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Phase II | 2018-2020

2018 K-ETS Summary Report

Ministry of Environment
Greenhouse Gas Inventory and
Research Center of Korea

Phase II | 2018-2020

2018 K-ETS Summary Report

Notes for the Reader

❶ This report analyzes the implementation results (1 Jan. '18 to 30 Sept. '19) for the Korean Emissions Trading System(K-ETS) including the allocation, trading, and surrender of emission permits for liable entities designated in accordance with Articles 8 and 9 of the Act on the Allocation and Trading of Greenhouse-Gas Emission Permits (hereafter "the Act").

❷ This report is based on entity-level data for emission permits provided by NGMS, ETRS, ORS, and KRX:

- **National GHG Management System (NGMS) :** 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)
- **Emissions Trading Registry System (ETRS) :** a computerized system for registering and managing all data related to the allocation and trading of emission permits, greenhouse gas emissions of liable entities, etc. (http://etrs.gir.go.kr)
- **Offset Registry System (ORS) :** a computerized system for registering and managing all data related to offset projects for the reduction, absorption, or removal of greenhouse gases, such as project methodologies and certified reductions (http://ors.gir.go.kr)
- **Korea Exchange (KRX) :** an emission permit exchange designated in accordance with Article 22 of the Act

❸ All numbers in this report are rounded, so some sums and totals may not match.

❹ This report uses tons (t), one thousand tons (kt), and one million tons (Mt) as the primary units for the allocation and surrender of emission permits by converting greenhouse gas (GHG) emissions into CO_2 equivalent tons (tCO_2eq) based on their global warming coefficient. However, when describing transactions for emission permits, English abbreviations (KAU, KCU, and KOC) are used for the emission permit units.

- **Korean Allowance Unit (KAU) :** emission permits allocated to liable entities in accordance with Article 12 of the Act
- **Korean Credit Unit (KCU) :** emission permits converted from the certified reductions derived from offset projects in accordance with Article 29 of the Act
- **Korean Offset Credit (KOC) :** certified reductions from offset projects, obtained by the reduction, absorption, or removal of greenhouse gases 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, KOC will also be referred to as one of the emission permits in the text)
- **1 tCO_2eq = 1 KAU = 1 KCU = 1 KOC**

❺ Some of the statistical data presented in Chapter III of this report are inconsistent with those presented in the previous year's report [1] because the over-the-counter trading results for liable entities have been analyzed in this report based on the date of transfer of the liable entities' emission permits (Articles 21(3) and 21(4) of the Act, Article 25(2)of the Enforcement Decree of the Act [hereafter "the Enforcement Decree"]), whereas these results were measured in the previous year's report based on the date of the transaction specified in the trading reports submitted by the liable entities to the Ministry of Environment (Article 25(1) of the Enforcement Decree).

1 Phase I ('15 - '17) Korean Emissions Trading System Report (Greenhouse Gas Inventory and Research Center of Korea, Jan. '19)

Summary

Forward

An emissions trading system is a market-based scheme designed to cost-effectively meet a nation's greenhouse gas (GHG) reduction targets by allocating a number of emission permits to liable entities that thereby allows them to emit GHGs up to the limit set by the allowances that they hold and to trade any surplus or deficit in their allowances with one another on the market. The Korean Emissions Trading System (K-ETS) was launched in '15, with its legal basis established in '12 through the Act (May '12) and the associated Enforcement Decree of the Act (Nov. '12), followed by the Master Plan for the Emissions Trading System (Jan. '14) and the Allocation Plan for Phase I ('15 - '17) (Sept. '14), which provide the details of the K-ETS. Phase I was focused on securely establishing the K-ETS and accumulating experience, with the implementation of policies such as 100% free allocation, benchmarking as an allocation method for certain sub-sectors,[2] flexibility mechanisms (e.g., offset mechanisms, banking, and borrowing), and market stabilization measures. When Phase II ('18 - '20) began, the government introduced a new Master Plan for the Emissions Trading System and Allocation Plan and amended relevant guidelines to ensure the more stable operation of the K-ETS. The significant changes in the K-ETS were the introduction of auctions (3% of the allowances allocated to the entities in sub-sectors permitted to use auctions) and the introduction of a market-maker as a means to ensure the liquidity of the K-ETS market. Furthermore, new criteria for the banking of emission permits across compliance years within a phase was introduced from Phase II, and benchmark-based allocation was expanded to seven sub-sectors [3] from the previous three.

This report provides detailed information on the policies and implementation of Phase II of the K-ETS and comprehensively analyzes data related to the overall K-ETS process, from the allocation of emission permits to the certification of emissions and the surrender of emission permits. The purpose of this report is to ensure that the entire K-ETS implementation process is transparent and to allow stakeholders to comprehensively understand the K-ETS. In reference to the previous report on Phase I [4], this report reviews the operational results for Phase II, starting from the allocation process and ending at the surrender of the emission permits during the first

2 Of the 26 sub-sectors in total, benchmarking was applied to three sub-sectors (cement, oil refining, and aviation) and grandfathering was applied to the others.

3 Oil refining, cement, aviation, power, integrated energy supply (residential), integrated energy supply (industrial), and waste

4 K-ETS Report for Compliance Year I and II ('15 - '16) of Phase I (Greenhouse Gas Inventory and Research Center of Korea, Mar. '18), Phase I ('15 - '17) Korean Emissions Trading System Report (Greenhouse Gas Inventory and Research Center of Korea, Jan. '19)

compliance year('18) (1 Jan. '18 to 30 Sept. '19). In Chapter I, the operational direction of the K-ETS is briefly explained, while the overall results, including the allocation, certification, and surrender of emission permits are examined in Chapter II. An analysis of the performance of the trading market and a survey of the liable entities participating in K-ETS are summarized in Chapters III and IV, respectively.

K-ETS Operational Results

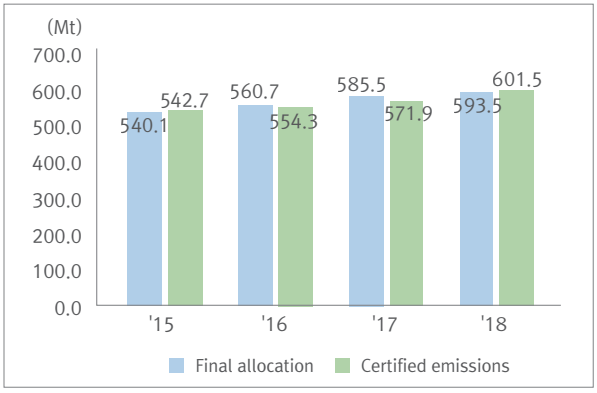
During Phase II, a cap amounted to 1,777.1 Mt, consisting of pre-allocated to business entities (1,643.0Mt) for six sectors - power, industry, buildings, aviation (domestic aviation), waste, and public services and other sectors, and a reserve for other purposes (78.3Mt for power and 55.8Mt for other than power). The total emission allowance during Phase II was thus 1,796.1 Mt, which included the cap (1,777.1Mt) and a separate reserve for market stabilization measures and market makers (19.0Mt).

For the first compliance year of '18, the final allocation was 593.5 Mt (587 business entities), consisting of 588.9 Mt of free allocation (99.2%) and 4.6 Mt of auctioned allowances (0.8%). The amount of final allocation in '18 increased by 1.4% compared to the previous year (585.5 Mt), but was 2.4 - 3.0% lower than the yearly rate of change for the final allocation in Phase I (3.8% and 4.4%). The certified emissions amounted to 601.5 Mt (586 business entities), which was 5.2% (29.6 Mt) higher than the previous year, exceeding the yearly rate of increase shown in '16 and '17 (2.2% and 3.2 %, respectively).

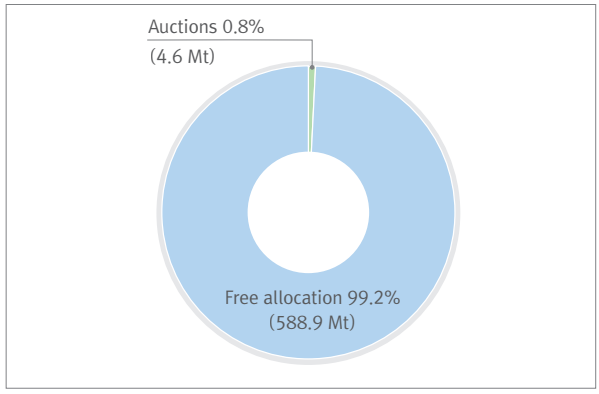
At the end of the '18 compliance year, the amount of emission permits surrendered by liable entities was 601.5 Mt, made up of 601.0 Mt from KAU18 (99.9%) and 0.5 Mt from KCU18 (0.1%). Penalties were imposed on one liable entity that failed to meet its obligations (1.4 kt).

In terms of the flexibility mechanisms (offsets, borrowing, and banking) utilized in the surrendering of emission permits in '18, 37.7 Mt of emission permits carried over from the previous compliance year ('17; 6.3% of the total amount surrendered), 0.5 Mt of KCUs (0.1%), and 5.2 Mt of borrowed emission permits (0.9%) were used. In addition, 35.6 Mt of emission permits were carried over into the second compliance year ('19; 5.9% of the total amount surrendered).

〈 Final allocation and certified emissions by year 〉



〈 Free allocation and auctions in '18 〉



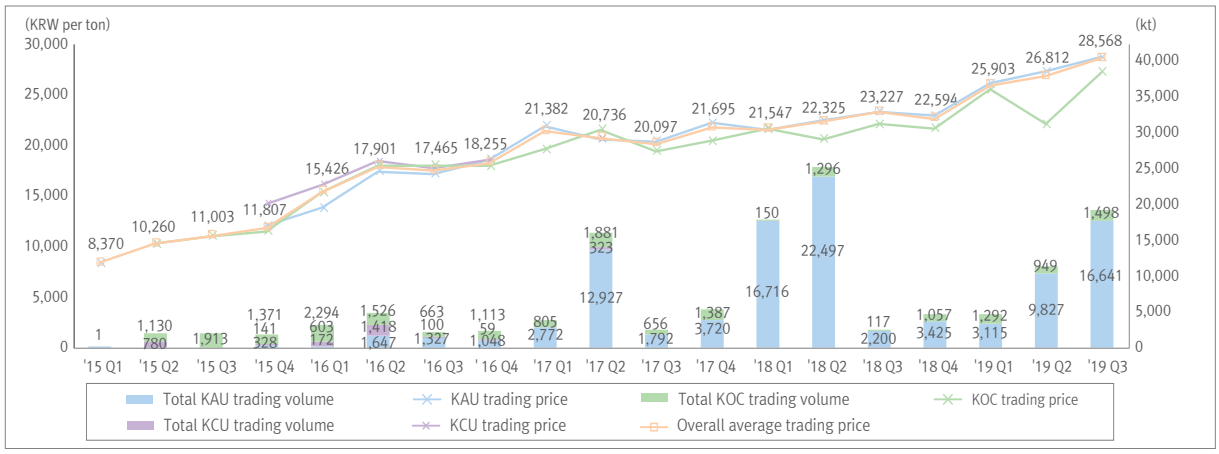
Analysis of Trading Market Performance

A total of 124.7 Mt of emission permits (KAU15, KAU16, KAU17, KAU18, KAU19, KAU20, KCU15, KCU16, KCU17, KCU18, KCU19, and KOCs) were traded through the exchange and/or over-the-counter until 30 Sept. '19 for Phase II's first compliance year ('18) from the introduction of the K-ETS (1 Jan. '15). Of this, 100.2Mt of KAUs, 3.4Mt of KCUs, and 21.1Mt of KOCs were traded, accounting for 80.3%(KAU), 2.7%(KCU) and 16.9%(KOC) of the total, respectively. The average price of the emission permits during this period in exchange and over-the-counter transactions rose continuously from KRW 11,013 per ton in '15 to KRW 17,256 in '16, KRW 20,951 in '17, KRW 22,118 in '18, and KRW 27,648 in '19, resulting in an annual increase of 156.7%, 121.4%, 105.6%, and 125.0%, respectively. The average price for the entire trading period was KRW 22,379. The continuous increase in the trading price and the growth in the trading volume also impacted the transaction value, which rose from KRW 62.4 billion in '15 to KRW 206.5 billion in '16, KRW 550.3 billion in '17, KRW 1,049.7 billion in '18, and KRW 921.3 billion in '19, resulting in an annual increase of 331.1%, 266.4%, and 190.8% during Phase I, respectively. In '19, the transaction value decreased [5)] by 87.8% compared to the previous year. The total transaction value for the entire period was KRW 2,790.1 billion, made up of KRW 2,344.5 billion in KAUs, KRW 55.4 billion in KCUs, and KRW 390.2 billion in KOCs (84.0%, 2.0%, and 14.0%), respectively.

When only the emission permits subject to surrender during the first compliance year ('18) for Phase II (KAU18 and KCU18) are taken into consideration, the total trading volume during the trading period for these emission permits (1 Jan. '18 - 30 Sept. '19) was 39.6Mt. Broken down by type of emission permit, KAUs accounted for 83.9% and KOCs for 16.1%. Over-the-counter trading accounted for 65.5%, compared to only 34.5% for exchange trading.

5 The total payments in '19 were reflected in these results up until the 3rd quarter. And taking into consideration the low volume of transactions after the surrender of emission permits until the end of year, there is a strong possibility that the trading volume of '19 will remain lower compared to the previous year.

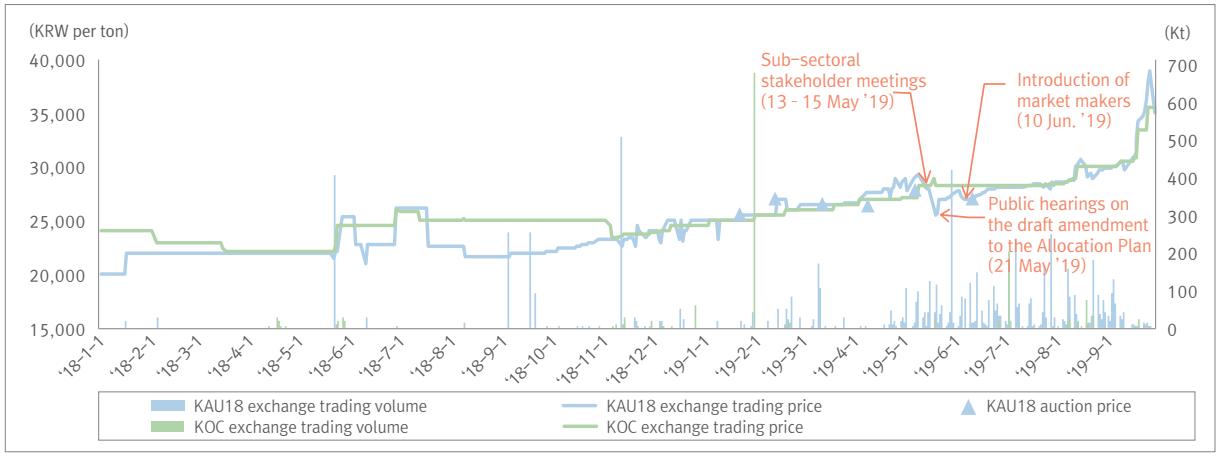
〈 Total trading volume and price trends for all emission permit types 〉



For the period of Jan. - Jun. '19 when auctioning had been conducted, the amount of allowances auctioned of the total trading volume accounted for 36.6% in the first quarter and 34.2% in the second quarter of '19, indicating that auctions accounted for a high percentage of the total trading volume. The total number of transactions during this period was 1,182, with exchange trades accounting for 90.4% and over-the-counter trades only 9.6%.

Exchange trades via the real-time volume of KAU18 with the participation of a market maker (e.g., a public financial institution), an initiative introduced on 10 June '19, accounted for 47.3% of the number of transactions. This shows that the market makers have played a role in ensuring the liquidity of the emissions trading market. During Phase II, the price for KAU18 rose from KRW 20,000 to KRW 39,000 (27 Sept.'19) and the price for KOCs rose from KRW 24,000 to KRW 35,600 (26 - 30 Sept. '19). The auction price for KAU18 was found to be similar to its market price.

〈 Price trends by emission permit type in the exchange market 〉



Analysis of a Stakeholder survey

A survey was conducted to examine liable entities' overall awareness of the K-ETS, its implementation status, and their participation in emission permits trading. A total of 541 liable entities participating in the K-ETS were selected for the survey, and 230 responded.

15.6% of the responding entities expressed satisfaction with the K-ETS, while 37.4% stated that they were somewhat satisfied, and the rest were not satisfied. In terms of measures taken in response to the K-ETS, a majority of the responding entities (52.2%) stated that they have been taking measures at the level of a relevant department or a person-in-charge. Company-level measures were undertaken by 22.6% of the liable entities; of these, 45.9% were large companies, more than twice that of mid-sized companies and other entities (e.g., public institutions).

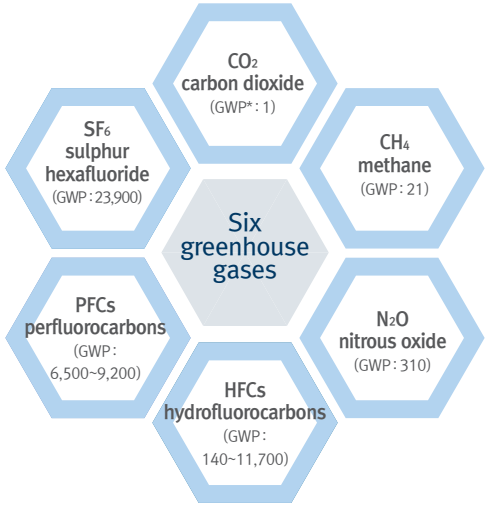
The percentage of liable entities that met their obligations through allocated emission permits combined with other measures (82.6%) was much higher than that of liable entities that met their obligations through allocated emission permits alone (14.8%). Other preferred measures included the purchase of emission permits (44.7% during Phase I; 60.5% during Phase II) and internal reduction activities (40.2% during Phase I; 44.7% during Phase II). Regarding the management of emission permits, respondents selected the minimization of trading (91.7%) rather than achieving a profit on emissions trading (8.3%), which was in line with the finding that the majority of the people in charge of emission permit management were risk-averse (69.9%).

Areas requiring improvement included the process of sharing information and collecting feedback (37.8%), information exchange and education on reduction technologies (50.9%), and financial support for the introduction of reduction technologies and facilities (61.8%). In terms of strategies that could lead to improvement, measures such as the expansion of incentives for entities pursuing GHG reduction efforts (51.3%) and policy consistency over the long term (51.3%) were suggested.

K-ETS at a Glance

1. K-ETS Overview

Gas coverage



GHG emissions: direct emissions + indirect emissions

- Direct emissions of six greenhouse gases
- Indirect emissions from electricity consumption

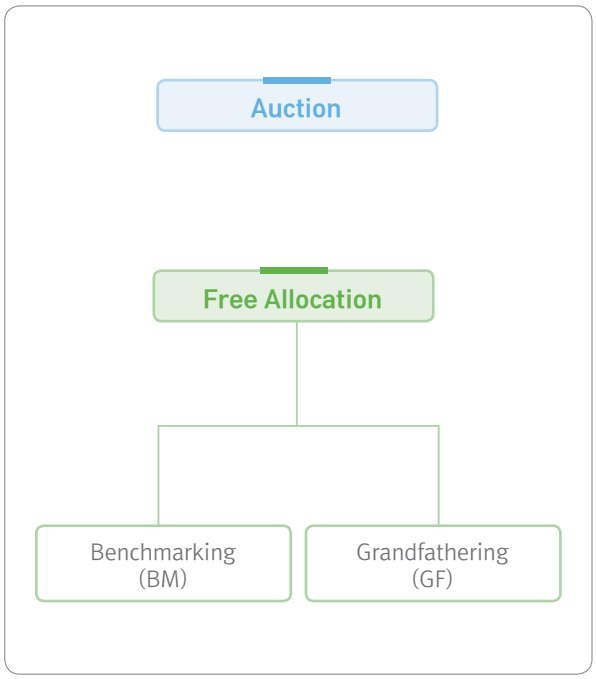
* Global warming potential

Sector coverage

Six sectors

- [Power]
- [Transport] (Domestic aviation)
- [Industry]
- [Waste]
- [Buildings]
- [Public services/ Other sectors]

Allocation methods

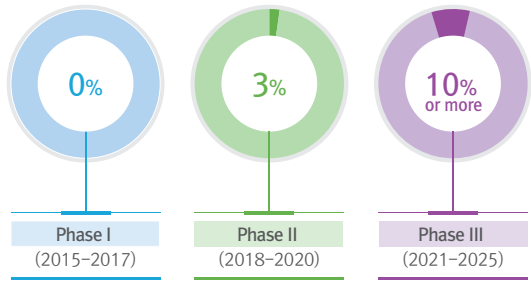


Covered entities

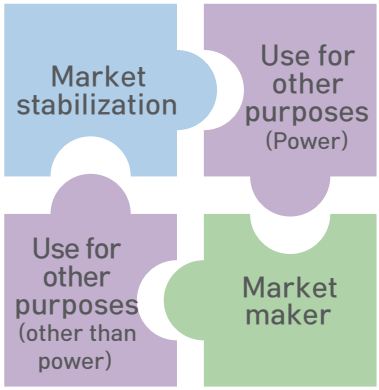
Total yearly average GHG emissions during the three years preceding a phase

- 125,000 t or more for entities
- 25,000 t or more for individual facilities

Percentage of auctioned emission permits for sectors subject to auctions for each phase

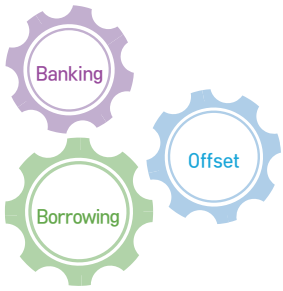


Reserve



Market stabilization	Additional allocation to manage the market price and liquidity, deemed necessary when the price of emission permits suddenly fluctuates and the supply of emission permits falls noticeably short of demand, thus making trading between liable entities difficult, etc.
Market Maker	A market maker such as a public financial institution suggests a standard price for emission permits and participates in the market to ensure the liquidity of the trading market
Use for other purposes* (Power/Other than power)	The reserve is used for allocation adjustment such as allocations to new entrants and voluntarily participating entities, additional allocations for the establishment and expansion of facilities, additional allocations for reduction contributions

Flexibility mechanisms



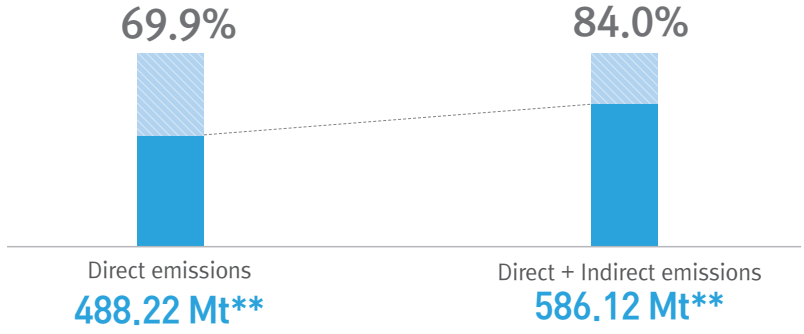
Banking	Surplus emission permits may be carried over to the next compliance year.
Offset	If a liable entity possesses or acquires GHG reduction credits generated outside the scope of business operations monitored by the K-ETS, it may convert all or part of them into emission permits, which can be used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

Emissions Coverage

National average GHG emissions during Phase I (2015 - 2017)

698.01 Mt*

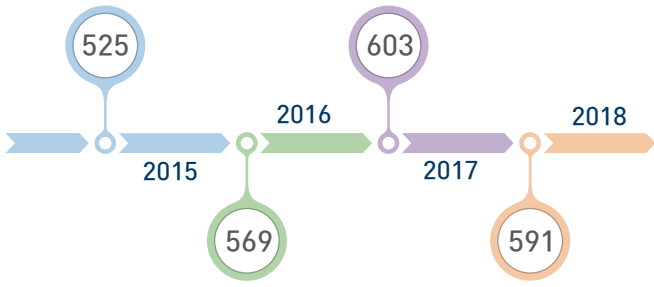
*Source : National GHG Inventory Report of Korea (Greenhouse Gas Inventory and Research Center of Korea, '19)



**Source: NGMS DB ('15 - '17 average GHG emissions of liable entities)

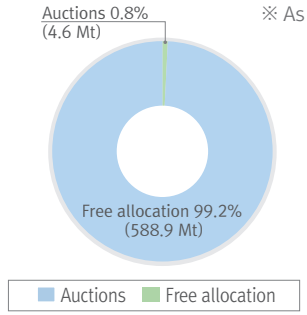
Operational Results

Number of liable entities designated per compliance year



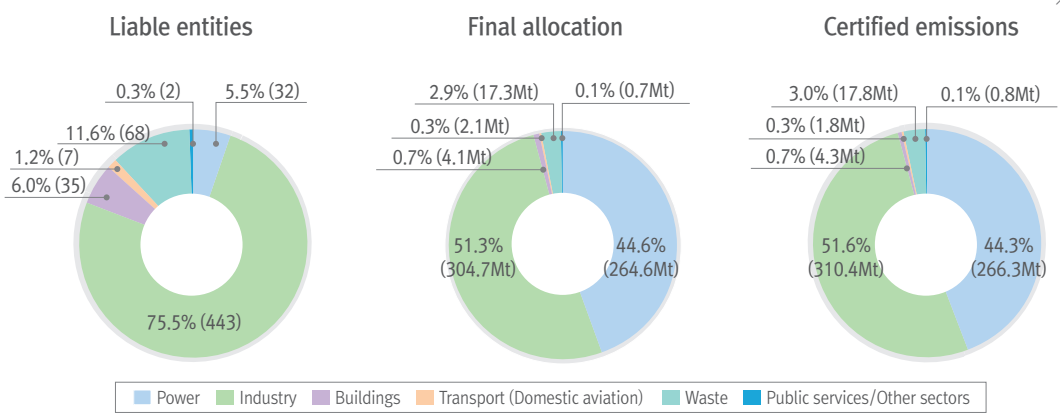
Free allocation and auctions

※ As of '18



Distribution by sector

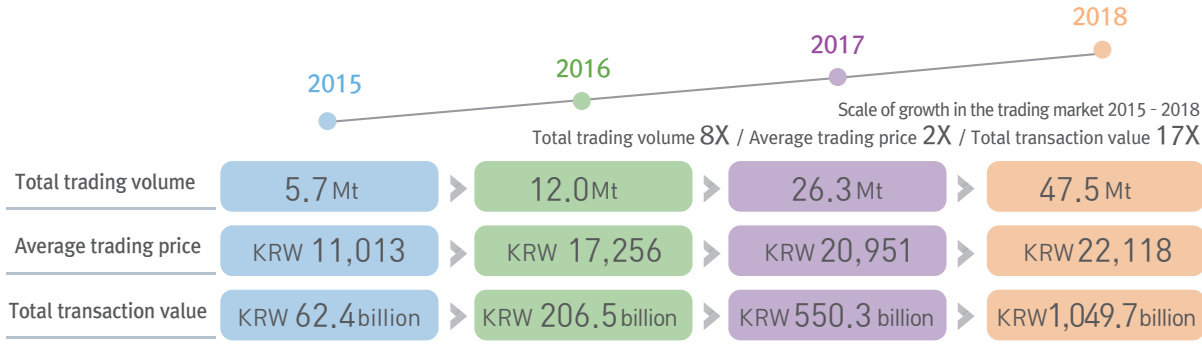
※ As of '18



Compliance results

2015	2016	2017	2018
99.8%(521/522 liable entities)	100%(560/560 liable entities)	99.7%(589/591 liable entities)	99.8%(585/586 liable entities)

Trading market performance



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Ⅰ. K-ETS Overview

1. Overview of K-ETS and its Operational Direction

An emissions trading system is a market-based scheme designed to cost-effectively meet a nation's GHG reduction targets by allocating a number of emission permits to liable entities that thereby allows them to emit GHGs up to the limit set by the allowances that they hold and to trade any surplus or deficit in their allowances with one another on the market. The K-ETS was launched in '15, with its legal basis established in '12 through the Act (May '12) and the associated Enforcement Decree of the Act (Nov. '12), followed by the Master Plan for the Emissions Trading System (Jan. '14), and the Allocation Plan for Phase I ('15 - '17) (Sept. '14), which provide all of the details of the K-ETS.

▶ Summary of the K-ETS Operational Results for Phase I

During Phase I of the K-ETS, a total of 1,686.3 Mt of emission allowances were free allocation to 592 business entities (as of '17) from 26 sub-sectors. The total amount of certified emissions for Phase I was 1,668.9 Mt, which was 20.9 Mt (1%) below the cap (1,689.9 Mt), with 37.7 Mt of surplus emission permits carried over into Phase II. Moreover, the total amount of emission permits (KAU15·16·17·18·, KCU15·16·17·18, and KOCs) traded in the emissions trading market until the surrender of the emission permits for Phase I (Jan. '15 - Sept., '18) was 86.2 Mt, with a total transaction value of KRW 1,747.7 billion. In the last compliance year ('17), the trading volume (29.3 Mt) was five times larger than in '15, the average trading price (KRW 20,279 per ton) was two times higher, and the transaction value (KRW 612.3 billion) was ten times larger.

〈Table Ⅰ-1〉 Operational direction by phase in the Master Plan

	Phase I ('15 - '17)	Phase II ('18 - '20)	Phase III ('21 - '25)
Main objectives	• Acquire experience and stabilize the K-ETS	• Substantially reduce GHG emissions	• Achieve effective reductions
System operations	• Improve the adaptability of the K-ETS , e.g.. ratio of offset credits, etc. • Establish necessary infrastructure for accurate monitoring, reporting, and verification (MRV)	• Expand the applicable scope of the K-ETS and raise the target • Develop various standards, e.g. emissions reporting, verification, etc.	• Reinforce the setting of the cap based on the Roadmap for the national GHG Reduction Targets • Expand market functions by strengthening the functions of market makers, introducing derivatives in the exchange, etc.
Allocation	• Allocate all free allocation • Apply lessons learned from the GHG and Energy Target Management System	• Introduce auctions • Develop allocation methods, e.g. benchmarking, etc.	• Improve the criteria for selecting sub-sectors eligible for free allocation and expand auctions • Expand the use of benchmarking for allocation

Source: Master Plan for the Emissions Trading System (Ministry of Strategy and Finance, '17)

Whereas Phase I focused on firmly establishing the K-ETS, the operational objectives of Phase II ('18 - '20) have placed emphasis on increasing the reduction of GHG emissions and gradually improving the K-ETS. The government prepared the Master Plan for the Emissions Trading System for Phase II (Jan. '17), which established the basic direction for the K-ETS during Phase II, and the Allocation Plan for Phase II: Step 1 ('18 - '20) (Dec. '17), which contained details of the regulations for the system, including those related to the cap. In the following year, an amendment to the Basic Roadmap for Achieving '30 National GHG Reduction Targets was completed, the purpose of which was to reflect the new government's environmental and energy policies. The amended Roadmap was reflected in the Allocation Plan for Phase II: Step 2 ('18 - '20) (Jul. '18), which added further detail to the standards, such as total emission allowances (1,796.1 Mt), standards for auctions, and benchmark-based allocations. The Allocation Plan for Phase II: Step 2 was amended (Jun. '19) to newly introduce criteria for the banking of emission permits across compliance years within a phase. In addition, the government made efforts to improve K-ETS by amending guidelines for the monitoring, reporting, and verification of emissions and guidelines for emissions trading.

〈Table I-2〉 National policies for GHG reductions and the Korean Emissions Trading System (K-ETS)

<table>
<tr><th colspan="2"></th><th colspan="3">Phase II ('18 - '20)</th></tr>
<tr><td rowspan="2">National Policies for GHG Reductions</td><td>National GHG Reduction Target</td><td colspan="3">• Established a plan to reduce GHG emissions by 37% from business-as-usual (BAU) levels by '30 (Jun. '15)</td></tr>
<tr><td>Implementation Plan for Sectoral Reductions</td><td>• Basic Roadmap for Achieving '30 National GHG Reduction Targets (Dec. '16)</td><td colspan="2">• Amendment of the Basic Roadmap for Achieving '30 National GHG Reduction Targets (Jul. '18)</td></tr>
<tr><td rowspan="2">Emissions Trading System</td><td>Master Plan</td><td colspan="3">• Plan for the Emissions Trading System for Phase II (Jan. '17) [2]</td></tr>
<tr><td>Allocation Plan</td><td>• Allocation Plan for Phase II: Step 1 (Dec. '17) [1][6]</td><td>• Allocation Plan for Phase II: Step 2 (Jul. '18) [2]</td><td>• Allocation Plan for Phase II: Step 2 amended (Jun. '19) [3]</td></tr>
</table>

1) Details on the allocation for Phase II and the cap (538.5 Mt) and reserve (14.0 Mt) for Phase I ('18) 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 environmental and energy policies, including the amended Roadmap ('18). It was also decided that the amount of allowances for '18 (Allocation Plan Phase II: Step 1) would be maintained and guaranteed even after the amount of allowances for the Action Plan for Phase II: Step 2 was determined, and this would be adjusted if the amount of emission permits for '18 increased or decreased.

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

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

6 See elsewhere in this report (Chapter II Operational Results 〉 2. Surrender of Emission Permits 〉 2) Flexibility Mechanisms)

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

	Guidelines
Allocation/ Adjustment/ Revocation	• Guidelines for the Allocation, Allocation Adjustment, and Allocation Revocation of GHG Emission Permits (Ministry of Environment, partially amended in Jul. '18)
Reporting/Certification	• Guidelines for the Reporting and Certification of Emissions Under the GHG Emissions Trading System (Ministry of Environment, partially amended in May '18)
Verification	• Guidelines for the Verification of the Operations of the GHG Emissions Trading System (Ministry of Environment, partially amended in May, '18)
Emissions Trading	• Regulations for the Additional Allocation of Emission Permits for Auctions and Market Stabilization Measures (Ministry of Environment, partially amended in Mar. '19) • Notification on GHG Emissions Trading (Ministry of Environment, partially amended in May '18) • Notification on Application Qualifications and Evaluation Standards for the Emissions Exchange (Ministry of Environment, partially amended in May '18) • Notification on the Supervision of the Emissions Exchange (Ministry of Environment, partially amended in May '18) • Notification on the Designation and Operations of Market Makers Within the Emissions Trading Market (Ministry of Environment, Jan. '19) • Notification on the Date of Designation of Market Makers in the First Compliance Year (Ministry of Environment, Mar. '19) • Notification on the Designation of Market Makers for the '19 Emissions Trading Market (Ministry of Environment, May. '19)
Offset Mechanisms	• Guidelines for the Feasibility Assessment of Offset Projects and the Certification of Reductions (Ministry of Environment, partially amended in Jun. '18)

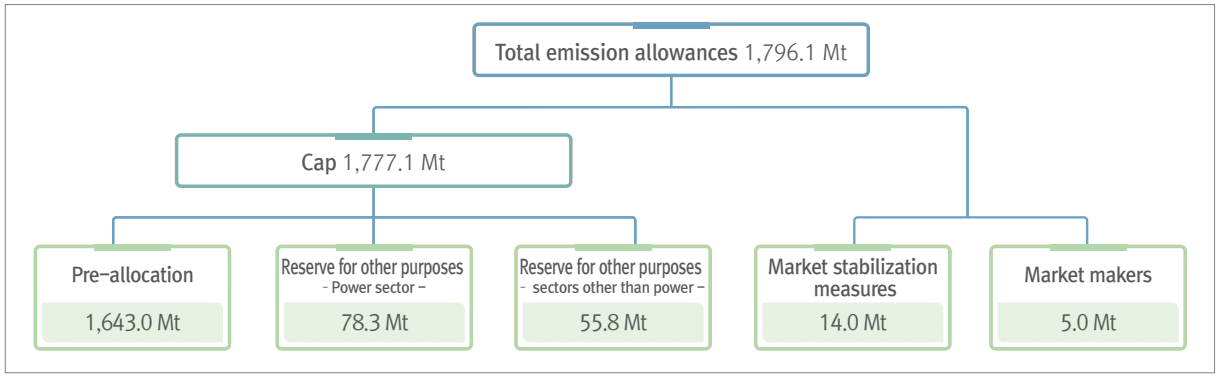
2. Cap and Total Emissions Allowances

The cap is the total amount of GHG emissions all liable entities as a group are allowed to emit during a phase as the emissions target. In the K-ETS, the cap is established based on national GHG reduction targets and the Basic Roadmap for achieving these national reduction targets as provided under Article 5(1) of the Act. The cap for Phase II was set by calculating the emissions from those sectors covered by the K-ETS from the national reduction targets reflecting the national growth prospects and reduction capacity for '18 - '20.

The cap for Phase II was calculated and divided among six sectors in order to ensure consistency between the K-ETS and the National Roadmap. Total emission allowances consist of the cap and an additional reserve established separately from the cap. The total emissions allowances for Phase II were set at 1,796.1 Mt, made up of the cap (1,777.1 Mt) and a separate reserve for market stabilization measures and market maker (19.0 Mt).

The reserve among the total emission allowances is not subject to pre-allocation and is retained by the government. The reserve totals 153.2 Mt, and is divided into 14.0 Mt for market stabilization measures, 5.0 Mt for market maker, and 134.1 Mt for other purposes [7] (power-related 78.3 Mt, [8], non-power related 55.8 Mt). The reserve for other purposes increased by 110.4 Mt compared to that for Phase I (23.7 Mt). This was partly the result of a change made to the allocation method of emission permits for the establishment and expansion of facilities introduced from Phase II, which allowed this purpose to be classified as a form of additional allocation rather than pre-allocation.

[Figure I-1] The cap and total emission allowances for Phase II



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 portion of the reserve allocated to other purposes is divided into those related to power and those that are non-power-related, representing 10.5% and 5.5% of the cap for a relevant sector, respectively.

8 This is calculated based on factors such as the allocation, additional allocation, and allocation revocation of emission permits for new entrants in Phase I and the 8th Plan on Electricity Demand and Supply.

II. Operational Results

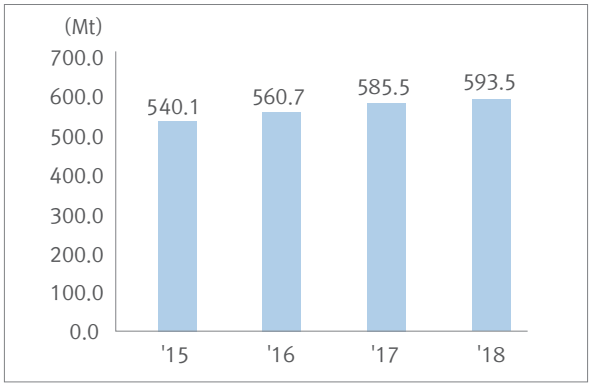
1. Allocation of Emission Permits

1) Allocation

When business entities designated as liable entities submit their allocation application to the Ministry of Environment four months prior to the commencement of a phase, the Ministry of Environment issues a notification of the allocated amount no later than two months prior to the start of the phase. This stage in the allocation of emission permits is referred to as pre-allocation. [9] In Phase I, the entire emission permits for liable entities was free allocation. Since auctions were introduced in Phase II, with liable entities now in sub-sectors subject to auctions, 3% of the allocated amount was deducted from the pre-allocation amount and set aside for purchase by liable entities through auctions in the emissions trading market.

In '18, the amount of emission permits set for pre-allocation was 567.5 Mt, while the final allocation amount, which reflected certain changes (e.g., new entrants, allocation adjustment, and allocation revocation) that occurred in the '18 compliance year, was 593.5 Mt (587 entities), a 1.4% increase compared to the previous year (585.5 Mt). However, compared to the yearly rate of increase observed in Phase I (3.8% and 4.4%), the final allocation amount for '18 decreased by 2.4 - 3.0%.

[Figure II-1] Yearly final allocation



〈Table II-1〉 Yearly final allocation

(Unit: Mt, entities)

Phase	Year	Final allocation	Annual rate of change	Number of entities
Phase I	'15	540.1	-	522
	'16	560.7	3.8%	564
	'17	585.5	4.4%	591
Phase II	'18	593.5	1.4%	587

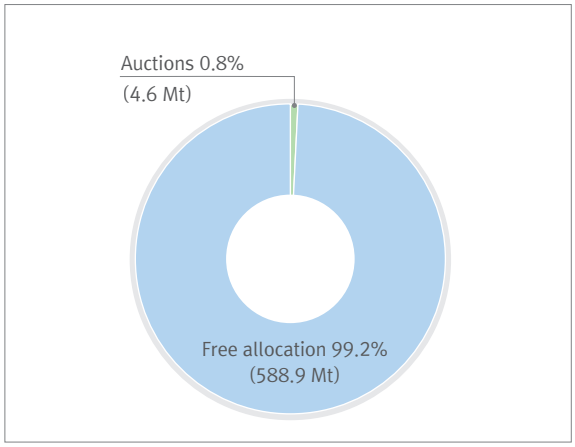
Source : Emissions Trading Registry System (ETRS) (as of Oct. '19)

9 The pre-allocation amount specified in Chapter I of this report is the amount set for allocation during the compliance year, and the pre-allocation amount specified in Chapter II is the amount that the liable entities are notified by the Ministry of Environment in response to their allocation application.

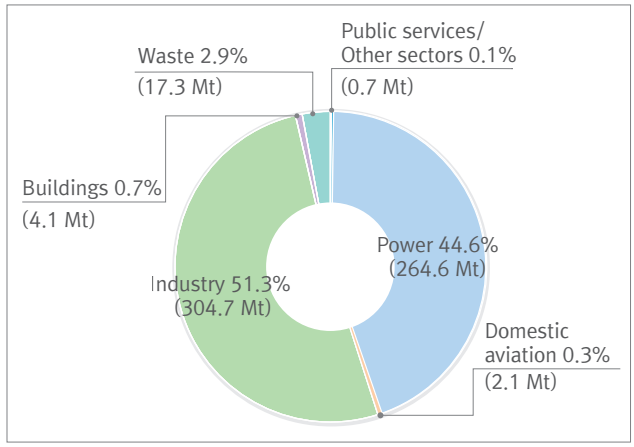
The final allocation consists of free allocation and auctioned allowances.[10] In '18, the allowances set for free allocation totaled 588.9Mt (99.2%), while auctioned allowances accounted for 4.6Mt (0.8%), which indicates that most of the allowances was free allocation.

Broken down by sector, the final allocation was as follows: industry 304.7Mt (51.3%), power 264.6Mt (44.6%), waste 17.3Mt (2.9%), buildings 4.1Mt (0.7%), domestic aviation 2.1Mt (0.3%), and public services and other sectors 0.7 Mt (0.1%).

[Figure II-2] Free allocation and auctions in '18



[Figure II-3] Final allocation by sector in '18



Allocation methods used in Phase II consisted of grandfathering, under which emission permits were allocated based on the average GHG emissions for the reference years, and benchmarking, under which emission permits were allocated based on each business entity's previous emissions in comparison to its activity data, such as their product output, taking into consideration the facility efficiency. During Phase I, the grandfathering method of allocation was used for the majority of sub-sectors, while the benchmarking method was applied only to three sub-sectors (cement, oil refining, and aviation). During Phase II, benchmarking-based allocation was applied to seven sub-sectors (power, integrated energy supply [residential], integrated energy supply [industrial], waste, and the three sub-sectors from Phase I).

10 The liable entities subject to free allocation and auctions are based on the sub-sectors they belong to, and the sub-sectors are categorized according to the groups listed under the 9th Korean Standard Industrial Classification (KSIC).In order to analyze the effect of the K-ETS on the international competitiveness of the entities involved, trade intensity and production cost were evaluated by sub-sectors. During Phase II, free allocation was available for 37 sub-sectors and auctions were available for 26 sub-sectors.

〈Table II-2〉 Final allocation by sector in '18

(Unit: Mt)

Sector	Final allocation (E=C+D)	Free allocation (C=A+B)	Pre-allocation (A)	Allocation changes (B)							Auctions (D)	Rate of change (E-A)/A
					New entrants	Allocation adjustment		Allocation revocation	Succession of rights and obligations			
						Additional allocation	Allocation adjustment		Transfer	Acquisition		
Power	264.6	260.0	247.4	12.6	-	15.5	-	3.0	0.001	0.001	4.6	6.9%
Industry	304.7	304.7	297.4	7.3	-	9.5	-	2.2	6.4	6.4	0.004	2.5%
Building	4.1	4.1	4.0	0.1	-	0.2	-	0.1	-	-	0.05	2.6%
Domestic aviation	2.1	2.1	2.0	0.05	-	0.1	-	0.02	-	-	-	2.2%
Waste	17.3	17.3	16.0	1.3	-	1.6	-	0.3	-	-	-	8.3%
Public services/ Other sectors	0.7	0.7	0.7	0.01	-	0.01	-	0.002	-	-	-	1.4%
Total	593.5	588.9	567.5	21.4	-	27.0	-	5.6	6.4	6.4	4.6	4.6%
No. of liable entities	587[1)]	587	591			242	-	224	17	19	12	-0.7%

1) Allowances were pre-allocated to 591 entities, but the number of liable entities at the time of final allocation decreased to 587 because the allocation to four entities was transferred or withdrawn due to the changes (allocation revocation, succession of rights and obligations, etc.) that occurred during the compliance year.

※ The number of entities for each item only indicates the number of entities falling under the relevant item, but there may be differences in the overall number of entities due to changes (e.g., the succession of rights and obligations, etc.) that occurred during the compliance year

Source: Emissions Trading Registry System (ETRS) DB (as of Oct. '19)

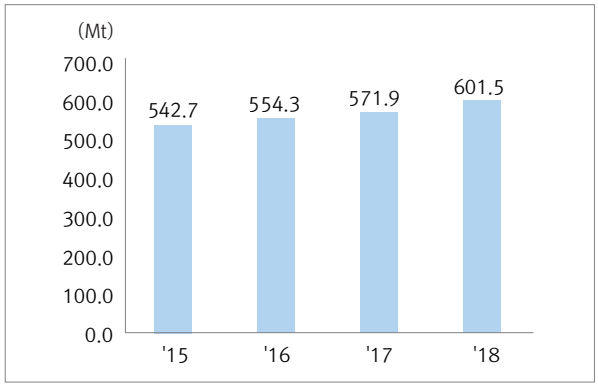
2. Certification and Surrender of Emission Permits

A. Certification of Emissions

A liable entity must report to the Ministry of Environment by submitting an emissions report in a measurable, reportable, and verifiable manner within three months from the date of completion of each compliance year. The Ministry of Environment must then evaluate the validity of the details specified in the report and certify the actual amount of GHG emissions produced by the liable entity. For '18, the certified emissions amounted to 601.5Mt (586 business entities [11)]), which was 5.2% (29.6Mt) higher than the previous year, exceeding the annual rate of increase shown in '16 and '17 (2.2% and 3.2 %, respectively).

11 In '18, the emissions of 586 entities were certified. Of the 587 entities subject to final allocation, one entity closed down its operations.

[Figure II-4] Certified emissions by year



〈Table II-3〉 Certified emissions by year

(Unit: Mt, entities)

Phase	Year	Certified Emissions	Annual rate of change	Number of entities
Phase I	'15	542.7	-	522
	'16	554.3	2.2%	560
	'17	571.9	3.2%	591
Phase II	'18	601.5	5.2%	586

Source: Emissions Trading Registry System (ETRS) DB (as of Nov. '19)

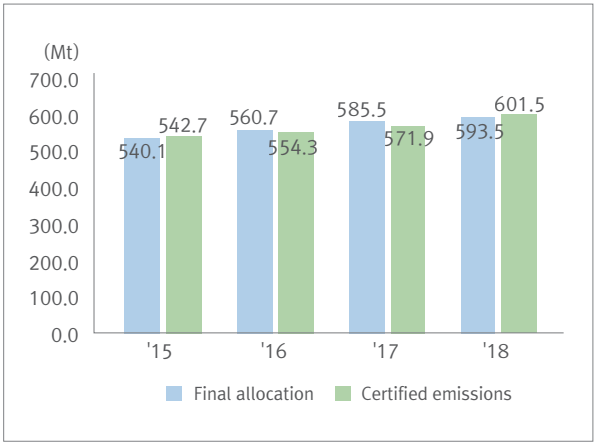
〈Table II-4〉 Surrender results by sector in '18

(Unit: Mt, entities)

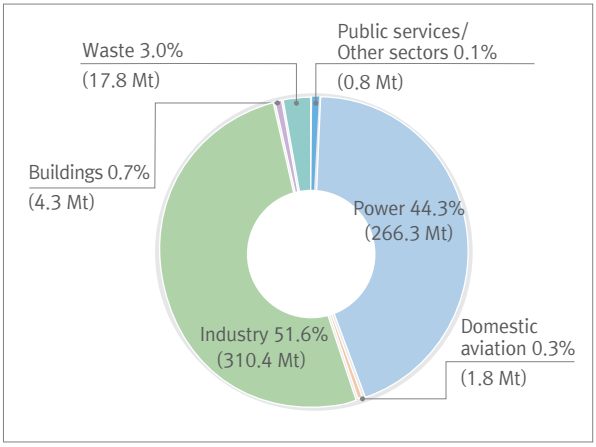
	Certification		Amount banked from the previous compliance year	KCU conversion	Trading				Surrender					Not surrendered[1]	Not banked[2]	Banking to the following compliance year		
	No. of entities	Certified emissions			KAUs sold	KAUs purchased	KCUs sold	KCUs purchased	Amount surrendered (A+B)	KAUs surrendered (A)			KCU surrendered (B)			Amount banked (C+D)	KAUs banked (C)	KCUs banked (D)
										Allocated	Borrowed	Surrendered in excess						
Power	32	266.3	11.5	0.02	14.1	17.4	-	-	266.3	265.9	0.3	-	0.02	-	-	13.4	13.4	-
Industry	442	310.4	24.3	0.5	13.7	10.1	-	-	310.4	305.5	4.5	-	0.5	-0.001	0.000001	19.9	19.9	0.003
Buildings	35	4.3	0.6	0.003	0.1	0.2	-	-	4.3	4.3	0.008	-	0.003	-	-	0.6	0.6	-
Domestic aviation	7	1.8	0.1	-	0.1	-	-	-	1.8	1.8	0.003	-	-	-	-	0.2	0.2	-
Waste	68	17.8	1.2	0.04	0.4	0.9	-	-	17.8	17.5	0.2	-	0.04	-	-	1.5	1.5	-
Public services/ Other sectors	2	0.8	-	-	-	0.04	-	-	0.8	0.7	0.1	-	-	-	-	-	-	-
Market makers[3]	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	586	601.5	37.7	0.5	28.5	28.5	-	-	601.5	595.8	5.2	-	0.5	-0.001	0.000001	35.6	35.5	0.003
No. of entities	586	-	454	18	193	146	-	-	586	586	125	-	19	1	1	406	406	1

1) The sum of the emission permits of liable entities that had failed to meet their obligations for the compliance year.
2) Surplus emission permits not carried over to the following compliance year by liable entities after meeting their obligations, which will expire automatically.
3) To ensure the liquidity of the emissions trading market, a market maker such as a public financial institution suggests nominal prices for sales and purchases and participates in transactions.
※ The number of entities for each item only indicates the number of entities falling under the relevant item, but there may be differences in the overall number of entities due to changes (e.g., the succession of rights and obligations, etc.) occurring during the compliance year.
Source: Emissions Trading Registry System (ETRS) DB (as of Oct. '19)

[Figure II-5] Final allocation and certified emissions by compliance year



[Figure II-6] Certified emissions by sectorin '18



B. Surrender of Emission Permits

Liable entities must surrender their emission permits in an amount equivalent to the amount of their certified emissions to the Ministry of Environment within six months from the date of completion of each compliance year using the KAUs of the relevant compliance year and other permits either banked from the previous compliance year or borrowed from the next compliance year, in addition to KCUs converted from KOCs.

Broken down by type of emission permit surrendered in '18, KAUs accounted for 601.0Mt (99.9%, 586 entities) and KCUs for 0.5Mt (0.1%, 19 entities). The surrender rate for KCUs was nine times lower compared to that during Phase I (0.9%). Had all liable entities fulfilled their obligation to surrender their emission permits, the amount of emission permits surrendered in '18 would have been 601.5Mt, which is the amount of certified emissions. However, one entity (1.4kt) failed to fulfill its obligations to surrender its emission permits, and penalties were imposed on that entity (Article 42 of the Enforcement Decree). In addition, one entity failed to carry over its surplus emission permits (1t) to the following compliance year, and these surplus emission permits expired automatically.

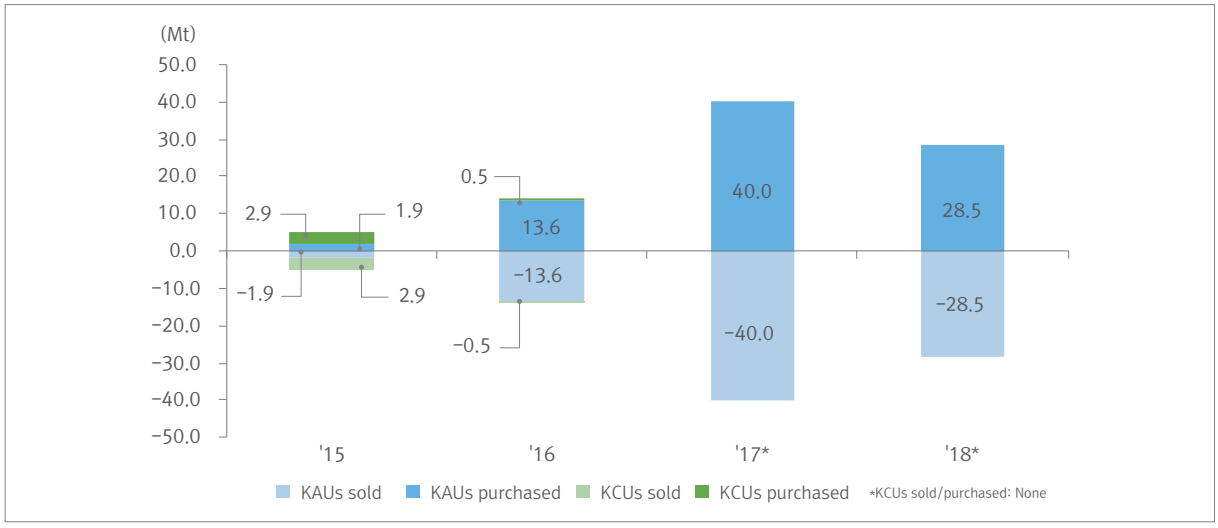
1) Emissions Trading

Emission permits can be traded through the exchange and/or over-the-counter transactions. The tradable permits are KAUs, KCUs, and KOCs. Because a detailed analysis of emission permits in '18 is given in Chapter III, the results of the KAU18 and KCU18 transactions are discussed here.

Of the total amount of KAU18 surrendered to the government in '18 (601.0Mt), 28.5Mt (4.7%) was generated through trading. The trading volume of KAU18 was 28.6% (11.4Mt) lower than the trading volume of KAU17 (40.0Mt [12]) but was higher than the trading volume of KAU15 (1.9Mt) and KAU16 (13.6Mt).

The total amount of KCU18 surrendered to the government in '18 (0.5Mt) does not include the amount generated through trading, as there had been no KCU transactions undertaken since the previous year (KCU17).

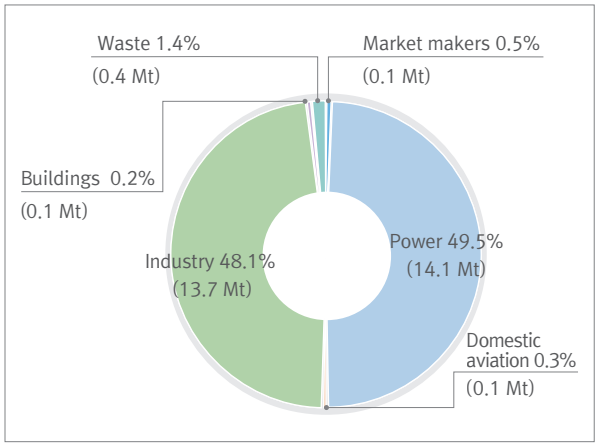
[Figure II-7] Trading volume of KAUs and KCUs by compliance year



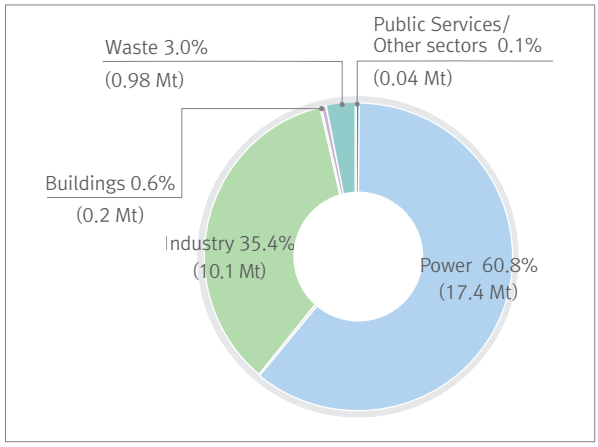
Broken down by sector, 14.1Mt (49.5%) of KAU18 were sold by the power sector, 13.7Mt (48.1%) by industry, 0.4Mt (1.4%) by waste, 0.1Mt (0.2%) by buildings, and 0.1Mt (0.5%) by market makers. In addition, 17.4Mt (60.8%) of KAU18 were purchased by the power sector, 10.1Mt (35.4%) by industry, 0.98Mt (3.0%) by waste, 0.2Mt (0.6%) by buildings and 0.04Mt (0.1%) by public services and other sectors. In the power sector, the amount of KAU18 purchased (60.8%) exceeded the amount of KAU18 sold (49.5%). In addition, participation of market makers as part of a new policy introduced in Phase II accounted for 0.5% of the sales of emission permits.

12 In terms of the KAU17 trading volume, sales of KAU17 suddenly increased because some liable entities sold their surplus emission permits for the last compliance year of Phase I, while others impacted by the restrictions imposed on the banking of emission permits for the next phase also sold their emission permits.

[Figure II-8] Amount of KAU18 sold by sector



[Figure II-9] Amount of KAU18 purchased by sector



The market-maker was introduced so that a public financial institution [13]designated as the market maker could suggest nominal prices for the sale and purchase of emission permits and participate in transactions. Taking into consideration the operational results of Phase I, the reserve for the market maker was set at 5.0 Mt separated from the cap.

After the guidelines for the market maker were promulgated [14], 200kt of KAU18 was lent to market makers (5 Jun. '19) and 129kt was sold. After the end of the lending period, 200kt was returned [15](28 Jun. '19) in the form of emission permits (71.0kt) and in the form of cash (129.0kt) [16].

2) Flexibility Mechanisms

Flexibility mechanisms are means to ensure flexibility in the surrendering of emission permits by offering liable entities various options other than trading so that they can achieve their GHG reduction targets and meet their surrender obligations. These options include the use of KCUs obtained through offset projects[17], borrowing and banking of emission permits.

13 As of Nov. '19, the Korea Development Bank and the Industrial Bank of Korea are designated as market makers.

14 Notification of the Designation and Operations Market Makers for the Emissions Trading Market (Ministry of Environment, Jan. '19), Notification of the Date of Designation of Market Makers of the First Compliance Year (Ministry of Environment, Mar. '19), Notification of the Designation of Market Makers for the '19 Emissions Trading Market (Ministry of Environment, May '19)

15 Emission permits lent to a market maker can be returned in the form of emission permits or cash after the end of the lending period. If returned in the form of emission permits, they are transferred from the market maker's account to the reserve account for market makers.

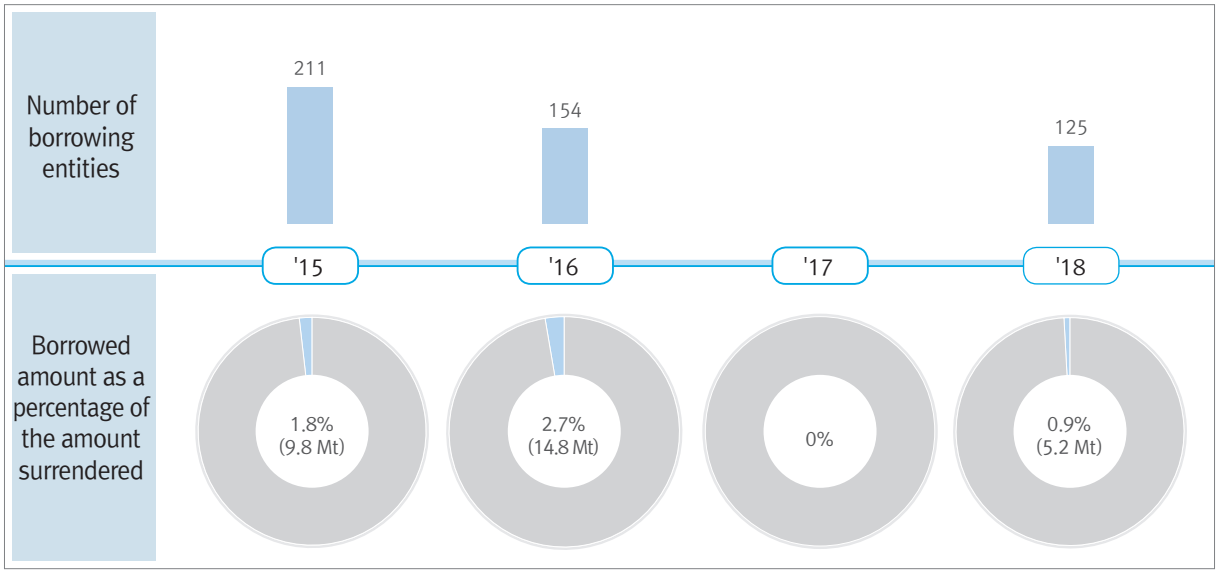
16 Of the revenue generated from the selling of the reserves for the market maker, the transaction value of the emission permits, excluding the transaction fees for the financial institution, is returned to the government.

17 Offset credits are allowed up to 10% of the total amount of emission permits surrendered.

Regarding the use of KCUs, in the period between the introduction of the K-ETS and the surrender of the emission permits for '18 (Phase II; 1 Jan. '15 - 30 Sept. '19), offset projects totaling 26.3Mt [18] were approved and registered. Of this total, 15.4Mt (9.5Mt in '15, 2.6Mt in '16, and 3.3Mt in '17) [19] was converted into KCUs during Phase I, and 0.5Mt was converted in '18.

In terms of borrowing, 5.2Mt (125 entities) was used for surrender in '18, which accounted for 0.9% of the total amount of surrendered emission permits (601.5Mt). This represented only 52.4% of the amount borrowed in '15 (9.8Mt, 211 entities) and 34.7% of the amount borrowed in '16 (14.8Mt, 154 entities).

[Figure II-10] Amount borrowed and number of borrowing entities by compliance year

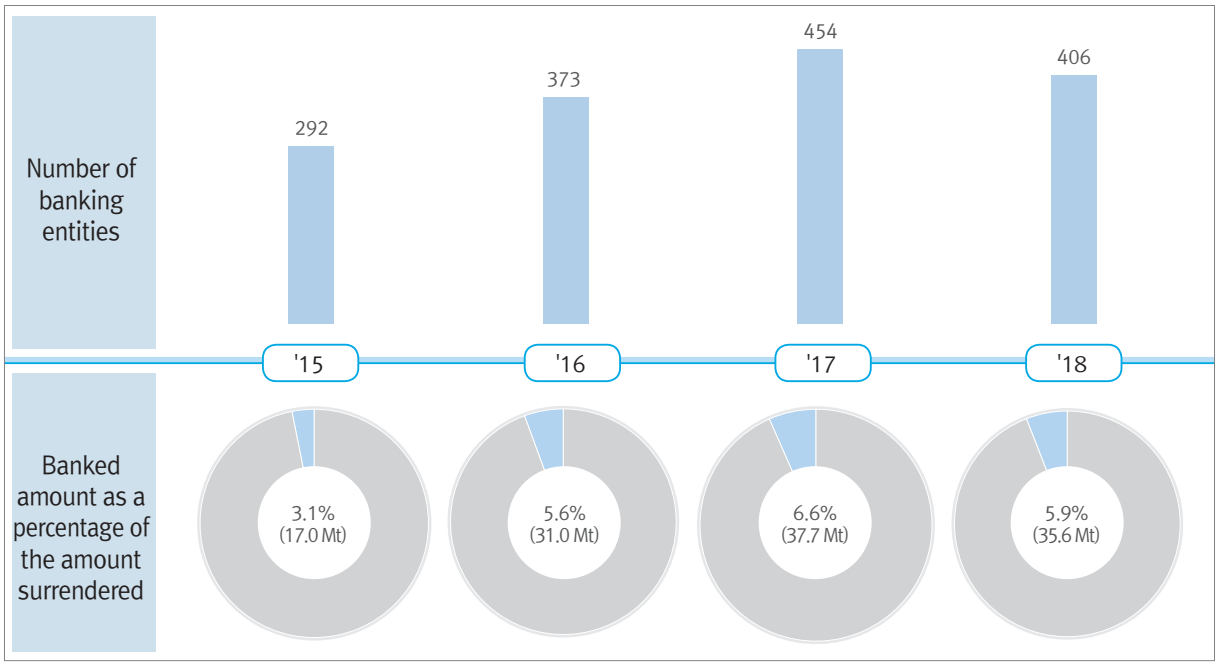


In terms of banking, 37.7Mt (454 entities) was carried over from the previous compliance year ('17), accounting for 6.3% of the total amount of surrendered emission permits (601.5Mt) and exceeding the amount of KCUs (0.5Mt, 0.1%) and borrowed emission permits (5.2Mt, 0.9%). After the completion of the surrender of emission permits for '18, 35.6Mt (406 entities) of surplus emission permits was carried over to the next compliance year ('19). This accounted for 5.9% of the total amount of surrendered emission permits (601.5Mt), 2.1 times higher than the amount carried over in '15 (17.0Mt) and 1.1 times higher than in '16 (31.0Mt). A similar amount of surplus emission permits (37.7Mt) was carried over from the final compliance year in Phase I ('17).

18 Certified offset project credits for the period 1 Jan. '15 - 30 Sept. '19 (26.3Mt) = 22.5Mt (up until the completion of the surrender of emission permits for Phase I [1 Jan. '15 - 9 Aug. '18)] + 3.8 Mt (up until the completion of the surrender of emission permits for the first compliance year ['18] of Phase II [10 Aug. '18 - 30 Sept. '19])

19 As of Nov. '19, 10.4 Mt of emission permits remain as certified offset project credits and have not been converted into KCUs.

[Figure II-11] Amount carried over and the number of banking entities by compliance year



Ⅲ. Analysis of the Emissions Trading Market[20]

1. Trading Records for the Market as a Whole

1) Trading Volume and Price Trends[21]

The total volume of emissions trading during the trading periods from Phase Ⅰ to the first compliance year ('18) in Phase Ⅱ (KAU15, KAU16, KAU17, KAU18, KAU19, KAU20, KCU15, KCU16, KCU17, KCU18, KCU19 [22], and KOCs) was 124.7Mt, consisting of 53.3Mt (42.8%) in the exchange market and 71.4Mt (57.2%) in the over-the-counter market. In terms of the types of emission permit, 100.2Mt was traded as KAUs, 3.4Mt as KCUs, and 21.1Mt as KOCs, accounting for 80.3%(KAU), 2.7%(KCU) and 16.9%(KOC), respectively. The total trading volume in each year was 5.7Mt in '15 [23], 12.0 Mt in '16, 26.3Mt in '17, 47.5Mt in '18, and 33.3Mt in '19, meaning that the trading volume in Phase Ⅰ increased by 211.3%, 219.4%, and 180.7% yearly, but there was a decrease of 70.2% in '19 compared to '18. Even though only 70.2% of the trading performance compared to the previous year's total trading volume was reflected in these results up until the 3rd quarter, taking into consideration the low volume of transactions after the surrender of emission permits until the end of year, there is a strong possibility that the trading volume of '19 will remain lower compared to the previous year.

The average price of the emission permits continuously increased, from KRW 11,013 per ton in '15 to KRW 17,256 in '16, KRW 20,951 in '17, KRW 22,118 in '18, and KRW 27,648 in '19, an increase of 156.7%, 121.4%, 105.6%, and 125.0% yearly. The overall average price during the trading period was KRW 22,379, with the average price of the KAUs being KRW 23,409, that of

20 The analysis was conducted on the trading of KAUs (KAU15, KAU16, KAU17, KAU18, KAU19, and KAU20), KCUs (KCU15, KCU16, KCU17, KCU18, and KCU19), and KOCs in the exchange and over-the-counter markets for the period Jan. 1, '15 to Sep. 30, '19 (the end of the surrender of emission permits for the first compliance year in Phase Ⅱ). However, a detailed analysis of the trading records, volume, and price for each type of emission permit was conducted with KAU18, KCU18, and KOCs, corresponding to the first compliance year of Phase Ⅱ. The trading price is the weighted average price in the KRX for trading in the exchange market, and the actual price reported to and verified by GIR(Greenhouse Gas Inventory Research Center of Korea) for trading in the over-the-counter market (the KRX closing price on the trading day in the absence of trading price information).

21 The records for KAU18 and KCU18 trading were to be included, but only the trading records for KAU18 are analyzed because there were no actual trades of KCU18.

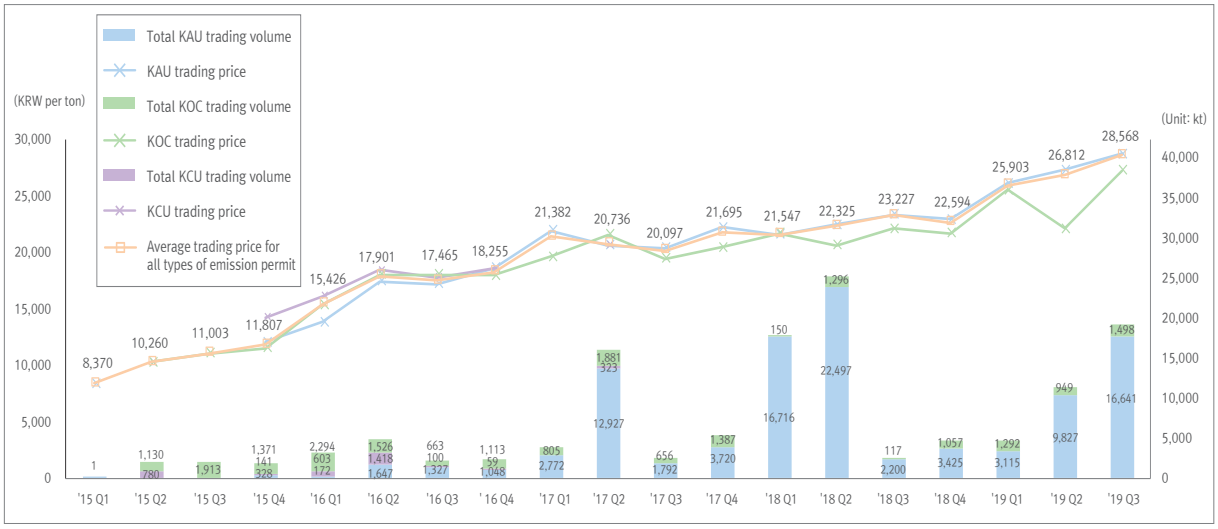
22 Because KCU20 has not been listed on the exchange, the records of KCU20 were not included. There are no actual records of KCU17, KCU18, and KCU19 trading.

23 Some of the numbers in Chapter Ⅲ of this report differ from those in the previous report (Emission Trading System Operation Report for Phase Ⅰ ('15-'17, Greenhouse Gas Inventory and Research Center of Korea, published on Jan. '19) because, in the records for emissions trading in the over-the-counter market, the data based on the date of trading in the trading reports submitted by the liable entities to the Ministry of Environment (Decree, Art. 25, Par. 1) differed from the data based on the date of transfer for the emission permits of the liable entities (the Act, Article 21, Paragraphs 3 and 4; the Decree Article 25, Paragraph 2).

the KCUs being KRW 16,175, and that of the KOCs being KRW 18,497. The average price was similar for the exchange market (KRW 22,715) and the over-the-counter market (KRW 22,128).

The continuous increase in the price and trading volume led to an increase in the total payments, from KRW 62.4 billion in '15 to KRW 206.5 billion in '16, KRW 550.3 billion in '17, KRW 1,049.7 billion in '18, and 921.3 billion KRW in '19, an annual increase of 331.1%, 266.4%, and 190.8% in Phase Ⅰ, and a decrease in '19 to 87.8% compared to '18. Although the price increased in '19, the total payments decreased as the trading volume decreased. The total payments for the entire trading period were KRW 2,790.1 billion. Total payments for the KAUs were KRW 2,344.5 billion compared to KRW 55.4 billion for the KCUs and KRW 390.2 billion for the KOCs, accounting for 84.0%, 2.0%, and 14.0%, respectively. The total payments in the exchange market were KRW 1,210.9 billion and those in the over-the-counter market were KRW 1,579.2 billion (43.4% and 56.6%, respectively).

[Figure Ⅲ-1] Total emissions trading volume and price trends



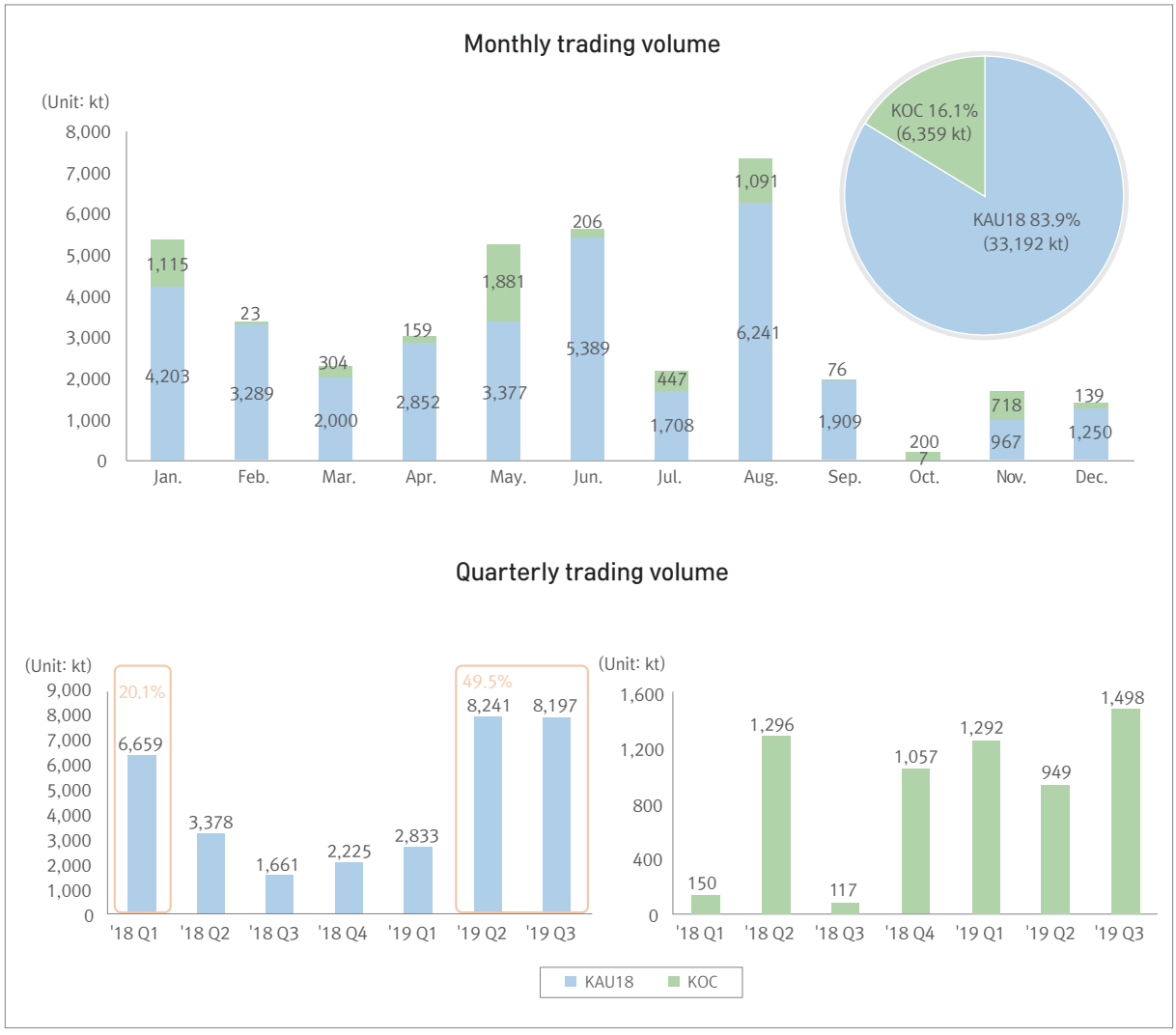
2. Trading Records for the First Compliance Year('18)

1) Detailed Analysis of the Trading Volume

In this section, it is presented with the trading volume for each type of emission permit (KAU18, KCU18, KOC18) in both markets during the trading period of the first compliance year (1 Jan. '18 to 30 Sep. '19). KCU18 was not included in this analysis due to no trading in this emission permit type. The total trading volume for this trading period was 39.6Mt. The trading volume of KAUs was 33.2Mt and that of KOCs was 6.4Mt, accounting for 83.9% and 16.1%, respectively.

In terms of the emission permit type, 49.5% of the total KAU trading volume occurred after the second quarter of '19 just before the period for surrendering the emission permits, and 20.1% of the trading volume took place in the first quarter of '18, when the trading first started. The KOC trading volume was relatively constant over the entire period, except for the first and third quarters of '18.

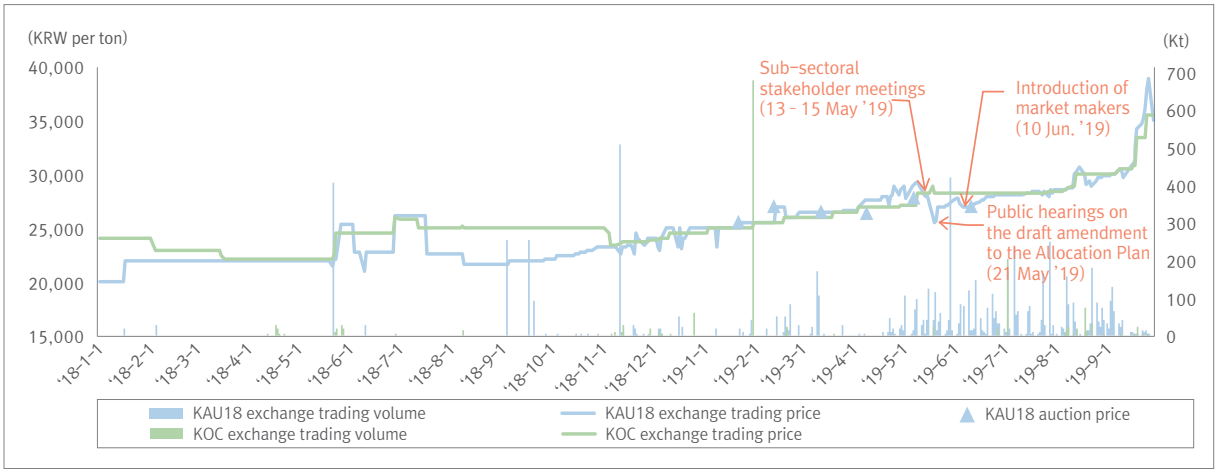
[Figure Ⅲ-2] Trading volume for each emission permit type



2) Detailed Analysis of Price

KCU18 was not traded during the first compliance year of Phase II. The price of KOCs was higher than that of KAU18 in the early stages of the period but they later became similar (from 6 Nov. '18).

[Figure Ⅲ-3] Price trends by emission permit type in the exchange market [24]



In Phase Ⅱ, the market started with KAU18 priced at KRW 20,000 per ton and KOC at KRW 24,000. Because the trading volume was low, the prices of KAU18 and KOC remained within the range of KRW 20,000 - 25,000 until Aug. '18 and Oct. '18, respectively. When the frequency of trading later increased, the prices gradually increased as well. KAU18 had been continuously traded since 19 Apr. '19. The price of KAU18 decreased considerably after industry meetings held in preparation for the public hearings for the second revised Allocation Plan, but it slowly increased following the public hearings and then continuously increased from 18 Sep. '19, when the banking and borrowing were completed, to 30 Sep., when the surrender of emission permits had ended. The highest price for KAU18 and KOC was KRW 39,000 (27 Sep. '19) and KRW 35,600 (26 - 30 Sep. '19), respectively. Auctions for KAU18 were held, once a month from Jan. to Jun. '19, and the price at these auctions was similar to the market price.

24 The weighted-average of the actual trading prices of the individual types of emission permits in the exchange market was applied on each trading day. When there was no trading, the KRX closing price on the trading day was applied.

Ⅳ. Stakeholder Survey

1. Stakeholder Overview

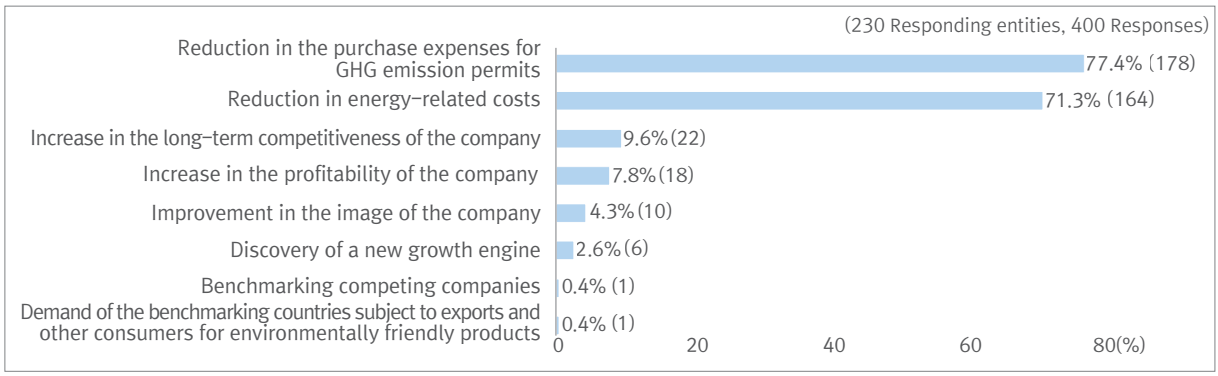
A survey was conducted with liable entities participating in the K-ETS on their views of the implementation, and the patterns of emissions trading. A total of 541 liable entities [25] from all six sectors were selected as subjects of the survey, [26] and the response rate was 42.5% (230 out of the 541 subjects). In terms of size, 61 (26.5%) of the responses were from large companies, 123 (53.5%) were from mid-sized companies, 24 (10.4%) were from small-sized companies, and 22 (9.6%) were from other entities (e.g., public institutions).

2. Survey Results

1) Views and Assessment of the K-ETS

The principal motivation of the liable entities in participating in the K-ETS were the reduction in the purchase expenses for GHG emission permits (77.4%) and the reduction in energy-related costs (71.3%). Other motivations were the discovery of a new growth engine (2.6%), an increase in the long-term competitiveness of the company (9.6%), and an improvement in the image of the company (4.3%).

[Figure Ⅳ-1] Motivations for participating in GHG emission reduction activities and responses to the K-ETS (up to two responses allowed)

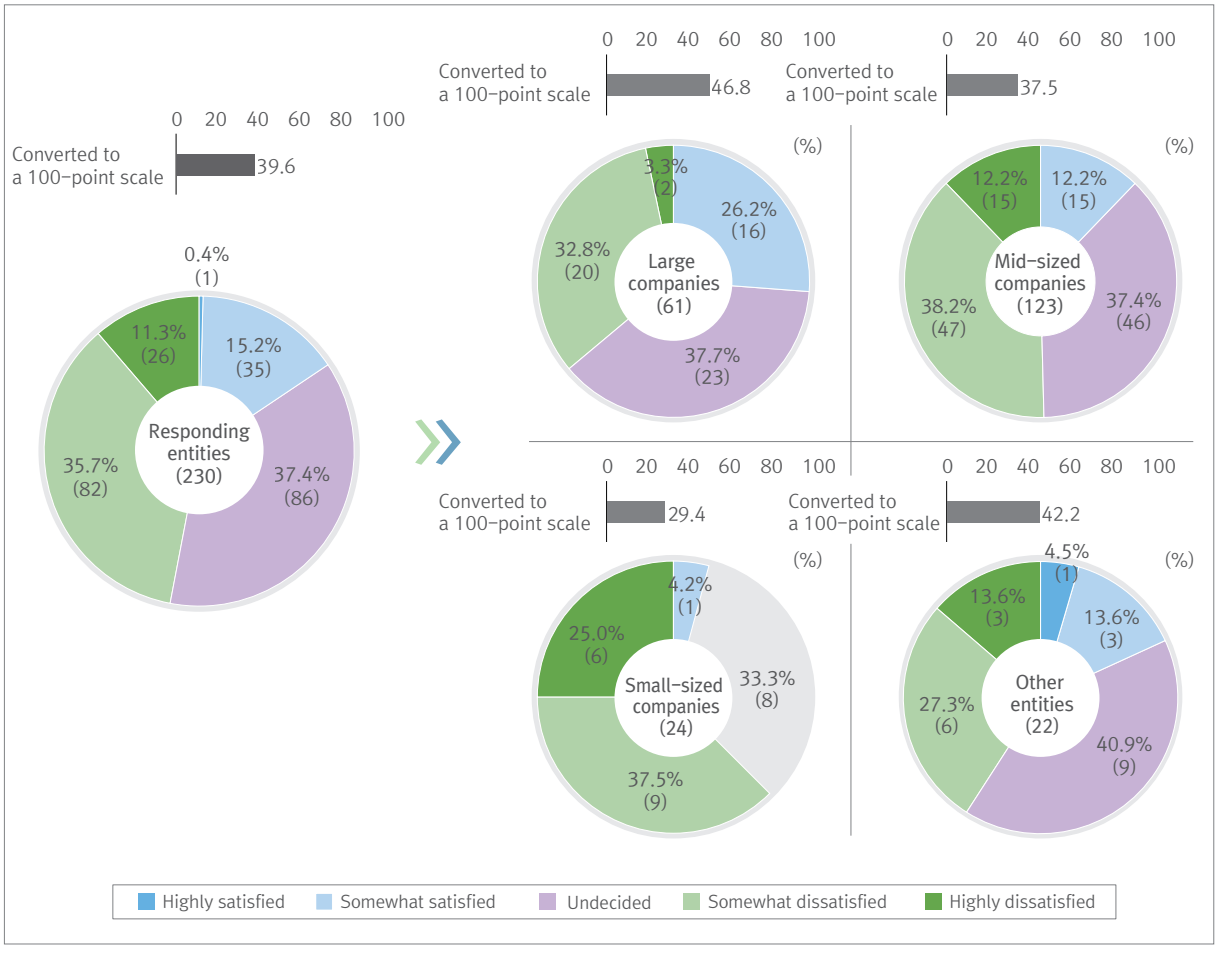


25 The survey was conducted in '18 with those liable entities that participated in Phases Ⅰ and Ⅱ.

26 A link of the questionnaire was sent via e-mail to the person-in-charge of the liable entities selected for the survey, and the person-in-charge was contacted twice during the survey period by phone to provide information about the survey and to request their participation.

The views of the responding liable entities on the impact of the K-ETS on overall business operations were also collected. The results showed that more entities were dissatisfied (47.0%) than satisfied (15.6%).[27] The average satisfaction with the impact on overall business operations, calculated on a 100-point scale,[28] was 39.6. The degree of satisfaction decreased as the size of the company decreased. Among large companies, 26.2% were classified as satisfied, with an average satisfaction of 46.8 points, compared to 12.2% and 37.5 points for mid-sized companies, and 4.2% and 29.4 points for small-size companies.

[Figure Ⅳ-2] Satisfaction levels regarding the impact of the K-ETS on business operations



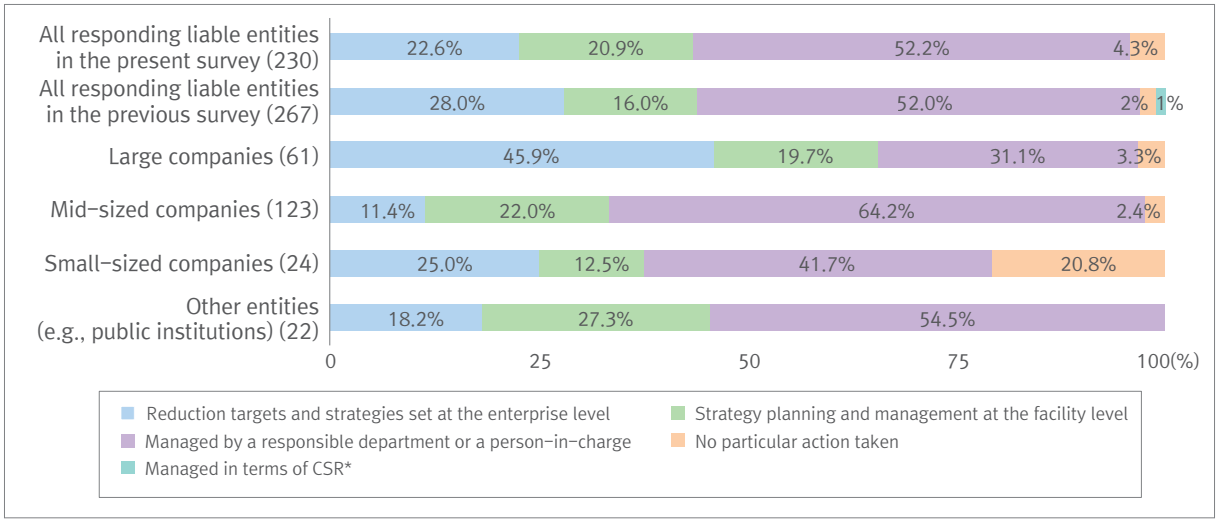
27 In the survey, "Satisfied" included "Highly satisfied" and "Somewhat satisfied," and "Dissatisfied" included "Somewhat dissatisfied" and "Highly dissatisfied."

28 Conversion of the five-point scale to the 100-point scale: "Highly satisfied" (100.0) "Somewhat satisfied" (75.0), "Undecided" (50.0), "Somewhat dissatisfied" (25.0), and "Highly dissatisfied" (0.0).

2) Response to and Compliance with the K-ETS

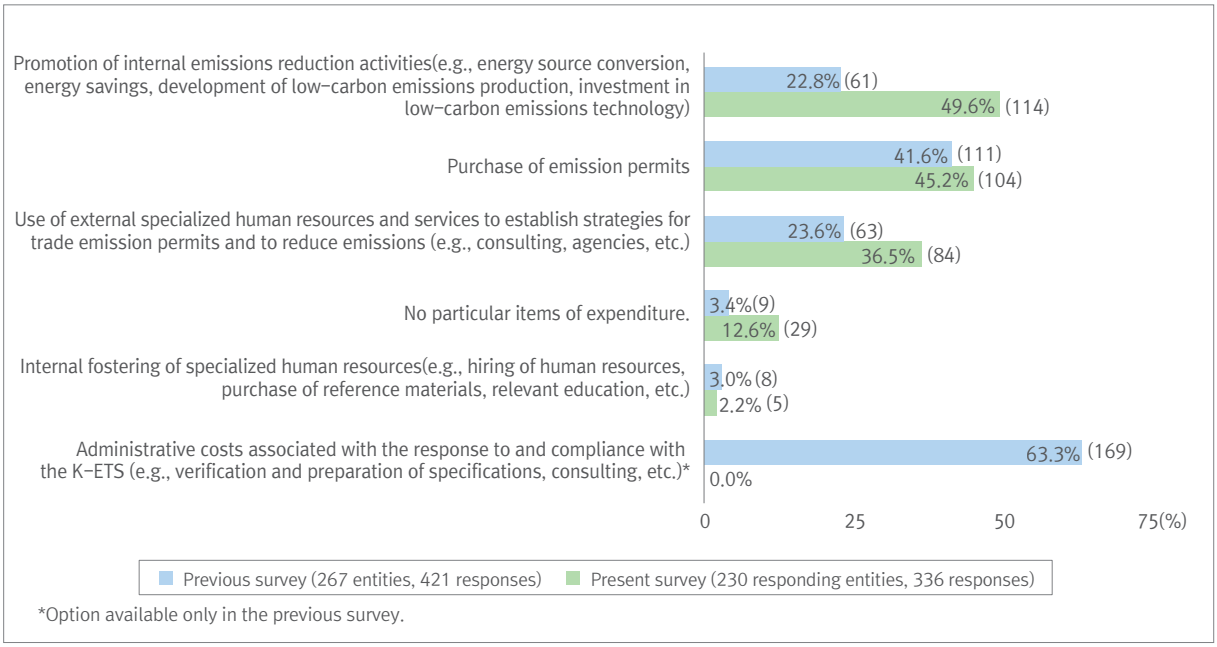
The survey results for the operational and strategic responses to the K-ETS were similar to the previous survey. The most common response to the K-ETS within the entities was at the level of the relevant department or person-in-charge (52.2%), followed by the level of the enterprise (22.6%) and at the level of individual facilities within the company (20.9%). In addition, 4.3% of the liable entities stated that no particular action had been taken. Large companies were twice as likely to respond to the K-ETS at the level of the entire company (45.9%) compared to mid-sized companies and other entities. The ratio of the entities that responded that they had taken no particular action was highest among small-sized companies (20.8%). All respondents classified as "other entities" (i.e., those not categorized as large, mid-sized, or small-sized companies) responded that they were pursuing operational and strategic actions in response to the K-ETS at various levels.

[Figure Ⅳ- 3] Operational and strategic response levels to the K-ETS by entity type



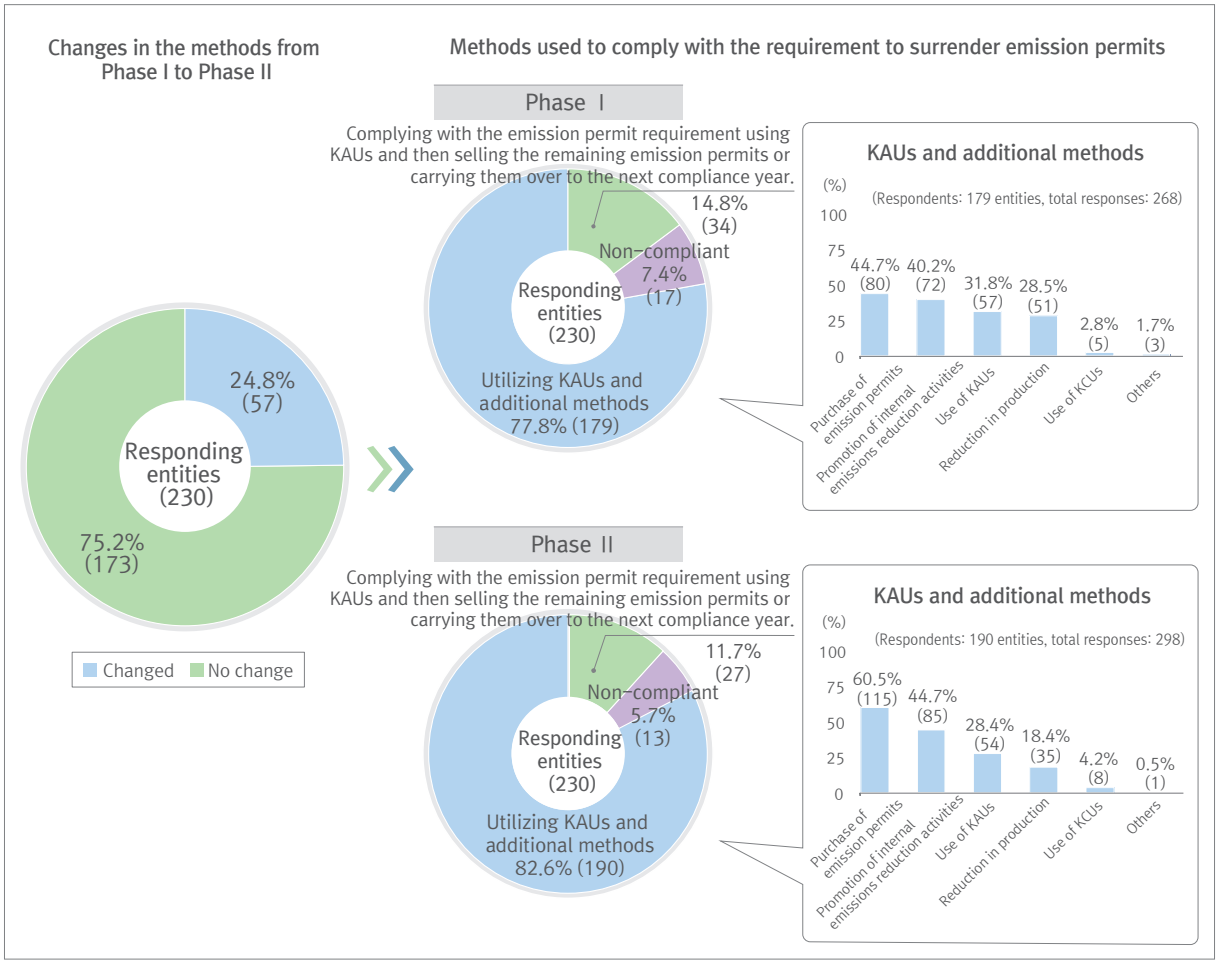
The survey results showed that the promotion of internal emissions reduction activities (49.6%), the purchase of emission permits (45.2%), and the use of external specialized human resources and services (36.5%) were the main costs associated with the response to the K-ETS. Compared to the previous survey, the proportion of entities paying for the promotion of internal emissions reduction activities and the use of external specialized human resources and services was increased, while the proportion of entities paying for the internal fostering of specialized human resources was similar.

[Figure Ⅳ- 4] Main cost items for the response to the K-ETS (up to two responses allowed)



In terms of the methods used to comply with the requirement to surrender the emission permits in Phase Ⅱ, the most common response was that there would be no change in the methods used to accomplish emission permit targets in Phase Ⅱ (75.2%) from Phase Ⅰ. As with Phase Ⅰ, the key approach to accomplishing the emission permit targets in Phase Ⅱ was the use of KAUs together with other methods (82.6%). Other entities responded that they would comply with the requirements to surrender emission permits using KAUs only (11.7%). The measures used by the entities included the purchase of emission permits (60.5%), the promotion of internal emissions reduction activities including technological investment (44.7%), the use of KAUs (28.4%), and the reduction in production (18.4%), which were similar to those used in Phase Ⅰ. However, the number or entities that responded that they would comply with the requirement by purchasing emission permits increased considerably.

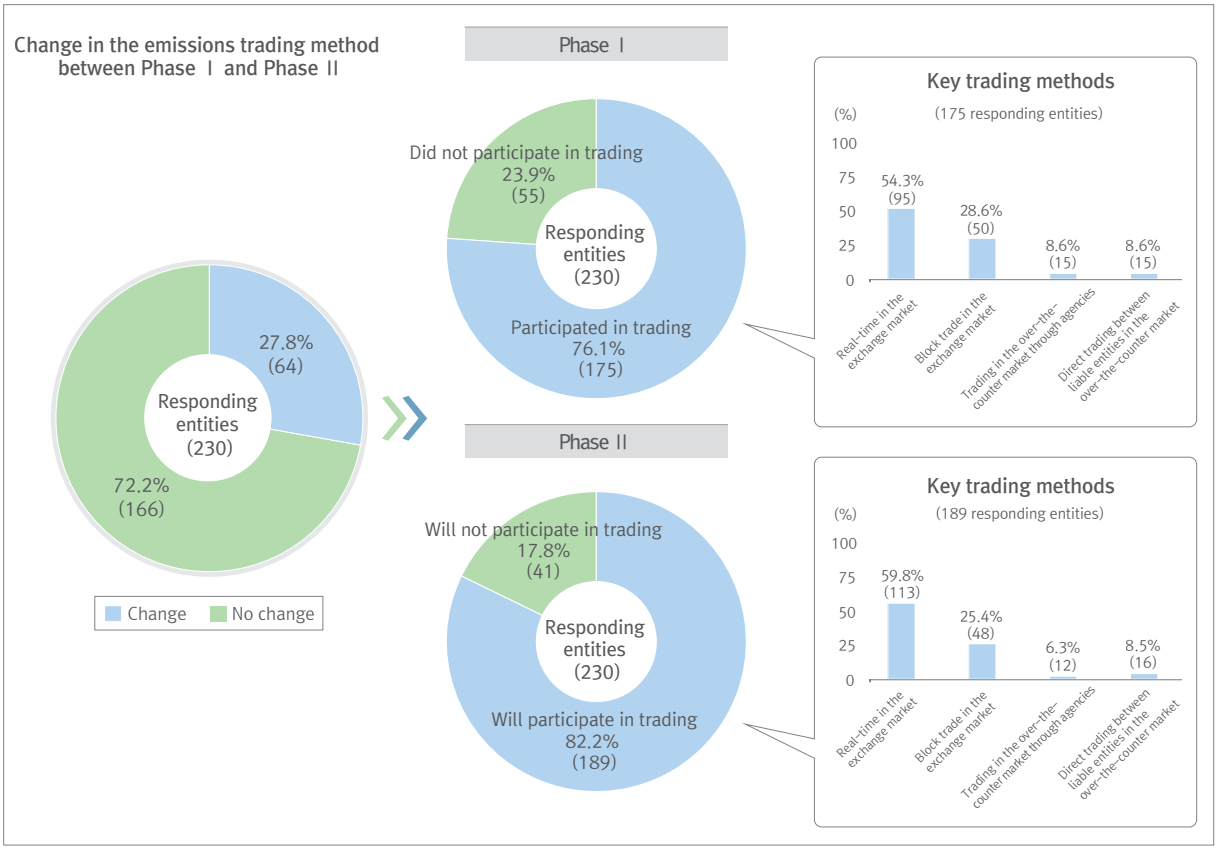
[Figure Ⅳ- 5] Methods used to comply with the requirement to surrender emission permits



3) Participation in the Emission Permit Trading Market and Market Prospects

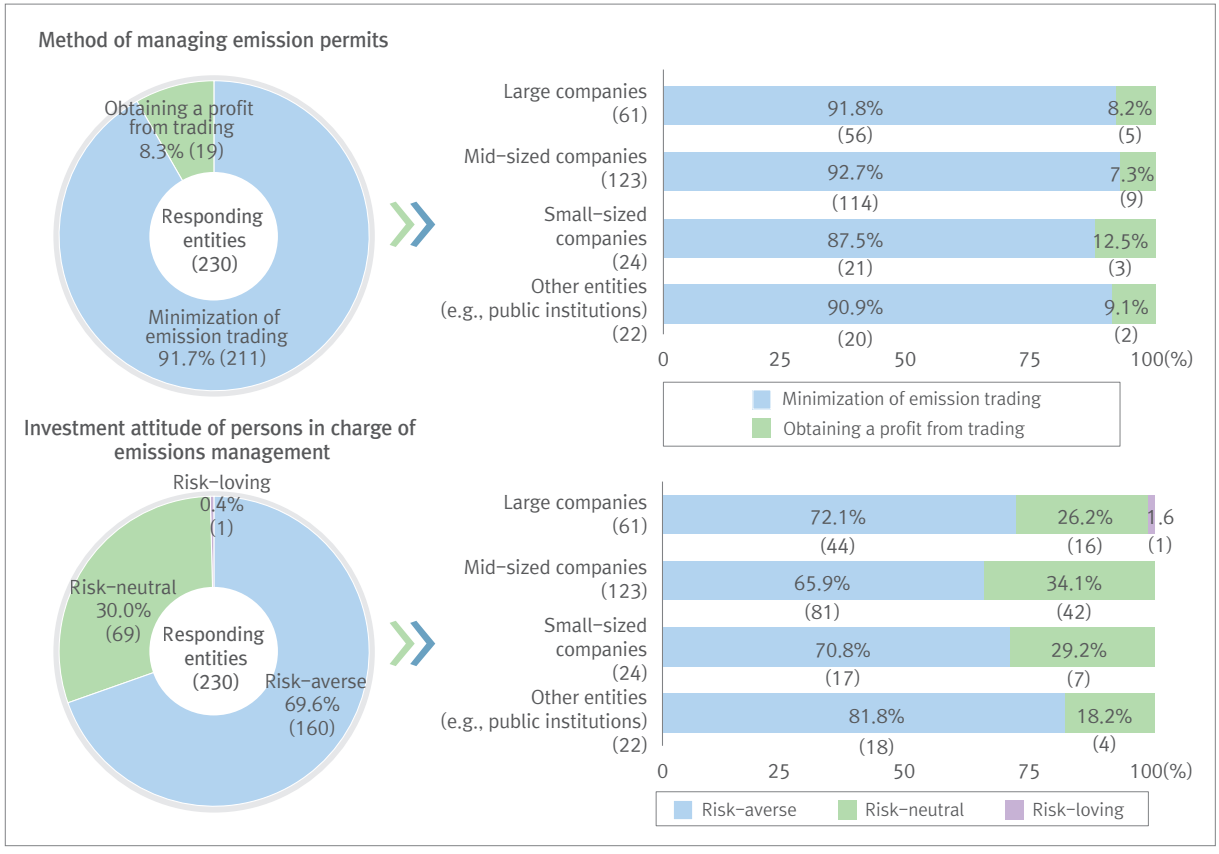
Only 64 of the liable entities (27.8%) responded that they would change the methods of emission permit trading from Phase Ⅰ to Phase Ⅱ, indicating there would be no significant change in the trading methods used by the liable entities. Overall, 82.2% of the liable entities stated that they had traded or that they would trade emission permits in Phase Ⅱ, which was slightly higher than in Phase Ⅰ. The most common method of trading the emission permits was real-time trading in the exchange market with an unknown trading counterpart at 59.8%, which was slightly higher than in Phase Ⅰ (54.3%). The number of liable entities that chose the block trading in the exchange market and trading in the over-the-counter market through agencies was slightly lower in comparison to Phase Ⅰ (28.6% to 25.4% and 8.6% to 6.3%. respectively). There was no significant change in the proportion of entities that engaged in direct trading in the over-the-counter market.

[Figure Ⅳ- 6] Participation in and types of emissions trading



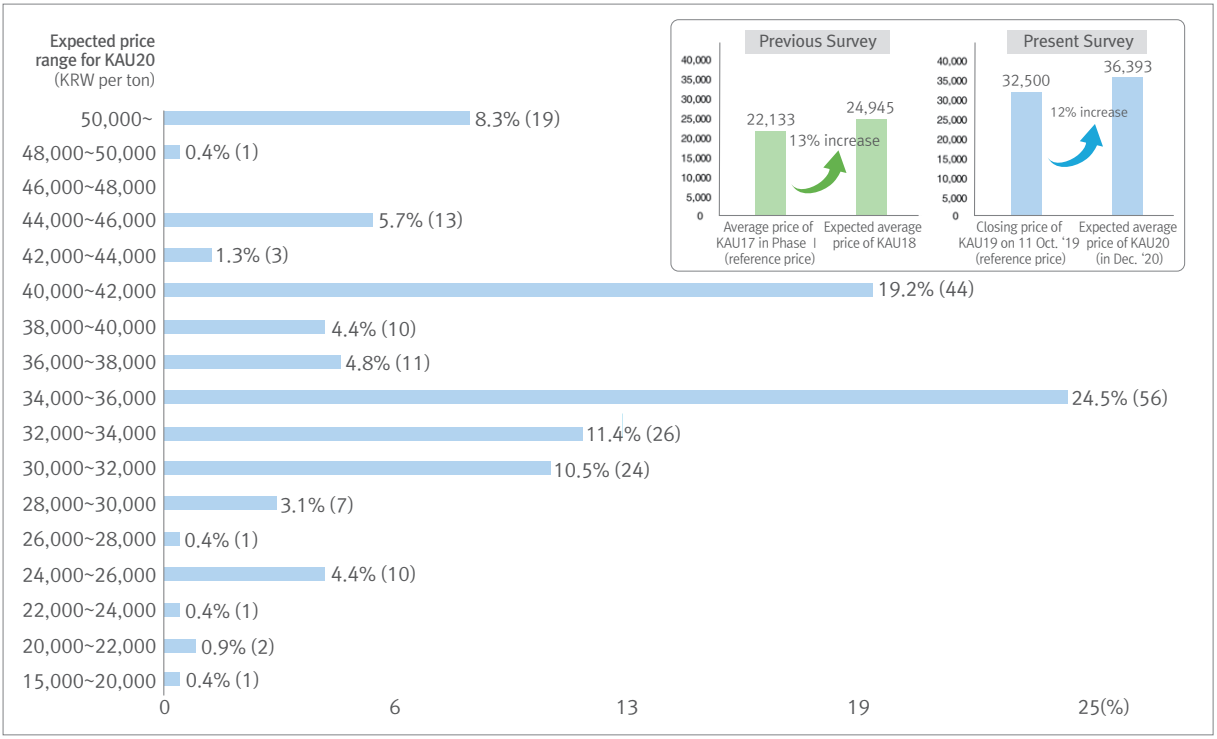
91.7% of the liable entities preferred the purchase of insufficient emission permits or carrying over the extra emission permits to the next compliance year. 8.3% of the liable entities wanted to obtain a profit from emissions trading. There was no significant difference in the method of managing the emission permits preferred by the liable entities, but the proportion that preferred emissions trading for the purpose of obtaining a profit was higher for small-sized companies (12.5%) than for large (8.2%) and mid-sized companies (7.3%) and other entities (9.1%). In addition, most persons in charge of emissions management were classified as risk-averse (69.6%), followed by risk-neutral (30.0%) and risk-loving (0.4%).

[Figure Ⅳ- 7] Methods of managing emission permits and the investment attitude of managers by entity type



In the previous survey, 68.5% of the responding liable entities (183 entities) expected the price of the emission permits to increase after one year in comparison with the reference price (KRW 22,133, the average price of KAU17 during Phase Ⅰ). In the present survey, 82.6% of the responding liable entities expected an increase in the price (190 entities). The price of KAU20 expected by the liable entities ranged from KRW 15,000 per ton to KRW 50,000. The liable entities expected the average price of KAU20 to be KRW 36,393, an increase of 12% from the emission permit price one day before the survey was held (KRW 32,500, the closing price of KAU19 on 11 Oct. '19). The expected price increase one year later was similar for the present and the previous surveys (13%).

[Figure Ⅳ-8] Expected price range for KAU20

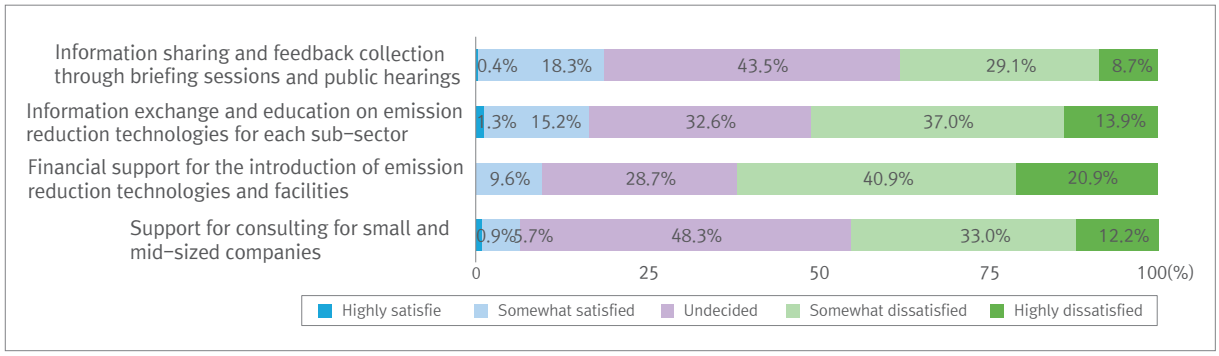


4) Improvement in the K-ETS

The degree of satisfaction among the liable entities with the government's support policies related to the K-ETS was analyzed. Only 18.7% of the entities were satisfied with the sharing of information and collection of feedback through briefing sessions and public hearings (dissatisfied: 37.8%), while 16.5% were satisfied with the exchange of information and education on emission reduction technologies for each sub-sector (dissatisfied: 50.9%), 9.6% were satisfied with the financial support for the introduction of emission reduction technologies and facilities (dissatisfied: 61.8%), and 6.6% were satisfied with the support for consulting for small-sized companies (dissatisfied: 45.2%).[29]

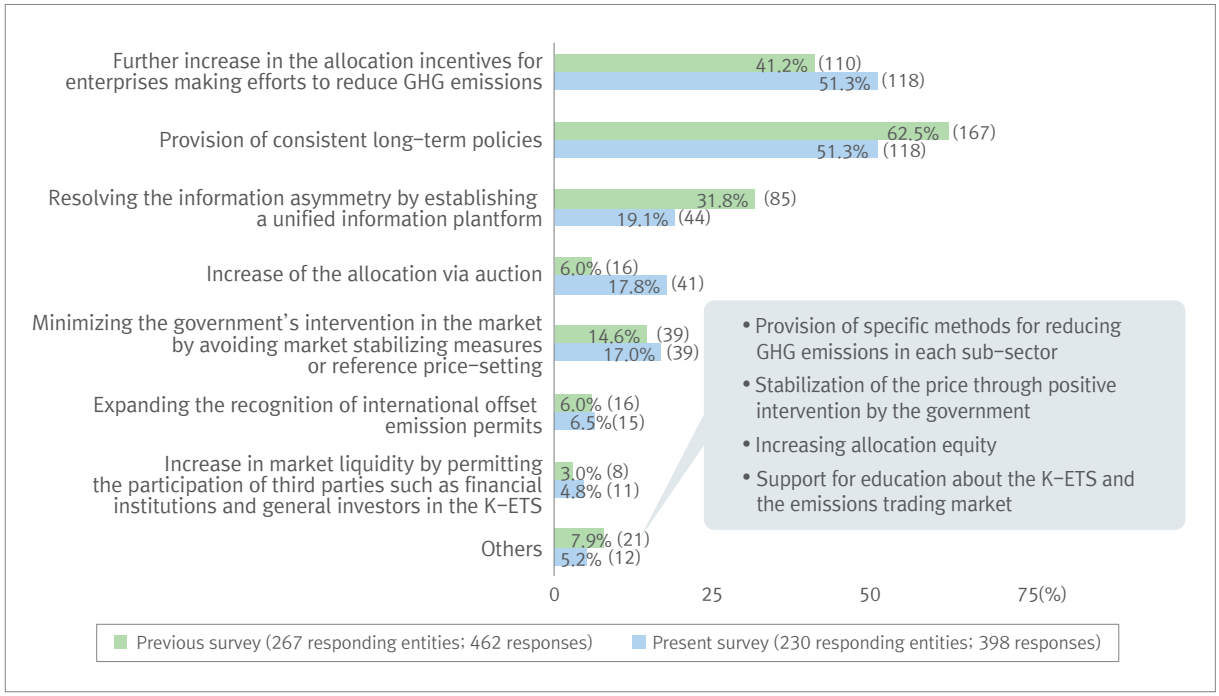
29 "Satisfied" included "Highly satisfied" and "Somewhat satisfied," while "Dissatisfied" included "Slightly dissatisfied" and "Highly dissatisfied."

[Figure Ⅳ- 9] Degree of satisfaction with the government's support policies for the K-ETS



In terms of the proposals for the future improvement of the K-ETS, the responding enterprises emphasized a further increase in allocation incentives for entities making efforts to reduce GHG emissions (51.3%) and the provision of consistent long-term policies (51.3%). In the previous survey, the provision of long-term consistent policies was supported by 62.5% of the responding entities, while the further increase of allocation incentives for enterprises making efforts to reduce GHG emissions and resolving the information imbalance by establishing a unified information platform were supported by 41.2% and 31.8% of the entities, respectively. Other suggestions included the provision of specific methods for reducing GHG emissions and the stabilization of the price through the positive intervention of the government.

[Figure Ⅳ- 10] Ways to improve the K-ETS (up to two responses allowed)



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