETS**

An emissions trading system is a market-based greenhouse gas (GHG) reduction scheme in which the government sets an emissions cap in each of the covered sectors and allocates annual emission allowances to entities that emit more than a certain amount of GHGs, meaning that they can emit GHGs up to the limit set by the emission allowances they hold. It is more cost-effective than direct regulation in that entities participating in the scheme can sell surplus allowances to others through market transactions or make up any deficit in their emission permits through auctions or market transactions.

For Phase I (2015–2017), in order to securely establish the Korean Emissions Trading System (K-ETS) and accumulate experience, the government allocated all emission permits free of charge, applied benchmarking (BM) as an allocation method only for certain sub-sectors, and introduced flexibility mechanisms (e.g., offsetting, banking, and borrowing). For Phase II (2018–2020), with the operational objectives placing emphasis on gradually increasing the size of the reduction in GHG emissions by covered entities, the government raised emission reduction targets so that they were higher than the level achieved in Phase I. In addition, in order to solve problems such as an imbalance in supply and demand for emission permits, the government established standards for the banking of surplus emission permits and implemented measures to activate the emissions trading market, such as the introduction of market makers.

For Phase III (2021–2025), the government established the Master Plan for the Emissions Trading System in December 2019 in order to support the effective achievement of Korea's Nationally Determined Contribution (NDC). The Master Plan focuses on promoting strategies such as further developing allocation methods, encouraging a substantial reduction in GHG emissions, and expanding market functions. For the implementation of these strategies, the Allocation Plan for Phase III (2021–2025) of the K-ETS, which contains detailed standards regarding total emission allowances, free allocation and auctions, and benchmark-based allocations, was established in September 2020.

In October 2021, Korea announced the updated NDC, under which the country has set an enhanced target of reducing its total national GHG emissions by 40% from the 2018 level by 2030, with the aim of achieving the goal of carbon neutrality. The enhanced NDC was adopted in close consideration of the purpose of Korea's carbon neutrality policy¹⁾ and its role as a member of the international community.

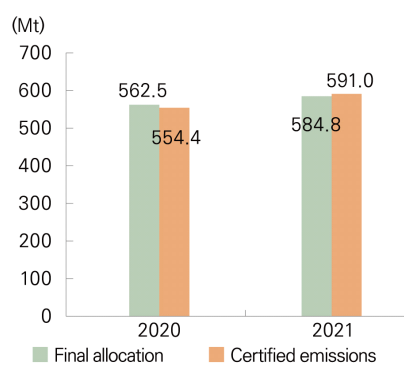
The K-ETS, which has been developed with the goal of establishing a stable system for Phase I and reducing a significant amount of national GHG emissions for Phase II, plays a pivotal role in achieving Korea's NDC. Institutional improvements, such as the revitalization of the emissions trading market, improvement of allocation methods, and adjustment of the emissions cap, are required to efficiently support the achievement of the enhanced NDC.

1) The Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis stipulates the government shall set the target of reducing national GHG emissions by a minimum of 35% from the 2018 level by 2030 (Art. 8(1)). The amount of GHG emissions in 2018 was 727.6 Mt, and the target amount of GHG emissions for 2030 is 436.6 Mt.

2) K-ETS Operational Results

For the 2021 compliance year, the pre-allocation amount was 567.4 Mt (684 entities), while the final allocation amount, which reflected changes such as additional allocations, allocation revocations, and the succession of rights and obligations, was 584.8 Mt (687 entities).²⁾ The final allocation in 2021 was 4.0% higher than the previous year (562.5 Mt), which was a result of the expansion of covered entities and emission activities under the K-ETS for Phase III. The final allocation amount (584.8 Mt) consisted of 570.1 Mt of free allocation (97.5%) and 14.7 Mt of auctioned allowances (2.5%).

According to the results of the government's verification of the emissions reports submitted by the 687 entities that received allocated emission allowances, the certified emissions for 2021 amounted to 591.0 Mt, which was 6.6% higher than the previous year (554.4 Mt, 636 entities). The amount of emission permits surrendered by covered entities in the 2021 compliance year was 590.98 Mt (686 entities), made up of 583.1 Mt from Korean Allowance Units (KAUs) (98.7%) and 7.9 Mt from Korean Credit Units (KCUs) (1.3%); while most of the emission permits surrendered were KAUs, the amount of KCUs surrendered increased 11-fold compared to the previous year. Penalties will be imposed on one covered entity that failed to meet its obligation to surrender emission permits for 2021 (49 kt).



〈Final allocation and emissions in 2020–2021〉

In addition to emission permits allocated by the government, emission permits banked from the previous compliance year, emission permits borrowed from the next compliance year, or KCUs may be utilized by covered entities to meet their obligation to surrender emission permits. The amount of emission permits banked from the previous compliance year (2020) used by covered entities to surrender and trade emission permits amounted to 17.9 Mt (499 entities). The amount of emission permits carried over to the next compliance year (2022) after the surrender for 2021 was 20.9 Mt (513 entities). The amount of emission permits borrowed from the next compliance year was 0.8 Mt (61

²⁾ Three entities have been added due to the succession of rights and obligations (i.e., designation of new covered entities arising from, for example, the splitting of covered entities).

entities), which was used only in the surrendering of emission permits. In addition, for the 2021 compliance year, a total of 7.9 Mt of Korean Offset Credits (KOCs) (7.1 Mt from domestic projects and 0.8 Mt from overseas projects) was converted to KCU21, all of which was used for the surrendering of emission permits (30 entities).

Broken down by sector, the amount of certified emissions exceeded the final allocation amount in the power, waste, and public services/other sectors, but emissions targets (i.e., final allocation amount) were met in all sectors through the utilization of trading, banking and borrowing of emission permits and offset mechanisms.

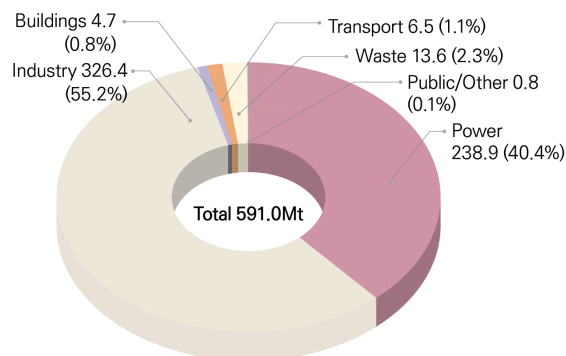
For the 2021 compliance year, the amount of certified emissions for the power sector was 238.9 Mt, which was 22.8 Mt higher than the previous year (10.5%). This was largely due to the increase in the number of covered entities from 36 to 58, which was due to the designation of six new covered entities and the reclassification of 16 covered entities from the industry sector to the power sector following the change in sector classification standards for Phase III.³⁾

The amount of certified emissions from the industry sector increased to 326.4 Mt, which was higher than the previous year by 12.4 Mt (4.0%). The inclusion of process emissions from the petrochemical sub-sector in the coverage of the K-ETS, the establishment and expansion of facilities, and an increase in production following the economic recovery have led to an increase in GHG emissions.

With the relaxation of the government's measures against the coronavirus disease (COVID-19) pandemic, gas, electricity and heat consumption in buildings increased as accommodations, hospitals and educational institutions resumed normal pre-COVID 19 operations. As a result, the amount of certified emissions of 39 covered entities in the buildings sector increased by 13.1% compared to the previous year, from 0.5 Mt to 4.7 Mt.

3) For Phase II, entities falling under "Steam, chilled, or hot water and air conditioning supply" were classified either as "Integrated energy supply (residential)" in the power sector or "Integrated energy supply (industrial)" in the industry sector, but for Phase III, all of these entities are classified as falling under the power sector.

In Phase III, the scope of the transport sector has expanded to include the railway, land/marine passenger, and road freight transport in addition to the air transport, leading to a significant increase in the number of covered entities (from 6 to 62 entities). As a result, the amount of certified emissions for this sector increased by 5.1Mt (348%) compared to the previous year, from 1.5 Mt to 6.5 Mt.



〈Certified emissions by sector in 2021〉

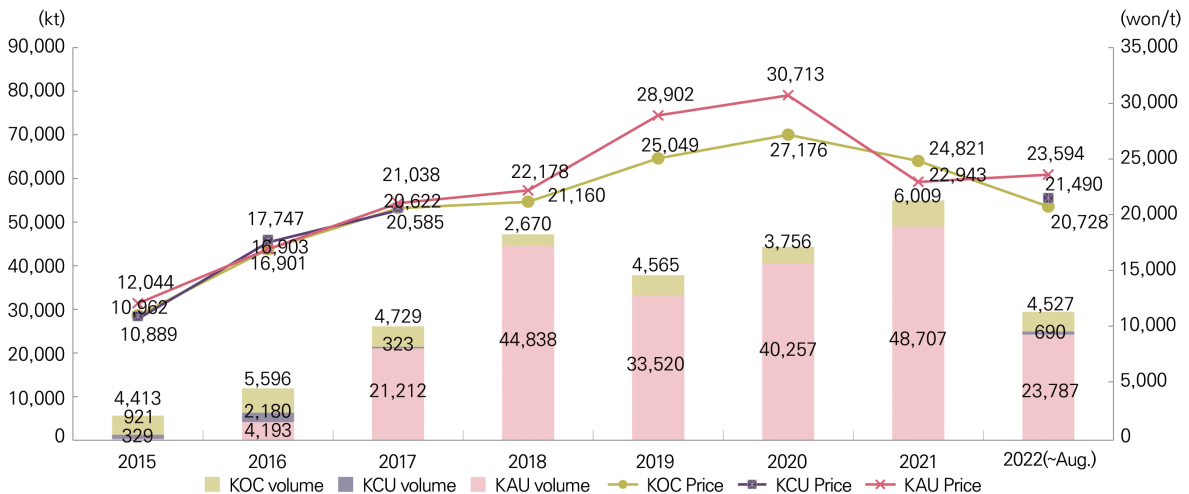
The amount of certified emissions from the waste sector was 13.6 Mt (76 entities), which was 4.2 Mt lower than the previous year (23.4%).

3) Analysis of Emissions Trading Market Performance

A total of 257.2 Mt of emission permits were traded through the exchange and over-the-counter markets during the trading periods in Phases I, II, and III (January 2015–August 2022). Of this, 216.8 Mt of KAUs (84.3%), 4.1 Mt of KOCs (1.6%), and 36.3 Mt of KCUs (14.1%) were traded. Broken down by market type, the trading volume was 120.2 Mt (46.7%) in the exchange market and 137.0 Mt (53.3%) in the over-the-counter market.

The average trading price of emission permits per ton during this period was 24,204 won. The average trading price per ton rose continuously between 2015 and 2020, from 11,013 won to 17,056 won, 20,951 won, 22,120 won, 28,440 won, and 30,411 won, before falling to 23,149 won in 2021 due to the effects of the COVID-19 pandemic. As of August 2022, the average 2022 trading price per ton was 23,097 won.

The continuous increase in the trading price and trading volume from 2015 led to an increase in total payments from 62.4 billion won in 2015 to 204.1 billion won in 2016, 550.3 billion won in 2017, 1,050.9 billion won in 2018, 1,083.1 billion won in 2019, 1,338.5 billion won in 2020, and 1,266.6 billion won in 2021. As of August 2022, the total payments for emission permits for 2022 were 669.9 billion won. The sum of the total payments for emission permits from 2015 to 2022 amounts to 6,225.8 billion won.



〈Trends in the Trading volume and Price by emission permit〉

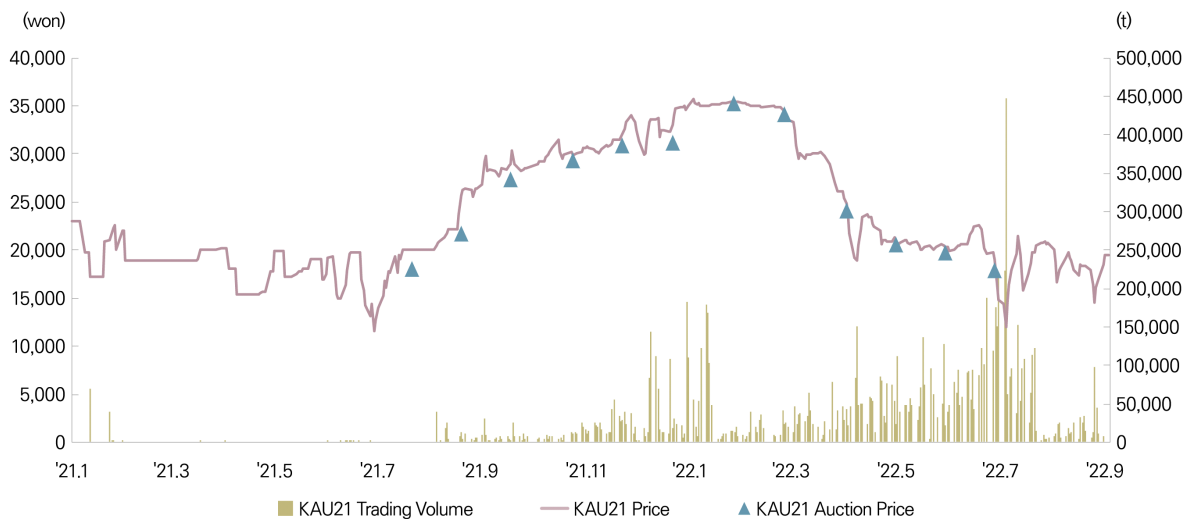
The total volume of KAU21, KCU21, and KOCs traded during the trading period in the 2021 compliance year (January 2021–August 2022), for which KAU21 was listed on the Korea Exchange, was 47.5 Mt. Of this, 36.4 Mt (76.6%) of KAU21, 0.6 Mt (1.2%) of KCU21, and 10.5 Mt (22.2%) of KOCs were traded.

Broken down by market type, the trading volume for KAU21 was 25.1 Mt (52.8%) in the exchange market and 11.3 Mt (23.8%) in the over-the-counter market. On the exchange market, emission permits are traded via real-time trading and block trading, which can be used by all covered entities, or via auctions, which can only be used by covered entities from sub-sectors eligible for auctions. The amount of KAU21 traded via auction was 14.7 Mt, which accounted for the highest proportion of the trading volume for KAU21 (30.9%). The trading volume of KAU21 was 10.0 Mt (21.0%) via real-time trading and 0.4 Mt (0.9%) via block trading. The fact that the amount of emission permits traded via auction accounted for the highest proportion of emission permits traded through both the exchange and over-the-counter markets was a noticeable difference compared with previous compliance years. For KAU20, while the total volume of bids made was 7.1 Mt, the total volume of valid bids was 3.2 Mt, representing only 45.6% of the total volume of bids made, which was a result of the government's temporary suspension of the auctions in consideration of the decrease in the emission permit price and the amount of surplus emission permits available on the market. In contrast, the total volume of bids made for KAU21 was 21.9 Mt and the total volume of valid bids was 14.7 Mt (67.1%).

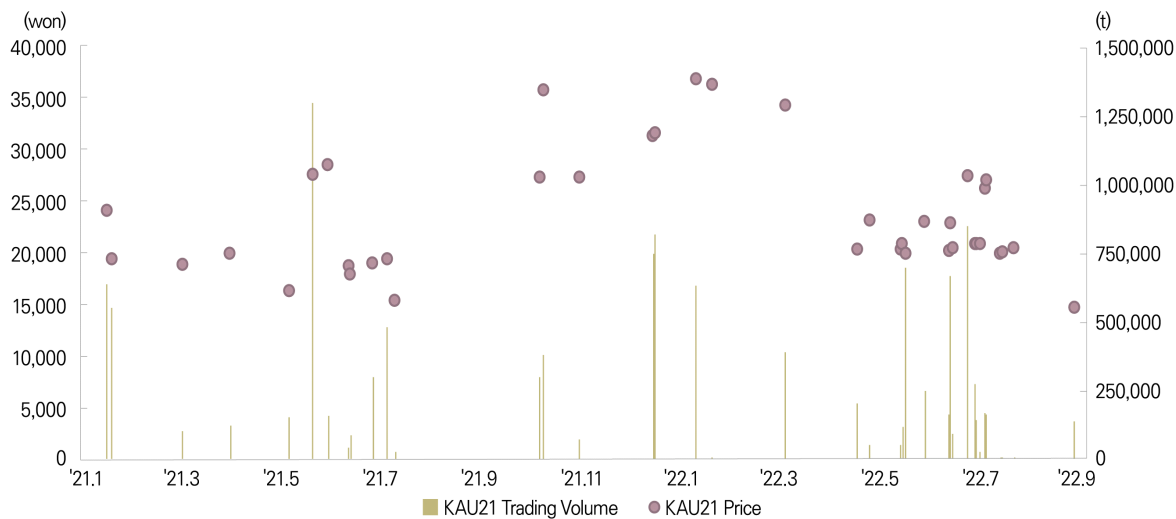
During the exchange trading period for KAU21, the amount sold and purchased by market makers was 1.3 Mt and 2.4 Mt, respectively. The proportion of market-maker trades from the total exchange trading volume for KAU21 (excluding the amount auctioned) was 13.7% for sales and 25.1% for purchases. Considering that the proportion of market-maker trades from the total KAU20 exchange trading volume was 3.7% (1.4 Mt) for sales and 5.2% (2.0 Mt) for purchases, the proportion in the emissions trading market has increased significantly. Securities companies that began to participate in the emissions trading market from December 2021 have sold 106 kt and purchased 566 kt, accounting for 1.1% and 5.9% of the total amount of KAU21 sold and purchased in the exchange market, respectively (excluding the amount auctioned).

The average exchange trading price for KAU21, which was 23,000 won on 4 January 2021, decreased together with a sharp decline in the price for KAU20 and reached 11,550 won on 23 June 2021. It recovered in July and steadily rose after the surrender of KAU20 had ended. The average trading price for KAU21 reached 35,123 won in January 2022 and began to decline from March 2022, largely because covered entities started to trade emission permits, in particular selling surplus permits, more actively after they ascertained the level of their emissions as the deadline to submit emissions reports approached. In June 2022, the average trading price for KAU21 rose to 17,155 won as the trading volume sharply increased for a short period of time with the commencement of the surrender of emission permits for the 2021 compliance year. The average trading price for KAU21 in August 2022 was 24,755 won; this price rise was led by KAU21 trades undertaken by some entities whose surrender of emission permits was delayed due to their objections to certified emissions. The auction price for KAU21 was 17,950–35,250 won. The average exchange trading price during the entire exchange trading period was 23,907 won.

The over-the-counter trading price for KAU21 fluctuated between 15,000 won and 32,000 won until July 2021 without any particular trend. Similar to the exchange trading price, the over-the-counter trading price for KAU21 rose from September 2021 and remained in the range of 27,000 won to 40,000 won until February 2022, with 40,000 won being the highest price for KAU21 traded in the over-the-counter market. The price sharply declined from March 2022 and remained in the range of 20,000 won to 23,000 won. The price ultimately dropped to 14,700 won in August 2022 (for a single transaction), which was the lowest over-the-counter trading price for the 2021 compliance year, which ended in August 2022.



〈Trends in Trading volume and Price for KAU21 in the Exchange market〉



〈Trends in Trading volume and Price for KAU21 in the Over-the-counter market〉

4) Analysis of a Survey of Covered Entities

A survey was conducted with covered entities in the K-ETS regarding their views of the K-ETS and its implementation, the patterns of emissions trading, the prospects for the price of emission permits, and the GHG emission reduction efforts and performance. A total of 686 covered entities were selected for the survey, of which 264 (38.5%) responded.

According to the survey results, covered entities were generally supportive of the K-ETS (positive: 58.3%; negative: 12.5%) and consider it absolutely necessary to achieve Korea's NDC (positive: 64.0%; negative 11.7%). In addition, the respondents reported that the K-ETS contributes to GHG reduction targets in a cost-effective manner (positive: 47.3%; negative: 18.2%).

The covered entities reported that they have actively invested to respond to the K-ETS and reduce GHG emissions, which has resulted in an increase in the costs of external consulting services to respond to the K-ETS, costs of exploring and applying low-carbon technologies, and costs of management and process improvement.⁴⁾ The proportion of negative responses was higher regarding additional profits from emission permit trading, the strengthening of corporate competitiveness at the domestic/international level through environmental business operations, a reduction in operational and management costs through internal emission reduction efforts, and the strengthening of product/service competitiveness against similar products/services in the same industry through internal innovation.⁵⁾ Considering these results, it appears that the operation of the K-ETS has not yet led to a strengthening of corporate competitiveness or an increase in corporate profit.

The key measures taken in response to the K-ETS included participation in emission permit trading (67.4%), internal investment in facilities and technologies to reduce GHG emissions (40.2%), the establishment of strategies to reduce GHG emissions and to respond to the K-ETS (22.0%), and the

4) An increase in the costs of external consulting services (positive: 52.7%; negative: 20.1%); an increase in the costs of exploring and applying low-carbon technologies (positive: 42.8%; negative: 23.1%); an increase in the costs of management and process improvement (positive: 39.8%; negative: 27.7%); an increase in the costs of establishing a taskforce and securing manpower to respond to the K-ETS (positive: 33.7%; negative: 35.6%).

5) An increase in additional profits from emission permit trading (positive: 32.7%; negative: 44.7%); the strengthening of corporate competitiveness at the domestic/international level through environmental business operations (positive: 22.3%; negative: 37.5%); a reduction in operational and management costs through internal emission reduction efforts (positive: 20.8%; negative: 46.6%); the strengthening of product/service competitiveness against similar products/services in the same industry through internal innovation (positive: 17.4%; negative: 46.6%).

use of external consulting services (18.9%), which were similar to the results of the surveys conducted after the completion of Phases I and II (2018 and 2020).

With regard to the methods of surrender for the 2021 compliance year, 59.8% of covered entities reported that they were able to meet their obligation to surrender emission permits through allocated emission permits (i.e., KAUs) alone. In terms of additional measures taken, the most common response was that the entities had engaged in emissions trading (78.3%). However, decision-makers within the entities preferred to minimize the purchase of emission permits and secure a reduction in emissions (39.8%) or bank surplus emission permits for the next compliance year (59.5%) to respond to the K-ETS, which is a trend that has continued since Phase II. Of the entities with surplus emissions in the 2021 compliance year (75.8%), the number of entities that responded that carrying the permits over to the next compliance year was their primary option (78.5%) outnumbered the number of entities that responded that they wanted to sell them on the market (21.5%).

The proportion of entities preferring to bank surplus emission permits has decreased over time from Phase I to Phase III, which appears to be a result of the strengthening of the restrictions on the banking of emission permits. The reasons for choosing to carry over the emission permits included an increase in emissions expected due to the growth of the company and an increase in production (34.4%), an expected increase in the price of emission permits due to a supply shortage of emission permits on the market (34.4%), and the deferment of decision-making on selling due to uncertainty regarding the market and policy (30.6%).

In terms of the methods for the trading of emission permits to be mainly used during Phase III, the number of entities that stated that they will trade emission permits through the Korea Exchange accounted for the highest proportion (86.4%), followed by those saying that they will trade them in the over-the-counter market (12.9%); a small number of entities responded that they will not engage in emissions trading (0.8%). Compared to the 2019 survey, the number of entities that stated that they will not engage in emissions trading (previously 5.5%) has decreased. In terms of the type of trading to be employed, the most common type of trading to be employed was spot trading for both the exchange and over-the-counter trades (exchange: 86.4%, over-the-counter: 55.9%).

In terms of the implementation of internal emission reduction activities in the 2021 compliance year, 39.4% of the responding entities reported that they have implemented these activities. Key activities undertaken by the entities included the installation of high-efficiency equipment and improvement of equipment performance (59.6%), recovery and utilization of unused thermal energy (31.7%), electricity generation and self-consumption using renewable energy (30.8%), and conversion from conventional to low-carbon fuels (26.9%). In addition, key actions taken by entities that have carried out external emission reduction projects (14.4%) included the use of new renewable energy (39.5%), transport measures including conversion to electric vehicles (18.4%), use of bioenergy (15.8%), and forest carbon absorption (13.2%). These results were similar to the results of the survey on planned future reduction projects. Specific projects that were planned to be implemented had a focus on equipment replacement with the aim of improving energy efficiency, including the installation of high-efficiency LED lighting, boilers, and inverters.

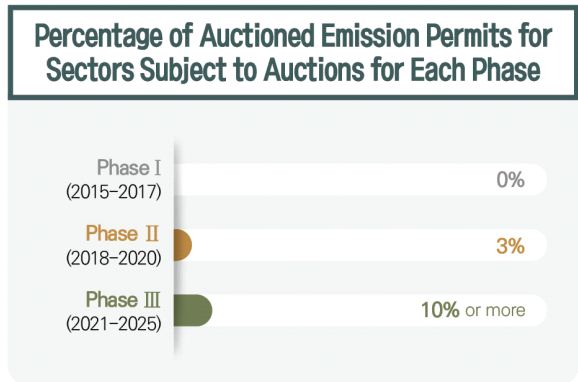
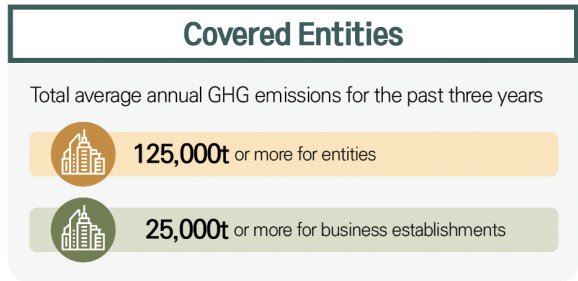
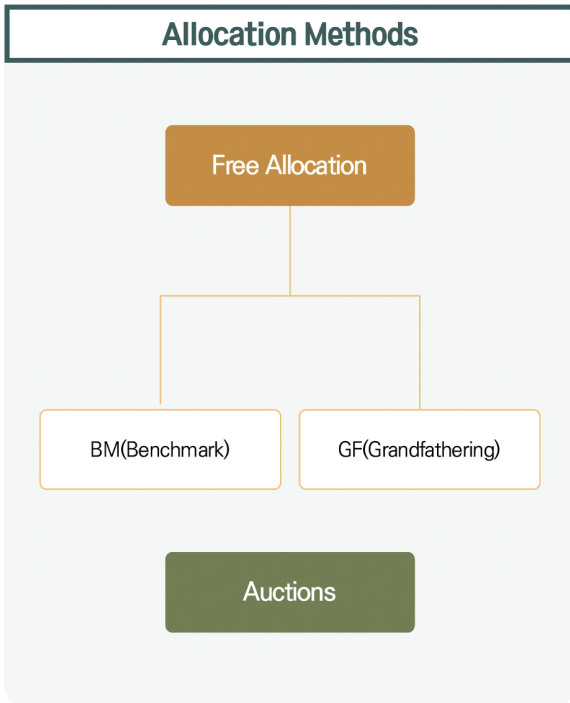
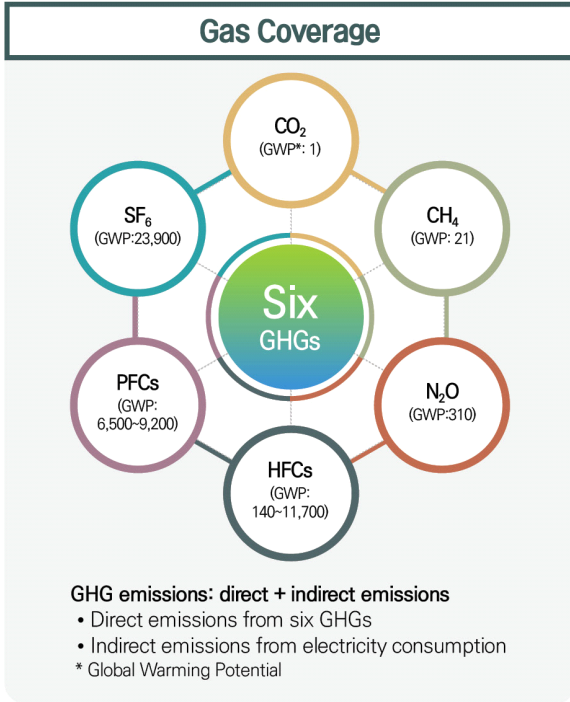
Similar to the results of the 2020 survey, in terms of the strategies necessary for the improvement of the K-ETS, the responding entities chose as the main three priorities the expansion of allocation incentives for entities pursuing GHG reduction efforts (48.1%), the presentation of consistent policies from a long-term perspective (43.9%), and financial support for the introduction of technologies to reduce GHG emissions (26.9%). In terms of the strategies for improving and supporting internal emission reduction activities, the responding entities emphasized financial support for the introduction of low-carbon facilities and technologies (61.4%) and, in terms of the support necessary for external emission reduction projects, the responding entities requested that the government actively search for external project models that apply new reduction methods (44.3%) as the main priority.

To provide government support for the active implementation of these internal and external emission reduction activities, financial resources are required. It appears that the responding entities believe financial resources can be gained from the revenue generated from emission permit auctions. The responding entities stated that the revenue should be used to finance the costs of introducing low-carbon technologies and related consulting services (63.3%), to finance the costs of using low-carbon energy sources and related consulting services (51.5%), to invest in R&D for low-carbon technologies (45.8%), and to provide a public resource for the implementation of climate change response policies (40.5%).

In terms of forecasting the average emission permit price for 2023, with reference to the closing price for KAU22 on 28 September 2022 (25,000 won), 54.9% of the responding entities expected an increase, 29.9% expected a steady price, and 15.2% expected a decrease. The top three reasons for expecting an increase in price were an expected insufficient allocation (64.8%), an insufficient supply in the emissions trading market (32.4%), and an increase in the demand for emission permits due to an increase in production resulting from the booming economy (22.8%).

K-ETS at a Glance

1. K-ETS Overview



Reserve

Market Stabilization	Additional allocation to manage the market price and liquidity, which is deemed necessary when the price of emission permits suddenly fluctuates or the supply of emission permits falls noticeably short of demand, thus making trading between covered entities difficult, etc.
Market Making	A market maker such as a public financial institution suggests a standard price for emission permits and participates in the trading market to ensure market liquidity
Use for Other Purposes* (Power and Other)	Adjusting allocation, such as allocation to new entrants and voluntarily participating entities, additional allocation for the establishment and expansion of facilities, and additional allocation for reduction contributions <small>*This reserve is divided into "power" and "other" in order to ensure fairness between sectors</small>

Flexibility Mechanisms

Offset	If a covered entity possesses or acquires GHG reduction credits generated outside the scope of business operations monitored by the K-ETS, it may convert all or part of them into emission permits, which can be used for trading or compliance
Banking	Surplus emission permits may be carried over to the next compliance year
Borrowing	If emission permits are insufficient to meet the surrender obligation, a portion of allocated emission permits may be borrowed from the next compliance year within a single phase

Calculation of the Cap

Step 1	• Calculate the average sectoral reduction targets for the relevant phase
Step 2	• Calculate the sectoral emissions coverage* from the ETS for the base year <small>*ETS emissions coverage = average emissions of the covered entities for the base year / average national emissions for the base year</small>
Step 3	• Calculate the sectoral ETS cap* for the relevant phase <small>*sectoral ETS cap = average sectoral reduction targets for the relevant phase × ETS emissions coverage for the base year</small>
Step 4	• Calculate the ETS cap for the relevant phase (i.e., summing the ETS cap for each sector)

2. K-ETS Operational Results

Number of Covered entities by Compliance year

Type	2015	2016	2017	2018	2019	2020	2021
Pre-allocation & New entities	525	525	525	591	587	604	684
Final allocation entities	522	564	592	587	611	637	687
Certified entities	522	560	591	586	610	636	687

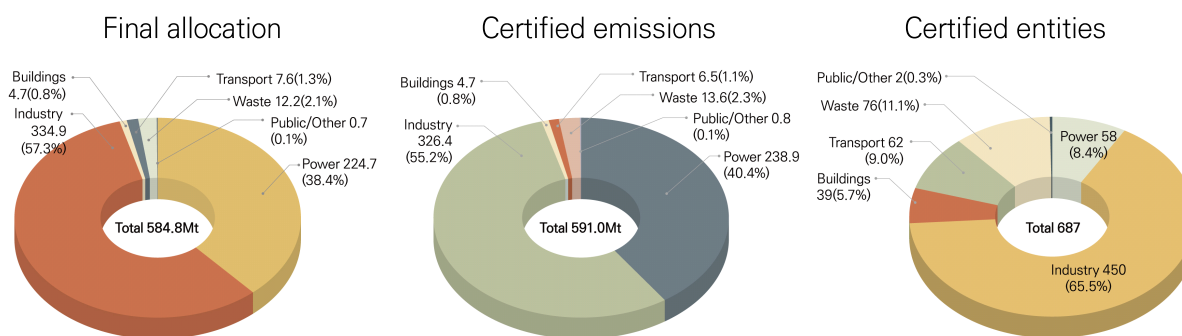
1) Pre-allocation and new entities: number of entities designated for pre-allocation and new entry allocation before the commencement of a compliance year

2) Final allocation entities*: number of entities after reflecting all changes that occur after pre-allocation and new entry allocation

3) Certified entities*: number of entities holding the obligation to surrender emission permits

* The designation of covered entities or the obligation to surrender emission permits can be canceled due to allocation revocation or mergers according to succession of rights and obligations during a compliance year

Distribution by Sector



Compliance Results

2015	2016	2017	2018	2019	2020	2021
99.8%	100.0%	99.7%	99.8%	99.8%	99.8%	99.9%
(521/522)	(560/560)	(589/591)	(585/586)	(609/610)	(635/636)	(686/687)

Trading Market Performance

Total trading volume grew 10x / Average trading price grew 2x / Total payments grew 20x from 2015 to 2021

Type	2015	2016	2017	2018	2019	2020	2021
Trading volume (Mt)	5.7	12.0	26.3	47.5	38.1	44.0	54.7
Average price (KRW/t)	11,013	17,056	20,951	22,120	28,440	30,411	23,149
Payments (100 mil. KRW)	624	2,041	5,503	10,509	10,831	13,385	12,666

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2022

K-ETS Annual Report

PART

I

K-ETS Overview

1. Overview of the K-ETS and Operational direction
2. Operation of the K-ETS

1

Overview of the K-ETS and Operational Direction

1.1 Overview

An emissions trading system is a market-based greenhouse gas (hereafter “GHG”) reduction scheme in which the government sets an emissions cap and allocates annual emission allowances to entities emitting more than a certain amount of GHGs so that they can emit GHGs up to the limit set by the emission allowances they hold. If a covered entity emits a lower amount of GHGs than the emission permits it secures, it can sell the surplus through market transactions. Conversely, if a covered entity emits a higher amount of GHGs than its emission permits allow, it can make up the deficit through auction or market transactions. In this sense, the emissions trading system is more cost-effective than direct regulation in terms of reducing GHG emissions.

The Korean Emissions Trading System (hereafter “K-ETS”) was launched in 2015, with its legal basis established in 2012 through the enactment of the Act on the Allocation and Trading of Greenhouse-Gas Emission Permits (May 2012) (hereafter “the Act”) and the associated Enforcement Decree of the Act (November 2012) (hereafter “the Enforcement Decree”), followed by the establishment of the Master Plan for the Emissions Trading System (January 2014), the Allocation Plan for Phase I (2015–2017) and relevant guidelines, which stated the total emission allowances that were connected with Korea’s Nationally Determined Contribution (hereafter “NDC”) and provided details of the operation of the K-ETS.

► **Summary of the K-ETS operational results for the Third compliance year of Phase II (2020)**

In 2020, which was the last compliance year of Phase II, a total of 562.5 Mt of emission allowances (559.3 Mt from free allocation and 3.2 Mt from auctioned allowances) were allocated to 637 entities from 64 sub-sectors. The final amount of certified emissions at the end of the 2020 compliance year was 554.4 Mt from 636 entities, which was 5.7% lower than the previous year (587.9 Mt from 610 entities). The total amount of KAU20 traded through the exchange and over-the-counter markets, including auctions, from November 2018 to August 2021 was 41.3 Mt. The final amount of emission permits surrendered by covered entities to the government at the end of the 2020 compliance year was 554.4 Mt from 635 entities (553.7 Mt of KAUs and 0.7 Mt of KCUs). Penalties were imposed on one covered entity that failed to meet its obligation to surrender its emission permits (5.4 kt). In addition, after the surrender for 2020, 17.9 Mt of emission permits were carried over to the next compliance year (2021).

〈Table I -1〉 Operational direction by Phase in the Master plan

Type	Phase I (2015~2017)	Phase II (2018~2020)	Phase III (2021~2025)
Main Objectives	<ul style="list-style-type: none"> Acquire experience and stabilize the K-ETS 	<ul style="list-style-type: none"> Substantially reduce GHG emissions 	<ul style="list-style-type: none"> Promote effective reductions
Operations	<ul style="list-style-type: none"> Improve flexibility e.g., the ratio of offset credits, etc. Establish necessary infrastructure for accurate Monitoring, Reporting, and Verification (MRV) 	<ul style="list-style-type: none"> Expand the applicable scope and raise the targets Develop various standards, e.g., emissions reporting, verification, etc. 	<ul style="list-style-type: none"> Reinforce the cap based on the Roadmap Expand market functions by strengthening the functions of market makers, introducing derivatives in the exchange, etc.
Allocation	<ul style="list-style-type: none"> Allocate all emission permits free-of-charge Apply lessons learned from the GHG and Energy Target Management System 	<ul style="list-style-type: none"> Introduce auctions Develop allocation methods, e.g., benchmarking, etc. 	<ul style="list-style-type: none"> Improve the criteria for selecting sub-sectors eligible for free allocation and expand the ratio of auctions Expand the use of benchmarking for allocation

Source: Master Plan for the Emissions Trading System (Ministry of Economy and Finance, 2017)

For Phase II (2018–2020), the government expanded the scope of the K-ETS and adjusted specific emission reduction targets to be consistent with Korea’s NDC in order to raise emission reduction targets so that they were higher than the level achieved in Phase I and gradually increase the size of the reduction in GHG emissions by covered entities. To this end, in 2017, the government prepared the Master Plan for the Emissions Trading System for Phase II (January 2017) to establish the basic direction for the K-ETS during Phase II and the Allocation Plan for Phase II: Step 1 (2018–2020)

(December 2017) to establish detailed regulations for the K-ETS including the cap.

In 2018, an amendment to the Basic Roadmap for Achieving 2030 National GHG Reduction Targets (July 2018) (hereafter “the amended Roadmap”) was completed, and the government subsequently announced the Allocation Plan for Phase II: Step 2 (2018–2020) (July 2018), which reflected the amended Roadmap and added further detailed standards, such as total emissions allowances (1,796.1 Mt), and standards for auctions and benchmark-based allocations.

An imbalance in the supply and demand for emission permits arose during Phase II as a result of surplus emission permits not being traded due to the unrestricted permission for the banking of surplus emission permits. In order to solve this problem, in June 2019, the government amended the Allocation Plan for Phase II: Step 2 (2018–2020) and introduced new criteria for the banking of emission permits.

In December 2019, the government prepared the Master Plan for the Emissions Trading System for Phase III, which aimed to pave the way for the achievement of Korea’s NDC. The Master Plan established strategies to further develop allocation methods, substantially reduce GHG emissions, and expand market functions in order to strengthen the efficacy of the K-ETS. In addition, the Allocation Plan for Phase III (2021–2025) (September 2020), which contained detailed standards, such as total emissions allowances (3,082.3 Mt), standards for free allocations and auctions, and benchmark-based allocations, was established for the implementation of these strategies.

In October 2021, the government announced the updated NDC, under which the country has set an enhanced target of reducing its total national GHG emissions by 40% from the 2018 level by 2030, with the aim of achieving the goal of carbon neutrality. The enhanced NDC was adopted in close consideration of the purpose of Korea’s carbon neutrality policy⁶⁾ and its role as a member of the international community.

Phase III of the K-ETS commenced in 2021. The K-ETS, which has been developed with the goal of establishing a stable system for Phase I and reducing a significant amount of national GHG emissions

6) The Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis stipulates the government shall set the target of reducing national GHG emissions by a minimum of 35% from the 2018 level by 2030 (Art. 8(1)). The amount of GHG emissions in 2018 was 727.6 Mt, and the target amount of GHG emissions for 2030 is 436.6 Mt.

for Phase II, plays a pivotal role in achieving Korea's NDC. Institutional improvements, such as the revitalization of the emissions trading market, improvement of allocation methods, and adjustment of the emissions cap, are required to efficiently support the achievement of the enhanced NDC.

<Table I -2> National policies for GHG reductions and the K-ETS in Phase II and III

Type		Phase II (2018~2020)	Phase III (2021~2025)
National policies for GHG reductions	Reduction target	• Reduction by 37% from BAU (Business -as-usual) levels in 2030 (Jun. 2015)	• Reduction by 40% of the total GHG emissions in 2018 by 2030 (Oct. 2021)
	Sectoral plan	• Basic roadmap for achieving 2030 national GHG reduction targets (Dec. 2016)	• Amendment to the basic roadmap for achieving 2030 national GHG reduction targets (Jul. 2018)
GHG Emissions Trading System	Master plan	• Master plan for the Emissions Trading System for Phase II (Jan. 2017)	• Master plan for the Emissions Trading System for Phase III (Dec. 2019)
	Allocation plan	• Allocation plan for Phase II: – Step 1 (Dec. 2017) ¹⁾ – Step 2 (Jul. 2018) ²⁾ – Step 2 amended (Jun. 2019) ³⁾	• Allocation plan for Phase III (Sep. 2020) ⁴⁾

1) Details on the allocation for Phase II, and the cap (538.5 Mt) for the first compliance year (2018) and reserve (14.0 Mt) are specified.

※ It was decided that the cap for Phase II would be determined in the Allocation Plan for Phase II: Step 2, taking into consideration the national policies including the amended Roadmap (2018). The amount of emissions allowances for 2018 (Allocation Plan Step 1) would be maintained and guaranteed after the amount of emissions allowances for the Allocation Plan Step 2 was determined, however, the emission permits for 2019 would be adjusted if those for '18 increased or decreased.

2) Details for Phase II such as the cap (1,777.1 Mt), total emissions allowances (1,796.1 Mt), and standards for auctions and benchmark-based allocation were added and specified.

3) Standards for the banking of emission permits across compliance years within Phase II and etc. were revised.

4) Details on the allocations for Phase III and the cap (3,048 Mt) and reserve (34.0 Mt) were specified.

〈Table I -3〉 Guidelines for the K-ETS in Phase III

Type	Guidelines
Allocation· Revocation	<ul style="list-style-type: none"> Guidelines for the Allocation and allocation revocation of GHG emission permits (Ministry of Environment, partially amended in December 2021)
Reporting· Certification	<ul style="list-style-type: none"> Guidelines for the Reporting and certification of emissions under the GHG Emissions Trading System (Ministry of Environment, partially amended in January 2022)
Verification	<ul style="list-style-type: none"> Guidelines for the Verification for the operations of the GHG Emissions Trading System (Ministry of Environment, partially amended in June 2021)
Emissions Trading	<ul style="list-style-type: none"> Regulations for the Additional allocation of emission permits for auctions and market stabilization measures (Ministry of Environment, partially amended in May 2020) Notification on GHG emission permits trading (Ministry of Environment, partially amended in May 2018) Notification on Qualifications and evaluation standards for an emission permits exchange (Ministry of Environment, partially amended in May '18) Notification on the Supervision of an emission permits exchange (Ministry of Environment, partially amended in May 2018) Notification on the Designation and operations of market makers in the emission permits trading market (Ministry of Environment, partially amended January 2021) Notification on Emissions trade brokerage companies (Ministry of Environment, newly enacted in October 2021)
Offset mechanisms	<ul style="list-style-type: none"> Guidelines for the Feasibility Assessment of Offset Projects and the Certification of Reductions (Ministry of Environment, partially amended in May 2021)

1.2. Operation of the K-ETS in the 2021 Compliance Year

The most significant changes in the K-ETS during Phase III are the improvement of allocation methods and the introduction of third-party trading. In particular, with regard to allocation methods, the proportion of auctions and benchmarking-based allocations has increased.

1.2.1. Expansion of Auctions

With the commencement of Phase III, taking into account international trends and covered entities' GHG emission reduction performance in previous phases, the government raised the proportion of auctionable allowances from 3% to 10% of the total amount of emission permits allocated to entities in sub-sectors eligible to use auctions.

For Phase II, (i) sub-sectors with a trade intensity of no less than 30%, (ii) sub-sectors with a production cost of no less than 30%, and (iii) sub-sectors with a trade intensity of no less than 10% and a production cost of no less than 5% were eligible for free allocation.

However, considering international trends including the practices of the EU, the method of selecting sub-sectors eligible for free allocation was changed. For Phase III, entities, local governments, schools, hospitals, and public transportation operators belonging to sub-sectors whose trade intensity multiplied by their production cost is no less than 0.002 (0.2%) were selected as eligible for free allocation. As a result, free allocation is available for 28 of the 69 sub-sectors in Phase III.

〈Table I -4〉 Sub-sectors subject to Free allocation by Phase

Type	Phase II (2018~2020)	Phase III (2021~2025)
Selection method	<ul style="list-style-type: none"> Sub-sectors with a trade intensity of no less than 30% Sub-sectors with a production cost incurrence rate of no less than 30% Sub-sectors with a trade intensity of no less than 10% and a production cost incurrence rate of no less than 5% 	<ul style="list-style-type: none"> Sub-sectors whose trade intensity multiplied by their production cost incurrence rate is no less than 0.002 (0.2%) Local governments, schools, hospitals, and public transportation operators
Sub-sectors	• 37 of the 62 sub-sectors in Phase II	• 28 of the 69 sub-sectors in Phase III

〈Table I-5〉 presents the number of entities eligible for auctions and the proportion of auctionable allowances in the pre-allocation stage for each compliance year. During Phase III, both the number of entities and the proportion increased by approximately 2% compared to Phase II.

〈Table I-5〉 Number of entities and the Proportion of allowances subject to auctions by compliance year

Type	2018	2019	2020	2021
Entities	116/591	119/587	122/604	192/684
Proportion (%)	1.34	1.22	1.21	3.85

Note: The number of entities subject to auctions and the proportion of auctionable allowances were calculated based on the pre-allocation amount for each compliance year. The results may be different when these are calculated based on the final allocation amount.

1.2.2. Expansion of the Use of Benchmarking-Based Allocation

The allocation methods for emission permits are grandfathering, under which emission permits are allocated based on past GHG emissions, and benchmarking (hereafter “BM”), under which emission permits are allocated based on GHG emissions intensity. While a structural limitation of the grandfathering method is that it is difficult for entities to have their GHG emission reduction performance recognized, the BM method does not suffer from this issue; accordingly, entities find it advantageous to utilize benchmarking for the more efficient allocation of emission allowances.

During Phase II, the BM allocation method covered approximately 52% of the total GHG emissions for the base period (2014–2016). However, during Phase III, it increased by approximately 64% of the total GHG emissions for the base period (2017–2019) due to the addition of five sub-sectors subject to BM allocation (steel, petrochemicals, buildings, pulp, and wood). For Phase III, business establishments, processes, and facilities with a low emission efficiency within these newly designated sub-sectors can employ the grandfathering allocation method as an exception.

〈Table I -6〉 BM sub-sectors by Phase

Phase I (2015~2017)	Phase II (2018~2020)	Phase III (2021~2025)
Oil refining, cement, aviation	Oil refining, cement, aviation + district cooling and heating, integrated energy supply (industrial), integrated energy supply (residential), waste	Oil refining, cement, aviation, district cooling and heating, integrated energy supply (industrial), integrated energy supply (residential), waste + steel, petrochemicals, buildings, pulp, wood

1.2.3. Proprietary Trading by Securities Companies

The volume of emissions trading has gradually increased since the introduction of the K-ETS in 2015. However, because only covered entities are able to participate in transactions, trades have primarily occurred during the settlement period for emission permits (June to August every year), causing trading prices to constantly fluctuate. To ensure the transparency of the emissions trading market and to stabilize prices by revitalizing the market, the government has enabled third-party participation in emissions trading. Consequently, proprietary trading by securities companies was launched in September 2021, under which securities companies trade emission permits under their own name and account. Starting in December 2021, 20 securities companies are now participating in the exchange market under the condition that each securities company may hold a maximum of 500 kt of emission permits (as of December 2022).

In the 2021 compliance year, the amount of KAU21 purchased by the 20 securities companies was 56.6 Mt, while the amount sold was 10.6 Mt, which accounted for 2.7% and 0.5% of the total amount of KAU purchased and sold, respectively. This indicates that the level of participation of the securities companies in emissions trading is not significant. However, it is expected that the volume of emissions trading will increase further when third-party consignment trading (under which securities companies are consigned by another entity to trade emission permits on behalf of that entity) and on-exchange futures trading are introduced, which will expand the scope and number of participants in the emissions trading market.

〈Table I –7〉 Legal grounds for the Proprietary trading in Phase III

Type	Legal grounds	Details
Definition	Art. 22 of the Act Art. 36 of the Enforcement Decree	<ul style="list-style-type: none"> • Matters necessary for emissions trade brokerage companies – A emissions trade brokerage company is an investment broker that simultaneously brokers transactions of emission permits for multiple parties through an information and communications network or an information processing system
Consultative body	Art. 3 of the Notification	<ul style="list-style-type: none"> • A consultative body in which emissions trade brokerage companies participate may be organized to consult on institutional improvements related to the brokerage of emissions trades and to discuss policy proposals, etc.
Facility criteria	Art. 2 and Annex of the Notification	<ul style="list-style-type: none"> • Facilities for data processing, communication, security, and etc. that brokerage companies must maintain are stipulated

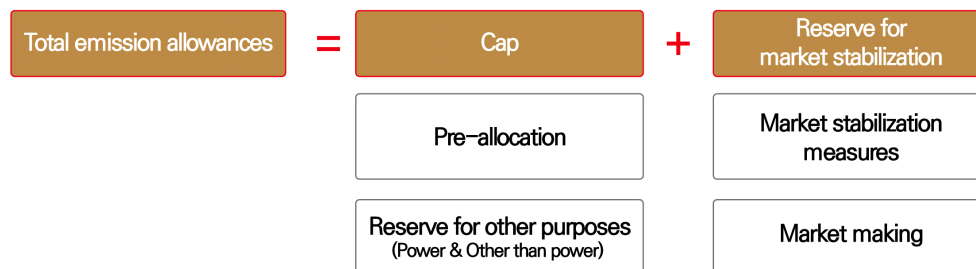
Source: Act on the Allocation and Trading of Greenhouse-Gas Emission Permits and its Enforcement Decree (Ministry of Environment, Ministry of Economy and Finance, and Office for Government Policy Coordination; amended on 24 September 2021 and 25 March 2022, respectively due to the revision of another statute).
Notification on Emissions Trade Brokerage Companies (Ministry of Environment, enacted on 19 October 2021).

2

Operation of the K-ETS

2.1. Cap

The cap is the total amount of GHG emissions that all covered entities are allowed to emit during a phase, and this is managed by the K-ETS as the emissions target. In addition to the cap, a reserve is established separately, and the sum of the two is the total emission allowances. The reserve is divided into three purposes: (i) market stabilization measures, (ii) market-making and liquidity management, and (iii) other purposes (power and other than power)⁷⁾. The reserve for market stabilization measures and the reserve for market-making and liquidity management operate separately from the cap, whereas the reserve for other purposes is included in the cap.



〈Figure I -1〉 Concept of total emission allowances

The cap is established based on the Basic Roadmap for Achieving National GHG Reduction Targets as provided under Article 5(1) of the Act. The method of calculation used to establish the cap for Phase III is illustrated in 〈Figure I-2〉.

⁷⁾ Taking into consideration factors such as the scale of GHG emissions and differences in the application criteria for the additional allocation of emission permits, the reserve allocated to other purposes is divided into those related to power and those that are non-power-related.

Step 1	Calculate the average sectoral GHG reduction targets(based on the 2018 amended Roadmap) for Phase III (2021~2025)
Step 2	Calculate the sectoral emissions coverage from the ETS* for the base years (2017~2019) * ETS emissions coverage = average emissions of the covered entities (2017~2019) / average national emissions (2017~2019)
Step 3	Calculate the sectoral ETS cap* for Phase III (2021~2025) * Sectoral ETS cap (2021~2025) = average sectoral reduction targets (2021~2025) × ETS emissions coverage (2017~2019)
Step 4	Calculate the overall ETS cap for Phase III (2021~2025) (i.e., summing the cap for each sector)

〈Figure I -2〉 Calculation for the cap for Phase III

〈Table I -8〉 Total emission allowances for Phase III

(Unit : Mt)

Type		2021	2022	2023	2024	2025	Total amount	
Total emissions allowances		-	-	-	-	-	3,082.3	
Reserve	Market stabilization measures ¹⁾	-	-	-	-	-	14.0	
	Market making ²⁾	-	-	-	-	-	20.0	
	Other purposes ³⁾	Power	-	-	-	-	-	72.7
		Other than power	-	-	-	-	-	73.5
Pre-allocation		589.3	589.3	589.3	567.1	567.1	2,902.1	
Power sector ⁴⁾	Power in general	215.1	215.1	215.1	197.9	197.9	1,041.1	
	Other power-related	5.0	5.0	5.0	4.7	4.7	24.6	
	Integrated energy supply (Industrial)	14.9	14.9	14.9	14.3	14.3	73.3	
Industry sector		328.5	328.5	328.5	325.4	325.4	1,636.3	
Buildings sector		4.8	4.8	4.8	4.7	4.7	23.7	
Waste sector		8.3	8.3	8.3	8.0	8.0	41.0	
Public services/Other sectors		12.0	12.0	12.0	11.3	11.3	58.5	

1) This reserve is utilized for the additional allocation of emission permits for the stabilization of prices, etc., in case of the following abnormalities in the emissions trading market (Art. 18, subpara. 3 and Art. 23(1) of the Act; Art. 38 of the Enforcement Decree):

- If the price of emission permits is, for six consecutive months, at least three times higher than the average price for the immediately preceding two years;

- If the average trading volume in the previous month is at least twice as high as the monthly average trading volume in the same month in the immediately preceding two years, and the average emission permit price in the previous month is at least twice as high as the average price in the immediately preceding two years;

- If the average price of emission permits in the previous month does not exceed 60% of the average price in the immediately preceding two years;

- If the trading of emission permits between covered entities is impracticable because the supply of emission permits tradable in the market is significantly short of the amount demanded due to reasons such as covered entities' not trading emission permits in their possession.

2) This reserve is utilized by market makers, such as public financial institutions, to revitalize the emissions trading market (Art. 18, subpara. 2 and Art. 22-2 of the Act).

3) This reserve is utilized for the additional allocation of emission permits in the case of increased GHG emissions due to the opening of new business establishments, the establishment or expansion of facilities within a business establishment, a covered entity's compliance with its obligations under other laws,* or the covered entity's engagement in activities contributing to the achievement of the NDC** (Art. 16(1) of the Act); for the allocation of emission permits to new entrants that are newly designated as covered entities during a phase (Art. 30, subpara. 1 of the Enforcement Decree); and for the processing of objections to pre-allocation, additional allocation, and the revocation of emission permits (Art. 18, subpara. 4 of the Act).

*Constrained-on generation under Article 45(2) of the Electric Utility Act, observance of the obligation to supply integrated energy under Article 16(1) of the Integrated Energy Supply Act, additional flight operations to observe the flight technology standards under Article 77 of the Aviation Safety Act, and facility construction to comply with stronger effluent water quality standards under Article 7 of the Sewerage Act.

**Observance of measures implemented for the expansion of public transportation and transport of large and heavy cargo, and the use of combustible waste instead of fossil fuel.

4) In principle, the cap is established for each sector but, in the power sector, sub-sector-specific (power in general, other power-related, and integrated energy supply(industrial)) caps were established as an exception for some sub-sectors/entities/business establishments* with different GHG emission characteristics.

*Entities belonging to the “electric power generation, transmission, and distribution” (KSIC Code: 351) that mainly use hydropower or nuclear power for power generation, or whose main business is power transmission/substation/distribution, or natural gas terminals; entities belonging to the “manufacture of gas and distribution of gaseous fuel through the mains” (KSIC Code: 352); and entities engaged in integrated energy supply (industrial/residential) belonging to the “steam, chilled, or hot water and air conditioning supply” (KSIC Code: 353).

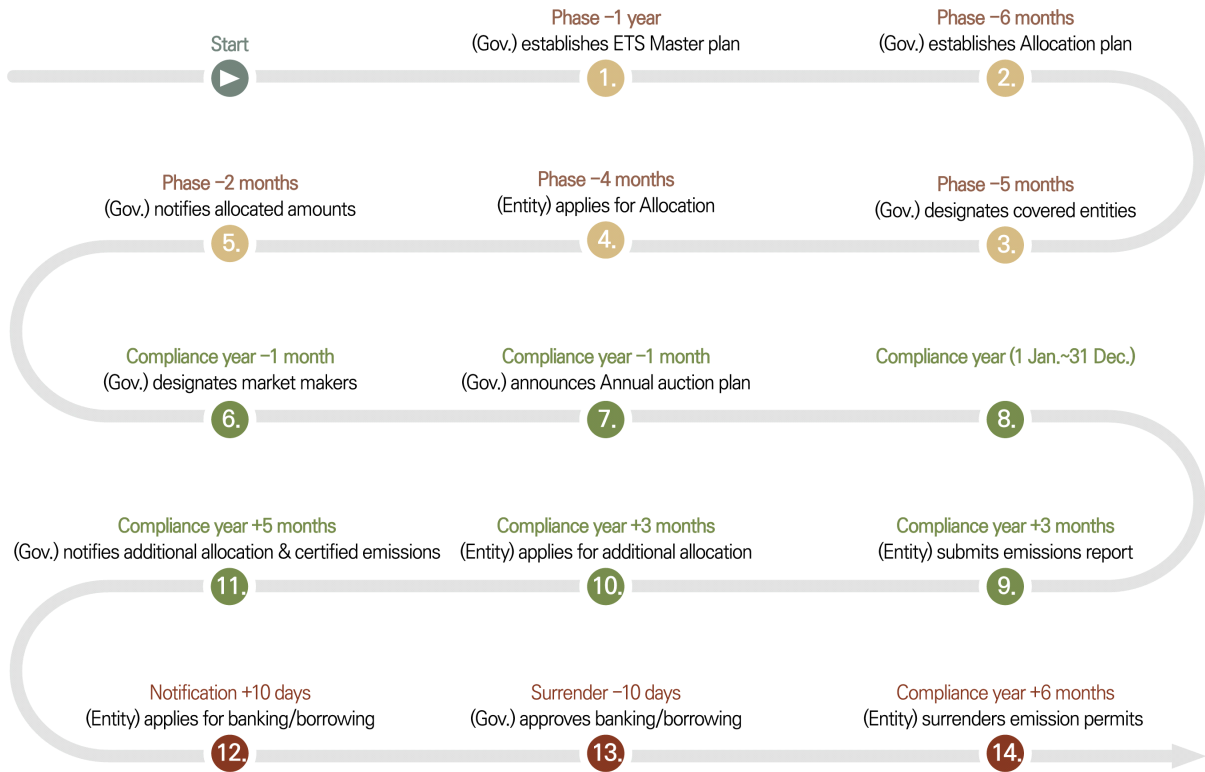
Source: Allocation Plan for Phase III (2021–2025) (September 2020).

2.2. Operating Process for the K-ETS

Covered entities that receive allocated emission allowances in accordance with the allocation plans must prepare a GHG Emissions and Energy Usage Report (hereafter “emissions report”) by compiling their GHG emission activities undertaken during the relevant compliance year (1 January–31 December). This report must be verified by an external verification institution and submitted to the government together with a verification report from the verification institution. The government then evaluates the amount of GHG emissions specified in the report and certifies the emissions.

Covered entities must surrender their emission permits to the government in an amount equivalent to the amount of certified emissions within six months from the date of completion of each compliance year. In the event that the amount of emission permits held by a covered entity is insufficient, the covered entity may, before surrendering its emission permits, make up for the deficit by purchasing emission permits from the market, or using carried-over or borrowing emission permits, while, if the amount of emission permits exceeds the amount of certified emissions, they can sell the surplus. Covered entities from sub-sectors eligible for auctions can also participate in auctions. The law-based operating schedule for the K-ETS is presented in <Figure I – 3>.⁸⁾

8) The amount of certified emissions, which serves as the basis for determining the amount of emission permits to be surrendered, is assessed for each compliance year (1 January–31 December). However, emission permits for free allocation are registered to the relevant entities' account before the commencement of a compliance year, and these emission permits can be traded from the date of registration until the date of surrender (exchange trading is possible after the listing of tradable permits on the Korea Exchange).



〈Figure I -3〉 Schedule for the K-ETS

PART

II

K-ETS Operational Results

1. Allocation of Emission Permits
2. Certification and Surrender of Emission Permits

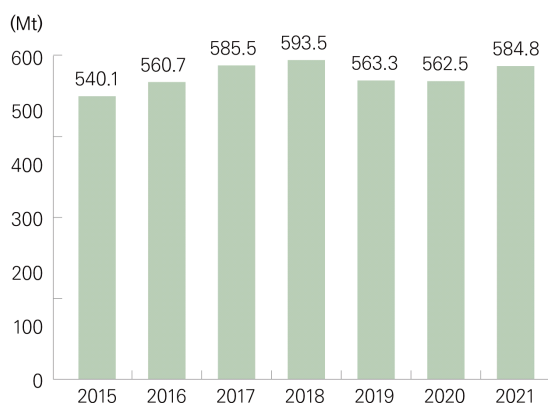
1

Allocation of Emission Permits

When entities designated as covered entities submit their allocation application to the government four months prior to the commencement of a phase, the government issues a notification of the allocated amount, which is referred to as the pre-allocation amount. From 2021, with the commencement of Phase III, the proportion of auctionable allowances was raised, with 10% of the total allocation for covered entities eligible for auctions deducted and set aside for purchase through auctions in the emissions trading market.

In the 2021 compliance year, the amount of emission permits set for pre-allocation was 567.4 Mt, while the final allocation amount, which reflected a number of changes that occurred during the compliance year (e.g., additional allocation, allocation revocation, and the succession of rights and obligations), was 584.8 Mt (687 entities). Unlike the yearly increase during Phase I and in the first compliance year of Phase II, the final allocation amount for the 2019 and 2020 compliance years decreased. The final allocation amount for 2021, which was the first compliance year of Phase III, increased by 4.0% compared to the previous year, which was due to the expansion of covered entities and emission activities under the K-ETS.

〈Figure II-1〉 Final allocation by compliance year



〈Table II-1〉 Final allocation and Entities by compliance year

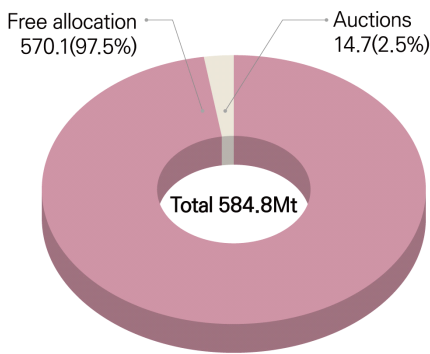
(Unit : Mt)

Phase	Year	Allocation	Annual change	Entities
I	2015	540.1	-	522
	2016	560.7	3.8%	564
	2017	585.5	4.4%	592
II	2018	593.5	1.4%	587
	2019	563.3	-5.1%	611
	2020	562.5	-0.2%	637
III	2021	584.8	4.0%	687

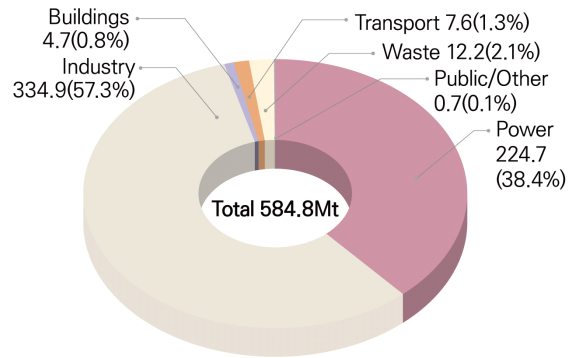
(Source) Emissions Trading Registry System Database
(as of Sep. 2022)

For the 2021 compliance year, 567.4 Mt of allowances were originally pre-allocated to 684 entities, but the number of entities increased because some entities that took over the rights and obligations of other covered entities were designated as covered entities (caused by, for example, the splitting of covered entities). Broken down by sector, the final allocation was 334.9 Mt for industry (57.3%), 224.7 Mt for power (38.4%), 12.2 Mt for waste (2.1%), 7.6 Mt for transport (1.3%), 4.7 Mt for buildings (0.8%), and 0.7 Mt for public services and other sectors (0.1%).

The difference between the final allocation and pre-allocation amount was higher for the buildings and power sectors (6.6% and 4.8%, respectively) than for the other sectors (2.0% for industry, 1.6% for waste, and -2.0% for transport).



〈Figure II-2〉 Free allocation and Auctions in 2021



〈Figure II-3〉 Final allocation by sector in 2021

〈Table II-2〉 Change between Pre-allocation and final allocation for the 2021 compliance year

(Unit : Mt)

Sector	Pre-allocation	Final allocation	Change
Total	567.4	584.8	3.1%
Power	214.4	224.7	4.8%
Industry	328.2	334.9	2.0%
Buildings	4.4	4.7	6.6%
Transport	7.7	7.6	-2.0%
Waste	12.0	12.2	1.6%
Public/Other	0.7	0.7	0.0%

Information on the sector-specific final allocation of emission permits for Phase III is presented in <Table II-3>. The final allocation amount (584.8 Mt) consisted of 570.1 Mt of free allocation (97.5%) and 14.7 Mt of auctioned allowances (2.5%). The amount provided for free allocation included a pre-allocation amount of 567.4 Mt (97.0%) and allocation changes of 2.7 Mt (0.5%), which resulted from additional allocation, allocation revocation, and the succession of rights and obligations.

<Table II-3> Final allocation by sector in 2021

(Unit: Mt)

Sector	Final allocation (E=C+D)									Change (E-A)/A
	Free allocation (C=A+B)							Auctions (D)		
	Pre- allocation (A)	Allocation Changes (B)					Succession of Rights & Obligations			
		Additional	Revocation	Transfer						
Acquisition				Transfer						
Industry	334.9	334.9	328.2	6.6	8.1	-3.7	-2.9	5.2	0.1	2.0%
Power	224.7	210.1	214.4	-4.2	8.6	-10.6	-2.6	0.4	14.6	4.8%
Buildings	4.7	4.7	4.4	0.3	0.4	-0.1	-	0.001	0.03	6.6%
Transport	7.6	7.6	7.7	-0.2	0.5	-0.6	-0.2	0.2	0.001	-2.0%
Waste	12.2	12.2	12.0	0.2	0.2	-0.05	-0.04	0.04	-	1.6%
Public/Other	0.7	0.7	0.7	-	-	-	-	-	-	0.0%
Total	584.8	570.1	567.4	2.7	17.7	-15.0	-5.7	5.7	14.7	3.1%
Entities	687	687 ¹⁾	684	-	220	166	33	34	27	0.4%

1) Pre-allocation allowances were allocated to 684 entities, but the number of covered entities at the time of the final allocation increased to 687 due to changes (e.g., allocation revocation, succession of rights and obligations) that occurred during the compliance year (Source: Emissions Trading Registry System Database, as of Nov. 2022)

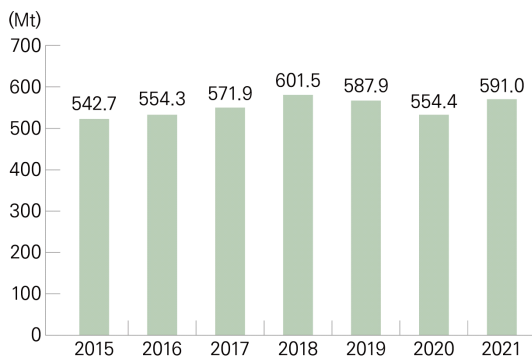
2

Certification and Surrender of Emission Permits

2.1. Certification of Emissions

According to the results of the government's verification of emissions reports submitted by 687 entities to which emission permits were finally allocated in the 2021 compliance year, the certified emissions amounted to 591.0 Mt, which was 6.6% (36.7Mt) higher than the previous year. The increase was a result of the restoration of production following the economic recovery from the COVID-19 pandemic and the expansion of covered entities and emission activities under the K-ETS for Phase III.

〈Figure II-4〉 Final allocation by compliance year



〈Table II-4〉 Certified emissions and Entities by compliance year

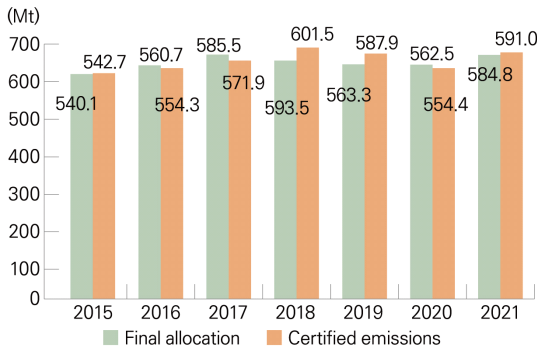
(Unit: Mt)

Phase	Year	Emissions	Annual change	Entities
I	2015	542.7	-	522
	2016	554.3	2.2%	560
	2017	571.9	3.2%	591
II	2018	601.5	5.2%	586
	2019	587.9	-2.3%	610
	2020	554.4	-5.7%	636
III	2021	591.0	6.6%	687

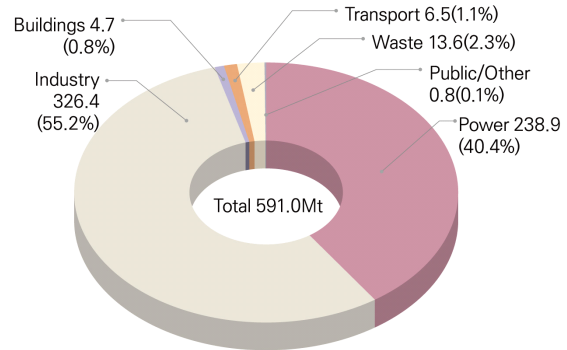
(Source) Emissions Trading Registry System Database
(as of Sep. 2022)

〈Figure II-5〉 shows the results of the comparison between the final allocation amount and the amount of certified emissions for each compliance year. Unlike the previous year, the certified emissions exceeded the final allocation by 6.3 Mt. However, covered entities (excluding one entity) were able to surrender the emission permits in excess of the certified emissions by utilizing emission permits that were traded, carried over from the previous compliance year, obtained from offset projects, or borrowed from the next compliance year.

Broken down by sector, the amount of certified emissions for the 2021 compliance year from the industry sector was 326.4 Mt (55.2%), compared to 238.9 Mt (40.4%) from the power sector, 13.6 Mt (2.3%) from waste, 6.5 Mt (1.1%) from transport, 4.7 Mt (0.8%) from buildings, and 0.8 Mt (0.1%) from public services/other sectors.



〈Figure II-5〉 Final allocation and Certified emissions by compliance year



〈Figure II-6〉 Certified emissions by sector in 2021

2.2. Surrender of Emission Permits

Covered entities must surrender emission permits to the government in an amount equivalent to the amount of certified emissions within six months from the date of completion of each compliance year. Emission permits can be surrendered using the KAUs allocated for the relevant compliance year, KCUs converted from KOCs, and other permits either banked from the previous compliance year (KAUs and KCUs) or borrowed from the next compliance year (KAUs). These surrender methods ensure flexibility so that covered entities can surrender emission permits through various methods other than emissions trading. In addition, the government has introduced market-maker trading and proprietary trading by securities companies to ensure the liquidity of the emissions trading market. Consequently, covered entities are now able to secure additional emission permits in a variety of ways if needed.

For the 2021 compliance year, a total of 591.03 Mt of emissions produced by a total of 687 entities was certified. Because one entity failed to fulfill its obligation to surrender its emission permits (49 kt), ultimately 686 entities surrendered 590.98 Mt of emission permits.

Broken down by the type of emission permit surrendered in 2021, KAUs accounted for 583.1 Mt (98.7%) and KCUs for 7.9 Mt (1.3%), which indicates that most of the permits surrendered were KAUs. The amount of KCUs surrendered increased significantly compared to the previous year (0.7 Mt, which accounted for 0.1% of the total amount of permits surrendered), which was the second largest following the 2015 compliance year. In addition, 17.9 Mt (499 entities) of the emission permits banked from the 2020 compliance year were used in the trading and surrender, and, after the surrendering, 20.9 Mt (513 entities) of the permits was carried over to the following compliance year. Also, 0.8 Mt (61 entities) of the permits borrowed from the 2022 compliance year was used for the surrender.

Pursuant to Article 33 of the Act, penalties will be imposed on the entity that failed to fulfill its obligation to surrender its emission permits, while surplus emission permits for nine entities amounting to 33 kt (the amount not carried over⁹⁾) expired.

9) The amount of emission permits not carried over to the next compliance year by covered entities after meeting their obligation to surrender or the amount remaining after the emission permits are carried over to the next compliance year to the fullest possible extent

〈Table II-5〉 Surrender results by sector in 2021

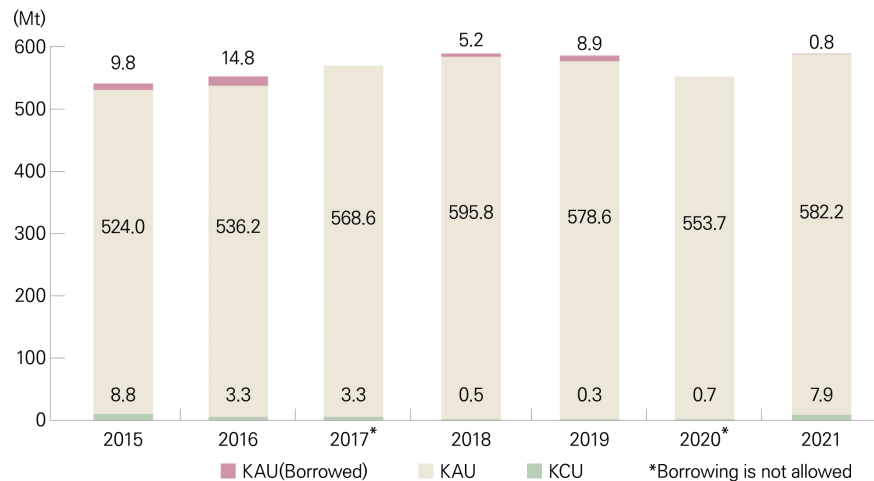
(Unit: Mt)

Sector	Certified		Banking (20→21)	KOC → KCU	KAU Traded ¹⁾		Surrendered				Not Surrender -ed	Not Banked	Banking('21→'22)		
	Emission	Entity			Sold	Purchased	Total	KAU	KAU (Borrow -ed)	KCU			Total	KAU	KCU
Industry	326.4	450	9.9	1.7	-13.3	5.6	326.4	324.0	0.6	1.7	-0.05	0.01	13.1	13.1	-
Power	238.9	58	5.0	6.1	-5.7	11.7	238.9	232.8	0.02	6.1	-	-	2.9	2.9	-
Buildings	4.7	39	0.3	0.01	-0.2	0.1	4.7	4.7	0.01	0.01	-	-	0.2	0.2	-
Transport	6.5	62	0.1	-	-0.5	0.03	6.5	6.5	0.1	-	-	0.03	0.8	0.8	-
Waste	13.6	76	1.2	0.01	-0.2	0.7	13.6	13.5	0.1	0.01	-	-	0.3	0.3	-
Public /Other	0.8	2	-	-	-	0.2	0.8	0.8	-	-	-	-	-	-	-
Market maker	-	5	1.4	-	-1.3	2.4	-	-	-	-	-	-	3.0	3.0	-
Securities	-	20	-	-	-0.1	0.6	-	-	-	-	-	-	0.5	0.5	-
Total	591.0	687²⁾	17.9	7.9	-21.3	21.3	591.0	582.2	0.8	7.9	-0.05	0.03	20.9	20.9	-
Entities	687	-	499	27	515	205	686	686	61	30	1	9	513	513	-

1) The entries are based on the trading volume registered in the Emissions Trading Registry System, which might be different from the trading volume specified under Part III (based on Korea Exchange data)

2) Market makers and securities companies are not counted as covered entities.

Source: Emissions Trading Registry System Database (as of Sep. 2022)



〈Figure II-7〉 Surrendered emission permits by compliance year

2.3. Emissions Trading

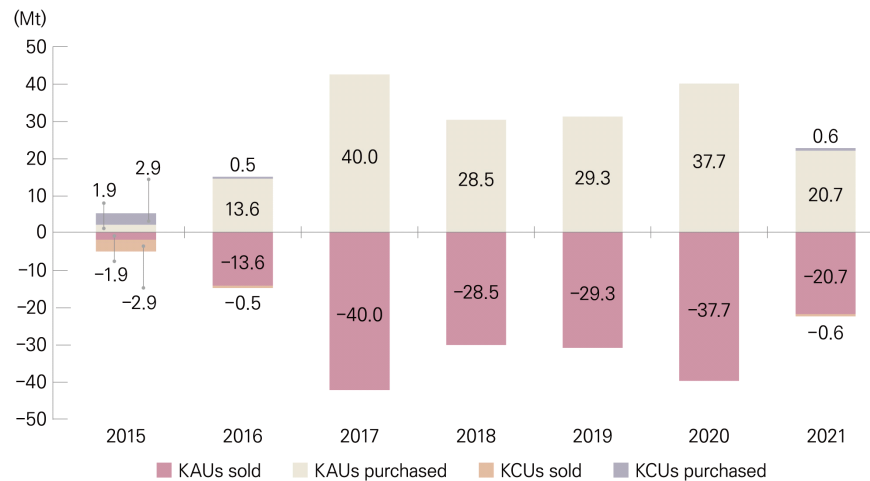
Emissions permits can be traded through the exchange and using over-the-counter transactions. The tradable permits are KAUs, KCUs, and KOCs. Exchange trading commences with the listing of tradable permits on the emission permit exchange¹⁰⁾ and ends with the delisting of these emission permits; accordingly, different trading periods are applied to each type of permit in exchange trades. As a result, KAU21 was traded between 4 January 2021 and 12 August 2022, while KCU21 was traded between 21 June 2021 and 12 August 2022. On the other hand, for over-the-counter trading, there are generally no restrictions on tradable permits or the trading period, and emission permits are traded based on contracts directly entered into between covered entities. Only the results of the exchange and over-the-counter trades for KAU21 and KCU21 are discussed here because a detailed analysis of emissions trading is provided in Part III. KOCs are also tradable but excluded from the analysis because they are not eligible for surrender.

2.3.1. Trading Volume by Sector

The trading volume for KAU21 (excluding the amount auctioned) was 20.7 Mt, which was 45.0% lower than the trading volume for KAU20 (37.7 Mt). Covered entities made up the deficit in their emission permits by trading emission permits, by borrowing emission permits from the next compliance year, and, through auctions (in the case of entities from sub-sectors eligible for auctions). There were no KCU transactions undertaken between 2017 and 2020, but 585 kt of KCUs were traded during the 2021 compliance year. This change appears to be a result of the revision of the government notification for external emission reduction projects in 2021,¹¹⁾ which restricted the trading of KOCs and the conversion of KOCs into KCUs (so that KOCs are tradable during the year of issuance and for two additional years, up to the last trading day of the final tradable year and must be converted into KCUs thereafter), thereby increasing the covered entities' need to convert the KOCs they held into KCUs so that they could use the latter for the trading and surrendering of emission permits.

10) In accordance with Article 22 of the Act and Article 34 of the Enforcement Decree, the Korea Exchange was designated as an emission permit exchange (January 2014) and has been in operation since the introduction and implementation of the K-ETS (since January 2015).

11) Guidelines for the Feasibility Assessment of External Emission Reduction Projects and the Certification of Reductions (Ministry of Environment Notification No. 2021-105, partially amended on 21 May 2021).

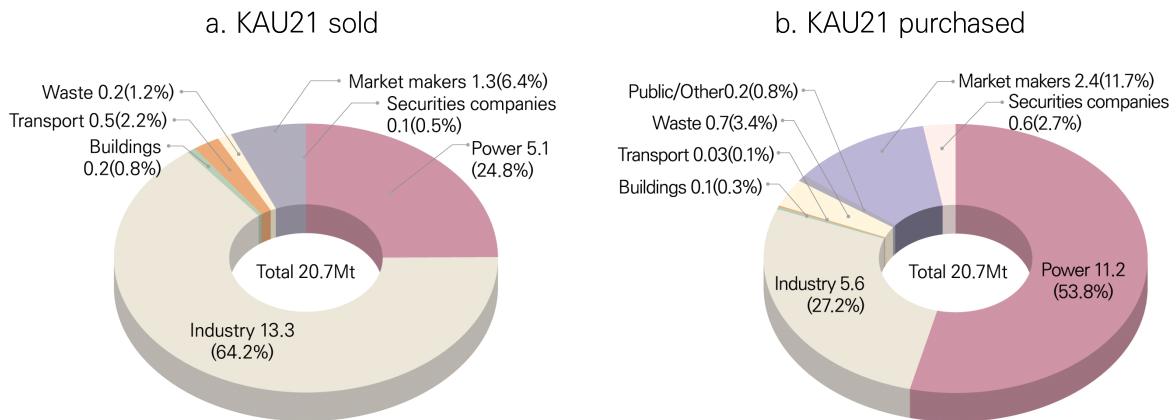


〈Figure 11-8〉 Trading volume for emission permits by compliance year

In the industry, buildings, and transport sectors, the proportion of KAU21 sold exceeded that of KAU21 purchased, and in the power, waste, and public services/other sectors, the proportion of KAU21 purchased exceeded that of KAU21 sold. In addition, the amount of KAU21 that market makers and securities companies purchased exceeded the amount of KAU21 they sold.

Broken down by sector, 13.3 Mt (64.2%) of KAU21 was sold by the industry sector, 5.1 Mt (24.8%) by power, 1.3 Mt (6.4%) by market makers, 0.5 Mt (2.2%) by transport, 0.2 Mt (1.2%) by waste, 0.2 Mt (0.8%) by buildings, and 0.1 Mt (0.5%) by securities companies. In addition, 11.2 Mt (53.8%) of KAU21 was purchased by the power sector, 5.6 Mt (27.2%) by industry, 2.4 Mt (11.7%) by market makers, 0.7 Mt (3.4%) by waste, 0.6 Mt (2.7%) by securities companies, 0.2 Mt (0.8%) by public services/other sectors, 0.1 Mt (0.3%) by buildings, and 0.03 Mt (0.1%) by transport.

Compared to the previous year, in the power sector, the amount (14.5 Mt → 5.1 Mt) and proportion (38.4% → 24.8%) of KAUs sold decreased significantly, while, in the industry sector, the amount (15.1 Mt → 5.6 Mt) and proportion (40.0% → 27.2%) of KAUs purchased fell dramatically.



〈Figure II-9〉 Trading volume of KAU21 by sector in 2021

2.3.2. Market-Maker Trading

In accordance with Article 22-2 of the Act, the government introduced the market-making system in Phase II to ensure the stable operation of the emissions trading market by revitalizing emissions trading, designating two financial institutions as market makers. In addition, three financial institutions and two institutions were designated in May 2021 and in December 2022 respectively. Accordingly, a total of seven institutions¹²⁾ are going to participate in the emissions trading market as market makers from 2023. Under this system, the government lends emission permits to market makers every month from the reserve for market-making, and market makers are required to suggest the asking or bidding price for emission permits and participate in emission permit transactions.

Similar to the previous year, the proportion of KAUs purchased by market makers exceeded that of KAUs sold by them. Both the proportion increased, with the proportion of KAUs sold increasing from 3.7% in 2020 to 6.4% in 2021 and the proportion of KAUs they purchased rising from 5.2% in 2020 to 11.7% in 2021. For every month, approximately 5,000–20,000 t of KAUs was lent to five institutions from the reserve for market making (a total of 1.2 Mt)¹³⁾ and 1.4 Mt carried over from the previous year. Of this, 1.3 Mt was sold, and 2.4 Mt was purchased. At the end of the lending period, 1.2 Mt was returned in the form of emission permits (0.7 Mt) and cash (0.5 Mt).¹⁴⁾

12) The Korea Development Bank and the Industrial Bank of Korea were designated in 2019. SK Securities, Hana financial investment and Korea Investment & Securities were designated in 2021. KB Securities and Shinhan Securities were designated in 2022,

13) 30 July 2021–29 July 2022.

〈Table II-6〉 Legal grounds and standards for the Market-Making system in Phase III

Type	Legal Grounds	Methods and Standards
Purpose	Art. 22-2 of the Act Art. 37 of the Enforcement Decree	<ul style="list-style-type: none"> The competent authority designates market makers to ensure the stable operation of the emissions trading market by revitalizing emissions trading, and the designated market makers engage in the following tasks: <ul style="list-style-type: none"> Suggest asking and bidding prices for emission permits and trade emission permits.
Designation	Art. 3 of the Notification	<ul style="list-style-type: none"> Any entity that intends to be designated as a market maker must submit an application to the Minister of Environment no later than three months before the commencement of each compliance year (or, if a market maker must be designated during a compliance year, no later than two months before the date set by the Minister of Environment on which the market-making tasks commence). The effective period for the designation of a market maker must be one year from the date of designation. However, if a market maker is designated during a compliance year, the effective period may be extended until 31 December of the following compliance year.
Assessment	Art. 22-2 of the Act Art. 37 of the Enforcement Decree Arts. 5 and 6 of the Notification	<ul style="list-style-type: none"> Market makers are required to deliver to the competent authority monthly reports on their performance and the competent authority evaluates these reports, which contain the following information: <ul style="list-style-type: none"> The amount of emission permits retained and traded by emission type. The number and volume of transactions undertaken at the asking and bidding prices, the time of submission for the asking and bidding prices, the price range between the asking and bidding prices, etc.
Lending and Return	Art. 7 of the Notification	<ul style="list-style-type: none"> Market makers may rent all or part of the emission permits necessary for market-making from the reserve for market-making, and the competent authority may lend emission permits in different amounts taking into consideration the results of the performance assessment. Market makers must return borrowed emission permits in the form of emission permits or equivalent cash at the end of the lending period.

Source: Act on the Allocation and Trading of Greenhouse-Gas Emission Permits and its Enforcement Decree (Ministry of Environment, Ministry of Economy and Finance, and Office for Government Policy Coordination; amended on 25 March 2022 due to the revision of another statute)
Notification on the Designation and Operations of Market Makers in the Emissions Trading Market (Ministry of Environment; partially amended on 15 January 2021).

14) Of the revenue generated from the selling of emission permits, the payments for emission permits, excluding transaction fees for financial institutions, are returned to the government.

2.4. Flexibility Mechanisms

Flexibility mechanisms are a means to ensure flexibility in the surrendering of emission permits by covered entities that minimize the cost of reducing GHG emissions. The flexibility mechanisms permitted by the government include the use of KCUs obtained from the conversion of KOCs, and the borrowing and banking of emission permits.

2.4.1. Use of KOCs and KCUs

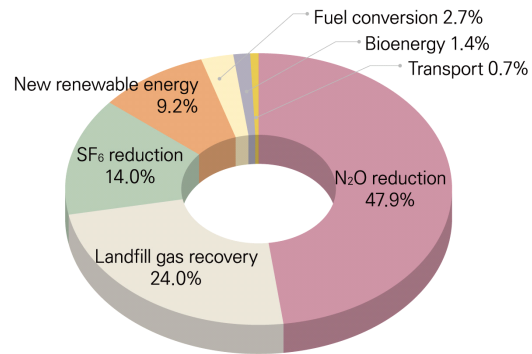
From 2015 to the end of 2022, a total of 43.7 Mt¹⁵⁾ of KOCs obtained from domestic (36.4 Mt, 83.2%) and overseas (7.4 Mt, 16.8%) offset projects were registered. The credits from overseas offset projects was first introduced during the 2020 compliance year. For the 2021 compliance year, a total of 5.4 Mt of KOCs were issued, which was more than five times higher than the amount issued in 2020 (1.0 Mt). The amount of KOCs obtained from domestic offset projects was 2.9 Mt in 2021.

A total of 288 methodologies have been approved as offset projects. In terms of domestic projects, the largest amount of certified reductions was achieved via projects related to technologies used to reduce N₂O emissions in the process of manufacturing petrochemical products, followed by those obtained from projects related to landfill gas recovery technologies (the waste sector), technologies used to reduce SF₆ emissions in the process of manufacturing semiconductors, and fuel conversion. In terms of overseas projects, certified reductions were achieved from fuel conversion projects and projects using bioenergy (e.g., new renewable energy, wood pellets, etc.).

¹⁵⁾ 43.7 Mt = 22.5 Mt from Phase I (1 January 2015–9 August 2018) + 10.3 Mt from Phase II (10 August 2018–9 August 2021) + 11.0 Mt from Phase III (10 August 2021–31 December 2022).

〈Table II-7〉 Projects and Certified reductions
(Domestic)

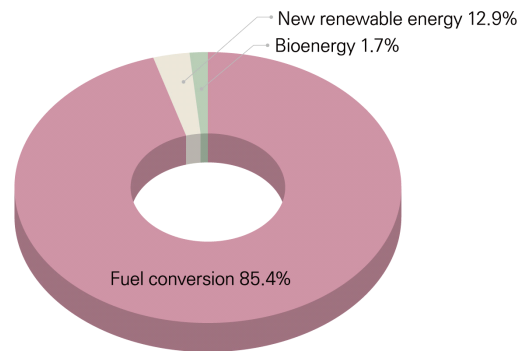
Project type	No. of Projects	Certified reductions (Mt)
Total	696	36.4
N ₂ O reduction	180	17.4
Landfill gas recovery	66	8.7
SF ₆ reduction	49	5.1
New renewable energy	135	3.4
Fuel conversion	213	1.0
Bioenergy	49	0.5
Transport	3	0.3
Forest carbon absorption	1	0.0002



〈Figure II-10〉 Proportion of Certified reductions
(Domestic)

〈Table II-8〉 Projects and Certified reductions
(Overseas)

Project type	No. of Projects	Certified reductions (Mt)
Total	328	7.4
Fuel conversion	313	6.3
New renewable energy	10	0.9
Bioenergy	5	0.1

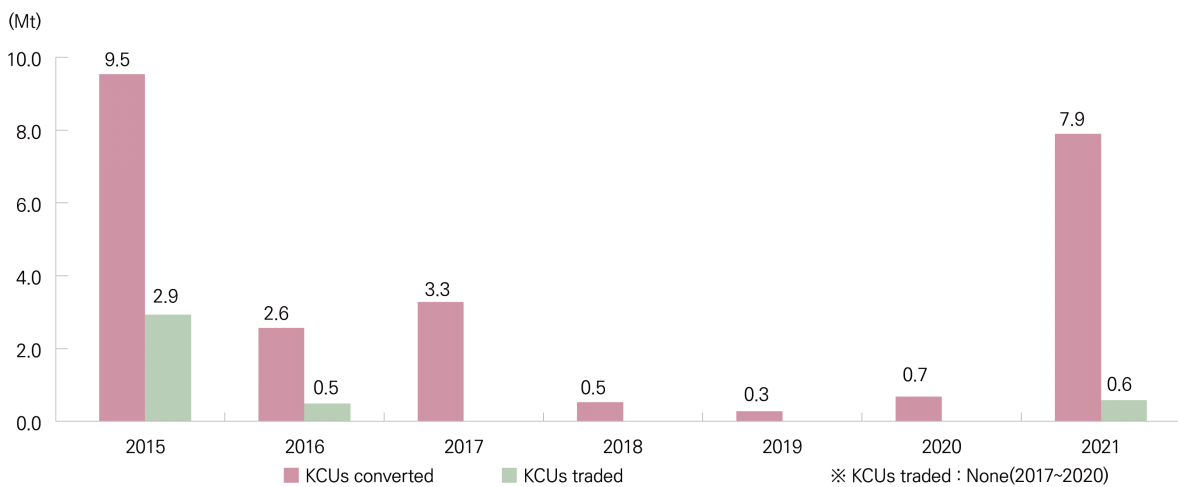


〈Figure II-11〉 Proportion of Certified reductions
(Overseas)

A total of 24.8 Mt¹⁶⁾ has been converted from KOCs to KCUs to date by the covered entities to be used in the surrendering of emission permits. The amount converted to KCUs in the 2021 compliance year was 7.9 Mt (7.1 Mt from domestic projects, 0.8 Mt from overseas projects), which was more than 10 times higher than the amount converted in 2020 (0.7 Mt).

16) 24.7 Mt = 15.4 Mt from Phase I + 1.5 Mt from Phase II + 7.9 Mt from Phase III.

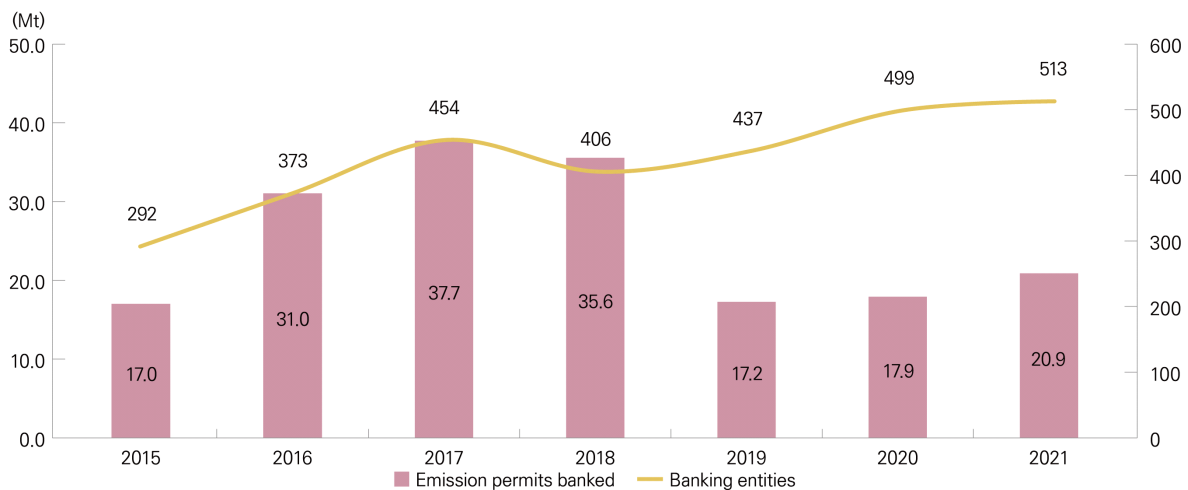
Unlike KAUs or KCUs, there had originally been no restriction on the trading period for KOCs but, since the revision of the government notification for external emission reduction projects in 2021, the trading of KOCs has been restricted. Accordingly, in the 2021 compliance year, KOC20-22, KOC21-23, and KOC22-24 were issued and traded, and the amount of KOCs converted to KCUs has increased. Converted KCU21 was used by 30 covered entities in the surrendering of emission permits (accounting for 1.3% of all permits surrendered). After the 2021 compliance year, 16.3 Mt of KOCs remained unconverted into KCUs as of September 2022.



〈Figure II-12〉 KCUs converted and traded by compliance year

2.4.2. Banking of Emission Permits

17.9 Mt of emission permits were carried over from the 2020 compliance year to the 2021 compliance year and used for either trading or surrendering. After the surrender, 20.9 Mt (513 entities)¹⁷⁾ of emission permits, 17% higher than the previous year, were carried over to the 2022 compliance year. While more than 30 Mt of emission permits had been banked annually during the period between 2016 and 2018, the amount fell by half in 2019 and has increased thereafter. Since the introduction of proprietary trading by securities companies in the 2021 compliance year, 14 securities companies have banked 0.5 Mt of emission permits. In addition, five market makers have banked 3.0 Mt of emission permits for the 2022 compliance year.

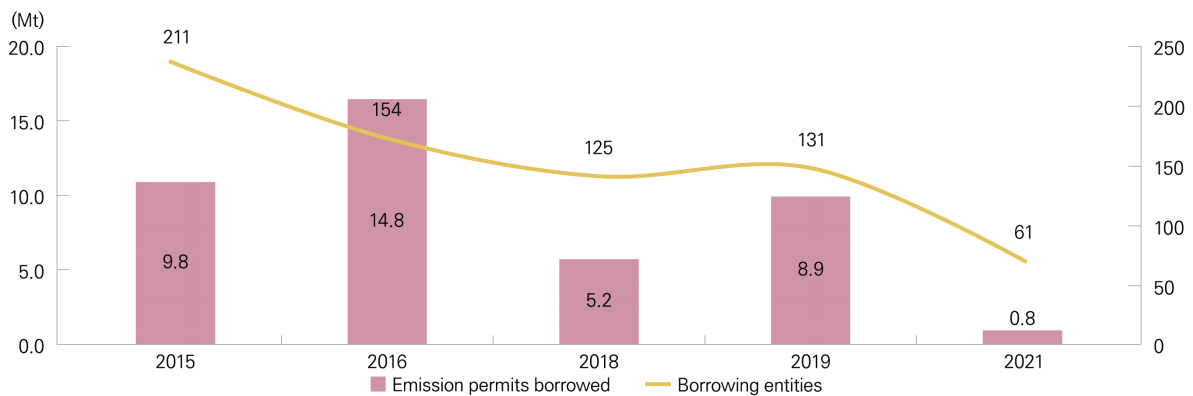


〈Figure II-13〉 Banking of emission permits by compliance year

17) All of which were KAUs; no KCUs were carried over to the 2022 compliance year.

2.4.3. Borrowing of Emission Permits

Emission permits borrowed from the 2022 compliance year for the 2021 compliance year were 0.8 Mt (61 entities), representing 0.1% of the total amount of emission permits surrendered. In the previous year, which was the final compliance year of Phase II, borrowing emission permits from the subsequent phase was not permitted. It appears that covered entities have primarily utilized flexibility mechanisms, such as banking from the previous compliance year and the conversion of KOCs to KCUs, and auctions to prepare for a possible supply shortage of emission permits in the future.



Note: Borrowing emission permits was not allowed in 2017 and 2020 compliance years.

〈Figure II-14〉 Borrowing of emission permits by compliance year

〈Table II-9〉 Legal grounds and standards for the Flexibility mechanisms in Phase III

Type	Legal grounds	Methods and Standards
Use of KCUs	Art. 29 of the Act Art. 47 of the Enforcement Decree	<ul style="list-style-type: none"> If a covered entity possesses or acquires GHG reduction credits generated outside the scope of business operations monitored by the K-ETS in a manner consistent with international standards, it may convert them into KCUs for trading and surrendering of emission permits, etc. Use of KCUs is allowed up to 5% of the total amount of emission permits surrendered.
Borrowing	Art. 28 of the Act Art. 45 of the Enforcement Decree	<ul style="list-style-type: none"> When the amount of emission permits held by a covered entity is less than the amount it must surrender, a portion of allocated emission permits from a different compliance year within a single phase may be borrowed. <p>〈Borrowing limits in Phase III〉</p> <ul style="list-style-type: none"> 1st compliance year: no more than 15% of the emission permits to be surrendered. 2nd-4th compliance years: (no more than) emission permits to be surrendered \times {borrowing limit in the immediately preceding compliance year - (ratio of borrowed emission permits in the immediately preceding compliance year \times 0.5)} 5th compliance year: borrowing from the subsequent phase is not allowed.
Banking	Art. 28 of the Act Art. 37 of the Enforcement Decree Allocation Plan	<ul style="list-style-type: none"> A covered entity may carry over emission permits in its possession to the next compliance year within the same phase or to the first compliance year in the subsequent phase, provided that it banks KAUs and KCUs of less than 100 t regardless of the standards specified below. <p>〈Banking within a single Phase〉 Banking is allowed in the following amounts:</p> <ul style="list-style-type: none"> 1st-3rd compliance years: twice the net amount of KAUs/KCUs sold* by a covered entity in each (first and second) compliance year. * Amount of KAUs/KCUs sold - amount of KAUs/KCUs purchased until the day before a covered entity applied for banking to the next compliance year, excluding the amount exchanged (KAU, KCU \leftrightarrow KAU, KCU, KOC) and auctioned 3rd-5th compliance years: the net amount of KAUs/KCUs sold* by a covered entity in each (third and fourth) compliance year * Amount of KAUs/KCUs sold - amount of KAUs/KCUs purchased until the day before a covered entity applied for banking to the next compliance year, excluding the amount exchanged (KAU/KCU \leftrightarrow KAU/KCU/KOC) and auctioned <p>〈Banking across Phases〉 Only banking to the first compliance year of Phase IV is allowed in the following amounts:</p> <ul style="list-style-type: none"> Annual average net amount of KAUs/KCUs sold* by a covered entity in Phase III * Amount of KAUs/KCUs sold - amount of KAUs/KCUs purchased until the day before a covered entity applied for banking for Phase IV, which is divided by the number of compliance years in Phase III applicable to the covered entity, excluding the amount exchanged (KAU21-25/KCU21-25 \leftrightarrow KAU/KCU/KOC from another phase) and auctioned <ul style="list-style-type: none"> Emission permit holders other than covered entities may carry over permits to the next compliance year within the same phase or to the first compliance year in the subsequent phase <p>〈Banking within a single Phase〉 Banking is allowed in the following amounts:</p> <ul style="list-style-type: none"> Proprietary trading by emissions trade brokerage companies: a maximum 200 kt of KAUs/KCUs Market makers: all KAUs/KCUs in their possession

Type	Legal grounds	Methods and Standards
		<p>(Banking Across Phases) Only banking to the first compliance year of Phase IV is allowed in the following amounts:</p> <ul style="list-style-type: none"> - Proprietary trading by emissions trade brokerage companies: a maximum 200 kt of KAU25/KCU25 - Market makers: all KAU25/KCU25 in their possession

Source: Act on the Allocation and Trading of Greenhouse-Gas Emission Permits and its Enforcement Decree (Ministry of Environment, Ministry of Economy and Finance, and Office for Government Policy Coordination; amended on 25 March 2022 due to the revision of another statute)
 Allocation Plan for Phase III (2021–2025) (Ministry of Environment, September 2020).

2022

K-ETS Annual Report

PART

III

Analysis of the Emissions Trading Market

1. Trading Records for 2015~2022
2. Trading Records for the 2021
Compliance Year of Phase III

1

Trading Records for 2015~2022

In Part III, trading records for KAUs (KAU15–KAU25), KCUs (KCU15–KCU22), and KOCs traded in the exchange and over-the-counter (hereafter “OTC”) markets during Phases I, II, and III (January 2015–August 2022) are analyzed. The analysis of KAUs was based on records of exchange and OTC transactions and on auction results, while the analysis of KCUs and KOCs was based on records of exchange and OTC transactions.

1.1. Trading Volume and Price Trends by Year¹⁸⁾

From the commencement of Phase I to August 2022 in Phase III, the total trading volume for all types of emission permits (KAUs, KCUs, and KOCs) was 257.2 Mt, the total payments were 6,225.8 billion won, and the average trading price was 24,204 won per ton. The yearly trading volume increased at an average annual rate of 103% from 5.7 Mt in 2015 to 12.0 Mt in 2016, 26.3 Mt in 2017, and 47.5 Mt in 2018. In 2019, a total of 38.1 Mt of emission permits were traded, 19.6% lower than the previous year. The trading volume grew to 44.0 Mt in 2020 and then to 54.7 Mt in 2021 while, in 2022, 29.0 Mt of emission permits were traded until August. Broken down by market type, the trading volume was 120.2 Mt in the exchange market and 137.0 Mt in the OTC market, accounting for 46.7% and 53.3% of the total trading volume, respectively.

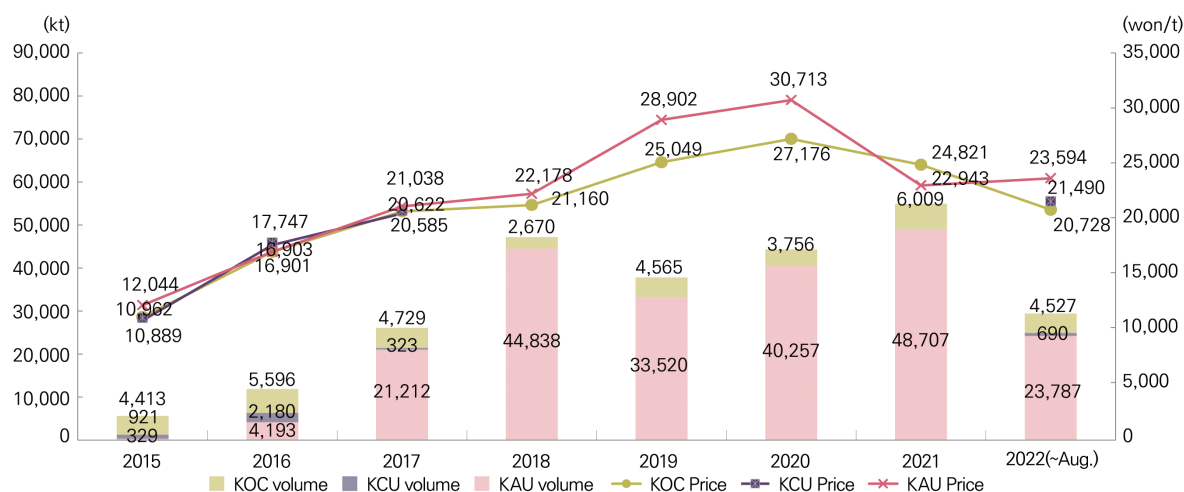
In terms of the type of emission permit, the total trading volume for KAUs was 216.8 Mt, which accounted for 84.3% of the total trading volume for emission permits, and that for KCUs was 4.1 Mt, which accounted for 1.6% of the total trading volume. There was no record of the actual trading of KCUs between 2018 and 2021, but in 2022, 0.7 Mt of KCUs were traded. In addition, the total trading volume for KOCs was 36.3 Mt, which accounted for 14.1% of the total trading volume.

18) The amount of emission permits that must be surrendered is determined based on the amount of certified emissions for each compliance year (1 January–31 December), but emission permits can be traded from the date of the listing of emission permits on the Korea Exchange until the date of the surrender of those emission permits (e.g., KAU21 was traded between 4 January 2021 and 12 August 2022). The years indicated in Section 1.1 of Part III are actual years, not compliance years.

From 2015 to 2020, the average trading price for the emission permits increased significantly at an average annual rate of 22.5% from 11,013 won in 2015 to 30,411 won in 2020. The average trading price fell to 18,354 won in the second quarter of 2021 due to the effects of COVID-19, but gradually recovered and reached 30,125 won in the fourth quarter of 2021. The average trading price for the entire 2021 year was 23,149 won, which was 23.9% lower than the previous year, and as of August 2022, the average 2022 trading price was 23,097 won, which was 0.2% lower than the previous year. The average trading price for Phases I, II, and III (until August 2022) was 24,204 won.

The average trading price for KAUs, which accounted for more than 80% of the total trading volume for emission permits, rose at an average annual rate of 20.6% from 12,044 won in 2015 to 30,713 won in 2020, and fell to 22,943 won in 2021, which was 25.3% lower than the previous year. As of August 2022, the average 2022 trading price for KAUs was 23,594 won, which was 2.8% higher than the previous year. The average trading price for KOCs rose at an average annual rate of 19.9% from 10,962 won in 2015 to 27,176 won in 2020. It was 24,821 won in 2021, which was 8.7% lower than the previous year, and 20,728 won in 2022, which was 16.5% lower than the previous year. In addition, the average trading price for KCUs rose sharply between 2015 and 2017 at an average annual rate of 37.6% from 10,889 won in 2015 to 17,747 won in 2016, and 20,622 won in 2017. There was no record of KCUs between 2018 and 2021, but the average 2022 trading price was 21,490 won. The average price in total was 17,066 won, which was the lowest of the prices for the three types of emission permits.

The continuous increase in the trading volume led to an increase in the total payments for emission permits between 2015 and 2020, with an average annual increase of 84.6%. The total payments were 62.4 billion won in 2015, 204.1 billion won in 2016, 550.3 billion won in 2017, 1,050.9 billion won in 2018, 1,083.1 billion won in 2019, and 1,338.5 billion won in 2020. They were 1,266.6 billion won in 2021, which was 5.4% lower than the previous year, and 669.9 billion won until August 2022. The total payments for emission permits between 2015 and 2022 were 6,225.8 billion.



〈Figure III-1〉 Trends in the total trading volume and price by emission permits

〈Table III-1〉 Trends in trading records by trading type

Type		2015	2016	2017	2018	2019	2020	2021	2022*	
Trading volume (kt)	Exchange	Real-time	51	2,062	4,640	4,814	4,636	8,263	13,574	8,100
		Block	1,191	2,771	10,094	8,351	4,373	4,520	1,119	1,093
		Auction	-	274**	-	4,665**	7,950	8,171	11,177	8,339
	OTC	4,421	6,861	11,530	29,677	21,125	23,059	28,846	11,472	
	Total	5,663	11,969	26,264	47,507	38,084	44,013	54,716	29,004	
Trading Price (won/t)	Exchange	Real-time	12,208	17,953	21,315	22,271	29,414	28,785	20,981	21,616
		Block	11,140	17,728	21,064	22,127	28,254	29,802	23,011	20,634
		Auction	-	16,221**	-	22,500	29,238	30,385	26,373	24,198
	OTC	10,965	16,549	20,706	22,034	27,965	31,122	22,926	23,577	
	Total	11,013	17,056	20,951	22,120	28,440	30,411	23,149	23,097	
Payments (100 million won)	Exchange	Real-time	6	370	989	1,072	1,364	2,378	2,848	1,751
		Block	133	491	2,126	1,848	1,236	1,347	257	226
		Auction	-	44**	-	1,050	2,324	2,483	2,948	2,018
	OTC	485	1,135	2,387	6,539	5,908	7,176	6,613	2,705	
	Total	624	2,041	5,503	10,509	10,831	13,385	12,666	6,699	

* Trading records until August 2022

** The amount auctioned from the reserve for market stabilization measures to address the imbalance in the supply and demand for emission permits in the 2015 and 2017 compliance years, not the amount allocated for auctions that were introduced in Phase II

〈Table III-2〉 Trends in trading volume by emission permit

(Unit: kt)

Type		2015	2016	2017	2018	2019	2020	2021	2022*	
KAU	Exchange	Real-time	13	918	3,641	4,588	4,485	8,073	12,101	7,959
		Block	308	1,370	10,067	8,278	3,343	4,490	641	484
		Auction	-	274**	-	4,665**	7,950	8,171	11,177	8,339
	OTC	8	1,631	7,504	27,307	17,742	19,523	24,787	7,005	
	Total	329	4,193	21,212	44,838	33,520	40,257	48,707	23,787	
KCU	Exchange	Real-time	38	482	296	-	-	-	0	0
		Block	883	1,401	27	-	-	-	0	585
	OTC	-	296	-	-	-	-	0	105	
	Total	921	2,180	323	-	-	-	0	690	
KOC	Exchange	Real-time	-	662	703	226	151	190	1,473	141
		Block	-	-	-	73	1,030	30	477	25
	OTC	4,413	4,934	4,026	2,370	3,383	3,536	4,059	4,362	
	Total	4,413	5,596	4,729	2,670	4,565	3,756	6,009	4,527	

* Trading records until August 2022

** The amount auctioned from the reserve for market stabilization measures to address the imbalance in the supply and demand for emission permits in the 2015 and 2017 compliance years, not the amount allocated for auctions that were introduced in Phase II

〈Table III-3〉 Trends in average trading price by emission permit

(Unit : won/t)

Type		2015	2016	2017	2018	2019	2020	2021	2022*	
KAU	Exch-ange	Real-time	10,998	17,712	21,314	22,208	29,384	28,633	19,887	21,528
		Block	12,073	17,366	21,065	22,105	28,780	29,733	16,339	20,495
		Auction	-	16,221**	-	22,500**	29,238	30,385	26,373	24,198
	OTC	12,700	16,169	20,867	22,139	28,653	31,935	23,059	25,437	
	Total	12,044	16,901	21,038	22,178	28,902	30,713	22,943	23,594	
KCU	Exch-ange	Real-time	12,637	18,173	20,605	-	-	-	-	-
		Block	10,815	18,082	20,813	-	-	-	-	20,501
	OTC	-	15,471	-	-	-	-	-	-	27,000
	Total	10,889	17,747	20,622	-	-	-	-	-	21,490
KOC	Exch-ange	Real-time	-	18,127	21,617	23,530	30,302	35,266	29,962	26,541
		Block	-	-	-	24,636	26,549	40,013	31,979	26,478
	OTC	10,962	16,739	20,405	20,826	24,358	26,633	22,114	20,508	
	Total	10,962	16,903	20,585	21,160	25,049	27,176	24,821	20,728	

* Trading records until August 2022

** The amount auctioned from the reserve for market stabilization measures to address the imbalance in the supply and demand for emission permits in the 2015 and 2017 compliance years, not the amount allocated for auctions that were introduced in Phase II

〈Table III-4〉 Trends in payments by emission permit

(Unit : 100 million won)

Type		2015	2016	2017	2018	2019	2020	2021	2022*	
KAU	Exch-ange	Real-time	1	163	776	1,019	1,318	2,311	2,407	1,713
		Block	37	238	2,121	1,830	962	1,335	105	99
		Auction	-	44**	-	1,050**	2,324	2,483	2,948	2,018
	OTC	1	264	1,566	6,046	5,083	6,235	5,716	1,782	
	Total	40	709	4,463	9,944	9,688	12,364	11,175	5,612	
KCU	Exch-ange	Real-time	5	88	61	-	-	-	-	-
		Block	95	253	6	-	-	-	-	120
	OTC	-	46	-	-	-	-	-	-	28
	Total	100	387	67	-	-	-	-	-	148
KOC	Exch-ange	Real-time	-	120	152	53	46	67	441	37
		Block	-	-	-	18	273	12	153	7
	OTC	484	826	821	494	824	942	898	894	
	Total	484	946	973	565	1,143	1,021	1,491	938	

* Trading records until August 2022

** The amount auctioned from the reserve for market stabilization measures to address the imbalance in the supply and demand for emission permits in the 2015 and 2017 compliance years, not the amount allocated for auctions that were introduced in Phase II

1.2. Trading Volume and Price Trends by Type of Emission Permit

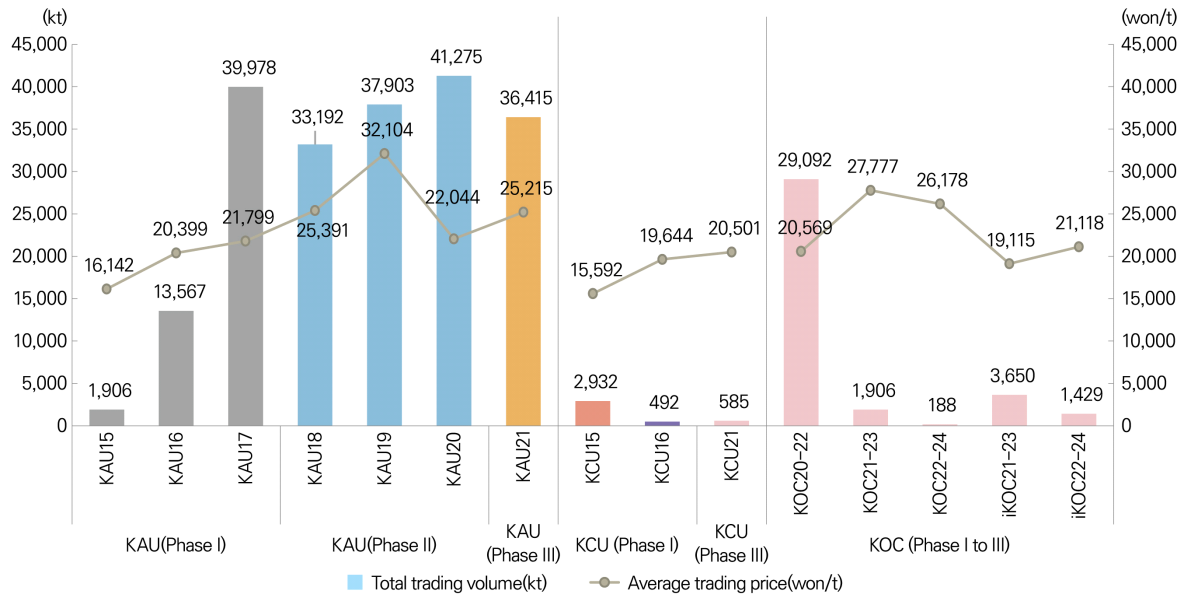
In this section, the trading volume and price for each type of emission permit (KAU, KOC, and KCU) are analyzed for each compliance year. The results of the analysis in this section differ from the results of the analysis of the yearly trading volume in the previous section because different trading periods apply to each compliance year.¹⁹⁾

The trading volume for KAUs continued to increase for each compliance year within a phase. During Phase I, the trading volume for KAU15, KAU16, and KAU17 rose sharply at an average annual rate of 350% to 1.9 Mt, 13.6 Mt, and 40.0 Mt, respectively. During Phase II, KAU18 slightly decreased to 33.2 Mt, but KAU19 and KAU20 increased to 37.9 Mt and 41.3 Mt, respectively. The trading volume for KAU21 was 36.4 Mt, which was 0.1% lower than the previous compliance year.

In the 2021 compliance year, in addition to KOC20–22, KOC21–23, and KOC22–24, which are certified reductions from domestic offset projects, iKOC21–23 and iKOC22–24, which are certified reductions from overseas offset projects, were traded. The trading volume for KOCs between 2015 and 2017 was between 4.4 Mt and 5.6 Mt and, unlike KAU trading, did not show any particular trend; however, the trading volume for KOCs declined significantly to 2.7 Mt in 2018 and then recovered to reach 4.6 Mt in 2019 and 3.8 Mt in 2020. The trading volume for KOCs rose significantly starting in 2021 with the introduction of iKOCs in the emissions trading market, recording 6.0 Mt in 2021.²⁰⁾

19) KAU21 refers to KAUs allocated for the 2021 compliance year that can be traded from the date of their listing on the Korea Exchange until the date of their surrender. Accordingly, KAU21 was traded from 4 January 2021 to 12 August 2022.

20) KOCs are not classified based on the compliance year but based on the actual year in which they are traded.



Note: KOCs issued prior to the revision of the guidelines were renamed KOC20-22.

〈Figure III-2〉 Total trading volume and Average trading price by emission permit

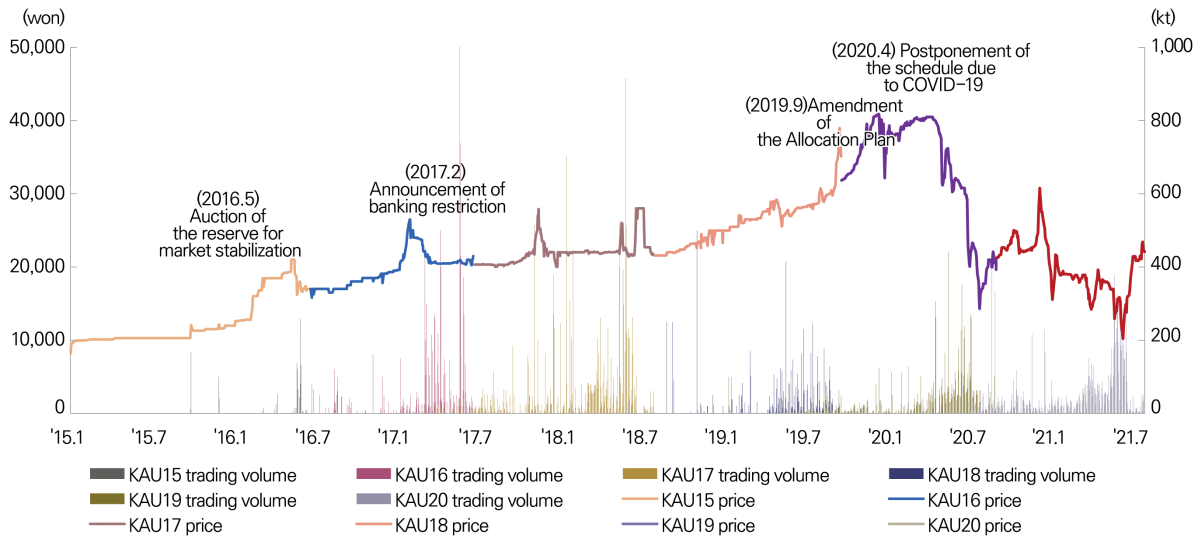
The trading volume for KCUs fluctuated widely by compliance year. 2.9 Mt of KCU15 and 0.5 Mt of KCU16 were traded, and there was no record of the trading of KCUs until it resumed in 2021, during which 0.6 Mt of KCU21 were traded.

1.3. Changes in the Trading Records for Each Phase

In an emissions trading system, the trading price and volume are determined by supply and demand for emission permits. In particular, the operational procedures and schedule for the K-ETS tend to serve as an incentive for the trading of emission permits.

The price for emission permits, which was 8,640 won on the first trading day of Phase I, fluctuated and rose to reach 21,600 won on the last trading day (9 August 2018), representing a 2.5-fold increase compared to the price on the first trading day. The price declined due to the auction of the reserve for market stabilization measures (May 2016) and the announcement of the policy restricting the banking of emission permits (February 2017) but stabilized at the time when the covered entities surrendered their emission permits.

During Phase II (2018–2020), only a small amount of KAU18 was traded until October 2018 at a price of 21,000–25,000 won, which was similar to the price for emission permits during Phase I. The price rose as the trading volume increased thereafter, but it fell sharply as the trading volume decreased after sub-sector meetings were held (May 2019) and the Allocation Plan was amended (September 2019) to reflect the amended Roadmap specifying the updated NDC. Thereafter, the price for emission permits rose again and stabilized at the time when the covered entities surrendered their emission permits (30 September 2019). The price for KAU19 and KAU20 sharply decreased due to the effects of COVID-19.



Note: For convenience, only the price and trading volume of the index emission permits for the corresponding periods are used. For example, although the trading of KAU20 began in 2019, the above graph is based the amount of KAU20 traded only in the 2020 compliance year.

〈Figure III-3〉 Trading price and Volume for KAU15-KAU20 in the Exchange market

2

Trading Records for the 2021 Compliance Year of Phase III

During the period in which KAU21 was listed on the Korea Exchange (January 2021–August 2022), KAU20–25, KCU21, KCU22, and KOCs were traded in the exchange and the OTC markets. The total trading volume for all types of emission permits during this period was 83.7 Mt, and the trading volume for emission permits excluding KAU20 was 60.2 Mt. In this section, trading records for KAU21, KCU21, and KOCs²¹⁾ used by covered entities to meet their obligation to surrender their emission permits for the 2021 compliance year are analyzed, for which the total trading volume was 47.5 Mt.

2.1. Analysis of the Trading Volume

In the 2021 compliance year, the trading volume was 36.4 Mt for KAU21, 0.6 Mt for KCU21, and 10.5 Mt for KOCs, accounting for 76.6%, 1.2%, and 22.2% of the total trading volume, respectively.

The trading volume for KAU21 continued to increase from the first to fourth quarters of 2021. In particular, in the fourth quarter of 2021, 10.6 Mt of KAU21 were traded, accounting for 29.2% of the total trading volume for KAU21. It decreased to 3.3 Mt in the first quarter of 2022 but increased again to reach a quarterly record of 11.8 Mt in the second quarter, which accounted for 32.4% of the total trading volume for KAU21, with the first deadline to surrender emission permits approaching. The 2021 compliance year ended in August 2022 with the trading volume for KAU21 reaching 0.6 Mt for the third quarter of 2022.²²⁾

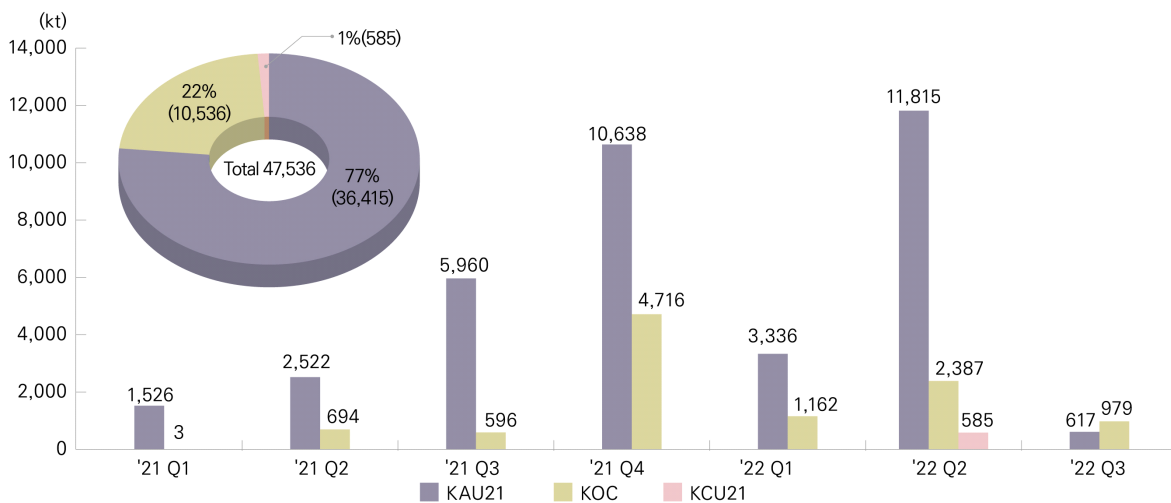
21) KOCs include KOC20–22, KOC21–23, KOC22–24, iKOC21–23, and iKOC22–24.

22) Covered entities must surrender their emission permits to the competent authority in an amount equivalent to the amount of certified emissions within six months from the date of completion of each compliance year; however, covered entities that have filed an objection must surrender their emission permits after receiving the results of the processing of the objection by the government (Art. 44 of the Enforcement Decree).

Until May 2021, trading was focused on KAU20. The trading volume for KAU21 began to increase in June 2021 when the first deadline to surrender KAU20 ended and continued to increase until December 2021. Between August and November 2021, more than 2 Mt of KAU21 were traded per month, and it reached a record of 5.4 Mt in December 2021, which was twice as high as the previous month. The trading volume for KAU21 fell dramatically to 0.7 Mt in January 2022 and steadily increased to approximately 1 Mt in February and March, 3 Mt in April and May, and 5.3 Mt in June. The trading volume for KAU21 increased sharply between April and June 2022, one to three months before the time when the emission permits were to be surrendered, which is a phenomenon that is commonly observed in the K-ETS. This trend indicates that the operation and schedule of the K-ETS affect the trading volume of emission permits.

The trading volume for KOCs did not demonstrate any notable trend. Until the third quarter of 2021, less than 0.7 Mt of KOCs were traded, and 4.7 Mt were traded in the fourth quarter of 2021, which accounted for 44.8% of the total KOCs traded from January 2021 to August 2022. In 2022, the trading volume was 1.2 Mt in the first quarter, 2.4 Mt in the second quarter, and 1 Mt in the third quarter.

A total of 0.6 Mt of KCU21 were traded in the second quarter of 2022, and there has been no record of the trading of KCUs in other quarters.



Note: The third quarter of 2022 includes the trading volume until August.

<Figure III-4> Quarterly trading volume by emission permit in the 2021 compliance year

Of the trading volume for KAU21, which represented 76.6% of the total trading volume for emission permits, 25.1 Mt were traded in the exchange market and 11.3 Mt were traded in the OTC market, accounting for 52.8% and 23.8%, respectively. On the exchange market, emission permits are traded via real-time trading and block trading,²³⁾ which can be used by all covered entities, or via auctions, which can only be used by covered entities from sub-sectors eligible for auctions. The amount of KAU21 traded via auction was 14.7 Mt, which accounted for the highest proportion of the trading volume for KAU21 (30.9%). 10.0 Mt (21.0%) was traded via real-time trading and 0.4 Mt (0.9%) via block trading. For KAU20, the trading volume in the OTC market was higher than that in the exchange market (exchange: 42%, OTC: 58%). However, for KAU21, the volume traded in the exchange market was higher than that in the OTC market (exchange: 69%, OTC: 31%) due to the larger volume of auctions.

The fact that the amount of emission permits traded via auction accounted for the highest proportion was a noticeable difference compared with previous compliance years. For KAU20, while the total volume of bids made was 7.1 Mt, the total volume of valid bids was 3.2 Mt, representing only 45.6% of the total volume of bids made, which was a result of the government's temporary suspension of the auctions in consideration of the decrease in the price and the amount of surplus emission permits available on the market. In contrast, the total volume of bids made for KAU21 was 21.9 Mt, and the total volume of valid bids was 14.7 Mt, representing 67.1% of the total volume of bids made. Auctions for KAU21 began in July 2021. The total volume of valid bids was 4.9 Mt in the third quarter of 2021, reaching a quarterly record of 6.0 Mt in the fourth quarter of 2021. It decreased significantly to 1.0 Mt in the first quarter of 2022, when the overall trading volume was low. However, it increased again to 2.8 Mt in the second quarter of 2022, with the deadline to surrender emission permits approaching.

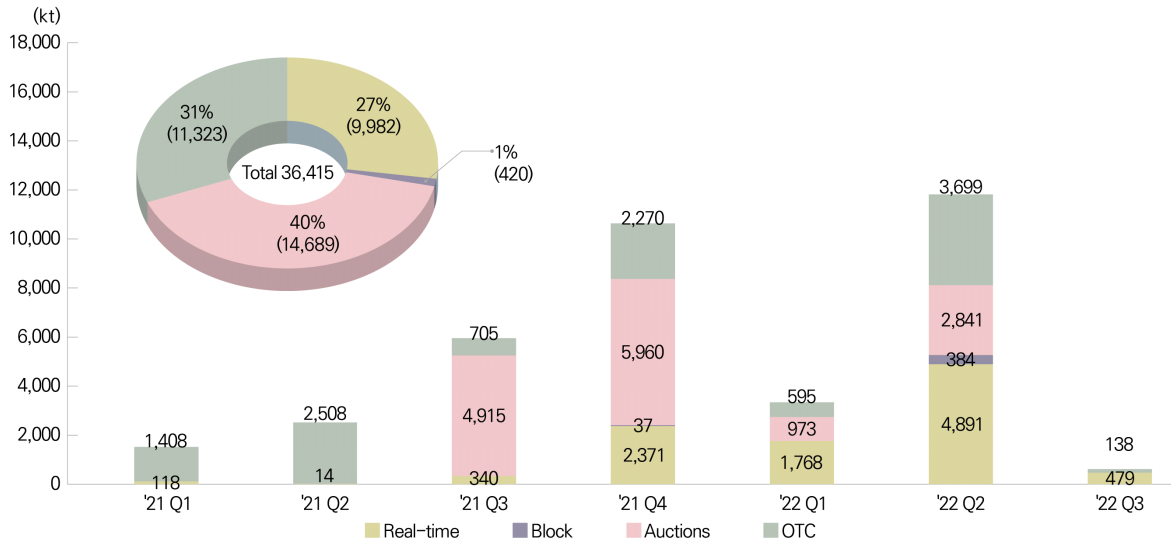
23) **(Real-Time Trading)** In the K-ETS, emission permits can be traded independently through competitive real-time trading, which can be divided into real-time trading with a single price and real-time trading with multiple prices. In real-time trading with a single price, participants submit selling or buying orders via an online platform on which the orders will be retained for a certain period of time, and the system matches the selling and buying orders at a price (matching price) that best suits both orders. During trading hours other than those designated for real-time trading with a single price, real-time trading with multiple prices takes place, under which orders are matched immediately if the price of a buying order is higher than the price of a selling order, provided that the orders are matched at the price that was submitted at the earliest time. **(Block Trading)** In the K-ETS, emission permits can be traded through block trading, in which the parties to the transaction negotiate in advance the type, price, and quantity of emission permits to be traded between them and submit the selling and buying orders so that the trading of the emission permits is consistent with the conditions that the parties have agreed on (Source: Operational Rules on the Emissions Trading Market and the KRX ETS Market Information Platform (ets.krx.co.kr)).

The OTC trading volume for KAU21 was 11.3 Mt, which accounted for the second-highest proportion of emission permits traded through both the exchange and OTC markets. In the first and second quarters of 2021, 1.4 Mt and 2.5 Mt were traded in the OTC market, respectively, leading KAU21 trades before the commencement of exchange trading. It increased from 0.7 Mt in the third quarter of 2021 to 2.3 Mt in the fourth quarter of 2021 and then decreased to 0.6 Mt in the first quarter of 2022. Similar to the trend in exchange trading, the OTC trading of KAU21 reached the highest quarterly trading volume of 3.7 Mt in the second quarter of 2022, near the time when the emission permits were to be surrendered.

A total of 10.0 Mt of KAU21 were traded via real-time trading. The real-time trading volume for KAU21 was only 0.1 Mt in the first quarter of 2021 and remained low until the third quarter of 2021, after which it sharply increased to 2.4 Mt in the fourth quarter of 2021. The real-time trading volume was 1.8 Mt in the first quarter of 2022, and it reached a quarterly record of 4.9 Mt in the second quarter of 2022.

The trading volume for KOCs was 8.4 Mt (79.9%) in OTC trading and 2.1 Mt (20.1%) in real-time and block exchange trading, which indicates that most KOCs were traded in the OTC market. In terms of OTC trading, 3.1 Mt of KOCs were traded in the fourth quarter of 2021, which was the highest quarterly trading volume, and 1.1 Mt and 2.3 Mt were traded in the first and second quarters of 2022, respectively. The exchange trading volume for KOCs was insignificant except for the trading of 1.7 Mt in the fourth quarter of 2021.

In addition, in the second quarter of 2022, all trades of KCU21 occurred via block exchange trading.



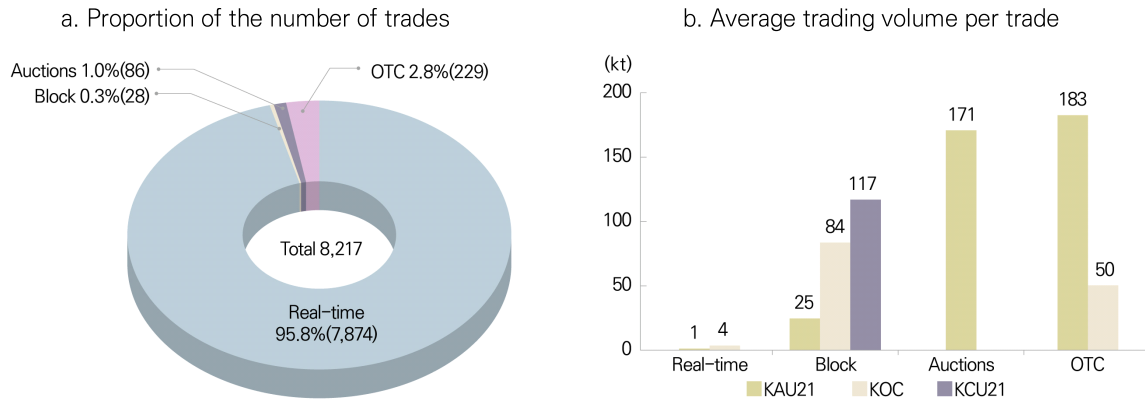
Note: The third quarter of 2022 includes the trading volume until August.

〈Figure III-5〉 Quarterly trading volume of KAU21 by market type

Of the total number of emission permit trades (8,217), 7,601 trades were for KAU21, 5 trades were for KCU21, and 611 trades were for KOC. Broken down by market type, 7,988 trades (97.2%) were made in the exchange market and 229 trades (2.8%) were made in the OTC market. In the exchange market, 7,874 trades (95.8%) were made via real-time trading, 28 (0.3%) were via block trading, and 86 (1.0%) were via auction, illustrating that most exchange trades were real-time trades. The number of real-time exchange trades, which involve transactions among a large number of unidentified entities, including market makers and securities companies, tends to exceed the number of block exchange trades and OTC trades, which involve one-on-one trades between specific entities, and auctions, which involve transactions among covered entities eligible for auctions.

The average trading volume for KAU21 per trade was 183 kt in OTC trading, 17.1 Mt in auctions, 25 kt in block exchange trading, and 1 kt in real-time exchange trading. Similar to previous compliance years, the results show that many small trades occurred in the exchange market, while fewer, larger trades occurred in the OTC market.

The average trading volume for KOCs per trade was 84 kt in block exchange trading, 50 kt in OTC trading, and 4 kt in real-time exchange trading, showing a similar pattern to the 2020 compliance year.



〈Figure III-6〉 Number of trades and Average trading volume by market in the 2021 compliance year

2.2. Analysis of Exchange Trading Prices

The average exchange trading price for KAU21 was 23,000 won on the first trading day (4 January 2021), before declining until June 2021. In April and June 2021, the trading price for KAU20, the index emission permits, fell sharply, which resulted in the implementation of market stabilization measures that led the government to set the lowest trading price for KAU20 in April and June at 12,900 won and 9,450 won, respectively. As an extension, the trading price for KAU21 also declined, and the average trading price for KAU21 reached 11,550 won on 23 June 2021, which was the lowest trading price for KAU21 during the exchange trading period (4 January 2021–12 August 2022).

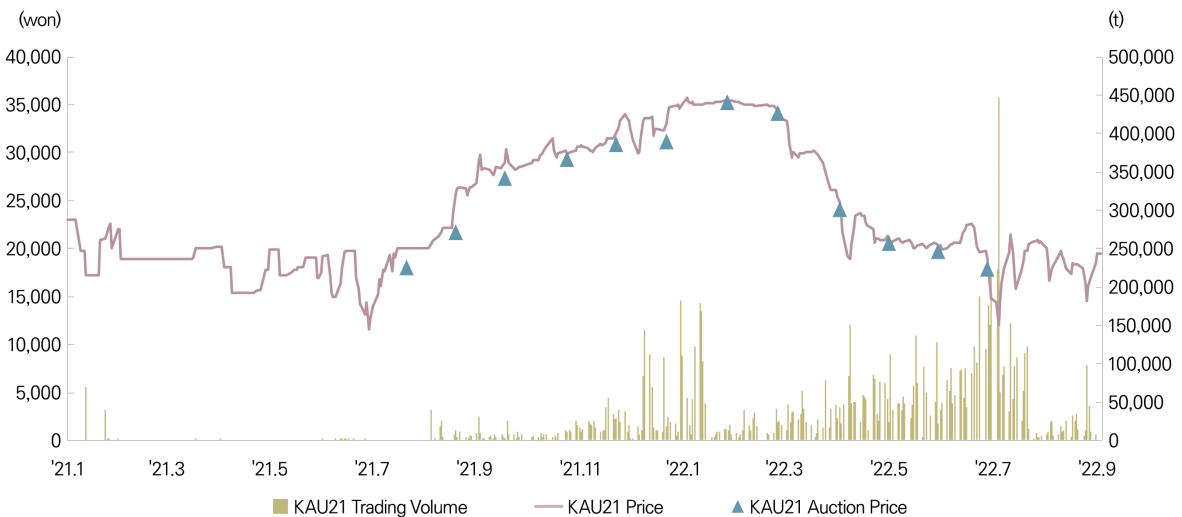
The trading price for KAU21 recovered to approximately 20,000 won in July, and both the trading volume and price for KAU21 began to rise after the surrender of KAU20 had ended in August 2021. The average trading price for KAU21 steadily rose from 25,668 won in August to 29,097 won in September, 30,310 won in October, 32,746 won in November, and 34,609 won in December. In particular, the exchange trading volume for KAU21 reached 1.3 Mt in December, which was the highest monthly trading volume in 2021, and the trading price reached the highest exchange trading price of 35,651 won on 23 December 2021.

This increase in the trading price continued until January 2022, and the average price for KAU21 was 35,121 won in January 2022. It began to fall from mid-February, with the monthly average trading price of 31,458 won. The trading price further declined from March; the price fell sharply from 30,144 won on 2 March to 18,963 won on 22 March, representing a 37% decrease over a 20-day period. This decline appears to be a result of the active trading of emission permits by covered entities, in particular the sale of surplus emission permits, after they ascertained of the level of their emissions with the deadline to submit emissions reports approaching. The monthly trading volume for KAU21 in April and May 2022 was more than 1 Mt, and the average trading price was 20,749 won and 20,914 won, respectively.

In June 2022, the trading volume for KAU21 sharply increased for a short period of time with the commencement of the surrender of emission permits for the 2021 compliance year. Similar to March, covered entities actively sold surplus permits, and the trading price also declined, reaching 12,040 won on 14 June 2022, which was the second lowest trading price for KAU21 during the exchange trading

period. The trading price rose thereafter to reach nearly 20,000 won, resulting in the average trading price for June being 17,155 won. The average trading price for KAU21 in July and August 2022 was 21,608 won and 24,755 won, respectively; this trading was led by some entities whose surrender of emission permits was delayed due to their objections to the certified emissions. The average exchange trading price for KAU21 during the entire exchange trading period was 23,907 won.

The auction price for KAU21 per ton was 18,100 won in July 2021 when the auctions began and continuously rose thereafter together with the increase in the exchange trading price for KAU21. It increased from 27,400 won in September to 30,900 won in November and then to 35,250 won in January 2022. In March 2022, 270 kt of KAU21 were auctioned at 24,100 won, which was the lowest volume of valid bids for KAU21. The auction price continued to decline thereafter, reaching 20,550 won in April, 19,700 won in May, and 17,950 won in June when the auction ended.



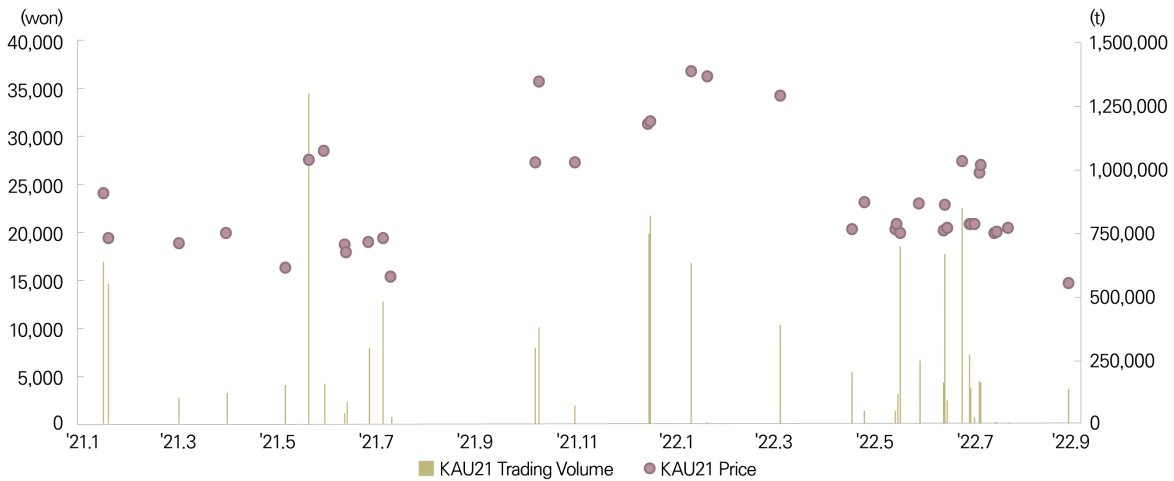
Note: The KAU21 price is weighted average on each trading day. In the absence of trading, the KRX closing price on the trading day was applied.

〈Figure III-7〉 Trading volume and price for KAU21 in the Exchange market

The first OTC trade for KAU21 was made on 18 January 2021. The trading price fluctuated between 15,000 won and 32,000 won until July 2021 without any particular trend. But the trading price was higher than the exchange trading price during this period. Similar to the exchange trading price, the OTC

trading price for KAU21 rose from September 2021 and remained in the range of 27,000 won to 40,000 won until February 2022, with 40,000 won being the highest price for KAU21 traded in the OTC market.

The OTC trading price sharply declined from March 2022 and remained in the range of 20,000 won to 23,000 won, except for three transactions made at approximately 27,000 won and one transaction made at approximately 16,000 won. The price ultimately reached 14,700 won in August 2022 (for a single transaction), which was the lowest OTC trading price for the 2021 compliance year, which ended in August 2022.



Note: The KAU21 price is weighted average on each trading day when trading was occurred in the OTC market.

<Figure III-8> Trading volume and price for KAU21 in the Over-the-counter market

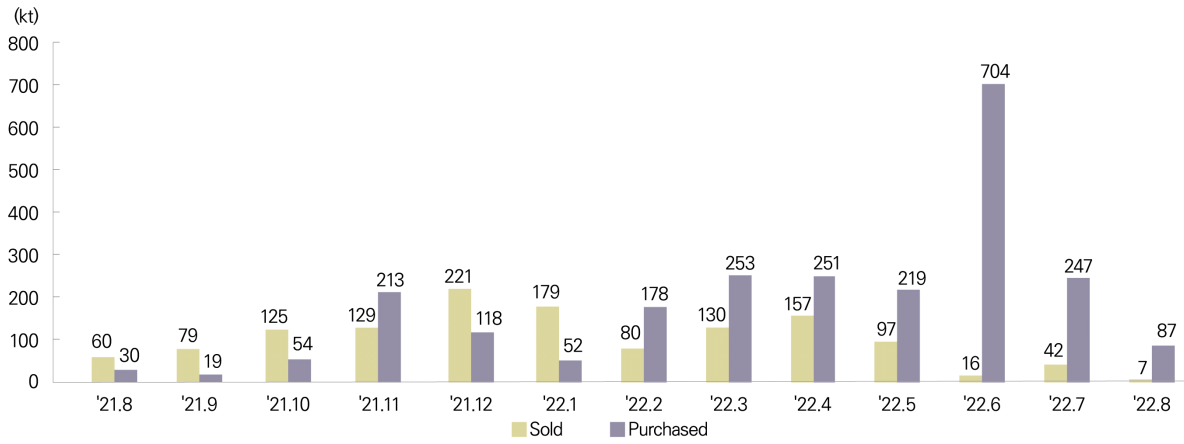
2.3. Analysis of the Trading Records for Market Makers²⁴⁾

During the KAU21 exchange trading period for market makers (August 2021–August 2022), the amount of KAU21 purchased by five market makers was 2.4 Mt, exceeding the amount of KAU21 sold which was 1.3 Mt. The proportion of market-maker trades from the total exchange trading volume for KAU21 (excluding the amount auctioned) was 13.7% for sales and 25.1% for purchases. Compared to KAU20 trades, the amount of KAUs sold by market makers has decreased by 4.6% and the amount purchased by them has increased by 22.6%. Considering that the proportion of market-maker trades from the total KAU20 trading volume was 3.7% (1.4 Mt) for sales and 5.2% (2.0 Mt) for purchases, the proportion of market-maker trading in the emissions trading market has increased significantly.

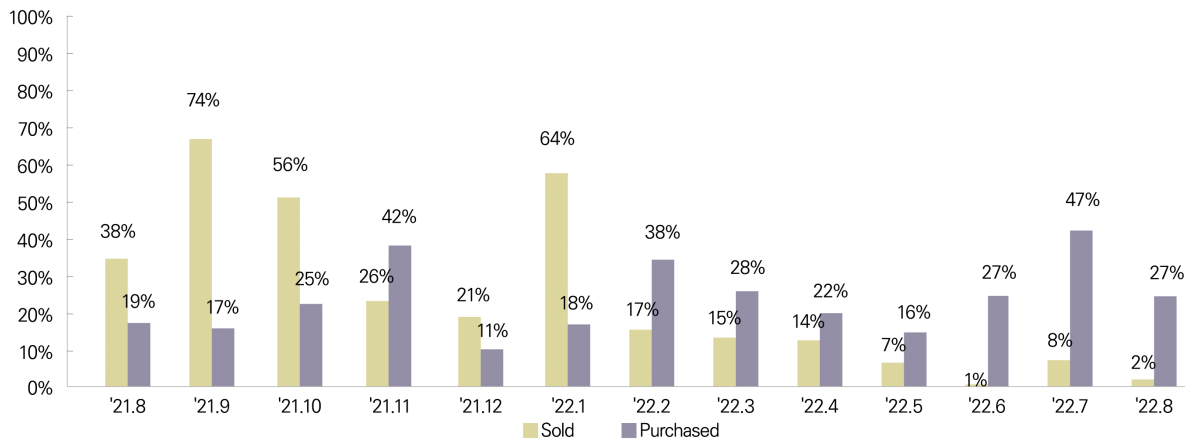
In terms of the monthly trading volume for sales, the proportion of KAU21 sold by market makers in the exchange market exceeded 20% from August 2021 to January 2022, a period during which exchange trades were actively conducted. In particular, the proportion reached a significantly high level of 74% in September 2021 and 64% in January 2022, which indicates that market makers have played a role in supplying emission permits during a time when the trading volume was low. The proportion of KAU21 sold declined to less than 15% after February 2022 as the trading volume for KAU21 increased. The monthly amount of KAU21 sold was in the range of 50 kt to 220 kt; however, in June 2022, when exchange trades for KAU21 were most active, the amount fell sharply to approximately 16 kt, accounting for 1% of the total amount of KAU21 sold.

The monthly purchase volume for KAU21 exhibited a different pattern. At the beginning of the trading period (from August to October 2021), the monthly amount purchased by market makers was as low as 55 kt. The volume started to increase in November 2021, with more than 100 kt from November 2021 to July 2022, except for January 2022. The proportion of KAU21 purchased by market makers in the exchange market fluctuated dramatically in the range of 11% to 47%. In contrast to the trend in selling, in June 2022, the amount of KAU21 purchased was 700 kt, which was the highest amount during the trading period. This sharp increase appears to be a result of the active trading of surplus KAU21 by covered entities with the deadline to surrender KAU21 approaching. In July 2022, market makers purchased 250 kt of KAU21, which accounted for 47% of KAU21 purchased in the exchange market.

24) This analysis was conducted based on the trading volume registered in the Emissions Trading Registry System.



〈Figure III-9〉 Trading volume of market makers for KAU21



〈Figure III-10〉 Proportion of market makers for KAU21 in the Exchange market

2.4. Analysis of Proprietary Trading by Securities Companies²⁵⁾

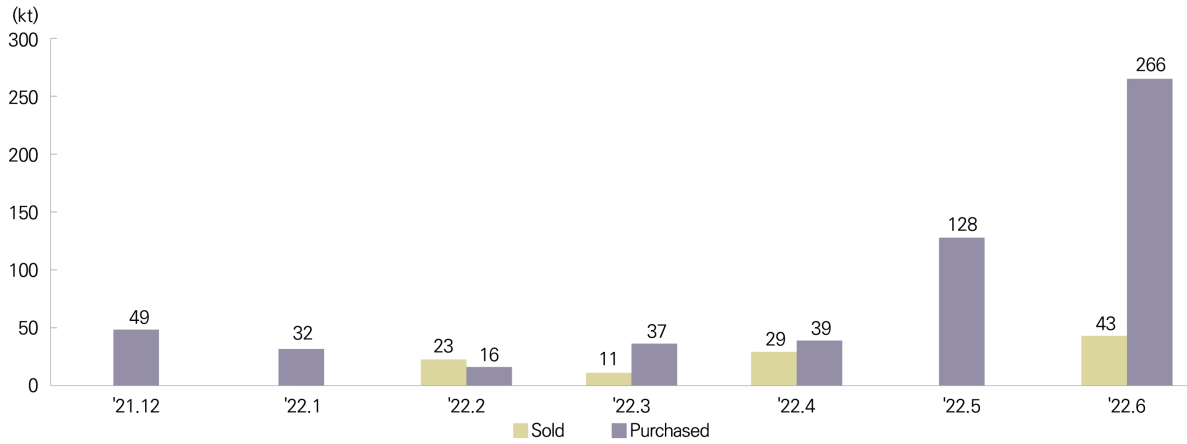
After the enactment and enforcement of the relevant notification²⁶⁾ in October 2021, 20 securities companies began to participate in the emissions trading market from December 2021 and traded emission permits until June 2022. During this period, securities companies sold 106 kt and purchased 566 kt of KAU21. As with market-maker trades, the amount of KAU21 purchased by securities companies exceeded the amount of KAU21 that they sold. The proportion of securities company trades from the total exchange trading volume for KAU21 (excluding the amount auctioned) was 1.1% for sales and 5.9% for purchases.

The purchase volume for KAU21 was 49 kt in December 2021, and it continued to decrease until February 2022. It rebounded in March 2022 and reached 128 kt in May and 266 kt in June. The proportion of KAU21 purchased by securities companies from the total volume of KAU21 sold in the exchange market was highest in January 2022 (11%), when the total amount of KAU21 traded was at its lowest. Except for January, the proportion of KAU21 purchased remained in the range of 3% to 5% between December 2021 and April 2022; the proportion was 9% in May and 10% in June 2022.

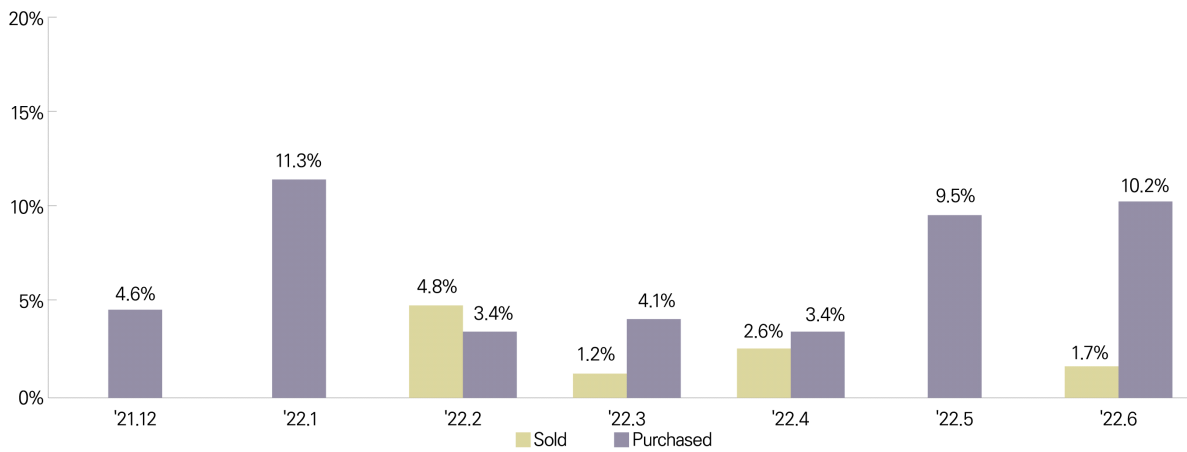
Sales of KAU21 by securities companies occurred only in February, March, April, and June 2022, with selling KAU21 for the first time in February 2022 (23 kt). As with the pattern for purchases, the amount of KAU21 sold by securities companies was highest in June 2022 (43 kt). The proportion of KAU21 sold from the total volume of KAU21 in the exchange market was in the range of 1% to 5%.

25) This analysis was conducted based on the trading volume registered in the Emissions Trading Registry System.

26) Notification on Emissions Trade Brokerage Companies (Ministry of Environment Notification No. 2021-203, enacted and came into force on 19 October 2021).



〈Figure III-11〉 Trading volume of securities companies for KAU21



〈Figure III-12〉 Proportion of securities companies for KAU21 in the Exchange market

2022

K-ETS Annual Report

PART

IV

Survey

1. Overview of the Survey
2. Views on and Response to the K-ETS
3. GHG Emission Reduction Performance and Efforts

1

Overview of the Survey

A survey was conducted with covered entities participating in the K-ETS regarding their views of the K-ETS and its implementation, the patterns of emissions trading, the prospects for the price of emission permits, and the GHG emission reduction efforts and performance. The survey was conducted for four weeks over two separate periods²⁷⁾ by selecting a total of 686 covered entities from six sectors, with a response rate of 38.5% (264 responses excluding duplicates). Except for the public services/other sectors from which no covered entity responded, the distribution of the responding covered entities within the individual sectors was relatively similar to the distribution of the covered entities selected for the survey within the individual sectors.

2

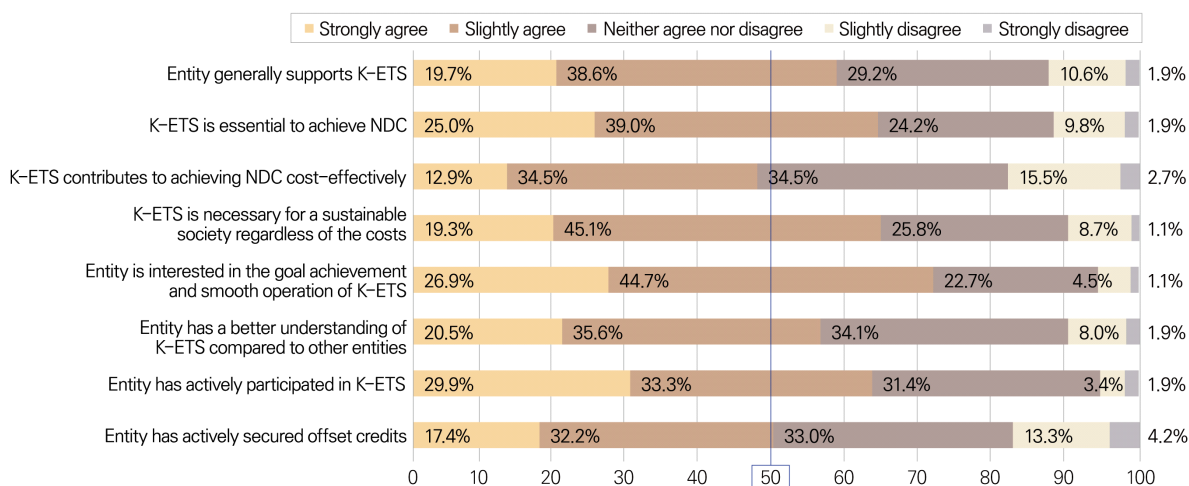
Views on and Response to the K-ETS

2.1. Views on the K-ETS

Covered entities' views on the K-ETS were analyzed. The survey results showed that covered entities were generally supportive of the K-ETS (positive: 58.3%; negative: 12.5%). The proportion of responding entities saying that the K-ETS is absolutely necessary to achieve Korea's NDC (positive: 64.0%; negative: 11.7%) and that the K-ETS is necessary for the transition to a sustainable society regardless of the costs of responding to it (positive: 64.4%; negative: 9.8%) was high. In addition, many respondents reported that the K-ETS contributes to GHG reduction targets in a cost-effective manner (positive: 47.3%; negative: 18.2%). These results correspond closely with the results of the previous survey, where the proportion of positive responses for the impact of the K-ETS on GHG reductions (41.1%) was greater than the proportion of negative responses (21.5%). In addition, the proportion of

27) The first survey period was from 30 September to 20 October 2022 and the second survey period was from 26 October to 1 November 2022.

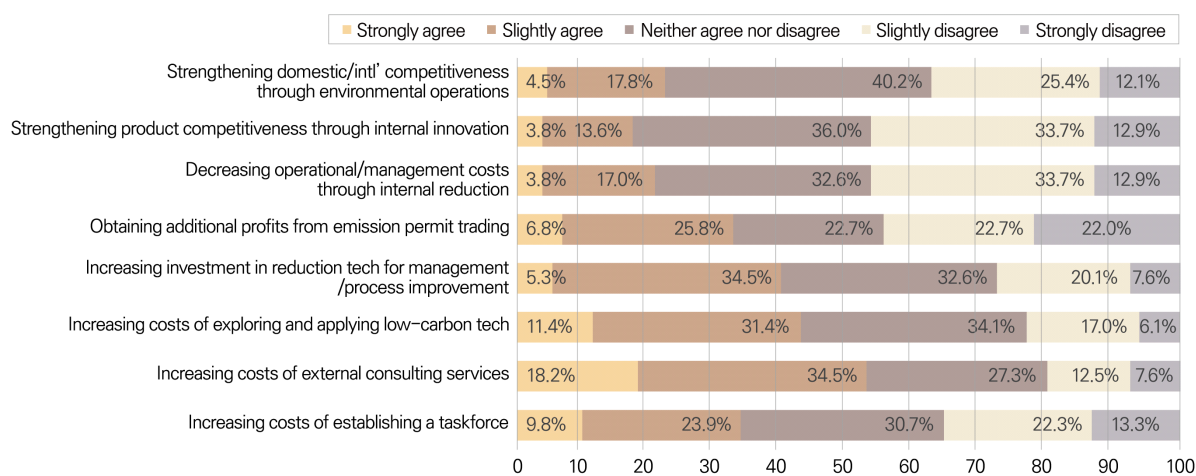
responding entities saying that they are interested in the successful achievement of the goals and smooth operation of the K-ETS (71.6%) was significantly higher than the proportion of entities who claimed otherwise (5.6%). The responding entities also reported that they have actively participated in the K-ETS (positive: 63.3%; negative: 5.3%) and actively secured a reduction in emissions (positive: 49.6%; negative: 17.5%).



〈Figure IV-1〉 Overall views on and response to the K-ETS

In order to determine the impact of the K-ETS on the business operations of the covered entities, the extent of their investment in and the costs incurred by their participation in the K-ETS were analyzed. The survey results showed that the proportion of positive responses was higher for an increase in the costs of external consulting services to respond to the K-ETS (positive: 52.7%, 139 responses; negative: 20.1%, 53 responses), an increase in the costs of exploring and applying low-carbon technologies (positive: 42.8%, 113 responses; negative: 23.1%, 61 responses), an increase in the costs of management and process improvement (positive: 39.8%, 105 responses; negative: 27.7%, 73 responses), and an increase in the costs of establishing a taskforce and securing manpower to respond to the K-ETS (positive: 33.7%, 89 responses; negative: 35.6%, 94 responses). These results suggest that covered entities have actively invested to respond to the K-ETS and secure offset credits. The proportion of negative responses was somewhat higher than the proportion of positive responses regarding the following survey items: an increase in additional profits from emission permit trading

(positive: 32.7%, 86 responses; negative: 44.7%, 118 responses), the strengthening of corporate competitiveness at the domestic/international level through environmental business operations (positive: 22.3%, 59 responses; negative: 37.5%, 99 responses), a reduction in operational and management costs through internal emission reduction efforts (positive: 20.8%, 55 responses; negative: 46.6%, 123 responses), and the strengthening of product/service competitiveness against similar products/services in the same industry through internal innovation (positive: 17.4%, 46 responses; negative: 46.6%, 123 responses). It appears that their investment has not yet led to the strengthening of their corporate competitiveness or an increase in corporate profit.



〈Figure IV-2〉 Impact of the K-ETS on the business operations of the covered entities

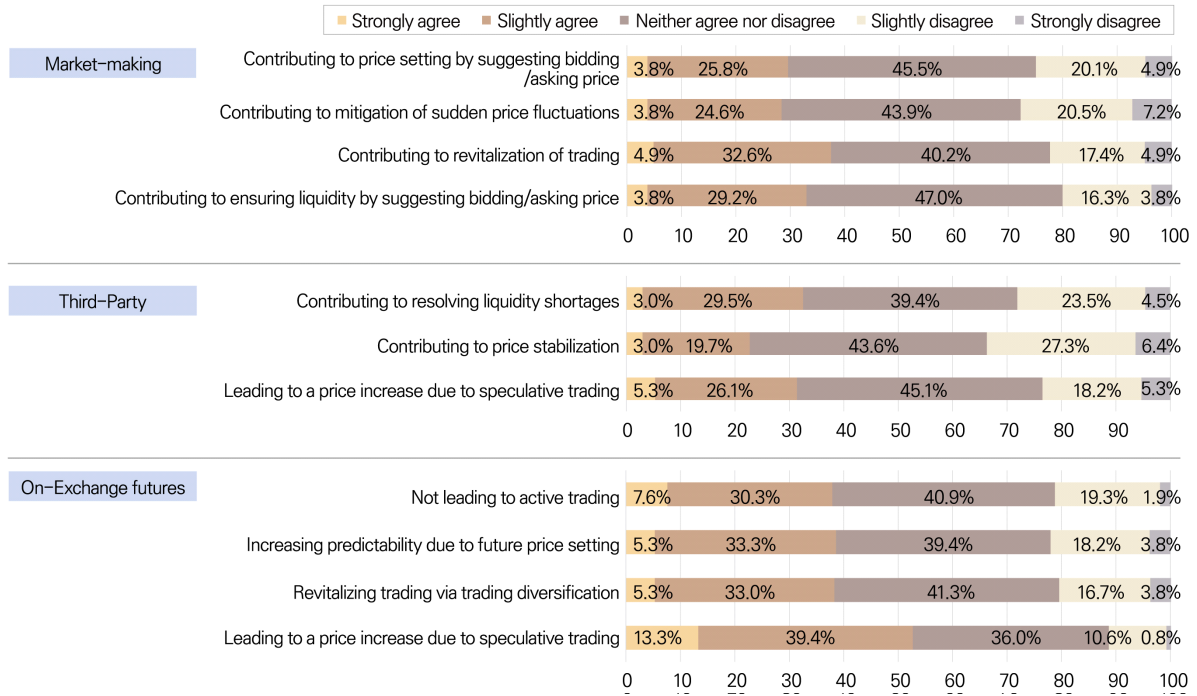
In addition, the views of the covered entities on the measures implemented to revitalize the emissions trading market were examined. For all survey questions regarding the impact of the market-making system introduced during Phase II, the proportion of positive responses was higher to a certain extent than that of negative responses. The entities responded positively regarding the market-making system's contribution in ensuring the liquidity of emission permits (positive: 33.0%, 87 responses; negative: 20.1%, 53 responses), revitalizing trading (positive: 37.5%, 99 responses; negative: 22.3%, 59 responses), mitigating sudden fluctuations in emission permit prices (positive: 28.4%, 75 responses; negative: 27.7%, 73 responses), and establishing prices by suggesting the bidding or asking price (positive: 29.5%, 78 responses; negative: 25.0%, 66 responses). However, a

high proportion of neutral responses for all survey questions indicates that covered entities did not have clear views on the impact of the market-making system on the emissions trading market.

With regard to the impact of third-party trading introduced during Phase III in improving the liquidity of the market, the proportion of positive responses (32.6%, 86 responses) was slightly higher than that of negative responses (28.0%, 74 responses). However, regarding its contribution to stabilizing the emission permit prices, the proportion of negative responses (33.7%, 89 responses) was higher than that of positive responses (22.7%, 60 responses). In addition, the proportion of entities saying that the price will increase due to speculative trading by third-party participants (31.4%, 83 responses) was higher than the proportion of entities that expected the opposite (23.5%, 62 responses). This indicates that some covered entities are concerned about the rise in the price caused by third-party trading.

In addition, covered entities' views on the introduction of on-exchange futures trading were surveyed. The survey results showed that the proportion of respondents who claimed that, even if an on-exchange futures trading system²⁸⁾ is introduced during Phase III, such trading will not be actively undertaken (37.9%, 100 responses) was higher than the proportion of respondents who claimed the opposite (21.2%, 56 responses). With regard to the impact of a fully established futures trading system on the emissions trading market, the number of respondents saying that it will contribute to an increase in market predictability (positive: 38.6%, 88 responses; negative: 22.0%, 58 responses) and to the revitalization of emissions trading (positive: 38.3%, 101 responses; negative: 20.5%, 54 responses) was higher than the number of respondents who claimed otherwise. On the other hand, it was found that concerns about an increase in the emission permit price due to the possible occurrence of speculative trading was also high (positive: 52.7%, 104 responses; negative: 11.4%, 30 responses). This result corresponds closely with the result of the previous survey, in which the most common reason for the respondents' opposition to the introduction of derivatives was the possible increase in the price due to speculative trading (86.6%).

28) In futures trading of emission permits, an agreement is concluded to buy or sell emission permits at a predetermined price at a future date. During Phase II, only spot trading was allowed for emission permit trades in the exchange market. However, on-exchange futures trading is planned to be introduced in Phase III.

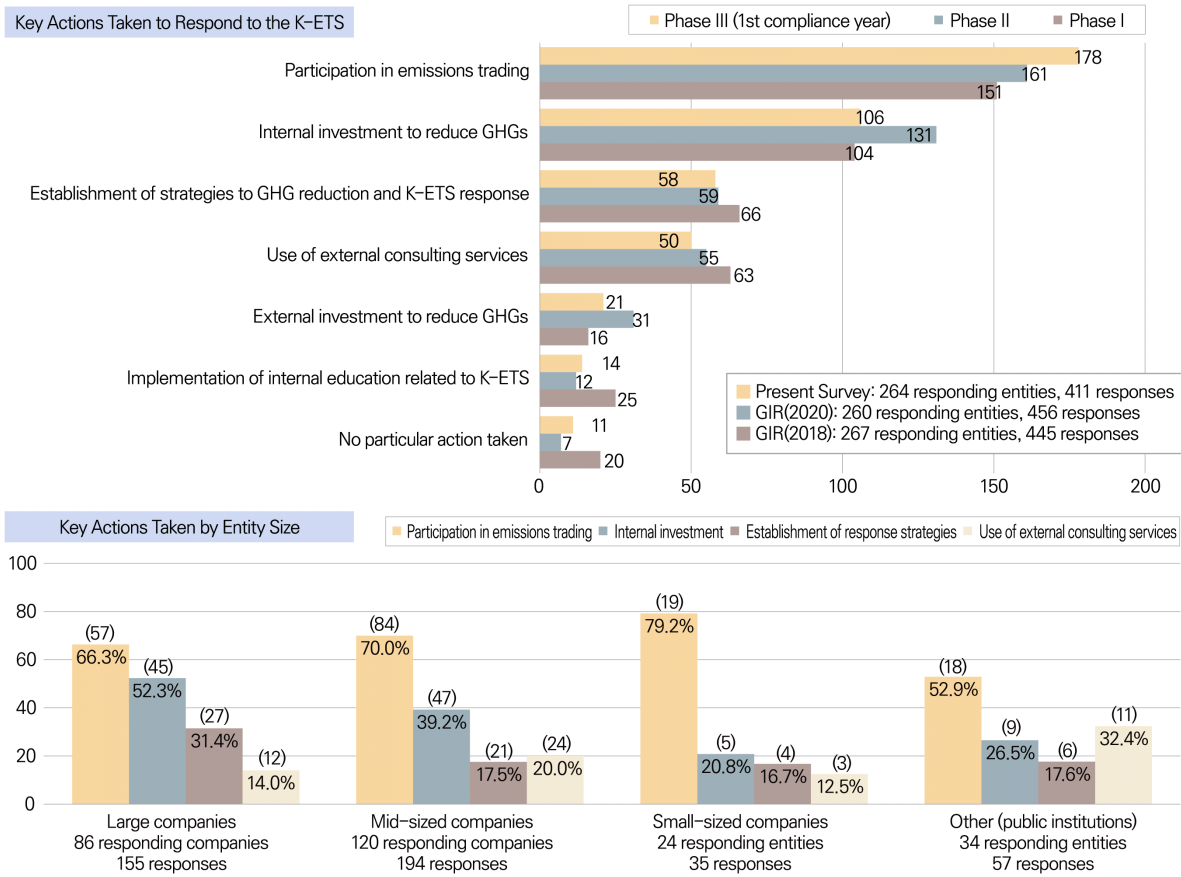


〈Figure IV-3〉 Views on market revitalization measures

2.2. Response to the K-ETS

The key actions that were taken by covered entities in response to the K-ETS included participation in emissions trading (67.4%, 178 responses), internal investment in facilities and technologies to reduce GHG emissions (40.2%, 106 responses), the establishment of strategies to reduce GHG emissions and respond to the K-ETS (22.0%, 58 responses), and the use of external consulting services (18.9%, 50 responses). Although there was a difference in the proportion, the top four measures adopted by covered entities were the same as for the results of the previous surveys (2018 and 2020) conducted after the completion of Phases I and II. However, the response rate for “internal investment in facilities and technologies to reduce GHG emissions” was significantly lower compared to the response rate in the 2020 survey.

The top four measures taken by covered entities were analyzed in terms of entity size and, for entities of all sizes, participation in emissions trading accounted for the highest proportion of responses, with 66.3% of large companies (57 responses), 70.0% of mid-sized companies (84 responses), 79.2% of small-sized companies (19 responses), and 52.9% of other entities (public institutions) (18 responses) reporting to have participated in emissions trading to respond to the K-ETS. Of note was that the smaller the size of the entity, the larger the percentage given to “participation in trading” and the smaller the percentage given to “internal investment.” These results appear to be an outcome of the difference in reduction capacity (e.g., access to information, technological development, recruitment of experts, etc.) between entities of different sizes.



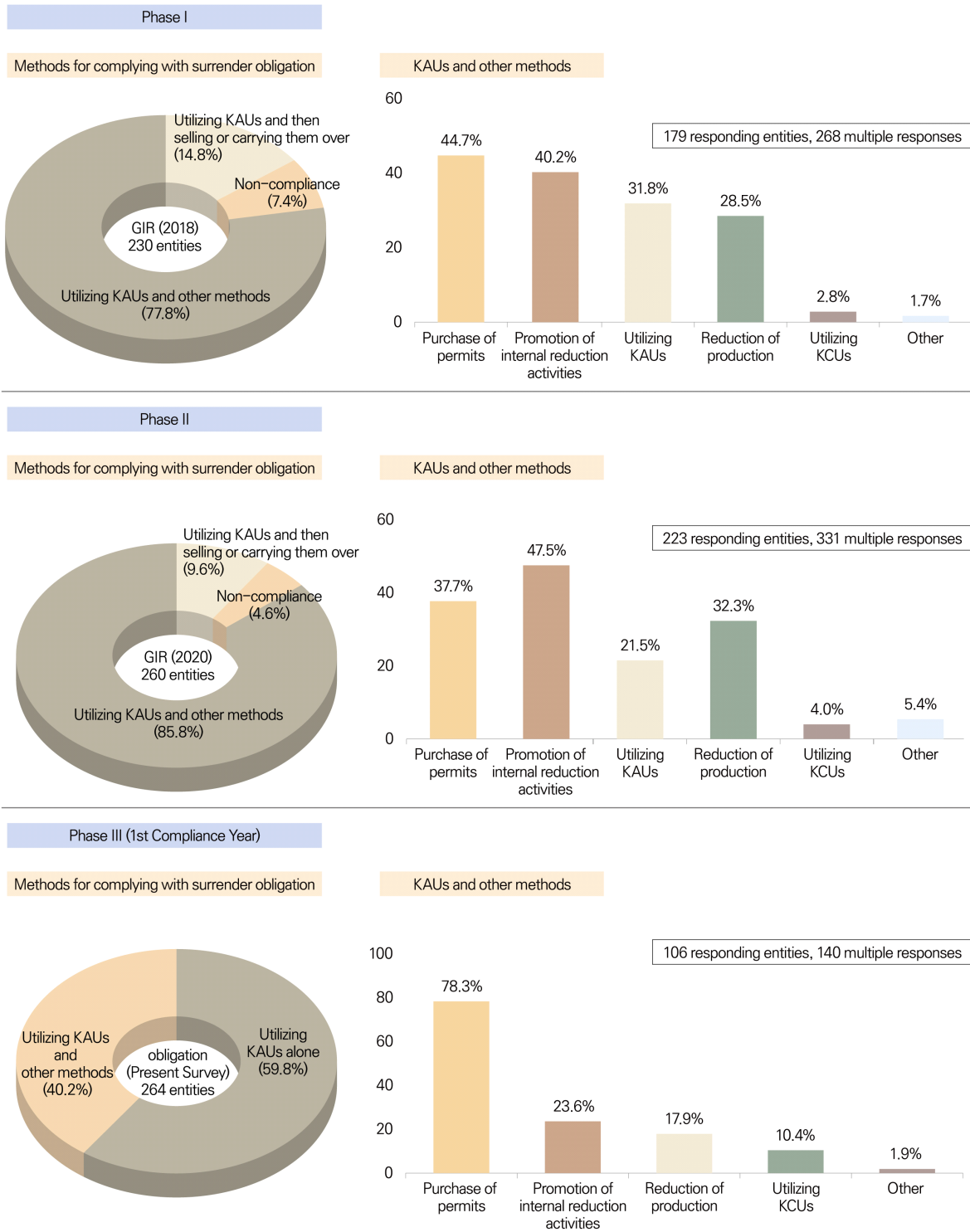
〈Figure IV-4〉 Key actions taken to respond to the K-ETS (up to two responses allowed)

Likewise, according to the analysis of methods used by covered entities to surrender emission permits for the 2021 compliance year of Phase III, participation in emissions trading was found to be the most commonly used method. In this regard, 59.8% of covered entities (158 responses) reported that they were able to meet their obligation to surrender emission permits through allocated emission permits alone, which was much higher than the results of previous surveys (Phase I: 14.8%, 34 responses; Phase II: 9.6%, 25 responses).

A total of 106 responding entities reported that their amount of certified emissions exceeded the amount of emission permits allocated to them for the 2021 compliance year. The reasons for these excess emissions included increased facility utilization to meet increased production (64.8%, 68

responses), the lack of means to additionally reduce GHG emissions (38.1%, 40 responses), difficulties in developing low-carbon technologies and obtaining relevant information (9.5%, 10 responses), uncertainty in government policies (6.7%, 7 responses), and difficulties in securing funds for carbon reduction activities (5.7%, 6 responses).

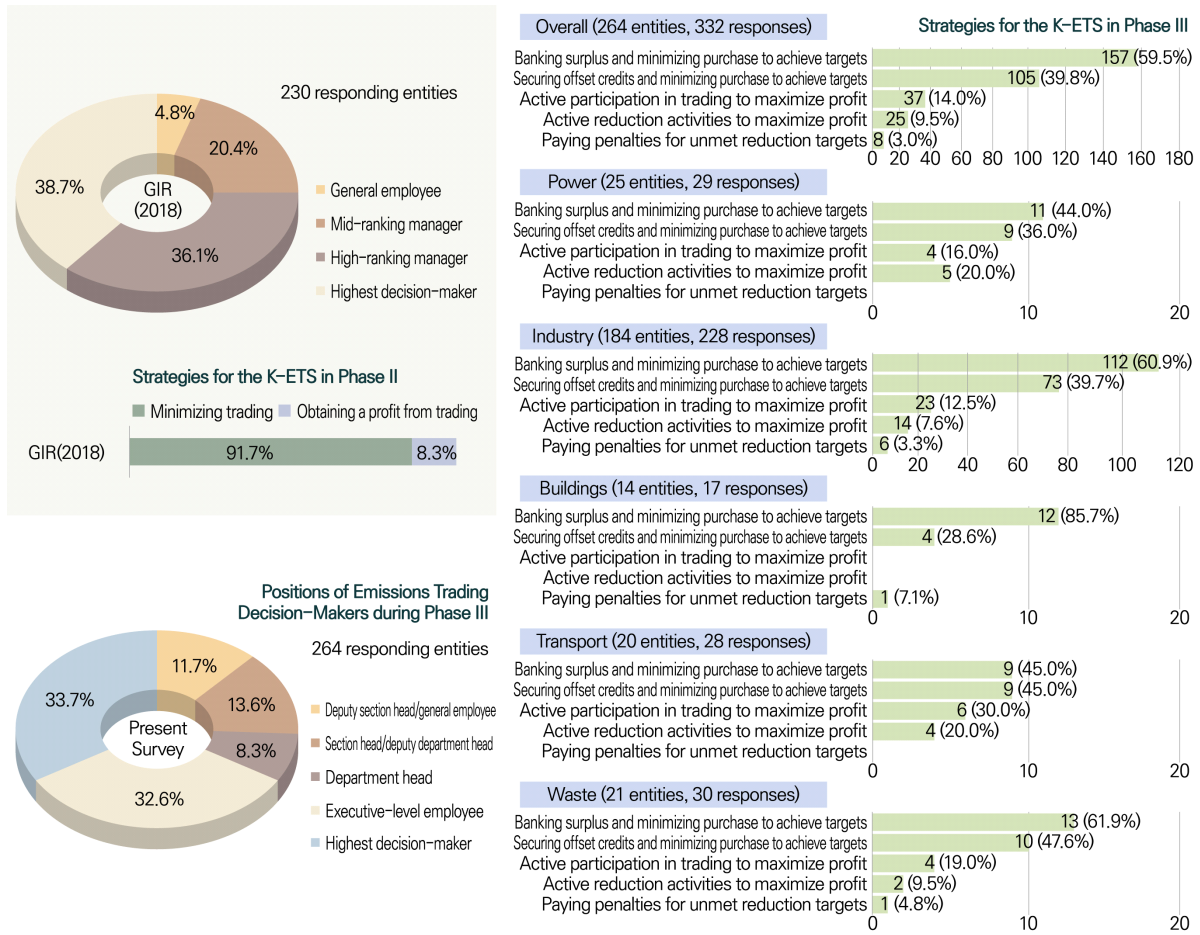
Broken down by entity size, for large and mid-sized companies, the most common reason for excess emissions was increased facility utilization to meet increased production (large companies: 75.0%, 24 responses; mid-sized companies: 71.7%, 33 responses), and the second most common reason was the lack of means to additionally reduce GHG emissions (large companies: 31.3%, 10 responses; mid-sized companies: 34.8%, 16 responses). The results were different for small-sized companies and other entities (public institutions) in that the most common reason was the lack of means to additionally reduce GHG emissions (small-sized companies: 71.4%, 5 responses; other entities: 45.0%, 9 responses), and the second most common reason was increased facility utilization to meet increased production (small-sized companies: 42.9%, 3 responses; other entities: 40.0%, 8 responses). Other methods employed by covered entities to comply with the obligation to surrender emission permits included the purchase of emission permits (78.3%, 83 responses) and the promotion of internal emission reduction activities (23.6%, 25 responses).



〈Figure IV-5〉 Methods for meeting emissions allowances

It was found that the positions held by employees within entities who have the authority to make decisions regarding emissions trading in Phase III are distributed similarly to the pattern found during Phase II. According to the survey conducted during Phase II, the largest proportion of decision-makers were highest decision-makers (38.7%, 89 responses), followed by high-ranking managers (36.1%, 83 responses), mid-ranking managers (20.4%, 47 responses), and general employees (4.8%, 11 responses). Although a different classification system has been used, the results of the present survey revealed a similar pattern, with the largest proportion of decision-makers being the highest decision-makers (33.7%, 89 responses), followed by those holding an executive-level position (32.6%, 86 responses), department heads (8.3%, 22 responses), section heads/deputy department heads (13.6%, 36 responses), and deputy section heads/general employees (11.7%, 31 responses). These findings indicate that, as in the past, those holding a high-ranking managerial position or higher tend to make decisions regarding whether and how their affiliated entity should trade emission permits.

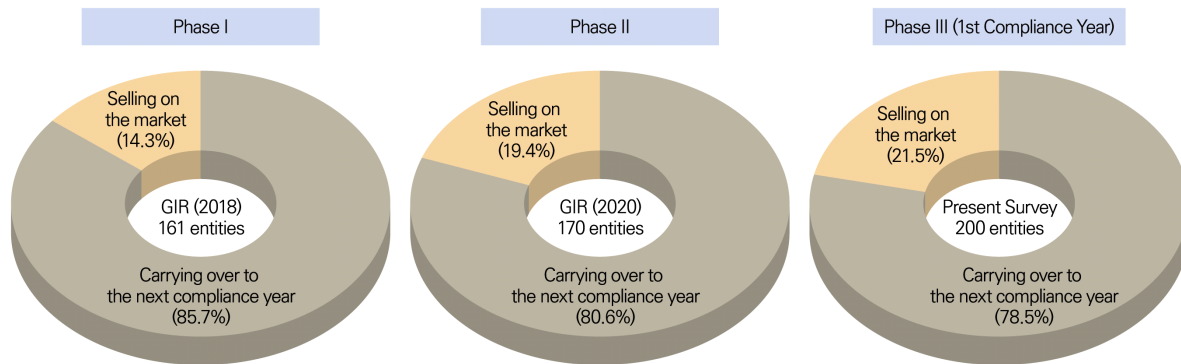
During Phase II, minimizing emissions trading was by far the most preferred strategy for the decision-makers within entities to respond to the K-ETS (GIR, 2020), and it was found that decision-makers' preference for passively responding to the K-ETS has continued since Phase III. The decision-makers within entities preferred to minimize emissions trading, and instead chose to bank surplus emission permits (59.5%, 157 responses) and secure a reduction in emissions (39.8%, 105 responses) to meet the Phase III reduction targets. This behavior was observed in all sectors, although to varying degrees.



〈Figure IV-6〉 Positions of decision-makers and their preferred strategies

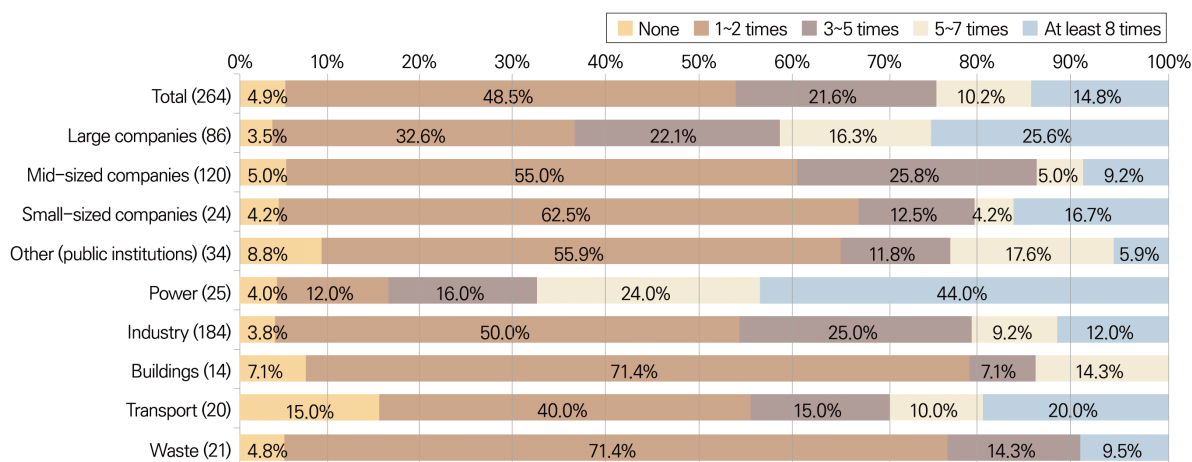
It was found that the tendency of decision-makers to favor the minimization of emissions trading over either the banking of surplus emission permits or securing a reduction in emissions has affected the methods for dealing with surplus permits. In the 2021 compliance year, 75.8% of the responding entities (200 entities) reported that they had surplus permits and 24.2% (64 entities) reported the opposite. Compared to the results of the 2020 survey, where 47.7% of the responding entities (124 entities) stated that they expected to have surplus emission permits and 51.5% (134 entities) stated that they did not have surplus permits, the proportion of responding entities that had surplus permits has increased. Broken down by sector, 60.0% of the responding entities (15 entities) in the power sector reported having surplus emission permits, 81.5% (150 entities) in industry, 64.3% (9 entities) in buildings, 65.0% (13 entities) in transport, and 61.9% (13 entities) in waste. The proportion of responding entities that had surplus emission permits was the highest for the industry sector.

Of the 200 entities that reported having surplus emission permits, 157 entities (78.5%) reported that carrying the permits over to the next compliance year was their primary option, while 43 entities (21.5%) stated that the sale of these permits on the market was their primary option, indicating an overwhelming preference for the banking of surplus permits. Of note is that the proportion of responding entities preferring to bank them has decreased over time from Phase I to Phase III, which appears to be a result of the strengthening of the restrictions on the banking of emission permits. The reasons for choosing to carry over the permits as the primary option included an increase in emissions expected due to the growth of the company and an increase in production (34.4%, 54 responses), an expected increase in the price of emission permits due to a supply shortage of permits on the market (34.4%, 54 responses), and the deferment of decision-making on selling due to uncertainty regarding the market and policy (30.6%, 48 responses). Other reasons included the holding of emission permits for their stable management. The reasons for choosing to sell the emission permits on the market included the lack of a particular reason to hold the surplus permits (44.2%, 19 responses), a decrease in the emissions expected due to downsizing of the business (20.9%, 9 responses), the supply of governmental reserves expected in the case of a lack of permits (16.3%, 7 responses), and an expected decrease in the permit price (11.6%, 5 responses). Other reasons included the restrictions on the banking of emission permits due to relevant banking standards.



〈Figure IV-7〉 Methods for dealing with surplus emission permits

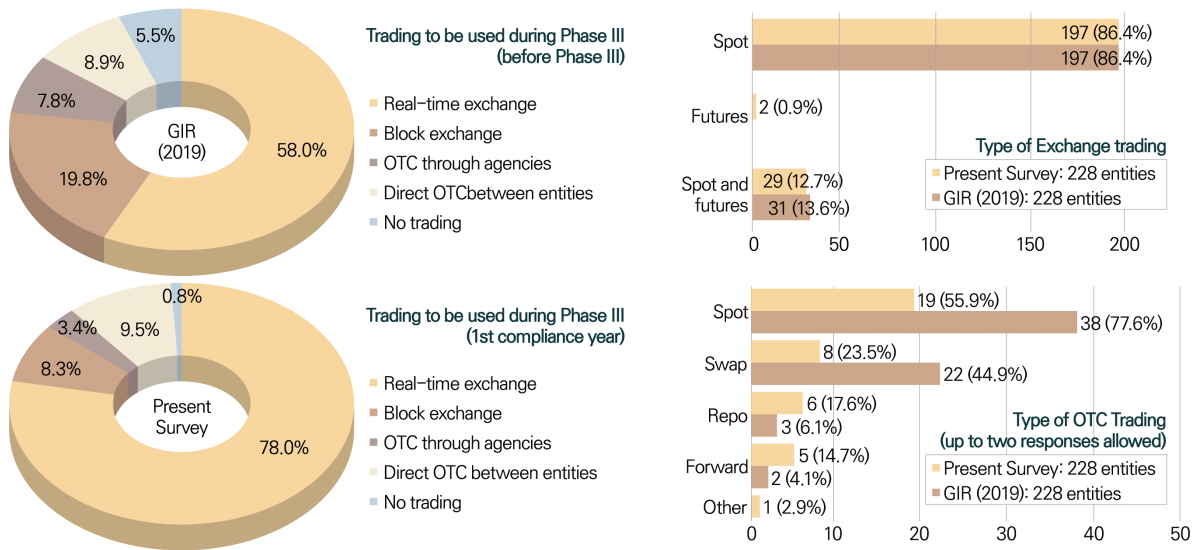
In the 2021 compliance year, 13 responding entities (4.9%) reported that they had not engaged in emissions trading, while 128 entities (48.5%) had engaged in trading 1–2 times, 57 entities (21.6%) 3–5 times, 27 entities (10.2%) 5–7 times, and 39 entities (14.8%) at least 8 times; the number of entities that had engaged in emissions trading 1–2 times accounted for the highest proportion of responses. The result was the same for entities of all sizes (large companies: 32.6%, 28 responses; mid-sized companies: 55.0%, 66 responses; small-sized companies: 62.5%, 15 responses; other entities (public institutions): 55.9%, 19 responses). In particular, the proportion of entities that had engaged in trading at least 5 times was higher for large companies (41.9%, 36 responses) compared to mid-sized companies (14.2%, 17 responses), small-sized companies (20.8%, 5 responses), and other entities (public institutions) (23.5%, 8 responses). Broken down by sector, the proportion of entities that had engaged in trading 1–2 times was highest for all sectors (buildings: 71.4%, 10 responses; industry: 50.0%, 92 responses; transport: 40.0%, 8 responses; waste: 71.4%, 15 responses) excluding the power sector (12.0%, 3 responses). In the power sector, the number of entities that had engaged in emissions trading at least 8 times accounted for the highest proportion of responses (44.0%, 11 responses), and the proportion of entities that had engaged in emissions trading at least 5 times was 24.0% (17 responses).



〈Figure IV-8〉 Participation in emissions trading

In terms of the methods for the trading of emission permits to be mainly used during Phase III, the number of entities that stated that they will trade emission permits through the Korean Exchange accounted for the highest proportion (86.4%, 228 responses); most of these entities reported that they will trade permits via real-time trading (206 responses) and the remaining entities reported that they will use block-trading (22 responses). In addition, the percentage of entities that responded that they will trade permits in the OTC market was 12.9% (34 responses); of these entities, some reported that they will trade emission permits through agencies (9 responses) and the remaining entities stated that they will utilize direct trading between entities (25 responses). The percentage of entities that responded that they will not trade permits was 0.8% (2 responses). In the previous survey (2019), 77.8% of the responding entities (228 responses) reported that they will trade emission permits through the Korea Exchange (real-time trading: 58.0%, 170 responses; block trading: 19.8%, 58 responses), 16.7% of them (49 responses) reported that they will trade them in the OTC market (through agencies: 7.8%, 23 responses; through direct trading between entities: 8.9%, 26 responses), and 5.5% of them (16 responses) stated that they will not trade permits. Compared to the 2019 survey, in the present survey conducted after the commencement of Phase III, the proportion of entities stating that they will not engage in emissions trading has decreased and the proportion of them reporting that they will trade permits by utilizing real-time exchange trading has increased significantly.

In both the present and 2019 surveys, of those entities that preferred trading in the exchange market, the method that they would choose was predominately spot trading (86.4%, 197 responses), followed by both spot and futures trading (present survey: 12.7%, 29 responses; 2019 survey: 13.6%, 31 responses) and futures trading (present survey: 0.9%, 2 responses; 2019 survey: 0.0%, 0 response). Of those entities that preferred the OTC trading, the most preferred method was spot trading (55.9%, 19 responses), followed by swap trading (23.5%, 8 responses), repo trading (17.6%, 6 responses), and forward trading (14.7%, 5 responses). The order was the same for the present survey and the 2019 survey. However, the results of the current survey differed in that the response rates for the preferred methods were relatively even across all methods excluding spot trading.



〈Figure IV-9〉 Changes in the methods for trading emission permits in Phase III

3

GHG Emission Reduction Performance and Efforts**3.1. GHG Emission Reduction Performance**

In order to determine the impact of the covered entities' participation in the K-ETS on their GHG emission reduction activities, the degree of investment they have made in reduction activities and their views of the subsequent reduction performance were analyzed. In terms of investment in reduction activities, the responding entities reported an increase in the costs of introducing low-carbon facilities or equipment (positive: 35.2%, 93 responses; negative: 26.9%, 71 responses), in the investment costs for low-carbon technology development (positive: 24.2%, 64 responses; negative: 33.4%, 88 responses), and in the investment costs of implementing external projects (positive: 18.2%, 48 responses; negative: 41.7%, 110 responses). In particular, the proportion of positive responses was higher than that of negative responses for an increase in the costs of introducing low-carbon facilities or equipment, while the proportion of negative responses was higher than that of positive responses for an increase in the investment costs for low-carbon technology development and an increase in the investment costs of implementing external projects. Regarding all of these survey items, the proportion of positive responses decreased in the order of large companies, mid-sized companies, and small-sized companies. In addition, for entities of all sizes excluding small-sized companies, the proportion of positive responses decreased in the order of an increase in the costs of introducing low-carbon facilities or equipment, an increase in the investment costs for low-carbon technology development, and an increase in the investment costs of implementing external projects, with the proportion of negative responses increasing in the same order.

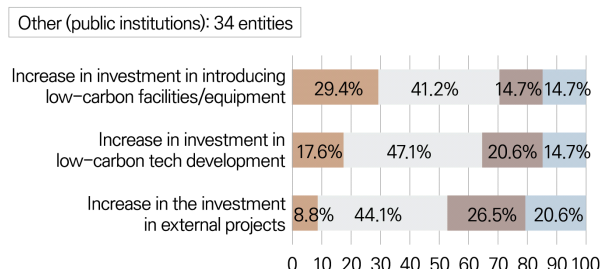
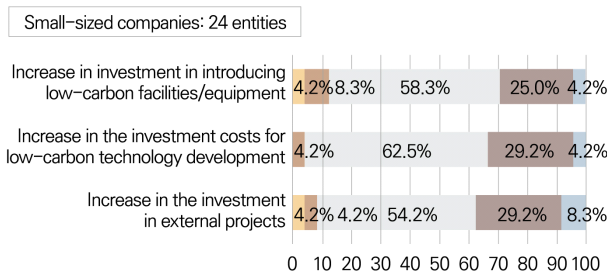
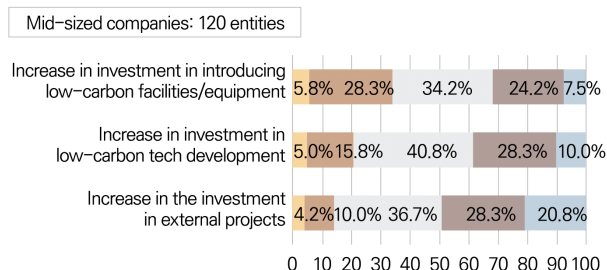
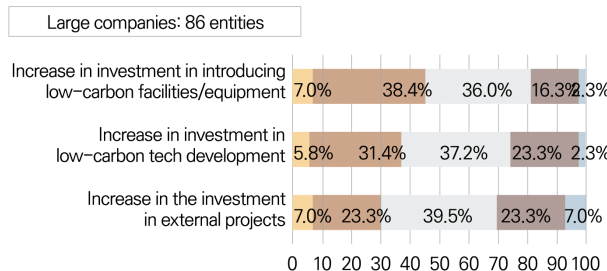
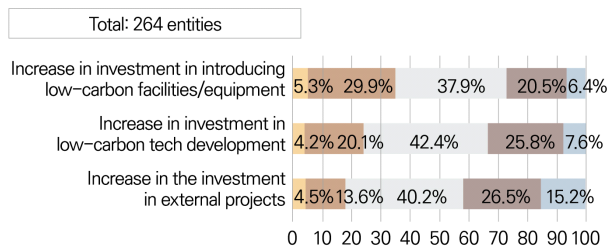
With regard to their GHG emission reduction performance due to participation in the K-ETS, the proportion of positive responses was higher than that of negative responses for an increase in energy efficiency (positive: 39.0%, 103 responses; negative: 19.3%, 51 responses) and a reduction in energy consumption (positive: 33.0%, 87 responses; negative: 28.4%, 75 responses), while the proportion of negative responses was higher than that of positive responses for an increase in low-carbon energy utilization (positive: 22.7%, 60 responses; negative: 40.1%, 106 responses), a reduction in GHG

emissions (positive: 29.2%, 77 responses; negative: 31.3%, 96 responses), and a reduction in waste generation (positive: 14.4%, 38 responses; negative: 39.0%, 103 responses). On a 100-point scale,²⁹⁾ the responding entities gave 55.4 points for their performance in increasing energy efficiency, 50.6 points for reducing energy consumption, 47.5 points for reducing GHG emissions, 44.4 points for increasing low-carbon energy utilization, and 42.3 points for reducing waste generation. Broken down by entity size, large and mid-sized companies and other entities (public institutions) responded positively regarding their performance in the order of an increase in energy efficiency and a reduction in energy consumption; small-sized companies responded positively regarding their performance in the order of a reduction in GHG emissions and a reduction in energy consumption. Compared to entities of other sizes, other entities (public institutions) gave slightly lower scores for their GHG emission reduction performance for most survey items.

29) A 5-point Likert scale was used in the survey, and the results were converted into a 100-point scale for analysis, with 100 points (5 points on the Likert scale) representing "strongly agree," 75-99 points (4 points) representing "slightly agree," 50-74 points (3 points) representing "neither agree nor disagree," 25-49 points (2 points) representing "slightly disagree," and 0-24 points (1 point) representing "strongly disagree."

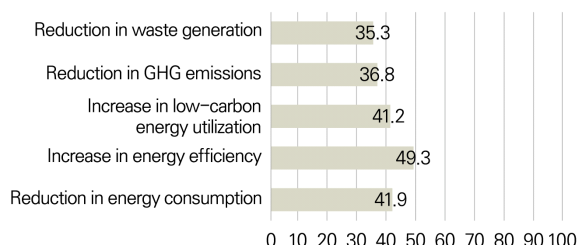
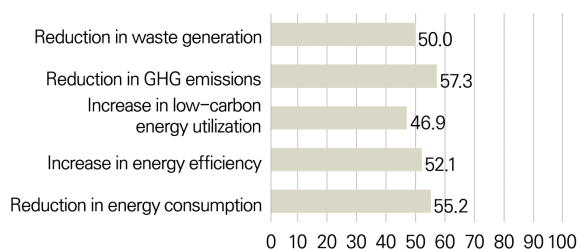
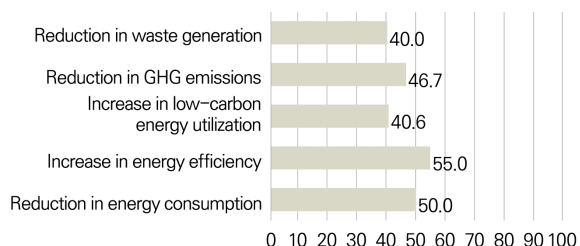
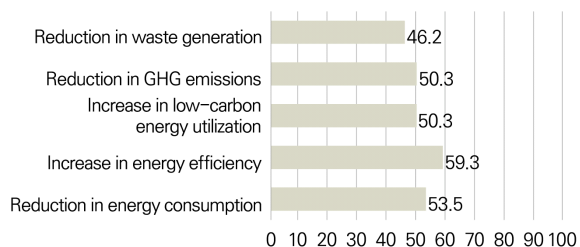
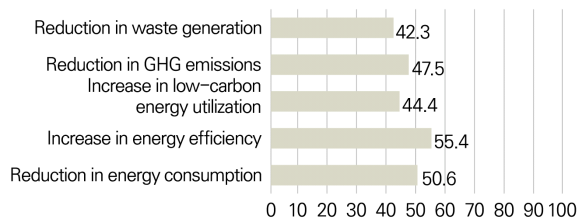
GHG Emission Reduction Activities

Strongly agree Slightly agree Neither agree nor disagree Slightly disagree Strongly disagree



GHG Emission Reduction Performance

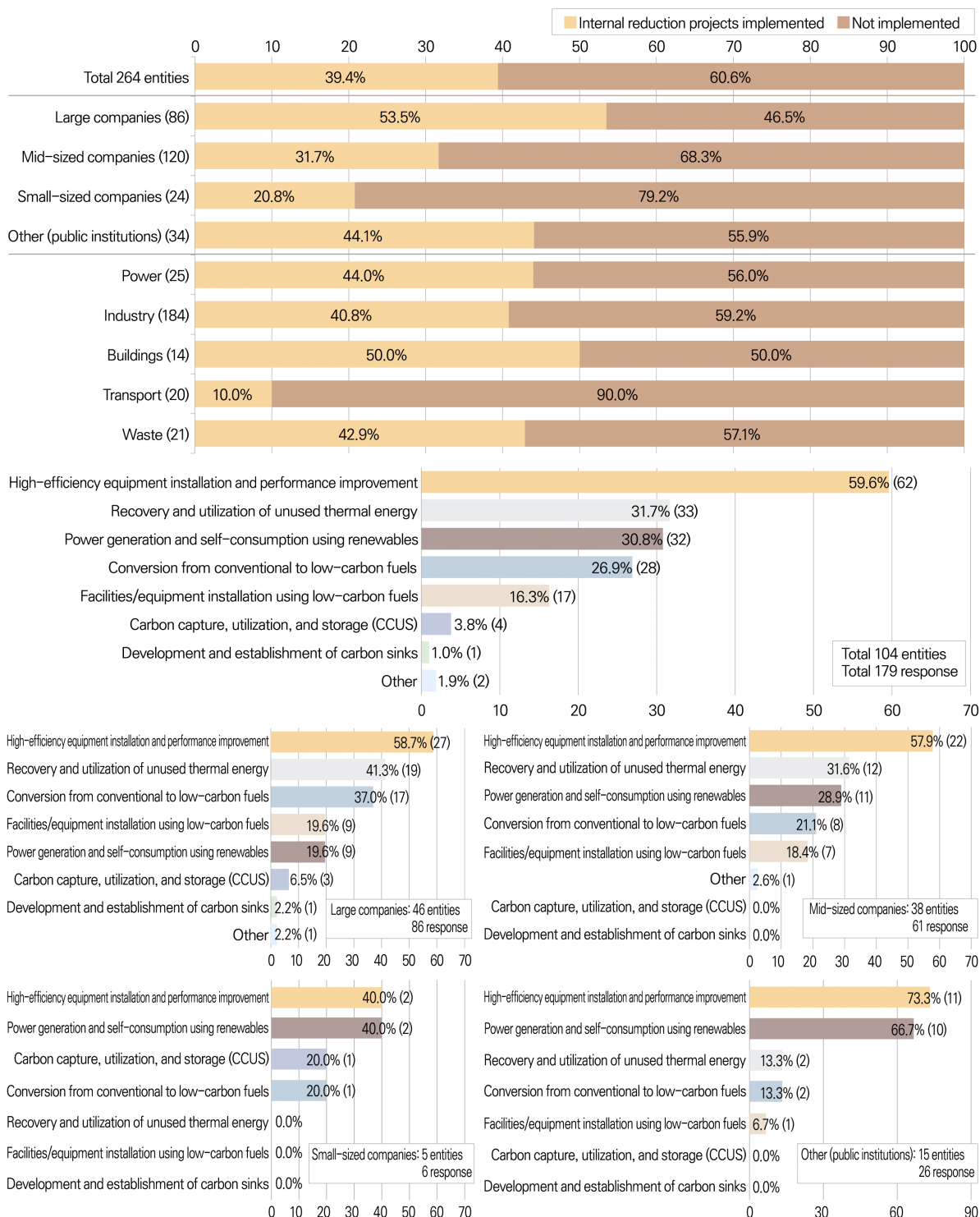
100-point scale



〈Figure IV-10〉 GHG emission reduction activities and views of performance under the K-ETS

The proportion of responding entities that reported to have not implemented internal GHG emission reduction projects in the 2021 compliance year was 60.0% (160 responses), which was approximately 1.5 times higher than the proportion of entities that reported to have implemented these projects (39.4%, 104 responses). Broken down by entity size, 53.5% of large companies reported to have implemented internal GHG emission reduction projects (46 responses), followed by 31.7% of mid-sized companies (38 responses) and 20.8% of small-sized companies (5 responses); the proportion of other entities (public institutions) that stated to have implemented these projects was 44.1% (15 responses). The proportion of positive responses was higher than that of negative responses only for large companies. Broken down by sector, the positive response rate was 50.0% for the buildings sector (7 responses), 44.0% for power (11 responses), 42.9% for waste (9 responses), 40.8% for industry (75 responses), and 10.0% for transport (2 responses).

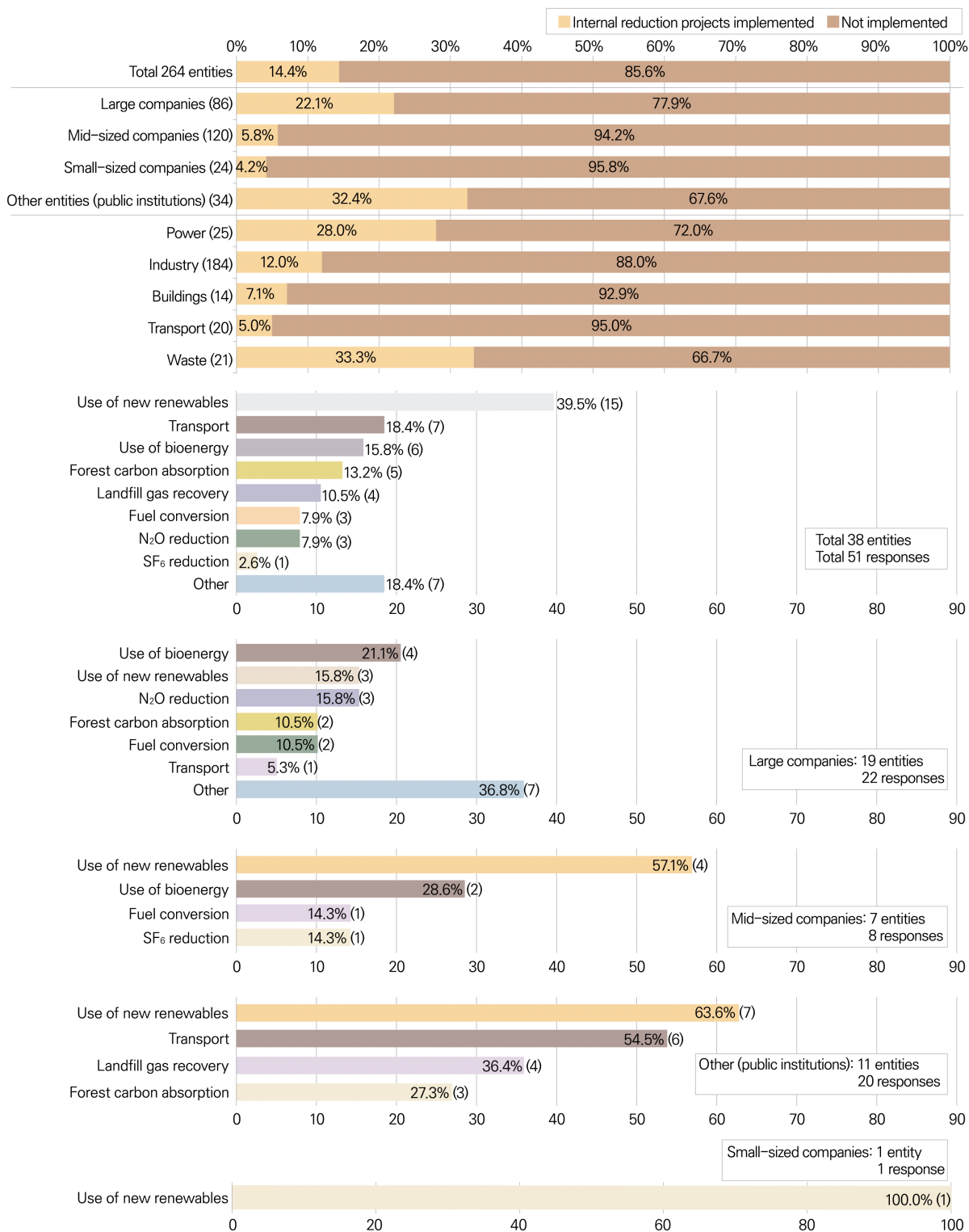
Technological investment and reduction activities conducted internally by the responding entities were mainly the installation of high-efficiency equipment and improvement of equipment performance (59.6%, 62 responses), recovery and utilization of unused thermal energy (31.7%, 33 responses), electricity generation and self-consumption using renewable energy (30.8%, 32 responses), and conversion from conventional to low-carbon fuels (26.9%, 28 responses). Broken down by entity size, the most common internal reduction activity undertaken by entities of all sizes was the installation of high-efficiency equipment and improvement of equipment performance (large companies: 58.7%, 27 responses; mid-sized companies: 57.9%, 22 responses; small-sized companies: 40.0%, 2 responses; other entities (public institutions): 73.3%, 11 responses). For small-sized companies, electricity generation and self-consumption using renewable energy was also the most common internal reduction activity they have undertaken (40.0%, 2 responses). The second most commonly undertaken internal reduction activity was recovery and utilization of unused thermal energy for large (41.3%, 19 responses) and mid-sized companies (31.6%, 12 responses) and electricity generation and self-consumption using renewable energy for other entities (public institutions) (66.7%, 10 responses).



(Figure IV-11) Internal GHG emission reduction performance for the 2021 Compliance Year

The proportion of responding entities that reported to have not implemented external GHG emission reduction projects in the 2021 compliance year was 85.6% (226 responses), which was approximately six times higher than the proportion of entities that reported to have implemented these projects (14.4%, 38 responses). Broken down by entity size, 22.1% of large companies reported to have implemented external GHG emission reduction projects (19 responses), followed by 5.8% of mid-sized companies (7 responses) and 4.2% of small-sized companies (1 response); the number of other entities (public institutions) that stated to have implemented these projects accounted for the highest proportion (32.4%, 11 responses). Broken down by sector, the positive response rate was 33.3% for the waste sector (7 responses), 28.0% for power (7 responses), 12.0% for industry (22 responses), 7.1% for buildings (1 response), and 5.0% for transport (1 response).

Technological investment and reduction activities conducted externally by the responding entities were mainly the use of new renewable energy (39.5%, 15 responses), transport measures including conversion to electric vehicles (18.4%, 7 responses), use of bioenergy (15.8%, 6 responses), and forest carbon absorption (13.2%, 5 responses). Broken down by entity size, the use of new renewable energy was the most common external reduction activity undertaken by mid-sized companies (57.1%, 4 responses), small-sized companies (100.0%, 1 response), and other entities (public institutions) (63.6%, 7 responses). The second-most commonly undertaken activity was the use of bioenergy for mid-sized companies (28.6%, 2 responses) and transport measures including conversion to electric vehicles for other entities (public institutions) (54.5%, 6 responses). For large companies, key actions taken were the use of bioenergy (21.1%, 4 responses), use of new renewable energy (15.8%, 3 responses), and N₂O reduction (15.8%, 3 responses).



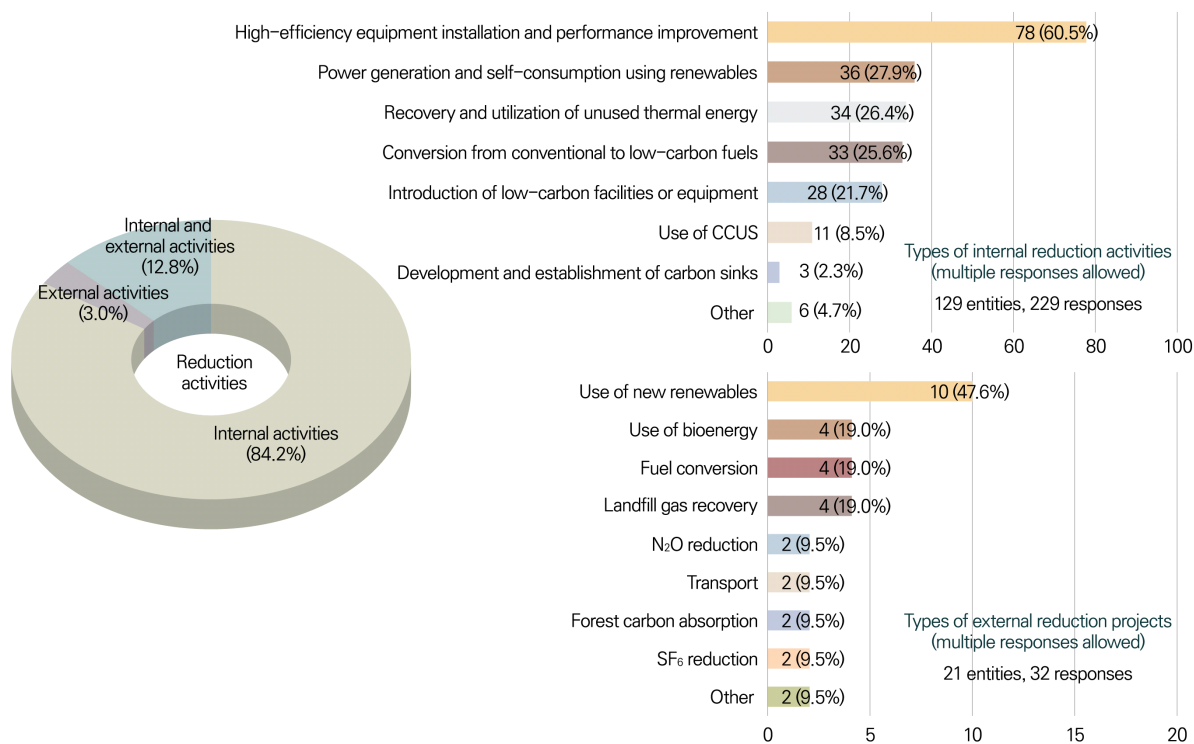
(Figure IV-12) External GHG emission reduction performance for the 2021 compliance year

3.2. GHG Emission Reduction Efforts

According to this analysis, 50.4% of all responding entities stated that they have a GHG emission reduction plan for Phase III (133 responses). Of these entities, 84.2% (112 responses) reported that they will reduce GHG emissions mainly through internal activities, 12.8% (17 responses) reported that they will utilize both internal activities and external reduction projects, and 3.0% (4 responses) reported that they will reduce GHG emissions mainly through external projects.

The planned internal reduction activities included the installation of high-efficiency equipment and improvement of equipment performance (60.5%, 78 responses), electricity generation and self-consumption using renewable energy (27.9%, 36 responses), recovery and utilization of unused thermal energy (26.4%, 34 responses), and conversion from conventional to low-carbon fuels (25.6%, 33 responses), which are identical to the main four actions undertaken in the 2021 compliance year. In addition, as the main external reduction project, the responding entities plan the use of new renewable energy (47.6%, 10 responses).

Specific reduction activities that were planned for Phase III had a focus on equipment replacement and the introduction of a management system with the aim of improving energy efficiency, including the installation of high-efficiency LED lighting, boilers, inverters, air compressors and burners, and the introduction of an energy management system for buildings. Other projects that were planned included the introduction of a waste heat recovery system, conversion from internal combustion engine vehicles to electric vehicles, improvement of vehicle fuel efficiency, installation of solar power generation facilities and self-power generation, installation of a methane gas recovery system for bioenergy utilization, production of waste plastic pyrolysis fuels, purchase of renewable energy, and use of carbon capture and utilization, and storage (CCUS).

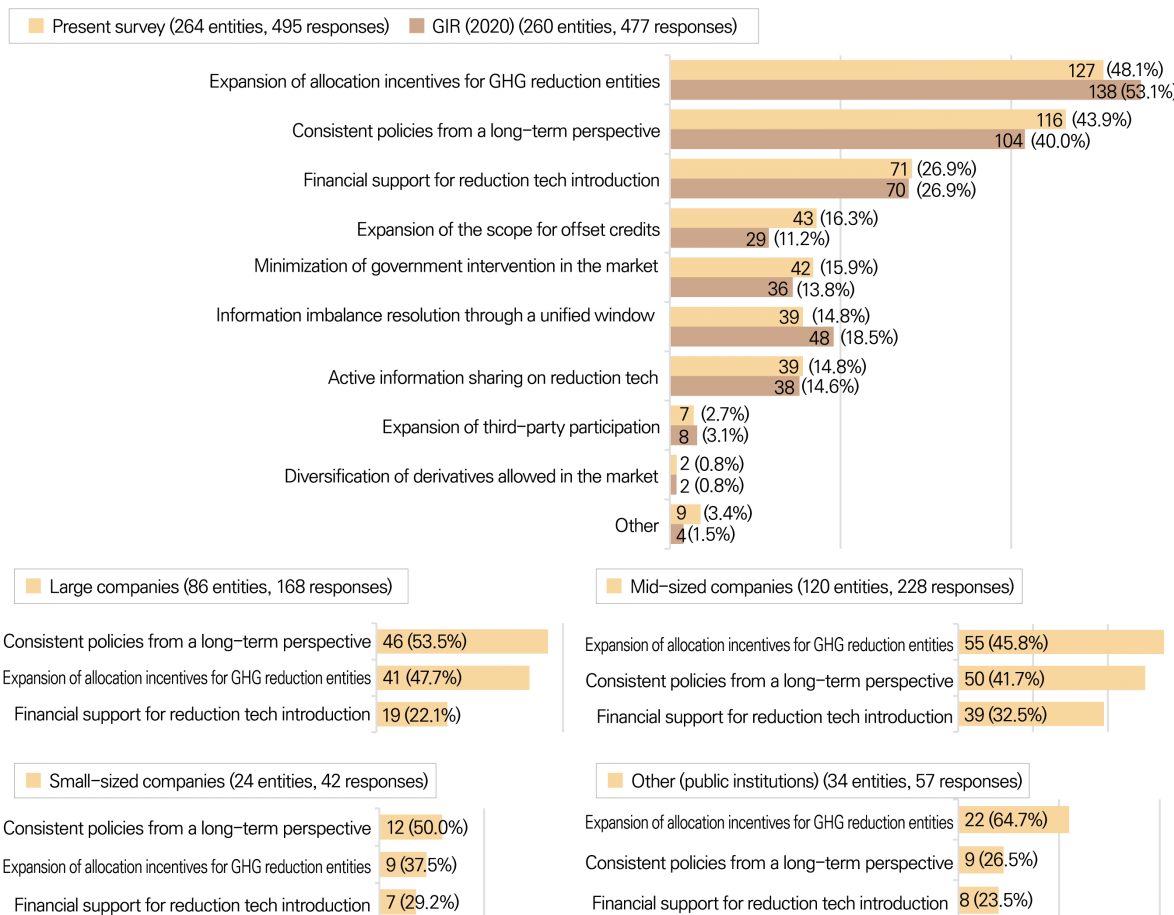


〈Figure IV-13〉 Types of GHG emission reduction activities planned for Phase III

3.3. Improvement of the K-ETS

Similar to the results of the 2020 GIR survey, with regard to the improvements required for the K-ETS, the responding entities chose as the main priorities the expansion of allocation incentives for entities pursuing GHG reduction efforts (48.1%, 127 responses), the presentation of consistent policies from a long-term perspective (43.9%, 116 responses), and financial support for the introduction of technologies to reduce GHG emissions (26.9%, 71 responses). Other proposals included the stabilization of emission permit prices and an increase in their predictability, support for reduction technology development, expansion of the government-led supply of environmentally-friendly energy sources, and the minimization of the administrative burden.

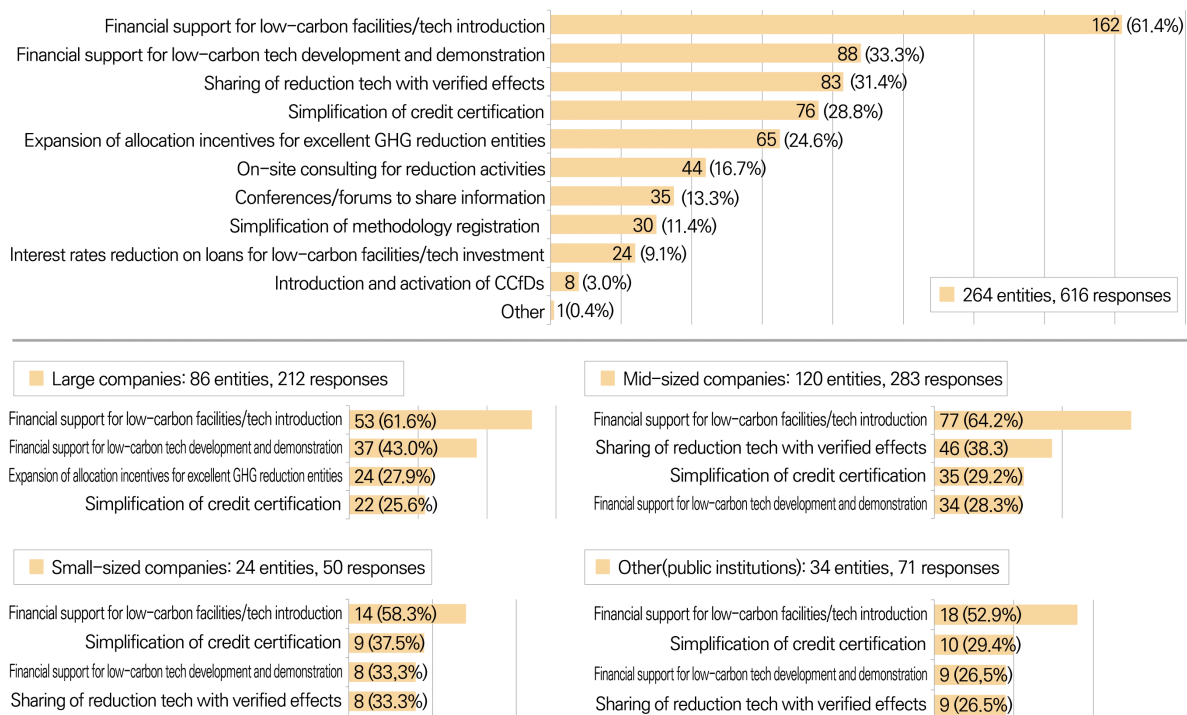
Broken down by entity size, the most required improvement for large and small-sized companies was the presentation of consistent policies from a long-term perspective (large companies: 53.5%, 46 responses; small-sized companies: 50.0%, 12 responses), and that for mid-sized companies and other entities (public institutions) was the expansion of allocation incentives for entities pursuing GHG reduction efforts (mid-sized companies: 45.8%, 55 responses; other entities (public institutions): 64.7%, 22 responses). In particular, while large, mid-sized, and small-sized companies identified financial support for the introduction of technologies to reduce GHG emissions as one of the main three priorities, other entities (public institutions) selected the expansion of the scope for approving offset credits as a main priority.



〈Figure IV-14〉 Improvements for the K-ETS (up to two responses allowed)

In line with their selection of financial support for the introduction of reduction technologies as a required improvement for the K-ETS, the responding entities emphasized that financial support for the introduction of low-carbon facilities and technologies (61.4%, 162 responses) is required for the institutional improvement of and support for the implementation of internal emission reduction activities. Entities of all sizes selected this measure as the most required strategy (large companies: 61.6%, 53 responses; mid-sized companies: 64.2%, 77 responses; small-sized companies: 58.3%, 14 responses; other entities (public institutions): 52.9%, 18 responses). The key measures requested by the responding entities included financial support for low-carbon technology development and demonstration (33.3%, 88 responses), sharing of reduction technologies with verified reduction effects

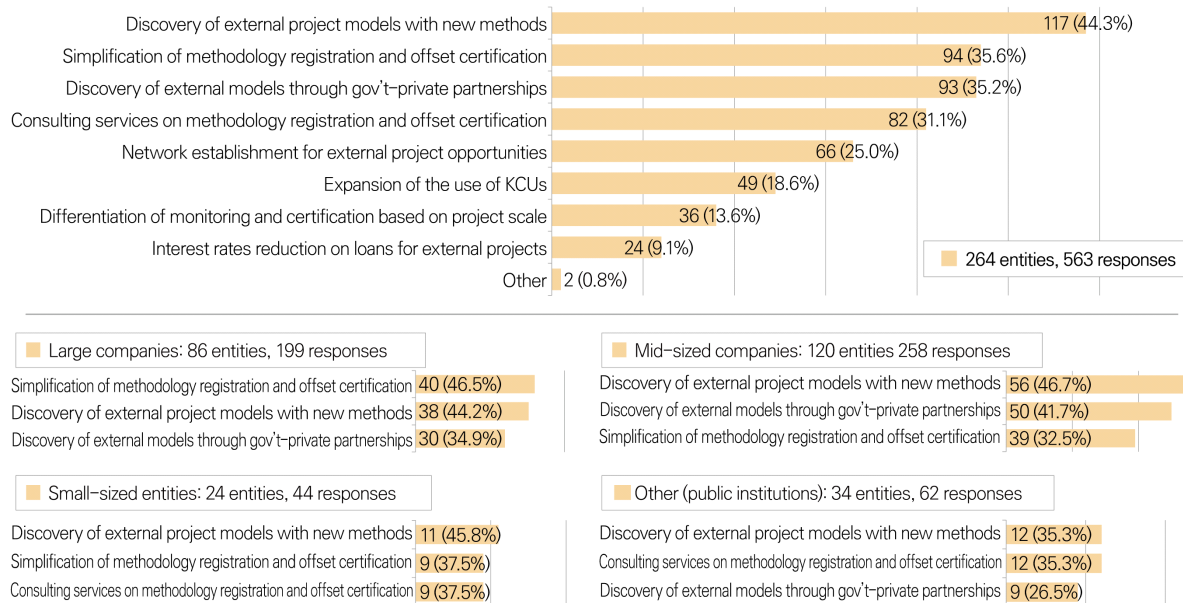
(31.4%, 83 responses), the simplification of emission reduction certification procedures (28.8%, 76 responses), and the expansion of allocation incentives for entities with excellent emission reduction performance (24.6%, 65 responses). These measures correspond closely with the factors hindering the implementation or successful execution of GHG reduction activities that were reported by the responding entities in the previous year's survey, which included difficulties in developing and securing low-carbon technologies, difficulties in mobilizing internal funds for the implementation of GHG reduction activities, and difficulties in obtaining information on low-carbon technologies.



〈Figure IV-15〉 Institutional improvement and support for internal emission reduction activities (up to three responses allowed)

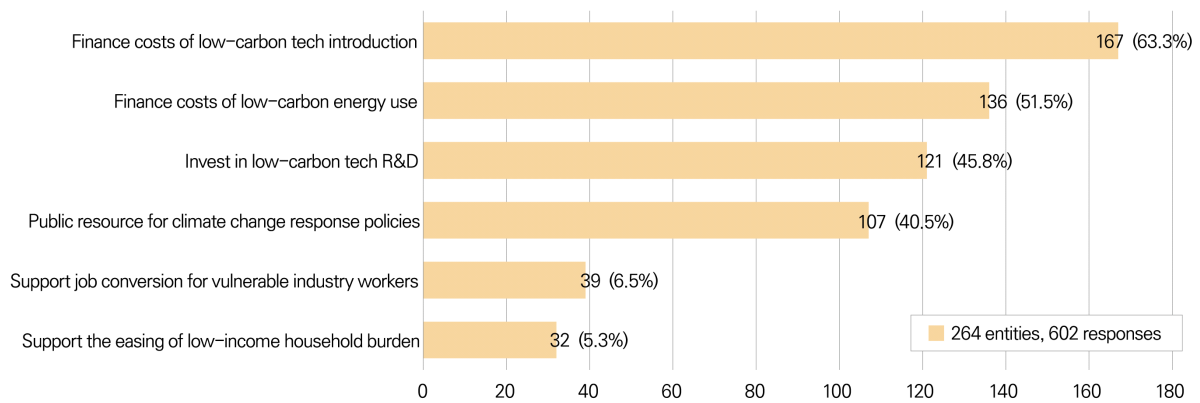
In addition, taking into account the current situation where the responding entities are not particularly willing to participate in external emission reduction projects, measures that the responding entities consider necessary for the institutional improvement of and support for the implementation of these projects were investigated. According to the survey results, the key measures proposed by the responding entities were the active discovery of external project models that apply new reduction methods (44.3%, 117 responses), easing of the registration procedures for new reduction methodologies and emission reduction certification procedures (35.6%, 94 responses), the active discovery of external project models through government–private partnerships (35.2%, 93 responses), and the provision of consulting services regarding reduction methodology registration and emission reduction certification procedures (31.1%, 82 responses).

Broken down by entity size, the key required measures (although in a different order) selected by entities of all sizes were the active discovery of external project models that apply new reduction methods (large companies: 44.2%, 38 responses; mid–sized companies: 46.7%, 56 responses; small–sized companies: 45.8%, 11 responses; other entities (public institutions): 35.3%, 12 responses), the active discovery of external project models through government–private partnerships (large companies: 34.9%, 30 responses; mid–sized companies: 41.7%, 50 responses; other entities (public institutions): 26.5%, 9 responses), and easing of the registration procedures for new reduction methodologies and emission reduction certification procedures (large companies: 46.5%, 40 responses; mid–sized companies: 32.5%, 39 responses; small–sized companies: 37.5%, 9 responses; other entities (public institutions): 35.3%, 12 responses). The results indicate that covered entities of all sizes require the sharing of project models that they can refer to in planning for the implementation of external reduction projects and the easing of administrative procedures for project implementation. In particular, the provision of consulting services regarding reduction methodology registration and emission reduction certification procedures was identified as one of the three measures most required for small–sized companies.



〈Figure IV-16〉 Institutional improvement and support for external emission reduction activities (up to three responses allowed)

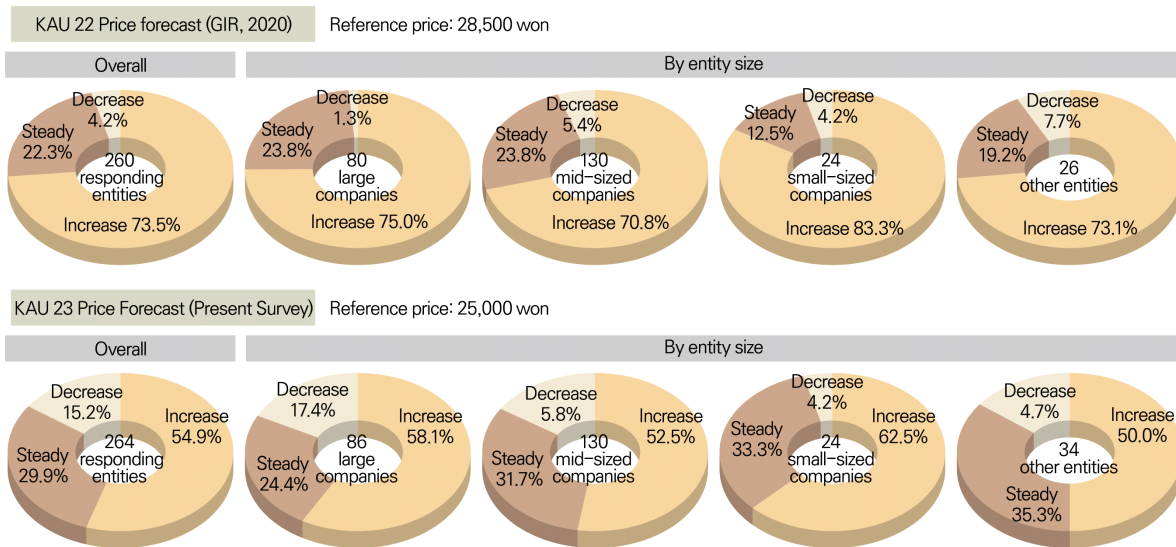
Financial resources are required for the government to provide financial and administrative support for the active implementation of internal and external emission reduction activities, and it appears that the responding entities believe financial resources can be obtained from the revenue generated from emission permit auctions. With the expected increase in revenue from auctions, the responding entities' views on the use of the revenue were surveyed. The responding entities stated that the revenue should be used to finance the costs of introducing low-carbon technologies and related consulting services (63.3%, 167 responses), to finance the costs of using low-carbon energy sources and related consulting services (51.5%, 136 responses), to invest in R&D for low-carbon technologies (45.8%, 121 responses), and to provide a public resource for the implementation of climate change response policies (40.5%, 107 responses). On the other hand, the proportion of responding entities saying that the revenue should be used to support vulnerable groups, such as to ease the burden for low-income households of rising energy and product prices (5.3%, 32 responses) and to support job conversion for workers in vulnerable industries following industrial restructuring (6.5%, 39 responses), was low.



〈Figure IV-17〉 Utilization of the revenue generated from auctions (up to three responses allowed)

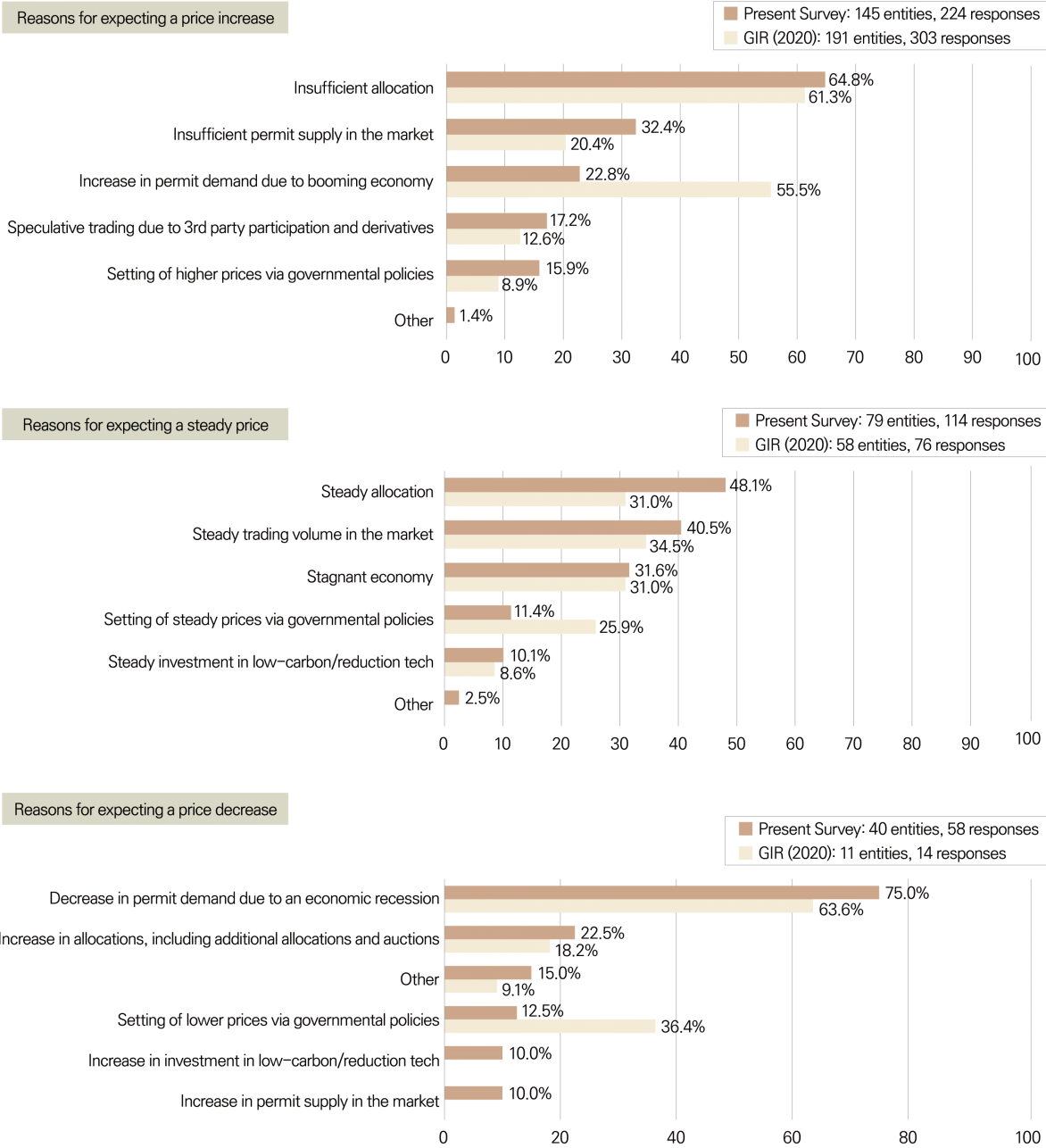
3.4. Forecasts for Emission Permit Prices

In terms of forecasting the average emission permit price for 2023, with reference to the closing price for KAU22 on 28 September 2022 (25,000 won), 54.9% of the responding entities (145 entities) expected an increase, 29.9% (79 entities) expected a steady price, and 15.2% (40 entities) expected a decrease. This corresponds closely with the results of the 2018 and 2019 GIR surveys where the responding entities anticipated the average KAU23 trading price for December 2023 would be 40,916 won and 37,300 won, respectively. Compared to the results of the previous year’s survey, in which 73.5% of the responding entities (191 entities) expected an increase, 22.3% (58 entities) expected a steady price, and 4.2% (11 entities) expected a decrease from the reference price of 28,500 won, the proportion of entities anticipating an increase has declined significantly and the proportion of entities anticipating a steady price and a decrease has increased. This change was observed in entities of all sizes; accordingly, in entities of all sizes, the proportion of entities anticipating an increase in the emission permit price has declined while the proportion of entities anticipating a steady price and a decrease has increased.



〈Figure IV-18〉 Forecasts for emission permit prices

The main reasons for expecting a decrease in emission permit prices were (i) a decrease in the demand for emission permits due to a decrease in production as a result of an economic recession (75.0%, 30 responses), which accounted for the highest proportion of responses, (ii) an increase in emission permit allocations, including additional allocations and auctions (22.5%, 9 responses), and (iii) setting of lower emission permit prices via governmental policies (12.5%, 5 responses). The top three reasons selected for the present survey were the same as those selected for the previous year's survey, although in a different order. Other reasons included the shutdown of emission-intensive companies due to weather conditions such as typhoons, an increase in the amount of surplus emission permits held by companies due to active reduction activities, a temporary increase in the supply of emission permits in the market due to the permission for the banking of permits, and an increase in the supply of KCUs for the first half of 2023. Similar to the results of the previous year's survey, the main reasons for expecting steady emission permit prices were a steady allocation (48.1%, 38 responses), a steady trading volume in the emissions trading market (40.5%, 32 responses), and a stagnant economy (31.6%, 25 responses). In addition, the primary three reasons for expecting an increase in emission permit prices was an expected insufficient allocation (64.8%, 94 responses). The second-most selected reason for expecting an increase was an insufficient supply of emission permits in the emissions trading market (32.4%, 47 responses) and the third-most selected reason was an increase in the demand for emission permits due to an increase in production resulting from the booming economy (22.8%, 33 responses). These differed from the results of the previous year's survey, in which the top two reasons were an insufficient emission permit allocation (61.3%) and an increase in the demand for permits due to an increase in production resulting from the booming economy (55.5%).



〈Figure IV-19〉 Reasons for forecasting emission permit prices

2022 Korean Emissions Trading System Report

Published in	May 2023
Published at	 Greenhouse Gas Inventory and Research Center Osongsaengmyeong-ro 210, Cheongju, Chungcheongbuk-do, Republic of Korea
Published by	President of the Greenhouse Gas Inventory and Research Center Hyungwook Cho (Director)
Written by	Sungwoo Lee, Kyeongah Ahn, Minju Lee Minji Cho, Jaehui Lee, Yumi Jung, and Gibong Yer
Telephone	043-714-7533 Fax 043-714-7530
Website	http://www.gir.go.kr
Government Publication Number	11-1480906-000007-10

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2022 K-ETS Annual Report



Ministry of Environment

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