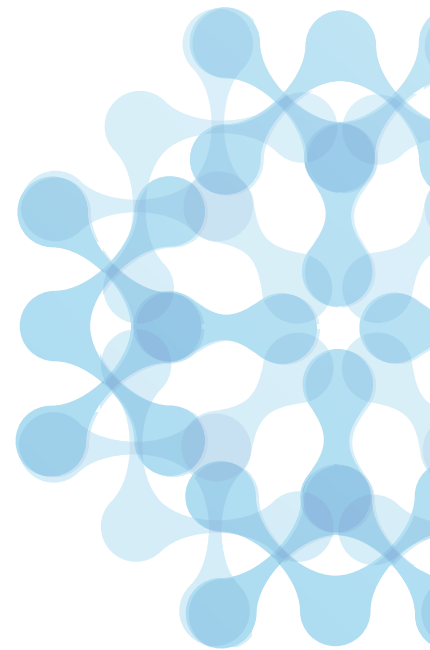
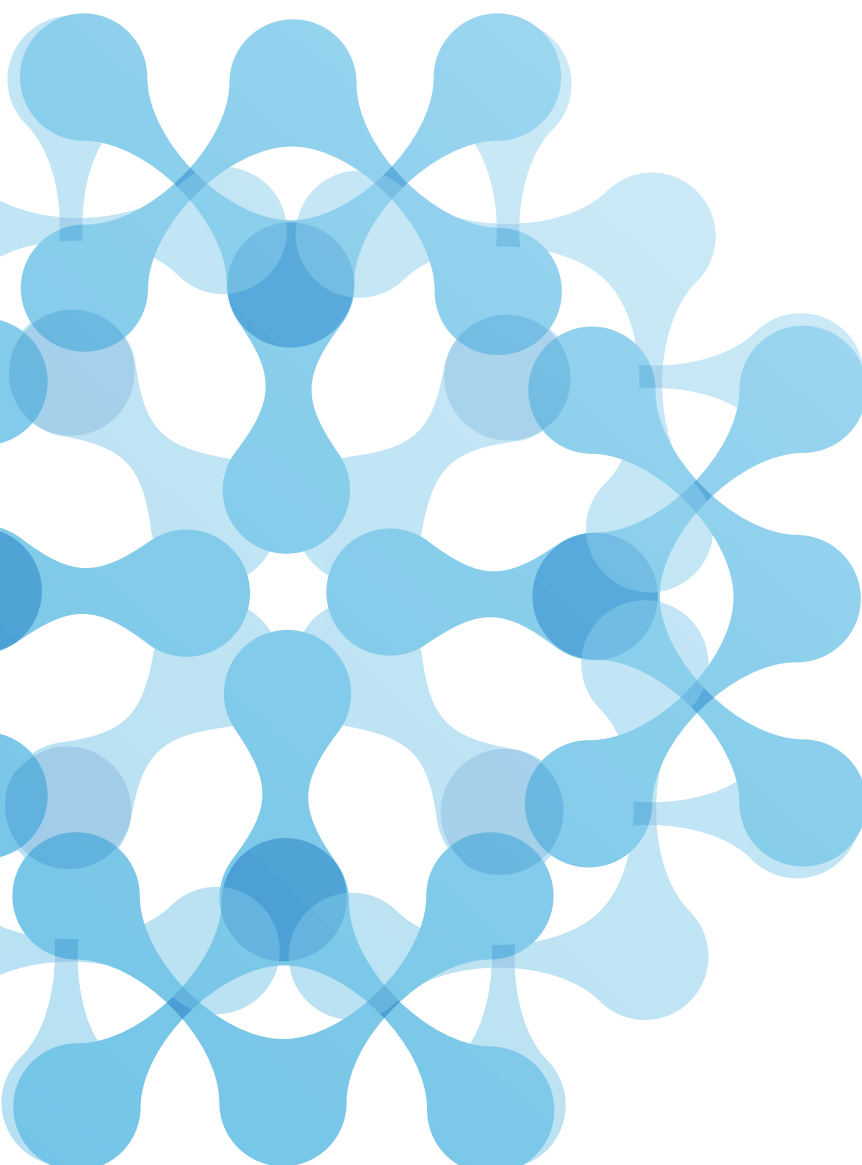


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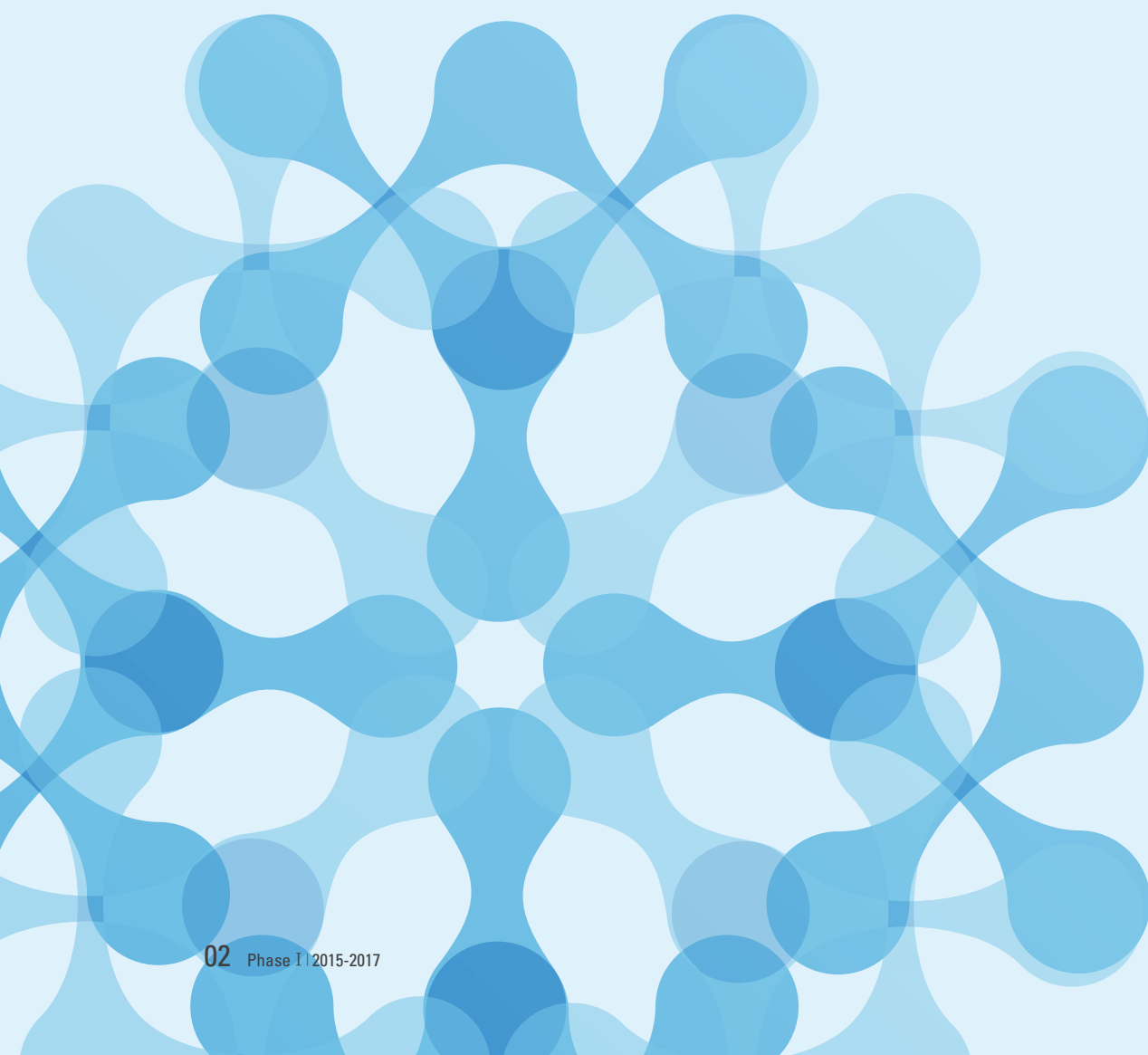
K-ETS Summary Report

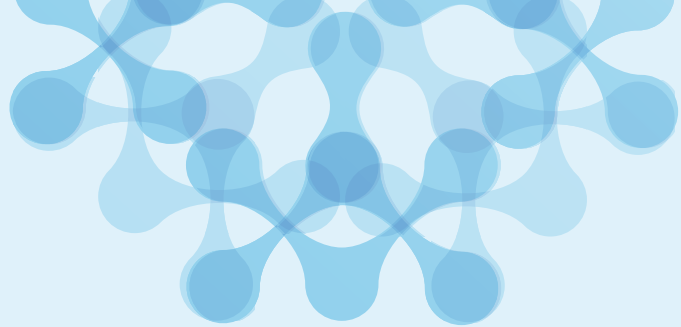


Ministry of Environment
Greenhouse Gas Inventory and
Research Center of Korea

Phase I | 2015-2017

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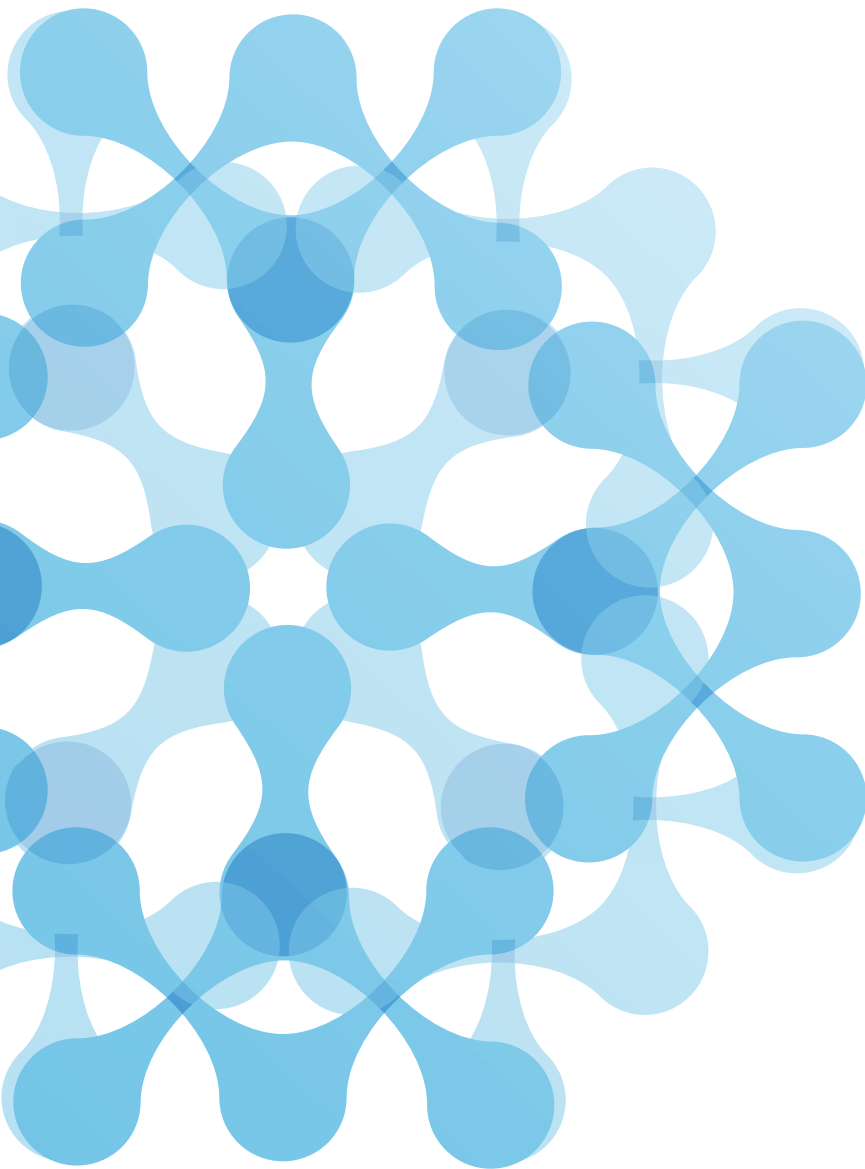
Foreword

An Emissions Trading System is a market-based scheme to cost-effectively meet the nation's GHG reduction targets by allocating a number of emission permits to business entities emitting GHGs which thereby allows them to emit within the amount of allowances they hold and to trade any surplus or deficit in their allowances with one another on the market. The Korean Emissions Trading System (hereinafter 'K-ETS') was launched in 2015 with its legal basis established in 2012 through the Act on the Allocation and Trading of Greenhouse-Gas Emission Permits (May '12, hereinafter 'Act') and the associated Enforcement Decree of the Act on the Allocation and Trading of Greenhouse-Gas Emission Permits (Nov. '12, hereinafter 'Enforcement Decree'), followed by the Master Plan for the Emissions Trading System (Jan. '14, hereinafter 'Master Plan') and the Allocation Plan for Phase I ('15~'17) (Sept. '14) which provide all the details of the K-ETS.

The K-ETS Report is an official government report, periodically published by the Greenhouse Gas Inventory and Research Center to support related policy decisions and stable operation of the K-ETS in accordance with the Enforcement Decree, wherein all available data related to the entire K-ETS process – from allocation of emission permits to certification of emissions and eventual surrender of emission permits – for each compliance year are analyzed and disclosed for increasing transparency in the management of the system as well as improving comprehension through meeting internal and external needs for detailed information on the K-ETS. Additionally, by elucidating difficulties, limitations and areas for potential improvements in the K-ETS identified by all stakeholders, including business entities, through a stakeholder survey and using them as a reference for evaluating and enhancing the system, this report serves not only as an efficient communication channel between the government and the stakeholders but also as a facilitator for frictionless operation of the system.

This report, available both in Korean and English, is a brief summary of the K-ETS Report for Phase I (2015–2017) published in January 2019, which contains a brief overview of the system and the core contents of the operational results during Phase I as well as the stakeholder survey. As the information regarding the implementation status and the performance of the K-ETS has been in high demand both internally and externally since its implementation in 2015, we do hope to significantly improve the understanding of relevant stakeholders by continuously disclosing and distributing such information with this periodic report.

K-ETS Summary Report



Notes for the Reader

① This report analyzes the implementation results of the K-ETS including the allocation, trading and surrender of emission permits of the liable entities designated in accordance with Articles 8 and 9 of the Act.

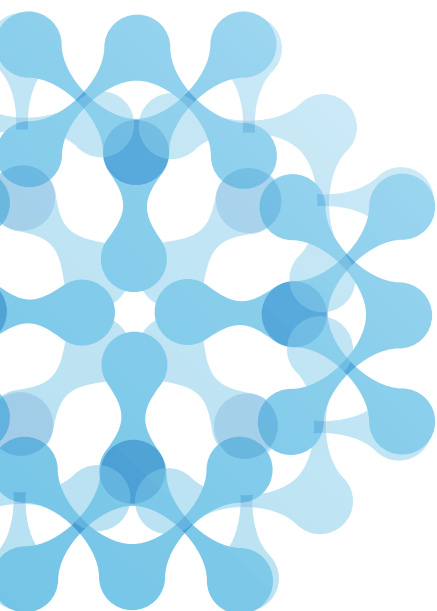
② This report is based on entity-level data of emission permits provided by NGMS, ETRS, ORS, and KRX.

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

③ All numerical values in this report are rounded figures and as such some sums and totals do not match.

④ This report uses the notation t (ton), kt (one thousand tons) and Mt (one million tons) as units for the allocation and surrender of emission permits by converting GHG emissions into CO₂ equivalent tons (tCO₂eq) based on their global warming coefficient. However, when describing transactions of emission permits, the English abbreviations (KAU, KCU, KOC) are used for emission permit units.

- **1tCO₂eq = 1 KAU = 1 KCU = 1 KOC**
- **KAU (Korean Allowance Unit):** emission permits allocated to liable entities in accordance with Article 12 of the Act
- **KCU (Korean Credit Unit):** emission permits converted from the certified reductions derived from external offset projects 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, KOC will also be referred to as one of the emission permits in the text)



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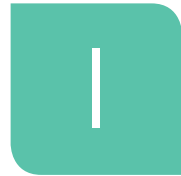
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K-ETS Overview

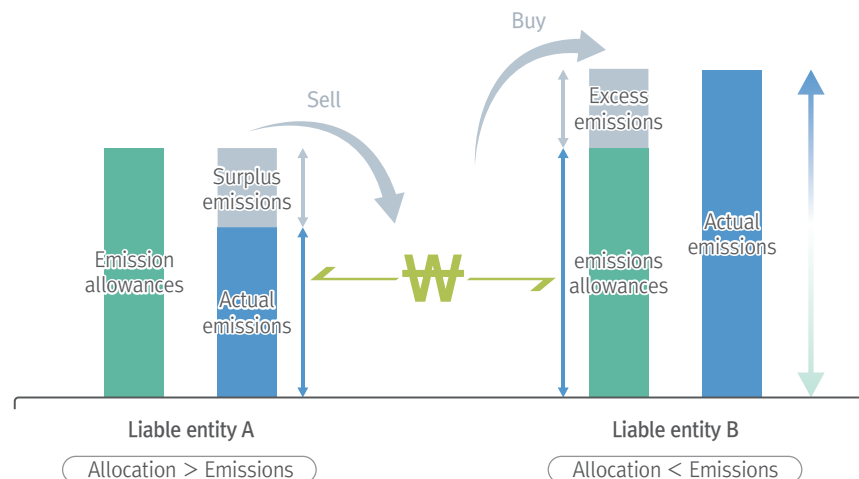
1. Operational Direction and Framework
 2. Scope and Procedure
- K-ETS at a Glance

I . K-ETS Overview

1. Operational Direction and Framework

An Emissions Trading System is a market-based scheme to cost-effectively meet the nation's GHG reduction targets by allocating a number of emission permits to business entities emitting GHGs which thereby allows them to emit within the amount of allowances they hold and to trade any surplus or deficit in their allowances with one another on the market. The K-ETS was launched in 2015 with its legal basis established in 2012 through the Act (May '12) and the associated Enforcement Decree (Nov. '12), followed by the Master Plan (Jan. '14) and the Allocation Plan for Phase I ('15~'17) (Sept. '14) which provide all the details of the K-ETS.

[Figure I -1] Conceptual diagram of the ETS



(Source) Master Plan for the Emissions Trading System (Ministry of Strategy and Finance, '14)

A phase is intended eventually to span 5 years, but in order to gain experience and resolve any potential issues during the initial implementation of the K-ETS, Phases I and II have been limited to 3 years each. Whereas Phase I was focused on securely installing the K-ETS, beginning with Phase II emphasis is to be placed on active and effective GHG reduction, which thereby provides the government with a gradual and stable basis for system operation while simultaneously notifying stakeholders, such as liable entities, of long-term system standards.

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

	Phase I ('15-'17)	Phase II ('18-'20)	Phase III ('21-'25)
Main objective	• Experience acquisition and system stabilization	• Substantial reduction in GHG emissions	• Active reduction in GHG emissions
System operation	• Improve system adaptability • Establish necessary infrastructure for accurate Monitoring, Reporting and Verification (MRV)	• Expand scope of the system and raise the target • Raise standards, e.g. for emissions reporting, verification, etc.	• Encourage voluntary reductions in preparation for a new climate regime • Improve market liquidity, e.g. by allowing third party trading
Allocation	• 100% free allocation • Wide application of lessons learned from the GHG and Energy Target Management System	• Launch auction • Advancement of allocation methods, e.g. benchmarking	• Expand auction • Establishment of advanced allocation methods

(Source) Master Plan for the Emissions Trading System (Ministry of Strategy and Finance, '14)

The K-ETS is being operated by the Ministry of Environment (hereinafter 'MoE') as the primary responsible body while the competent authorities are in charge of external offset projects for each sector based on their relevant expertise in order to ensure the reduction of national GHG emissions.

〈Table I -2〉 K-ETS operational framework

	Function	Authority in charge	Notes
General function (policy/ system)	Legal authority	MoE-Ministry of Strategy and Finance Ministry of Strategy and Finance Office for Government Policy Coordination	Joint authority
	Master Plan	Ministry of Strategy and Finance-MoE	Systematic participation of ministries in charge of each sector
	Allocation Plan	MoE	
	Operation of Emission Permits Allocation Committee	MoE	Chair : Minister of Strategy and Finance Secretary : Vice Minister of Environment
	Operation of Deliberation Committee on Determinations of Allocation	MoE	Chair : Vice Minister of Environment Secretary : Director, MoE
	Operation of Emissions Certification Committee	MoE	Chair : Vice Minister of Environment Secretary : Director, MoE
	Management of guidelines for allocation, certification and external offset projects	Collaboration of competent authorities for each sector	MoE, Ministry of Trade, Industry and Energy, Ministry of Agriculture, Food and Rural Affairs, and Ministry of Land, Infrastructure and Transport
	Management of other guidelines, e.g. for auctioning, trading, verification, etc.	MoE	-
	Auction revenue management	MoE	Review auctioning ratio and revenue usage when establishing the Allocation Plan
Executive function	Allocation of emission permits for each liable entity	MoE	-
	Evaluation and certification of emissions for each liable entity	MoE	-

	Function	Authority in charge	Notes
Executive function	Evaluation and certification of external offset projects	Competent authorities for each sector in coordination with MoE	Increase jurisdictional expertise applied to external offset projects
	Market operation and auctioning	MoE	-
	Surrender of emission permits and imposition of penalty fees	MoE	-
	Support for GHG reduction projects	Competent authorities for each sector	Strengthen link with GHG reduction policies in each jurisdiction

2. Scope and Procedure

The greenhouse gases covered by the K-ETS are the six major gases¹⁾ specified in Article 2 (1) of the Act and Article 23 (1) of the associated Enforcement Decree. Business entities whose annual average GHG emissions over a period of three years in the four years preceding a phase exceed 125,000 t or with a facility generating in excess of 25,000 t are mandatorily defined as liable entities eligible for allocation. Additionally, any business entity exceeding the annual average GHG emission threshold over a three-year period due to the alteration, expansion or foundation of a new facility during the phase will also be designated as such (new entrants). Business entities and facilities that have been designated and publicly notified as liable entities should comply with their emission allowances from the year when they have been allocated emission permits within their individual capacity by reducing their GHG emissions and/or purchasing additional permits, as necessary.

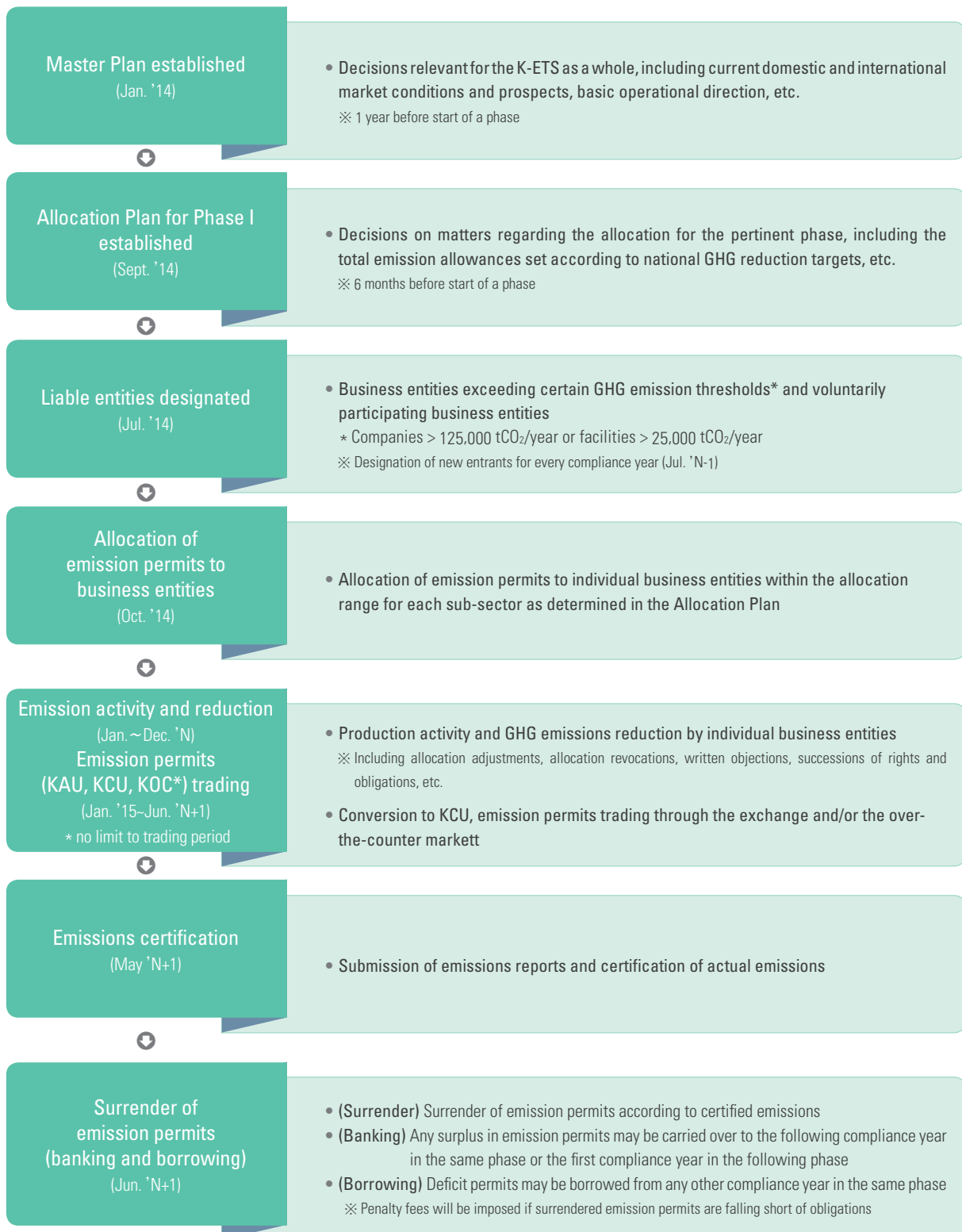
In order to meet their allocation targets for each compliance year, liable entities should submit a monitoring plan and an emissions report per compliance year based on the MRV system. Furthermore, if the necessary criteria are met, applications for revocation of allocation (if grounds for revocation exist), applications for a succession of rights and obligations (in case of an acquisition, merger, etc.), applications for additional allocation (where warranted) etc. and other associated documents can be submitted to the competent authorities electronically via the NGMS. However, if a document is filed, such as a monitoring plan, an emissions report, an application for additional allocation, etc. that changes the amount of a business entity's emissions, third party verification by a designated verifying organization is required.

1) · Carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆)

According to the operation schedule for each compliance year, once liable entities have filed their documents via the NGMS, the competent authorities will review them and notify the business entities of the results. However, if there are any objections to the contents of the notice, those can be submitted in writing within 30 days from the receipt of the notice, upon which the competent authorities shall review the objections and convey the results within another 30 days (this period can be extended by an additional 30 days, if unavoidable circumstances make a timely decision impossible).

Liable entities shall surrender emission permits in KAU or KCU within 6 months from the end of each compliance year based on their certified emissions after trading. Any surplus in emission permits in their possession may be carried over to the following compliance year in the same phase or the first compliance year in the following phase, while a deficit may be compensated for by borrowing from any other compliance year in the same phase. The procedure for the surrender of emission permits for each compliance year during Phase I is illustrated in [Figure I -2].

[Figure I -2] Emission permits surrender process for compliance year N during Phase I

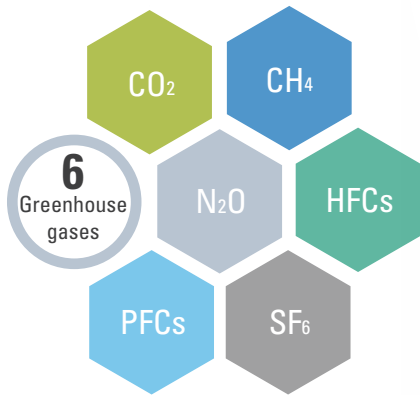


(Source) Allocation Plan for Phase I ('15~'17) (Ministry of Environment, '14)

K-ETS at a Glance

The “1st” Nationwide ETS in East Asia

Gas coverage



- Direct emissions of 6 greenhouse gases
- Indirect emissions from electricity consumption

Emissions coverage



National average GHG emissions during the base years (2011-2013) of Phase I

688.94 Mt*

* (Source) 2018 National GHG Inventory Report of Korea (Greenhouse Gas Inventory and Research Center, '18)

67.3%

80.2%

Direct emissions
463.85 Mt**

Direct + Indirect emissions
552.39 Mt**

** (Source) NGMS DB ('11-'13 average GHG emissions)

Sectors & thresholds



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

125,000 t or more for business entities

25,000 t or more for individual facilities



• Energy (2) : power generation, Integrated energy supply(residential)



• Industry (20) : Integrated energy supply(industrial), mining, food and beverages, textiles, wood, pulp, oil refining, petrochemicals, glass, ceramics, cement, steel, nonferrous metals, machinery, semiconductors, displays, electrical and electronics, automobiles, shipbuilding, telecommunications



• Buildings (1) : buildings



• Transport (1) : aviation



• Public services (2): water, waste

Number of liable entities per compliance year

| 2015 |



44 new entrants

| 2016 |



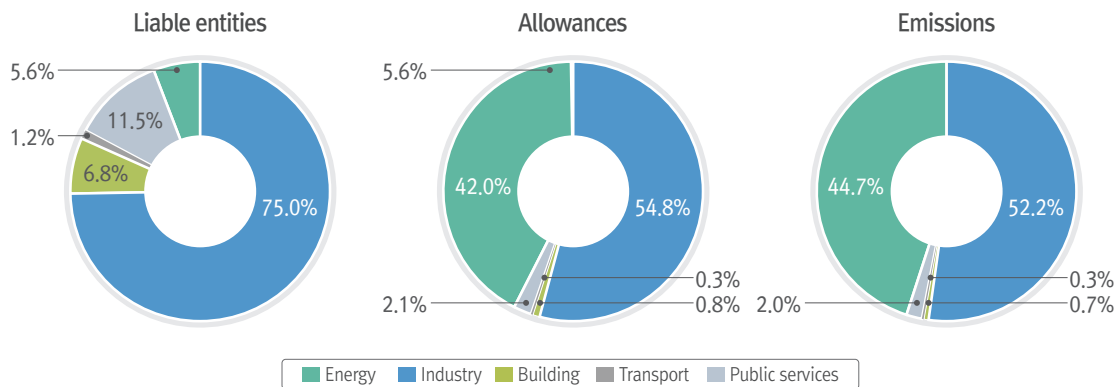
34 new entrants

| 2017 |

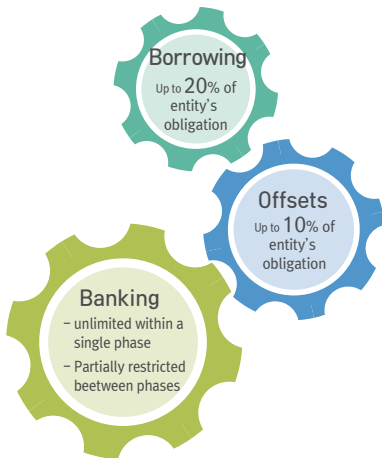


Distribution by sector

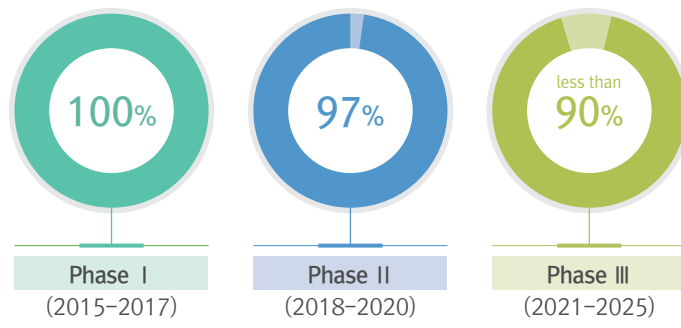
※ As of 2017



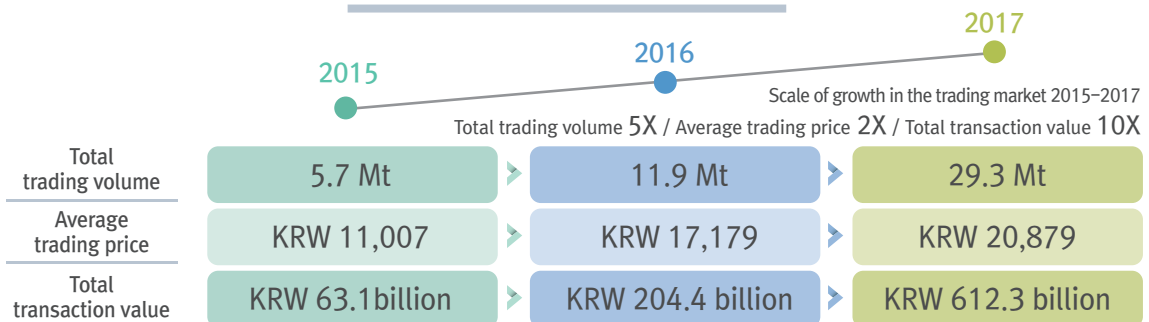
Flexibility mechanisms



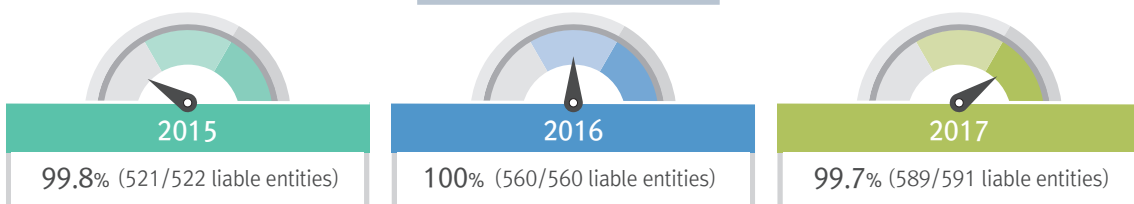
Free allocation per phase



Trading market performance

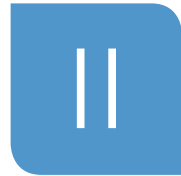


Compliance results



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Phase I Operational Results

1. Allocation
2. Surrender
3. Reserve

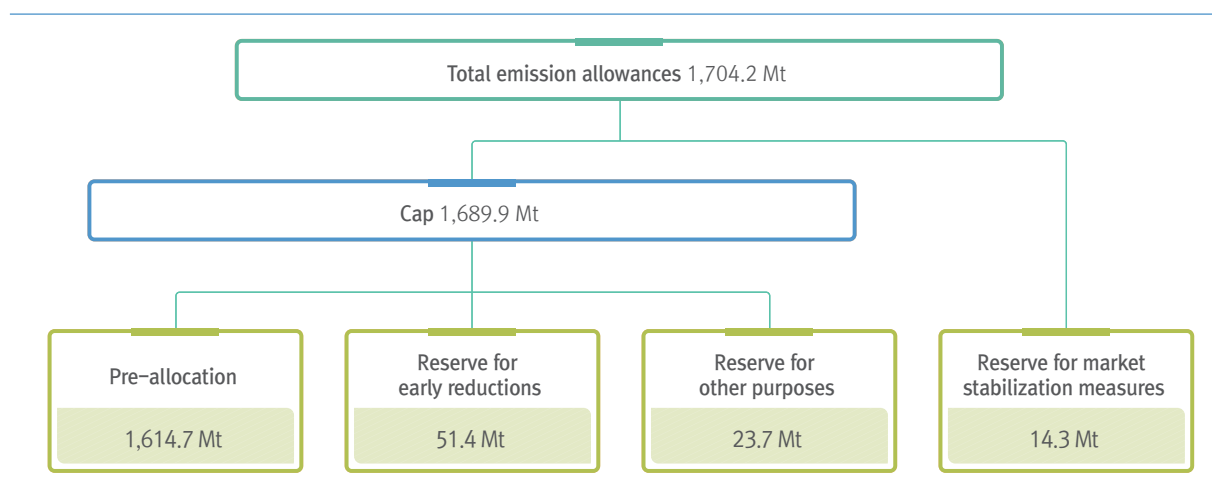
II. Phase I Operational Results

1. Allocation

During Phase I, the cap permissible to liable entities amounted to 1,689.9 Mt, consisting of 1,614.7 Mt pre-allocated to business entities prior to the implementation of Phase I, 51.4 Mt of reserve for early reductions and 23.7 Mt of additional reserve for other purposes to be distributed during Phase I according to relevant guidelines when applicable. The total emission allowances to be held by the government during Phase I was set at 1,704.2 Mt including the cap as well as a separate reserve for market stabilization measures of up to 14.3 Mt which was to ensure the stability and liquidity of the K-ETS market.

► **Total emission allowances** Entirety of emission permits retained or allocated by the government during each phase, consisting of pre-allocation and the overall reserve, which includes a separate additional reserve for the cap

[Figure II – 1] Total emission allowances and the cap in Phase I



(source) Allocation Plan for Phase I ('15~'17) (Ministry of Environment, '14), Revised Allocation Plan for the Third Compliance Year ('17) of Phase I ('15~'17) (Joint ministries, '17)

For Phase I, a total of 1,622.6 Mt ('15: 545.9 Mt, '16: 535.1 Mt, '17: 541.6 Mt) was pre-allocated to 525 business entities, followed by allocation changes (new entrants, early reductions, allocation adjustments, allocation revocations, successions of rights and obligations, etc.) for each business entity over the course of the relevant compliance years amounting to 63.7 Mt (4%), which resulted

in a final allocation of 1,686.3 Mt ('15: 540.1 Mt, '16: 560.7 Mt, '17: 585.5 Mt). Compared to the pre-allocation, the final allocation in '15 was decreased by 1% (-5.8 Mt), while in '16 and '17 it was increased by 5% (25.6 Mt) and 8% (43.9 Mt), respectively. The final allocation decrease in '15 was mainly due to the revocation of allocations (13.1 Mt), while the increases observed in '16 and '17 were caused by additional allocations for early reductions (51.4 Mt).

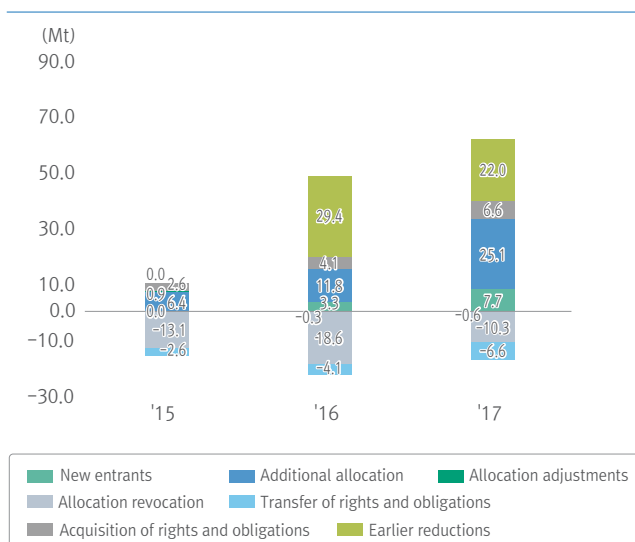
The overall number of liable entities was fluctuating frequently because some entities revoked their allocations, others inherited the rights and obligations of entities they had acquired or merged with, new entrants were designated, etc. so that the number of liable entities at the time of final allocation was 522 in '15 (-3 compared to pre-allocation), 564 in '16 (+39) and 592 in '17 (+67).

- ▶ **Pre-allocation** The amount allocated to liable entities following their submission of an application for allocation to the MoE 4 months prior to the start of a phase upon which the MoE shall issue a notification regarding the allocated amount no later than 2 months prior to the phase (including additional allocations for any potential objections to the pre-allocated amount)
- ▶ **Allocation method** There are two methods for allocating emission permits, the grandfathering (GF) method based on the average GHG emissions of the reference years and the benchmark (BM) method which considers equipment efficiency based on each business entity's previous activity data, such as product output, etc. For Phase I, the GF method was applied to all sub-sectors, except for three (cement, oil refining and aviation).

[Figure II-2]
Pre- and final allocations by compliance year



[Figure II-3]
Allocation changes by compliance year



〈Table II -1〉 Allocation results by compliance year

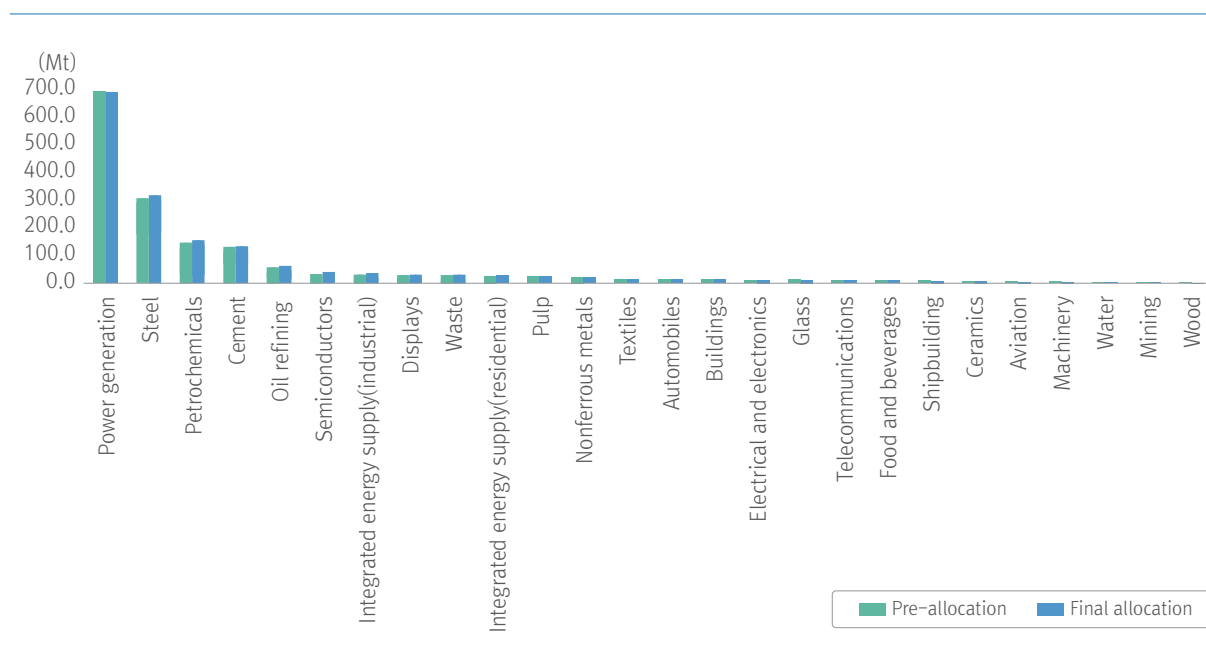
		Pre-allocation (A)	Allocation changes over the course of the compliance year (B)							Final allocation (A+B)	Ratio of changes
			New entrants	Early reduction	Allocation adjustment		Allocation revocation	Succession of rights and obligations			
					Additional allocation	Allocation adjustment		Transfer	Acquisition		
Total amount (Mt)	'15	545.9	-	-	6.4	0.9	-13.1	-2.6	2.6	540.1	-1%
	'16	535.1	3.3	29.4	11.8	-0.3	-18.6	-4.1	4.1	560.7	5%
	'17	541.6	7.7 ¹⁾	22.0	25.1	-0.6	-10.3	-6.6	6.6	585.5	8%
	Total	1,622.6	11.0	51.4	43.3	-	-42.0	-13.2	13.2	1,686.3	4%
No. of liable entities	'15	525	-	-	63	1	211	23	24	522	-
	'16	525	44	336	161	1	249	35	36	564	-
	'17	525	78 ¹⁾	184	337	1	269	56	54	592	-

1) Allocation amount and number of liable entities include new entrants in '16 (44) and '17 (34).

※ The number of liable entities for each item only indicates the number of entities applicable to the relevant item, but there were fluctuations in the overall number of liable entities due to changes occurring during the compliance year (succession of rights and obligations, etc.)

(Source) Emissions Trading Registry System (ETRS) (as of Nov. '18)

[Figure II -4] Pre- and final allocations by sub-sector



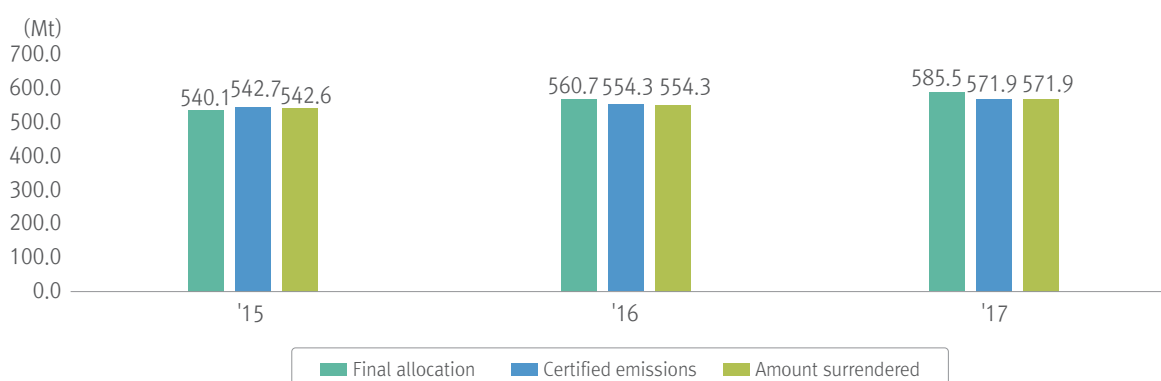
2. Surrender

The result of the emissions validity evaluation by the MoE on the liable entities' emissions for each compliance year indicated that the total certified emissions for Phase I amounted to 1,668.9 Mt, which was 20.9 Mt (1%) below the cap and 17.4 Mt (1%) lower than the final allocation. Broken down by compliance year, the figures were 542.7 Mt (522 liable entities) in '15, 554.3 Mt (560 liable entities) in '16, and 571.9 Mt (591 liable entities) in '17, with '16 and '17 showing a rate of increase compared to the previous year of 2% and 3%, respectively.

According to the procedure for the surrender of emission permits, all liable entities must surrender permits equivalent to their certified emissions but the amount actually surrendered was 1,668.9 Mt (KAU 1,653.5 Mt (99%), KCU 15.4 Mt (1%)) with a deficit of 34 kt. Penalties were imposed on the three liable entities that failed to meet their obligations (1 in '15, 2 in '17).

- ▶ **Emissions certification procedure** (Liable entity) submits an emissions report in a measurable, reportable, and verifiable manner within 3 months from the end of each compliance year → (MoE) evaluates the validity of the details in the report and certifies the actual amount of GHG emissions
- ▶ **Procedure for the surrender of emission permits** Liable entities shall surrender emission permits equivalent to their certified emissions to the MoE within 6 months from the end of each compliance year by using KAUs of the relevant compliance year and other permits either banked from the previous compliance year or borrowed from the next compliance year as well as KCUs converted from KOCs.

[Figure II –5] Final allocation, certified emissions and surrendered amount by compliance year



〈Table II-2〉 Surrender results by compliance year

(Unit: Mt)

	Certification		KCU converted	Trading				Surrender					Not surrendered ¹⁾	Not banked ²⁾	Banking		
	No. of entities	Certified emissions		KAU sold	KAU purchased	KCU sold	KCU purchased	Amount surrendered (A+B)	KAU surrendered (A)			KCU surrendered (B)			Amount banked (C+D)	KAU banked (C)	KCU banked (D)
									Allocated	Borrowed	surrendered in excess						
'15	522	542.7	9.5	-1.9	1.9	-2.9	2.9	542.6	524.0	9.8	0.000002	8.8	0.002	0.000001	17.0	16.3	0.7
'16	560	554.3	2.6	-13.6	13.6	-0.5	0.5	554.3	536.2	14.8	-	3.3	-	-	31.0	31.0	0.01
'17	591	571.9	3.3	-40.0	40.0	-	-	571.9	568.6	-	-	3.3	0.03	0.0001	37.7	37.7	0.005
Total	-	1,668.9	15.4	-55.5	55.5	-3.4	3.4	1,668.9	1,628.8	24.7	0.000002	15.4	0.03	0.0001	85.8	85.1	0.7

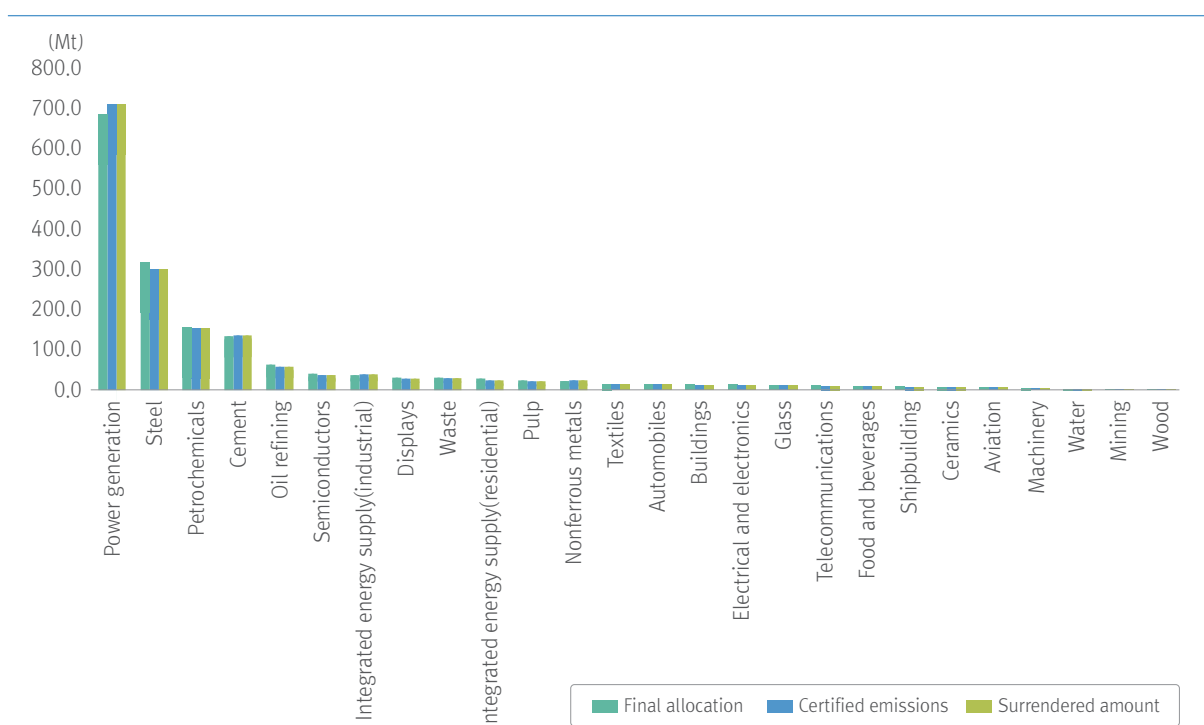
1) Overall emission permits of liable entities that failed to meet their obligations for each compliance year

2) Surplus permits not carried over to the following compliance year by liable entities after meeting their obligations, which will expire automatically

※ The number of liable entities for each item only indicates the number of entities applicable to the relevant item, but there were fluctuations in the overall number of liable entities due to changes occurring during the compliance year (succession of rights and obligations, etc.)

(Source) Emissions Trading Registry System (ETRS) (as of Nov. '18)

〔Figure II-6〕 Final allocation, certified emissions and surrendered amount by sub-sector



In addition to using the emission permits allocated for each compliance year, liable entities are able to meet their obligations by surrendering permits purchased through trading and/or from the reserve for market stabilization measures as well as those obtained through flexibility mechanisms. A detailed breakdown of these options used in Phase I is given below.

1) Emission Permits Trading

Emission permits can be traded through the exchange ²⁾ and/or over-the-counter. Tradable permits are KAU, KCU as well as KOC. ³⁾ In general, unlike over-the-counter trading where there are no limits on tradable items and trade periods, each item has different trade periods in the exchange due to some restrictions on the start of trading through listing, delisting, etc.

The overall trading volume ⁴⁾ in Phase I was 58.9 Mt (KAU 55.5 Mt, KCU 3.4 Mt) accounting for approximately 4% of the total amount surrendered. Broken down by compliance year, the ratios were 1% (4.8 Mt) in '15, 3% (14.1 Mt) in '16 and 7% (40.0 Mt) in '17, indicating that along with the increase in trading volume, the relative importance of trading for surrender was growing year by year.

Emission Permits Trading A liable entity may, in addition to the emission permits allocated for a given compliance year, procure additional permits to cover a deficit or dispose of a surplus through trading with other entities.

[Figure II -7] Trading period by item in the exchange

Tradable permit	Phase I ('15 - '17)						Phase II ('18 - '20)			
	'15		'16		'17		'18		'19	
	1 st half	2 nd half	1 st half	2 nd half	1 st half	2 nd half	1 st half	2 nd half	1 st half	2 nd half
KAU15 ¹⁾	tradable									
KAU16 ¹⁾	tradable									
KAU17 ¹⁾	tradable									
KAU18 ³⁾							tradable			
KCU15 ⁴⁾	tradable									
KCU16 ⁴⁾			tradable							
KCU17 ⁴⁾					tradable					
KCU18 ⁴⁾							tradable			
KOC ⁵⁾	tradable									

1) KAU15 - KAU16 - KAU17 : listed simultaneously with the opening of the emission permits exchange (12 Jan. '15)

2) KAU17 - KCU17 : the delisting date was postponed to 9 Aug. '18 to take into account the processing time for objections to certified emissions

3) KAU18 : listed simultaneously with KAU19 and KAU20 (2 Jan. '18)

4) KCU15 - KCU16 - KCU17 - KCU18 : listed individually for each compliance year according to the KCU conversion (6 Apr. '15, 18 Jan. '16, 4 Apr. '17, and 22 Jun. '18, respectively)

5) KOC : listed after the revision of the operational regulations for listing KOC and the development of related systems (by the Korea Exchange and the Greenhouse Gas Inventory and Research Center) (23 May '16)

2) In accordance with Article 22 of the Act and Article 26 of the Enforcement Decree, the Korea Exchange was designated as an emission permits exchange (Jan. '14) and with the launch of the K-ETS it has begun operating (from Jan. '15)

3) Tradable permits during Phase I were KAU15, KAU16, KAU17, KAU18 as well as KCU15, KCU16, KCU17, KCU18, and KOC

4) Overall trading volume of KAUs and KCUs only (while KOCs are tradable, they are not subject to the surrender of emission permits and the trading volume of KOCs converted into KCUs for the purpose of surrender is already included in the calculation of the KCU trading volume)

[Figure II -8] Trading volume by compliance year



Trading market performance

Scale of growth in the trading market from 2015 to 2017

Total trading volume **5x** (5.7 Mt → 29.3 Mt)

Average trading price **2x** (KRW 11,007 → KRW 20,879)

Total transaction value **10x** (KRW 63.1 billion → KRW 612.3 billion)

● Trading volume

During the overall trading period (1 Jan. '15~9 Aug. '18), the total trading volume of all tradable emission permits (KAU15 · KAU16 · KAU17 · KAU18, KCU15 · KCU16 · KCU17 · KCU18, KOC) reached 86.2 Mt, with the exchange and over-the-counter trades accounting for 37.5 Mt (44%) and 48.7 Mt (56%), respectively. Broken down by type of emission permit, KAUs accounted for 66.6 Mt, KCUs for 3.4 Mt, and KOCs for 16.2 Mt resulting in a ratio of 77%, 4%, and 19%, respectively. The overall trading volume by year was 5.7 Mt in '15, 11.9 Mt in '16, 29.3 Mt in '17, and 39.2 Mt in '18 corresponding to a year-by-year increase of 208%, 246%, and 134%, respectively. Given that for the last year only the market performance of the first half of the year is reflected, the market growth rate for '18 is likely to be similar to or even surpass the rate of the previous two years.

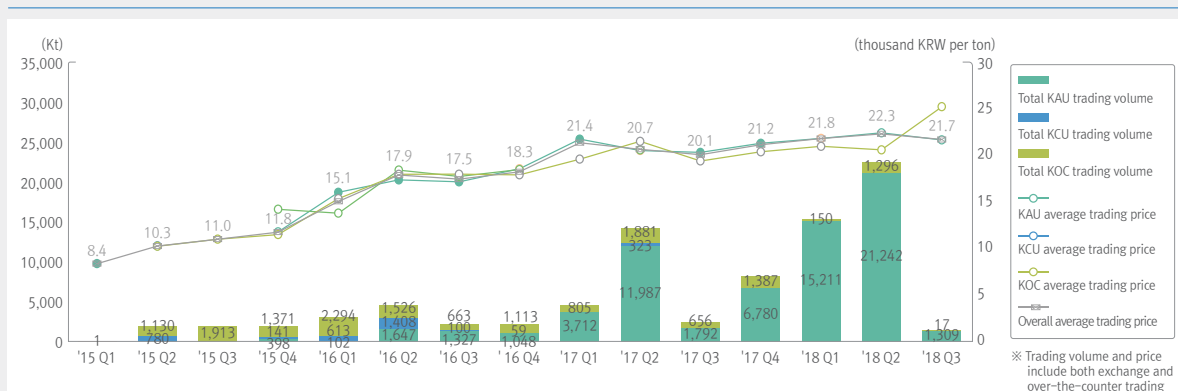
● Trading price

During the same period, the average trading price for emission permits both in the exchange and over-the-counter transactions rose continuously from KRW 11,007 per ton in '15 to KRW 17,179 in '16, KRW 20,879 in '17, and KRW 22,127 in '18, resulting in a year-by-year increase of 156%, 122%, and 106%, respectively, finally closing at a price more than double the starting average trading price in '15. The average trading price over the entire trading period was KRW 20,279. Broken down by type of emission permit, KAU was priced on average at KRW 21,382, KCU at KRW 15,767, and KOC at KRW 16,703, meaning that KAU was being traded at a significantly higher price than the other permits (KRW 5,615 more than KCU and KRW 4,679 more than KOC). Looking at the trading markets, the price in the exchange (KRW 20,831) was slightly higher (by KRW 976) than in the over-the-counter market (KRW 19,855).

● Transaction value

The continuous increase of the trading price and the growing trading volume also impacted the transaction value which rose from KRW 63.1 billion in '15 to KRW 204.4 billion in '16, KRW 612.3 billion in '17, and KRW 868.0 billion in '18, resulting in a year-by-year increase of 324%, 300%, and 142%, respectively, adding up to a total transaction value of KRW 1.7 trillion. Broken down by type of emission permit, the total transaction value amounted to KRW 1.4 trillion for KAUs, KRW 54.0 billion for KCUs, and KRW 270.6 billion for KOCs, resulting in a ratio of 81%, 3%, and 15%, respectively, while the total transaction value in the exchange was KRW 781.0 billion versus KRW 966.7 billion in the over-the-counter market corresponding to a ratio similar to that of the trading volume of 45% to 55%.

[Figure II -9] Total trading volume and price trends in Phase I



2) Reserve for Market Stabilization Measures

During Phase I, the reserve for market stabilization measures was made available for purchase twice in Jun. '16 and Jun. '18 for a combined amount of 4.9 Mt ('16: 0.3 Mt, '18: 4.7 Mt) and used for surrender, which accounted for 8% of the total trading volume and 0.3% of the total amount surrendered. The reserve was auctioned at a level ⁵⁾ below the exchange trading price, and all revenue from the auctions, excluding transaction fees, is scheduled to be used by the government for financing eco-friendly investment projects.

► **Market Stabilization Measures** When the price of emission permits drops below or exceeds certain fixed threshold prices, the supply of emission permits falls noticeably short of demand thereby making trading between liable entities difficult, etc. Thus it is deemed necessary to take measures to ensure stable price formation and market liquidity. To this end, the MoE may limit on the minimum or maximum amount of emission permits held or allocate additional permits from the reserve.

3) Flexibility Mechanisms

Regarding the use of KCU, by the time of completion for the surrender of emission permits for Phase I (9 Aug. '18) a total of 139 external offset projects had been registered and approved. Of these 22.5 Mt worth of GHG reductions certified and issued as KOCs, 70%, corresponding to 15.4 Mt ('15: 9.5 Mt, '16: 2.6 Mt, '17: 3.3 Mt), were converted into KCUs and used for the trading and surrender of emission permits. The amount surrendered by compliance year was 8.8 Mt in '15, 3.3 Mt in '16, and 3.3 Mt in '17, meaning that the overwhelming majority of KCUs (99.97%, 1% of the total amount surrendered) were surrendered, while the remaining 5 kt were carried over into Phase II.

As for borrowing, in the years '15 and '16, 211 liable entities borrowed 9.8 Mt and 154 entities borrowed 14.8 Mt, respectively, for a total of 24.7 Mt which were used for surrender, accounting for 1% of the total amount surrendered.

As for banking, in the three compliance years overall 85.8 Mt ('15: 17.0 Mt, '16: 31.0 Mt, '17: 37.7 Mt) were carried over, of which a combined total of 48.1 Mt (3% of the total amount surrendered) from the years '15 and '16 were used for surrender, while the remaining 37.7 Mt in the final compliance year were carried over into Phase II.

5) · In '16 the auction price per ton was KRW 16,200 for the first two days and KRW 16,400 for the last day, which was 11~12% below the average exchange trading price (KRW 18,433) over the same period, and in '18 the reserve was auctioned at KRW 22,500, 3% below the previous day's closing price (KRW 23,200)

► **Flexibility mechanisms** Means to ensure flexibility in surrendering emission permits by offering liable entities various ways, other than trading, to achieve their GHG reduction targets and meet their surrender obligations, such as the use of KCUs obtained through external offset projects, the borrowing or banking of emission permits.

- **Offset mechanism** If a liable entity possesses or acquires GHG reductions (KOCs) generated outside the scope of business operations monitored by the K-ETS, it may convert those into KCUs for trading or compliance. In cases of compliance, in Phase I only domestic offset credits were allowed up to 10% of each entity's obligation per compliance year.
- **Borrowing** If a liable entity is experiencing difficulties meeting its obligation, holding fewer emission permits than needed for compliance at the time of surrender, it may, with approval from the MoE, borrow a portion of its allocated emission permits from a different compliance year within a single phase (up to 20% of each entity's obligation in Phase I), but not across phases.
- **Banking** Liable entities may carry over emission permits in their possession or any surplus remaining after surrender, with permission from the MoE, to the next compliance year within the pertinent phase (unlimited) or the first compliance year in the subsequent phase (partially restricted). Emission permits for a given compliance year that have not been surrendered or carried over to the next year will expire automatically 6 months from the end of the compliance year.

3. Reserve

The reserve in Phase I amounted to a total of 89.4 Mt divided by purpose into 51.4 Mt (57%) for early reductions, 23.7 Mt (27%) for other purposes, and 14.3 Mt (16%) for market stabilization measures.

Regarding the reserve for early reductions, the overwhelming majority of it (99.9%) was used during the phase for additional allocations to liable entities to reward their early action, while 85% of the reserve for other purposes was used for objections to pre-allocation, allocations to new entrants and voluntarily participating business entities, additional allocations for the establishment and expansion of facilities as well as the expansion of public transportation, allocation adjustments based on the results of objections, etc. As for market stabilization measures, only 34% of its reserve was used. Emission permits revoked during the phase were transferred and added to the reserve for other purposes, and the entire remainder of the reserve was deleted from the ETRS by decision of the Emission Permits Allocation Committee.

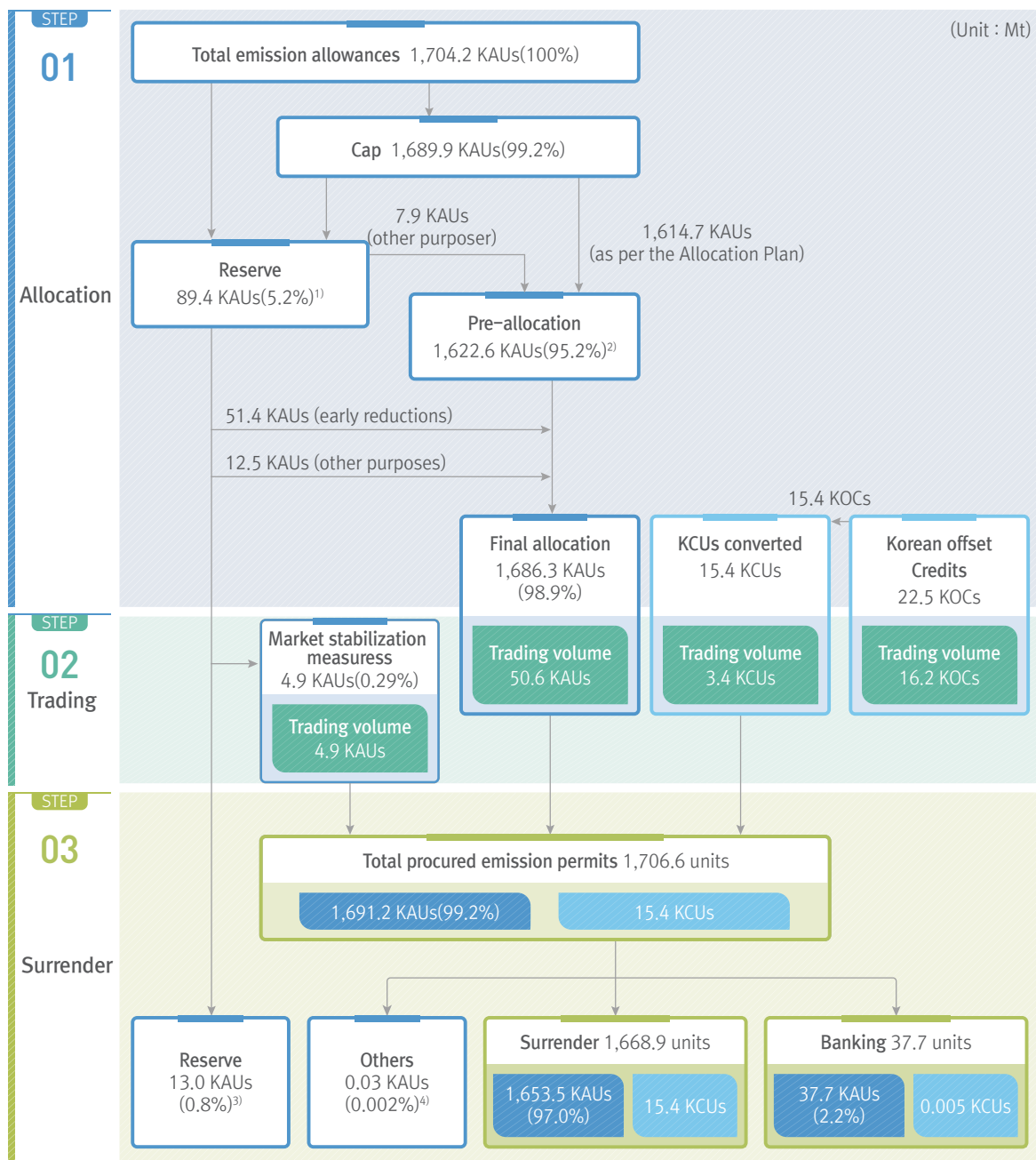
► **Reserve** Emission permits left unallocated among the total emission allowances of the pertinent phase, for use in market stabilization measures and any additional allocations in case of unforeseeable circumstances during the pre-allocation stage prior to the phase

〈Table II-3〉 Amount used and remainder of the reserve by purpose

(Unit: Mt)

	Reserve for early reductions	Reserve for other purposes	Reserve for market stabilization measures	Total
Amount used	51.4(99.9%)	20.2(85%)	4.9(34%)	76.4
Remainder	0.0002(0.0004%)	3.6(15%)	9.4(66%)	13.0

[Figure II –10] Emission permit flow chart in Phase I



1) Reserve 89.4 million KAUs = 51.4 million KAUs (early reductions) + 23.7 million KAUs (other purposes) + 14.3 million KAUs (market stabilization measures)

* Reserve for market stabilization measures is set separately, outside the cap

2) Pre-allocation 1,622.6 million KAUs = 1,597.7 million KAUs (*14 Allocation Plan) + 17.0 million KAUs (*17 revised Allocation Plan) + 7.9 million KAUs (objections, etc.)

3) Reserve 13.0 million KAUs = 0.0002 million KAUs (early reductions) + 3.6 million KAUs (other purposes) + 9.4 million KAUs (market stabilization measures)

4) Remaining emission permits not surrendered, surrendered in excess, and not banked

※ (%): Distribution ratio of emission permits as a fraction of the total emission allowances

Phase I | 2015-2017

K-ETS Summary Report



Stakeholder Survey

1. Survey Overview
2. Survey Results

III. Stakeholder Survey

1. Survey Overview

A survey on the response to the K-ETS and its improvements was conducted for a multi-layered evaluation and analysis of the K-ETS through examining the implementation status and overall awareness of liable entities as well as external stakeholders. A total of 553 liable entities ⁶⁾ from 26 sub-sectors and 130 relevant external stakeholders ⁷⁾ were selected for the survey which was conducted ⁸⁾ over the course of one month from 1 until 31 Aug. '18 and resulted in a total of 267 entities and 46 stakeholders participating with a response rate of 48% and 35%, respectively. In case of liable entities, there was no response at all from two sub-sectors, namely mining and displays.

〈Table III -1〉 Responses from liable entities by sub-sector

Sub-sector	No. of recipients	Distribution ratio of recipients	No. of respondents	Response rate	Distribution ratio of respondents
Power generation	14	2.5%	11	78.6%	4.1%
Integrated energy supply(residential)	14	2.5%	11	78.6%	4.1%
Integrated energy supply(industrial)	13	2.3%	10	76.9%	3.7%
Mining	5	0.9%	0	0.0%	0.0%
Food and beverages	24	4.3%	13	54.2%	4.9%
Textiles	14	2.5%	6	42.9%	2.2%
Wood	7	1.3%	5	71.4%	1.9%
Pulp	40	7.2%	17	42.5%	6.4%
Oil refining	5	0.9%	3	60.0%	1.1%
Petrochemicals	89	16.4%	46	50.5%	17.2%
Glass	19	3.4%	9	47.4%	3.4%
Ceramics	7	1.3%	3	42.9%	1.1%
Cement	24	4.3%	9	37.8%	3.4%
Steel	38	6.8%	12	31.6%	4.5%

6) As of 30 Jul. '18, out of a total of 592 liable entities in Phase II, those who have been participating since Phase I, excluding 39 entities who are new entrants of Phase II or who have closed or merged their businesses

7) Representatives affiliated with related academic, research, financial, consulting and verifying institutes, NGOs, industrial associations, etc.

8) All targeted recipients were sent a survey link via e-mail after a one-time phone call that served to provide prepared survey information as well as request their participation (during the survey period an additional phone call was made to non-respondents in order to encourage participation)

Sub-sector	No. of recipients	Distribution ratio of recipients	No. of respondents	Response rate	Distribution ratio of respondents
Nonferrous metals	24	4.3%	15	62.5%	5.6%
Machinery	13	2.3%	3	23.1%	1.1%
Semiconductors	20	3.8%	11	52.4%	4.1%
Displays	3	0.5%	0	0.0%	0.0%
Electrical and electronics	25	4.5%	8	32.0%	3.0%
Automobiles	31	5.6%	11	35.5%	4.1%
Shipbuilding	11	2.0%	5	45.5%	1.9%
Telecommunications	7	1.3%	5	71.4%	1.9%
Buildings	33	5.9%	19	57.6%	7.1%
Water	2	0.4%	1	50.0%	0.4%
Waste	64	11.5%	28	43.8%	10.5%
Aviation	7	1.3%	6	85.7%	2.2%
Total	553	100.0%	267	48.0%	100.0%

〈Table III -2〉 Responses from external stakeholders by institutional affiliation

Affiliation	No. of recipients	Distribution ratio of recipients	No. of respondents	Response rate	Distribution ratio of respondents
Academia	20	15.4%	7	35.0%	15.2%
Research institutes	17	13.1%	5	29.4%	10.9%
Financial institutes	5	3.8%	2	40.0%	4.3%
Consulting organizations	22	16.9%	10	45.5%	21.7%
Verifying organizations	8	6.2%	3	37.5%	6.5%
NGOs	21	16.2%	3	14.3%	6.5%
Industry	33	25.4%	16	48.5%	34.8%
Others	4	3.1%	0	0.0%	0.0%
Total	130	100.0%	46	35.4%	100.0%

The survey was divided into five categories, such as the overall awareness of and response to the K-ETS in Phase I, future market prospects, system improvements, etc., with basic common questions not limited to specific business sectors or entities. In case of external stakeholders who do not directly participate in the K-ETS, responses were limited to the questions related to market prospects and system improvements.

〈Table III-3〉 Survey structure

Category	No. of questions	Subject of survey	
		Liable entities	External stakeholders
I . Overall awareness of and response to the K-ETS	7	○	-
II . Response to Phase I ('15-'17)	4	○	-
III . Market prospects for Phase II ('18-'20)	1	○	○
IV . Improvements to the K-ETS	2	○	○
V . General state of liable entities	1	○	-

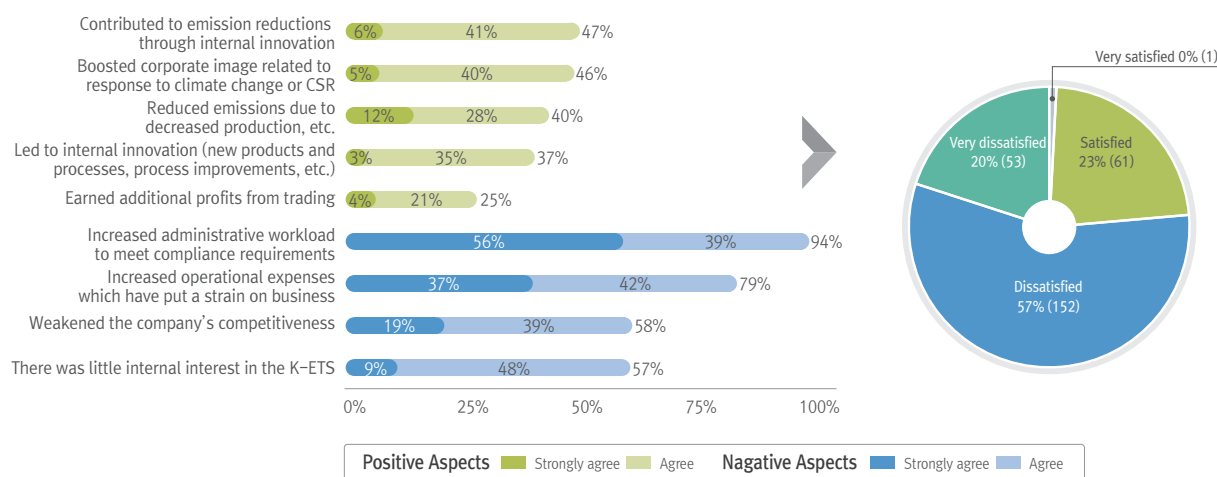
For the survey results, in addition to a simple technical analysis, correlations between related questions were examined in order to draw more well-founded conclusions. The main results of the survey are presented below.

2. Survey Results

1) Awareness and Assessment of the K-ETS

In the assessment of the impact of the K-ETS on business operations during Phase I, negative aspects (administrative burden, increased operational expenses, reduced competitiveness, etc.) were dominant rather than positive ones (internal innovation, corporate image boost, earnings from trading, etc.), a trend which was also reflected in the overall satisfaction with the K-ETS, with only a 23% rate of satisfaction among responding entities. Principal reasons for satisfaction were raised awareness of GHG reduction, improved interest of senior management, among others, while the reasons given for dissatisfaction were the poor effectiveness of emission reductions, increased expenses, a lack of reduction capacity (specific to certain sub-sectors), a lack of interest among senior management, redundant administrative procedures, etc.

[Figure III-1] Impact of the K-ETS on business operations and level of satisfaction with its impact

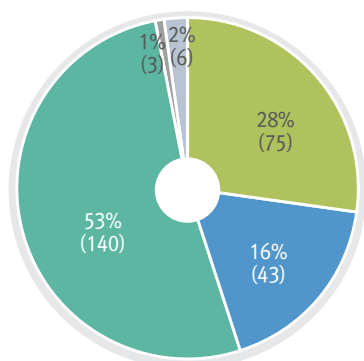


2) Response to and Compliance with the K-ETS

Regarding the response to the K-ETS, a majority of responding entities was managing it at the level of a responsible department or through a designated person (53%) or hired external experts (57%). The main purpose of using external experts was to get administrative assistance for compliance such as allocation applications, emissions reporting, etc.

[Figure III -2]

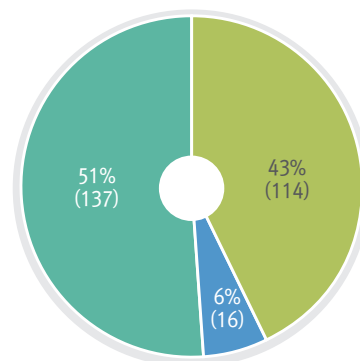
Level of operational and strategic response



- Reduction targets and strategies set at the enterprise level
- Strategy planning and management at the facility level
- Managed by a responsible department or a person in charge
- Managed in terms of corporate social responsibility
- No particular activity

[Figure III -3]

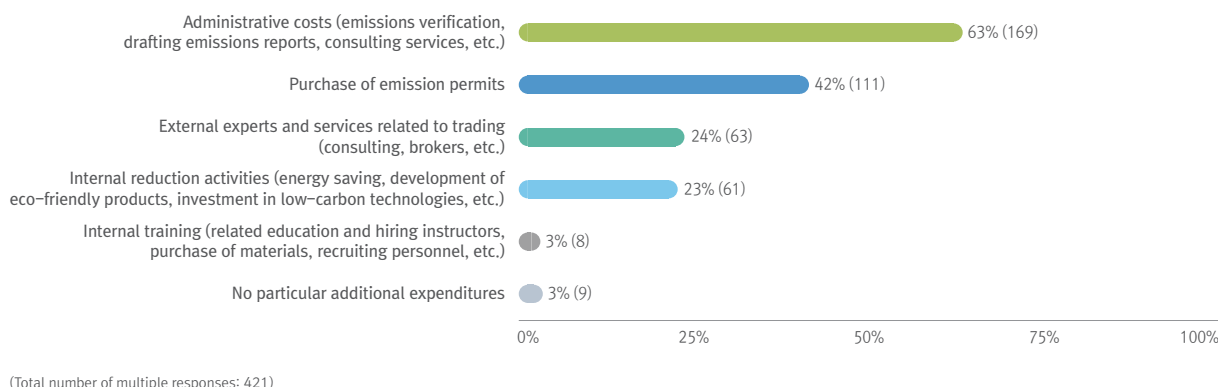
Ratio of internal and external experts use



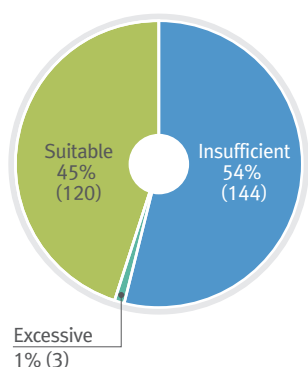
- Managed by only internal personnel
- Managed by both internal and external personnel
- Managed by only external personnel

In responding to the K-ETS, liable entities mostly accrued expenses from administrative costs (63%), the purchase of emission permits (42%), external experts or services (24%), internal reduction activities (23%), etc. and it was found that they engaged in various proactive activities such as trading (57%), investment in internal facilities or technologies (39%), and the setting of response strategies (25%). In particular, some differences in those activities were observed depending on the entities' evaluations of their allocations in Phase I, where entities evaluating their allocation as either 'excessive' or 'suitable' (123 entities, 46%, hereinafter 'sufficient group') focused on certain aspects such as investing in internal reductions, strategy setting and in-house education, while those considering their allocation 'insufficient' (144 entities, 54%, hereinafter 'insufficient group') tended to prioritize emission permits trading, external consulting services and investing in external reductions.

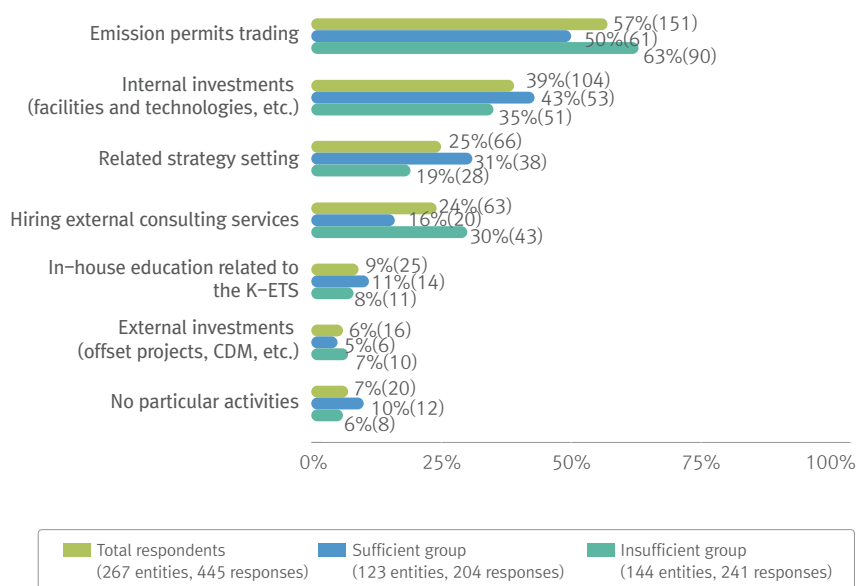
[Figure III-4] Major expenses incurred by the K-ETS



[Figure III-5] Evaluation of the allocation in Phase I



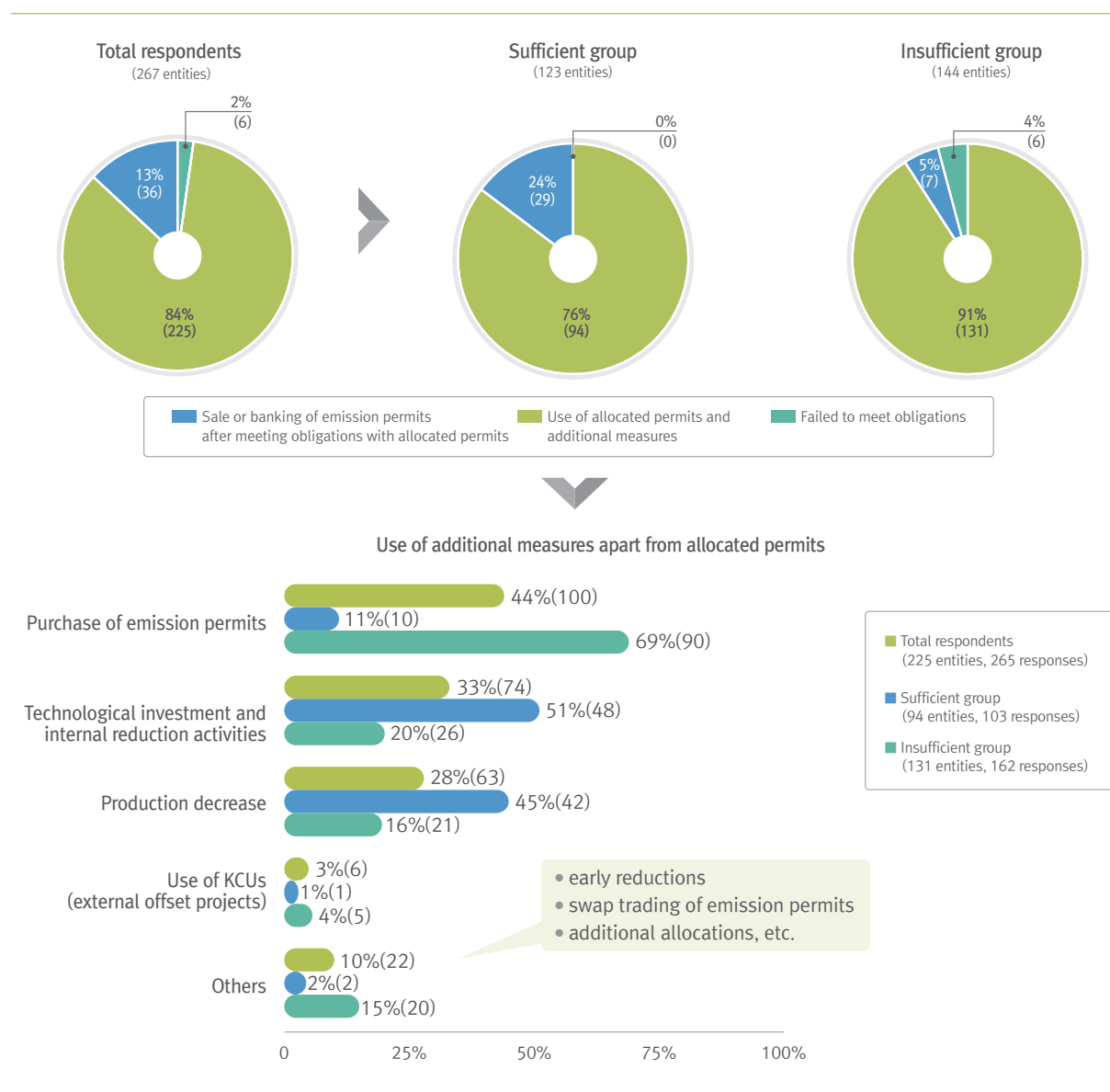
[Figure III-6] Measures taken in response to the K-ETS



Looking at the surrender measures, excluding the respondents that failed to meet their obligations (6 entities, 2%), liable entities were divided into two groups, those who were able to meet their obligations through allocated emission permits alone (36 entities, 13%) and those who needed to employ additional measures (225 entities, 84%). These additional measures included the purchase of emission permits (44%), technological investment and internal reduction activities (33%), the use of early reductions, additional allocations from the establishment of new or expansion of

existing facilities, swap trading of emission permits, etc. A distinct difference in the measures taken was observed again between the sufficient and insufficient groups, with the former constituting a larger portion of those who were able to meet their obligations through allocations alone, compared to the latter. The same held true for the additional measures where the sufficient group was mainly focusing on technological investment and internal reduction activities (51%) apart from decreased production, while a much larger percentage of the other group prioritized the purchase of emission permits (69%).

[Figure III -7] Surrender measures

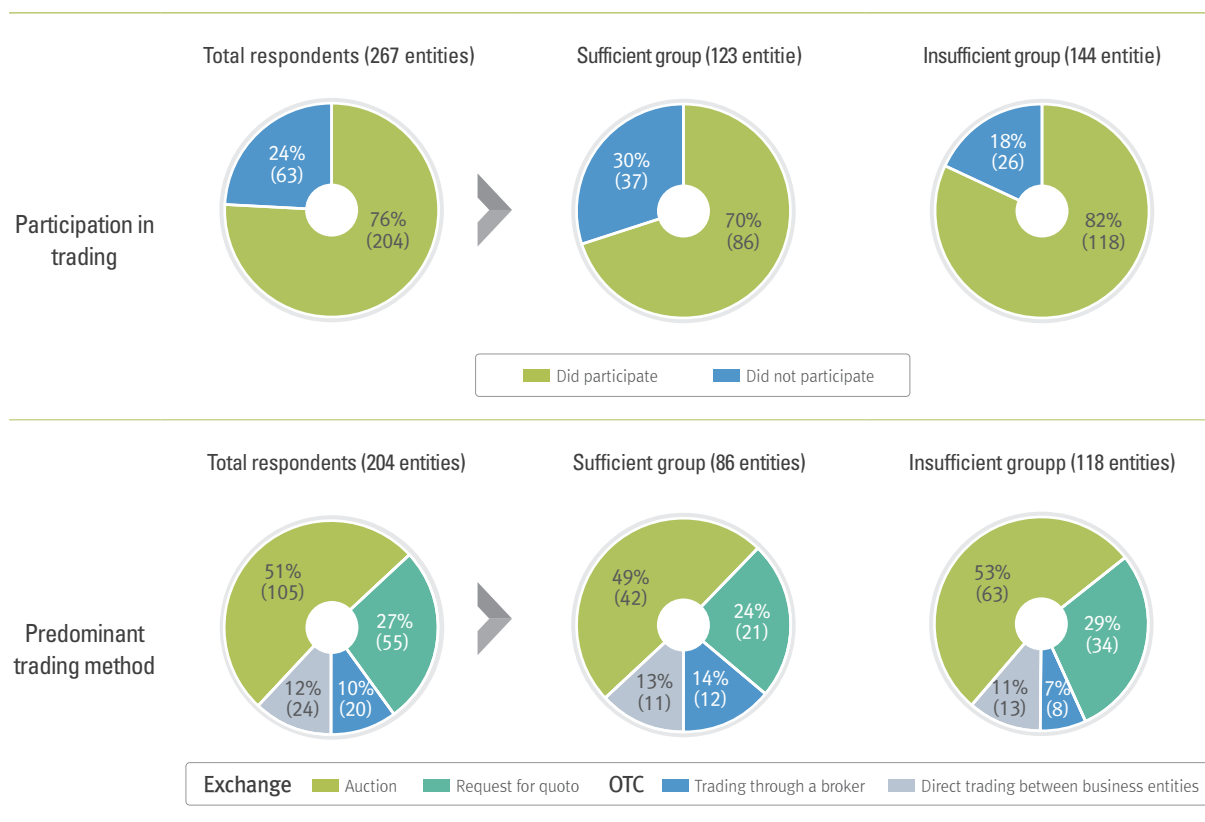


3) Participation in Emission Permits Trading and Market Prospects

76% (204 entities) of all respondents indicated their participation in trading during Phase I, 78% of which had opted for trading through the exchange. In particular, among these entities, the proportions of trading experience and the use of the exchange for trading were higher in the insufficient group (both 82%) than the sufficient one (70% and 73%, respectively), signifying a slight difference in trading behavior depending on the perceived allocation level.

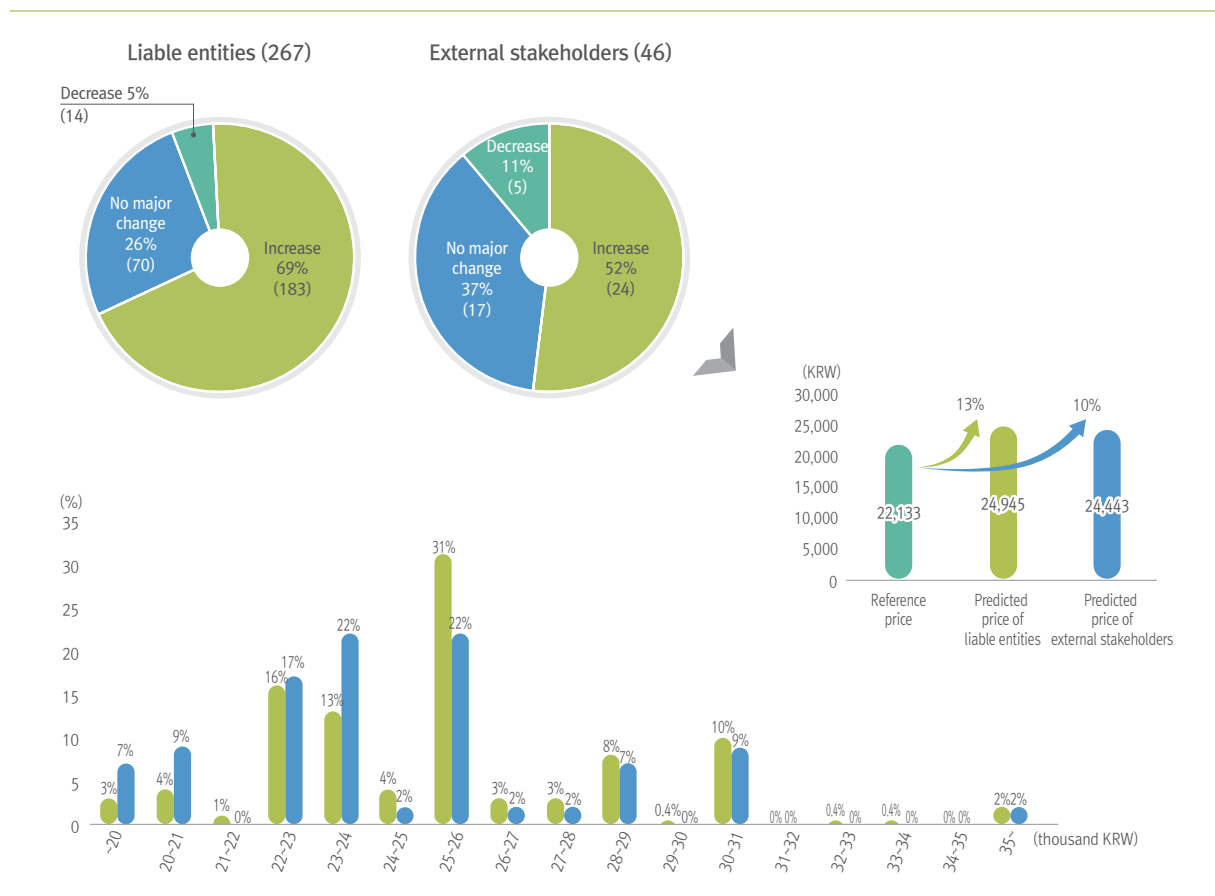
Business entities mainly relying on exchange trading gave the convenience of trading procedures as their primary reason, followed by the rational pricing in case of auction, and the ability to flexibly negotiate volume, price, etc. in advance in case of request for quote. Regarding over-the-counter trading, apart from the common reason of allowing for flexible negotiations, the main motivations were to secure trade profits and remove risks by employing a broker as well as to avoid paying transaction fees through direct trading with other entities.

[Figure III -8] Participation in trading and types of trading



When asked to predict the price of emission permits (KAU) in one year's time, both liable entities and external stakeholders predominantly expected it to rise (69% and 52%, respectively), and although they ranked them differently, both named insufficient allocation (86% and 54%, respectively) and a lack of supply on the market (50% and 75%, respectively) as overwhelming reasons. The predicted average prices were KRW 24,945 and KRW 24,443, an increase of 13% (KRW 2,812) and 10% (KRW 2,310) compared to the reference price (KRW 22,133, the average price of KAU17 in Phase I), respectively.

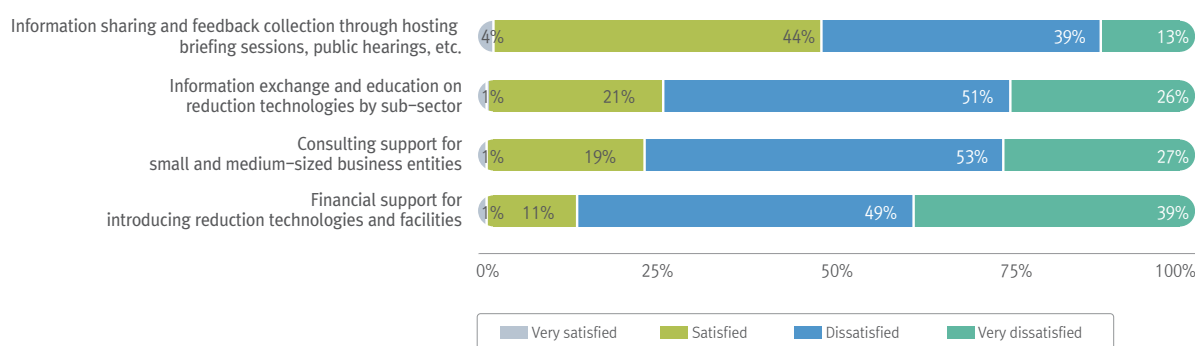
[Figure III -9] KAU price forecasts



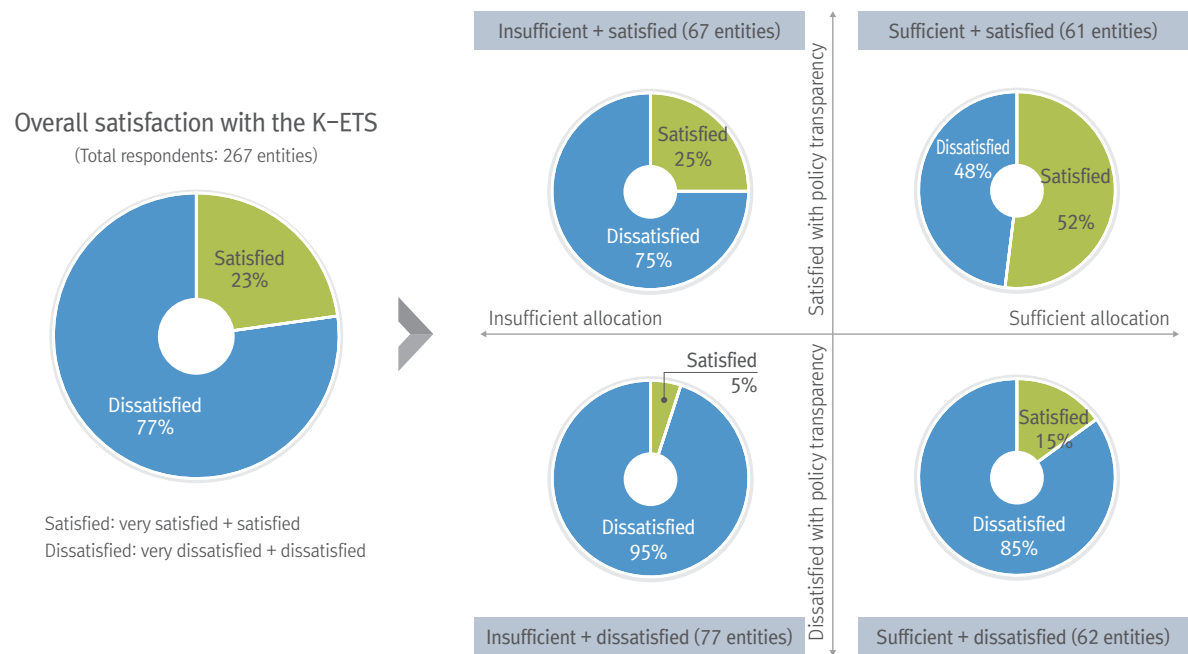
4) Recommendations for the K-ETS

Among the government's supporting policies for the K-ETS, satisfaction was highest with the process of sharing information and collecting feedback through briefing sessions, public hearings, etc. at 48%, while it was lowest with financial support for the introduction of reduction technologies and facilities only at 12%. The relatively high satisfaction with the information sharing and feedback collection process was interpreted as satisfaction with the transparency of the policy. Then a comparative analysis was performed to uncover any connections among three indicators, namely, an entity's perceived allocation level in Phase I, satisfaction with policy transparency and the overall satisfaction with the effects of the K-ETS. The result was that depending on the perceived allocation level and the level of satisfaction with policy transparency, the existing satisfaction with the K-ETS (23%) could be improved to a maximum of 52% (sufficient allocation + satisfied with policy transparency) or drop as low as 5% (insufficient allocation + dissatisfied with policy transparency), suggesting that these indicators are interconnected. It is worth noting that the overall satisfaction with the K-ETS was higher if policy transparency was satisfactory even though the allocation level was seen as insufficient (25%) compared to the scenario where the allocation level was considered sufficient but policy transparency was dissatisfactory (15%), meaning that regardless of perceived allocation level, the overall satisfaction with the K-ETS can be improved to some extent through appropriate policy support.

[Figure III –10] Satisfaction with the government's supporting policies for the K-ETS

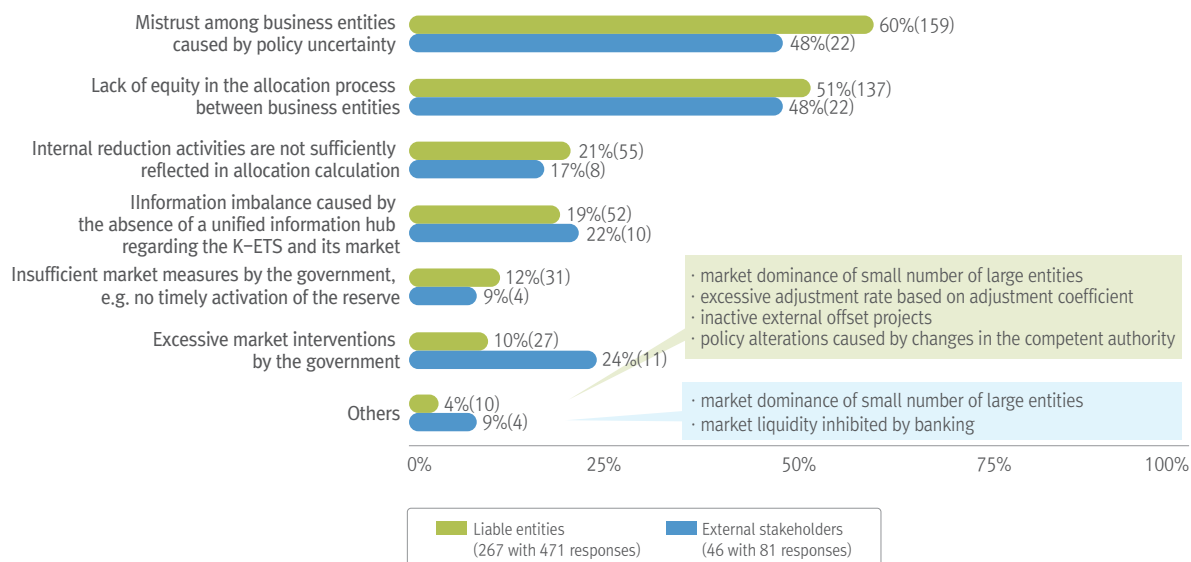


[Figure III –11] K-ETS satisfaction levels depending on the perception of allocation and the satisfaction with policy transparency

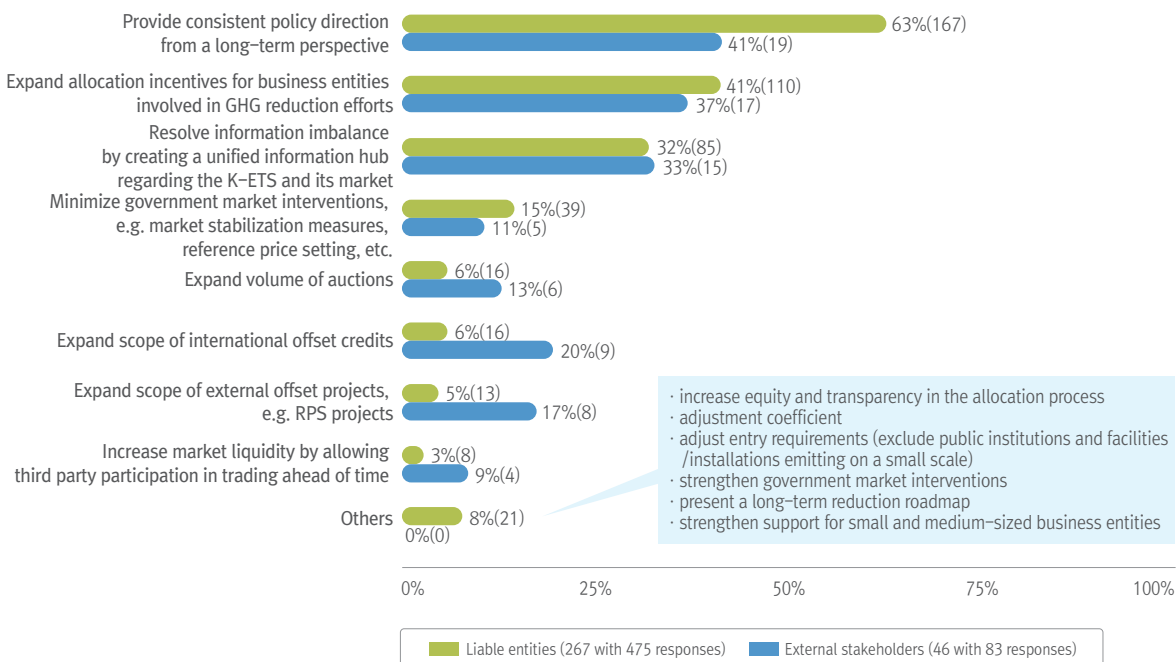


Furthermore, when asked about the limitations of the K-ETS, liable entities and external stakeholders both mostly pointed to policy uncertainty regarding the K-ETS (60% and 48%, respectively) and a lack of equity in the allocation process (51% and 48%, respectively). As for their preferred necessary improvements to the K-ETS, they suggested, for example, policy consistency from a long-term perspective (63% and 41%, respectively), an expansion of incentives for GHG reduction efforts (41% and 37%, respectively), addressing the information imbalance (32% and 33%, respectively), etc.

[Figure III – 12] Limitations of the K-ETS in Phase I



[Figure III – 13] Ways to improve the K-ETS



Phase I | 2015-2017

K-ETS Summary Report

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