

The cover features decorative floral illustrations in the corners. In the top-left and bottom-left corners, there are sprigs of green leaves with clusters of small purple flowers. In the top-right corner, there is a similar sprig, but it is partially cut off by the edge of the page.

Environmental Review 2013, Korea

ECOREA

ECOREVIEW



MINISTRY OF ENVIRONMENT
REPUBLIC OF KOREA



ECOREA

is a compound of the prefix "ECO", which suggest an ecologically sound and comfortable environment, and the name of the nation, "KOREA"





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Minister's Message

Over the last half a century, Korea has transformed itself from an agricultural country to a highly industrialized country. During the process, various environmental challenges have emerged. The Environment Administration was established in 1980 in response to those challenges and upgraded to the Ministry of Environment in 1990.



In early years, Korea's environmental policy mainly focused on traditional environmental protection such as air and water quality control, waste management and nature conservation. Precautionary environmental policies represented by total pollution load management, strategic environmental impact assessment and extended producer responsibility have been introduced since the late 1990s. In more recent years, the policy scope has been expanded to encompass climate change and environmental health. Considerable progress and accomplishment have been made throughout the history of the Ministry.

Despite those achievements, the Ministry still has a long way ahead to keep up with the rapidly growing demand and expectation of the people. Moreover, our not-yet-born children as well as animals, plants and all the living things on this planet keep reminding us of our obligation to protect and conserve the environment, on which their survival and livelihood depend.

Under the newly launched administration of Korea, the Ministry of Environment will carefully listen to not only the voice of the people living today but also of our next generation and the nature. The Ministry has an ambition to upgrade Korea's environmental policy to the world's highest level, especially in the areas of environmental welfare, chemicals management and sustainable development. It seems to be meaningful to briefly introduce the Ministry's new policy vision.

First, the Ministry aims at providing a safer living environment. Those who cause environmental damage will be forced to take the entire responsibility through paying all the cost of the consequence. With the strict enforcement of the polluter pays principle, environmental accidents will be forcibly prevented.



Second, the Ministry seeks way to offer higher quality of environmental services to all the people across the nation. Water supply and sewerage services for rural households will be expanded up to the level of urban areas which are already at the top status in the world. Air quality in cities will be improved through applying more stringent measures including the control of fine particulate matter(PM_{2.5}).

Third, the Ministry endeavors to enhance sustainability of the country through establishing eco-friendly land management, reducing resource and energy intensity, creating a resource-recycling society, conserving biodiversity and strengthening climate change responses.

The publication of Ecorea has the purpose to introduce Korea's major environmental policies in progress and share the experiences and lessons we have gained over the course of the recent years. It is my sincere hope that Ecorea will be of good use to the interested readers around the world. Lastly, I would like to assure that the Ministry of Environment is always ready and open-minded to work together with the global community to address regional and global environmental challenges.

June 2013

Yoon Seongkyu
Minister of Environment



01 Climate Change



1.1 Current Status

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1. Climate Change

1.1 Current Status

A. Domestic Status

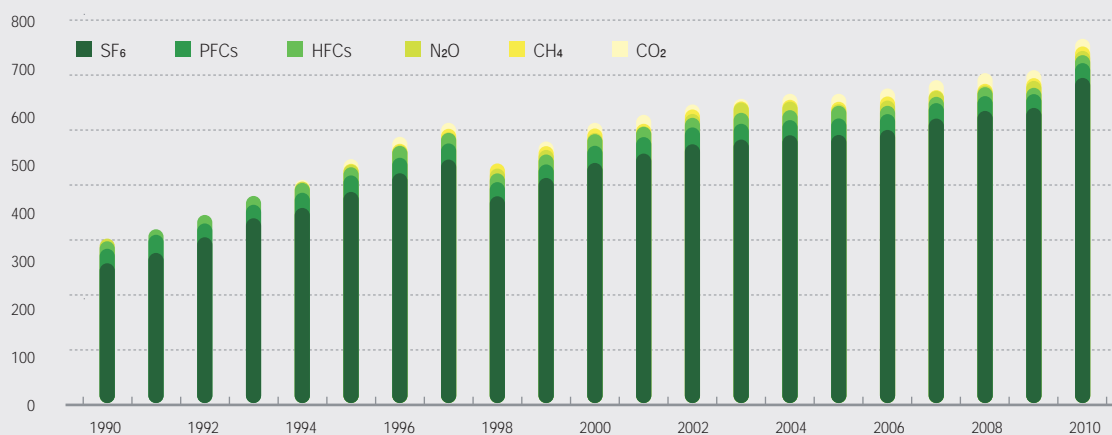
「The National Greenhouse Gases Statistics Management Committee」 finalized and announced the 「2010 Statistics of National Greenhouse Gases」, and it was verified by the Greenhouse Gas Inventory & Research Center of Korea (hereafter referred to as the "Center").

- The total amount of greenhouse gas emissions in 2010 is 669 million tons of CO₂eq, and the amount of greenhouse gas emissions was increased by approximately 9.8% from the previous year due to the thermal power generation affected by heat and

cold waves, as well as the increased amount of greenhouse gases from the steel industries.

- It was found that energy (85.3%) is the biggest emission source followed by industrial process (9.4%), agriculture (3.2%) and wastes (2.1%). While the amount of waste emissions (-1.5%) was reduced, energy (10.6%), industrial process (9.1%) and agriculture (0.4%) were increased.
- The order of the importance by each greenhouse gas would be CO₂ (89.1%), CH₄ (4.2%), SF₆ (2.9%), N₂O (2.1%), HFC (1.2%) and PFCs (0.4%).

[Figure 1-1] The Amount of Emissions of Six Main Greenhouse Gases in Korea from 1990 to 2010



The total amount of emissions and emissions per capita are increasing, and according to the data analysis, greenhouse gas emission per capita in 2010 was 13.5 (tons CO₂eq / person) which was a significant increase of 9.3% from the previous year.

- The recent abnormal weather conditions including

heat and cold waves increased demand for thermal power generation to operate heating and air conditioning system, and the expansion of steel industry demanded the use of electricity. These are the two reasons that contributed to the significant increase of greenhouse gases from 2009.

[Table 1-1] Analysis Result of the Amount of GHG Emissions per Each Year

Item	2000	2006	2007	2008	2009	2010
Total amount of emissions (Million tons CO ₂ eq.)	512.0	575.4	590.3	604.1	609.1	668.8
Increase rate of emission amount compared to the previous year (%)	6.9	1.2	2.6	2.3	0.8	9.8
The amount of emissions per GDP CO ₂ eq / billion)	737.1	632.3	617.1	617.4	620.5	641.8
Increase rate of emission amount per GDP (%)	-1.74	-3.81	-2.40	-0.04	0.50	3.44
Emission amount per person (Ton CO ₂ eq / person)	10.9	11.9	12.2	12.3	12.4	13.5
Increase rate of emission amount per person (%)	6.02	0.68	2.10	1.61	0.34	9.30

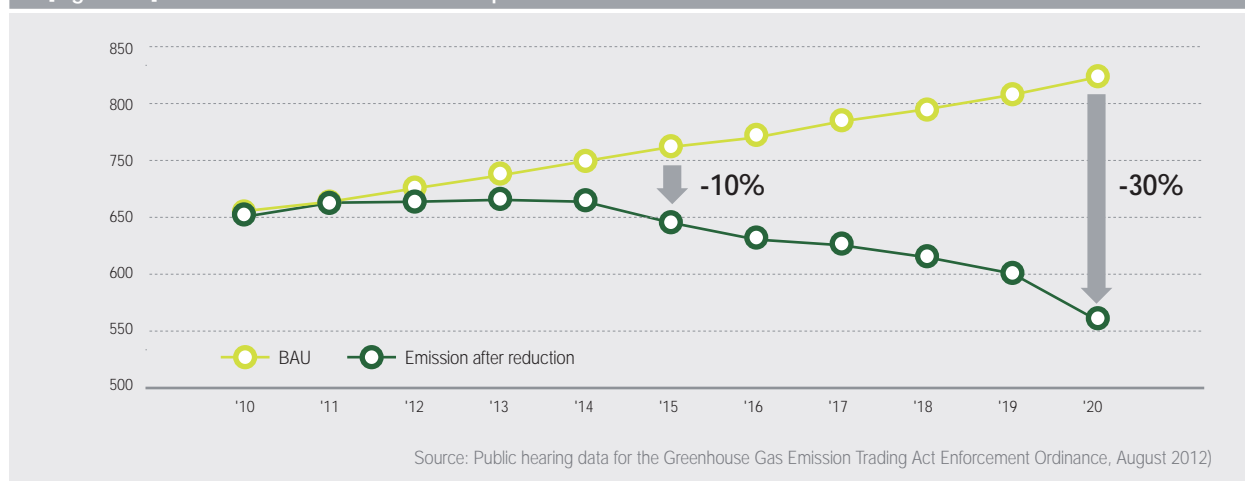
The plans to achieve the reduction target of 30% BAU (Business As Usual) by 2020 pledged to the international community and to commence national greenhouse gas emissions reduction from 2015 includes the followings:

- Establish a strong foundation to improve the effectiveness of GHG Target Management System enforced in 2012, and prepare a robust foundation to implement the emission trading system from 2015.
- Enhance electricity management system through various policy measures and promotion of social awareness to rationalize energy price and provide electricity at an affordable price, and modification of lifestyle to conserve energy in our daily life.

National greenhouse gas statistics included six greenhouse gases (CO₂, CH₄, N₂O, HFCs, PFCs, SF₆) from five sectors including Energy, Industrial Process, Agriculture, Waste, Land Use and Land-Use Change and Forestry(LULUCF), and four indirect greenhouse gases (NO_x, CO, SO₂ and etc) from 1998 in accordance with the UNFCCC.

Statistics of this year were verified by the experts in Statistics Verification Institute, approved by the UNFCCC, in accordance with the 「2010 Guidelines for the Measurement, Reporting, and Verification of National Greenhouse Gas Statistics」 which was prepared by the 1996 IPCC Guideline.

[Figure 1-2] Greenhouse Gas Reduction Path per Each Year



B. Foreign Status

Korea was ranked as 10th and 9th largest greenhouse gas emitter in 2008 and 2009 respectively. However, Korea is recognized as the 7th largest emitter of greenhouse gas in 2010, following China, USA, India, Russia, Japan and Germany.

- The increased amount of emissions has been reduced gradually since 1995 and the increasing rate was dropped to 2% in 2008 and 2009, but it was significantly increased to 9.1% in 2010.

[Table 1-2] The List of Countries Ranked by Total National Greenhouse Gases Emissions (IEA, 2012)

(unit: million tCO₂)

	1990	1995	2000	2005	2007	2008	2009	2010	Ranking
China	2244	3022	3077	5103	6072	6549	6846	7259	1
USA	4869	5139	5698	5772	5763	5587	5185	5369	2
India	582	777	973	1165	1362	1439	1564	1626	3
Russia	2179	1575	1506	1516	1579	1593	1533	1520	4
Japan	1064	1148	1184	1221	1242	1154	1093	1143	5
Germany	950	868	825	809	796	800	747	762	6
Korea	229	359	438	469	490	502	516	563	7
Canada	433	466	533	559	569	551	526	537	8
Iran	179	251	315	422	488	498	514	509	9
England	549	517	524	533	523	513	466	484	10

※ IEA (International Energy Agency) annually announces the CO₂ emissions from burning fuels in 136 countries, and it accounts for approximately 85% of total CO₂ emissions, which is similar to the rankings of the total national CO₂ emissions.

1.1.1 The Progress in Emissions Reduction

1.1.1.1 Energy

In 2009, the total amount of emissions in energy sector was increased 1.3% from the previous year standing at 516.0 million tons.

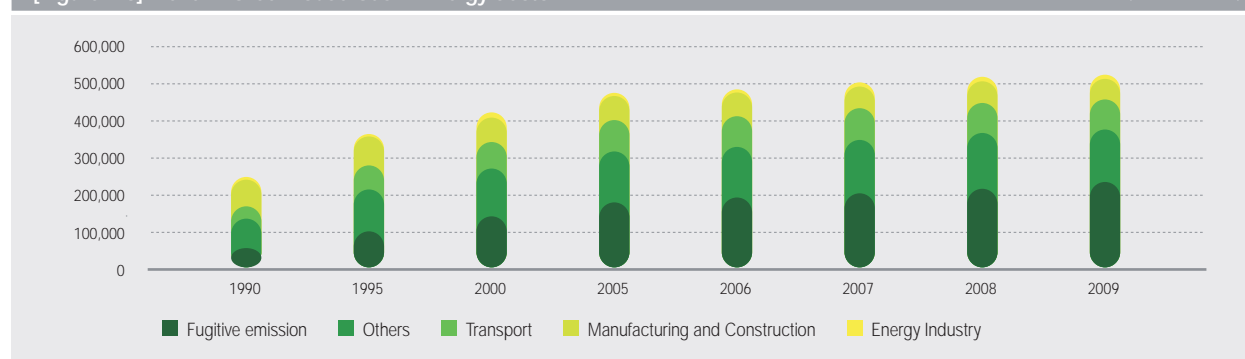
- Energy industry (electricity generation) accounted for the largest share of the total GHG emissions in energy

sector with 44.3%, followed by 27.3% in manufacturing and construction, 16.0% in transportation, 11.2% in others and 1.2% in fugitive emission.

The amount of emissions in the energy industries increased 8.3% from the previous year.

[Figure 1-3] Trend in Greenhouse Gas in Energy Sector

(Unit: 1,000 ton)



1.1.1.2 Industrial process

The total amount of emissions in industrial process sector was decreased in 2.7% from the previous year to 56.7 tons in 2009.

- Mineral production accounted for the largest share

of the total GHG emissions in industrial process with 50.8%, followed by 47.6% in halocarbon and use of SF₆, 1.4% in chemical industries and 0.3% in metal production.

[Figure 1-4] The Progress of Greenhouse Gases in Industrial Sector

(Unit: 1,000 ton)



1.1.1.3 Agriculture

The total amount of emissions in agriculture sector was 19.8 million tons in 2009, increased by 2.3% from the previous year.

- If we consider the emissions per each area, the highest importance is rice cropping with 31.1%, followed by agricultural land 30.0%, intestinal fermentation 19.4% and disposal of excreta 19.1%.

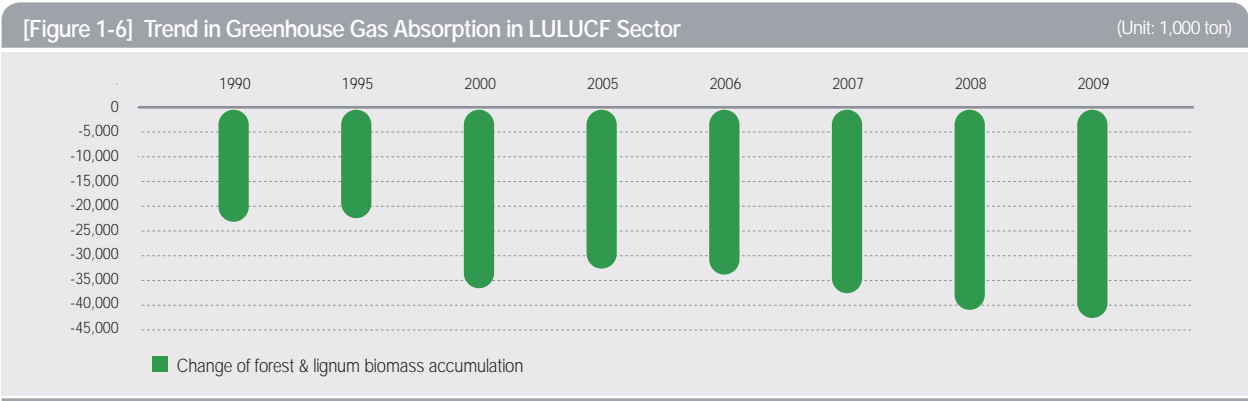
[Figure 1-5] Trend in Greenhouse Gas Emissions in Agriculture Sector

(Unit: 1,000 ton)



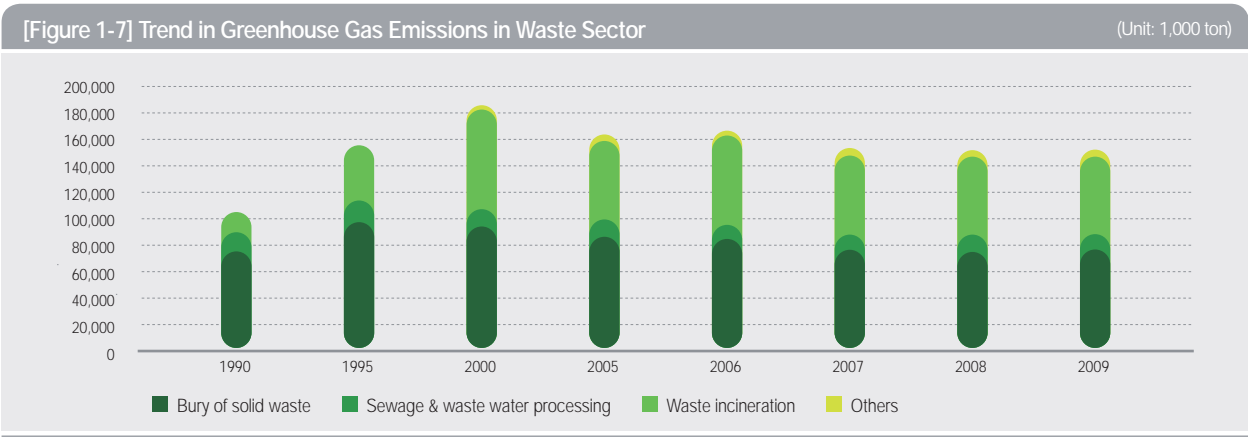
1.1.1.4 Land-Use, Land-Use Change and Forestry

The total amount of absorption in LULUCF sector increase compared to the previous year.
in 2009 equals to 42.9 million tons, which is a 4.7%



1.1.1.5 Waste

The total amount of emissions in waste sector was the previous year.
15.1 million tons in 2009, decreased by 0.1% from



1.1.2 National Greenhouse Gas Inventory

Introduction

- Climate change refers to a significant change in the climate system that have been observed and measured for an extended period of time. These unusual changes from the variation of greenhouse gas concentration are caused by human activities. In this regard, it is very important to understand the sources of emissions and absorption, and precisely calculate the total amount of emissions and absorptions from each sources. In other words, precise calculation of national greenhouse gas inventory (greenhouse gas statistics) is essential to establish and implement relevant policies. National greenhouse gas inventory was prepared, analyzed and announced by the Ministry of Knowledge Economy (formerly the Ministry of Commerce, Industry and Energy) in accordance with the Framework Act on Energy, however the national greenhouse gas inventory faced its limitations as it was calculated without consistent and unified standards.
- Hence, the Ministry of Environment has conducted the national greenhouse gas inventory in accordance with the Framework Act on Low Carbon, Green Growth (hereafter referred to as 'Green Law') since 2010. The principle and system of greenhouse gas inventory management and the installation of the Greenhouse Gas Inventory & Research Center of Korea is specified in this law, and the establishment of a clear and effective 'National Greenhouse Gas Information Management System' was made available.

Inventory Preparation System

- The preparation of national greenhouse gases inventory is based on the Green Law. The preparation and submission are conducted by the responsible organization and the verification of the submitted inventory is conducted by the center. The deliberation and vote to determine the final national greenhouse

gases were conducted by the 'National Greenhouse Gases Statistics Management Committee' (hereafter referred to as "Management Committee"), the working level consultation between the ministries by the 'National Greenhouse Gas Statistics Working Level Council' (hereafter referred to as "Working Level Council") and the technical advice by the 'National Greenhouse Gas Statistics Technical Committee' (hereafter referred to as "Technical Committee"). Then, the system was developed to prepare national greenhouse gases inventory with a more reinforced verification stage.

Process of Inventory Preparation

- The first step to prepare national greenhouse gas statistics is that the center should provide the Guidelines for the Measurement, Reporting, and Verification (MRV) of National Greenhouse Gas Statistics to each responsible organization. The center is responsible to decide and provide the MRV guideline which is modified, supplemented and confirmed through the deliberation of the Management Committee while reflecting the improvement of the problems occurred when preparing the 'National Inventory Report (NIR)' and 'Common Reporting Format (CRF)' of the previous year by the end of February to each of the responsible organization. In the meantime, the designated estimating organization in each area by each responsible organization should estimate the NIR and CRF based on the same guideline and each responsible organization should submit the prepared NIR and CRF by the 30th of June.
- Submitted NIR and CRF will be verified from July to the end of August and, the center should prepare the verification report based on the final result. The first stage of verification will be conducted by the specialists in each area internally, and the second stage of verification will be conducted by the outside specialists who were not involved in the actual statistics preparation if needed. Each responsible

organization should submit the modified and supplemented NIR and CRF based on the verification report to the center by the end of October. After then, they will be announced on December after the review of the Technical Committee, consultation of the Working Level Council and final deliberation and determination of the Management Committee is completed.

- National greenhouse gas statistics applied the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (1996 IPCC GL), Good Practice Guidance and Uncertainty Management for National Greenhouse Gas Inventories (GPG 2000), and Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG-LULUCF) that was

developed by IPCC as the estimation method. Also, the sectors involved in the statistics estimation¹⁾ are divided in Energy, Industrial Process, Agriculture, Waste, Land-Use, Land-Use Change and Forestry (LULUCF), and the greenhouse gases included in the estimation are CO₂, CH₄, N₂O, HFCs, PFCs, SF₆. They are known as the 6 major greenhouse gases in Kyoto Protocol²⁾ and direct greenhouse gases³⁾. CO₂ eq., Carbon Dioxide Equivalent was used as the estimating unit and the Global Warming Potential⁴⁾ was used as the conversion standard. In addition, the indirect greenhouse gases such as NO_x, CO, Non-Methane Volatile Organic Compounds (NMVOC), sulphur dioxide (SO₂) are estimated and reported as well.



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- 1) 'Solvent and other product use' from IPCC report guideline was excluded from the estimation due to the lack of activity data and Korean Government is planning to estimate later after understanding the related activity data.
 - 2) This is the modified United Nations Framework Convention on Climate Change accepted at Kyoto in Japan in 1997 which defined the reduction goal per each of the country listed on the appendix I. Korean Government ratified on Nov. of 2002.
 - 3) Direct greenhouse gases bring out the direct greenhouse effect while indirect greenhouse gases are converted to the greenhouse gas by combining with the other substances.
 - 4) Global Warming Potential (GWP): This is the numerical level of the greenhouse gases that contribute to the Global Warming by comparing to the CO₂ as the criteria. This index shows the Global Warming effect per unit mass, and it applies the numerical values suggested from Second Assessment Report (SAR).

1.2 Policy Overview

The goal of a 30% greenhouse gas reduction relative to the BAU by 2020 was established through the systematic and integrated analysis for the expected emission amount of greenhouse gases using a global standard analyzing system by constructing the research team centered around the national research

and development institutes in September 2008. Three scenarios were suggested in August 2009 in consideration of analysis result of estimated reduction as well as requirement of the international society, and 30% reduction plan was finally adopted after taking into account public opinion.

1.2.1 Establishment of Reduction Goal of Greenhouse Gases in Each Sector

1.2.1.1 Background and Progress

Since the Industrial Revolution the global greenhouse gas emissions has sharply increased, and the average temperature of the Earth continuously increased over the last 100 years (IPCC, 2007). The climate change by the global warming is expected to negatively affect the water resources, ecological system, food, coastline and health; and also from economical point of view, GDP might be reduced to a maximum of 20% due to the climate change (Stern, 2006), and the needs for the establishment of joint responding system for the climate change is higher at the international level.

However, the amount of domestic greenhouse gases is being sharply increased due to the Korea's energy intensive industrial structure. The increasing rate of the total amount of greenhouse gas emissions between 1990 and 2007 is 113% which is the highest rate in OECD countries (IEA, 2009). A strong voice to make efforts in reducing greenhouse gases is highlighted in the country and also the international society requires Korea to make more efforts in accordance with its international status as an OECD member and the 10th largest economy in the world.

The Korean government decided to promote assigning a reduction goal for each area and industrial classification by participating the industrial circles and civil society in a wide range and analyze the BAU and potential reduction amount systematically and periodically by establishing the independent permanent research system. Based on this decision, the Inventory & Research Center of Korea (hereafter "Center") supervised and conducted the 'analysis on greenhouse gas reduction goal for each area and industry', was stood on the base of existing national reduction goal and its purpose was to establish this reduction goal in detail. In order to accomplish this, the analyzing subject in this operation was divided into 25 areas and the goal for each year from 2012 to 2020 was derived. Though MARKet ALlocation (MARKAL) used as the reduction model for 2009 operation, various models such as Long-range Energy Alternatives Planning system (LEAP), Model for Energy Supply System Alternatives and their General Environmental impacts (MESSAGE), Asia-Pacific Integrated Model (AIM) are used simultaneously for this operation, which increases the complementarities between each model.

1.2.1.2 Estimation Method for Potential Reduction Amount

The basic premise of the estimation of potential reduction amount is as follows. The baseline year was set as 2007 and the period for the analysis was set to process the analysis every year from the baseline year to the reduction target year of 2020. 5.5% of discount rate was applied for cost estimation and the prospect data of the Korea Energy Economics Institute was used for the energy price but the assumptive values

were used for some of the energy source not included in the prospect data by considering the relative ratio of the existing price. The IPCC 1996 Guideline values were used for the emission coefficients of the greenhouse gases, but the data of the corresponding industries and related literatures are referred and applied for some of the emission coefficients not included here.

1.2.1.3 BAU and Estimation Results of Potential Greenhouse Gas Reduction

The greenhouse gases potential reduction amount from the model analysis would be as follows. 30% of the total BAU amount (813 million tons of CO₂eq) in 2020 was allocated by each sector and industrial classifications, and the amount to be reduced for each sector is Industries (34.0%), Power generation (28.0%), Buildings (19.7%), Transportation (15.1%), Public & Others (1.9%), Waste (0.7%) and Agriculture & Fishery (0.6%). In the meantime, the reduction rate relative to the BAU for each sector is Transportation (34.3%), Buildings (26.9%), Power generation (26.7%), Industries (18.2%) Waste (12.3%) and Agriculture & Fishery (5.2%).

It is expected to accomplish the decoupling between the economic growth and the emission of greenhouse gases while the total amount of the greenhouse gases path in the whole nation is reduced from 2015 after the peak is reached in 2014 if the reduction of greenhouse gases in each area is successfully executed. The reason for this expectation is because the low cost reduction plan will be applied while considering the cost minimization and technical investment required period during the initial period (~ 2014), but the high cost reduction plan is expanded in stages from 2015 and the amount of the greenhouse gas emission will be reduced sharply.

1.2.1.4 Economic Ripple Effect

The ripple effect of the macroeconomics of the greenhouse gases reduction is analyzed using a Computable General Equilibrium (CGE). Approximately 0.5% of GDP is expected to be reduced relative to the BAU in 2020 if the reduction goal of the greenhouse gases for each area and industrial classification derived from this operation is successfully accomplished. This amount is relatively lower than the those developed countries promoting the greenhouse gases reduction program similar to Korea. For Japan, the maximum 0.9% of GDP reduction is expected if the reduction goal is accomplished (14% reduction until 2020 if the amount is compared to 2005), and for the United

Kingdom, 0.82% of GDP reduction is expected if the reduction goal is accomplished (21% reduction until 2020 if the amount is compared to 2005). The reason for the relatively low GDP reduction rate was because the economic effect was minimized by the effective method while the input cost for short term (~2014) is not, and due to the dynamic effect such as technical advancement from green growth during mid and long term and also, because the preoccupation of global green market is expected. Previous studies show that GDP ripple effect can be positive in mid and long terms of period due to the technical advancement effect if the carbon related financial revenue is converted to R&D investment.

[Table 1-3] Reduction Goal of Greenhouse Gases for Each Sector and Industrial Classification

(Unit : Million Ton CO₂eq)

Hierarchical classification	Sub-divided classification	'07 Emission amount	'20 BAU	Deduction goal			
				Deduction amount	Discharging amount after deduction	Deduction rate(%)	
Industries	oil refining		12.8	17.1	1.28	15.83	(7.5)
	mining industry		1.0	0.68	0.027	0.655	(3.9)
	steel industry		86.0	121.35	7.88	113.47	(6.5)
	cement		42.2	41.48	3.53	37.95	(8.5)
	petrochemistry		50.7	63.47	4.77	58.7	(7.5)
	paper manufacture, lumber		8.7	7.73	0.55	7.18	(7.1)
	textile / leather		11.9	9.81	0.61	9.2	(6.3)
	Glass / ceramics		4.5	5.50	0.22	5.28	(4.0)
	nonferrous metal		5.4	5.02	0.21	4.81	(4.1)
	machinery		10.2	13.10	0.99	12.11	(7.6)
	electricity/ electronics	energy	9.7	12.09	0.96	11.14	(7.9)
		non-energy	18.0	29.25	24.55	4.70	(83.9)
	electronics displayer		6.3	71.65	28.32	43.33	(39.5)
	semiconductor		8.4	14.53	4.03	10.5	(27.7)
	automobile	energy	6.7	8.72	0.68	8.04	(7.8)
		non-energy	2.9	3.62	3.25	0.36	(90.0)
	shipbuilding		1.8	3.79	0.25	3.54	(6.7)
	other manufacturing		17.6	16.91	0.29	16.62	(1.7)
	food / beverage		6.8	6.16	0.31	5.86	(5.0)
	construction		2.5	3.22	0.23	2.99	(7.1)
	Sub-total		314.1	455.18	82.937	372.265	(18.2)
Transportation	transportation, car		87.7	107.25	36.82	70.43	(34.3)
Building	housekeeping		70.5	87.44	23.62	63.82	(27.0)
	business		67.6	91.52	24.44	67.08	(26.7)
	Sub-total		138.1	178.96	48.06	130.9	(26.9)
Public & Others	Public & Others		16.2	18.85	4.70	14.15	(25.0)
Agriculture & Fishery	Agriculture & Fishery		30.0	29.10	1.52	27.59	(5.2)
Waste	Waste		17.1	13.83	1.71	12.13	(12.3)
Major 6 area					175.7	637.3	(21.6)
Conversion			610	8131)	68.22)		
Grand total					243.9	569.1	(30.0)

1.2.2 Private and Public Sectors

1.2.2.1 Management by Objectives System

In order to support the greenhouse gas reduction activities of enterprises in the future, the Korean government is looking for various plans, and actively preparing for the implementation of emissions trading system and global greenhouse gas reduction obligation.

Korea is promoting the connections between the existing “Management by objectives system” and “emission trading system” to regulate the reduction of greenhouse gases.

Korea finalized the Enforcement Ordinance of the Act on Allocation and Trading of Emissions Allowances (hereafter “Emission Trading Law”) on November 13, 2012.

The ground for this system is ‘Framework Act on Low Carbon, Green Growth’ that was passed by the National Assembly at the end of 2009.

The basic design of the “Emission Trading system” that will be started from 2015 through the Enforcement of allocation and trading for the Emission Trading system Law was completed.

Therefore, the greenhouse gases to be emitted will be allocated to the companies that have

the business places emitting greenhouse gases in volume such as steel manufacturing, power generation, cement, paper manufacturing etc. and to the companies spending lots of energy from the year 2015.

In order for the effective goal management, the Ministry of Environment prepared the statement to enforce the capability of the person in charge of estimation and report in managing organization. They published & distributed the handbook, and have been operating the industrial classification education course since 2011. In order to secure the new personnel and to respond for the climate change, the Ministry of Environment has conducted a four week training course for the university graduates (including prospective graduates) & those under 35 years old for the related areas such as environment and energy with full amount government expenses since 2009. As of January 2013, there are approximately 1,100 of professionals specialized in greenhouse gases who were nurtured and have been working at the management organizations and specialized consulting organizations on greenhouse gases. This announcement and follow up measures

[Table 1-4] Number of Companies to be Managed by the Reduction Goal in 2013

Organization in charge	Ministry of Trade, Industry and Energy		Ministry of Agriculture, Food and Rural Affairs	Ministry of Land, Infrastructure and Transport		Ministry of Environment	General
Area	Power generation	Industries	Food and beverage	Buildings	Transportation	Wastes	General
Management	32	345	26	40	11	26	480

Data 1) News release by the Ministry of Environment, October 2012

for the goal management guidelines are expected not only to contribute to achieving the greenhouse gases reduction goal but also to become a bridge that builds the human & physical infrastructures for the preparations of the prearranged Emissions Trading system.

(1) Full Scale Greenhouse Gas Reduction of Target Companies from 2012

Some 458 target companies agreed on the greenhouse gases & energy reduction goal for 2012 in October 2011, and submitted the implementation plan using the National Greenhouse Gas Reporting System in December, same year. Thus, the full scale objective management system was completed on January 1, 2012.

The greenhouse gas & energy reduction goal by each target company is set through three stages including goal consultation (between organization in charge and target company), determination of allowable emission and reduction coefficient by business (National Greenhouse Gas Policy Council), and determination of goal for each company (voted by Goal Setting Council for each area). The goal consultation between the responsible organization and target company was processed from September 2011. Immediately after the anticipated emission reflecting the new & expanded plan by each organization for 2012 was discussed and determined, the National Greenhouse Gas Policy Council (chairman: Vice Minister of the Ministry of Environment, members: chiefs of bureaus of the organizations in charge) was held in October 2011 and finalized the allowable emission and reduction coefficient by business while securing the consistency and reduction goal by each area and industry. Following this, the Goal Setting Council consisting of government authorities of each responsible organization and industrial & civil specialists, was hosted and the reduction goal for individual target company was established.

(2) Promote Greenhouse Gas Reduction in Public Sector through the Management by Objectives(MBO) System

The Framework Act on Low Carbon, Green Growth defines not only target companies but also the public sector including central administrative agency and local governments. Therefore, the Ministry of Environment announced the guideline for the operation of objective management (MBO) in public sector, separate from the MBO system for target companies (January 5, 2011).

The purpose of the MBO system in public sector is to make the public sector leading the national greenhouse gas reduction in connection with the MBO system of target companies in industrial sector. There are approximately 760 target organizations as of June 2012 which include the central administrative agency, local governments, government offices, local public corporations and industrial complexes, national & public universities, Seoul National University hospitals and dental clinics. Especially, extended agencies of central administrative agency & local government, branch & business place of the government offices are also included in the targets. However, for public power companies designated as target organizations, duplicated regulation was avoided by replacing the submitting documents with execution plans, execution results and specifications of the target organizations.

The MBO was conducted for the owned buildings or the buildings being used and the vehicles (buildings: fuel burn for heating, use of electricity and steam, vehicles: management of mobile combustion) of the MBO target organizations in public sector. However, if emission sources such as generation facilities, water, waste sanitation facilities besides building and vehicles meet the conditions for the target companies designation, they will be included in the MBO for the target companies as well. Government Complex will be regarded as the facilities of the government office building managing organization (Ministry of Security and Public Administration) including the areas that

the organizations are using, and for the case they rent part of the civilian's building, they will be regarded and managed as the building of the occupied organizations.

However, even though they are government offices, some of the facilities can be exempt from the MBO for the national security, public order and protection of right of learning. Military base, vehicles for police and firefighting, elementary & middle schools, welfare facilities for senior citizens, children and handicaps and small buildings less than 100m² will be included here.

The biggest difference between government offices MBO and managed companies is that MBO is the set up method of reduction goal, which means that the

mid term goal was reduced by applying the 'absolute quantity reduction system' instead of industrial sector, 'regulation of total amount relative to the BAU regulating system'. In other words, the target organizations are supposed to set up the annual reduction target between 2011 and 2015 with more than 20% of reduction compared to the standard emission amount (annual average value of '07 ~ '09) by 2015 and should meet this target. However, the goal later than 2016 will be readjusted with a proper level by reviewing the BAU by each area and reduction goal etc. It is expected that the government offices MBO system can be the catalyst not only for the corresponding organizations but also for the expansion of the whole nation's reduction of greenhouse gases & energies.

1.2.2.2 Vehicles

Vehicle is the biggest emission source that generated approximately 31% of domestic air pollutants and 13% of domestic greenhouse gases. The success of greenhouse gas reduction in vehicle sector is the critical and necessary task to accomplish the goal of national greenhouse gas reduction by 2020 because there is relatively high possibility through the technology development and improvement of transportation culture of citizens.

Therefore, government announced the 「Development And Distribution Plan for Electric Vehicles」, a next generation environmentally friendly transportation that emits no greenhouse gases, and established the national vision to be one of the 'big four electromobile countries' with the plan to supply 100 million electric cars by 2020. The Ministry of Environment has been promoting the electric car projected to provide them since 2010 based on the capabilities in the successful Low Pollution Vehicle Projects such as natural gas bus and hybrid vehicles. Electric vehicle supply project is the one that fosters the institutional foundation for the early popularization of electric cars centered around

the Public area, and can be called 'icon industry' of low-carbon green growth as it provides the investment ground that can secure the new growth engine for global vehicle market of domestic industries as well as the greenhouse gas reduction and air quality improvement.

The paradigm shift from fossil fuel based internal combustion engine vehicles to environmentally friendly electric cars is the worldwide phenomenon. Not only the major vehicles exporting countries such as USA, Germany and Japan but also the newly emerging countries such as China are promoting the electromobile supply projects while considering the situation of their countries.

A 'Public Private Partnership Electric Vehicle Charging Infrastructure Demonstration Project' was conducted in 2010 as the preparation stage for electromobile supply project with the Ministry of Environment and other 12 enterprises. For a year of demonstration project period, 16 electromobile charging infrastructures were installed at various places in metropolitan areas including Seoul, Incheon and Gwacheon and the electric cars

developed and manufactured in Korea were used. During this period of time, the electric cars were used same as the one used in actual business with the same operational patterns at the participating organizations. The information for the operation of the electric cars and use of charging infrastructures were monitored in a real time basis, and the operation status, charge effectiveness, cost-benefit etc. were analyzed and evaluated.

Based on the result of this project and the consultative meeting of the related specialists, a full scale electromobile distribution was started centered around the public area such as national organizations, local government and government offices in 2011 after the criteria for the provision of electromobile and charging facilities were set. In order to form the electromobile distribution condition with regard to the Life Cycle Cost, a certain amount of price difference between electric vehicles and the same level internal combustion engine vehicles were subsidized when purchasing the electric cars and the high initial purchasing cost is conserved by supporting the charge infrastructure installation. Maximum 4.2 mil won of tax benefit was provided by reducing the specific consumption tax and education tax, and various incentives such as discount for public parking lot fee and the reduction of congestion fee are being institutionalized with the cooperation of the local governments.

303 electric cars were sold in the first year, 2011, and 1,091 electric cars were supplied in 2012. Also, a long term electromobile lease program was provided for cars kept for business to expand the supplying area. New business models such as electromobile car sharing or electromobile rent-a-car were introduced so that the general citizens can experience the electromobile directly. The development of various supplying models will lead the gradual drop of electromobile sell price by forming the initial market while expanding the supply of electric cars as well as improving the air quality of

downtown and sustainable use of excellent natural landscape area.

Also, in order to improve the effectiveness of electric vehicle supply project and to increase the promotion effect, 8 local governments such as Seoul, Jeju, Gwangju, Dangjin, Bucheon, Yeongkwang, Pohang and Changwon were selected as the leading Electric Vehicle (EV) cities for the centers to provide electromobile and charging infrastructure (Nationally 338 units were installed in 2011 and 1,061 units were built by 2012). These cities are being reformed as environmentally friendly cities by establishing new traffic system with the introduction of electric vehicle sharing in downtown areas, environmentally friendly electromobile rent-a-car, the low carbon industrial complex managing system using electric vehicles.

It is essential to establish the charging infrastructure for the operation of electric vehicles. Therefore, when purchasing the electromobile in public sector, slow charger installation cost is provided subject to open to the general public in the future and also the high-speed charger is being established for emergency demands in major traffic points. 111 high-speed chargers were established in EV leading cities by 2012 to obtain the whole country transportation possibility and the national charging network will be completed by 2015 by expanding to the broad area, expressway and main trunk roads in stages. Also, the electromobile operation base is being enforced by structuring the charging infrastructure information system that provides the location and use information.







The electric vehicles market is expected to expand as the regulation on green house gases generated by vehicles has been toughened in many countries and the interests of the people for the environmental friendly, high efficiency vehicles are increasing. Major consulting organizations are anticipating the world market share of the electromobile in 2020 as 5% ~

20%. Since the electromobile supply support system will be operated continuously and especially, the new electromobile mass production models from major vehicle manufacturing companies are planned to be released, a year 2013 is being expected to be the new starting point of electromobile market growth. Domestic market also has the plans to supply the electric cars with more reasonable prices and trying to expand the scope of support so that the individual consumer can purchase while considering the market maturity and adjusting the supplying scale.

Even though 1,091 electric cars were sold by 2012, and it takes only 0.006% of registered vehicles, it is expected to make the new paradigm for the vehicle area that takes 60% of the domestic gasoline consumption in the future. Not only for the national greenhouse gases reduction goal in 2020, but also for the green competitiveness for preoccupation of the global environment friendly vehicle market, the electromobile will open the era as the symbol of sustainable development instead of the symbol of pollution.

[Table 1-5] Ranking of National Greenhouse Gases Discharging Amount IEA (2012)

(unit: million tCO₂)

Classification		High speed electric cars		Electric bus		Classification	Slow charger	High speed charger
Manufacturer		Kia	Renault Samsung	Hyundai	Hankuk Fiber	Purpose	Long time parking	In emergency
Vehicle Name		 Ray EV (Light weight car)	 SM3 Z.E (mid size)	 Elec-city (low floor bus)	 E-Primus (low floor bus)	Shape		
Number of passengers		5 passengers	5 passengers	51 passengers	49 passengers	Power supply	Single phase 220V, 7.7kW	3 phase 380V, over 50kW
Number of passengers		5 passengers	5 passengers	51 passengers	49 passengers			
Max. speed		130km/h	140km/h	100km/h	100km/h	Charging time	Within 6 hours	Within 30 minutes
Max. speed		130km/h	140km/h	100km/h	100km/h			
Mileage per each charge		135km	182km	75km	69.8km			

1.2.3 Improvement of National Sustainable Development Capability

Presidential Commission on Sustainable Development is consisted of main committee and 4 expert subcommittees. The main committee, consisting of 1 chairman and less than 50 members, establishes the plan for the effective promotion of national sustainable development and evaluates its performance as a legal deliberation agency. The four expert subcommittees are consisted of 20 ~ 80 members per subcommittee and the chairman assigns them to support the activities of the main committee. They will prepare the professional measures for each of the area through professional research, investigation and review for the deliberation of the main committee.

The 6th Presidential Commission on Sustainable Development launched in September 2010 is consisted of 24 members including 18 civil members and 6 official members. Its main functions are to review the sustainable development plan being prepared every 5 years, prepare the sustainable development index and evaluate the national sustainability on a regular basis with 2 years of cycle, prepare the national sustainability report focused on the political tasks involved in the basic plan of sustainable development by applying the sustainable development index. In addition, it is to supply, educate and promote the knowledge and information of sustainable development, and finally to implement the issues related to the international agreement and cooperation in regards to the sustainable development.

The Presidential Commission on Sustainable Development, that was established to consult with the President in regards to the sustainable vision and political tasks, prepared the legal foundation by enacting the 'Framework Act on Sustainable Development'. Also, the institutional ground for the role of local Presidential Commission on Sustainable Development was established to build a cooperative system in order to promote the sustainable development between

the nation and provinces, and the basic principle was specified to promote the effective sustainable development through national sustainability evaluation.

The 2nd Basic Plan for Sustainable Development (2011-2015) (Draft) prepared by deliberation at the Presidential Commission on Sustainable Development is planned to be finalized after the deliberation and vote at the Presidential Committee on Green Growth and Cabinet meeting. In preparation for the Rio+20 (World Summit on Sustainable Development) in 2012, a sustainability report was prepared with regards to the performance of sustainable development and future plan. Also, the status of Korea in the world can be improved by introducing the 2nd Basic Plan for Sustainable Development and the evaluation results for sustainable development internationally. In order to secure the sustainability of national policy, the performance plan for sustainable development of each department will be modified and supplemented by evaluating the performance plan of central administrative agency and sustainable development index every 2 years.



1.2.4 Establishment and Implementation of National Climate Change Adaptation Policies

In order to provide various institutional strategies to promote the low-carbon green growth in an effective and systematic manner, the government enacted the Framework Act on Low Carbon, Green Growth (December 29, 2009), which became effective on April 14, 2010. The Framework Act on Low Carbon, Green Growth is a comprehensive law addresses the climate change and energy issues, as well as comprehensively defines the green technology and R&D, change

and support of the green industries, green country, city, buildings, transportation, and green life, holds significant meaning as and it is important that the law is related to the new national development strategy. Article 48 of the Framework Act on Low Carbon, Green Growth and the Article 38 of its Enforcement Ordinance specify the role of the government to establish and execute measures for the Adaptation to Climate Change.

1.2.4.1 Establishment of National Climate Change Adaptation Plan (2011- 2015) by 13 Government Offices

According to the Clause 4, Article 48 of the Framework Act on Low Carbon, Green Growth and the Article 38 of its Enforcement Ordinance, government offices jointly established the National Climate Change Adaptation Plan (2011- 2015). Each year, 87 detailed tasks in 10 areas were developed and the performance evaluation by each project content was conducted, and in order to flexibly react to the climate change, the detail plans are being established every 5 years. The public health sector aimed to establish counter measures to protect the citizen's lives and health environment from heat wave and air pollution, and disaster and calamities management sector aimed to establishes plans for

disaster prevention and enforcement of stability of social infrastructure. The agriculture sector focused on adaptation of agricultural production system to climate change, and the forestry sector established plans for forest health improvement and prevention of the forest disasters such as forest fire. For marine and fishery, the plans to secure the stable marine & food product resources and to minimize the damages were established. For water management, water response system for the flood and drought is established and for ecological system, the plans to secure the biodiversity through the identification of climate change sensitive species were established.

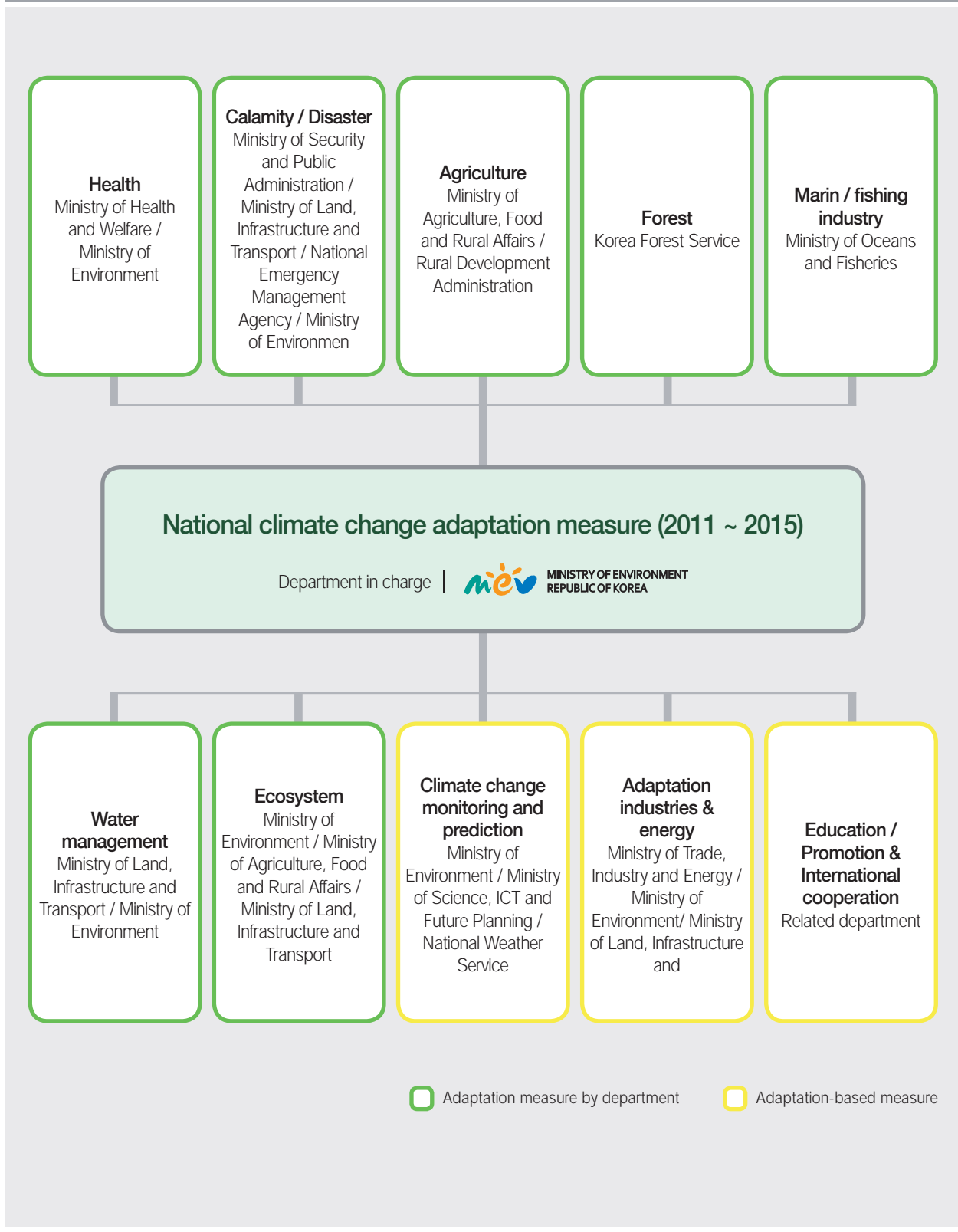
1.2.4.2 Modification and Supplement to the National Climate Change Adaptation Plan that takes Representative Concentration Pathways into Account

After the recent analysis on the IPCC new climate change scenario, the need for the modification and supplement to the National Climate Change Adaptation Plan, comprehensive integration of the climate change adaptation plans, was proposed as climate change is likely to accelerate at a much faster pace than expected. In particular, fluctuation in temperature and precipitation in Korea is expected to be above the global average, therefore, modification and supplement were promptly implemented in consideration of the environmental changes. The National Climate Change

Adaptation Plan was modified and supplemented by reflecting the Representative Concentration Pathways (RCP), a new climate change prospect scenario in December 2012.

The basic direction for modification and supplement to the adaptation plan is to conduct impact analysis vulnerability assessment in each sector in accordance with the RCP, and to establish measures that put vulnerable group and regions in priority, and to promote cross-sectoral cooperation rather than

[Figure 1-8] Related Department of the National Climate Change Adaptation Policies



measures for the individual sectors. According to the RCP on the basis of more precise climate change observation and sophisticated analytical technique, it is predicted that faster and more extreme climate change will take place in Korea. The predicted average temperature of the Korean Peninsula will be increased 3.2°C which is 1.4°C higher than the one predicted before, and the predicted rain fall will increase to 15.6% which is 4.1% higher than the one predicted before. Therefore, the measures to be applied to the weak areas for the climate change were selected and enforced. Vulnerable social group customized measures were established to prevent any direct health damages caused in people exposed to the climate change as senior citizens, handicaps and the people with chronic illnesses; and the climate change adaptation information integrating system was promoted to support the establishment of integrated policy and the use of the climate change information in private companies. Based on this, the professionalism between departments was mutually supplemented and the long term climate change adaptation R&D for the support of highly effective adaptation policies establishment was promoted.

Along with the adaptability enforcement of public sector, in order to improve the adaptability of civilians including industrial sector, the development of climate change risk evaluation system and the measures to expand the civilian adaptability was promoted by preparing the government offices (public enterprise) adaptability reporting system.

‘Climate Change Council Between Related Offices’ which is consisted of the Vice Minister of the Ministry of Environment as the chairman and the chiefs of the bureaus as the members is operated for this and the progress of each department is being evaluated. The chief of the central office group should prepare the detailed execution plan for the adaptation policies and get the evaluation from the Ministry of Environment, and the counter measures for the corresponding issues should be prepared primarily by analyzing the impact of the local climate change and vulnerability assessment. As of March 2012, the evaluation on the detailed execution plan and performance results for related departments were finalized. For the multi-regional municipal governments, they were finalized in August 2012.

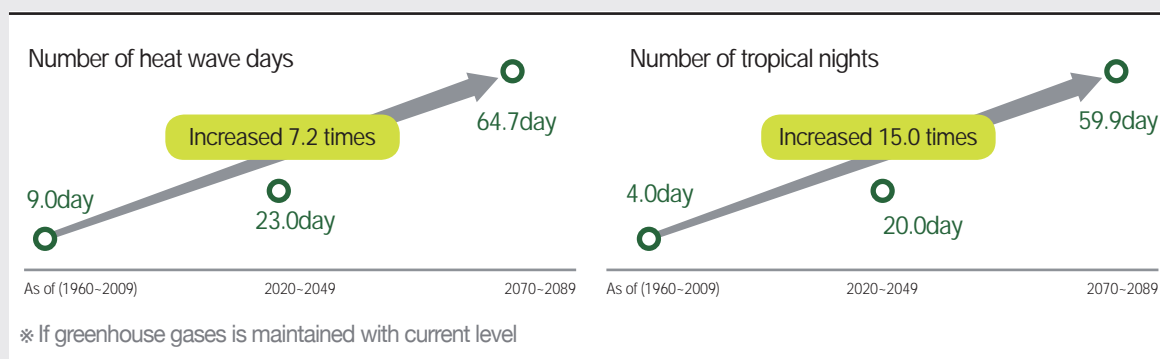


[Table 1-6] Prediction of National Institute of Meteorological Research

Prediction of National Institute of Meteorological Research (announced on Nov. '11)

If greenhouse gases are emitted in current trend (RCP 8.5), the temperature of in Korea will increase by 3.2°C by 2050 and the annual rainfall will increase by 15.6%, and surface of the sea level will rise by 27cm.

- Subtropical climate will be expanded to all of the country except the interior, and heat wave & tropical night will increase.



Temperature of all seasons will increase and especially in Winter time

Prediction of temperature rise per each season in the Korean Peninsula

(°C)

	Spring	Summer	Autumn	Winter	Average
Current	11.5	23.5	13.9	0.2	12.3
'50	14.2 (+2.7)	26.6 (+3.1)	16.9 (+3.0)	4.4 (+4.2)	15.5 (+3.2)

Spring (+10 days, Seoul) and Summer (+19 days) will be longer and winter will be shorter (-27 days). Summer will start from early May and continues to early October for more than 5 months.

Change of the Length of Season (Seoul)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
'10	Winter		Spring			Summer				Autumn		Winter
'50	Winter (-27 days)		Spring (+10 days)			Summer (+19 days)				Autumn (-2 days)		Winter

The Ministry of Environment provides the institutional, technical support for establishment and executes smooth adaptation policies of local government. Also, the Ministry of Environment supports the technical development for the impact of the climate change analysis and vulnerability assessment together with the enforcement of capability of adaptation policies establishment of local government using professional

consultation of the Korea Adaptation Center for Climate Change (KACCC) in the Korea Environment Institute (KEI). For instance, the evaluation of climate change impact considering the climate pattern by each area and the provision & training of vulnerability consultation (September 2011) are implemented, and the review for the consistency of national climate change adaptation plan is conducted while preparing adaptation measures.

1.2.4.3 Establishment and Support for Climate Change Adaptation Plans by Local Governments

The Ministry of Environment and the KACCC established the detailed execution plan of the climate change adaptation policies through the climate change impact evaluation for climate prediction and specialization (Seoul and Incheon), health and disaster area (Seoul), marine ecosystem and maritime disaster area (Incheon) as the demonstration project to support the climate change impact evaluation and adaptation policies establishment of Seoul and Incheon in 2010.

The establishment and execution body of the detailed adaptation implementation plan for each area established by the National Climate Change Adaptation Plan (2011-2015) includes not only central offices but also multi-regional local government⁵⁾. Detailed execution plan of the metropolitan council is being executed through the cooperative system of the various related departments such as metropolitan council (establishing entity), the Ministry of Environment

(overall management of adaptation), the KACCC in the KEI (operates the consultation group to support local governments, establishes and supports the detailed execution plan such as manual distribution), National Weather Service (prepares and provides the weather information and scenario), National Institute of Environmental Research (provides the impact of the climate change by each area and the evaluation result of vulnerability assessment). In the meantime, the base for the materialization of adaptation policies that the characteristic of each local government is reflected should be prepared by conducting the demonstration project to establish detailed execution plan for 35 primary local governments by 2012~2013, and the establishment of detailed execution plan will become mandatory even to the local governments from January 2015 by modifying the Clause 2, Article 38 of Enforcement Ordinance of the Framework Act on Low Carbon, Green Growth.

5) metropolitan councils already established the detailed execution plan for the adaptation policies and the self adaptation capability enforcing measures are being prepared. However, this will be expanded to all of the primary local government starting from 2015 through the demonstration project in 2012.

1.3 Key Issues

1.3.1 Introduction of Emissions Trading Scheme

Importance and Prospect of Korea's Emissions Trading Scheme

- Institutional frame that reduces the greenhouse gases with cost effective policies, converts the Korean industrial structures to low carbon high efficiency energy industry and creates the new growth power based on the green technology was prepared through the enactment of the Emissions Trading Act and its enforcement ordinance.
- The enactment of the Emissions Trading Act holds significant meaning as it finalizes the legal infrastructure for the green growth policies following the Framework Act on Low Carbon, Green Growth (December 2009), Special Law for Smart Grid (November 2011) and Green Building Supporting Law (February 2012).

Government showed its plan to enforce the national power that leads the international low carbon green growth by stabilizing the virtuous cycle structure of environment preservation and economic progress while operating the Emissions Trading to be successfully executed from 2015.

- The annual predicted reduction path (2010 ~ 2020) of greenhouse gases emission by 2020 was determined at the 2011 Cabinet meeting and it predicted that the national emission amount will gradually increase until 2014 and then the total amount will be reduced from 2015. In the meantime, through the practical reduction activities of the organizations from this year (2012), it is expected that emission of the national greenhouse gases will be reduced practically from 2015.
- MRV system that predicts and estimates the emission of target companies will be established by internally reinforcing the operation of the current MBO system. In the meantime, setting up of a reasonable and fair

emission permissible amount based on this system could be expected to be the valuable property that makes possible to secure the flexibility in forming the stable emission trading market and in executing the reduction obligation of allocation target organization through precise and fair allocation by the Emissions Trading from 2015.

Main Characteristics of the Korean Emissions Trading Scheme

- Main characteristics 1) The characteristics of the Korean Emissions Trading Scheme is that it fits to the global standard and the competitiveness of the domestic industries is considered when the system is designed.

1-1) (Free Allocation) In order to minimize the burden of the industries during the initial stage and to improve the effectiveness of Emissions Trading, the free allocation rate will be expanded gradually from 2018. Also, 100% of free allocation will be applied if the trade integration or production cost occurrence is higher than certain rate by considering the competitiveness of domestic industries.

- Main characteristics 2) (governance of the competent authorities) In order to improve the reliability of system operation and efficiency of administration, competent authorities are needed to be unified and the Minister of the Ministry of Environment was decided to be the competent authority.

2-1) Participation of the related department was institutionally guaranteed through Allocation Deliberation Committee and Emission Certification Committee for the consideration of economic and industrial policies during the execution.

[Table 1-7] Free Allocation Rate by Each of the Main Planning Period under Emissions Trading

Main planning period	1st planning period ('15-'17)	2nd planning period ('18-'20)	3rd planning period After ('21-'25)
Free allocation rate	100%	97%	Less than 90%

[Table 1-8] 100% 100% Free Allocation Type of Business under Emissions Trading

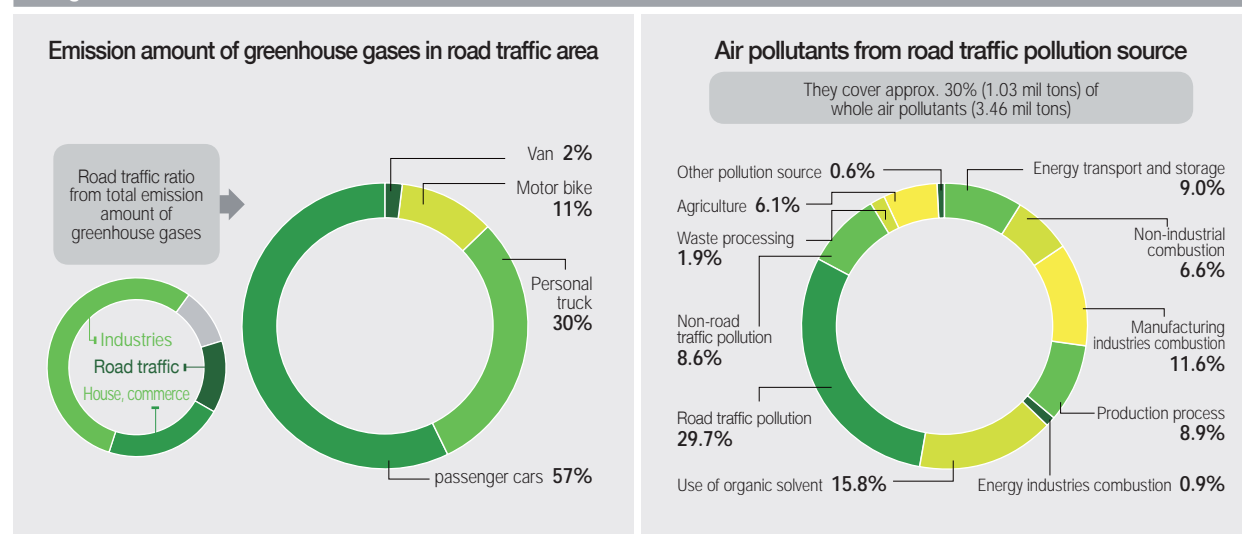
100% free allocation type of business
Over 10% of trade integration + over 5% of production cost occurrence
Over 30% of trade integration
Over 30% of production cost occurrence

1.3.2 Introduction of Subsidy for Low Carbon Vehicles

In order to respond to the climate change, the amount of greenhouse gas reduction allocated to transportation sector by 2020 is 37 million tons of CO₂ (34%) which is the

most ambitious greenhouse gas reductions target. In this regard, it is essential to reduce greenhouse gas emission in transportation sector in order to achieve reductions target.

[Fig. 1-9] Mission of Greenhouse Gases and Air Pollutants



Note 1) trade integration = (Annual average export amount for the standard period + Annual average import amount for the standard period) / (Annual average sales amount for the standard period + Annual average import amount for the standard period)

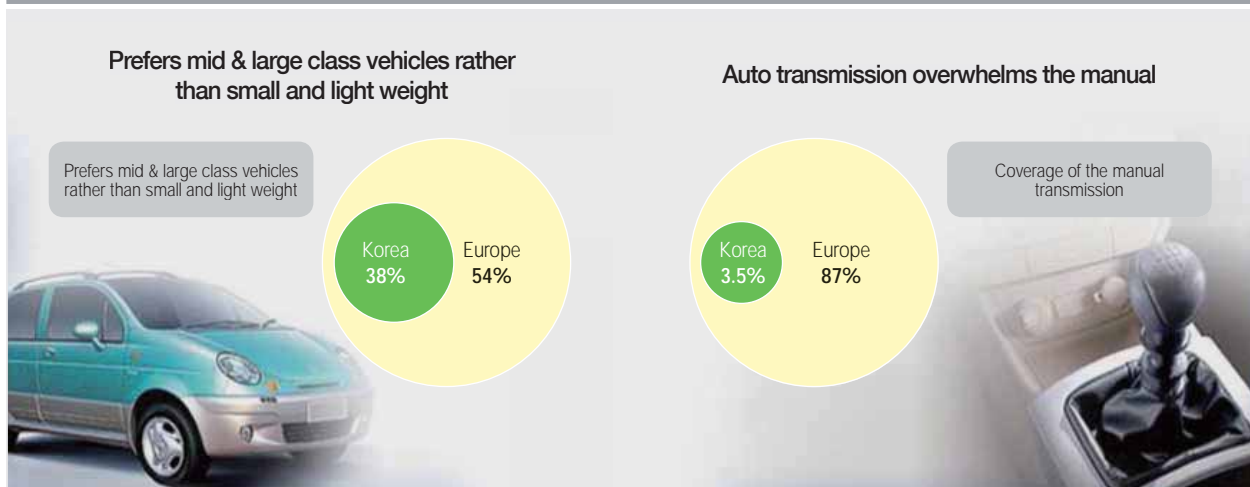
Note 2) occurrence of production cost = (Annual average greenhouse gases emission for the standard period × Emissions Trading price for the standard period) / Annual average added value output for the standard period

In order to adapt to the global warming and to improve the vehicle structure to low carbon type, the Ministry of Environment is going to introduce the 'low carbon vehicle fund system' and expand the supply of Zero Emission Vehicle (ZEV), the new concept vehicle that uses the new renewable energy. In order to reform the mid & large size vehicle oriented consuming culture (81.9%, 2011), 'low carbon vehicle fund system' will be introduced (to be effective in January 2015) and the subsidy & allotment will be applied from the purchasing stage, which will enforce the support for

the low carbon vehicles.

In the meantime, 'low carbonization' measures for the whole process through supporting policies such as discount of parking & toll fee and reduction of car tax for the low carbon vehicles are being considered, and the environmental improvement and new technology development is being induced by converting the fossil fuel based transportation paradigm significantly while supplying ZEVs that do not emit pollution substances and greenhouse gases at all.

[Figure 1-10] Weight of Light Weight Vehicles and Manual Transmission Vehicles



1.3.3 Expected Effects and Future Plan

The effects that can be nationally expected through the accomplishment of mid term reduction goal are as follows. Firstly, conversion of domestic economy and industrial structure to high efficiency & low carbon will be promoted by providing the government's specific signal for the greenhouse gases reduction to the main bodies of national economy. Specifically, greenhouse gases

emission per GDP was 77.0 (ton CO_{2e} / 100 million won (currency of the Republic of Korea, KRW)) in 2007 and it will be improved to 42.4 (ton CO_{2e} / 100 million won) in 2020, which is 45% improvement, and the greenhouse gases emission per person is expected to be decreased from 12.7 (ton CO_{2e} per capita) in 2007 to 11.5 (ton CO_{2e} per capita) in 2020.

The background is a textured, light beige paper with visible fibers and some faint, scattered red and yellow marks. Several black ink stems with yellow and red watercolor flowers are scattered across the page. One stem is prominent in the lower left, curving upwards and to the right, with several buds. Another stem is in the upper right, and a few individual flower buds are floating in the center and lower right.

02 Air

2.1 Current Status

2.1.1 Emissions of Fine Dust (PM)

2.1.2 Emissions of Volatile Organic Compounds (VOCs)

2.2 Policy Overview

2.2.1 Licensing System for Workplace Management

2.2.2 Nomination of Special Area and Specific System

2.3 Key Issues

2.3.1 The Second Measures in the Capital Area

2.3.2 Risk Considered Enforcement of Air Pollutants Management



2. Air

2.1 Current Status

2.1.1 Emissions of Fine Dust (PM)

Fine dust concentration in the Seoul metropolitan area in early 2000s was very high, approximately 2 ~ 3.9 times higher than the other major cities in developed countries, and 1.3 ~ 1.4 times higher in other regions (non-capital regions) as well. Due to this kind of

pollution problems in the capital area, the social costs reached to 1 billion won, which hindered the national development and also, it was presumed that it will lead early death of 11,127 people annually, which is 3 times more than the death by traffic accident.

[Table 2-1] Comparison of Fine Dust Concentration with World Major Large Cities

(Unit : $\mu\text{g}/\text{m}^3$)

Major cities (Year)	Seoul ('01)	London ('01)	Paris ('01)	Tokyo ('00)	New York ('97)
Fine dust concentration	71	20	20	40	28

In order to protect the citizens' health from such a serious air pollution and to improve the national development by reducing the social costs through this, the government established and promoted the basic plan for the capital area air quality management. The goal of this plan is to improve the fine dust pollution to the level of the developed countries. In this case, sea in front of Incheon City can be seen from the top of the Nam mountain on a clear day. In the meantime, Fine dust concentration is being improved every year by the continuous promotion of the government policy

such as installation of emission reduction device on diesel engine vehicles and low pollution vehicle supply project (393,837 vehicles), total air pollution load management system at business places (304 places), low NOx burner installation project (2,931 vehicles). Fine dust concentration in the capital area was reduced from $56 \mu\text{g}/\text{m}^3$ in 2008 to $51 \mu\text{g}/\text{m}^3$ in 2011, which is approximately 9% reduction and the number of satisfied days for environmental requirement was increased from 175 days in 2008 to 205 days in 2011, which is approximately 37% improvement.

[Table 2-2] Fine Dust Concentration and the Number of Satisfied Days for Environmental Requirement

(Unit : $\mu\text{g}/\text{m}^3$)

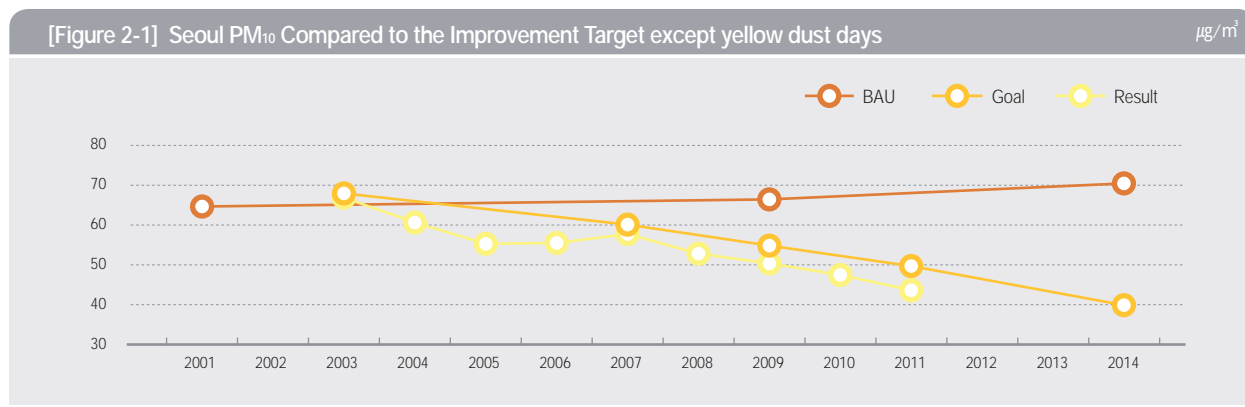
Classification		2008	2009	2010	2011
Fine Dust Concentration (Except yellow dust day)	Capital area	56	56	53	51
	Seoul	53	51	47	44
	Incheon	56	57	53	51
	Kyunggi	58	58	56	53
Satisfied Days for Environmental Requirement	Capital area	176	176	190	205
	Seoul	189	211	218	235
	Incheon	155	168	225	189
	Kyunggi	154	167	221	168

The average fine dust concentration of Seoul in 2011 was $44\mu\text{g}/\text{m}^3$ which was the lowest value since the fine dust concentration was measured.

Fine dust concentration of Seoul in 2010 was $47\mu\text{g}/\text{m}^3$, which satisfied $50\mu\text{g}/\text{m}^3$ of the air quality standard

for 2 consecutive years. For the case of Incheon and Gyeonggi, they were $51\mu\text{g}/\text{m}^3$ and $53\mu\text{g}/\text{m}^3$, respectively, which also recorded the lowest value ever. The visibility is getting improved for all area of Seoul, Incheon and Gyeonggi province.

[Figure 2-1] Seoul PM₁₀ Compared to the Improvement Target except yellow dust days



[Table 2-3] Visibility Distance in the Capital Area

(Unit : km)

Classification	'05	'06	'07	'08	'09	'10
Seoul	12.1	11.4	11.6	11.5	12.6	12.9
Incheon	11.6	10.8	11.9	12.1	11.8	12.8
Kyunggi (Suwon)	12.3	10.1	11.5	11.6	12.1	13.6

2.1.2 Emissions of Volatile Organic Compounds (VOCs)

VOCs are emitted from various sources and the organic solvent covers 69.7% of the whole emission amount, which is the biggest one, and the next is the business

places such as manufacturing process and they cover 14.3%.

[Table 2-4] Annual Emission Amount of VOCs by Each Source (2011)

Classification	Total	Burn from Energy industry	Burn from non-industry	Burn from manufacturing process	manufacturing process	Energy transportaion and storage	Use of organic solvent	Road pollution	Non-road pollution	Waste process
Emission (1000 t / year)	298.2 (100)	2 (0.7)	1.5 (0.5)	0.7 (0.2)	11 (3.7)	14 (4.8)	209 (69.7)	40 (13.5)	5 (1.7)	15 (5.2)

2.2 Policy Overview

2.2.1 Licensing System for Workplace Management

Workplace is classified from classification 1 to 5 substances from the air pollution emission facilities. depending on the emission amount of the pollution

[Table 2-5] Classification of Business Places

Class	Emission amount of pollution substances
Class 1	Business place with the Emission amount of pollutant is over 80 tons per year
Class 2	Business place with the Emission amount of pollutant is 20 ~ 80 tons per year
Class 3	Business place with the Emission amount of pollutant is 10 ~ 80 tons per year
Class 4	Business place with the Emission amount of pollutant is 2 ~ 80 tons per year
Class 5	Business place with the Emission amount of pollutant is less than 2 tons per year

※ Emission amount of air pollutants means the amount estimated by calculating the emission amount of dust, sulfur oxides and nitrogen oxide that did not pass the pollution control facilities, and the calculation was done by using the air pollutants calculating method.

2.2.1.1 Allowable Emission Standard System

Allowable emission standard for air pollutants

- Allowable emission standard for air pollutants emitted from the discharging facility regulates the gaseous substances and the particles separately starting from January 1, 2015 based on the definition of Separate Table 8 of the Enforcement Regulations of the Clean Air Conservation Act (Clause 1, Article 16 of the Clean Air Conservation Act, Article 15 and Separate Table 8 of the Enforcement Regulations of Clean Air Conservation Act).
- Allowable emission standard for air pollutants to be applied from the year 2015 will be separately applied by using common applying standard or enforced standard that is to be used in case single emission amount of specified harmful substance exceeds tons per year

Exceptions for the discharging facilities that transmits the measuring result to the control center of the remote sensing system of smoke stack

- For the discharging facilities that transmits the measuring result to the control center of the remote sensing system of smoke stack by installing the remote sensing system of smoke stack (Clause 1, Article 32 of the Clean Air Conservation Act, and Item 2, Clause 1, Article 17 of the Enforcement Ordinance of Clean Air Conservation Act), the excess of the allowable emission standard will be determined depending on "the exceptions (Item 3 in Separately Table 8 of the Enforcement Regulations of Clean Air Conservation Act) for the discharging facility that transmits the measuring result to the control center of the remote sensing system of smoke stack (Article 15 of Enforcement Regulations of the of Clean Air Conservation Act and Item 3 in Separately Table 8).

Allowable emission standard according to ordinances

- For metropolitan cities, provinces or special self-governing provinces (hereafter 'Cities'), if it is

recognized that the province environmental standard cannot be maintained or the air quality of air environment regulated area needs to be improved, more stringent allowable emission standard than the allowable emission standard in the Clean Air Conservation Act can be set (only for the case that the authority is devolved to the governor of the Cities) (Clause 3, Article 16 of the Clean Air Conservation

Act).

- If there are any areas that the allowable emission standard according to ordinances is not applied in the cities or provinces where the standard is applied, then the allowable emission standard according to ordinances will be applied to the discharging facility installed or to be installed in those areas (Clause 6, Article 16 of the Clean Air Conservation Act)

2.2.1.2 Odor Management Policy

Current Status

The Malodor Prevention Act revised in February 2005 defines the odor as the “pungent gaseous substances such as hydrogen sulfide, mercaptan, amine and others that gives displeasure and disgust by stimulating the sense of smell”. Therefore, odor means that the bad smell which gives harm to the pleasant emotional life and health of human being by stimulating the sense of smell while existing in combined status of various components. This makes people reveal the self-awakening response such as disgust, headache, loss of appetite, difficulty in breathing and allergies by promoting the mental & physiological stresses. Also, it gives much of displeasure even with low concentration, which brings a lot of civil complaints.

In many of the cases, civil complaints for the odor occurs because of the provincial conditions such that the industrial and residential areas are mixed together. In the meantime, another reason is that the lack of research and investigation for the odor causing materials generated from the odor vulnerable business (lack of analyzing technique and tools can be another

reason) and of management policy for the sources of odor and odor causal factors.

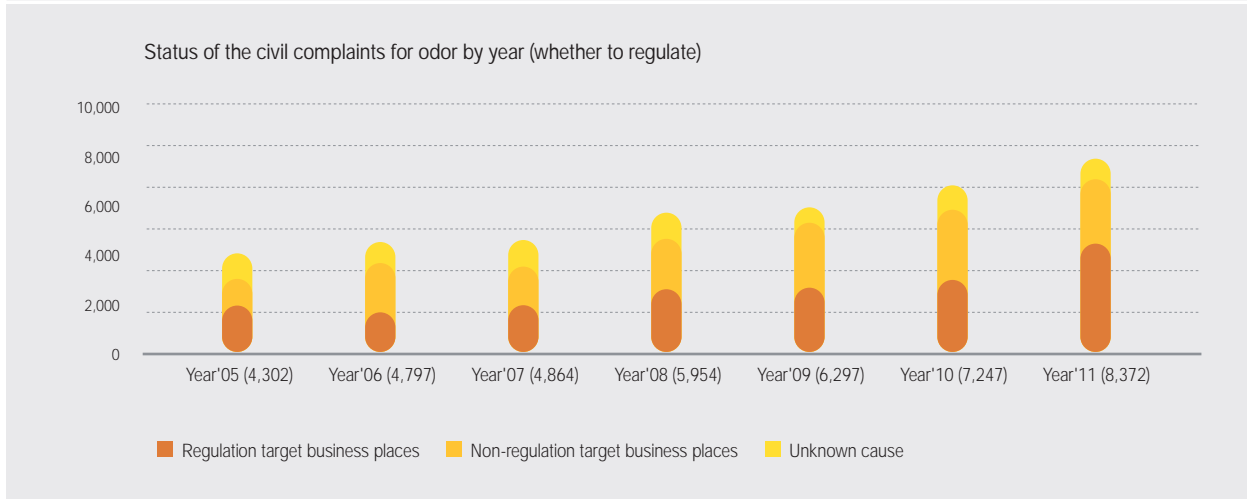
In order to solve this problem, the Ministry of Environment is responsible to manage the odor independently by enacting the Malodor Prevention Act separately (odor has been regulated by following 「Clean Air Conservation Act」 since 2005), and the Comprehensive Policy for Malodor Prevention (2009~2018)」 was established and executed to construct the suitable odor managing system that fits to the domestic status.

Civil Complaints for the Odor

Civil complaints for the odor has increased by approximately 13% each year. The number of civil complaints for the odor was 4,302 in 2005 but it was increased to 8,372 in 2011, which was increased by approximately 2 times than 2005. If we review the status by each province, the biggest 5 metropolitan councils are Gyeonggi, Incheon, Gyeongnam, Seoul and Jeonbuk in descending order, and 5,552 complaints (66.3%) occurred in these areas.

[Figure 2-2] Civil Complaints Status for the Odor by Year

(Unit: 1,000 ton)



If we review by primary local government, the 5 biggest are Seo-Ku in Incheon, Yongin-City in Gyeonggi, Namyangju-City, Chungju-City in Chungbuk, and Changwon-City in Gyeongnam in descending order, and 2,754 complaints from top 10 primary local government covers 32.9% of the total complaints of the whole nation.

Establishment and Implementation of Comprehensive Policy for Malodor Prevention

Since the civil complaints for odor is being sharply increased, differentiated managing system needs to be established considering the characteristics of the generated odor, and the Ministry of Environment established the Comprehensive Policy for Malodor Prevention (2009~2018) in 2008 and promoted the detailed reduction plan that supplements the problems of previous odor reduction plan systematically. This odor control comprehensive policy is the first legal one prepared for the odor management area, and it specifies the roll between the nation and local government. This policy is consisted of 3 practice goals such as odor discharging source management, development of odor reduction technology and system reorganization, and 5 implementation strategies such as business place odor management, aesthetic odor management, livestock odor management, development of odor control

technologies based construction and rationalization of odor managing system with the vision that “creates healthy and pleasant quality of life”.

Detailed implementation plans for each area of the comprehensive policy for malodor prevention is as follows.

Firstly, business place odor management project includes the customized technology support and follow up management, odor control facility installation and preparation of technical instruction, technical diagnosis obligation for the odor of the priority management business place, installation of odor reduction facility in petty business places and provide the improvement fund, development and distribution of industrial classification odor management manual.

Secondly, aesthetic odor management project includes the odor reduction plan for the non-regulation target odor discharging facility, green buffer zone supporting project for the improvement of civilian's living environment, promotion of odor from daily life reducing project, technical diagnosis obligation for the odor of public environmental facilities etc.

Thirdly, livestock odor management project includes

the support of odor reduction technology for stock farmers, support of odor management for the buried places of stamping out stocks. development and supply of stock breeding odor reducing and controlling technology etc.

Fourthly, development of odor management technology based construction project includes establishment of base for the real time odor monitoring system, expansion of the continuous measuring network for the designated odor materials at site and preparation of the integrated managing system for the odor discharging business places, promotion of joint control facility installation project for the odor discharging facility concentrated area etc.

Lastly, rationalization of odor managing system includes the improvement of odor process test method, preparation of the verification system for the odor reduction technology, cultivation of odor management specialists, improvement of application method of odor emission quality standard etc.

In the meantime, the Ministry of Environment improved and supplemented the Comprehensive Policy for Malodor Prevention (January 2012) to reflect the new odor reduction policies for the odor from daily life by considering the life quality improvement and



characteristics of the civil complaints while hosting the "Advancement of odor management forum" in 2011 and collecting various opinions from specialists. Important improvements include the plan for applying the primary cause of odor to the environmental impact assessment system and preparation of standard plan, promotion of odor improvement project on the public environmental facilities, trade off study for the complex odor emission quality standard, reliability for the odor process testing method, establishment of the base for the real time odor monitoring system, preparation of selecting guideline of deodorizing apparatuses for the odor discharging facility in daily life etc.

Enactment and Modification of 「Malodor Prevention Act」

Unlike the air pollution, odor causing materials are various and complex, and since they break out locally and momentarily and then disappeared. In this regard, effective odor management method inevitably reaches the limit.. Therefore, odor was separated from the 「Clean Air Conservation Act」 and 「Malodor Prevention Act」 was enacted on February 9, 2004 and was enforced on February 10, 2004. In order to manage the odor more effectively, from the 「Malodor Prevention Act」, the management target was changed from 'facility' to 'local area' and the quantity of the designated odor materials are increased to 22 from 8 which means 14 kinds are added, and also, the application period was expanded annually. In the meantime, in order to improve the reliability of the measurement, the lack of objectivity and inconvenience of quantification of 'direct sensory method (one of the odor measurement methods)', 'air dilution olfactory method' was introduced, and in order to supplement the limit of the 'air dilution olfactory method', instrumental method was introduced as well, and all of the effort is to improve the measurement method using scientific techniques.

Based on the operation of Malodor Prevention Act, regulation for the recommendation or release of the odor management area designation was prepared, and

also, Malodor Prevention Act was modified on February 5, 2011 to manage the odor discharging source effectively with compulsory technical diagnosis for odors in public environment facilities. In the meantime, following the enforcement of Malodor Prevention Act, customized technical support for the Korea Environment Corporation has been being progressed since February 20, 2006 to improve the odor reduction performance of petty odor discharging business places and the air quality of odor vulnerable area through the technical diagnosis and support for the industrial classification process condition of odor discharging business places, discharge characteristics, preventive technology with optimized efficiency, operation of the processing technology etc.

Odor Management by Local Area

Odor management policies suitable for the local area situation and condition can be promoted by enforcing the authority and responsibility of local government, and the governors of cities & provinces or the chairman of metropolis can appoint the odor managing area and can set up the strict emission quality standard. Based on this, 25 areas including Ulsan, Mipo, Onsan national industrial complex etc. were appointed on the 17th of Mar. 2005 and since then have been being managed as the odor management area.

The governors of cities or the chairman of metropolis needs to check whether the odor is being managed properly matching to the appointment purpose of the odor management area by investigating the concentration in the air and the level of odor of designated odor material periodically and also, they can set up the strict emission quality standard.

In case odor discharging facility is to be installed within the odor management area, it is compulsory to report the odor discharging facility to the governors of cities or the chairman of metropolis with the plan to prevent the odor such as odor control facility so that the odor is to be discharged with the amount less than emission

quality standard.

In order to support the odor management operation of the local government, the Ministry of Environment researched the odor managing policies for the petty business places and prepared the odor management instruction, and promoted the technical support for the odor vulnerable facilities. Also, the Ministry of Environment is making and distributing the odor management manual for each industry and promoting the construction project for green buffer zone in industrial complex from 2003 to reduce the inconvenience of the civilians around the place and to create pleasant environment by reducing the odor induced to the residential area.

Supporting Odor Reduction Technology and Follow-up Management

In order to support the odor management operation of local government, the Ministry of Environment has been providing a continuous technical support and follow up management to the small petty business places since 2006. This is to improve the odor management ability by supporting the customized technology for the odor discharging business places and to improve the environment of the industrial complex and business places by reducing the odor. Also, the effectiveness of odor management policy is being improved by analyzing & evaluating the results of the technical support and applying them to the national integrated odor control policies.

In the meantime, the conference for the cases of advanced odor management was hosted and there was a chance to share the information with the odor specialists from local government, academic world and industry. From this conference, excellent cases and odor reduction technologies were spread over, and also there was a chance to introduce the technical support to petty business places and technical diagnosis system for the public environment facilities, all of which are conducted by Korea Environment Corporation.

[Table 2-6] Technical Support and Result of the Follow-up Management

(unit: number of business sites)

Classification	Total	2007	2008	2009	2010	2011	2012
Technical support plan	850	100	150	200	200	200	200
Result of technical support	918	115	153	220	220	210	204
Result of follow up management	255	36	34	60	65	60	60

2.2.1.3 Policies for Vehicle Exhaust Gases

In order to reduce one of the most serious air pollution problems (particle materials) in the capital area, the production of car related reduction measures are being promoted continuously to enforce the production car emission quality standard. However, it is pointed out that nobody can be free from the limit without reducing the particulate materials discharged from the diesel vehicles.

Therefore, the Ministry of Environment is applying more stringent emission quality standard to the warranty expired diesel vehicles (particular diesel vehicles)

based on the 「Special Act on Seoul Metropolitan Air Quality Improvement」, and if the vehicles do not meet this standard, they should attach the reduction device (DPF, p-DPF, DOC), or they have to modify the engine to low pollution one or early scrappage.

Since 2004, low pollution devices have been attached to the diesel vehicles in government offices and non-profit corporation, and the low pollution engine or early scrappage demonstration project has been promoted. Low pollution modifications for 715,000 vehicles have been completed until 2012.

[Table 2-7] Status of Pollution Reduction of Diesel Vehicles in Capital Area

(unit: vehicles)

Classification	Total	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	715,466	2,734	41,313	119,313	149,761	102,173	85,617	86,284	77,110	51,161
DPF	241,010	479	18,054	25,684	40,334	21,445	22,002	48,043	43,193	21,776
DOC	146,492	1,022	16,573	62,234	53,461	7,076	5,945	181	-	-
Engine modification	184,317	1,233	6,557	28,769	35,788	45,383	31,759	22,469	8,999	3,360
Early scrappage	143,647	-	129	2,626	20,178	28,269	25,911	15,591	24,918	26,025

In the meantime, since 2010, Low Emission Zone (LEZ) has been allocated at the air quality management area and the operational restriction will be applied to

the vehicles without low pollution measures such as exhaust gas reduction device.

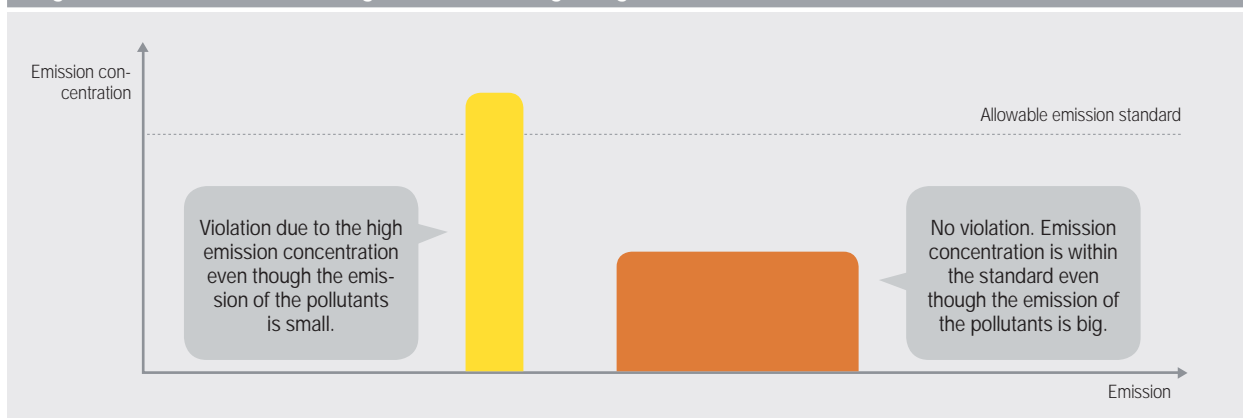
2.2.1.4 Total Air Pollution Load Management System

Introduction of Total Air Pollution Load Management System in Business Places

The purpose of the total air pollution load management system is to improve the atmospheric environment of the capital area and the ground of this system is Special Act on Seoul Metropolitan Air Quality Improvement which was enacted in December 2003. The demonstration project was conducted in 100 business places during May 2006 ~ Mar. 2007. After the total air pollution load management system was conducted in 118 Class 1 business places in Jul. 2007, the management system was expanded to approx. 300 Class 2 business places in 2010. The target air pollutants for the management are nitrogen oxides and sulphur oxides.

The total air pollution load management system is the advanced environment management system that controls the emissions of pollution materials by converting the existing post concentration (ppm, mg/m^3) management to preventive total amount (kg) management, and the purpose of this system is to control the air pollution materials within the proper environment limit. This is an excellent environment management policy that reduces the energy use and air pollutants simultaneously by inducing the pollution materials to be emitted within the allocated amount by allocating the allowable emissions by year. This system is being executed separately for the local total maximum load of metropolitan council and total maximum load of business places.

[Figure 2-3] Problem of the Existing Concentration Regulating Method



The Requirement of the Total Air Pollution Load Management System in Business Places

Comparing the air quality of capital area with main cities of OECD countries, Korea ranks the lowest and the pollution is 2 ~ 3 times higher than the others. In the meantime, the excess rate of the ozone warning, nitrogen dioxide and fine dust is more serious than the other cities. Moreover, the annual social cost for the air pollution reached to 10 trillion won, which is a very urgent issue to improve.

Therefore, in order to improve the air quality, the Ministry of Environment has been promoting the special measure to improve the air quality of the capital area since 2005, but the effect of various measures is not good at all because of the increase of pollution sources such as vehicles and business places. For the case of business places, since there is a limit with the existing post concentration management due to the increase of the pollution source despite of the enforcement of allowable emission standard of air pollutants,

preventive advanced environment managing system
- Total air pollution load management system for business places - was introduced and conducted in July of 2007.

Progress of the Total Pollution Load Management System

The total air pollution load management system for business places was planned to be conducted by setting the target materials such as nitrogen oxides, sulfur oxides and dust. However, for the case of 'dust', since it is difficult to set the allocation standard of emission amount and the contribution rate is very low compared to the whole emission amount, the allocation of total allowable emission amount was postponed in December 2007 and the 'capital area air environmental management committee' decided that dust is excepted from the management target substances in Aug. '09. Dust was finally excepted from the target substances through the modification of the Special law and this system is being applied to nitrogen oxide and sulfur oxides now. Also, the enforcement plan for the allocation of total allowable emissions for business places was prepared during Jul. ~ Dec. of 2007 and was enforced on January 1. 2008 with the 118 business places where the annual emission is more than 30 tons (nitrogen oxides) and 20 tons (sulfur oxides).

Since 2010, the business places are expanded to 300 by including the mid size business places (Class 2) that emits 4 tons of air pollutants (nitrogen oxides and sulfur oxides) a year. It is analyzed that the Class 1 and 2 business places emit approx. 60% of air pollutants that point pollution sources in the capital area emit

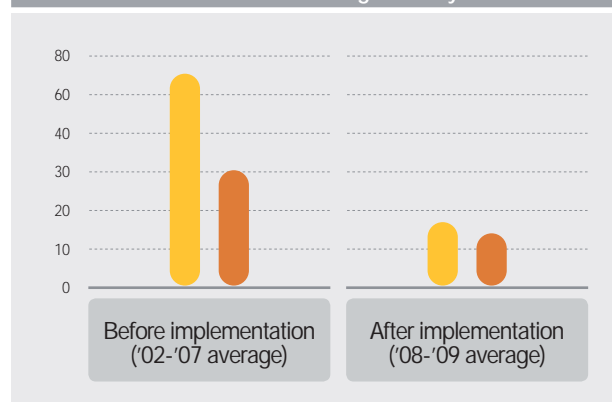
Contents of the Total Air Pollution Load Management System in Business Places

In order to settle the total air pollution load management

Results of the Total Air Pollution Load Management System

In order to settle the first stage total air pollution load management system for the Class 1 business places fast, the Ministry of Environment educated the target business places and hosted the briefing session periodically. They also supported the technologies, which induced the improvement of air pollution preventive facility and early installation of optimized preventive facilities etc. Finally, total allowable emission amount for each business place has been being observed and as a result, 25,779 tons of nitrogen oxides and 2,358 tons of sulfur oxides have been reduced. In the meantime, the net benefit was analyzed to be 107.4 billion won, which means that the economic effect is very high as well.

[Figure 2-4] Before and After Implementation of the Total Air Pollution Load Management System (1000 tons)



system fast and manage effectively, the Ministry of Environment established and operates the 'total air pollution load management database' - the 2-way online management system between government and business places. With this online system, the air pollution emission for each business place is calculated every month and the information is transmitted on a real time basis from the Smokestack Tele-Monitoring System (TMS) installed on the outlet (chimney) and grasp the situation such as the status of air pollutants emission in

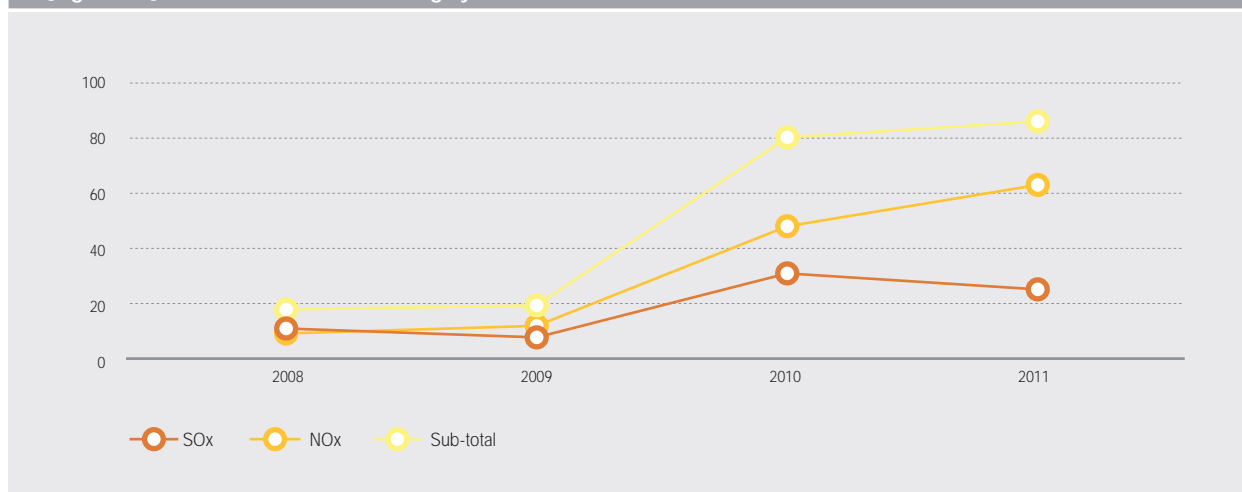
the capital area. Also, in order for the early settlement and stable management of the total air pollution load management system, scientific and effective follow up management is required, and the 118 class 1 business places that have been in the total air pollution load management system since 2008 are being evaluated that they are in stable management stage, and the class 2 business places that have been included in the management target since 2010 are being enforced with the total air pollution load management system related education, briefing session and technical support.

Emissions Trading of Air Pollutants

In the meantime, the total air pollution load management system is being reinterpreted as the flexible environment controlling method instead of

regulation while providing the incentives such as the relaxation of existing fuel regulation and allowable emission standard, and the business places that reduced the emission by installing the facilities such as optimized preventive facilities etc. can create benefits as well through the Emissions Trading. In order to vitalize the Emissions Trading, the Ministry of Environment has been operating the 'electronic trading system for the emissions of air pollutants' since December 2009 and as a result of the effort for the revitalization of Emissions Trading such as the preparation of the announcement related to the Emissions Trading in Dec. 2011, the trading is sharply increased such that 18 trades (1,010 ton / 29 mil won) in 2008, 80 trades (2,296 tons / 164 mil won) in 2010 and 88 trades (2,296 tons / 164 mil won) in 2011.

[Figure 2-5] Number of Emission Trading by Year



Future Promoting Plan

In order to be prepared for the termination of first allocation (2008~2012) of the first stage business places during 2011~2012 and for the 2nd allocation during 2013~2017, rational allocation coefficients and standard are being prepared while reviewing the

types and efficiency of the proper preventive facilities, the problem of the existing allocation method and the change of the technology of the preventive facility and comparing the technologies between the domestic and abroad air pollutants optimized preventive facilities.

2.2.2 Nomination of Special Area and Specific System

2.2.2.1 Introduction of Voluntary Agreement

Though the emission of air pollutants is significantly improved with the effort of government, citizens and organizations, degressive environment that the civilians felt does not seem to be satisfactory. Therefore, organizations need to set up the goal by themselves to reduce the air pollutants and try hard to reduce the emission of air pollutants during the agreed period of time, which is called a Voluntary Agreement.

Until now, there were Voluntary Agreements with 4

areas such as Gwangyangman, Ulsan area, Daesan/Dangjin area and Shipbuilding industry VOC. They made an agreement for 5 years period from the year 2006 or 2007 to promote the air pollution reduction. They made an agreement with Gwangyangman, the air preservation special countermeasure area and Ulsan, the biggest industrial area in Korea in 2006, and they set up business places reduction goal for the VOC substances in Daesan / Dangjin area and Shipbuilding industry in 2007.

[Table 2-8] Voluntary Agreement for the Reduction of Air Pollutants

Agreement name	Period	Agreed date	participants	Target substances	Reduced amount	Invested amount
Gwangyangman	'06~'10 '12~'16	'05.10.28 '12.1.13	15 17	SOx, NOx, Dust SOx, NOx, Dust, VOC	20,829 ton (20000 ton)	40.579 bil won (15 bil won)
Ulsan	'06~'10 '12~'16	'06.3.29 '12.3.9	23 23	SOx, NOx, Dust SOx, NOx, Dust, VOC	27,653 ton (7,200 ton)	10.549 bil won (43.59 bil won)
Daesan /Dangjin	'07~'11	'06.12.8	10	SOx, NOx, Dust, VOC	45,991 ton	77.81 bil won
Shipbuilding industry VOC	'07~'11	'07.11.28	9	VOC	19,948 ton	64.70 bil won
Daesan / Dangjin	'07~'11	'06.12.8	10	SOx, NOx, Dust, VOC	45,991 ton	77.81 bil won
Shipbuilding industry VOC	'07~'11	'07.11.28	9	VOC	19,948 ton	64.70 bil won

2.2.2.2 Reduction of Air Pollutants Emission through Voluntary Agreement

The Ministry of Environment evaluates the execution results for the Voluntary Agreement business places, and as a result of evaluation, all of the 4 Voluntary Agreement were analyzed to have a significant air pollution reduction effect during 2006 ~ 2011.

The execution evaluation for the Voluntary Agreement is consisted of 3 stages such as the Ministry of Environment self evaluation, evaluation by specialists and evaluation by statistics based on the report that the business places submit. The evaluation is focused on

the points that if the air pollution substances reduction goal was achieved, investment for the reduction project, efforts of the business places for the reduction of emission, effective investment rate and efficiency of the environmental investment. During the Voluntary Agreement period, NOx from Gwangyangman, Dust from Ulsan, VOCs from Dasan/ Dangjin were reduced significantly and the reduction rate by each area is that goal 13% actual 15% for Gwangyangman, 15% 18% for Ulsan, 18% 17% for Dasan / Dangjin and 30% 49% for Shipbuilding industry VOCs, which

means that most of the areas achieved the reduction goal and the air quality of the areas was improved significantly.

In addition, in order to reduce the emission of air pollutants, the Voluntary Agreement business places invested more than 6,500 billion won for the environmental facilities such as desulfurization & denitrification facility, dust collecting system, fuel change, Regenerative Thermal Oxidation (RTO) and Leak Detection and Repair (LDAR) etc.

[Table 2-9] Reduction of Pollution Substances by Voluntary Agreement

Agreement name	Period	Reduced amount (ton)					Remarks
		Total	Dust	NOx	SOx	VOC	
Gwangyangman	'06~'10	20,829	651	14,082	6,096	-	
Ulsan	'06~'10	27,653	1,236	13,708	12,709	-	
Daesan / Dangjin	'07~'11	45,991	586	30,678	11,893	2,834	
Shipbuilding industry VOC	'07~'11	19,948	-	-	-	19,948	

As a result of promotion of Voluntary Agreement, though the reduction effect of the air pollutants is very good with the aggressive participation of the organizations concerned and civilians care and support of government, the Ministry of Environment judges that there is more chances to reduce the pollution substances in the future. In order for this, the Ministry of Environment is deducing the

reduction goal that fits to the characteristics of each local area based on the 1st stage evaluation result and promoting the 2nd stage Voluntary Agreement with Gwangyangman and Ulsan area during the period of 2012 ~ 2016 through close cooperation, and is trying to improve the clean and clear air quality continuously by making an agreement with Shipbuilding industry VOC.

2.2.2.3. Regulation by Each Area

VOCs regulating area can be distinguished as 'Special Countermeasure Area' and 'Air Environment Regulation Area' and the management target will be different by each area. As a 'special countermeasure area', Yeosu industrial complex area has been regulated since 1996 and Ulsan & Mipo Industrial complex has also been regulated since 1997. Starting from Jan. 2001, laundry, warehousing & storage, waste storage & processing

facilities have been added to the regulation targets. In air environment regulation areas, the regulation requires the measures for the suitable prevention & control facilities such as sealing, Local Ventilation Equipment, VOCs prevention facilities etc. As of 2012, 11 types of business such as petroleum refining, petrochemistry manufacturing, oil reservoir, gas station and laundry are included in this regulation target.

[Table 2-10] Regulation Target Type of Business in Air Environment Regulation Area and Special Countermeasure Area

Classification	Area	Regulation target type of business	Relevant statutory provisions
Air environment regulation area	Seoul, Incheon, Kyunggi, 15 Cities, Busan, Daegu	manufacturing, oil reservoir, gas station, laundry, organic solvent & paint manufacturing, Automobile manufacturing, shipbuilding & large steel structure manufacturing, other manufacturing, waste storage & processing facility, primary metal industries, storage and warehousing	item 1, article 45 of Enforcement of Clean Air Conservation Act and Ministry of Environment Notification number 2009-173
Special countermeasure area	Ulsan & Mipo Industrial Complex, Yeosu Industrial Complex		

2.2.2.4 Reduction of Paint VOCs

The VOC emission from organic solvents covers more than 60%, which needs to have a systematic management measure and the plan for the reduction of VOCs in organic solvents area was established in May of 2003.

As a part of the plan, the policy to reduce the organic solvent in paint was promoted. 7 major domestic paint manufacturers made the voluntary agreement and had the manufacturers reduce the content of the organic solvent voluntarily. On the other hand, in order to expand the low VOC paint market, criteria for the VOC content was set in 2005 for the paints supplied to the

capital area, and the standard to be applied in 2010 was prepared in 2007. Also, the VOC regulation target materials to be applied to the VOC content standard in paint was changed from 37 kinds to TVOC (Total VOC) on July 1, 2009.

In the meantime, the Clean Air Conservation Act was passed the Assembly plenary session (May 2, 2012) and the VOC content standard will be expanded to the whole nation around June of 2013. Also, the VOC content standard for the paint for shipbuilding will be prepared separately to reduce the VOC emission from the organic solvents.

2.2.2.5 VOC Reduction from Gas Station

In order to reduce the VOC generated from the gas station, the preventive facilities (Oil mist recollecting facility) for Stage I (the stage from the manufacturing facility to the storage facility in gas station) was completed by the end of Dec. 2004, and the preventive facility for the Stage II (from the storage facility to the fuel tank of vehicles) became compulsory in 2007 and the oil mist recollecting facilities were installed from

2008 to 2012 in stages depending on the gasoline sales amount.

Also, 「Clean Air Conservation Act」 will be modified to install the Stage I and Stage II preventive facility from 2015 to 2019 for the gas stations located in over 500,000 population mid & large cities besides the environment regulation areas and special countermeasure areas, and this will be expanded to the other areas as well.

2.3 Key Issues

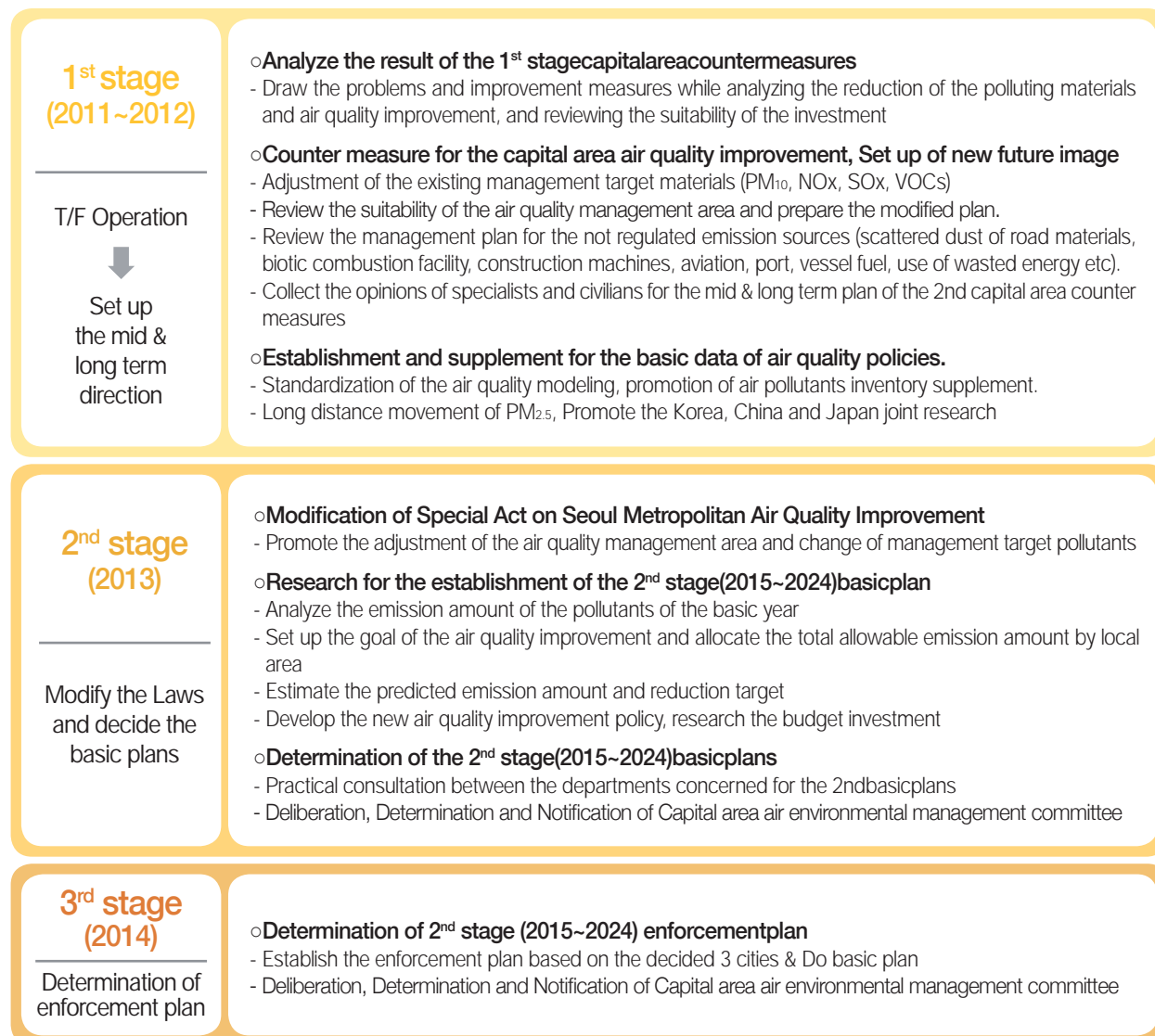
2.3.1 The Second Measures in the Capital Area

For NOx & VOCs, the effect of the improvement is not enough or not clear. Because of the low NOx burner project, 2,805 tons of NOx was reduced from 2006 to 2011 but due to the increase of the traffic of vehicles, the result was not satisfactory despite of various automobile low pollution plans. In the meantime, for VOCs, the result is not enough due to the lack

of practical counter measures for the use of organic solvents or scattering emission sources.

Therefore, in order to establish and promote the basic plan for the control of the capital air environment, 'environmental welfare' concept is planned to be introduced to develop a happy-life policy which can be sympathized with the general public using new political

[Figure. 2-6] Promotion Schedule to Establish the 2nd Stage Basic Plan



paradigm so called 'health risk' and this is planned to be promoted intensively.

A task force team was constructed to establish the basic plan of the 2nd stage and the special law modification and basic plan for the air quality improvement of the capital area will be prepared through the collection of various opinions from public hearing, expert forum etc. while having the close cooperative network with the specialists and organizations concerned such as

civil group, central office group, local government, academic world, related organizations, etc. in 2013. After then, this plan will be deliberated by the capital area air environmental management committee and will be decided and notified. In the meantime, the execution plan by each of the local government (3 cities & province) based on the basic plan will be established in 2014 and the second air environment management plan in the capital area will be practically executed.

2.3.2 Risk Considered Enforcement of Air Pollutants Management

2.3.2.1 VOC (Volatile Organic Compounds) Management

Volatile Organic Compounds (VOCs) are the substances that exist all of the domains we live, but the internationally united definition or category of the target substance is not prepared, yet. Therefore, the definition or category of VOCs may be slightly different from each country or location depending on the background of VOCs regulation and ozone pollution substance in the air.

In general, VOCs are the hydrocarbon substances emitted into the air in gaseous form in room temperature & normal pressure. These substances are defined as 'petrochemical, organic solvents or other materials that are notified by the Minister of the Ministry of Environment after discussion with the chief of a central administrative

agency' on the Clause 10, Article 2 of the Clean Air Conservation Act. In the meantime, in accordance with the Volatile Organic Compounds designation notification (the Ministry of Environment Notification No. 2009-198, August 28, 2009), 37 substances including acetaldehyde, benzene and gasoline are the regulation targets in VOCs emission facilities, and in other target places besides the emission facilities (VOCs content standard for paint etc.), the "organic compound that has the minimum boiling point under 250°C at 1 atmosphere" (except the substances that the chief of National Institute of Environmental Research appointed and notified such as carbonic acid and its bases) is regarded as the target of the regulation.

2.3.2.2 PM_{2.5} Management

The fine dust smaller than 2.5 μ m is much more harmful to the human body than PM₁₀ that was defined as the air quality standard. Therefore, in consideration of the fact that population aging is more rapidly taking place in Korea, the possibility of increase of social burden by the lung disease and cardiovascular system disease is anticipated and in order to minimize the risk for the citizen's health by the fine dust, the air quality standard for the PM_{2.5} needs to be created.

Creation of the air quality standard for fine dust (PM_{2.5})

- Because the fine dust particle size of PM_{2.5} is much smaller than PM₁₀ which was defined as the air quality

standard, they are more harmful to health if inhaled into a body. However, as no air quality standard for this size exists, there is a limit in preparing the systematic reduction plan.

- Therefore, besides the existing air quality standard for PM₁₀ fine dust, a new air quality standard is created for PM_{2.5} with the details that less than 25 μ g/m³ for annual average value and less than 50 μ g/m³ for 24 hours average value.

- By creating the air quality standard for PM_{2.5}, more harmful PM_{2.5} generation source can be systematically managed through the detailed reduction plan.

03 Water



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3. Water

3.1 Management of Water Environment

3.1.1 Current Status

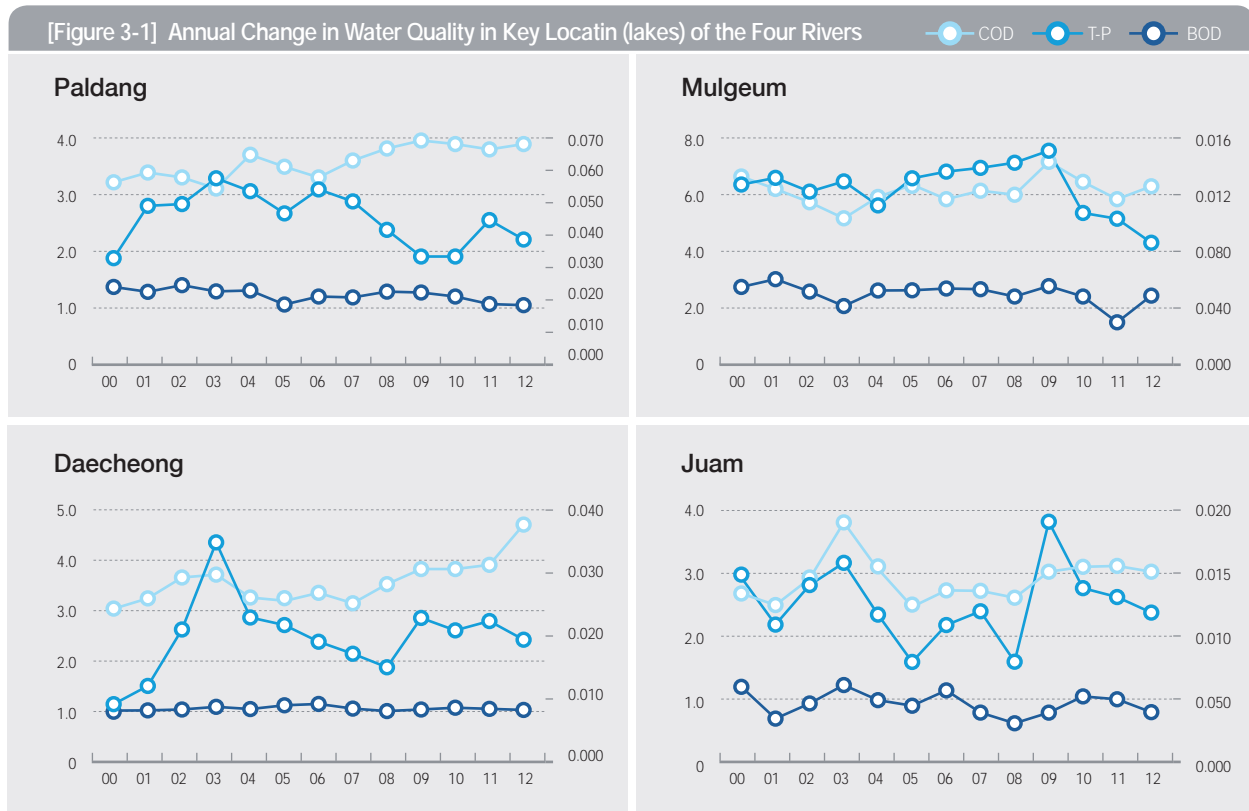
3.1.1.1 Changes in Water Quality in Key Locations of the Four Rivers

Due to the implementation of Comprehensive Water Quality Management Measures in 1996, Comprehensive Water Quality Improvement Measures on the Four Major Rivers (1998-2005) and Master Plan for Water Environment Management (2006-2015), BOD (Biological Oxygen Demand) levels in public waters has improved largely. However, COD (Chemical Oxygen Demand) levels show either slight or unsatisfactory improvement when compared to BOD due to the inflow of non-degradable organic pollutants from nonpoint source (NPS) pollution and the increased use of chemical compounds. Moreover, with the algal bloom

and decay, Total Phosphorus (TP) concentration, the limiting factor of organic productivity, also increased.

The targets of water environment quality by 2015 were set as follows - (1) to achieve 'good' water quality (BOD less than 3 mg/l) in over 98 of total 115 mid-watershed regions at rivers and (2) to improve the water quality in 46 out of total 49 lakes, which are mainly used as drinking water sources, by reducing COD below 4mg/l. As a result, by 2015, 85% of mid-watersheds and 94% of major lakes in the country will reach good water quality.

[Figure 3-1] Annual Change in Water Quality in Key Locatin (lakes) of the Four Rivers



3.1.1.2 Results of the 'Survey and Evaluation of Aquatic Ecosystem Health'

Since 2007, the survey on aquatic ecosystem has been proceeding at the four major rivers and other main rivers on following parameters - attached algae, fish, benthic macro-invertebrates, inhabitation/waterside environment, and organism's habitat. The ecological health status is evaluated and categorized as four different grades (Optimum, Fair, Average,

and Poor) by using quantified composite index. In 2012, the aquatic ecosystem was assessed at 960 locations (segments) countrywide. The results showed that the proportion of grade 'Fair' or 'Optimum' for benthic macroinvertebrates and inhabitation/riparian environment was high, whereas it appeared low for attached algae and fish.

3.1.2 Policy Overview

3.1.2.1 Water Environment Management Policy

Comprehensive Measures for Supplying Clean Water

In 1993, the Comprehensive Measures for Supplying Clean Water (1993-1997) was established for packaged implementation of water management policies including water quality conservation, water resources management, drinking water supply, etc. The measures, which is established as a five-year plan, includes building wastewater treatment plants (WWTPs) at a cost of 2.16 trillion Korean won (won) by 1996 and designating the two important drinking water sources as the 'Special Water Conservation Area'. The total cost of the comprehensive measures was won 15.9 trillion.

Comprehensive Water Quality Improvement Measures on the Four Major Rivers

The Comprehensive Water Quality Improvement Measures on the Four Major Rivers (1996-2005) was aimed at improving the quality of all drinking water sources to Grade II or better, enlarging the water reserve rate to 9%, and increasing the Multi-Regional Water Supply System ratio to 65%. 26.9 trillion won was invested in building the environmental infrastructures including WWTPs to achieve 80% of sewage population and distribution rate. New watershed management programs were introduced

to build sustainable watershed communities including Total Water Pollution Load Management System, Designated Riparian Buffer Zones, Water Use Charge & Watershed Management Fund, Land Purchase Project, and Civilian Water Quality Monitoring Support System.

Master Plan for Water Environment Management (2006~2015)

A Master Plan for Water Environment Management (2006-2015) was established in September 2006, as the follow-up of "Comprehensive Water Quality Improvement Measures on the Four Major Rivers". The entire country was divided into 4 large-watershed, 117 mid-watershed, and 840 small-watershed regions. The master plans for large-watershed were drawn up by the Ministry of Environment (MOE) and those for mid-watershed and small-watershed were established by Regional/River Basin Environmental Office and local governments, respectively. According to the plan, by 2015, over 85% of all rivers in the country will be improved to be 'Fair' or 'Optimum' and 25% of all damaged rivers will be restored into ecologically healthy rivers. And 30% of riparian zones at drinking water sources will be turned into Riparian Ecological Belts.

3.1.2.2 River Basin Management

Total Water Pollution Load Management System

The first stage of Total Water Pollution Load Management System was carried out during 2004-2010 in total 66 cities and counties (26 on Nakdong River, 23 on Geum River, and 17 on Yeongsan River and Seomjin River). It appears that the target water quality and the annually allocated pollution load are generally in compliance with the initial plan. And local governments show interest in the system. Therefore, Total Water Pollution Load Management System is considered to be confirming its status.

Designated Riparian Buffer Zones

As storm water runoff can carry NPS pollutants directly into the surface water and deteriorate water quality, certain areas are designated Riparian Buffer Zone for intensive management. In the Designated Riparian Buffer Zones, the construction of new facilities such as restaurants, lodgings, public baths, factories and livestock barns are restricted to reduce the influence of both point source (PS) and NPS pollutants. The Ministry of Environment is gradually purchasing the land at Designated Riparian Buffer Zones in consultation with owners. The purchased land is restored to riparian green areas and served as the buffer zone for the control of NPS pollutants.

Land Purchase System

Land Purchase System is a program to purchase land or buildings located in areas that have a great impact on the water quality such as those in riparian buffer zones and other water source protection areas, in consultation with owners. The main purpose of the program is to mitigate the increased water pollution source and to create riparian buffer for water quality improvement and protection of ecosystem. Purchased land is to be used in improving water quality by creating habitats, wetlands, shore with vegetation and forest. Land Purchase System has been carried out in Han River watershed since 2000, and in other three major river watersheds since 2003. As

of late 2011, 1.20 trillion won was invested to purchase 45,724,000 m² of land.

Water Use Charge & Watershed Management Fund

According to the 'use-prays-principle', the Water Use Charge is applied to the end users of raw or purified water delivered from public waters. The charge is proportional to the amount of water use. The charging rate (won per ton) is determined and adjusted every two years by Watershed Management System, the representative decision-making body for the four rivers basin management. Watershed Management Fund is grounded on Water Usage Charge. Han River Watershed Management Fund was created in August 1999 followed by the fund for the other three river watersheds in 2002. Since 2003, water quality improvement project and residential community support project have been carried out. The fund is used for supporting water quality improvement projects by local governments in the upstream of the drinking water sources, supporting the residential communities in the designated areas, and purchasing land adjacent to riparian areas, in order to improve water quality and protect drinking water sources.

Drinking Water Source Management Area Support System

Drinking Water Source Management Area Support can be divided into residential community support and local government support. Residential Community Support System was introduced to minimize the disadvantages of regulation and encourage active cooperation and participation for drinking water sources management by improving the living conditions and income levels of local communities who suffer from an assortment of regulations on the designated areas. The Watershed Management Fund partially supports to construct or operate the environmental infrastructures including WWTPs and advanced wastewater treatment processes, and sewage pipelines of the local

governments in the drinking water source areas. This arrangement alleviates the financial burden of local governments and promotes the construction and operation of the environmental infrastructures, which result in the positive impact on water quality management in drinking water source areas.

Civilian Water Quality Monitoring Support System

Watershed Management Fund supports civilian water quality monitoring activities in order to encourage

voluntary participation of the private sector and the implementation of basin management based on partnership. Candidates for the support program are local NGOs which dedicates to activities for environment conservation. Support priorities are the trusted and well-recognized organizations, those with impressive performance and experience in environment conservation activities, and the organizations which contributes to nation and community in solving environmental problems.

3.1.2.3 Lake Water Quality Management Measures

Lake Water Quality Survey

Currently, the country has 17,760 lakes, most of which are artificial lakes created by the construction of dams and serve as agricultural reservoirs. Because they are structured as closed or semi-closed water space, most lakes have low self-purification capacity compared to rivers and the high potential of nutrient accumulation. So, they are very susceptible to eutrophication and other secondary pollutions. To establish and implement appropriate water quality and ecosystem conservation measures, water quality is monitored regularly (every year or every three years) at the lakes with a daily water intake of greater than 300,000 tons and a full water level area of over 0.5 km². The survey results are used as basic data for water quality management. At present, target water quality standards and deadlines on COD, TP, and TN (Total Nitrogen) are set at 49 major lakes.

Prevention of Algal Blooms

To control algal blooms, continuous efforts to prevent nutrients such as nitrogen and phosphorus from entering the water body are being made. The effluent water quality standards of the environmental infrastructures continue to be strengthened, while the advanced wastewater treatment for nutrient reduction are expanded in phases. From 2009, as part of Water Quality Improvement Measures on the Four Major Rivers, TP treatment facilities were installed at all the

WWTPs in the four major river basins. After 2012, the effluent standard of TP was strengthened to one-tenth as compared to the previous requirement. Local authority officials and civilian environmental groups at each river basin are making efforts to monitor and restore the river environment.

Intensive management of Selected Reservoirs

Water Quality and Ecosystem Conservation Act was amended in 2012 to designate the reservoirs required intensive management, and the government will devise and implement measures from 2013. Reservoirs with a capacity of over 10 million m³ or agricultural ones with Grade IV ('Slightly Poor') water quality, or other reservoirs worse than Grade III ('Average') will be classified as the targets of the intensive management.

Algae Alert System

To early alarm the massive algal blooms and prepare appropriate preventive countermeasures, Algae Alert System was established in 1998 at four important lakes - Paldang Lake, Daecheong Lake, Chungju Lake, and Juam Lake - which are used as major drinking water sources. The Algae Alert System continues to be extended to other lakes which is highly susceptible to algal blooms. As of late 2011, the system is established and operated at 22 lakes.

Water Quality Forecasting System

In order to prevent water quality deterioration, water quality forecast has been in service at 16 weirs of the four major rivers since 2012. The system provides chlorophyll-a concentration and water temperature for next 7 days. The short-term (a week later) and long-term (3 months later) forecasts are provided to water management agencies, and the agencies prepare for water use and water quality deterioration. The system can instantly respond to the variable climatic conditions and it can be viewed as an example that conserve water quality and aquatic ecosystem against climate change with the scientific water quality forecasting methodology.

Estuary and Lagoon Management Measures

In addition to the estuaries of the five major rivers, there are a total of 329 estuaries in thirteen national

ivers and 316 local rivers. And there are 18 lagoons including Gyeongpo Lake in Gangneung on the east coast alone. For the management of estuaries and lagoons, their scopes were delineated and the survey and assessment for ecological integrity has been continuously carried out on 329 estuaries in local rivers since 2006. Moreover, Seomjin River Estuary Program (2007-2008) was launched, which is the country's first demonstration project of the estuary management. During the program, ecological health status was monitored at major estuaries, and comprehensive measures were prepared and implemented for damaged ones. To solve the marine debris problems during floods, cost-sharing agreement was concluded between local government of upstream and estuaries. Then the national government partially supports the cost of managing marine debris including collection, storage, disposal etc.

3.1.2.4 Four Major Rivers Restoration Project

Among total 66 mid-watershed regions at four major rivers, 34 watersheds were selected due to increasing trends in pollution or adjacent large drinking water sources. From 2009, intensive investment was made at the selected watersheds to improve water quality and construct the environmental infrastructures including WWTPs, TP treatment facilities, animal manure treatment

facilities etc. It is noteworthy that WWTPs are equipped with TP treatment facilities and the effluent standards of TP are strengthened by maximum 20-fold from 2012.

In Korea, the seasonal variability of rainfall is relatively high and there is low precipitation and river flow during every dry season. And water quality deterioration

[Figure 3-2] Examples of Best Management Practices (BMPs) for Nonpoint Source (NPS) Control



Ecological wetland at a detention pond



Vegetation Buffer at a farmland

repeatedly occurs as river flow decreases at the season. To alleviate the problems, uncommitted river flows has been secured through the expansion of 96 agricultural reservoirs and the construction of 3 new dams. Since 2012, Water Quality Forecast System has been in operation. If the system expects the water quality deterioration during dry season, water management agencies can jointly discuss the preventive measures such as securing river flows and reducing the pollution loads.

The contribution of NPS pollution keeps on increasing with urban developments and agricultural activities. To control the NPS pollution, the Best Management Practices (BMPs) has been installed nation-wide since 2008. Through the Four Major Rivers Restoration

Project, 23 ecological wetlands and riparian buffers have been constructed to control NPS from alpine field runoff, urban storm water etc. In 2012, the 2nd Comprehensive NPS Control Measure was prepared and launched, which is focused on the four major river basins. Animal manure from small cattle sheds served as important NPS. As countermeasures, Animal Manure Management Initiative was prepared. It enables to amend the related laws and to expand the manure treatment facilities. Furthermore, the farm lands at floodplain were recovered and compensated for abandonment of farming. While fertilizers and pesticides could directly enter the water body from the floodplain farmland in the past, enhanced protection of water quality and ecosystem is expected after the floodplain recovery.

3.1.2.5 Source-Specific Management Measures

As of late 2010, there are 48,266 units of wastewater discharging facilities in Korea, which generate daily 5,229 tons of industrial wastewater. The number of hogs and cattle are approximately 9.88 million and 3.35 million, respectively, and they generate daily 118,000 tons of animal manure.

Industrial Wastewater Management Measure

The toxic chemicals in the industrial effluent and public water are being regularly monitored. The frequently detected compounds with high toxicity are designated as Water Pollutant or Priority Pollutant List and effluent standards are developed. It results in the suppression of the industrial use of the toxic chemicals and the inflow into public water of the pollutants. Recently, acrylamide, a potential carcinogen, is included in the Priority Pollutant List, and the compounds regulated by the effluent standards were expanded from 35 to 42 chemicals, including 1,4-dioxane and vinyl chloride.

Ecotoxicity Management System was established for the integrated management of the chemical toxicity in the industrial effluents. To develop the system, the

research projects including "The source detection and mitigation of ecotoxicity on different industrial classification and facilities (from 2007)" were carried out. The ecotoxicity standard of industrial effluent was proposed and technical assistants were provided for the facilities which exceed the ecotoxicity standard. Public hearing and forums were held at each region to make the system foundation secure. If the ecotoxicity standard is exceeded by salts, the industrial facilities which discharge their effluent into port and coastal waters and those established prior to the enforcement of the system were exempted (enforcement regulation in Apr. 2010). And the procedure and method for proving the ecotoxicity by salts were announced (Jul. 2010).

Animal Manure Management Measures

Animal manure takes up 1% of total wastewater and accounts for 37% of water pollution. Compared with its significant contribution, its management has been unsatisfactory so far. Currently, animal manure is managed in accordance with <Act on the Management and Use of Livestock Excreta> and public animal

manure treatment facilities have been constructed to treat the waste from stock farmers. They are classified into three different groups by size of livestock operation – authorization-required, registration-required, and registration-free. Installation of animal manure treatment facility is obligatory to the authorization- or registration-required stock farmers and effluent standard is also applied.

To facilitate the communication between public agencies and livestock industries, various types of workshops and public hearings on animal waste management are prepared. Also, every year a joint inspection is conducted to reinforce the animal manure management, while grievances are figured out and suggestions are collected from local farmers in each quarter. With the voluntary agreement between local governments and Korea Pork Producers Association, autonomous inspection system is established and the results are regularly disclosed through local bulletins like neighborhood meeting newsletter.

Starting in 1991, to alleviate the stock farmers' burden of disposing of animal manure as well as to improve water quality, national budget has been provided to construct and operate public animal manure treatment facilities at each local governments (as of late 2012, 89 facilities (10,400m³/day) in operation and 23 facilities (2,500m³/day) installed or being expanded). New approach which regards the animal manure as resources, not wastes, is adopted. A public treatment facilities capable of generating biogas and liquefied fertilizer as well as purification were constructed as a demonstration project (in 2010, 4 demonstration projects for utilizing the intermediate processed water as liquefied fertilizer, and between 2011 and 2012, 7 demonstration projects for constructing local-integrated animal manure management centers)

Nonpoint Source (NPS) Management Measures

As of 2003, the BOD load from NPS at the four major rivers watersheds takes up around 52.6% of total BOD

pollution loads. As the increased development activities and expansion of urban areas, the contribution of NPS is expected to reach around 72% of total BOD loads in 2020.

In response, the 'NPS Comprehensive Management Measures at the Four Major Rivers' were established in March 2004). It deals with institutional reforms, R&D activities, demonstration projects of NPS treatment facilities and public relations. Through the measures, the diversified and systematic management of NPS was legitimately implemented at the state level.

Also 「Water Quality and Ecosystem Conservation Act」 was amended in March 2005. It gives the national and local governments an authority to manage NPS on imposes duty on large-sized development projects and wastewater discharging facilities to install NPS control facilities. Regulations on NPS management and environmentally friendly land use at the early stage of development projects were continuously incorporated in the 27 laws and guidelines including Environmental Impact Assessment (EIA), City Master Plan etc.

Aquatic Ecosystem Restoration Project

The government established '10-Year Plan for Restoring Ecological Streams' and has moved ahead with survey of ecosystem impairment, restoration of aquatic ecosystems, and R&D activities on ecosystem restoration.

Recently, the following projects are implemented in a systematic way including restoring the dried and covered-up urban streams, conserving flagship species at a stream, creating ecological corridors, matching a stream with an interested company, restoring ditches and rills at the upstream, etc. In September 2010, 'Mid- & Long-Term Plan for Implementing Ecological Streams Restoration Project' was established, which aimed to increase the proportion of the ecological streams from 45% to 51% by restoring around 11% (1,667 km) of the ecologically impaired streams (14,722 km).

3.1.3 Key Issues

3.1.3.1 Advancement of Water Quality Standards

Human Health Criteria

Currently, the country's environmental standards of water quality and aquatic ecosystems are determined for rivers, lakes, and underground water. The human health criteria (20 parameters) are applied to both rivers and lakes, while the residential environment criteria is differently set for rivers (9 parameters), and lakes (10 parameters). The residential environment criteria is composed of 7 grades in water quality which consider not only pollutants' concentrations but also the impacts on the living organisms in aquatic ecosystems.

Whether a river or lake meets the target standard is determined by the presence of any pollutant whose annual arithmetic average concentration exceeds the human health criteria. From 2007 when the target standards in human health were established, the water quality of 114 mid-watershed regions and 49 major lakes has met the target.

Three parameters have been added to human health criteria (total 20 parameters). To expand the number of parameters up to 30 by 2015, a phased monitoring

is carried out for the compounds with the highest risk potential. And to help citizens' understanding of water quality, an easy-to-see, scientific, and comprehensive classification on water quality and aquatic ecosystem has been introduced since 2007. The new classification composed of 7 grades from Very Good to Very Poor provides the narrative description on the characteristics and use of water body.

Adopting Total Organic Carbon (TOC) as Water Quality Criterion

Total Organic Carbon (TOC) is going to be established in water quality criteria. TOC is expected to manage the considerable part of non-biodegradable organic compounds which cannot be measured by the current criterion, BOD. It will result in the significant change on various standards of wastewater discharging facilities and WWTPs' effluents. 「Enforcement Decree of the Framework Act on Environmental Policy」 was amended to include TOC to the current parameters, BOD, COD, TP and pH. The new amendment goes into effect from 2013. River water quality of "Very Good" must not only meet BOD (below 1 mg/ℓ) and COD (2 mg/ℓ) criteria but also satisfy TOC criterion (2 mg/ℓ)

3.1.3.2 Advancing Industrial Wastewater Management System

Improving 'Wastewater Discharging Facilities Permit System'

For effective management, the wastewater discharging facilities are classified into authorization-required or registration-required ones based on the location of pollution sources or the properties of the discharged pollutants. And for the areas, where special water quality management is necessary, the installation of wastewater discharging facility is restricted. Provided that the facility treats or reuses all wastewater within its bound and discharge no wastewater into public water,

such "zero-discharge" facilities can be authorized to locate at the areas of special water quality management on condition that the procedures and requirements of construction and operation are to be strictly stipulated.

The Ministry of Environment introduced Tele-Monitoring System (TMS) in stages at WWTPs and wastewater discharging facilities (type 1 & 2), which can monitor pH, organics (BOD or COD), TN, TP and suspended solids (SS). The TMS is expected to monitor the effluent water quality in real-time, to charge the

discharge levy reasonably, and to secure the credibility of administration. WWTPs and wastewater discharging facilities beyond a certain capacity are required with a TMS instrument which can measure the discharged pollutants' concentration all-time (in accordance with Water Quality and Ecosystem Conservation Act, amended on May 17, 2007).

TMS has been installed for 4.3% of the total facilities and is monitoring the 95% of total wastewater quantity. The system monitors the wastewater discharged from public WWTPs up to 98% in real-time, while up to 73% of wastewater discharged from private sector

is monitored. Because TMS enables the real-time monitoring of the major sources in wastewater, water quality has been significantly improved. For example, the pollution load was reduced by average 33% as compared to 2008 when TMS had yet to be installed. As of Dec. 2012, TMS is installed at 688 operations, while there are 225 wastewater discharging operations, 371 public sewage treatment facilities, and 92 final wastewater treatment facilities. Since the deadline for installing TMS at small-sized public sewage treatment facilities (700 tons or larger and below 2,000 tons) is set to Jan. 16, 2014, the coverage of TMS is expected to increase, thereby further improving water quality.

[Table 3-1] Reduction of Pollution Loads at the Facilities Equipped with TMS

Parameter	No. of facilities	2008 (A)	2009 (B)	2010 (C)	2011 (D)	Difference (D-A)/A
BOD (ton)	32	3,822	2,070	1,964	2,337	39%
COD (ton)	464	73,774	68,136	66,023	62,875	15%
SS (ton)	507	34,357	25,897	20,219	19,875	42%
T-N (ton)	432	98,514	78,561	76,836	73,362	26%
T-P (ton)	424	8,196	5,767	5,250	4,647	43%

3.1.3.3 Advancing Animal Manure Management

It is necessary to advance the animal manure management system in order to deal with the tougher circumstances such as Korea-US Free Trade Agreement, Ocean Dumping Ban Act, etc. A Comprehensive Measure for Advancing Livestock Waste Management was prepared in May 2012, which strengthens the restriction of livestock husbandry, enhances the animal manure discharging facilities at the level of industrial wastewater discharging facilities, and manages the entire life cycle of animal manure from generation to the final disposal. To alleviate stock farmers' burden and to enhance their

competitiveness, various measures were prepared as follows. By 2012, 98 public animal manure treatment facilities were constructed and it is expected that those public treatment facilities can treat 50% of the animal manure until 2020. The operation of the facilities is being optimized by process and operation improvements. Also, to manage animal manure in a resource-recycling manner, the government concentrates on the recycling of animal manure and the active distribution of manufactured fertilizers as demonstrated in locally-based integrated management centers.

3.1.3.4 Nonpoint Source Control

The 2nd Comprehensive NPS Control Measure (2012-2020) established in May 2012 shifted the policy directions as follows – from pollutants' concentration reduction to runoff volume reduction and from a post-treatment to preventive management. In the light of these changes, various policies are implemented to reduce the runoff volume and minimize NPS pollution by means of improved water circulation system.

LID Method

Low Impact Development (LID) is a method of improving water circulation and reducing pollutions simultaneously. The reduced impervious areas can increase infiltration of storm water, hence decreasing the surface runoff. LID is applied to preventive the measures of NPS in urban areas. To promote LID, the preparation of LID guidelines and revision of relevant directions are in progress. The administrative support will be also carried out including giving incentives on LID application.

Green Storm water Infrastructure

Compared with centralized storm water management that collects and treats rainwater discharge at the end of a basin, Green Storm Water Infrastructure (GSI) is made of scattered small-scale rainwater harvesting, infiltration, and reuse practices. By implementing the

small-scale functional scenic elements such as rain gardens and green roofs close to NPS, it is possible to suppress surface runoff, enhance infiltration, and filtrate or treat NPS in storm water. Moreover, it can contribute to restore water circulation system including recharging ground water and preventing river dry. As detailed plan, the Ministry of Environment is promoting "GSI-Applied Water Circulation City Demonstration Project (2012-2015)" and preparing "GSI Construction Project at Urban Center (from 2014)."

Performance Verification System

There is lack of the administrative procedures to verify the efficiency, capacity and structural safety of BMP (best management practice) facilities. At present, most of BMP facilities are installed underground and it is difficult to verify the efficacy after construction. Therefore, the verification procedure needs to be prepared for each type of commercial BMP products. As the introduction of such a verification system is under consideration, it can help to improve the monolithic design standard and the uncertainties in the application and efficiency of BMPs. With a view to the introduction of verification system, the responsible organization is to be selected. And its role, budget, verification method and the utilization of the verified results will be prepared.

3.1.3.5 Restoration of Aquatic Ecosystem

Ecological Restoration of Rivers and Estuaries

Current projects of restoring the dry and covered-up rivers in urban areas will be expanded to other rivers. After the completion of the demonstration project such as Sangok-cheon ('stream') of Hanam (promoted by of the Ministry of Environment), the results will serve as the models for aquatic ecosystem restoration. Also, survey and mapping of ecological status, technology development for habitat restoration and flagship species restoration project will be actively promoted. Besides, the efforts will be put together to promote the

participation of citizens. For example, the partnership building among business, NGOs, and citizens on river conservation and restoration will be promoted and the programs of experiencing ecological rivers will be provided to citizens and students.

Restoring Ditches and Rills

Starting in 2007, the surveys have been conducted of ditches and rills mainly at drinking water source protection areas and critical water quality deterioration areas. 697 spots have so far been investigated for

general status like location and water intake, pollution type, and water quality, while 35 of them have been restored as a demonstration project. To set about the restoration of ditches and rills in earnest, 25 leading projects are launched. They are total solution programs which include removal of contaminated sediment and animal manures, reformation of waste collection system, plantation of water-purifying plants, environmental education, village cleanup and dismantling of artificial rivers. Ditches and rills in each jurisdiction is being surveyed and the results are managed by using GIS to build basic database.

Aquatic Ecosystem Health Survey

In aquatic ecosystem health survey, attached algae, fish, benthic macro-invertebrates, inhabitation and waterside environment, and organism habitat are monitored. The ecological health is classified into four grades (Optimum, Fair, Average, and Poor) by using quantified indicators. In 2007, the survey and assessment of aquatic ecosystem was carried out at 540 sites. The number of surveyed sites gradually increased to 640 in 2008, 720 in 2009, 800 in 2010, and 880 in 2011. In 2012, 960 sites were surveyed and assessed.

3.1.3.6 Water Quality and Aquatic Ecosystems Management at Four Major Rivers

During the Four Major Restoration Project, the Four Rivers Environment Research Centers of National Institute of Environmental Research (NIER) have monitored the aquatic ecosystems at the 16 segments where weirs are constructed ('Aquatic Ecosystem Impact Assessment Project of Pre-/Post Weir Construction'). The project monitors the changes in the biota including vegetations, benthic fauna, fish, amphibian & reptiles, birds, and mammals at the segments 2km of up and down stream of each weir. During 2010 and 2011, the project figured out the status of the aquatic ecosystem in each segment

where a weir was built, while the impact assessment of the aquatic ecosystems is being implemented after the weir construction (from 2012). 'Ecosystem Monitoring at Four Major River Watersheds'(From 2010) surveys aquatic ecosystems as well as such legally protected species as mammals, migratory birds, and terrestrial plants at principal locations. The monitoring focuses on the changes to biological species in consideration of the connection between aquatic and terrestrial ecosystems so that they can be applied to protect biological species in the Four Major Rivers Restoration Project.

3. Water

3.2 Management of Waterworks and Sewerage

3.2.1 Current Status

3.2.1.1 Waterworks and Sewerage Management System

Water Supply Management System

Water supply in Korea is composed of ordinary, industrial, and dedicated type and the ordinary water supply is divided into local waterworks and metropolitan waterworks which are managed by the local and central government, respectively. In local waterworks, a local government supplies raw or treated water to local residents in its jurisdiction or neighboring local governments, or neighboring residents. The central government establishes a comprehensive plan on waterworks, develops policy measures and provides technological and financial support to waterworks

operators. The areas that are not covered by local or metropolitan waterworks depend on small-sized facilities like village waterworks.

Water Conservation Zone

City mayor or provincial governor can designate and adjust Water Conservation Zone to supply clean water to people by securing clean drinking water sources and protecting the quality of source water from deterioration or hazardous compounds. The management of Water Conservation Zone is based on Water Supply and Waterworks Installation Act.

[Table 3-2] The Status of Water Conservation Zone

No. of Water Conservation Zone	Designated area (km ²)	Water intake capacity (m ³ /day)	Residents (person)
321	1,447,027	22,762.2	37,144

Sewage and Human Waste Management System

Local governments establish a Sewage Management Master Plan every two decades, while they review the plan's validity every five years and modify the plan if necessary. If the pollution sources are scatters like agricultural or fishing areas, public sewage cannot be provided due to the excessive construction cost the sewage pipeline. In such areas, sewage is managed by privately owned sewage treatment

facilities. The wastes from no-flush toilet and most of the residues after the cleanup of the septic tank and sewage treatment facilities are transferred to and treated by public human waste disposal facilities (192 facilities as of late 2011). 72.8% (142 facilities) of them are combined and operated with public WWTPs. At the remote areas where the collection is difficult, the generated human wastes are disposed independently.

3.2.1.2 Management Criteria

Drinking Water Quality Standards

Drinking water usually refers to the natural water that people usually drink, the tap water that is drinkable

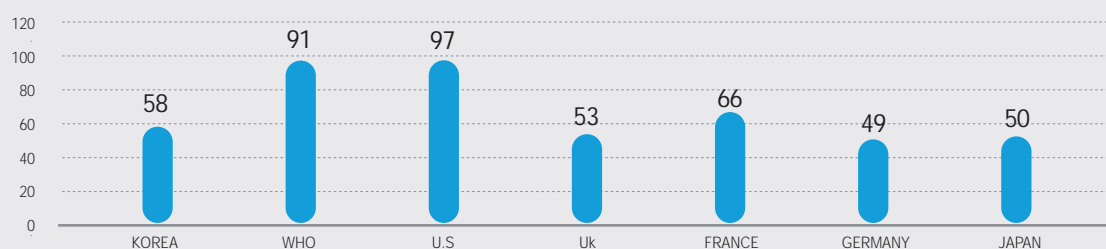
through treatment of natural water, drinkable spring water, and drinkable deep sea water. Recently, more strengthened management on pathogens such as

viruses is required. Therefore, the enhanced filtration and disinfection requirements have been adopted in the water treatment standard. 1,4-dioxane, a micro-pollutant, was included in drinking water quality standard (enforced in Jan. 2011). One pathogen (Norovirus) and three disinfection by-products (DBPs) such as bromate were added to the monitoring list of drinking water quality (Nov. 2010). Drinking water standard for formaldehyde was also established (amended in Jan. 2011; enforced in Jan. 2014).

From 1989 to 2010, the micro-pollutants of drinking

water quality have been annually monitored at major waterworks for 526 compounds which were selected from the micro-pollutant list of World Health Organization (WHO) and US Environmental Protection Agency (EPA). The monitoring is carried out at 40 drinking water treatment plants (DWTPs) and the raw water at 10 sites is also analyzed. In addition, the contaminant candidates are regularly screened for approximately 140 compounds in the source water at four major river watershed. Based on the monitoring results, the monitoring list is added or refined, and the drinking water quality standards are strengthened.

[Figure 3-3] Numbers of Items in Drinking Water Quality Standard Different Countries



Treated Wastewater Management Criteria

As sewage treatment facilities continue to increase, approximately 6.8 billion tons of wastewater are generated as of 2011. Yearly 1.24 billion tons of treated wastewater will be reused until 2016 in accordance with Water Circulation Use Master Plan (Feb. 2007). The 'Guidebook on Reuse of Treated Wastewater' was published in December, 2007, which addressed the

planning, implementation, operation and management of re-using the treated wastewater. Later with the enactment of the Promotion of and Support for Water Reuse Act (enforced on Sep. 6, 2011), the "Integrated Guidebook on Installation and Management of Water Reuse Facilities" (Aug. 2011) was published and distributed. And it consolidated the storm water use and wastewater reclamation & reuse.

3.2.1.3 Statistics Related to Water Supply and Sewage

Status of Water Supply

As of late December of 2011, 50,638,000 persons, taking up 97.9% of the country's total population, are supplied safe drinking water by 162 local and one multi-regional waterworks operators. The 162 local waterworks are composed of 7 special and metropolitan cities, 1 special self-governing province, 73 cities, and

81 counties. The capacity of water supply is 30,893,000 m³/day. Daily water supply per person is 335ℓ and has decreased steadily since 2001. It reflects the decrease in water use by installing water-saving devices and Save Water campaign as well as the reduced leakage ratio by the continuous implementation of the revenue water ratio enhancement project.

[Table 3-3] Water Charge (nationwide, as of 2011)

Total water supply (1,000m ³)	Annual revenue water (1,000m ³)	Revenue (1 million won)	Revenue water ratio (%)	Production cost (1 won/m ³)	Cost recovery (%)
6,020,698	5,025,096	3,29,200	83.5	813.4	76.6

[Table 3-4] Annual Status of Water Supply

Category	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total population (1,000 persons)	48,518	48,824	49,053	49,268	49,624	50,034	50,394	50,644	51,435	51,716
Water supply Population (1,000 persons)	43,021	43,633	44,187	44,671	45,270	46,057	46,733	47,336	48,395	50,638
Water supply rate (%)	88.7	89.4	90.1	90.7	91.3	92.1	92.7	93.5	94.1	97.9
Supply capacity (1,000m ³ /day)	28,561	28,462	23,156	30,950	31,138	31,265	30,571	31,416	30,936	30,893
Daily Water supply per person (ℓ/day · person)	362	358	365	363	346	340	337	332	333	335

* Supply capacity for 2004 excludes waterworks in metropolitan cities, while industrial water treatment capacity is included.

* Water supply population and rate include the population supplied through village waterworks and small-scale water supply facilities.

Status of Sewage System

As of late 2011, the percent of sewered population reaches 90.9% which is calculate from the population in the sewage service area by public sewage treatment facilities (including 500m³/day or less) and wastewater

treatment facilities. The country has 505 public sewage treatment facilities whose capacity is 500m³/day or more, and 2,858 facilities whose capacity is 500m³/day or less. The total capacity of sewage system reaches to 25,228,000m³/day.

[Table 3-5] Annual Status of Sewage System

Category	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total population (1,000 persons)	48,824	49,053	49,268	49,624	50,034	50,394	50,644	51,435	51,717
Sewered population (1,000 persons)	38,449	39,924	41,157	42,450	43,570	44,631	45,264	46,358	47,034
No. of treatment facilities	242 (878)	268 (1,153)	294 (1,404)	344 (1,681)	357 (1,854)	403 (1,991)	438 (2,332)	470 (2,594)	505 (2,858)
Percent of sewered population (%)	78.8	81.4	83.5	85.5	87.1	88.6	89.4	90.1	90.9
Treatment capacity (1,000 tons/day)	20,954	21,617	22,568	23,273	23,942	24,568	24,925	25,118	25,228

* () indicates the number of facilities whose capacity is less than 500m³/day.

As of late 2011, the total length (118,329km) of sewage pipelines accounts for 73% of the planned length (161,321 km) by Sewage and Drainage Master Plan. The combined sewage that drains storm water and

sanitary sewage accounts for 40%, while the separated sewage that carries them through a different set of sewer takes up 60%.

[Table 3-6] Annual Status of Sewage Pipeline

(Unit: km)

Category		2003	2004	2005	2006	2007	2008	2009	2010	2011
Planned length		129,779	132,183	137,474	141,156	145,563	150,540	156,444	159,051	161,321
Total		78,605	82,214	85,755	91,098	96,280	102,078	107,843	113,494	118,329
Constructed length	Combined	46,167	47,255	48,257	48,966	49,636	49,460	49,386	47,976	47,510
	Separated	32,438	34,959	37,498	42,132	46,643	52,618	58,457	65,519	70,820

3.2.2 Policy Overview

3.2.2.1 Water Supply Management

Water Demand Management

The country's annual average precipitation per person (2,629 m³/person) accounts for about 16% of the global average (16,427 m³/person), but the country's annual water use per person is relatively high compared with other Organization for Economic Co-operation and Development (OECD) countries.

The government has actively promoted Comprehensive Water Saving Measures including installation of water-saving devices, reusing wastewater, reforming water price, replacing outworn water supply pipelines etc. Such measures resulted in the saving of total 890 million tons of water by 2010. The economic effect

was evaluated as total 1.33 trillion won which is the sum of 691.7 billion won of drinking water production cost (based on the average drinking water production cost at 777 won per ton in 2010), 636.5 billion won of sewage treatment cost (applying average sewage treatment cost of 715 won per ton). In September, 2007, the 'National Comprehensive Water Demand Management Measures' were established, which include spreading water-saving devices in consumer-oriented manner, raising revenue water ratio (thereby reducing leakage ratio), reusing wastewater etc. Such measures resulted in additional saving of 228 million tons of drinking water during 2007-2010.

[Table 3-7] The Estimated Saving of Water Supply

(Unit: million tons)

Category	Estimated Annual Saving of Water Supply											
	Total	2001	2002	2003	2004	2005	2005	2007	2008	2009	2010	2011
Total	890.2	61.8	151.4	104.5	124.9	64.8	61.8	91.6	60.3	54.4	22.3	21.8
Water-saving devices	434.8	33.4	116.0	67.5	88.2	38.4	33.9	-	1.8	0.6	0.4	3.1
Wastewater reclamation & reuse	89.8	1.7	5.5	7.9	8.1	1.6	7.2	6.8	33.5	2.9	2.5	9.1
Outworn water pipes replacement	365.6	26.7	29.9	29.1	28.6	24.8	20.7	84.8	25	50.9	19.4	9.6

※ The replacement of outworn water pipes by 2006 accounts only for replacement, while that from 2007-2011 includes both replacement and regeneration.

[Table 3-8] Implementation of Water Demand Management Measures

Category	Unit	Annual Implementation of Water Demand Management Measures										
		2002	2003	2004	2005	2005	2007	2008	2009	2010	2011	
Water-saving devices	Total	1,000	1,980	1,468	1,883	896	2,108	-	218	73	57	265.6
	Toilet	1,000	672	510	563	302	659	-	72	24	19	12.6
	Faucet	1,000	1,308	958	1,320	594	1,449	-	146	49	38	256
Wastewater reclamation & reuse	1	20	16	14	17	64	19	21	11	34	34	
Outworn pipes replacement	km	2,489	2,421	2,383	2,069	1,727	2,027	2,939	3,232	2,732	3,106	

※ The replacement of outworn water pipes by 2006 accounts only for replacement, while that from 2007-2011 includes both replacement and regeneration.

Moreover, spreading the habit of valuing and saving water as well as building extensive infrastructures has been encouraged to enhance the water-saving effects. For example, every year, the government holds World Water Day ceremony (Mar. 22), operating the homepage "I Love Water" (www.ilovewater.or.kr), developing

educational materials for children, delivering water newsletters, various education and public relations such as water loving and saving through media, and so on.

Local and multi-regional waterworks operators must

establish 'Comprehensive Water Demand Management Plan' every five years and obtain the approval by the Ministry of Environment. The 1st Comprehensive Plan during 2007-2011 was established by every waterworks operators, and the approval & evaluation was completed, while 2nd Comprehensive Plan is being established and under approval. It was evaluated that total 223.4 million m³/year of water was saved during 2007-2009

by water demand management. To encourage water demand management at private sector, Water Supply and Waterworks Installation Act imposes a duty to distribute water-saving devices and to introduce water-consumption labelling. Since 2011, the water-consuming products have been required to display the water-consumption labels. It is estimated that 353.4 million tons of drinking water can be saved by 2020.

Hygiene and Safety Certification of Water Supply Materials and Products

To prevent contamination of drinking water during the distribution process, hygiene and safety standards were established for the potential hazardous compounds which can be leached from water supply materials and products (Water Supply and Waterworks Installation Act amended in 2006 and enforced in 2009). In addition, in order to guarantee the effectiveness of the standards and to manage the quality of water supply

materials and products, Water Supply and Waterworks Installation Act was amended in 2010 and Hygiene and Safety Standards Certification System was established in May, 2011. Those who want to manufacture or import water supply materials or products must obtain the hygiene & safety certification from the Minister of Environment. Otherwise, their manufacturing, import, distribution, and sales are prohibited.

3.2.2.2 Sewage and Animal Manure Management

Building Integrated Operation & Management System of Public Sewage Treatment Facilities

To fundamentally improve the water quality at the upstream areas of multi-purpose dams, 1.17 trillion won of national budget money was invested during 2004-2011 to the 28 cities and counties located at the upstream of multi-purpose dams including Soyang Dam. Total 434 public sewage treatment facilities were constructed or upgraded and the sewered population ratio at the upstream areas of the dams was increased from 27% in 2004 to 71.3% in 2011. By combining environmental technology (ET) and information technology (IT), Integrated Operation & Management System of Public Sewage Treatment Facilities was established at upstream areas of the dams, which enables the remote surveillance and control via internet network, thus realizing efficient financial investment and operation.

Measures on the Four Major Rivers, TP treatment facilities were installed at the WWTPs located in the watershed. From 2012, the effluent standard of TP was strengthened to one—tenth. For example, it was lowered from 2 mg/ℓ to 0.2 mg/ℓ at Water Conservation Zone. The water quality of effluents was analyzed for the 155 public WWTPs where TP treatment facilities were installed and operated as of May 2012. Compared with 2010, when the effluent standard was not strengthened yet, the water quality of the effluents were improved by greater than 83%. It reflects that stricter management of the effluents from public WWTPs and enhanced management of ecological safety greatly contributed to the safe water-use and the ecosystem conservation in public water.

To maximize the economical and operational efficiencies in the construction and management of WWTPs, Sewage Act was amended in February, 2012 and 'Watershed-Sewage Maintenance Plan'

Starting in 2009, as part of Water Quality Improvement

was introduced. It is planned to establish Watershed-Sewage Maintenance Plan at 30 watersheds by 2015. And the current separated sewage management systems will be integrated inter-regionally in the long run, which will result in about 10 integrated sewage management systems with 2 or 3 large regions.

Inducement of the Private Capital to the Sewage Project and Advancement of the Operation of Sewage System

For the area where the sewage project is urgently necessary but the available fund is limited, the private capital is induced to partially meet the budget of the local government. The private capital can help to complete the establishment of WWTPs and the maintenance of sewage pipelines. Total 101 projects with the private capital are carried out, and 78 projects of them are proposed by private sector while the others (23 projects) are announced by the government. The gross scale of the sewage projects reaches 3.10 trillion won, while 844.7 billion won of the private capital is invested. Besides, the operation and maintenance (O&M) of the sewage system has been partially open to the private sector for enhancing the specialty of O&M, creating jobs and fostering water industry through competition. The Sewage Act was amended to enable the private sector to carry out the technological diagnosis of the sewage system. Because the Public Sewage Management Agency Business Registration System will be introduced in February, 2013, the subordinate provisions including registration requirement are being prepared.

Water Reuse

While the storm water harvesting & reuse facilities and the wastewater reclamation & reuse facilities have been separately managed by the different laws, the integrated legal structure is established. The previous guidelines on storm water and wastewater reuse are merged as 'Integrated Guidebook on the Installation and Management of Water Reuse Facilities' (Aug. 2011) and more systematic and efficient management

is expected. Furthermore, 'Water Reuse Master Plan' was established in September 30, 2011, which presents the direction in national water reuse policies for ten years (2011-2020). It is the highest level of the national water reuse plan, and the expected results by 2020 are as follows – securing 2.52 billion tons of environment-friendly alternative water source, saving 1.1 billion tons of drinking water by the alternative water source, and fostering the related technology development and industries.

Policy to Transform Sewage Sludge into Energy

As the ocean dumping of sewage sludge was banned in 2012, the sludge treatment facilities under construction will be completed as soon as possible. The priority will be given to integrate the facilities' operation multi-regionally rather than to construct new facilities. The integrated operation can increase the operational rate and decrease the treatment cost through the extension of the combined treatment of sewage sludge from neighboring areas. In this light, the project for building two sludge treatment facilities in Buyeo-gun and Hoengseong-gun was cancelled in 2012. The sludges generated from the two counties will be treated together with the sludges from neighboring Gyeryong City and Wonju City. It is expected that the construction and O&M cost will be reduced and the operational rate will be increased.

The economic assessment indicates that the sludge reduction at the source is more favorable than the sludge treatment after the generation. Hence, for the WWTPs with a certain capacity, the upgrading of the existing digesters or the construction of new digesters is being carried out to increase the treatment efficiency or to reduce the sludge volume, respectively. The 'Life Cycle Assessment and Management Plan of Sludge Treatment Facilities' will be provided to optimize the treatment technologies and to develop the construction & maintenance guidelines through the assessment of the entire processes including sludge treatment and reduction.

3.2.2.3 Drinking Water Management

Safe Drinking Water Management

The drinking water quality is secured by enforcing the drinking water quality standards for 58 items and by monitoring the contaminant candidates of 26 items. Pathogen and three DBPs such as bromate were newly added to the monitoring list in November, 2010, and the water quality standard for hazardous micro-pollutants was established in January, 2011. The accident response system was prepared for securing safe and clean water supply in any circumstances. Moreover, to upgrade the response system to radiation accidents, a 'Routine Manual for the Emergency Response to the Radiation Accident at Neighboring Countries' was prepared in February, 2012. And the response system such as alerting the radiation accident and emergency was established and the structures of the drinking water supply chain were reinforced.

As the hazardous micro-pollutants continue to increase in raw water of drinking water source, relevant measures are being prepared and applied. The water quality standard and the requirement of treatment technologies are going to be upgraded including the installation of the advanced water treatment for the micro-pollutants. Considering the international drinking water management systems, the domestic drinking water standard will be improved and the monitoring list of the contaminant candidates will be expanded. The drinking water quality standard is expected to cover the items of WHO Guidelines of Drinking Water by 2030. In addition, Public Reporting System on Drinking Water Quality was introduced. Every waterworks operator

must analyze the drinking water quality quarterly, and the results are open to the public. The Public Reporting System is based on the compliance with drinking water quality standards, while turbidity and residual chlorine concentration are also considered. The system assesses not only DWTPs but also water supply pipeline network. By evaluating the waterworks operators and classifying them into four categories - Very Good, Good, Average, and Poor - the operators are expected to compete with each other for improving drinking water quality.

Management of the Bottled Spring Water

Since the bottled spring water is manufactured and provided for citizens' drinking water, the authorization requirements are strictly specified.

Because the groundwater is usually bottled, an institutional mechanism serves to prevent the over-abstraction of the groundwater. The proponent of the bottled spring water manufacturing is required to submit the Environmental Impact Assessment Report when the proponent applies for the authorization of the spring water abstraction. The authorization expires after five years. To guarantee the bottled water quality and protect citizens' health, the manufacturer must carry out the voluntary water quality test. In addition, the Ministry of Environment also tests the bottled water products collected from the market. If a product fails to meet the drinking water standard for the bottled water by the test, then the whole quantity of the target product must be taken off the shelf and discarded.

3.2.2.4 The Promotion of Water Industry

The government included the Promotion of Water Industry and its Entry to Oversea Markets in 5-Year Plan on Green Growth (Sep. 2009). And Water Industry Promotion Strategy was established in October, 2010. Those policies result in certain achievement including the development of core technologies and

multi-regional integration of water supply and sewage systems. As the advancement of water industry to overseas is not satisfactory, however, "Checkup On the Promotion of Water Industry and its Entry to Oversea Markets" was carried out on May 23, 2012, and future measures were prepared.

Of all 13 detailed tasks in 3 categories established in July 2009 and October 2010, 10 tasks including development and commercialization of the core technologies, multi-regional integration of the water supply and sewage systems etc. are being implemented. The membrane filtration process which is developed by the domestic technology was applied to the Yeongdeungpo DWTP whose capacity is 50,000 tons/day (Apr. 2011). It can be regarded as a successful model of technology transfer and commercialization. To make an institutional foundation, Act on Promotion and Support of Water Reuse was enacted in June, 2010, which specifies the candidates required to install water reuse facilities and the installation standards. And the innovative advanced wastewater treatment technology (I3 system) was developed and applied to the Guri WWTPs whose capacity is 6,250 tons/day (May, 2011).

Promoting the water-specialized companies and creating the foundation of water industry make another set of achievements in water supply and sewage system

sectors. For example, joint operations between public and private companies are expanded, the entrustment of public company to private sector is increased, human resources specializing in water industry are developed and the water industry statistics and portal information system was established. Furthermore, many efforts have been made for building international networks of domestic water industry through the feasibility study on the promotion of water industry to overseas, the support for the master-planning projects, Global Green-Biz Partnership, and the partnership building with Azerbaijan, Indonesia, and Algeria. Those efforts resulted in significant orders including WWTPs in Bihn Duong, Vietnam (Mar. 2011; 71.5 billion won), WWTPs in Ain-Sefra, Algeria (Oct. 2010; 48 billion won), wastewater reuse project in Azerbaijan (100 billion won), River "El Harrach" Restoration in Algeria (450 billion won), and River "Ciliwung" Restoration in Jakarta, Indonesia (about 1 trillion won). The next water industry policies will take aim at creating 130,000 jobs in water industry, exporting 6 billion dollars from water industry, and sharing 1% of global water market by 2017.

3.2.3 Key Issues

3.2.3.1 Waterworks

Expanding Local Waterworks and Advanced Treatment Process

Recently, floods and drought are getting caused more frequently by climate change and other factors, forecasting water shortage of about 1 billion m³ in 2016. In order to ensure drinking water supply and relief the imbalance between water supply and demand, the government formulated a waterworks expansion plan and the corresponding fund is being applied. 6,547 waterworks received a national fund of 353.8 billion won during 2008-2011 and their facilities - including water intake, treatment, disinfection, distribution - and pipelines were upgraded. And 47.4 billion won was appropriated to upgrade the facilities of 551 sites. In

addition, the intra-regional waterworks adjustment is being carried out in 9 regions (North Han River Region, Yeongdong Region, Gum River South Region, Yeongsan River Region, Han River Region, South Han River Region, Nakdong River North Region, and Nakdong River South Region). To adjust the intra-regional waterworks, various survey and evaluation have been carried out including public and non-public water supplied area, future water demand and supply, the production capacity of waterworks etc.

In the drought of 2009 at Kangwon province, the leakage of water pipeline was significantly responsible for the water supply suspension and emergency water

supply. So, the 'Water Network Optimization Project' is being carried out at 46 local governments with fiscal self-sufficiency rate below 30%. The project is composed of integrating the adjacent local waterworks and replacing the outworn water pipelines with block-system of pipeline network. To promote the project efficiently, the Ministry of Environment and the Ministry of Strategic Planning and Finance signed a memorandum of understanding (MOU) in 2009. A national fund of 232.6 billion won is being invested during 2010-2014 in the local waterworks to raise the revenue water ratio up to maximum 85%. For the management of the underground water pipelines, leakage pin-pointing technologies and the robot capable of visual scan and pipe regeneration were developed. The technologies have been deployed in the field as a demonstration project since 2011.

Since 2009, a national fund of 32,163 million won has been spent to expand advanced treatment processes in

DWTPs. The severely outworn DWTPs have the priority of investment and 17 local governments received 18,100 million won in 2012. To increase the efficiency of DWTPs, Water Supply and Waterworks Installation Act amended in 2007 requires technical diagnosis of DWTPs and pipeline networks every five years. To support the small and medium-sized local waterworks, technical assistance is provided every year.

Continuous efforts have been made to support the water supply vulnerable areas including farming and fishing areas as well as islands. The revised 2-stage waterworks expansion plan was prepared and 1.07 trillion won was spent during 2008-2011. The statistics of waterworks reflect the continued commitment. As of late 2011, the water supply ratio at 'myeon' (sub unit of county) increased from 47% in 2008 to 65%, while it is 98.7% at cities. In 2011, 242.7 billion won was spent to provide water supply to 177 farming and fishing communities as well as 50 islands.

[Figure 3-4] Supplying Residential Water or Securing Drinking Water Source at Farming & Fishing Community and Island



Residential water supply project at farming and fishing community



Drinking water source development of an island

The revised 2nd Agricultural and Fishing Villages Waterworks Expansion Plan will be implemented, which envisions 76% of the villages receive water supply by 2014. In 2012, 256.8 billion won was spent in 178 farming and fishing communities to increase the water supply

ratio up to 67%. And 3rd Agricultural and Fishing Villages Waterworks Expansion Plan for 2014 will be prepared to improve the water service at farming and fishing communities and to secure water supply in the vulnerable areas where local waterwork services are not provided.

3.2.3.2 Sewerage

Building Urban Sewage System That Can Deal with Climate Change

Korea has experienced a temperature rise of 1.5°C, twice as much as the global average, while precipitation is also on the rise. In Seoul, temperature has rose 2.4°C per year and annual precipitation has increased 27% over last century (1908-2007). Moreover, the rainfall intensity has significantly increased. The occurrence of heavy rains, defined as 50 mm or more per hour, was recorded as 8 during 1960s, while it was 111 times in the 2000s.

As climate change causes more and more meteorological disasters, Sewage Act was amended in Feb. 2012 which included the legal basis for storage facilities and the designation of 'Intensive sewage Management Areas'. The sewage management project was diversified and expanded. From 2011, the Value Engineering (VE) was incorporated for the environmental infrastructures, which resulted in the saving of 17.5 billion won from 16 project in June 2012. During 2012 to 2015, sewage maintenance projects for preventing urban floods are in progress at 16 municipalities including Gimhae City.

[Table 3-9] Investment Plan in Storage Facilities (by 2022)

(Unit: 100 million won)

Category	Annual investment								
	Total budget	2010	2011	2012	2013	2014	2015	2016	2017-2022
Total	26,645	39	510	524	1,541	1,638	1,638	1,638	19,117
National funds	15,954	20	256	329	869	966	966	966	11,582
Local funds	10,691	19	254	195	672	672	672	672	7,535

By the amendment of Sewage Act on Nov. 14, 2011, the storage facility is defined in the act. And provisions related to pollutants discharged from drainage districts and installation of storage facilities were included in Sewage Management Master Plan. As the heavy rainfalls cause sewage overflows and urban inundation, Sewage Act was amended once again on Feb. 1, 2012. The amendment included the designation of 'Intensive Sewage Management Areas' and the reinforcement of sewage design standard (on Apr. 22, 2011). To upgrade conveyance capacity of sewage pipelines, the design flood standard, a.k.a. rainfall return period, was increased from 10 year to 10-30 year. While there was no design standard to a pumping station, 30-50 year is adopted for it. Besides, 'Guideline for Management and Operation of Public Sewage' was amended on Jan. 30, 2011. By the revision, the areas susceptible to inundation can be designated as 'Intensive sewage Management Areas' and the sewage systems at the designated areas will be thoroughly checked prior to rainy season (mid-July).

And it also specified the procedures of managing public sewage systems against heavy rainfalls.

The advanced flood simulation technique was introduced and the checkup of sewage system was newly institutionalized in flood prone areas. In May 2012, Sewage Management Measures against Urban Flooding was prepared. The sewage system in the flood-prone areas will be upgraded, while 6 demonstration projects are being carried out from 2013 to 2015. Expanding on the demonstration projects, the sewage Management Measures will be extended to the entire country. By shifting the paradigm of storm water management, a proactive and preemptive flood prevention system will be prepared with respect to climate change and meteorological disasters. By 2022, 3.67 trillion won will be invested in upgrading sewage pipelines with insufficient capacity, constructing storage facilities, and maintaining pumping stations at the flood-prone areas.

04 Soil and Groundwater





4.1 Current Status

4.1.1 Management Criteria

4.1.2 Monitoring Network

4.2 Policy Overview

4.2.1 Soil

4.2.2 Groundwater

4.3 Key Issues

4.3.1 Soil

4.3.2 Groundwater



4. Soil and Groundwater

4.1 Current Status

4.1.1 Management Criteria

(1) Soil

Land areas are divided into Area 1, 2, and 3 based on land use classification, each of which two distinct standards apply with regarding 21 soil pollutants: soil contamination concern standards and soil contamination measure standards.

Since contamination is likely to cause problems on human health and wealth as well as the growth

of animals and plants, the polluted condition that requires such restrictive measures as land disuse and prohibition of installation of facilities is set as soil of contamination measure requiring response, and the level of contamination which as 40% of the soil requiring measure should be kept from aggravating is determined as soil of concern (Table 4-1).

[Table 4-1] Soil Contamination Standard

(Unit: mg/kg)

Pollutants	Soil Contamination Concern Standard			Soil Contamination Measure Standard Pollutants		
	Area 1	Area 2	Area 3	Area 1	Area 2	Area 3
Cadmium	4	10	60	12	30	180
Copper	150	500	2,000	450	1,500	6,000
Arsenic	25	50	200	75	150	600
Mercury	4	10	20	12	30	60
Lead	200	400	700	600	1,200	2,100
Hexachromium	5	15	40	15	45	120
Zinc	300	600	2,000	900	1,800	5,000
Nickel	100	200	500	300	600	1,500
Fluoride	400	400	800	800	800	2,000
Organic phosphorus compounds	10	10	30	-	-	-
Polychlorinatedbiphenyl	1	4	12	3	12	36

Pollutants	Soil Contamination Concern Standard			Soil Contamination Measure Standard Pollutants		
	Area 1	Area 2	Area 3	Area 1	Area 2	Area 3
Cyanogen	2	2	120	5	5	300
Phenol	4	4	20	10	10	50
Benzene	1	1	3	3	3	9
Toluene	20	20	60	60	60	180
Ethylbenzene	50	50	340	150	150	1,020
Xylene	15	15	45	45	45	135
Total petroleum hydrocarbons (TPH)	500	800	2,000	2,000	2,400	6,000
Trichloroethylene (TCE)	8	8	40	24	24	120
Tetrachloroethylene (PCE)	4	4	25	12	12	75
Benzo (a) pyrene	0.7	2	7	2	6	21

※ Reference

1. Area 1: land used for paddy fields, orchards, ranches, mineral bath resorts, and building lot (applicable only to the lots for residential purpose under (a), Paragraph 8, Article 5 of the Enforcement Decree of the Cadastral Act) school lots, drain, fish park, park, historical site, burial ground, in accordance with the land classification of the Cadastral Act, and children amusement facilities (applicable only to outdoor facilities) in accordance with Paragraph 2, Article 2 of the Safety Management Act on Children Amusement Facilities.
2. Area 2: land used for forest, salt farm, sites (all sites other than those of Area 1), warehouse sites, streams, water supply, sporting facility sites, amusement parks, religious activity zones, and multipurpose lots (applicable only to (1) or (3) of Paragraph 27, Article 5 of the Enforcement Decree of the Cadastral Act), in accordance with the land classification of the Cadastral Act.
3. Area 3: land used for factories, parking lots, gas stations, roads/railroads, embankments, and multipurpose lots (all multipurpose sites other than those described in Area 2) in accordance with the land classification of the Cadastral Act, and the land used for military and national defense purpose under (1) through (5) of Paragraph 1, Article 2 of the Act of National Defense and Military Installations Projects.
4. In case of returning the acquired land in accordance with Article 48 of the Act on the Acquisition of Land, etc for Public Works and the Compensation Thereof, or removing soil pollutions, etc in the returned/granted areas in accordance with Article 12 of the Special Act on Support for Areas Granted to the US Forces, the zone standard according to the usage after return of the applicable land shall be applied.
5. 'Benzo (a) pyrene' item shall be applied only to the areas using the facilities manufacturing and storing toxic materials and the waste timber (ex: railroad lots, park, plant lots and streams, etc)

(2) Groundwater

The management of groundwater quality is carried out for two different water uses: drinking water and non-drinking water. Non-drinking water is further specifically divided into domestic water, farming and fishery water, and industrial water, and water quality management criteria and standards are prescribed in the Ministry of Environment Decree, 'Rules on Groundwater Quality Conservation' (Table 4-2). For non-drinking water, 14 to 19 management criteria are specified to uses, which includes four general pollutants of hydrogen

ion concentration, total coliform, nitrate nitrogen, and chloride ion and fifteen specific hazardous substances of cadmium, arsenic, cyan, mercury, organic phosphorus, phenol, lead, hexavalent chrome, trichloroethylene, 1,1,1-trichloroethane, benzene, toluene, ethylbenzene, and xylene.

Meanwhile, in case groundwater is used as drinking water, the 47 criteria as specified in Art. 5 of Management of Drinking Water Act are applied as water quality standards (Table 4-3).

[Table 4-2] Groundwater Quality Standards(Non-drinking)

(Unit: mg/L)

Category	Water use	Domestic Water	Agricultural Fishery Water	Industrial Water
General Pollutants (4 in total)	pH	5.8~8.5	6.0~8.5	5.0~9.0
	Total Coliforms	≤5,000 (MPN/100ml)	-	-
	Nitrate Nitrogen (NO ₃ -N)	≤ 20	≤ 20	≤ 40
	Chloride (Cl ⁻)	≤ 250	≤ 250	≤ 500
Specific Hazardous Substances (15 in total)	Cadmium (Cd)	≤ 0.01	≤ 0.01	≤ 0.02
	Arsenic (As)	≤ 0.05	≤ 0.05	≤ 0.1
	Cyanide (CN)	≤ 0.01	≤ 0.01	≤ 0.2
	Mercury (Hg)	≤ 0.001	≤ 0.001	≤ 0.001
	organic Phosphorous	≤ 0.0005	≤ 0.0005	≤ 0.0005
	Phenol	≤ 0.005	≤ 0.005	≤ 0.01
	Lead (Pb)	≤ 0.1	≤ 0.1	≤ 0.2
	Hexachromium (Cr ⁺⁶)	≤ 0.05	≤ 0.05	≤ 0.1
	TCE (Trichloroethylene)	≤ 0.03	≤ 0.03	≤ 0.06
	PCE (Tetrachloroethane)	≤ 0.01	≤ 0.01	≤ 0.02
	1,1,1-Trichloroethane	≤ 0.15	≤ 0.3	≤ 0.5
	Benzene	≤ 0.015	-	-
	Toluene	≤ 1	-	-
	Ethylbenzene	≤ 0.45	-	-
	Xylene	≤ 0.75	-	-

Source : Rules on Groundwater Quality Conservation etc.

※ Reference

1. In case any of the following items should be applied, the criterion of chloride ion may not be applied
 - A. Fishing water
 - B. If chloride ion concentration is found harmless to human body, with regard to the intended use of groundwater
 - C. In case chloride ion concentration temporarily increases with seawater intrusion
2. In case farming/fishery water and industrial water are also used as residential water, the quality standards for residential water are applied

[Table 4-3] Groundwater Quality Standard (Drinking)

Classification	Pollutants	Standard
Micro-organism	Total Colony Count	≤100CFU/mL
	Total Coliforms	ND/100mL
	Escherichia Coliforms Fecal Coliforms	ND/100mL
Hazardous Inorganic Substances	Fluoride (F)	≤1.5mg/L
	Lead (Pb)	≤0.01mg/L
	Arsenic (As)	≤0.01mg/L
	Selenium (Se)	≤0.01mg/L
	Mercury (Hg)	≤0.001mg/L
	Cyanide (CN)	≤0.01mg/L
	Chromium (Cr+6)	≤0.05mg/L
	Ammonium Nitrogen (NH ₃ -N)	≤0.5mg/L
	Nitrate Nitrogen (NO ₃ -N)	≤10mg/L
	Cadmium (Cd)	≤0.005mg/L
	Boron (B)	≤1.0mg/L
Hazardous Organic Substances	Phenol	≤0.005mg/L
	Diazinon	≤0.02mg/L
	Parathion	≤0.06mg/L
	Fenitrothion	≤0.04mg/L
	Carbaryl	≤0.07mg/L
	1,1,1-Trichloroethane (1,1,1-TCE)	≤0.1mg/L
	Tetrachloroethylene (PCE)	≤0.01mg/L
	Trichloroethylene (TCE)	≤0.03mg/L
	Dichloromethane	≤0.02mg/L
	Benzene	≤0.01mg/L
	Toluene	≤0.7mg/L
	Ethylbenzene	≤0.3mg/L
	Xylene	≤0.5mg/L
	1,1-Dichloroethylene	≤0.03mg/L
	Carbon Tetrachloride	≤0.002mg/L
	1,2-Dibromo-3-Chloropropane	≤0.003mg/L

Classification	Pollutants	Standard
Aesthetic Substances	Copper(Cu)	≤1mg/L
	Iron (Fe)	≤0.3mg/
	Manganese (Mn)	≤0.05mg/L
	Zinc (Zn)	≤3.0mg/L
	Aluminium (Al)	≤0.2mg/L
	Sulfate (SO ₄ -2)	≤200mg/L
	KMnO ₄ Consumed	≤10mg/L
	Odor (Other than sterilization)	ND
	Taste (Other than sterilization)	ND
	Turbidity	1NTU
	Color	≤5
	Hardness	≤300mg/L
	Sulfactants	≤0.5mg/L
	pH	5.8~8.5
	Chloride (Cl ⁻)	≤250mg/L

Source : Drinking Water Management Act

4.1.2 Monitoring Network

(1) Soil Monitoring Network

Total 21 criteria (8 heavy metals, 11 ordinary metals, and pH) are checked in 1,521 Soil Monitoring Networks nationwide to figure out the status of soil contamination and contamination trend and reflect the resulting data in the establishment of soil conservation policy including soil contamination prevention. As for the change in annual average contamination level with five heavy metals including cadmium, with the change to total content

testing method (on Jan. 1, 2010), the concentration increased in 2010-2011 as compared to 2007-2009, but below 30% of the level causing concern (area 1). As for mercury, zinc, nickel, fluorine, and cyan, the concentration remains at similar levels year on year out and TPH is on the rise year after year in housing land, industrial land, road site, and railroad site, but 2011 contamination level was 7.4% of the level causing concern (area 1).

[Table 4-4] Monitoring Results of Soil Quality by Soil Monitoring Network

(Unit: mg/kg)

Classification	Cd	Cu	As	Hg	Pb	Cr6+	Zn	Ni	F	organic phosphorus compounds	PCB	CN	Phenol	Oil					TPH	TCE	PCE
														BTEX	Benzene	Toluene	Ethylbenzene	Xylene			
Average																					
Level in 2011	1.293	23.756	5.641	0.038	35.825	0.351	89.227	15.494	203.426	0.000	0.000	0.007	0.003	-	0.001	0.005	0.011	0.051	36.641	0.000	0.000
Average																					
Level in 2010	1.094	19.934	4.821	0.030	26.763	0.142	78.563	12.759	196.773	0.000	0.000	0.008	0.001	-	0.001	0.003	0.000	0.003	36.870	0.000	0.000
Average																					
Level in 2009	0.059	2.994	0.338	0.042	3.903	0.048	73.197	8.624	193.519	0.000	0.000	0.005	0.000	0.007	-	-	-	-	20.489	0.000	0.000
Average																					
Level in 2008	0.049	3.521	0.241	0.037	4.042	0.013	82.662	9.150	215.473	0.000	0.000	0.001	0.000	0.000	-	-	-	-	16.447	0.000	0.000
Average																					
Level in 2007	0.063	3.799	1.064	0.053	5.068	0.000	83.324	11.052	209.941	0.000	0.000	0.003	0.000	0.009	-	-	-	-	21.557	0.000	0.000
A Level of concern (Area 1)	4	150	25	4	200	5	300	100	400	10	1	2	4	-	1	20	50	15	500	8	4

Source : Monitoring Results of Soil Quality by Soil Monitoring Network (2007-2011)

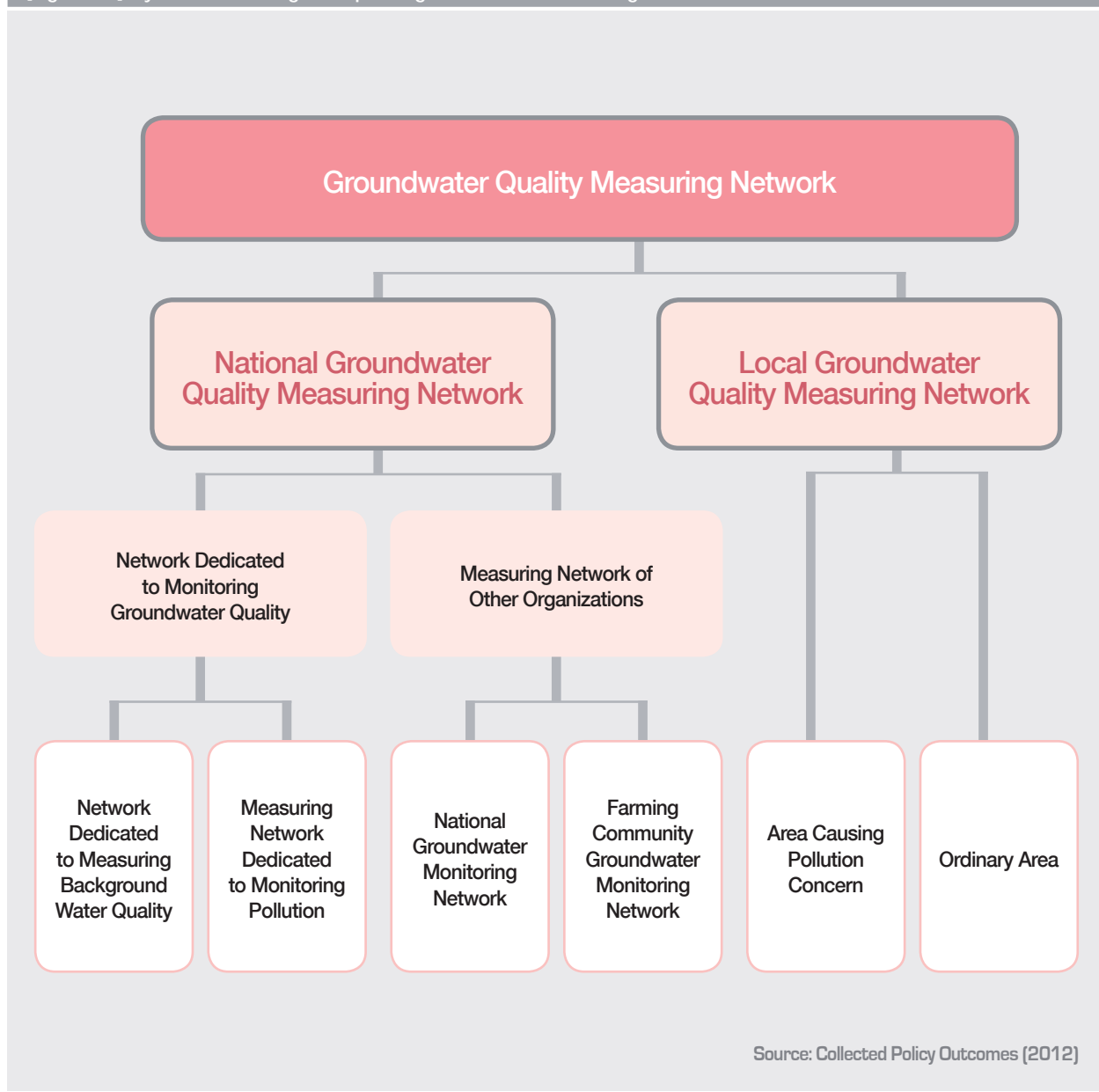
※ The amendment of the subordinate statutes of Soil Environment Conservation Act (Jun. 2009) specified regional criteria based on land use level (Area A, B & C Area 1, 2 & 3). Also, as for five heavy metals of Cd, Cu, As, Pb, Cr (VI), the category changed from elution to total content, while BTEX further ramified into benzene, toluene, ethylbenzene, and xylene.

(2) Groundwater Quality Measuring Network

To regularly figure out the status of groundwater contamination and the trend in water quality nationwide with a view to using the resulting data in the establishment of policy for conserving groundwater quality, Groundwater Quality Monitoring Network was installed and operated to conduct an investigation in 20 criteria (5 general pollutants and 15 specific hazardous substances).

Groundwater Quality Monitoring Network was divided into National Monitoring Network and Local Monitoring Network in 2008; the former is operated by the Ministry of Environment, the Ministry of Land, Infrastructure and Transport, and the Ministry of Agriculture, Food and Rural Affairs, while the latter is operated by cities and provinces (including local Environmental Agencies) (Table 4-2).

[Figure 4-1] System of Installing and Operating Groundwater Measuring Network



The results of operation of Network Dedicated to Monitoring Groundwater Quality in 2011 show that 392 (8.0%) of total 4,879 survey samples turned out to fall below the water quality standards. By pollutants, about 70% of the samples were surveyed as exceeding the standards in quality criteria for general pollutants. General pollutants came in the order of total coliforms (48.6%), nitrate nitrogen (11.2%), and chloride ion (11.2%), and the principal cause is presumed to be tube wells or poorly managed hygiene. Besides,

trichloroethylene (TCE, 9.0%) and tetrachloroethylene (PCE, 2.6%), used as detergents for textiles and metals, were found to exceed standards in industrial complexes and urban residential areas.

According to the results of operation of monitoring network in general areas in 2011, average excess rate was reported to be 2.4%. By area, excess rate showed highest with 6.4% in Gangwon Province, with the rate appearing higher than average in Seoul (4.7%), Chungnam Province (3.6%), and Busan (3.1%).

[Table 4-5] Results of Operation of Groundwater Quality Measuring Network

(Unit: mg/L)

Category	No. of spots	No. of surveys	No. of excesses	Criteria exceeded	Excess rate (%)	No. of spots with excess for criteria																	
						Electrical conductivity	pH	Nitrate nitrogen	Chloride ion	Total coliforms	Total coliform count	Cd	As	CN	Hg	phenol	Organic phosphorus	Pb	Cr 6+	TCE	PCE	1,1,1-TCE	Benzene
2011	2,579	4,879	392	420	8.0	0	38	47	47	204	-	2	23	2	0	4	0	2	2	38	11	0	0
2010	2,568	4,901	256	276	5.2	0	42	66	49	40	-	3	7	2	1	2	1	1	2	37	21	0	2
2009	2,499	4,847	296	338	6.1	0	22	55	36	48	98	1	7	0	2	2	0	0	2	35	29	1	0
2008	2,499	4,827	335	354	6.9	0	33	92	41	15	117	1	4	2	1	2	0	0	2	34	10	0	0
2007	2,499	4,828	260	276	5.4	0	40	56	49	15	64	1	6	0	0	0	0	0	2	39	4	0	0

Source: Monitoring Results of Groundwater Quality by Groundwater Quality Monitoring Network (2007-2011)

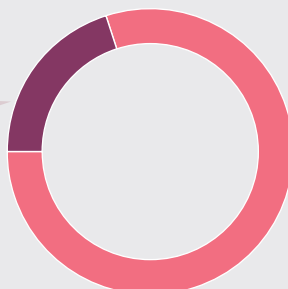
※ Since one sample showed excess in two or more criteria, the number of excesses and the criteria with excess differed.

※ With the change in the criteria for groundwater quality standards (enforced on Feb. 16, 2010), Coliform groups and Total colony count were removed while Total coliforms was included. Total coliforms for 2007-2009 was indicated in Total coliforms.

[Figure 4-2] Status of Excess Rates for Pollutants

Specific Toxic Substances **84 / 20%**

- General contaminants
 - Total coliforms (204)
 - Nitrate nitrogen (47)
 - Chloride ion (47)
 - pH (38)



General contaminants **336 / 80%**

- Specific toxic substances
 - TCE (38)
 - PCE (11)
 - Lead (2)
 - Arsenic (23)
 - Phenol (4)
 - Others (6)

Source: Report on Results of 2011 Operation of Measuring Network

4.2 Policy Overview

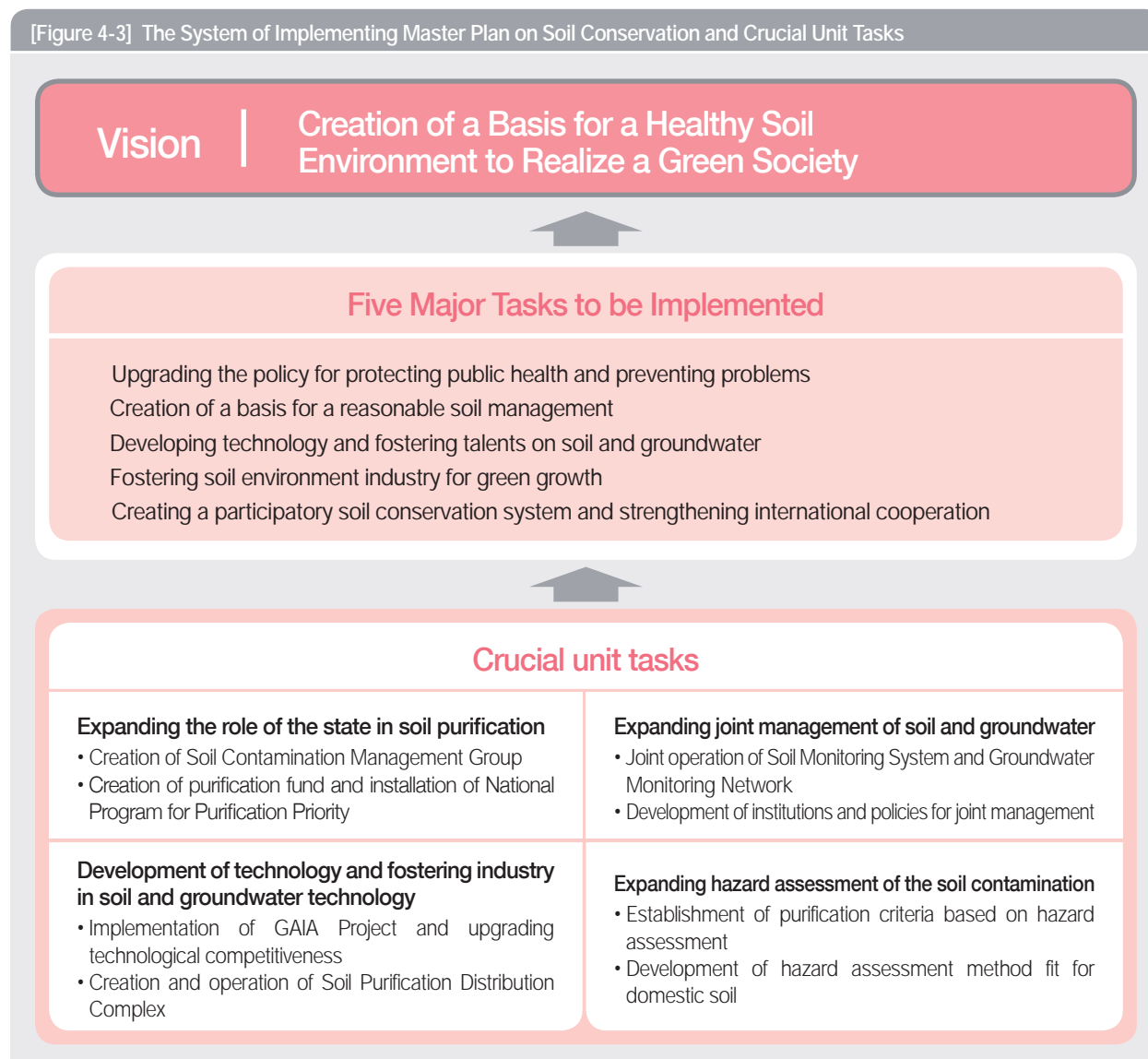
4.2.1 Soil

4.2.1.1 Master Plan for Soil Conservation (2010-2019)

Since the enactment of Soil Environment Conservation Act in 1995, Korea's soil environment conservation policy has made much progress in different areas. Yet, the fragmentary measures focused on ex post facto management implemented in different areas have had only limited effect in efficient prevention of soil contamination and protection of people's health and ecosystems. As it

became necessary to go beyond harmony and establish a virtuous circle between environment and economy and establish a systematic plan for a shift toward a policy for soil resources conservation and circulation, a comprehensive plan on soil environment conservation that would present a vision and a direction for the soil environment policy to be implemented for the next decade (2010-2019).

[Figure 4-3] The System of Implementing Master Plan on Soil Conservation and Crucial Unit Tasks



4.2.1.2 Specific Soil Pollution Management System

The comprehensive definition of Target Facilities for Soil Contamination Management refers to those facilities, devices, buildings, structures, and places that are feared to pollute soil in the process of producing, transporting, storing, handling, and processing soil pollutants, and the system is designed to prevent soil contamination by designating as Target Facilities for Specific Soil Contamination Management those facilities for producing and storing petroleum products

(20,000 liters or more) and oil pipelines which are likely to pollute soil. A person who has installed Target Facilities for Specific Soil Contamination Management must regularly conduct Soil Contamination Test (1 to 5 yrs) and Leakage Test (8 yrs), and perform soil purification and facilities improvement where soil contamination exceeds the level of causing concern or, as a result of leakage test, the facility is judged inappropriate.

[Table 4-6] Status of Target Facilities for Specific Soil Contamination Management (2011)

(Unit: No. of locations)

Year	Total	Petroleum products				Toxic substances
		Total	Gas station	Industrial facilities	Others (heating facilities etc.)	
2011	22,976	22,633	15,154	4,726	2,753	343
2010	22,394	22,089	14,735	4,515	2,839	305
2009	22,640	22,327	15,135	4,295	2,897	316
2008	22,451	22,172	14,952	4,371	2,849	279
2007	22,481	22,215	14,734	4,533	2,948	266

Source: Press release from the Ministry of Environment (July 19, 2012)

As a result of implementation of regular and irregular soil contamination tests on 8,326 facilities in 2011, 287 locations (3.4%) exceeded soil contamination level causing concern, while 57(4.7%) out of 1,201 facilities tested for leakage, were judged inappropriate. In the future, a nationwide survey of soil contamination sources will be conducted and archived in the form of computerized database, with which soil contamination is to be prevented through a strict monitoring and institutional improvement. Moreover, Clean Gas Station System that was pushed ahead since 2006

will be extended for expanded designation. Clean Gas Station Designation System is designed to prevent soil contamination as well as financial loss due to purification of polluted soil by creating soil contamination prevention system that installs the facilities for preventing leakage of pollutants such as double wall tank, double piping, and drain and spillover prevention facilities as well as leakage detection system. It was first applied and operated in 2006 at five gas stations as a pilot project, and as from 2011, 413 Clean Gas Stations were designated.

4.2.1.3 Management of the Environment in Easily Polluted Areas and in Abandoned Metal Mines

As environmental contamination in idle or abandoned metal mines loomed as a social issue, environmental contamination investigation targeting soil and groundwater and mining damage prevention project has been implemented since 1992, and the survey of 936 previously identified abandoned metal mines was completed by 2010. Moreover, a survey of the impact

from environmental contamination targeting business operations where mining damage prevention project was completed was implemented, finishing investigation of 101 places by 2011. As to abandoned asbestos mines, formal examination is being pushed for year after year by 2017 in the order of priority based on Medium-and-Long-Term Investigation Plan of Feb. 2011.

4.2.2 Groundwater

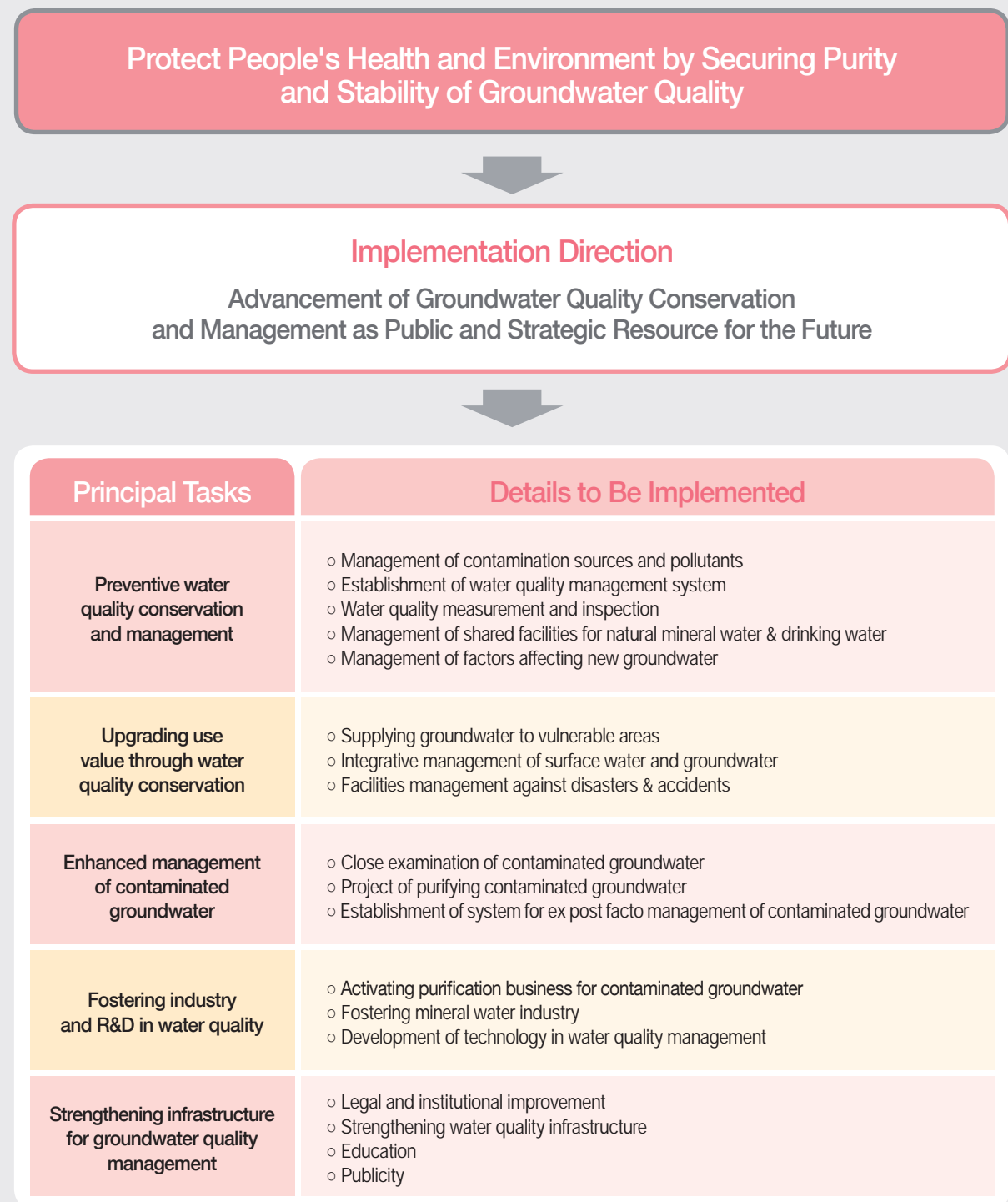
4.2.2.1 Master Plan on Groundwater Quality Management (2012-2021)

As popular interest in water grows because contamination sources diversify with intensifying drought due to climate change, and various disasters and accidents such as the outbreak of foot-and-mouth disease, nuclear power plant disaster in Fukushima of Japan, clean and safe groundwater is drawing more spotlight. Since the enactment of the relevant law in 1993, however, groundwater management has been done with a focus

on water quantity management, which has been focused on dealing with impending issues. Master Plan on Groundwater Quality Management, to be implemented for a decade (2012-2021), was established with a view to presenting a proactive vision and policy direction in securing clean and safe groundwater and building a framework for using groundwater as strategic resource of the future in a sustainable way.



[Figure 4-4] Vision, Goal, and Implementation Strategy for Master Plan on Groundwater Quality Management



Source: Establishment of Master Plan on Groundwater Quality Management (2012)

4.2.2.2 Facilities Using and Development Groundwater

Groundwater Act stipulates that when a person wants to develop and use groundwater, the person must get authorization from or register with city or county mayor or ward chief, with authorization or registration depending on the water pumping capacity of the

facility and the diameter of the discharge pipe. In terms of authorization, a person who wants to develop or use groundwater must conduct an investigation of the impact of groundwater prior to application for authorization.

[Table 4-7] Classification of Groundwater Development and Use when Authorization or Registration is Required

Classification of Use	Classification	Authorization or registration required
	Without power unit	Waived
Home	With power unit	Registration required
	Water pumping capacity of over 100 tons per day (discharge pipe diameter over 40 mm)	Authorization required
Farming & Fishery	Water pumping capacity of less than 100 tons per day (discharge pipe diameter less than 50 mm)	Registration required
	Water pumping capacity of over 100 tons per day (discharge pipe diameter over 50 mm)	Authorization required
Defense & Military	Regardless of water pumping capacity	Registration required
General	Water pumping capacity of less than 100 tons per day (discharge pipe diameter less than 40 mm)	Registration required
General	Water pumping capacity of over 100 tons per day (discharge pipe diameter over 40 mm)	Authorization required
Emergency water supply in wartime etc.	Regardless of water pumping capacity	Registration required
Response to disaster etc.	Regardless of water pumping capacity	Registration required
In groundwater conservation areas	Water pumping capacity of 30 tons or more per day (discharge pipe diameter 32 mm or bigger) (regardless of use)	Authorization required

Source: Groundwater Act

As of late 2011, 3.91 billion m³/year of groundwater was used in 145 million locations across the country. Compared to the previous year, this meant an increase of about 70,000 holes and about 100 million m³ of groundwater used. Classified by uses, 1.93 billion m³ (49%) of farming & fishery water, 1.78 billion m³ (46%)

of residential water, and 170 million m³ (4%) were used. By region, Jeonnam used the largest amount of 560 million m³ per year, while Seoul used the smallest amount of 220 million m³ per year. By used water quantity per area, Jeju was the largest and Gangwon was the smallest.

[Table 4-8] Status of Groundwater Usage as of Late 2011

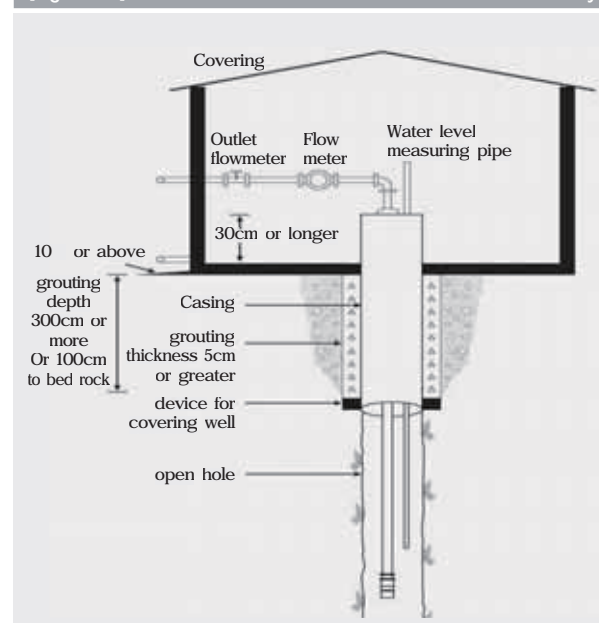
Use	Used amount		No. of facilities	
	Used amount (1 million tons / year)	%	Locations (holes)	%
Residential	1,776	45.4	808	55.8
Farming	1,933	49.5	622	43.0
Industrial	172	4.4	13	0.9
Others	26	0.7	4	0.3
Total	3,907	100	1,447	100

Source: Use of Groundwater, Nara Index

4.2.2.3 Groundwater Contamination Prevention Facilities

Groundwater Act stipulates that anyone who develops or uses groundwater is responsible for ex post facto management including the maintenance of facilities for groundwater development & use and installing groundwater contamination prevention facilities for groundwater quality conservation, but contamination of groundwater is a concerning matter because of the insufficient contamination prevention facilities or unsatisfactory ex post facto management. This has led to the joint survey of the facilities for groundwater development & use designed to upgrade the obligation to install facilities for preventing contamination with regard to development & use of groundwater and the amendment of the Rules on Groundwater Quality Conservation etc.

[Figure 4-5] Structure of Groundwater Pollution Prevention Facility



4.2.2.4 Public Drinking Water Facilities Designation & Management System

Developed with the purpose of supplying drinking water to a multiple number of persons or naturally created water springs, washing places watered by spring, and wells were designated as public drinking water facilities, and the places are subject to water quality inspection at least once a quarter (every month in the third quarter).

Most of "Inappropriate" items come from the microbial criteria such as Ordinary Bacteria and Total Coliforms, and the major causes of "Inappropriate" items are inflow of nearby pollutants in rainy season precipitation and inflow of wild animal excreta. Those facilities found inappropriate by water quality standards are subject to such adequate measures as repairs, reinspection, or closure in compliance with Public Drinking Water Facilities Management Guideline.

[Table 4-9] Results of Water Quality Test at Public Drinking Water Facilities

Year	'07	'08	'09	'10	'11
No. of Tests	9,751	9,347	9,156	8,688	7,982
No. of Inappropriate cases	2,379	2,049	2,092	1,911	2,030
Inappropriate rate (%)	24.4	21.9	22.8	22.0	25.4

Source: Establishment of Master Plan on Groundwater Quality Management (2012)

4.2.2.5 Establishment of Soil & Groundwater Information System (SGIS)

Starting in 2004, Soil & Groundwater Information System was developed and created to enhance of information sharing on soil & groundwater among related areas and service to people with a view to applying them to configuration of nationwide groundwater contamination and restoration projects and upgrading operational productivity and organizational competitiveness through the advancement of soil & groundwater management, systematic information management, and creation of a basis for processing and utilization. The system provides the following information.

- Support for the work of installing and operating monitoring networks

- Search of data for monitoring networks and contamination status
- Search of data for soil monitoring networks and contamination status
- Search of data for soil status and contamination status
- Search of data for formal examination and purification of soil
- Search of data for information on soil & groundwater contamination sources
- Search of location of soil & groundwater monitoring networks
- Status of Target Facilities of Specific Soil Contamination Management and results of contamination test

4.3 Key Issues

4.3.1 Soil

4.3.1.1 Management of Environment of Returned USFK Bases

Korea and the United States are pushing for the return of total 80 bases in accordance with Land Partnership Plan (LPP), Yongsan Relocation Plan (YRP), and irregular consultation on return. By the end of 2011, a total of 49 places were returned, while 31 additional bases and other major locations including Yongsan are yet to be returned. For those bases set to be returned, the environmental survey and hazards assessment are conducted by SOFA Environmental Subcommittee, and based on the results, negotiations are to ensue with the US military on the agent and level of the recovery work on the specific areas.

As a result of the environmental survey on the 23 returned US military bases which was conducted between 2005 and 2006, soil & groundwater contamination was discovered on a considerable number of the bases, the return of which, while there exists a deadlock between Korea and the US with the disagreement over the agent and level of purification of the areas in question, triggering criticism at a National Assembly hearing on the unsatisfactory environment of the returned US military bases. Some 30 cases of environmental pollution have arisen since 2000 with US military bases granted and used. Notably, in 2011 nationwide attention was given to the suspected burial of defoliant at Camp Carroll located in Chilgok, Gyeongbuk.

To solve this problem, the negotiations proceeded between the two countries on the agent and level of contamination treatment work, which came up with a scientific basis for the bilateral negotiation on treatment while allowing for flexible extension of the period of investigation and creating a procedure on negotiation. Concerning areas near the US military

bases, a total of 30 places has been underwent with an environmental survey between 2008 and 2011 in accordance with Special Act on Support for Areas etc. Adjacent to Districts to the United States Armed Forces in Korea, and the Ministry of National Defense is conducting purification process of those returned bases. With 2012 legal amendment, the agent of the investigation, which used to be divided into local governments and the Ministry of Environment, found its unified authority with the Ministry of Environment.

The return of the military bases that came to a halt in the middle of 2011 investigation into the suspected defoliant burial is set to move forward to meet the planned relocation of the US military base to Pyeongtaek set for 2016, and in that regard, the basic preparation including budget and man power is to proceed for the implementation of an environmental investigation and hazards assessment.



4.3.1.2 Management of Contamination Concerned Areas such as Abandoned Metal Mines

As the environmental pollution at idle or abandoned metal mines loomed as a social issue, starting in 1992, environmental pollution investigation and mining damage prevention project had been carried out on soil & groundwater since 1992, while an on-spot survey was completed by 2010 on 936 abandoned metal mines that were previously found. And 1,153 more abandoned metal mines were discovered in 2010, an on-spot survey has been going on year by year since 2011. An effective implementation of the mining damage prevention project was ensured by conducting an on-spot contamination survey targeting abandoned

coal & asbestos mines in order to discover as early as possible and purify contamination while preventing and minimizing the involved hazards. Regarding abandoned asbestos mines, in accordance with Medium-and-Long-Term Examination Plan (a planned formal examination of 13 abandoned coal mines and 17 mines potentially containing asbestos) established in Jan. 2011, a formal examination of abandoned asbestos mines is underway in the order of priority year by year until 2017. A Medium-and-Long-Term Examination Plan is to be drawn up for a systematic investigation of abandoned metal and coal mines.

[Table 4-10] Medium-and-Long-Term Examination of Abandoned Asbestos Mines

(Unit: location)

Category	Total	2011	2012	2013	2014	2015	2016	2017
Abandoned asbestos mine	13 (1)	2 (1)	5	3	3			
Mine potentially containing asbestos	17	1	1	1	2	2	6	4

※ () refers to abandoned asbestos mines added through the examination. / Source: Ministry of Environment Collection of Policy Outcomes (2012)

4.3.1.3 Establishment of Measures for Topsoil Conservation

Topsoil refers to surface soil rich in organics and microbes in which contamination purification and circulation of substances take place, and is considered to have a value of about 26.4 trillion won with its circulation of substances and environmentally beneficial functions involving purification of pollutants, carbon storage, and air cooling. As a matter of fact, Korea needs a systematic management of the land as it is found to be quite vulnerable to topsoil erosion, losing over 33 tons of topsoil per ha in over 30% of the entire country due to the topographical and climatic characteristics (mountainous terrains and heavily concentrated summertime

precipitation). According to the OECD statistics, the country's risk in topsoil erosion is ranked 8th out of 28 member states (as of 2008). Therefore, a Comprehensive Plan on Topsoil Conservation was drawn up to create an efficient topsoil management system and maximize the use value of topsoil. First of all, an on-spot survey of topsoil erosion is to be conducted to precisely figure out topsoil erosion, create Topsoil Erosion Map based on its results, and establish a Korean model for topsoil erosion examination. Going one step further from surveying of the actual condition, a basis shall be established for preventing, restoring and managing erosions.

4.3.1.4 Enhanced Measures for Environmental Management Related to Agricultural Pesticides

In 2011, an on-spot survey was conducted of pesticides used in golf courses to prevent and monitor contamination of soil & groundwater in golf courses and neighboring areas and minimize the damage to downstream areas by preventing the use of deadly poisonous or highly toxic pesticides and ensuring compliance with requirements for safe use through an on-spot survey of pesticides used in golf courses and a test for residues. As a result of an on-spot survey for pesticidal residues performed on 421 golf courses around the country, 172 courses were found with 11

kinds of pesticides mainly remaining in grass and soil, while none of them was found with any pesticidal ingredients in their final outflowing water. As a result of the on-spot survey on used pesticides, the practice varied from pesticide-free golf courses to use of up to 86kg per ha. A plan will be prepared and implemented for managing the use of pesticides in golf courses with a view to reducing the use of pesticides, and a program is being planned for managing pesticides used in sports facilities with grass including soccer fields, baseball parks, and neighboring parks.

[Table 4-11] Comparison of Pesticides Used in Golf Courses between 2010 and 2011

Category		2010	2011	Change in amount
Amount of pesticides used (total amount / amount of ingredients)		(391.8 tons, 116 tons)	(400 tons, 118 tons)	2.1%
Average amount of pesticides used per specific area	By total amount	17.41 kg/ha	16.90 kg/ha	2.9%
	By amount of ingredients	5.15 kg/ha	5.01 kg/ha	2.7%

※ Total amount/amount of ingredients: amount specified for the container on sale / amount of valid pesticidal ingredients.
Source: Press release from Ministry of Environment (Oct. 18, 2012)

As the Regulation on Examining the Discharged Amounts of Pesticides in Golf Courses and Drinking Water Sources now lacks credibility to be reflected of

the current situation due to long negligence, targets of the survey shall be selected again while the survey and analysis methods is to be improved.

4.3.2 Groundwater

4.3.2.1 Development of a National Branding Project for Drinking Mineral Water

Drinking (natural) mineral water market is steadily expanding with growing demand, rising income levels, and increasing outdoor activities. For the last five

years, the average growth registered approximately 10%, while the total value of the domestic drinking mineral water market was 375 billion won (as of 2011).

[Table 4-12] Domestic Sales of Potable Mineral Water

(Unit: 1,000 tons and 1 million won)

Year	2007	2008	2009	2010	2011
Amount sold	2,548	3,049	3,251	3,348	3,469
Total sales	285,104	307,578	326,830	340,141	375,367

Source: Ministry of Environment Collection of Policy Outcomes (2012)

While Korea's export of drinking mineral water continues to surpass imported amount, a trade imbalance is incurred as domestic drinking mineral water is exported at relatively low prices whereas foreign drinking mineral water is imported at higher prices (as of 2010, export is priced at USD 402.5/ton and import is priced at USD 725.2/ton), which seems to be attributable to the low international recognition and insufficient differentiation of the domestic drinking mineral water. And it has been pointed out that contamination sources such as burial sites and wastes disposal facilities located near where water is taken are likely to pollute the ground

water, thus requiring the upgrade of water quality including ground water quality monitoring. Therefore, the validity survey and marketing strategy study have been carried out with regard to the development of a national brand of drinking mineral water. With the development of the name and logo design for national premium brand, a company producing drinking mineral water has been selected for experimental application of the national premium brand. And with the legitimate implementation following the pilot operation and performance evaluation, a basis has been created for promoting the export of drinking mineral water.

[Table 4-13] Export and Import of Potable Mineral Water

Year	Export		Import	
	Weight (ton)	Sum (1 thousand dollars)	Weight (ton)	Sum (1 thousand dollars)
2006	7,336	2,879	5,674	3,489
2007	7,453	3,698	7,308	5,208
2008	7,727	3,577	7,051	5,783
2009	12,855	4,947	8,515	6,629
2010	17,936	7,220	12,078	8,759

Source: Ministry of Environment Collection of Policy Outcomes (2012)

Also, with the amendment of Management of Drinking Water Act, which enabled possible the manufacture and sales of potable saline groundwater, types of drinking water increased, and through the easing of drinking mineral water quality standards, products rich in minerals and alkali products are now entering the market. Moreover, through the creation and operation of the remote monitoring of the amount and quality of mineral water produced by drinking mineral water manufacturers, a real-time management of mineral

water is now possible, enabling immediate response to any problems including water contamination. Methods for specialization and advancement of drinking mineral water continue to be implemented, while for this purpose, expansion of criteria for monitoring drinking mineral water quality and upgraded management are being planned. Also, by designating which is of high value to the manufacture of drinking mineral water, and their vicinities, as mineral water conservation areas, excellent domestic water sources will be actively managed

4.3.2.2 Securing Water Welfare Safety Net in Areas Disadvantaged for Drinking Water

Most of the vulnerable residents in islands, coastal areas, and some of the farming and fishery communities who are not provided with waterworks still get their drinking water from the groundwater in long-used wells without any quality test. Waterworks are supplied to less than 60% of farming areas (myeons or smaller areas), and while groundwater in some of the farming communities register 30% to 40% in the ratio in excess of quality standards for nitrate nitrogen and total coliforms, unregistered use or protracted test period (2 or 3 yrs) keep the drinking water management vulnerable. Since an across-the-board supply of waterworks should be inefficient thus limited for farming communities, a paradigm shift of drinking water supply focused on provision of waterworks is required. To begin with, test kits are to be used in farming communities to perform cost-free potable groundwater quality test, while water welfare disparities shall be dissolved and resident health shall be enhanced by implementing Safe Groundwater Project that comprises Safe Well Designation, installation and distribution of tube wells dedicated to drinking water. Methods to be implemented in 2013 are as follows.

Drinking water and groundwater quality test in disadvantaged areas

- Groundwater quality test in areas without waterworks, burial sites, and livestock complexes (12,500 places nationwide in 2013)
- ※ Drinking groundwater quality test using test kit (3,000 tests in 2013)

Analysis of methods for supporting drinking water in areas without waterworks (first half of 2013)

- On-spot survey of drinking water in areas without waterworks and types of support

Establishment of a 5-year plan (2013 - 2017) on securing water welfare safety net in areas disadvantaged for drinking water

Implementation of Safe Drinking Groundwater Project (from 2013)

- Pilot program of designation safe wells, installation and distribution of tube wells dedicated to drinking water, development of customized water purifier, free of charge instant quick drinking water test, and introduction of voucher for water quality test
- Expansion of support for safe drinking water through the participation of social enterprises

4.3.2.3 Upgraded Management of Livestock Burial Sites and their Surroundings

Foot-and-mouth disease, first confirmed in Andong, Gyeongbuk in November, 2010, spread to 11 cities and provinces, leading to outbreak in 75 cities, counties, and districts. To eradicate the infection and spread of the foot-and-mouth virus, the disease control authorities carried out a killing and burial of 3.48 million head of pigs, oxen and cows, and 6.47 million head of chickens and ducks, in effect creating 4,799 burial sites nationwide.

As the killing and burial of livestock were carried out as emergency quarantine operation focused on stopping the spread of the foot-and-mouth virus, it was not easy for local governments to observe the standards related to burial. Moreover, as the massive creation of the burial sites was not predicted, they were not prepared with materials, equipment, manpower needed for the work. Hence, some of the burial sites were built at slopes, sites near rivers, areas with abundant groundwater, and on roads and sites close to residential areas, creating such issues as eventual loss, feared water contamination, and stench. Furthermore, insufficient soil compaction inside burial sites, uninstalled water drains and sumps, and damaged vinyl covers due to burial of live animals brought to the public a great concern over the leachate from burial sites and groundwater contamination.

As the general environmental manager related to the burial sites, the Ministry of Environment pushed for a national-level environmental survey on burial sites to respond to the concern over the leakage of leachate and groundwater contamination. Through the quarterly surveys of 7,679 tube wells near the burial sites in 2011, 25% to 36% of them appeared to be in violation of water quality standards, while the causes of the excess turned out to be livestock excreta and wastewater instead of leachate from the burial sites. Also, as a result of the massive survey of environmental impact in 300 burial sites near rivers (conducted in the first half of 2012), 21 sites were found with risks of leachate leakage, so local

governments took measures including relocation and reinforcement of leachate collection.

In addition, with a view to an adequate response to the concern over leachate leak from burial sites and groundwater contamination, the Ministry of Environment pushed for the following multiple measures.

Implementation of the test of background water supply to the groundwater in livestock compounds, designed to figure out the quality of the background water supply to the groundwater near livestock compounds (on 1,500 tube wells in 50 compounds between January and December, 2012).

Implementation of environmental impact survey on 300 burial sites (until Dec. 31), groundwater quality test on 8,000 tube wells near burial sites (until Dec. 31; half-yearly), and microbial test on 600 tube wells (until Dec. 31; half-yearly).

Implementation of a concerted government inspection of thawing season and rainy season of 2012 (Mar. 26 to Mar. 30 and May 30 to Jun. 8 comprising the Prime Minister's Office, the Ministry of Public Administration and Security, the Ministry for Food, Agriculture, Forestry and Fisheries, the Ministry of Environment, and relevant local governments) and voluntary environment patrol.

In 2013, the third year in foot-and-mouth disease related environmental management (2011-2013), burial sites are gradually stabilizing, yet safety management is necessary on groundwater and drinking water near burial sites. For this, it should be imperative to secure representative data on the groundwater concentration in the background to ensure a pre-selection of candidate burial sites in the case of an outbreak of foot-and-mouth disease and safe supply of groundwater and drinking water. For this purpose, the Ministry of

Environment continues to push forward with measures for the environmental management of the burial sites including implementation of environmental impact survey on the burial sites, comprehensive examination of groundwater monitoring wells, examination of contamination of livestock farms and the concentration in the background, and preparation of measures for ex

post facto management of burial sites of over three years. At the same time, while in cooperation with the Ministry of Agriculture, Food and Rural Affairs, the Ministry of Environment plans to implement preventive measures for environmental management on burial sites including training of local government employees and pre-selection of candidate burial sites.



05-1 Natural Environment and Land





5.1 Conservation and Restoration of Natural Environment

5.1.1 Current Status

- 5.1.1.1 Ecosystem and Biodiversity
- 5.1.1.2 Conservation and Use of Natural Environment

5.1.2 Policy Overview

- 5.1.2.1 Conservation and Management of Areas with Excellent Natural Environment
- 5.1.2.2 Conservation of Biodiversity
- 5.1.2.3 Survey and Research on Natural Environment

5.1.3 Key Issues

- 5.1.3.1. Hosting of the IUCN World Conservation Congress
- 5.1.3.2 Establishment of National Institute of Ecology
- 5.1.3.3 Expansion of Natural Parks
- 5.1.3.4 Enactment of Act on Conservation and Use of Biodiversity

5-1. Natural Environment and Land

5.1 Conservation and Restoration of Natural Environment

5.1.1 Current Status

5.1.1.1 Ecosystem and Biodiversity

The Ecosystem of the Korean Peninsula

The Korean Peninsula has very unique geographical and climatic conditions. The diversity of the ecosystem has been maintained by the mountain range running from Baekdu Mountain down to Jiri Mountain as well as the physiographical conditions shaped by it, and the geographical condition of being surrounded by seas on three sides. The mountainous regions that take up two-thirds of the territory and three thousand or so islands together create breathtaking scenery, while providing various habitats for diverse species. As Korea's leading biological habitats, Baekdudaegan, Jeju Island, Ulleungdo, and West Coast lagoons stand out.

Along the forest on the axis of Baekgudaegan, the peninsular ecosystem can be categorized into farm land, fresh water, islands/coasts, and seas. Forest takes up 64% of the entire territory of Korea. While there exist a variety of vegetation zones from subtropical to temperate in terms of forest physiognomy, coniferous

forest occupies the largest area at 41%, deciduous forest at 27%, and mixed coniferous-deciduous forest at 29%. As a single species of plant, pine trees are most commonly distributed accounting for 27% of the entire forest area. Broad-leaved evergreens grow on the south coast and islands, while frigid conifers grow in high mountains and the northern region.

The agricultural ecosystem takes up 17.9% of the total land, 60% in paddies and 40% in fields. With rapid urbanization, farm land continues to diminish. In particular, paddies, which serve as habitat for aquatic organisms, is decreasing in noticeable pace.

Geomorphologically, the freshwater ecosystem is formed along the rivers gently flowing into the West Sea and South Sea, whereas many of the rivers flowing into the East Sea are short and rapid. Since the precipitation is heavily biased seasonally, the amount of flowing water is large in the rainy season and small for the rest of the year. The river ecosystem is greatly disturbed by physical



[Figure 5.1-1] Diverse Species in Korea

factors such as dam construction, straightening, aggregate extraction, and embankment. Wetlands are relatively well-preserved in areas around large rivers, such as Upo on Nakdong River. On the other hand, they are rare around lakes, since many of Korea's lakes are artificial and their water level show large fluctuation.

As for the coastal ecosystems, the west and south coast have a large area of mud flat, totalling 2,489km². The total length of the coastline is 12,682km, of which 78% is natural. Coastal and marine areas of Korea have a good scenic value with bays, lagoons, mud flats, shoals, and underwater areas and serve as resources for ecotourism.

Biodiversity

The country has unique topography, terrains, and climate conditions including well-developed coastlines, clear-cut four seasons under the influence of seasonal winds, thousands of islands, diverse vegetation zones ranging from subtropical to frigid, and flood and typhoon. For this reason, as compared to other countries in the temperate zone, Korea is inhabited by relatively diverse species as per its land size, with the number of native species estimated at 100,000. The total number of biological species recorded as of 2012 is 39,150, including 5,281 plants, 1,889 for vertebrates, 20,613 invertebrates, and 11,367 micro-organisms. The number of endemic species inhabiting Korea is 2,177 (as of 2011).

The biggest threat to biodiversity is the loss of habitat. As land use is increasingly changed such as conversion of forest 12,000ha of forest disappears every year despite afforestation, colony restoration, and natural restoration leading to gradual decrease of habitat. Biodiversity is also threatened by climate change and invasion of alien species. With summer temperature rising, the growth of Korean fir, an endemic species, is decreasing, and with rising sea water temperature tropical species are clambering onto the country's coastal areas. The total number of alien animal and plant species that are naturally or artificially introduced into the country stands at 1,128 (309 plant species and 819 animal species). Of these species, 18 species that disturb the ecosystem and encroach onto the habitat of endemic species are designated as ecosystem disturbing species and kept under control.

Wildlife species endangered by natural or artificial threats are under legal protection according to the severity of the risk. Based on the 「Act on Wildlife Protection and Management」, the number of designated 'endangered wildlife species' increased from 221 to 246 in 2012 (51 Category I species and 195 Category II species). 57 species have been newly listed, while, 32 previously designated species that have escaped the risk of extinction or no longer inhabit the country have been deleted.

[Table 5.1-1] Endangered Species of Wild Flora and Fauna (246 species)

Classification	Total	Category I	Category II
Total	246	51	195
Mammals	20	11	9
Birds	61	12	49
Amphibians&Reptiles	7	2	5
Fish	25	9	16
Insects	22	4	18
Invertebrates	31	4	27
Plants	77	9	68
Seaweed	2	-	2
Higher fungi	1	-	1

* Category I: a species facing imminent extinction because of a decrease in the population caused by a variety of human and natural factors.

* Category II: a species likely to become endangered because its population is decreasing due to a variety of human and natural factors.

[Table 5.1-2] Endangered Species Category (51)

Classification	Species
Mammals (11)	<i>Canis lupus coreanus</i> , <i>Cervus nippon hortulorum</i> , <i>Ursus thibetanus ussuricus</i> , <i>Myotis formosus chofukusei</i> , <i>Moschus moschiferus arripes</i> , <i>Naemorhedus caudatus</i> , <i>Lutra lutra</i> , <i>Lynx lynx</i> , <i>Vulpes vulpes peculiosa</i> , <i>Panthera pardus orientalis</i> , <i>Panthera tigris altaica</i>
Birds (12)	<i>Aquila chrysaetos</i> , <i>Eurynorhynchus pygmeus</i> , <i>Egretta eulophotes</i> , <i>Grus japonensis</i> , <i>Falco peregrinus</i> , <i>Platalea minor</i> , <i>Haliaeetus pelagicus</i> , <i>Tringa guttifer</i> , <i>Dryocopus javensis</i> , <i>Cygnus olor</i> , <i>Ciconia boyciana</i> , <i>Haliaeetus albicilla</i>
Amphibians & Reptiles (2)	<i>Sibynophis chinensis</i> , <i>Hyla suweonensis</i>
Fish (9)	<i>Pseudopungtungia nigra</i> , <i>Pseudobagrus brevicorpus</i> , <i>Odontobutis obscura</i> , <i>Cobitis choii</i> , <i>Koreocobitis naktongensis</i> , <i>Microphysogobio rapidus</i> , <i>Acheilognathus somjinensis</i> , <i>Liobagrus obesus</i> , <i>Gobiobotia nakdongensis</i>
Insects (4)	<i>Hipparchia autonoe</i> , <i>Aporia crataegi</i> , <i>Polyphylla laticollis manchurica</i> , <i>Callipogon relictus</i>
Invertebrates (4)	<i>Cristaria plicata</i> , <i>Charonia sauliae</i> , <i>Pseudohelice subquadrata</i> , <i>Lamprotula coreana</i>
Plants (9)	<i>Cypripedium japonicum</i> , <i>Sedirea japonica</i> , <i>Euchresta japonica</i> , <i>Cotoneaster wilsonii</i> , <i>Diapensia lapponica</i> var. <i>obovata</i> , <i>Cymbidium lancifolium</i> , <i>Cypripedium guttatum</i> , <i>Neofinetia falcata</i> , <i>Cymbidium kanran</i>

[Table 5.1-3] Endangered Species Category (195)

Classification	Species
Mammals (9)	<i>Martes flavigula</i> , <i>Mustela nivalis</i> , <i>Callorhinus ursinus</i> , <i>Phoca largha</i> , <i>Prionailurus bengalensis</i> , <i>Murina ussuriensis</i> , <i>Eumetopias jubatus</i> , <i>Plecotus auritus</i> , <i>Pteromys volans aluco</i>
Birds (49)	<i>Anser cygnoides</i> , <i>Larus saundersi</i> , <i>Haematopus ostralegus</i> , <i>Emberiza aureola</i> , <i>Grus grus</i> , <i>Cygnus columbianus</i> , <i>Larus relictus</i> , <i>Terpsiphone atrocaudata</i> , <i>Strix uralensis</i> , <i>Dryocopus martius</i> , <i>Platalea leucorodia</i> , <i>Otis tarda</i> , <i>Aegypius monachus</i> , <i>Nipponia nippon</i> , <i>Gallix cinerea</i> , <i>Ciconia nigra</i> , <i>Emberiza sulphurata</i> , <i>Pandion haliaetus</i> , <i>Pernis ptilorhynchus</i> , <i>Accipiter soloensis</i> , <i>Gorsachius goisagi</i> , <i>Synthliboramphus wumizusume</i> , <i>Galerida cristata</i> , <i>Accipiter nisus</i> , <i>Falco subbuteo</i> , <i>Locustella pleskei</i> , <i>Milvus migrans</i> , <i>Emberiza yessoensis</i> , <i>Bubo bubo</i> , <i>Circus melanoleucos</i> , <i>Numenius madagascariensis</i> , <i>Strix aluco</i> , <i>Grus vipio</i> , <i>Circus cyaneus</i> , <i>Accipiter gularis</i> , <i>Accipiter gentilis</i> , <i>Cygnus cygnus</i> , <i>Anser fabalis</i> , <i>Ixobrychus eurhythmus</i> , <i>Buteo hemilasius</i> , <i>Pitta nympha</i> , <i>Aquila clanga</i> , <i>Mergus squamatus</i> , <i>Branta bernicla</i> , <i>Grus monacha</i> , <i>Columba janthina</i> , <i>Charadrius placidus</i> , <i>Anser erythropus</i> , <i>Aquila heliaca</i>

Classification	Species
Amphibians & Reptiles (5)	<i>Elaphe schrenckii</i> , <i>Mauremys reevesii</i> , <i>Eremias argus</i> , <i>Kaloula borealis</i> , <i>Rana chosonicus</i>
Fish (16)	<i>Pseudopungtungia tenuicarpa</i> , <i>Pungitius sinensis</i> , <i>Coreoperca kawamebari</i> , <i>Gobiobotia macrocephala</i> , <i>Lethenteron reissneri</i> , <i>Gobiobotia brevibarba</i> , <i>Microphysogobio koreensis</i> , <i>Acheilognathus signifer</i> , <i>Culter brevicauda</i> , <i>Rhynchocypris semotilus</i> , <i>Iksookimia pumila</i> , <i>Brachymystax lenok tsinlingensis</i> , <i>Kichulchoia brevifasciata</i> , <i>Lethenteron japonicus</i> , <i>Rhodeus pseudosericeus</i> , <i>Cottus hangiongensis</i>
Insects (18)	<i>Protantigius superans</i> , <i>Nannophya pygmaea</i> , <i>Macromia daimoji</i> , <i>Cicindela anchoralis punctatissima</i> , <i>Libellula angelina</i> , <i>Prosopocoilus blanchardi</i> , <i>Damaster mirabilissimus mirabilissimus</i> , <i>Lethocerus deyrolli</i> , <i>Parnassius bremeri</i> , <i>Chrysocroa coreana</i> , <i>Gymnopleurus mopsus</i> , <i>Spindasis takanonis</i> , <i>Copris tripartitus</i> , <i>Fabriciana nerippe</i> , <i>Damaster changeonleei</i> , <i>Bibasis striata</i> , <i>Osmoderma opicum</i> , <i>Sinia divina</i>
Invertebrates (27)	<i>Chasmagnathus convexus</i> , <i>Dendronephthya suensoni</i> , <i>Tubastraea coccinea</i> , <i>Clithon retropictus</i> , <i>Plumarella spinosa</i> , <i>Ellobium chinense</i> , <i>Euplexaura crassa</i> , <i>Plexauroides reticulata</i> , <i>Dendronephthya castanea</i> , <i>Verrucella stellata</i> , <i>Sesarmops intermedius</i> , <i>Ophiacantha linea</i> , <i>Dendronephthya mollis</i> , <i>Koreanomelania nodifila</i> , <i>Karatohelix adamsi</i> , <i>Dendrophyllia cribrosa</i> , <i>Nacospatangus alta</i> , <i>Dendronephthya putteri</i> , <i>Dendrophyllia ijimai</i> , <i>Scelidotoma vadososinuata</i> <i>hoonsooi</i> , <i>Plumarella adhaerens</i> , <i>Koreanohadra koreana</i> , <i>Plexauroides complexa</i> , <i>Gammarus zeongogensis</i> , <i>Antipathes japonica</i> , <i>Uca lactea</i> , <i>Dendronephthya alba</i>
Plants (68)	<i>Euryale ferox</i> , <i>Eleutherococcus senticosus</i> , <i>Nymphaea tetragona</i> var. <i>minima</i> , <i>Quercus gilva</i> , <i>Astilboides tabularis</i> , <i>Glaux maritima</i> var. <i>obtusifolia</i> , <i>Gymnadenia cucullata</i> , <i>Gastrochilus fuscopunctatus</i> , <i>Trientalis europaea</i> ssp. <i>arctica</i> , <i>Drosera peltata</i> var. <i>nipponica</i> , <i>Kirengeshoma koreana</i> , <i>Lilium dauricum</i> , <i>Viola mirabilis</i> , <i>Rhododendron aureum</i> , <i>Iris koreana</i> , <i>Aster altaicus</i> var. <i>uchiyamae</i> , <i>Halenia corniculata</i> , <i>Anagallidium dichotomum</i> , <i>Iris dichotoma</i> , <i>Cymbidium macrorhizon</i> , <i>Cicuta virosa</i> , <i>Ranunculus trichophyllus</i> var. <i>kadzusensis</i> , <i>Lasianthus japonicus</i> , <i>Ceratopteris thalictroides</i> , <i>Abeliophyllum distichum</i> , <i>Aconitum coreanum</i> , <i>Orobanche filicicola</i> , <i>Vexillabium yakusimensis</i> var. <i>nakaianum</i> , <i>Cypripedium macranthos</i> , <i>Silene capitata</i> , <i>Thrixspermum japonicum</i> , <i>Paeonia obovata</i> , <i>Saururus chinensis</i> , <i>Pterygopleurum neurophyllum</i> , <i>Dendrobium moniliforme</i> , <i>Viola raddeana</i> , <i>Bupleurum latissimum</i> , <i>Scrophularia takesimensis</i> , <i>Aconitum austrokoreense</i> , <i>Iris ruthenica</i> var. <i>nana</i> , <i>Psilotum nudum</i> , <i>Brasenia schreberi</i> , <i>Pedicularis ishidozana</i> , <i>Thalictrum coreanum</i> , <i>Viola websteri</i> , <i>Cyrtosia septentrionalis</i> , <i>Utricularia yakusimensis</i> , <i>Dysophylla yatabeana</i> , <i>Lychnis wilfordii</i> , <i>Iris laevigata</i> , <i>Mankyua chejuense</i> , <i>Menyanthes trifoliata</i> , <i>Sarcandra glabra</i> , <i>Cleisostoma scolopendrifolium</i> , <i>Lycoris chinensis</i> var. <i>sinuolata</i> , <i>Oberonia japonica</i> , <i>Michelia compressa</i> , <i>Polygonatum stenophyllum</i> , <i>Metanarthecium luteo-viride</i> , <i>Bulbophyllum drymoglossum</i> , <i>Epilobium hirsutum</i> , <i>Gastrochilus japonicus</i> , <i>Asplenium antiquum</i> , <i>Leontopodium hallaisanense</i> , <i>Pedicularis hallaisanensis</i> , <i>Habenaria radiata</i> , <i>Arctous alpinus</i> var. <i>japonicus</i> , <i>Hibiscus hamabo</i>
Seaweeds (2)	<i>Dictyosphaera cavernosa</i> , <i>Coccophora langsdorfii</i>
Higher fungi (1)	<i>Lampteromyces japonicus</i>

Meanwhile, the program for managing the export of species has been in service since 2002, with the purpose of creating lists for endemic species inhabiting the Korean Peninsula or species with economic value and protecting them from being taken out of the country indiscriminately. Currently, the total number of species designated as biological resources requiring authorization for export comes at 1,971, and the figure is expected to increase to 3,000 in 2014. The designated species list includes 670 insects, 104 arachnids, 596 plants, 110 mollusks, 181 other invertebrates, 116 mycomycetes, 107 seaweeds, 76

fish, 10 lichens and 1 reptile.

In 2010, the National Institute of Biological Resources selected 100 Climate-Sensitive Biological Indicator Species in order to perform an effective monitoring and prediction on the influence and vulnerability that climate change impose on the species distribution on the Korean Peninsula. They are the representative indicator organisms expected to increase or decrease their habitat, or concerned for extinction in the face of global warming. The list includes 18 vertebrates, 28 invertebrates, 44 plants, and 10 fungi/algae.

5.1.1.2 Conservation and Use of Natural Environment

Designation of Protected Areas

Korea is protecting and managing areas especially worthy of protection for its excellent ecosystem and abundant biodiversity, by designating them as Ecological and Scenery Conservation Areas and others. As of June 2010, the ecologically protected areas are as follows: 39 Ecological and Scenery Conservation Areas (362.31km²), 29 Wetland Preserving Regions (332.99km²) and 170 Special Islands (10.545km²) including Dokdo.

Also, many areas are registered or designated as international conservation areas such as Ramsar Wetland and UNESCO Biosphere Reserve. Total 18 areas including Yongneup marsh of Mt. Daeam, Uponeup marsh, and Suncheon Bay mudflat were listed as Ramsar Wetlands, while Seoraksan, Jeju Island, Shinan Dadohae and Gwangneung Forest were designated as UNESCO Biosphere Reserves.



[Table 5.1-4] National Ecological and Scenery Conservation Areas

Name	Location	Area(km ²)	Features	Date of Designation
12 Areas designated by the Ministry of Environment (277.228km ²)				
Nakdonggang Estuary	Gangseo-gu, Saha-gu, Busan	34.20	Migrant birds Estuary habitat	Mar. 10, 1989
Jirisan	Gurye-gun, Jeonnam	20.20	Virgin forest (Korean fir. etc)	Dec. 29, 1989
Mt. Daeam	Inje-eup, Gangwon	1.06	High moor	Dec. 29, 1989
Uponeup	Changnyeong-gun, Gyeongnam	8.54	Primitive natural marsh	Jul. 26, 1997
Moojehineup	Ulju-gun, Ulsan	0.184	Habitat of rare wild animals	Dec. 31, 1998
Seomjingang Otter Habitat	Gurye-gun, Jeonnam	1.83	Habitat of endangered otter	Dec. 1, 2001
Gosanbong Habitat of myotis formosus chofukusei	Hampyeong-gun, Jeonnam	8.78	Habitat of endangered myotis formosus chofukusei	May 1, 2002
Donggang Valley	Yeongwol-gun, Jeongseon-gun, Pyeongchang-gun, Gangwon	64.97	Superb topography and scenery / Habitat of rare wild animals	Aug. 9, 2002
Wangpicheon Valley	The whole area of Geunnam-myeon/ Seo-myeon, Uljin-gun, Gyeongbuk	102.838	Superb topography and scenery / Habitat of rare wild animals	Oct. 1, 2005 Dec. 8, 2006
Sohwang sand Dune	The whole area of Hasidong-ri, Gangdong-myeon, Gangneung-si, Gangwon	0.121	Costal sand dune / Habitat of rare wild animals	Oct. 28, 2005
Hasidong/Anin Sand Dune	The whole area of Hasidong-ri, Gangdong-myeon, Gangneung-si, Gangwon	0.234	Superb topography and scenery of sand dune	Dec. 17, 2008
Unmunsan	The whole areas of Unmun-myeon, Cheongdo-gun, Gyeongbuk	26.395	Scenery/Habitat of endangered species such as otters, flying squirrels and martens	Sep. 9, 2010
4 Areas designated by the Ministry of Land, Transport and Maritime Affairs(70.373km ²)				
Sinduri Sand Dune	Taeon-gun, Chungnam	0.639	Diverse vegetation and peculiar topography	Oct. 9, 2002
Mundo island and its waters	Seogwipo-si, Jeju	13.684	The only one coral community/ diverse seaweed community exist	Nov. 5, 2002
Oryukdo island and its waters	Nam-gu, Busan	0.35	Uninhabited island with fantastic rocks and stones	Dec. 31, 2003
Daeifakdo island and its waters	Ongjin-gun, Incheon	55.7	Superb scenery/main habitat of marine organisms and benthos	Dec. 31, 2003

[Table 5.1-5] Wetland Protected Areas

Name	Location	Area(km ²)	Features	Date of Designation (Ramsar)
Wetland Protected Areas (Inland Wetlands) Designated by the Ministry of Environment (17sites, 114.316km ²)				
Nakdonggang estuary	Saha-gu & Gangseo-gu, Busan	37.718	Migratory birds arrival site	Aug. 9, 1999
Yongneup of Mt. Daeam	Inje-gun, Gangwon	1.36	The only high moor in the country composed of bogs and deciduous forest	Aug. 0, 1999 (Mar. 2, 1998)
Uponeup	Changnyeong-gun, Gyeongnam	8.54	Primitive natural wetland	Aug. 9, 1999 (Mar. 2, 1998)
Moojechineup	Ulju-gun, Ulsan	0.184	Mountainous wetland with endangered species	Aug. 9, 1999 (Dec. 20, 1997)
Mulyeongari-oreum	Seogwipo-si, Jeju	0.309	A parasitic volcanic crater	Dec. 5, 2000 (Oct. 18, 2006)
Hwaumneup	Yangsan-si, Gyeongnam	0.124	Mountainous wetland	Feb. 1, 2002
Du-ung wetland	Taeon-gun, Chungnam	0.067	Back marsh of Shinduri Dune with rare wildlifes	Nov. 1, 2002 (Dec. 20, 2007)
Shinbulsan Mountainous Wetland	Yangsan-si, Gyeongnam	0.308	Mountainous wetland with rare wildlife	Feb. 20, 2004
Damyang Wetland	Damyang-gun, Jeonnam, Buk-gu, Gwangju	0.981	Riverine wetland with endangered and protected wildlife	Jul. 8, 2004
Jangdo island High Moor	Shinan-gun, Jeonnam	0.090	Mountainous wetland in and island	Aug. 31, 2004 (Mar. 30, 2005)
Han River Estuary	South of Kimpo bridge to Ganghwa-gun, Gyeonggi	60.668	26 endangered species	Apr. 17, 2006
Sandeulneup of Jaeyaksan	Milyang-si, Gyeongnam	0.58	Thick-layered peats, endangered species(e.g. Leopard cat)	Dec. 28, 2006
1100 Altitude wetland	Jeju-si & Seogwipo-si, Jeju	0.126	Mountainous wetland with endangered species and rare wildlifes	Oct. 1, 2009 (Oct. 12, 2009)
Muljangori-oreum	Jeju-si, Jeju	0.610	volcanicwetland with unique geology and rary wildlifes	Oct. 1, 2009 (Oct. 13, 2008)
Dongbaekdongsan	Jocheon-eup, Jeju	0.590	Gotjawal forest with high biodiversity, abundant groundwater supply	Nov. 12, 2010
Gochang Ungok Wetland	Gochang-gun, Jeonbuk	1.797	Rich in biodiversity Endangered Species(e.g. Otter)	Mar. 14, 2011 (Apr. 7, 2011)

[Table 5.1-5] Wetland Protected Areas

Name	Location	Area(km ²)	Features	Date of Designation (Ramsar)
Wetland Protected Areas (Inland Wetlands) Designated by the Ministry of Environment (17sites, 114.316km ²)				
Gonggumjee	Sangju-si, Gyeongbuk	0.264	Endangered species(i.e. Common buzzard, Northern Garrier, Eagle Owl)	Jun. 29, 2011
Wetland Protected Areas (Costal Wetlands) Designated by the Ministry of Land, Transport, and Marine Affairs (9 sites, 202.04km ²)				
Muan Tidal Flat	Muan-gun, Jeonnam	42.0	Rich in biodiersity, Geological calue	Dec. 12, 2001 (Jan. 14, 2008)
Jindo Tidal Flat	Jindo-gun, Jeonnam	1.44	Beautiful scenic view and rich in biodiversity, Migratory birds arrival site	Dec. 28, 2002
Suncheon Bay	Suncheon-si, Jeonnam	28.0	Beautiful scenic view, Hooded crane habitat & arrival site	Dec. 31, 2003 (Jan. 20, 2006)
Bulgyo Tidal Flat	Bosung-gun, Jeonnam	10.3	Abundant fisheries Resources	Dec. 31, 2003 (Jan. 30, 2006)
Jangbong Tidal Flat	ongjin-gun, Incheon	68.4	Rich in biodiversity, Rare migratory birds arrival site	Dec. 31, 2003
Buan Julpo Bay	Buan-gun, Jeonbuk	4.9	Rich in biodiversity, Rare migratory birds arrival site	Dec. 15, 2006 (Jan. 1, 2010)
Gochang Tidal Flat	Gochang-gun, Jeonbuk	10.4	Beautiful scenic view, Abundant fishery resources	Dec. 31, 2007 (Feb. 2, 2010)
Seocheon Tidal Flat	Seocheon-gun, Chungnam	15.3	Beautiful scenic view, Eurasian Oystercatcher	Feb. 1, 2008 (Feb. 1, 2010)
Jungdo Tidal Flat	Shinan-gun, Jeonnam	31.3		Jan. 29, 2010
Wetland Protected Areas Designated by Cities and Provinces (3sites, 6.634km ²)				
Dalsung riverine wetland	Dalsung-gun & Dalsuh-gu, Daegu	0.178	Migratory birds arrival site, Rich in plant biodiversity including Floating Heart	May 25, 2007
Choodong wetlang of Daechong Reservoir	Dong-gu, Daejeon	0.346	Rare animals and birds such as Otter and Common Buzzard	Dec. 26, 2008
songdo Tidal Flat	Yeonsu-gu, Incheon	6.11	East Asia migratory birds Flyway	Dec. 31, 2009

Natural parks are designated and managed to protect natural ecosystems, breathtaking natural scenery and cultural heritage, so that citizens can continuously enjoy them. Natural parks are divided into national parks, provincial parks, county parks, and Geoparks. As of late 2012, there are 78 natural parks (total area of 7,910km²), 21 national parks (6,656km²), 29

provincial parks (1,005km²), and 28 county parks (240km²). Geopark is a system newly established in 2012. Geoparks are determined through certification instead of designation, and two locations (Jeju Island and Ulleungdo/Dokdo) have been certified. Especially Jeju Island was certified by UNESCO as Global Geopark in October, 2010.

[Table 5.1-6] National Parks

Order of Designation	Name	Location	Park District		Remarks
			Designation Date	Area (km ²)	
Total			21 parks	6,656.246	
1	Mt. Jiri	Jeonnam, Jeonbuk, Gyeongnam	Dec.29, 1967	483.022	
2	Gyeongju	Gyeongbuk	Dec.31, 1968	136.550	Cultural Heritage
3	Mt. Gyeryong	Chungnam, Daejeon	Dec.31, 1968	65.335	
4	Hallyeohaesang	Jeonnam, Gyeongnam	Dec.31, 1968	535.676	Marine 408.488
5	Mt. Seorak	Gangwon	Mar.24, 1970	398.237	
6	Mt. Songni	Chungbuk, Gyeongbuk	Mar.24, 1970	274.766	
7	Mt. Halla	Jeju	Mar.24, 1970	153.332	
8	Mt. Naegang	Jeonnam, Jeonbuk	Nov.17, 1971	80.708	
9	Mt. Gaya	Gyeongnam, Gyeongbuk	Oct.13, 1972	76.256	
10	Mt. Deogyu	Jeonbuk, Gyeongnam	Feb.1, 1975	229.430	
11	Mt. Odae	Gangwon	Feb.1, 1975	326.348	
12	Mt. Juwang	Gyeongbuk	Mar.30, 1976	105.595	
13	Taeanhaean	Chungnam	Oct.20, 1978	377.019	Marine 352.796
14	Dadoehaehaesang	Jeonnam	Dec.23, 1981	2,266.221	Marine 1,975.198
15	Mt. Bukhan	Seoul, Gyeonggi	Apr.2, 1983	76.922	
16	Mt. Chiak	Gangwon	Dec.31, 1984	175.668	
17	Mt. Worak	Chungbuk, Gyeongbuk	Dec.31, 1984	287.571	
18	Mt. Sobaek	Chungbuk, Gyeongbuk	Dec.14, 1987	322.011	
19	Byeonsanbando	Jeonbuk	Jun.11, 1988	153.934	Marine 17.227
20	Mt. Wolchul	Jeonnam	Jun.11, 1988	56.220	
21	Mt. Mudeung	Jeonnam	Dec.27, 2012	75.425	

Eco-friendly Use of Natural Environment

As vacation is enjoyed more than ever before with the introduction of five-day workweek and general improvement of life quality, leisure activities taking more than two days are increasingly in demand. Particularly with the rapid progress of urbanization (urbanization rate at 91.1% as of 2011), eco-tours that

provide citizens with visits to natural, historical, and cultural resources are in high demand.

Areas with excellent eco-tour resources see particularly increasing number of visitors. National parks, as the leading eco-tour destinations, attract 40 million visitors each year since the removal of admission fee in 2007.

[Table 5.1-7] Status of Visitors to National Parks

[Unit: 1,000 persons]

Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
No. of Visitors	23,042	25,000	25,841	26,878	24,948	37,975	37,707	38,219	42,658	40,804	40,959

The visitors flocking to national parks inflict much damage on the hiking trails and their surroundings. While repair work on hiking trails continued, 'Nationwide Eco-Tour Routes Creation Project' was pushed for as a policy that would provide a systematic protection of natural, cultural and historical resources and meet the popular demand for eco-tour. After Nationwide Eco-Tour Routes Creation Plan was drawn up in 2007 with the aim of creating 1,000km National Eco-Tour Routes by 2012, 13.25 billion won was spent in 49 locations from 2008 to 2012. As of late 2012, total 1,084.3km of eco-tour routes were completed.

Local governments are also promoting ecotourism to vitalize the local economy through conservation

of local ecosystems. Among the successful cases of ecotourism projects led by local governments are Suncheon Bay and Uponeup. In the case of Suncheon Bay, citizens' campaign contributed to conserve estuary wetlands, while the local government developed various programs including bird watch and reed festival, turning the eco-tour into a brand. 2011 saw an inrush of 3.6 million visitors, bringing with them economic benefits worth 150 billion won. In the case of Uponeup, on the occasion of Ramsar Convention Meeting held in October 2008, inland wetland, previously thought to be useless, turned into an excellent eco-tour destination as the infrastructures including ecological experience hall and tour routes were developed.

[[Figure 5.1-2] Reed Bed in Suncheon Bay



[Figure 5.1-3] Uponeup, a Ramsar Wetland



5.1.2 Policy Overview

5.1.2.1 Conservation and Management of Areas with Excellent Natural Environment

Management of Nature Conservation Areas

In order to conserve areas with excellent natural environment, possible damage is prevented by i) designating such areas as Ecological Scenery Conservation Areas, Wetland Protected Areas, Special Islands, etc., and ii) restricting construction and land type conversion. Also, to stop further damage to the impaired areas, prevention facilities and rehabilitation projects are being carried out. Furthermore, a systematic management of conservation areas including 'the basic plan for management of scenery conservation areas' and 'the wetlands conservation plan' is established and implemented.

In those areas designated as nature conservation areas, construction and extension of buildings as well as land type conversion are peremptorily restricted, and when necessary, access is prohibited or only limited access is allowed. In addition, conservation areas are strictly managed with restrictions, under which the violators are subject to fine and become liable to restore the original condition. Also, private lands in conservation areas are purchased by the state through negotiations with the owners.

Management of Natural Parks

Korean natural parks are small in size compared to those in foreign countries and are mainly composed of mountains. Since the designation of Jirisan as the first national park in 1967, major areas of the country with excellent ecosystems have been protected as natural parks. The high population density in the country creates a great multitude of visitors as shown in the fact that national parks alone have 40 million visitors each year. Accordingly, efforts are made to meet the public expectation by upgrading the tour services as well as the level of conservation.

Korea National Park Service (KNPS) works to preserve natural ecosystems, scenery, and historical sites in

national parks and manage visitors. Moreover, KNPS conducts investigation and research on natural resources for effective management of natural ecosystems, and pushes for ecosystem restoration in areas damaged from excessive number of visitors and abusive use. As a part of the efforts, KNPS designates those areas inhabited by a number of endangered species or with an excellent ecosystem as special protection zones and restricts the access.

As visitors of national parks multiplied with the abolition of the admission fee in 2007, visitor management staff were allocated in principal areas to reinforce prohibition of using by-paths and crackdown on illegal acts. Also, to ensure visitors' pleasant tour, upgraded tour guide services have been provided while more amenities are secured in the parks. Currently, 9 Visitor Information Centers, 77 Tour Support Centers, 78 Nature Observation Trails, 2 Nature Learning Facilities, and 300 Eco-guides are in service, while various ecological interpretation programs are provided. Additionally, enhanced explanation is available on the historical and cultural resources in national parks, while special programs themed to the characteristics of each park are provided.

National parks in Korea include high percentage of privately-owned land (19%) and a number of developed areas. Through the adjustment of the national park areas between 2010 and 2011, 207km² of the already-developed private land was excluded while 130km² of state-owned or public land with excellent vegetation was newly included. In the meantime, the purchase of the privately-owned land within the parks has been continued, resulting in the acquisition of 6km² for last six years.

While the national park management in the past was mainly focused on the conservation of biodiversity

and areas with excellent natural scenery, Geopark certification program was introduced in 2011 to ensure a systematic conservation of topographical and geological resources. With regard to Geopark, i) certification standards will be established to assess candidates, ii) a system will be set up for monitoring and follow-up management of certified Geoparks, and iii) Geotourism programs tapping into topographical and geological resources will be developed and distributed.

The year 2012 saw the completion of 'the First Basic Plan on Natural Parks', which had been prepared for a decade (from 2003 to 2012), and the establishment of the Second Basic Plan to be implemented for next decade starting in 2013. As the goal to be achieved in 2022, a decade from now, the current Basic Plan presents the following: 159m² as national park area per capita (as compared to the current 139m²), 63.29 million visitors to national parks (as compared to the current 40.80 million visitors), and 45,000 persons employed from surrounding area (as compared to the current 29,000 persons).

Construction of Ecological Networks on the Korean Peninsula

The government has established a nationwide ecological network in order to enhance ecosystems which were damaged by large-scale development and intensive growth strategies. Three Major Ecological Networks in the Korean Peninsula — Baekdudaegan mountain range, demilitarized zone [DMZ], and coastal and islands areas — have been established to restore damaged and disconnected habitat patches, which are exposed in a fragile condition. In particular, conservation of ecosystems and development of eco-tour are promoted through the establishment of management plan for ecosystem conservation and wise use in the DMZ, which represents great historical and ecological sites.

Meanwhile, the National Comprehensive Environmental Plan (2006-2015) divides the territory into five regions,

and conceives five wide-area ecological axes based on the five regions in connection with the three core ecological axes. Afterwards, to specify boundaries, years of research were carried out and 'the Plan for Building Ecological Axes on the Korean Peninsula' was established in 2010. According to the Plan, the five wide-area ecological axes were designed to manage forest (50,198km²), aquatic ecosystem (5,196km²), and areas with wild animals (3,745km²), and it has developed to the conception of Ecological Networks on the Korean Peninsula connecting mountains, rivers, and seas.

For the construction of the Ecological Networks on the Korean Peninsula, protected areas will be expanded and the restoration of damaged ecosystems will be reinforced. In this respect, the Ministry of Environment is pushing for the following: purchase and restoration of damaged or disconnected areas on principal ecological axes, restriction on development, inclusion of Baekdudaegan and habitats for migratory birds into protected areas, creation of eco-tour routes that connect wide-area ecological axes and urban ecological axes, and creation of urban biotopes (such as ecological ponds, green alleys, and green roofs).



5.1.2.2 Conservation of Biodiversity

Protection of Wildlife

The Ministry of Environment carries out a variety of projects for protecting and managing wildlife with the policy goal of 'creating a sound natural environment where humans and wildlife coexist'. The policy for protecting wildlife is implemented in three principal directions: to increase wildlife population and its density, to decrease the population and density of wildlife causing conflicts with and damage to humans, and to keep up monitoring to check whether an optimum wildlife population and density are maintained. The projects implemented for wildlife protection include the installation and operation of Wild Animals Rescue Center, prevention of damage to wild animals, protection of migratory birds through a contract for managing biodiversity, support for ex-situ conservation institutions, and crackdown on poaching. Also, surveys on population density is conducted for wildlife management which includes monitoring of ecosystem disturbing species, census of winter migratory birds, and survey on the inhabitation status of wild animals and endangered species.

Korea prohibits poaching of most mammals, birds, amphibians, and reptiles living in the wilds. Furthermore,



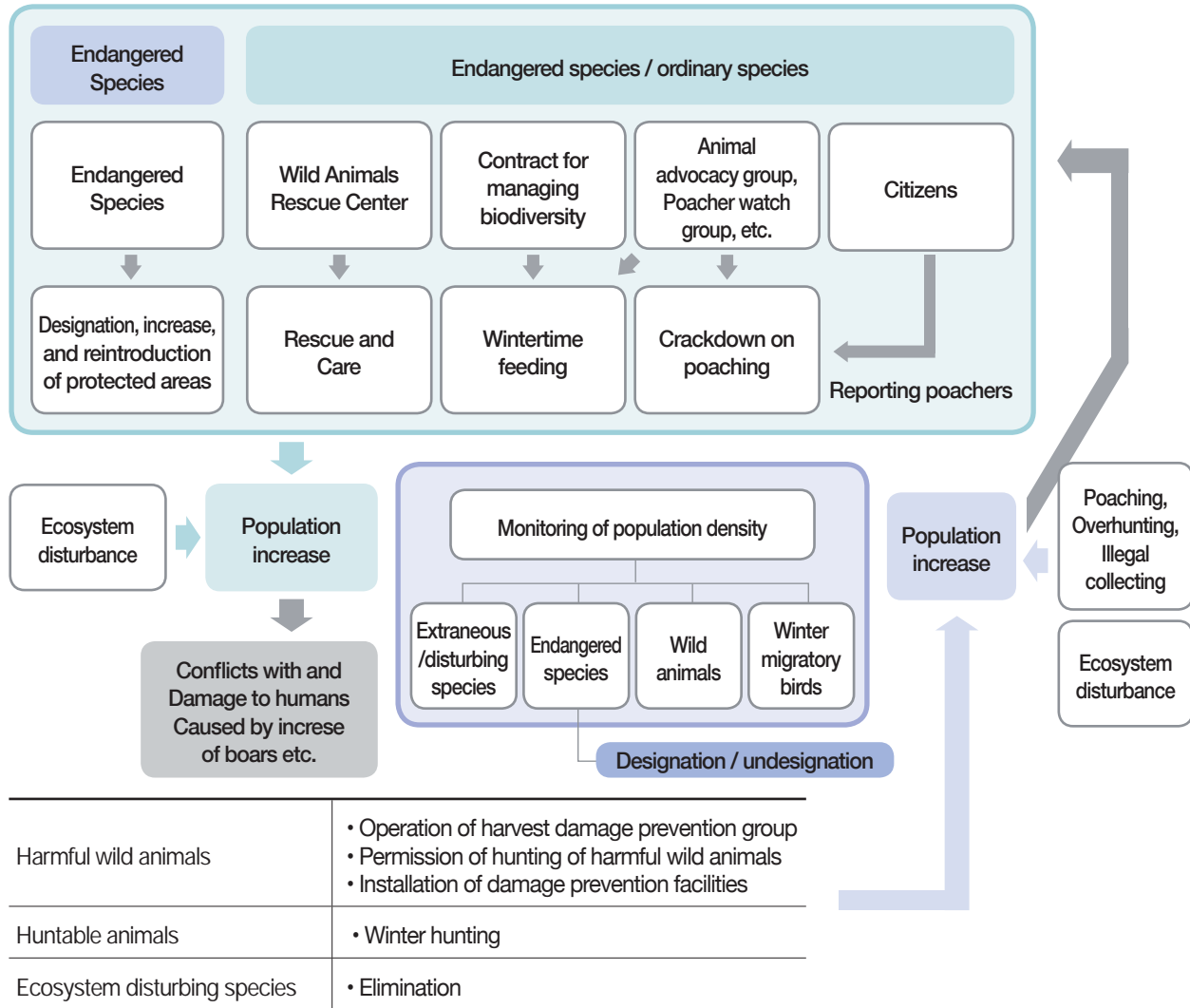
the government and private sector jointly organize and operate poacher watch groups to uproot poaching and trafficking. Poaching and trafficking have steadily dwindled since 2001, and in that regard, awareness campaign and poaching crackdown will continue.

Much effort is being made in rescuing and caring for wounded wild animals. First founded in 2004, there are currently a total of 11 Wild Animals Rescue Centers, which will be increased to 16 by 2015. Every year, over 5,000 wild animals are rescued and treated, and recovered individuals undergo rehabilitation training before they are released into nature.

Hunting is under strict supervision, being allowed only in authorized areas in winter. The type and number of huntable wild animals are specified, and hunters should acquire a license. As for boars and magpies that continue to proliferate and cause damage to farming and power supply facilities, hunting is frequently performed besides in the winter to control their population.

There are 1,128 alien animal and plant species naturally or artificially introduced into Korea. Among them, 16 species that disturb ecosystem and encroach on endemic species are designated as Invasive Alien Species for control purpose. Typical Invasive Alien Species are the red-eared slide (*Trachemys scripta elegans*) and largemouth bass (*Micropterus salmoide*) which recklessly devour aquatic insects, fish, and frogs, resulting in the degradation of the freshwater ecosystem and decline in the number of indigenous species. Invasive Alien Species are prohibited from being planted or released into nature, and restricted from being imported except for research purpose. In addition, the Ministry of Environment, local governments, and private groups are carrying out efforts to exterminate and eliminate ecosystem disturbing species.

[Figure 5.1-4] A Schematic View of Wildlife Protection Activities



Protection of Endangered Species and Migratory Birds

Protection of endangered wildlife constitutes the core policy for conserving biodiversity in Korea. Currently, surveys are conducted on the distribution of 246 endangered wildlife species, while their habitats are under maximum protection. Those who illegally hunt or collect endangered wildlife species are subject to a

sentence of up to 5 years in prison or a fine up to 30 million won. As a major importer of biological resources, Korea is a signatory of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) designed to protect endangered wildlife species from international commercial trade.

As for 43 endangered wildlife species that require extra

care in addition to protection of the habitats, restorative measures are established and implemented. For example, since there had been only 5 Asiatic black bears left in Jirisan under high risk of extinction, 34 Asiatic black bears were imported and released to nature until 2012. As 10 or so mountain goats had been living in Woraksan faced with extinction due to inbreeding, a project is under way to restore genetic diversity by getting individuals from other regions and releasing them into the area. Meanwhile, to ensure ex-situ proliferation and conservation of endangered

wildlife species, 22 ex-situ conservation institutions are designated and supported.

Of all birds reported to inhabit Korea, there are 391 migratory birds (86%), with 337 of them visiting Russia, 281 visiting Japan, 337 visiting China, and 59 visiting Australia. In this light, Korea signed bilateral agreements on the protection of migratory birds with Russia in 1994, with Australia in 2006, and with China in 2007. Furthermore, in 2008, the city of Incheon hosted the Secretariat of East Asian-Australasian Flyway Partnership (EAAFP).

5.1.2.3 Survey and Research on Natural Environment

Survey and Research on Biodiversity

In mid-1990s, about 30,000 species were recorded to inhabit the Korean Peninsula. Korea is implementing a national project for surveying and listing the species in order to identify the species living across the Korean Peninsula and to upgrade the capacity for biological classification. As of 2012, 39,150 species were identified in Korea, and a total of 60,000 species will be recognized by 2020.

In 2007, the Ministry of Environment established

National Institute of Biological Resources (NIBR), where 60 or so taxonomists work. As NIBR compiles past researches and intensifies the survey on biodiversity, the number of identified species in Korea is sharply increasing. Furthermore, NIBR contributes to capacity building on biological classification by carrying out survey and research on biodiversity in Cambodia, Laos, China, Mongolia, and Russia and fostering specialists in each of the countries through bilateral cooperation.

[Figure 5.1-5] Activities of NIBR



Korea-Myanmar Cooperation



Publication: Red Data Book of Korea

The Korean government is increasing its investment in expanding the infrastructure for biodiversity research. Apart from NIBR established by the Ministry of Environment, three biodiversity research institutions

are slated to be built (with one of them currently under construction), and the Ministry of Maritime Affairs and Fisheries is building National Institute of Marine Biological Resources (NIMBR). With these research

institutions going into service starting in mid-2010s, it is expected that Korea's biodiversity research capacity will be greatly upgraded, thereby contributing to the conservation of biodiversity in neighboring Asian countries.

Survey and Research on Natural Environment

The survey and research on natural environment has a great significance as a basis for establishing and implementing policy for conservation of natural environment. Currently conducted surveys and researches on natural environment are divided into National Ecosystem Survey, Intensive Surveys of Valuable Ecosystems, Survey of Endangered Species, and National Long-Term Ecological Research (NLTER), which are led by National Institute of Environmental Research (NIER) through partnership with National Institute of Biological Resources (NIBR).

As a comprehensive country-wide survey of natural environment performed every five years based on 'Natural Environment Conservation Act', 'National Ecosystem Survey' proceeds in the way of investigating certain segments of the country covering total nine categories: land forms, vegetation, flora, benthic macroinvertebrates, terrestrial insects, freshwater fish, amphibians and reptiles, birds, and mammals. First started in 1986, the survey will finish its third round by 2013. The fourth survey will be started in 2014 and conducted for the following five years.

However, the map-based National Ecosystem Survey does not qualify as in-depth survey of specific ecological areas or endangered species. Accordingly, 'Intensive Surveys of Valuable Ecosystems' and 'Survey of Endangered Species' are separately conducted. Intensive Survey of Valuable Ecosystem is a close examination based on the characteristics and location of ecosystems covering nine areas; starting in 2002 with Survey on Natural Caves, it is expanded to National Coastal Dunes

Survey, Estuary Ecosystem Survey, Inland Wetland Survey, Survey on Baekdudaegan Mountains Reserve, Survey on Wetland Protected Areas, Ecosystem Survey on Uninhabited Islands, Special Islands Survey, and Survey on Areas of Valuable Ecosystem and Landscape. Survey of Endangered Species targets 246 currently designated species, as it continues to monitor the location of habitat, size of distribution area, population and threats for each species. The results of the investigation are reflected in designation and undesignation of legally protected species.

In the meantime, KNLTER is being carried out for monitoring the changes in the ecosystem due to climate change. Average temperature of the earth rose by 0.5 degrees in the 20th century, however, climate change appears to be more severe on the Korean Peninsula, with temperature rising by 1.0 to 1.5 degrees in South Korea and 1.9 degrees in North. Starting in 2004, KNLTER has been carried out for three decades (in three 10-year stages) to ensure a medium- and long-term monitoring of changes in ecosystems due to climate change, and to cope with the decline of species and changes in ecosystems. Currently, the first stage of research is under way, with land, freshwater, coastal, and animal ecosystems being monitored in 19 locations across the country.

Meanwhile, the Ministry of Environment has built GIS-DB on Natural Environment based on research results drawn from natural environment survey. Notably, by using Actual Vegetation Map and Distribution Map of Flora and Fauna, the Ministry has classified the entire territory into three categories according to ecological value, based on which the National Map of the Ecology and Nature with the scale of 1:25,000 has been created. The GIS-DB is open to the public on the Internet (Environmental Geographic Information Service [EGIS]; <http://egis.me.go.kr>). It is used as basic data for environmental impact assessment in various development projects.

5.1.3 Key Issues

5.1.3.1 Hosting of the IUCN World Conservation Congress

The IUCN World Conservation Congress (WCC) is the world's largest conference on natural environment involving 180 countries, 1,100 member organizations and experts and is held every four years. The WCC presents results of research on various issues related to the conservation of the earth's natural environment and discusses direction of conservation policy and its implementation methods.

Also, governments, NGOs, and experts get together and share information in search of practicable solutions related to conservation and development, and the discussions at the Congress exercise huge influence on various areas of international environment conventions, regulations, laws and etc.

Korea expressed its intention to host the WCC at Ramsar Convention Meeting 2008 held in Changwon, Korea, and the IUCN Board of Directors meeting of November

2009 selected Jeju Island as the venue of the WCC 2012. The Congress had some 11,000 participants, and consisted of World Leaders' Dialogue as the first panel debate with leaders in environmental area, World Conservation Forum, intersession programs, and Members' Assembly where the selection of resolution and recommendation, budget endorsement, and the election of executives took place. The WCC 2012 held in Jeju Island had its opening ceremony on Sep. 6th and lasted 10 days through Sep. 15th; World Conservation Forum and World Leaders' Dialogue proceeded between Sep. 7th and 11th, while the IUCN assembly was held between Sep. 8th and 15th. Holding out 'Nature+' as its slogan and 'Resilience of Nature' as its theme, the WCC 2012 discussed five topics including evaluation and conservation of biodiversity, fair and equitable sharing of natural benefits, nature-based response to climate change, and ecosystem management for improving food security.



At the WCC, Korea submitted the largest number of proposals among all member nations, out of which total twenty items including green growth and reducing damage from yellow dust storm were included in the IUCN Resolution. As the first session for the congress with global leaders on the panel, the World Leaders' Dialogue attracted huge attention and participation. Highlighting incumbent and former presidents, ministers, secretary generals of international bodies, and corporate CEOs, who could lead the environmental issues of the international community, the panel presented various discussions on climate change, food security, green growth, conservation and poverty, and natural values and conservation. The 'Jeju Declaration' adopted at the end of the Congress stated to continue the forum as a regular event where environmental issues and policy are discussed.

5.1.3.2 Establishment of National Institute of Ecology

In recent years, global warming in the wake of climate change has emerged as a major environmental issue of the 21st century. In responding to global warming, the Ministry of Environment is pushing for the construction of National Institute of Ecology (Ecoplex) that performs research on changes in ecosystems, ecological education, and public relations and exhibition. Ecoplex includes Ecoplex Main Building, Restoration Ecology Building, Ecological Education Building, a large-scale

green house (Ecorium), a field ecosystem exhibition, and Visitor's Center. Korean Peninsula Forest Learning Area, Wetland Learning Area, Marshlands Hands-on, Ecological Deer Park, Plant Nursery, etc. will be created on the outdoor space. Especially, Ecorium will allow visitors to experience hard-to-access ecosystems by reproducing major ecosystems of the planet including tropical forest, subtropical regions, the Mediterranean, temperate climate zone and the polar regions.

[Figure 5.1-6] Ecorium inside Ecoplex



5.1.3.3 Expansion of Natural Parks

While the Ministry of Environment continues its efforts to increase nature conservation areas, expansion of national parks stopped in 1988 when the 20th national park was designated. Recently, the Ministry of Environment and the Korea National Park Service work together with responsive local governments, for designating a couple of new national parks.

As the first outcome of such efforts, Mudeungsan in Gwangju and Jeonnam area has become the 21st national park in December, 2012. Previously, Mudeungsan had been a provincial park since 1972, and with its upgrade as a national park, the area has become 2.5 times larger(75.425km²). Mudeungsan National Park has total 2,296 species including 8 endangered wildlife species, and is dotted with scenic resources in 61 locations featuring mountain peaks as well as oddly formed rocks and strangely shaped stones. Being adjacent to the City of Gwangju and highly accessible, Mudeungsan attracted 6.79 million

visitors in 2010. The positive effect will not be limited to ecosystem protection and restoration of damaged areas, but include regional development with financial and human support from the state.

In 2010, Jeju Island was certified as UNESCO Global Geopark by UNESCO Geoparks Network. As it shows, Korea has abundant geological heritage, but the country did not have an institutional framework for its effective management in the past. In that light, the Ministry of Environment amended 「National Park Act」 and introduced 'Geopark Certification Program', wherewith not only natural ecosystems but also geological heritage would be managed in accordance with the Act. Moreover, for the efficient implementation of Geopark Certification Program, Basic Guideline on Geopark Management was prepared while detailed standards for Geopark certification were established. Later in December, 2012, the program certified Ulleungdo/Dokdo and Jeju Island as National Geopark.



[Figure 5.1-7] Natural Scenes of Jeju Island Geopark



5.1.3.4 Enactment of Act on Conservation and Use of Biodiversity

In the past, wildlife, agriculture, forest, marine, and bioinformation were separately handled by different ministries, therefore Korea's legal system related to biodiversity lacked a systematic management. A comprehensive response on a national level was required by the changes in the world situation including Nagoya Protocol selected at the 10th meeting of the Conference of the Parties (COP10) of Convention on Biological Diversity (CBD). In a nutshell, state-led efforts were necessitated to protect biodiversity and secure biological resources for their utilization.

From this perspective, the Ministry of Environment enacted 「the Act on Conservation and Use of Biodiversity」 in February, 2012. The Act is designed to i) contribute to the enhancement of biodiversity

by creating a national management system, ii) build a basis for the development of biological industry, and iii) cooperate with the international mechanisms including Convention on Biological Diversity and Nagoya Protocol. The Act implements the following: (1) establishment of National Biodiversity Strategy and Action Plan every five years, (2) creation of a system for sharing information with National Biodiversity Center with a view to an integrated management of information on biodiversity, (3) creation of National Index of Species, (4) cooperation with North Korea for conservation of biodiversity and endemic species on the Korean Peninsula, (5) fair and equitable sharing of benefits from the use of biological resources, and (6) required pretest of alien species for any hazards to the local ecosystem.

05-2 Natural Environment and Land





5.2 Precautionary Land Management

5.2.1 Current Status

- 5.2.1.1 Status of Environmental Impact Assessment (EIA)
- 5.2.1.2 Status of Prior Environmental Review
- 5.2.1.3 Present Condition of Strategic Environmental Assessment (SEA) Introduction

5.2.2 Policy Overview

- 5.2.2.1 Establishment of an Advanced management System for Sustainable Land management
- 5.2.2.2 Expansion of Environmental Impact Assessment Service
- 5.2.2.3 Reinforcement of Support for Promotion of Eco-friendly Development Project

5.2.3 Key Issues

- 5.2.3.1 Introduction of Strategic Environmental Assessment System
- 5.2.3.2 Operation of Environmental Location Consulting System

5-2. Natural Environment and Land

5.2 Precautionary Land Management

In principle, development projects affecting the land environment should be performed within the range of environmental capacity; the environmental capacity refers to the nature's own ability to maintain the quality of environment or to accommodate, purify and restore the condition from various environmental loads.

To do this, a methodical consideration for land environmental capacity is required at the planning and drawing up stage of development project. However, in the past, because of unwilling to consider environmental capacity and a poor institutional groundwork at the development process, the precautionary management of land environment is still limited to disjunctive level. First, consider a precautionary management of land environment by reviewing processes of introduction and development of environmental impact assessment (EIA) in Korea.

In accordance with Article 5 (prior consultation) of the 「Environment Conservation Act」 enacted on Dec, 1977, a consultation basis was established first for 3 areas including urban development, development of industrial complex and energy development executed by administrative institutions; thereby, the EIA was introduced and implemented with the prior consultation.

However, the implementation guideline for EIA was not established yet; therefore, it was not able to perform an actual EIA. Since the amendment of 「Environment Conservation Act」 in 1981 and enactment and announcement of "regulation on writing a statement of the EIA (Announcement of Environmental Office, no. 81~4)", the EIA has started to conduct in full-scale and the scope of project subjected to assessment has gradually expanded; in addition to this, it started to cover more than administrative institutions, such as public organization, governmental investment

institution and private projects.

「Framework Act on Environmental Policy」 was enacted in 1990 to establish the framework of the EIA; furthermore, the EIA Act was enacted and implemented as a single act in 1993, the EIA system was improved by changing procedures for key system and strengthening the post management system for projects. Ultimately, the assessment system in Korea started to develop with the raised status of the Ministry of Environment in 1990 and full reorganization of the legislation system related to environment; thereby, the assessment system could be developed and settled down. Regarding this, a system to collect opinions from citizens was introduced to adjust interests between the residents in advance and also to improve the rationality in development process. In addition to this, in case of a development project in a regional unit, an actual review became practicable by delegating EIA consultation works to the regional environmental office.

Other impact assessments, including traffic impact assessment, disaster impact assessment and population impact assessment that are similar to the EIA are conducted by related divisions such as the Ministry of Land, Infrastructure and Transport or national emergency management agency; however, the repetition of procedure between each assessment in each division and also economic and time burdens that business operator would feel with performing 2 or more assessments were raised as an issue. Therefore, the 「Environmental-Traffic-Disaster, etc. Impacts Assessment Act」 was revised on Dec 31, 1999 and this started to apply in 2001. In the past, despite the partial progress, the actual integration of impact assessment was not completed because the assessment consultation for each area is conducted

by its responsible department with individual law. Because of the problems such as duplicated assessment due to subject duplication of traffic impact assessment, disaster impact assessment, population impact assessment with the EIA and double burden to business operator, any items related to traffic, disaster and population were removed and the system improvement including the obligation of scoping procedure was made. Finally, the 「Environmental Impact Assessment Act」 was enacted in March, 2008 and started to enforce on the 1st of January, 2009.

Although the existing prior environmental review and environmental impact assessment system were prior consultation system with the same purpose, they were separately operated by 「Framework Act on Environmental Policy」 and 「Environmental Impact

Assessment Act」; however, this created certain problems such as too complicated process required in the procedure and confusion in application. Therefore, the 「Environmental Impact Assessment Act」 was enacted on July 22, 2012 and since then, has been implemented to improve environmental assessment procedure rationally by defining dualized environmental impact assessment system as one legislation and then dividing it into strategic environmental impact assessment, environmental impact assessment and small scaled environmental impact assessment.

In the future, an effort to strengthen the groundwork for environmental impact assessment should be continuously promoted to encourage sustainable development of land and play its role as an advanced system to prevent social conflicts due to development in advance.

[Figure 5.2-1] History of legislation and revision on Environmental Impact Assessment Act

1977	○ Enactment of Environmental Conservation Act, Introduction of Environmental Impact Assessment
1981	○ Revision of Environmental Conservation Act, Enactment and Announcement of "Environmental Impact Assessment Report Writing Act", Full implementation of Environmental Impact Assessment
1990	○ Enactment of Frame Act on Environmental Policy, Establishment of framework for Environmental Impact Assessment, Introduction of citizen's opinion collecting system, Delegating regional development project to local environmental office
1999	○ Enactment of Environmental·Traffic·Disaster, etc. Impacts Assessment Act, Promoting integration of varied impact assessments
2008	○ Revision of Environmental Impact Assessment Act, Removal of items related to traffic, disaster and population, obligation of scoping procedure
2012	○ Integrated revision of Environmental Impact Assessment Act, Integration of prior environmental review, introduction of strategic environmental assessment

5.2.1 Current Status

5.2.1.1 Status of Environmental Impact Assessment (EIA)

Developing Area

Developing area for environmental impact assessment was limited to those projects conducted by administrative institutions only according to 「Environment Conservation Act」 enacted on Dec, 1977. However, at that time when the legislation was revised in 1986, it has started to include private development project in development area for assessment and since then, the developing area has been continuously expanding.

All types of developing area cannot avoid environmental impact while executing projects regardless its size or scale; therefore, it is desirable to conduct environmental impact assessment to protect the natural environment. However, it would be reasonable to remove any unuseful

project from the developing area in the consideration of social cost and time spent to perform environmental impact assessment and conduct the environmental impact assessment based on the distinct characteristics of the region and the level of impacts on the environment. Currently the Korean Environmental Impact Assessment Act defines 78 unit projects in a total of 17 areas including urban development, construction of industrial location and complex, energy development and others as a developing area and its details are shown in the Table 5.2-1.

This applies a positive list for developing area determined earlier, it is different than preliminary review adopted in the U.S.

[Table 5.2-1] Developing Area for Environmental Impact Assessment

Project Area	Detailed Project and Scale
A. Urban developments (13)	<ul style="list-style-type: none"> • City and residential environment maintenance, Site formation, Development of housing site, construction of residential area, School construction: 300,000m² • Urban development, Inno-city development, Station influential area development: 250,000m² • Construction of terminal facilities center, Installation of passenger vehicle terminals, Installation of freight terminal, Consolidation of rural village : 200,000m² • City planning facility project: canals, distribution facilities (200,000m²), parking lot (200,000m²), market (150,000m²) • Installation of public-private sewage treatment facility (100,000m³/day)
B. Industrial Complexes (7)	<ul style="list-style-type: none"> • Development of industrial complex, development of SMEs complex, Designation of free trade zone, Installation of factory, Creation of industrial site, Creation of industrial technical complex, Creation of research development zone: 150,000m²
C. Energy Developments (7)	<ul style="list-style-type: none"> • Development of power resources, electrical installation: power plant (10,000kW, 3,000kW for constructions of dam and reservoir water, 100,000 kW for solar-wind-fuel cell plant, 30,000kW for self generation electricity equipment in factory site, Ground transmission line (More than 345kV and 10km), outdoor substation (765kV), Ash treatment (300,000m²), coal yard (50,000m²) • Submarine mining industry, mining industry (300,000m²), Installation of oil storage facility in oil pipeline facilities (100,000kL), Installation of petroleum storage facility- Construction of petroleum stockpiling facility (100,000kL), gas storage facility (100,000kL)
D. Port constructions (5)	<ul style="list-style-type: none"> • Construction of fish tank facility: Outer facilities (300m, 30,000m² when carrying a landfill), Mooring facilities (Landfill, 30,000m²), Others (150,000m², 30,000m² when carrying a landfill) • Construction of harbor facilities, Construction of new harbor facilities: Outer facilities (300m, 30,000 m² hen carrying a landfill), Function facilities (Landfill, 30,000m²), Others (150,000m², 30,000m² when carrying a landfill) • Harbor dredge (100,000m², dredging volume 200,000m³), Harbor redevelopment (300,000m²)

Project Area	Detailed Project and Scale
E. Road construction (1)	• Establishment (4km, width in urban area, 25m)·Expansion (more than 2 lines and 10km)·Establishment and expansion (Establishment length/4km+expansion length/10km=1)
F. Water resources developments (3)	• Dam·River facility (Construction of estuary dam), Creation of reservoir water·water storage: Maximum water surface 2,000,000m ² , reservoir capacity 20,000,000m ³
G. Railway constructions (3)	• Railroad construction (express included), Urban railroad construction: 4km or 100,000m ² • Cableway·track construction (Cable way: 2km, track: 4km or 100,000m ²)
H. Airport construction (1)	• Airport construction: Airfield, Land strip (500m), others (200,000m ²)
I. River development (1)	• River development (River area, flood control zone) : 10km
J. Reclamation·landfill (2)	• Landfill project: 300,000m ² , in designated seaport· new port· Natural environment conservation area, 30,000m ² • Reclamation·cultivation project: 1,000,000m ²
K. Tourism complexes (6)	• Construction of tourism, tourist attraction or tourist facilities complex, Hot springs development: 300,000m ² • Collective facility area of national park (100,000m ²), Amusement park installation (Facilities area 100,000m ²), Urban park (Facilities area 100,000m ²)
L. Production area development (2)	• Cemetery·enshrinement construction (250,000m ²), Grassland construction (300,000m ²), Forest land use conversion (200,000m ²) • Forest road construction: More than 8km A project in district of 1st graded·ecosystem· naturalness
M. Special area district developments (10)	• Local integrated development plan (200,000m ²), ROK facility, Globalization district development, Pyeongtaek-si development, Multifunctional administrative city construction, company city development, new airport development, Free Economic Zone development, hydrophilicity zone construction, Regional balance development and regional small and medium business promotion
N. Physical facilities (5)	• Youth training facility construction, Youth training district construction: 300,000m ² • Physical facility installation, Rowing·cycling facility installation, Racetrack construction: 250,000m ²
O. Waste·human waste· animal waste treatment facility (2)	• Waste treatment facility installation: Landfill facilities (Area, 300,000m ² or capacity, 3,300,000m ³ , Area 50,000m ² or capacity 250,000m ³ for designated waste), Incineration treatment (100tons/day) • Waste·human waste· animal waste treatment facility: 100kL/day
P. National defense·military facilities (3)	• Execution in military air bases : airfield, landing strip (500m), others (200,000m ²) • National defense· military facility project (330,000m ²), Facility project in naval base (150,000m ² , 30,000 m ² when carrying a landfill)
Q. Collection of soil, etc. (7)	• Soil and stone collection in river and coastal area: 20,000m ² in water resource protection area , Upper region of water resource protection area, less than 5km, 50,000m ²) • Mountain soil and stone collection (100,000m ²), Coastal mineral collection (Gangwon · Gyeongbuk 20,000m ² , other 30,000m ²), Coastal aggregate collection (250,000m ² , collected volume 500,000 m ³), Designation of site expected for aggregate collection: 250,000m ² , 500,000m ³), Designation of aggregate collection area, designation of stone-cutting area

Performance of Consultation

The environmental impact assessment system has been implemented since February, 1981. At the early stage, however, the projects conducted by administrative institution and governmental investment institution were counted only for developing area; thus, the number of consultations was not that many.

However, since developing area had expanded through the legislation amendment in 1990s, the performance of consultation was improved. Especially the number of consultation cases was significantly increased from 2008 to 2010 compared to the previous year, the total number of cases in 2012 was 2,153.

[Table 5.2-2] Status of Environmental Impact Assessment Consultation

(Unit: case)

Division	Total	1982 2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	4,766	2,153	117	167	181	211	232	214	209	282	303	288	189	220
Urban development	849	447	19	25	30	40	46	35	44	32	48	43	17	23
Energy development	409	317	2	2	7	10	4	1	9	11	8	4	15	19
Industrial complex	655	245	7	11	6	10	21	25	19	55	79	85	37	55
Road construction	1,002	418	50	59	62	69	81	61	30	47	42	29	31	23
Physical facility	419	135	4	5	7	17	16	29	39	49	44	39	20	15
Other	1,432	591	35	65	69	65	64	63	68	88	82	88	69	85

5.2.1.2 Status of Prior Environmental Review

Subject to consultation

A prior environmental review is in accordance with the Article 25 (prior environmental review) under the 「Framework Act on Environmental Policy」 and the subject to consultation is according to subparagraph 2 (A subject to prior environmental review) of the Article 25 under the 「Framework Act on Environmental Policy」, which to be regulated by annexed table 2 of Article 7 of the Enforcement Decree.

It covers upper administrative plan of development project such as road, dam or railway and regulates 91 administrative plans (annexed table2 of Article 7 of Enforcement Degree) as an administrative plan subjected

to prior environmental review consultation. In case of development project, the development project, its scale greater than certain scale (5,000~10,000m²) within 19 use areas having a high environmental conservation value, should go through a prior environmental review.

Since June 2006, the upper administrative plan of development projects that have been a social issue in the meantime, such as urban master plan, road maintenance master plan or long-term comprehensive plan for dam construction, are now newly included into a subject to review. This became an opportunity to establish an institutional framework to prevent social issues regarding to development and conservation in advance.

[Table 5.2-3] A Subject to Consultation of Prior Environmental Review

Project Area	
1. Urban development	10. Reclamation and public water surface landfill
2. Industrial location and construction of industrial complex	11. Development of sightseeing complex
3. Energy development	12. Development of producing area
4. Construction of port	13. Development of special zone
5. Construction of road	14. Installation of physical facility
6. Development of water resources	15. Installation of waste treatment facilities
7. Construction of railroad (Urban railroad included)	16. Installation of national defence and military facilities
8. Construction of airport	17. Collection of soil, sand, gravel, mineral and etc.
9. Use and development of river	

Consultation Results

- Consultation results by 「Framework Act on Environmental Policy」

Because of scattered small sized development conducted in suburban area or management area, the national sprawling development had emerged as an environmental or social issue. Accordingly, a prior environmental review system was enacted and included in 「Framework Act on Environmental Policy」. This was expanded (August, 2000) to cover development projects in private sectors; the total 50,619 cases were consulted as of 2012.

So far, the total 1,296 cases (2.6%) were disagreed due to the inappropriateness of location and plan, such as adverse impacts on water resources, damages to natural environment, exceeding the water quality standard for river, discontinuity in natural ecosystem. About 43,813 cases (86.6%) were conditionally agreed due to modification of plan or reinforcement of cut back plan, such as scale adjustment and change of land use plan, securing of public green belt, tightening of pollutants treatment standard, etc. The number of cases originally agreed on development plan was 1,018 (2.0%); and the number of other (reject) cases such as non applicable subject to consultation or violation of administrative procedure was 4,492 (8.9%).

5.2.1.3. Present Condition of Strategic Environmental Assessment (SEA) Introduction

Subject Plan

A strategic environmental impact assessment is a system to review the appropriateness of plan and the validity of location from the environmental perspective when establishing upper plan that may affect the environment. This assesment is currently being

conducted in 27 countries including the U.S., Canada, Australia and the EU. The plan subjected to conduct a strategic environmental impact assessment removed 5 plans from administrative plans (93) that are subjected to original prior environmental assessment but added 13 plans; determined to total 101 plans.

[Table 5.2-4] Plans Subjected to Strategic Environmental Assessment

Division	Plan subjected to strategic environmental assessment (101 plans)
Ministry of Land, Transport, Maritime Affairs(51)	Policy plan (3)
	Development master plan (48)
Ministry of Knowledge Economy(15)	Policy plan (2)
	Development master plan (13) <i>Mining area promotion plan, Designation of special zone and its plan</i>
Ministry of Food, Agriculture, Forestry and Fisheries(8)	Policy plan (2)
	Development master plan (6)
Ministry of Culture and Tourism(5)	Policy plan (2)
	Development master plan (3)
Others(22)	Policy plan (5) <i>Master plan for Erosion Control, Master Plan for forest, Master plan for forestry culture and recreation, Master plan for mountain village development</i>
	Development master plan (17) <i>Forestry Development Plan, Mountain village development plan, Hot springs development plan, Comprehensive plan for hot springs development, Farming and fishing village road framework plan, Mid and long term plan for cemetery, Long term plan for underground, Designation of development island and its project plan</i>

Note: Added (Bold, italic)

5.2.2 Policy Overview

5.2.2.1 Establishment of an Advanced Management System for Sustainable Land Management

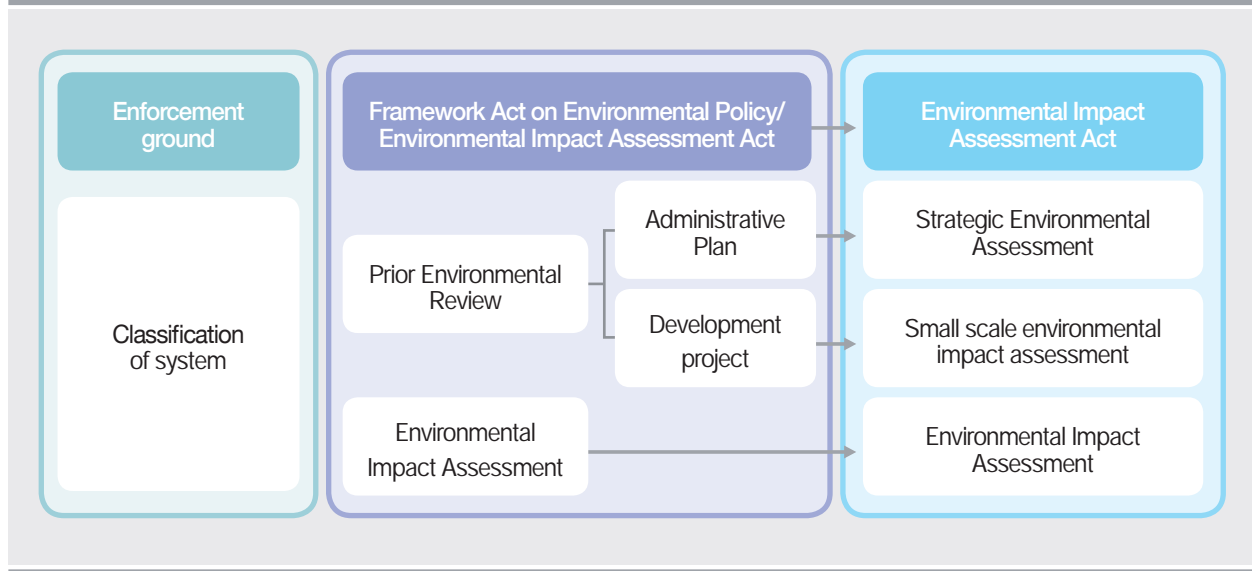
Unification of Environmental Impact Assessment and Procedural Rationalization

The two prior consultation systems whose purposes are same, the environmental review and environmental impact assessment are operated by each legal ground, 「Framework Act on Environmental Policy」 and 「Environmental Impact Assessment Act」, respectively; thus, they are recognized as two different systems. Duplicated consultation or role division is pointed out to be uncertain; therefore, two systems were suggested to integrate into one system. Accordingly, a bill was established based on service results (2007) for revision of integrated Environmental Impacts

Assessment Act, submitted to National Assembly in 2008; finally the Integrated Environmental Impacts Assessment Act was proclaimed on Jul 21, 2011, started to enforce on Jul 22, 2012.

Integrated, revised Environmental Impact Assessment Act could keep its consistency in the system by reforming environmental review on administrative plan on the existing Framework Act on Environmental Policy to a strategic environmental assessment and development project for environmental sensitive area to a small scale environmental impact assessment.

[Figure 5.2-2] Comparison of Integrated Environmental Impact Assessment System



Establishment of Qualification for Environmental Impact Evaluator and Registration of Natural Ecosystem Assessment

Environmental Impact Evaluator

The environmental impact assessment is an area which requires a continuous study and development on prediction and assessment technique to minimize the environmental impacts by predicting and analyzing the environment impacts which may be caused in varied development projects and also to scientifically predict the uncertainty of environmental changes in the future. Therefore, the fosterage of outstanding professional labor should be systematically achieved. Especially the strategic assessment included in the prior environmental review in the past required a review focused on the appropriateness of plan and validity of location; unfortunately, however, it has difficulties in comprehensively and professionally reviewing the land space and urban development, land use design or ecological and landscape plans with labors who acquired the national technical qualification only.

Those environmental impact assessment businesses who deputize writing an environmental impact assessment report are mainly composed of technical labors specialized in each area (national technical qualification such as water quality, atmosphere, etc.); thus, there are insufficient approaches to social and economic assessment; in the reality, environmental technicians are only 6 areas compared to the items in the environmental impact assessment are 20 in 6 areas, therefore, it has limitation in comprehensive analysis and review on overall environment including social and economic environments.

Therefore, the needs for the establishment of national qualification (environmental impact evaluator) that can manage and adjust EIA works have been continually asked since 2000 and as a result of this, a case to consider the establishment of new national qualification has been passed through qualification policy council in 2008. Also the amendment of 「Environmental Impact Assessment Act」 including a ground for establishing a qualification for environmental impact evaluator passed the National Assembly, became effective from Jul, 22, 2012.

The environmental impact evaluator system is limited to a person who acquired engineer certificate, certain qualification or career and this person is planned to be developed to a professional labor suitable to the status and capability of EIA general manager by properly harmonizing theory and practical work, including environmental policy, national environmental plan, environmental impact assessment system for testing subject and field work.

A qualification examination for environmental impact evaluator is planned to conduct once a year from the completion of implementation preparation in 2013 and is composed of two test: 1st for written examination and 2nd for interview. Those who qualified certain condition may be exempted from some parts in 1st test. A type 1 EIS agency should hire 1 or more impact evaluators; however, required hired period was modified to be applied from the first of January, 2020 by considering supply and demand of evaluator.

Natural Ecosystem Area

A work related to natural ecosystem requires a long-term and close investigation, continuous observation

on organism than other field; however, a proper investigation is not properly performed because of client request and burden of long-time investigation that the current assessment agency has.

To resolve these fundamental problems and to conduct more professional and reliable investigation on ecosystem, a separate professional agent in responsible for investigating ecological environment, which equipped with specialized resources than currently existing EIA agent, was newly established in the enforcement Decree of 「Environmental Impact Assessment Act」 revised on July, 2012.

The natural environmental survey business (2 types) is required to hire total 6 personnel, including 2 senior engineer investigators and 4 professional investigators (current agent is composed of two personnel, 1 engineer and 1 assistant); therefore, the professional has improved. In the future, if EIA agent (type 1) outsourcing ecological survey to separate institute, only the natural environmental survey business (2 types) can do the survey, securing the reliability in natural ecological survey.

5.2.2.2 Expansion of Environmental Impact Assessment Service

Providing Location Information on Mobile

A mobile service system is currently under the construction to improve the satisfaction of national environmental information service which is the purpose of project, "improvement and advancement of Environmental Impacts Assessment Information Support System". An EIA mobile service uses mobile DB system to strengthen the post environmental assessment and ensure internal stability of post management system for EIA by development of mobile information input system such as location information of business site or site pictures. This also allows to manage performances including check of post

management statistics in real time manner.

With an establishment of 'smart pad website' and 'mobile based service' of EIA information support system, it enables access to EIA integrated DB to search consultation project around and also utilize information such as related project overview, status of consultation and measurement of environmental quality when site survey is conducted.

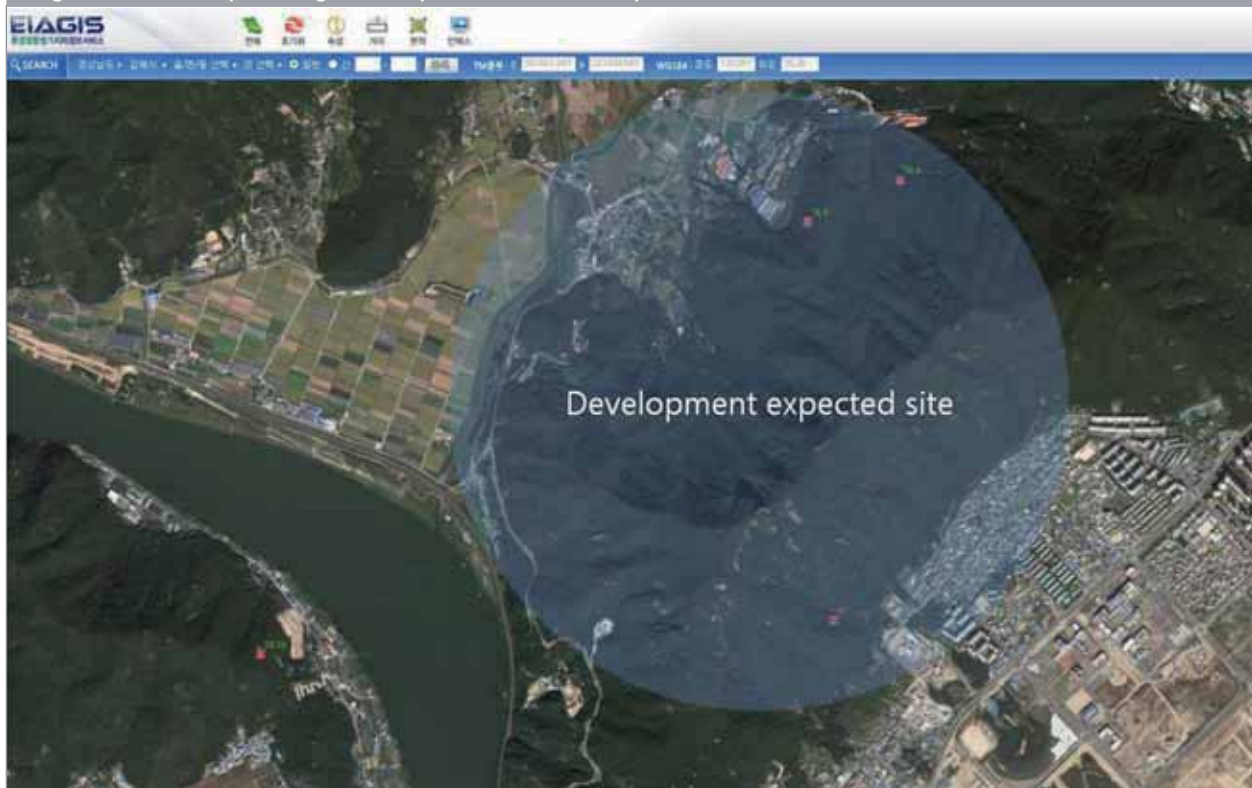
Supporting Natural Ecological Survey Service for Site Expected for Development

When the Ministry of Environment reports activities to president (Dec. 27, 2011), the president had pointed out that it is required to seek a way to build ecological databases using an IT in advance for better service; accordingly, an improvement plan for EIA service including the ecological survey on development expected site was established and promoted. Local government and public institutes were asked to fill out a demand survey to investigate the development expected site from Jan. 2 ~ to Jan. 10, 2012 and the opinions from experts and related institutions were collected to build ecological database (Jan. 12, 2012); finally, a final plan was established. A subjected area including industrial or tourist complex creating jobs and great economic effects were preferentially promoted and it is planned to expand the areas annually. In 2012, considering the budget and other conditions, the survey was implemented in 4 projects registered in 2 basic local governments

(Anseong-si, Pocheon-si) of metropolitan areas; in the future, it is planned to implement a service in 20 projects by 2013 with a purpose of expansion and implementation for nationwide. The information in 6 different areas including geography, vegetation, animal and plant, bird, etc. is made in a closer map (1/5,000) than current (1/25,000) and they are provided through Environmental Impact Assessment Support System (EIASS) operated by the Korea Environmental Institute (KEI).

In order to vitalize the environmental assessment services, a MOU has entered between 3 parties, a minister of the Ministry of Environment, a governor of Gyeonggi province and a direct of the Korea Chamber of Commerce & Industry (KCCI) on June 27, 2012, held by KCCI. 3 parties have committed to cooperate each other to create good environment for business to improve business competitiveness.

[Figure 5.2-3] Conceptual Diagram of Expected Site for Development



5.2.2.3 Reinforcement of Support for Promotion of Eco-friendly Development Project

Dissemination of Eco-friendly Plan Technique Development

During a year, 2012, a study related to eco-friendly plan technique has been conducted in varied areas.

This study covered various areas from traditional environmental areas including water resources, atmosphere, waste, EIA, etc. to energy, light pollution, etc.

[Table 5.2-5] Studies of Eco-friendly Plan Technique

Serial no.	Name of Project
1	A planning study to create eco-friendly course and establish assessment standard
2	A study on development of light pollution environmental impact assessment technique
3	Drawing strategic project for river mouth experts forum and eco-friendly management of river mouth
4	Analysis of environmental impact and economic feasibility by construction of Yeongheoung power plant no. 7 and 8
5	An environmental assessment plan (2) to prepare CCS project
6	A study on environmental management strategy for nuclear energy development
7	A study on environmental assessment for tidal and offshore wind
8	Demonstration of environmental assessment monitoring for housing site development in Pangyo district, Seongnam
9	Status analysis of 2nd phase post monitoring in 4 rivers refurbishment project
10	SOC construction and environmental impact assessment
11	A study on environmental impacts of shale gas introduction and its countermeasures
12	Expert forum on revision of regulations related to environmental impact assessment
13	Establishing improvement plan on procurator system for EIA
14	EIA expert forum on overland wind plant
15	Build a plan to introduce post environmental management assessment system
16	A study on the establishment of a guideline to create green industrial complex
17	Settlement of fair subcontracting of environment assessment and reasonable restriction on poor company
18	Focused on key environmental impact-forest road of forest management based facility
19	Study on coastal change by sea wall construction- Study on physical change in coastal environment in Asan bay through a numerical modeling
20	Case study on the application of cumulative impacts assessment and its implications
21	A guideline of 3D noise forecasting model applied to EIA
22	Study on improvement of EIA to protect environmental conflict - Approach through study on EIA related litigation case
23	Study on environmental assessment measure for baekdudaegan

Disclosure of National Environmental Zoning Map

A National Environmental Zoning Map evaluates a variety of national environmental information (65 items) comprehensively and scientifically to divide nation into 5 grades based on environmental value and indicate them with different color, allowing anyone to easily understand environmental factor. Also by inducing and supporting eco-friendly uses of the land, preventing social conflict caused by environmental issues and disclosing map on internet to improve the expected availability of land use for developer, this map is made to prevent any losses followed by the selection of inappropriate location.

Building a Land Environmental Information Integrated System

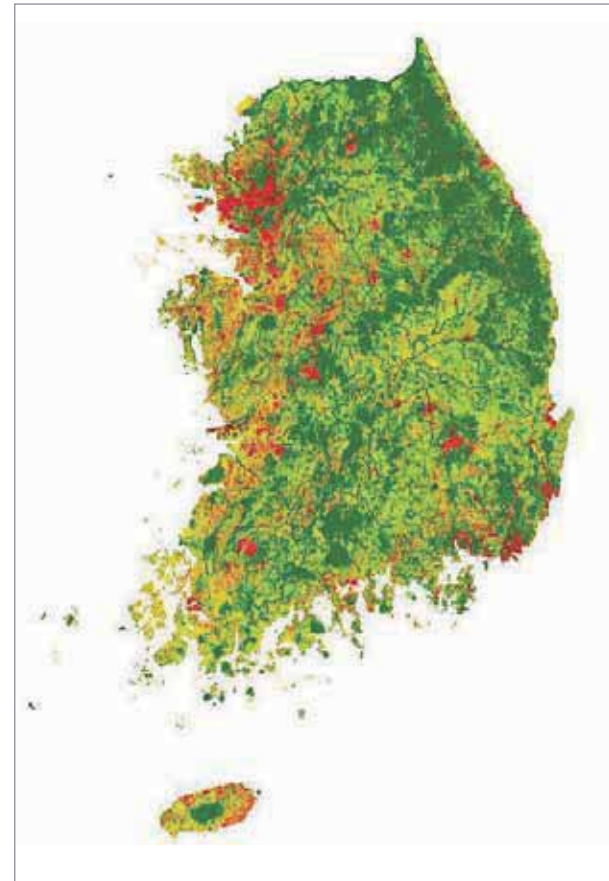
A system that manages consultation details and history regarding the environmental assessment has been managed by separated into 2 types: 「Environmental Impact Assessment Support System, EIASS」 (2005) according to the Environmental Impact Assessment Act and 「Prior Environmental Reviews Management System」 (2007) according to the Framework Act on Environmental Policy.

The environmental assessment for development project is conducted through 3 phases including prior environmental review, environmental impact assessment and post environmental survey; thus, it has mutual relation but operated separately, the agent for environmental impact assessment or business operator was uncomfortable to check the data.

Accordingly, 2 systems were integrated into "Environmental Impact Assessment Support System (EIASS)", the consultation status and information through a life cycle of EIA has started to be provided since Feb 1, 2010.

In this system, the transparency has been improved by disclosing information on reviewer of assessment report for project in ongoing EIA negotiation, progress

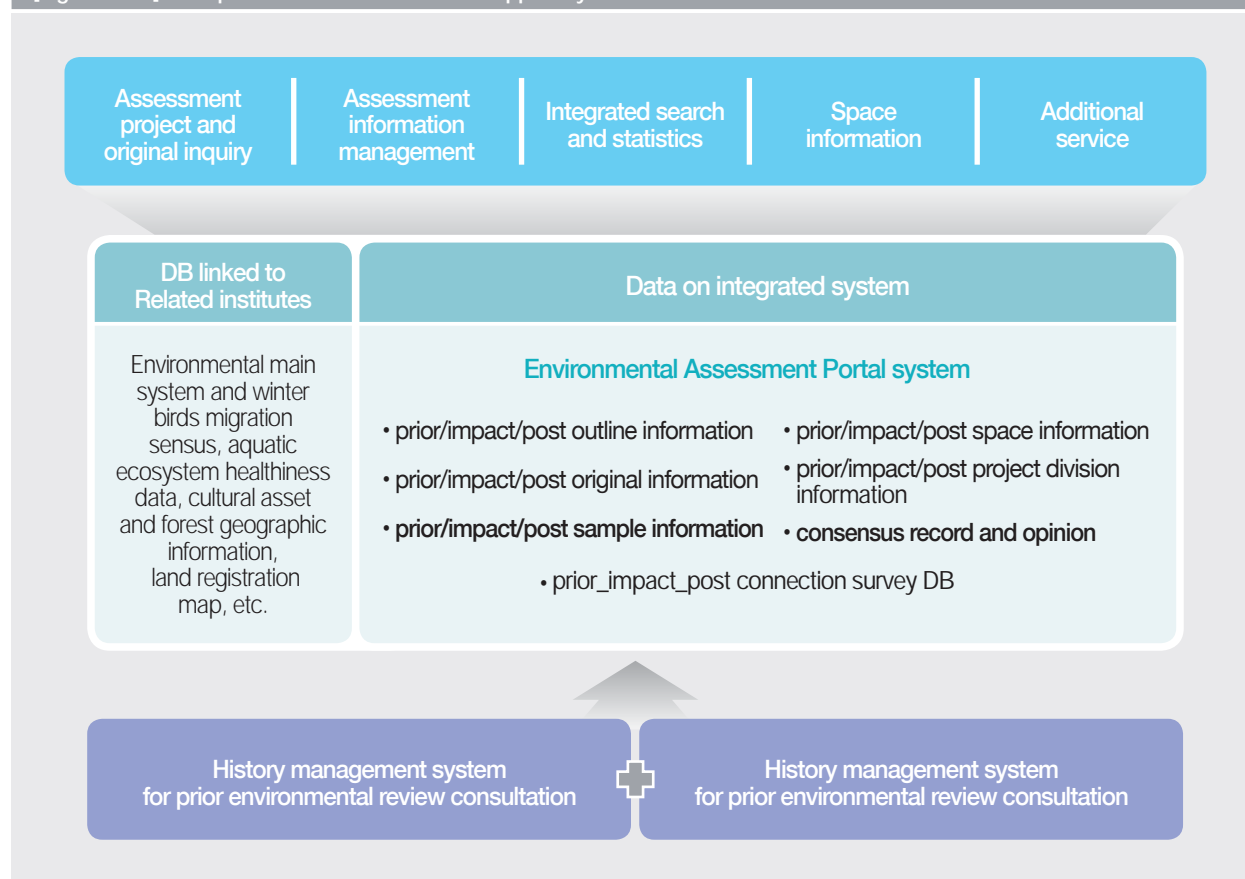
[Figure 5.2-4] Map of National Environmental Assessment



information and details of negotiation. The databases on national natural environment and ecological zoning map are provided, and the system also provides services by connecting related institution system with information such as cultural asset-forest geographic information, land registration map, weather-climate, etc.; this system also is equipped with an additional service for business operator to make a self diagnosis on the availability of location for development project by utilizing above information.

With the integration of the system, basic information related to environmental assessment and various services including statistic confirmation can be provided by one portal, the utilization of service by responsible public official, evaluation agent or business operator has been improved.

[Figure 5.2-5] Composition of EIS Information Support System



5.2.3 Key Issues

5.2.3.1 Introduction of strategic Environmental Assessment System

Background and Significance of Policy Establishment

A prior environmental review system was introduced to consider the environment effect at the establishment stage of administrative plan or development project in August, 2000; however because the limitation that the systematic environmental review could not be achieved from the upper policy establishment stage to actual project, the social issues had continued to occur while promoting key national projects including road and dam.

Accordingly, the concept of strategic environmental impact assessment has been introduced since June, 2000 to consider the environmental impacts at the establishment stage of administrative plan or development project and then promoted reorganizing EIA system in which the number of subject for assesment of administrative plan expanded (38 83); however, the problem linked to the lack of integration and consideration of environmental effects with economic and social effects was emerged when

establishing policy plan, prior to the development plan. Also the purpose of a strategic environmental impact assessment was not fully reached because of its non legalization and poor level of concept adaptation.

To solve these fundamental problems, the revision of environmental impact assessment that reorganizes the previous administrative plan subjected to prior environmental review to a strategic environmental impact assessment had begun in earnest since 2008, the revision of law was completed on July, 2012.

Policy Outcomes

The most significant performance in policy was to accord with international flow and enact advanced environmental management tool, which is the strategic environmental impact assessment that is suggested by UN and OECD.

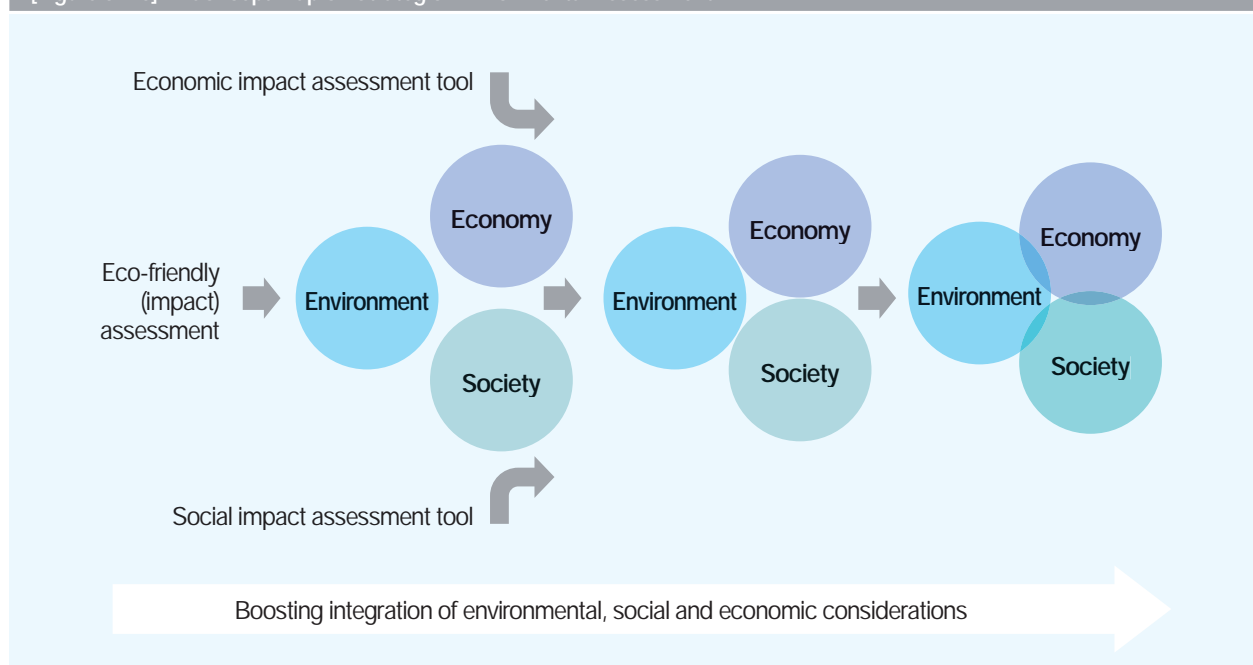
Since the beginning of study on the introduction of

strategic environmental impact assessment in 2003, a prior environmental review system was introduced to strategic environmental impact assessment and full revision of enforcement decree and enforcement regulations of the Environmental Impact Assessment Act were begun since April, 2008; finally the full revision of Act was completed on July 22, 2012.

A strategic environmental impact assessment is to be used as the most ideal way to realize the governance; however, in the previous, it is meant to be emerges from the application of DAD method (Decide Announce Defend) in which government itself decides and notifies the varied national projects but explains and persuades if a problem occurs later.

Also it may be evaluated that the ground to secure environmental validity through a systematic environmental assessment system from the establishment of development plan to execution of development project and also to minimize environmental conflicts by inducing social agreement at the early stage has been secured.

[Figure 5.2-6] A Concept Map on Strategic Environmental Assessment



Project in the Future

Despite the legislation of advanced environmental management tool, the strategic environmental impact assessment, a key upper plan related to development including urban master plan is not thoroughly included in the plan subjected to strategic environmental impact assessment.

Currently the project plans subjected to strategic environmental impact assessment are total 101, somewhat increased from an administrative plan subjected to previous prior environmental review; however, Korea will continuously make an effort for key upper plans related to national land development to conduct a strategic environmental impact assessment.

5.2.3.2 Operation of Environmental Location Consulting System

Background and Significance

One of the most importances in the early stage of development project which is a subject of EIA is the suitability of expected location. If project entity selected inappropriate location at the initial planning phase, this may cause delay in approval and environmental assessment and conflicts with community that will not allow project going through process smoothly; furthermore, this brake in project will generate delay in project completion, loss on investment purchasing cost and social conflicts. If considering the scale of development project subjected to EIA ranges from several million won to several trillion won, a preliminary assessment for environmental suitability of expected

location could be the important factor to avoid social loss.

Accordingly, since 2006, before this environmental assessment, a prior location consultation system that determines the legal and environmental appropriateness of development-expected site was conducted based on simple consulting data and created many productive results; however, the manpower shortage of the first-line administrative office intensified followed by the increased average demands, it was difficult in conducting a site investigation for expected site; a condition to provide service got worse.



Accordingly, in order to improve the reliability in decision of location appropriateness and provide more faithful administrative service, the prior location consultation were fully reorganized and newly introduced an environmental location consulting system that provides the location appropriateness consulting system with a private consultant in Feb, 2012. A private consult provides faithful and detailed consulting reviews that include results of site investigations; it would be expected to significantly increase the quality of service on location decision of regional environmental office.

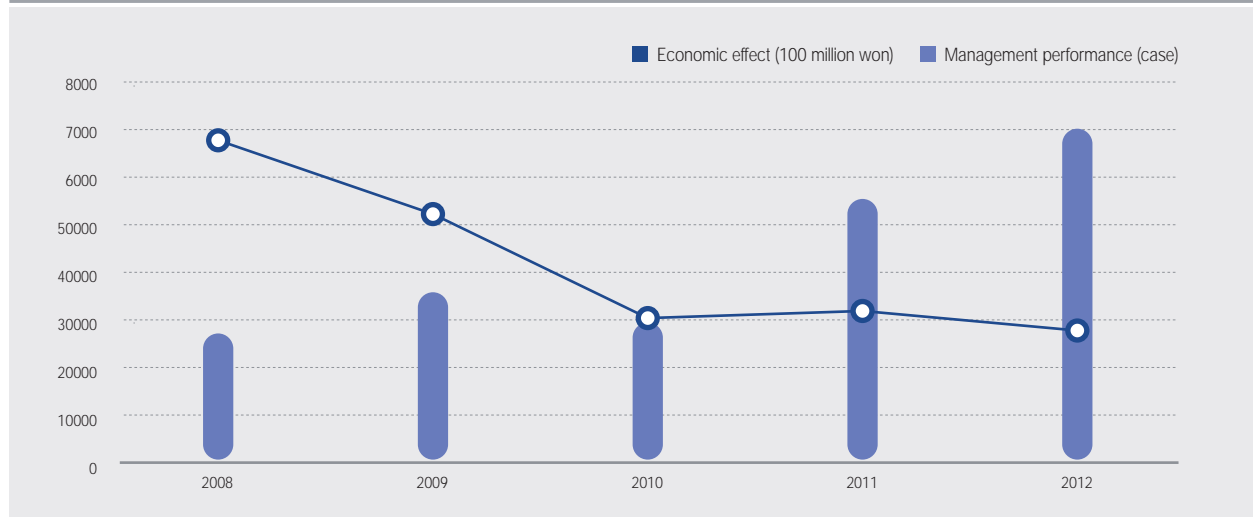
Policy Outcomes

Through the decision of location appropriateness so

far, the prior location consultation produced a great economic effect avoiding more than KRW 370 billion loss in investment and more than 20,000 hours delays in project period, averagely per year in advance. For this year, it prevented KRW 370 billion lost in investment and more than 9,480 hours delays in project period through 145 consultations from prior location consultation and environmental location consultation before the reorganization.

Also, it is expected for business operator to get more qualified helps for imperfection by providing detailed consulting opinions through site investigation in cooperaton with a private consultant.

[Figure 5.2-7] Results of Environmental Location Consultation Operation



Project in the future

In order to improve the utilization of the environmental location consulting system, active promotion needs to be made targeting those who use environmental assessment services including developers and relevant institutes. Also in order to quickly settle down the cooperation with the private consultants, which is currently in the beginning stage, more

reliable administrative services with expanded and trained workforce will be provided. In the long run, this system will enable the access to large ecosystem DB service through integration with a currently developed support program for ecological survey on planned development areas and realize a higher quality service.

06 Waste



6.1 Current Status

6.1.1 Waste Generation

6.1.2 Waste Disposal and Recycling

6.2 Policy Overview

6.2.1 Waste Prevention Policy

6.2.2 Waste Reuse Promotion Policy

6.2.3 Recycling Policy

6.2.4 Energy Recovery Policy

6.2.5 Safe Management of Hazardous Wastes and Prevention of Environmental Pollution



6.3 Key Issues

6.3.1 Recirculated Resource Trade Center

6.3.2 Improvement of Extended Producer Responsibility (EPR)

6.3.3 Reinforcement for Recycling of Electrical & Electronic Products and Automobiles

6.3.4 Green Energy Parks

6. Waste

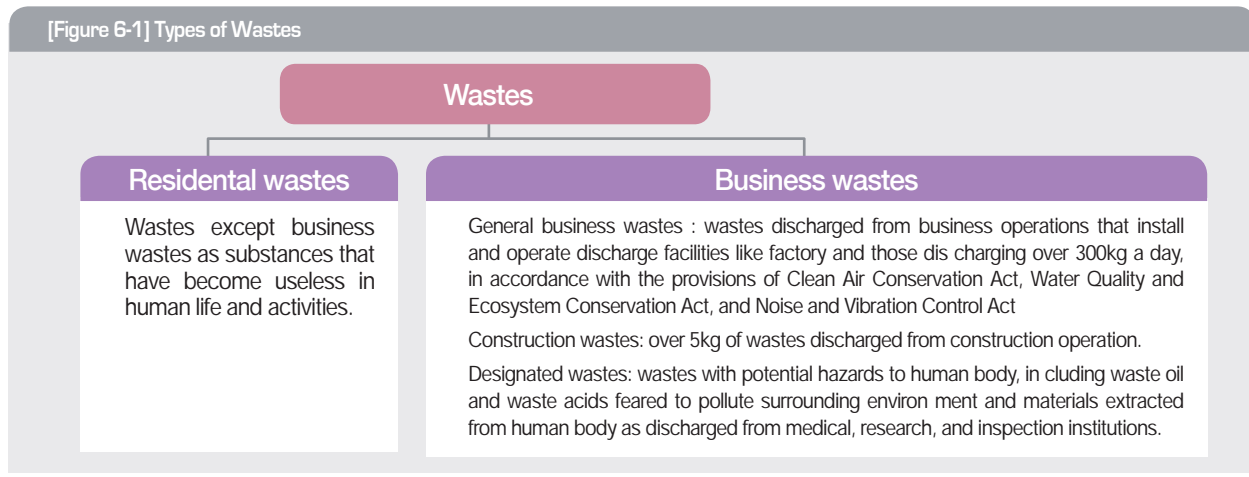
6.1 Current Status

6.1.1 Waste Generation

Wastes Control Act defines wastes as "substances that have become useless for human life or business operation" and finds their examples in "garbage, burned substances, sludge, waste oil, waste acids,

waste alkalis, dead animal bodies etc.", classifying them largely into 'residential wastes' and 'business wastes' depending on the source and amount of generation.

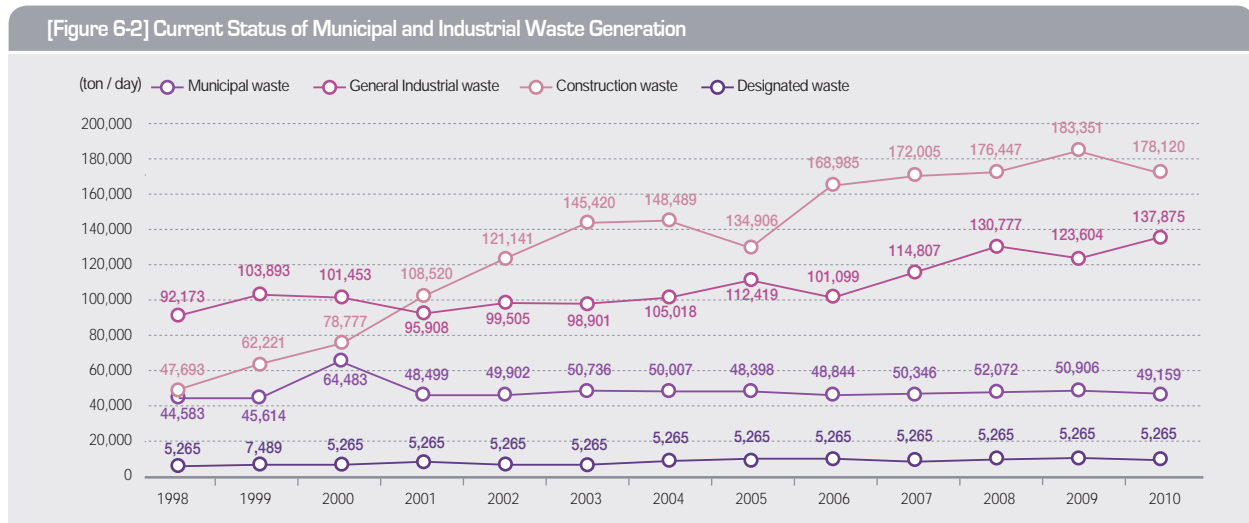
[Figure 6-1] Types of Wastes



Total waste generation is gradually growing, and municipal waste generation per capita was reduced from 1.3 kg/day in 1994 to 0.96 kg/day in 2010. In particular, the amount of waste landfilled or incinerated has been reduced greatly due to continuous increase of recycling

since the implementation of the Volume Based Waste Fee System in 1995. Industrial wastes include general industrial waste, construction waste and designated waste, and among these, the generation of construction waste is gradually growing every year.

[Figure 6-2] Current Status of Municipal and Industrial Waste Generation



6.1.2 Wastes Disposal and Recycling

There is an increase in recycling and a decrease in landfill, but incineration treatment is on the growing trend.

In 1995, 72.3% of municipal waste was buried and only 23.7% was recycled, but with the implementation of Volume Based Waste Fee System and other recycling

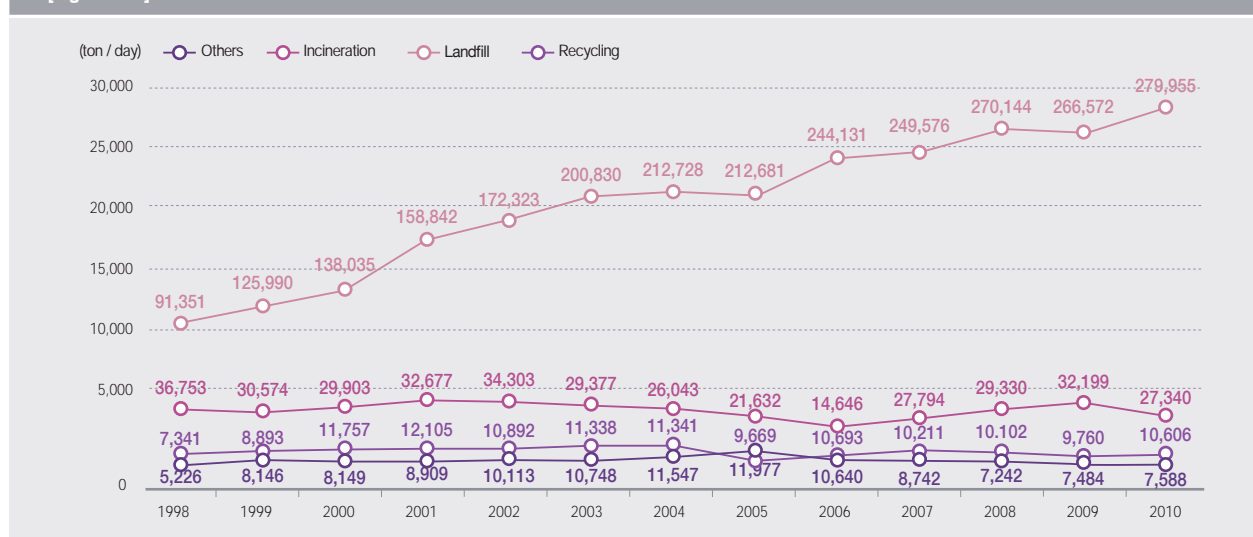
policies, in 2010, recycling rate skyrocketed to 60.5% and landfill rate plummeted to 17.9%, indicating a desirable change in the waste treatment structure. Incineration rate of municipal waste in 2008 did not increase by much compared to previous years(18.6% in 2007, 19.9% in 2008).

[Figure 6-3] Designated waste



Landfill treatment of industrial waste was decreasing, as was the case with the municipal waste, but it started to increase again since 2007. Rate of recycling is continuously increasing with more than 80% in 2010.

[Figure 6-4] Status of Industrial Waste Treatment



6.2 Policy Overview

With a view to going beyond simple disposal of generated wastes and creating a resource-recycling society in which all waste resources are recirculated, the Ministry of Environment actively contributes to green growth including the achievement of targeted supply of new & renewable energy by implementing recycled products certification program, expansion of waste resources and biomass, national R&D projects and various recirculation industry support policies. In 2012, the first Master Plan on Resource Recycling

(2011-2015) was established to encapsulate a long-term vision for a national resource recycling policy and its goal to be accomplished by 2015. Based on the quantitative growth in the world-class recirculation rate, Korea plans to realize a sustainable zero-waste society by shifting towards "upcycling" that upgrades the value of waste resources by reusing high value-added substances, and by performing energy retrieval and advanced treatment, and steadily monitoring the implementation of the National Resource Recycling Index.

[Figure 6-5] Paradigm Shift in Wastes Policy

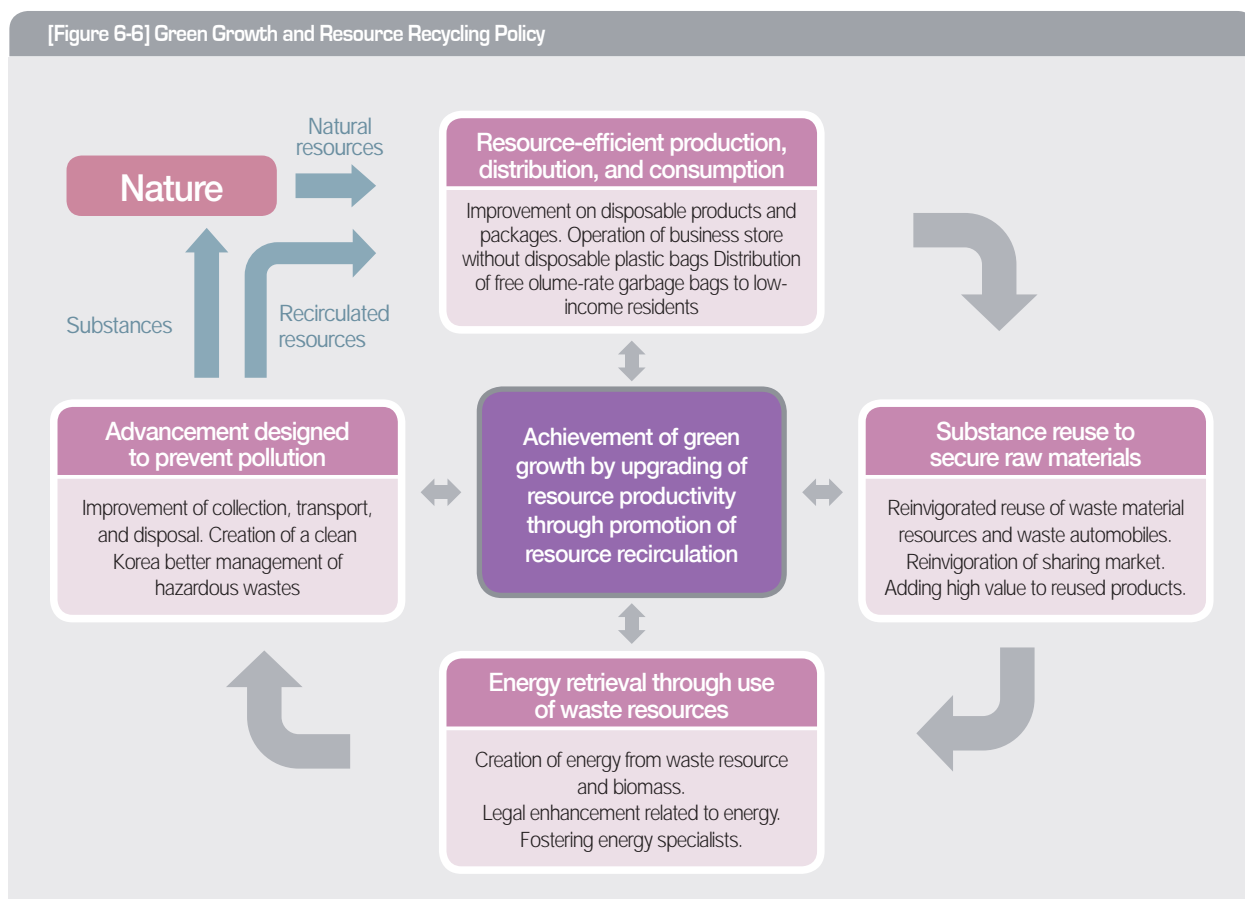
Category		Erstwhile policy	New policy direction	
Policy conditions		Worsening environmental pollution due to wastes	Climate change, and depletion of raw materials & energy	
Goal		Climate change, and depletion of raw materials & energy	Creation of a resource-circulating society	
Implementation strategy		Reduction recycling treatment	Efficient production & consumption Substance recycling Energy retrieval Advancement of disposal	
Principal tasks		Volume-based Waste Fee System, Extended Producer Responsibility, and installation of disposal facilities	Assessment of resource recirculation, recycled product certification, creation of energy from waste resources, and expansion into metropolitan disposal	
Key concept		"wastes"	"Resource (recycled / natural)"	



6.2.1 Waste Prevention Policy

Leading waste prevention policies include constraints on disposables and over-packaged products, waste charging system, volume based garbage disposal

system, volume based food waste disposal system, and reduction of business wastes. The specifics for each policy are as follows.



6.2.1.1 Suppression of Disposable and Over-Packaged Products

(1) Background and Significance of the Policy Establishment

As the rapid growth of the national economy and increased living standards have let excessive convenience supplant the previous lifestyle of frugality and reuse, the use of disposables or ostentatiously over-packaged products has become common, causing waste of resources and generating unnecessary wastes to bring about negative impacts to the environment. Accordingly, the Ministry of Environment started to act in 1994 to control the use of disposables and over-packaged products in accordance with Act on the Promotion of

Saving and Recycling of Resources, and secured the legal basis for regulating disposable products through the amendment of the Act.

The Ministry has reflected the social and cultural changes by exempting biodegradable resin products from the regulation of disposable products, abolishing the disposable cup deposit program and report reward system of disposable products on the account of insufficient legal basis, and permitting the use of disposable paper cups and free paper bags to shoppers in order to ensure a

reasonable regulatory enforcement, while encouraging the reduction of disposables and over-packaged products by providing incentives including the conclusion of voluntary agreement involving voluntary participation from businesses and citizens as members of the society based on social responsibility as well as launching campaigns comprising civic groups and public service advertisement. As for packaging wastes, previous regulation on number of times of product packaging and the ratio of space in a

package had their limits in reducing the packaging wastes that take up half of all residential wastes. So, through research and development of an eco-friendly packaging method that would improve on the material and structure of packaging, resource recycling has been enhanced by reducing packaging materials used and adopting materials easier to recirculate.

Currently, restricted disposal products, regulations, and standards regulating packaging wastes are as follows.

[Table 6-1] Regulated Items in Major Business Types and Instructions

Business type	Instruction	Applicable disposable products
Food and entertainment, collective food service	Constraints on the use	- Disposable cup, platter, and container (made of synthetic resin and metal foil) - Disposable chopsticks, toothpicks, and plastic tablecloth
Bath house business	Ban on free offering	- Disposable shaver, toothbrush & tooth paste, and shampoo & conditioner
Large store, wholesale & retailer	Ban on free offering	- Disposable envelopes and shopping bags (except paper)
Finance, insurance & pension, securities and futures trade	Constraints on the use including production and distribution	- Disposable advertisement and promotion materials

[Table 6-2] Criteria for Packaging Materials and Methods

Category	Principal regulatory criteria
Packaging material	- Packaging that uses polyvinyl chloride (PVC) for lamination, shrink packaging, or coating (including the cover label attached on the container of a product) is prohibited. - Packaging made with synthetic resins (like PVC) is prohibited or is to be phased out year by year. - Prohibited (PVC): packages for 6 products of egg, quail egg, fried food, seaweed rice roll, hamburger, and sandwich. - To be phased out year after year: 4 products including egg box, platter, and noodle bowl
Packaging method	- Manufacturers, importers, and sellers of 23 products including processed food can package the product no more than twice and must keep the package space of 10% to 35%.

(2) Achievements

Working to implement the policy for reducing the use of disposable products with interest groups including companies that use a large amount of disposable cups and plastic envelopes, the Ministry of Environment

has reached an agreement, which is voluntary and not legally bound with continued dialogues geared to tuning and communication.

The 2011 voluntary agreement with five mega stores designed to create 'Stores That Do without Disposable

Plastic Bags' reduced a social cost of won 7.5 billion and 6,390 tons of CO₂ tantamount to 150 million plastic shopping bags. Starting in 2012, 800 or so nationwide stores of five super supermarkets launched 'Stores That Do without Disposable Plastic Bags', thereby reducing 66 million disposable plastic shopping bags a year and achieving cost reduction of some won 3.3 billion and 2,831 tons of CO₂.

Moreover, by entering a voluntary agreement in December 2012 on 'Reducing Disposable Plastic Shopping Bags' with two bakery franchises that were using a lot of disposable plastic bags, the Ministry eliminated the practice of providing products in plastic bags unnecessarily while encouraging continued awareness on doing away with disposable plastic bags. Seven distributors that participated in the agreement in accordance with Farm Produce Green Packaging

Safety Regulations, which includes reducing the use of accessory packaging materials like paper bands and ribbons and complying with packaging standards, did not use paper bands for 685,443 (54.5%) out of a total of 1,258,567 fruit gift baskets for Chuseok holidays in 2012, and plan to expand the no-paper band practice to over 70% of all fruit gift baskets by 2015.

Designed to develop a packaging method that would reduce packaging wastes that take up half of the total residential wastes and would facilitate their reusability, a research project (May 2011 to March 2014) is underway. In 2012, a technology for flexible packaging and paper container packaging was developed and the related manual was created, while an experimental project in eco-friendly packaging that applies the manual has been implemented in partnership with retailers and civic groups.

6.2.1.2 Wastes Charge System

(1) Background and Significance of the Policy Establishment

Waste Charging System is designed to control the generation of wastes and prevent waste of resources by charging the manufacturers or importers the cost for disposing of products, materials and containers that include poison or substances harmful to air or water quality in specific areas, or are difficult to reuse and have potential to create problems in waste management under the polluter pays principle.

Collected wastes charges are used to fund studies on waste reduction and reuse as well as development of related technology, supporting projects of installing wastes disposal facilities and reusing wastes, funding local governments for retrieving and reusing wastes, and purchasing and stocking up on reusable resources.

As waste problems emerged in the wake of the rapid industrialization through the 1980s, the polluter pays principle was adopted to dispose of wastes. In the 1980s, manufacturers of raw materials were only charged for the cost of disposing of waste plastics, but as the costs for treating various wastes increased, Act on the

Promotion of Saving and Recycling of Resources was enacted in 1992, thereby providing legal specification of items for which the polluters must pay the cost. The initial items subject to waste charging included things like cosmetics containers, batteries, and fluorescent light bulbs that were difficult to reuse and likely to cause problems in wastes management. Later on, plastics that were considered impossible to reuse and synthetic resin being used as the raw materials were also charged for the disposal cost.

As the items previously charged for the disposal cost were increasingly reused with the changes in the domestic and international environment due to technological advancement and rising oil prices, the items charged as of 2012 were reduced to six items: pesticide and poisonous substance containers, anti-freeze, chewing gum, disposable diaper, cigarettes, and plastics. As for plastics, the disposal cost is levied to the end product rather than the raw material itself, considering the varying reuse rates.

(2) Achievements

Since the launching of waste charging system, yearly 1.1 million tons of plastics were reused to prevent the import of raw materials that cost won 1 trillion, while the waste generation diminished with the increase of reusability, effectively saving yearly won 400 billion in wastes disposal and creating a matching effect of installing of incinerators or landfills.

In addition, due to the increased price competitiveness of recycled materials that are not charged for disposal cost, the recycling industry was vitalized and the burden sharing between the EPR operators and the payers of waste charges was improved.

Moreover, as a result of calculating reduced financial burden of businesses and employment inducement coefficient in the manufacturing sector from the exemption of about won 47.9 billion to the manufacturers that voluntarily implemented the agreement led to the creation of 1,269 jobs.

In 2011, an additional exemption of wastes charge of won 5,647 million was given to small-and-medium-sized companies that generate a yearly revenue of less than won 20 billion, while seven small-and-medium-sized startups were exempted from waste charges, which contributed to the improvement of business environment for small-and-medium-sized companies.

6.2.1.3 Improvement of Volume-based Waste Fee System

(1) Background and Significance of the Policy Establishment

Due to the progress of urbanization and industrialization, the public awareness was raised and population was concentrated in cities, and the speed of waste generation increased rapidly as garbage disposal increased in line with the rising living standards. In an aim to reduce waste generation and encourage recycling of as many wastes as possible, Volume Based Wastes Disposal System was launched in 1995, in accordance with polluter pays principle, precautionary principle and economic incentives principle. Volume Based Wastes Disposal System applies to residential wastes and business wastes that are similar in properties to residential wastes

that can be collected, transported, and disposed of with the same standards and methods as residential wastes. In accordance with polluter pays principle, Volume-Rate Wastes Disposal System, which one pays in proportion to the amount of residential wastes one generates, mandates local governments that are responsible for the disposal of residential wastes to charge the fees based on the type and quantity. And it is based on Art. 14 of Wastes Control Act that stipulates the charging may be collected by selling volume-rate garbage bags or labels marking wastes, as specified in the ordinance of the local government.

(2) Achievements

Since its implementation in 1995, Volume Based Wastes Disposal System took its roots in the hearts and minds of the people, thus reinvigorating the recycling of residential wastes. With this, a daily generated amount of residential wastes per person decreased from 1.02kg in 2007 to 0.96kg in 2010 and residential wastes reuse ratio rose from 57.8% in 2007 to 60.5% in 2010, while burial rate drastically diminished from 23.6% in 2007 to 17.9% in 2010, thus extending the service life of landfills. Moreover, much improvement has been made on the policy for Volume Based Wastes Disposal System that comprises changing of wastes collection method fitting

regional conditions, the public campaign on the garbage pickup time and garbage placement procedures, and free pickup of reusable items. With raised public awareness on wastes reduction and in the wake of campaigns for not using disposable products, increasing the use of lasting type of shopping bags, using refillable products, and Anabada (like 3R), the amount of wastes generated has decreased while used items' barter and trade has grown active. Thanks to the active recycling, new growth is now witnessed in various middlemen of wastes encompassing technology of separating mixed wastes of colored glass bottles and colored PET bottles and the

technology for processing wastes into intermediate raw materials for recycled products.

After all, total economic benefits of won 20 trillion for fourteen years from 1995 through 2009 arose from the

implementation of Volume Based Wastes Disposal System thanks to the saved costs of wastes disposal due to the decrease in residential wastes (to be buried or burned) as well as the economic value of the recycled products.

6.2.1.4 Introduction of Volume-based Food Waste Fee System

(1) Background and Significance of the Policy Establishment

Past implementation of the policy has not been focused on 'Constraints on generation of food wastes' but on 'recycling and disposing of the discharged wastes', so the policy related to 'food wastes reduction' has remained restricted to transient education and publicity with intent to simple guidance.

With the increasing economic and social costs for disposing of food wastes which even adversely influence energy and climatic change, Korea is currently shifting its policy focus from ex post factor treatment onto prevention and control.

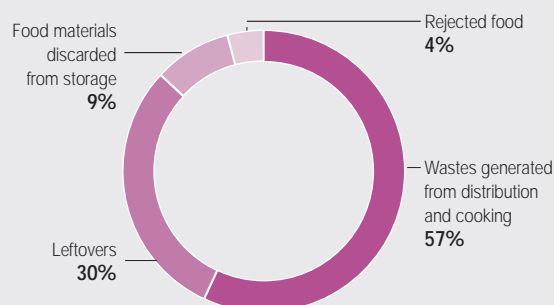
Accordingly, the government prepared 'Comprehensive Measure for Reducing Food Wastes' through joint efforts of relevant ministries in 2010, and has worked to ensure efficient implementation of food waste control policy through the discovery of feasible solutions matching stages and distribution sources and institutional improvement that could support them.

Currently, daily generated amount of food wastes is about 13,000 tons, gradually on the decrease since its peak in 2008. It appears that not only the continued government policy for reducing food wastes, but also changed food life due to the development of food service industry has worked to bring the decrease in the generated amount of food wastes.

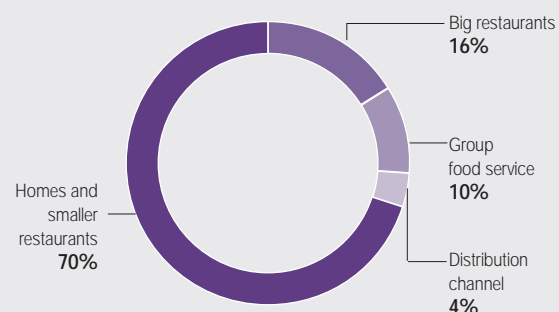
Food wastes are created not only with leftovers from eating, but also from the process of production, transport, distribution, storage and cooking of food materials. The generation of wastes takes up about 57%, 30%, 9%, and 4% from distribution and cooking, leftovers, food materials discarded from storage and uneaten food respectively.

Food wastes are generated in largest amounts at homes and small eateries (70%), followed by big restaurants (16%), group food services (10%), and farm produce markets (4%).

[Figure 6-7] Composition of Food Wastes



[Composition of Food Wastes]



[Classification into Sources]

Most food wastes are converted into resources such as fertilizers and compost, and additional treatment is required for the highly concentrated wastewater (food waste leachate) that is generated in the process since it causes water and soil pollution. Stench produced during the collection, transport and treatment process is one of the causes that harms residential environment. As such, not just the impact that the treatment of food

(2) Achievements

As for the achievements of the implementation of customized measures for reducing food wastes, food wastes at the cafeteria of the Integrated Government Building have been reduced by about 40%, while military bases and five university cafeterias joining the pilot program have reduced food wastes by an impressive 48% and 36% respectively. This shows that with a little attention, food wastes can decrease drastically in a short period of time.

As a method for implementing generation control policy together with the measure for waste sources, a plan to implement Volume Based Wastes Disposal System that charges fees in proportion to the amount of food wastes generated by 2013 is underway. So far, food wastes have been collected free of charge or were charged for a certain amount of fee in 144 cities where food wastes are separately collected. After 2013, disposal cost is due to be charged in proportion to the amount of discharged food wastes in order to ensure continued reduction of food wastes through economic incentives.

As for the status of Volume Based Wastes Disposal

wastes has on the environment, but also the energy consumption and greenhouse gas emission involved in the food making process including production, transport, distribution and cooking poses challenging questions.

Furthermore, the yearly value that the wasted food has as food resource amounts to won 20 trillion, while a yearly cost of won 800 billion is spent on disposing of food wastes.

System in January 2013, 126 out of 144 local governments were participating while 18 have yet to join it, and 6,318,000 out of total 8,550,000 are participating (participation rate of 88% among multi-unit housing residents).

As for the outcome of the experimental implementation of the project by local governments, RFID Volume Based System was gradually implemented starting in 2010 to expand to all regions in January 2012, while discharged food wastes are measured by weight and charged by differential rates. With this, in Gimcheon city, the amount of generated food wastes decreased impressively by 54% from 26.5 tons in 2010 to 12.3 tons in 2012, and a yearly reduction of won 200 million disposal cost contributes to saving local budget and improving city's image.

In addition, in the case of Busan, Jeonju, and Chuncheon that have been on the program for a while, beating the initial concern that the implementation of the system would bring with it a steep price hike, the fees either remain the same as before or have been even lowered for a smaller amount of discharged food wastes.

6.2.1.5 Diminution of Business Wastes

(1) Background and Significance of the Policy Establishment

Reduction of Business Wastes is a program that is concerned with reducing environmental hazards by minimizing the amount of wastes disposed of through the control of their generation and expansion of recycling in order to encourage the voluntary efforts of a business to reduce harmful wastes.

Wastes reduction is based on the domestic policy of

3R applied in waste management, and was proven successful since the introduction of Volume-Rate Wastes Disposal System in 1994, as the amount of residential waste generation has stagnated. In contrast, business wastes continued to increase with the growing economy, and the need for an effective business wastes reduction program loomed large since 1995. Thus, with a view

to their contribution to improvement, businesses that were considered to generate large amounts of wastes were designated for the reduction program and were encouraged to voluntarily make improvement on waste reduction, aiming to produce an industry-wide ripple effect. To this end, waste reduction plan and records are kept to the unique conditions of individual businesses, while waste generation and recycling are encouraged with the help of technological development, process improvement, and the use of eco-friendly raw materials. Furthermore, Businesses with excellent records in wastes reduction are to be awarded with incentives including government citations, while those with poor records are provided with guidance for technical

(2) Achievements

An analysis and evaluation of waste reduction records at 1,360 target businesses in 2010 shows that the generated amount per won of output was 52.4 kg/ton,

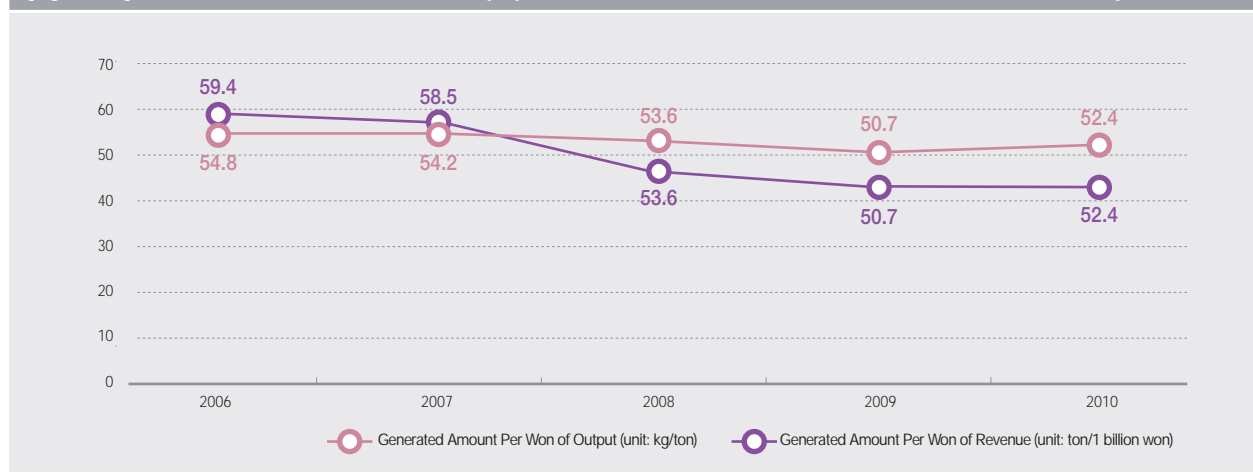
diagnosis and reduction techniques, all to help effective reduction.

After all, the significance of the program lies in upgrading the environmental competitiveness of business through the minimization of generated amounts of wastes and contributing to prevention of environmental pollution from wastes and reduction of waste management costs on a national level.

The waste reduction program, which was introduced with the amendment of Wastes Control Act in August 1995 and the implementation of the Guideline on Business Wastes Reduction, has helped to improve institutions involving a larger number of businesses through several amendments.

marking a yearly average of 1% decline, or about 4% as compared to 2006. Viewed by the generated amount per won of revenue, there was a yearly decrease of some 7% through four recent years.

[Figure 6-8] Generated Amount of Wastes Per Won (Reported Records in Business Wastes Reduction for 2010; June 2011)



The economic benefits deriving from the implementation of Business Wastes Reduction Program in 2007 is calculated at about won 480 to 590 billion, which includes the production cost reduction, wastes disposal cost reduction, and environmental cost reduction.

The key for a successful wastes reduction program depends on the maximized participation from

business operations that discharge wastes. Business Wastes Reduction Program relies on voluntary records management and currently has no regulation against a poor performance in wastes reduction while there are insufficient methods for motivating the excellent performance. Hence, the appropriate support is in urgent need to be produced through continued monitoring and a consensus among related parties.

6.2.2 Waste Reuse Promotion Policy

As representative waste reuse promotion policies, Empty Container Deposit Program and Packaging

Container Reuse Program may be cited, and they are as follows.

6.2.2.1 Empty Container Deposit Program

(1) Background and Significance of the Policy Establishment

The program is a kind of consumer deposit based on polluter pay principle, and it is about ensuring motivation through economic incentives and encouraging retail and wholesale businesses to return empty containers to the manufacturers through the retrieval system in which a consumer is charged an empty container deposit added to the price of liquors or soft drinks, which is to be refunded to the consumer as he or she returns the container.

As for Empty Container Deposit Program, liquors had been managed by National Tax Service (1985) while soft drinks were handled by the Ministry of Health and Welfare (1988) until both came under a consolidated supervision of the Ministry of Environment in January 2003.

While liquors were managed by the National Tax Service (NTS), a liquor manufacturer who wanted to charge deposit at delivery from factory with a view to retrieving containers and packaging materials that could be reused was subject to a regional tax office head's authorization in due observance of the standards set by NTS Director. On the other hand, soft drinks were managed by the Ministry of Health and Welfare on unclear grounds. In those days, Art. 29 of Food Sanitation Act stipulated that food manufacturers must comply with what is specified by the Ministry of Health and Welfare ordinances with regard to quality control among others. And the related enforcement regulation, which stipulated compliance with what is instructed by Minister of Health and Welfare in recognition of its need for achieving food sanitation and food consumer protection including management of a hygienic and efficient use of containers, installed Empty Container Deposit Program

with an announcement grounded thereon. But it was at variance with the purpose of Empty Container Deposit Program and was reaching beyond the boundary of delegated legislation, tantamount to virtual absence of legal provision. Afterwards, the amendment of the enforcement regulation on August 31, 1995 stipulated that a business that manufactures or processes food must comply with the requirement related to the implementation of Empty Container Deposit Program as set by Minister of Health and Welfare with a view to promote reuse of containers of soft drinks etc., which again was a practically groundless provision, reaching beyond the purpose of legislation in Art. 29 of Food Sanitation Act.

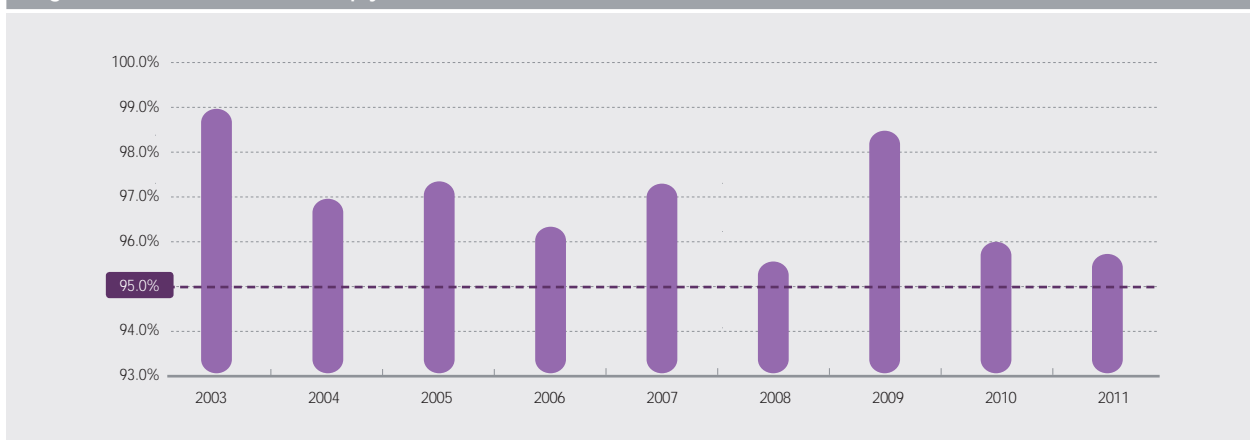
Since Empty Container Deposit Program has been operated on the announcement by NTS Director and Minister of Health and Welfare without a clear legal basis, there existed no adequate sanctions on the case of incompliance. Moreover, because the implementation of the policy on the reuse and recycling of empty containers was divided among NTS, the Ministry of Health and Welfare, and the Ministry of Environment, the policy lacked unity and efficiency, which added to the difficulty of developing policies fitting the purpose of the program. Eyeing a solution to these problems, on February 4, 2002, the amendment of Act on the Promotion of Saving and Recycling of Resources (Art. 15-2) provided a clearer legal basis for it and ensured the Ministry of Environment's sole control over the matter. The change also broadened the scope of applicable containers, replacing "Empty Bottle Deposit" with "Empty Container Deposit".

(2) Achievements

The products that were subject to Empty Container Deposit Program between 2003 and 2011 following the consolidation of the program management under

the Ministry of Environment recorded a yearly average of 95% in retrieval rate, with the reuse rate surpassing 85%.

[Figure 6-9] Retrieval Rates of Empty Containers



This demonstrates the excellent aspect of Empty Container Deposit Program that ensures prevention of neglect, diffusion, and abandonment of reusable and recyclable resources and their return to the resource circulation system. It also minimizes the production of new bottles, reducing the import of natural resources, energy used to manufacture bottles and greenhouse gas emission and the economic and environmental benefits are calculated at an annual amount of won 607.1 billion.

Furthermore, the evaluation of implementation of the voluntary agreement signed by ten soju (Korean distilled spirits) manufacturers in March 2010 for sharing soju bottles shows that in July 2011, the ten companies that adopted the standardized bottles collected an annual economic benefit of about won 32 billion in saving the cost for new bottles and an annual environmental benefit of about won 31.8 billion in reducing CO₂ and saving resources and energy.

6.2.2.2 Reuse of Packaging Containers

(1) Background and Significance of the Policy Establishment

The program recommends businesses to produce products of which a certain amount of packaging containers can be reused. Businesses can save container manufacturing cost and thus production cost, thereby leading to lowered price, while consumers can choose to buy only the contents, which should bring economic benefits and help price stabilization of living necessities, eventually cutting down on wasted resources and contributing to environmental protection.

Reinvigorated production and sales of refillable products has the advantage of not only reducing wastes and saving energy, but also contributing to price

stabilization. In this light, to promote the production of products whose containers can be reused, the Ministry of Environment pushed for the amendment of Standards on Product Packaging Materials and Methods in 2003, which stipulated a manufacturer's obligation to make efforts to produce products with reusable containers and a distributor's obligation to cooperate.

Furthermore, to reinvigorate the reuse of containers, the Ministry is pushing for an amendment of Standards on Product Packaging Materials and Methods, which would recommend using of reusable containers to business operators of multi-use facilities including lodging industry, public baths, and training institutes.

6.2.3 Recycling Policy

Representative recycling promotion policies include Extended Producer Responsibility, Program for Ensuring Environmentality in Electrical & Electronic

Products and Automobiles, and Construction Wastes Reuse Program, which are described as follows.

6.2.3.1 Extended Producer Responsibility (EPR)

(1) Background and Significance of the Policy Establishment

Resources that lie in cities and in wastes discarded in living spaces are larger than those still kept in nature. Because we just did not have the technology for extracting them and it cost a lot to do so, the importance of converting wastes to resource wasn't highlighted in the past. Entering into the 1990s and the first decade of the new millennium, however, the aggravating environmental crisis ensuing resources and energy depletion as well as climate change domestically and globally, epochal advancement in wastes retrieving and recycling technology helped mature the conditions for the transition to a resource circulating society that maximizes the recirculated resources generated from wastes by reuse, recycle, and recovery.

Along with such social atmosphere, the programs for reusing wastes were introduced, which included Separate Garbage Collection of 1991, and Wastes Deposit Program of 1995. Entering into the first decade of the new millennium, Extended Producer Responsibility (EPR), extended and developed from Wastes Deposit System, was implemented.

EPR shares historical context with Wastes Deposit System. The System allows manufacturers to deposit a cost in proportion to their production output and retrieve it in the amount in proportion to their records in reuse. But the system has faced persistent criticism for being

ineffective in that the unretrieved deposits return to the national funds while companies simply pay the charge and do not make actual efforts to reuse. Under such circumstances, there emerged a talk of introducing EPR, which had been practiced in countries with advanced environmental practices including Germany and Japan with the purpose of strengthening the producer responsibility for reusing disused products. And through the preparatory period that begun in 2000 with electronic products to 2002 that covered a total of 7 items with a voluntary agreement between the government and industry, Act on Promotion of Saving and Recycling of Resources (Art. 16) was amended on February 4, 2002 to start a full-fledged implementation in 2003 of Extended Producer Responsibility that would strengthen producer responsibility from production to after-use retrieval and recycle of products.

EPR literally ensures a manufacturer to design a product that is easy to recycle and takes responsibility for reusing the product when it is discarded. Currently, a total of 25 items that we frequently discharge as residential wastes are designated for EPR, and they include packaging containers such as metal cans, glass bottles, PET bottles, and plastics, and electronic products such as computers, refrigerators, and washing machines.

(2) Achievements

More than a decade has passed since the start of the voluntary agreement in 2000. In fact, it is not too much to say that Korea's recycling market was created and has been developed thanks to EPR. Recycling businesses have sharply multiplied, while their size of operation has grown to that of a small-and-medium-

sized company. The public awareness on separate garbage collection and recycling has changed and now regards wastes as reusable resources, while much of the previous, negative perception of recycled products has faded away.

Looking at the numerical representation of the erstwhile

outcome since the enforcement of EPR in 2003, the total amount of recycling has grown by around 46%, which has achieved an economic benefit of about won 5.1 trillion, an employment of 8,570 persons, and a

reduction of about 4 million tons of greenhouse gas. Meanwhile, recycling infrastructure has been extended and recycling reinvigoration system has been set up, thus contributing to recycling market.

6.2.3.2 Program for Ensuring Environmentality in Electrical & Electronic Products and Automobiles

(1) Background and Significance of the Policy Establishment

Eco-Assurance System(ECOAS) is concerned with promoting environmental conservation and a sound development of the national economy by creating a resource circulation system encompassing the whole process from design and production to disuse in order to promote recycling by ensuring a domestic manufacture of electrical & electronic products and automobiles that controls the use of harmful substances and thus facilitates recycling, and by supporting through the constraint on the import of environmentally hazardous products and upgraded competitiveness of domestic products in the domestic environment as well as the domestic market.

To this end, businesses are encouraged to create a precautionary management system that includes assessment of compliance of standards on inclusion of harmful substances, assessment of compliance with year-by-year reusability of automobiles, enhancement of material composition of electrical & electronic products, and provision of information on recycling, and a resource circulation system through the use of eco-friendly and easy-to-recycle raw materials that do not include harmful substances. Furthermore, mandatory reuse ratios are imposed on different electrical & electronic products to push for the creation of after-use recycle management system that includes fulfillment of recycling responsibility and achievement of recycle ratio for disused automobiles.

As a large amount of wastes generated from mass production and mass consumption continue to aggravate environmental pollution in the contemporary society and thus accelerate the depletion of natural

resources, the problem needs to be addressed through appropriate resource circulation. In particular, disused electrical & electronic products and automobiles, which include large amounts of metal and non-metal resources, urgently demand an adequate system for recycling and resource circulation.

Advanced countries enforce a variety of environmental regulations on electrical & electronic and automobile industry more strictly to serve the cause of sustainable development, and such regulations as WEEE, RoHS are expected to influence the export of domestic companies.

Accordingly, on January 1, 2008, Korea has implemented an Act on the Resource Circulation of Electrical and Electronic Equipment and Vehicles for resource circulation and environmental conservation in a joint legislation by the Ministry of Environment, the Ministry of Knowledge & Economy, and the Ministry of Land, Transport and Maritime Affairs.

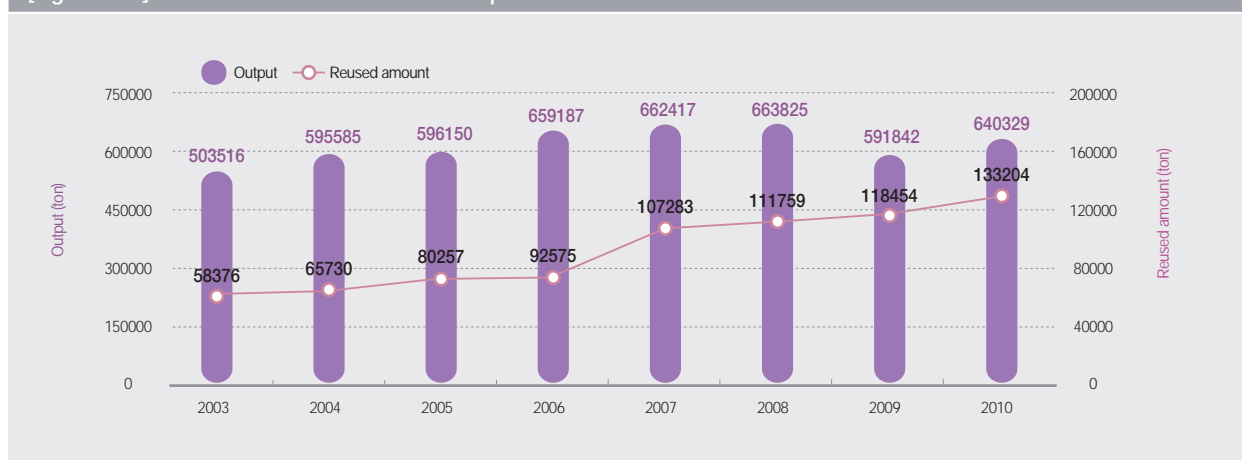
Act on the Resource Circulation of Electrical and Electronic Equipment and Vehicles as an extension of EPR that had been implemented since 1992 aims to ensure a preliminary management that emphasizes a manufacturer's role for improvement of the environmentality of a product as well as enhanced recycling of disused products. Since promotion of recycling requires manufacturers to consider recycling in production of all products so that disused products may be easily recycled at a low cost, the implementation of an artificial support program that would enable recycling of wastes that are not recirculated in a spontaneous market, or the obligation of specific agents with recycle, are reflected in ECOAS.

(2) Achievements

An analytical assessment of the 3-year performance following the implementation of ECOAS shows that 2,283 business operations are participating in the program, 948 operations (71%) up from the year of 2008, while disused electrical & electronic products reuse ratio was 21%, a 9% increase from 2003 when

EPR was still in force and a 3% increase from 2008 when ECOAS was in its early stage of implementation. For the last 3 years, product shipment has decreased by 3.5% but reuse ratio has increased by 19%, while mandatory fulfillment ratio has registered an average of 119%, exceeding 100% for three consecutive years.

[Figure 6-10] Electrical & Electronic Product Output and Reused Amount



Disused vehicle recycling rate has continued to improve, registering an overall increase of 2.8% from 82.5% in 2008 to 85.3% in 2012. The law specifies recycling rate per scrapped vehicle as 85% until 2014 and 95% after 2015, and it is yet to be seen whether the goal will be achieved. The reasons include the legal structure that imposes responsibility on a

multiple number of recycling agents and debilitates a uniform responsibility, the cumbersome, costly stage left out by recycling focused on current value for lack of clear accountability, and the limitations of upgrading of environmental improvement and recycling rate due to small scale of scrapped vehicle business.

[Table 6-3] Disused Vehicle Reuse Ratio

Year	Category	Average weight of scrapped vehicle	Reused amount at dismantling	Reused amount at crushing	Reuse ratio
2010	Ratio(%)	100	57.4%	27.1%	84.5%
	Weight (kg)	Around 1,207	Around 693.1	Around 327.3	
2011	Ratio(%)	100	57.8 %	27.3%	85.1%
	Weight (kg)	Around 1,207	Around 714.0	Around 337.7	
2012	Ratio(%)	100	60.2%	25.1%	85.3%
	Weight (kg)	Around 1,207	Around 748.3	Around 312.6	

The economic benefits from the implementation of ECOAS include a saved cost of won 257.6 billion in after-use treatment of harmful substances, won 82.9 billion in reusing disused electrical & electronic products,

and employment of 215 persons (for won 79.8 billion), while in contribution to responding to climatic change, it reduces 123,563 tons of CO₂ in electrical & electronic sector and 1,908,688 tons of CO₂ in automobile.

6.2.3.3 Construction Wastes Recycling Promotion

(1) Background and Significance of the Policy Establishment

Despite the measures such as requiring local governments to use recycled aggregates and recycled asphalt, establishment of quality standards and quality certification for recycled aggregates, the use of recycled aggregates remains meager on construction sites, while it is applied mostly to low-level uses like mounding and backfill.

Accordingly, the Ministry of Environment has developed various policies to increase the use of recycled aggregates and explore more fundamental, high-quality uses for them, while it has implemented such policies as nationwide public campaign, development of pilot projects, development of information management system, and creation of a close cooperation with related ministries.

As construction wastes continue to grow, taking up over 50% of total wastes with the improvement of residential environment as well as the active rebuilding and redevelopment, and the taking of natural aggregates

causes damage to environment, securing alternative resources has become an urgent task.

Therefore, the Ministry has come up with Construction Waste Recycling Promotion Act and Program for Mandatory Use and Quality Certification of Recycled Aggregates, to provide substitutes for natural aggregates and contribute to the development of national economy and public well-being by appropriately treating and promoting the reuse of construction wastes generated in the implementation of a construction project.

The relevant legal basis includes Construction Waste Recycling Promotion Act, Enforcement Decree, and Enforcement Regulations, Regulations on Recycled Aggregates Quality Certification and Management, and Announcement on Uses and Mandatory Used Amount of Recycled Aggregates and Recycled Aggregates and Products Using Recycled Aggregates in Construction Projects Required to Use Recycled Aggregates etc.

(2) Achievements

The application of recycled aggregates to high-value-added uses (represented in Real Reuse Ratio and Natural Aggregates Substitution Ratio) grew nearly twofold from 17.0% in 2006 to 33.0% in 2011, and the economic value created therewith is estimated at won 2.5 trillion.

Record of developing construction waste conversion to high-value-added resource is quite impressive, which is represented by the fact that since October 31, 2012, 38 new environment technologies and 3 new constructional technologies were developed and applied by 470 or so manufacturers across the country.

The stable creation of Construction Wastes Information Management System works in preventing unauthorized disposal of construction wastes through the entire

process from discharge, treatment, reuse, and burial of construction wastes, thus only about one case of abandoned waste is generated each year.



6.2.4 Energy Recovery Policy

The world is currently suffering from resource crises such as sharply rising oil prices and environmental crisis represented by climatic change, as the resources and energy consumption increases owing to the expansion of economic activities due to advancement of trade liberalization and globalization as well as the emergence of BRICs. Korea, as the tenth largest energy consumer, depends on import for 97% of the energy needs. Therefore, it is imperative that the country comes up with methods for reducing its dependence on imported energy by extending the production and distribution of new & renewable energy that could replace the primary energy like petroleum or coals.

In 2007, the ratio of total domestic primary energy to new & renewable energy was a mere 2.37%, but the government plans to increase the portion of new & renewable energy to 20% by 2050. The remarkable fact is that currently over 76% of new & renewable energy is produced from wastes, and its production cost is

cheaper at 10% of solar power and 66% of wind power. Thus, energy production using wastes has emerged as the method that can realize new & renewable energy in the most effective way at an early stage.

Therefore, the Ministry of Environment has been pushing ahead with the implementation of various measures for converting wastes to energy since it disclosed Measures for Waste Resource and Biomass Energy in October 2008 and an implementation plan for the same measures in July 2009. Also, in accordance with Art. 4 of Wastes Control Act (State Responsibilities), the Ministry continues to provide budget and technology for local governments in support of the expansion of the facilities for converting waste resource to energy.

The domestic policies for converting waste resource to energy are focused on combustible waste resource, organic resource, residual heat from waste incineration, and landfill gas, which are described as follows.

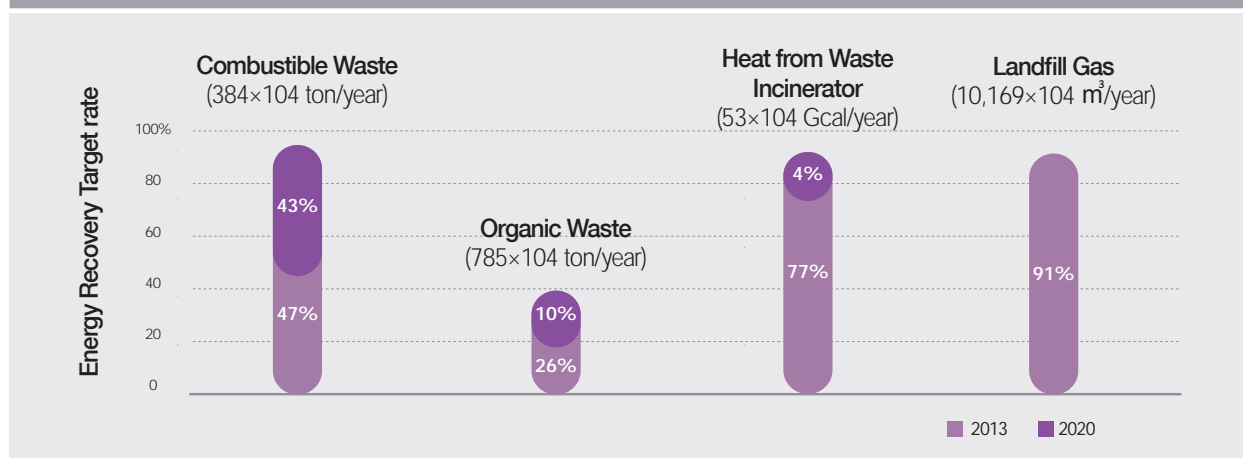
6.2.4.1 Energy Recovery from Combustible Wastes

(1) Background and Significance of the Policy Establishment

The Ministry has been pushing ahead with the implementation of various measures for converting waste resources to energy since it disclosed Measures for Waste Resource and Biomass Energy in 2008 designed to realize the national vision of 'low-carbon green growth'. In 2007, each amount of soluble and

combustible wastes convertible to energy was about 3.84 million tons/year, but only 1.5% of each (58,000 tons/year) was used. In the same measure, the Ministry of Environment is aimed to convert 47% (1.82 million tons/year) of soluble and combustible wastes into energy, and is pushing for measures.

[Figure 6-11] Goals in Converting Wastes to Energy



(2) Achievements

To achieve the conversion of 47% (1.82 million tons/year) of soluble and combustible wastes into energy, the Ministry of Environment provided a national fund of won 110.1 billion to 18 facilities for converting combustible wastes to energy and won 53.5 billion to 4 solid fuel boilers between 2007 and 2012.

The facility for converting wastes to energy (for pre-processing) run by the City of Wonju has been in operation since 2007, and in April 2010, an experimental facility for converting residential wastes to energy was built on Metropolitan Landfill Site and has been operating to process 200 tons of residential wastes daily to produce refuse-derived fuel (RDF). The RDF produced in Wonju and Metropolitan Landfill Site has been used as substitute fuel by paper factories, cement factories, and thermoelectric plants; initially, it was provided free of charge for the reason of quality, but since 2010 it has been sold at 25,000 won per ton, drawing spotlight on solid fuel products. In addition to the facilities in Wonju, Metropolitan Landfill Site, Namhae, and Bucheon, combustible wastes pre-processing facilities started operation

in Buan and Gapyeong in 2012, while aiming their completion between 2013 and 2015, solid fuel product manufacturing facilities are being designed or installed in 12 locations including Busan.

The Ministry of Environment is pushing forward with the design and installation of solid fuel product manufacturing facilities in 12 locations including Busan, which is scheduled to be completed between 2013 and 2015. Especially the solid fuel boilers to be installed in connection with the solid fuel manufacturing facilities are being pushed for in the form of private funding in Busan, Pohang, Daegu, and Daejeon. When the facilities are completed, the electricity produced at the boilers will be sold to KEPCO, while the heat will be supplied for district heating or used in the sewage sludge drying process. Furthermore, for a systematic management of the entire process including the manufacturing, distribution, and use of solid fuel products, Solid Recycled Fuel Information System has been created and in operation, which contributes not just to optimized quality management on solid fuel, but also to creation of a stable solid fuel market.

6.2.4.2 Energy Recovery from Organic Wastes

(1) Background and Significance of the Policy Establishment

In accordance with 1996 Protocol to London Convention that went into force in March 2006, a stricter regulation has been globally urged with regard to dumping of wastes into the sea. In 2007, Korea disposed of 53.8% of food waste leachate generated in the process of recycling food waste, 68.5% of sewage sludge, and 4.1% of livestock excreta by dumping them into the sea. Meanwhile, to promote conservation of marine environment and safe fisheries, the dumping of sewage sludge and livestock excreta was prohibited in January

2012 and dumping of food waste leachate into the sea is prohibited in January 2013, hence the urgency of measures for their disposal on land. But the burial of the wastes would bring with it an issue with the safety of the landfill site and bad smell, while incineration would cause air pollution with dioxin and a high disposal cost. Therefore, conversion of organic wastes to biogas is preferred to burial and incineration as the substitute for land disposal, and is to be employed to produce new & renewable energy and reduce greenhouse gas.

(2) Achievements

In 2012, a project to construct facilities for converting 4,738 tons of organic wastes a day to biogas was promoted by 20 local governments across the country with subsidies from the central government, and some of the facilities's designs are completed or construction

is underway or were to be funded by 2013 budget (or proposed budget) or were completed, demonstrating the brisk implementation of the project for converting organic wastes to energy.

Dongdaemun-gu of Seoul is operating a facility that runs a 1-MW generator using biogas as fuel that is

produced by processing 98 tons of food wastes a day, and Sokcho City also operates a facility for producing 40 tons of biogas a day. Also, installed on Metropolitan Landfill Site as a measure for substituting transport fuel entirely imported from overseas, the facility for converting biogas to vehicle fuel started its test operation in June 2011, thereby expanding facilities across the country for converting biogas produced with organic wastes to vehicle fuel.

In 2013, facilities for converting food waste leachate

to biogas are nearing completion in Jinju (150 tons of leachate a day), in Daegu (300 tons of leachate a day), and in Goyang (260 tons of leachate a day), followed by Seoul metropolitan facilities for converting leachate to biogas (500 tons a day). The Ministry of Environment will complete 8 facilities for converting organic wastes to biogas (1,960 tons a day) in 2013 and 10 of them (2,640 tons a day) in 2014, and supply the produced biogas to electricity production, district heating, vehicle operation, and city gas.

6.2.4.3 Residual Heat Recovery of Incineration

(1) Background and Significance of the Policy Establishment

Incineration Residual Heat Recovery refers to facilities that supply heat and electricity to residential facilities for hot water and heating and district heating facilities by installing gas cooling tower, boiler, and generator with the purpose of retrieving and using waste heat generated in wastes incineration. considering the change in wastes management policy (safe disposal recycling resource recirculation) and the age of high oil prices, the value of using waste-incinerated residual

heat is increasing higher than before.

Therefore, the Ministry of Environment plans to promote incineration residual heat recovery by providing national funds for the remodeling and repairs of the existing incinerators to save energy. Where residual heat recovery is in operation, recovery rate is aimed to be increased, and facilities that do not recover heat will be supplemented with residual heat recovery facilities.

(2) Achievements

While won 5.3 billion was provided for incineration residual heat recovery facilities, Announcement on Method and Procedure for Testing Criteria for Energy Retrieval amended in April 1999 and Criteria for

Calculating Incinerator Residual Heat Retrieval Ratio and Use Rate created in December 2012 are applied to facilities for recovering of residual heat in incinerator. Since 2012, Residual Heat Plant (750 tons a day) has been in operation in Mapo, Seoul.

6.2.4.4 Energy Recovery from Landfill Gas

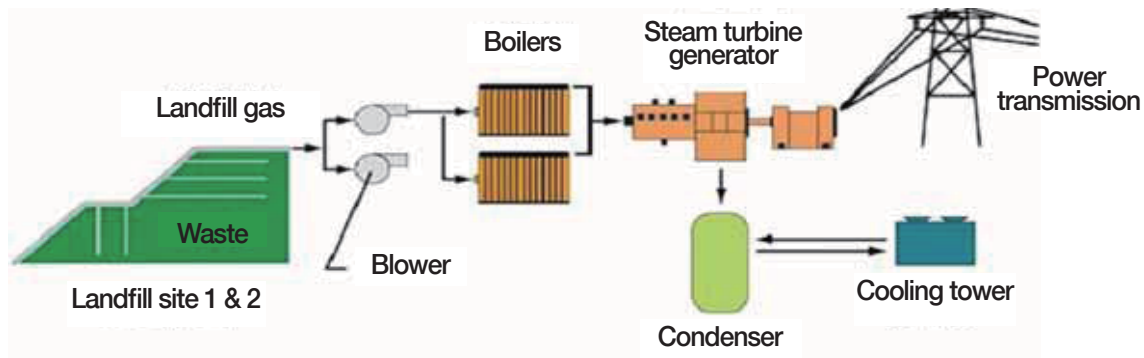
(1) Background and Significance of the Policy Establishment

There has been a paradigm shift from a focus on reduction of generated wastes, optimized treatment, and improvement of reuse ratio to the creation of 'a resource-recycling society'. Accordingly, wastes are perceived as a new resources, while the framework of recycling, which was previously limited to 'substance retrieval' is now expanding to 'energy recovery'.

As part of its efforts for energy recovery, the Ministry of Environment recovers and purifies landfill gas

generated in landfill sites to supply it as fuel to cogeneration facilities or as industrial and heating fuel. As measures for achieving the national vision of 'low-carbon green growth', the Ministry of Environment disclosed Measure for Waste Resource and Biomass Energy in October 2008 and an implementation plan for the Measure in July 2009, thus pushing ahead with the execution of various measures for converting wastes to energy.

[Figure 6-12] Flowchart of Landfill Gas Power Generation



(2) Achievements

Since 2009 when landfill gas to resource project was pushed for at small-and-medium-sized landfill sites, Gupo Landfill Site in Gumi (450 kWh), Masan Residential Wastes Landfill Site (900 kWh), and Jinju Region Metropolitan Landfill Site (750 kWh) were completed with national subsidies and are in operation, while in Gwangju (1,000 kWh), Mokpo (2,000 kWh), and Gwangyang (640 kWh), private businesses installed landfill gas generation facilities and are operating them.

Most small-and-medium-sized landfill sites diffuse landfill gas into atmosphere or burn it to emit greenhouse gases, which needs to be tapped into as an energy source. However, since there exists no data to estimate the generated or decreasing amount of landfill gas, local governments and industry are passive in investing in facilities. Against this backdrop, through an on-spot survey of 23 nationwide landfill sites, the Ministry of Environment provided local governments with the economic feasibility assessment and analysis of Clean Development Mechanism (CDM) project on 10 locations (2009) and performed a research project on a method for creating database management system needed to estimate the generated amount of landfill gas (May 2010 to December 2010), while holding workshops to push for the landfill to resource project.

Korea created Landfill Gas Power Plant (500 MW) at Metropolitan Landfill Site in 2007 and has operated it,

and based on it, production of yearly 400 million kW of electricity is being planned. Moreover, after the start of the operation of the power plant (April 2007), carbon emission rights have been granted from UNFCCC as part of CDM project, and emission rights for total 3,149,000 tons of CO₂ until 2010 have been secured, representing the country's continued efforts to reduce greenhouse gas. Landfill power generation and CDM projects are being actively implemented, not just at Metropolitan Landfill Site but also at Residential Wastes Landfill Sites managed by local governments.



6.2.5 Safe Management of Hazardous Wastes and Prevention of Environmental Pollution

While creating an advanced safety management system for waste management, the Ministry of Environment is focused on efficient management of medical wastes and

abandoned wastes. Besides, the Ministry has created and has been operating an online system for legitimate treatment of wastes. The policies are described as follows.

6.2.5.1 Safe and Advanced Management of Hazardous Wastes

(1) Background and Significance of the Policy Establishment

Since the enactment of Wastes Control Act in 1986, the government has continued to push for safe management of harmful wastes generated by the industry. Still, with the industrial advancement, newly designated wastes are generated in various kinds. On the other hand, with steadily rising income levels, interests in health are increasing while public demand for safe management of harmful wastes is growing.

In response to the changes at home and abroad, the government created an advanced safety management system for designated (harmful) wastes and is thereby pushing for an upgraded safety management with regard to designated (harmful) wastes that remain in blind spots.

The classification of designated (harmful) wastes as specified by Wastes Control Act is not fully segmentalized to represent the harmful properties of different types of wastes and is still using most of the classification system from the early 1990s. Business owners have been burdened with time and money

required to conduct a component analysis to see whether their discharged wastes belong to designated (harmful) wastes, while it has been questioned whether it is appropriate for the designated wastes classification method to depend on the party that discharges wastes. In addition, due to the limitations of the classification itself, the treatment criteria and methods do not precisely take account of the properties of harmful wastes.

To solve such problems involved in the classification of designated (harmful) wastes, a medium-and-long-term plan has been drawn up to push for improvement of listing and management system with a view to safe management of designated (harmful) wastes.

The legal basis is found in Art. 4 of Wastes Control Act (State Responsibility), which requires the country to take responsibility for understanding the status of the discharge and treatment of designated wastes and providing necessary measures to ensure an adequate treatment of designated wastes.

(2) Achievements

From 2008 to 2012, the government conducted an adequacy assessment by analyzing harmful substances, comparing and examining the harmfulness of 317 different processes and types of wastes to come up with a list of 205 processes, and it plans to complete the listing of designated wastes on 245 processes by investigating 405 processes by 2013. Detailed classification of designated wastes ensures global compatibility and the party that discharges

wastes becomes responsible for a reduced cost for classifying wastes. And since the classification further prevents harmful wastes from being discharged and inappropriately treated as ordinary wastes, safe management of designated wastes is expected to be further enhanced.

To alleviate blind spots in management of designated wastes and prevent hazards caused by wastes, criteria for hazardousness of recycled items have

been adopted, while imported wastes can be ordered to be taken out of the country in case they are found with any risks to health and/or environment that could not be predicted at import declaration. Safety Management System has been enhanced regarding designated wastes, thus strengthening burial standards so that asbestos will not disperse while waste asbestos is buried, to prevent hazards

from waste asbestos.

In preparation for signing global convention on mercury, the government has prepared a plan on improving the management system for mercury-containing wastes and is conducting a basic survey of discharged mercury-containing wastes etc., while it plans to complete the creation of the safety management system related to mercury-containing wastes by 2016.

Plan on Improving the Management System for Mercury-Containing Wastes

- Basic survey of discharged mercury-containing wastes etc. and creation of a database (2012-2015).
- Improvement of the management system related to mercury-containing wastes (2013-2015).
- Creation of the system for retrieving and treating mercury-containing wastes (discharged from homes).
- Creation of classification criteria, and a system for separate discharge/storage and eco-friendly treatment of wastes (discharged from business) (legislation to be completed by 2014)
- Implementation of the installation of facilities dedicated to treatment and storage of mercury-containing wastes (2014-2016).
- Implementation of the development of technology for retrieving/storing mercury and treating mercury-containing wastes (from 2014).

6.2.5.2 Safe and Efficient Management of Medical Wastes

(1) Background and Significance of the Policy Establishment

Medical wastes require strict management and safe treatment, as they are generated in medical services and research activities related to diseases and containing disease-spreading viruses and bacteria that are highly infectious and have high risks of secondary infection that are difficult to treat. Currently, 115,000 tons of medical wastes are generated yearly (as from 2010), and the amount is expected to continue to grow with the increasing elderly population, which buttresses the need to steadily push for a policy for an efficient safety management related to medical wastes.

While the infectious character of medical wastes requires a strict management, their efficient management within a scope that reassures safety must not be disregarded. Thus, it has been necessary to create an efficient management system and alleviate the burden of the

discharging party (e.g. hospitals), while reinforcing the safety management from discharge to treatment of medical wastes.

To make improvement on such problematic aspects, the government has come to work to upgrade efficiency in the use of containers dedicated to medical wastes within a scope that assures safety management while moving to establish RFID that would ensure real-time computerized monitoring of the discharge, collection, transport, and disposal of medical wastes.

The legal basis for the policy is found in Art. 4 of Wastes Control Act (State Responsibilities) stipulating that the country manages the discharge and treatment of designated wastes and prepares necessary measures to ensure an appropriate disposal of designated wastes.

(2) Achievements

As the RFID-applied tracking of the entire process of discharge, collection/transport, and treatment of wastes was required for the transfer of medical wastes (August 4, 2008), and thereby ensured a real-time monitoring for an appropriate discharge, collection/transport, and treatment of all medical wastes, a considerable portion of illegal wastes treatment has been eradicated.

In 2008, an improvement allowed mixed type of storage reflecting properties, source, and character of medical wastes so that treatment is facilitated to meet the demand from discharging parties and treatment business. Solid types of pathological, biochemical, blood-tainted, and ordinary medical wastes were allowed to be stored together in envelope-shaped or cardboard containers, and liquid types of wastes were to be stored in synthetic resin container, while highly

infectious quarantine wastes, body tissues likely to decompose in room temperature, and damageable matters were still prohibited from mixed type of storage, thus ensuring an efficient management by rationalizing criteria on storage of medical wastes.

In 2010, standards were liberalized to facilitate the storage, transport, and treatment by discharging parties and medical wastes treatment business, creation of dedicated containers of the size that the beneficiary desires, and legal action was ensured against a person who produces, distributes, or uses illegal dedicated containers. Furthermore, in 2011, the requirement related to the labeling of containers dedicated to medical wastes was improved to alleviate the waste-discharging person's financial burden related to the use of dedicated containers.

6.2.5.3 Implementation of Measures for Treating Abandoned Wastes

(1) Background and Significance of the Policy Establishment

Abandoned wastes are generated when a discharging person or a treating business cannot dispose of them in a timely manner for the reason of business difficulty including bankruptcy, and as the failure to dispose of them promptly would cause secondary pollution and add further damage to the environment, they should be quickly taken care of through execution by proxy. To this end, it is necessary to realize the system of performance bonds for execution by proxy to ensure disposal of all wastes, while it is more important to prevent occurrence of abandoned wastes. Against this background, the government has gone beyond the past practice of encouraging local governments to dispose of abandoned wastes and is now pushing for institutional improvement for realization of implementing performance bonds regarding abandoned wastes and creation of a computerized management system for prevention of their occurrence.

Things were in such a state that in order to suppress the occurrence of abandoned wastes, it was necessary

to secure a clear-cut legal basis for a proactive action that would ensure a discharging person, a treating business or its successor from generating abandoned wastes, while there existed difficulties in disposing of abandoned wastes since the amount of implementation deposit regarding disposal of abandoned wastes was small. Therefore, a legal basis for ordering the discharging person, a business or its successor to obviate occurrence of abandoned wastes has been specified in Wastes Control Act, realizing the unit price of treatment of performance bonds regarding disposal of abandoned wastes.

The legal basis is found in Art. 40 of Wastes Control Act (Disposal of Wastes Abandoned by A Treating Business etc.), which stipulates that in order to steer clear of any occurrence of abandoned wastes, performance bonds regarding disposal of abandoned wastes is paid in advance, and that in the occurrence of any abandoned wastes, an order for their disposal and execution by proxy shall proceed in due order.

(2) Achievements

In October 2008, costs for disposal of different types of abandoned wastes were raised to ensure an efficient implementation of abandoned wastes disposal, and in July 2010, the procedure was revised so that in case a waste-discharging person passes a deadline on the storage of the wastes, suspension of business and disposal of the wastes in storage shall be simultaneously ordered. With additional legal provision

against occurrence of abandoned wastes, a successor to the rights and responsibilities of a discharging person or a treatment business shall be ordered to dispose of abandoned wastes.

Through institutional improvement and efforts by cities, counties, and districts for timely disposal of abandoned wastes, the amount of abandoned wastes steadily dwindled, decreasing about 60% from 322,000 tons by the end of 2007 to 126,000 in 2010.

[Figure 6-13] Year-by-Year Occurrence of Abandoned Wastes



6.2.5.4 Online Waste Disposal Verification System (Allbaro System)

(1) Background and Significance of the Policy Establishment

'Wastes Disposal Proof System' that was previously enforced in order to track and monitor the mobility of wastes could not achieve its intended goal, since it demanded excessive amounts of manpower and time for comparing and checking for tracking purpose as the whole procedures including creation of Wastes Receipt or Simplified Wastes Receipt, transfer, and report to relevant administrative organization were all manually carried out. To address the issues, in September 2001, the System for Legitimate Disposal of Wastes (Allbaro System),

which would enable entry, comparison, check, analysis, and record-keeping related to the entire process from discharge and final disposal of wastes on the Internet, was developed and created as information support project by the Ministry of Information and Communication, and following its pilot run, started its legitimate operation in September 2002, serving business discharging large amounts of designated wastes and their contracted and entrusted collectors, transporters, treatment businesses.

The System for Legitimate Disposal of Wastes makes sure by processing on the Internet as electronic data Wastes Receipts circulated by discharger, transporter, treatment businesses, and administrative organization and consolidating, comparing, and analyzing it with the existing information on authorization and permission involving business as well as wastes transfer, that a user can check real-time on realization of legitimate and transparent mobility of wastes, thus preventing inappropriate disposal of wastes.

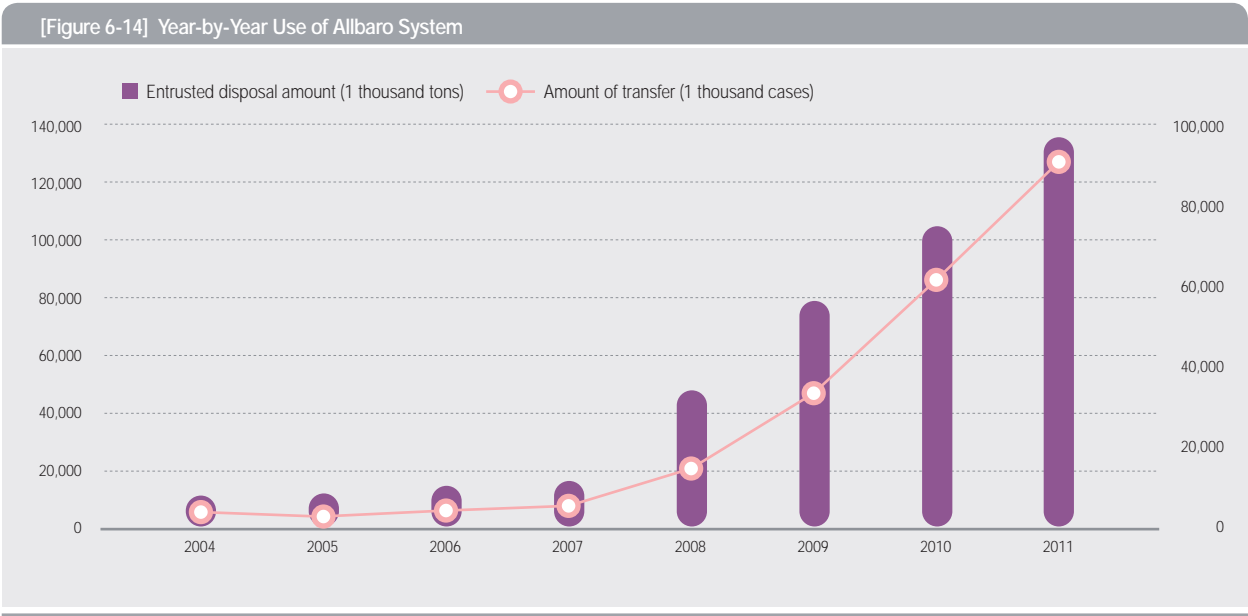
With the successful pilot run and gradual expansion of System for Legitimate Disposal of Wastes that was operated to ensure legitimate disposal of business

wastes, Wastes Control Act was amended in 2007 to make mandatory creation of an electronic receipt using the System when business wastes are to be discharged, transported, and/or disposed of. Previously restricted to some of business wastes, the policy was expanded and applied to construction wastes that take up the majority of the total amount of domestically generated wastes in 2010 to enable management of most of the business wastes, and starting in July 2011, the scope of obligated business was extended to include business subject to register wastes, which enabled acquisition of accurate statistical data on wastes, which is expected to be of much use in drawing up policies related to wastes.

(2) Achievements

Following the full-blown operation of the system that began in September 2002, it was gradually expanded to ensure its use for discharge, transport, and disposal of business wastes, and as from late 2011, about 310,000 businesses were using the system, while yearly 900 million electronic receipts were issued to demonstrate the electronic management of about 123 million tons, taking up most of the domestically generated business wastes,

which can be calculated into the economic benefit of won 225.4 billion of saved money and the outcome of 4,792 tons of reduced greenhouse gas. The discharge, transport, and/or disposal of most of business wastes are collected and analyzed real-time by the system and used for wastes management policy, with the created data being effectively utilized for fostering industry and institutional improvement related to wastes.



6.3 Key Issues

6.3.1 Recirculated Resource Trade Center

While last five years (2005-2010) have registered 4.2% hike in annual average growth of wastes, the annual average growth of recycling has declined to 0.79%, which has led to the Installation and Operation of Recirculated Resource Trade Center for raising the resource recirculation rate.

The project was promoted by the Ministry of Environment in 2012, Ubiquitous Public Service Promotion Project jointly with the Ministry of Public administration and Security (November 2011 to December 2011), and was selected as one of the major government policy tasks for the second half of 2012. In July 2012, the Plan on Establishment and Operation of Recirculated Resource Trade Center was formulated, and for three months from September 2012, a trial run site was installed and operated with a view to its legitimate online operation.

With the implementation of publicity campaign and events targeting used home electronics, furniture, and baby products, and wastes, as from December 2012, 14,437 users joined the membership, registered their items in 2,252 cases, and sold items (in trade) in 1,108 cases, showing a steady growth.

Furthermore, based on the basic data of Allbaro System and transition-related information, a matching system was created, which through computerization of trades in wastes between demand and supply led to the creation of Computerized Wastes Trade System (Recirculated Resource Trade Center) in November 2012.

In the future, a legal basis will be provided in Act on the Promotion of Saving and Recirculating of Resources to push for improvement of related institutions including EPR for institutionalization and stable operation of Recirculated Resource Trade Center, while publicity will be brought to the presence of the Center to promote its use by the public and a resource recirculating society.

Growth of users and trade volume will be induced by attracting sellers of refurbished products (products with defects repaired and resold at prices lower than original market price), which enjoy active membership and trading, while a series of events are planned to help reinforce BOM marketing through social networking services, increase membership, and attract customers. Besides, the member information sharing is being pushed for between the System and the Recirculated Resource Trade Center.

6.3.2 Improvement of Extended Producer Responsibility (EPR)

Since the Ministry's focus has been kept on reinvigoration of recycling and the establishment of the program, there have been insufficient efforts deployed in adding higher value to the recycling industry, which constitutes the ultimate goal of EPR. As recycling records involving obligated producers have been judged solely based on 'recycled amounts', there exist insufficient incentives to encourage the efforts by obligated producers or recycling business owners to make high-quality recycled products.

Furthermore, while disagreements persist over recognition of recycling records as small-scale recycling

business characteristically gets away with issuance of arbitrary receipts and inaccurate measurement, there exists no advanced computerized system for the management of the procedure and the insufficient supervision of recycling businesses leads to the limited transparency and soundness in the operation of the program.

For such issues, EPR can be said to be the top contributor to provision of the fundamental basis for the national promotion of recycling. Now, it is time to put in efforts in securing smart solutions to the problems, advancing the institution, and ensuring a step forward.

Up ahead, the system for operating the program will be refashioned to focus on mutually beneficial society as a producer responsibility organization (PRO) to make sure, as intended by the introduction of EPR, that a producer plays a role (in recovery, recycling, and preliminary improvement in composition of materials for enhanced recyclability).

For a successful EPR, a mutually beneficial society as a PRO must play an adequate role. A system is planned to ensure its expected performance of the role as a producer as well.

In addition, breaking away from the operation mode leaning on quantified performance to ensure a value-upgrading management of wastes, differentiated

subsidies will be awarded to businesses with high-value-added achievement in improving the quality of recycled products, while incentives will be given to the producers who raise the recycle value by improving composition of materials in production stage.

Finally, mistrust and lack of transparency involving recognition of recycling records shall be removed by improving transparency and efficiency in the operation system, while a computerized system for recycling records management will be created to eradicate illicit acts including submission of false records by recycling business. The management shall be stricter to keep those businesses that submit falsified records from participating in EPR for a certain period of time.

6.3.3 Reinforcement for Recycling of Electrical & Electronic Products and Automobiles

As Program for Ensuring Environmentality in Electrical & Electronic Products and Automobiles currently applies to 10 biggest electrical & electronic products (television, refrigerator, washing machine, air-conditioner, PC, audio, mobile phone, copy machine, printer, and fax machine) and 3 vehicle types (car, passenger van, and truck 3 tons or less), efficiency in the program implementation is not satisfactory yet.

The current domestic recycled amount of 10 biggest electrical & electronic products is 2.76kg per person, far below 4kg per person of the EU. To create a system for continued resource recirculation in electrical & electronic products, the EU-style of program for management of targeted per person recycle should be adopted to expand the designated list to cover

all products eventually. As the country is a producer and exporter of world-class electrical & electronic products, with a view to achieving a goal higher than the EU standards, improvement of a collection and recycle system, upgrade of standards for recycling facilities, and strengthened standards for refrigerant recovery by a waste home electronics recyclers are being pushed for.

In addition, to achieve expansion of the list of recyclable disused vehicles and per vehicle recycle ration (95% targeted after 2015), the recycle ratio will be raised to the level of advanced countries (e.g. EU, Japan etc.) by introducing EPR that imposes on manufacturer and importer the responsibility for reusing non-metal substances (e.g. CFC, ASR etc.).

6.3.4 Green Energy Parks

In order to alleviate side-effects from disorderly creation of individual regional facilities and ensure economy of scale in securing waste-to-energy facilities by encouraging their metropolitan expansion and

concentration, the Ministry of Environment plans to create Green Energy Parks encompassing waste-to-energy facilities.

The Ministry's first step on the plan is to lay down

the foundation of Green Energy Parks expanded nationwide by creating an experimental compound for it at Metropolitan Landfill Site. Metropolitan Landfill Site, with an area of around 20 million m² is largest of its kind in the world, daily disposing of about 18,000 tons of wastes generated in the Seoul metropolitan region. Metropolitan Landfill Site is going to be reborn as a global brand, establishing itself tourist destinations through 'creation of the world's largest new & renewable energy production base', 'creation of the leading model for response to climate change', and 'development of a world-renowned environmental tourist attraction'.

The New & Renewable Energy Production Base (Green Energy Parks) to be built on a site of 4.6 million m² originally earmarked for future landfill operation is composed of Waste Resource Energy Town, Natural Forces Energy Town, Bioenergy Town, and Environment & Culture Complex. Among these, Waste Resource Energy Town will accommodate an assortment of waste-to-energy facilities including RDF manufacturing facility and dedicated boilers, food waste leachate to biogas facility, sewage sludge-to-energy facility, and landfill gas power plant will produce energy with wastes previously dumped into the sea. Currently, a 50-MW landfill gas power plant, an experimental RDF manufacturing facility (200 tons a day), biogas to vehicle fuel facility (10m³/min.), leachate-to-biogas facility (500 tons a day), and the legitimate RDF project (1,000 tons a day) are being pushed for. Natural Forces Energy Town will use sunlight and wind to produce new & renewable energy, while Bioenergy Town will

produce biomass energy such as bio-circulation forest and energy grass. Environment & Culture Complex will provide exhibitions, publicity, and consulting for visitors to Environment & Energy Integrated Town. It is expected that the targeted national waste-to-energy ratio of 43% will be achieved by converting 1.44 million tons of wastes to energy arriving by the end of 2013 at the Waste-to-Energy Town to be created on the Landfill Site.

Moreover, Metropolitan Landfill Site is going to obtain carbon emission right of about 7 million tons of CO₂ for a decade (April 2007 to April 2017) by implementing a CDM project on the 50-MW landfill gas power plant currently in operation. Combined with the development of the technology for fixing CO₂, the project will be established as 'the leading model for response to climate change'.

Furthermore, 13 Environment & Energy Integrated Towns are going to be created primarily in metropolitan waste landfill sites and sites for new cities in 8 regions created out of the country in consideration of their geographical, economic, social, and cultural conditions. The Towns are expected to achieve conversion to energy of 43% of target waste resource, and the creation of 15 waste resource to energy facilities in 9 nationwide Towns is being pushed for. New Provincial Office of Chungnam and New Provincial Office of Gyeongbuk have completed validity survey and are preparing for project implementation, while Saemangeum-Gunsan Free Economic Zone and the New City of Pyeongtaek will be provided for in the future, when favorable time arrives for their implementation.

07 Environmental Health





7.1 Current Status

- 7.1.1 The Number of Patients with Environmental Disease
- 7.1.2 Civil Complaints Status against Noise and Vibration

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- 7.2.1 Protection Public Health from Environmental Risks
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- 7.3.1 Expansion of Environmental Health Service for Children and Elderly and Other Populations Vulnerable to Environment
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- 7.3.3 Expanding the support for removing slate materials in rural area
- 7.3.4 Development of Environmental Health Technology for Everyday Life

7. Environmental Health

7.1 Current Status

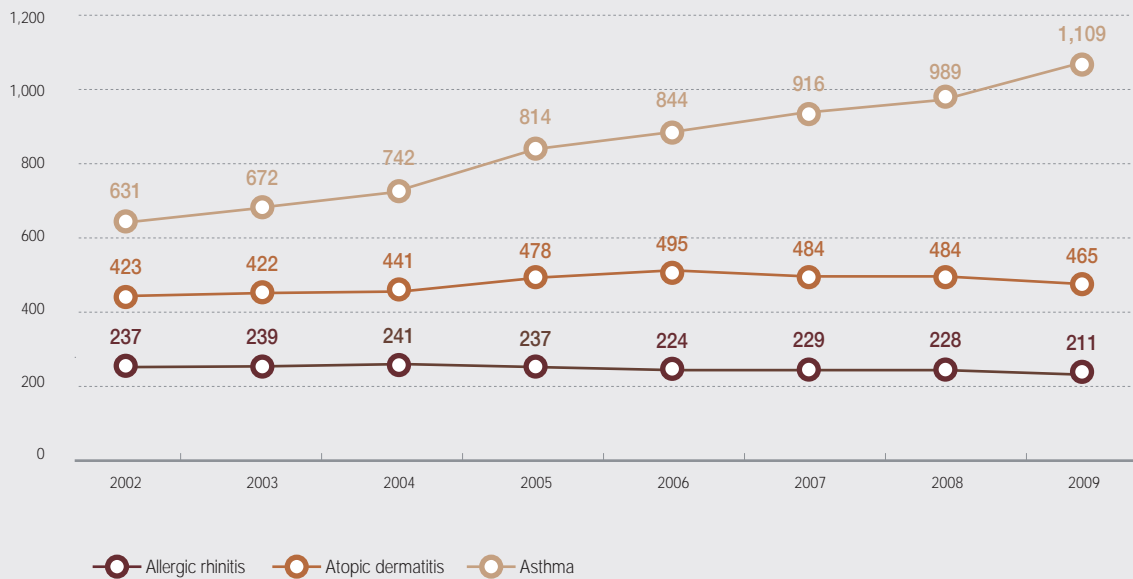
7.1.1 The Number of Patients with Environmental Disease

Environmental related disease is disease recognized to be related with environmental factors that are proved by epidemiological investigation. It is caused by water pollution, toxic chemical substances, asbestos, environmental accidents, ambient and indoor air pollution, which are not transmitted by infection. The

progress of patients with major environmental related diseases in Korea from 2002 to 2009 is shown in Figure 7-1. The number of patients with an allergic rhinitis is constantly increasing; however, the rate of increase in patients with atopic dermatitis and asthma is slightly decreasing compared to previous year since 2008.

[Figure 7-1] Patients with Major Environmental related Disease

(Unit : individual / 10,000 population)



Investigated by age, patients under 10 accounted for the most part of allergic rhinitis (21%) and patients under 4 accounted for the most part of atopic dermatitis (34.5%). In asthma, the patients under 4 accounted for 22.7% and the patients aged between 5 to 9 accounted

for 16.4%. The number of patients with asthma aged 65 years or more was ca. 260,000 in 2003 and ca. 350,000 in 2009, The number of elderly patients with asthma is rapidly increasing.

7.1.2 Civil Complaints Status against Noise and Vibration

Noise discharging facilities have properties of fixed noise source. As noise source does not disappear after installation, the facilities can do harm or damage to the neighboring region. According to 「Noise and Vibration Control Act」 revised in March, 1997, permit system toward discharging facilities in the areas around schools, general hospitals, public libraries and nurseries requiring tranquility continued to exist and the system in other areas turned into reporting system. In 2011, the number of noise discharging facility permits or reportings was 35,215, which means that the number increased by 1.9% compared to 34,544 in 2010. Among the facilities, 985 facilities were required to get permit because they were located in the tranquil areas. Traffic noise with a very high noise level, which is discharged mostly from automobiles and trains, does harm or damages over wide range of areas. In particular, automobiles, which are steadily increasing with expanding road networks, are considered as a main noise source in large cities. From aspects of traffic noise in urban areas, residential areas as well as commercial and industrial areas are under the influence which is expanding into rural areas as road networks including expressways are being expanded.

Various noises in daily life arise from loud speakers, construction works, small sized manufacturers, bars

and night club noises, etc. Noise sources in daily life is rapidly increasing with population growth, urbanization and industrialization in recent years. However, as the standard of living has improved, the demand for tranquil living environment is also increasing. The number of civil complaints related to noise in daily life was 56,244 in 2011, which indicates an increase by 4.7% compared to 53,718 in 2010. Noise complaints account for 33.4% of all civil complaints, therefore, effective measures against noise pollution is needed.

With a rapid increase in newly launched air routes and the number of flights, health hazard caused by aircraft noise is becoming a critical environmental issue. Since 1989, the Ministry of Environment launched an aircraft noise monitoring system to secure the baseline data for noise reduction plan in aviation sector; noise level is measured for 24 hours, on regular basis.

Vibration, strong oscillations caused by the use of machines or tools, generates secondary noise in the building since it spreads throughout the building structure propagating through the ground. In 2011, the number of vibration discharging facility permits or reportings was 6,645, showing an increase by 11.5% than in 2010. Among these facilities, the number of facilities subject to permit was 140.

[Figure 7-2] Before and after replacing a slate roof



7.2 Policy Overview

7.2.1 Protection Public Health from Environmental Risks

7.2.1.1 Establishment and Promotion of Comprehensive Plan for Environmental Health

Since 2000, there have been changes in environmental attitudes focusing health effects of environmental pollution rather than controlling pollution. The Ministry of Environment established '5-Year Comprehensive Plan for Environmental Health(2006-2015)', which suggested a mid and long term planning blueprint to transit the policy protecting public health. In addition, 「Environment Health Act」 was enacted in 2008. The purpose of 「Environment Health Act」 is to investigate and audit damages and impacts of environmental pollution on public health and ecosystem, to protect people from public health threats, and to maintain people and ecosystem healthy. The ministry established National Master Plan suggesting fundamental principles of environmental & health policy and its' detailed action plans, which reflects circumstances and changes in policy and social needs. 'Comprehensive Plan for Environmental Health' (2011 -

2020) was established as a legal comprehensive plan according to 「Environment Health Act」.

The objectives of 'Comprehensive Plan for Environmental Health' (2011 - 2020) are to build a healthy and safe society by protecting the people's health from environmental risks and to leap into more advanced country in environmental health by reducing burdens of environmental diseases. The Ministry of Environment is promoting 65 detailed projects in 5 areas including the following projects: minimization of environmental health risks reduction of health effects by different hazard establishment of the management system for controlling whole processes of environmental hazards health protection from environmental risks. 65 detailed projects in 5 areas is promoting including investigation, surveillance and damage aid of environmental diseases and preparation of groundwork for climate change for the next 10 years.

7.2.1.2 Environmental Disease Prevention and Control

To minimize the population at risk caused by environmental pollution, a nationwide survey on environmental diseases such as asthma and atopic disease is to be executed to investigate the relationship between environmental pollution and incidence of disease. In addition, disease surveillance system is to be launched and short- and long-term disaster assistance programs are to be reviewed for the health impacts of environmental hazards.

Since 2005, 'investigation on children's health impacts from environmental exposure' promoted to comprehensively compare and investigate children's health status including incidence of environmental disease such as an atopic disease and heavy metal contaminations. A basic database for children's health

protection is being established to investigate the relationship between health impacts and environmental pollution and the incidence and progression of environmental disease. Gradually, the database is expected to include teens.

It is important to identify environmental exposure and health status among fetus and infants who are in their most vulnerable and critical period in life that can permanently affect their future. Since 2006, 'the Mother and Child Environmental Health Study' has been executed to conduct a Mother and Child Cohort Study and to track infant exposure to pollutants such as heavy metal and phthalate and to investigate their health impacts including atopic disease and cognitive deficits in their development.

Conducting health impacts surveys among elderly that are one of the most vulnerable groups, an environmental health surveillance system for one's life was established to promote a health impacts surveys "from infant to elderly" that are vulnerable to environmental pollution. A panel survey on elderly, 'health impact caused by environmental exposure of aging population', was performed since 2008, which studied environmental exposure and its' health impacts. In 2011, guideline to reduce environmental exposure customized to each

group (pregnant mother to infant, children, and elderly) was developed based on investigations and studies of the vulnerable.

In addition, blood and urine heavy-metal concentration level testing has been performed in adults since 2005, which identifies the level of exposure to pollutants and used to establishing environmental policies in the future and used to evaluating the effect. 'Korean National Environmental Health Survey' has been expanded and promoted based on 「Environment Health Act」 in 2009.

7.2.1.3 Health Protection for Children and Other Sensitive Population

In 2006, 'Environmental Health Protection Policy for Children' was established to recognize the necessity of environmental health protection for children, to protect environmental rights of children, and to provide them healthy and safe environment. The main goal of the policy is to secure environmental safety in children's activity area, to protect children's health from hazardous products, and to strengthen education and promotion that enables children to prepare for their exposure to hazardous substances.

The purpose of securing environmental safety in children's activity areas is to eliminate health hazards derived from the comprehensive exposure and risk assessment; by doing so, it is intended to provide healthy and safe environment to children. Pollutants analysis and environmental risk assessment was conducted to monitor playgrounds and schools of children in 2006. The ministry prepared plans for controlling children's activity space, and will promote

improvements in the future. In 2009, 'Environmental Safety Management Standards' on children's activity space was launched based on 'Environment Health Act'.

Risk assessment and control of children's products was conducted to protect children's health from hazardous products. Risk assessment methodology for children's products such as baby bottle and toy was developed and has been conducted for main products. Children's product safety is focused on restricting or prohibiting the sale of products identified as hazards, and encouraging manufacturers to voluntarily reduce hazardous substances.

For the purpose of education and promotion, "Environment and Health Web Portal for Children (www.chemistory.go.kr)" was launched to provide information and directions of chemical substances and of children's activity space so that children could avoid having access to hazardous chemical substances.

7.2.1.4 Health Protection for the Vulnerable Population Living near Abandoned Mines and Industrial Complexes

As health concerns of people living near abandoned mines or industrial complexes are on a growing trend, research on the health impacts of residents near abandoned metal mines has been conducted since 2005 to reduce the concerns by identifying the cause of causality.

As adverse health effects of contaminated soil were suspected, preliminary health impact research in all abandoned metal mines in Korea was performed in 2007. Based on the preliminary study, a comprehensive health impacts research has been performed annually on those requiring more accurate health impact research since 2008.

Since 2003, the Long-term (20 years) health impact research (Cohort Study) on residents who are affected by environmental diseases or who live near the

complexes emitting a large amount of pollutants in five industrial complexes including Ulsan and Pohang has been conducted annually.

7.2.2 Providing Tranquil and Pleasant Environment

7.2.2.1 Noise and Vibration

Facility installation permits are required to control discharging facilities in quiet areas such as schools, hospitals, and the residential areas. Continued guidance and control ensures compliance of emission standards. The areas, where adverse health effects are caused by noise and vibration from roads, railroads, and vehicles, are designated as traffic noise and vibration area and require necessary measures such as speeding limit. For automobiles, noise and vibration standards are administered both for driver's acceleration, gas exhaustion and honking of horns of green vehicle and for gas exhaustion and honking of horns of in-use vehicle.

Under 「Noise and Vibration Control Act」, control is measured such as installation of noise proof equipment, and work time adjustment when noise level exceeds permissible limits. 'Comprehensive Plan for Reducing Daily Noise' (2011 - 2015) was established to provide tranquil environment with integrated noise control, a comprehensive and systematic noise and vibration control system is being developed to reduce exposure

to noise and vibration and to protect public health.

Revised in 2009, 「Noise and Vibration Control Act」 specifies to conduct preventive noise control such as installation of noise monitoring equipment and noise mapping in construction sites. 'National Noise Information System (www.noiseinfo.or.kr)' was launched to integrate different monitoring networks and to provide monitoring data service including hot spot information linked with GIS. In addition, 「Act on Aviation Noise Prevention and Supports for Noise Damaged Area」 was established in 2010, which provided basis for noise controls for aircraft noise.

Under 「Noise and Vibration Control Act」, vibration insulating facility designates three types of facilities such as elastic supported facility and vibration damping facility. Vibration suppressing devices require installing a discharging facility. Comprehensive guidance and surveillance are executed for vibration discharging facilities with permits to comply with the standards. Especially, manufacturers in residence areas are required to install vibration insulating facility before operation.

7.2.2.2 Indoor Air Quality Management

Increased indoor air pollution occurs due to staying longer indoors, increased indoor pollutants, and lack of ventilation. 「Act on Indoor Air Quality control in Public Use Facilities, etc.」 was wholly revised to maintain and control the indoor air quality properly in public use facilities and apartment buildings. "Master Plan on Indoor Air Quality Management" was developed to introduce and promote

different policies managing indoor air quality.

Public facilities subject to 「Act on Indoor Air Quality control in Public Use Facilities, etc.」 include 21 groups of facilities including underground subway station, underground shopping areas, medical facilities, large scale shopping centers, etc. To rigidly control the indoor air quality, the Ministry of Environment established

standard limits on 5 substances including PM10 particulates and can take administrative measures imposing penalty, improvement command, etc. Preventing indoor air pollution in public facilities in advance requires installing ventilation and air purification equipment in newly built public facilities. Existing public

facilities are to be improved providing that maintenance standards are violated.

Construction companies of newly built apartment buildings that would cause sick building syndrome are required to monitor and inform indoor air quality and use building materials that emit less pollutants.

7.2.2.3 Establishment of Light Pollution Control Groundwork

With rapid industrialization and urbanization, excessive lighting facilities or equipments are installed even to the extent of pollution. According to 「Act on Prevention of Light Pollution Caused by Artificial Lighting」 enacted in 2003, the plan for preventing light pollution is to be established every 5 years and comprehensive control policy toward artificial lighting is to be implemented. According to National Comprehensive Plan, light pollution preventing plan is to be established and

implemented. 「Comprehensive Plan for Preventing Light Pollution(2013 - 2017)」 presents policy directions and institutional improvement measures for controlling light pollution in order to protect public health. Light pollution environmental impact assessment is conducted every three years, checking the influence of light environment in their territories on the neighboring regions and controlling artificial lighting in the territories at a proper level on the basis of the results of assessment.

7.2.3 Making Korea Safe from Asbestos

Asbestos is a generic term for fibrous silicate minerals stemming from the nature. When inhaled, the first class carcinogen, asbestos can cause malignant mesothelioma, lung cancer and other diseases and have 10 to 40 years of latent period. Since 2009, 'Comprehensive Policy for Asbestos Management' was established and promoted in cooperation with related ministries to protect people from asbestos.

'Comprehensive Policy for Asbestos Management', a governmental policy taking overall responsible for asbestos monitoring, provides pan-national measures on asbestos management by combining various measures of different ministries and departments, and sets 18 mid-term tasks and 55 detailed tasks in 5 areas including 'primary elimination of asbestos', 'life cycle management of asbestos safety in buildings', 'controlling asbestos mines and natural asbestos', 'health hazards management and aid' and 'risk

communication'.

In addition, the government is revising and enforcing 「Act on Asbestos Damage Relief」 which was enacted in 2010 to immediately relieve health damages caused by asbestos. 「Act on Asbestos Safety Management」 was revised and enforced to manage asbestos safely and protect national health from asbestos damages since 2011. According to 「Act on Asbestos Safety Management」 a detailed geological map to identify the distributed area of asbestos is to be prepared annually and survey on national health impact is to be conducted if necessary. Also, areas concerned with asbestos shattering is to be designated as a management area. The Ministry also plans to conduct an asbestos investigation for public buildings, schools and multi-purpose facilities to manage asbestos by drawing asbestos map and appointing manager in charge of the safety of asbestos-containing building.

7.3 Key Issues

7.3.1 Expansion of Environmental Health Service for Children and Elderly and Other Populations Vulnerable to Environment

As environmental health issues are becoming a social concern and the needs of people are increasing, the diversified efforts are made to provide various environmental health services. To realize the environmental safety welfare for nation and isolated group, the Ministry of Environment has been providing an eco-friendly health assistance visiting service since 2009. An eco-friendly health assistance service is provided to protect the vulnerable population from toxic substances. A health service helper, who completed certain courses for monitoring toxic substances, visits each house to measure and examine hazardous factors causing the environment related diseases and provides consultation on environmental improvement. In 2012, a diagnostic and consulting service is provided to a total of 2,000 households including vulnerable groups, such as low-income families and senior citizens who live alone. The system was developed to actively support people, who

have the environment related disease in the family, can refer to environmental health center, which is designated to consult on environment related diseases for free of charge. The Ministry of Environment is also operating a camp that is activity linked with natural experience program at place with good natural environment such as a National Park for children and family suffering from environment related diseases such as an atopic dermatitis and asthma to provide ways to practice healthy lifestyle and also to improve their health.

Since 2009, the Ministry of Environment has been supporting the construction of prevention and control center for environment in cooperation with local governments to prevent, control and improve national environment related diseases. The Ministry is supporting 8 locations in 2012 and will support a total of 10 locations in future gradually.

[Figure 7-3] Jinan-Gun Eco Education Center



7.3.2 Improvement of Indoor Air Quality Management System

Act on Indoor Air Quality control in Public Use Facilities, etc. is being amended to strengthen the control of indoor air quality pollutants, which are discharged from composite wood products widely used for furniture, interior, etc. and indoor finishing materials in a preventive way. Current 'Notice on Architectural Materials Discharging Pollutant'

based on post-control has limitations in reducing pollutants. Therefore, the ministry is planning to obligate a discharging test for imported and manufactured architectural materials and composite wood products and to introduce a system of restricting the sale of improper products and their use in public facilities.

To induce voluntary control and to foster basis of self-regulating competition, the ministry is planning to give accreditation to excellent facilities of indoor air quality management, and is operating accreditation system toward nurseries and large scale malls with pilot programs.

Since 2007, the ministry has continuously been carrying indoor air quality monitoring and improvement projects at small nurseries, children welfare facilities, libraries, that are smaller than legal scale standard, and is encouraging facility managers to control indoor air quality by developing and providing facility control manual.

7.3.3 Expanding the Support for Removing Slate Materials in Rural Areas

Slate, a typical construction material containing highly enriched asbestos (10~15%), was widely used as construction material during 1970s. In 2010, the number of slate building structures was 1.23 million among 6.83 building units throughout the country on the basis of building register, which accounts for 18%.

Because of increased health hazards caused by the deterioration of slate and increased social request for immediate demolition of slate, the Ministry of Environment has established a 「Comprehensive Plan for Slate Management (2011 - 2021)」 in cooperation with responsible departments to build a basis to treat slate. The main goals of the comprehensive plan are elimination of slate, improvement of treatment system, promotion of slate treatment support and management plan for slates in rural and downtown areas, etc.

Relevant ministries such as the Ministry of Environment, the Ministry of Public Administration and Security, the Ministry for Food, Agriculture, Forestry and Fisheries, the Ministry of Employment and Labor, the Ministry of Land, Transport and Maritime Affairs have been the project of disposing of slate roofs through organized collaboration between ministers. The national funds, 2.8 billion won were invested in 2011 to support eliminating slate roofs in around 2,500 complexes; in 2012, national funds, 6.0 billion won were invested to support eliminating slate roofs in around 10,000 complexes.

Slate treatment is evaluated to contribute to protecting health for people living in slate containing houses and improving the quality of life. The government plans to expand project scale and budget investment in phases to quickly and effectively eliminate asbestos slate.

7.3.4 Development of Environmental Health Technology for Everyday Life

Public health impacts by environmental pollutants have become a social issue. To cope with this problem, it is necessary to investigate the correlation between environmental diseases and environmental pollution scientifically and conduct R&D for developing technology of preventing health damage caused by environmental pollution at the government level. Thus, the Ministry of Environment launched "Development Project for Environmental Health Technology for Everyday Life", which is designed to prevent health damage caused by environmental problems and to support environmental

health policy scientifically, in 2012.

"Development Project for Environmental Health Technology for Everyday Life" is divided into the following three categories: the first category is to develop technology for risks in order to prevent and manage health impacts; the second category is to develop technology responding to environmental diseases to prevent and control environmental diseases; and the last category is to develop technology for risk management against hazardous substances to prevent and control adverse health effects.

08 Chemicals





8.1 Current Status

- 8.1.1 Hazardous Chemicals Management System
- 8.1.2 Distributed Quantity and Emissions of Chemical Substances
- 8.1.3 Status of Domestic Chemical Industry

8.2 Policy Overview

- 8.2.1 Establishment of a Precautionary Risk Management System
- 8.2.2 Enforcement of Hazardous Chemical Substances Management
- 8.2.3 Risk Management of Chemicals in Daily Life
- 8.2.4 A Management Focused on Internationally Concerned Substance

8.3 Key Issues

- 8.3.1 Plan to Improve Safety Management of Toxic Chemicals
- 8.3.2 Enactment of Act Concerning Registration, Evaluation, etc. of Chemical Substances

8. Chemicals

8.1 Current Status

8.1.1 Hazardous Chemicals Management System

In Korea, the chemical substances are managed by 14 legislations in 7 ministries according to the purposes of their uses and properties.

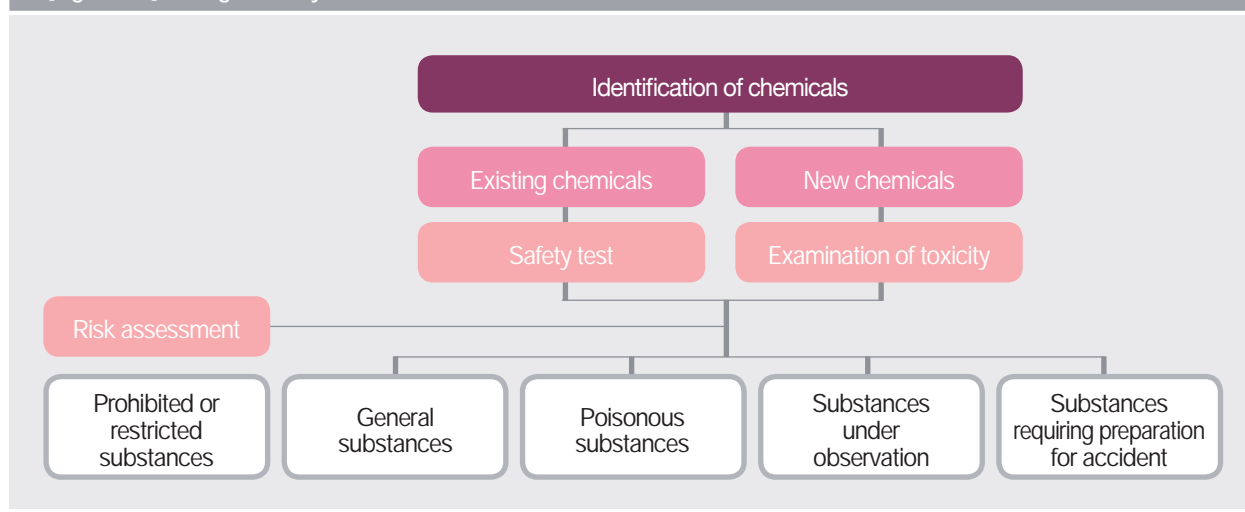
[Table 8-1] Laws related to Chemical Substances in Korea

Subject	Responsible Department	Legal Ground	Purpose of Management
Toxic chemicals	Ministry of Environment	Toxic Chemicals Control Act Persistent Organic Pollutants Control Act	Protecting public health and environmental from toxic chemicals
Hazardous substances	Ministry of Employment and Labor	Occupational Safety and Health Act	Prevention of industrial disasters and maintenance and enhancement of safety health for labor
Agricultural pesticides fertilizer feed	Ministry of Food, Agriculture, Forestry and Fisheries	Agrochemical Control Act, Fertilizer Control Act Control of Livestock and Fish Feed Act	Improvement of quality in agricultural pesticides, fertilizer and feed and management of demand and supply
Medical drug, narcotics	Ministry of Health and Welfare	Pharmaceutical Affairs Act, Act on the Control of Narcotics	Improvement of national health through appropriate management of medical drugs
Food additives	Ministry of Health and Welfare	Food Sanitation Act	Prevention of harms caused by food and improvement of quality in food nutritions
Cosmetics	Ministry of Health and Welfare	Cosmetics Act	Safety management of cosmetics
Dangerous goods, explosive	Ministry of Public Administration and Security	Safety Control of Dangerous Substances Act Control of Firearms, Swords, Explosives, etc. Act	Prevention of harms caused by dangerous goods secure public safety Prevention of risk and disaster caused by explosives High-pressure gas
High-pressure gas	Ministry of Knowledge Economy	High-Pressure Gas Safety Control Act	Prevention of dangers caused by high-pressure gas
Radioactive substance	Ministry of Education, Science and Technology	Atomic Energy Act	Atomic Energy Act

The Ministry of Environment is enacting and operating 「Toxic Chemicals Control Act」 to protect public health from the chemical substances and to manage the toxic chemical substances. The 「Toxic Chemicals Control Act」 is a basic Act for chemicals control in Korea and aims at controlling the harmfulness of

chemical substances, safety management of toxic chemicals, investigation of emission and distribution of chemical substances, response to accidents related to chemical substances. The management system followed by 「Toxic Chemicals Control Act」 is as follows.

[Figure 8-1] Management System of Chemical Substances in Korea



The Toxic Chemicals Control Act prescribes that chemicals are divided into phases such as manufacturing, importation, use and disposal of chemicals or prior management (before manufacturing and import declaration) and post management (after manufacturing and import declaration) to manage them.

First the ingredient of chemical should be confirmed before entrance into the market; once it has been confirmed as a poisonous substances through the risk assessment, it is to be designated as a poisonous substances at the distribution stage to minimize their chances of being released into the environment.

8.1.1.1 Identification System of Chemical Substance

According to the wholly revised the Toxic Chemicals Control Act at the end of 2004, any person who intends to manufacture or import a chemicals shall identify the presence of chemical subject to regulation including poisonous substances and then submits the report; the chemical identification system has been established and implemented in earnest since January 1, 2006.

In February, 2012, the exemption system was improved for those products maintaining its shape and function created from manufacturing process to final utilization

process and its utilization process doesn't emit any chemicals (enforced on Feb, 2013), putting efforts for settlement of chemical identification system and improvement of its performance.

The toxic chemicals (poisonous substances, substances under observation, restricted or prohibited substance) were applied to the announcement, 「integrated announcement」 by the Ministry of Knowledge and Economy, which is in charge of determining condition and procedure of importation in September, 2011.

8.1.1.2 Implementation of 'Non-phase-in Chemicals' Safety Test

Existing Chemicals' refer to chemicals distributed in the country before the enforcement of 「Toxic Chemicals Control Act」 (February 2, 1991) and announced by the Minister of Environment on December 23, 1996 and also chemicals that has gone through examination of toxicity since February 2, 1991 and announced by the Minister of Environment (43,580 types as from the end of 2011). Since the chemicals, which were announced on December 23, 1996 were approved as chemicals already distributed without a close verification on toxicity of the substances, the examination of toxicity on above substances might be very important to prevent any problems caused by unidentified toxicity in advance. The Ministry of Environment has been conducting a toxicity test (or safety test) on about 20 types of existing chemicals since 1988, before the enactment of the 「Toxic Chemicals Control Act」. According to the result, the Ministry designated substances that are either poisonous or under observation to manage them. Since the end of 2011, the

total of 610 types of chemicals underwent a toxicity test; 55 types and 6 types have been designated as poisonous substances or substances under observation, respectively. If the data on chemical substances are not enough domestically and internationally, it utilizes existing data without additional toxicity test to designate substance as poisonous or under observation (or ex officio examination); as from the end of 2010, a total of 488 types of chemical substances were examined, while about 398 types have been designated as poisonous and 8 types have been designated as substances under observation.

The OECD is also promoting risk assessment project (SIDS: Screening Information Data Set) on existing chemicals from mass production through cooperation among member countries. Korea is also participating in the project after joining the OECD in 1996. Korea has been preparing early SIDS reports for 25 chemicals as from September, 2012, and has submitted reports on one or two types of chemicals every year since 2001.

[Table 8-2] Status of SIDS Reports in Korea

Submission year	Chemicals subjected to SIDS Reports in Korea
2001	Acetanilide, Disodium disulfide
2002	Benzoyl peroxide
2003	Calcium sulfate, Dihydrate, 4-Methyl benzenesulfonic chloride
2004	Ferric Chloride
2005	Barium carbonate, Cuprous chloride
2006	4,4-Oxibis (benzenesulfonylhydrazide), 1,1-Dichloro-fluoroethane, Dibasic potassium phosphate
2007	Strontium sulfate, 2-Methyl naphthalene, Manganese dioxide
2008	1,4-Cyclohexane dimethanol, Barium chloride
2009	Phosphoric acid, Dodecylbenzenesulfonic acid, Potassium cyanide, Calcium
2010	Thiram, Magnesium sulfate
2011	Magnesium chloride, Calcium hydrogen phosphate
2012	Calcium distearate

1) OECD cooperative project on chemicals produces data on risk and harmfulness by reviewing basic risk assessment based on toxicity and exposure data of chemicals (HPV; High Production Volume (Chemicals)) produced or imported more than 1,000 tons per year. Currently, about 4,843 HPV types (re-revised on 2004) are registered and Korea also registered 273 chemicals as a HPV. As a result of chemical production predicted by OECD based on 1995, it is expected to increase to 80% by 2020.

The Ministry of Environment translates various risk information and assessment data on major substances from OECD's SIDS final reports into

Korean language and publishes them on the Chemicals Information System (<http://ncis.nier.go.kr>) to be easily utilized by related industries and experts.

8.1.1.3 Implementation of risk screening on 'New Chemicals Substances'

'New Chemicals' refer to chemicals already in use overseas but has no record of domestic distribution and the ones that are firstly produced or imported to Korea. Unlike the existing chemicals, new chemicals are not yet determined or designated for management as poisonous substances under the Toxic Chemicals Control Act. Therefore, such substances are required to go through a risk assessment according to Article 10 under the Toxic Chemicals Control Act. If the chemical(s) turns out to be toxic or concerned to have toxicity according to the standards of Article 2 of the enforcement degrees under the Toxic Chemicals Control Act, the chemical(s) would be designated and announced as poisonous substances or substances under observation.

The number of items for initial examination of toxicity was 6 (acute toxicity, genotoxicity, degradability, acute toxicity

from fish, water flea, birds). However, 3 more items (eye irritation, skin irritation and skin sensitivity) were added in 2009, enabling assessment at advanced country level. From 1991 to 2011, the risk assessments for total 6,559 types of new chemical substances were performed; among them, 182 types were designated as poisonous substances and 56 types were designated as substances under observation.

In the future, it is assumed that more poisonous substances will be newly designated as new chemicals that are continuously imported to Korea. The Ministry of Environment will take legal actions against those products or import new substances without an examination and also continuously tighten the management of new chemicals through institutional measures, including prohibition order of chemical sales or uses.

[Table 8-3] Results of Examination of Toxicity on New Chemicals

(Unit : Type)

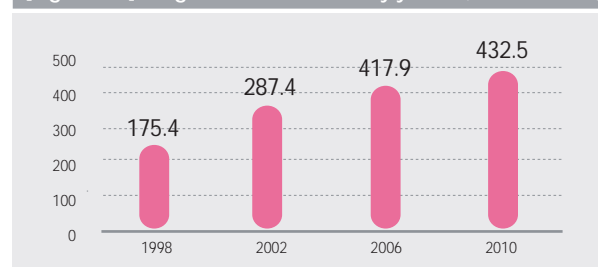
Division \ Year	Total	1991-2004	2005	2007	2006	2008	2009	2010	2011
Number of screening case	6,559	3,135	575	918	660	441	298	198	334
poisonous substances	182	108	7	10	14	6	10	7	20
Results Substances under observation	56	9	2	13	8	1	10	6	7
General Substances	6,321	3,018	566	895	638	434	278	185	307

8.1.2 Distributed Quantity and Emissions of Chemical Substances

8.1.2.1 Investigation of Distributed Quantity of Chemical Substances

The investigation of distributed quantity of chemicals is to identify the types of chemical and production, import, use, export and the purpose of uses of substances and

[Figure 8-2] Progress of Circulation by year (Unit : 1 million ton)



is being used as a basic data for management policy of chemicals. This began as a demonstration project in investigating the amount of chemicals distributed in 1996 and total investigation is conducted every 4 years. The distributed quantity of chemicals in 2010 was 432.5

The amount of chemicals imported was 231 million tons, increased by 22% compared to 2006 (189.3 million tons). The amount of crude oil imported was decreased

Chemical Production (Unit: 1 million tons)

Year	1998	2002	2006	2010
Output	181.2	216.2	286.3	289.1
Variation	-	35.0	70.1	2.8
Variation percentage	-	19.3%	32.4%	0.98%

The amount of chemicals exported were 87.6 million tons, which was increased by 51.8% compared to 2006 (50.8million tons). Major 5 exported chemicals were: crude

Chemical Import (Unit: 1 million tons)

Year	1998	2002	2006	2010
Output	42.3	122.0	189.3	231
Variation	-	79.8	67.3	41.7
Variation percentage	-	189.1%	55.2%	22%

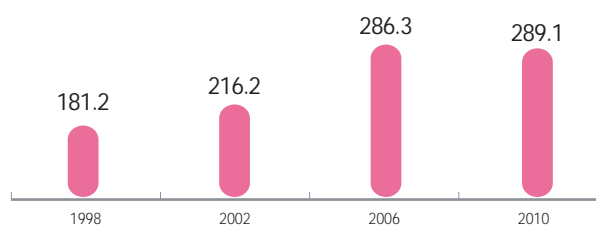
The amount of chemicals exported was 87.6 million tons increased by 51.8% from 2006 (50.8million tons). 5 major export chemicals were: crude petroleum (14.2 million

Chemical Export (Unit: 1 million tons)

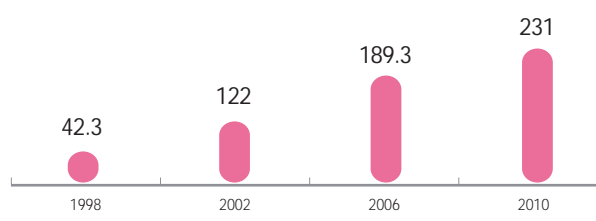
Year	1998	2002	2006	2010
Output	48.0	50.8	57.7	87.6
Variation	-	2.8	6.9	29.9
Variation percentage	-	5.8%	13.6%	51.8%

million tons, increased by 3.5% compared to 2006 (14/6 million tons). This also shows similar progress in the comparison analysis with a national statistic index related to crude oil imports, rate of operation in the manufacturing factory and industrial production.

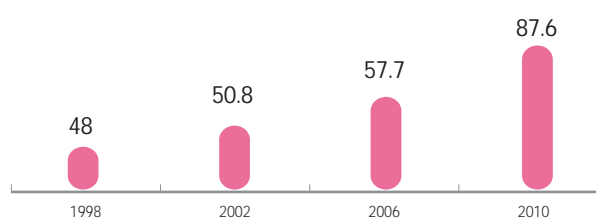
(4.6 million tons); however, the amount of naphtha and ferric oxide used to steel material were increased, or 2.7 million tons and 5.2 million tons, respectively.



petroleum (14.2 million tons), kerosene (6 million tons), Naphtha (5.4 million tons), xylan (6 million tons) and diesel (4.6 million tons), accounted for 41% of the total exports.



tons), kerosene (6 million tons), Naphtha (5.4 million tons), xylan (6 million tons) and diesel (4.6 million tons), accounted for 41% of the total exports.



8.1.2.2 Investigation of Emissions of Chemical Substances

A Pollutant Release and Transfer Register (PRTR) is a system that allows industry sector to present pollutant or substance released to air, water system or environment while treating chemical substances in the site and to find out the amount of release outside for recycling or treatment and report to the government. The government collects these data and discloses to the public. This emission reporting and disclosure project was implemented in 1999 and the results were presented in 2001 for the first time, disclosing results every year. Emission rate (emission/dealings) is tended to gradually decrease since the beginning of the system. The

volume of class one carcinogen contracts is increasing steadily while the emission is decreasing. A tendency to decreased emission is much more obvious.

The number of business site subject to information disclosure has been increasing gradually since 2008 and as from 2010, business sites should disclose the total emission of chemicals. Also the purpose of PRTR and business's efforts to reduce emission are continuously trained and promoted to avoid any unnecessary misunderstanding and exaggeration in emission results among related parties, including the public and businesses.

[Table 8-4] Chemical Emission

Division	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of reported substances (type)	116	146	148	218	223	222	219	215	212	213
Investigated business place (site)	1,023	1,199	1,384	2,892	2,741	2,769	3,012	2,945	2,917	2,985
Emission (ton)	36,587	34,272	38,041	51,021	47,299	47,796	47,688	47,625	46,989	50,034
Emission percentage (%) (Emission/dealing)	0.038	0.037	0.039	0.045	0.042	0.040	0.037	0.037	0.035	0.035

8.1.3 Status of Domestic Chemical Industry

The number of chemicals distributed worldwide as of present has reached about 100,000 types, and every year, about 2,000 types of new chemicals are developed and commercialized. A growth in chemical industry is expected to continue in the future.

In Korea, more than 40,000 types of chemicals had been distributed or currently being distributed and more than 400 types of new chemicals are entering into Korean

market every year and the uses of chemicals are increasing steadily. Furthermore, the chemical industry is rapidly growing compared to other sectors, accounting for 14% of the total domestic manufacturing output and 9% of the total employment. In particular, the petrochemical industry ranked third in ethylene production, constituting a great portion worldwide. Accordingly, a safety management for various chemicals has emerged as an urgent task.

2) As a result of chemical production predicted by OECD based on 1995, it is expected to increase to 80% by 2020.

8.2 Policy Overview

8.2.1 Establishment of a Precautionary Risk Management System

8.2.1.1 Registration and Assessment of Chemical Substances

The Ministry of Environment is promoting the enactment of 「Act on registration, evaluation, etc. of chemical substances」 (hereinafter referred to as "the act") to advance the management system of domestic chemicals and to proactively take action to a current trend of its tightened international chemical regulation. The act went through the prior announcement of legislation in February, 2011 and organized and operated a forum with the parties concerned to collect various opinions from industries and related departments. The act also mandates to adjust different opinions through several

business conferences, National Assembly discussions and meeting with industries. The act helped create a consensus to promote legislation through policy council with different departments in March, 2012, and was submitted to the National Assembly in September 2012. Since the introduction of the act, the law allows business sectors to produce and register substance information. It also provides a precautionary risk management through securing of toxicity information on chemical substances and restriction and prohibition of harmful substance uses including carcinogens.

8.2.1.2 Strategic Approach to International Chemical Management (SAICM)

The UN has selected a "Strategic Approach to International Chemical Management" (SAICM) as an international standard at Dubai in February, 2006 to minimize the health and environmental risk caused by the production and uses of chemical substances till 2020. Korea has been operating SAICM promotion council composed of the Ministry of Environment as a center and related ministries including the Ministry of Employment and Labor and the Ministry of Knowledge and Economy, NGO, industries and private experts to implement SAICM

in Korea, since 2006. Meanwhile, the total of 5 SAICM promotion councils were held to discuss international meetings related to SAICM, responses in each country and the direction of SAICM implementation in Korea. Based on 273 detailed implementation areas mentioned in SAICM, the status of domestic implementation and implementation plan by subject (government, industry, NGO, etc.) were drawn and national implementation plan was built at the pan governmental level for SAICM implementation, finally submitted to UNEP in 2011.

8.2.1.3 Green Chemistry

A sustainable green chemistry refers to efficient, effective, safe eco-friendly process and sustainable design, manufacturing, and technology of product to reduce the use and causes of harmful chemical substances. In order to achieve a policy goal in domestic chemical management policy, the technical support is needed and this can be achieved through the technical development of green chemistry. Accordingly, the Ministry of Environment

has started a chemical management technology research group since April 2011 and established a sustainable R&D roadmap (2011~2020) for a regulatory response to chemicals. Currently, it is divided into chemicals management based technology, basic study on toxicity and risk assessment and risk reduction technology; conducting technical development of green chemistry.

8.2.1.4 Risk Assessment

A project of risk concerned substance is being promoted to establish a reasonable management plan including setting environmental standard and emission allowance standard by evaluating risk concerned chemicals in all chemicals being used in Korea. Furthermore, 100 types of national priority pollutants list which should be urgently managed at the national level were drawn (October, 2010) and detailed risk assessment was separately conducted according to the result of annual initial risk assessment.

Risk assessment for risk concerned chemical goods has started since 2012 and this risk assessment was performed for main ingredients contained in air freshener and deodorizer. It is expected to establish a management plan according to the results of the assessment.

Furthermore, the announcement related to the 「guideline on selection standard, procedure and methodology of substances subjected to risk assessment」 is planned to be newly revised in 2013.

8.2.2 Enforcement of Hazardous Chemical Substances Management

8.2.2.1 Designation · Management of Poisonous Substances and Substances under Observation

A poisonous substance refers to chemicals with less than 1mg/L concentration that can kill more than half of testing fish in toxicity test or chemicals with equivalent or higher skin, eye irritation compared to hydrochloric acid, sulfuric acid, 10% aqueous solution or phenol 「sodium hydroxide」 potassium hydroxide, 5% aqueous solution. As from September, 2011, about 625 types including phenol, chloroform, benzene and toluene were designated and announced.

The type and uses of poisonous substance to be

imported to Korea should be reported to Korea Chemicals Management Association in advance and those who wish to produce or sell poisonous substances in Korea or such dealing behaviors including use, save, store, transport or sale, need to register poisonous substance business at the district local government. The amount of poisonous substances distributed in 2011 was 32,524,000 tons produced and 6,803,000 tons imported and the number of poisonous substance business reached around 6,800 companies.

[Table 8-5] Distribution of Poisonous Substances by Year

(Unit : 1,000 tone)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total(a+b)	24,446	25,833	31,058	31,788	32,294	35,064	34,250	34,447	37,995	39,345
Output (a)	20,806	21,791	26,688	26,103	27,017	29,019	29,095	29,207	30,353	32,542
Imports (b)	3,640	4,042	4,370	5,685	5,277	6,045	5,155	5,240	7,642	6,803

Note) Amount distributed = Amount produced + Amount imported

[Table 8-6] Registration of Poisonous Substance Business Operator

(Unit : place)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total	5,132	5,447	5,518	5,600	5,783	6,101	6,265	6,381	6,560	6,874
Manufacture	415	447	444	459	449	487	486	514	515	536
Trading	1,884	1,943	1,959	1,977	2,002	2,120	2,150	2,193	2,285	2,371
Sales	2,833	3,057	3,115	3,164	3,332	3,494	3,629	3,674	3,760	3,967

Note) Dealing business refers to the sum of businesses storing, saving, transporting or trading.

The substances under the observation refer to chemicals proved to cause cancer in animal test or chemicals determined to cause cancer by international professional institutes such as International Agency for Research on Cancer (IARC) or chemicals whose bioconcentration factor in fish is higher than 500. In the late June, 2011, about 64 types including

4,4'-bisphenol A were designated and those who produced or imported them should report the type, expected amount of production or import and the uses of substance to Korea Chemicals Management Association. However, unlike the poisonous substances, there is no special regulation for business activities.

8.2.2.2 Extension of Restricted and Prohibited Substances

The Toxic Chemicals Control Act designates and manages the substances of high concern from risk assessment or substances prohibited or restricted by the international organization or agreement to manage highly risk concerned substance. Risk refers to toxicity that substance has as well as impacts to human and environment in the case of exposure. Restricted substance is a substance restricted for use or distribution for certain purposes due to high risk when being used for a special use and prohibited substance is a substance prohibited for all purposes.

Since its membership of the OECD in 1996, Korea had revised the Toxic Chemicals Control Act to accept OECD regulation and changed 'specific poisonous substance' to 'restricted poisonous substance'. Furthermore, the revised Act in 2005 divided substances into 'restricted substance' and 'prohibited substance' for management. 41 types from 45 restricted poisonous substances were totally prohibited and 4 types were prohibited for special purpose only.

In 2008, 2 types of toxic heavy metals, Cadmium and Chromium mixtures; and Trichlorethylene and Tetrachloroethylene had been designated as restricted substance to tighten the chemical substances management. Since the designation of 3 types as prohibited substance in 2006, Talc containing more than 1% of asbestos was designated as a prohibited substance in 2009. Currently, 12 restricted substances and 60 prohibited substances were designated.

The amount of restricted substances produced or used are extremely small as 5,000 tons per year. However, much efforts were made for management in consideration of substances with high risk. In order to manage designated substance, the test method to detect each substance has been established gradually since 2010 and test methods for all 12 restricted substance are expected to be established by 2012. Furthermore, systematic substance designation and management will be performed by investigating the distribution status of restricted substances.

8.2.2.3 Enforcement of Management of Accident Precaution Substances

About 69 types of substances requiring preparation for accident, which are highly likely to cause accident or serious damage in the case of accident, are designated and managed. Those dealing with more than a certain amount of accident precaution substances need to establish their emergency preparedness plan that includes the labor and composition of safety management organization, emergency response plan when accidents occur, and resident evacuation plan for area expected to be damaged. If there is concern over

accident, the emergency action required for danger prevention according to its emergency preparedness plan should be performed and those operators of substances requiring preparation for accident facility within the area designated by enforcement decree such as national industrial complex or free trade area should notify their emergency preparedness plan to residents of the surrounding area in advance.

In addition, the impacts on national health or environment from accident caused by substances

requiring preparation for accident or toxic substances are thoroughly investigated to take appropriate actions required for recovery or post management, strengthening post management prepared for accident. Since substances requiring preparation for accident are regulated to be prepared with emergency preparedness plan but no additional management standard, emergency situations (accident, terrorism)

8.2.2.4 Chemical Accident · Terrorism

The Ministry of Environment is responsible for chemical terrorism and also plays a role as a support institute for Central Disaster Response Division (Ministry of Public Administration and Security) in case of spill accident of poisonous substances or substances requiring preparation for accident. To this end, the Ministry establishes and provides data including the physical properties of chemicals or related toxicity for prevention, preparation, response or post management of chemical accident or terrorism and establishes safety plan or inspection for facility dealing with toxic chemicals including substances possibly used for terrorism. It also implements correspondence training or educations response to chemical accident or terrorism for accident personnel including fire fighters or police and performs impact assessment after the accident.

Furthermore, it is operating 'Chemical Accident Response Information System (CARIS)' that provides information including the properties of chemical substance, treating facility, predicted range of substance dispersion, control and resident evacuation know-how for initial response institutions such as fire stations or police to assist effectively and promptly response to accident.

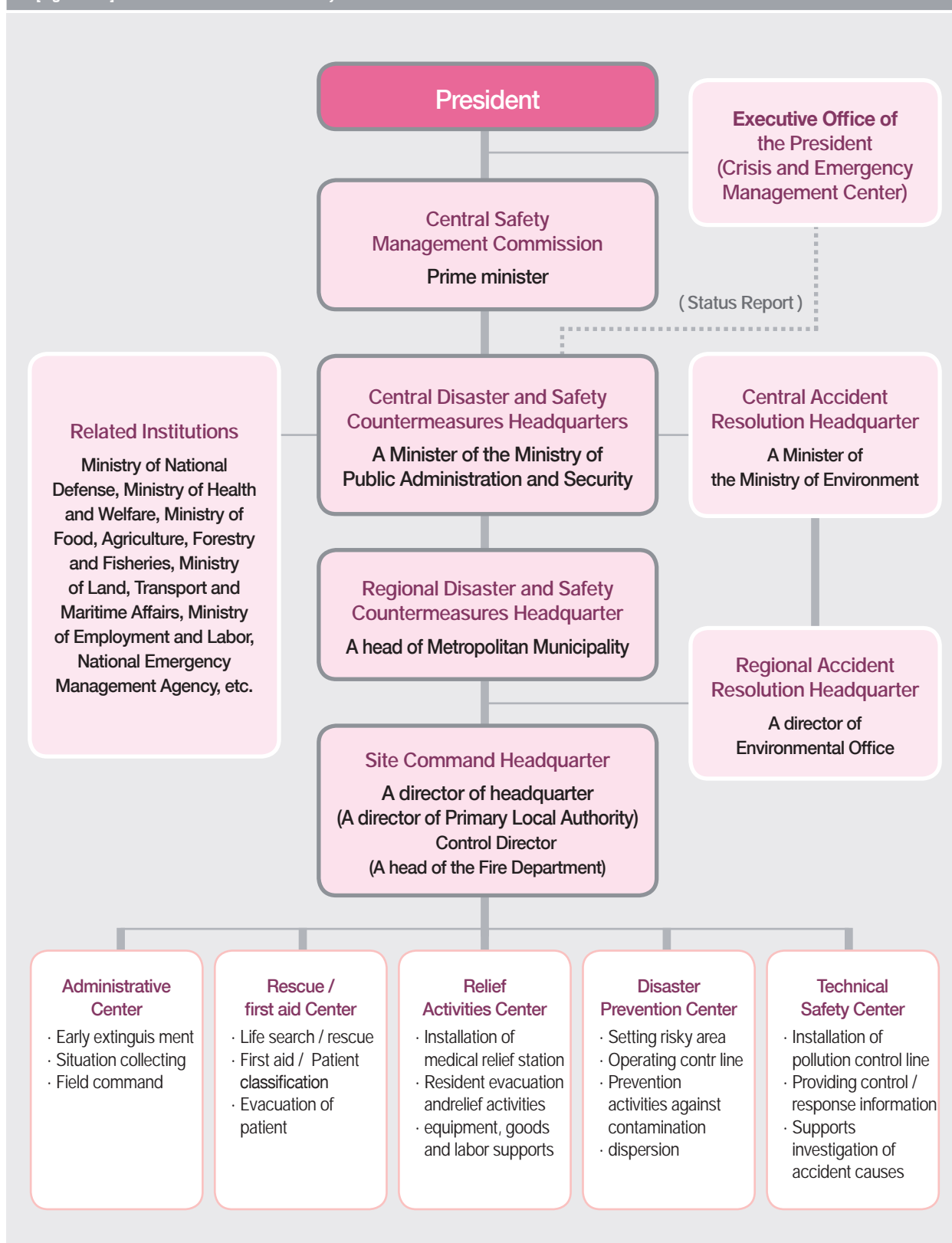
In November, 2005, a practical manual to response to toxic chemicals spill accident (revised in February, 2012) and the 'action manual for field action to toxic chemicals spill accident' (revised in March, 2012) in November, 2006 were published for prompt and effective response to accident when spill accident occurred or highly concerned to be occurred, established more precise response system.

are highly likely to take place at all times. Accordingly, the personal data of visitors to site should be recorded and saved. The 「Toxic Chemicals Control Act」 has been revised (enforced on February 2, 2013) to give obligations of reporting and inspection for ones dealing with substances requiring preparation for accident and finally strengthened the management of substances in the case of accident.

In case serious chemical accidents took place, the Regional Disaster Safety Response Division headed by a governor or mayor, head of district office as the director of division and site command headquarter is composed to conduct site responses and actions required to manage an accident. The head of regional environmental office will install a regional accident resolution headquarter to assist site responses of the local government. When accident is of serious scale, causing serious damage to life and properties and the wide scope of its impact that requires comprehensive responses at the governmental level, the Central Disaster Response Division at the Ministry of Public Administration and Security and Central Accident Resolution Division at the Ministry of Environment will be organized to deploy governmental response activities against disasters.

Also the ministry establishes response system as a responsible institute for chemical terrorism through a 'practical manual to response to chemical terrorism' (revised in February, 2012) which regulates the detailed response procedure and control actions to be applied in case of chemical terrorism. To eradicate manufacturing method of improved explosive device using poisonous substances or its illegal distribution on the internet, a 'cyber watchdog for chemicals' had been organized with 20 internet users (September 28, 2011). While this being operated, about 27 cases of suspicious harmful contents had been removed as from the late 2012 and also the ministry is holding a competition for response capability against chemical terrorism and accidents once every year since 2009.

[Figure 8-3] Chemical Accident Resolution System



8.2.2.5 Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

Each country is committed to introduce and promote Globally Harmonized System of classification and labelling of chemicals (GHS) at the UN WSSD in 2002 to encourage safe management of chemical substance and break down technical barriers when importing and exporting by harmonizing classification and indication of different chemical substances in each country. In the main ideas, the chemical substances are classified into 16 different categories according to the physical risk and 11 different categories according to the health and environmental risk. It is to indicate according to container and package and also to indicate safety data. The Ministry of Environment has been promoting research project to introduce GHS in Korea since

2004. In 2008, the ministry has enacted an 「Act on classification standard and indication of poisonous substances」 that regulates classification standard and indication by items for GHS 27 items through collecting opinions from industries and parties concerned. New poisonous substances have been subject to GHS since July, 2008.

For existing single poisonous substances, all announcements were completed on June 17, 2011 and became effective since July, using poisonous substances supporting system to build English, Chinese and Japanese for labeling system. To prepare enforcement on July 1, 2013, the ministry is currently working to establish classification and indication plan.

8.2.3 Risk Management of Chemicals in Daily Life

8.2.3.1 Humidifier Disinfectants

The Ministry of Environment is tightening the chemical goods control in daily life such as disinfectant in humidifier. Since the establishment of 「comprehensive plan for living chemical goods safety control」, the ministry has performed a risk assessment for 17 main ingredients contained in product group of air refreshener and disinfectant in living chemical goods in 2012. This was promoted in cooperation with the Ministry of Environment, Food and Drug Administration (FDA) and Korean Agency for Technology and Standards.

The ministry plans to tighten risk management system for chemical substances in daily life through the Act

concerning registration, evaluation, etc. of chemical substances currently being promoted. It also plans to continuously promote evaluating and managing the risk of concerned chemicals, which are contained in the living chemical goods and people are directly exposed to in daily life. Especially a management roadmap for highly concerned biocide, which human body or environment are directly exposed to and has high risk at the small exposure, is to be established in 2013. The technical development of risk assessment for active component contained in the biocide has been promoted continuously since 2012.

8.2.3.2 SMART (Stewardship-based Management for Area-specific Risk reduction Target) Program

The Ministry of Environment has promoted a voluntary agreement (30/50 program) to reduce chemical releases from key sites to induce business sectors to make an effort to reduce the emission. The key idea in the

agreement is to reduce emission by 30% within 3 years and by 50% within 5 years. It also allows participants to voluntarily choose the substances subjected to reduction.

After the conclusion of agreement with 17 major emitter sites in December, 2004, this has been spreading nationwide since 2005. A total of 203 sites entered into voluntary agreements. Participant site had invested won 803.4 billion (won 391.9 billion for facility improvement, won 267.8 billion for maintenance, won 143.7 billion for material candidate) and achieved the goal in emission reduction by 80% compared to the base year (2001).

Also in order to draw practical results from 30/50 program, Korea held an annual information exchange meeting on regular basis and a 'support system for chemicals emission' (<http://ncis.nier.go.kr/tri>) is providing information related to good example of emission reduction, technology introduction and Q&A board; supporting a web-based emission calculating technology and emission reduction technology since 2010.

Based on these results of 30/50 program, Korea is

promoting a "Smart Program to reduce the emission of chemicals" to reduce targeted chemicals focused on receptor in each region since 2011. A SMART program selects areas (industrial complex) emitting many specific substances, collects opinions from varied stakeholders by organizing a consultative group composed of residents, environmental group, related companies and local governments to set a goal. In addition, this sets the reduction goal for individual company by considering its ability in reducing releases, relieving SMEs' burdens. In 2011, Korea entered a voluntary agreement for demonstration project and conducted projects for class one carcinogens such as benzene and 1,3-butadiene in 3 industrial complexes including Daesan, Yeosu and Ulsan from 2012 to 2017 for 5 years. Through this, more effective reduction in emission is expected to be achieved.

8.2.4 A Management Focused on Internationally Concerned Substance

8.2.4.1 Persistent Organic Pollutants

Persistent Organic Pollutants (POPs) such as DDT, PCBs or dioxins are toxic substances, which have strong toxicity and remain in the environment for long time to be accumulated in organisms with high concentration and seriously damage humans and ecosystem. UNEP has declared the Stockholm Convention on Persistent Organic Pollutants in 2001 and issued it in 2004; Korea ratified the convention in January, 2007. In order to fulfill the Stockholm Convention, which regulated the production and emission of 12 types toxic chemicals including PCBs, Dioxins, etc., Korea has enacted 「Persistent Organic Pollutants Control Act」 in January, 2007, enforced in January, 2008, establishing and promoting response strategy at the governmental level for a systematic management of POPs.

14 agricultural pesticides among 21 POPs types by

the Stockholm Convention were not yet introduced domestically, or cancelled its registration and prohibited the use. Thus, a special management is not required. However, it is continuously being monitored through investigation of persistent concentration using a monitoring network. 7 POPs (Dioxins, PCBs, perfluorinated compounds, brominated flame retardants (BFR)) being used and produced in Korea are managed with various management policies.

As for dioxin, 'national emission level for dioxin in 2011' was firstly presented based on actual measurement in October, 2005. Furthermore, a 'national emission for dioxin (emission list)' is presented through the investigation of emitter and emission amount. As a result of national emission analysis for dioxin, the amount of dioxin released to atmosphere was 126.6g I-TEQ/year in

2009; reduced by 87%, 23% compared to 2001 (1,004g I-TEQ/year) and 2007 (164.5g I-TEQ/year), respectively. These significant reductions could be achieved by various policies continuously promoted to reduce the emission of dioxin through setting and strengthening of emission allowance standards, monitoring on dioxin concentration by operating a monitoring network and improving facilities through measurement and inspection of facilities releasing dioxin.

Various methods have been discussed for PCBs to be treated in ecofriendly manner and for 3 years since 2007, the PCBs containing waste treatment technologies were developed in consideration of domestic conditions through demonstration of high temperature incineration, treatment by high temperature incineration and chemical treatment for PCBs containing waste. Since a ground has been established to eradicate PCBs by the enforcement of 「Persistent Organic Pollutants Control Act」 and receiving reports on PCBs equipment to write PCBs inventory list from the owner of such oil immersed type transformer, the KEPCO (Korea Electric Power Corporation) treated about 15,000 waste transformers that has been accumulated until the end of 2010. Starting from 2011, KEPCO establishes a system to treat goods produced in each month.

On the other hand, KEPCO built an 'integrated DB system (<http://pcbs.me.go.kr>) for PCBs containing equipment' that allows collecting equipment together from scatters to manage for national inventory list preparation and safe management of PCBs containing equipment. The system has been operating since May, 2010.

Industrial POPs, which are PFOS (perfluorinated compounds) and brominated flame retardants (BFR) that are gaining international attention and additionally registered in 2009 are regulated based on the enforcement of decrees under the 「Persistent Organic Pollutants Control Act」 revised in April, 2011. In order to secure basic data to understand the pollution condition

of new POPs and establish a management plan by identifying persistent concentration of new POPs and analyzing influential factor, the following were promoted:

Study ('05~'07) on the real condition of perfluorinated compounds in major rivers, lakes and ocean nationwide,

Study on persistence of suspected endocrine disrupter in the environment (focused on brominated flame retardants, 2008), Study of spatio-temporal distribution of new POPs in the environment and estimation study on emission ('10~'12) and Study of the real condition of brominated flame retardants in electric, electronic device wastes.

The Stockholm Convention regulates the production and uses of 12 toxicants and their environmental emission including dioxin, PCBs, etc. In order to fulfill this convention, Korea has enacted 「Persistent Organic Pollutants Control Act」 in January, 2007 and written NIP (National Implementation Plan) based on the Article 7 (Implementation Plan) of above agreement in April, 2009 and submitted it to the conference of the parties. Also the Ministry of Environment has revised the enforcement of degrees under the 「Persistent Organic Pollutants Control Act」 in April, 2011 and institutionally reflected 9 new POPs through the ratification procedure for the amendment of Stockholm Convention, finally issuing NIP in December, 2011 and submitted it to the agreement secretariat.

Also as a monitoring project to evaluate the performances of Stockholm Convention implementation, Korea is promoting database of POPs monitoring results from each country in East Asia, data sharing and data exchange with international organizations. In this project, 10 countries in East Asia (Indonesia, Japan, Laos, Malaysia, Mongol, Philippine, Singapore, Thailand and Vietnam) are currently participating and have been holding a workshop every year since 2005. Also 'country customized POPs analysis training' is combined and conducted to improve analysis skill of POPs monitoring participant country in East Asia since 2011.

8.2.4.2 Management of Suspected Endocrine Disruptor

Since suspected endocrine disruptors have been at the center of international attention since the late 1990s, the Ministry of Environment established a 'mid-long term research plan for suspected endocrine disruptors' and implemented study on persistence condition in environment and ecological impacts since 1999. In March, 2007, the ministry has established '5 years ('07~'11') plan for investigation and management of suspected endocrine disruptors' to respond all together in cooperation with related ministries. Accordingly, the Ministry of Environment is promoting the following study and investigation under the supervision of the National Institute of Environmental Research:

- 1) Study on persistent condition in environment for suspected endocrine disruptors including phthalate group, alkylphenol group in 115 places nationwide, air, water quality, ground or soil
- 2) Study on economic impacts including examination of fish tissue and analysis of concentration accumulated in the organism
- 3) Joint study on pollution of PBDEs related ground, ocean environment, body and food with related ministries
- 4) Evaluation of toxicity using domestic distinct organism

species and application of analysis technique using in vitro essay

Since 1999, the National Institute of Environmental Research has investigated the persistent condition in environment, focusing on total 99 places including major rivers and industrial complexes containing suspected endocrine disruptors in Korea. As a result, 27 out of 48 investigated substances were detected from one or more environmental media. Especially, the substances continuously detected from water or ground for the last 5 years ('04~'08) were 12 different types, including phthalate group. Dioxin in the atmosphere was continuously reduced since the beginning of investigation of average detection concentration in 1999 and the area exceeding the air quality standards (0.6pg) is not found. In the result of ecological impacts, the frequency of abnormal reproductive cells in fish was shown to be high. However, it was similar level to the results of investigation conducted in non-polluted area and overseas including the UK or Netherlands. To see the feminization indicator of male, the average concentration of vitellogenin in investigated male carp was 0.48~8.35 $\mu\text{g}/\text{Ml}$, similar to average concentration of male carp in non-polluted area.

8.2.4.3 Response to Tightened International Regulations on Chemicals Including Mercury

As an internationally emerged issue these days, the international agreement related to mercury is in a rapid process for establishment. Mercury Convention aiming at the reduction of mercury use and emission was agreed in January, 2013.

Domestically, as a result of heavy metal concentration in the citizen's body, the blood mercury concentration was detected 5 to 6 times higher than that of advanced countries. However, due to lack of basic study on mercury, the necessity of systematic management plan was raised to closely combine mercury management by media such as water and atmosphere and be aware of interventional regulation such as response to mercury agreement. Finally, a comprehensive plan ('05, '10) on

mercury management had been established.

About 15.7 billion won is consumed to strengthen a basis for mercury management in the second planning period ('11~'15), and Korea faithfully implements it through regular evaluation by holding annual conferences to promote a comprehensive plan on mercury management.

The vision of the plan is 「minimizing health risk caused by mercury pollution」, it is expected to reduce the number of people exceeding the national blood mercury concentration (EPA recommended level 5.8 $\mu\text{g}/\text{L}$) from 26.2% in 2009 to 15% in 2015. Korea is promoting 37 projects in 5 areas in an aim to establish response system to international agreement on mercury.

8.2.4.4 Promotion of Projects to Secure Nano Substance Safety

Korea has been participating in the OECD nano production working level meeting and related international cooperation projects since 2006. Korea produced toxicity testing information on 5 nano materials (silver nano, titanium dioxide, multiwalled carbon nanotube, silica and gold nano) and established its test technique. Korea submitted Tour de Table and Fact Sheet to the OECD secretariat in 2011, published and distributed assessment on environmental exposure of manufactured nano substances and a guideline for safety management. In 2012, Korea secured data on risk of domestic manufactured nano substances and submitted national report by participating in OECD international safety cooperation projects.

In addition, Korea is investigating the distribution and detailed conditions to secure basic data for safety management of nano substances that are domestically

distributed since 2011.

On the other hand, for the precautionary management of potential risk and support of strengthening nano-technology and industrial competitiveness, Korea has established and promoted 『The First Comprehensive Plan on Nano Safety Management (‘12~‘16)』 at the governmental level in 2011, based on 『Mid-term plan for Nano Safety Management (‘10~‘14)』 established in 2010 at the level of the Ministry of Environment through collecting and systematically promoting ongoing projects and policies related to nano safety implemented by each department. This plan has been confirmed through the result of national awareness on nano safety (May, 2011), meetings with related departments (5 times, Jan~Jul, 2011), professional forums (2 times, Apr~Jun, 2011), workshop (Jul, 2011) and Cabinet council (Oct, 25, 2011).

[Figure 8-3] Withered Plants due to Hydrogen Fluoride Leak in Gumi



8.3 Key Issues

8.3.1 Plan to Improve Safety Management of Toxic Chemicals

In order to prevent chemical accidents in advance and to minimize the damage, the Korean government covers poisonous substances and substances requiring the preparation for accident (700 types), hazardous and noxious substances (700 types), energy and high pressure gases (50 types) and dangerous materials (3,000 types) and those substances to be hazardous substance to manage. Furthermore, each ministry builds prior management system for chemical accident

through its prevention plan (Ministry of Environment), Process Safety Report (Ministry of Employment and Labor), Safety Improvement Plan (Ministry of Knowledge and Economy). To establish an improvement plan for these systems, each ministry conducts self inspection and a special inspection in cooperation with the government for safety management status and emergency response system of business or related institute dealing hazardous substances.

8.3.1.1 Maintenance of Accident Response Agent

Since various ministries are managing chemical substances recently, the ministry managing substances should be responsible for accident responses and resolution to improve the ambiguity of the ministry in charge of resolving accident. However, in case of overlapped or unclear (substance excluded from management according to the current law) responsibility of some ministries, the response or resolution system is to be unified to the Ministry of Environment, allowing prompt responses. Also, governmental responses, including declaration of special disaster area are to be promoted and the government refines laws for damage supports when serious disasters such as chemical accident occur, clarifying the resolution for disasters.

The risk of accidents increases as the distribution of chemical materials increases, however, the fact that the current organization and man power cannot respond systematically to complicated and various chemical accidents was raised as an issue of concern. Accordingly, a center responsible for chemical accidents at the Ministry of Environment will be established. First, the establishment of 'chemicals safety center' as an additional organization by expanding and reorganizing responsible department (Chemicals Safety Management Center) at the National Institute of Environmental Research is under review. It is planned to reinforce the organization to strengthen regional environmental office's responses against chemical accident.

8.3.1.2 Enforcement of Accident Response System

The accident response manual in which the role of institution and response procedure are prescribed required partial improvement to take a seamless action when accidents take place in reality. Accordingly, the institutions that require situation report are noted in the manual to avoid from missing. The initial response institutions such as all local governments and fire stations with business sites dealing with

hazardous substances more than the specific volume are mandated to write related manuals. Meanwhile, considering the nature of chemical accidents that require directly issuing warnings of "alert" and "serious" without issuing "attention" and "caution", the resident evacuation order was changed in a realistic manner to issue "serious" instead of "alert".

In preparation for chemical accidents and terrorism,

the National Institute of Environmental Research is operating the Chemical Accident Emergency Response Information System (CARIS). However, its utilization is substandard due to absence of operating ground poor data poor understanding due to too many uses of professional terminology. Also because of scattered information throughout the department, information such as manufacturing, import and uses of hazardous substances, it was hard to understand the accurate state and take a prompt and appropriate action when accident occurred. Accordingly, it is planned to improve and revise all systems by

establishing legal operating regulation of information system response to chemical accident, information updates and advancement of function; it is also planned to improve system for a smooth information sharing by interconnecting information system being operated and managed by each department. Furthermore, to strengthen the management of hazardous substances transportation, a tracking management system for chemicals transportation will be established by attaching GHS to moving tank lorry truck and improve classification and indication system for hazardous substances.

8.3.1.3 Enforcement of Educational Training and Expansion of Equipment

In order to foster professional talents, training courses specialized in response measures for chemical accidents will be established, and courses for the person in charge of manuals will become mandatory to enhance expertise.

It is planned to expand equipment such as a special vehicle that can block air pollution upon entering accident

sites, equipment to analyze the property of substances and multi functional decontamination facilities.

It is planned to strengthen practical training related to accident by building new training ground for chemical accident or terrorism and conducting simulation training with related institutes and also to conduct mandatory education and training for individual business site.

8.3.1.4 Enforcement of Safety Management and Inspection

Current process of safety management, which is not applied to sites with less than 5 employees even the amount of toxicants used is higher than the certain volume will be improved to apply to all sites regardless of the number of employees; the applicable substance is also to be expanded (around 21 types 40 types). In addition to this, it is planned to strengthen the site management by a joint inspection of related department (the Ministry of Environment, the Ministry of Employment and Labor, and the Ministry of Knowledge and Economy) and a spot inspection for small sized companies.

In order to improve safety management of sites, safety manager fully qualified to site dealing with substances should be appointed to prepare for accidents. Businesses that use certain amount of the concerned chemicals will be required to buy insurances in preparation for chemical

accidents. As for big businesses that jointly perform safety management with subcontractors, additional grades for assessment reports and other incentives will be given so as to encourage businesses to perform voluntary safety management.

In order to strengthen safety management in industrial complex, it is planned to dispatch expert to provide consultations on chemical substances and perform safety instructions at the Major Occupational Accident Prevention Center (5 regional industrial complexes) of the Ministry of Employment and Labor, secure safe separation distance between residential areas and other businesses when approval for occupancy of industrial complex and also expand Chemical Management Service in which professional company manages overall process of chemicals used by companies.

8.3.2 Enactment of Act concerning Registration, Evaluation, etc. of Chemical Substances

Since the introduction of REACH system from the EU to tighten the safe management of chemical substances, Japan and China started to introduce similar system. Korea is the 7th largest chemical industrial country. However, the management of existing chemical substances and the risk management have not yet reached the satisfactory level. Korea finally had realized the necessity for introduction of

similar system with REACH to response to international trend in reinforcing chemical substances management, strengthening domestic industrial competition and to protect national health and ecosystem by finally promoting the enactment of 「Act on registration, evaluation, etc. of chemical substances」 (hereinafter referred to as "the Act"). the key contents of the Act is the follows.

8.3.2.1 Report of Manufacture etc. of Chemical Substances

Any person who intends to annually produce or import more than 1 ton of chemical substances shall report the purposes, manufacturing and imports of chemical substances every two years to provide information on

the general status of chemical substances and the information will be used as basic data for selecting persons or businesses that are subject to prior registration.

8.3.2.2 Registration of Chemical Substances

Any person who intends to produce or import more than 1 tone of new chemical substances or existing chemical substances subject to registration shall submit hazard data (more than 1 ton), risk data (more than 100 tons) for registration. As for existing chemical substances, factors such as their domestic distributed quantity and hazards shall be considered to be designated and announced as subjects required

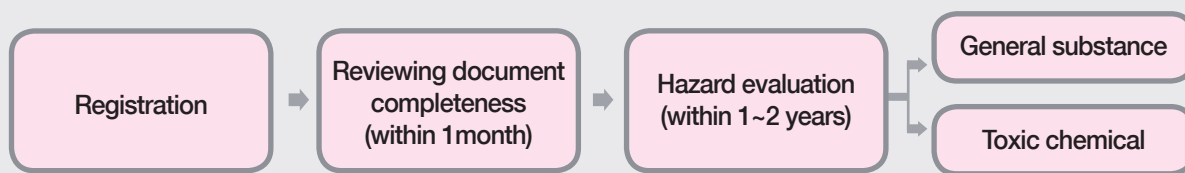
to be registered preferentially as existing chemical substances and give registration grace period in consideration of burden of businesses. In order to prevent duplication of data, the registrant needs to submit certain registration application jointly (existing chemical substance to be registered), and registrant should also be allowed to utilize the data with consent from an owner to use.

8.3.2.3 Evaluation of Hazard and Risk Assessment

Minister of Environment should evaluate hazard of the registered chemical substances and notify the results to the registrant, designate and announce any substance with toxicity as a toxic chemical according to certain

standard. The minister should also conduct a risk assessment based on the evaluation of the hazards on chemical substances produced or imported more than 100 tons per year and notify the results to the registrants.

[Figure 8-4] Designation Procedures for Toxic Chemicals



Designation of toxic chemical: Designate substances having great toxicity resulted from acute toxicity test, gene mutation and carcinogens test

8.3.2.4 Designation of Chemical Substances subjected to Anthoriziton

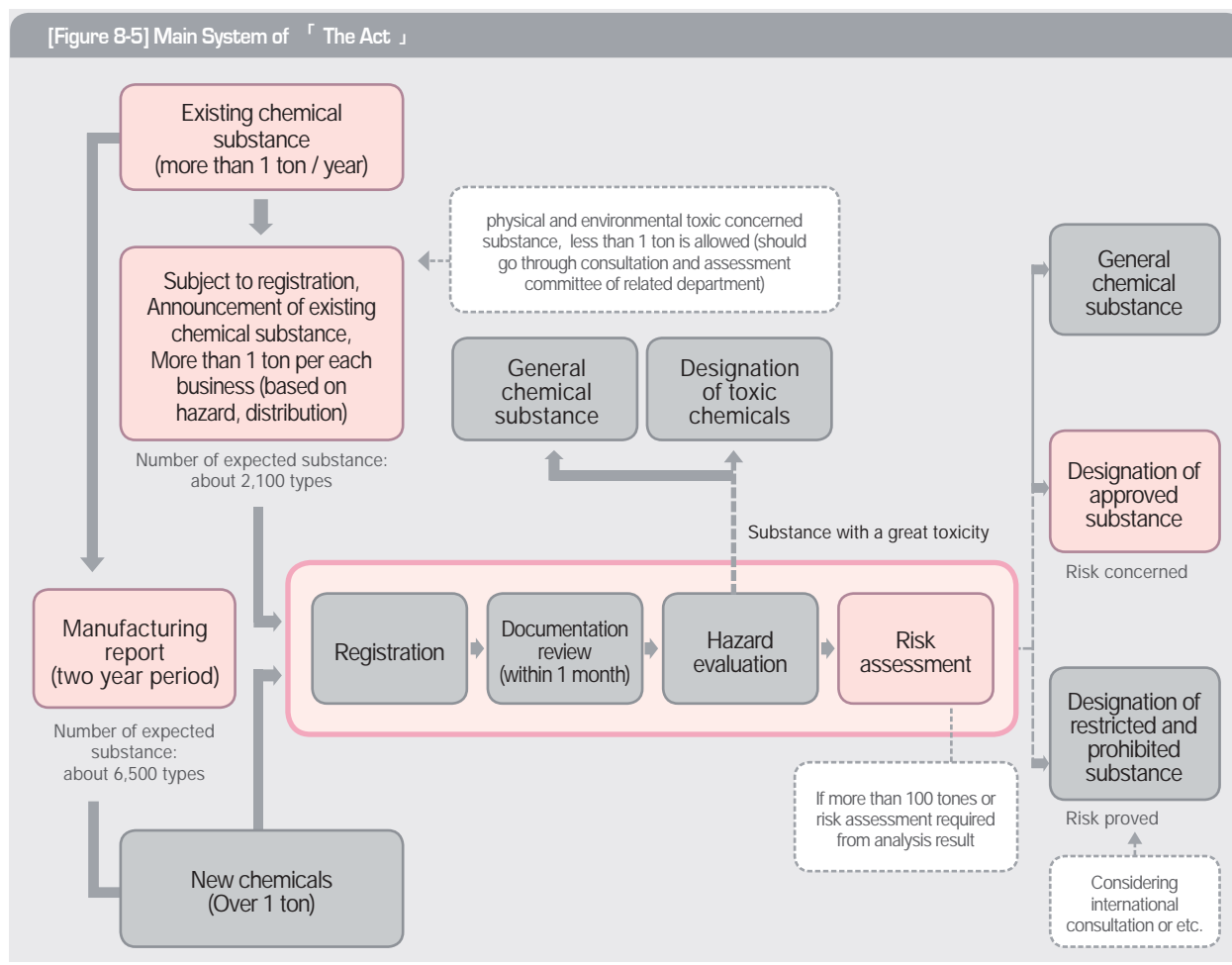
A risk concerned chemical substance is to be designated as an approved substance through risk assessment considering the purpose of use and degree of exposure. The substance which proved to pose risks is to be designated and announced as a restricted and prohibited substance. The designation of an approved substance is for high risk concerned substances including CMR (carcinogenic, mutagenic, toxic to reproduction) and PBT (persistent, bioaccumulation,

toxic substance) and these are planned to be designated by analyzing and reviewing ways to appropriately manage risk and alternativeness (economic feasibility). Restricted substances refer to substances that are restricted due to their risks posed on human health or the environment for specific purposes and prohibited substances refer to substances that are prohibited due to their risks posed on human health or the environment for all purposes.

8.3.2.5 Provision of Chemicals Information


Chemical substances information is sent to substance supply network to support sharing of information for lower users. Any person who transfers a chemical substance should provide information on hazard and risk to transferee. As 「The Act」 has been introduced, industrial sectors

are to produce and register substance information and a precautionary management system is to be built through restriction and prohibition of harmful substance uses. It is expected to be a ground to build an advanced management system of chemical substances.



09 Eco-friendly Lifestyle and Industry





9.1 Green Growth and Green Lifestyle Policy

9.1.1 Green Growth Policy

9.1.2 Status of Implemented Green Lifestyle in Korea

9.2 Nurturing Environmental Industry and Development of Environmental Technology

9.2.1 Domestic Environmental Market Conditions

9.2.2 Expansion of the Environmental Industry into the Global Market

9.2.3 Efforts of Korea in the World

9.2.4 Expansion to Global Environmental Market

9. Eco-friendly Lifestyle and Industry

9.1 Green Growth and Green Lifestyle Policy

9.1.1 Green Growth Policy

[Outline] Korea proclaimed the 'Low-carbon Green Growth' as the new national vision in a speech celebrating Independence Day on August 15, 2008. Korea adopted 'green growth' as a national strategy, which included economy, industry, technology, land, environment, public opinion, and behavioral changes beyond the conceptual category.

[Goal] The growth in harmony with the economy and the environment by saving and effectively using the energy and resources to reduce climate change and environmental damage by securing new growth power through R&D of clean energy and green technologies and by creating new work places.

[Meaning] Green growth is a concept to actualize the win-win for the environment (Green) and the economy (Growth), with two meanings depending on the direction of the win-win. They are:

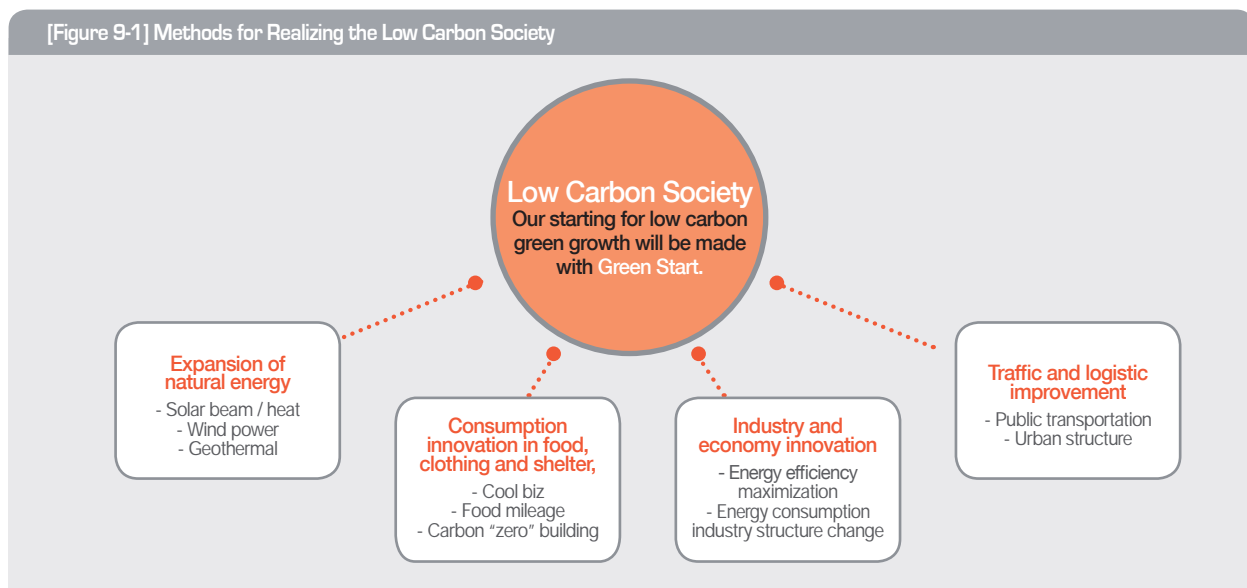
Economy → Environment: the economic growth protecting the environment rather than damaging it
Environment → Economy: the economic growth adopting the environment as new power

[Necessity] Korea shows a typical condition of high carbon society today and an innovative and dramatic change is necessary for a low-carbon society in Korea.

- CO₂ emission per capita (9.86 ton in 2006) is 1.7 times that of France (7.61 for Italy and 5.97 for France)
- The energy consumption per capita (4.48 ton in 2006) is same as that of advanced countries (OECD average 4.7, Germany 4.23 and Japan 4.13)

In the midst of this situation, Korea has been implementing 'the expansion of natural energy use, innovation of the consumption for food, clothing and housing, innovation of the industrial economy, improvement of transportation and logistics, and implementation of the Green Start movement.

[Figure 9-1] Methods for Realizing the Low Carbon Society



9.1.2 Status of Implemented Green Lifestyle in Korea

9.1.2.1 Green Lifestyle Campaign

The green lifestyle refers to a lifestyle which uses our resources and energy in a wise and environmentally friendly manner in order to reduce the level of greenhouse gas (GHG) emission and realize a low-carbon green society. Non-industrial sectors including residential,

commercial, and transportation emit 43% of total greenhouse gases in Korea. Accordingly, the campaign for green lifestyle has actively been in progress, focusing on the 'Green Start National Network' to effectively reduce GHG from the non-industry sector.

(1) Principle for Reducing CO₂ ("Me First" for CO₂ reducing)

The Ministry of Environment has established 'The wisdom for Green Life', which includes principles for citizen's practice to reduce CO₂ in home, work place and school for the settlement of GHG reduction lifestyle (Refer to Table 1-1). 'The wisdom for Green Life' is to discover and propose concrete actions towards green life.

(a) Not wasting electricity, gas and water at home, reducing waste and developing customer preference for low-carbon environmentally friendly products.

(b) Creating green work place by using stairs, cool style, bringing in personal mugs and using video conference systems.

(c) Setting the preference for means of transportation in the order of: walking > riding the bicycle > taking mass transit > driving in an environmentally friendly manner.

(d) Reducing energy and resource waste at school and further educating the students on these habits. (For more information, visit www.greenstart.kr)

(2) Green Start movement

Green Start is a nationwide movement towards reducing greenhouse gas emissions in the non-industry sector through participation and actions of citizens. The movement was initiated in October 2008 with the foundation of the Green Start National Network. Green Start Network has been deploying various activities to realize a low-carbon green society with the establishment of 246 local networks by the pivotal action of the local government and Local Agenda 21 with the participation of public and private organizations in December 2012 since its launching in October 2008 as a governance organization through private public partnership (PPP). In addition, it carries out the GHG reduction within companies by entering MOU with companies and expands the Green Start movement throughout the daily life by cooperating with diversified fields such as products and media. The government has been investing some won 4.5 billion (2012) to support such activities.

The background for the Green Start movement is due to the non-industrial sectors including residential, commercial,

transportation, which emit 43% of greenhouse gases in Korea. Furthermore, the cost of reducing greenhouse gas emission in the non-industrial sectors is low and the effects can be immediate. Therefore, the low-carbon green lifestyle is very important.

The vision for the Green Start movement is the low carbon and green growth through citizen participation, and it is targeted for The establishment of a low carbon life style, A nationwide movement to lead the green era of the 21st century.

This campaign was initiated on and offline in order to alert the need to combat climate change and entice a nationwide participation in the move towards reducing greenhouse gas emissions in our everyday lives. As of December 2012, as the key activity for Green Start movement, 85,880 green leaders were nurtured for each region and they have been performing a key role in leading and spreading the realization of a green life everywhere in the country. Especially, the green leaders who completed the medium or advance level courses

(9,176 leaders for medium level and 3,322 leaders for advance level) have been conducting diagnosis of the GHG emissions or consulting the reduction methods (medium level), and they have been educating students and general population on climate change (advanced level) by visiting their homes.

In addition, they have been performing active movements such as the One Week Event For Climate Change (April), the Creating a Green Summer Vacation Campaign (July and August), the Green Holidays (New

Year's day and Korean Thanksgiving day), and energy conservation campaigns in the summer and winter seasons. The main focus was to raise public awareness on the importance of green lifestyle practice until 2012. The movement will explore more specific programs for reducing the greenhouse gases after the launching of a new government in 2013. In addition, the mid and long term target and operative direction, which will lead the 'Green Start movement,' will be established for the coming 10 years.

(3) Operation of the Carbon Point System

- The carbon point system is a program for nationwide greenhouse gas reduction with participation of 2.91 million households since July 2009 and was enforced by the Ministry of Environment to promote the voluntary reduction of greenhouse gases in the non-industry sectors such as the residential and

commercial industry.

- It is a system to grant the point for the accomplishment of greenhouse gas reduction and to provide corresponding incentives for savings that were made for electricity, water and gas consumption in the residential and commercial buildings.

[Table 9-1] Summary of Carbon Point System

Classification	Description
Target members	Head of household host or family members, users of commercial facilities
Items for points	Selection out of the electricity, water and gas by the local
How to join	On-line registration on the carbon point homepage (www.cpoint.or.kr) or paper application by visiting local government (City hall, district office and resident center)
Incentive details	Accumulation of maximum won 70,000 per year if the individual consumption for 6 month's electricity, water or gas is reduced more than 10% compared to the previous 2 years
How to grant incentives	Payment in various ways including cash, accumulation of the green card point and traditional gift cards depending on the local government

[Table 9-2] Standard of Granting the Carbon Point

Classification	Point for granting (Yearly)	
	5~10% of reduction rate of green house gas	More than 10% of reduction rate of green house gas
Electricity	10,000 Points	20,000 Points
Water	20,000 Points	5,000 Points
City gas	2,500 Points	10,000 Points

Note) The additional incentive granting is available for reduction amount depending on the local government.

9.1.2.2 Dissemination of Green Consumption Culture

The Ministry of Environment has been actively disseminating the green consumption culture focusing on the Green Card by adopting the diversified system such as the expansion of green consumption incentive, installation and operation of the green purchasing

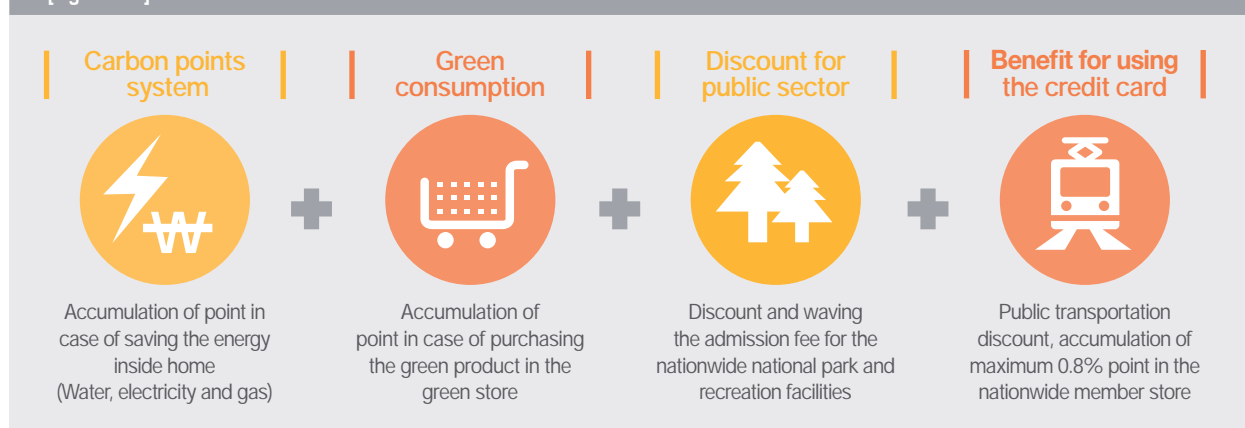
support center for each district and strengthening the education & promotion of green consumption (Education program such as the Green consumption week and Eco-Mom and etc) to spread the green consumption culture.

(1) Green Card

The green card had been introduced in July 2011 to spread the environment friendly life culture of the nation by granting the point from the government, local government and companies if green lifestyle was practiced, such as the energy conservation and the green product purchases. It utilizes a point system similar to the credit card and it has been drawing much attention as a representative green product in Korea, exceeding 4.5 million members by the end of 2012. One characteristic of the system is that it accumulates the eco-money (green points) when green lifestyle

is practiced during daily life, and more than won 200,000 of actual incentive can be provided per year. A maximum of won 70,000~100,000 can be accrued when the energy consumption such as electricity, water and gas is reduced, and 1~5% of the product price can be provided as the eco-money if a green product is purchased. In addition, up to won 5,000~10,000 can be accumulated per month for the use of public transportation and free entry or discount benefit can be provided if you want to use one of 18 organizations and 381 public facilities in the country such as the national camping sites and national natural recreation facilities.

[Figure 9-2] Benefits of Green Card



Source : www.greencard.or.kr

The green card induced national participation in green consumption and green life for the environment conservation and GHG reduction, and about 18% of the economically active population promised to become green people to practice green lives. The number of green product participating into the Green Card has been consistently increasing and 855 products from 103 companies have participated in the program. At

the same time, the participation of the green products for every day life such as kitchen detergent, food and beverage has contributed to the spread of the green consumption culture. The Ministry of Environment will increase the amount of participating products and distribution stores for reward points in the future so that more people can enjoy benefits and practice green life through the Green Card System and related policies.

(2) Installation and Operation of Green Purchase Support Center for Each Regional District

The Green Purchase Support Center is an organization that supports citizens to participate in green product consumption and green lifestyle through projects such as providing information and education on green products as well as promoting green products. The Green Purchase Support Center established the legal basis for the operation of the system by the Act on Encouragement of Purchase of Green Products in April 2011. The green market grew by 16 times from won 1.5 trillion in 2004 to won 25 trillion in 2010 thanks to the purchases by the public sector and the influence of companies, which voluntarily agreed for green purchases in accordance with the Act on Encouragement of Purchase of Green Products that was enforced in 2005. In order to solve insufficient purchasing of green products by general consumers, the Ministry of Environment revised

regulations to include a new provision for establishment and operation of the Green Purchase Support Center in 2011, and supported the consumers to make green consumption easier and more convenient by developing and operating programs for green consumption life based on the network between related organizations, business providers, and consumers for green lifestyle in the district. The Ministry of Environment will develop local community for green consumption lifestyle based on the green purchasing infrastructure, previously implemented by the private sector, with the establishment of 16 Green Purchase Support Networks in the nation by 2015, and establish the supporting base for private groups to strengthen the cooperative system for green consumption among the central & local governments and private organizations in the region.

(3) Strengthening the Green Consumption Education · Promotion (Education Program such as Green Consumption Week and Eco-Mom)

There is a need for change of the green consumption structure along with R&Ds on green technology and green production for the green consumption culture to spread into the entire society.

To establish the green value chain (green consumption green distribution green production) of green production, distribution and consumption, the Ministry of Environment attracted voluntary participation of the economic entities in the production, distribution, and consumption, and strengthened the consistent education and promotion for green consumption, and The Ministry of Environment and the Korea Environmental Industry & Technology Institute have launched the

green consumption week campaign from 2009 jointly with the distributors, consumers, citizen groups and industries upon agreement on hosting a joint campaign for the green consumption with 10 distributors out of 33 companies that entered into the voluntary agreement in November 2008 for the promotion of green product distribution in 2007, has nurtured 150 Eco-Moms and 275 eco-leaders from 2009 till 2011 through the operation of the Eco-Mom campaign and eco-leader school linked with the private groups along with the operating of Green Consumption Week. In addition, more than 40 teachers completed teacher's workshop with the theme of climate change and green consumption since 2011.

9.1.2.3 Efforts to Revitalize Green Products

(1) Green Products

Definition on the Green Products

- Products that minimize the mobilization of energy and resources and the generation of greenhouse gases in accordance with the Framework Act on Low-Carbon, Green Growth, Article 2, Clause 5.



Targeted Green Products

- 1) Products certified and appropriate for the certification standard in accordance with the Development of and Support for Environmental Technology Act, Article 17, Clause 1.
- 2) Products certified for good recycled (GR) and

appropriate for the certificate standard designated by the decision of Minister of Knowledge and Economy in accordance with the Act on the Promotion of

Saving and Recycling of Resources, Article 33 and Industrial Technology Innovation Promotion Act, Article 15.

[Table 9-3] Targeted green products

Item	Products with Environmental Labels	Good Recycled (GR) Products
Laws	Support For Environmental Technology and Environmental Industry Act	Act on the Promotion of Saving and Recycling of Resources
Target product	153 product groups including office equipments, construction materials and household supplies	223 products in 15 areas including the waste paper and waste glass
Certified status	8,217 products from 1,444 companies (as of March 31, 2012)	223 products from 185 companies (as of March 31, 2012)
Certified by	Korea Industry Technology Institute The Ministry of Environment	Resources Circulation Industry Promotion Association
Design		

Source: Green product information system homepage (www.greenproduct.go.kr)

Purpose of Operation of the Green Product Information System

- Provision of information on green products according to the compulsory purchasing system of the public organization
- Calculation of the purchasing records and plan of the public organizations for compulsory purchasing
- Provision of the related organization information through

management of the product information details

- Provision of the linked information for revitalization of purchasing by the private and industrial sector

Basic Laws for the Green Product Information System

- Establishment-operation of the green product information management system [Laws for green product purchasing acceleration (Article 14-2)]

(2) Carbon Labeling System

The Carbon Labeling System is a system that is designed to spread the low-carbon consumption culture and to induce GHG reduction initiated by the market disclosing information on the GHG emission generated from all processes of production, transportation, use and discarding of the products. It has been executed actively since February 2009 after the period of demonstrative project (May~ December, 2008)

In the past, information sessions for the Carbon Labeling System, exhibitions of certified products, advertisements by news media and outdoor billboards, and publication of news letters were performed. Fee

trainings were provided for small and medium sized companies in 2009 and 2010 with the agreement (April 2009) of Korea-UK SPF (Strategic Program Fund) and 50% of the certification cost has been supported within the budget limit for the extension of participation by the small and medium companies since 2010.

Currently 807 products were certified for Carbon Labeling mark and introduced into the market as of December 2012. In the future, the number of certified products for carbon labeling will be continuously expanded to more than 1,000 items by 2013 through the diversified incentives and promotions.

[Figure 9-3] Carbon Emission Certification Mark



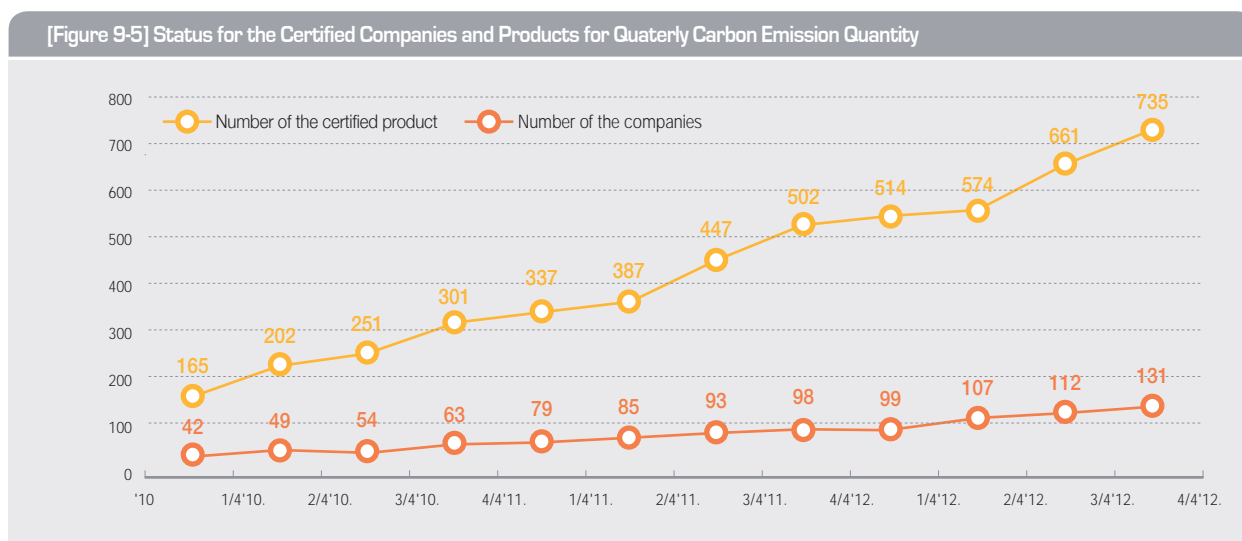
In addition, the framework of the system was prepared by the revision (September 2011) of the Operation Regulation for Carbon Labeling System and establishment (November 2011) of the Low-Carbon Product Certification System in order to introduce the low-carbon product certification system in earnest as the

second stage project of this system in 2011, and low-carbon products (9 items) were introduced to the market on November 25, 2011. At the same time, the low carbon certified products will be expanded to 120 items in 2013 through educational programs for low-carbon products and methods of incentives for the low-carbon products.

[Figure 9-4] Low Carbon Product Certification Mark

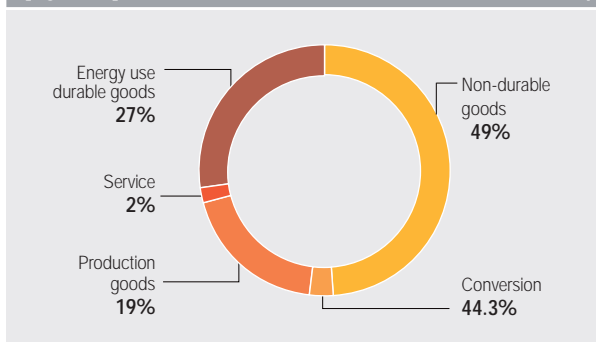


[Figure 9-5] Status for the Certified Companies and Products for Quaterly Carbon Emission Quantity



Note) The number of the companies and certified product are the cumulative figures for each quarter.

[Figure 9-6] Carbon Emission Certificate Rate for Each Product Group



Source: News Letter on Domestic Trend of Carbon Labeling, KEITI (2012), No.4 2012



Green Products

[Table 9-4] Status for Certification of the Carbon Product (End of December 2012 Status Quo)

Classification	Certification period	Non durable general product	Durable general product	Production goods general product	Energy used durable goods	Total (Cumulative)
Low carbon product	2012	44	1	10	17	72

Source: News Letter on Domestic Trend of Carbon Labeling, KEITI (2012), No.4 2012

(3) Environment Labeling System

The Environment Labeling System provides correct environmental information for products labeled with the environment mark, which cause relatively less contamination and can save resources in the process of production and consumption of the product among same product lines. It was designed to induce companies to develop and produce environmentally friendly products that meet the needs of consumers.

Outline of the Environment Labeling System

- The Environment Labeling System is the certification system enforced by the government (Ministry of Environment) based on Article 17 (Certification of the environment labeling) of the Support For Environmental Technology and Environmental Industry Act, and it certifies the environment label by selecting good environmentally friendly products (including services) with high quality and performance as well as comprehensive environmental effects in the entire process of the product which was first introduced in April 1992.
- The Environment Labeling System is a voluntary certification system that is designed to reduce the

energy and resource consumption throughout the entire process for production » distribution » use» discard among same product lines and to label with the designated logo (Environment Mark) and a simple explanation by selecting environmentally friendly products which minimize the generation of contaminants.

Legal Basis for the Environment Mark Certification System

- Article 17 (Certification of Environment Labeling) of Support For Environmental Technology and Environmental Industry Act.
- Notice by the Ministry of Environment - Notice for application fee and fee schedule for environment label
- Notice by the Ministry of Environment - Target products for environment labeling and certification standard

Targets of Certification for the Environment Labeling System

- The Environment Labeling System grants the certification on the products which causes less environment contamination and save the resources compared to the other products among same product lines, and the application for environment labeling certification is available only to the product and service specified in the notice of the environment labeling standard.

[Table 9-5] Certification Range of the Environment Labeling System

Part	Remark	Middle classification	Sub classification
1. Office equipment and goods	Stationeries, office equipment and office furniture	3	21
2. Materials and facilities for house construction	Electric material, materials for water supply-plumbing and facilities	4	42
3. Personal supplies and household goods	Detergent, textile-leather and other miscellaneous goods	3	18
4. Home appliances and furniture	Electric devices, electronic goods and furniture	3	13
5. Product related to the transportation, leisure and culture	Products related to the automobile and products related with leisure and culture	2	12
6. Industrial products and equipments	Raw material-material, Assembled product-equipment	2	13
7. Multiple use and others	Products using energy and alternative energy Plastic, rubber, and wooden products Metal, inorganic material, and ceramic products	4	24
8. Services	Accommodation facility operation business	2	2
Total		23	146

Note) In the case of services, the legal basis to expand the scope of certification of environment labeling products was provided when the definition on the product was revised to include the services in the Article 17 of the Support For Environmental Technology and Environmental Industry Act in 2007, through which the environment labeling certification for the services was reviewed in earnest.

Certification System for Environment Labeling System

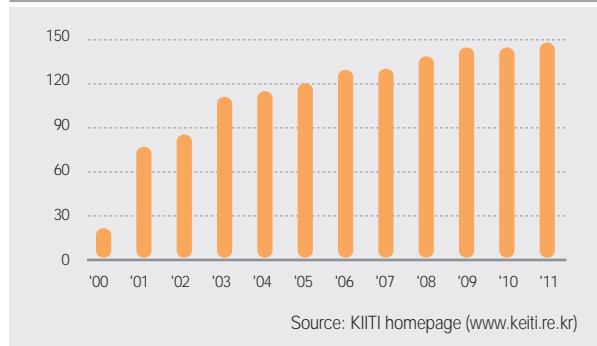
- Overall management and operation organization

Overall control organization	
Ministry of Environment (Green Technology Economy Dept)	<ul style="list-style-type: none"> · Overall management on the general system such as the establishment, revision of the related laws for Environment Labeling System · Notification of products for the target environment labeling and certification standard · Identification and notification for the purchasing records of environment product by public organization · Technical and administrative support related to the environment system
Operation Organization	
Korea Environment Industry Technology Institute (Certification Team for Environment Label, Management Team for Environment Standard)	<ul style="list-style-type: none"> · Selecting the products and establishment-revision of the certification standard for each product for environment labeling · Certification on the environment labeling and post-management on the certified product · Project to promote the Environment Labeling System and certified product · Provision, education, and promotion of environmentally friendly product information

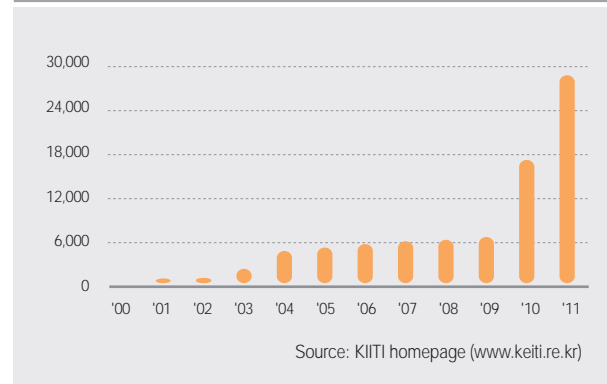
Status for Environment Labeling Certification

- A total of 28,372 products are registered for environment labeling as of November 30, 2012.
- 6,531 in 2009, 15,806 in 2010 and 28,37 in 2011 were registered for the environment labeling certification.
- The number of certified companies were high with 1,455 in 2009, 1,464 in 2010 and 1,386 in 2011.
- The number of the target product groups for each year has been increasing consistently and it was 143 in 2010 and 148 in 2011.

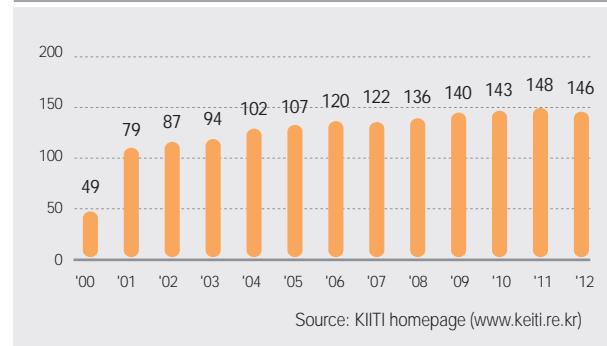
[Figure 9-8] Number of Certified Companies in Each Year (Unit: Pcs)



[Figure 9-7] Number of the Certified Products in Each Year (Unit: Pcs)



[Figure 9-9] Number of Target Product Groups for Each Year (Unit: Pcs)



(4) Good recycled (GR) system

The good recycled product certification system is to alleviate the consumer's disbelief and extend the demand by improving the quality of the recycled products, which were neglected by consumers, with the certification by the government for the quality of recycled products and environment friendliness. The environment labeling certification shall be certified for good recycled product with GR mark.

- The good recycled product certification mark (GR mark) is granted to good products after thorough experiment, analysis and evaluation on the products developed, produced and recycled in the country.
- The target items are the products which are recycled products specified in Article 2 of the Enforcement Rule for the Environmental Technology and Environmental Industry Act.

(5) Dissemination of the Ecological Design

Outline of Ecological Design

- It is an activity to identify the environmental effects as well as design parameters including the function, price, performance, quality, related regulation and technical feasibility in the initial stage of product development and to integrate them into the product design process.

- Activities to develop products that can minimize the generation of environmental impact such as the resource depletion, global warming, environment toxicity and acidification.
- For companies, it is necessary to perform the Ecological design and promote it actively as a tool to enhance the competitiveness of products and

services, and social responsibility.

•For consumers, the virtuous cycle is formed towards the sustainable society by revitalizing the use of products applying the Ecological design in the Ecological design activities of the company.

- Korea Environment Industry and Technology Institute operates the Ecological design information system.
- Legal basis: Support For Environmental Technology and Environmental Industry Act, Article 26, Clause 4 Introduction of the Ecological Design Project

1) Development of Ecological Design Software

- The Ministry of Environment developed the software for Ecological design (October 2002)
- Designated Korea Environment Industry and Technology Institute as the organization to operate software (October 2002)

2) Project to Disseminate Ecological Design in the Industries (as of 2012)

- Diagnostic and consulting at the Ecological design sites and exchange of advanced technologies (10 companies)
- Development and distribution of on-line education program for the Ecological design
- Preparation of the legal basis for establishing Korean style Ecological designs
- Hosting of the international seminars on the Ecological design

3) Development and Operation of the Environment Management Integrated Information System

- Development
- The Ecological design information system was developed as part of the environment management integrated information system

(ecological design, notice of the corporate environmental information, and comprehensive consulting) in 2008 (homepage <http://ecodesign.konetic.or.kr>)

- It provides information on green technology, green material, green parts and green products which have less loading to the environment while providing superior performance as an example of ecological design.

- Scope of support

- It provides a portal service related to the ecological design such as ecological design information, on-line education, site diagnostic and consulting, and promoting of the good products
- Annual update of about 160 cases of information DB for ecological design, including the laws and policy trends related to ecological design in Korea and overseas, on good green technologies, materials, parts, products, and service information

4) Nurturing professional manpower for ecological design

- Implementing the project to foster the specialized manpower for the industrial sector (June-December, 2005)
- Implementing the project to foster the specialized manpower for academic field (January 2009-present)
- Appointing and operation of specialized graduate schools to foster specialized manpower as the market demand increases in the ecological design part for the industrial sector.

9.2 Nurturing Environmental Industry and Development of Environmental Technology

9.2.1 Domestic Environmental Market Conditions

9.2.1.1 Size of Domestic Environment Market

Now it is the time to strengthen competitiveness in the global market, to improve the quality of life for the people and to make an effort to pre-occupy the means for participation in the conservation of the global environment by fostering the environmental industry with indefinite possibility for domestic and international growth as the environment became the key word for restructuring the international market. The number of businesses related to the environment in Korea is 34,196 as of 2011 and the number of employees in the

environment industry are 183,538. Some won 60 trillion in revenue in the environment industry and about won 4.9 trillion of environment industry export were accomplished (2011 Survey of Environment Industrial Statistics, Korea Environment Industry and Technology Institute). According to the result of the survey, it was estimated that there are 34,196 businesses related to the environment, 183,538 employees in the environmental area and about won 59.3 trillion in revenue in the environmental sector.

[Table 9-6] Status for the Businesses in the Industrial Sector for Each Year

Item	2008		2009		2010		2011	
	Total	Per company	Total	Per company	Total	Per company	Total	Per company
Businesses (units)	30,221	-	31,728	-	33,835	-	34,196	-
Sales turnover (won 100 mil)	408,061	13.5	440,064	13.9	555,522	16.4	593,632	17.4
Employees (Person)	185,346	6.1	195,587	6.2	214,648	6.3	183,538	5.4

Source: Report on the 2011 Survey of Environment Industrial Statistics

9.2.1.2 Status of Nurturing Environment Sector by the Ministry of Environment

The Ministry of Environment has been implementing specialized supporting projects for environment sector by establishing an exclusive organization, the Korea Environmental Industry & Technology Institute (KEITI) in April 2009 to systematically nurture the environment industry.

Korea has revised the Support For Environmental Technology and Environmental Industry Act (previously, the Development of and Support for Environmental Technology Act) in April 2011 has provided the institutional foundation to foster the environmental industry including the mid and long term comprehensive plan for fostering the environmental industry and advancing overseas. The Ministry of Environment has assisted the mutual cooperation such as technology alliance between large, medium and small companies by

hosting a 'resolution rally for environmental companies to grow together' (April 2011) to improve the competitiveness of the small and medium environment companies that are relatively weak in the commercialization of new technologies, brand value, information network, fund operation, and marketing capability. In addition, Korea will induce a specialized and scaled up environmental industry to realize the economy of scale and scope by establishing a 'comprehensive technology support center for the environmental industry' as well as 'the test-bed for environmental industry'. In addition, KEITI has been supporting the 'environmental industry promoting loan', 'environmental improvement fund', and 'recycling industry promoting loan' and supporting other projects to develop business from promising new technologies of environmental companies.

(1) Fostering and Supporting Policy for Environmental Industry in Korea

Establishment of Environment Industry Association

The 'Korea Environment Industry Association', which will open a new chapter for the environmental industry in Korea, was launched in December 2012. It will perform a pivotal role in the pre-occupancy of the global environmental market and the fostering of domestic environmental industry. In the future, the Korea Environment Industry Association will perform change of information and protection of rights between members, research on the system to foster environmental industry, information survey for the overseas market, and operation of the overseas market development group. At the same time, it performs the mid-long term tasks such as surveying of performance, certification of environmental technology, and education for the environmental technologies and its scope of work will be gradually expanded in the future. The Ministry of Environment expects to maximize the synergy effect by linking the KEITI and 'Korea Environment Industry Association in the project for fostering the domestic environmental industry and advancing into the global market by 'the Third Plan for Fostering Environmental Technology and Industry' (2013~2017) and announced the plan to establish a successful model to grow together in the environment sector by inviting some 500 companies in large, medium, and small size as member companies of Korea Environment Industry Association by 2017.

Appointing super companies for environment industry

The designation of good environmental companies is a system first introduced in 2012 under the slogan of expanding the environmental industry and strengthening the inroads into the global environmental market, providing various benefits to selected promising environmental companies. The Ministry of Environment and the KEITI prepared systematic institutional framework for the operation of the system including the enactment of related notices by Minister of Environment on the basis of Support for Environmental Technology

and Environmental Industry Act. Four stage evaluations including pre-review, evaluation committee meeting, site inspection, designated evaluation are performed, and good environmental companies are selected based on indicators, business accomplishment, superiority of the technology competence, growth, profitability, export competitiveness and employment creation.

The Ministry of Environment selected final 10 companies as the 'good environmental companies in 2012' to expand their competitiveness in the global environmental market and to lead the domestic environmental industry based on such an institutional system. The companies were selected among small-and-medium sized companies and leading companies, which lead the environment industry of Korea throughout many fields such as the water quality, air, waste, soil and energy. Those selected companies will be supported for the overseas marketing and management consulting along with brand advertisement in Korea and overseas besides direct support, and will receive indirect support such as interest reduction for the environmental policy promoting fund. The average employees of these good companies are 60 and they employ 10 times more manpower compared to the average of environment industry (about 6 workers), contributing to the creation of workplace with 29% of employment increase. The Ministry of Environment plans to provide multi directional support to the selected good environmental companies so they can grow further in the overseas market at the time when the global environmental market is rapidly growing primarily centered in developing countries.

Report on the environment industry Statistics

With the increased interest for realization of a green country, the Report on the Environment Industry Statistics is prepared to strengthen the national competitiveness by intensively fostering the environmental technology and industry to promote the wealth and employment creation as an economic activity area, and to provide the basic data for the

comprehensive diagnosis and systematic analysis on the alternatives for the national environmental industry and technology policy by identifying the structure and status of the Korean environmental industry. The Ministry of Environment and Statistical Office jointly prepared a report as a sub-task of the Environmental Industry Development Strategy since 2001.

Support the fund for fostering the environmental industry

Funding to foster the environmental industry has been granted in the magnitude of won 10 billion per year since 2009 for the revitalization of environmental businesses and production of technology business. The KEITI has supported the fund to strengthen the infrastructure of the environmental industry and to support projects contributing to the promotion of waste reuse and environment conservation according to Clause 3, Article 6 of the Development of and Support for Environmental Technology Act, Article 56 of the Framework Act on Environmental Policy (Support of the Environment Control for Business Providers), Article 31 of the Act on the Promotion of Saving and Recycling of Resources (Support of the Fund).

Environmental improvement industry promoting fund

The 'environmental industry promoting fund' amounting to won 10 billion per year has been provided to revitalize businesses and to produce technology businesses for the environmental industry. The loan can be made for the areas such as cost for facilities, cost to produce business with developed technology, cost to advance into the overseas market, cost to prepare basis for growth, and cost to support logistics and sales. The supported areas for loans include the cost for production, purchasing, installation, and construction of the environmental companies or environmental facility production companies, cost for production, purchase, and installation of equipments, devices, and facilities required for the business development of environmental technology, cost for the information gathering, advisory consulting and marketing promotion for advancement abroad, cost to prepare base of

growth for environmental industry, and cost for logistics and sales to promote the purchase of green products.

Environmental improvement fund

Korea Environment Industry and Technology Institute (KEITI) has supported won 40 billion per year through the operation of the environmental improvement fund to install environmental pollution control facilities from 1984. The supported areas for environmental improvement fund include the installation of environmental pollution control facilities to treat air, water quality, soil, and odor within the limit of won 3 billion, and the fund for technology development within won 400 million.

Recycling industry promoting fund

The KEITI has supported the recycling industry promoting fund in the magnitude of won 65 billion per year for the management of environmental companies and production of business for the technology. Supported areas for the recycling industry include the cost for facilities, cost for making business with developed technology, cost for technology development, cost for management stabilization, and cost for logistics and sales support. The funding is available within won 2.5 billion, won 1 billion, or won 400 million is available depending on the area of support.

Environment industry test-bed

Korea is planning to establish the 'environment industry test-bed' to provide a total service for the entire cycle of the environmental industry from the development of environment technology, demonstration test, production of test products, creation and nurturing of business, and overseas marketing for the period of 4 years from 2013 to 2016 in 119,300 m² of land and 52,808 m² of building with the national treasury of won 156 billion. The construction of the environment industry test-bed is reflected in 'The Third 5-year Plan for Environment Technology and Environment Industry', which consists of a demonstration research support center, a demonstration laboratory, and a production support center. It is expected to be the center of the environmental technology and industry in Korea.

Fostering specialized manpower for environmental industry

The Ministry of Environment has been conducting a project to support the innovation of environmental technology education by investing won 20.8 billion from 2005 till 2014 (10 years). This project is being implemented with the purposes to support courses on industry-academia cooperation in graduate schools to foster an advanced level workforce, to nurture 10 hub graduate schools for the manpower in environment technology, and to foster qualified manpower with cutting edge expertise, complex environmental technology in response to the demand of environmental industry. Accordingly, the Ministry of Environment: has implemented 9 environmental manpower fostering projects including a specialized graduate school for climate change; has been implementing a project to foster customized manpower for on-site work such as greenhouse gas control, soil, ground water, and reuse of wastes since 2011; has fostered the field application oriented advanced manpower to supply qualified personnel for the environmental industry in the future; has extended educational programs for environment services such as climate change, risk management, and international environmental restrictions, and has established a human resource management system to respond to the demand of industry through the database for all environment professionals in each part; and plans to foster 10,000 high quality experts with master's and doctoral degrees and field oriented experienced professionals by 2013 by operating specialized graduate schools and special educational programs.

Establishment of comprehensive technology support center for the environmental industry

The comprehensive technology support center for the environmental industry for each region is being established to actively foster the environmental industry in line with job creation and strategic export of the environmental industry, which are major projects of the new government. The comprehensive technology

support center for the environmental industry is a system to support the entire process of the project from the provision of basic technology for environmental industry, joint use of equipments by providing a shared laboratory, and technology development to product development and sales, and it is expected to contribute to the creation of national benefit from the systematic fostering through the integration of the environment industry.

The Honam center is being built in the land area of 40,000m² and the total floor area of 8,000 m² in Gangjin, Cheonnam with the project cost of won 29 billion (won 14.5 billion from national treasury) from 2009 till 2012. Yeongnam Center will be constructed in the land area of 11,000 m² and the total floor area of 10,000 m² in Daegu with the project cost of won 39.6 billion (won 19.8 billion from national treasury) from 2011 till 2014.

Support the Advancement of Environmental Industry to Overseas

- 1) Support to the localization of international consortium project for environmental technology

Introduction of the localization of international consortium project

- Support local demonstration of optimal technology and making business suitable for the local environmental conditions jointly with foreign cooperative institutions to expand the advancement of the Korean environmental technologies overseas
- Supported areas: Practicalization technology for 8 areas of application technologies to solve the current environmental issues for each country
- **Measurement and analysis of air, drinking water, sewage and wastewater, wastes, soil, ground water, reduction of greenhouse gases, replacement of the hazardous materials**
- Targeted countries : Entire world (Asia, Middle East, America, Europe and Russia)
- China before 2006 China and South East Asian countries in 2007 Entire world after 2011

Status of support for international consortium for each year

[Table 9-7] Support for International Consortium for the Environmental Industry by Year

Description	Total	'05	'06	'07	'08	'09	'10	'11	'12
no. of development work (new)	109	11	5	11	13	16	18	19	16
Government support amount (100 million, won)	334	20	29	41	44	50	50	50	16
Export performance (100 million, won)	2,193	-	27	43	181	184	385	524	50

Source: Korea Environment Industry and Technology Institute

9.2.2 Expansion of the Environmental Industry into the Global Market

9.2.2.1 Condition of Overseas Environmental Market

According to the survey by the Environmental Business International Inc. (EBI)¹⁾, a global environment consulting institute, the global environment market has grown from USD 544 billion in 2000 to USD 796.7 billion in 2010. In addition, it will consistently increase by 3.2% of annual average for the next 10 years to expand to the scale of USD 1.865 trillion in 2020. Among which, the water industry market is expected to grow from USD 482.8 billion in 2010 to USD 865 billion in 2025.

It is expected that volume of the drinking water market will grow as much as USD 110 billion, another USD 110 billion for wastewater treatment market, and USD 20 billion for desalination of seawater in 2015. The waste energy market is expected to grow from USD 20.75 billion in 2008 to USD 29.98 billion in 2015. The

expected market share of the waste energy market in 2015 will be 48.2% for Europe, 31.6% for Asia-Pacific, 7.8% for USA and 2.4% for other areas. It is expected that the scale of the air quality control market will growth by 2.7% in average per year. It will be expanded from USD 115 billion in 2009 to USD 14 billion in 2016. In particular, the Asia-Pacific area will be the key market exceeding the North American market with the growth to USD 7.9 billion in 2016. Green growth has appeared as the preferential paradigm for the economy as the environmental technology is defined as growth engine for the breakthrough from the economic crisis and long term growth, therefore, advanced countries have been implementing the environmental policy focused on the green growth.

[Table 9-8] Green Growth Strategies of the Leading Countries

Country	Strategy direction	Policy name	Main content
Republic of Korea	Low Carbon, Green Growth	Framework Act on Low Carbon, Green Growth	Job creation through the green industry for new and renewable energy.
United States	Development of alternative & renewable energy, response to climate change, and creation of green jobs	2008 Comprehensive Plan for New Energy	In the future, invest 150 billion USD to renewable energy field and create 500 million new jobs.

1) Environmental Business International Inc. (EBI, www.ebiresearch.com) is a publishing and research company that generates strategic market intelligence on emerging opportunities in the climate change

Country	Strategy direction	Policy name	Main content
EU	Development of new technology for climate, ecology, and sustainable growth	The 7th Framework Program for the Development R&D Technology	Set budget more than twice of which the 6th environment implementation plan.
United Kingdom	Proceeding with low-carbon nation	2008 Green Revolution Plan	Invest 200 trillion won to innovate thenational energy supply system by 2020 and reform the nation to the carbon zero by 2050.
Germany	Realization of the great power for clean energy.	New and Renewable Energy Act	Establish obligatory generation of new and renewable energy, and provide subsidy
China	Greatest and best low-carbon technology country in the world	Renewable Energy Act	Establish obligatory use of solar, wind and bio energy in mountain and remote areas
Japan	Realization of 3R society (reduction, recycling, and reuse). Environmental technology became one of the four priority policies.	Fukuta's vision of the innovation plan for cool earth energy	Develop 21 core technologies to reduce 60-80% of CO ₂ by 2050.

9.2.3 Efforts of Korea in the World

9.2.3.1 Adoption of Green Growth Strategic Report by OECD

Korea played the major role to adopt the Declaration on Green Growth as a chair country (Chairman: former Prime Minister, Han Seung-soo) in the OECD Council of Ministers in

June 2009. The 'Green Growth' was put into the mainstream in the OECD discussion based on the first official report related to the green growth of the OECD in May 2011.

9.2.3.2 Adoption of RI0+20 Summit Declaration

The Future We Want was derived as a new blue print of international society at the Rio+20 Summit which was held in Brazil in June 2012. The "Green economy in terms of the sustainable development and poverty eradication" and the "institutional frame for sustainable development" had been handled as the main agenda and the international society approved the balanced development of economy, society, and environment to realize the sustainable development and acknowledged the green economy as an important tool. Korea played the leading role to expedite the conversion of the international society to the green

economy in the course of providing the Rio+20 summit meeting by proposing the knowledge sharing platform and innovative partnership. Korea, which declared the low-carbon, green growth as the national vision in 2008, carried out the green growth policy later on by sharing the success case for green growth of Korea and establishing various partnerships through the in-depth discussion with the government of each country, industry and citizen society in the Rio+20 summit meeting.

Korea will make the common effort for successful transformation to the green economy and realization

of the sustainable development by consistently implementing the green growth policy such as the official development assistance supporting the green economy conversion of developing countries externally

and consistent implementation of green growth policy including the response to climate change, attraction of the green industry and green life internally as follow-up actions for Rio+20 summit meeting.

9.2.3.3 Instruction for treatment of Waste Electrical and Electronic Equipment (WEEE) & Restriction of Hazardous Substance (RoHS)

Korea has continuously showed environmental cooperation with developed countries in Europe to improve the domestic environment through the introduction of the advanced environmental policy, legislation, and technology. In particular, hosting of joint seminars, exchanging of experts and launching of joint cooperative projects have been conducted by signing the Memorandum of Understanding with the United Kingdom, France, Denmark, Netherlands, Germany and Norway. Korea has been consistently dispatching environmental officials to the delegation of the Republic

of Korea to the EU since the effectuation of the Republic of Korea-EU Cooperation framework agreement (January 4, 2001). Korea identified the trends of environmental policy of the EU including new policies of End-of-Life Vehicle Directive(ELV), Restriction of Hazardous Substances(RoHS), Waste Electrical and Electronic Equipment(WEEE), Registration, Evaluation, Authorization and Restriction of Chemicals(REACH). In addition, Korea has discussed the method for cooperation in the environmental field by hosting Korea-EU joint committee in Belgium and Seoul in turn each year.

9.2.4 Expansion to Global Environmental Market

With the increased interest and significance in the global climate change and environment and reinforced support and promotion for the environmental industry by each nation to reduce greenhouse gases and improve the environment, Korea puts its full efforts for active support and promotion in the environmental sector in Korea. In addition, Korea strives to support

and develop environmental technologies responding to the international society's demand for 'low-carbon, green growth'. Korea is implementing various policies and assistance to extend advancement of environmental industry into the global market and help other developing nations improve their environment and grow their industries.

9.2.4.1 Establishment of Master Plans for Environmental Improvement in Developing Countries

A project to support developing countries in establishing master plans for environmental improvement has been implemented in 2007 to build a cooperative network on a government level and to establish friendly conditions for Korean environmental companies into the international market by supporting the establishment of master plans for environmental improvement. In particular, the purpose of the project is to explore promising businesses, priority investment targets, and cooperative

businesses for Korean companies through the execution of project and to accelerate Korean preoccupation in the environmental markets in target countries. The project was conducted in a total of countries including Vietnam, Indonesia, Azerbaijan, Tanzania, Algeria and others from 2007 to 2012. As a result, an international project in the magnitude of 2.3 trillion won is in progress in connection with the Official Development Assistance(ODA) and other private investments (refer Table 9-10).

[Table 9-9] Performance of Project on Supporting Developing Countries in Establishing Master Plans for Environmental Improvement

Target country	Project name	Project period	Project organization	
			Korean industry	Counterpart nation
Vietnam	Establishment of long term comprehensive plan for the environmental protection by region in Vietnam	Nov. 2007 ~ Dec. 2008	Korea Environment Institute / Business Institute for Sustainable Development / Hyundai Engineering Co., Ltd.	Vietnam Environment Protection Agency
	Basic survey on the air quality monitoring in the northern region of Vietnam		Korea Environment Corporation	Vietnam Environment Protection Agency
	Basic survey on the solid waste disposal and management system in the Dong Nai, Vietnam		Sudokwon Landfill Site Management Corp.	BienHoa Urban Environment Service Company
	Basic survey on the hazardous waste management and information system in Vietnam		Korea Environment Corporation	Vietnam Environment Protection Agency
Indonesia	Establishment of comprehensive plan for the waste management in Indonesia	July. 2008 ~ Apr. 2009	Eco-Frontier	Eco-Frontier Department of Environment, Indonesia
Cambodia	Establishment of comprehensive plan for environmental improvement for Cambodia	Mar. 2009 ~ Dec. 2009	GS E&C / Sunjin Engineering & Architecture	Department of Environment, Cambodia
Azerbaijan	Establishment of comprehensive plan for environmental improvement for Azerbaijan		Korea Environment Institute / EFMC LTD.	Department of Environmental & Natural Resources, Azerbaijan
Uzbekistan	Establishment of comprehensive plan for environmental improvement	Mar. 2010 ~ Dec. 2010	Korea Environmental Industry & Technology Institute / Dongho / EFMC Ltd.	Department of Public Service, Uzbekistan
Tanzania	Establishment of comprehensive plan for environmental improvement for Tanzania		Korea Environmental Industry & Technology Institute / Cheil Engineering	Department of Environment, Executive Office of President, Tanzania
Mozambique	Master plan for environmental improvement for Mozambique	March 2011 ~ December 2011	Korea Environmental Industry & Technology Institute/Korea Engineering Consultants Corp./Dongho Co.Ltd./Kolon Global/ Soosung Engineering	Mozambique Department of Environment Adjustment / Dept of Public Housing Project

Target country	Project name	Project period	Project organization	
			Korean industry	Counterpart nation
Mongolia	Establishment of master plan for improving the water supply and wastewater in Ulaanbaatar City in Mongolia	March 2011 ~ December 2011	JS Construction / Jaeil Engineering	Tul River Estuary Committee/ Water and Wastewater Corp. in Ulaanbaatar City
Algeria	Establishment of master plan for improving the water quality in the river of El Harrach in Algeria		Dongmyung Technology Industry Complex/Daewoo Construction/High&Tech/ Korea Bio System	Algeria DRHEE
Bangladesh	Establishment of master plan for sewer improvement in Bangladesh	March 2011 ~ December 2011	Hyundai Eng, Bumhan EngG, Hyundai Construction / KEITI	Dept of Local Government in Bangladesh
Peru	Establishment of master plan for sewer improvement in Peru		Dongho, Susung ENG, POSCO Construction, Daewoo Construction / KEITI	Dep't of House Water and Wastewater Corp. in Peru
Chile	Establishment of plan for air pollution improvement in Chile		Environment Industrial Complex, KC Cottrell, Environment & Civilization/ KEITI	Dept of Environment in Chile

9.2.4.2 Support for Feasibility Study of Foreign Environmental Projects

Supporting of feasibility study of foreign environmental projects is to support the cost of feasibility study which is required in the initial stage of the international environmental projects for the purpose of exploring and promoting participation in foreign environmental

projects by Korean firms in connection with international support projects including EDCF of Export-Import Bank, private public partnership (PPP) programs and/or private investment projects (refer Table 9-11, Table 9-12 and Table 9-13).

[Table 9-10] Status of Support for Feasibility Study of Foreign Environmental Projects by Year

Item	Applied businesses (Unit)	Supported business (Unit)	Government grant (won 100 million)	Target country for support
Total	217	95	66.4	70
2008	373	14	9.0	9
2009	50	19	14.0	14
2010	53	23	17.4	19
2011	41	19	13.0	15
2012	36	20	13.0	13

Source: KEITI homepage (www.keiti.re.kr)

[Table 9-11] Status of Support for Feasibility Study of Foreign Environmental Projects by Sector

Item	Number of supported businesses					
	Total	Water	Waste	Energy	Air	Soil
Total	95	36	26	28	4	1
2008	14	4	6	3	1	0
2009	19	9	3	6	0	1
2010	23	9	7	5	2	0
2011	19	4	5	10	0	0
2012	20	10	5	4	1	0

[Table 9-12] Status of Support for Feasibility Study of Foreign Environmental Projects by Country

Area / year		2008	2009	2010	2011	2012
Asia	Northeast Asia	China(3), Mongolia	Japan, China(2)	Japan(2), China(2)	China(3)	China(2)
	Southeast Asia	Philippines(3), Vietnam(2), Indonesia, Malaysia	Vietnam(2), Indonesia(3), Thailand(2), Philippines	Malaysia, Vietnam, Cambodia(2), Thailand, Philippines	Laos, Malaysia, Vietnam, Indonesia, Philippines	Myanmar, Vietnam(3), Indonesia(3), Cambodia, Thailand(2), Philippines
	Southwest Asia	-	-	Sri Lanka	Bangladesh, Sri Lanka	-
	Central Asia	-	Uzbekistan	Turkmenistan	-	-
	Middle East	-	Saudi Arabia, Kuwait	Iran	UAE	Oman, Kuwait
the Middle East-Africa	North Africa	-	Libya, Algeria	Tunisia	-	-
	Sub-Saharan Africa	Angola	Mozambique, Tanzania	Ghana, Nigeria, Mozambique, Tanzania(2)	Ghana, South Africa	Angola, South Africa
Europe	-	Azerbaijan	Turkey	Russia	Turkey	-
America	North America	-	-	-	United States	-
	Latin America and the Caribbean	Nicaragua	-	Chile, Peru	Colombia	Ecuador Peru(2)
Other	-	-	-	Australia	Australia	-

Source: KEITI homepage (www.keiti.re.kr)

9.2.4.3 Dispatch of Public & Private Joint Market Development Group

The Korean government has been dispatching public & private joint market development groups to resolve difficulties of the entrance to the international market

for private entities and to provide political support through consultations with government officials of target countries for major international environmental projects.

The Korean government has been making efforts to increase the project quality by dispatching pan-offices joint group including the Ministry of Environment, Ministry of Knowledge Economy, Ministry of Land, Transport and Marine Affairs, Ministry of Foreign Affairs and Trade for each area such as water, air, wastes and new & renewable energy. Market development groups have been dispatched starting with the Southeast Asia Water Industry Development Group (Malaysia, Myanmar, and Thailand) in June, 2012, Market Development Groups for Africa (Ghana and the South Africa) in September, and the Northern Africa (Algeria and Morocco), East European Water Market Development Group for Bulgaria

and Rumania in October and another group for Brazil, Columbia and Peru in November for a total of 12 counties in 5 regions. Some 55 Korean environmental companies participated in the market development group and obtained opportunities to improve the recognition of Korean technology including 94 business consultations and project development in won 2.12 trillion. In addition, market development groups were dispatched to a total of 12 countries including China, Indonesia, Thailand, Kuwait, Lebanon, Ethiopia and Turkmenistan to review possible cooperation areas between Korean and related countries, and to prepare cooperation basis for market entry.

9.2.4.4 International Environment Cooperation Center

The environment industry is greatly influenced by the government regulation, providing large investments and has long return period for the investment. Therefore, most projects are implemented under the government's lead rather than by private investments. Accordingly, international environmental centers were established in main target regions for export to perform joint projects among relevant countries as well as to provide local support for export activities by environmental companies. As a part of the action, such environmental centers have been established in China(Beijing), Vitenam(Hanoi) and Indonesia(Jakarta)

to provide supports for local business activities and network expansion with local governments. The international environmental centers provide free business lounges and perform activities such as development of joint businesses with main provinces in China and environmental ministries in Vietnam and Indonesia, provisions of local information, and coordination with buyers. Furthermore, the centers are hosting theme business forums and discussions with local governments and related authorities to provide business opportunities with proven international buyers focused on possible projects that can win contracts.

9.2.4.5 Voluntary Agreement of Small and Medium Environmental Companies on Green Export

The small and medium companies account for almost 90% in the entire business of Korean environment industry. However, their export capability is in insufficient condition due to the poor business structure. Therefore, a support project was prepared to develop export capabilities including the export marketing for the small and medium companies, which have excellent environmental technologies. The voluntary agreement of small and medium environmental companies for green export reached agreement with 30 small and medium companies to improve green export for three years (2011

- 2013). The agreement partnership targets small and medium environmental companies that are fully prepared with technical capabilities, export wills, and financial soundness and promotes the voluntary efforts of partner companies by excluding unsuccessful companies in achieving goals through annual evaluations. Major support programs include the export marketing, the international market research, the international patent certification and verification, the international public relations, and export consulting and provides services through cooperating institutions with expertise in relevant fields.

10 Environmental Information & Communication Technology (ICT)





10.1 Current Status

- 10.1.1 Usage of Ministry of Environment Website
- 10.1.2 2012 Implementation Plan on National Information & Communication Technology(ICT)

10.2 Policy Overview

10.3 Key Issues

- 10.3.1 Launch of Mobile Service
- 10.3.2 Advancement of User-Focused Environmental Administration Portal Service

- 10.3.3 Establishment of Cyber Security Control Center and Reinforcement Information Protection
- 10.3.4 Advancement of Environmental Statistics
- 10.3.5 Advancement of Environmental Spatial Information as Eco-friendly Policy Guide
- 10.3.6 Knowledge Service in Environmental Administration

10. Environmental Information & Communication Technology (ICT)

10.1 Current Status

10.1.1 Usage of Ministry of Environment Website

The Ministry of Environment created its website (www.me.go.kr) in July 1997, and as of December 2011, a daily average of 10,600 users visit the web site. The Ministry of Environment's website provides the following.

- (1) Environmental information: information on major policies, environmental measurement and statistical data, and key approved documents
- (2) Civil affairs: appointment reservation for visitation on civil affairs, preliminary counsel on location, and verification of the owner of land to be purchased
- (3) Services designed to gather various public opinions: suggestion of idea, suggestion of regulatory reforms, and talk with the Minister

[Figure 10-1] The Ministry of Environment Homepage



10.1.2 2012 Implementation Plan on National Information & Communication Technology (ICT)

The projects in progress according to Master Plan on National ICT established by the President's Council on National Information & Communication Technology (ICT) Strategies include the 20 existing ones including 'Creation of Information System on Waterworks and Sewerage' and 21 projects including 'Integrated ICT System on Sewage Treatment', a new project in 2012. In writing the national ICT implementation plan for 2012, for 18 projects with less urgency or similar to or overlapping with other projects as judged by the performance evaluation criteria to be met in environmental ICT, their details and scope were adjusted so that efficient appropriation of budget may be in harmony with project implementation.

ICT Project for 2012, designed for a choice matching the direction of the investment and intensive appropriation of budget is being implemented by spending 4.5 billion won on five projects including 'creation of National Environmental Industry Technological Information System' for promoting conversion to a green country, 13.4 billion won on 14 projects including 'creation of Waterworks ICT System' for improving quality of people's life through ICT, and 3.2 billion won on 2 projects including 'creation of Environmental ICT' for realizing a mature society of trust. Also, as a new project, the creation of Sewage Treatment Integrated ICT System is being pushed for in order to efficiently carry out investment of national funds of about 2 trillion won every year related to sewage treatment facilities.

[Table 10-1] National ICT Implementation Plan for 2012

Project Name	Supervised by
Waterworks ICT System	Water Supply Policy Division
Sewage Treatment Integrated ICT system	Sewerage Division
Soil & Groundwater ICT System	Soil & Groundwater Management Division
Creation of Water Environment Policy System	Water Environment Policy Division
Creation and Operation of Wastes Management System	Waste Resources Management Division
Creation of RFID-Based Food Wastes Management System	Waste Resources Management Division
Creation of Resource Circulation ICT System	Resource Recirculation Policy Division
Creation of Natural Environment ICT Foundation	Nature Policy Division
Creation of National Environmental Industry Technical Information System	Green Technology & Industry Division
Creation of Chemicals Information Integrated System	Chemicals Management Division
Creation and Operation of Asbestos Damage Relief and Management System	Environmental Health Policy Division
Natural Environment Comprehensive GIS-DB	National Institute of Environmental Research
Creation of National Environment Comprehensive Information System	ICT (official in charge)
Creation of Environment ICT Foundation	ICT (official in charge)
Creation of Environmental Research ICT Foundation	National Institute of Environmental Research
Creation of Remote Stack Monitoring System	Climate & Air Quality Management Division
Creation of Environmental Health Foundation	National Institute of Environmental Research
Promotion of Eco-Friendly Products Distribution	Green Technology & Industry Division
Creation of Water Pollution Causing Operation Remote Monitoring System	Aquatic Ecosystem Conservation Division
Comprehensive Measure for Responding to Convention on Climate Change	National Institute of Environmental Research
Creation of Electrical & Electronic Products and Automobile Recycling System	Resource Recycling Division

10.2 Policy Overview

The goal of environmental ICT consists of creating operational environment based on advanced ICT for realizing the national vision of low-carbon green growth and the Ministry's vision of beautiful environment as well as healthy future. To this end, inventory creation and system advancement for each environmental

medium was pushed for to strengthen the function of supporting decision-making related to environmental policy and access to and use of environmental information was upgraded by encouraging the creation of a system that considered user convenience, while maximized effect of budget appropriation was eyed

by preventing overlapping investments through encouraging functional integration, openness, sharing and collaboration between similar systems.

With regard to Personal Information Protection Act that went into force on May. 19, 2012, establishment of an information protection policy is being implemented against malicious hacking and personal information leakage, which are dysfunctional in the Age of Information adverse effects of the information society. And to make sure that efficient environmental ICT in accordance with Electronic Government Act plays a crucial role as an axis of national ICT, The Ministry of Environment's tasks are faithfully carried out by establishing the Ministry of Environment's annual National ICT Implementation Plan that reflects specific details of practice in accordance with the government's basic and implementation plan on national ICT.

Environmental policy is shifting its focus from media onto recipient, so the advancement of environmental administrative information service will be implemented in the way of supporting environmental ICT. First of all, greenhouse gas emission will continue to be reduced through the advancement of the National Greenhouse Gas Comprehensive Management System, and the existing Water Environment Policy System and Waterworks and Sewerage ICT System will be refashioned to meet the public needs in order

to ensure safe management of water, which people drink, while a stable water management system will be created in preparation for potential water shortage by pushing for Livestock Excreta Electronic Transfer System and System for Linking Water Purification Plant with Drinking Water Flow Rate. In addition, the existing Waste Management System that fuses together Korea's advanced ICT and environmental policy through sophisticated RFID system, which was adopted for the first time and successfully implemented by the Korean government, will be exported to developing countries, while Food Wastes Management System designed to reduce the amount of food wastes produced due to the Korean food culture shall successfully take root.

The recent ICT trend is going through a sharp paradigm shift. The key-words are : mobility, intelligence, and knowledge service. As we have entered the era of two-way communication represented by smart devices, environmental ICT must also move towards supporting environmental issues based on social governance. Therefore, efforts must be put minimize the dysfunctions of ICT, and environmental ICT may serve as a basis for the realization of environmental policy designed to improve the quality of people's lives.

ICT may serve as a basis for the realization of environmental policy designed to improve the quality of people's lives.

10.3 Key Issues

10.3.1 Launch of Mobile Service

Along with the improved quality of life, the need for conserving pleasant environment is increasing. Therefore, in order to accommodate various environmental information, consumer-centered administrative system is reinforced that includes expanding communication space with the public. To this end, connection speed and readability were

improved by enhancing the design of mobile website, while services linked to the Ministry of Environment's social networking services like Facebook and twitter are scheduled to be provided. Furthermore, the mobile web accessibility was enhanced to ensure equal environmental services that are provided with all types of mobile devices.

10.3.2 Advancement of User-Focused Environmental Administration Portal Service

In order to support the accommodation of various environmental information and efficient implementation of internal environmental administration, the projects such as environmental information service for people and environmental administration portal service for the Ministry have been implemented annually since 2006. In 2012, the security of mobile e-Office was further strengthened by applying the common security system for the mobile electronic government. As part of the e-government project, the scope of mobile administrative

service is expanded to include functions such as work information and work support (i.e. short message reporting). As of 2013, the government's administrative information sharing system will be actively used to reinforce interconnectedness and system of practical usage between local governments and environmental administrative information. Moreover, providing mobile administrative service, which can be used in the actual field such as supervision and inspection on facilities that emit pollutants of every kind, is also scheduled.

10.3.3 Establishment of Cyber Security Control Center and Reinforcement of Information Protection

As DDoS and other cyber threats are increasing in a continuous manner, Cyber Security Control Center was established in 2010 and has been operating to monitor 24/7 monitoring on the information system of the organizations subject to the control, thus ensuring to provide a stable environmental administration service by and eliminating threats in advance. To prevent internal information leakage, Internet network and work network were separated (January, 2009), and integrated e-mail for government employees (mail.korea.kr) is being used, while security system for responding to DDoS and others has been introduced, in order to deal with persistent cyber

threats through a stable operation of the system. Efforts are being made to protect personal information by overhauling and enhancing related systems such as establishing log management system that manages history of system access, adopting searching and encrypting solutions for personal information protection in accordance with Personal Information Protection Act. In addition, education and promotion sessions to inform employees of security threats and response measures in every work stage and methods to protect personal information in each life cycle are continuously provided to enhance individual personal information protection capacities.

10.3.4 Advancement of Environmental Statistics

Government-authorized statistics managed by the Ministry of Environment has a total of 25 types as of June 2012, including Statistics on Waterworks and Sewerage as well as National Greenhouse Gas Emission Statistics in accordance with the enforcement of Low-Carbon Green Growth Framework Act. In addition, 36 types of basic statistics for policy and 25 types of e-Nara Index are produced for the use of policy establishment and evaluation. The Ministry of Environment publishes such environmental statistics in statistical reports such as Environmental Statistical Year Book, Generation and Treatment of Industrial Wastewater, Statistics on Waterworks and Sewerage, and Status on National

Waste Generation and Treatment. Environmental Statistical Year Book, for instance, has been published annually since 1988 to raise public awareness on environmental conservation by disclosing information on environmental status and management related to air quality, water quality, wastes etc. Moreover, Environmental Statistics Portal System (stat.me.go.kr) is made available to the public so that people can promptly and conveniently have access to environmental statistics, while the advancement of the environmental statistics is actively pushed for through the implementation of the environmental statistics mobile service (January, 2010) and Forum on Advancement of Environmental Statistics.

10.3.5 Advancement of Environmental Spatial Information as Eco-friendly Policy Guide

As environmental problems arise in wide areas due to various and complicated factors, since the mid-1990s, the focus of environmental policy was changed from point pollution source to nonpoint source pollution in the unit of "myeon"(township in Korea) areas. Accordingly, the Ministry of Environment introduced its first Satellite Image Use System in 1990, and used it in general environmental administration comprising nonpoint source pollution, environmental impact assessment, and consultation on national land planning. Furthermore, it greatly contributed to the activation of national spatial information system by being widely distributed to public organizations and academic research institutions for the purpose of public interest. Since 1998, Land Cover Map has been produced to make it possible to figure out properties such as green area ratio, storm water run off rate, nonpoint pollutants discharging rate, and greenhouse gas, emission rate, and collection of the information in different administration

districts. Accordingly, such information was used to draw up various policies such as nonpoint source pollution management, climate change projection modeling, land-change monitoring, and landslide and flood prediction.

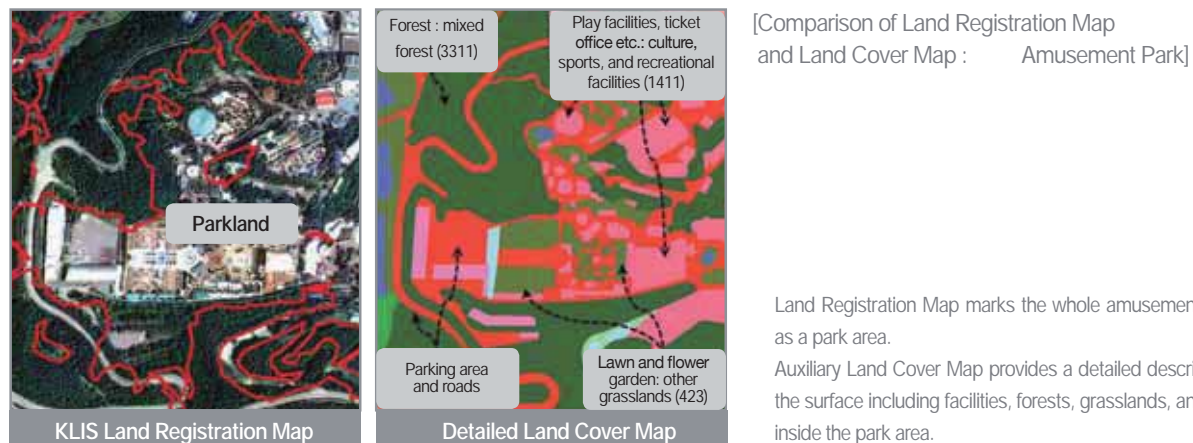
In addition, by providing basic information on various environmental thematic maps such as biotope maps, ecological zoning maps, and environmental conservation value assessment maps, it is analyzed that there is a cost-saving effect of won 137.7 billion on a five-year basis.

User convenience has been improved to make environmental spatial information available both on and offline, in order to increase the usage of various environmental spatial information. In 2012, in line with the government's SMART education program, educational contents for elementary, middle and high school curriculum was developed thus advancing environmental education and improving understanding by using spatial information.

[Table 10-2] Status of Land Cover Maps Production

Classification	Establishment					Renewa		Advancement		
	1st	2nd	3rd	4th	5th	1st renewal	2nd renewal	1st renewal	2nd renewal	3rd renewal (underway)
Project period	Nov. 1998 Nov. 1999	Dec. 2000 Jun. 2001	Jan. 2002 Dec. 2002	Feb. 2003 Dec. 2003	Jun. 2004 to Apr. 2005	Jun. 2006 Dec. 2007	Mar. 2009 Nov. 2009	Feb. 2010 Dec. 2010	Feb. 2011 Dec. 2011	Apr. 2012 Jan. 2013
Section (1:50,000)	South Korea	South & North Korea (1980s, 1990s)	-	-	-	-	-	South & North Korea (late 2000s)	-	-
Division (1:25,000)	(1990s)	Seoul Metropolitan Region	Han River / Geum River Region	Nakdong River Region	Yeongsan River Region / Jeju Region	Simultaneous renewal nationwide	Seoul Metropolitan Region and part of Chungcheong Region	DMZ	-	-
class (1:5,000)	-	-	-	-	-	-	-	North Han River / South Han River basins	Upstream of Nakdong River	Midstream and downstream of Nakdong River
Satellite images used	-	Landsat TM IRS-1C	Landsat ETM+ IRS-1D IKONOS	SPOT-5	SPOT-5	SPOT-5	Airang 2	Airang 2	Airang 2	Airang 2
Print volume	Greater classification	Landsat TM	736 copies	-	-	-	-	487 copies	-	-
	Medium classification	238 copies	119 copies	321 copies	225 copies	173 copies	813 copies	130 copies	36 copies	-
	Smaller classification	-	-	-	-	-	-	760 copies	1,622 copies	1,359 copies

[Figure 10-2] Comparison of Land Registration Map and Auxiliary Land Cover Map



10.3.6 Knowledge Service in Environmental Administration

The Ministry of Environment has worked for multiple years in supporting various contents of environmental knowledge and enhancing the internal capacity through program development in order to proactively respond to the rapidly changing circumstances in and out of the country and policy alternatives.

To accumulate and manage work-related knowledge, Knowledge Management System (KMS) was adopted in 2003, through which knowledge has been shared on administrative work know-how as case studies of success and failure. Especially for efficient performance in environmental affairs, the online management of One Job One Person Manual ("Best On-Job Practice") is mandatory to ensure operational continuity and transfer of know-how. The work manual that started its production in 2008 currently has a total of 4,564 entries, in which the Ministry employees continue to modify and revise the history related to key details of individual job descriptions, experience, know-how, and work procedures, and this enables the transfer of job descriptions and obviates downtime in performance, thus leading to improved service for people. Besides, Community of Practice (CoP) has been in service since 1999, where employees who share interests learn and debate together with specialists from outside to find solutions to pending environmental problems. As of June

2012, 39 CoPs are active, among which CoP on Food Culture Improvement was selected in 2012 as an excellent research group in national administrative organizations for policy achievements including development of a mobile application for refrigerator management and reinvigoration of sales in smaller packages (for singles).

In order to systematically conserve and manage administrative assets, starting in 2010, building of Digital Environmental History Hall was pursued, whereby various materials including photo images, posters, and leaflets related to events are exhibited. The system was the first of its kind to be adopted by a government ministry, and handles all materials excluding official documents, registering 85,599 materials as from June 2012. This is expected to make a major contribution to efficient storage and management of the administrative assets that are feared to suffer loss due to the relocation of government offices to Sejong City in starting in 2012. Also, the Ministry of Environment Digital Library webpage was created to provide 445,000 pieces of information to the public. The webpage allows not only searching for various data, but also online access to e-books that include full texts of various reports (about 9,800 or so of them as of June 2012) published by the Ministry and its affiliated public organizations.

11 International Environmental Cooperation



11.1 Current Status

- 11.1.1 International Environmental Conventions
Joined by Korea
- 11.1.2 Environmental Agreements and MOU
Signed by the Ministry of Environment

11.2 Policy Overview

- 11.2.1 Bilateral and Multilateral Environmental
Cooperation
- 11.2.2 Environmental Cooperation with
International Bodies
- 11.2.3 Response to Environmental
Negotiations in the Process of
International Trade Agreement
- 11.2.4 Response to Climate Change
Convention
- 11.2.5 Response to Convention on Biological
Diversity (CBD)

11.3 Key Issues

- 11.3.1 High Level Climate Change Meeting
- 11.3.2 Follow-up Measures with Regard to
Hosting the Green Climate Fund
- 11.3.3 Hosting Biological Diversity Convention
Conference of the Parties
- 11.3.4 Mercury Convention



11. International Environmental Cooperation

11.1 Current Status

11.1.1 International Environmental Conventions Joined by Korea

There are a total of 221 international environmental conventions at present and South Korea is a member country of 56 conventions including United Nations Framework Convention on Climate Change, Vienna Convention for the Protection of the Ozone Layer, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Biological Diversity, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention),

United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (Convention to Combat Desertification), etc. The conventions joined by South Korea are divided into the following categories: 8 conventions on air and climate; 23 on ocean and fisheries; 3 conventions on hazardous chemicals and waste; 8 on nature and wildlife protection; 7 on nuclear safety and 7 conventions on other subjects.

[Table11-1] International Environmental Conventions and Conventions Joined by South Korea

division	total	air-climate	fresh water protection	ocean - fisheries	nature - wildlife protection	nuclear safety	hazardous chemicals - waste	others
adopted	221	14	15	86	50	13	13	30
in effect	164	10	9	66	40	12	8	19
joined	56	8	-	23	8	7	3	7

Air · Climate (8)

No.	Convention Names in English	conventions		Korea	
		adopted	into effect	joined (ratified) date	effective date
1	United Nations Framework Convention on Climate Change	'92. 5. 9	'94. 3. 21	'93.12.14	'94. 3. 21
2	Kyoto Protocol to United Nations Framework Convention on Climate Change	'97.12.11	'05. 2. 16	'02.11. 8	'05. 2. 16
3	Vienna Convention for the Protection of the Ozone Layer	'85. 3. 22	'88. 9. 22	'92. 2. 27	'92. 5. 27
4	Montreal Protocol on Substances that Deplete the Ozone Layer	'87. 9. 16	'89. 1. 1	'92. 2. 27	'92. 5. 27
5	The London Amendment to the Montreal Protocol	'90. 6. 29	'92. 8. 10	'92.12.10	'93. 3. 10
6	The Copenhagen Amendment to the Montreal Protocol	'92.11.25	'94. 6. 14	'94.12. 2	'95. 3. 2
7	The Montreal Amendment to the Montreal Protocol	'97. 9. 17	'99.11.10	'98. 8. 19	'99.11.10
8	The Beijing Amendment to the Montreal Protocol	'99.12. 3	'02. 2. 25	'04. 1. 9	'04. 4. 8

Ocean · Fisheries (23)

No.	Convention Names in English	conventions		Korea	
		adopted	into effect	joined(ratified)date	effective date
9	International Convention for the Regulation of Whaling(ICRW)	'46.12. 2	'48.11.10	'78.12.29	'78.12.29
10	International for the Conservation of Atlantic Tunas (ICCAT)	'66. 5.14	'69. 3.21	'70. 8.28	'70. 8.28
11	Convention on the Conservation of the Living Resources of the Southeast Atlantic	'69.10.23	'71.10.24	'81. 1.19	'81. 2.18
12	Convention on the Conservation of Antarctic Marine Living Resources(CCAMLR)	'80. 5.20	'81. 4. 7	'85. 3.29	'85. 4.28
13	International Convention for the prevention of Pollution of the Sea by Oil, 1954(as amended in 1962 and in 1969)	'54. 5.12 '62. 4.11 '69.10.21	'58. 7.26 '67. 6.28 '78. 1.20	'78. 7.31	'78.10.31
14	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention)	'72.12.29	'75. 8.30	'93.12.21	'94. 1.20
15	International Convention on Civil Liability for Oil Pollution Damage(CLC)	'69.11.29	'75. 6.19	'78.12.18	'79. 3.18
16	Protocol to the International Convention on Civil Liability for Oil Pollution Damage, 1969	'76.11.19	'81. 4. 8	'92.12. 8	'93. 3. 8
17	International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971 (Fund Convention)	'71.12.18	'78.10.16	'92.12. 8	'93. 3. 8
18	Ptocol of 1978 on the International Convention for the Prevention of Pollution from Ships, 1973(MARPOL PROT, 1978)	'78. 2.17	'83.10. 2	'84. 7.23	'84.10.23
19	Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries	'78.10.24	'79. 1. 1	'93.12.21	'93.12.21
20	United Nations Convention on the Law of the Sea	'82.12.10	'94.11.16	'96. 1.29	'96. 2.28
21	Agreement on the Implementation of the Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982	'94. 7.28	'96. 7.28	'96. 1.29	'96. 7.28
22	Protocol of 1992 to Amend the 1969 International Convention on Civil Liability for Oil Pollution Damage	'92.11.27	'96. 5.30	'97. 3. 7	'98. 5.15
23	Protocol of 1992 to Amend the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage	'92.11.27	'96. 5.30	'97. 3. 7	'98. 5.15
24	International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990(OPRC, 1990)	'90.11.30	'95. 5.13	'99.11. 9	'00. 2. 9
25	Agreement for the Establishment of the Indian Ocean Tuna Commission	'93.11.25	'96. 3.27	'96. 3.27	'96. 3.27
26	Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea	'94. 6.16	'95.12. 8	'95.12. 5	'96. 1. 4
27	Convention for the Conservation of Southern Bluefin Tuna	'93. 5.10	'94. 5.20	'01.10.17	'01.10.17
28	Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean	'92. 2.11	'93. 2.16	'03. 5.27	'03. 5.27
29	Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas	'93.11.24	'03. 4.24	'03. 4.24	'03. 4.24
30	Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean	'00. 9. 5	'04. 6.19	'04.10.26	'04.11.25
31	Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, London 1996	'96.11. 7	'06. 3.24	'09. 1.22	'09. 2.21

Hazardous Chemicals · Wastes (3)

No.	Convention Names in English	conventions		Korea	
		adopted	into effect	joined (ratified)date	effective date
32	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention)	'89. 3.22	'92. 5. 5	'94. 2.28	'94. 5.29
33	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	'98. 9.10	'04. 2.24	'03. 8.11	'04. 2.24
34	Stockholm Convention on Persistent Organic Pollutants(POPs)	'01. 5.22	'04. 5.17	'07. 1.25	'07. 4.25

Nature · Biodiversity Preservation (8)

No.	Convention Names in English	conventions		Korea	
		adopted	into effect	joined (ratified)date	effective date
35	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	'73. 3. 3	'75. 7. 1	'93. 7. 9	'93.10. 7
36	Convention on Biological Diversity	'92. 6.5	'93.12.29	'94.10. 3	'95. 1. 1
37	Convention on Wetlands of International Importance Especially as Waterfowl Habitat(as amended in 1982 and in 1987) (RAMSAR)	'71. 2. 2	'75.12.21	'97. 3.28	'97. 7.28
38	International Plant Protection Convention	'51.12. 6	'52. 4. 3	'53.12. 8	'53.12. 8
39	Plant Protection Agreement for the Asia & Pacific Region	'56. 2.27	'56. 7. 2	'81.11. 4	'81.11. 4
40	International Tropical Timber Agreement, 1983(ITTA)	'83.11.18	'85. 4. 1	'85. 6.25	'85. 6.25
41	International Tropical Timber Agreement 1994	'94. 1.26	'97. 1. 1	'95.9.12	'97. 1. 1
42	Cartagena Protocol on Biosafety to the Convention on Biological Diversity	'00. 1.29	'03. 9.11	'07.10. 3	'08. 1. 1

Nuclear Safety (7)

No.	Convention Names in English	conventions		Korea	
		adopted	into effect	joined (ratified)date	effective date
43	Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Underwater	'63 8. 5	'63.10.10	'64. 7.24	'64. 7.24
44	Convention on the Physical Protection of Nuclear Material	'80. 3. 3	'87. 2. 8	'82. 4. 7	'87. 2. 8
45	Convention on Early Notification of a Nuclear Accident (Notification Convention)	'86. 9.26	'86.10.27	'90. 6. 8	'90. 7. 9
46	Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention)	'86. 9.26	'87. 2.26	'90. 6. 8	'90. 7. 9
47	Convention on Nuclear safety	'94. 9.20	'96.10.24	'95. 9.19	'96.10.24
48	Treaty on the Prohibition of the Emplacement of the Nuclear Weapons and Other Weapons of Mass Destruction on the Sea Bed and the Ocean Floor and in the Subsoil Thereof	'71. 2.11	'72. 5.18	'87. 6.25	'87. 6.25
49	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	'97. 9. 5	'01. 6.18	'02. 9.16	'02.12.15

Others (7)

No.	Convention Names in English	conventions		Korea	
		adopted	into effect	joined (ratified)date	effective date
50	The Antarctic Treaty	'59. 12.1	'61. 6.23	'86.11.28	'86.11.28
51	Protocol to the Antarctic Treaty on Environmental Protection	'91. 10.4	'98. 1.14	'96. 1. 2	'98. 1.14
52	United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa	'94. 10.14	'96.12.26	'99. 8.17	'99.11.15
53	Convention for the Protection of the World Cultural and Natural Heritage (World Heritage Convention)	'72.11.23	'75.12.17	'88. 9.14	'88.12.14
54	Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies	'67. 1.27	'67.10.10	'67.10.13	'67.10.13
55	Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques	'76.12.10	'78.10. 5	'86.12. 2	'86.12. 2
56	Convention on the Prohibition of the Development, Production and Stockpiling of the Bacteriological (Biological) and toxin Weapons, and on Their Destruction	'72. 4.10	'75. 3.26	'87. 6.25	'87. 6.25

11.1.2 Environmental Agreements and MOU Signed by the Ministry of Environment

As of now, the Ministry of Environment signed environmental agreements and Memorandum of Understandings (MOUs) to promote effective implementation of overseas projects. The ministry signed 9 environmental agreements relating to environmental cooperation

and migratory birds protection and 59 MOUs on environmental cooperation and overseas technical training. Of the 34 MOUs are in effect except the ones expired or without mutual exchange for a prolonged period of time.

[Table11-2] International Environmental Agreements Signed by Korea (as of January 25, 2012)

No.	date	country	type	note
1	93.6.29	Japan	Agreement	Environmental Cooperation
2	93.11.28	China	"	Environmental Cooperation
3	94.6.2	Russia	"	Environmental Cooperation
4	94.6.2	Russia	"	Migratory Bird Protection
5	06.12	Australia	"	Migratory Bird Protection
6	07.4.10	China	"	Migratory Bird Protection
7	07.5.5	Tunisia	"	Environmental Cooperation
8	07.11.22	UNEP	"	Environmental Cooperation
9	12. 1. 23	the United States	"	Environmental Cooperation

[Table11-3] Environmental Cooperation MOUs Signed by Korea (as of December 31, 2012)

Division	Effective date	Country	Type	Note
1	87.11.2	the United States	MOU	
2	94.3.28	France	Arrangement	
3	95.9.5	Canada	MOU	the 1st MOU
	00.3.22			the 2nd MOU
4	96.1.15	Australia	MOU	signed by Minister Kim; effective by Minister Chung
5	98.11.11	Denmark	MOU	expired
6	96.6.12	Netherlands	MOU	
7	00.8.9	Vietnam	Arrangement	the 1st Arrangement
	04.11.5			the 2nd Arrangement
	11.4.19			the 3rd Arrangement
8	00.9.4	Mongolia	Arrangement	
9	01.2.8	IBRD (WORLD BANK)	MOU	KP Project
	01.8.6		MOA	memorandum of agreement
10	01.7.6	Germany		
11	01.4.7	Japan	MOU	chemical substances
12	03.7.8	China	MOU	
13	04.12.15	Mexico	Letter Of Intent (LOI)	climate change cooperation
14	05.2.15	Singapore	MOU	CNG technology/policy
15	05.3.28	Iran	MOU	environmental cooperation
16	05.6.7	China	MOU	yellow dust information sharing
17	05.11.10	UN ESCAP	Arrangement	Agreement to follow-up actions of Seoul Initiative
18	05.12.7	Canada	MOU	climate change cooperation
19	06.11.13	Egypt	MOU	expired
20	06.11.15	France	LOI	climate change cooperation
21	07.8.6	Mongolia	Arrangement	nature reserve cooperation
22	07.11.6	Cambodia	MOU	global biosphere reserve
23	07.12.13	Indonesia	MOU	environmental cooperation
24	08.5.19	Azerbaijan	MOU	environmental cooperation
25	08.5.27	United Kingdom	MOU	climate change
26	08.7.4	Norway	MOU	environmental cooperation
27	08.7.30	Kuwait	MOU	environmental cooperation
28	08.9.4	Mozambique	MOU	environmental cooperation

Division	Effective date	Country	Type	Note
29	08.11.12	Israel	MOU	environmental cooperation
30	08.12.11	Chile	MOU	environmental cooperation
31	09.1.15	Cambodia	MOU	environmental cooperation
32	09.2.23	Tanzania	MOU	environmental cooperation
33	09.5.26	United Arab Emirates	MOU	environmental cooperation
34	09.8.18	Zimbabwe	MOU	water & sewage cooperation
35	09.8.20	UNEP	MOU	environmental cooperation (expired)
36	09.10.8	Algeria	MOU	water & sewage cooperation
37	09.11.18	Israel	MOU	water & sewage cooperation
38	09.12.17	Sri Lanka	MOU	environmental cooperation
39	10.2.9	Uzbekistan	MOU	environmental cooperation
40	10.5.17	Bangladesh	MOU	environmental cooperation
41	10.9.9	Ecuador	MOU	environmental cooperation
42	10.9.30	Kazakhstan	MOU	environmental cooperation
43	10.10.26	Saudi Arabia	MOU	water & sewage cooperation
44	10.11.11	Egypt	MOU	water & sewage cooperation
45	10.11.15	Peru	MOU	environmental cooperation
46	10.12.6	Costa Rica	MOU	environmental cooperation
47	11.1.10	OECD	MOA	sending interns
48	11.6.1	Morocco	MOU	environmental cooperation
49	11.6.21	Ghana	MOU	water & sewage cooperation
50	11.9.15	Colombia	MOU	environmental cooperation
51	11.9.30	Chile	MOU	environmental cooperation
52	11.12.7	Mexico	MOU	environmental cooperation
53	12.3.28	Bangladesh	MOU	water & sewage cooperation
54	12.3.30	Hungary	MOU	environmental cooperation
55	12.4.12	Peru	MOU	waste management and recycling
56	12.4.13	Peru	MOU	water & sewage cooperation
57	12.8.13	Angola	MOU	environmental cooperation
58	12.9.20	Denmark	MOU	environmental cooperation (revised)
59	12.10.22	Egypt	MOU	environmental cooperation (revised)
60	'12.11.9	Colombia	MOU	water & sewage cooperation
61	'12.12.5	ROK-Benin	MOU	environment in general

11.2 Policy Overview

11.2.1 Bilateral and Multilateral Environmental Cooperation

For the past 5 years, the Ministry of Environment has taken the lead in building international environmental cooperation partnership by strengthening sustainable development capability domestically and passing on our accumulated experience or know-how to the international community, and has promoted regional environmental cooperation projects with countries in North East Asia, South East Asia, Europe, North and South America, and Africa.

In North East Asia, in which Korea, China and Japan are located, drastic changes for attaining dynamic economic growth and improving the quality of life take place and require joint efforts of countries in this region. Since the 1992 UNCSD (UN Commission on Sustainable Development), the three North East Asian countries have been promoting exploring ways for environmental cooperation through founding multilateral environmental cooperation mechanism such as the North-East Asian Sub-regional Programme for Environmental Cooperation (NEASPEC) and signing bilateral agreements. Especially notable is the Tripartite Environment Ministers Meeting among Korea, China and Japan (TEMM) which was established in 1999. Since then, TEMM has contributed to strengthening environmental cooperation in this region. At the 14th meeting held in Beijing, China, in May, 2012, ministers of the three countries reviewed the progress in the Ten Priority Cooperation Areas for Future Tripartite Environment Cooperation adopted at the 12th meeting in 2010. They expressed satisfaction for the smooth progress of joint cooperation projects and agreed to further cooperation. Recognizing the importance of participation of private sector as well as government organizations for coping with environmental problems effectively, 'The Forum for Students and The Industrial Community' was held at the 2012 meeting and the outcomes were reported the Ministerial Meeting. In addition, ministers of the three countries adopted "Joint Communique" concerning common cooperation for

solving environmental issues in North East Asia and the world including climate change, green growth, biological diversity, contamination control, environmental industry, yellow dust, electronic waste, etc. This includes the establishment of Policy Dialogue on Biodiversity among the three countries, promotion of green growth, evaluation of Korean government's effort for attracting Green Climate Fund (GCF), promotion for turning Global Green Growth Institute (GGGI) into an international body, strengthening cooperation for controlling long range air pollution and coping with dust and sandstorms (yellow dust), cooperation in respect to Korea's hosting of World Conservation Congress (WCC) to Korea, the 12th Convention on Biological Diversity Conference of the Parties, Climate Change Ministerial Meeting, etc.

At bilateral meetings with China and Japan, Korea also suggested strengthening cooperation regarding trans-boundary air pollution including fine dust to China and agreed to conduct joint research. Korea suggested strengthening cooperation with regard to asbestos safety including slate disposal to Japan, reached a consensus on joint cooperation including information sharing, asked for Japan's cooperation relating hosting Climate Change Ministerial Meeting, the 2012 World Conservation Congress (WCC), etc. and Japan promised to cooperate actively. Korea also demanded that summit talks, Tripartite Environment Ministers Meeting among Korea, China and Japan (TEMM), Environmental Cooperation Channel in North East Asia, etc. should deal with yellow dust as one of important environmental cooperation tasks at a regional level of North East Asia in order to prepare countermeasures since damage caused by yellow dust is increasing every year.

In South East Asia, where rapid industrialization and urbanization are taking place, the scale of environmental market is growing, and as a result, the importance environmental diplomacy of environmental industry is also growing. Thus, the Ministry of Environment is

reinforcing cooperation with countries in this region. The basic direction of this environmental cooperation can be divided into three categories: the first is about contribution to environmental conservation in countries of this region; the second is about supporting or promoting activities of Korean environmental companies in South East Asia; and the third is about seeking pragmatic environmental diplomacy by establishing Korea's broad base of support on the international stage.

Thus, the government is giving institutional support to environmental cooperation in the region of South East Asia by regularly hosting or participating at Environment Ministers Meeting between Korea and Vietnam (since 2000), ASEAN + 3 Environment Ministers Meeting (since 2002) and Environment Ministers Meeting affiliated with East Asia Summit (since 2008). At the 11th meeting held in Bangkok, Thailand, in September, 2012, our delegation introduced "Project for Restoring Destroyed Tropical Forests in South East Asia" as one of major cooperation projects between Korea and ASEAN, suggested "Project for Building Korea-ASEAN Biological Diversity Research Capability" as a new project, explained current status of cooperation projects in progress including "Korea-ASEAN River Restoration Forum", "ASEAN Civil Servants Training Project" and "Seoul Initiative for Green Growth", and promised to push ahead these projects continuously. "Project for Restoring Destroyed Tropical Forests in South East Asia" is one of a representative Korea-ASEAN cooperation projects in progress at the moment. With regard to this project, which started in 2000, the 1st year program of stage 4 from July, 2012 to June, 2013 was successfully completed with \$300,000 of Korea-ASEAN Special Cooperation Fund and the 2nd year program of stage 4 from July, 2011 to June, 2012 is also expected to be completed successfully with \$300,000 of Korea-ASEAN Special Cooperation Fund. Based on successful outcomes over the years, the government is pushing ahead with research commissioned by this region, educational program, the participation at World Conservation Congress (WCC), Workshop for Strengthening Research Capability of 4 Countries including Cambodia as important cooperation

projects. Besides, the government is annually operating invitation training programs to share our experience and know-how concerning environment with ASEAN member countries. The government invited 16 people from ASEAN member countries to Korea from June 10 to June 27, 2012, to educate them about How To Cope With ASEAN Climate Change (focusing on new renewable energy and environmental health).

After adopting "Singapore Declaration Concerning Climate Change, Energy and Environment" for environmental cooperation in the region of East Asia, Korea participated at East Asia Summit Environment Ministers Meeting held in Vietnam in November, 2008, for follow-up action and implementation, adopted "Environmentally Sustainable City" as an agenda and discussed environmental cooperation areas for adapting to climate change in East Asia. At the 3rd meeting held in Bangkok, Thailand, in September, 2012, Korea supported the efforts of the international community for coping with climate change including Singapore Declaration, introduced various activities including "Partnership for Coping with Korea-ASEAN Climate Change" in progress to play a bridge role between developing countries and advanced countries, and promised to make efforts so that East Asia Summit (EAS) Environment Ministers Meeting can evolve into an environmental cooperation body discussing many different pending issues seeking

[Figure 11-1] Tripartite Environment Ministers Meeting among Korea, China and Japan (TEMM) in 2012



effective solutions.

Vietnam, which signed a joint declaration of "21st Century Comprehensive Partnership" in 2001 and that of "Strategic Partnership" in 2009, is the largest Official Development Assistance (ODA) country of Korea establishing close cooperation relations with Korea based on complementary industrial structure. Korea signed Environmental Cooperation MOU in 2000 for the first time among the countries in South East Asia and agreed to hold regular high level conferences. Environment Ministers Meeting Between Korea and Vietnam was held every other year from 2000 to 2003, but this Meeting is held every year since 2004. The 9th Meeting was held in Hanoi, Vietnam, in May, 2012. At the 9th Environment Ministers Meeting, the two countries signed "Implementation Agreement concerning Vietnam's Soil & Underground Water Purification and Relevant Legal System Improvement" to establish mutual cooperation framework for strengthening Vietnam's capability concerning soil and underground water laws, assessed the outcomes of three projects including "Green Growth and Cooperation for Coping Climate Change". "Cooperation for Environmental Industry & Technology and Basic Environmental Facilities Construction" and "Expanding Cooperation for Training Environmental Human Resources" agreed at the 8th meeting and discussed continuous cooperation in the future. Meanwhile, the Ministry of Environment of Korea held "The 2nd Korea-Vietnam Green Business Conference", at which some 200 business persons in the environmental field from the two countries participated, to help Korean companies advance into the environmental market of Vietnam and find cooperation projects.

The Ministry of Environment is assisting and promoting activities of Korean environmental companies in the Middle East and Central Asia countries and contributing to environmental conservation of these countries. The Ministry of Environment, which signed Environmental Cooperation MOU with Iran for the first time among these countries in March, 2005, laid the foundation for the cooperation with these countries by signing MOU with Azerbaijan, one of Central Asian countries rich in

resources, in May, 2008, MOU with Kuwait in July, MOU with Israel in November, MOU with United Arab Emirates in May, 2009, MOU with Kazakhstan in September, 2010. The ministry is also not sparing any diplomatic effort for the cooperation between Korean environmental companies and nearby countries including Saudi Arabia and Turkmenistan.

Africa has immense potential for developing resources in the future. However, this region requires large scale investments in basic environmental facilities. In Africa, environmental destruction is a critical factor limiting economic development and it is absolutely necessary to cope with environmental problems. Therefore, the basic direction of environmental cooperation with the region of Africa can be classified into two categories: the first is about contributing to environmental conservation in African cooperation countries; and the second is about solving poverty problems in this region through environmental conservation, which is linked to the attainment of Millenium Development Goals (MDGs). Through cooperation concerning basic water management and waste management infrastructure in Africa, Korea should contribute to achieving. The Ministry of Environment held "Korea-Africa Environmental Cooperation Forum" in Seoul in November, 2010, and in November, 2011 for strengthening environmental cooperation groundwork between Korea and Africa and promoting the entry of Korean environmental companies into Africa, and concentrated its efforts on checking the demand for environmental policy and management in African countries including Cote d'Ivoire, Morocco, Senegal, Cameroon, Ghana, Nigeria, Mozambique, Tanzania, etc. The Ministry of Environment has a plan to further or expand bilateral and regional cooperation with African countries.

To improve domestic environment through the introduction of advanced environmental policy, system and technology, the Ministry of Environment is also steadily promoting environmental cooperation with developed countries in North America and Europe. With regard to countries including the United States, Canada, the United Kingdom, France, Denmark, Netherlands,

Germany and Norway in particular, the ministry signed Environmental Cooperation MOU and is carrying on joint cooperation projects like joint seminar and experts exchange. Since Korea signed Environmental Cooperation MOU with the United States in March, 1987, the ministry has been conducting varied forms of cooperation activities like 9 environmental technology cooperation tasks including Research on Causes of the Poor Visibility in Large Cities in association of the United States-Asia Environmental Partnership. As Korea-US Environmental Cooperation Agreement came into effect on March 15, 2012 (signed on January 23, 2012), the two countries established a framework for promoting environmental cooperation including environmental protection, sustainable management

of natural resources, conservation and protection biological diversity, reinforcement of environmental laws enforcement and cooperation for assistance and development of clean energy. According to this agreement, the two countries held the 1st Environmental Cooperation Commission on February 14, 2013, and agreed to promote work program between 2013 and 2015. This work program stipulates 8 categories including environmental laws enforcement, multilateral environmental cooperation agreement, conservation of ecology and natural resources, improvement of public perception and sustainable city as priority cooperation areas, and the two countries agreed to exchange contact points in each of the above areas for promoting detailed cooperation tasks.

11.2.2 Environmental Cooperation with International Bodies

Korea is also further strengthening the leadership in environmental cooperation with international bodies. At OECD Meeting of the Council at Ministerial Level held in June, 2009, Korea took the lead as chair country (Chairperson was the then prime minister Han Seung-Su) in adopting Declaration on Green Growth. At the 10th Environment Ministers Meeting under the title of 'Making Green Growth

Deliver' held in March, 2012, Korea presided over the plenary session as chair country (Chairperson was the environment minister of Korea). In 2008, when Korea announced 'Low Carbon Green Growth' as a national vision, United Nations Environment Program (UNEP) advocated 'Green Economy Initiative' and published 'Report on National Strategies for Green Growth in Korea' in April, 2010.

11.2.3 Response to Environmental Negotiations in the Process of International Trade Agreement

The concept of sustainable development through environmental cooperation is being introduced in the process of reshuffling international trading system. This trend, which started to spring up since United Nations Conference of the Human Environment in 1972 has been discussed mostly focusing on the establishment of relations between environmental protection and free trade, and began in earnest since World Trade Organization (WTO) and its affiliated 'Committee on Trade and Environment' was founded in 1994. In particular, 'Doha Development Agenda' launched in November, 2001, and 'Free Trade Agreement'

regime positioned as basis for trade negotiations and current international trade served as a momentum for attaining sustainable development based on mutual development of trade and environment by providing a place for discussing varied agendas related to environment and trade. Korea concluded its first Free Trade Agreement (FTA) with Chile on October 24, 2002, brought FTA with Singapore that came into effect through the National Assembly's approval in February, 2006, and concluded FTA with EFTA (Iceland, Switzerland, Norway and Liechtenstein) in 2005 and the agreement came into effect in September, 2006. Korea

signed Comprehensive Economic Partnership Agreement (CEPA) with India in August, 2008. In addition, Korea-Peru FTA was concluded in August, 2010, and Korea-EU FTA was concluded in October, 2010. Korea-Peru FTA came into effect on August, 2011, and Korea-EU FTA came into effect since July, 2011. Korea-the United States FTA approved by the National Assembly in November, 2011, came into effect on March 15, 2012. the initialling of Korea-Colombia FTA was concluded on August 31, 2012, waiting for the National Assembly's ratification. Besides, Korea is conducting negotiations with regard to Korea-China FTA, Korea-Turkey FTA, Korea-Vietnam FTA and Korea-Canada FTA.

Discussion on the linkage between trade and environmental problems drew little attention from the international community under the regime of GATT (General Agreement on Tariff and Trade), but the discussion has resurfaced since fundamental stands concerning mutually supportive relationship of trade and environment were defined at the 1992 Rio UN Conference on Environment and Development, 'Marrakesh Agreement on Trade and Environment' was adopted at Marrakesh Ministerial Conference for the establishment of World Trade Organization (WTO) in 1994, and WTO's affiliated Committee on Trade and Environment (CTE) was organized. Committee on Trade and Environment (CTE), organized temporarily, held 13 official conferences from 1995 through 1996 to discuss 10 agendas including the relations between multilateral environmental agreements (MEAs) and WTO's free trade norms, the interaction between trade policy and environmental control policy, etc. However the committee failed to reach a detailed agreement because of different positions between developed and developing countries. The international community included a total of 6 agendas consisting of 3 negotiation agendas and 3 review agendas in the ministerial declaration at the 4th WTO Ministerial Meeting held in Doha in November, 2001, and started negotiations in relation to Doha Development Agenda from January, 2002. Trade and environment issues including trade liberalization with regard to environmental products and services and the establishment of the relationship between trade norms within multilateral environmental agreements (MEAs) and WTO's trade norms are being

discussed under the leadership of Committee on Trade and Environment (CTE).

Discussion in FTA can be divided into concession negotiations in environmental service and environmental agreement negotiations. Above all, concession negotiations in environmental service is progressing by indicating services to be opened among environmental services including waste treatment service, wastewater treatment service, natural landscape protection service, environmental consulting service, etc. into the concession table, and by writing measures limiting service trade including 'national treatment', 'most-favored-nation treatment', 'performance requirements of foreign corporations in the country', 'safeguard measures to market approach', etc. into the annex (reservations list). Korea-the United States FTA opened contaminated soil remediation service and environmental consulting service belonging private environmental service additionally as well as industrial wastewater and waste treatment, air pollution prevention, reduction of noise and vibration, and environmental impact assessment included in the concession list of WTO/DDA submitted in 2005. Korea-EU FTA opened domestic sewage treatment service by the private sector additionally as well as existing opened services. Korea-ASEAN FTA negotiations launched in 2005 contributed to gaining a foothold for environmental cooperation agreement by including CNG environmental cooperation, etc. at a level of securing a bridgehead for the entry of Korean environmental industry into ASEAN market given that ASEAN can be an important market for Korean environmental companies.

Korea-the United States FTA, which came into effect on March 15, 2012, prohibited the exemption or evasion of environmental protection obligations for promoting high level of environmental protection obligations as well as trade and investment by adding a separate environment chapter, and inserted an environment article reinforced by guaranteeing the institution for environmental damage relief and sanctions against environmental law violations and expanding the public's participation opportunity. In addition, Korea-US FTA organized Environmental Affairs Council (EAC) to

review the status of environment chapter performance by the two countries, and gave a greater binding power to environment chapter performance by applying general dispute resolution procedures to environmental disputes taking place in either of the two countries and imposing a penalty in case of not fulfilling the panel's decision. According to environment chapter of Korea-US FTA, the 1st Korea-the United States Environmental Affairs Council (EAC) was held in Washington DC on February 14, 2013. At this council, both countries introduced their environmental policies at a level of reviewing environment chapter performance.

Korea-EU FTA also specifies obligation performance of multilateral environmental agreements (MEAs) including Climate Change Convention ratified by both parties, and prohibition obligation of environmental protection level reduction in case of governing laws by establishing Trade and Sustainable Development Chapter as a separate chapter with regard to environment and

labor. The most important characteristic of Trade and Sustainable Development Chapter is to stress the performance of the agreement through consultations between both parties including resolution through consultations between governments instead of general dispute resolution procedures or referral of a dispute to a specialist panel when disputes concerning agreement performance take place. The Agreement also stipulates that Civil Society Forum should be held annually to guarantee the participation of civil society in the process of agreement performance. Thus, Korea and EU held the 1st Trade and Sustainable Development Commission in June 23, 2012, and the 1st Civil Society Forum on June 24, 2012, in Brussel, Belgium, drew up operation rules of the commission, agreed to establish 'Specialist Panel', and discussed cooperation proposals on environmental issues regarding trade including Eco-Labeling.

11.2.4 Response to Climate Change Convention

Korea's response to climate change negotiations was more active and proactive than that of any other country in the world, which helped Korea establish an image of green country. An ultimate goal of climate change negotiations is to become a low carbon country. Thus, Korea, which is striving to do away with a wrong fixed idea 'Economic growth is emission of greenhouse gases', is implementing various environmental policies for turning into a low carbon country based on Green Growth as a long-term vision.

By declaring Low Carbon Green Growth on August 15, 2008, the government established a new national vision as Green Power, and the Ministry of Environment has been implementing the plans after announcing action plans for Green Growth in the area of environment. In order to realize green growth, strategies, technology and resources for supporting green growth are required. Only when these three conditions are met, green growth can be realized. Thus, Korea is implementing or planned to implement varied policies including 'Framework Act

on Green Growth', 'Act on Smart Grid', '4 Major Rivers Project', 'Act on Greenhouse Gases Emission Trading' setting a goal for reducing greenhouse gases (30% reduction compared to estimated emission), etc. as a strategy for reducing greenhouse gases and realizing green growth. The government also established Global Green Growth Institute (GGGI) and is supporting the Building of Green Growth Knowledge Platform, at which OECD, UNEP and World Bank are participating.

As part of response to post-2012 and post-2020 New Climate Regime, Korea suggested NAMA Registry, an online registry of reporting developing countries' voluntary reduction actions for reduction COP 15 Copenhagen Congress. As a consequence this proposal was reflected in the agreement of COP16 Cancun Conference of the Parties. Voluntary efforts of developing countries for greenhouse gases reduction can be recognized through the online registry. Therefore, NAMA Registry is expected to help voluntary reduction

efforts of countries including Korea not requiring any assistance recognized by the international community. In October, 2012, Korea succeeded in attracting Green Climate Fund (GCF) planned to be established for raising resources responding to climate change. Green Climate Fund is an international financial organization planned to be established by the international community to cope with climate change in an effective way. As it is the most important and practical task to raise sufficient resources for coping with climate change, the 17th Conference of the Parties held in Durban, South Africa, last year decided to establish the Green Climate Fund (GCF). Korea successfully held this fund's 2nd meeting of the board in Songdo, Incheon when Korea succeeded in attracting this fund. Korea expressed the most aggressive intention of donation including assistance of initial operating expenses among candidate countries, and this intention was reflected in Durban Agreement. As a result of this effort, the country successfully hosted the GCF. In addition to this, the government's promotion of North East Asia Climate Partnership helped the country establish an image as a country leading Green Growth and will help our green industry advance into overseas markets. This Partnership will pay attention to varied projects including water resources management, low carbon city, forests, new renewable energy and waste treatment. As Korea is classified as one of major emitters, the

country is most likely to be reclassified as one of obligatory reduction countries. Thus, the government has been implementing proactive and effective greenhouse gas reduction policies including the introduction of emission trading system. However, reduction has room for further discussion because it can accompany stagnation of economic growth and interests of different areas are complicated. Thus, our society should resolve possible problems by adjusting the direction and stages of reduction. The Ministry of Environment is seeking a new direction and drawing up our negotiation strategy by holding seminars or forums and listening to opinions from industrial, academic and government communities. The ministry is also seeking systematic reduction policies including Greenhouse Gas Center checking greenhouse gases in real time to secure credibility and the building of greenhouse gas database. Korea will raise its national status as a green power by accomplishing 30% reduction goal compared to BAU (business as usual) by 2020 announced in 2009, proactively responding to the building of Climate Regime through faithful efforts for reduction and arbitrating different opinions from developed countries and developing countries.

To take the lead in climate negotiations, the country successfully held Pre-COP Ministerial Meeting suggesting political directions for reaching a settlement of negotiations at the COP18 Conference of the Parties from October 21 through October 23, 2012. This Pre-COP18 Ministerial Meeting was the first large scale meeting on climate change at which environment ministers from around 40 countries participated. Korea led discussions so that detailed action plans can be drawn in each agenda of Climate Change Convention and different opinions concerning greenhouse gas reduction level and reduction performance system of advanced and developing countries can be settled smoothly. Minister level delegates from the countries made efforts to seek ways of settling difficult reality in climate change crisis management and to regather political will. As a consequence, this conference served as an important guidance for COP18 Doha Conference of the Parties.

[Figure 11-2] Keynote Speech for the COP18 in 2012



11.2.5 Response to Convention on Biological Diversity (CBD)

In October, 1994, Korea joined Convention on Biological Diversity (CBD), which was born with three goals including biological diversity conservation, sustainable use of biological diversity components and Access to Genetic Resources and Benefit Sharing (ABS), and is taking part in international conservation efforts by establishing and implementing "National Biological Diversity Strategy and Action Plan according to recommendations of CBD.

The 10th CBD Conference of the Parties held in Nagoya, Japan, in October, 2010, adopted the protocol on "Access to Genetic Resources and Benefit Sharing (ABS)" (on October 29, 2010). In the future, great burdens associated with the use of biological resources including each country's sovereignty reinforcement on biological resources and obligatory benefit sharing are expected to take place, and competition between countries surrounding biological resources is also expected to grow more fiercer. Korea participated at the 10th CBD Conference of the Parties (in Nagoya on October 10), contributed to the adoption of ABS Protocol by coordinating opinions from advanced and developing countries from the perspective of balancer, and signed the Protocol in September, 2011.

Thus, the Ministry of Environment discussed how to respond to the Nagoya Protocol by establishing a pan-government level cooperation system through the organization of Task Force Team consisting of experts from 10 ministers (Ministry of Foreign Affairs and Trade, Ministry of Education, Science and Technology, Ministry for Food, Agriculture, Forestry and Fisheries, Ministry of Land, Transport and Maritime Affairs, Ministry of Health and Welfare, Ministry of Knowledge Economy, Ministry for Food, Agriculture, Forestry and Fisheries, Korea Forest Service, Korean Intellectual Property Office and Korea Food & Drug Administration) and led by the vice environment minister. The government also drew up "Pan-National Countermeasures to the Nagoya Protocol" (in November, 2011) by operating a

forum consisting of specialists from various fields of biological resources in order to raise professionalism in our response and gathering opinions from interested parties and experts as well as consultations between relevant ministries, and established detailed action plans of relevant ministries for materializing and practicing the Pan-National Countermeasures (in June, 2012). The content of "Pan-National Countermeasures to the Nagoya Protocol" is as follows:

As Korea is not rich in indigenous biological resources, more than 2/3 of companies using biological resources are dependent on overseas biological resources. Biological resources in the territory of Korea are estimated to account for some 100,000 species, and some 37,000 species have been excavated as of 2011. Thus, the Ministry of Environment plans to build Comprehensive Management System for securing and managing indigenous biological resources in order to strengthen our sovereignty on biological resources. To begin with, the ministry plans to build the list of traditional knowledge consisting of more than 50,000 pieces with high value (including 32,200 pieces excavated to date) in the industry in respect to biological resources by increasing the speed of excavating biological resources to 2,000 species from 800 species a year and investigating or excavating around 60,000 species of indigenous biological resources by 2020 (including 36,921 species excavated to date). In addition, the ministry is planing to continuously conduct research on samples of biological resources indigenous of the Korean Peninsula collected by overseas organizations, to investigate the current status of biological resource samples indigenous of the Korean Peninsula collected by 53 organizations in 15 countries by 2017, and to secure image or video materials.

The ministry is planning to conserve, manage and use Korean biological resources effectively by building database on biological resources data excavated this

way and establishing Comprehensive Management System for national biological resources in association with biological resources databases built by the fields of forestry, fisheries, marine life, etc.(in December, 2012) The Comprehensive Management System for national biological resources, which is basis for securing biological sovereignty, will build a systematic database on biological resources by classifying some 37,000 species of indigenous biological resources and biological resources managed by different ministries according to organized classification categories including habitat, will contribute to raising the utilization in the biological resource industry by linking information derived from analysis data of biological resources properties (DNA information, etc.) to DB centered on real biological resources, and will improve users' access to biological resources information through the standardization of biological resources and linkage to relevant detailed information.

To respond to the Nagoya Protocol effective, the ministry is preparing follow-up countermeasures including national level organization of relevant domestic institutions and enactment of relevant laws.

Act on Biological Diversity and Use, characterized by framework law for management of domestic biological diversity reflected in the framework of the Nagoya Protocol including biological resources benefit sharing and traditional knowledge protection, was enacted in February, 2012, and became effective since February, 2013. The government also drew up a draft of tentatively named Act on Access to Genetic Resources and Benefit Sharing (in July, 2011) including access to domestic biological genetic resources and use procedures, designation of organization in charge and obligation observance according to the use of biological genetic resources through consultations between relevant ministries, has been conducting complementary work on the draft, and is planning to legislate the draft, considering follow-up negotiations on the Nagoya Protocol and stands or movement of

other countries including EU.

Ramsar Convention, which recognizes the importance of wetlands with ecological, social, economic and cultural values and is intended to protect wetlands by controlling loss or erosion, is directly linked to biological diversity protection. This Convention was adopted in Ramsar on February 2, 1975 and came into effect in December, 1975. Korea joined this Convention in March, 1997. The number of wetlands registered in the Ramsar Convention accounts for 2,098 as of February, 2013, and there are 18 registered wetlands including Upo Wetland in Korea.

In 2008, Korea successfully held "The 10th Ramsar Convention Conference of the Parties" in Changwon, South Gyeongsang Province, and 11 delegates from the government, Korea National Park Service, local governments and NGOs led by international cooperation officer from the Ministry of Environment participated at The 11th Ramsar Convention Conference of the Parties held in Bucharest, Romania, from July 4 through July 13, 2012. At The 11th Ramsar Convention Conference of the Parties, the international cooperation officer from the environment ministry chaired the first day's meeting and operation committee as chairperson of the previous conference, and presided over the 44th and 45th standing committees held during the Conference of the parties smoothly as chairperson, meeting with favorable reviews. Korea, which was elected as a standing committee member country during the period from 2008 to 2012, is reelected as a member country of Ramsar Convention Asia Standing Committee during the period from 2013 to 2015, confirming our national status in the international community.

The delegation showed Suncheon Bay PR video clips during Asian regional conference sessions and showed a documentary 'The Great Flight' during a side event of East Asian Regional Ramsar Center, which encountered favorable comments. Many participants asked the delegation to hand out PR video clips. In this way, our delegation developed varied PR activities during the period of the Conference of the Parties.

11.3 Key Issues

11.3.1 High Level Climate Change Meeting

To take the lead in climate negotiations, the country successfully held Pre-COP Ministerial Meeting suggesting political directions for reaching a settlement of negotiations at the COP18 Conference of the Parties from October 21 through October 23, 2012. This Pre-COP18 Ministerial Meeting was the first large scale meeting at which environment ministers from around 40 countries participated. Korea led discussions so that detailed action plans can be drawn in each agenda of Climate Change Convention and different opinions concerning greenhouse gas reduction level and reduction performance system of advanced and developing countries can be settled smoothly. Minister level delegates from the countries in the world made efforts to seek ways of settling difficult reality in climate change crisis management and to gather political will. As a consequence, this conference served as an important guidance for COP18 Doha Conference of the Parties.

As Korea successfully held the 2012 Pre-COP Climate Change Ministerial Meeting, succeeded in attracting the GCF, and successfully turned the GGGI into an international body, the international community expects Korea to play a role of bridging developed countries and developing countries. Through his keynote speech at the 18th Climate Change Conference, the environment minister stressed the necessity of

simultaneous consideration of emission reduction and financial assistance, stating that Korea is willing to provide a place for discussion by holding regular high level ministerial meetings. High Level Climate Change Conference is scheduled to be held during the second half of the year 2013, at which some 100 minister level chief delegates from about 30 important countries participating in climate change negotiations and from important organizations relating to climate change (GCF, IPCC, etc) will participate to discuss balanced expansion of reduction and finance, upward adjustment of Pre-2020 reduction goals, ways to establish stable financial support system for developing countries, ways to seek mid and long term financial resources, etc.

The Ministry of Environment is planning to take the lead in future climate change negotiations by suggesting directions for climate change discussion and playing a role of bridging developed countries and developing countries for a smooth settlement as an arbitrator. The ministry is now preparing strategy for drawing detailed outcomes by gathering or listening to opinions of experts from industrial, academic and government communities and through consultations among relevant ministries, and is doing its best to promote the country's international status as a country leading green growth.

11.3.2 Follow-up Measures with Regard to Hosting the Green Climate Fund

As Korea's hosting the secretariat of the GCF was finally determined in December, 2012, at the 18th Climate Change Conference held in Doha, Qatar, the government is preparing follow-up action plans for meeting the international demands and implementing our promises as follows:

As part of support for launching the GCF as soon as possible, the government is planning to conclude

Headquarter Agreement for legal corporate personality recognition, privilege & exemption and assistance and to enact a special law tentatively named 'Act on Green Climate Fund Support'. The main contents of this special law includes the ground and method of making financial contributions to the GCF, the ground of supporting the cultivation of developing countries' capabilities, the adjustment of work in respect to the

GCF, etc. With regard to fund raising and business model for the GCF, the international community agreed to raise 100 billion dollars annually commencing with 2020 from a long term perspective, but the government is planning to suggest our opinions on the GCF business model and the organization of the executive office as well as disputed issues since there are different opinions concerning detailed fund raising methods and division between countries. With regard to 'Fund for Cultivating Developing Countries' Capabilities (40 million dollars), the government is consideration of using this fund as a lever for inducing developing countries to cooperate with the GCF through GCF pilot project excavation and modelling

To maximize the effect of the GCF attraction on our society, the government is planning to improve domestic conditions for cultivating experts or specialists as well as consulting firms in the area of climate change policy

and technology so that domestic companies and competent people can participate in GCF projects, and to turn the country into a green model country by fostering green practice efforts in the people.

With regard to future action plans, the government is planning to continue consultations with relevant international organizations including Global Environment Facility (GEF), United Nations Development Programme (UNDP), etc, to conclude Headquarter Agreement with the GCF, to enact a special law tentatively named 'Act on Green Climate Fund Support' (in the first half of the years 2013), to develop strategy for discussion on the GCF fund raising and business model, to promote research on how to use Fund for Cultivating Developing Countries' Capabilities (40 million dollars) (from January, 2013), and to make plan for cultivating experts or specialists and domestic companies in relation to climate change policy and technology (during the year of 2013).

11.3.3 Hosting Biological Diversity Convention Conference of the Parties

At the 11th Conference of the Parties held in Hyderabad, India, in October, 2012, Korea was selected as the host country of the 12th Biological Diversity Convention Conference of the Parties. As Korea successfully held major international conferences including the Ramsar Conference in 2008, the United Nations Convention to Combat Desertification Conference in 2011, the World Conservation Congress in 2012, etc, performed important environmental conventions including Biological Diversity Convention faithfully, and negotiation ability shown in the process of adopting the Nagoya Protocol received high praise, the country succeeded in hosting the 12th Biological Diversity Convention Conference of the Parties. The 12th Biological Diversity Convention Conference of the Parties in 2014 is expected to be very important because the 1st Nagoya Protocol Meeting of the Parties on 'Access to Genetic Resources and Benefit Sharing' is going to be held, and that discussion on strategies for biological diversity conservation and strategies for performing Aichi Target and raising financial resources

smoothly is expected to begin in earnest.

As the country will host the 12th Biological Diversity Convention Conference of the Parties, the Ministry of Environment is planning to start consultations between relevant ministries for securing organization and resources for the conference, to excavate agendas capable of leading international discussion in the area of biological diversity, to amend or supplement domestic institutions including 'Biological Diversity Strategy and Action Plans' made in 2009 in a systematic way, and to select host city through pre-verification of symbolism and infrastructure and fair assessment by domestic and overseas experts and specialists.

The coming 12th Biological Diversity Convention is to serve as an opportunity for consolidating our country's status as a group leading the international community in the area of biological diversity along with great economic and non-economic effects and give considerable contribution to domestic biological industry using biological resources as original materials.

11.3.4 Mercury Convention

The Minamata Convention on Mercury aiming at the reduction of mercury use and emission was agreed at the 5th Intergovernmental Negotiating Committee in Switzerland from January 13 through January 18, 2013. The international community started the first negotiating conference in 2010 and drew a draft for convention by coordinating stands of different countries through four conferences over the years. The Mercury Convention was reported to the 27th United Nations Environment Program (UNEP) Executive Board in February of this year. The convention is going to be formally adopted through diplomatic conference in October.

While many countries have been conducting mercury management, the effort of each country was confronted with limitations in protecting health of the people and environment since mercury has properties of long range mobility through air and great bio-concentration. For this reason, the international community including United Nations Environment Program (UNEP) and NGOs has been pushing ahead with International Convention for promoting the participation and effort of the whole world. Convention Draft agreed at the 5th Intergovernmental Negotiating Committee includes regulations concerning mercury supply and trade, products containing mercury, mercury emission into air, water and soil, storage and disposal, financial and technical support, etc. Products containing mercury

are divided into the following product categories: phased prohibition category, reduction category and use permission category. With regard to mercury emitted into the air, the result and status of facility management performance for reduction must be reported to the Conference of the Parties. This convention is expected to give an impact on manufacturers of products containing mercury, facilities emitting pollutants into the air, etc, but its impact on Korea is expected to be relatively low.

As products containing mercury like fluorescent lamps or batteries are controlled by domestic content standard which is similar to the content standard stipulated in the Convention Draft, and facilities emitting pollutants into the air are controlled by criteria in domestic laws much more strict than those stipulated in the Convention Draft, the impact of the Convention on Korea is not expected to be large.

For the ratification of the Convention, relevant ministries need to strengthen the foundation for domestic implementation and draw up relevant laws through close cooperation as soon as possible. In the preparation of the ratification and effectuation of the Convention, the Ministry of Environment is planning to establish legal, institutional and technical performance basis including the enactment or revision of relevant laws in an proactive way on the basis of research of the actual condition and opinions from interested parties.

[Figure 11-3] Rio+20 Conference in 2012



12 Appendix



12.1 The Organization and Functions of the Ministry of Environment and Its Affiliated Organizations

- 12.1.1 Main Office
- 12.1.2 National Environmental Dispute Resolution Commission (NEDRC)
- 12.1.3 Nation Institute of Environmental Research (NIER)
- 12.1.4 National Institute of Biological Resource (NIBR)
- 12.1.5 National Institute of Environmental Human Resources Development (NIEHRD)
- 12.1.6 Greenhouse Gas Inventory & Research Center of Korea
- 12.1.7 Local Environmental Offices
- 12.1.8 Sudokwon (Metropolitan) Landfill Site Management Corp.
- 12.1.9 Korea Environmental Corporation (KECO)
- 12.1.10 Korea Environmental Industry & Technology Institute (KEITI)
- 12.1.11 Websites of Subsidiary/Affiliated Organizations

12.2 Related Ministries and Organizations

- 12.2.1 Related National Administrative Organizations
- 12.2.2 Local Governments
- 12.2.3 Environmental Council and Advisory Body
- 12.2.4 Environment-Related Committees

12.3 Table of Environment-Related Laws

- 12.3.1 Laws Enacted or Amended in 2012
- 12.3.2 Act on Preservation and Use of Biodiversity (enacted)
- 12.3.3 Act on Prevention of Light Pollution Caused by Artificial Lighting (enacted)
- 12.3.4 Clean Air Conservation Act
- 12.3.5 Waste Control Act



12. Appendix

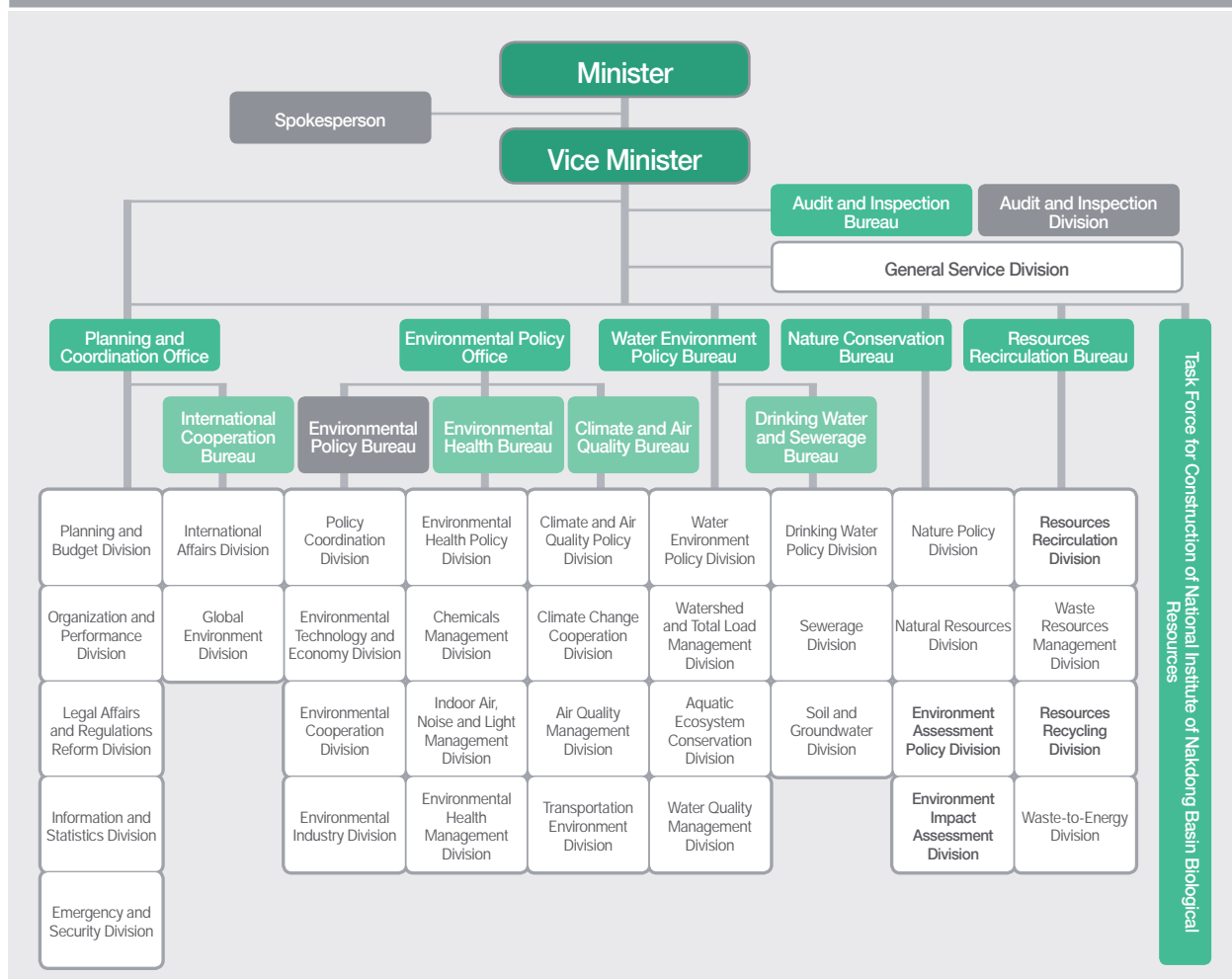
12.1 The Organization and Functions of the Ministry of Environment and Its Affiliated Organizations

12.1.1 Main Office

The Ministry of Environment in charge of drawing up a comprehensive environmental policy is composed as of October 2010 of two departments, three bureaus, thirty-four divisions, five teams, and two task force teams (543 regular personnel as of October, 2013), and handles (a) the enactment and amendment of environmental laws and the establishment of a basic system of environment and administration including the introduction of environment-

related institutions for national environmental management, (b) the establishment and implementation of medium-and-long-term plan for environmental preservation, (c) the establishment of an assortment of regulatory criteria, (d) the administrative and financial support for environmental management by regional environment agencies and local governments, and (e) the implementation of international cooperation on environmental conservation.

[Figure 12-1] Organization Chart of the Ministry of Environment



12.1.2 National Environmental Dispute Resolution Commission (NEDRC)

The Commission was formed to resolve disputes over damage from environmental pollution in accordance with Article 4 of Environmental Dispute Adjustment Act.

The Ministry of Environment has NEDRC, while Seoul Metropolitan City, other metropolitan cities,

and provinces have Regional Environmental Dispute Resolution Commission. NEDRC is composed of chairman (virtually Class 1 government official and permanent) and eight non-permanent members, and has a secretariat (23 regular personnel as of October. 2012) for handling affairs related to dispute resolution.

12.1.3 National Institute of Environmental Research (NIER)

The NIER was launched as a research arm dedicated to environment in July 1978 in order to handle affairs related to investigation, research, test and evaluation designed to preserve nature and prevent environmental pollution as a spinoff from Korea National Institute of Health. In 1980, with the launch of Agency of Environment, NIER transferred there from the Ministry of Health & Society. On July 22, 2005, the name changed

to National Institute of Environmental Research and its organization was reshuffled in order to become a performance-oriented research organization.

NIER conducts research and investigation needed to support the policy-making of the Ministry of Environment including media-integrated research, and is composed of five departments, sixteen divisions, five research arms and three centers (331 regular personnel as of October 2012).

12.1.4 National Institute of Biological Resource (NIBR)

The NIBR was launched as a research institution dedicated to biological resources in March 2007 to handle affairs related to research and investigation for effective preservation and utilization of national

biological resources and publicity and exhibition on biological resources, and has two departments and eight divisions (102 regular personnel as of Oct. 2010).

12.1.5 National Institute of Environmental Human Resources Development (NIEHRD)

NIEHRD was launched as a training organization dedicated to environment in order to handle affairs related to the training of government employees and civilians who work in environmental affairs

in December 2006 as a spinoff from NIER (from its Department of Environmental Training), and is composed of two divisions (30 regular personnel as of October. 2012).

12.1.6 Greenhouse Gas Inventory & Research Center of Korea

The Center was launched in July 2010 with the enforcement of the Framework Act on Low-Carbon and Greenhouse Growth to handle affairs related to establishment and adjustment of the medium-and-long-term plan for a comprehensive management of information

on greenhouse gas, establishment and adjustment of a plan for a total management of greenhouse gas statistics, and establishment and support of national and sectorial greenhouse gas reduction target, and is composed of three teams (10 regular personnel as of October. 2012).

12.1.7 Local Environmental Offices

These are special local administrative agencies that perform the management of the basin in the water system of the Four Rivers and have Agency of Environment respectively for the basins of Han River, Nakdong River, Geum River, and Yeongsan River and Local Agency of Environment for Wonju, Daegu, and Saemangeum, while Sudokwon (Metropolitan) Air Quality Management Office is dedicated to the improvement of atmospheric environment in Seoul metropolitan region (801 regular personnel as of October, 2012).

Local Environmental Offices handle (a)the establishment and implementation of respective environment management plans for affected areas, (b)the consultations on Prior Environmental Review (PERS) and Environmental Impact Assessment (EIA), (c)the preservation of natural environment including preservation of ecosystems, (d)the investigation of sources of environmental pollution and the measurement and analysis of level of environmental

pollution, (e)nurturing and supporting environment-related businesses, (f)the management of creators and processors of specified wastes, and (g)the instruction and supervision of operation of basic environmental facilities.

Among other local environmental offices, Agency of Environment for the Basins of the Four Rivers including the Han River conducts affairs in accordance with Special Act on Watershed such as Watershed Management Committee, Watershed Management Fund, authorization of water quality improvement projects by local governments, authorization and evaluation of implementation plans for Total Maximum Daily Load Management System (TMDL), and imposition to and collection from private waterworks operators of water use charge, and Metropolitan Air Quality Management Office is dedicated to preventive and wide-area air quality management in the Seoul metropolitan region.

12.1.8 Sudokwon (Metropolitan) Landfill Site Management Corp.

With the enactment and promulgation of the Act on Establishment and Operation of Sudokwon (Metropolitan) Landfill Site Management Corp. in 1997, Sudokwon Landfill Site Management Corp. was formed on July 22, 2000. The Corporation, created with the purpose of facilitating the proper processing and conversion into resources of wastes generated in Seoul metropolitan region and contributing to the creation of a pleasant environment for the residential life of the neighboring community, conducts, based on the Plan on Seoul Metropolitan Landfill Site Management, the treatment of the wastes arriving at the landfill site in Seoul metropolitan region, the installation and management of waste treatment facilities and accessory facilities, the installation and management of facilities for turning wastes into resources, the creation of fund for supporting the local community and supporting neighboring affected areas, the determination and collection of carry-in fee, additional dues, and burden

charge, the management of environment on landfill sites in Seoul metropolitan region and neighboring areas, the installation and management of pollution prevention facilities, the development and operation of borrowed pits for securing soils for earth sheltering, the management of landfill sites in Seoul metropolitan region after their completion, the installation and operation of parks, sports and cultural facilities in landfill sites in Seoul metropolitan region, other affairs entrusted by the state or local governments in relation to installation and operation of landfill sites in Seoul metropolitan region, and accessory affairs for the above projects such as investigation, research, technological development, planning, supervision with responsibility, measurement and analysis of environmental pollutants and technological support. Having undergone work process improvement, the Corporation currently has five executives, thirteen departments, and one center (with 204 regular personnel).

12.1.9 Korea Environmental Corporation (KECO)

Korea Environmental Corporation, redefining its purpose through Korea Environmental Corporation Act in May 2012 as 'contribution to eco-friendly national development by efficiently implementing greenhouse gas related project designed to prevent environmental pollution, improve environment, promote resource recirculation, and respond to climate change, reestablished its status as an environment organization dedicated to preemptively responding to climate change. As a Ministry of Environment affiliated quasi-government organization (for entrusted execution),

the Corporation conducts the improvement of environmental quality, the environmental pollution prevention, the management of resource recirculation, and the technological support and implementation of environmental health and environmental policy, in all areas including climate and atmosphere, water environment, resource recirculation, and environmental health. The Corporation has 1,890 regular personnel including environment-related manpower (72 with Ph.D., 86 professional engineers, 408 with master's degree, and holders of multiple degrees).

12.1.10 Korea Environmental Industry & Technology Institute (KEITI)

The Korea Environmental Industry & Technology Institute (KEITI) is a subsidiary governmental institute established on April 8, 2009 in accordance with the Development of and Support for the Environmental Technology Act. It was created for the purpose of improving the quality of life, contributing to national economic advancement through the promotion of green technology development and green product consumption by launching various programs such as eco labelling and carbon footprint labelling certification, and establishing plans supporting the overseas export of the environmental industry suitable to government policies.

KEITI supports international joint research projects, which are a part of R&D projects and takes a leading role in helping countries involved in the inter-governmental project with environment management master plans, working towards the establishment and enhancement of environmental cooperation networks between Korea and counterpart countries. On/off-line export consulting services as well as professional consulting services have been made available as a way to provide Korean enterprises with comprehensive export consultation in an effort to encourage overseas marketing for Korean environmental enterprises. KEITI is committed to administering the "Feasibility Study Assistance Program

for Overseas Environmental Project" to help domestic enterprises in environmental fields properly evaluate the technological and economical feasibility of overseas environmental projects, thereby supporting overseas trade activities. KEITI has also helped domestic environmental businesses receive orders from abroad.



12.1.11 Websites of Subsidiary/Affiliated Organizations

For more information about the subsidiary/affiliated organizations, visit their websites.

Organization	Website
National Env' l Dispute Resolution Commission (NEDRC)	http://edc.me.go.kr/
National Institute of Environmental Research (NIER)	http://nier.go.kr/
National Institute of Biological Resources(NIBR)	http://nibr.go.kr/
National Institute of Environmental Human Resources Development (EHRD)	http://ehrd.me.kr/
Greenhouse Gas Inventory & Research Center(GIR)	http://www.gir.go.kr
Han River Basin Environmental office	http://www.me.go.kr/hg/
Nakdong River Basin Environmental Office	http://www.me.go.kr/ndg/
Geum River Basin Environmental Office	http://www.me.go.kr/gg/
Yeongsan River Basin Environmental Office	http://www.me.go.kr/ysg/
Metropolitan Air Quality Management Office	http://www.me.go.kr/mamo
Wonju Regional Environmental Office	http://www.me.go.kr/wonju
Daegu Regional Environmental Office	http://www.me.go.kr/daegu
Jeonju Regional Environmental Office	http://www.me.go.kr/jeonju
Sudokwon Landfill Site Management Corporation	http://www.slc.or.kr
Korea Environment Corporation (KECO)	http://www.keco.or.kr
Korea National Park Service (KNPS)	http://www.knps.or.kr
Korea Environmental Industry and Technology Institute (KEITI)	http://www.keiti.re.kr

12.2 Related Ministries and Organizations

12.2.1 Related National Administrative Organizations

Since environmental affairs are complicated with an extensive scope, the Ministry of Environment alone cannot handle all of the environmental affairs. Apart from the Ministry of Environment that is responsible for general management of environmental policy, several ministries including the Ministry of Land, Transport and Maritime Affairs are directly or indirectly engaged in conducting part of the environmental affairs. Outstanding among them are Korea Forest

Service that handles forest that takes up most of the land of the country, the Ministry of Land, Transport and Maritime Affairs that handles national land use plan, water quantity management and river management which are inseparable from environmental issues, and the Ministry of Knowledge and Economy that handles policy on energy demand and supply related to air pollution as well as policies for fostering and managing companies that generate pollutants.

12.2.2 Local Governments

Environment-related administrative work and functions are split between national and local governments. To be specific, the Ministry of Environment provides the basic framework of environmental policy including enactment of related laws and establishment of relevant regulatory standards, while local environmental offices and local governments are responsible for their enforcement.

Local governments deal with its proper tasks such as (a)the establishment and implementation of measures for preserving areal environment in the jurisdiction, (b) the collection and treatment of residential wastes, (c) the treatment of wastewater, human waste and livestock wastewater, (d)the regulation of noise, vibration and

automobile exhaust, and tasks entrusted by Minister of Environment such as (a)the management of businesses creating environmental pollutants and (b)the imposition and collection of burden charge for environmental improvement. While environmental administrative organizations slightly differ with local governments, sixteen metropolitan governments have installed and operate Environment and Green Bureau, Environment Bureau or a bureau integrating environment, culture, tourism and maritime affairs, and local governments install Environmental Protection Division, Environmental Division, or a division integrating maritime and urban function to conduct environmental affairs

12.2.3 Environmental Council and Advisory Body

Government-Military Environment Council

The Ministry of Environment and the Ministry of National Defense created Government-Military Environment Council in June 1998 as an organic body for cooperation between the military and the administrative organization designed for providing measures for environmental issues on military posts and mutual support in activities for environmental conservation based on the Ministry of Environment Instruction No. 409. Government-

Military Environment Council is divided into National Environment Council and Local Environment Council, and holds two sessions, one each for the first and second half of the year. National Environment Council is co-chaired by Head of Green Environment Policy Office of the Ministry of Environment and Military Installations Planning Bureau of the Ministry of National Defense, and includes up to nine members appointed by the co-chairpersons as division heads of national

ministries including the Ministry of Environment and environment-related division heads in the Ministry of National Defense and Army, Navy and Air Force. Local Environment Council is co-chaired by a general officer of a homeland reserve division and director of basin-based (local) agency of environment, and includes up to nine members appointed by co-chairpersons as division heads of basin-based (local) agency of environment, relevant officials from local government, and field-grade environment-related officers from Army, Navy and Air Force, and is installed and operated in regions. Government-Military Environment Council conducts consultation on various issues including support to investigation, diagnosis, and assessment needed to preserve environment on military posts, provision of instructors and teaching materials, technological instruction needed to install and operate environmental facilities and equipment, support designation and operation of a military post for environmental demonstration, supply of military manpower and equipment for environmental preservation activities in the region, Clean Land Day with joint participation of private, government, and military sector and underwater cleanup operation, training for defense against chemical attack and terror, entry into military controlled zone for investigation and research on natural ecosystem, and monitoring of regional environmental pollution. Also to actively respond to environmental disasters (involving fuel, chemical, and soil contamination), procedures for responding to environmental disasters are set up and operated for prompt response by the government and the military, while administrative organizations and military posts in specific regions consult one another over various supportive procedures for implementing environment preservation activities including rehabilitation work related to environmental disasters and environmental damage.

Business Council for Environmental Policy

Starting in June 1998, Business Council for Environmental Policy was formed and operated with

representatives from government and business in order to share opinions with business as a directly interested party and strengthen mutual cooperation in the decision-making process related to environmental policy. The Council that launched as an unofficial consultation body officially became Business Council for Environmental Policy with the enactment in July 2000 of Regulation on Business Council for Environmental Policy (as a Ministry of Environment instruction), and eight basin-based (local) agencies also form and operate respective local councils. Business Council for Environmental Policy has been co-chaired by Director of Planning & Coordination Department of the Ministry of Environment and Chair of Environment and Safety Committee (currently Committee on Green Growth, Environment, and Climate) of the Korea Chamber of Commerce & Industry (KCCI), and has 40 or so members including directors of related departments and bureaus of the Ministry of Environment, executives of business organizations, and business CEOs, and holds its regular meeting twice a year in the first and second half of the year. Starting in November 2004, Small and Medium Business Council for Environmental Policy was formed with government representatives and executives of small and medium business cooperatives in business types to publicize environmental policy to small and medium companies and discuss their problems and suggestions. The Council is co-chaired by Director of Environmental Policy Department of the Ministry of Environment and Permanent Vice President of Korea Federation of Small and Medium Business, and holds its regular meetings twice a year. A system for efficient cooperation between government and business is established through Business Council for Environmental Policy and Small and Medium Business Council for Environmental Policy, and especially in the first half of 2011 meeting of Business Council for Environmental Policy were Minister of Environment, Chairman of KCCI, and business CEOs were present to discuss pending environmental issues including the emissions trading and UN Climate Change Conference.

Private and Public Council for Environmental Policy

Civil and Public Council for Environmental Policy is a body for consultation on environmental policy between the government and private environment groups designed for mutual understanding and brisk exchange through the meeting between the government and private environment groups, consultation on principal environmental policies and issues, and promotion of joint investigation and research related to principal pending environmental issues, established in February 2006 in accordance with the Ministry of Environment Instruction No. 652.

Since its establishment, Private and Public Council for Environmental Policy had held a total of eight meetings including 2009, and its six subcommittees had held a total of thirty-one sessions in which views were collected while pending environmental issues and principal environmental policies were discussed. Official operation of Private and Public Council for Environmental Policy was interrupted as private groups participated in candlelight protest and their opposition to Four Rivers Project, and since, meetings

and workshops have been held with a view to resumption of communication and collection of sound policy ideas.

Religious Groups Council for Practicing Environmental Policy

In January 2000, the Ministry of Environment Instruction No. 448 was enacted to form Religious Groups Council for Practicing Environmental Policy with the purpose of ensuring a specific discussion with religious communities for solutions to environmental problems and providing implementation methods. Currently the Council has 12 members participating from seven religious orders of Buddhism, Protestant church, and Catholic church, and since its establishment, the Council has held a total of forty-three sessions in which principal pending environmental issues were discussed while implementation methods were explored. Furthermore, through a variety of seminars and lectures and with the participation of all religious groups, the Council makes a major contribution to spreading on-spot environmental preservation campaign.

12.2.4 Environment-Related Committees

With the amendment of Framework Act on Environmental Policy (amended Feb. 4, 2010), National Advisory Committee on Environmental Preservation was expanded and reshuffled into National Environmental Policy Committee. National Environmental Policy Committee is composed of specialists in environmental policy, natural conservation, water quality preservation, water and sewage, wastes, and environmental protection (150 regular personnel as of 2010). National Environmental Policy Committee has provided advice on the Ministry of Environment's operation plan, method for advancing water quality standards, and plan for developing environmental education. Other environment-related advisory bodies include

Advisory Committee on Sewage, which is a body providing technical advice on drawing up policy on sewage based on Sewerage Act, and Toxic Chemicals Control Committee that deliberates on principal policies related to toxic chemicals based on Toxic Chemicals Control Act.

Other private advisory committees included Ilsahoe, which was launched in April, 1976 as Korea Environmental Issues Council composed of environment specialists and has contributed to state-level environmental protection through provision of environmental information and collection of data domestically as well as internationally, and Association of Retired Former Ministry of Environment Employees.

[Table 12-1] Status of Environment-Related Committees (as of October, 2012)

Serial No.	Name	Principal function	Ground for installation	Composition		Character
				Chair	Membership	
1	National Environmental Policy Committee	Deliberation of matters related to principal environmental policies	Art. 37 of Framework Act on Environmental Policy	Minister and private -sector member	157	Deliberative
2	Environment & Health Committee	Deliberation of principal matters related to environment & health promotion	Art. 9 of Environmental Health Act	Vice Minister	20	Deliberative
3	Toxic Chemicals Control Committee	Deliberation of principal policies related to toxic chemicals control	Art. 7 of Toxic Chemicals Control Act	Head of Environmental Health Policy Division	20	Deliberative
4	Na Committee on Measures for Yellow Dust Storm	Deliberation and coordination for prevention of damage from yellow dust storm	Art. 14 of Clean Air Conservation Act	Minister	19	Deliberative
5	Seoul Metropolitan Region Air Quality Control Committee	Deliberation and coordination for basic plan and implementation plan for air quality improvement in Seoul metropolitan region	Art. 11 of Special Act on Metropolitan Air Quality Improvement	Minister	20	Deliberative
6	Committee for Deliberation of Policy on Water Quality and Ecosystem Conservation	Deliberation of matters related to policy direction and management system for water quality and ecosystem conservation	Art. 10-3 of Water Quality and Ecosystem Conservation Act	Minister	18	Deliberative
7	National Wetlands Committee	Deliberation of establishment and alteration of basic plans	Art. 5-2 of Wetland Conservation Act	Vice Minister	30	Deliberative
8	Natural Parks Committee	Deliberation of matters related to Art. 10 of Natural Park Act	Art. 9 of Natural Park Act	Vice Minister	20	
9	Ecoplex Founding Committee	Deliberation of important matters related to the founding of Ecoplex	Regulation on Ecoplex Founding Committee	Vice Minister and private-sector member	15	Deliberative
10	National Environmental Dispute Adjustment Committee	Environmental dispute adjustment, investigation and analysis of civil complaints, and dispute prevention and resolution	Art. 4 of Environmental Dispute Adjustment Act	Chairperson	15	Deliberative

Serial No.	Name	Principal function	Ground for installation	Composition		Character
				Chair	Membership	
11	Sustainable Development Committee	Deliberation of establishment and alteration, consultation, adjustment, check on implementation of the basic plan on sustainable development	Art. 15 of Sustainable Development Act	Private-sector member	24	Deliberative
12	Environmental Education Promotion Committee	Deliberation of comprehensive plan, and promotion and support of environmental education	Art. 7 of Environmental Education Promotion Act	Minister and private-sector member	20	Deliberative
13	Environmental Education Program Certification and Screening Committee	Development, spread and certification of environmental education program	Art. 14 of Environmental Education Promotion Act	Private-sector member	10	Deliberative
14	Committee for Deliberation of Objection to Environmental Impact Assessment	Deliberation of objection to environmental impact assessment	Art. 20 of Environmental Impact Assessment Act	Director of Nature Conservation Bureau	-	Deliberative
15	Government Committee for Supporting World Conservation Congress 2012	Handling matters requiring government support in relation to preparing and holding of World Conservation Congress and matters related to support for organizing committee operation	Art. 20 of Special Act on the Support for 2012 World Conservation Congress	Prime Minister	15	Deliberative
16	Water Reuse Policy Committee	Deliberation of important matters including policy on water reuse	Art. 7 of Water Supply and Waterworks Installation Act	Vice Minister	20	Deliberative
17	Asbestos Damage Relief Screening Committee	Handling procedure related to screening requested review of appeal on requested examination of asbestos relief	Art. 39 of Asbestos Damage Relief Act	Minister and private-sector member	13	Deliberative
18	Geo-Park Committee	Deliberation of procedures related to certification and operation of Geo-parks	Art. 27-4 of Enforcement Decree of Natural Park Act	Vice Minister	20	Deliberative
19	Asbestos Safe Control Committee	Deliberation of matters related to safe control of asbestos and prevention of damage to health	Art. 3 and 4 of Enforcement Decree of Act on Safe Control of Asbestos	Vice Minister	20	Deliberative

12.3 Table of Environment-Related Laws

12.3.1 Laws Enacted or Amended in 2012

As of June 2012, Act on Preservation and Use of Biodiversity and Act on Prevention of Light Pollution Caused by Artificial Lighting were enacted. And a total

of nineteen laws including Clean Air Conservation Act and Wastes Control Act were enacted or amended. The details of enacted or amended laws are as follows.

12.3.2 Act on Preservation and Use of Biodiversity (enacted)

The Act was enacted to improve the citizens' life and promote international cooperation by aiming at a comprehensive and systematic preservation of biodiversity and a sustainable use of biological resources.

For this purpose, an institutional basis has been secured for establishment of a national strategy on biodiversity,

creation of a national list of biological species, authorization of delivery of biological resources out of the country and a foreigner's application for obtaining biological resources, operation of National Biodiversity Center, sharing of profits from biological resources and protection of traditional knowledge, and management of foreign living organisms harmful to ecosystem.

12.3.3 Act on Prevention of Light Pollution Caused by Artificial Lighting (enacted)

The Act was enacted to ensure citizens' life in a healthy and pleasant environment by preventing the hazards to citizens' health or environment from excessive light radiation from artificial lighting and managing artificial lighting in an eco-friendly way.

To this end, light pollution prevention plan is to be established and implemented every five years and Light Pollution Prevention Committee is to be formed with the

Ministry of Environment, while city mayors and provincial governors are obligated to designate lighting environment management zones to manage light properly in their jurisdiction. Furthermore, acceptable standards for light radiation are to be determined by a Ministry of Environment order, while city mayors and provincial governors are to assess the environmental impact that light has on the surrounding areas, once every three years at the maximum.



12.3.4 Clean Air Conservation Act

The Act specifies procedures for opinion collection including hearings in the establishment of an air improvement plan, and provides for controlling average motor vehicle exhaust emission and inspection of the efficiency of exhaust emission reduction device, while irregular inspection of motor vehicles in operation and

close inspection of emissions have been improved. Moreover, classification of air pollutants has been improved and a more specific measure for suppressing materials that cause change in climatic ecology has been prepared, while regular inspection of exhaust emission from two-wheeled motor vehicles has been enforced.

12.3.5 Waste Control Act

Administrative procedures are simplified for installation of waste treatment facilities that dispose of both food wastes and livestock wastes, while inspection

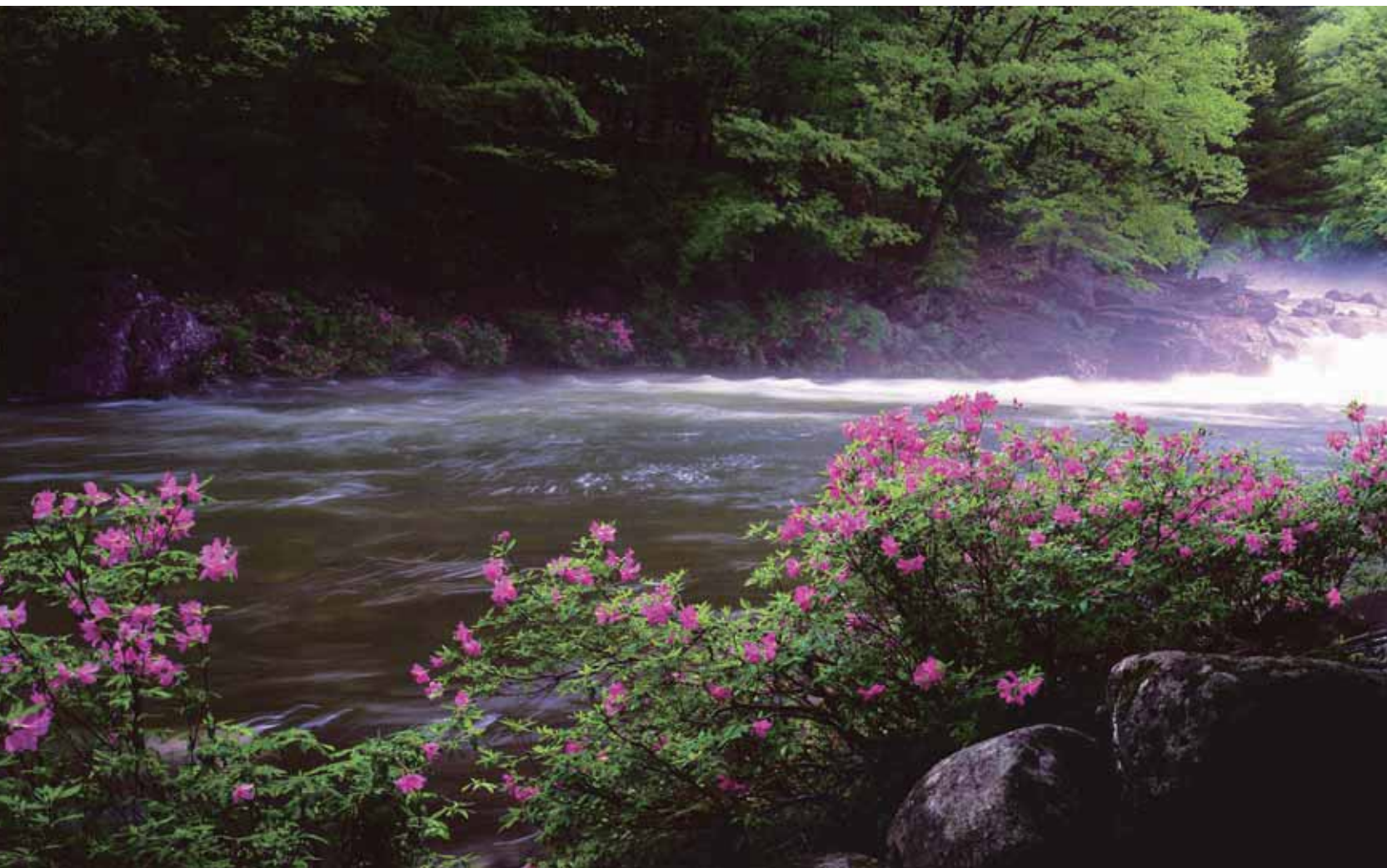
is introduced for termination or closure of wastes disposal facilities and on disposal facilities to be managed beyond termination.

[Table 12-2] History and Status of Environmental Laws

1960 (6 laws)	1970 to 1980 (9 laws)	1990 to 2011 (49 laws)		
		Status	Date of enactment	Last amendment date
Environmental Pollution Prevention Act (enacted Nov. 5, 1963)	Environmental Conservation Act (enacted Dec. 31, 1977)	Indoor Air Quality Control in Public Use Facilities, etc. Act	Aug. 1, 1990	Feb. 1, 2012
		Clean Air Conservation Act	Aug. 1, 1990	May. 23, 2012
		Framework Act on Sustainable Development	Aug. 3, 2007	Jan. 13, 2010
		Environmental Education Promotion Act	Mar. 21, 2008	Mar. 21, 2008
		Environmental Health Act	Mar. 21, 2008	Feb. 1, 2012
		Indoor Air Quality Control in Public Use Facilities, etc. Ac	Dec. 30, 1996	May 25, 2010
		Noise and Vibration Control Act	Aug. 1, 1990	Jun. 9, 2009
		Foul Odor Prevention Act	Feb. 9, 2004	Feb. 1, 2012
		Special Act on Metropolitan Air Quality Improvement	Dec. 31, 2003	Apr. 28, 2011
		Water Quality and Ecosystem Conservation Act	Aug. 1, 1990	Feb. 1, 2012
		Act Relating to the Han River Water Quality Improvement and Community Support	Feb. 8, 1999	May 31, 2010

1960 (6 laws)	1970 to 1980 (9 laws)	1990 to 2011 (49 laws)		
		Status	Date of enactment	Last amendment date
Environmental Pollution Prevention Act (enacted Nov. 5, 1963)	Environmental Conservation Act) (enacted Dec. 31, 1977)	Act Relating to the Nakdong River Watershed Management and Community Support	Jan. 14, 2002	Mar. 21, 2008
		Act Relating to the Geum River Watershed Management and Community Support	Jan. 14, 2002	Feb. 1, 2012
		Act Relating to the Yeongsan & Sumjin River Watershed Management and Community Support	Jan. 14, 2002	May 25, 2010
		Natural Environment Conservation Act	Dec. 31, 1991	Jun. 9, 2009
		Act on Special Measures for the Control of Environmental Offenses	May 31, 1991	Feb. 1, 2012
		Environmental Dispute Adjustment Act	Aug. 1, 1990	Feb. 1, 2012
		Act on Antarctic Activities and Environmental Protection (jointly enacted)	Mar. 22, 2004	Mar. 22, 2004
		Act on the Promotion of the Purchase of Environment-Friendly Products	Dec. 31, 2004	Feb. 1, 2012
		Act on Environmental Test and Examination	Oct. 4, 2006	Feb. 1, 2012
		Environment Improvement Expenses Liability Act	Dec. 31, 1991	May 25, 2010
	Natural Park Act (enacted Jan. 4, 1980)	Asbestos Damage Relief Act	Mar. 22, 2010	Mar. 22, 2010
		Act on Safe Control of Asbestos	Apr. 28, 2011	Apr. 28, 2011
		Natural Park Act	Jan. 4, 1980	Jul. 28, 2011
		Special Act on the Ecosystem Conservation of Islands such as Dokdo Island	Dec. 31, 1997	Jul. 28, 2011
		Wetland Conservation Act (jointly enacted)	Feb. 8, 1999	Mar. 21, 2008
		Environmental Impact Assessment Act	Dec. 31, 1999	Jul. 21, 2011
		Soil Environment Conservation Act	Jan. 5, 1995	Feb. 1, 2012
		Act on the Protection of Baekdudaegan Mountain System (jointly enacted)	Dec. 31, 2003	Mar. 5, 2009
		National Trust Act on Cultural Heritage & Natural Environment Assets (jointly enacted)	Mar. 24, 2006	Mar. 24, 2006
		Special Act on the Support for 2012 World Conservation Congress	May 17, 2010	Nov. 14, 2011
Act Relating to the Protection of Birds, Mammals and Hunting (enacted Mar. 30, 1967)		Wildlife Protection Act	Feb. 9, 2004	Jul. 28, 2011

1960 (6 laws)	1970 to 1980 (9 laws)	1990 to 2011 (49 laws)		
		Status	Date of enactment	Last amendment date
	Environmental Pollution Prevention Corporation Act (enacted May 1, 1983)	Environment Management Corporation Act	Feb. 6, 2009	May 23, 2012
		Act Relating to Special Accounting for Environment Improvement repealed (enacted Jan. 5, 1994; Jul. 22, 2012)		
		Development of and Support of Environmental Technology Act	Dec. 22, 1994	Apr. 28, 2011
Act Relating to Toxic & Hazardous Substances (enacted Dec. 13, 1963)		Toxic Chemicals Control Act	Aug. 1, 1990	Feb. 1, 2012
		Persistent Organic Pollutants (POPs) Control Act	Jan. 26, 2007	Feb. 1, 2012
Water Supply and Waterworks Installation Act (enacted Dec. 31, 1961)	Waste Control Act (enacted Dec. 31, 1986)	Waste Control Act	Dec. 31, 1986	Jun. 1, 2012
		Act on the Disposal of Sewage, Excreta & Livestock Waste (jointly enacted)	Sep. 27, 2006	Feb. 4, 2010
		Act on the Management and Use of Livestock Manure (jointly enacted)	Dec. 8, 1992	Feb. 1, 2012
		Act on the Resource Recycling of Electrical and Electronic Equipment and Vehicles (jointly enacted)	Apr. 27, 2007	Apr. 5, 2011
		Act on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal	Dec. 8, 1992	Mar. 22, 2010
		Act on the Promotion of Construction Waste Recycling	Dec. 31, 2003	Jun. 9, 2009
		Promotion of Installation of Waste Disposal Facilities and Assistance etc. to Adjacent Areas Act	Jan. 5, 1995	Dec. 27, 2007
		Sudokwon Landfill Site Management Corporation Act	Jan. 21, 2000	Jul. 28, 2011
		Compound Waste Treatment Corporation Act (enacted Dec. 28, 1979)		
Sewerage Act (enacted Aug. 3, 1966)		Sewerage Act	Aug. 3, 1966	Feb. 1, 2012
Water Supply and Waterworks Installation Act (enacted Dec. 31, 1961)		Water Supply and Waterworks Installation Act	Dec. 31, 1961	Nov. 14, 2011
		Water Supply Waterworks Installation Act	Jun. 8, 2010	Jun. 8, 2010
		Management of Drinking Water Act	Jan. 5, 1995	Jun. 1, 2012







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