I·SEOUL·U

02

Seoul Solution for Urban Development

Housing
Environment

2015

SEOUL METROPOLITAN GOVERNMENT

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Housing

1. Seoul's Public Lease Housing Policy

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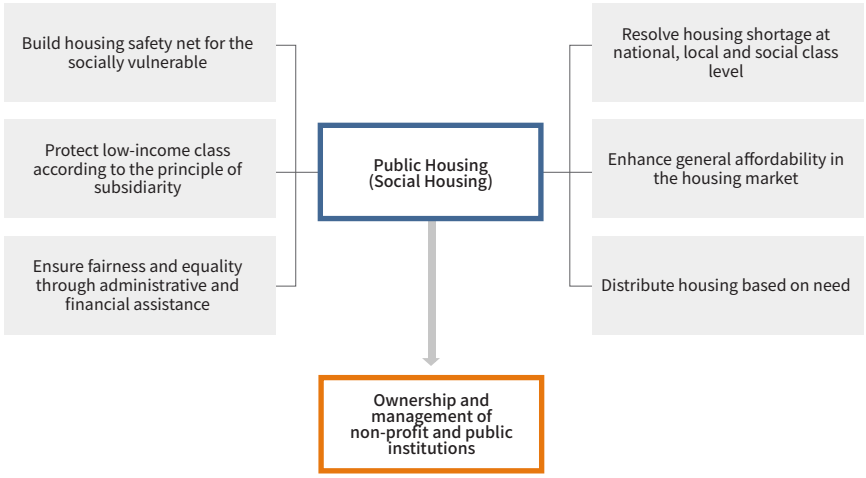
Policy Area: Housing

Policy Background

Generally, public lease housing or social housing is provided to the social class that has difficulty acquiring adequate housing in the private sector housing market. In countries where social welfare is not well developed, the government builds or purchases units to provide as public housing. Every society has a class of people who are in need of assistance with housing, as they do not have the financial wherewithal to provide it alone. Of course, this most often refers to those below the poverty line and low income earning households, and it is these people that public lease housing is meant to assist.

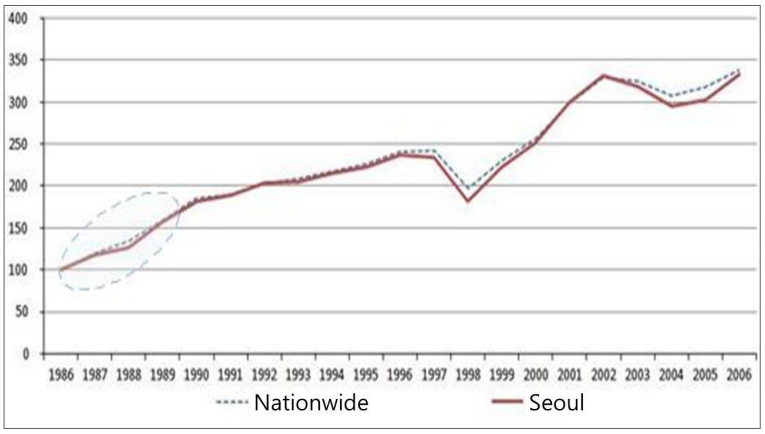
Figure 1 - Significance & Purpose of Public Lease Housing



In South Korea, the provision of public housing began in earnest in the late 1980s. From the 1960s, Seoul and the metropolitan area saw a concentrated inflow of people; the city's population quadrupled from 2.435 million in 1960 to 9.626 million in 1985, depleting the land available for development. In 1985, the Joint Redevelopment Program was launched in existing residential areas by private entities. At the same time, the economy was booming. International trade turned to surplus and stock prices skyrocketed, along with wages and housing and other prices. After the 1988 Olympics, private apartments soared in price, leaving many people incapable of affording a place to live. In National Assembly elections the same year, the ruling party lost, and blamed the housing issue as one of the reasons. The government then came up with a plan to build 2 million houses, a dramatic increase in the housing supply. This plan included the construction of various types of public housing – permanent lease housing, long-term lease housing, and lease housing for workers. Besides skyrocketing lease and housing prices, the background to public housing for the low-income classes during this period included strong resistance from tenants as they were evicted due to city improvement plans, the government's sense of urgency due to the heated political campaigns, and the absolute number of housing units failing to keep pace with the increasing number of households in the 1980s. The chronic housing shortage grew even worse; in 1987, the housing supply rate was 69.2% nationally, while the number

was considerably lower in Seoul, standing at 50.6%. Prices were exacerbated by the inflow of surplus funds into the real estate market, and in particular, lease prices (jeonse) increased by 60% between 1986 and 1989 alone.

Figure 2 - Lease Price (Jeonse) Index (1986.12=100)



Source: Kookmin Bank, KB Housing Price Trend, (http://nland.kbstar.com).

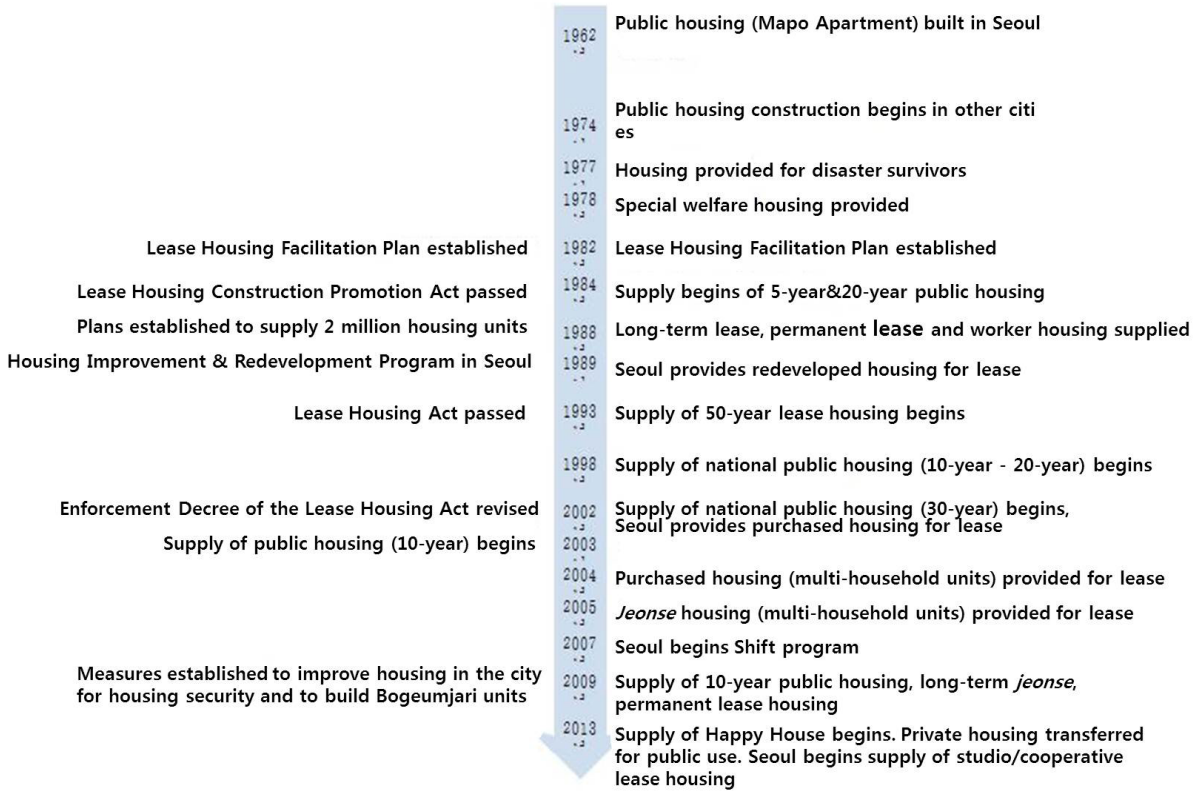
Due to the soaring housing and lease prices, stability of the housing market became a serious social issue. Numerous tragedies occurred where tenants committed suicide due to the financial distress caused by the skyrocketing cost of housing. While real estate prices were buoyed up by the economic boom in the late 1980s, suffering doubled of people in the low-income classes already experiencing housing insecurity. Conflict between landowners and tenants grew bitter. As the housing issue became one of the most serious causes for societal conflict, it added fuel to other issues, such as labor disputes, demands for wage increases, financial investment, and unstable prices, to name a few. In addition to this, tenants evicted from their homes also posed a severe problem. Because they could not pay the high housing costs, they were pushed away to basement apartments, poor neighborhoods and the city outskirts. They were resentful, and this resentment led to crime.

The permanent lease housing program that began in 1989 aimed to supply public housing to tenants who met the statutory requirements to be considered low-income earners, selected based on the need for housing, not the ability to pay. In the meantime, the City of Seoul revised its Guidelines for the Housing Improvement & Redevelopment Program to build lease housing for tenants as part of the housing redevelopment program. Associations of developers and residents would build the houses for lease within redevelopment districts, and the City of Seoul would purchase these to lease to the tenants.

In 1993, the 50-year public housing program was introduced. The government's financial burden was reduced to 50% and that of the tenants increased to 30%; the remaining 20% was financed by the National Public Housing Fund. From 1998, the supply of 10-year and 20-year public housing started. In 2002, the policy was modified and the housing leases became 30-year leases, but the government's financial burden was reduced to the 10 - 40% range.

Seoul, in need of housing sites, began to purchase existing housing units in 2002 to provide them as public housing. From 2007, the city utilized the housing reconstruction and other programs to supply long-term jeonse housing (SHift) that included the middle class as eligible candidates. SHift targeted the middle class and non-homeowners with actual need and provided medium to large housing units (59 m², 84 m², and 114 m²), for long-term jeonse[1], rather than monthly rent and a smaller deposit. At the time, national lease housing absorbed into SHift and receiving financing from the National Public Housing Fund or other government organizations was limited to the lowest income quartile; other national lease housing was open to anyone, regardless of their income

Figure 3 - Changes in the Public Housing System



1. The new jeonse-type public housing ensured up to 20 years of lease at 80% or less of the market jeonse amount for the area.

Major Public Housing Policies

Public Housing Stock in Seoul

As of December 2013, the public housing stock in Seoul amounted to 216,000 units. Of these, 155,000 were supplied by Seoul (through the SH Corporation), about 70% of all public housing in Seoul. The central government (through the LH Corporation) supplied the remaining 61,000 units. By type, the number of 50-year public housing units, including redeveloped lease housing, was highest, at 77,000 units (35.6%), followed by permanent lease housing units (48,000 or 22.1%). The remaining units were long-term jeonse housing (12.2%), national lease housing (10.1%), and purchased housing available for lease (7.2%).

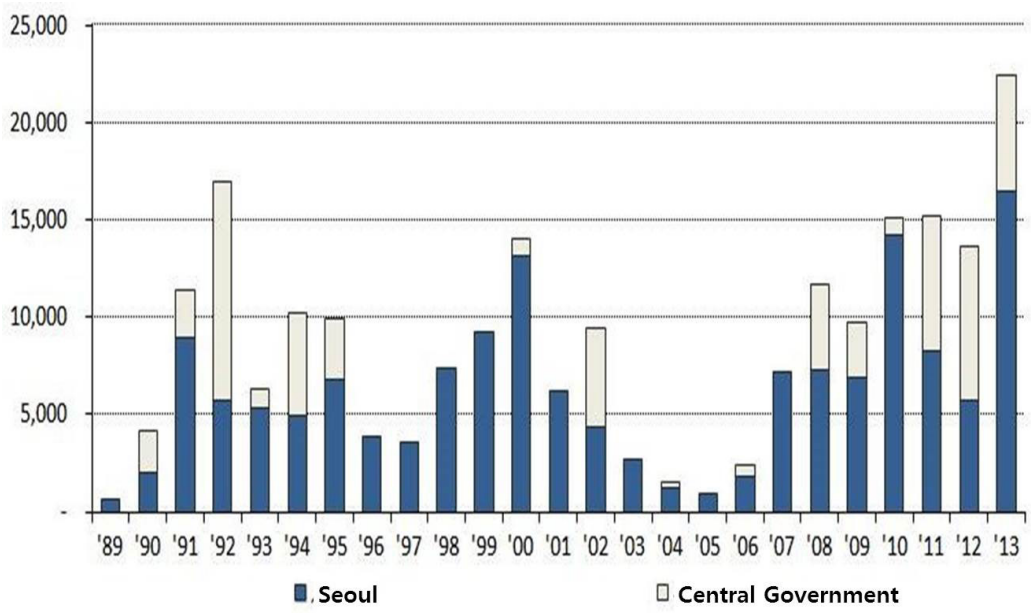
Table 1 - Public Housing Stock in Seoul (December 31, 2013)

(Unit: Housing Units)

Category	Permanent Lease	50-year Public Lease	National Lease	Purchased Housing for Lease	Long-term Lease	Others	Total
Stock	47,672	76,946	21,724	15,623	26,303	27,632	215,900
Percentage (%)	22.1	35.6	10.1	7.2	12.2	12.8	100.0

Source: Internal documents, Seoul Metropolitan Government, 2014.
Note: 50-year public lease housing includes redeveloped lease housing.

From 1989 to 2013, an annual average of 8,636 public housing units were built and supplied in Seoul; in the years 1991 - 92, 1994, 2000, 2008, and 2010 – 13, an average of 10,000 or more units were supplied a year.



Dual-Sourced & Residual Lease Housing System

In advanced European nations, the percentage of public lease and social housing hovers around the 10% level. In South Korea however, public housing accounts for only 5%. Public housing is provided to the socially vulnerable and low-income earners at a considerably lower lease than available in the private sector. In other words, the public and the private sectors are independent of each other in this area. The South Korean system of lease housing is a typical dual-sourced or residual model. Under this system, the government provides financial assistance for the construction and supply of public housing, which is made available to those financially incapable of providing housing without assistance. Candidates are income- and asset-tested to determine their eligibility to move in. Under this system, public housing policy regards tenants more as persons needing protection than as customers, which can be seen in the residual housing policies and benefits.

Table 2 - Types of Public Housing Policy

Category		· Single System/Universal Model	· Dual System/Residual Model
Nature		· Living standards and housing choices for the middle class are deemed as important as those of the low-income class.	· Provided as a social safety net for the so-cially vulnerable and the low-income clas-ses.
Lease		· Lease is lower than in the private market, but the difference is not substantial.	· Lease is considerably lower than in the private market.
Non-profit, Private		· NPOs own, operate and manage public housing (social housing).	· The percentage of NPO ownership of pub-lic housing (social housing) is significantly lower.
Housing Features	Percentage of Pub-lic Housing for Lease	· Relatively high	· Relatively low
	Relationship with Private Lease	· Integrative, competitive	· Separate, isolated
	Percentage of Owned Units	· Relatively low	· Relatively high

Welfare System	· Social democra-cy · unionism	· Liberalism	· Undeveloped · elementary
Countries	· Sweden, Finland, Germany, Netherlands, France	· UK, USA, Australia, Japan, South Korea	· Spain, Greece, Portugal
Main Agenda	· Residual/ownership pressure	· Demand for social integration due to isolation	

Under this dual-sourced or residual model, the City of Seoul has supplied various types of public housing, such as permanent lease housing, 50-year public housing (including redeveloped lease housing), national lease housing, purchased housing for lease, and long-term jeonse housing.

Table 3 - Financing & Eligibility for Public Housing Programs in Seoul

Type (Net Area)	Program Entity	Financed by	Lease Period	Policy Target (Tenant)
Permanent Lease (40 m^2 or less)	Central Government (LH Corp.) City of Seoul (SH Corp.)	· Central and local government: 85% · -Tenant: 15%	Permanent (indefinite)	· Benefit recipients as per the National Basic Livelihood Security Act · Low-income single-parent families, veterans, etc. · Holders of apartment savings accounts
50-year Public Housing (60 m^2 or less)		· 1992 – 93: government 50%, the Fund 20%, tenant 30% · From 1994: The Fund financed by scale	50 years	· Holders of apartment savings accounts · Others subject to special supply conditions (veterans, evicted residents, the disabled, etc.)
National Lease Housing (60 m^2 or less)		· Government financing 10 – 40% · Housing Fund 40 – 50% · Program entity 10% · Tenant 10 – 30%	30 years	· Income level: Non-homeowners earning up to 70% of the average household monthly income for urban workers in the previous year. · Other assets and vehicle ownership are taken into account.
Long-term Jeonse Housing (115 m^2 or less)		· For former national lease housing: identical to national lease housing financing structure. · Financing for the remainder is 100% by the program entity	20 years	· 60 m^2 or less: Non-homeowners earning up to 100% of the average household monthly income for urban workers in the previous year. · Over 60 m^2 to 85 m^2: Non-homeowners earning up to 120% of the average household monthly income for urban workers in the previous year. · Over 85 m^2: Non-homeowners earning up to 150% of the average household monthly income for urban workers in the previous year.
Purchased Housing for Lease (No limit)		· Government financing 45 – 50% · Housing Fund 45 – 50% · Tenant 5%	Up to 10 years	· Non-homeowners residing in the program target area. · 1st Priority: National Basic Livelihood Security Benefit recipients, low-income single-parent families. · 2nd Priority: the disabled, non-homeowners earning up to 50% of the average household monthly income for urban workers in the previous year.

Note: The percentage of contribution for the national lease housing scheme differs by type of assistance.
Source: SH Corporation Website (www.i-sh.co.kr); LH Lot Sale. Lease/Subscription System Website (myhome.lh.or.kr).

Permanent Lease Housing

Policy Outline

It can be said that permanent lease housing is Korea's first public housing in its true sense. Indeed there were public housing units before the emergence of permanent lease housing, but because they were leased on the condition that the tenants purchase them after a specific period of time, it cannot be said that they held

as much importance in terms of social policy. Permanent lease housing was first created out of the 1988 plan to build 2 million housing units. One of the goals of this plan was to supply 250,000 units of permanent lease housing, but in reality, 190,000 units were supplied between 1989 and 1993. Of these, 140,000 were supplied by the central government (through the LH Corporation) and 50,000 by the local governments. At the time, 47,000 permanent lease houses were supplied to Seoul– a quarter of the total, with two-thirds to other cities (Busan, Daegu, Gwangju, Daejeon, Ulsan and Incheon). Built to house low-income urban dwellers, permanent lease housing was usually built as a large complex of apartments. They were mostly located on the outskirts of a city, with small unit sizes of between 23 m^2 and 45 m^2.

Some 85% of the cost for the permanent lease housing program was financed by the government, with tenants responsible for the remaining 15%. Contrary to the original plan, the permanent lease housing program was suspended after supplying 190,000 units in 1993 but was resumed in 2008, supplying only a small number of units.

Policy Summary

Because permanent lease housing mainly targets the poorest class, the cost of leasing is a maximum 30% of market rates, taking into account the financial wherewithal of the residents. Priority is given to the socially vulnerable (National Basic Livelihood Security Benefit recipients etc.). In some cases, non-homeowners who made 50% or less of the average monthly income for urban workers in the previous year are placed at the bottom of the list. The lease contract is renewed or cancelled every 2 years, with National Basic Livelihood Security Benefit recipients usually able to stay. Even if the tenant loses eligibility for the National Basic Livelihood Security Benefit scheme, they are allowed to stay if they can pay the 30% increase in lease amount at the time of contract renewal.

The Permanent Lease Housing Program also rents out store space within the complex to reduce residents' housing management fees. Moreover, non-polluting apartment-type factories, shared workplaces for female workers, and job information centers are provided to assist tenants in finding work and securing a source of income.

Moving-in Process

By statute, permanent lease housing is for low-income earners, but not all are able to move in. Eligible candidates submit a permanent lease housing application and go on a standby list. If there is no housing in the desired area, or if the number of household members exceeds the amount of available housing, the candidate may be denied.

Figure 5 - Permanent Lease Housing: Moving-in Process

Evaluation

Permanent lease housing is significant in that it was the first type of public housing, introducing the concept of social welfare into the housing policy. This program however could not be maintained and was suspended after supplying only 190,000 units of housing, due to the lack of demand for this housing, even though the program was designed to assist the lowest income class. This lack of demand can be attributed to the reasons in the following paragraphs.

First, permanent lease housing complexes were not located in built-up areas where the targeted people could easily find jobs. Because the government wished to build large complexes within a limited timeframe, suitable housing sites were difficult to find in such areas, resulting in development occurring in the outskirts, where land was more affordable. Those in the lowest income class were simply unable to move away from the city (where the jobs were) to the outskirts where the permanent lease housing was built. Transportation and distance between work and potential home resulted in vacancy. The original plan to build 250,000 units was modified to 190,000, but this did nothing to resolve the vacancy issue. In the end, the eligibility requirements had to be eased.

Second, the permanent lease housing program was not designed with demand in mind. For instance, units were just too small to accommodate large families, even if they were financially constrained. Moreover, the lease amount was not determined by household income but by housing location. Those who could not afford the area could not move in.

Third, permanent lease housing, located in the outskirts as they it was, resulted in the areas being isolated and led to quicker deterioration of the living environment. Currently, the widespread perception is that permanent lease housing is a place where the lowest income class is concentrated. Such social isolation of permanent lease housing residents surfaced as a serious social problem. Although a social welfare center was mandatory for permanent lease housing complexes, the services provided by the center were insufficient to properly respond to the social issues.

50-year Public Housing (Including Redeveloped Lease Housing)

Policy Outline

The 50-year Public Housing Program was launched in 1992 to replace the Permanent Lease Housing Program after completion. The plan to build 2 million housing units helped stabilize housing prices until the mid-1990s, and the rise of jeonse prices also slowed compared to the 1980s. Plans were put in place to shift from government-led to private sector-led provision of housing to ensure a steady supply, and particularly focused on fostering the private lease market. During this period, the overarching trend was that private entities would borrow from the National Public Housing Fund to build the housing, which would be leased for 5 years and then sold to the tenants. Such a trend continued, boosted by policies aiming to revitalize the construction market amidst the Asian financial crisis in 1998. The public sector's reduced role put an end to the Permanent Lease Housing Program, and the 50-year Public Housing Program was launched instead.

When the 50-year public housing was first supplied, the government financed 50% of the total cost, the National Public Housing Fund 20%, the program entity 10%, and the tenants 20%. This public housing program was designed as a follow-up to permanent lease housing, but government financing ceased in 1994 due to trends towards privatization. This inevitably pushed the National Public Housing Fund share up to 70%, on top of the interest burden. By 1995, the central government's 50-year Public Housing Program was effectively suspended, with completed units numbering 39,000.

In the meantime, the City of Seoul built lease housing for tenants as part of the Housing Redevelopment Program and began using the units for the 50-year Public Housing Program in 1989. The Housing Redevelopment Program generally began with full-demolition of an area, resulting in other area tenants feeling threatened. Redeveloped lease housing aimed to secure housing stock for these tenants and their housing stability as well as to realize a return on the investment. In this context, the City of Seoul ensured that a certain percentage of houses in the redevelopment area were comprised of lease housing for tenants. Thanks to this program, the City of Seoul maintains the percentage of its public housing at 6% of the total stock, relatively high compared to other cities.

The Redeveloped Lease Housing Program was carried out in the following way: a redevelopment association would have lease housing for tenants constructed in the redevelopment area and the City of Seoul would purchase these units to lease them out to the tenants; or the City of Seoul would build lease housing for tenants in the land provided by the redevelopment association in the redevelopment area and then lease them out to the tenants. In the beginning, the program was operated in accordance with the internal administrative guidelines of the City of Seoul, but from 2005, lease housing supplied through the redevelopment program was not confined to Seoul but included the entire country. Since then, the redeveloped lease housing has also been financed by the government, and the purpose of the program broadened from only provisional housing for evicted tenants to low-income family housing as well.

Policy Summary

Initially, the 50-year public housing units were 50 m² or smaller in terms of net area. Eligible residents were those with higher income or more assets than those eligible for permanent lease housing, specifically those people earning up to 70% of the average monthly income for urban workers. The 50-year public houses were only for lease; they were not up for lot sale at a later time. The contract renewal was every 2 years, and lease was a maximum of 60% of the market rate.

Redeveloped lease housing mainly targeted evicted tenants, and this was the biggest difference from other types of public housing. However, evicted residents were not the only ones eligible. From 2003, the City of Seoul opened eligibility to include those on the permanent lease housing waiting list, eligible candidates for 50-year public housing, and holders of apartment savings accounts when there was vacancy in redeveloped lease housing.

Evaluation

The location of the 50-year public housing units differed according to the program of which they were a part – site development or redevelopment. In the former, the living environment was quite favorable as the units and infrastructure (schools, roads, parks, etc.) were developed uniformly according to a comprehensive plan. However, some of the redevelopment programs did not have such favorable conditions as they disregarded the geographic and topographic characteristics of the location. Moreover, excessive emphasis on development of new housing and the lack of improvement to amenities and infrastructure prevented improvement to the surrounding environment.

In 1995, the central government's 50-year public housing program came to an end. Since then, the 50-year public houses were built and provided only for lease as part of the Housing Redevelopment Program. The main target of the redeveloped lease housing scheme was mostly evicted tenants, which made the income and length of residence requirements rather ambiguous. In other words, priority was given to tenants evicted from the corresponding region regardless of income. This meant that households with the ability to find a home on the market were also eligible while there were low-income tenants who could not afford the lease. These tenants could not secure housing through the redeveloped lease housing scheme and had to opt for the migration assistance scheme instead. In the end, the program that aimed to assist tenants evicted from the redevelopment area ended up housing households that could afford housing at market prices but pushed those households that could not to other regions.

National Lease Housing

Policy Outline

National lease housing is a public housing program introduced to ensure housing security for low-income families in 1998 when the nation was hard hit by the Asian financial crisis that threatened many jobs and

homes. In February 1998, the government came up with its "100 National Agenda" and planned to build 500,000 units of lease housing, including 100,000 houses for permanent lease which would be financed until 2002. However, the Asian financial crisis brought economic instability, job market volatility and skyrocketing interest rates. Moreover, Korea had accepted IMF aid and had to adopt belt-tightening measures. The plan had to be changed, and the construction of permanent lease housing was abandoned. The government decided to reduce what it had to pay for and build 50,000 units of national lease housing. Faced with austerity measures, massive restructuring and unemployment, the lowest income classes needed lease housing. The government wanted something that was less expensive than permanent lease housing but provided stability for low-income earners. As a result, the National Lease Housing Program was adopted.

By late 2000, the economy began to recover. Housing prices which had plummeted during the financial crisis turned upward in 2001. However, lease prices also quickly began to catch up with housing prices, mainly due to excessive regulations and insufficient housing supply after the crisis. In April 2002, a plan was developed to build 500,000 national lease housing units. By May, this number was increased to 1 million units. In September 2003, it was announced that 1.5 million long-term public housing units would be built, including 1 million national lease housing units. It was decided that the National Lease Housing Program would be financed in this way: 30% by the government; 40% by the National Public Housing Fund; 20% by tenants; and 10% by the program entity (local government and the Land Corporation).

Policy Summary

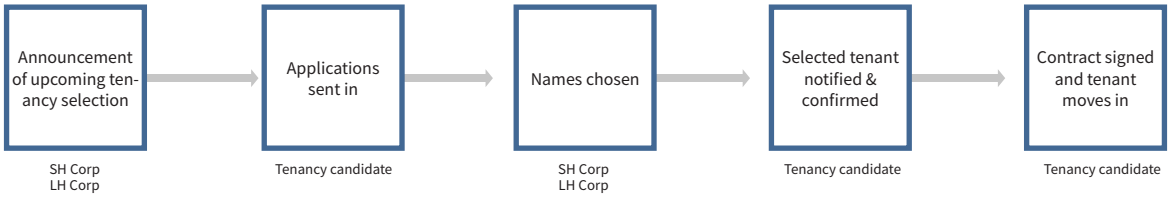
The National Lease Housing Program targets tenants who earn a higher income than those in the Permanent Lease Housing Program. While the Permanent Lease Housing Program was for the first and second deciles, national lease housing is for the lowest-income class in the bottom quartile. Eligible candidates included non-homeowners earning up to 70% of the average monthly income for urban workers in the previous month, with priority given to households earning 50% or less. The maximum net area of national lease units is 60 m^2, with the lease price 50 – 80% of the market rate.

When the program was first introduced, the mandatory period of lease was 10 years (net area: 60 m^2 or smaller) and 20 years (net area: 50 m^2 or smaller). In 2003 however, these were changed to 30-year leases to transition the program into a long-term public housing scheme. To allow tenants to move into an affordable unit of an appropriate size, the target candidates, unit size and percentage of financial contribution were diversified. Lease rates were also differentiated.

Moving-in Process

Candidates for national lease housing are drawn by lot from the list of subscribers. When an announcement is made that tenants will be chosen for the National Lease Housing Program, people may apply. Eligibility is determined by score, with lots drawn to choose from those eligible.

Figure 6 - Moving-in Process: National Lease Housing



Evaluation

In some respects, national lease housing was used as a means to overcome the financial crisis; this can be seen from the fact that the originally-planned 50,000 units were increased to 1 million in 2002. Some critics announced that the government's public housing policy was inconsistent and improvised according to the political situation and market environment. Others argued that the plan at first was a short-term measure to bring stability but was changed to propose more fundamental mid-to long-term measures to address the worsening housing situation. From 2003 to 2007, the National Lease Housing Program supplied 467,000 houses nationally, contributing substantially to better housing for low-income earners who could not afford to buy. However, the supply of affordable public housing was still insufficient, limiting home ownership to an extent. In Seoul, the supply was low due to the shortage of housing sites and the high cost of land.

Purchased Housing for Lease

Policy Outline

Purchased housing for lease allows the poverty and low-income classes to reside in their current location with the current income by purchasing existing buildings and leasing them out at an affordable price. This program was unique in that it supplied a small number of units across regions and prevented social isolation in existing public housing programs from moving into large complexes. In 2001, the City of Seoul announced its plans to build 100,000 units of public housing over the next 8 years, and the Purchased Housing for Lease Program, begun in 2002, was a way for the City of Seoul to secure a stock of public housing. The Purchased Housing for Lease Program aimed to supply more public housing to stabilize lease prices and improve significantly deteriorating multi-household buildings. The City of Seoul implemented this program on its own through the SH Corporation, but financing and management difficulties led to suspension of the program in the pilot phase, within 2 years.

However, the central government reviewed Seoul's Purchased Housing for Lease Program, established its own pilot program in 2004, which began operation the following year. In this program, the LH Corporation or the local governments purchased units in the city to lease them out; sometimes, through the National Public

Housing Fund, they bought houses built by private sector entities that had gone bankrupt. When it became an official public housing program of the central government, the program no longer suffered from poor funding as it had under local governments. The City of Seoul reintroduced this program in 2007, with 45% financed by the government, 50% by the National Public Housing Fund, and 5% by the program entity.

Policy Summary

The tenants of purchased housing for lease can renew every 2 years up to 4 times, for a total of 10 years. The types of housing supplied by the City of Seoul include: multi-household, studio, and Hope Housing. Multi-household housing targets non-homeowners who reside in the City of Seoul. Top priority goes to recipients of the National Basic Livelihood Security Benefit and single-parent families, with second priority going to households that earn up to 50% of the average monthly income for urban dwellers. Studio housing targets single persons presently without a residence and living in the City of Seoul. Top priority goes to households that earn up to 50% of the average monthly income for urban dwellers, with second priority given to households that earn up to 70%. Hope Housing provides purchased housing to university students at an affordable price. Assuming that eligibility is maintained, tenants can live there for up to 4 years. Eligible persons include: recipients of the National Basic Livelihood Security Benefit and their children; children of the lowest and second lowest income percentiles; and children of households that earn up to 50% of the average monthly income for urban dwellers.

Housing lease rates when the City of Seoul first initiated the program were linked to market rates, unlike other public housing programs. Lease rates also varied by housing location; if the surrounding environment was good and the market rate was high, the lease rate was also higher than that of other public housing. When it became the official program of the central government, lease rates were calculated in the same way as for permanent lease housing: usually a maximum of 30% less than the market rate.

Table 4 - Eligibility for Seoul's Purchased Housing for Lease Program

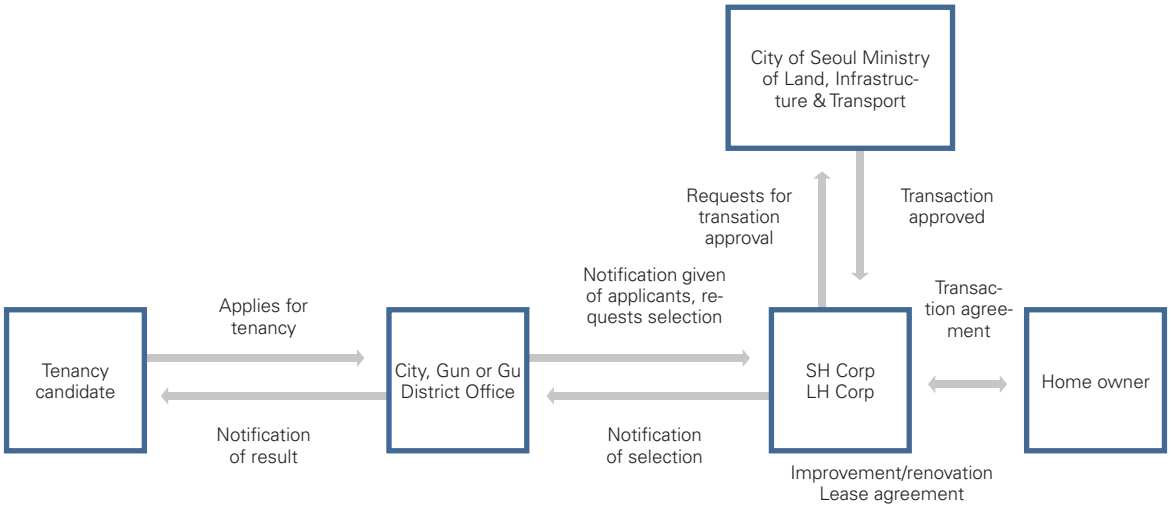
Category	Multi-household Housing	Studio Housing	Hope Housing
Priority 1	· Recipients of the National Basic Livelihood Security Benefit · Single-parent households	· Households earning up to 50% of the average monthly income for urban dwellers.	· Benefit recipients or their children, residing in regions other than Seoul. · Persons leaving children's welfare facilities.
Priority 2	· Households earning up to 50% of the average monthly income for urban dwellers. · The disabled: Households earning up to 100% of the average monthly income for urban dwellers.	· Households earning up to 70% of the average monthly income for urban dwellers.	· Children whose parents are in the lowest income percentiles, residing in regions other than Seoul.
Others	-	-	· Children of households earning up to 50% of the average monthly income for urban dwellers, residing in regions other than Seoul.

Note: permanent lease housing tenants are excluded.

Moving-in Process

The moving-in process for this type of public housing involves the LH Corporation or the SH Corporation purchasing the existing houses with central/local government approval and selecting tenants from the eligible applicants.

Figure 7 - Moving-in Process: Purchased Housing for Lease



Evaluation

Purchased housing for lease is a public housing program welcomed by many tenants as it allows low-income earners, students and people just joining the workforce to live close to where they work or study. However, the supply cost per unit is higher than other types of public housing, and comes with efficiency issues, among others, in managing the facilities and tenants. When private units are used, the home owner (the entity) selects the tenants and supplies the units for lease, but with purchased housing, the local government is responsible for selecting the tenants and housing is supplied through the SH Corporation or LH Corporation (the entity). In other words, the supply of public housing is dual-sourced. Because housing is only provided to the policy target with priority, some people do not know they are eligible. Some candidates in the top priority give up their lease to move into housing that meets their expectations.

From the perspective of management, this type of housing is a problem as maintenance is not adequately done. Generally, maintenance is easier with apartment types of public housing, but these purchased houses, dispersed across different regions, are expensive and time-consuming to maintain. Furthermore, tenants living in the purchased housing do not benefit as much from welfare services. To address this issue, multiple units need to be purchased within the same region, improved or renovated, and supplied in groups of lease housing.

Long-term Jeonse Housing (SHift)

Policy Outline

Long-term jeonse housing was a public housing program introduced by the City of Seoul in 2007, ensuring up to 20 years of lease at 80% or less of the jeonse rate in the surrounding areas. The program leases out medium to large units (net area: 59 m², 84 m², 114 m²) as jeonse to the middle class and non-homeowners with actual demand. It began with an aim to change the housing paradigm from "ownership" to "residence". To reflect this desired change, the City of Seoul named its long-term jeonse housing program "SHift".

Policy Summary

At its start, the Long-Term Jeonse Housing Program had 3 sources of supply. First, the former national lease housing units (net area 59 m²), planned to be part of the National Lease Housing Program were transferred to the SHift program. Second, the former public housing units (net area: 59 m², 84 m², 114 m²), built to be sold by Seoul's SH Corporation to the general public, were transferred to the SHift program. Lastly, the housing units (net area: 59 m², 84 m²), built as part of the reconstruction program of multi-unit housing, were transferred to the SHift program.

It can be seen that in the beginning, it was only the former national lease housing that targeted the lowest-income class of the lowest income quartile while the rest gave eligibility to the middle class as well as high-income earners. Critics argued whether it was necessary to provide public housing to high-income earners, whether the housing size was excessive, and whether existing home owners should be eligible to apply for public housing.

Figure 8 - Eligibility for Seoul's Long-term Jeonse Housing by Income Percentile (Early Years)

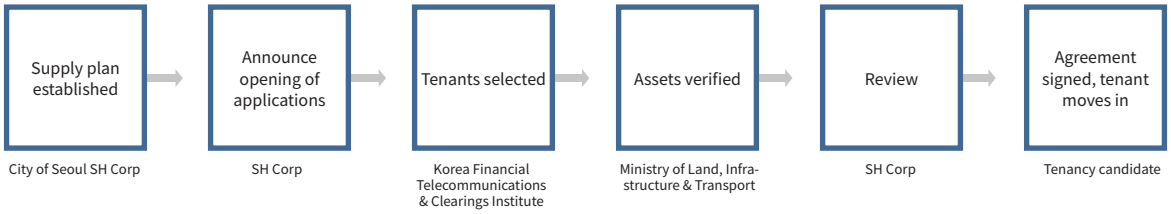
Income Class (Income Decile)	Percentage Against Average Income for Urban Workers	SHift (Long-term Jeonse Housing)	Existing Public Lease Housing Policies
High (9th - 10th)	150% or more	Housing to be sold later, Purchased housing for lease in redevelopment(net area: 114m²)	<Find a home on the private market>
Middle - Upper Middle (7th - 8th)	Between 100% and 150%	Housing to be sold later, Purchased housing for lease in redevelopment(net area: 114m²)	National lease housing (net area: 60m² - 85m²) *Not supplied
Middle - Lower Middle (5th - 6th)	Between 70% and 100%	Former national lease housing (net area: 59m²)	National lease housing (net area: 60m² or less) 50-year public housing for lease (including redeveloped housing for lease) Permanent, purchased housing for lease
Low (3rd - 4th)	Between 50% and 70%		
Poor (1st - 2nd)	Up to 50%		

Responding to such criticism, the City of Seoul modified SHift eligibility in 2011 based on academic studies in a direction that would help enhance housing availability for those in the low-income classes and middle class without a home. As a result, SHift housing was supplied to non-homeowners earning less than the middle class, depending on income and asset tests. Currently, the former national lease housing units are provided to non-homeowners in the lowest income quartile. As for the former public housing to be sold later or the purchased housing in redevelopment, the smaller units (net area: 60 m² or less) are leased out to households that earn up to 100% of the average monthly income for urban workers, while the larger units (net area: above 60 m² to 85 m²) are leased out to households that earn up to 120% of the average monthly income for urban workers. Units with a net area exceeding 85 m² are for those that earn up to 150%, but supply of such units will not continue.

Moving-in Process

As with other public housing, prospective tenants of long-term jeonse housing need to apply. Priority is determined by applicant income and assets.

Figure 9 - Moving-in Process: Long-term Jeonse Housing



Evaluation

Traditionally, the public sector has directly supplied public housing for the housing stability of the low-income classes as well as to the middle class so they may purchase the unit later. SHift (long-term jeonse housing) is different in that public housing is supplied to those in the middle class or higher to change the perception of house "ownership" to "residence". One of its positive impacts is that the City of Seoul continues to promote the Long-Term Jeonse Housing Program and has helped to reverse the negative image that public housing is for low-income earners only. In this context, the central government introduced Seoul's Long-Term Jeonse Housing Program in 2008 as one of its official public housing programs.

However, prospective tenants require a sizable sum of money as deposit for the long-term jeonse unit, which is a great burden on low-income earners who cannot afford to save. Indeed, one of the criticisms of SHift is that the program used public funds to provide for the middle class, when those funds should have been used to help the low-income classes. Others see the program as unfair and damaging to the public interest because it leases medium to large units to the middle or higher income classes but has failed to secure sufficient stock for the low-income classes.

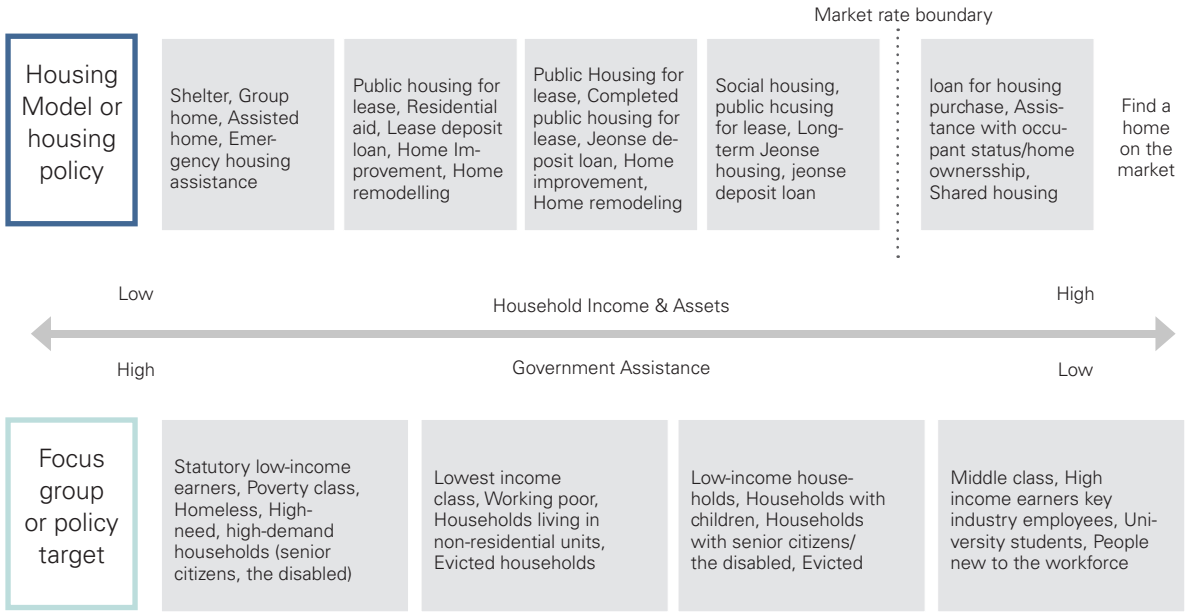
Issues during Implementation

In South Korea, public housing has successfully supplied housing for lease at an affordable rate lower than the market rate, thereby enhancing housing security and easing living costs for low-income non-homeowners. While public housing is welcomed by many, new programs were introduced whenever there was a change of administration, throwing the policy targets into confusion. While the central government was making decisions on eligibility, lease rates, financing, assistance and volume of supply, the following issues surfaced:

First, public housing is provided to the lower income quartiles based on average monthly income of an urban worker household comprised of 2 or more people; by average monthly income of all households, including single-person households, this equates to the sextiles. Moreover, the disabled, evicted residents, and hold-

ers of apartment savings accounts can move in regardless of their income, creating an issue of fairness. However, many advanced countries with liberal/unionist welfare systems have recently been expanding eligibility requirements to include not just the public housing policy targets or focus groups, but also university students, new employees just joining the workforce, and even high-income earners.

Figure 10 - Generalization of Housing Model & Focus Group



Second, the calculation of lease differs by public housing type, but the basic approach is a rate based on construction costs, potentially causing problems of fairness for the tenants and negatively affecting the financial health of the program entity. Generally, public housing leases can be divided in the following way: ① a cost-based lease, based on the cost of providing and operating the unit; ② a value-based lease, based on unit characteristics; ③ an income-based lease, based on tenant income level; and ④ a market-based lease, based on leases of nearby comparable units on the market. However, the calculation of leases in Korean public housing is mostly linked to construction costs and includes financial assistance and subsidies at the point of construction. Therefore the lease amount can vary depending on the size of government subsidies and other forms of assistance. Leases were very low on units supplied at a time when government aid was abundant and it was cheaper to purchase the site and borrow from outside, while leases were higher on units supplied when less government aid was available and dependence on external borrowing was high. Sometimes leases varied greatly, even in the same region. Because the focus was on supply, financial assistance and subsidies for operating costs were insufficient, serving as one of the reasons for a buildup of debt for LH Corporation and SH Corporation.

Third, the lack of policy continuity, consistency and sustainability can be identified in pursuing the public

housing program. Under the national Permanent Lease Housing Program, which targeted the poverty class, original plans were to build 250,000 units but the program ceased after only 190,000. With the national 50-year Public Housing Program that followed, financial assistance tapered, and that program too soon ended. The public housing program was then picked up by the City of Seoul and barely maintained as part of the Re-developed Lease Housing Program. As for the National Lease Housing Program, the original plan for 50,000 units was soon modified to providing a whopping 1 million units. Suspending a public housing program as a government response to housing demand can lead to the loss of people's trust and decrease demand the next time around. Moreover, suspension leads to poor management of the already-built housing complexes, accelerating deterioration. There were cases where there was a sudden increase in planned supply in a short period of time, such as with the National Lease Housing Program. This was because the supply plans were frequently changed according to the socioeconomic and political climate even though they were supposed to be based on housing demand and financial situation. The purpose of the programs – to ensure housing security for the low-income class – is a good one. However, the process was not carefully thought through, and the programs reacted sensitively to external factors, causing them to change often.

Fourth, the supply of public housing was mostly led by the central government, which often resulted in inconsistency between supply and demand. From its standpoint, the government had to supply a massive volume in a short period of time due to the shortage of public housing stock. It was more inclined to meeting quantitative supply targets than consider the public housing demand by region or district. Understandably, large apartment complexes were preferred to provide this massive supply quickly, resulting in public housing being built on the outskirts, following availability of extensive housing sites or new city development. In the end, the programs did not sufficiently satisfy the demand for housing for the low-income class living in the city. In later years, programs such as the Purchased Housing for Lease Program were introduced to make use of existing units in the city to address the above-mentioned issues.

Fifth, the programs were more housing- and supplier-oriented than tenant- and demand-oriented. Launching of the programs by the government was a positive step to providing public housing for low-income earners but the planning should have been more considerate of the needs of the actual tenants. For example, permanent lease housing accommodated a large concentration of low-income earners, senior citizens, and the disabled, but without the proper support of public medical, welfare, and cultural services, further exacerbating poor conditions. This led to stigma against not only the housing areas, but also against the residents. Unlike permanent lease housing, national lease housing residents were from all income quartiles, but the housing was shunned by residents of the planned site as well as the local governments. Due to the lack of assistance with economic independence for the residents and revitalization of the communities, public housing became islands of isolation in the city.

The City of Seoul is seeking to amend the old ways of concentrating the poor and low-income classes in a housing complex by attempting to introduce a mix of social levels and ages in housing programs. However, a negative image of these projects has long been impressed in the minds of the public and is unlikely to be

erased easily. This from time to time has been revealed in the form of social conflict between the different classes.

Outcome & Implications

Considerations for the Public Housing Programs

While South Korea's public housing policy is only 25 years old, it is on par with Japan's, one of the most advanced in quantitative terms in Asia. It should also be noted that there is social consensus to an extent with regard to the need for more public housing stock. The public housing program is indeed a necessary policy for housing security for low-income earners and social integration, but the financial burden of securing a large volume of housing is substantial. Currently, the City of Seoul is without new housing sites. It is extremely difficult to build an expansive complex for public housing. Therefore, discussion is underway on the points found in the following paragraphs.

First, the public housing programs need to diversify their supply methods. In the past, apartments were supplied after housing site development; housing for lease supplied according to the mandatory percentage in the housing improvement programs; or lease housing supplied by purchasing existing houses or paying for jeonse. The existing methods have reached their limitations due to depletion of available land, declining housing improvement programs, and reduced cost-effectiveness. It is necessary to diversify the methods by utilizing city-owned land for public facilities, public facilities and land owned by the private sector.

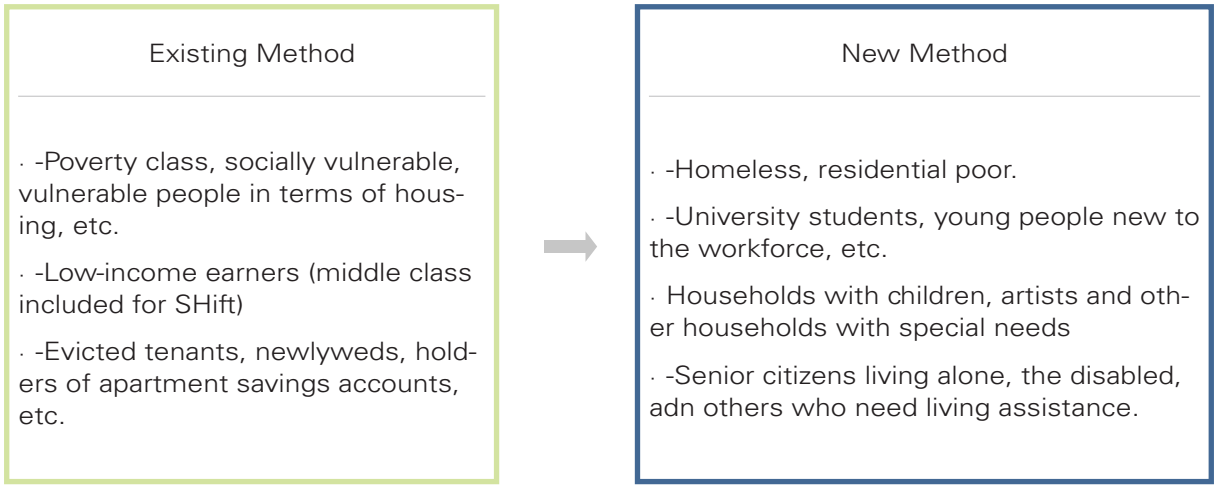
Figure 11 - Diversification of the Public Housing Supply

Existing Method	New Method
· Mostly apartments supplied after housing site development. · Housing for lease supplied according to required percentage in housing improvement programs. · Lease housing supplied by purchasing existing houses or through jeonse system.	· Utilize city-owned land for public facilities. · Supply housing through public facilities · Supply through the private sector (e.g., private land lease, public construction, renovation, or remodelling).

Second, it is necessary to increase public housing development in line with actual demand. In the past, public housing was provided to the poverty class, the socially vulnerable, vulnerable people in terms of housing, low-income earners, evicted tenants, newlyweds, and holders of apartment savings accounts. Because public housing demand is greater than the number of low-income earners, the eligibility requirements are made favorable to specific groups of people. Many low-income earners are caught between the requirements of

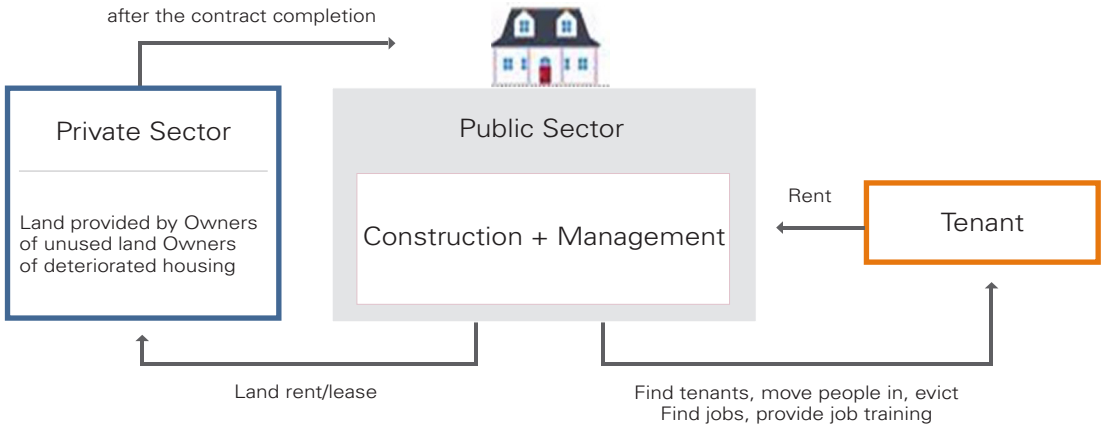
the systems, unable to meet their need for housing. The needs of the tenants should be considered and the types of public housing should to be diversified so that more low-income earners from the community can reside in public housing.

Figure 12 - Development & Expansion of Public Housing in Line with Demand



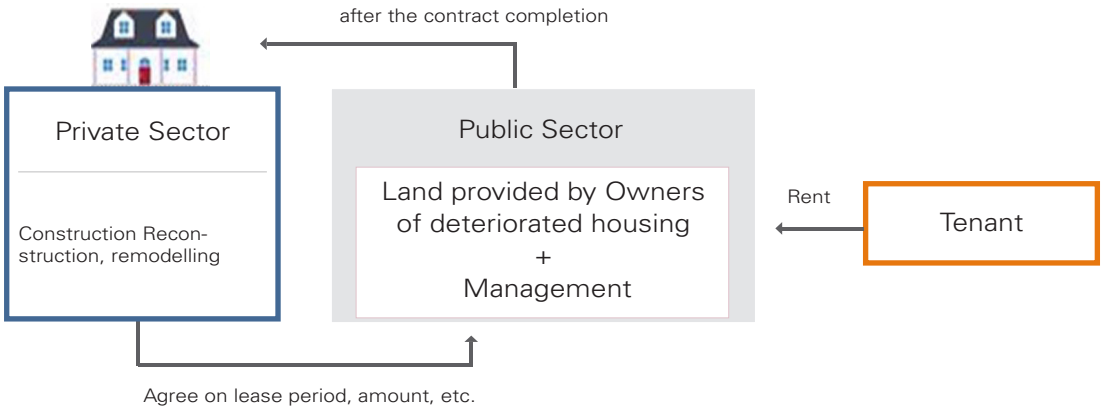
Third, it is extremely difficult to find new sites for public housing, therefore making it necessary to introduce diversified approaches to public housing through the private market. It is essential to learn from Europe's social landlord system (housing associations, housing trusts, housing unions, etc.) to encourage the emergence of not-for-profit suppliers of social housing. Before anything, private land with development potential should be developed on a small scale and leased to provide public housing. This can be done by the public sector utilizing unused land (or land on which significantly deteriorating housing stands) in the private sector to build units to provide as public housing for a certain period of time. The owners of significantly deteriorating houses or unused land who do not have the ability to develop the area would be encouraged to take part in the program. The constructed structures and facilities, excluding owners' shares, would be used to provide public housing for a specific period of time and then returned to the owner. The continuation of such a program after small-scale development would facilitate the management of deteriorating housing made difficult by program suspensions and encourage social integration in development.

Figure 13 - The Concept of Public Housing on Private Land



Another option is for the public sector to renovate or remodel significantly deteriorating houses into public housing and have the land owners manage the new housing. People would use the public housing for a contract period agreed on with the private sector and fix the rent at 80% of the market rate. The private land owner would be responsible for finding tenants and maintaining the units. When the contract expires, the duties and responsibilities would end, and use of the building would transfer to the land owner. Advantages to the land owners would be that they do not pay for renovation or remodeling and still retain the rights for later use of the building. This type of approach is usually applied to a small housing site and thus there would not be any massive supply of housing, but it facilitates improvement of the living environment. Furthermore, public housing would be in existing residential areas, preventing isolation and encouraging integration with the larger community.

Figure 14 - The Concept of Public Housing after Public Construction (Renovation, Remodeling)



Fourth, the financial problems surrounding public housing also need to be addressed. In the past, it was common practice for program entities such as the LH Corporation or the SH Corporation to use profits from housing site development or housing supply to build public housing. Recently, the sluggish real estate market has made it very difficult to realize these profits, and it is unlikely that extra loans could be taken out as the time to repay the National Public Housing Fund is drawing near. The government should consider increasing subsidies instead of having program entities source the funds required for construction and operation.

Fifth, the overly complicated eligibility requirements and lease structure should be simplified. Currently, lease conditions vary by type of program and at what point the housing was supplied. In other words, leases vary not according to household income but according to construction financing, the point of construction and the type of lease housing. This demonstrates that the programs are supplier/manager-oriented, not demand-oriented. Then there is an issue of fairness in leasing that differs by region. Simplification of this complicated structure should be a priority while improving eligibility requirements and leasing structure in a way that ensures fairness.

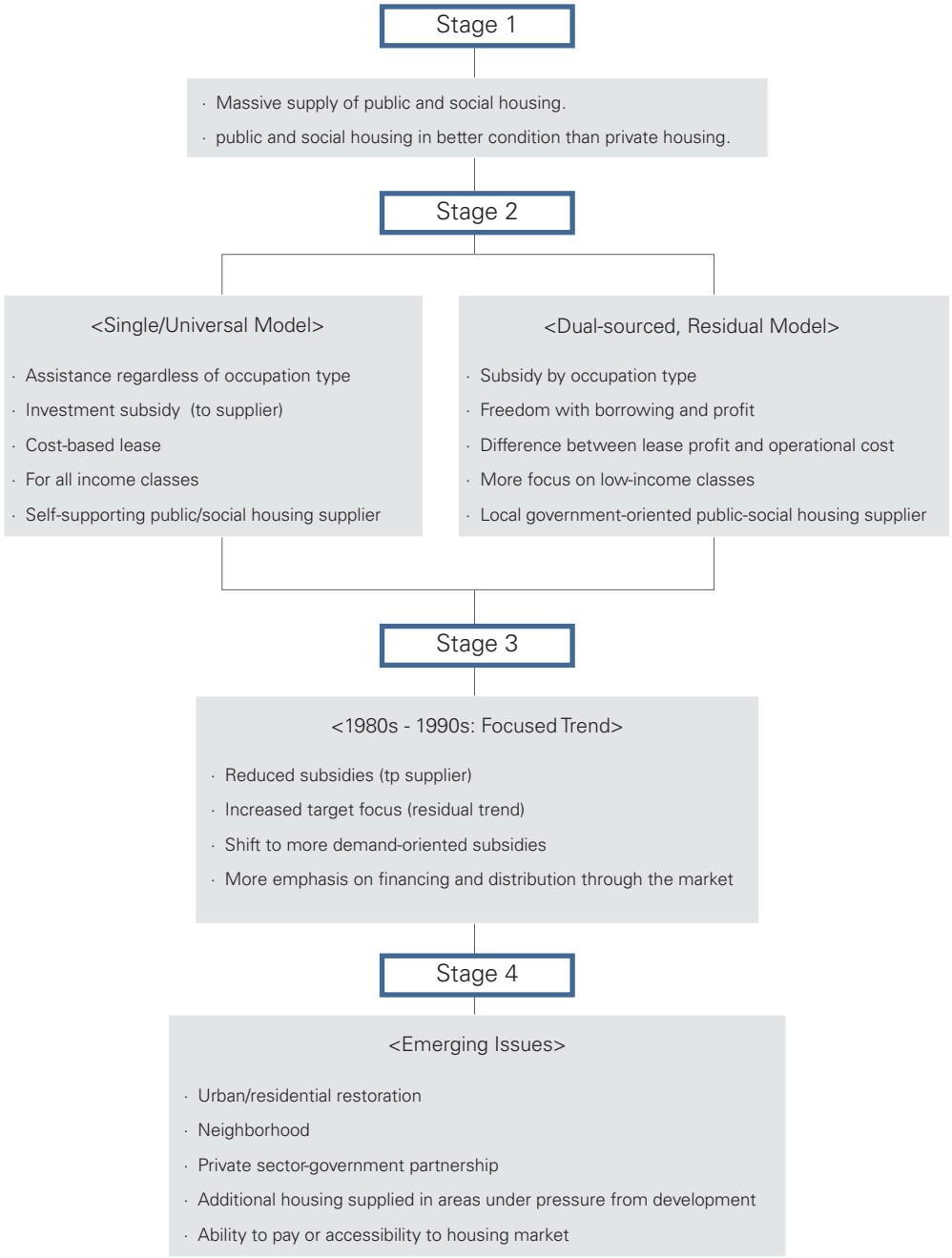
The Public Housing Program as a Housing Policy for Low-Income Earners

The Public Housing Program is fundamentally the policy of a welfare state. The government supplies public housing for those low-income earners who cannot afford comfortable, safe housing at market prices. Most advanced nations have this type of policy in place. Though there may be differences as to what extent the policy is adopted, it is generally a basic policy measure adopted in accordance with the individual welfare system. Developing nations however do not have advanced welfare systems and instead, the priority is on economic growth. The supply of public housing is naturally almost non-existent. Even if there are public houses for lease, they are small in number, built mostly for display. Some turn a blind eye to extensive construction of unauthorized settlements, allowing this to pacify low-income earners without government investment.

The public housing program requires substantial resources. A country's economy has to be of a certain level to be able to pay for residential welfare and supply public housing of a certain quality to low-income earners. Without sufficient resources, a public housing program will only end in suspension and other adverse outcomes. Governments need to consider the residential, social and cultural environments that vary by region, and those without adequate resources should address the issues in a way that suits local needs.

Many European nations began supplying public housing after WWII. They introduced the social landlord system where the public system works with or competes with the market to provide public and social housing. After experiencing financial crisis and low growth in the 1980s and 1990s, these countries have gradually reduced their public housing subsidies and expanded the scope of eligible candidates. South Korea is also in a similar situation, now facing the challenge of efficiently managing its public housing stock, introducing relevant regulations on the market or lease housing, encouraging tenant resettlement, providing benefits to a wider scope of policy targets, and supplying public housing through the private sector (particularly the non-profit sector).

Figure 15 - Changes in European Housing Policy since 1945



Source: Whitehead, C., 2006, "Privatisation of Housing in Europe: Challenges for the Social Housing Sector", Current Developments in Housing Policies & Housing Markets in Europe: Implications for the Social Housing Sector, CECODHAS European Social Housing Observatory, p.51.

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2. Seoul Housing Policy

Writer : SH Urban Research office Dr. Young-Hee Jang

Policy Area: Housing

Background: Housing Policy Beginnings

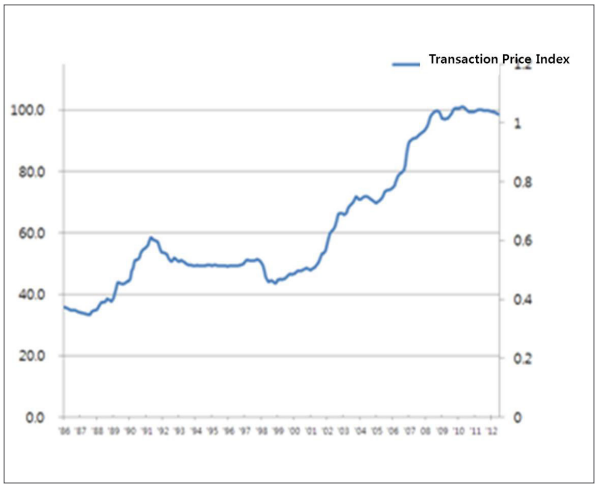
Abrupt Increase of Housing Demand due to Rapid Urbanization

Until the local government system came into effect in 1995, Seoul focused its housing policy mainly on supplying houses to meet the demands caused by population growth. The city's population rose dramatically from 2.45 million in 1960 to 5.43 million in 1970, 8.36 million in 1980, and 10.61 million in 1990, but the amount of housing fell far short of the growth. Seoul was in perpetual need of housing.

The housing shortage caused by Korea's continued economic growth and urbanization often precipitated housing price increases and speculation. Finding solutions for this problem has always been a crucial national challenge while the country was enjoying rapid economic growth, and was the reason that housing supply and price control policies were alternately implemented in response to the cycle of housing shortage, followed by rising house prices, followed by speculation and then control policies. The household/housing supply ratio reached 100% nationally in the early 2000s; but not until 2010 for Seoul.

Figure 1 - Number of Households vs. Houses in Seoul (1926 – 2011)

Figure 2 - Housing Prices in Seoul



Source: National Statistical Office, Census (1926 – 2011); the Seoul Institute, quoted from "Seoul in Maps".

Massive Supply of Housing

Revision of Institutional Measures for a Massive Supply of Affordable Sites & Housing

Until the mid-1950s, the government's housing policies amounted to no more than emergency aid. With the 5-Year Economic Development Plan in 1961 however, policies began to look like construction policies. In 1962, the Korea National Housing Corporation was created to aggressively respond to the housing shortage; in 1967, the Korean Housing Fund was established. The Land Readjustment Program Act was passed in 1966 to take on systematic construction of the urban area. In the mid-1970s, the institutional framework was founded to supply more affordable housing.

Land Readjustment Program

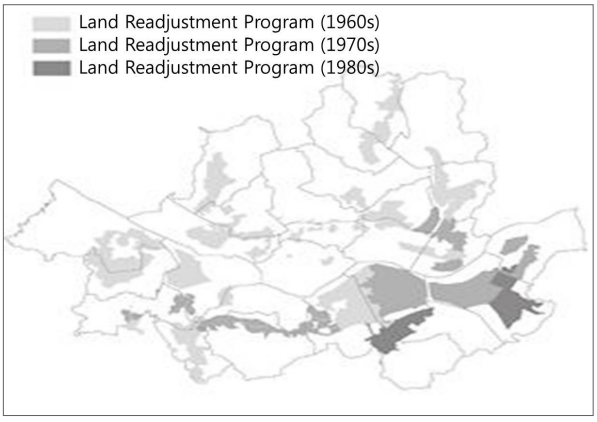
The first 5-Year Economic Development Plan generated higher demand for public land to be used for housing, industry and transportation. The augmented Land Readjustment Program focused on systematic development of urban areas on the outskirts of existing ones. In Seoul, the Land Readjustment Program was most active in the 1960s and 1970s, and the areas it targeted accounted for some 40% of the total urban area. Because it mainly supplied detached housing sites, it did not make the most efficient use of the land. In some regions such as Yeongdong, municipal housing complexes were built to attempt to supply houses at affordable prices. However, the question of whether to construct housing was left to landowners to decide, limiting the program's effectiveness in terms of addressing the housing shortage.

Table 1 - Land Readjustment Program by Period

	1960s	1970s	1980s
Number of Program-Implement-ed Areas	20	14	5
Total Area	63,673,800 m^2	49,650,100 m^2	14,541,300 m^2
Average Area	3,183,700 m^2	3,546,400 m^2	2,908,300 m^2
Lot size re-duction rate	31.6%	43.7%	55.0%

Source: Seoul Metropolitan Government, The Seoul Institute, 2009.

Figure 3 - Seoul Land Readjustment Program Areas by Period



Source: Seoul Metropolitan Government, The Seoul Institute, 2009.

Mass Supply via Public Development

Judging from detached houses alone could not resolve the shortage in Seoul, the government initiated a policy designed to supply housing on a massive scale via public development in the 1970s. For this development, the Housing Construction Promotion Act and the Housing Site Development Promotion Act were passed in 1972 and 1980, respectively. In 1976, the Urban Planning Act adopted an apartment district system to facilitate apartment supply, designating Banpo, Apgujeong, Seocho, Dogok, Cheongdam and Gaepo as such areas – the areas that had been developed in accordance with the Land Readjustment Program. Housing was built in earnest under the 10-Year Housing Construction Plan in 1972. In line with the plan to supply 2.5 million units between 1972 and 1981, some 1.87 million were built nationally with 497,000 units in Seoul. However, the programs pursuant to the Housing Construction Promotion Act only targeted residential areas within the boundaries of the urban plan zone, and supplying land on a large scale became an issue.

To facilitate the supply of housing sites, the Housing Site Development Promotion Act was enacted in 1981. The Housing Site Development Program is a type of public development designed to develop inexpensive land (green spaces in urban outskirts, etc.) and supply a large number of houses at affordable prices. Unlike the Land Readjustment Program, authorization is limited to public institutions, using development profits for urban infrastructure, facilities and public housing. Nationwide, 640 km² was developed through the Housing Site Development Program, 336 km² in the Seoul metropolitan area and 37 km² in Seoul itself. Large apartment complexes were built in Godeok, Sanggye, Junggye, Gaepo/Yangjae, Suseo, Shinnae, and Mokdong. Land was supplied through the Housing Site Development Program at 60% of the land development cost for public lease housing and at 95 – 110% for house purchase, depending on unit size.

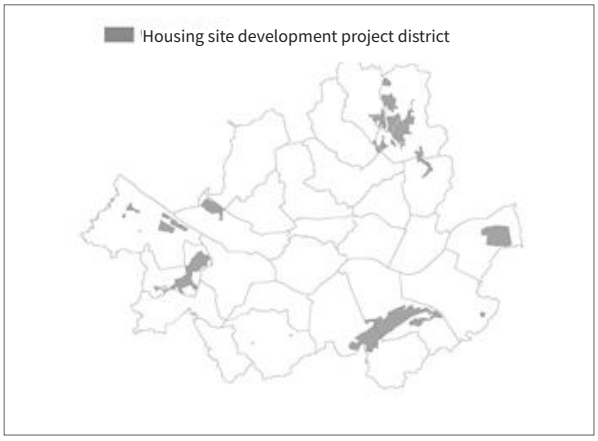
Table 2 - Outcome of District Designation for the Housing Site Development Program (late 2006)

(Unit: km², (%))

Category	Total	Korea Land Corporation	Korea Housing Corporation	Local Governments
National	639,674 (100.00)	344,313 (53.83)	171,325 (26.78)	124,036 (19.39)
Seoul Metropolitan Area	336,123 (100.00)	190,042 (56.54)	88,199 (26.24)	57,882 (17.22)
Seoul	37,106 (100.00)	6,438 (17.35)	7,378 (19.88)	23,290 (62.77)

Source: Seoul Metropolitan Government, The Seoul Institute, 2009.

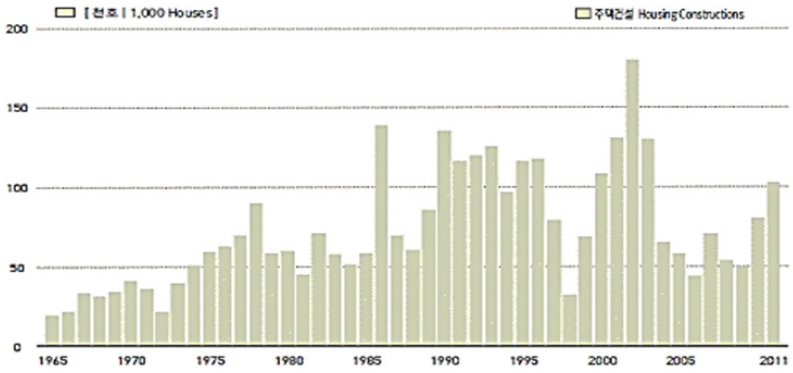
Figure 4 - Housing Site Development Program Districts in Seoul



Source: Seoul Metropolitan Government, The Seoul Institute, 2009.

In 1988, a plan was drafted to supply 2 million units, resulting in 2.14 million units being built in the Seoul metropolitan area, including the 5 new cities – such as Bundang and Ilsan – by 1991. Even after 2002, the policy to supply housing en masse continued, including plans for 1 million national public housing and 1.5 million Bogeumjari units.

Figure 5 - Housing Construction in Seoul (1965 – 2011)



Source: Seoul Metropolitan Government, Seoul Statistics, 2013, quoted from "Seoul in Maps".

Redevelopment of Deteriorating Houses

Redevelopment of Deteriorating Housing in the 1980s

In the early phase of industrialization, a large amount of unauthorized housing was built throughout Seoul. These "slum" areas were mostly located on hillsides adjacent to urban areas and were often called by their nickname, Dal-Dongne. The Dal-Dongne redevelopment projects began in earnest after passage of the Urban Redevelopment Act in 1976.

Start of the Joint Redevelopment Program

The Joint Redevelopment Program was launched in the early 1980s to encourage the redevelopment of such housing areas. This program is jointly carried out by residents' associations and private construction companies. The unit- and landowners did not have to contribute to receive newly-constructed units, but there was no real consideration of tenants, inviting strong opposition. Through this joint program, some 140,000 seriously deteriorating units were demolished by 2008 and 290,000 new ones built. Seriously deteriorating houses that low-income earners had lived in were replaced by high-rise apartments occupied by the middle class. The shortage of affordable housing, caused by this method of redevelopment, became a driving factor behind the construction of detached houses for multiple households during the time when housing prices soared in the late 1980s.

Table 3 - Housing Improvement Programs in Seoul

	Total Number of Areas	Area of Planned Districts	Area of Desig-nated Districts	Area of Program Execution	Program Com-pleted Areas
Total	1,300	374	200	292	434
Designated for Improvement	305	57	121	105	22
Redeveloped	529	60	36	91	342
Areas for De-tached House Reconstruction	276	186	39	49	2
Areas for Apart-ment Re-con-struction	190	71	4	47	68

source: Seoul Metropolitan Government, Jan. 2012.

Figure 6 - Designated Housing Improvement Program Areas in Seoul

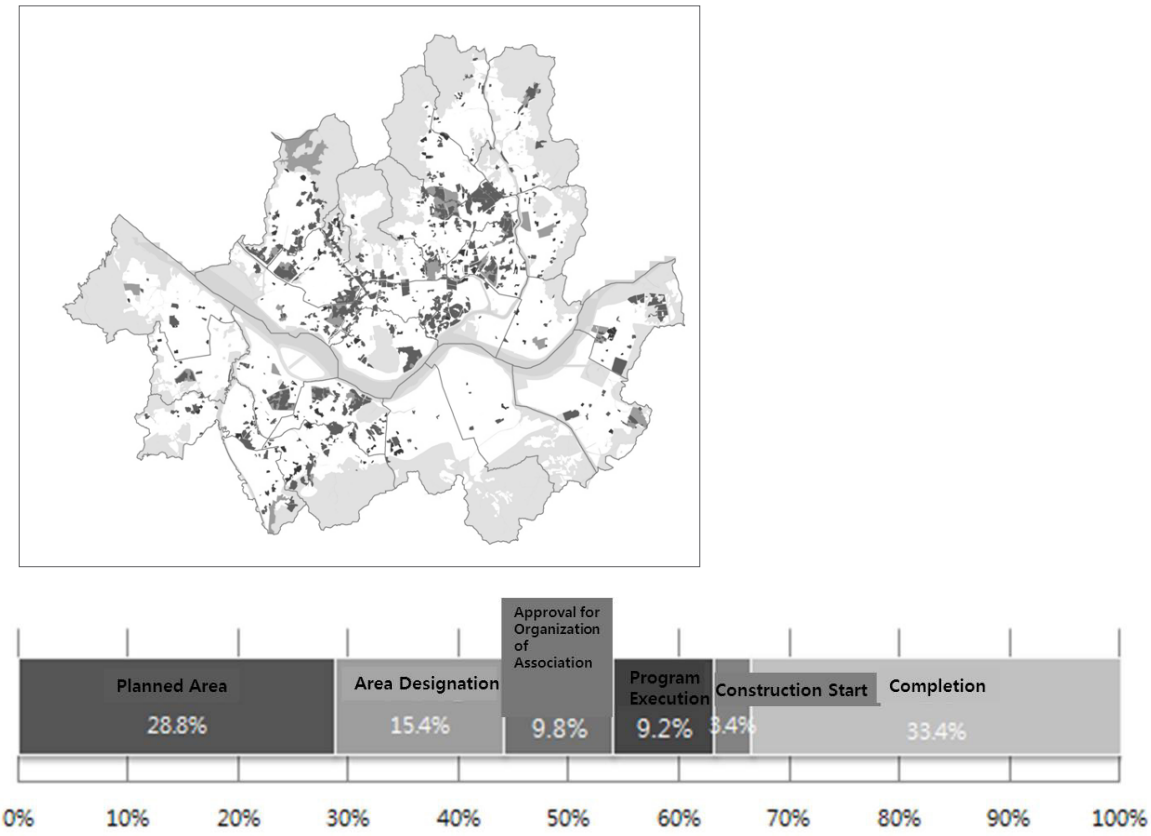


Figure 7 - Heukseok-dong

Figure 8 - Oksu-dong

Figure 9 - Oksu-dong

Supply of Redeveloped Lease Housing for Tenants

In the Joint Redevelopment Program, many houses were demolished without any back-up plans for low-income tenants evicted from their homes into sometime even poorer conditions, creating greater insecurity among such families. Seoul thus began building public housing for tenants, used in the redevelopment lease housing system that the city introduced. However, supply was only 20% of the total demand, and many tenants had to give up and move to other regions. Even today, the public lease housing supplied via redevelopment numbers only 56,500 units.

Introduction of the Residential Environment Improvement Program for Low-Income Residents

The Residential Environment Improvement Program aims to improve the residential environments of areas occupied by aging, dilapidated houses. In an effort to reduce the involuntary migration of low-income residents, the City of Seoul limited its extensive improvement programs that relied on full demolition in 2012 and adopted the Residential Environment Improvement Program which seeks to both preserve and improve the existing urban area at the same time. The public sector provides assistance with infrastructure (roads, parking lots, public squares etc.) and community facilities (community centers, childcare centers, senior centers etc.) while residents participate in improving houses and the community itself. Today, the program is active in 23 districts in Seoul.

Supply of Public Lease Housing for Low-Income Earners

Increased Supply of Public Lease Housing

In Seoul, the supply of public lease housing began with housing for permanent lease for those in the lowest income class in 1988. Untill 2013, housing for permanent lease, public lease housing, redeveloped housing for lease and other types of public lease housing had been built for the low-income class, but as of that year, housing with 20-year leases or longer accounted for only 6.1% of the total housing stock. This is due to the difficulty of increasing the stock in a short span of time as it is not easy to supply large housing sites and finance the costly construction projects. Currently, the City of Seoul aims to increase public lease housing to

10% of total housing.

The types of public lease housing can be divided by income level of the potential tenants: first, housing for permanent lease and purchased housing for lease of those in the lowest income class; second, public lease housing (e.g., national public housing and redeveloped housing for lease) for those earning 70% or less of the average income; and third, SHIFT for lower class households and those in the middle class earning up to 180% of national average income. These types are explained in the following paragraphs.

Type 1: Purchased Housing for Lease and Housing for Permanent Lease

The policy for permanent lease housing, pursued in line with the plan to supply 2 million houses, was the first housing welfare policy for the poorest class, including those covered by the livelihood protection scheme. Permanent lease housing was deemed innovative because 85% of the construction cost was financed from the national coffer. It inevitably put a strain on the national budget, forcing a stop to the program after 190,000 units were built nationwide (47,000 in Seoul). From 2003, multi-unit houses were purchased in the down-town area as part of the purchased housing policy to be used for lease to those in the lowest income class. Purchased housing for lease was available in built-up areas and tenants were very satisfied with the policy. In 2005, the government introduced a system where it leases private houses from the owners and then sub-leases them out to low-income tenants.

Type 2: Public Lease Housing for Those Earning 70% or Less of National Average Income

Public lease housing was provided as part of the subsequent program to the Housing for Permanent Lease Program, but supply was limited due to the insufficient nature of government support. The supply of public lease housing began in earnest in 1998 after the Asian financial crisis hit South Korea. A certain percentage of public lease housing was necessary to ensure housing for families hit hard by the financial crisis, which had caused housing prices to fluctuate wildly. Examples of public lease housing include 50-year public lease housing, national public housing, and redeveloped housing for lease. Redeveloped housing for lease has been supplied to evicted residents since the 1990s while national public housing began in the 2000s. The national public housing program expanded to 1 million units by 2003. To further facilitate housing supply, the Special Act on National Public Housing Construction was passed.

Type 3: SHIFT (Long-term Public Lease) to Include the Middle Class

In 2008, the City of Seoul introduced a long-term public lease system called SHIFT, which included the middle class. Unlike public lease housing for which the tenants pay monthly rent, SHIFT is a public housing system where the tenants pay the jeonse deposit (50% of the house price). It is enthusiastically supported by the middle class, who have some amount of extra funds.

Table 4 - Public Lease Housing in Seoul

	Type 1			Type 2			Type 3	Total
	Housing for Per-manent Lease	Purchased Housing for Lease	Jeonse Lease	Redev-el-op-ment, Envi-ron-ment Im-prove-ment Lease	Public Lease Housing, 50-Year Lease Housing	National Pub-lic Housing	SHIFT	
Period	1988 – 1993	2004 – Present	2005 – Present	1989 – Present	1992 – 1995	1998 – Present	2007 – Present	
Govern-ment Financing	85%	45%	City of Seoul	City of Seoul	50%	30%	City of Seoul	
National Public Housing Fund Loan	-	50%	-	-	20%	40%	-	
Target Bene-ficia-ries	Benefit re-cipients, single parent families, housing savings ac-count hold-ers	Benefit recipients, lowest in-come class	Benefit recipients, lowest in-come class	Persons evicted from un-au-thorized housing areas	Evicted resi-dents, hous-ing savings account hold-ers	People earning 70% or less of national aver-age income, housing sav-ings account holders	Housing sav-ings account holders	
Units Sup-plied	47,700	15,600	27,600	56,500	20,500	21,700	26,300	215,900

Financial Residence Assistance for Low-Income Residents

Rent Assistance for Low-Income Residents

Despite the continuing supply, there is still a serious shortage of public lease housing. For low-income tenants who cannot move into public lease housing, the Jeonse Deposit Loan Program and the Monthly Rent Assistance Program are available. The Jeonse Deposit Loan Program, financed by the National Public Housing Fund, was provided to 14,600 low-income households and 17,400 working households each year between 2002 and 2009.

Since 2002, the City of Seoul has had its own monthly rent assistance system for low-income households. Recipient incomes are verified every year; eligible candidates belong to the socially vulnerable classes, earning 150% or less of the minimum cost of living. The program is financed through the Social Welfare Fund

created by the city and from 2002 to 2010, 23,300 households benefited from the program. Since 2010, the number of assisted households has been increasing annually. From 2015 and onwards, the Housing Voucher Program will be implemented at the national level. The rent assistance system is deemed an effective policy as it utilizes an extensive range of private lease housing to minimize the number of those who are left behind, and responds to varied demands for housing assistance.

Table 5 - Number of Rent-Assisted Households in Seoul

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of Households	963	1,040	1,537	2,231	2,782	3,255	3,175	3,382	4,982

Source: Internal documents, Seoul Metropolitan Government.

Introduction of Minimum Required Residential Conditions

"Minimum required residential conditions" refers to the basic conditions required of residential units, and were introduced to the Housing Act in 2010 to ensure the rights to housing for low-income earners. The minimum conditions are divided into 3 categories – area, facilities, and structure/performance/environment; if any one of these is not up to the standard, a unit is considered to have failed in satisfying minimum requirements. "Area" refers to the minimum area required to house a certain number of people in a household: 14 m^2 for a single-person household and 43 m^2 for a 4-person household. The number of houses in Seoul that fail to meet this requirement quickly dropped from 23.5% in 2000 to 19.1% in 2005 and to 8.9% in 2010.

Table 6 - Required Area by Number of Household Members (Minimum Required Residential Condition)

Number of Household Members	One	Two	Three	Four	Five	Six
Area	14 m^2	26 m^2	36 m^2	43 m^2	46 m^2	55 m^2

Know-how of Introducing the Policies

Regulatory Policies for Housing Market Stability

The further housing construction expanded, the greater the industry's influence became, and the market became one of the most important drivers of the economy. Naturally, housing policies had 2 overarching goals – to ensure housing stability and to manage the economy. Regulations were placed and removed from the market time and again.

Policies designed to control speculation contributed significantly to laying the foundation for the housing market and to stabilize housing prices. When real estate prices went up, various measures were announced to contain speculative activities. These included: modification of the transfer income tax in 1978; differentiation of the housing sale prices in 1982; introduction of the housing bond bidding system in 1983; introduction of the integrated land tax in 1985; enactment of three Acts on the public concept of land ownership in 1989; requirements for property registration to be in the name of the actual owner in 1995; strengthened standards for reconstruction in 2002; introduction of the comprehensive real estate tax in 2003; stronger LTV(Loan To Value ratio) in speculation prone areas; mandatory reporting of actual transaction prices in 2005; and maximum caps on sale prices in speculation prone areas in 2007. Currently, a significant number of speculation control measures are used to ensure fairness and efficiency in the housing market.

Organizational Structure for Massive Housing Supply

Collaboration between the Central Government's Economic & Land Development Departments and Seoul

Policies to supply housing on a mass scale cannot be pursued without political determination and support at the national level. In the past, the policy was part of the 5-Year Economic Development Plan, but in the 1970s, the 10-Year Housing Construction Plan and the plans to supply 2 million units were separate plans. In this process, much of the legal framework and many institutional measures were introduced to ensure a supply of affordable housing sites and secure funds to implement the relevant policies, such as the Housing Construction Promotion Act, the Housing Site Development Promotion Act, and the National Public Housing Fund. At the time, housing policies were the core policies implemented by the central government, pursued in collaboration with the Economic Planning Board, the Ministry of Construction, the City of Seoul and other government organizations.

Foundation of the LH Corporation & SH Corporation to Supply Housing for Low-Income Families

Passed in 1963, the Public Housing Act defined public housing as affordable housing provided to local government institutions and non-homeowners. Founded in 1962, the Korea Housing Corporation had built some 2 million houses by 2008; of these, 63% were for purchase or short-term lease, and 37% were for long-term lease. The City of Seoul also founded the SH Corporation in 1989 to pursue its own lease housing programs, which supplied 155,000 units of lease housing and 88,000 units of housing for sale. The Corporation also exe-

cutes various other programs for the city, such as the Eunpyeong New Town and the urban development program in Magok District. The LH Corporation and the SH Corporation are institutions that translate government housing policies into action (e.g., housing site development and supply, making affordable housing available to low-income families, and construction of public lease housing for low-income households). They have contributed considerably to ensuring housing for low-income families in a period of fast-paced economic growth.

Policy Financing

Introduction of the National Public Housing Fund

The National Public Housing Fund is the heart of South Korea's public housing finance. The Fund was first created in 1981 pursuant to the Housing Construction Promotion Act. Before then, the housing funds were used to issue housing bonds and build houses, but the lack of financing resulted in only negligible results. The National Public Housing Fund is funded by government contributions, money from issued National Housing Bonds and housing lottery tickets, deposits from the general financial market and National Public Housing Fund bonds, and housing savings accounts which give priority for housing to its holders. The proportion each is responsible for varies according to the circumstances of the market. In 2005 when the housing market was booming, housing bonds provided a high percentage of funding. In 2010 however, there were more funds on standby from housing sales (such as through the housing savings accounts) than from other sources.

The Fund has various uses: construction of housing for lease or sale; assistance with house purchases or jeonse deposit loans; improvement of seriously deteriorating houses; or purchase of housing sites. The National Public Housing Fund has financed approximately 4.5 million housing units, with public lease housing accounting for 48.2% and small housing units for sale making up the remaining 51.8%.

Table 7 - Sources of the National Public Housing Fund

(Unit: %)

	National Housing Bonds	Housing Sav-ings Ac-counts	Funds Car-ried Forward	General Ac-count Trans-ferred Funds	Lottery Fund Pro-ceeds	Loan Re-pay-ments	Loan & Deposit Interest	Total
2005	37.3	7.2	19.4	-	2.1	24.1	9.5	100.0
2011	23.2	21.1	19.8	2.8	1.1	24.3	7.6	100.0

Source: Land & Maritime Affairs Statistics, Ministry of Land, Transport & Maritime Affairs (Http://stat.molit.go.kr)

Policy Challenges

Increasing Housing Prices due to Extensive Housing Site Development & Infrastructure Construction

The Public Housing Site Development Program has been quite effective in terms of supplying affordable housing sites and creating built-up areas in a systematic manner. Sizable housing sites were made available in a short period of time due to the acceptance of private land for public development under the Housing Site Development Promotion Act. However, a prerequisite of the program was accepting land from the private sector, which meant resistance from those evicted and social conflict from compensation issues. Moreover, extensive development programs for both residences and infrastructure on the city outskirts pushed residential site and housing prices up. Investing profits from public development of infrastructure enabled a steady supply of housing and continued construction of infrastructure, but the program was structurally limited in that increased compensation for land and development unavoidably led to an increase in housing prices.

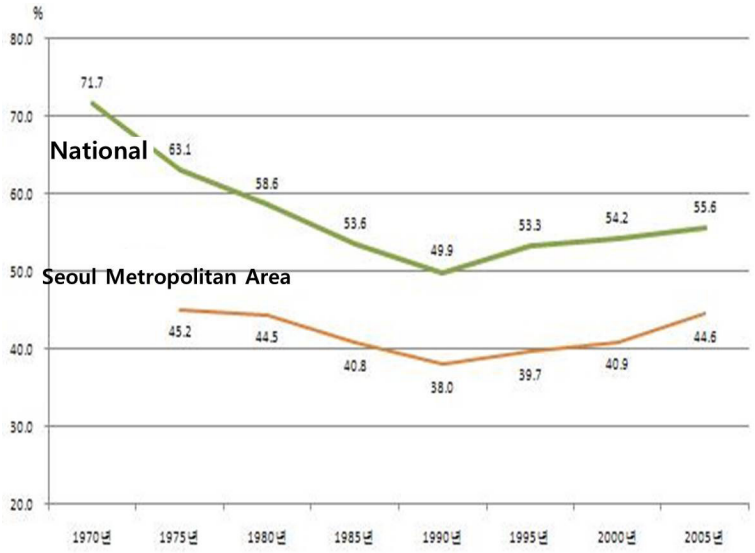
Urban Expansion & Development of Bedroom Communities Leads to Chronic Traffic Congestion between Seoul and the New Cities

The chronic issue of traffic congestion between Seoul and the adjacent new cities triggered controversy and called for construction of self-sufficient cities. New cities were built to supply housing in a short time and most of them now act as bedroom communities. Recently, extensive development has changed so that it provides both a place to live and a place to work; as part of this program, separate business areas have been built in some new cities (e.g., Pangyo, Gwanggyo). The views of new city development are changing.

Reduction of the Number of Owner-Occupants

Despite rising incomes and a massive supply of housing, owner-occupant rates have dropped. Nationally, the rate was 71.7% in 1970; by 2005, it had dropped to 56%. In Seoul, the rate remained in the low 40% level until 2005. Housing prices that increased faster than income levels are the reason for these low rates.

Figure 10 - National & Seoul Owner-Occupant Rates



Source: National Statistical Office, Census (1970 – 2005)

Increased Public Housing Supplier Debt

Despite the positive assessment of public lease housing, supplier debt has soared, evidence that any policy to provide housing for low-income families will increase the burden on government.

Reduction of Affordable Housing due to the Housing Improvement Program

Under the Joint Redevelopment Program launched in the early 1980s, 140,000 seriously deteriorating houses were demolished and 290,000 built by 2008. Even so, the program had problems remaining public in nature, due to such issues as forced eviction and the low rate of original returning resident. While it is true that many from the unauthorized residential areas escaped poverty and entered the middle class, it has become all the more important to address the ever-worsening polarization in income and provide adequate housing for low-income earners.

Shortage of Permanent Lease Housing for the Lowest Income Class

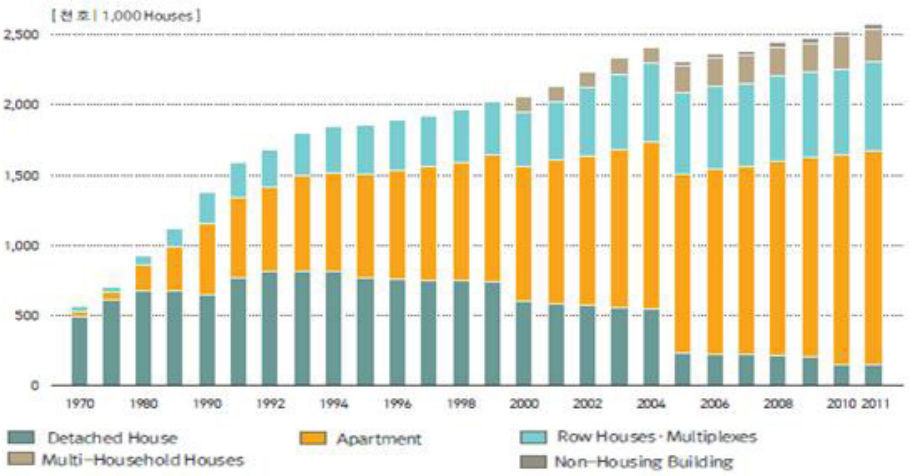
Permanent lease housing is for those in the lowest income class, with rent equal to only 20% of rent on the free market. The number of people on standby for permanent lease housing is 66,000 nationally, and 20,000 households in Seoul. This indicates that the demand for affordable public lease housing is quite high. National public housing is for the lower two income quartiles, but the rent is too high for those in the first and second quartiles. The fact that permanent lease housing leads to social isolation of low-income earners calls for integrated management of both permanent lease housing and national public housing. Recently, the Act on Support for Improving the Quality of Life of Tenants in Long-Term Public Rental Housing has passed, making it possible for the government to provide assistance based on the different amounts reflected in rental pay-

ments. Basing rent on income level may help resolve the shortage of permanent lease housing and include areas not covered by previous policies.

Change of Housing Type from Detached Housing to Apartment Units

The extensive development of housing sites and massive supply of housing subsequently transformed the type of housing constructed. The preference for apartment units over detached houses was due to the concentration of apartments in Gangnam and the new cities. Some 70 – 80% of new housing units were apartments, which accounted for only 0.8% of total housing stock in 1970 but jumped to 53.0% by 2005. However, the higher rent and purchase prices, when compared to multi-unit housing, has been another source of pressure on people.

Figure 11 - Housing Stock by Type, 1970 – 2011



Source: National Statistical Office, Census (1926 – 2011); The Seoul Institute, quoted from "Seoul in Maps".

Effect of the Policies

100% Housing Supply Rate

So far, South Korea's housing policy has been aimed at home ownership through massive supply of housing. It was tacitly assumed that economic and income growth would keep housing demand afloat. Thus for the past 40 years, the government's housing policy encouraged people to resolve the housing issue by finding their own homes. Unlike the US or European countries that promoted home ownership through financial and tax incentives, Korea focused more on providing homes at affordable prices. Thanks to the housing site development program, which provided affordable housing sites and homes, the housing supply stood at 100% in the early 2000s. However, the rate in Seoul, where a quarter of the nation's population lives, reached 100% only in 2010.

Increased Supply of Public Lease Housing

Permanent lease housing, 50-year public lease housing, and national public housing are some of the most well-known housing welfare policies where tenants can live at an affordable price for a long time. The City of Seoul has endeavored to secure sufficient public lease housing, making it mandatory in private-sector redevelopment and reconstruction programs to include a certain percentage of public lease housing. This allowed for some 56,000 units of public lease housing, which is a phenomenal feat. Based on such efforts, 210,000 units of public lease housing were available in Seoul as of 2013, bringing the percentage against the total housing stock to 6.1%. Recently, more varied approaches have been taken to resolve the shortage of housing sites: studio-type housing on small city-owned lands; supply of public lease housing based on a cooperative-type approach; and quasi-public lease housing supplied by remodeling privately-owned homes.

Table 8 - Percentage of Public Housing for 20-Year or Longer Leases against Total Housing Stock

Year	1995	2000	2004	2010	2012	2013
Percentage	3.5	4.5	5.0	4.6	5.2	6.1

Source: Seoul Metropolitan Government, Basic Seoul Urban Plan for 2020, 2006; The Seoul Institute, 2013.

Shift to Community-oriented New Towns & Redevelopment Policies

Some of the excesses of the New Town and redevelopment programs have reduced the number of affordable housing units and caused involuntary migration of the previous residents. To address this issue, the City of Seoul has recently adopted a new vision for its housing improvement program – "The city where people come first". The existing programs relied heavily on profitability and full demolition and were modified and diversified to put more emphasis on resident communities and villages, and the city provides administrative and policy support to ensure the right of tenants to housing. The city has also conducted research on existing areas where the programs were at a standstill to incorporate input from residents and set a new direction for development. When residents agree to go further with the program, the city provides administrative support to carry it on.

Implications

Housing policy in South Korea has maintained home ownership as its goal, through economic and income growth. The full-scale housing site development program that began in the early 1980s developed green zones on the city outskirts to keep the supply of housing affordable. This in turn allowed housing prices to stay low, thereby encouraging more people to own homes and increasing the size of the middle class. After the Asian financial crisis however, the financial market for the real estate industry opened, accelerating housing price increases and the resulting size of mortgages. Because housing prices rose faster than income levels, home ownership in Seoul has remained near the 40% level despite the massive supply of housing.

Extensive development of housing sites was carried out by including the cost of infrastructure (roads, parks, waterworks, sewer lines etc.) in housing prices. Prices of housing in these programs were lower than market prices, and the expectations for price increase were what maintained the demand for new housing, but the prerequisite for this was that high economic and income growth must be maintained. It is questionable whether this model would be reasonable in many developing countries. Without both economic and income growth, the extensive development programs could also serve as a means to provide more housing units to high-income earners.

Unlike the new housing program pursued by the public sector, the programs to improve existing built-up areas were led by private capital. As a result, areas previously occupied by low-income earners were taken over by the middle class, while the original residents were pushed out to basement units nearby or cheap housing on the outskirts. This indicates that large-scale demolition type improvement will inevitably result in the migration of low-income residents. Extensive development of existing built-up areas also reduces the affordable housing stock, putting additional strain on these low-income earners. It is therefore necessary for the public sector to invest in infrastructure and community facilities, encourage residents to improve and preserve their residential environment, and diversify program methodology. Public investment in infrastructure and community facilities is critical. In Seoul, the dilapidated houses in Dal-Dongne reduced living costs during fast-paced economic growth, thereby helping people work their way into the middle class. Widespread awareness that the residential areas for low-income earners within the city hold their own significance is essential.

During its rapid growth, South Korea developed its own policies and methodologies to apply to its own market. The research institutes at government agencies and institutions played a pivotal role in this process. Well-trained experts helped reduce adverse effects from the policies and introduced or developed new policies after conducting onsite research, data analysis and simulations. Each country is unique in its economic, social and cultural circumstances. It would be unwise for another country to take the Korean model for direct application, but such a country would be advised to refer to the experience and make adjustments as neces-

sary. To do this, central and city governments need to conduct their own research and studies to build on the Korean experience and make further progress.

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3. Establishment & Operation of SH Corporation

Writer : SH Urban Research Office Researcher Young-Kuk Kim

Policy Area: Housing

General

The predecessor to SH Corporation was Seoul City Development Corporation founded in 1989, which was a public corporation established and fully financed by the City of Seoul to contribute to stability and welfare of Seoul citizens in terms of residence, pursuant to the Local Government Act and the Ordinance on the Installation of Local Public Corporations. Its main scope of work included: land acquisition, development, supply and other related matters; housing construction, renovation, supply, leasing and management; redevelopment in areas designated by the mayor of Seoul; implementation of urban and infrastructure plans; work commissioned by the national or local governments; and other urban development-related responsibilities. In 2004, the Corporation changed its name to SH (Seoul Housing) Corporation. Its responsibilities include: building lease housing for low-income families; conducting urban readjustment programs and pursuing the Eunpyeong New Town project; implementing SHIFT programs, which changed the housing market paradigm; and executing environmentally-friendly renewable energy programs such as those in the Magok District Development program. Debt has risen due to the supply of lease housing and a sluggish construction market. Socioeconomic conditions and the construction industry have changed, which in turn has led to changing demands. To meet these demands, SH Corporation has pursued growth and adapted to change as the central body overseeing residential welfare and urban restoration.[2]

1. Objective: Article 1, City of Seoul Ordinance on the Establishment & Operation of SH Corporation

- To develop and supply land, build, renovate, supply, and manage housing so as to contribute to residential stability and enhance resident welfare.

2. Scope of Work

- Land acquisition, development, and supply
- Housing construction, renovation, supply, leasing, and management
- Improvement, redevelopment, and reconstruction of the residential environment; urban environment improvement programs
- Urban infrastructure and urban planning
- Work commissioned by national or local governments
- Overseas construction projects, attraction of foreign capital and investment, etc.

2. SH Corporation: Program Status, 2014.

3. History

- December 1988: City of Seoul Ordinance on Installation of the Urban Development Corporation enacted.
- February 1989: Seoul City Development Corporation founded (Capital: KRW 300 billion; 389 employees)
- March 1990: Corporation changes location (Jeong-dong, Jung-gu ⇒ Seongsu-1-ga-dong, Seongdong-gu)
- December 1998: Corporation changes location again (⇒ Gaepo-dong, Gangnam-gu)
- March 2004: Corporation name changes (⇒ SH Corporation of the Seoul Metropolitan Area)
- November 2014: Byeon Chang-heum appointed as the 13th CEO
- December 2014: Reorganization (5 headquarters, 2 departments 13 divisions)

4. Capital: KRW 5 trillion / Paid-in Capital: KRW 4,736 billion (Cash: KRW 2,993.1 billion; In-kind: KRW 1,742.9 billion)

Role & Status[3]

As an institution that has conducted various public projects that affect the general lifestyle of Seoul residents, SH Corporation has been engaged in building housing, managing lease housing, readjusting residential environments, and supplying the necessary infrastructure through use of public funds and profits from land development and housing sales. The role of SH Corporation is to act as a central organ that contributes to residential stability and supplies housing to Seoul residents. It also pursues urban restoration and development.

Residential Stability & Housing Supply

Founded to enhance the residential welfare of Seoul residents, as of late 2013 SH Corporation has carried out land development projects in an area of 16.9 km² (twice the size of Yeouido and spanning over 38 districts including Suseo, Daechi, and Gayang), and has supplied housing to 244,000 households (approximately 6.9% of all houses in Seoul). The Corporation's housing projects include both construction and redevelopment, and reconstruction after purchase. The modes of supply are diverse, in accordance with socioeconomic circumstances and policies.

The Corporation also supplies and manages lease housing to resolve housing issues for low-income families; as of the end of 2014, the Corporation was managing 160,000 units of lease housing. Considering plans for future supply, this number is expected to reach 297,000 within 4 years.

3. SH Corporation Report to the Seoul Metropolitan Council, December 2014.

Figure 1 - Magok Urban Development

Figure 2 - Naegok Boge-umjari Housing

Figure 3 - Shinnae 3 National Public Housing

Figure 4 - Shinjeong SHIFT

Source: SH Corporation Promotional Materials, 2013.

The Program Entity for Urban Restoration

The importance of public participation in urban restoration is more important than ever in terms of achieving balanced development and improving existing residential environments that are declining due to the recent urban expansion focused more on new cities and new built-up areas. SH Corporation offers various programs designed to improve the residential environment, urban environment, urban facilities, and apartment-type factories so as to breathe vitality into the city, restore the urban community, and recover and transform urban functions.

Figure 5 - Seun Improvement District

Figure 6 - Shingil 13 Reconstruction

Figure 7 -Yeongdeung-po Low-cost Housing Project

Figure 8 - Southeast Distribution District

Source: SH Corporation Promotional Materials, 2013.

The Provider of Residential Welfare

SH Corporation has undertaken various social contribution activities and provided residential welfare services to the vulnerable in society to help improve their quality of life, rather than focusing on the number of housing units supplied. As the provider of residential welfare, the Corporation has reorganized and strengthened the functions of regional integrated management centers, making an enterprise-wide effort to provide more specialized services.

Figure 9 - SH Academy

Figure 10 - Free Medical Services, Eutteumi Volunteer Group

Figure 11 - Peace of Mind Call Service

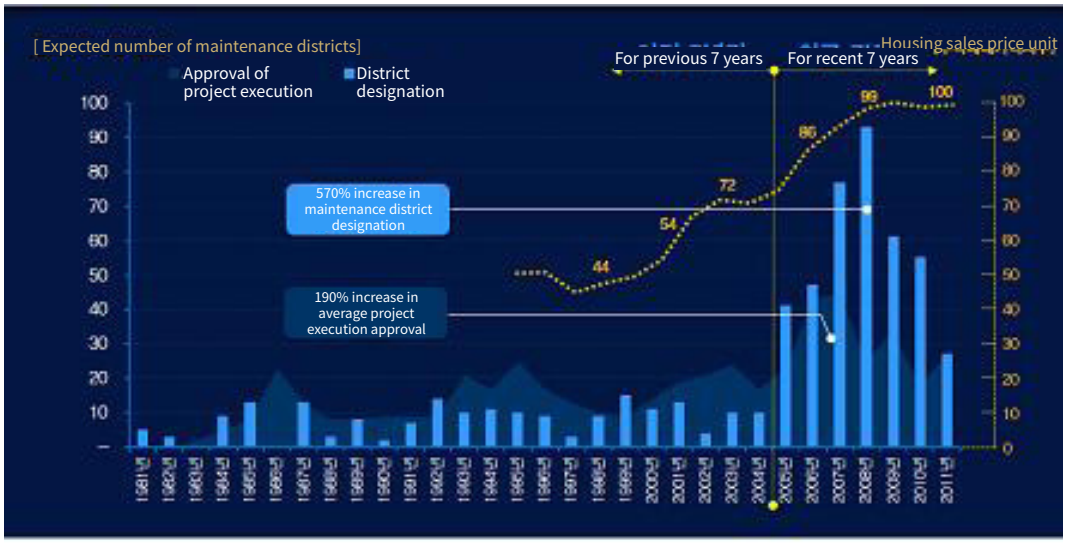
Figure 12 - Group Weddings

Source: SH Corporation Promotional Materials, 2013.

SH Corporation: Past & Present

Background to the Foundation of SH Corporation[4]

Figure 13 - New Town Redevelopment



4 . SH Corporation's Program Status, 2014.

Since the mid 1960s, the central government has undertaken the development of apartment complexes to supply housing. In the first economic development plan, housing construction was treated as a part of the economic plan. Various institutional measures were introduced for the plan, based on which development programs were implemented. In 1988, the central government adopted the policy of providing more land and housing (such as through construction of 2 million housing units and development of 5 new cities in the capital area), necessitating creation of the Seoul City Development Corporation. As a result, the number of new housing units soared from 244,301 units in 1987 to 750,378 units in 1990. Thanks to reconstruction of deteriorating housing and development of new towns, the City, which had no new land available, was able to realize a housing rate of 65% in 1995 and 100% in 2011.

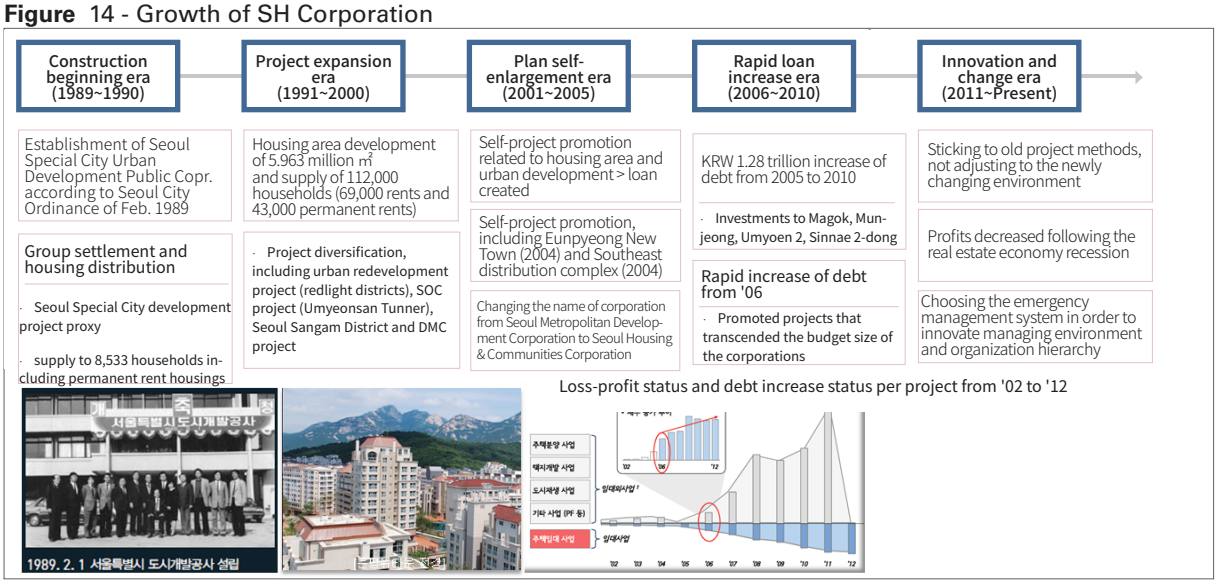
During this process a universal development approach was taken where public institutions would develop land in designated districts and private construction companies would come in and build housing complexes. In 1993, the reconstruction standards for deteriorating apartments were eased and public housing reconstruction projects spread quickly. While this top-down approach by government authorities generated several issues such as landscape degradation, insufficient supporting urban infrastructure, and damage to residential and community environments, it also opened a door to new approaches such as including residents in the plans.

Amidst sweeping socioeconomic and policy changes, SH Corporation has constantly worked to adapt by adjusting its roles and functions. This is evidenced by such programs as SHIFT where the idea of owning housing (a byproduct of physical and quantitative-oriented development) has been switched to inhabiting housing; newlywed and single/couple housing designed to keep up with demographic and social changes; and the 'Nest of Hope' program for residential stability of low-income families.

Growth

Since its establishment in 1989, SH Corporation has grown into a healthy public entity as it has managed the supply of public lease housing and urban development programs for Seoul. After the mid-2000s however, it began carrying out major policy programs such as Eunpyeong New Town, Magok, and Munjeong, all at the same time, falling into financial difficulties due to snowballing debt.

Figure 14 - Growth of SH Corporation



Undisclosed Data: SH Corporation Mid-to-Long-term Management Strategies 2014 - 2018, 2013

Foundation of the Corporation (1989 – 1990)

In December 1988, the Ordinance on Installation of the Seoul City Development Corporation was passed. In February of the next year, the public corporation was finally launched, with KRW 300 billion in capital (increased to KRW 1 trillion in 1990) and comprised of 3 departments, 9 divisions, and 28 teams, and employing 389 people. In the early years, major achievements included supply of permanent lease housing for 810 households in 1989, sale of public housing to 3,481 households in 1990, and supply of 311 commercial units in Junggye and Gangdong, etc.

Expansion of Program Scope (1991 – 2000)

During this period, the Corporation increased the supply of land and housing (both public lease and sale) and contributed to residential stability. In 10 years, it developed an area of 5,962,718㎡ and supplied housing to 112,000 households (69,000 lease housing, 43,000 housing for sale). It also carried out several urban development (restoration) programs, such as the Urban Redevelopment Program in Jeokseon District, SOC (Umyeon Mountain tunnel), and reconstruction programs (KIT apartment reconstruction). The Corporation took an active part in preserving residential culture, participating in projects to preserve traditional housing in Bukchon, Seoul. The Corporation has diversified its scope of programs to include, among others, the Sangam District and DMC programs.

Expansion of Corporation Programs (2001 – 2005)

Based on past performance in housing supply and urban development, the Corporation pursued its own programs such as the Jangwi/Wolgye District Land Development project in 2001, and other large-scale devel-

opment programs like Eunpyeong New Town (2014) and the Southeast Distribution Complex (2004).
As its programs diversified, it was renamed 'SH Corporation' and its capital increased to KRW 5 trillion (2004), a dramatic increase. The pursuit of land and urban development programs by the Corporation actually began as a policy decision made by the City of Seoul, but pursuing public policy as part of its mandate resulted in the need for additional, borrowed funding.

Increasing Liabilities (2006 – 2010)

As the Corporation's program scope expanded, large-scale investments were made in Magok, Munjeong, Umyeon 2, and Shinnae 2, leaving the Corporation with substantial liabilities. These programs were not by internal decision or analysis but by the Corporation's failure to stop conducting projects on behalf of the City of Seoul. Moreover, the lease housing projects led to even greater debt, and reduced land development and sale housing projects pushed the Corporation to the financial brink.
Currently, in accordance with orders from the City and national governments, the Corporation is restructuring itself to restore its financial health.

Major Achievements

In total, SH Corporation has developed 16,946,000 ㎡ of land and built or supplied 230,000 housing units. It has also continued to pursue programs of its own (improvement of the urban environment, apartment-type factories, the Southeast Distribution Complex, urban planning and facilities) as well as urban restoration (development) programs commissioned by the City of Seoul.

Table 1 - SH Corporation: Major Achievements

Type of Project		Scope	Details
Land Development		38 districts 16,946,000 ㎡	· Suseo, Daechi, Gayang, Banghwa, Gongneung, Sanggye, Sangam, Balsan, etc.
Housing Construction & Supply	Construction by SH Corp. and Purchase	175,544 households (Lease: 94,462) (Sale: 81,082)	· Land development: 151,724 households (Lease: 75,759/Sale: 75,965) - Including Hope Housing and public studio apartments, etc. · Residential environment: 6,185 households (Lease: 1,963/Sale: 4,222) · Redevelopment: 2,629 households (Lease) · Reconstruction: 1,490 households (Lease: 595 / Sale: 895) · Construction by SH Corp.: 244 households (Lease) - Sangam DMC, Lease for foreign nationals: 175 / Wangshimni Commercial-Residential: 69 · Purchase/Lease: 13,272 households (Lease) - Multi-household: 6,600 / Jeonse lease: 2,635/ SHIFT: 2,979 / · Purchased studio units: 1,043 / row houses: 15
	Purchased by the City of Seoul	53,413 households	· Redevelopment: 51,836 households (Lease) · Reconstruction (SHIFT): 1,577 households (Lease)

Urban Environment Improvement	1 district	· Jeokseon 2 District
Apartment-type Factory	6 districts (339 units)	· Shinnae, Shintree, Junggye, Gayang (2), Sangam High-tech Industry Center
Commercial Arcade, Southeast Distribution Complex	8,360 units	· Life (5,358 units), Works (734 units), Tool (2,268 units)
Urban Planning Facilities & Other Projects	48 projects	· Road construction: 'Seoul – Bucheon', 'Bongcheon – Nakseongdae-gil', etc. · Public car depot: Gangdong, Songpa, Yangcheon, Jungnang, Jangji, Jingwannae, etc. · Traditional Korean housing: Donhwa Cultural & Artist Village (1 building, 7 units) · Others: Hyangdongcheon Improvement Project, Seogang Remodeling Project, etc.

Source: SH Corporation Programs, 2014 (as of December 31, 2013).

Future of SH Corporation

Current Issues & Challenges

Growing Internal/External Need to Secure Financial Health

The unsold Eunpyeong and Southeast Distribution Complex housing and their consequent increase in debt led to KRW 540 billion in operating losses and KRW 12.6 trillion in debt as of 2012. The Corporation has taken serious steps to sell the unsold lots and has tightened its belt to reduce debt. However, the Ministry of Public Administration & Security increased the financial management standards for local public corporations, making it more difficult to issue public bonds, which in turn has driven the Corporation deeper into its financial mire.

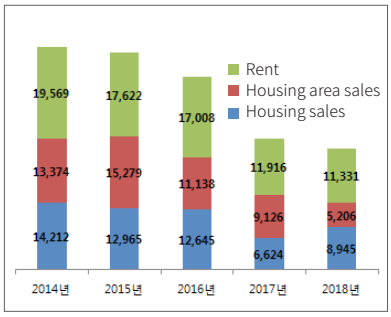
Debt from Existing Programs & Lack of Profitable New Programs

With some 85% of Seoul already developed, there is not much room for development in the city and profit from land and housing development is expected to fall in the future. Each year, more and more supplied housing requires maintenance and repairs, further increasing debt from the lease programs, which is expected to reach KRW 214.7 billion by 2013 and KRW 475 billion by 2020. Maintenance costs are also growing over time: between 2002 and 2012, they went up 3.5 times while profits from leasing only doubled.

Growing Demand for Residential Welfare

A rapidly-aging society and low birthrates have caused the demand for residential welfare to spike among the elderly and socially vulnerable. The central and Seoul governments are requesting more "Happy Homes" and public lease housing, but the Corporation is increasingly financially incapable of handling such demands. The central government and the City of Seoul will need to provide adequate financial assistance to the Corporation if they wish to develop and supply new housing to respond to changing household types and meet community demands for better residential welfare and services.

Figure 15 - Housing Investment Plans for the Next 5 Years



Source: Seoul Metropolitan Council Reporting Materials, December 2014.

Figure 16 - Article on Local Public Corporations

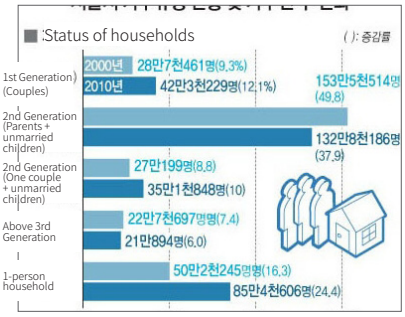

매일경제

부실 지방공기업 8곳 구조조정

SH·강원도개발공사 등 … 인력감축 포함

Source: Maeil Business Newspaper, December 28, 2013.

Figure 17 - Changes in Types of Household



Source: Hankyoreh, December 2012.

Outlook on Major Programs[6]

Land Development

While the previous government-led development used up large plots of land, this is changing toward improving the living environment, aided by resident participation. This new approach is in response to growing awareness of the qualitative value of existing urban and residential environments.

In the future, abolishment of the Housing Site Development Promotion Act is expected to limit large-scale projects even further, and new projects are expected to be carried out in collaborative partnership with the City of Seoul (Public Development Center).

Some of the projects that are expected in the future include: construction of more Happy Homes, utilizing public/private land (lots reserved for the rail network) pursuant to the relevant central government policies; joint private-public development projects to ease the burden of initial investment; and housing construction projects after changing original urban plans for unsold parcels.

Housing Construction

The new housing policies geared for small/medium housing, such as Bogeumjari Housing or SHIFT, have helped enhance residential stability and quality of life for lower income families, responding to the specific demands of people with different needs such as newlyweds or large families. Over time, the demands for housing types have also changed, which were met by various lease housing policies such as Long-term Housing, Hope Housing, Cooperative Lease Housing, Urban Housing, and SHIFT. A wider range of options for lease housing is expected in the future. The existing approaches of supplying housing on a single, large plot of land may well become less common as need for a more diverse approach grows, which can include taking advantage of complex developments, unsold land, city-owned land, and urban planning facilities. One

6. Undisclosed Data: SH Corporation Mid-to-Long-term Management Strategies 2014 - 2018, 2013.

of the options under consideration is to increase the supply of lease housing while building houses for sale to strike a balance in profitability.

Urban Restoration

Urban restoration has usually been centered on redevelopment of lease housing, but it is now time to improve profitability. Because there are limited land and urban development projects now, urban restoration will be necessary as the next projects (one of the main programs). By nature, urban restoration is for the good of the public, making it important to review ways to make up for profit shortfalls. Some options include: low-income housing project; public studio lease; small lease housing built under overpasses; and restoration projects in collaboration with local government bodies.

Improvement programs pursuant to the Act on the Maintenance & Improvement of Urban Areas and Dwelling Conditions for Residents are currently led only by SH Corporation, but joint implementation with cooperatives is under consideration.

Figure 18 - Human Town & Village Programs and Bogeumjari Housing Projects

서울경제 2008년 12월 05일 금요일

종합 06면

보금자리주택 내년 하반기 시범분양

인근 아파트보다 15% 싸게… 서울 뉴타운 추가지정 추진도

국토부 "후속입법 연내 완료"

인근 지역에서 분양하는 민간 아파트보다 15%가량 낮은 분양가로 공급되는 보금자리주택이 내년 하반기 시범 분양된다. 또 서울 뉴타운 추가 지정이 내년에 본격 추진될 것으로 보인다.

국토해양부는 올해 6월부터 마련한 각종 부동산 대책들의 후속 입법이 연내 대부분 완료돼 내년 초부터 시행에 들어갈 예정이라고 4일 밝혔다.

우선 9·19대책에서 발표된 보금자리주택이 내년 하반기 중 시범 공급된다. 내년 6월까지 시범지구를 지정하고 하반기에 사전예약제 방식으로 첫 분양된다. 입주는 오는 2012년 하반기로 예정돼 있다.

도시 근교 개발제한구역(그린벨트) 해제 지역에 공급될 보금자리주택은 인근 지역의 신규 분양아파트보다 15% 내려 공급된다.

서울 뉴타운 추가지정은 현재 재검토 단계로 국토부는 이 결과가 나오는 대로 서울시와 추가지정 문제를 긴밀히 협의해나갈 계획이다.

또 시중 임대료의 30% 수준인 영구임대주택의 건설이 재개된다. 내년에는 5,000가구, 그 이후에는 약 1만가구씩 건설돼 2012년부터 첫 입주가 시작된다. 시중 임대료의 60~80% 수준으로 30년간 장기 임대할 수 있는 '국민임대주택'도 올해 6만5,000가구 공급에 이어 내년에 8만8,000가구가 공급된다.

재건축·재개발 사업의 시공자 선정 시기 조기화, 안전진단 완화 등 절차규제 간소화의 경우 '도시 및 주거환경정비법' 개정안이 10월30일 발의되고 지난달 27일 상임위(국토위)를 통과함에 따라 이르면 연내 시행이 가능할 것으로 보인다. 이 가운데 11·3대책에서 제시한 소형평형 의무비율 완화는 '도시 및 주거환경 정비법 시행령' 개정안이 현재 입법예고 중이며 관련 절차들을 최대한 단축해 연내 개정을 완료할 방침인 것으로 전해졌다.

/최석영기자 sychoi@sed.co.kr

The Block-Unit Housing Rearrangement Project (10,000㎡ or smaller) and residential environment management projects implemented by the City of Seoul are still in the initial stages and may need participation by SH Corporation.
Undisclosed Data: SH Corporation Mid-to-Long-term Management Strategies 2014 - 2018, 2013.

Residential Welfare

The focal point of residential welfare programs has been on management and operation of lease housing, which is likely to continue. There is a growing need for a stronger role for residents in restoring urban communities, meaning there is a greater responsibility to develop and manage community space and programs so they better suit the needs of the community. Above all, there is a constant need for more services and assistance to improve the residential welfare of people living in lease housing, especially the socially vulnerable. In the future, SH Corporation is expected to continually supply and manage lease housing of its own as well as that of the City of Seoul, in accordance with the city's long-term plans which also include purchasing or redeveloping existing houses for lease.

Figure 19 - Diversified Community Space & Activities

Source: SH Corporation Promotional Materials, 2013.

Compensation

Due to the reduction in land development projects, compensation is likely to decrease accordingly. While compensation for large-scale development will decrease, it is important to keep up with compensation for smaller lots. SH Corporation will need to sharpen its competitive edge by utilizing its past experience with smaller projects and other various types of projects.

Others

There has been a wide range of projects, from preservation and promotion of traditional housing to U-City and integrated energy projects in Mokdong and Nowon, as well as the PF project.

Preservation of traditional housing, Eunpyeong Traditional Village, the Southeast Distribution Complex Arcade (Garden Five), and other projects have been developed pursuant to various city policies. As such, SH Corporation will need to respond to each new policy program as it comes.

Based on past experience with development and supply of research and industrial complexes, the Corporation will need to examine ways to participate in the PF project by reviewing the construction projects in Magok Complex and the city's quasi-industrial complex, analyzing fluctuation in the property market, and studying the objective of and necessity for the programs and projects. The Corporation will also need detailed plans on the integrated energy program (January 1, 2002 – current) commissioned by the City of Seoul.

Figure 20 - U-City, Distribution Center, and Integrated Energy Projects



Source: SH Corporation Promotional Materials, 2013.

Policy Suggestions

SH Corporation has fulfilled its role in urban development and housing supply to enhance residential stability. However, it is now facing a crisis brought on by multiple elements: a changing management environment (policy changes by the central and Seoul governments), increasing public demand for better residential welfare, etc.), depletion of available land for large-scale development, and debt from public lease housing. To survive, the Corporation needs effective strategies to ensure a sustainable source of revenue and a basis for further growth.

Policy Priority on Residential Welfare

By the late 20th century, Singapore and nations in Europe had already adopted policies that emphasized the importance of quality living environments, and have focused their efforts on building publicly-owned lease housing. When a certain percentage of public housing stock has been secured on the property market, they strengthened their residential welfare policies, providing rent subsidies and other types of assistance.

Today, public housing is only 5.5% of total housing stock in South Korea, and more is needed. Residential welfare policy will need to be more comprehensive in order to supply affordable housing to the marginalized, assist them in becoming more self-sufficient, enhance their quality of life, and realize social integration. It should be understood that the past approach of using land development profits to supply public housing is no longer valid, and that partnership with the private sector is crucial.

As a rapidly-aging society, Korea has seen a great increase in the number of senior citizens, and demographic and social changes have altered the composition of families. Those people who were left out of the previous policies will need to be included in the future to ensure that they too benefit from residential welfare and public lease housing tailored to the needs of actual users. The previous method of lease management should be made efficient in order to minimize the deficit. While the old way focused on facility management and repairing problems, the new way should go beyond this and strive to provide what residents actually need.

Urban Restoration as the Next Engine for Growth

SH Corporation has earned the trust of the public by fulfilling its duty as the developer for Seoul, but it did not have a systematic program with a long-term perspective while executing its policy-based programs. Because there is no available land for large-scale projects within the boundaries of Seoul, the Corporation will need to use urban restoration as specified in the Special Act on Urban Regeneration to secure what is needed for projects. It may also wish to refer to examples where a local public corporation has implemented a project in a way that best utilizes the local characteristics and modify these into programs so they are suited to its own use.

From the perspective of balanced urban development, it is reasonable for the public to participate in the regeneration of deteriorating residential areas occupied by the marginalized and low-income households excluded from previous urban restoration projects. However, such participation without any detailed plans will only exacerbate the present financial crisis. The Corporation should have a competitive edge over the private sector and choose areas where it can perform well. For example, it may wish to consider participating in development of national or city-owned land, using its past development and management experience. Another option would be to manage construction of small residential area projects, considering the trend today of using such improvement projects for the benefit of the public. With effective strategies to strengthen its abilities in urban restoration for the public good and ensure profitability at the same time, SH Corporation could well be a central organization that propels urban restoration in Seoul.

In Closing

As it has shared in Seoul's growth, SH Corporation has accomplished many things and contributed to urban development and supply and management of housing in the city. Times have changed as have demands, and SH Corporation has endeavored to restructure itself and pursue innovation. However, its role – the engine behind Seoul's balanced development, residential stability, and improved welfare – has not changed. In fact, this role, and that of other local public corporations, is critical and should be further expanded to resolve housing issues, improve quality of life, and meet the welfare needs of local residents who also experience demographic changes and social polarization.

Other partnering cities can refer to the following SH Corporation experiences in establishing their own public corporations:

First, the management system needs to fully understand and incorporate the characteristics of the local public corporations and ensure autonomous management. The roles of the central government, local authorities, and the corporation should be clearly defined when it comes to public policy programs. There will also be a need for an institutional and legal framework to create a vertical relationship, aid in autonomous and responsible management, and further define the roles.

Second, systematic financial planning is crucial for sustainable management. In its public lease housing and urban restoration programs, a public corporation should focus less on profitability and more on the virtuous cycle and good business structure such as good returns on investment and balanced profit and loss, by, for example, going back to study precedents and other related cases. It may also prove useful to engage in risk management in order to prepare countermeasures (e.g., financial assistance) for potential losses in the policy programs.

Third, good business models are necessary to strike a balance between the public interest and profitability. For residential welfare programs designed for the public good, an adequate profit model is needed, one that sets itself apart from those of the private sector. This will not only prevent deficits from negatively impacting welfare services but also create the groundwork for providing quality services on a continued basis.

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4. Residential Environment Improvement Program for the City of Seoul

Writer : Seoul Institute Dr. Da-Mi Maeng

Policy Area: Housing

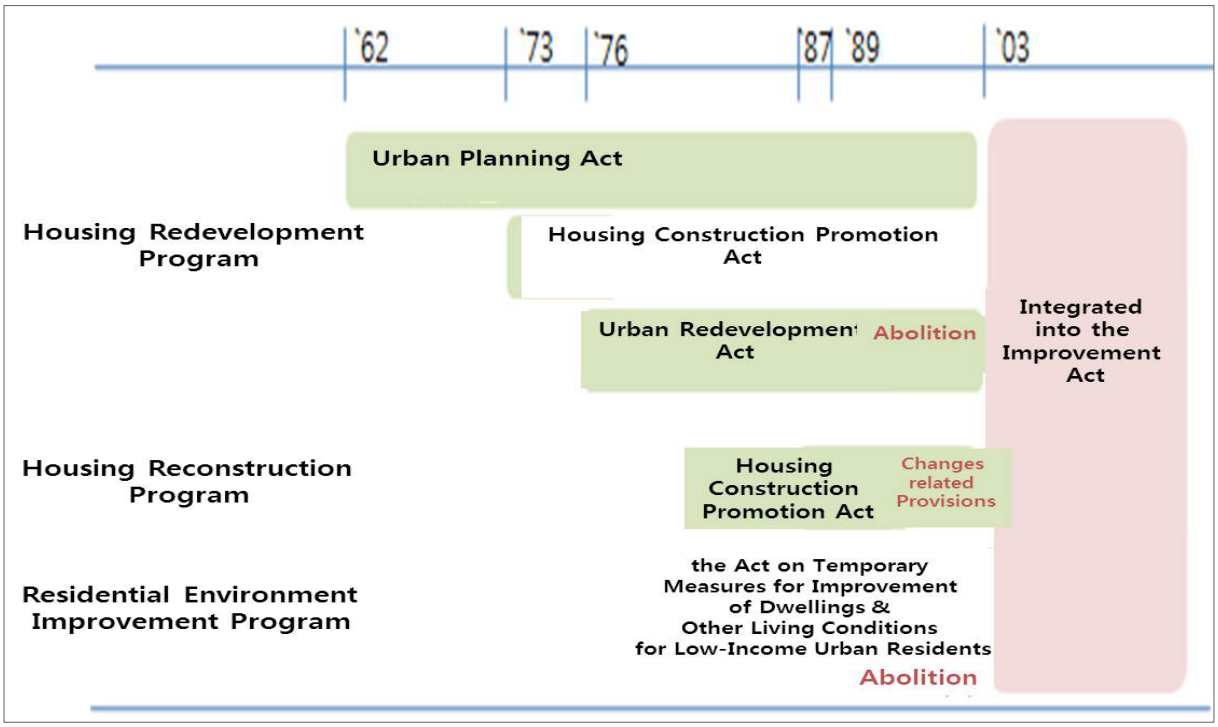
Background to the Residential Environment Improvement Program

Thanks to the intensive economic growth of the 1970s and 1980s, housing demand snowballed in Seoul. Naturally, the government followed aggressive policies to provide sufficient housing for its people. Urbanization slowed somewhat in the 1990s, leading to a growing demand for government policy to address the need for improvements to areas where housing had deteriorated, including redevelopment. The initiative which began in the 1960s to improve living environment can be divided into three programs: housing redevelopment, housing reconstruction, and residential environment improvement. Each was based on different laws and implemented through different procedures and methods. Of these three, the last played a crucial role in supplying new housing and improving significantly deteriorating areas, particularly in Seoul where the available land for development is limited.

The real estate market had been very active due to housing demand until the Asian financial crisis in 1997. The market then stagnated and the government was asked to revitalize it. The existing improvement programs up to that time had been carried out for profit on a small scale, independent of each other, without consideration of urban infrastructure that needed a broader approach. Various problems arose as a result, such as an overburdened infrastructure, damage to the cityscape, and loss of needed residential areas. To resolve these problems, improvements had to be made at a broader level and in a systematic manner.

Extensive issues were created by the execution of individual programs under different laws. These programs included: the Housing Redevelopment Program pursuant to the Urban Redevelopment Act; the Housing Reconstruction Program pursuant to the Housing Construction Promotion Act; and the Residential Environment Improvement Program pursuant to the Act on Temporary Measures for Improvement of Dwellings & Other Living Conditions for Low-Income Urban Residents. To address the issues created, the three separate laws were integrated into the Act on Maintenance & Improvement of Urban Areas and Dwelling Conditions for Residents (the "Improvement Act") in 2003. In the Improvement Act, and the establishment of a Master Plan for Redevelopment of Urban Central & Residential Areas was made mandatory in an effort to minimize the undesirable outcomes of poorly coordinating the separate improvement programs.

Figure 1 - Enactment of the Improvement Act



Summary

Master Plan for Redevelopment of Urban Central & Residential Areas 2010

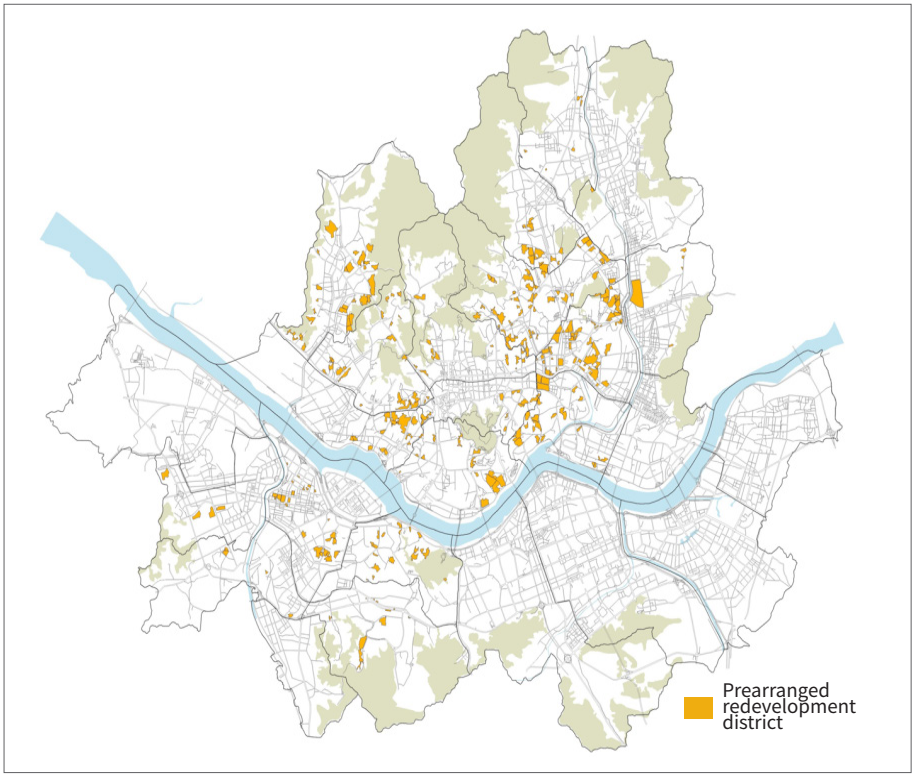
The Improvement Act required that a Master Plan for Redevelopment of Urban Central & Residential Areas be established, which was to be a higher-level plan for the individual improvement plans, for better integrated urban management. The Redevelopment Master Plan would then be carried out in connection with its own higher plan – the Basic Urban Plan – as well as with other urban management plans, making it easier to respond to changes with more flexibility. According to the Act, the basic principles and development guidelines would have to be presented, including such information as target areas, directions, facility standards, development density standards, and methodology. In the following paragraphs, the major specifics in the Redevelopment Master Plan are introduced.

The first initiative introduced to the Redevelopment Master Plan was the "community sphere", a concept used to develop wider-area plans. "Community sphere" refers to the small living environment for a community. This is the basic unit at which plans for residential management, infrastructure improvement, and house leasing are developed. The community sphere served as a basis for planning infrastructure. Whereas the individual improvement programs that had been implemented for profit led to the previously mentioned

extensive urban problems (an overburdened infrastructure, damage to the cityscape, and loss of needed residential areas), the community sphere plan took a broader and more systematic view of infrastructure improvement so as to maximize the effects of improvement, make reasonable adjustments to physical features (e.g., roads, geography-related matters), and allow for reasonable access to pedestrians and other rights.

Second, the concept of "prearranged improvement for target districts" was introduced to allow for the "Plan First, Develop Later" scheme. The districts that were to be improved would be designated, and then selected for redevelopment, reconstruction, or residential improvement. This system of designating a target area granted greater flexibility and encouraged a broader perspective of the improvement from the point of view of the entire urban planning scheme. However, this system, adopted to "plan first and develop later", was altered to "designate first, plan next, and improve later", quite the opposite of what was originally intended. In fact, the system led investors to expect high returns from development and caused property prices to rise. This in turn pushed program costs up, not to mention the fact that executing programs individually at the prearranged district level undermined systematic planning of roads and other infrastructure facilities.

Figure 2 - Prearranged Improvement for Target Districts for the Master Plan for Redevelopment of Urban Central & Residential Areas 2010 in Seoul



Source: Seoul Metropolitan Government, 2004, Master Plan for Redevelopment of Urban Central & Residential Areas 2010 for Seoul, Seoul Metropolitan Government Redevelopment Program

Third, height and density management was introduced for the cityscape. Under the Basic Housing Redevelopment Plan, high-rise buildings were allowed on hills or in low-rise residential areas as there were no regulations on number of floors when calculating estimated floor space. However, the Redevelopment Master Plan used the floor specifications from the type classifications under the General Residential Area, promoting adequate development by land use and systematic improvement of the cityscape.

Residential Environment Improvement Program

The Improvement Act is utilized to assist implementation of the Residential Environment Improvement Program. The program can be introduced pursuant to this Act, provided that all the physical conditions and legal grounds (consent from owners, etc.) for the area designation are met. The Improvement Act categorizes parts of the Residential Environment Improvement Program by target area characteristics into: the Residential Environment Improvement Program, the Housing Redevelopment Program, and the Housing Reconstruction Program. It is also by these characteristics of the target area that the type of program is determined. The Residential Environment Improvement Program is implemented at the lot unit level, targeting areas with high concentrations of significantly deteriorating buildings and low-income earners, and where the infrastructure is extremely poor. The Housing Redevelopment Program is for areas with high concentrations of significantly deteriorating buildings and where the infrastructure is poor. The Housing Reconstruction Program is for areas where the infrastructure is good but contain a high concentration of significantly deteriorating buildings. These programs are further divided according to the entity that carries out the programs: private development, public development, and joint development. The methods utilized include management and disposal, improvement, housing construction, replotting, and acceptance.

The procedures for housing redevelopment and reconstruction programs include planning, preparation, execution, and completion. In the planning stage, an improvement plan is developed and target areas designated. The preparation stage requires that consent from a majority of land owners, etc. be obtained to organize a program committee or a resident council and obtain approval for the organization of an association. In the execution stage, approval is obtained and the construction company selected. After approval is granted for the management and disposal plan, significantly deteriorating buildings are demolished to make way for new construction. The program is concluded once construction is completed, residents move in, liquidation is settled, and the association disbands.

Advancement of Residential Environment Improvement Policies

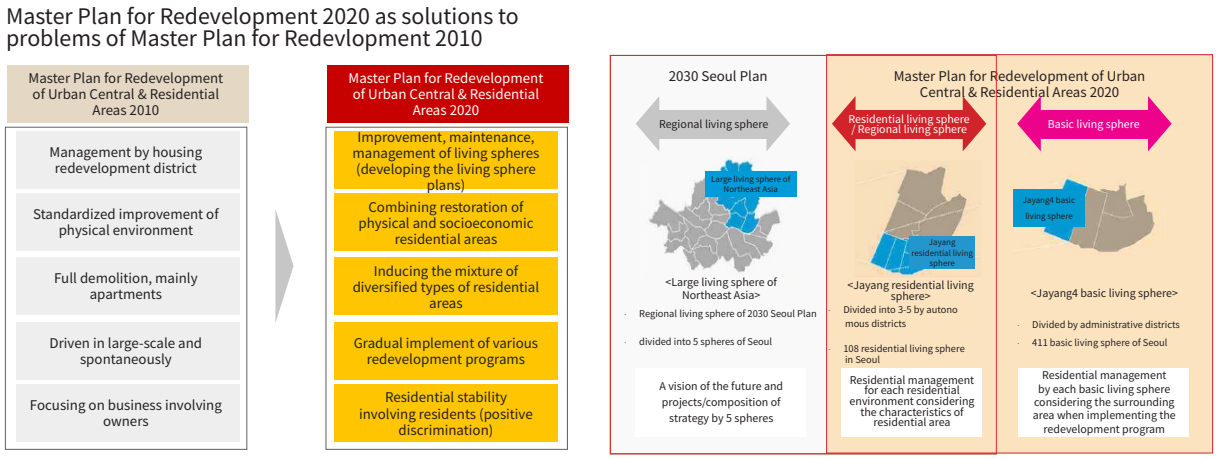
Once the Residential Environment Improvement Program and the New Town Program (a broader level program) were pursued in earnest, problems again began to surface. Only a small number of original residents returned; small, affordable houses disappeared; housing and jeonse lease prices jumped; and conflict frequently occurred between residents. The City of Seoul therefore organized the Advisory Committee for Residential Environment Improvement Policy to come up with fundamental solutions to these problems.

The Advisory Committee worked to address the current issues – a lack of sufficient housing for low-income families; development of the target area management system; diversification of housing types; expansion of the public role in the improvement programs; and revision of the residential area change management system. Accordingly, the City of Seoul maintained the basic structure of existing residential areas, comprised of low-rise buildings, in 2009, while introducing a public management system by which the role of the public sector was strengthened in the "Human Town" programs and improvement programs. The city government also developed a tool to calculate improvement program costs, endeavoring to offer an enhanced system for the tenants.

Master Plan for Redevelopment of Urban Central & Residential Areas 2020

Of the individual improvement plans, the Master Plan for Redevelopment of Urban Central & Residential Areas 2020 is said to be the key comprehensive people- and location-oriented residential area management plan. It offers systematic improvement of infrastructure and effective use of local resources, and enables overarching improvement, maintenance and management of living spheres. Revised in February 2012, the Improvement Act requires that plans are developed at the living sphere level as part of the Master Plan for Redevelopment of Urban Central & Residential Areas. The Master Plan for Redevelopment of Urban Central & Residential Areas 2020 replaced the living sphere plan with a plan on target areas and plans by stage, which ensured consistency of the living sphere plan with the Basic Seoul Urban Plan for 2030. For its residential restoration policy, Seoul suggested 3 goals: Residential areas which enhance the value of life and the future; Residential areas that appreciate people and the community; and Residential areas shaped by residents throughout the entire process.

Figure 3 - Direction of the Master Plan for Redevelopment of Urban Central & Residential Areas 2020



Source: Internal data, Housing Policy Bureau, Seoul Metropolitan Government (2013)

The following paragraphs are a summary of the Master Plan for Redevelopment of Urban Central & Residential Areas 2020 as built on the above goals:
First, residential areas fall under comprehensive management under the living sphere plan, which replaces the target area system. The living sphere plan is comprised of the residential sphere plan – a statutory plan built by the City of Seoul – and the basic sphere plan – an administrative plan developed by autonomous districts. The roles and details are categorized by this structure.

Second, the Residential Environment Index is introduced to objectively analyze the living sphere, a management system to create residential environment at the global level that meets international standards. It is comprised of 35 indices – 25 physical and 10 socioeconomic. Analysis of the indices influences the direction of planning.

Third, a new management system is introduced in place of the target area system. The new standard, called the Residential Improvement Index is introduced to designate areas. The new system also manages the supply and loss of housing and provides guidelines for the improvement programs.

Fourth, the residential environment management program types are diversified. A Residential Management Index is also introduced to determine whether public assistance is needed, and restoration programs are actively pursued to maintain and manage the residential areas.

Fifth, management of special residential areas is strengthened (residential areas with low-rise buildings, adjacent to the city walls, near the major mountains, waterways, or areas such as Bukchon).
The living sphere plans ensure that the existing basic improvement plans focus on improvement, maintenance and management of residential areas. With an aim to manage residential areas through living spheres and meet local needs, housing supply plans were developed to help install infrastructure, promote resident stability, and ensure a pleasant living environment in each sphere.

Emergence of Resident-Involved Restoration Programs

The negative impacts from the existing improvement plans that leaned heavily on demolition led the public to call for an alternative. In the widespread low-growth trend, the improvement plans experienced paradigm changes, with shifts from owners to residents and from demolition to preservation. It was in this process that residents were encouraged to be involved in the restoration programs. Resident-Involved Restoration Programs refer to "tailored plans and programs, including the improvement of living environment, construction of infrastructure, and assistance with home improvements in order to resolve complaints and address issues that arise in small communities with a concentration of detached/multi-household housing and townhouses." (Seoul Metropolitan Government 2013b, p.27)

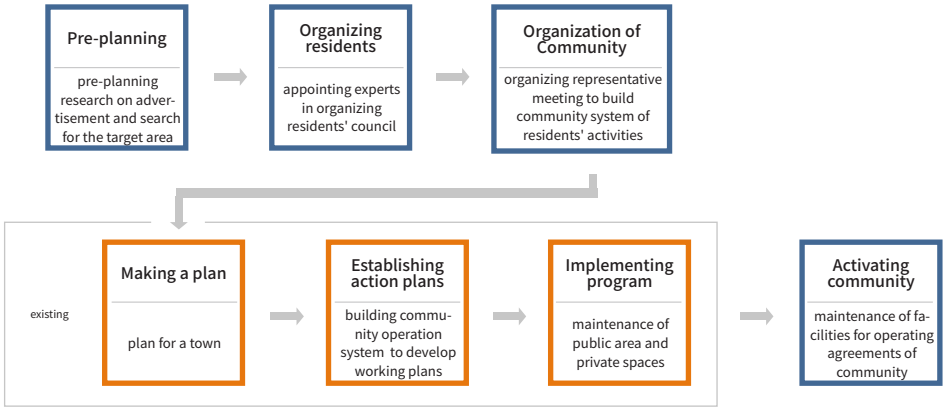
Revised in February 2012, the Improvement Act included new programs – the Residential Environment Improvement Program and the Block-Unit Housing Rearrangement Program – in addition to the Housing Redevelopment Program, the Housing Reconstruction Program, and the residential environment improvement program. The new programs are pursued as part of the Resident-Involved Restoration Programs in connection with the Make My Community program.

Residential Environment Improvement Program

In an effort to preserve and improve low-rise residential buildings without resorting to demolition, the Improvement Act, revised in February 2012, introduced a new method to improve the residential environment. In 2010, the concept of the "Human Town" was adopted, which is dedicated to preserving the residential areas of low-income families, providing needed housing, and improving the environment occupied by low-rise residential buildings. This Human Town program captured the core problem in such areas with low-rise residential buildings – safety and security – and added convenient infrastructure and amenities. In the beginning, there were no legal grounds or institutional basis in the Improvement Act to support the Human Town program. Financing was also temporary, funded by a portion of the Urban & Residential Environment Improvement Fund, which, as it became apparent, was not a permanent solution. The Human Town needed an institutional framework for financing.

The new Residential Environment Improvement Program also included the existing Human Town programs, which still continued afterwards. Under the program structure, the public sector assists with building the infrastructure or public facilities for the community. The residents take the lead in creating a community and take an active part in the restoration of the community environment. The targets include residential areas with a concentration of detached and multi-unit housing, General Residential Area Types 1 and 2 and the areas to be removed from the improvement target list, and the areas for reconstruction or redevelopment of detached housing where 50% or more of the (land) owners agree with the shift to the Residential Environment Improvement Program. To help the residents take the lead, a community is created first. Then overall plans are made, action plans drafted, and the program launched. This process is designed to maintain community activities after the program is successfully completed.

Figure 4 - Process of the Residential Environment Improvement Program



Source: Seoul Metropolitan Government, 2012, Development of an Alternative Model and Pilot Program for the New Town Redevelopment & Improvement Program

The public sector provides assistance for basic infrastructure (roads, parking lots, squares, security lights, CCTV etc.) and specific streets and walking trails for pedestrians, with resident-proposed ideas given priority. Support includes assistance with public facilities for residents (community centers, childcare centers, senior centers, public housing for temporary lease, etc.), waste treatment facilities, no-wall campaign, and the "Green Parking" program. Experts in master planning and community are dispatched to design future plans for the area and put the plan into action. Each program district has on/offline channels that provide consultation in accordance with income level and building type, offering opinions on such things as home improvements, their scope and cost estimates. These channels also guide residents to institutions that offer loans, and if necessary, those at a low interest rate. Financing is available for individual or joint renovation or improvement of housing or other buildings; 80% of the cost of improvement or construction within the residential environment management district may be taken out as a loan. Home renovation and improvement standards are available in manual form to help residents understand the requirements and procedures.

In addition to the 8 areas where the existing Human Town programs were absorbed into the Residential Environment Improvement Program, the City of Seoul plans to add 15 new areas each year to continue the program. The areas designated for the Residential Environment Improvement Program as of July 1, 2014 can be seen in Table 1 below.

Table 1 - Areas Designated for the Residential Environment Improvement Program in Seoul

	Areas to be Removed from the Improvement Target List	Areas to Remain in the Improvement Target List	General Areas	Special Areas	Number of Designated Areas
Selected before 2011	Yeonnam-dong, Bukgajwa-dong	Heukseok-dong, Siheung-dong, Gireum-dong	Banghak-dong, Onsu-dong		7
Selected in 2012	Samseon-dong, Guro-dong	Siheung-dong	Gaebong-dong, Eungam-dong, Shinsa-dong, Hwigyeong-dong, Sangdo-dong, Miah-dong, Jamsil-dong	Dobong-dong, Daerim-dong, Jeungneung-dong, Hongje-dong	14
Selected in 2013	Hongeun-dong (2), Shinwol-dong, Gongneung-dong, Miah-dong, Jeungneung-dong, Yeokchon-dong, Seokgwan-dong, Suyu-dong, Amsa-dong, Seongnae-dong, Geumho-dong (2), Bulgwang-dong, Sangdo-dong, Guro-dong, Hwigyeong-dong, Siheung-dong,		Sangwolgok-dong, Shinwol-dong, Dorim-dong, Daerim-dong	Jeonnong-dong	23
Selected in 2014	Samseon-dong, Garibong-dong		Yeokchon-dong, Doksan-dong		4

Source: Summary from the Magok Program on Seoul Housing, Urban Planning & Real Estate website (http://citybuild.seoul.go.kr/archives/2997).

Block-Unit Housing Rearrangement Program

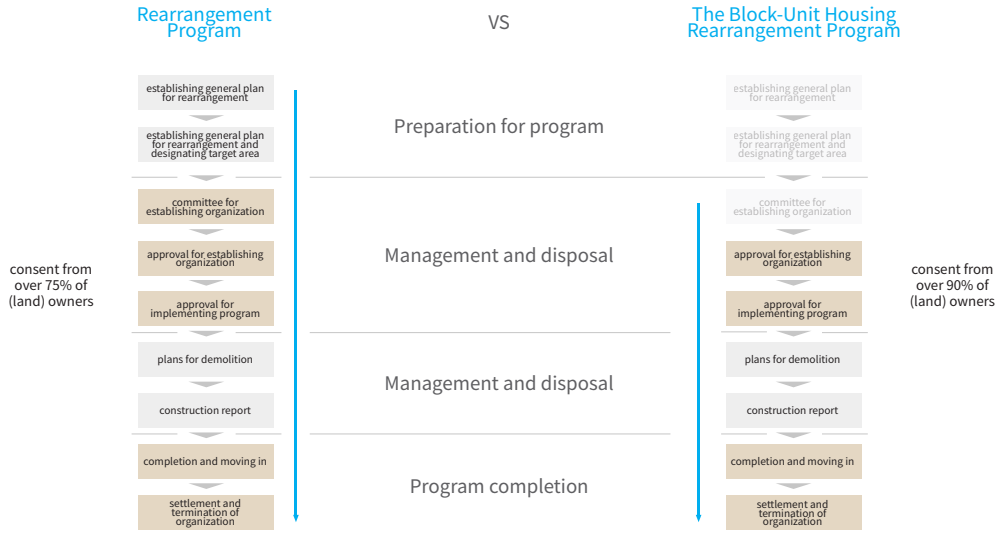
The Block-Unit Housing Rearrangement Program was introduced alongside the Residential Environment Improvement Program, after revision of the Improvement Act in February 2012. While the existing improvement program relied on the full demolition of significantly deteriorating houses across wide areas, the newer system was designed to maintain the urban structure and street networks and build small multi-unit dwellings.

Target areas include blocks surrounded by city/gun-district roads, 10,000 ㎡ or less in area, and without any through road except for those 4m or less in width. This program could be launched with the following conditions: in some or all of the block-units that met such requirements, two-thirds or more of all buildings must be significantly deteriorating, and there must be 20 or more households in existing detached houses and multi-unit buildings.

The entity that pursues the program may do so i) as an association comprised of land and house owners, or ii) jointly with the city mayor/gun-district governor, Housing Corporation, construction company, registered entity, or legitimately approved entity when the association obtains consent from the majority of its members. To organize an association, 8 out of 10 (land) owners covering two-thirds of the relevant land area must consent.

The Block-Unit Housing Rearrangement Program omits some of the processes found in existing improvement programs (designation of improvement target areas, establishment of improvement plans etc.) stipulated in the Master Plan for Redevelopment of Urban Central & Residential Areas and starts from the stage of obtaining approval for the organization of an association.

Figure 5 - Block-unit Housing Rearrangement Program Process



Source: Seoul Metropolitan Government, 2012, Development of an Alternative Model and Pilot Program for the New Town Redevelopment & Improvement Program

Changes to the System

Major Revisions to the Improvement Act

Since its enactment, the Improvement Act has undergone multiple revisions. The following paragraphs summarize the two major revisions.

The first revision in 2009 provided plans for adequate compensation for residential and commercial tenants. As part of a more attractive compensation package and to encourage tenants to return, commercial tenants were given priority for purchase/tenancy, and compensation for closing the business was increased from 3 months of estimated business revenue to 4 months. A tenant migration plan was incorporated in program execution, and an ear given to tenants, with public housing for lease also made available for temporary use by these tenants. Moreover, the letter approving construction indicated the demolition schedule allowing residents to plan ahead. A dispute committee was formed to address conflicts between the association and tenants, and the obligation to properly compensate tenants became stronger. Any loss suffered by the association due to the additional tenant compensation was offset by the benefits from easing the floor space ratio.

In 2012, the second revision laid the groundwork for a program exit strategy and alternatives. A "sunset system" was introduced to remove improvement target areas from the list if and when certain conditions (e.g., resident consent) were met even if it proved difficult to pursue the program due to the sluggish property market or conflict with residents. The competent administrative government was also allowed to approve the program committee or cancel association approval in accordance with input from residents. This revision also allowed for assistance from the local government entity to help replace some of the money spent by the cancelled program committee, and information could be provided to the (land) owners relevant and necessary for the residents to make informed decisions, such as the approximate costs of the program or estimated contributions. In the meantime, an institutional basis was developed to encourage sustainable restoration of the residential areas. Where areas were removed from the improvement target area list, the Block-Unit Housing Rearrangement Program and the Residential Environment Improvement Program were able to be introduced – an alternative to the old method of demolition instead of improvement, maintenance and management of the areas.

Various measures were taken to make the program launching in designated areas successful. In areas under the public management system, relevant regulations were loosened, the process was simplified (organization of a program committee was unnecessary, etc.), and the floor space ratio applied in the redevelopment programs could be increased to the legal maximum. The increased floor space ratio could be offset by the construction of small houses. Furthermore, the legal framework was laid to allow city mayors or gun-district governors to request verification of the feasibility of the management and disposal plan. The scope of the public sector's role was also expanded by adding responsibilities from developing the residential or migration plan for tenants to assisting with the development of the management and disposal plan.

The revisions provided a basis for the residential area management plan according to living sphere. There was no need to designate the areas to be improved, and integration of improvement, maintenance and management of each living sphere was made possible. It became mandatory to provide information to the residents and listen to their input to ensure the free exercise of their rights to know and keep the program transparent throughout the process. Future disputes were to be prevented by providing information such as the estimated compensation to the (land) owners before agreeing to organization of an association. Many institutional measures were implemented to improve the flow of information to the residents. The system for obtaining consent from the residents became more effective. The percentage of direct participation in the major general meetings grew from 10% to 20%, and even general meeting resolutions on development of the program execution plan would need to be agreed by a majority of the association members. Penalties were strengthened for corruption or irregularities in the process of selecting a construction company or electing an association executive.

Enactment and Revision of the Ordinance on Seoul Urban & Residential Environment Improvement

Based on the Improvement Act initiated in 2003, the Ordinance on Seoul Urban & Residential Environment Improvement (the "Improvement Ordinance") was passed in December 2003, which dealt with matters stipulated in the law in more detail. The Improvement Ordinance has since been revised a few times. Pursuant to revision of the Improvement Act in February and of the Enforcement Decree of the Improvement Act in August 2012, the Improvement Ordinance was revised twice.

The first revision addressed the following: requests for association disbanding and the scope of consent required from the (land) owners for cancellation of the program committee and association approval in cases where a program was canceled; the percentage of consent required for (land) owners to request the head of the gu-office to disclose information on the total cost of the improvement program or estimated compensation; and the percentage and use of small houses built to offset the increased floor space ratio. To inject vitality into the program area, the revised Ordinance included a public management system and expanded the scope of assistance. The scope of public management covered assistance for development of residential and migration plans for tenants and for the management and disposal plan. In an attempt to boost acceptance of the improvement program in designated areas, input from residents was carefully considered and their opinions sought on designation of areas for improvement, (land) owners were given the opportunity to state their desired housing size and compensation, and tenants encouraged to move back in after improvements and lease a unit. Measures designed to help tenants were also included, such as relaxing eligibility requirements for those living on Basic Livelihood benefits. The methodology and procedures were specified to adjust the program approval timeline and the management and disposal plan. If an excess of 1% of the housing stock in the autonomous district or the number of existing housing in the improvement program area exceeded 2,000 units, that area was subject to deliberation. Requirements for an area to be designated for the Housing Reconstruction Program was that the improvement plan should be for 10,000㎡ or more, and the area should be occupied by a concentration of residential buildings, two-thirds of which would be scheduled for reconstruction.

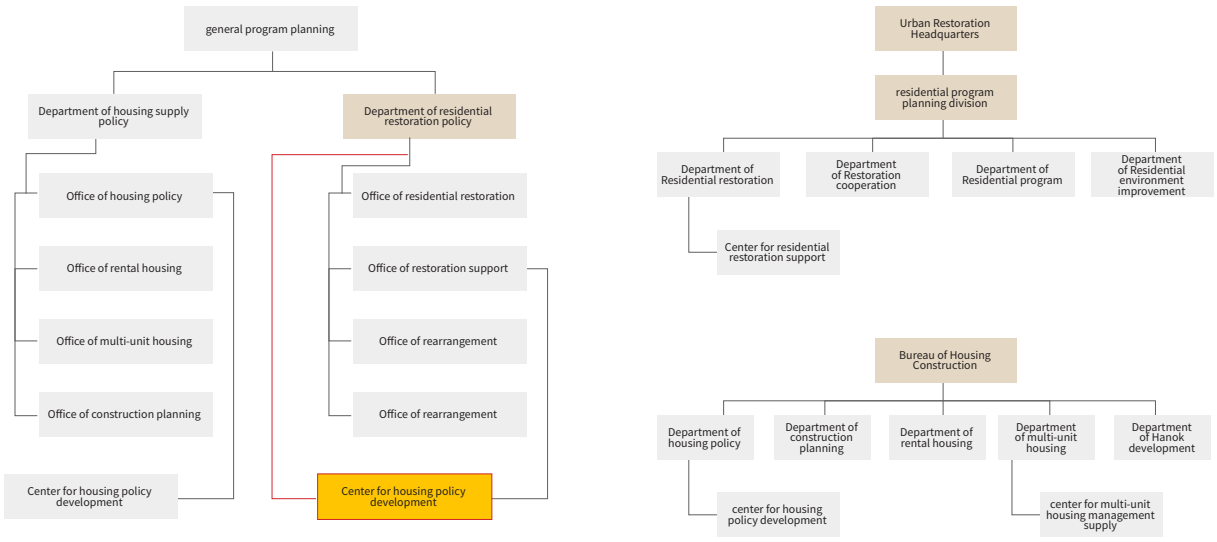
The second revision included details on the scope and method of assistance with program committee expenses described in the law and the enforcement decrees, and organization and operation of a committee to monitor program committee expenses. The revision also allowed the facilities used by residents (management office, security office, gym facilities, library, waste treatment facilities etc.) to be classified as joint facilities as part of the Residential Environment Improvement Program, which would make their construction eligible for assistance from the public sector (such public assistance and loans facilitated the programs). Furthermore, the revised ordinance included information on the procedures to follow once a program committee was disbanded in the area under public management as well as on the regulations relevant to removing eligibility requirements for the detached housing reconstruction program.

Organizational Reshuffling

Since enactment of the Improvement Act, the Residential Environment Improvement Program for Seoul has been under the supervision of the Department of Housing Improvement, the Housing Bureau. Leading up to the fifth popular election of Seoul, the New Town program grew sluggish. The Balanced Development Headquarters were dismantled, and the functions of the New Town program were absorbed by the Housing Bureau. In 2010, the Housing Bureau was expanded and renamed the Housing Headquarters. The Department of Housing Improvement was reorganized as the Department of Residential Restoration in July 2011 when discussions on housing restoration became active once more. In December of the same year, the Housing Headquarters was again changed to the Office of Housing Policy with the goal of increasing the supply of low-income housing and enhancing residential welfare. In line with the 1.30 New Town redevelopment plan announced in early 2012, the Residential Restoration Support Center was created in September under the Office of Housing Policy's Housing Restoration Program in order to handle disputes from the improvement programs and seek alternative resolutions. It works with the Department of Restoration Assistance of the Office of Housing Policy for any necessary administrative assistance.

In January 2015, the Urban Restoration Headquarters was created, and housing restoration-related tasks were transferred from the Office of Housing Policy to the Urban Restoration Headquarters' Residential Program Planning Division. The Residential Restoration Support Center works with the Department of Residential Restoration at the Headquarters and receives the necessary administrative assistance. In charge of housing-related matters, the Office of Housing Policy was reorganized into the Bureau of Housing Construction with 5 departments (Residential Restoration, Restoration Cooperation, Residential Program, and Residential Environment Improvement).

Figure 6 - Reorganized Seoul City Housing Organizations



Major Achievements

Improvement of Significantly Deteriorating Housing

The Residential Environment Improvement Program is a public program, providing the means to improve areas with significantly deteriorating houses that the private sector cannot improve alone. Once the Korean War ended, Seoul experienced rapid urbanization and population growth, leading to uncontrolled construction of houses while urban infrastructure was still poor. These concentrations of aged and deteriorated houses, turning quickly into slum areas. The public sector was able to efficiently improve these significantly deteriorating houses without substantial spending by taking a "full demolition" approach to housing redevelopment and reconstruction programs, except for local improvement programs under the Residential Environment Improvement Program.

Improved Infrastructure Such as Roads & Parks

By law, the entity that carries out the Residential Environment Improvement Program is required to provide infrastructure such as roads or parks. This program lessens the financial burden on the public sector while providing the roads and parks needed in the program areas.

New Housing in Existing Built-up Areas

After liberation from Japanese colonial rule, Seoul underwent intensive urbanization and industrialization to become a city of 10 million. Population growth led to growing demands for housing, and the Residential Environment Improvement Program played a pivotal role in supplying new houses to a limited area. As of 2012, 80% of the housing supply in Seoul has come through the Residential Environment Improvement Program.

Housing for Lease

The redeveloped housing for lease was supplied to encourage the original residents and tenants to return to the redeveloped areas and promote a resident stability. The percentage of the redeveloped housing for lease against all lease housing stock in Seoul exceeded 40% in 2000 and reached 51% by 2006. The lease housing provided by the redevelopment programs has made a significant positive impact on housing stock.

Overall Quality Improvement of Housing Stock & Residential Environment

The Residential Environment Improvement Program involved full demolition and supply of apartments. Not only did it enhance the overall quality of individual housing but it also improved the quality of the residential environment, by supplying infrastructure such as roads, waterworks, sewer lines, parks, parking lots and facilities for public welfare.

Limitations & Challenges

Limitations of the Residential Environment Improvement Program

The Residential Environment Improvement Program is characterized by its full demolition approach based on the mechanism of the real estate market. While this approach helped improve residential areas in a short period of time, it also resulted in various problems. When a group of housing units reaches a certain level of deterioration, it is completely demolished and a medium-sized apartment complex put in its place. The loss of affordable housing aggravated lower-income tenants and residents, unable to afford the new housing. This made it more difficult to return to the area and led to the loss of the existing community. Because the infrastructure and landscape of adjacent areas were not considered, these areas were occupied with high-rise, high-density buildings, creating typical issues that accompany any poorly-managed development and adding a monotonous appearance to the cityscape. Moreover, apartment complexes have led to interruptions in the urban space. During the programs, conflicts occurred between residents for and against the program, and between landowners and tenants regarding compensation and migration. The recent slowdown in the real estate market has also stunted the improvement programs, and residents are under pressure from the excessive share. The program now faces a number of limitations.

The Need to Switch to a Residential Restoration Paradigm

To move beyond the limitations of the Residential Environment Improvement Program, it is important to switch to a residential restoration paradigm. Residential restoration in line with socioeconomic changes respects the existing community and encourages residents to take the lead in restoring the area. It cannot be done in a short period of time; it requires active participation by the residents in order to create a sustainable and cyclical approach to residential restoration.

Such resident participation in the restoration is a break from the existing programs led by the public sector that resulted in monotonous types of housing and residential areas. It is necessary to provide for an institutional framework in which residents are encouraged to take leadership in creating diversified types of housing, and the pilot program has laid the foundation for further execution.

Implications

When quantitative growth was important during the period of condensed urbanization, the greatest virtue was to supply what was needed as quickly as possible. Residential environment improvement that began with full demolition was effective in improving areas with significantly deteriorating houses and supplying new units in a short period of time. It contributed significantly to addressing Seoul's housing shortage and elevating the overall quality. However, it also meant that existing communities were destroyed and the uniqueness that defined those areas was lost. The Residential Environment Improvement Program and its purpose, targets and approach have long been a subject of controversy.

Despite the contention, the Program is useful where it is absolutely necessary, such as redevelopment and reconstruction programs that require full demolition, if the public sector takes a more active role and assists owners and residents in reaching consensus. However, an institutional framework that ensures transparency in the decision-making process is necessary.

Seoul's recent restoration programs encouraging resident involvement is an alternative that can address the side-effects of existing programs and pursue improvement in a more gradual manner. However, it requires sustainable financing and new ideas to encourage residents to be voluntarily involved.

In the future, the Resident Involved Restoration Programs will need to identify detailed strategies based on the following 5 action goals:

First, raise public awareness, engage in active promotion through contests, provide education to create consensus, and form a network of experts. Second, launch the Village Worker campaign, discover and support local businesses and social enterprises, and foster local talent and expert personnel. Third, build a public support system that provides administrative and financial assistance at each stage, dispatches experts, and secures the necessary funding. Fourth, overhaul the relevant institutional framework and systems to facilitate the programs (build inter-departmental collaboration, create dedicated teams for the programs at corresponding autonomous government offices, etc.). Fifth, launch and monitor Stage 1 of the pilot program, refining as necessary to ensure the stability of later expansion of the program.

Introduction of the concept of "living spheres" laid the groundwork for a more comprehensive residential area management as it provides for simultaneous improvement, maintenance and management of the residential areas. Because this type of program has more targets than the existing plans do and requires more specific details, it is critical that the public and private sectors as well as residents and other relevant entities work together to ensure the success of the plans.

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5. Seoul Type Housing Voucher Program

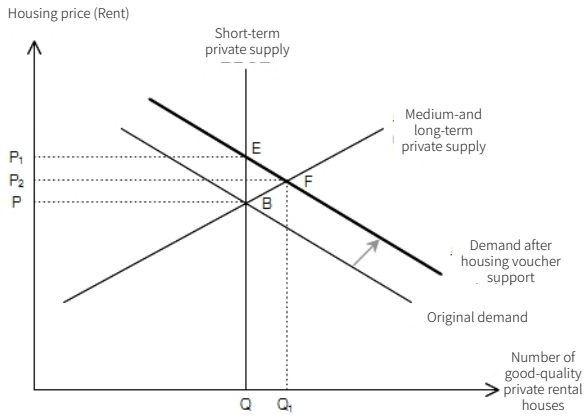
Written by : Eun-Cheon Park of the Seoul Institute

Policy Area : Housing

Background of Housing Subsidy Program

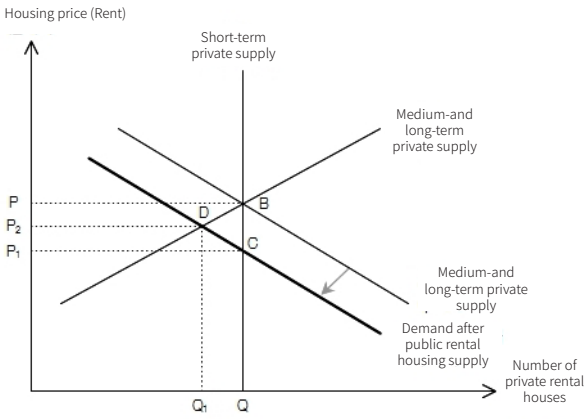
A housing welfare program, which serves as a housing policy for low-income brackets, can be roughly divided into two types; public rental housing and a housing subsidy. Until early 2000, South Korea's public rental housing program including a permanent rental housing project, which was introduced in 1989, formed a main part of the housing welfare policy. In most of the developed countries, which have run both types housing welfare programs so far, the public rental housing policy was put into implemented first, and the housing subsidy was introduced later on. When it comes to public rental housing, its construction and operation require a lot of money. However, it has a large effect as a program by providing houses directly to policy recipients. On the contrary, the housing subsidy system produces a lower effect because the subsidy given to recipients can be used for purposes other than housing expenses. Furthermore, the public rental housing program tends to lower rental rates in the housing market, while the housing subsidy system actually increases the rental rates. Therefore, in most of the advanced countries, the former has been put into force first, and the latter has been introduced and reinforced later from the 1980's after undergoing financial crisis.

Figure 1 - Housing Voucher's Effect on Short-Term and Medium-and Long-Term Markets



Source: O'Sullivan, A., 1996, Urban Economics, Boston: Irwin/McGraw-Hill, p.427.

Figure 2 - Public Rental Housing's Effect on Short-Term and Medium-and-Long-Term Markets



Source: O'Sullivan, A., 1996, Urban Economics, Boston: Irwin/McGraw-Hill, p.420.

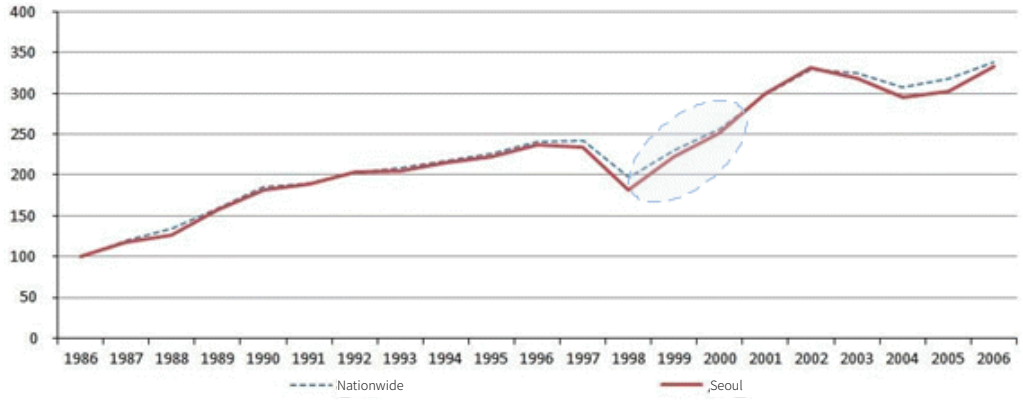
In the Republic of Korea, the protection of fundamental human rights to live was legalized through the Livelihood Protection Act in 1961. Afterwards, this law has been improved partially through several amendments. However, it has failed to take a step further than simply remaining as the residual/beneficent livelihood security, which shifts the responsibility for poverty to individuals. When it comes to the housing problems of poor people, its responsibility has been attributed to individuals, too. Since the 1980's, the suicide rate among low-income people who were kicked out onto the streets due to the rapid increase of housing prices and rent has become a social issue. In response, the government could not leave the housing issues of the

poor to the mercy of market mechanisms. Under these circumstances, the public rental housing program was launched in earnest from 1989 as a way to alleviate social discontent and realize social integration. As for housing expenses support, the Secured Loan Rental Housing Program for low-income people was introduced from 1990, while the Secured Loan Rental Housing Program for workers and common people was introduced from 1994.

Then, with the social security system not yet matured, the financial crisis (IMF bailout loan) occurred in 1998, causing a social problem of mass unemployment. Accordingly, the National Basic Livelihood Security Act was put into effect from 2000 in order to overcome the limits of the "Livelihood Protection Act" and guarantee that all people living with less than the minimum cost of living shall reach the minimum standard of living and support themselves. In the early stage of this system, those who were entitled to benefit from the National Basic Livelihood Security Act received living allowances including housing expenses. Setting aside the existing living allowances, a new system for housing allowances was established so that recipients could receive appropriate allowances according to their actual housing conditions and live in better residential environments. However, its low level of allowances fell short of giving substantial assistance to poor people and also failed to consider their regional and household characteristics. What is worse, there was no clear division between living allowances and housing allowances. So, in many cases recipients could not afford to move into better houses by using their housing allowances.

Before the IMF financial crisis, the rent of private rental houses continued to rise, thus imposing a heavy financial burden not only on the poor, but also on most low-income tenants. Unlike other regions, it was not easy to secure a new housing site in Seoul. Due to its relatively high land prices, it was also difficult to supply more houses there. Under these circumstances, the rent rose drastically while household incomes dropped sharply since the IMF bailout loan. So, those in the low-income group could not receive help while suffering from an increasingly heavy burden of housing expenses.

Figure 3 - Changes of House Leasing Price Index



Note: The prices were scored out of 100 in 1986.
Source: Kookmin Bank, KB House Price Movements (http://nland.kbstar.com/)

In 2000, the ratio of public rental housing compared to all housing in Seoul amounted to 4.9%, which was higher than the nationwide ratio of 2.3%. However, in a situation where both housing stock and public rental housing inventory were not enough to cover all demands for housing on a national scale, a heavy burden was laid on low-income people who resided in private rental houses. Against those backdrops, there was a growing demand for introducing a housing subsidy system in order to complement the public rental housing program, which required an enormous amount of financial resources as well as significant time investments to construct houses.

Since the 2000's, the existing lease system also underwent a significant change in such a way that the deposit-based lease decreased and the monthly rent increased. What is worse, the problem lay not only with the recipients of national basic livelihood guarantees, but also with low-income people. They could not benefit from the government assistance, even if they were having financial difficulty and felt heavily burdened by monthly rent. Therefore, the Seoul government launched a monthly rent aid system that supports housing expenses for low-income tenants by using only its own budget from 2002. Its financial resources came from the housing fund (currently named the "housing assistance account of the social welfare fund") installed by the Seoul government itself. However, the Seoul Type Housing Voucher takes on a type of lump-sum grants with a small amount of money due to the limits of financial resources and the difficulty in figuring out actual household incomes. Therefore, it can be considered a housing subsidy system, putting more focus on income support rather than giving housing vouchers.

Currently, the housing subsidy system has not been implemented nationwide yet in the Republic of Korea. As the national basic livelihood security system was transformed into individual benefit modes in 2014, the housing voucher system will go into effect beginning next year after undergoing a pilot project.

Content of Seoul Type Housing Voucher System

Policy Overview

The Seoul type housing voucher system was put into execution using the name "monthly rent aid system" from 2002 in order to lighten the housing cost burden on low-income citizens living in rental houses. From 2010, it was used under the name "housing voucher," but provided a subsidy not as a coupon but in cash. In fact, it is not regarded as a "housing voucher" but "housing allowance" or "income subsidy." It gives aid to households classified in the bottom 20% of income brackets (whose recognized incomes represent at most 150% of the minimum cost of living), excluding the recipients under the "National Basic Living Security Act."

Eligible Households and Amount of Subsidy

When the "monthly rent aid system" began in 2002, its assistance went to the social vulnerable class out of those households whose incomes represented less than 120% of the income criteria for selecting recipients under the "National Basic Living Security Act" (less than the bottom 15% of income brackets), and lived in private rental houses on a monthly basis, but excluding those who received housing allowances under the "National Basic Living Security Act." The subsidy was provided on a fixed amount basis according to the number of household members; 33,000 won for single or two-person households, 42,000 won for three or four-person households and 55,000 won for at least five-person households.

Then, in 2008 the subsidy was increased to 43,000 won for single or two-person households, 52,000 won for three or four-person households, and 65,000 won for at least five-person households. The criteria for rental rates were made in 2010, excluding those whose rent-converted security deposit value (= security deposit + monthly rent × 50) exceeded a fixed amount. In other words, the subsidy for rent was provided only to households whose rent-converted security deposit value was less than 60 million or 70 million won.

From November 2010, the existing rent subsidy was renamed to "general voucher," and a "specific voucher" and a "temporary housing voucher (coupon)" were newly established to convert into the Seoul type housing voucher system. It used the word "voucher," but actually supported subsidy with cash without using a voucher or coupon. In other words, it took on a housing allowance system under the name of "housing voucher." This new Seoul type housing voucher system was reformed to support housing expenses, even to households whose incomes were higher than the existing income cutoff through a specific voucher. The temporary housing voucher was a program for allowing free residence in public houses for three to six months, and targeted tenants who faced a housing crisis due to their rental house being put up for auction or the exhaustion of security deposit.

From 2013, the Seoul government has started to integrate the general voucher and the specific voucher into one and abolished the temporary housing voucher. In other words, the current Seoul type housing voucher has been simplified to target only the households whose incomes represent the bottom 20% of income brackets (within 150% of the criteria for selecting beneficiaries under the "National Basic Living Security Act") while residing in private rental houses on a monthly basis. However, it excludes the recipients under the "National Basic Living Security Act" and households whose rent-converted security deposit values exceed 70 million won. The subsidy is determined according to the number of household members; 43,000 won for single-person households, 47,500 won for two-person households, 52,000 won for three-person households, 58,500 won for four-person households, 65,000 won for five-person households, and 72,500 won for at least six-person households.

Application of Rent Subsidy and Payment Method

To benefit from rent subsidy, tenants have to complete an application only after concluding a lease agreement. At that time, the required documents include a copy of the lease agreement, a document for proving subsidy qualifications and a copy of a deposit book.

In the early stage of this system, it paid money to those eligible for rent subsidy on a monthly basis by depositing the money into their bank accounts. From 2010, however, the system was reformed to deposit money directly to the lessor's account and the money could be sent to tenant's account for inevitable reasons only. In fact, more than 90% of housing voucher beneficiaries has received the subsidy through bank accounts. If their monetary claims are put under attachment due to defaults of obligation, the subsidy could go to spouses, linear relations and collateral relatives with three degrees, instead.

Payment Procedure

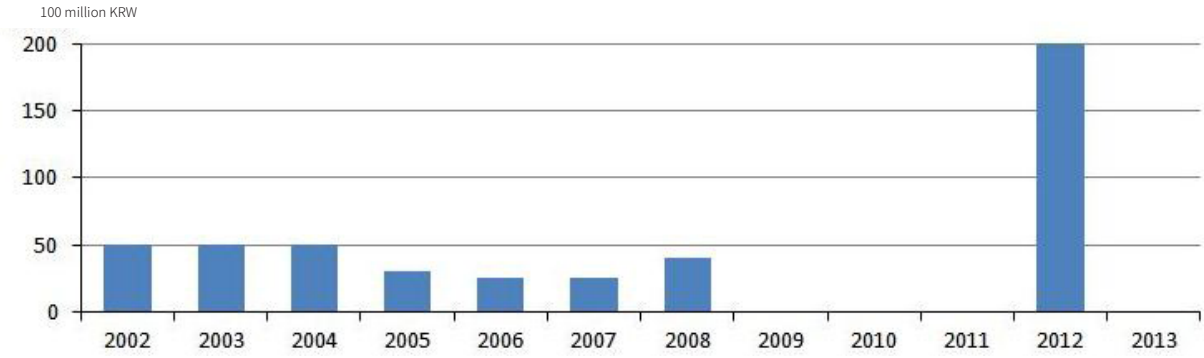
Until 2009, subsidy recipients were selected after due deliberation of the basic security committee installed in autonomous regions (Gu). From 2010, however, its selection procedure was transformed into selecting recipients based on the income survey conducted through the integrated social welfare management system (Haengbok-eUm). To receive the housing voucher, recipients must complete an application directly at their community service centers (Dong). The autonomous Gu has decided its subsidy recipients through their income surveys and has made a request for budget allocations in order to give subsidies to house owners or subsidy beneficiaries.

Figure 4 - Housing Voucher Supporting Procedure

Financial Resources for Housing Vouchers

Currently, the financing source for the Seoul type housing voucher is the "housing assistance account" of the Seoul Social Welfare Fund. Its main resources come from contributions from the general account budget of the Seoul government, in which 47 billion won was raised from 2002 until 2013. The Seoul government contributed 5 billion won to that account continuously between 2002 and 2004. However, its deposits were decreased to 3 billion won in 2005, 2.5 billion won in 2006 and 2007 and 4 billion won in 2008. It even failed to make any contributions from 2009 to 2011. However, with the election of a new Seoul mayor, 20 billion won was deposited to the housing assistance account from the general account budget in 2012.

Figure 5 - Contributions from Seoul Government's Budgets



Subsidy Results

The number of households supported by the Seoul type housing vouchers has increased continuously. For example, only 963 households could benefit from this system on an average monthly basis when this system was first launched in 2002. Then, the number was increased by 500 or so every year from 2004 to 2007. That number decreased in 2008, but was increased again to 4,982 in 2010, 1,600 more than the previous year. As the extension of Seoul type housing voucher was included in the "Seoul Citizens' Welfare Standards" from 2012, the number of households supported was increased by 2,000 or more from the previous year. Then, such number reached 10,094 on an average monthly basis in 2013.

An annual grant also continued to increase drastically from 340 million won in 2002 to 5.56 billion won in 2013. The total amount of subsidy was 23.24 billion won from 2002 to 2013 and an annual grant by households rose as much as 200,000 won from 352,000 won in 2002 to 551,000 won in 2013.

Table 1 - Seoul Type Housing Voucher (Monthly Rent Subsidy) Assistance Results by Years

Classification	Monthly Average Households Supported	Total Annual Subsidy (1 million KRW)	Annual Subsidy by Households (10,000 KRW)
2002	963	338.8	35.2
2003	1,040	453.4	43.6
2004	1,537	679.5	44.2
2005	2,231	976.4	43.8
2006	2,782	1,268.20	45.6
2007	3,255	1,497.10	46
2008	3,175	1,461.60	46
2009	3,382	1,992.00	58.9
2010	4,982	2,611.50	52.4
2011	5,540	3,102.90	56
2012	7,685	3,299.00	42.9
2013	10,094	5,562.00	55.1
Total	46,666	23,242.40	49.8

Source: Internal Data from Seoul Government, 2013

Tasks in Promotional Process

The housing subsidy system including housing voucher and housing allowance was designed to basically raise a low-income household's ability to pay rent. The ultimate goal of this policy may be to help recipients move into better houses by using its subsidy. It is also capable of reducing the government's expenditures in comparison with the public rental housing program, so many developed countries have maintained a policy of reinforcing housing subsidies since the 1980's. However, it may increase the rent of private rental houses, if the number of houses is less than that of households, or there are a number of policy recipients. What is worse, it may cause problems of unfair or delayed benefits, if it fails to determine accurate household incomes and rent needed for calculating housing subsidies.

Therefore, it may **decrease** the rent of private rental houses, if there is a lack of housing stock or there are many people living in poor houses. It is also required to extend the supply of public rental houses, which has a large effect on the beneficiary's residential stability and benefits. In many advanced countries, the public rental housing program was implemented first, and then the housing subsidy program was introduced later on. Most of them have experience supplying public rental houses from the 1940-50's, while reducing the supply of public rental houses and extending the housing subsidy system after undergoing a financial crisis in the 1970's. However, they had the large stock of public rental houses. So, in spite of their reduction of supply, they still owned a sufficient level of housing inventory. Recently, however, there is also an argument that the

cost efficiency of the housing subsidy system may be lower than that of the public rental housing program in the long term, especially in countries that have run the housing subsidy system for more than 20 years. As a result, for the residential stability of low-income renter households, it is required to preferentially secure a sufficient stock of public rental houses, then it is desirable to utilize the housing subsidy system later on as a complementary policy.

Results and Suggestions

According to the report on "Seoul Citizens' Satisfaction Survey on Administrative Housing Policies," the satisfaction with the Seoul type housing voucher appeared to be relatively good. About 73.2% of respondents said that the housing voucher's subsidy was "helpful (very + somewhat)" in reducing the housing cost burden, while about 26.6% of respondents said that it was "not helpful (very + somewhat)." As a result, the positive answers were double the negative ones. For housing/residential stability, however, what they wanted from the Seoul government was "more supply of public rental apartments (45.4%)" and "more subsidy for housing vouchers (12.2%)" in order. The dissatisfaction with housing vouchers was mainly caused by the amount of subsidies.

Table 2 - Satisfaction with Seoul Type Housing Voucher

Satisfaction with Housing Voucher System	Very satisfactory	Somewhat satisfactory	Somewhat unsatisfactory	Very unsatisfactory	No idea/answer
	11.00%	51.00%	34.60%	2.60%	0.80%
Contribution to Reduction of Housing Expenses	Very helpful	Somewhat helpful	Somewhat not helpful	Not very helpful	No idea/answer
	6.40%	66.80%	21.40%	5.20%	0.20%

Source: The Opinion, 2012, "Report on the Seoul Citizens' Satisfaction Survey on Administrative Housing Policies."

Due to too a high level of private housing rent in Seoul, the housing voucher subsidy cannot play a substantial role in reducing the rent burden on low-income tenants. However, the Seoul type housing voucher is different from the U.S. housing choice voucher that encourages beneficiaries to consume housing-related goods and services more by supporting a part of the rent based on the household income. It is similar to a housing allowance that focuses on how appropriate residential services are needed rather than the actual housing services they have consumed. On the contrary, the Seoul government's housing voucher seems to be a fixed-amount subsidy system designed to complement household incomes because its subsidy amount is small due to budget limits.

From now on, the level of subsidies must be increased by 20-30% of reference or actual rents so that the housing subsidy system can lead to actual residential stability or upward housing mobility. In this case, we

need to build a new system that can figure out the low-income tenants' incomes and rent accurately. Like the U.S. Housing Choice Voucher and the U.K. Local Housing Allowance, we need to increase the amount of subsidies considerably enough to link with the recipients' incomes and rent. However, the program that involves giving cash directly to recipients requires not only a large budget but also public consensus.

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6. New Town Project in Seoul

Written by: Senior Researcher Jang Nam-Jong of the Seoul Institute

Policy Area: Urban Planning

The new town project was designed to maintain the equality of basic living service facilities and educational conditions across the regions and alleviate the financial gap between autonomous regions (Gu). By doing so, it set an ultimate aim at improving the urban functions comprehensively in living areas. The new town plan deals with the combination of several neighborhood districts (Gu) in the same living zone. Therefore, it targets an entire scope of several projects that influence residents' city lives.

Background

Introduction of New Town Project for Balanced Regional Development in Gangnam and Gangbuk Areas

A regional imbalance between Gangnam and Gangbuk regions started to occur due to the "policy for suppressing downtown concentration and promoting Gangnam development" since the 1970's. Its issue began to appear in the early 1990's, but has become a serious social problem since the 2000's with the sudden rise of housing prices in Gangnam. After the third popular election, the Seoul government established a four-year plan for public administration (2002-2006) in 2002 and introduced the "new town project" for regenerating the deteriorated residential area in Gangbuk region in order to actively resolve the regional unbalance.

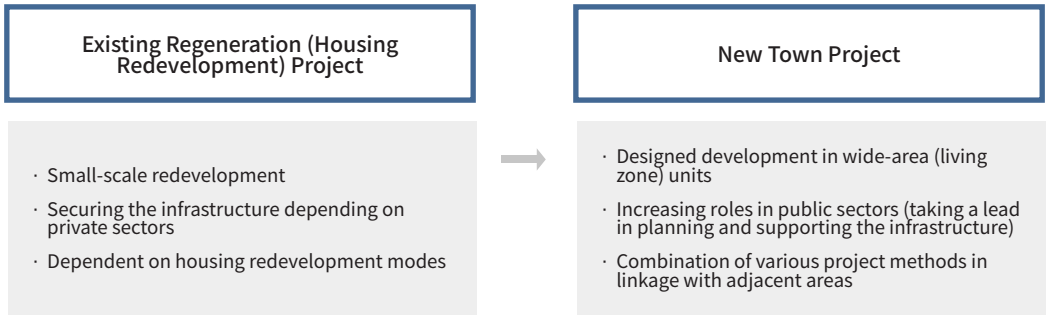
New Renewal Method for Wide-Area Old Housing Sites in Living Space Units

The renewal of existing residential sites was conducted mainly as a private-led individual project on a small scale, so its development could be hardly linked with those of other adjacent regions. There was also a limit to installing urban infrastructures including roads, parks and school sites, thus making it difficult to improve the residential environments in living space units. Accordingly, there was a growing need for solving the problem of connecting the infrastructure with adjacent areas, which had occurred from private-led individual projects including redevelopment and reconstruction, and for laying the framework to secure the infrastructures in terms of wide-area living spaces.

Forming the Community of Various Social Groups through Resettlement of Original Residents

Since the existing redevelopment projects used to put the priority on making development profits, most low-income native inhabitants found it difficult to settle down again, thus pushing the established community into collapse. Therefore, there was a growing need for shortening a project period through joint investments in the infrastructure, alleviating the heavy burden on residents, and increasing the rate of resettlement of original residents.

Figure 1 - Comparison between Existing Urban Regeneration and New Town Projects



Development Process

The Seoul government's New Town Project can be roughly divided into three periods; time for starting a pilot new town project, time for designating the new town extension, and time for converting into the renewal promotion district.

Pilot New Town (2002)

Time for the pilot new town project fell on the period when the three pilot project districts were designated in October, 2002. At that time, a balanced regional development promotion division was established according to the plan for installing the organization in charge of dealing with pending policies.

Designation of New Town Extension (2003 - 2005)

The Seoul government enacted the "ordinance on the balanced development support for Seoul," so that it could announce the 12 districts for the second new town in November of the same year after receiving applications from each autonomous district (Gu). At that time, the government reformed and extended the existing balanced regional development promotion division into the new town project headquarters in order to effectively manage the districts in second new town.

Conversion into Renewal Promotion District (2005 - 2007)

The Seoul government lacked legal grounds for both the pilot and second new town projects, and found it impossible to take various mitigation measures to promote the business more efficiently. Therefore, the Seoul government proposed a new town special act (tentatively named) to the central government in August, 2005. With this as momentum, it enacted the special act for urban renewal promotion in December of the same year, thus laying the legal foundation for the new town project.

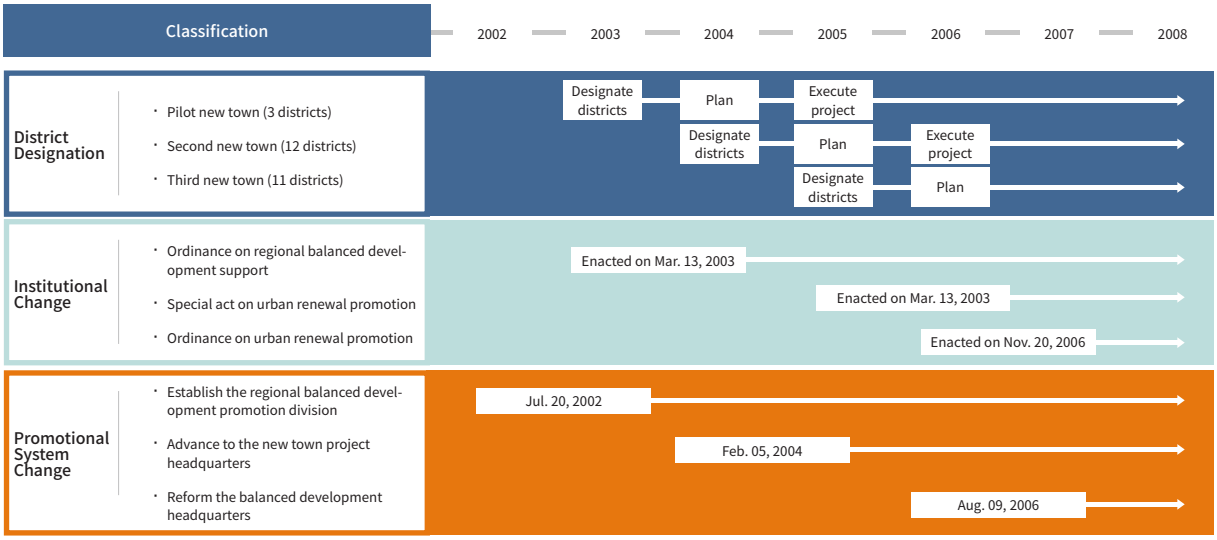
According to this enactment of the special law, the new town project headquarters was reformed into the regional balanced headquarters in August, 2006. Then, the government enacted the special ordinance for Seoul

City's urban renewal promotion to make a decision on various matters delegated by laws.

At that time, a total of 11 districts (8 districts in December 2005 and an additional 3 districts then) were designated as the third new town project. Those of the third new town project were designated as the "urban renewal promotion district" after the enactment of the special act, so its planning process and determined contents were different from those of the pilot and second new town projects, where they used to be performed under the previous municipal ordinance.

Since the enactment of the special law, some of the pilot and second new town districts came up for discussion as a renewal promotion district, so that the new town districts could coexist with the renewal promotion districts.

Figure 2 - Promotion System Changes



Promotional Details

Changes to Seoul City's Promotional Organizations

Installation of Regional Balanced Development Promotion Division

In July, 2002, the department taking charge of the new town project in Seoul was the regional balanced development promotion division, which had been established as a separate organization. At the time of establishment, it consisted of three teams; a regional plan team, a traditional market task force and a regional development project team under the umbrella of the urban planning bureau. Then, it was put under the direct control of the vice mayor in order to carry out the new town project more actively and the housing bureau was designated as an assistant department in order to organize a more effective project promotion system.

Extension and Reform into New Town Project Headquarters

The regional balanced development promotion division was extended and reformed into the new town project headquarters in February, 2004. During that process, the balanced development promotion districts were designated along with the second new town. For its effective business, the regional plan team was reorganized into the promotional district project team. For the effective management of 12 new town districts (second), the new town master team was extended and reorganized into three teams; the general coordination team, the facilities planning team and the plan management team.

Reorganization into Balanced Development Headquarters

The special act on urban renewal promotion was enacted in December, 2005. As this special law was put into effect in July, 2006, the new town project headquarters was reorganized into the balanced development headquarters in August of the same year. The balanced development headquarters was divided into a downtown revitalization planning division and a new town project planning division. The existing new town master team was disassembled and transformed into a new project system where there were one to seven project teams under the control of three officers within the new town project planner.

Figure 3 - Promotional System for Regional Balanced Development Promotion Division

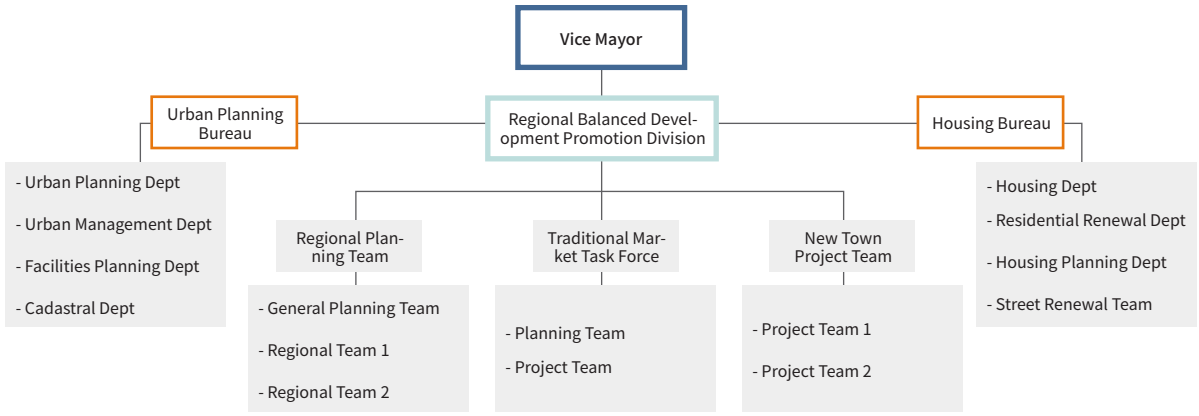


Figure 4 - Promotional System for New Town Project Headquarters

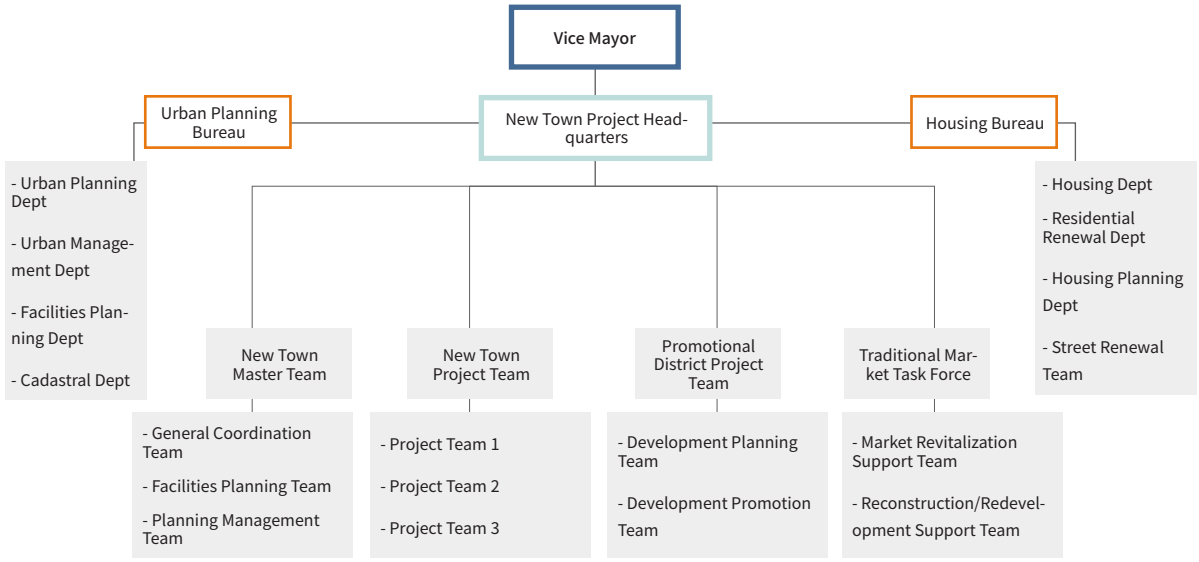
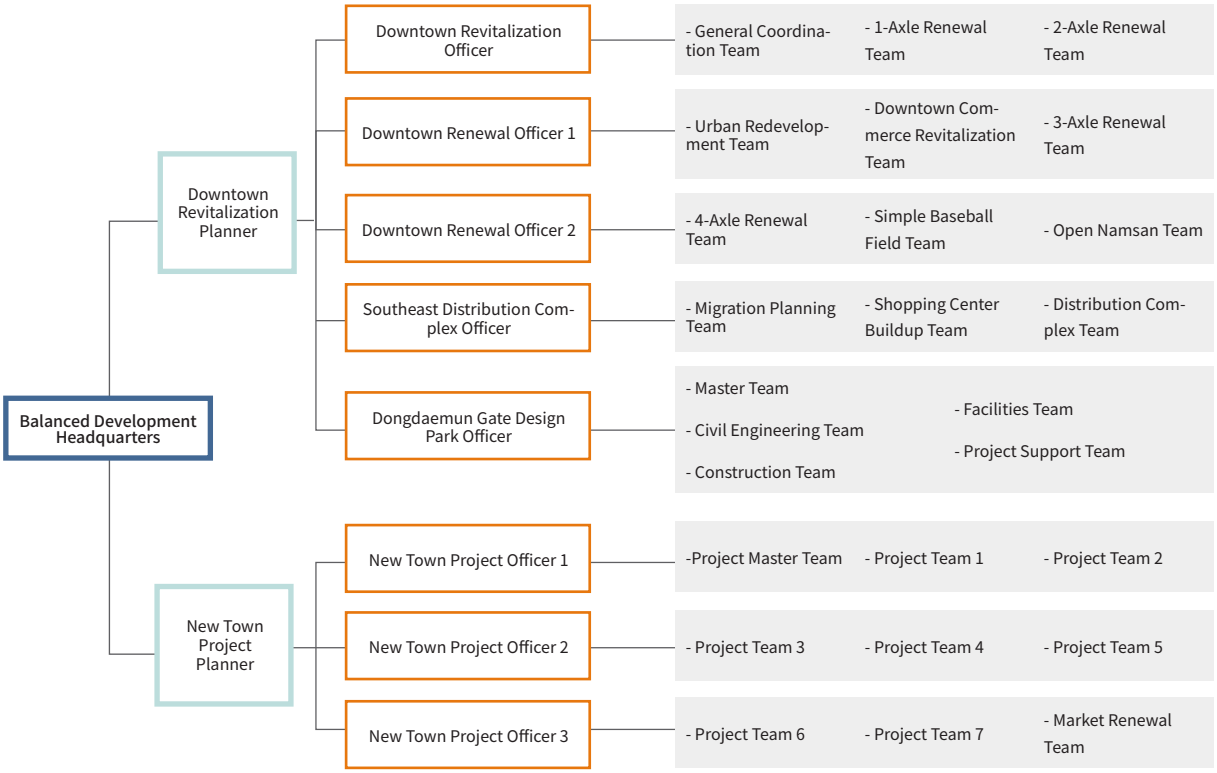


Figure 5 - Promotional System for Balanced Development Headquarters



Other Organizations

Regional Balanced Development Committee / Urban Renewal Committee

The regional balanced development committee was established in April, 2003 according to the ordinance, in order to deliberate on and consult on matters regarding the policies and projects for balanced development in Seoul City. It gives advice on various matters such as establishing basic plans, designating project districts, establishing renewal plans (designating districts) for each project execution type, making detailed plans for project execution before authorization and determining the target and scope of supporting project costs.

The urban renewal committee was organized in December, 2006 along with the execution of the special law. Along with the roles of the former regional balanced development committee, this committee deals with matters regarding the renewal promotion districts and their promotional plans.

Task Force by Autonomous Districts (Gu)

Within the autonomous districts (Gu), the organizations in charge of projects, including a balanced development promotion division, a balanced development promotion group, a balanced development project division, a new town project group and a new town project team, were set up to play various roles; supporting Seoul City's planning, giving assistance with data for new town plans, discussing the projects with residents and collecting their opinions, and establishing basic development plans.

Master Planner (MP)

The Master Architect (MA)/Master Planner (MP) method involves authorizing one architect to maintain the systematic design of outdoor spaces in carrying out a large-scale project with different owners and development periods within a development area, and entrust him/her with the role of coordinating different designs, thus drawing an overall plan for development of the entire land. The MA/MP method in the new town project will play a role of a coordinator and controller that integrates and coordinates various opinions and interests together.

- Consisting of experts in various fields such as urban planning, urban design, construction, landscaping, transportation and business feasibility
- Consisting of general MA/MP, advisory MA/MP, public officials, etc.
- Determining various plan-related alternatives and decisions in the MA/MP conference
- Participating in the whole process of establishing a basic direction for plans, a development direction and a basic development plan
- Playing a role in integrating and coordinating a number of project districts

Designator and Agent: SH Corporation

SH Corporation was designated as a business operator for new town project by the Seoul government and has carried out the establishment and execution of a new town plan. It was designated in that its organi-

zational characteristics are suitable to promptly deal with the whole process of the project including compensation, planning, design, construction and sale. With regard to the new town project, the organizational system of SH Corporation has a new town project office under the urban restoration headquarters, and also has sub six teams including a planning design team, a civil engineering team, construction teams 1 and 2, a mechanical team and an electrical communication team. It takes charge of various jobs; designating new town districts, designating and notifying project operators, approving and notifying new town project development/execution plans, establishing civil engineering plans, approving/permitting their execution, ordering and supervising construction, establishing basic plans, and doing basic/detailed designs.

Step-by-Step Special Organizations for New Town Development Basic Plans

There are also special organizations for each step in establishing basic plans for new town development, including a new town development promotion council, a working-level new town promotion team, and a development advisory committee.

Related Institutional Changes

Enactment of Ordinance on Regional Balanced Development Support in Seoul

The Seoul government has prepared its administrative and financial assistance plans for regional balanced development by designating the three districts of Eunpyeong, Gireum and Wangsimni as pilot districts in October, 2002 and enacting the "ordinance on regional balanced development support in Seoul" in March, 2003. The corresponding ordinance was designed to make a great contribution to urban development and provide better quality of living by setting a direction for regional balanced development policies, standardizing its execution procedure and method for efficient promotion of the regional balanced projects, and institutionalizing administrative and financial assistances.

It made an attempt to connect the pilot new town districts with its upper plans, related urban plans and other development projects and to pursue eco-friendly and sustainable development, considering the characteristics of Gangbuk region, and laid down the principle for creating a harmonious space with the coexistence of people from various income brackets and generations in order to diversify rental houses and raise the resettlement of original residents.

Proposal of New Town Special Act and Enactment of Special Act on Urban Renewal Promotion

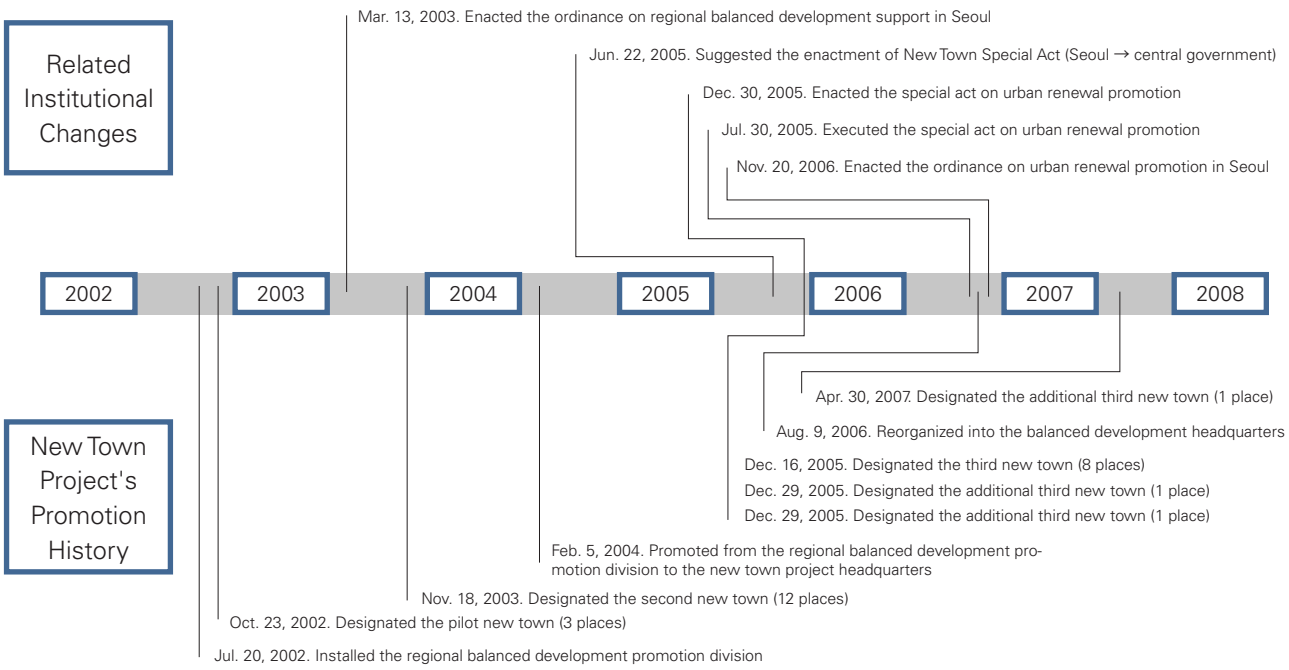
The pilot and second new town projects were based on the "ordinance on regional balanced development support in Seoul." Then, the Seoul government prepared a special new town act (bill) and submitted its proposal to the central government in summer, 2005 in order to solve the problem of having no legal grounds for new town projects and to promote a more efficient and comprehensive renewal project for worn-out residential areas.

With this proposal as momentum, the bill was renamed during the discussion in the National Assembly session, and the "special act on urban renewal promotion" was enacted in December, 2005 and became the legal basis for the new town project in Seoul.

Enactment of Special Ordinance on Urban Renewal Promotion in Seoul

According to the enactment and proclamation of the Special Act on Urban Renewal Promotion and the enforcement decree of the same law, a special ordinance on urban renewal promotion in Seoul was enacted to specify the delegated matters by law and others necessary for their execution. This ordinance includes the contents of the criteria for designating new town districts or balanced development promotion districts, establishing plans, project execution methods and project financing.

Figure 6 - New Town Project's Institutional Changes and Progress History



Financing

Urban Renewal Special Accounting

The new town budget was originally raised through urban development special accounting according to the "ordinance on regional balanced development support" for the pilot and second new town districts. Starting with the third new town district, the budget was secured through urban renewal special accounting according to the "special ordinance on urban renewal promotion" enacted in 2007.

The financial resources of the urban development special accounting consist of 11 items including the money transferred from general accounting and the government subsidy, which can be used for the new town project as well as others. So, it cannot be considered a stable resource for the new town project.

On the other hand, the tax revenues of urban renewal special accounting consist of the money transferred from general accounting, government subsidy, municipal-reverted congestion charges, urban planning tax of 30%, etc. It is meaningful as a stable resource based on the law for supporting a renewal promotion project.

The national treasury for new town project is just 1.2 billion won, making up 0.6% of the entire budget of urban renewal special accounting. So, it fails to draw much support from the central government and the most of the budget was appropriated from the Seoul government's own budget (money transferred from general accounting and congestion charges).

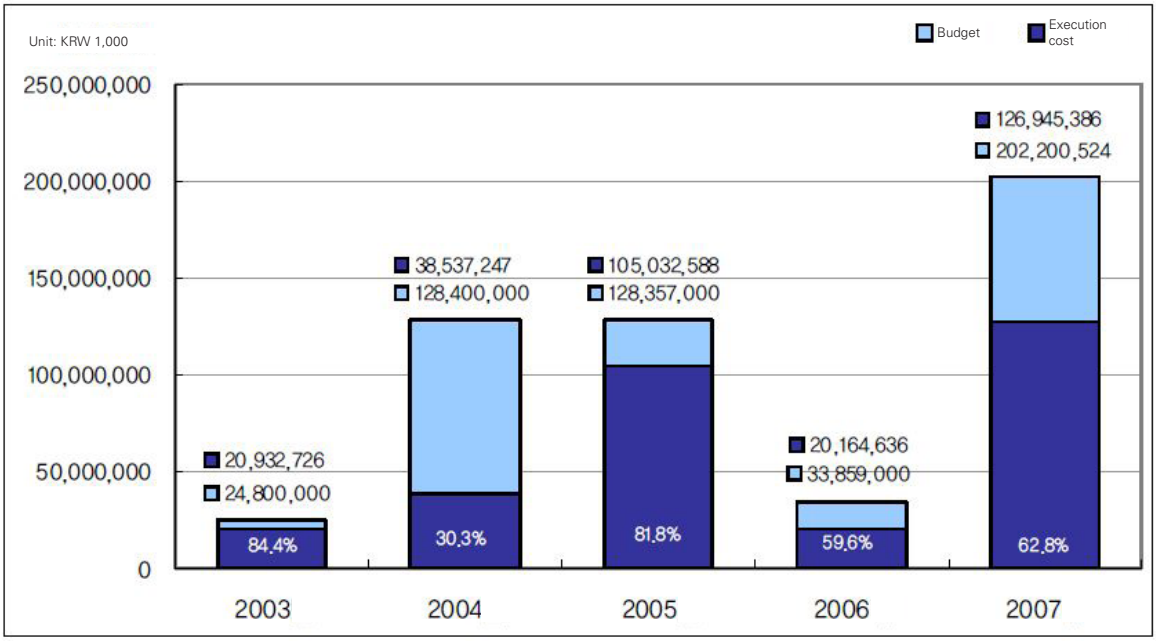
The new town project budget is generally supported for establishing a basic development plan and installing the infrastructure. About 80% (110 billion won) of the execution budget was supported specifically for installing the infrastructure in 2007 when renewal special accounting was first introduced.

Table 1 - Status of Tax Revenues on New Town Project (Unit: 1 million KRW)

Classification	1st Session				2nd Session				
	2003	2004	2005	2006	2007	2008	2009	2010	2011
Urban Development Special Accounting	24,800	128,400	131,459	35,561	-	-	-	-	-
Urban Renewal Special Accounting	-	-	-	-	202,200	290,400	181,310	248,060	149,000

Source: Written settlement of accounts concerning revenue and expenditure (2003-2011)

Figure 7 - New Town Project's Budget Execution Details



Promotional Content

The Seoul government's new town project has been put into execution on three different occasions. A total of 26 districts have been designated as new town districts and their areas make up 23.8㎢, which accounts for about 4% of the entire area of Seoul.

Figure 8 - Status of Designated New Town Districts

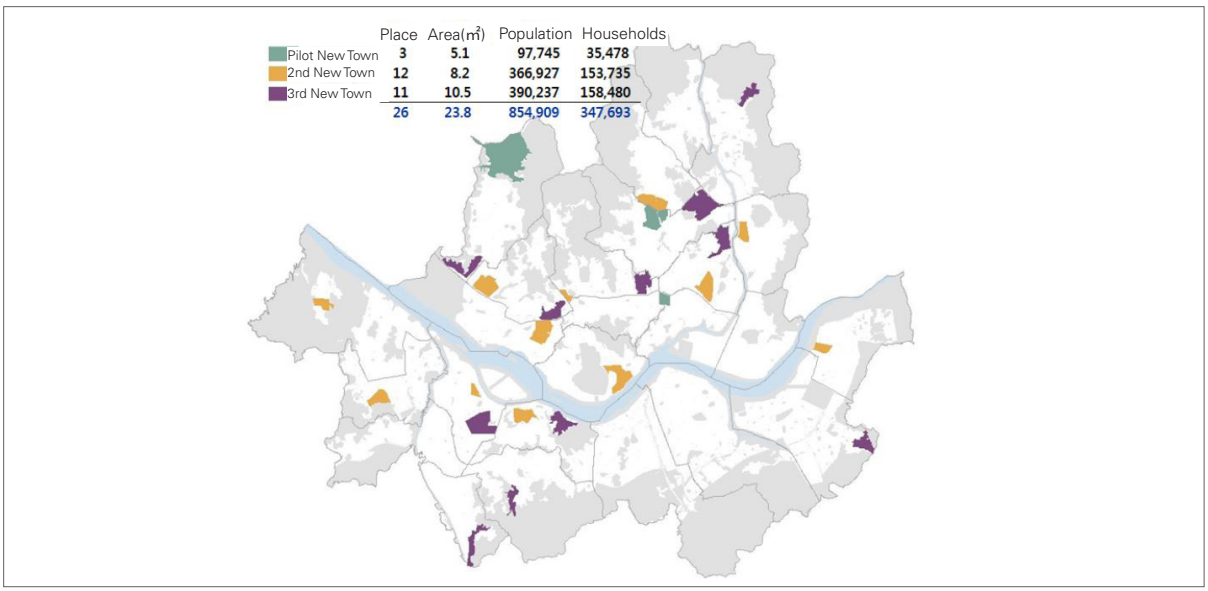


Table 2 - Status of Designated New Town Districts

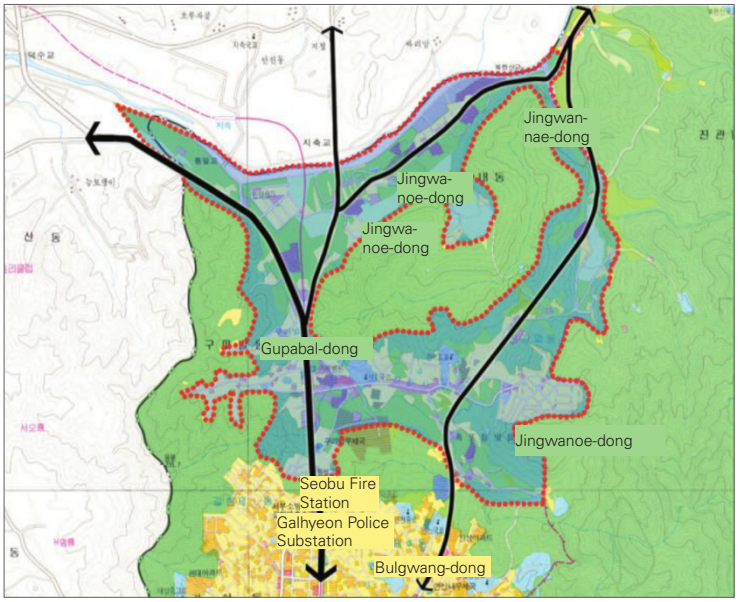
Classification	District	Date of Designation	Area (㎡)	Population (persons)	Total Households	Tenant Households	Ratio of Tenants (%)
Pilot New Town 3 Districts -2002	Eunpyeong	Oct. 23. 2002	3,492,421	28,604	10,596	4,302	40.6
	Gireum	23.Oct.02	1,249,793	57,280	20,311	12,949	63.8
	Wangsimni	23.Oct.02	337,200	11,861	4,572	3,620	79,2
	Sub-total	2002	5,079,414	97,745	35,478	20,871	58.8
2nd New Town 12 Districts -2003	Donuimun	18.Nov.03	200,297	4,231	1,945	1,559	80.2
	Hannam	18.Nov.03	1,111,049	37,089	18,616	13,935	74.9
	Jeonnong/ Dapsimni	18.Nov.03	905,833	34,900	13,900	11,036	79.5
	Junghwa	18.Nov.03	510,517	39,910	18,234	7,982	43.8
	Mia	18.Nov.03	606,056	42,831	18,243	8,058	44.2
	Gajaeul	18.Nov.03	1,073,000	55,370	21,662	12,409	57.3
	Ahyeon	18.Nov.03	1,088,000	44,787	18,443	14,544	78.9
	Sinjeong	18.Nov.03	700,700	37,525	14,190	8,450	59.6
	Banghwa	18.Nov.03	508,914	19,183	7,454	5,804	77.9
	Yeongdeungpo	18.Nov.03	226,006	4,966	2,141	1,860	86.9
	Noryangjin	18.Nov.03	901,383	30,230	12,160	9,985	82.1
	Cheonho	18.Nov.03	412,485	15,885	6,757	5,353	79.2
	Sub-total	2003	8,244,240	366,927	153,736	96,632	65.7
3rd New Town 11 Districts (since 2005)	Imun/Hwigyeong	26.Jan.06	1,013,398	39,910	18,234	14,859	81.5
	Jangwi	16.Dec.05	1,867,851	70,000	26,890	20,973	78.0
	Sanggye	16.Dec.05	647,578	22,691	8,938	6,947	77.7
	Susaek/ Jeungsan	16.Dec.05	897,090	31,814	12,383	8,775	70.9
	Bukahyen	16.Dec.05	899,302	33,330	13,982	4,779	34.2
	Siheung	16.Dec.05	721,416	25,634	9,691	4,279	44.2
	Singil	16.Dec.05	1,469,910	56,730	24,258	21,257	87.6
	Heukseok	16.Dec.05	894,933	29,222	13,241	10,592	80.0
	Sillim	16.Dec.05	527,790	20,082	8,478	6,443	76.0
	Geoyeo/ Macheon	16.Dec.05	738,426	34,082	8,478	6,443	76.0
	Changsin/ Sungin	30.Apr.07	846,100	26,734	9,083	7,019	77.3
	Sub-total	2005 - 2007	10,523,794	390,237	158,480	116,380	73.4
Total			23,847,448	854,909	347,693	232,883	68.5

Source: Seoul City's balanced development headquarters, New town project 1 officer's internal data (Sep. 2008)

Pilot New Town: Eunpyeong District (New Town Type)

Eunpyeong New Town is located at Jingwan-dong and Gupabal-dong within Eunpyeong-gu, Seoul, and its area amounts to about 3.5㎢. The district designated as Eunpyeong New Town had also been designated as a limited development district (LDD) from 1970's. Thus, construction was restricted there for almost 30 years. So, its residential environments were very worn out. Accordingly, the new town project for this district was put into execution with an aim at reorganizing and improving the obsolete residential living environments in terms of regional balanced development.

Figure 9 - Eunpyeong New Town Location



Objectives & Basic Direction

Eunpyeong New Town project was launched with the following three objectives; ① creating an ecological residential space together with its adjacent areas, ② constructing a regional exchange network and creating culture and ③ characterizing green transportation based on public transportation. Accordingly, this project was intended to improve residential environments and create a community space by setting its basic direction toward community-centered, socially

Details

The Eunpyeong New Town district was intended to build a residential area that can accommodate about 16,000 households, secure necessary infrastructure and carry out district-centered commercial functions from 2004 to 2011.

Land Use and Architectural Plan: Its plan for land use consisted of apartment-centered housing sites (39%),

commercial sites (3%), infrastructure (54%) such as roads, parks, schools and parking lots and others (5%).

Transportation Plan: It was planned to build an interregional main road (San Tongil-ro, Yeonseo-ro, etc.), newly establish and adjust internal roads within the district and form a circulation network of neighborhood streets and bike lanes so that it could raise the efficiency of land use and form a center around Gupabal Station.

Park & Green Area Plan: It conceived a green system that maximizes the preservation of the existing green areas and builds three greenbelts and linear parks which make contact with watersides. It also conceived an ecological green system that connects two green belts (north and south) and also connects the separate green areas and ecosystems with each other through the installation of eco-bridges (3 places) for the connection of parks.

Plan for Infrastructure and Public Facilities: It planned educational facilities including five elementary schools, two middle schools and four high schools, and also public buildings including fire stations, post offices, patrol divisions and community service centers.

Characterization Plan: It was intended to build neighborhood streets such as a street of harmony, a street of festival and a street of family and also made a plan for forming an ecological wetland park, protecting cultural heritage and recovering small brooks.

Figure 10 - Land Use Plan

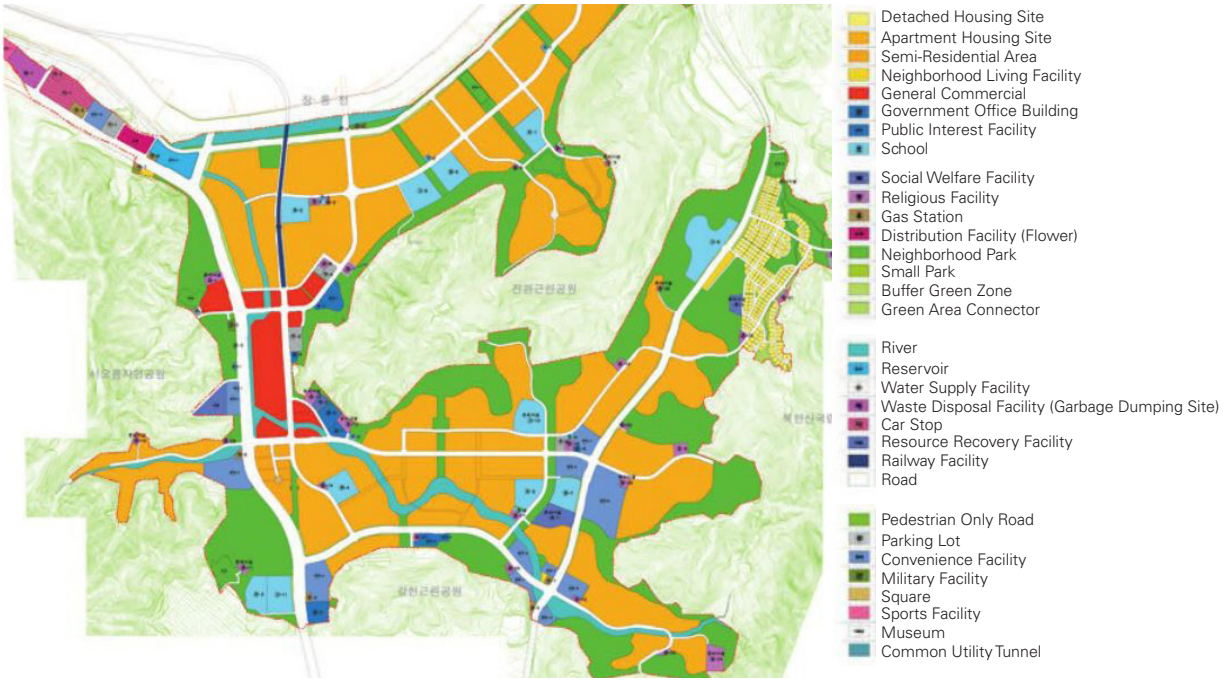


Figure 11 - Road Network Plan

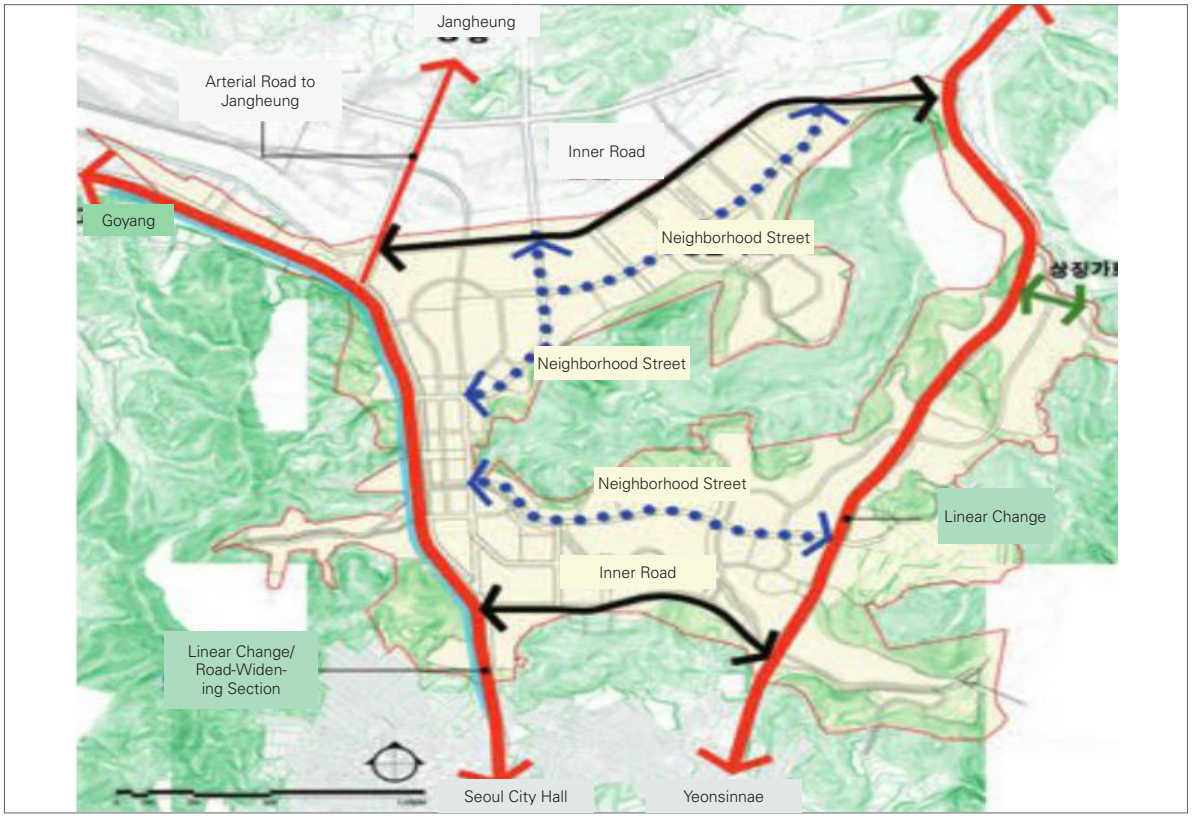


Figure 12 - Bird's Eye View

Figure 13 - Park/Green Area Plan

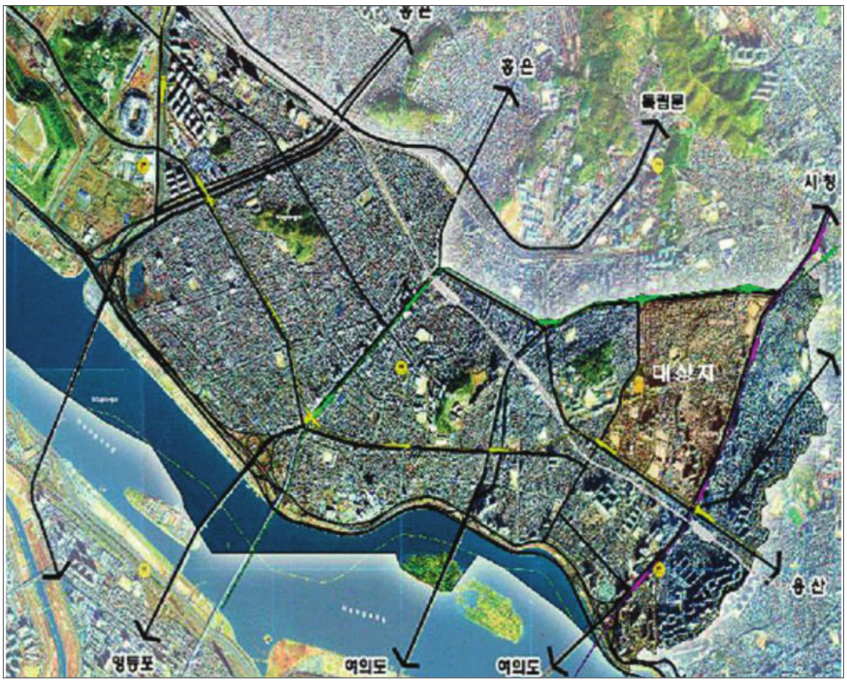
Promotional Process

Eunpyeong New Town was selected as a candidate for the pilot new town project on October 23, 2002. Its basic development plan was announced in April 2003 and it was designated as an urban development zone on December 30, 2003 through a public inspection, a public hearing and the deliberation of Seoul's urban planning committee. Starting from the notice of implementation plan approval for the 1st district of Eunpyeong New Town in December 2004, the approval of implementation plan for the second and third districts was notified in December, 2006. The first district's construction was completed in June 2008, the second one was constructed in December 2008, and the third one was done in June 2010.

Second New Town: Ahyeon District

Ahyeon New Town, located within 3km of downtown Seoul, is equipped with good educational conditions as well as easy access to public transportation, because it is adjacent to a number of universities including Yonsei University and Ewha Womans University. It has an area of about1㎢ with high-density single apartments scattered around due to the past individual redevelopment and reconstruction projects, and a number of old and poor houses were distributed over a wide area. In general, there were residential buildings like detached and multiplex houses, and commercial and business buildings were placed along the main roads and subway influential areas.

Figure 14 - Ahyeon New Town's Locational Characteristics



Objectives and Basic Direction

Ahyeon district, designated as the second new town, was set up under the theme of "complex life culture town" that represents the urban future with the coexistence of human beings, nature and culture. Accordingly, it aimed to realize a human-friendly, nature-friendly and culture-friendly new town and established more detailed objectives as follows.

Objectives	Detailed Content
Human-Friendly New Town	· Establish a construction plan to allow original and new residents to coexist together · Form a socially integrated space between classes, generations, and lease and sale · Create pedestrian-centered neighborhood streets to enable various activities and exchanges
Nature-Friendly New Town	· Build a circuit street system that adapts itself to geographical features of hills and integrates the earth as a whole · Establish a plan for block layout, parks and green areas considering original geography · Construct a green network that organically connects pedestrian spaces with rest spaces
Culture-Friendly New Town	· Develop various cultural contents that reflect local history and culture · Set a plan for multiplex cultural facilities, considering the living space system · Promote multiplex space that grafts public service, education and cultural programs

Details

Land Use and Architectural Plan: Its plan for land use included apartment-centered residential sites (62%), commercial sites (8%) and infrastructure (30%) including roads, parks, schools and parking lots. Residential buildings had 8 to 25 stories around the various housing landscapes that suit land characteristics such as a block-type, tower-type, terrace-type, court-type and flat-type. It was intended to form a socially/hierarchically integrated space by making an integrated lease/sale plan for each complex and building a community ring along the neighborhood streets.

Transportation Plan: It planned a road width in connection with business and commercial areas in order to minimize traffic load on nearby streets and appropriately distribute traffic volume in the area. Also, it took measures to minimize the use of passenger cars by forming a public transportation-centered axis as well as a safe, convenient pedestrian axis.

Park & Green Area Plan: One neighborhood park was allocated as a core and symbolic space within the district. A children's park and a cultural park were also built as organic experience places with their own specialized play and cultural themes. Also, the five small parks were built for the purpose of providing shelter to residents.

Plan for Infrastructure and Public Facilities: Community service centers, police substations, post offices, etc. were moved into complex government buildings. A daycare center and a library were created as a part of a multiplex space. Additionally, it made a plan for cultural facilities, schools, etc.

Figure 15 - Infrastructure Layout

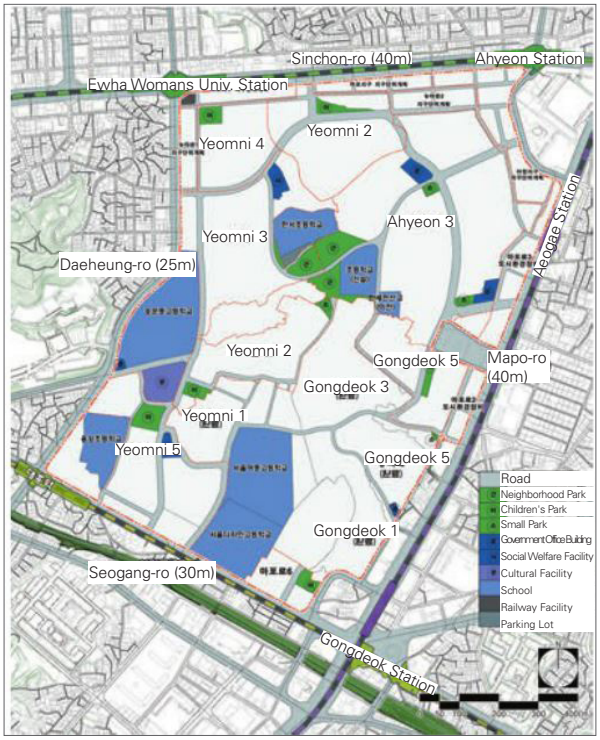
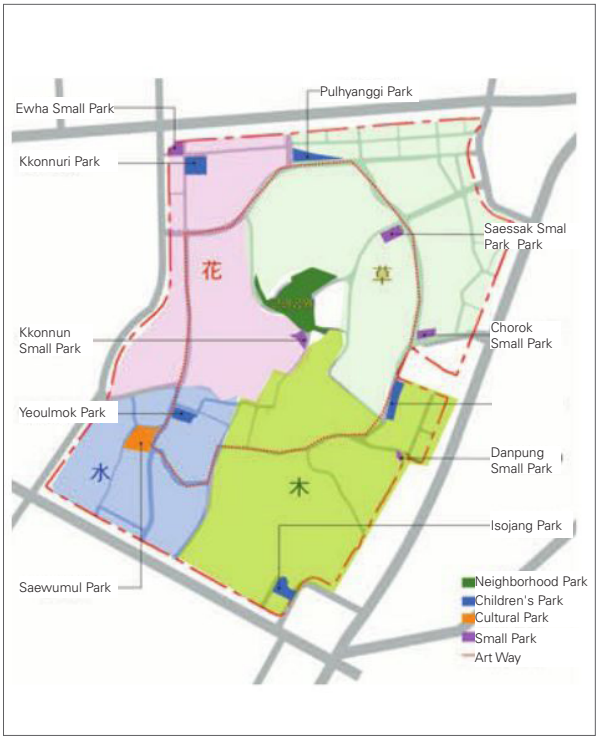


Figure 16 - Park & Green Area Plan



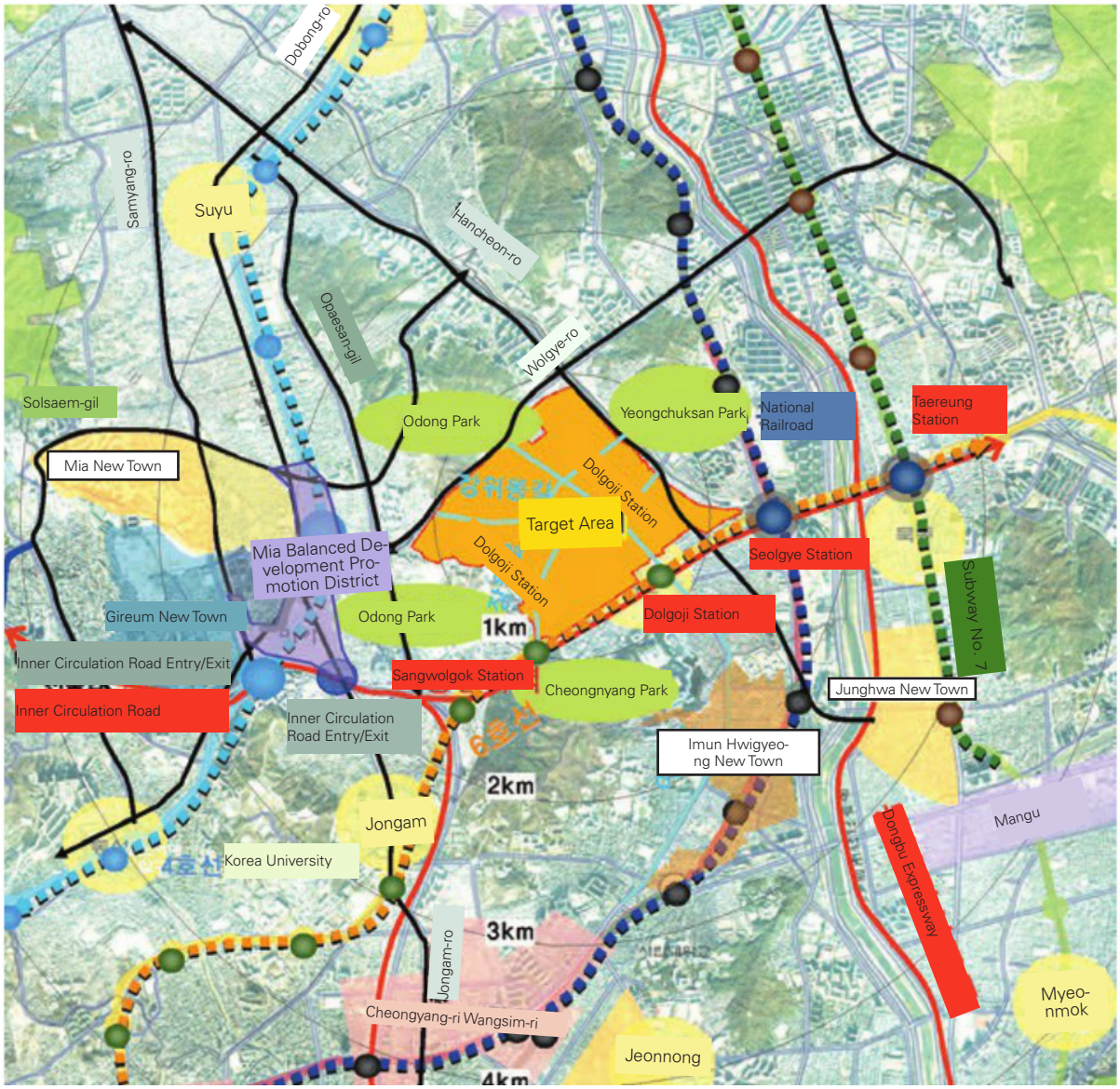
Promotional Process

Ahyeon New Town was designated as the second new town district in November, 2003. Then, starting from the announcement of its basic development proposal in May 2004, the basic development plan was approved in December 2004 through a presentation for residents, a consultation with related departments and a deliberation of the regional balanced development committee. Out of eight districts within the district, one was launched in November 2008 and is still underway.

Third New Town: Jangwi District

Jangwi New Town district has easy access to public transportation with three nearby subway stations and one national railroad. Its adjacent areas are also under reconstruction, including Gireum New Town, Mia New Town and Imun/Hwigyeong New Town. It has an abundant natural environment including a river and neighborhood parks.

Figure 17 - Jangwi New Town Location



Objectives and Basic Direction

Jangwi New Town district has set detailed goals as follows, under the ultimate goals to build an eco-friendly city, cultural city, well-organized city and young and lively city.

Goals	Details
Eco-Friendly City	· Build the Green+Blue network that connects new town inside and outside · Supply a residential site designed to recover natural environments, conserve good resources and adapt to geographical features · Maximize the utilization of existing resources · Expand living zone-centered parks and green areas
Cultural City	· Form a central street of living zone as a central space for cultural fun · Build a platform for delivering culture and art · Create a daily cultural experience space, centering on community service centers · Characterize neighborhood streets
Well-Organized City	· Secure public facilities and cultural/welfare facilities for each living zone · Construct a public/green-centered transportation system · Improve the transportation system with better road width and linearity · Maximize the utilization of existing urban infrastructure
Young and Live City	· Create a young atmosphere by attracting cultural activities around nearby universities · Form a community festival street and revitalize the culture/art street · Build parks and community facilities within 10 minutes' distance from residential areas · Construct block-type stores where main buildings harmonize with streets

Details

Land Use and Architectural Plan: Its land use plan included apartment-centered housing sites (63%), public sites (33%) and other sites (4%). In particular, a high ratio of parks and green areas was secured (1.5%→15%) in order to build an eco-friendly new town. Apartments were planned with a minimum of 14 stories and a maximum of 33 stores according to locational characteristics (whether the area has hills or not) considering a sky line of 16 stories on average.

Transportation Plan: It was intended to maximize a walking network within complexes by planning pedestrian roads that minimize the discontinuity of walks between facilities such as housing complexes, schools, parks and pedestrian's green ways, and planning a public transportation system including an efficient interval between stops considering walking rights of pedestrians.

Park & Green Area Plan: It tried to secure a maximum number parks and green areas by planning 12 parks within living zones and 7 green area connectors.

Infrastructure and Public Facilities Plan: Jangwi New Town was intended for the "1 plus 4" structure based on "central living zone + neighborhood living zone" and also made a plan for public facilities in the units of living zones, considering a plan for living zones and the boundaries of administrative districts. Accordingly, it set a plan for allocating cultural facilities in the living zones as well as public facilities such as welfare, administration and education in the neighborhood living zones.

Figure 18 - Land Use Plan

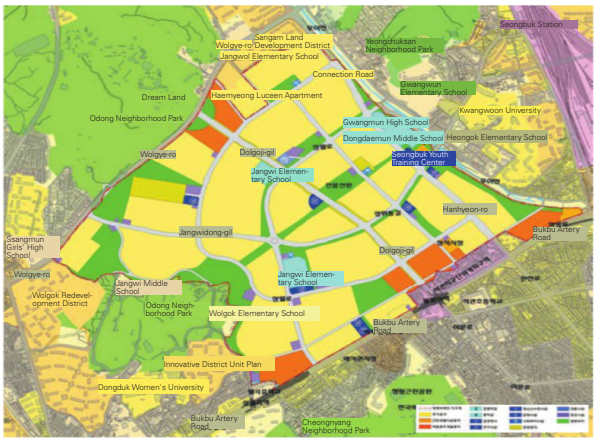


Figure 19 - Bird's Eye View

Figure 20 - Public Facilities Plan

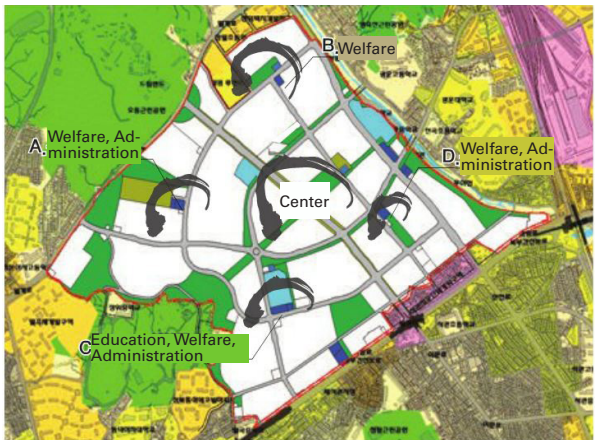
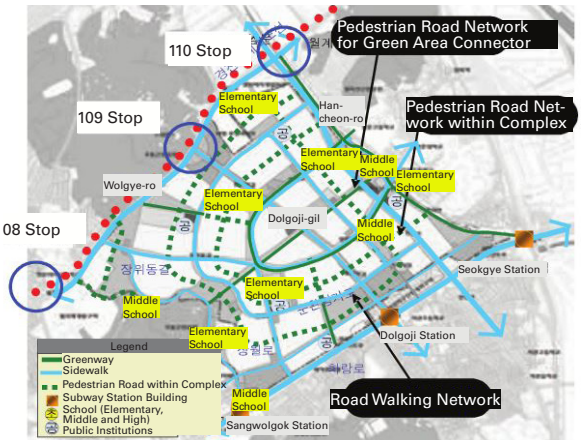


Figure 21 - Transportation and Pedestrian Circulation Plan



Promotional Process

Jangwi New Town was designated as the third new town district on December 16, 2005. Starting from the designation as a renewal promotion district and the determination of the renewal promotion plan in October, 2006, an application for Jangwi renewal promotion plan was made in November 2007 through the Seoul's urban renewal committee's consultation, public inspection, the district council's listening to opinions and public hearing, and its decision was made in April, 2008, so that 15 districts could be put under individual projects. Out of them, Jangwi Districts 12 and 13 were cancelled according to the sunset law and the application for union approval.

Results and Suggestions

To lay the groundwork for wide-area infrastructure by introducing the concept of renewal in the units of living zone.

The past redevelopment and reconstruction projects used to be implemented in the units of individual projects, so they could hardly be connected with adjacent projects and had a limitation of securing the infrastructure. Therefore, it was difficult to improve the residential environments in terms of living zones. However, in the new town project, the concept of renewal in the units of living zone was newly introduced to address problems with the renewal practices in the units of individual projects. Accordingly, it is meaningful that it has laid the framework for securing wide-area infrastructure within the established sections of city.

Enables various plans considering regional characteristics in the wide-area planning unit

The existing renewal for residential sites had some problems in that it took on a uniform-style renewal for apartment-centered housing sites and was also unable to carry out a planned renewal, considering regional characteristics. The new town project was performed in the wide-area unit, so it could lay the groundwork for establishing comprehensive renewal plans for various house types, sizes and densities within the district, which was impossible to do in the existing individual renewal plans.

To establish a plan with experts like the Master Planner (MP) and project manager (PM)

The existing renewal projects were performed on a private-led basis, so they tended to ignore public interests, for example, failing to secure the infrastructure by putting more focus on business feasibility and ignoring public interests such as appropriate developable density. Therefore, in the new town project, a planned system was introduced in order to help the MP, project manager and public parties participate in the planning and execution stages.

However, the new town project started in 2002, and designated 26 districts (23.8㎢) within just three years until the third new town district in 2005. Therefore, its districts were designated at a very fast speed across a wide area, causing many problems due to the lack of preparation and the insufficiency of legal systems. Furthermore, most of the designated districts were inhabited by almost 70% of tenants on average. However, the ratio of rental houses to be established (17% of total households) was low, so it was pointed out that there were not sufficient measures to help original residents resettle.

In retrospect, the Seoul government announced its measures for the new town in January 2012 and searched for a way out of the new town and redevelopment projects according to residents' opinions, and have searched for various ways by introducing new regeneration methods such as Human New Town or residential environment management project.

References

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- Seoul Metropolitan City, 2012, "Seoul's Efforts and Tasks for New Town and Redevelopment Project"
- Seoul Metropolitan City, 2010, "Seoul's Seven Year-Records of New Town Project"

New Town Project Procedure

- The new town project procedure is classified into a planning stage and an execution stage. In the planning stage, a basic development plan is determined in the process of designating districts. On the other hand, in the execution stage, an implementation plan is determined, including the process of changing urban plans and designating districts for each project district, and its project is executed accordingly.
- Designation of New Town Project Districts

  - New town type: For regions that require a comprehensive new town development because their lands with low development density are scattered around, for example, non-development areas and low-development areas.

  - Downtown type: For regions that need to develop or attract new urban functions such as residential, commercial and business areas because their downtowns and the nearby established streets have been formed in disorder.

  - Residential-centered type: For regions that require redevelopment due to the high density of old and worn-out houses or are under the redevelopment projects, and of which urban functions may be put into danger unless all the living zones are not developed due to the lack of urban infrastructure such as roads and parks.
- Establishing Basic Development Plans

  - To establish plans for each section including a purpose of designating project districts, an execution period, a development direction, an execution method, a land use plan, installation of major infrastructure such as roads, parks and schools and financing and cost burden

  - At that time, it was intended to collect various opinions through the master plan (MP), consultations for each planning stage and residential hearings.
- Implementation Plan and Project Execution

  - It executes a service for detail design according to basic development plans. New Town's business methods included housing redevelopment, housing reconstruction, residential environment improvement, urban environment renewal projects according to the Urban and Residential Environment Regeneration Act and urban development projects according to the Urban Development Act. Out of these methods, an appropriate one can be executed according to purposes and target areas, or performed with a combination of at least two methods.

District Designation	Designate new town project districts (Mayor) ⬇	· Designate the approved land transaction districts (Cadastre Dept.) · Notify the limited construction approvals (construction dept. autonomous Gu) · Control the camouflaged move-in (administration dept.)
Basic Development Planning	Organize the master planner (M.A) team (Mayor) ⬇	· Within a total of 3-5 persons - 1-3 external experts and 2 public officials (Si/Gu)
	Place basic plan service orders and launch (Head of Gu) ⬇	· Operate M.A Team (Supporting development directions and concepts, technical guidance and coordination, consultation, advice, etc.)
	Request for approval of planning stage-based coordination (Head of Gu -> Mayor) ⬇	· Evaluation/advisory group's evaluation targets - Status analysis, development direction and setting goals - Basic plan and development strategy - Basic development plan - Before presentation for residents and execution of urban planning procedure
	Establish basic plans and request approval (Head of Gu -> Mayor) ⬇	· Listening to residents' opinions (public hearings, etc.) · Consultation with municipal urban planning committee and report to the municipal council
	Approve basic plans and select preferential project districts (City) ⬇	· Deliberation by the regional balanced development committee · Execution planning and investment examination by years
Implementation Plan Execution	Execute implementation design service (Head of Gu) ⬇	· MA team: Participate as a design advisor · Select target areas by years
	Determine urban plans (determination of districts) (Mayor and Head of Gu) ⬇	· Execute urban planning procedures according to the related laws by project execution methods
Project Execution	Approve and execute project (implementation plan) (Head of Gu)	· Execute the project according to related regulations (Approval of implementation plan and project promotion)

02

Environment

1. Changes in Park & Green Space Policies in Seoul

Writer : Seoul Institute Dr. Won-Ju Kim

Policy Area: Environment

This report explores the park and green space policies of the Seoul Metropolitan Government by period, from the time Korea opened its ports to the outside world until today. The periods are divided into: modernization and Japanese colonial rule; the first and second republics; the third and fourth republics; the fifth and sixth republics; and local autonomous government administrations elected by popular vote. For each period, this report examines the institutional and spatial changes in urban parks.

Modernization & Japanese Colonial Rule: the Dawn of Urban Parks

Defining Characteristics: mountains and valleys serving as parks (Joseon Dynasty); Independence Park (Open-door Period); destruction of cultural heritage (Japanese colonial government)

The concept of parks and green spaces as planned facilities was introduced as a byproduct of modernization in the late 19th and early 20th century. Of course there had been places that served as parks and green spaces ever since the Kingdom of Joseon moved its capital to today's Seoul in 1394. The city is surrounded by an inner ring of 4 mountains and an outer ring of another 4 mountains, with the Han River flowing east to west. During the Joseon Dynasty, the walled city was located to the north of the Han, and the significance of the inner ring of 4 mountains (Bugak Mountain, Inwang Mountain, Nak Mountain, and Nam Mountain) was profound as the city walls were built on the ridges of the inner ring. The scholars of old use to visit nearby mountain valleys where they wrote and recited poems for leisure. They were not particularly interested in creating a park in a separate location; they simply visited and admired the beauty of natural scenery. There was another culture of leisure that usually took place in the rear gardens of the mansions of the upper class or the Confucian schools of learning. Because Joseon was strictly bound by social hierarchy, commoners and the lower classes could not dream of a separate place of leisure. At the time, Seoul was located to the north of the Han, whose banks were approximately 4 km away. The city was about 134 km² and populated by 200,000 people.

Korea's neighbors, China and Japan, opened their doors to the outside world and accepted Western civilization. Naturally, Korea was also influenced by modernization, which began with the seaports and nearby concession areas once Korea opened its doors in 1876. Korean envoys to foreign lands and students studying overseas grew interested in the concept of parks and introduced them to the nation when they returned. Soon, large parks were built in Seoul, Busan, and Incheon, usually by foreign residents in their settlements in Korea. Parks built by Korea included Independence Park by the Independence Association; Pagoda Park, a symbol of enlightenment built under the leadership of the Korean Empire; and Hwaseong Park, or Nam Mountain Park, built by the Japanese settlers.

Launched in 1896, the Independence Association set out to build Independence Park for the purpose of public enlightenment. They used newspapers and Association newsletters to promote the necessity for a

park and proposed its construction to the government. In the editorial of an October issue of Independence Newspaper, a writer suggested planting trees around the city walls to create a park. The Association understood the park as a place for commemoration and public enlightenment. The park was originally built on a vacant lot near Independence Gate and Independence Center, but its precise location is not known because Independence Gate had to be moved for road expansion in 1979. Today's Independence Park opened on August 15, 1992 on the site of Seodaemun Prison in commemoration of the historical significance of Korean independence.

Pagoda Park, the first park in Seoul, is a Western style park built on the site of the ancient Wongak Temple after clearing the homes that were packed tightly around the 10-storey Buddhist temple tower. In 1899, unauthorized houses were demolished to make way for Palgakjeong Pavilion, and then the tower and monuments were erected. At the time, it was owned by the royal family and was not open to the public. After the Japanese colonial government took over, it planted trees and opened the park to the public in 1913. The Kingdom of Joseon understood a park not as a structure to improve urban features but as a symbol of a modern city. On March 1, 1919, the Independence Declaration was recited here, with the Japanese government shutting down the park immediately afterwards.

Nam Mountain Park was also built during the period of open ports. From the outset, it was built for the Japanese and served as the heart of Japanese efforts to transform all Koreans into loyal constituents of imperial Japan. In 1897, the Japanese association of settlers secured 1 hectare of land to the south of their settlement (near today's Sungeui Girls' High School) and built a shrine named Hwaseongdae Park, also referred to as Great Nam Mountain Shrine. The park was expanded in 1907 for Gyeongseong Exhibition. Back then, Nam Mountain had several parks: Hwaseongdae Park, Gyeongseong Park and Hanyang Park (near today's Nam Mountain Tunnel #3). Later, they were collectively called Nam Mountain Park. In 1925, Japan destroyed the shrine for the Korean guardian deity at the top of Nam Mountain. The year before, Japan had already debased the lineage of the Joseon royal house by designating Sajikdan (the altar to the state deities) as a public park. It also banned rituals at Jangchungdan, an altar built in 1900 to inspire patriotic fervor in the people, and turned the area into a park. Changgyeong Palace became a zoo and a botanical garden to humiliate the royal family. Hyochangwon, the tomb of Euibin of the Seong Family and one of the concubines of King Jeongjo, was also turned into a park. As such, the parks built under Japanese colonial rule were not built to provide a place of rest and leisure. They were used as colonial tools to eradicate the native culture and traditions of Korea.

The First & Second Republics (1945 – 1961): the Ordeal for Urban Parks

Parks were abandoned in the chaos created by the Second World War and the destruction of the Korean War. When Seoul was recovered by South Korea, refugees settled in the parks. After the War, these refugees, together with other people in need, were simply trying to survive and ended up in the abandoned parks. The green spaces were damaged during this time, and shacks built. This was the beginning of the poor hillside neighborhoods famously known as the Moon Village (Daldongne), and the green spaces gradually vanished. During the Rhee Seung-man administration, the government could not afford to invest in parks nor did it have the legal framework to do so. The administration built the statue of Rhee and Unamjeong Pavilion, attempting to justify their presence by transforming Nam Mountain Park into a citizens' park, ultimately turning it into a personal memorial park for Rhee. Another statue of the ex-president was erected under the name of the Korean Boys' Club at Pagoda Park.

The Third & Fourth Republics (1961 – 1979): Expansion of Urban Parks

Defining Characteristics: enactment of park-related laws; transformation of cultural and historical sites into neighborhood parks; utilization of parks for propaganda

Park-related laws included the Gyeongseong Town Planning Ordinance established by the Japanese colonial government in 1934, and the Final Notification on Gyeongseong Town Park based on the Ordinance. The laws remained as they were until 1962 when the new Urban Planning Act was promulgated. In 1967, the Parks Act was separated out of the Urban Planning Act and passed as an independent Act. This Parks Act was later divided into 2 separate Acts: the Urban Park Act and the Natural Park Act in 1980. A new type of park – a cemetery park – was introduced, and the national cemetery in Dongjak-dong became the Seoul National Cemetery Park. According to the Basic Urban Park Plan of 1968, the basic system of Seoul's parks and green spaces, such as neighborhood and children's parks, are arranged in a radiating ring. After the Urban Park Act was passed in 1980, parks were classified as children's parks, neighborhood parks, urban natural parks, and cemetery parks. Natural parks were divided into national, provincial, and gun county parks. Green spaces were also divided into green buffer and landscape zones, to be installed as necessary.

Table 1 - Changes in Parks & Green Spaces up to 1990

Period	Description
Opening of the Ports	· Parks were built near the foreign concessions.
Japanese Colonial Rule	· Parks were built as part of urban planning. Nam Mountain Park was turned into a shrine by the Japanese. · 1930: Japan's park and green space policies were formed as part of urban planning.
Liberation – 1960s	· Nam Mountain Park was turned into a memorial park for Rhee Seung-man.
1960s – 1970s	· 1967: The Parks Act was passed. · 1971: The Urban Planning Act was revised to designate development-prohibited areas. · 1973: The Parks Act was revised to distinguish urban parks from green spaces. · 1977: Green spaces were expanded and the system improved as part of the plan to improve urban parks. · 1978: The Parks & Green Spaces Plan for the capital area was established pursuant to the Basic Seoul Urban Plan.
1980s – 1990	· 1980: The Parks Act was divided into the Urban Park Act and the Natural Park Act. · 1982: Efforts to preserve the natural environment began, and efforts to disperse industry and population well-established by the Seoul Metropolitan Area Readjustment Planning Act. · 1985: A campaign to build parks across the nation was launched. · Standards and direction for park/green space system guidelines were proposed in accordance with Seoul's study on park and green space policies. · 1986: The Han River Park Basic Plan was established. · 1989: Plans were developed to use natural parks as neighborhood parks pursuant to the Seoul Mountain Parks Plan. · 1990: Parks and green spaces were improved as cultural, leisure, and welfare facilities pursuant to the Basic Seoul Urban Plan.

One noticeable change after the parks became a part of urban planning was that the 5 cultural and historical sites of Gyeongbok Palace, Changdeok Palace, Changgyeong Palace, Deoksu Palace, and Jongmyo Shrine became neighborhood parks. This was a continuation of the Japanese colonial government's humiliation of the Korean heritage. Ponds at the royal palaces were used for ice skating, and Changgyeong Palace was degraded into zoo for the recreation of the general public.

Figure 1 - Changgyeongwon Used as a Recreational Facility

It was during this period that land readjustment was being carried out and areas built up. The city grew as the area south of the Han was developed, with the government developing Gangnam and Yeouido to boost economic growth. To make way for public facilities, parks were removed. Nak Mountain Park and Wawoo Park were dismantled, and apartments, to be demolished in later years, were built. Parks were treated as unused land.

Despite the circumstances, some new parks were being built. In 1973, Children's Grand Park was opened on the old golf course donated by Seoul Country Club. With a children's center, a zoo, botanical garden, and amusement park, Children's Grand Park became a favorite place for kids.

Throughout history, political leaders have built statues or memorial towers in parks as a way to advocate ideologies such as nationalism, anti-communism, or modernization. One example is Nakseongdae Park and its statue on the historical site of General Gang Gam-chan. Initially called the May 16th Plaza, Yeouido Plaza was also built in 1971 to boast of Korea's prowess in national defense. It was used for military parades and religious assemblies until the 1980s when Yeouido Han River Park was built. By then the plaza was called Yeouido Plaza, and most visitors came here to ride bicycles. In 1999, lawns and trees were added and the Plaza was renamed Yeouido Park.

Figure 2 - Children's Grand Park

Figure 3 - Yeouido Plaza & Yeouido Park

The development of Gangnam began in earnest in 1971, and parks were added to newly built-up areas in accordance with urban plans. During this time, Dosan Park, Shinsa Park, and Hakdong Park were built. Such parks were about 60,000 m² in size. Large-scale land development was underway at the time, but there was scarcely any consideration for parks and green spaces.

In 1971, development was restricted to the outskirts of Seoul; by 1973, it was applied nationwide. After the North Korean attack on the Presidential Office in 1968, the government sought to secure the space for security reasons, protect the natural environment, and prevent unauthorized urban sprawl. Development prohibited areas still maintain their boundaries and have successfully preserved green space in Seoul. However, they were also the subject of endless civil complaints. In 1998, the prohibition was lifted off some regions by the Kim Dae-jung administration and regulations eased.

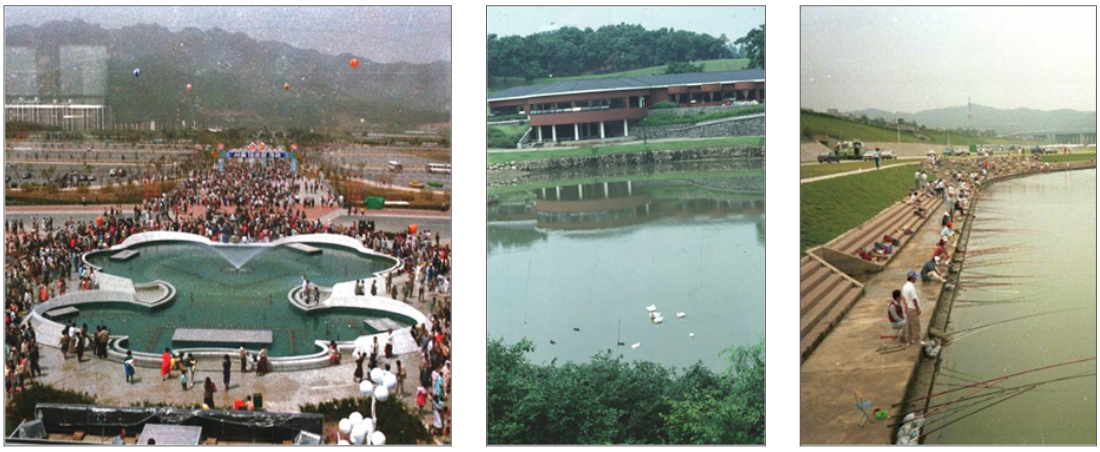
The Fifth & Sixth Republics (1979 – 1993): Improvement of Urban Parks

Defining Characteristics: construction of large theme parks, transformation of old sites into parks after relocation, and development of parks on the Han River

While urban dwellers had growing need for cultural areas, the city did not have sufficient land to provide these. Seoul Grand Park (1988) was thus built at the foot of Cheonggye Mountain in Gwacheon, Gyeonggi Province as a recreational area, and included a zoo, botanical garden, sports facilities, the National Museum of Contemporary Art (1986), and Seoul Land (1988). Other theme parks like Seoul Land included Dream Land (1987; in Beon-dong, Gangbuk-gu, the current site of Dream Forest); Lotte World Adventure (1989); and Race Park (1989) in Gwacheon.

When Seoul National University moved from Dongsung-dong, Jongno-gu to Gwanak-gu in 1975, the lot remained vacant. In 1985, Marronnier Park was built, around which many other facilities were developed for culture, art, and performances. No car zone was instituted, while high-end restaurants moved into the area one after the other, turning the area into one of the most popular places and a cultural center for young people.
From 1981, the whole nation started preparing for the Asian Games in 1986 and the Olympics in 1988. To commemorate these international events, Asia Park and Olympic Park were built. After the events, these facilities were open to the public. The government established plans to develop the Han River area; by 1986, open, spacious Han River parks were equipped with sports facilities, natural parks for children, and bicycle paths. Trees taller than a meter were not allowed due to flood risk. In Jamsil and Shingok, reservoirs were made to keep the Han River full at all times and prevent introduction of seawater. Cruise boats, yachts, and other water recreational facilities were provided to maximize use of these parks.

Figure 4 - Seoul Grand Park , Olympic Park, Comprehensive Han River Development



As Seoul expanded and urban functions were dispersed to Gangnam, some of the schools north of the Han were moved to the south. The old school sites were replaced with parks: Gyeongheegung Park (1986) on the site of Seoul High School on Shinmun Road; Boramae Park (1986) on the site of the old Korea Air Force Academy; Son Gi-jeong Park (1990) on the old site of Yangjeong High School; Wonseo Park replaced Hwimun High School; and Susong Park replaced Sukmyung Girls' High School. When Seodaemun Prison was moved to Euiwang City, Independence Park (1992) was built on the site, and opened on Independence Day. On the old site of the Bureau of Monopoly storage (Dapshimni-dong, Dongdaemun-gu), Gandeme Park (1998) was developed, spanning over 150,000 ㎡. The old Pilot Factory site (27,000 ㎡) in Cheonho-dong, Gangdong-gu was turned into Cheonhodong Park, with nature facilities for students.
For the leisure of urban dwellers, Yongsan Family Park (1993) was developed on the 90,000 pyeong (0.29 ㎢) site – golf course and heliport – from the 1 million pyeong (3.3 ㎢) area used by the 8th USFK Army. Because it has long been a military zone, the greens and water were well preserved, saving much money and time in the development process.

The plans developed at the time were as follows. In 1981, the Comprehensive Han River Development Plan was established to utilize the aggregate and riverside space along the Han. In 1982 and 1987, the 5-year Green Plan for the Capital Area was established; a Study on the Park & Green Space Policies of Seoul and Restoration Plan for Mountains in the Vicinity were developed in 1985 and 1989, respectively.

Figure 5 - Yongsan Family Park

Local Government Administrations Elected by Popular Vote (after 1993): Ecological Approach to Urban Parks

Defining Characteristics: sustainable development introduced; Nam Mountain Restoration Program

By the 1990s, local autonomy had been introduced. During this period, a new, important concept was introduced: the Environmentally & Socially Sustainable Development (ESSD) was proposed at the 1992 Earth Summit in Rio de Janeiro, Brazil where representatives from governments and private organizations around the world gathered. As much as the environment was important, landscape was another crucial policy aspect. Celebrating its 600th anniversary as the capital city, Seoul launched the Nam Mountain Restoration Program from 1991 to 1998. Apartments housing foreigners at Nam Mountain were removed, the Agency for National Security Planning was moved, the beacon tower was restored, and a botanical garden and traditional Hanok Village were developed at Nam Mountain. From the outset, the plan was a comprehensive one, embracing history, ecology, and urban planning. Relevant departments worked closely with each other and endeavored to communicate with residents, experts, and the media. For the first time, residents were actively involved and the 100 Citizen Committee was created. It was the first plan that considered history, culture, ecology and resident participation as well as urban planning and development. In the meantime, smaller local governments worked to meet the needs of their residents by building small parks, village squares, and sports facilities.

Figure 6 - Nam Mountain Restoration Program (Before & After)

Table 2 - Size of Parks in Seoul after Liberation from Japanese Colonial Rule

Year	Administrative District (㎢)	Population (10,000)	Planned Parks			Facility Parks			Facility Park/ Planned Park Ratio(%)
			No. of Parks	Area (㎢)	Area per Person (㎡)	No. of Parks	Area (㎢)	Area per Person (㎡)	
1945	136	90.1	142	80	88.75	10	1.04	1.15	1.3
1961	268.35	257.8	124	25.22	9.79	N/A	N/A	N/A	N/A
1963	613.04	325.5	136	25.04	7.69	N/A	N/A	N/A	N/A
1968	N/A	433.5	152	55.81	12.87	N/A	N/A	N/A	N/A
1975	627.06	690	645	158.85	23.02	387	31.7	4.59	19.96
1980	N/A	836.7	908	173.99	20.8	367	41.2	4.92	23.68
1985	N/A	960	1074	153.73	16.01	713	48.73	5.08	31.7
1990	605.42	1062.8	1325	152.37	14.34	1038	89.51	8.42	58.75
1995	605.77	1059.6	1404	150.84	14.24	1141	105.79	9.98	70.13
1999	605.52	1032.1	1423	154.23	14.94	1258	130.26	12.62	84.46
2010	605.27	1046.4	2531	169.05	16.16	1925	145.05	13.86	86.36
2014	605.21	1038.8	2782	170.08	16.37	2184	148.15	14.26	87.11

Source: Seoul Parks Data & Annual Statistics

As can be seen in the above table, by the 1960s, the total area of Seoul's administrative district had grown 4.5 times larger than it was when Korea was liberated from Japanese colonial rule, a size that has changed little since that time. Under Japanese rule 142 parks were planned, but only 10 were built. After the Parks Act was passed, hundreds of parks were built from the mid 1970s, and the ratio steadily grew to 70 – 80% in the 1990s.

Term 1, Election by Popular Vote (August 1996 – June 1998)

Defining Characteristics: Seoul Agenda 21, creation of ecoparks, and implementation of the "Great Streets to Walk" program

During this period, the 5-year Plan for Parks & Green Spaces was established by the City of Seoul by Mayor Jo Sun. This plan was marked by a shift from the existing government-led policies that had focused on securing as much land as possible for parks and green spaces to a resident-oriented approach. The new plan included efforts such as securing land for parks and green spaces for residents, upgrading the green spaces and landscape in built-up areas, establishing a foundation for forest vegetation to grow, improving the green space management system, and encouraging resident-involved campaigns for more green space. Environmental policies were also improved during the period. The City of Seoul Framework Ordinance on the Environment and the Environment Charter were enacted, and the Seoul Agenda 21 was formed and implemented in collaboration with resident organizations.

It was also during this period that Yeouido Saetgang Eco Park (1996) and Gildong Eco Park (1996) were opened, introducing the concept of "ecopark", starting with the natural river restoration program at Yangjae Stream, which resulted in flora and fauna that were not easily seen in a large city.

Various citizens' campaigns were also begun, such as the No-wall Movement (1996) and the Village Square program. In the same context, activities by NGOs (e.g., Green Korea, Citizen Solidarity for a Beautiful City to Walk) were also active. With the Ordinance on Pedestrian Rights in 1997, the "Create a Beautiful City to Walk" program was pursued from 1998 to 2002, encouraging citizens to be more involved in improving the city's parks and green spaces. In the meantime, residents continued to plant trees as they felt the growing need for more parks and green spaces in the city.

In addition, Yeouido Plaza, completed in 1971, was transformed into Yeouido Park (1999). Parks were built on sites where other facilities had been located; for instance, the City of Seoul purchased the old site of OB Beer factory and developed Yeongdeungpo Park (1998).

Term 2, Election by Popular Vote (July 1998 – June 2002)

Defining Characteristics: "Plant 10 Million Trees" program, development of Seonyudo Park/Nak Mountain Park/World Cup Park, and increased NGO activities

The "Plant 10 Million Trees" program was the fulfillment of a key promise by Mayor Goh Geon. The aim was to plant trees where there was asphalt and concrete, to turn the grey of the city into green. To reach the goal of planting 10 million trees in the 4 years of the mayor's term, 2.5 million had to be planted each year. Ten million was an unrealistic goal; moreover, there was not enough land available to plant that many trees. It was thus decided to plant 3 million trees and 7 million shrubs, with 7 million to be planted by the public sector and 3 million by the private sector. Public servants had to go out and hunt for vacant lots; the city launched a

campaign urging residents to help them. The city even announced that it would fund tree planting on vacant lots, whether they were on private land or not. The public reacted positively: by 2002, 16.41 million trees were planted in an area of 3.5 km², increasing the percentage of land taken up by parks and green spaces from 25.44% to 26.11%. Olympic Expressway and other parts of Seoul began to turn green, but unfortunately, the ecological effect was not carefully considered.

In Seonyudo, the water purification center was moved away, but the facilities were used to make Seonyudo Park. Nak Mountain Park was restored, as it had been damaged by poorly-managed urban development – including construction of 34 5-storey apartment buildings – in the 1960s. Some years later, Wawoo Apartment Building, built on the steep slope of a rocky hill, collapsed. This served as a reason to demolish all apartment buildings at Nak Mountain around 2000 and construct Nak Mountain Park in their place.

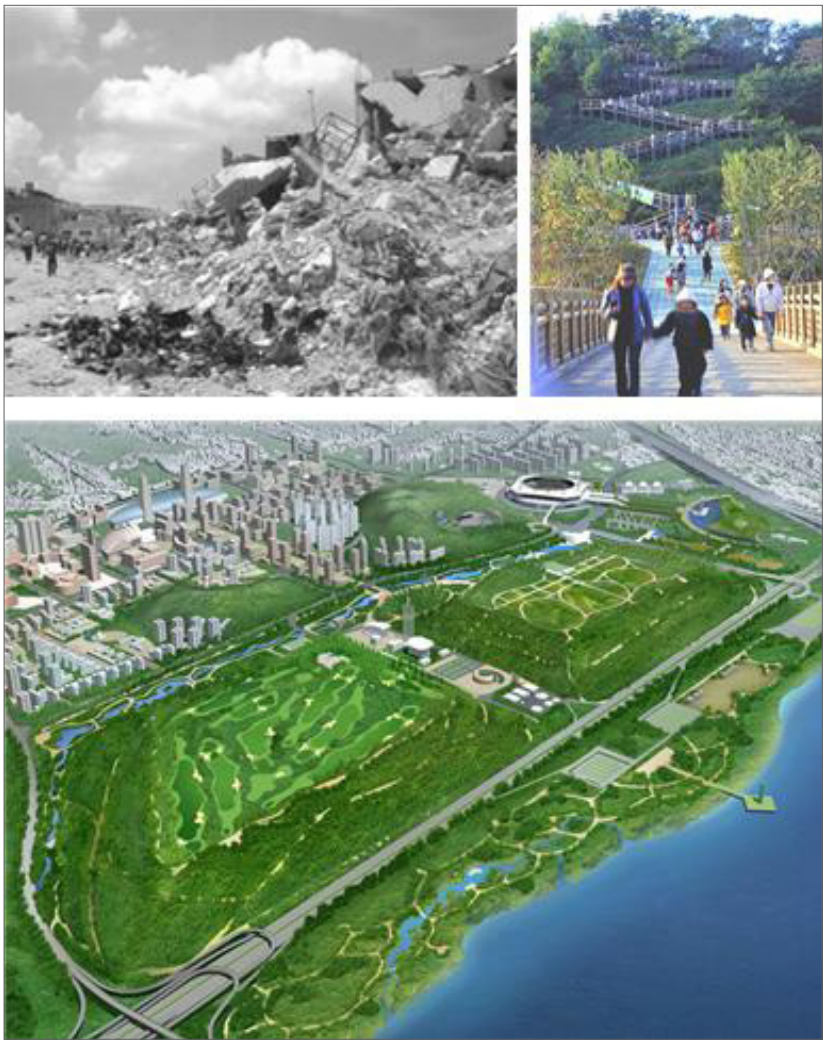
Figure 7 - Naksan Park (Before & After Park Construction)

In the process of preparing for the 2002 World Cup, Nanjido (a landfill site) and its vicinity were transformed into the World Cup Park Complex (Peace Park, Sunset Park, Sky Park, and Nanji Stream Park). Other programs were also carried out, including: "Rooftop Parks" (2000 –), "Urban Green Belts", "Green Parks & Forests", "Forest of Hope for Citizens", and "Green Preservation".

The advancement of ICT particularly contributed to increasing resident participation and enabling their involvement in government. A good example of this is the Forest Program of 2000. Green Consumer Network and other NGOs also engaged in other environmental activities.

Figure 8 - Residents Involved in Tree Planting Programs

Figure 9 - Transformation of Nanjido into World Cup Park



(Top: Before & After; Bottom: Master Plan)

Term 3, Election by Popular Vote (July 2002 – June 2006)

Defining Characteristics: Restoration of Cheonggye Stream; construction of Seoul Forest, Seoul Square, and Sungnyemun Gate Square, and the "Greener 1 Million Pyeong (3.3 k㎡)" program

During this period, Mayor Lee Myung-bak pursued the demolition of Cheonggye Stream Overpass and restoration of the stream itself (2003 – 2007). After the 2002 World Cup, the citizens of Seoul were awakened by the nation's enthusiasm during the games. To meet this enthusiasm, the traffic island in front of City Hall was transformed into a lawn covered square (13,000 ㎡) in 2004. Sungnyemun Gate Square (7,900 ㎡) was also developed in 2005.

The city administration had other policies for parks and green spaces, such as the "Greener 1 Million Pyeong (3.3k㎡)" program. Policy was about reinforcing private-public collaboration and increasing green areas and access by the general public, with an emphasis on resident participation. The "School Parks" program (2006) was undertaken in accordance with this policy, led by a non-government organization called Forests for Life, making 376 schools (364,422 m²) greener. As part of the campaign 16 universities opened their doors, resulting in the expansion of green spaces by 40,360 m².

Table 3 - "Greener 1 Million Pyeong (3.3 km²)" Program (July 2002 – June 2006)

	Project	Area (m^2)	Remarks
Total		3,546,130	= 1.07 million pyeong
Parks	Urban Natural Parks	1,772	
	Neighborhood Parks	637,243	
	Children's Parks	-14,697	
	Cemetery Parks	-47,463	
	Other Parks (incl. Seoul Forest)	1,209,813	
Green Spaces	School Parks	364,422	
	Open-door Universities	40,360	
	Green Projects by Public Institutions	15,600	
	Green Walls on Urban Structures	35,613	
	Beautiful, Green Street to Walk	42,820	
	Water Features	87,980	
	Green Riversides	476,818	
	Green Railroads	19,011	
	Green Facilities	52,455	
	Aged Tree Protection Areas	6,606	
	Broader Green Areas along Streets	107,285	
	Green Rooftops	27,224	
	Green Spare Lots	6,121	
	No-wall Apartments	1,000	

Ecology	Cheonggye Stream Restoration	375,705	
	Restoration of Ecological Preservation Area in Bangyi-dong	58,909	
	Ecological Corridor	1,210	
	Restoration of Basin Area	40,322	

Figure 10 - Restoration of Cheonggye Stream (Before & After)

Figure 11 - Seoul Forest

Thanks to the contribution and participation of residents, Seoul Green Trust was established in 2003, and Seoul Forest (2005) was developed in a 1.15 ㎢ area in Ttukseom in a private-public partnership. Unlike other parks built solely by the public, the Forest was built through the efforts of residents who planted trees and also of NGOs that worked with residents to maintain the forest. This was a whole new approach to park management. The Forest was fragmented in many places due to roads, but they were planned as separate units: an eco forest, citizen space, learning space, and wetland, completed by some 420,000 trees. The makers of the Forest placed particular focus on ecological significance of the convergence of the Han River, Jungnang

Stream, and Cheonggye Stream. With diverse programs and activities for people, it has now become one of the most loved places in the city.

With introduction of the "Wellness" concept and the 5-day work week, people began to have more time for leisure. In 2005, the Green Seoul Bureau was established in the city government, and the importance to the public sector of parks and green spaces grew. Nadeuri Park (Mangwu-dong, Jungnang-gu), Pureun Arboretum (Hang-dong, Guro-gu), and Amsa Ecological History Park (Amsa-dong) were also built around this time. In addition, another program was set up to build a park in each dong district, such as the neighborhood parks in Munjeong-dong, Songpa-gu built on an abandoned railroad lot. The city endeavored to supply more green spaces to strike a regional balance. Green spaces isolated by roads were connected to restore the ecosystem and greenbelt continuity.

Term 4 and 5, Election by Popular Vote (July 2006 – August 2011)

Defining Characteristics: Dream Forest for balanced development of Gangnam & Gangbuk; Han River Renaissance & Nam Mountain Renaissance

During this period when Mayor Oh Se-hun served 2 consecutive terms, the Han River Renaissance and Nam Mountain Renaissance were pursued. The city aimed to achieve a balanced development of Gangnam and Gangbuk and implemented such policies as creating large and neighborhood parks in Gangbuk, recreating parks with resident participation, and encouraging residents to participate via the "Seoul Oasis". Relatively speaking, the urban conditions in Gangbuk were poor, and programs were introduced to improve things. One of these programs was development of Dream Forest (2009), about 663,000 ㎡ in area, on the old site of Dream Land. An observation tower, cultural center, lake, pavilion, and Wolgwang Waterfall are located inside the Forest. Sejong Center for the Performing Arts provides performances and exhibitions at the Forest, attracting many visitors. These represent effective ways of resolving complaints about the existing parks with strategic management plans that are well-received by the public.

Figure 12 - Dream Forest

West Seoul Lake Park (2009, 225,000 ㎡) was developed on the site of Shinwol Water Purification Center in Yangcheon-gu. The grounds around the water treatment facility, closed in 2003, were turned into a theme park. In Dobong-gu, another theme park was built called Seoul Changpowon (53,000 ㎡) with 12 themes, such as irises, medicinal plants, and wetlands.

Some deteriorating children's parks were also targeted and renovated. For instance, KRW 87.68 billion was spent on the "Children's Parks of Imagination" program (2008 – 2010), by which some 300 outdated children's parks were renovated. Eco-friendly materials were used for children's safety, and local residents and their kids participated in the planning, construction and management of the parks. This is in stark contrast to the rigid park development methods of the 1970s and 1980s, demonstrating a shift in awareness that the needs and desires of the actual users should be reflected in the making of the parks.

Figure 13 - Park Involved in "Children's Parks of Imagination" (Before & After)

Mayor Oh Se-hun introduced policies to increase the brand value of Seoul and achieve a target of attracting 12 million tourists. Festivals were held by season, and international energy and environmental events, such as C40, were hosted in Seoul to breathe more vitality into the city. Greenery was deemed especially significant in the city's landscape; to make it greener, Seoul introduced a program of turning rooftops of privately-owned buildings green.

Figure 14 - Green Rooftop (Before & After)

From 2009, the city embarked on the Nam Mountain Renaissance project. With "recovery" and "communication" as the two overarching concepts, the Nam Mountain Renaissance Master Plan employed 6 strategies to develop Nam Mountain as a brand. The city also established plans to build 4 neighborhood parks in Jangchung, Yejang, Hoehyeon, and Hannam, and develop the vicinity of Seoul N Tower to create a new source for culture at Nam Mountain.

Figure 15 - Nam Mountain Renaissance Plan (Before & After)

As part of the Han River Renaissance project that started in 2006, the floating Islands Sebit was developed at Banpo District of the citizens' parks; at Yeouido District, unique themes were given to the park, for example, by installing fountains. Bicycle paths were created and access roads improved at the interchange to allow easier access. Some of the shoreline embankments were restored to their natural state, but the effects were minimal. Moreover, the nightscape programs caused disruptions to the ecosystem and wildlife habitats.

Term 6, Election by Popular Vote (October 2011 – Today)

Defining Characteristics: Completion of mountain paths and tracks; inspection and measures for slope stability; development of parks by lifecycle

After the disastrous landslide from Umyeon Mountain in July 2011, Mayor Park Won-sun and his administration became acutely aware of the danger and reinforced the slopes. The city also implemented urban safety policies. Because mountains act as doctors keeping Seoul and its citizens healthy, tracks and paths were built on the mountains in the city and those forming the outer rings to promote walking and hiking. Other programs were also put in place such as "Green Walls", "Open Green Apartments", and "School Parks".

Figure 16 - Open Green Apartments (Before & After)

As for the Han River, the 2030 Natural Restoration Plan for the Han River was established to restore the natural waterway. Natural embankments and wetlands are part of the plan, so as to create an environment favorable to both humans and wildlife. In 2013, the city announced its "Green City Declaration" with public landscapers and has since been working on changing the traditional park paradigm, to create a "park city" that goes beyond traditional park boundaries to embrace all possible spaces, from streets, alleys, squares, rooftops, and even walls.

Well aware of the value of urban farming, the city designed public vegetable gardens on Nodeul Island. Today, residents take the lead in managing these green spaces; with examples including the Citizen Gardener and Adopt-a-Tree/Park programs. There are also green spaces specifically designed to be included in daily life, such as healing parks by life cycle; 80 vegetable gardens at schools and social welfare facilities; Ssamji Madang; forests for babies; and "customized" neighborhood hill parks. After relocation of the USFK base in Yongsan is complete, Yongsan Park (2.57 ㎢) at the center of the north-south green belt will be the ecological heart of Seoul.

Major Policy Changes

Changes From Government-led to Private-led

From Japanese colonial rule to military dictatorship, parks were treated as tools to promote ideology to the people. The rulers erected statues of themselves and commemorative structures across the country, and in the process damaged the cultural and historical heritage. When democratic governments began being elected, public awareness increased and residents began to participate in the development and management of parks. In turn, they could access the services they wanted and needed. Today, parks and squares are not only for leisure and recreation but also for demonstration of their rights as citizens.

From Sacrifice of Nature to Peaceful Cohabitation

At a time when economic growth was the priority, parks were deemed as unused land, a place where buildings could be erected as needed. As cities grew, green areas slowly disappeared and vacant lots were hard to come by. In recent years however, air pollution, health issues, and demands for leisure reminded people of the significance of parks and green spaces. Over time, they began making the effort to discover and visit natural environments, and realized that development should not be in a conflicting relationship with parks, but at peace. As a result, the city adopted such concepts as biotope areas, mandatory percentages of park and green space in redevelopment projects, and "green" initiatives for privately-owned buildings. As part of the special measures taken by the Mayor of Seoul, public institutions in Seoul are required to ensure a certain level of biotope area from July 2004. From 2006, this requirement also applied to the housing performance rating system of the Ministry of Construction & Transportation. Because the index is incorporated in environmental impact assessment, the relevant authorities are encouraged to carefully consider and expand the percentage of natural ground and waterfront areas in the city, the ratio of pervious surfaces, and man-made green spaces (e.g., green rooftops).

From Damage to Preservation of the Ecosystem

If other types of life cannot survive in the city, people are not likely to lead healthy lives either. The living environment can only be healthy when birds, insects and other animal life thrive in the city. That is why it was important to remove Cheonggye Overpass, restore Nam Mountain to its natural state, designate environmental preservation areas, and improve the environment so that people can live alongside other forms of life in peace. Preserving the ecosystem is to protect the living environment of the people. The areas rich in biodiversity or with beautiful landscapes are therefore designated for preservation and are managed in a systematic manner. These areas include: Bamseom Island on the Han River, designated as a Ramsar wetland in June 2012; wetlands in Dunchon-dong and Bangyi-dong; Tan Stream; Wonteo Valley at Cheonggye Mountain; and the royal garden at Changdeok Palace.

Discontinued & Interrupted Policies

Under the dictatorships, parks were used to idolize an individual or promote power. The democratic governments did work to meet the needs of their citizens, but many plans were discontinued or isolated in nature as candidates made promises to win elections and had to finish them before they left office. Naturally, the plans were more focused on quantity than quality.

Furthermore, rising land prices in the city made it difficult to secure the land necessary for new parks and green spaces. Seoul was slowly seeing less and less land development and housing construction projects over time, allowing the focus to shift from quantity to quality. There are many lots that were designated for park construction, but nothing has been done for a long time on those sites due to the failure to secure funding. When designation is removed from such sites in 2020 pursuant to the Sunset Law, the area for parks will

be drastically reduced.

It is therefore crucial to find ways to secure land that is available, while coming up with further plans to improve the park services and ecosystem therein. Park development projects need to focus less on facilities and more on green areas for the health of both residents and the city as a whole as well as on the aesthetic and environmental aspects. It should also be noted that securing sufficient funding is critical for land compensation and improving the cost structure for park maintenance.

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2. Changes in Seoul's Air Quality Control Policy

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Policy Area: Environment

Introduction

Air pollution in urban areas is caused mostly by heating, industry, development, and transportation. The types of pollution that develop continue to change according to evolving social and economic conditions. Various types of en vironmental issues that Seoul faces today are ultimately connected with environmental quality, degradation of which stems from diverse, complex causes, making it difficult to reach an accurate understanding of the environmental issues. The severity of pollution too differs by the level of industrialization and urbanization as a result of rapid population growth concentrated in the cities, technological developments and economic growth, all of which are interconnected and act together in a complicated manner across society, affecting the urban ecosystem and human health.

Air pollution is a result of a complex reaction between pollutants from natural and artificial sources, making it difficult to identify exact sources, evaluate and predict air quality, and develop plans to reduce pollution.

Seoul's air pollution patterns share the complexities of air pollution of large cities in and outside of South Korea, but in general, vehicle emissions are a major cause. This is not likely to cease being the case until there is a fundamental reduction at source (car ownership, frequency of travel, etc.) and action is taken in connection with land use, energy, and other sectors that have direct and indirect impact on the growth of vehicle demand.

The following pages will touch upon the quantitative expansion and qualitative diversification of Seoul as well as the changes in the city's air quality control policy.

1960 – 1977: Air Quality Control

After the Korean War in the 1950s until the early 1960s before the economic development plan was implemented, attempts to manage and control the air quality in South Korea were rare. In 1962, the first 5-year economic development plan was established, in accordance with which various development projects were undertaken. With it urbanization began in earnest, followed by laws and institutional frameworks on air pollution and control.

In November 1963, the Pollution Prevention Act was passed to prevent harm to health or the environment from air pollution, water pollution, noise, or vibration, and thereby improve public health and create a healthier living environment. The Act defined air pollutants as substances such as exhaust, dust, gases, etc. that can contaminate the air. Yet the only subject of interest at the time was to escape poverty, and there was almost no regard for what pollution might be created. The law existed, but there was no organization responsible for administration, no budget allocated to enforce it, and no regulatory authorities. The Act was revised in January 1971 and provided for basic legislation at least, but there was little effort to use the Pollution Prevention Act to regulate air quality. This situation was frowned upon both in and outside Korea. According to a report

by the Japan Environmental Council (JEC, 2000), South Korea's Pollution Prevention Act had no regulations on total emissions in place and with punitive measures so mild, it was not a Pollution Prevention Act but a Pollution Permission Act.

In the 1970s, measured air pollutants were mostly gases such as CO (carbon monoxide) and SO2 (sulfur dioxide). These measurements however were hotly debated over their veracity. The Smithsonian Institute in the US gathered the research data of the scholars and wrote in a report of its shock that in Seoul's rapid urbanization, the city was one of the most polluted in the world and that its citizens suffered from chronic respiratory diseases.

Most authority as per the Pollution Prevention Act was held by the central government. Local governments that were supposed to be the entities with primary responsibility ended up as bit players. Seoul was not equipped to resolve its own air pollution issues.

Because the Korean War had ravaged the forests, the nation was devoid of heating and cooking fuel, and coal briquettes surfaced as the main energy source. The use of coal briquettes is estimated to be the chief cause of air pollution in South Korea, especially in cities, at the time. In the early 1970s, a city gas plant was built in the south of Seoul to decrease pollution and modernize the demand for fuel, but the gas supply was not significant.

1977 – 1990: Air Quality Control

The economic development plans were successful, but various pollution issues arose. The public gradually became more conscious of pollution. Towards a more aggressive manner of addressing the environmental issues in a comprehensive way, the government introduced the Environment Conservation Act in December 1977. Judging that the Pollution Prevention Act alone could not ensure preservation of the environment, the new Act contained a wider scope of regulations and preventative measures. New systems were adopted in accordance with this Act, including environmental standards, environmental impact assessments, and regulation of total emissions. It also contained regulations on fuel use, sulfur content in fuel, automobile emission standards, fuel additives, and incineration of odorous substances.

In 1978, the first SO2 standard was created, followed by standards on CO, NO2, and TSP (total suspended particles), and O3 (ozone) in 1983. The standards were then continually strengthened.

Back in 1978, 40,000 households in Seoul used LPG, but plans were made to increase this to 500,000 of the 800,000 total households in the city. The replacement of coal briquettes with cleaner fuel was considered one of the most important policies that helped reduce air pollution levels in Seoul. Since then, the government has implemented several policies to supply clean fuel: fuel with lower sulfur content in 1981; restrictions on use of solid fuel in 1985; unleaded petrol in 1987; and mandatory use of LNG in 1988. As a result, SO2 and TSP levels began to improve in Seoul.

1990 – 2003: Air Quality Control

Since 1980, the Environment Conservation Act had been revised a few times but was abolished in the end to better respond to the diversifying environmental issues, and the Framework Act on Environmental Policy was enacted in 1990. It was based on this Framework Act that 6 other Acts were passed, including the Clean Air Conservation Act and the Water Quality Conservation Act.

The Clean Air Conservation Act is about revision of the emissions charge system and determines permissible emission standards, types of pollutants, emission period and volume; fuel use; standards for sulfur content in fuel; regulations on odor generation; automobile recalls; and strengthened regulations on installation and operation of emission facilities and pollution-prevention equipment. The Act was revised several times afterwards to increase punitive measures for illegal emission facilities. In December 1995, revisions were included that allowed city mayors and provincial governors to push ahead with their own policies designed to improve air quality in their jurisdictions. It was then the era of local autonomy, which had begun in June 1995, and the role of local governments was amplified in protection of air quality.

Accordingly, Seoul took action to pave the way for localized air quality management. It enacted the City of Seoul Framework Ordinance on the Environment to provide basic principles for the city's environment policy and enacted/promulgated the Seoul Local Air Environment Standard (March 1998) – a step forward from the standards set up by the central government. In addition, it created an Air Conservation Department within its environment organization, creating its own foundation for air quality control. In the meantime, the Ministry of Environment designated Seoul, Incheon, and other parts of Gyeonggi-do Province (15 cities) as air quality control areas on July 1, 1997, pursuant to the Clean Air Conservation Act (Ministry of Environment Announcement #97-51). Joint effort by local governments for protection of air quality was now a legal concept.

The continued supply of clean fuel in Seoul helped decrease the primary air pollutants (SO2, TSP, CO, and other substances directly from source) markedly below environmental requirements. Pollutants common in advanced nations – particulate matter (PM), ozone, and nitrogen dioxide formed by chemical or physical reaction in the air – were still above environmental requirements and did not improve much. Seoul belatedly realized that it had not come up with plans to reduce vehicle emissions, which were rapidly increasing. This shows that in relation to designation of air quality control areas, the city needs to pursue its own projects to keep its air clean and also work with the surrounding local governments and the central government to review and analyze their roles in such efforts. In the end, the primary focus of Seoul's efforts to improve its air and environment is on managing the sources of air pollution within the city but collaboration with the central government and other local governments is also needed to reach the desired goals.

2003 – Today: Air Quality Control

In December 2003, the Special Act on the Improvement of the Air & Environment for Seoul Metropolitan Area (the "Special Act on the Air") was enacted, aiming to improve air quality and overall environment of the Seoul metropolitan area, which at the time was one of the worst of OECD member country cities.

The Act was mainly concerned with air quality improvement, local permissible emissions, framework plans on air and environmental improvement in the Seoul metropolitan area, management of total emissions at the workplace, use of low emission vehicles, and strengthening controls on exhaust emissions. Every decade, a Framework Plan On Air and Environmental Improvement in the Seoul metropolitan area is to be established to reduce the levels of nitrogen oxide compounds, sulfur oxide compounds, VOCs, and particulate matters pursuant to the Special Act on the Air. Phase 1 of the framework plan was scheduled for 2014, and focused on PM10 and NO2 levels in the capital area. The Seoul Action Plan On The Air and Environment Improvement (2005 – 2014) was developed and adopted in accordance with the framework plan, and its strategy of 'selection and concentration' visibly improved the environment and reduced particulate matter (PM10), the main culprit in poor visibility and incidence of respiratory disease. In 2001, PM levels in Seoul were at 71㎍/㎥; by 2012, this had fallen to 41㎍/㎥. PM levels, a major environmental indicator of the competitiveness of global cities, are still higher in Seoul than elsewhere. Further improvement is still an important demand.

Scheduled to start in 2015, Phase 2 of the Framework Plan On The Air and Environment Improvement targets more pollutants, including PM10, P㎥.5, NO2, and O3. It seeks to minimize potential causes of air pollution and other threats to health.

During this latest period, the low emission vehicle program was introduced to the Seoul metropolitan area so as to minimize the emission of air pollutants by vehicles, and comprises projects such as lowering emissions from diesel vehicles, increasing the number of "green" cars, and creation of natural gas stations.

Seoul piloted an LPG engine retrofit program on 135 2.5-ton cleaning trucks used by local governments to pursue lower emissions from diesel vehicles, a project launched by both the city and the surrounding areas in 2003. From 2005, the project was expanded to cover city buses and business vehicles, introducing the installation of DPF and DOC devices, LPG engine retrofits, and early termination of vehicle registration for vehicles failing to meet the emissions requirements.

Seoul is also interested in encouraging the use of electric cars as a fundamental solution to air pollution, and has distributed such "green" cars since 2009 and built charging stations to test-run for wider use of electric cars. The city is a leader in "green" car projects, starting with electric bicycles, low-speed/retrofitted/high-speed electric cars, electric buses, hydrogen-powered cars, and online electric car, etc. Beginning in 2009, Seoul has built charging stations at City Hall, local district offices, parks and other public facilities, and developed a "smart payment" system to meet potential demand for easy payment.

To ensure air quality control is systematic, Seoul operates monitoring stations across the city. Following the ozone alert system in 1995, a particulate matter alert system was introduced in 2005 to help protect city

residents.

The happiness of people in Seoul is directly related to the health of the city. The importance of air quality control is receiving more emphasis than ever before considering the potential impact of climate change on public health. To enhance the environment of a global city like Seoul and ensure that the conditions for good health are protected, the city needs to communicate with citizens on ideas as it sets itself on a path of transformation to a fresh air city (one of Seoul's 4 main goals), an international capital with a healthy environment. Seoul proposes to reduce fine particulate matter, which directly impacts health, by 20% by 2018. Its policies, designed to stop emissions at source, include low emission projects for older diesel vehicles, reduction of nitrogen oxide compounds from heavy vehicles, introduction of electric cars and hybrid CNG buses, etc., and work to fine-tune its strategies to meet the specific needs of the city and its people. At the same time, the city plans to encourage more of its citizens to take part in environmental efforts, by, for example, driving eco-friendly cars, while refining legal and institutional frameworks to promote the purchase and use of new low-emission vehicles.

Based on a comprehensive "diagnosis and prescription" tailored to the needs and characteristics of the city, Seoul is focused on identifying detailed action plans to achieve its goals and continue to improve air quality and the overall environment for the future.

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3. Energy Management Policy (1997 – 2014)

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Policy Area: Environment

Background to Energy Policy

Through 2 oil crises in the 1970s and the Framework Convention on Climate Change in 1992, the world became increasingly interested in energy. Into the 2000s, damage and loss from climate extremes spread across the world, and many countries became actively engaged in discussions, arguing that consumption of fossil fuel should be reduced. This however did not lead to an actual reduction. Not only was it costly to reduce the use of fossil fuel and expand the use of renewable energy, but this also involved conflicts of interest. Many central governments, including South Korea's, had espoused central government-led energy policies. This was mainly due to the fact that energy is closely associated with national industry and economic development and therefore requires prohibitive investment in infrastructure. In the 1990s, the South Korean government began to disperse some of its manpower and budget funds to local governments, leading to the emergence of local energy policies. In 1995, the system of local autonomy was implemented, and local governments planned to manage their own energy supply and demand based on their own energy policies. However, these policies could not unfold, as the manpower and funds necessary for the management of supply and demand were monopolized by the central government. Local energy policies remained in their infancy.

Suddenly, oil prices skyrocketed in 2008, with a nuclear accident in Fukushima in 2011. There were blackouts on a broad scale, and frequent reports of problems and corruption at nuclear plants. Anxiety in the nation grew. Reports were heard of people at risk from high voltage (765kV) power transmission towers, built to send electricity from the nuclear power plants at the shores of Miryang and Cheongdo to consumers in the cities. Whereas people before had limited interest in energy issues, they were now paying attention to specific issues, such as the question on discontinuation of nuclear power plants and construction of transmission towers. As circumstances changed, local governments needed to strengthen their administrative influence on energy policies.

Until the late 1990s, even the City of Seoul could not easily establish and execute its own energy policies. However, by this time, local energy policies and plans began to emerge and take shape. Through former Mayor Oh Se-hoon and Mayor Park Won-soon, Seoul gradually instituted its own energy policies and systems for implementation, which today include: distribution and safe management of coal, oil, city gas, LP gas, and high pressure gas; expansion of an integrated energy system and unused energy (e.g., sewage heat); management of electrical product manufacturing and electrical/electrical construction programs; expanded distribution and use of renewable energy (e.g., photovoltaic power, fuel cells); and energy saving and efficiency programs.

Seoul's energy consumption is steadily rising, but the rate of growth has recently eased. As of 2012, the city's final energy consumption was 15,582,000 TOE per annum: oil accounted for 5,822,000 TOE (37%); city gas, 5,127,000 TOE (33%); electricity, 4,062,000 TOE (26%); district heating and other energy, 572,000 TOE (4%). The percentage of oil fell while electricity and city gas rose.

This report is an analysis of how Seoul, a mega city with more than 10 million people, established and exe-

cuted its own energy policies: the development of independent local energy plans in 1997, the advancement of policy, and what policies were key for each time period, thereby providing a reference for other cities to consider.

Development of Energy Policy

Until the government officially adopted local energy policies in 1996, South Korea did not have any energy policy at the local government level. Local governments touched upon heating fuel management, management of energy safety, permit and cancellation responsibilities, and energy saving campaigns, but no more. From 1960 to the mid-1990s, the main responsibilities of Seoul in terms of energy were to ensure a stable supply and safe management of fossil fuels used for cooking and heating.

In the 1960s, coal briquettes were the main source of fuel for heating and cooking. Petrol followed from the 1970s to the mid-1990s, and natural gas was supplied by the late 1980s, with distribution rates soaring 20% per annum by the 1990s. The administrative organization in charge of energy was called the "Fuel Department" until the late 1990s, which was responsible for stability in fuel supply and management of safety. Between 1987 and 1993, the "Gas Department" was temporarily created to focus on the distribution of city gas.

The government was determined to reinforce the local government's authority in terms of energy, making them energy independent and helping to boost the local economy. In 1996, plans to pursue development of local energy policies were announced. Pursuant to the Energy Use Rationalization Act, local energy plans and programs were established and put into action.

Local energy plans are at least 5 years in duration, with establishment every 5 years led by city mayors or provincial governors, mainly in regard to: trends in and forecasting energy supply and demand; stability of supply; renewable energy plans; plans to reduce greenhouse gas emissions and ensure responsible use of energy; plans for supply of integrated energy; plans to develop and utilize waste energy sources; and energy policies. At the local and provincial level, energy programs receive the assistance of the central government, mainly in the form of infrastructure building projects, involvement in education, promotion, and feasibility testing, projects that support biotechnology facilities, photovoltaic, solar, and geothermal energy, and policy planning programs (assistance for photovoltaic projects on islands and remote areas, "green villages", etc.) to provide assistance with facilities in specific fields.

The City of Seoul commissioned the Institute of Industrial Resources with the first local energy plan in 1997, and the Korea Energy Economics Institute with the second local energy plan in 2003. At the time, the city established plans in accordance with the central government's policy decisions but did not make efforts to execute the plans. Nevertheless, this move to develop energy plans at the regional level was why the period from 1997 to 2005 (until the tenure of Mayor Lee Myung-bak) was seen as a step toward development of local energy plans. The Fuel Department was closed up in 1998 and the responsibility for management of gas

safety was transferred to the Fire & Disaster Headquarters. The duties of the now-defunct Fuel Department – a stable supply of heating and cooking fuel and electricity-related responsibilities (electrical product manufacturers, electrical works, electrical construction, etc.) – were divided among other departments until June 2006. During this period, plans were established but the execution system regressed.

Under Oh Se-hoon (in office between July 1, 2006 and June 30, 2010) who was elected for the 33rd and 34th mayorship, the city's energy policy began to mature. After reorganization in 2006, energy-related duties divided among the departments in the Ministry of Industry were transferred to the Clean Seoul Headquarters, and the English word "energy" was included in the department names. In 2007, the Seoul Energy Declaration was issued, demonstrating the city's determination to implement energy policies in earnest. In June 2009, the third local energy plan (the 2030 City of Seoul Framework Plan for Environmentally-Friendly Energy)[1] was announced. With an aim to make Seoul an energy-advanced city that recycled more energy and consumed less of it, the third local energy plan presented specific details on mid to long-term plans for home, commercial, transport and public sector programs.

In 2008, the Energy Policy Division was added to the Clean Seoul Headquarters to ensure development of comprehensive policies, from a stable supply of fuel and the distribution of renewable energy to promoting energy efficiency and response to climate change. Led by Mayor Oh Se-hoon, the framework energy plan was instituted, which enabled the city to come up with a platform on which to develop energy policies tailored to the city, and resulted in a reshuffling of its administrative organization. Its governance organization, the Citizens' Committee for a Green Seoul, heard from the people their views on energy policy.

Seoul's energy policy took a remarkable leap during the incumbency of the 35th Mayor, Park Won-soon (in office between October 27, 2011 and June 30, 2014), represented by the One Less Nuclear Power Plant campaign. Seoul emphasized its influence and responsibilities as an energy consumer and set out to save 2 million TOE based on using less, increasing efficiency, and enhancing production of renewable energies. A Green Energy Department and a Citizens' Cooperation Team were added to the Climate & Environment Headquarters; a Citizens' Committee and Implementation Committee were set up for the One Less Nuclear Power Plant campaign as governance organizations. The Green Energy Department itself was made up of 6 teams: Energy Policy; Integrated Energy; Solar Development; Renewable Energy; Energy Efficiency; and Power Management.

Reelected in August 2014, Mayor Park Won-soon announced his "Sustainable Energy Policy" as part of the second phase of the One Less Nuclear Power Plant policy. While Phase 1 focused on quantitative demand management and reducing use by 2 million TOE, Phase 2 expanded the policy to the energy industry and welfare to provide better quality energy services to city residents. The Sustainable Energy Policy was launched in July 2014, targeting 2020 for completion. This environmentally-friendly policy was set by Mayor Park as one of the city's core priorities, and it has made considerable progress.

1. Established in accordance with Article 7 of the Framework Act on Energy and Article 10 of the City of Seoul Ordinance on Energy.

Major Policies by Period

1) Development of Local Energy Plans (1997 – June 2006)

In June 1997, the Institute of Industrial Resources (Head: Yu Sang-hee) released a "Study on Development of the Local Energy Plan for Seoul"[2]. It was a 5-year plan, from 1997 to 2001, and proposed to develop enterprises dedicated to energy conservation and institute a reasonable energy administration system.[3] In accordance with this plan, the city implemented 7 projects (including development of energy plans, awareness campaigns, plans for waste energy sources, and feasibility testing of minor hydropower generation at sewage treatment facilities); spending KRW 360 million. Against the total budget, KRW 350 million is a small amount for energy policies that cover all of Seoul for 5 years. After the first local energy plan was developed, the Korea Energy Economics Institute was commissioned in August 1998 to conduct a study on the status and utilization of waste energy sources in Seoul. However, such studies were not translated into policy.

One of the most noteworthy activities of this time was the enactment of the City of Seoul Ordinance on Energy in January 2002. On June 26, 2000, the Korea NGO's Energy Network was launched to produce energy saving campaigns, relying on the private sector for voluntary and creative activities. The Korea NGO's Energy Network aimed to support the public activities of society responding to the dearth of domestic energy resources and climate change. As part of its work, the Network started a campaign to pass local government ordinances on energy so as to create and support a sustainable energy system. The City of Seoul was the first local government to pass such a city ordinance.

In April 2003, the Korea Energy Economics Institute came up with the second local energy plan, and Seoul announced the outcome. This was also a 5-year plan to cover the period from 2002 to 2006, and included: expanding distribution of residential district heating; CES (Community Energy System) for large, energy-inhaling buildings; increased supervision of residential insulation; utilization of ESCO companies; transportation demand management; and policies for unused "waste" energy (sewage treatment, heat recovery from the Han River and Cheonggye stream; methane gas; geothermal energy cooling/heating system; pilot public park powered by waste energy, etc.). The Korea Energy Economics Institute suggested that dedicated teams and personnel were needed for the plan, but this advice was never incorporated as the energy administration functions and programs were transferred from the Industrial Policy Department at Industry and Economy to the Employment Stability Department in 2003 and then to the Living & Economy Department in 2005. The local energy plan remained on paper only.

2. The study talks about various measures including reduced use of public vehicles, improved power facilities for metro/subway lighting, energy conservation in residential, commercial, and public areas, increased production of integrated energy, wind and photovoltaic power generation at Haneul Park, and increased use of renewable energies such as landfill gas from Nanjido, etc.

3. The power independence of Seoul was 7.5% at the time.

2) Introduction of Environmentally-friendly Energy Policy (July 2006 – June 2011)

On April 2, 2007, Mayor Oh Se-hoon issued the Seoul Energy Declaration, proposing to reduce the city's energy consumption to 2000 levels (a 12% decrease) by 2010, with a total reduction of 15% by 2020, as well as the city's greenhouse gas emissions to 1990 levels (a 20% decrease) by 2010 with a total reduction of 25% by 2020. The plan was to build photovoltaic generators around the city and realize a 10% increase in the use of renewable energy by 2020.

The status of energy use was thus studied, and specific goals were set to enhance energy efficiency of multi-household housing and "office-tel" buildings and to encourage the use of eco-friendly vehicles (hybrid, fuel cell cars etc.). Seoul also worked with Germany's Fraunhofer-Gesellschaft to build a "zero-energy house" (Energy Information Center) and the "Renewable Energy Landmark of Seoul" (photovoltaic power generation facilities) near World Cup Park. The city declared that its new City Hall would adopt diverse environment-friendly designs, such as rain and heavy water recycling systems, air curtains, high-efficiency transformers, and a rooftop garden. The building would also use photovoltaic and geothermal energy to enhance energy independence. The city put this plan into action.

Seoul's plan also included building a pilot renewable energy complex in New Town and Magok to take advantage of photovoltaic and geothermal energy, and using sewage heat from[4] water regeneration centers, such as the one for Tancheon, as the source of integrated energy. There were other plans as well, such as utilizing water regeneration centers, water treatment facilities, and subway car depots to build a photovoltaic generator. In Phase 1, the 2MW generators would be built at the Southwestern Water Regeneration Center, Ttukdo Water Treatment Facility, and the Gunja subway car depot.

Floor space ratio incentives were provided when a private structure built pursuant to the district unit plan and/or the urban environment redevelopment program invested 1% of the construction cost in renewable energy or 1% of its total energy consumption came from renewable energy. Dividend and transferred income from the general accounts of the Korea Gas Corporation and the Korea District Heating Corporation – funded by the City of Seoul – were to be used to create the "Seoul Energy Fund" to finance research, technology development, and energy projects.[5]

The "Clean Seoul Energy Team" was created and placed under the Clean Seoul Headquarters. In 2008, Seoul became the first city in the nation to establish a Climate Change Ordinance. This was significant as it was the first low-carbon legal framework in South Korea despite the absence of a higher level law regarding climate change. Based on the Seoul Energy Declaration of 2007, the City of Seoul issued a third local energy plan (the

4. The plan was to encourage distribution and use of photovoltaic and other forms of renewable energy as well as the use of waste energy sources such as sewage heat so as to increase the overall use of renewable energy (0.6% in 2004) to 2% by 2010 and 19% by 2020.

5. The Seoul Energy Fund was created to finance Seoul's energy studies, technology development, and renewable energy projects. The existing Ordinance on the Creation of the City Gas Fund was abolished and the Ordinance on the Creation of the Energy Fund was passed. The Energy Fund had its funds rolled over from the City Gas Fund (KRW 49 billion currently) and would be completed by the dividend (KRW 5.5 billion in 2005) and transferred income from the general accounts (KRW 5 billion each year) of the Korea Gas Corporation and the Korea District Heating Corporation

2030 City of Seoul Framework Plan for Environmentally-friendly Energy)[6] in June 2009.

On August 15, 2008, the Lee Myung-bak administration announced its "Low Carbon Green Growth" policy, which the City of Seoul actively embraced. In 2009, the city issued its "2030 Seoul Master Plan on Low Carbon Green Growth", which consisted of 22 key projects and extended the 2020 plan from the Seoul Energy Declaration (April 2007) to 2030. It also set higher goals, aiming to reduce greenhouse gases (by 40%) and energy use (from 15% to 20%) and encouraging the use of renewable energy (from 10% to 20%).

According to this Master Plan, Seoul will attract private investment and invest some KRW 44 trillion by 2030, to ▲ reduce greenhouse gas emissions by 40% (to 1990 levels); ▲ create a million "green" jobs; and ▲ preemptively respond to climate change. The Clean Seoul Headquarters set up a dedicated management system for the Low Carbon Green Growth policy, and the head of the Headquarters is in charge.

Table 1 - Main Policies of the 2030 Seoul Master Plan on Low Carbon Green Growth

_ ▲ Make 10,000 buildings (2,000㎡ or larger) "green"

_ ▲ All new buildings to obtain environment-friendly verification

_ ▲ All public transit vehicles to be switched to "green" technology

_ ▲ Public transit share of transportation to be expanded to 70%

_ ▲ Bicycles to have 10% of transportation share through construction of 207 km of bicycle paths along arterial roads

_ ▲ Create 1 million "green" jobs by developing top 10 green technologies for Seoul (e.g., hydrogen fuel cells, solar cells, power IT, "green" buildings, LED lighting, "green" IT, "green" cars, urban environment regeneration and restoration, utilization of waste, and technologies for handling climate change)

_ ▲ Establish an urban management infrastructure to respond to extreme heat, water shortage, infectious diseases, and other impacts from climate change

_ ▲ Establish an integrated response system based on evaluation of the impact from climate change and vulnerability

_ ▲ Develop customized medical protective equipment and gear for extreme heat, yellow dust, etc.

_ ▲ Establish urban design and development standards in line with climate change

6. Developed in accordance with Article 7 of the Framework Act on Energy and Article 10 of the City of Seoul Ordinance on Energy.

During this period, The Seoul Institute performed significant research on energy policy and played a role in helping Seoul create its long-term energy plans and policies. Mayor Oh Se-hoon helped provide an administrative platform upon which long-term energy plans could be established and put into action to meet the demands of the city. In Seoul, homes and commercial buildings consume a lot of energy. In consideration of this, "Eco Mileage" was introduced in September 2009 successfully helping people save energy on a daily basis. In May of that same year, the "C40 Cities Climate Leadership Group" was hosted, and the Seoul Declaration issued. With its influence as a mega city, Seoul promoted its efforts against climate change to the international community. While Mayor Oh Se-hoon helped Seoul take its energy policy one step forward, critics point out that the execution system was inadequate to achieve the goals he proposed, such as the reduction of greenhouse gas emissions and increased use of renewable energy.

Table 2 - Major Energy Sector Studies by the Seoul Institute during the Introduction of Seoul's Environmentally-friendly Energy Policies

Year	Major Studies on Seoul's Energy Policy
2007	City of Seoul Framework Plan for Environmentally-friendly Energy; Seoul's Climate/Energy Map (Year 2); Plans to create a renewable energy community; Research on energy consumption trends in Seoul
2008	Seoul's plan to reduce fossil fuel use; Analysis of changes in CO_2emission by transport sector and potential for reduction; Promotion and monitoring of green rooftops for energy conservation; Feasibility re-view of a sustainable, environmentally-friendly system in the Magok ur-ban development district
2009	Seoul's Climate/Energy Map (Year 3)
2010	Strategy to reduce energy use in buildings to achieve low carbon emission goals; Evaluation of the program to reduce energy use in buildings; Com-parative analysis of "zero energy community" policies of major cities around the world; Plan for renewable energy facilities based on a renewable portfolio standard
2011	Mid to long-term basic plan for renewable energy (2011 – 2015); Energy performance evaluation and utilization for building retrofit; Evaluation of potential and technology trends in use of sewage energy; Development of technology to derive bio-energy from food waste and fecal matter from res-idential areas; Introduction of the ISO50001 energy management system to improve the system of response to climate change

3) Period of the One Less Nuclear Power Plant Policy (November 2011 – June 2014)

On April 26, 2012, the City of Seoul announced a comprehensive energy plan titled the "One Less Nuclear Power Plant" plan, declaring its intention to reduce energy use by 2 million TOE by 2014, equal to the energy produced by one nuclear power plant. Seoul proposed a vision of "Building a foundation to achieve energy independence and become a global capital on climate initiatives". It outlined plans to reduce 730,000 of the 2 million TOE goal through energy conservation efforts, 770,000 TOE by improving energy efficiency, and replacing 500,000 TOE with renewable energy sources, sewage heat recovery, and waste heat from incineration. The total budget was KRW 2,784.7 billion, 78% (KRW 2,186.1 billion) of which would be financed by private capital.

The plan for the One Less Nuclear Power Plant began to take form in November 2011, and is noteworthy as it was shaped by the participation of and ideas from residents. From January to April 2012, the city, the

Policy Advisory Group of Hope, and citizens' organizations prepared a draft plan through 16 meetings. This initial draft was reviewed and revised at the One Less Nuclear Power Plant Policy Workshop held at Literature House at Nam Mountain (February 21, 2012) and at the Citizen Debate (April 16), the latter of which saw 400 participants hold lively discussions in 22 different groups. The participants contributed valuable ideas, which included suggestions that energy conservation efforts be emphasized through education at home and school, that energy-inhaling buildings should have to disclose their energy consumption, and that some roads should be for public transit and pedestrians only. Some 109 different ideas were reflected in the policy.

The One Less Nuclear Power Plant policy was first created when the city realized that it needed a plan to respond to its energy crisis. Seoul accounted for 10.9% of all power consumption in the nation and yet its power independence was only 2.95% (as of 2011). Moreover, nationwide energy consumption was soaring, a potential cause for a crisis of supply. With the Fukushima nuclear accident in 2011, a series of blackouts on a large scale, and conflicts from the transmission towers in Miryang and Cheongdo, people were very supportive and willing to embrace the energy policy.

The comprehensive One Less Nuclear Power Plant policy was made up of 10 key programs in 6 areas, 21 policy tasks and 78 projects. The 10 key programs were designed to: 1) make Seoul a "sunlight city", a city that is a photovoltaic generator in itself; 2) help major facilities achieve energy independence through hydrogen fuel cells; 3) implement plans to improve building energy efficiency; 4) find innovative ways to encourage the use of LED and smart lighting; 5) build a compact city to allow for a low energy urban space; 6) reinforce design standards for new buildings (e.g., total energy use requirements); 7) encourage car sharing; 8) create "green" jobs in the energy sector; 9) promote grass root energy-conservation campaigns; and 10) install and operate the "Energy Foundation".

Since launching of the One Less Nuclear Power Plant campaign in 2012, many measures have been taken to save energy and enhance efficiency. In 2 years, the city has reduced its energy use by 2 million TOE. Moreover, Seoul's electric power, city gas, and oil consumption are on the decrease. Up to the first half of 2014, some 1.7 million residents were participating in the Eco Mileage program where incentives are given for saving energy. At 500 schools, 20,000 students took part in the Energy Guardian Angels groups, saving energy at home and school. Some 20,000 buildings participated in the energy efficiency programs, and 6.79 million light bulbs were replaced with environmentally-friendly, highly-efficient LED lights. In July 2014, the City of Seoul announced the successful completion of its goals for Phase 1 of the One Less Nuclear Power Plant campaign, and announced a Phase 2.

Table 3 - Phase 1 Achievements for the One Less Nuclear Power Plant Campaign

Photovol-taic Power Gen-eration (MW)	Building BRP (No. of Build-ings)	LED Re-placement (10,000 LED lights)	Eco Mileage Members (10,000 per-sons)
22.8 → 69 (2011) (June 2014)	475 → 2,111 (2011) (June 2014)	20 → 679 (2011) (June 2014)	50 → 168 (2011) (June 2014)

Table 4 - Major Energy Sector Studies by the Seoul Institute during the One Less Nuclear Power Plant Policy Period (2012)

_ -Model for Estimated Energy Consumption by Residential Buildings in Seoul

_ -Development of Evaluation Index for Seoul's Greenhouse Gas & Energy Reduction Program, and Performance Assessment

_ -Development of Techniques for Analysis of Seoul's Energy Policy Impact on Energy Conservation

_ -Analysis of Energy Consumption by Residential Housing in Consideration of Seoul Resident Lifestyles

_ -Study on Measures to Introduce the Solar Energy Generation Assistance Program for Seoul (in Response to the Mandatory Requirement to Supply Renewable Energy)

_ -Plan to Promote Improvement of Heating Energy Efficiency in Detached Housing in Seoul

_ -Strategy to Achieve Energy Independence for Basic Environmental Facilities & Infrastructure in Seoul

4) Seoul's Sustainable Energy Action Plan (One Less Nuclear Power Plant, Phase 2) (July 2014 – 2020)

In July 2014, Phase 2 of the One Less Nuclear Power Plant campaign began. This phase was also shaped by residents from the beginning. Led by the Execution Committee of the One Less Nuclear Power Plant plan, opinions were collected for 6 months through surveys and discussions, etc. The official name for Phase 2 of the One Less Nuclear Power Plant plan is "Seoul's Sustainable Energy Action Plan", which seeks energy independence, sharing, and participation of energy, and aims to increase the city's power independence to 20%. This will help Seoul to reduce 4 million TOE in energy consumption and 10 million tons of greenhouse gas. The detailed policy methods will involve: 1) distributed energy production; 2) an efficient, low-consumption social structure; 3) creation of good energy jobs through innovation; and 4) friendly, energy-sharing communities. For distributed production of energy, photovoltaic (250W) generators will be distributed, which can easily be installed on apartment balconies, with 10,000 units to be distributed each year, for a total of 40,000. In addition, the "Citizen Fund, Seoul Solar Power Generator" project will be launched, granting a guaranteed

interest rate of 4% per annum on investments in the fund, which the city expects to reach KRW 100 billion by 2018.

To enhance energy efficiency, buildings will be subject to intensive management as they account for 56% of the city's total energy use. Loans at 1.75% interest will be provided to buildings to improve their insulation. Environmental impact assessment standards will be more stringent for new, large buildings. Energy saving technologies and facilities will be strengthened so that zero-energy design standards can be applied from 2023. As for lighting, all 2.2 million lights used by the public sector, including the traffic lights and street lamps, will be replaced with LED lights by 2018. For the private sector, 29 million LED lights – about 65% of the total – will be distributed.

While Phase 1 mainly focused on conservation, efficiency, and production, Phase 2 focuses on jobs and welfare. The city will subsidize building energy management systems (which are useful in large cities), smart grids, and other power-related IT, while supporting and developing some 70 social enterprises and cooperatives in the green energy sector. Each dong district will have a local energy hub that provides comprehensive energy services from installation of energy equipment to monitoring and follow-up. There will be emergency assistance programs, an energy welfare platform, and city ordinances targeting the energy-deprived social class. The city will also support energy-independent communities as part of its local energy community program. As of 2015, Seoul is in the process of developing the fourth local energy plan, which will include the plans proposed by the One Less Nuclear Power Plant policy as well as long-term plans that look ahead as far as 2035.

Table 5 - Details of the One Less Nuclear Power Plant Phase 2 (23 Tasks, 88 Programs)

Distributed Productio 5 Tasks, 19 Programs	Low Energy City 9 Tasks, 34 Programs	Good Energy Jobs 4 Tasks, 17 Programs	Welfare & Sharing 5 Tasks, 18 Programs
· Seoul: A Sunlight City! Project · Distributed energy production at buildings · Integrated energy to 60,000 households, saving up to 20% in heating costs · Identify waste energy sources across the city · Support energy independence through institutional innovation	· Zero energy at new buildings · A healthy, pleasant city with accurate energy analysis and efficiency · Increased responsibilities of the public sector in improving energy efficiency · Seoul: A City of LED Light! · Urban restructuring towards low energy consumption · Encourage the use of "green" cars · Energy saving streetlight · Encourage energy saving lifestyles · Make the city a global leader in recycling	· Work with citizens to create "green" en-ergy jobs · Customized assistance for "green" energy companies by lifecycle · Build infra-structure for "green" energy industries and technologies · Foster inno-vative "green" energy IT	· Create a Citizen Fund (platform) for energy welfare · Ensure basic right to energy · Efficiency programs to reduce energy costs · Special measures for disadvantaged households · Community energy programs

Policy Outcomes

The period of Seoul's environmentally-friendly energy policy (July 2006 – June 2011), led by Mayor Oh Se-hoon, was important in that it was the time when energy plans were established, providing a framework in which the needs of Seoul would be met. The fact that Mayor Park Won-soon, elected in by-elections, could draft the One Less Nuclear Power Plant policy in a relatively short period of time was because of the foundation formed by the environmentally-friendly energy policy. Before Oh Se-hoon took office, the first and second local energy plans were established (1997 – June 2006), but these were done only to comply with the law as it required local energy plans to be developed at local government level every 5 years.

Mayor Oh emphasized the significance of energy efficiency and focused on the Eco Mileage, BRP, and LED programs. Long-term greenhouse gas reduction and renewable energy plans were also developed at the city level. Nonetheless, the administrative focus and funding did not follow through to put plans into action. As a result, Seoul's energy use continued to grow, and the distribution and use of renewable energy remained the same. However, the Energy Dream Center – a zero-energy building – and the environmentally-friendly energy construction of the new City Hall that he promised were completed.

Mayor Park Won-soon invested the city's manpower and funds in energy policy – a decision rarely made by any local government in South Korea – and pushed ahead with the One Less Nuclear Power Plant (November 2011 – June 2014) policy. The One Less Nuclear Power Plant team was created and added to the Environment Policy Department at the Climate & Environment Headquarters, with the addition of the Green Energy Department and the Citizens' Cooperation team to create a system for implementation. The new governance included the Citizen Committee and the Execution Committee on the One Less Nuclear Power Plant campaign. Through these specific details and institutional improvements, the One Less Nuclear Power Plant policy was a success, and had the necessary organizational support and funding.

The success of the One Less Nuclear Power Plant campaign manifested itself in several ways: 1) a local energy policy vision was presented and translated into action; 2) BRP loan conditions were improved (up to KRW 2 billion for buildings, KRW 10 million for houses at a 2% per annum interest rate), allowing for profit from private power generation (capacity lower than 50kW; KRW 50 per kWh) and small photovoltaic generators, and developing successful policies such as the integrated management of photovoltaic power in the public sector; 3) citizens participated in improving public awareness; 4) a successful demand management system was realized at the local government level; 5) space was secured for energy education and development of energy-related content/data; and 6) the name of the program itself became an official brand: "One Less Nuclear Power Plant".

Let's look closer at Seoul's successful demand management system at the local government level. Because the local government does not have the right to determine or supervise energy prices, Seoul was limited in terms of what it could do independently with its energy policy. Even so, the city was able to institute independent policies and some unique institutional improvements during the process of expanding the use of renewable energy. The power generation profit system had vanished at the national level, but Seoul introduced its own power generation profit system to encourage the distribution of photovoltaic power generators. City ordinances were revised to improve the rent system (5% of the official land price → KRW 25,000/kWh) to assist owners of small photovoltaic power generators and this change influenced other local governments to revise their own ordinances. Encouraged by such revision in the capital, people ready to form solar power generation cooperatives were able to urge their local governments to revise the necessary ordinances. Some of the outstanding policies in terms of citizen participation include the Energy Designer program that employs people dedicated to energy conservation, and the Energy-Independent Community program.

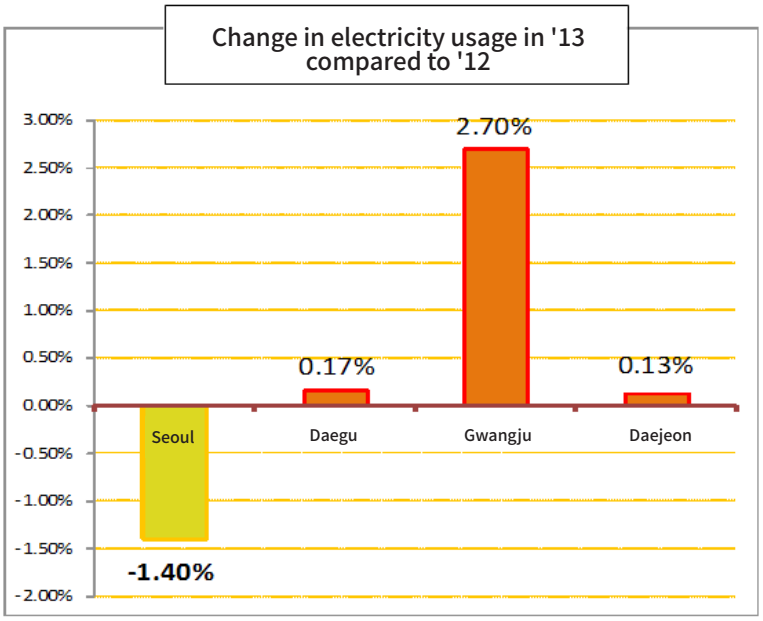
Table 7 - Examples of Outstanding Policies Identified in the One Less Nuclear Power Plant Campaign

Outstanding Policy	Description
Install LED First, Pay Later	Existing lights are replaced with LEDs first and paid for with the power bill savings from LED use. Seoul established an SPC to help replace lights with LEDs at metro/ subway.
Improve-ment of Loan Con-ditions for the Build-ing Retrofit Project (BRP)	This program seeks to save energy at houses and other buildings by reinforcing insula-tion, replacing regular lights with LEDs, and regu-lar heaters and air conditioners with high-efficiency devices. Seoul expanded its long-term, low-rate BRP loan program, eased eligibil-ity requirements, expanded the scope, and reduced the interest rate.
Sunlight Map	The map provides information to residents interested in photovolta-ic power genera-tion and simulates the amount of power that a pho-tovoltaic power generator on the roof can generate. Local potential for natural energy is identified and disclosed online to allow resi-dents to discover the benefits of installing a generator (New York's Solar Map, Seoul's Sunlight Map).
Seoul's Power Gen-eration Profit Sys-tem	Under the RPS system, it is difficult to invest in small-scale pho-tovoltaic power generation facilities. In Seoul, existing profit poten-tial and the amount of daylight are insufficient. To address this is-sue, Seoul introduced a power generation profit system in 2013. The city instituted an assistance program for solar power generation with photovoltaic power generators (50kW or less) to provide KRW 50 per kWh for 5 years, considering the amount of electricity they sell to KEPCO. The city helped secure sales channels by supporting sales agreements between the mandatory supplier and inves-tors in small-scale photovoltaic power generators.
Distribu-tion of Small Pho-tovoltaic Power Gen-erators	Small photovoltaic power generators (less than 250W in capacity) are distributed to households, with installation costs (approximately KRW 600,000) covered by the city.
Integrated Photovolta-ic Power Manage-ment (Pub-lic Sector)	Photovoltaic power generators installed at public organization build-ings in Seoul are managed through an integrated system, with col-lected data used to shape photovol-taic power-related policy.
Improve-ment of Rent for Photo-volta-ic Power Generators	The basis for calculating the rent for rooftop space for photovoltaic power generation has been switched from official land prices to gen-eration capacity. This significantly reduces the burden of rent in Seoul where official land prices are high.
Long-term, Low-rate Loans for Photovolta-ic Power Generation Facilities	For small to medium facilities with a capacity of 150kW or less, assistance is provided for loans, with an annual interest rate of 2.5%, to be repaid in installments over 8 years. Half of the installa-tion cost is covered by the city, to a maximum of KRW 150 mil-lion per generator. As of 2013, Seoul has provided assistance worth KRW 6.3 billion.
Energy De-signer Pro-gram	Seoul directly employs staff devoted to energy conservation and ef-ficiency.
Energy In-dependent Communi-ty – Energy Communi-ty Assis-tance	This is a campaign for community energy, with a focus on phased-in participation in energy conservation, efficiency, and production.

Table 8 - Comparison of Power Usage (2012 & 2013)

Category(GWh)	2012	2013	Change
Nation-wide	466,593	474,849	1.76%
Seoul	47,234	46,555	-1.4%
Daegu	14,955	15,080	0.8%
Gwangju	8,131	8,274	1.8%
Daejeon	9,160	9,225	0.7%

Figure 1 - Seoul vs. 3 Cities with Similar Socioeconomic Structures & Power Consumption Patterns: A Comparison



Individually, Koreans are steadily using more energy over time. There is a strong tendency to lean heavily on electricity due to the inversion of the price of oil versus the price of electricity. It is commendable that the city has achieved an actual reduction in energy use under these circumstances. However, improvements are needed for the current structure where more than half of the energy reduction is due to individual residents saving energy. While instilling a culture with daily energy-saving habits is important, it is now time to look toward qualitative change: saving energy through innovative energy infrastructure and services.

Phase 2 of the One Less Nuclear Power Plant – Seoul's Sustainable Energy Action Plan (July 2014 – 2020) – is ongoing. There is yet time to see what will become of Seoul's policy to increase energy independence to 20% and be a city where people produce their own energy and use it efficiently.

Suggestions & Implications

In a centrally-controlled system where the Ministry of Trade, Industry & Energy sets the course for and implements energy policy, Seoul's environmentally-friendly energy policy period (July 2006 – June 2011) and the One Less Nuclear Power Plant period (November 2011 – June 2014) laid the foundation for local energy policy to take root. In February 2012, 46 district governments, led by Nowon Gu District Office, issued the No Nuclear Energy City declaration. In April 2015, a second Declaration is scheduled. This demonstrates that more lower-level local governments are demanding their energy policies be localized.

Seoul has had difficulties with its energy policy, encountering central government institutional stumbling blocks. First of all, the city does not have any right to adjust energy rates as part of demand management or impose fines on companies using excessive amounts of energy. Secondly, the central government's RPS (Renewable Portfolio Standard) restricts the amount of RECs (Renewable Energy Credits) available for bidding and the REC prices also dropped by a significant margin, making it more difficult to encourage the use of renewable energy. In the first half of 2013, the size of the REC bidding market open to power generating companies was 63MW, but Seoul's photovoltaic power generation goal for 2013 was 180MW. Even if all RECs were combined, it would not have accommodated the needs of the city. Thirdly, the central government's regulation of potential renewable energy sites is prohibitive. For energy policies from Seoul and other local governments to be effective, the central government needs to change its own energy policy.

In the meantime, Seoul's energy policy needs to be connected to climate change policies. At the UN Climate Summit 2014 in New York on September 23, a Compact of Mayors was announced. The key to this Compact is for local governments to register their greenhouse gas reduction goals and outcomes on the cCR (carbonn Climate Registry) and disclose this data every year. It was an expression of the determination by local governments to make systematic efforts to reduce greenhouse gas emissions and to have their performance assessed. It is meaningful that cities, producing 70% of the world's greenhouse gas emissions, are taking the lead to reduce these emissions in line with the UN's IPCC guidelines.

Against this background, Seoul's proactive energy policy measures will provide a useful model to other cities in South Korea and the world. With the cooperation of the central government, the influence will be far-reaching. Seoul will need to work on systemizing its energy policy even further to help local energy policies take effect across Korea, while pressing the central government to make institutional improvements to national energy policy.

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4. Municipal Solid Waste Management

Writer : Seoul Institute Dr. Kee-Young Yoo

Policy Area: Environment

Seoul Seeks Breakthrough in Reduction & Utilization of Waste

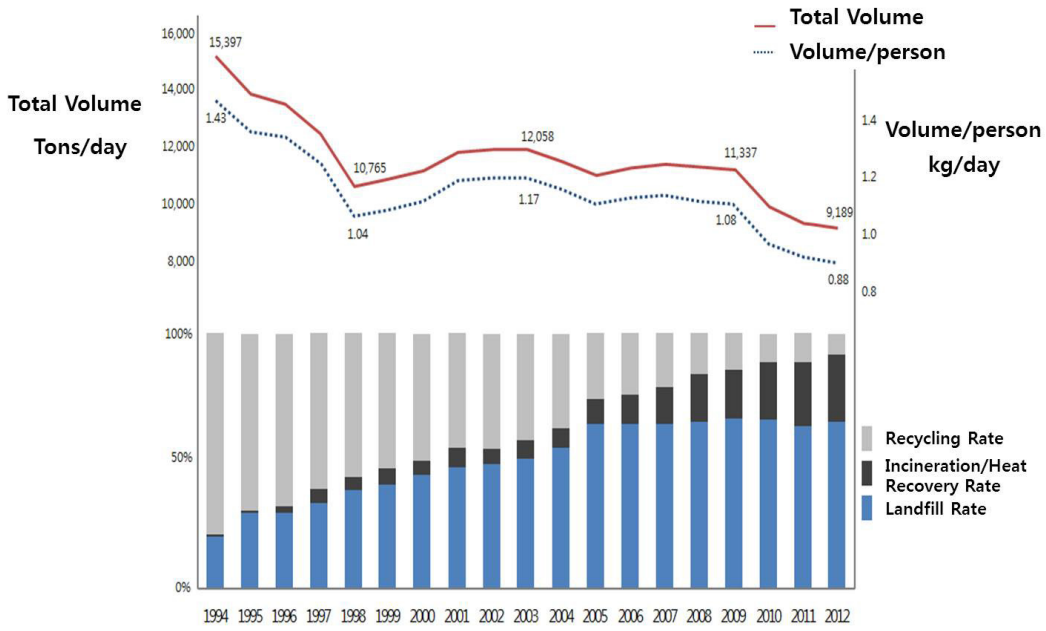
Modern waste management policy tends to place the greatest priority on reduction (reduction at source, reuse) and then recommends utilization (recovery of material and stored energy) of the waste that is unavoidable. Waste for which there is no use is disposed of, for example, by incinerating, or burying to reduce the level of hazard (David C. Wilson, 1996). In other words, waste management policy has a hierarchy, with reduction at the top of the ladder, followed by utilization, incineration, and landfill. This stratum was set up in consideration of various negative aspects such as social conflict in the waste disposal process (disposal concentrated in areas occupied mostly by the socially vulnerable, the "not-in-my-backyard" attitude, negative impact on real estate values, etc.); environmental degradation (traffic congestion generated by waste disposal vehicles and facilities, odor, pests, dust, noise, etc.); and loss of available resources (exhaustive use of land and other natural resources).

Until the 1980s however, the lower levels of the waste management policy hierarchy – incineration and landfill – were more widely accepted than the higher levels – reduction and utilization. While the former were easier for the government to pursue, the latter were only effective if producers and consumers were willing to reduce and recycle. Upon closer look, it can be seen that Seoul's municipal waste management of the last 20 years reflects this modern concept of waste management. For instance, the total volume of waste generated in 2012 has dropped by 60% (in tons/day), while the volume generated per person (kg/person/day) has fallen 62% since 1994. Landfill, a lower level management method in the hierarchy, was also reduced to one-tenth of the total, from 78.6% in 1994 to 7.9% in 2012. In the meantime, the rate of utilization more than tripled, from 20.5% in 1994 to 65.3% in 2012. In 2012, the waste volume was down 6,200 tons/day over 1994, utilization volume was 6,000 tons/day, incineration and energy recovery volume was 2,500 tons/day, and the landfill volume only 700 tons/day. This order of waste volumes is consistent with the modern concept of waste management.

The central government adopted this management hierarchy via the Wastes Control Act of 1986. However, local governments – governing at the level where municipal waste is actually generated – struggled with collection and disposal of the amount of daily waste. Nanjido Landfill, scheduled to be closed in 1983, was used until 1993. In 1989, the construction of a landfill began in Gimpo, Gyeonggi-do to cover the capital area (Seoul, Incheon, Gyeonggi). In 1991, the City of Seoul planned to build 11 incinerators in Seoul as part of its basic plan to dispose of waste. The development and use of the landfill proved to be very difficult: residents were fiercely opposed, and any waste entering their areas was strictly monitored. Incineration also faced resistance from residents and general society due to the concerns of pollution and usable resources being lost forever. Until completion of the Mapo facility in 2005, Seoul had only 4 facilities with a total capacity of 2,850 tons/day. The only option to make up for the shortfall was to reduce the volume and make greater use of the discarded materials. Fortunately, people reacted very positively. Recycling thus surfaced in 1990,

starting at apartment complexes, and gradually spread to detached houses and commercial arcades. A new system was introduced where fees for waste were charged according to volume, a system to which people also responded favorably. In 1998, the utilization of food waste began. From 2005, all food waste was to be disposed of separately for recycling, which people also willingly followed. A greater diversity of items was collected for recycling, including paper, glass, metal, plastic, electronics, and waste oil. A recycling rate of 65.3% in 2012 was made possible due to both individual and business participation in waste management policies and programs.

Figure 1 - Municipal Waste Generation & Treatment in Seoul



Building a Waste Treatment Infrastructure: Top Priority of the 1980s & 1990s

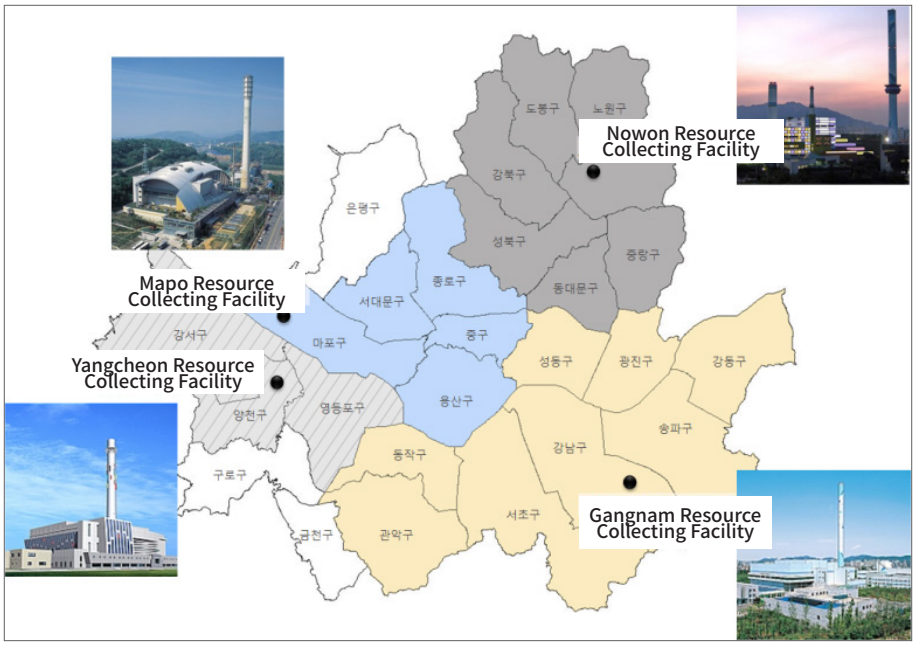
Nanjido Landfill was the first official waste treatment facility for Seoul, taking care of waste from multiple sources (municipal, construction, sewers, etc.) from 1978 to 1993. Before 1978, the city used inorganic waste such as coal briquette ash, soil, or stone for land or Han River development projects. By the 1970s, land development projects were nearing their end. People enjoyed a better quality of life, and waste increasingly included plastic, electronics, furniture, food, and items that were difficult to dispose of. The waste increased in volume as well. Seoul found itself with no space in the city to use for landfill, not after Nanjido was discontinued. Nanjido could be viewed in plain sight from the roads leading from Gimpo and Incheon Airports to Seoul, but nothing could be done except to live with it through the Asian Games in 1986 and the Olympics in 1988: there was simply no other option. And this type of problem was not confined to Seoul itself, but affected the entire capital area. The central government stepped forward and implemented a construction project for a landfill site along the coast near Gimpo, Gyeonggi-do, with the City of Seoul paying 71% of the land purchase.

Area residents were vehemently opposed, interrupting construction and making countless demands. The landfill project was not going to be easy. Moreover, its estimated service life was only 25 years. The City of Seoul Basic Waste Treatment Plan (1991) was established to build 11 incinerators (able to handle a total 16,500 tons/day), and it reflected the uncertainties surrounding the continued use of the site for landfill from the capital area, the ability to shoulder the cost of transporting waste an average 45 km away, and the wisdom in using a site with such a short service life (25 years). Area residents were worried about environmental degradation from the incinerators, and refused to accept waste from other areas, pointing out the excessiveness of Seoul's facility plans and the reliability of facilities designed to prevent pollution. In the end, the Yangcheon facility was built in 1996, followed by one in Nowon (1997), Gangnam (2001), and Mapo (2006). Over the course of 13 years, Seoul only built 4 facilities, with a processing capacity of 2,850 tons/day).

While the number of facilities fell far short of the original plan, the bigger problem was that they were not fully utilized. As of 2005, Yangcheon was operating at only 33% capacity, Nowon at 19%, Gangnam at 24%, and Mapo at 59%. The driving causes were the failure of the designs to reflect the circumstances surrounding policy trends with recycling (including food waste), and a significant drop in coal briquette ash (Seoul Metropolitan Council, 2006). From 2001, Seoul decided to expand the use of the incinerators to cover a larger area and share with the adjacent local governments: up to this time, Yangcheon, Nowon, and Gangnam facilities had only accepted waste from their own areas, but were now to accept waste from neighboring areas, while the Mapo facility, which was already treating the waste from Mapo-gu, Jung-gu, and Yongsan-gu, was to accept waste from more areas. With this move, the number of gu districts that used the 4 incinerator facilities rose substantially. Only 6 districts used the facilities in 2005, but by 2010, 20 were sending their waste. In 2012, Dongdaemun-gu was added, followed by Gwanak-gu in 2013. As of 2014, 22 districts were using the

4 incinerator facilities. The joint use pushed operations to increase from 19 – 59% of each facility's capacity (33% of the total facility capacity) in 2006 to 77 – 92% (85% of the total facility capacity) in 2012. As of 2012, only 7.9% (approx. 700 tons/day) of Seoul's municipal waste was going to landfill sites.

Figure 2 - Seoul Incinerator Facilities & Coverage



Waste Utilization Stabilizes in the 2000s

Until the 1980s, waste utilization was led by the private sector, mostly dealing with paper, metal, and glass bottles delivered for recycling by collectors. Collecting recyclables from the waste vehicles that arrived at Nanjido was one of the most important sources of income for low-income earners. In 1990 when finding a new landfill site proved extremely difficult and incinerators were criticized for causing environmental issues, the Korea Resources Recovery Corporation distributed recycling bins, with distribution including detached houses from 1992. Due to the strengthening opposition to incinerators and landfill at the time, public expectations were high. Yet the public often mixed general waste with recycling and vice-versa, a problem that was unresolved until introduction of fees based on volume of waste in 1995, where standardized garbage bags had to be purchased (larger ones costing more). Recyclables remained free to dispose of in recycling receptacles. This system is extremely useful in terms of separating bulky paper items, glass, plastic, and cans. In the meantime, the government revised the Wastes Control Act in 1998, prohibiting food waste from being buried without proper treatment from 2005. With the volume-based fee system in place, the percentage of food waste grew, causing odor and pests at the incinerators and landfills, further increasing conflict with area

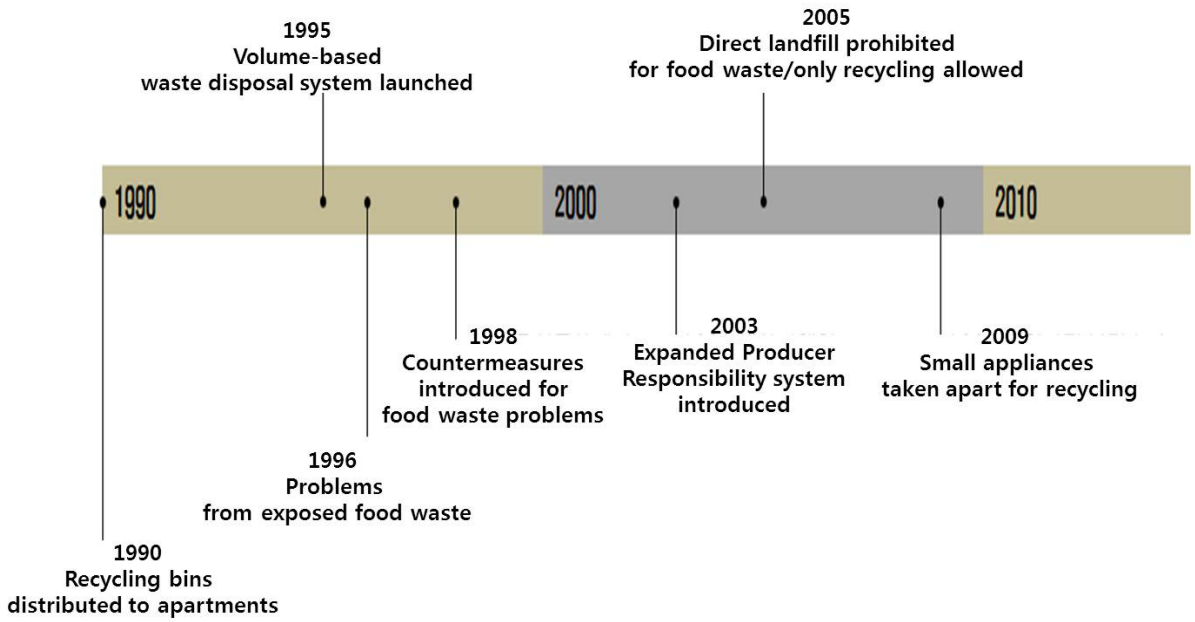
residents.

Gu districts, which were responsible for the treatment of municipal waste, found themselves with more difficulties as the volume of waste to be utilized soared. No market existed to deal with the newly recyclable materials, which were left in piles at the loading sites. The prices recyclable items attracted dropped, removing the motivation for the private sector to collect them. These too ended up at the loading sites. Communities rejected the food waste treatment facilities as strongly as they had incinerators and landfills, and using private facilities led to an increase in cost.

Instability in waste utilization improved in the 2000s, with the Expanded Producer Responsibility introduced in 2003, requiring manufacturers to process their own products collected from recycling. Failure to do so led to a fine. The volume and number of items that producers are required to process is steadily increasing. The central government provided subsidies to local governments who built food waste facilities, while loans were provided to private companies that did so. In this way, communities were able to comply with the restrictions against direct burial of food waste in 2005.

Generally, the rate of recycling in cities that do not utilize organic waste tops out at 40%. Adding organic waste to this could bring the rate to 60% or more. Seoul's recycling rate of 65% in 2012 is evidence that the system of waste disposal, collection, and treatment processes work. In 2009, Seoul launched a program where small appliances are taken apart for recycling, expanding the scope of utilization even further.

Figure 3 - Seoul's Waste Utilization Timeline



Volume-based Waste Disposal Fee System: the Key to Waste Management

In 1995, South Korea introduced a volume-based waste disposal fee system, except in rural agricultural areas, being the first nation to adopt such a system at the national level. Before implementation, Seoul piloted the program in the commercial arcades in Jung-gu, detached housing in Seongbuk-gu, and apartments in Songpa-gu (Seoul Metropolitan Government, 1994.3). Volume was measured through standardized garbage bags, which were taken by the gu district offices to be divided into household, commercial, and business use. Bags are in 2, 3, 5, 10, 20, 30, 50, 75, and 100 liter sizes, with people able to purchase the size and quantity of bags they wish at designated stores. Money raised in this way covers collection/transport, treatment, and bag production, as well as a profit for the outlets carrying the bags. For instance, a 20-liter bag for household use is priced between KRW 340 and 400. In 2010, multi-purpose bags were introduced. The garbage bags available up to then were single-use, just like other plastic bags. To improve on this, the government allowed warehouse stores (E-mart, Home Plus, Lotte Mart, Nonghyup Hanaro Club, Mega Mart, etc.) to sell multi-purpose bags to their customers, who purchase these bags instead of regular plastic grocery bags to use for shopping and then later as garbage bags. In 2013, the City of Seoul applied this fee system to food waste as well. Until then, it was up to the gu district offices to decide whether they would charge any fees: food waste was collected for free, all homes paid the same fee regardless of how much they discarded; or the fees varied according to certain criteria. However from 2003, the volume-based system was also applied to all food waste, but with options to choose from: standard bags, stickers, or RFID weight scale. As such, the system has steadily evolved since it was launched in 1995, with 2015 being the 20th anniversary.

The nature of this system is quite simple: people pay to dispose of waste. However, the system has gone beyond this simple mechanism to help modernize the South Korean waste management system. First of all, it has contributed significantly to reducing the volume of municipal waste, although some cities say this was largely due to the decrease in the use of coal briquettes, a switch from volume to weight-based measurement, the Asian financial crisis in 1997, and the government's policy of waste reduction (Son Yeong-bae, 2001; Oh Yong-seon, 2006). After the system was introduced, many people began asking stores to take the packaging from products they purchased, and sometimes avoided products with a large amount of packaging. This of course pressured manufacturers to change their product packaging, something which certainly contributed to waste reduction to a certain degree, as statistics given by Jeong Gwang-ho et al (2007) reveal. Secondly, the volume-based fee system contributed definitively to a widespread willingness to take items apart for recycling. In Korea, recyclables are collected free of charge. Paper, plastic, and metal products take up a large space until they are taken apart or otherwise reduced in volume. Because of this, the recycling rate, which was 21% in 1994, jumped to 29% by 1995. This also led to fewer burdens on incineration or landfill. Thirdly, the system improved the shortcomings of the existing fee system, where fees were imposed according to housing or asset ownership. This was based on a hypothesis that the richer people were, the more waste

they generated. Previously, households paid between KRW 1,156 and KRW 2,102 per month, a difference of about KRW 1,000, but under the newer system, monthly fees per household decreased to KRW 2,224 – 2,288 (Yu Gi-yeong, Jeong Jae-chun, 1995). Now that the fees are equalized, gu district offices will be more convincing in their logic when they wish to adjust the fees to secure financing for waste disposal.

Figure 4 - Weight Scale for Waste Generated in Seoul

Standard Bag for General Waste

Weight Scale for Food Waste

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5. Joint Use of the Municipal Waste Incineration Infrastructure in Seoul

Writer : Seoul Institute Dr. Kee Young Yoo

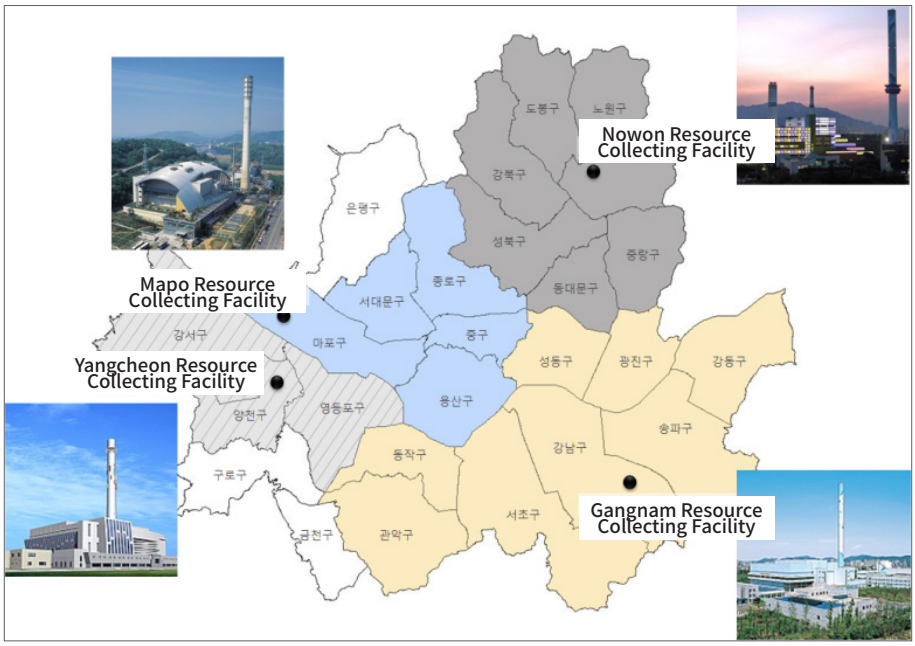
Policy Area: Environment

Background

Status: 4 Incineration Facilities with Processing Capacity of 2,859 Tons a Day

Seoul has incineration facilities in operation in Yangcheon, Nowon, Gangnam, and Mapo, with a combined processing capacity of 2,850 tons of municipal waste a day. The plans for these facilities were developed in 1991, with construction beginning in October 1992. Yangcheon was completed in February 1996, Nowon in January 1997, Gangnam in December 2001, and Mapo in May 2005. At the beginning, the 4 facilities had only processed municipal waste from their own districts but began in 2007 to process waste from adjacent districts as well. For instance, the Yangcheon facility incinerates the waste from 3 districts, and Gangnam from 8 districts. These facilities handle municipal waste from 22 of the 25 districts in Seoul.

Figure 1 - Seoul's Incineration Facilities & Their Coverage

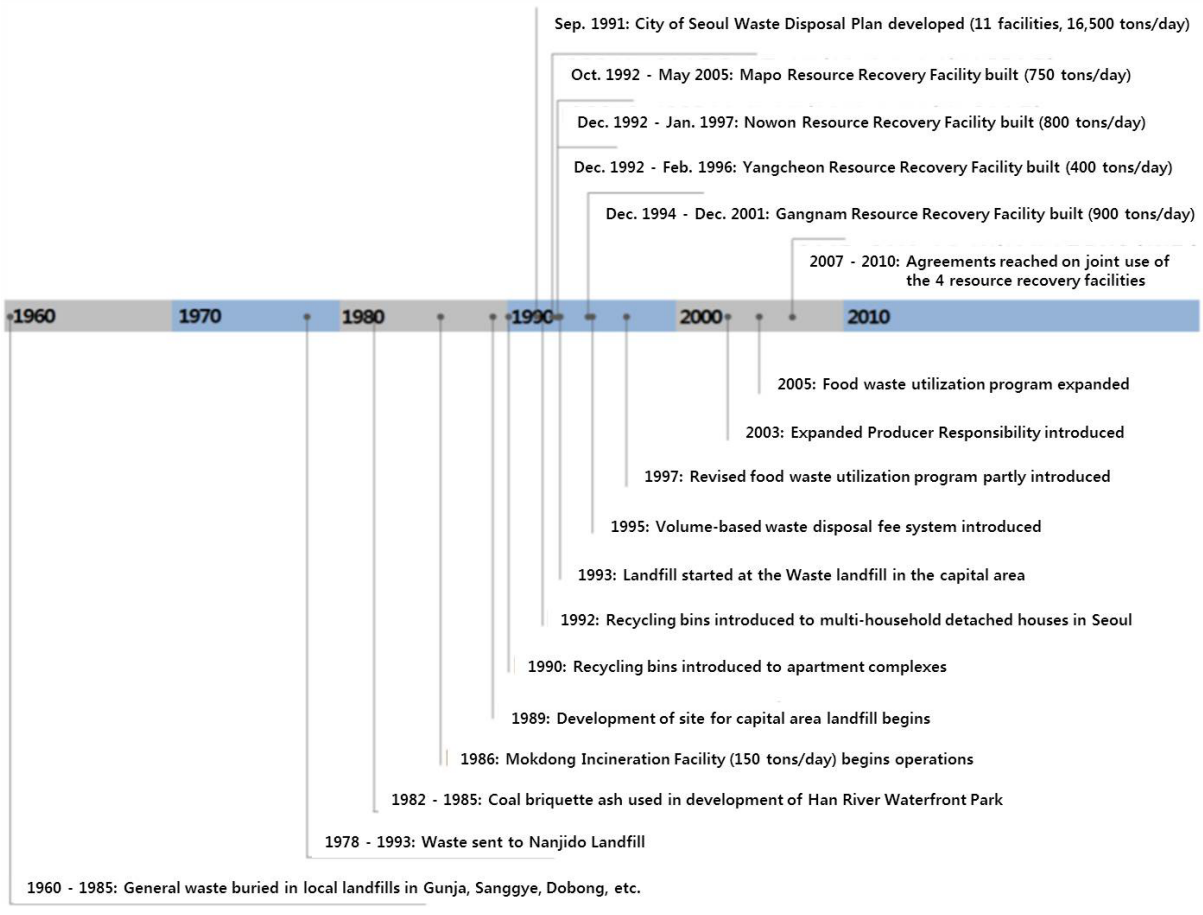


Before these incineration facilities were built, Seoul's municipal waste went to Nanjido Landfill, where today's World Cup Stadium stands. Nanjido had its specific purpose as a landfill, but before Nanjido, waste was used to fill up and develop sites in land development programs, according to records. In the 1980s when Nanjido was used as a landfill, South Korea saw rapid economic growth. It hosted the Asian Games in 1986 and the Olympics in 1988. South Korea's international status increased, and the number of foreign visitors soared. Behind the scenes however was a serious waste management problem, due to increasing volume and worsening management conditions, aggravated by the widespread use of plastic products. Nanjido Landfill was located along the road that leads from the international airport to downtown, and the problem of waste management was exposed in plain sight.

In 1991, Seoul established plans to build 11 more incineration facilities with a total processing capacity of

16,500 tons per day.[7] At the time, there were 23 gu districts in Seoul; 11 incineration facilities would mean there would be 1 for every 2 districts. The current 4 facilities (with a capacity of 2,850 tons/day) are reduced by 36% in number and by 17% in capacity compared to the original plan, but each incineration facility handles the waste coming from 6 or 7 districts. Plans for additional incineration facilities were hotly contested by civic groups for burning potentially usable resources and producing toxic chemicals such as dioxin. During construction this fierce opposition continued, with residents arguing that the facilities would damage the environment and their property values. Others criticized the city for building and planning to operate such highly-disliked incineration facilities instead of leaving the matter to each of the 25 districts. The existing 4 facilities would not be able to cover wider areas if it were not for the volume-based waste disposal fee system, recycling, utilization of food waste, and other innovative waste reduction policies.

Figure 2 - Major Changes in Seoul's Incineration Facilities & Waste Management Policy



7. Seoul Metropolitan Government, 1991, The City of Seoul Waste Disposal Plan.

Joint Use of the Incineration Infrastructure as a By-product of Social & Technical Policies

Despite many challenges, the City of Seoul built the infrastructure for joint use of the 4 incineration facilities it had by 22 districts, with several triggers spurring the city to change its waste management focus from landfill to incineration in the early 1990s.

First, Seoul did not have sufficient land space for landfills, not even in the surrounding areas. Nanjido Landfill had served its purpose from 1978 to 1993 despite being originally scheduled for 5 or 6 years of use. In accordance with this plan, the city began to look for another landfill in 1982 but could not find a site within city boundaries. In fact, all cities in the capital area shared the problem of insufficient waste management facilities for various reasons, such as the consequent increase in the volume of waste due to the nation's overall rapid economic growth, the Asian Games in 1986, and the Olympics in 1988, as well as the increasing percentage of plastic products in the waste. The national government decided to build a landfill in Gimpo, Gyeonggi-do (located in today's Incheon) at the do (provincial) level. Seoul took part in this and has processed its waste there since 1993. However, residents living near the landfill fiercely objected to the construction. While a landfill for the capital would resolve the immediate need, the same problems – conflict during site development, long distance to the landfill (48 km on average from Seoul), and consequently rising costs – were bound to repeat themselves. In the process of developing a landfill site in the capital area, the parties involved realized that a facility was needed within the city to deal with municipal waste.

Second, the incineration of municipal waste at the time was beginning to be recognized as a method with many advantages. In Japan, Tokyo was operating 18 incineration facilities, handling 80% of the municipal waste. Those countries with limited land space and an advanced tourism industry (e.g., France, Austria, Belgium, and Switzerland) also relied heavily on incineration, doing so within a day or two of receiving the waste, therefore occupying less space. Incineration also reduced the weight of waste to 30% and volume to 10%, as well as destroying most of the odor. Sending the outcome of incineration to a landfill also reduced the burden of securing and managing landfill sites. In Paris, France, heat from waste incineration was recovered for use as energy. This seemed very attractive to Seoul, having experienced the oil shocks in 1973 and 1978, and restrictions on the use of low-grade, polluting fuels such as coal briquettes and bunker C fuel oil in the 1980s. From the late 1970s, the development of new towns in Yeongdong, Yangcheon, Sanggye, and Gangnam gave rise to the hope of utilizing incineration heat as a source of district heating. In fact, as of 2012, Seoul's 4 incineration facilities had district heating facilities nearby and supplied incineration heat as an energy source. Incineration heat accounts for 16 – 57% of the total energy source of the 4 district heating facilities.[8]

8. Yu Gi-yeong, Jo Hang-mun, Kim Gwi-yeong, 2013, "Study on the Effectiveness of Integrated Operation & Management of Seoul's Integrated Energy & Basic Environmental Facilities", The Seoul Institute.

Table 1 - Incineration Facilities & District Heating Facilities Network

	Yangcheon Area	Nowon Area	Gangnam Area	Mapo Area
Scale of District Heating Supply	140,000 households	128,000 households	176,000 households	70,000 households
Energy Produced by Incineration Facilities	Heat, Electricity	Heat	Heat	Heat, Electricity
Source of Energy for District Heating (2012)	· Incineration Heat: 15.7% · Power Generation Heat: 51.0% · Heat Generation: 33.3%	· Incineration Heat: 23.2% · Power Generation Heat: 37.8% · Heat Generation: 39.0%	· Incineration Heat: 27.0% · Power Generation Heat: 12.7% · Heat Generation: 60.3%	· Incineration Heat: 56.8% · Power Generation Heat: 33.8% · Heat Generation: 9.4%

Third, construction became very time-consuming due to the conflicts with residents, and in the meantime, society began to pay attention to resource cycling. Seoul spent 14 years (1992 – 2005) building 4 incineration facilities, and received 396 complaints from nearby residents. Some 67% of the complaints were in the form of collective protests while the rest were written complaints. The topic of complaints was varied, ranging from objection to construction to demands that the project be modified (moving the site, reducing the size, installing equipment that would prevent pollution etc.). In response, Seoul held 121 public discussions and presentations. Due to the volume of complaints, the Nowon facility was reduced in capacity from 1,000 to 800 tons, and the Gangnam facility from 1,800 to 900 tons. The Gangnam facility was supposed to be used jointly with Songpa-gu but this was changed to use only by Gangnam-gu. The program period (development of plans to construction) was between 3 and 13 years.[9] Because of conflict and project delays, the planned sites were used for other purposes or budget plans changed. It was difficult to execute the program with consistency or according to a system. As mentioned, society also began paying attention to recycling and resource cycling as it experienced the volume-based waste disposal fee system (1995), the Expanded Producer Responsibility (2003), the prohibition on direct burial of food waste (2005); and the "green growth" industry (2008) etc. Incineration as the best method of waste management was disappearing from popular view.

Fourth, the waste to be incinerated was substantially reduced in volume in the 1990s and 2000s. Capacity at Seoul's 4 incineration facilities had been designed to handle waste volumes at the time (in 1991) and for the future, and could handle 2,850 tons a day. There was a huge gap between designed capacity and actual volume (volume that is incinerated and goes to landfill) in 2012. For example, the 400-ton Yangcheon facility was using only 53% of its capacity for waste from Yangcheon-gu in 2002. By 2012, volumes had dropped even further to 25%. Mapo Resource Recovery Facility, designed to handle 750 tons of municipal waste from Mapo-gu, Jung-gu, and Yongsan-gu, was using only 60% of the designed capacity, mainly due to the aforementioned dramatic changes in South Korea's waste management system (the volume-based waste

9. Seoul Metropolitan Council, 2006, Study on Improvements to Resource Recovery Facility Productivity

disposal fee system in 1995, Expanded Producer Responsibility in 2003, and banning of direct burial of food waste in 2005). In the end, one of the goals in waste management in Seoul became efficient utilization of the remaining facility capacity, which meant that facilities would be shared with adjacent districts.[10]

Table 2 - Capacity & Actual Waste Volumes at Seoul Incineration Facilities

Facility	Coverage (Original Plan)	Facility Capacity (Tons/Day)	Incinerated/Buried (2002, Tons/Day)	Incinerated/Buried (2012, Tons/Day)
Yangcheon	Yangcheon-gu	400 (1.00)	212 (0.53)	101 (0.25)
Nowon	Nowon-gu	800 (1.00)	201 (0.25)	121 (0.15)
Gangnam	Gangnam-gu	900 (1.00)	294 (0.33)	305 (0.34)
Mapo	Mapo-gu, Jung-gu, Yongsan-gu	750 (1.00)	-	453 (0.60)

Fifth, expertise and cost effectiveness are better developed when incineration facilities are larger, such as at the city level, than smaller, such as at the gu district level. Waste incineration facilities require advanced technologies and are operated 24 hours a day, and demand a high number of expert and general personnel. Each of the 4 incineration facilities is currently operated by 65 – 77 staff members, with between 12 and 20 nationally-accredited experts in industrial safety, electricity, energy utilization, prevention of environmental pollution, fire safety, and high pressure gas management, etc. The cost to hire experts and operate such large facilities is enormous. As of 2012, the 4 facilities spent between KRW 8.3 and 21.3 billion per year. Excluding the Mapo facility, they operate at an annual loss of KRW 500 million – 1.5 billion. The overall operational loss is KRW 15.5 billion a year, which is covered by the City of Seoul budget. KRW 393.1 billion was spent to build the facilities, all paid by the City of Seoul and the central government. This shortfall is another reason that Seoul shares the incineration facilities between gu districts. The financial burden is too excessive for one gu district to handle, and technical difficulties too complex. This type of program is in the scope of Seoul's responsibilities, as defined by the Wastes Control Act.

Table 3 - Operational Profit & Loss of Seoul Incineration Facilities (As of 2012)

(Unit: KRW 1 million)

Facility	Revenue	Expenses	Profit (Revenue – Expens-es)
Yangcheon	3,236	8,384	-5,148
Nowon	4,659	14,606	-9,947
Gangnam	19,794	21,338	-1,544
Mapo	14,472	13,378	+1,094
Total	42,161	57,706	-15,545

10. Ministry of Environment, 2013, Nationwide Waste Generation & Management Status

Construction of the Incineration Infrastructure for Joint Use

Phased Construction of Incineration Facilities Designed to Prevent Pollution

In 1991, Seoul developed a plan to build 11 incineration facilities with a capacity of 16,500 tons, with construction beginning in 1992. Yangcheon was completed in 1996, Nowon in 1997, Gangnam in 2001, and Mapo in 2006. It took 13 years to build 4 facilities.

Construction of the Yangcheon facility began in December 1992 and was completed in February 1996. It can process 400 tons/day with two 200-ton incinerators. Main features include tipping facilities, incinerators, and equipment for prevention of pollution. Air purifying equipment such as scrubbers, semi-dry reactors, bag filters, and selective catalytic reduction (SCR) units remove air pollutants (e.g. carbon monoxide, sulfur oxide, nitrogen oxide, and dioxin). Facilities such as a swimming pool, fitness center, reading room, and auditorium are provided for the residents at affordable rates. A total of KRW 31.8 billion was spent to build the incinerator facilities (KRW 200 million from the central government with the City of Seoul footing the remainder); KRW 8.1 billion was spent on the public-use facilities. Six protests were held by residents and 20 written complaints lodged during the process of construction. The City of Seoul held 20 presentations as information sessions for residents.

Construction of the Nowon facility began in February 1992 and was completed in January 1997, with two 400-ton incinerators giving the facility a processing capacity of 800 tons/day. Main incineration facilities include tipping facilities, incinerators, and facilities for prevention of pollution (electric dust collectors, wet scrubbers, bag filters, SCR units, etc.). Public-use facilities include a swimming pool, fitness center, culture center, and reading room. The incineration facility itself cost KRW 74.3 billion (paid by the City of Seoul) to build, and the public-use facilities KRW 9.4 billion. During the construction, residents held 38 protests and lodged 60 written complaints. The City of Seoul held 18 presentations as information sessions for residents.

Construction of the Gangnam facility began in December 1994 and was completed in December 2001, with three 300-ton incinerators giving the facility a processing capacity of 900 tons/day. Main incineration facilities include tipping facilities, incinerators, and equipment for prevention of pollution: scrubbers, semi-dry reactors, bag filters, and SCR units remove air pollutants (such as carbon monoxide, sulfur oxide, nitrogen oxide, and dioxin). Public-use facilities include a swimming pool, fitness center, culture center, and reading room. The incineration facility cost KRW 115.5 billion (KRW 14.4 billion from the central government, with the City of Seoul footing the rest), while the public-use facilities cost KRW 9.4 billion. During the construction, residents held 5 protests and lodged 38 written complaints. The City of Seoul held 15 presentations as information sessions for residents.

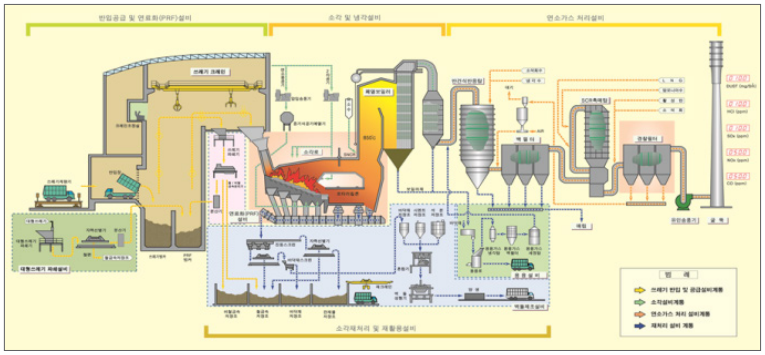
Construction of the Mapo facility began in December 2001 and was completed in May 2005, with three 250-ton incinerators providing the facility with a processing capacity of 750 tons/day. Main incineration facilities include tipping facilities, incinerators, and equipment for prevention of pollution (semi-dry reactors, bag filters, SCR units, and police filter). Public-use facilities include a sauna, fitness center, indoor golf range, and reading

room. The incineration facility cost KRW 171.2 billion (KRW 46.9 billion from the central government, with the City of Seoul footing the rest); KRW 9.5 billion was spent on the public-use facilities. During the construction, residents held 184 protests and lodged 45 written complaints. The City of Seoul held 68 presentations as information sessions for residents.

Table 4 - Outline of Incineration Facility Construction in Seoul

	Yangcheon Facility	Nowon Facility	Gangnam Facility	Mapo Facility
Capacity	400 tons/day (2 incinerators)	800 tons/day (2 incinerators)	900 tons/day (3 incinerators)	750 tons/day (3 incinerators)
Construction Period	Dec. 1992 – Feb. 1996	Dec. 1992 – Jan. 1997	Dec. 1994 – Dec. 2001	Dec. 2001 – May 2005
Site Area	14,627 m²	46,307 ㎡	63,813 ㎡	58,435 ㎡
Construction Cost	KRW 32.1 billion	KRW 74.3 billion	KRW 115.5 billion	KRW 171.2 billion
Incinerator Type	Stoker-type	Stoker-type	Stoker-type	Stoker-type + Rotary kiln
Air Purification	· Scrubbers · Semi-dry reactors · Bag filters · SCR units	· Electric dust collectors · Wet scrubbers · Bag filters · SCR units	· Scrubbers · Semi-dry reactors · Bag filters · SCR units	· Semi-dry reactors · Bag filters · SCR units · Police filter
Amenities	· Swimming pool · Fitness center · Reading room · Auditorium	· Swimming pool · Fitness center · Culture center · Reading room	· Swimming pool · Fitness center · Culture center · Reading room	· Sauna · Fitness center · Indoor golf range · Reading room

Figure 3 - Structure of the Mapo Incineration Facility



Four Incineration Facilities: Single District Use → Citywide Use

With completion of the Mapo Incineration Facility (750 tons/day) in 2005, Seoul had 4 incineration plants: Mapo, Yangcheon, Nowon, and Gangnam. However, the operation rate[11] as of 2005 was only 33% at Yangcheon, 19% at Nowon, 24% at Gangnam, and 59% at Mapo: the facilities were just not processing as much waste as intended. One direct cause was that the facilities processed the municipal waste only from their own gu district (except the Mapo facility, which processed the waste from Mapo-gu, Jung-gu, and Yongsan-gu). There were many other reasons as well, such as the effectiveness of the volume-based waste disposal fee system, Expanded Producer Responsibility, food waste recycling, various waste management policies introduced after facility design, all of which led to a lower volume of waste to be incinerated. Plus, municipal waste had to be transported all the way to the landfill in the capital area, about 45 km away, instead of using the nearby incineration facilities. This resulted in extra cost, financial burden, and negative environmental impact. The goal of a return on investment would just not be reached. The fact that the facilities were not fully used led to various concerns over potential damage, errors and deterioration of the facilities, each comprised of 2 or 3 incinerator units, pollution-prevention facilities, and precision device controls.

To resolve this issue, Seoul decided to widen the coverage area for each incinerator in 2001 for joint use by adjacent gu districts: the Yangcheon, Nowon, and Gangnam facilities that had resisted processing waste from outside their own districts were forced to accept waste from other districts, while the Mapo facility, which had been processing the waste from Mapo-gu, Jung-gu, and Yongsan-gu, was asked to process more. With consent from the Resident Support Councils of the 4 incineration facilities, the issue could easily be resolved. The Resident Support Council is an organization[12] that represents residents to protect their health and welfare in relation to the incineration facilities, but also discusses other matters of importance according to an agreement with the City of Seoul, such as overseeing the areas where the waste is taken to and monitoring the waste properties. This too proved to be a tumultuous road and required countless numbers of meetings and negotiations. In the whole process of instituting joint use, the City of Seoul met 160 times with the Resident Support Council of the Gangnam facility over 5 years. They finally reached agreement on joint use on May 7, 2007. The Nowon facility had 100 meetings over 6 years and reached agreement on June 30, 2007; the Mapo facility had 40 meetings in one year and reached agreement on February 10, 2009. In comparison,

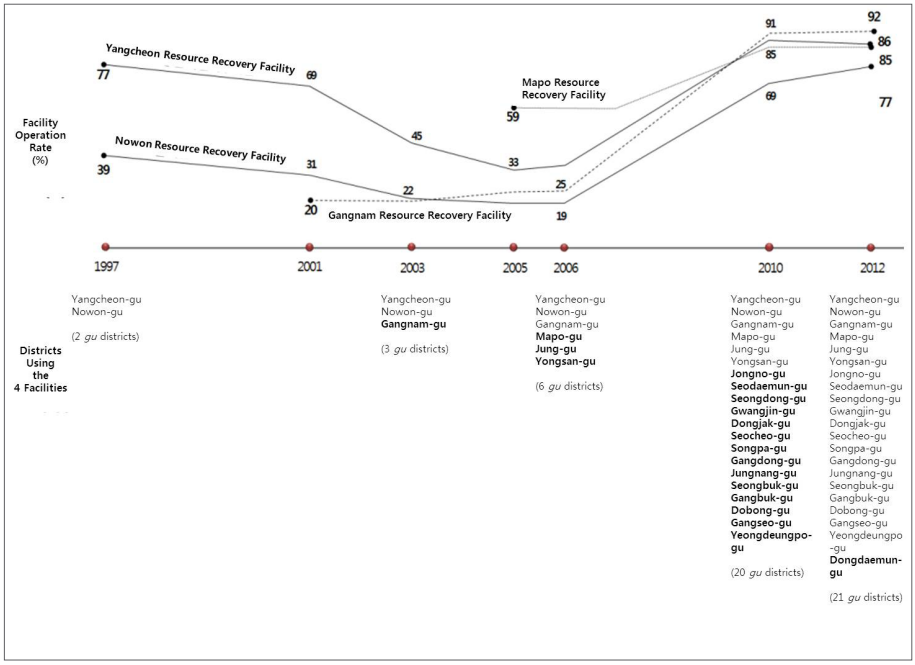
11. Operation rate refers to the actual volume of waste processed by the facility. All incineration facilities go through 30 – 60 days of maintenance each year, during which time no waste is processed. An operation rate that excludes this period and only considers normal operation days is the operation rate against the normal operation days. For instance, the Yangcheon facility has a capacity of 400 tons/day. Based on its normal operation days and the actual volume of waste processed (131 tons), the operation rate against the normal operation days would be 33%.

12. Pursuant to the Promotion of Installation of Waste Disposal Facilities & Assistance, etc. to Adjacent Areas Act, the Resident Support Council is comprised of resident representatives from the affected area, recommended by the gu district council, and 2 experts recommended by the corresponding gu district councilor or resident representatives from where the resource recovery facility is located (up to 15 members total), upon negotiation by the installer of the waste processing facility (Seoul Metropolitan Government) and the corresponding gu district office and/or its council, in consideration of the distance to the resource recovery facility (waste processing facility), the level of environmental impact, number of residents, etc. The roles of the Resident Support Council are: selection of an expert research institute for an environmental impact study; negotiation on installation of public-use facilities and on the resident support programs in the affected areas; recommending resident monitoring agents; execution of matters agreed upon with the installer of the incineration facilitie

the Yangcheon facility needed 9 years and 150 meetings, but finally came to an agreement on May 10, 2010. The success of the plans for joint use of the facilities manifested itself in a number of ways. First of all, the number of districts using the 4 incineration facilities jumped. In 1997, there were only 2 such facilities in Seoul: Yangcheon and Nowon. Only 2 districts used the facilities. Then the Gangnam and Mapo facilities were built, but only 6 districts used them. By 2007, joint use began and by 2010 when the final facility, Yangcheon, reached agreement with residents, the program allowed 20 districts access to the incineration facilities. Dongdaemun-gu and Gwanak-gu joined in 2012 and 2013 respectively. As of 2014, 22 gu districts have access to the 4 incineration facilities in Seoul.

With this change, the operation rate of the 4 facilities, which had been at 19 – 59% (averaging 33% for all facilities) in 2006, rose to 77 – 92% (85% average for all facilities) by 2012. Now the 4 facilities cover the 25 gu districts in 4 zones – Southwest (Yangcheon Facility), Northeast (Nowon Facility), Southeast (Gangnam Facility), and Northwest (Mapo Facility).

Figure 4 - Facility Operation Rate after Joint Use Agreement & Gu District Joining Dates



Strategies for Construction of Incineration Infrastructure for Joint Use

Building Incineration Facilities & Energy Utilization in Connection with the New City Area District Heating Program

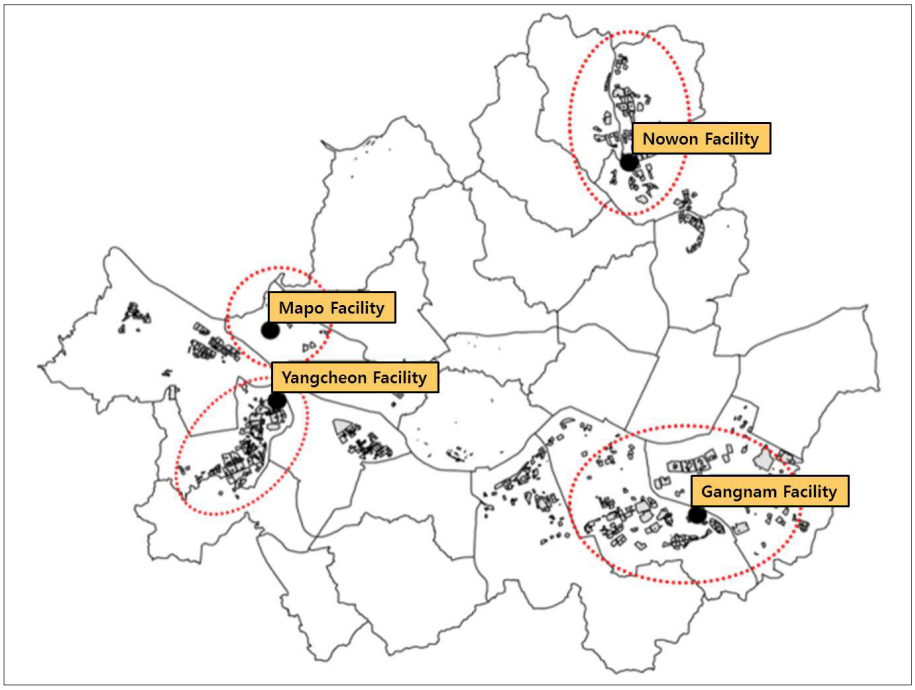
For the last 60 years, South Korean cities have enjoyed dramatic growth. City outskirts were quickly developed into residential areas to accommodate the massive population inflow from farming areas. In 1960s Seoul, Yeouido (1967) and Yeongdong (1967) were developed into new city areas, while in the next decade, Jamsil (1971) was created to divert the concentration of urban features away from Jongno and Jung-gu. In the 1980s, large-scale residential areas – Gaepo (1981), Godeok (1981), Mokdong (1983), and Sanggye (1985) – were built.[13] In this process, the Yangcheon incineration facility (with construction decided as part of the plans to develop the new city area in Mokdong in May 1983) and the Gangnam facility (designated as a waste processing facility as part of an urban plan in January 1986) were able to secure their sites with relative ease. The Mapo facility was also built on part of the World Cup Park site in the Sangam Land Development District program carried out from 2000. The site where the Nowon facility was erected had already been designated for waste processing in December 1977, before the Sanggye district was developed in 1985.

As such, tying the construction of incineration facilities with new city area development made it easier to identify appropriate sites and reduce conflict with local residents. Another advantage of this approach is the use of heat from incineration as a source of district heating. District heating first began in 1877 at LOCK PART in the state of New York, USA and later spread across America, Europe and Japan. In South Korea, the starting point was in 1981 when a feasibility study was conducted on the supply of heating to Yeouido, Dongbu Ichon-dong, and Banpo district, after renovation of Seoul Thermal Power Plant to adopt the combined heat and power method in 1981. The actual program went into effect in November 1985 when power generation heat from the CHP plant and incineration heat were used to provide district heating to 20,000 households in Mokdong and Shinjeong-dong. Because the 1970s were a decade of growing social interest in energy efficiency after the first and second oil shocks, the following decade saw some relevant changes: in 1987, Seoul Thermal Power Plant was changed into a CHP plant, and in 1989, district heating programs were introduced in 5 new cities, including Ilsan, following the Mokdong project.[14] Seoul used this opportunity to connect all 4 incineration facilities with the district heating facilities. In the Yangcheon project, which supplied 140,000 households with heating, the energy share of the incineration heat against district heating was 16%, the share in Nowon (128,000 households) was 23%, 27% in Gangnam (176,000 households) and 57% in Mapo (70,000 households) – not insignificant by any means.

13. Lee Beom-hyeon, 2012, 2011 Module Program of the Economic Development Experience: Korean-type New City Development, Ministry of Land, Transport & Maritime Affairs and the Korea Research Institute for Human Settlements.

14. Hwaseong Office, Korea District Heating Corporation, 2013, Handbook on Facilities Using District Heating

Figure 5 - District Heating Coverage & Location of Incineration Facilities in Seoul



Stringent Pollution Management to Ease Concerns of the Public

Incineration facilities that handle municipal waste have multiple sources of pollution such as the incinerators, trash storage bunkers, and transporting vehicles. Pollutants vary from general pollutants (odor, dust, and nitrogen oxide) to pollutants specific to waste incineration (hydrogen chloride, sulfur oxide, and dioxin). When soldiers and their children who were exposed to defoliants used by the US army in Vietnam began to show side effects, dioxin captured the attention of the world in the early 1990s. It was also around this time that incineration was known to be one of the greatest producers of dioxin. In this environment, civic groups in South Korea expressed serious concerns over incineration, and residents living near the incineration facilities expressed concerns over location and environmental countermeasures. Seoul responded by coming up with diverse yet close-knit measures to protect the environment during installation and operation and initiated projects designed to improve the lives of those anxious about the construction.

First, Seoul installed incineration gas purifying equipment to a point that seemed excessive to some. One aspect of pollution from the incineration facilities that residents were most worried about were pollutants emitted alongside incineration gas, which is usually made up of heavy metals such as mercury, corrosives such as sulfur oxide and nitrogen oxide, and toxic chemicals like dioxin. The incineration facilities in Seoul have neutralizers, dust collectors, and catalyst equipment to remove these pollutants, and more than 50% of the construction cost was invested in their installation. Operation of the incineration facilities is also costly in terms of chemicals, energy used, and equipment replacement. During the construction phase, residents were provided with detailed explanations on the features and performance of this equipment and facilities. According to gas emission measurements in 2012, nitrogen oxide emission is less than half of the maximum

permitted level, while the other pollutants listed above were measured at 1/10 to 1/1000 of the legal maximum level.

Table 5 - Analysis of Gas Emissions from Incineration Facilities in Seoul (2012)

Emission	Legal Maximum	Yangcheon	Nowon	Gangnam	Mapo
Dust	20 ㎎/Sm³	2.07	1.74	1.14	0.88
Sulfur oxide	30 ppm	0.43	0.14	0.29	0.34
Nitrogen oxide	70 ppm	23.00	23.78	12.39	16.67
Carbon monox-ide	50 ppm	10.30	7.16	10.55	1.07
Hydrogen ch-lo-ride	20 ppm	2.26	0.48	2.73	1.15
Dioxin	0.1 ng/Nm³	0.000 – 0.009	0.000 – 0.003	0.000 – 0.002	0.000 – 0.000

- Maximum permitted dioxin emission levels strengthened: 0.5→0.1 ng/Nm³ (July 2003).
- Maximum permitted dust emission levels strengthened: 30→20 ㎎/Sm³ (January 2010).
- Maximum permitted nitrogen oxide emission levels strengthened: 80→70 ppm (January 2010)

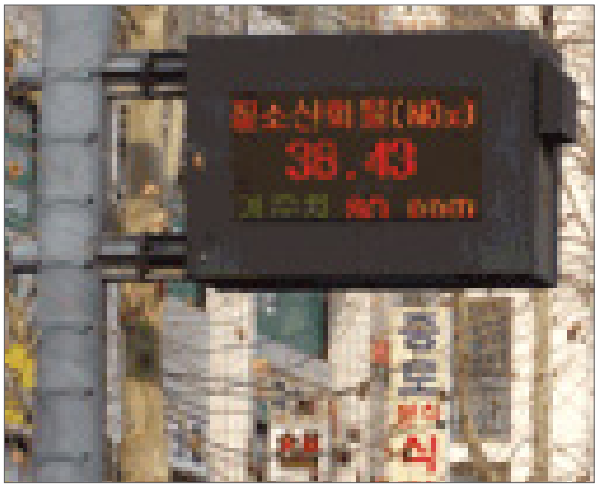
Second, the city examines the properties of the waste so that nothing toxic is fed into the incineration facilities. While high-performance equipment to prevent pollution is crucial, it is equally, if not more important to stop the potentially polluting elements from reaching the incineration facilities to begin with. Heavy metals such as mercury, usually hidden in the waste, spread into the air when burned. What is known as dioxin is formed during incineration by aromatic compounds and chlorine. The waste that produces such dioxin includes food waste, waste with high moisture content, PVC, etc. Of course people are asked to separate these items when they dispose of their waste, but inevitably some are mixed into the general waste. The incineration facilities conduct random checks on the trucks for materials that will become toxic chemicals. If any is found, the truck is sent back and may be penalized. Investigation and supervision is performed by the people recommended by the Resident Support Council (called the Resident Monitoring Agent[15]). These agents are on duty during the hours when waste is sent to the incineration facilities. When the food waste recycling system was introduced, 10 – 20% of the waste at the incineration facilities was food, but this has been reduced to less than 5%, thanks to this constant monitoring.

Third, the city runs a real-time measurement and display of air pollutants. Seoul verifies that the equipment that removes gases is properly installed and properly monitors the waste properties, and also measures the amount of pollutants in the emitted gas in real time for public disclosure. An automatic tele-monitoring system on the smokestack, automatic dioxin sampler, and gas concentration level display screen are a few of the

15. To ensure that the waste processing is performed in an appropriate manner at the resource recovery facilities, the installer of the waste processing facility (Seoul Metropolitan Government) commissions a local resident recommended by the Resident Support Council with the responsibility of the Agent, pursuant to the Promotion of Installation of Waste Disposal Facilities & Assistance, etc. to Adjacent Areas Act. The Resident Monitoring Agents have a defined set of responsibilities. The scope of their activities (pursuant to Article 32 of the Enforcement Decree of the Promotion of Installation of Waste Disposal Facilities & Assistance, etc. to Adjacent Areas Act) includes: verification of the properties of waste and appropriate processing; confirmation of the normal operation of the pollution-prevention equipment; and verification of the pollution inspection process in the surrounding area.

items in this system. To ensure measurements are accurate, facility operators are prohibited from accessing the measurement equipment. The automatic tele-monitoring system on the smokestack (TMS)[16] is installed at the halfway point up the stack, and measures the levels of dust, sulfur oxide (SO2), hydrogen chloride (HCl), nitrogen oxide (NOX), carbon monoxide (CO), oxygen (O2), oil/fluids, and temperature. The results are sent to the facility's central control and the government's control center in real time. It is also displayed on the screen for residents of the nearby community to see. Near the Gangnam facility, 3 screens are installed; one each in Yangcheon, Nowon, and Mapo. The measurement of which the residents were most skeptical about was dioxin . Unlike other pollutants, it is difficult to automatically measure dioxin in real time. It could only be measured manually by sampling and taking it to a laboratory (the same day), once every 6 months. This meant that there would be a lag between sampling and the potential for manipulating data during the sampling process, undermining any trust residents had in the process. Seoul responded by installing the same dioxin samplers used in Europe at all smokestacks at the 4 incineration facilities. This sampling kit absorbs dioxin from a small amount of emitted gas over 3 – 6 months, enabling an analysis of dioxin in the gas during that period. After the dioxin[17] analysis, the kit is replaced with a new one, which would then sample the chemicals for the next round of analysis.

Figure 6 - Pollutant Levels Displayed on Screen; a Dioxin Sampler



Screen Display near Incineration Facility

Dioxin Sampler Kit

16. The automatic tele-monitoring system on the smokestack (Clean SYS, TMS) is a 24-hour system used at the resource recovery facility or such to monitor air quality at the facilities, measure pollutant and emission levels, and send these measurements to the control center main computer at the Environmental Management Corporation. The automatic tele-monitoring system on the smokestack is installed at the halfway point, and measures the levels of dust, sulfur oxide (SO2), hydrogen chloride (HCl), nitrogen oxide (NOX), carbon monoxide (CO), oxygen (O2), oil/fluid, and temperature. The data is collected and sent to the control center at the Environmental Management Corporation in real time to check for toxic gas emission. The data can also be seen by nearby residents via a screen installed outside the facility.

17. By definition, dioxin is short for polychlorinated dibenzo –p-dioxins. "Poly" means 'many' and "chlorinated" means that the hydrogen is substituted with chlorine; "di" refers to 'two'; "dibenzo" thus means '2 benzene rings'; "dioxin" means '2 oxygen'; para (p) refers to the fact that two oxygen atoms occupy opposite positions. Dioxin has a chemical structure of 2 chlorinated benzene rings facing 2 oxygen atoms. Its acronym is PCDD or PDSSs. Dioxin, a compound of 2 chlorinated benzene rings, has 75 types with 2 oxygen atoms and 135 furans with 1 oxygen – a total of 210 types.

Fourth, Seoul controls the number of waste trucks and their operating hours. The trucks spread odor during transport, emit exhaust gas, and add to the traffic on the surrounding roads. The city therefore requires trucks to collect the waste at night or in the early morning to reduce people's exposure to the smells and reduce traffic during the day. Any waste that comes from other districts can only be transported on 11-ton or larger trucks to reduce the number of trips required.

Fifth, the city constantly monitors the health of the residents. Other than monitoring waste, controlling truck hours of operation, and ensuring the performance of pollution-prevention equipment, Seoul has adopted a program to monitor the impact on health since 2000. The health of the residents is monitored over the long-term to identify and objectively evaluate the effect of pollutants (e.g, dioxin) from the incineration facilities so as to ensure safety, help ease concerns, and come up with effective measures if any negative aspects are found. There are 3 main areas included in the monitoring: air quality in adjacent areas (environmental impact); the level of dioxin and heavy metals in the bloodstream of residents (physical impact); and general physical and psychological health (health impact). Physical impact and health impact studies are conducted on fixed research groups of community residents, volunteers, and facility operators. Recently, the monitoring has been reduced to the fixed research group as residents requested, but more pollutants – dioxin and black carbon – have been added to the study over time. For study continuity, the 10th research project is underway as of 2014, with categories, methods, and targets determined after discussions with the Resident Support Council. No significant environmental, physical, and health impacts have been identified so far.

Table 6 - Study of Impact on Health of Residents near Incineration Facilities in Seoul

Period	2000 – 2004	2005 – 2008	2009 – 2012	2013 – 2015
Frequency	3 times	3 times	3 times	3 times
Region	Areas affected by the Yangcheon, Nowon, and Gangnam Facilities and Reference Areas			
Category	· Health impact evaluation: dust, heavy metals, odor		· Same as in Stage 1, 2	· Same as in Stage 3
	· Physical impact evaluation: dioxin, heavy metals, etc. in the bloodstream		· Analysis of dioxin in the air added	· Traffic impact evaluation (black carbon, etc.)
	· Health impact evaluation: general health, awareness, quality of life		· Environment impact evaluation added in the autumn	
Group	· Residents in the affected area and reference area, and worker classification survey		· Residents in the affected area and reference area classification survey	· Residents in the affected area
Method	· Individually recruited · Follow-up survey	· Individually recruited Research group follow-up survey	· Research group follow-up survey	· Research group follow-up survey

Number of Targets	· Heavy metals: 270 persons · Dioxin: 53 persons	· Heavy metals: 270 persons · Dioxin: 75 persons	· Heavy metals: 270 persons · Dioxin: 100 persons	· Heavy metals: 360 persons · Dioxin, tumor marker: 100 persons
Remarks		· ncreased number of dioxin testing targets	· Increased number of dioxin testing targets	· Tumor marker test added · Traffic impact evaluation added · Comparative disease and illness evaluation based on regional data from the National Health Insurance Service

Sixth, the city has programs to enhance residents' daily lives in the affected areas. These include programs related to heating bills, management fees, rental assistance for multi-household housing, assistance with housing improvement programs (waterproofing, painting, etc.), and assistance with medical bills and public-use facility fees. Eligible residents include those living within 300m of the incineration facility site boundaries[18]: a total of 12,637 households (3,413 in the Yangcheon area; 6,190 in the Nowon area; and 2,934 in the Gangnam area). The programs are financed pursuant to City of Seoul ordinances, and the related fund is called the Resident Assistance Fund[19], created with contributions from the City of Seoul and the gu districts that use the facilities as well as profits from management of the Fund. Contributions made by Seoul are comprised of a fund for construction of the incineration facilities; heating assistance (up to 70%) for multi-household housing in the affected areas; and contributions from the fee for facility waste handling (which includes 10% of the facility waste handling fee and an additional 10% handling fee paid by joint users – the gu districts). Contributions from the gu districts that use the facilities are determined according to the joint use agreement. For instance, joint users of the Yangcheon facility contribute KRW 21,000 per ton of waste on top of the handling fee until 2020. Profits from management of the Fund come mostly from the interest earned at the bank. From 1996, when the Yangcheon facility started operations, to 2013, the Resident Assistance Fund created by the 4 incineration facilities totaled KRW 169.9 billion. The amount paid into the fund per ton of waste sent to the 4 incineration facilities is KRW 25,260; the amount of funding per household in the affected area is KRW 13.56 million.

18. Article 17 of the Promotion of Installation of Waste Disposal Facilities & Assistance, etc. to Adjacent Areas Act calls this "an indirectly affected area". The scope of the indirectly affected area as stipulated in Article 20 of the Enforcement Decree of the same Act is within 400m of the incineration

19. Seoul Metropolitan Government assistance fund for areas adjacent to the resource recovery facilities

Table 7 - The Resident Assistance Fund (1996 – 2013)

	Total	Yang-cheon Facil-ity	Nowon Facility	Gangnam Facili-ty	Mapo Facility
Resident Assistance Fund (KRW 1 million)	169,945	45,230	63,765	60,275	675
No. of Residents in Affected Area (Households)	12,537	3,413	6,190	2,934	0
Incinerated Volume (tons) (1997 – 2013)	6,727,728	1,389,705	1,767,559	2,023,626	1,546,838
Payments into Resident Assistance Fund(KRW/ton)	25,260	32,547	36,075	29,785	436
Resident Assistance Fund per Household in Affected Area (KRW 1,000)	13,556	13,252	10,301	20,544	-

Benefits of Joint Use

Dramatic Reduction of Municipal Waste Landfill

One of the greatest weaknesses in Seoul's waste management system is that it does not have its own landfill sites and probably never will. Thus the reduction of waste needing to go to landfill is a crucial goal. Joint use of the 4 incineration facilities significantly help fulfill this goal, with the amount of waste, in absolute terms, buried in 2012 equaling only 10% of the 1997 level, when the Yangcheon and Nowon facilities had just begun operating. One of the reasons for this drop was a reduction of the actual volume of waste (both incinerated and in landfill) to a third, but the incineration capacity being increased by 3 – 4 times since 1997 also cannot be overlooked. The percentage of the waste that goes to a landfill against the incinerated amount dropped dramatically from 93.6% in 1997 to 25.4% in 2012. If the 4 facilities had continued to process only waste from Yangcheon-gu, Nowon-gu, Gangnam-gu, Mapo-gu, Jung-gu, and Yongsan-gu, then the amount of buried waste would still be around 2006 levels (76.3%). Joint use of the facilities has helped enhance Seoul's municipal waste management, and the percentage of waste for landfill is now 7.8% as of 2012 (61.9% in 1997).

Table 8 - Changes in Landfill Waste at Incineration Facilities: Before & After Joint Use Agreement

	Before Joint Use Agreement			After Joint Use Agreement	
	1997	2003	2006	2010	2012
Incineration Facility	Yangcheon Nowon	Yangcheon Nowon Gangnam	Yangcheon Nowon Gangnam Mapo	Yangcheon Nowon Gangnam Mapo	Yangcheon Nowon Gangnam Mapo
Amount Incinerated at the 4 Facilities (tons, [1])	187,096	162,795	320,562	740,287	771,110
Landfill Waste (tons, [2])	2,730,200	1,866,096	1,033,738	527,790	262,435
Incinerated + Landfill (tons, [3]=[1+2])	2,917,296	2,028,891	1,354,300	1,268,077	1,033,545
Landfill (%. [2]/[3])	93.6	92	76.3	41.6	25.4
Landfill (%) (Municipal Waste)	61.9	42.4	24.8	14.4	7.8

Enhanced Productivity of the Incineration Facilities

After joint use began, use of the 4 incineration facilities quickly increased. In 2005, before joint use, the 4 facilities processed 253,561 tons of municipal waste; in 2012 (after joint use had begun) three times that number was processed (771,110 tons). The utilization rate rose from 37% in 2005 to 85% in 2012, and better utilization led to a reduction in operational costs. In 2005, operational cost (including labor, expenditures, general management, and profit for the commissioned operator) per ton of incinerated waste was KRW 90,508; in 2012, it was KRW 69,355, down by KRW 20,000. In the meantime, KRW 16.3 billion was coming from the city's budget to finance the operation of the incineration facilities. Fixed costs decreased due to the increased processing volume, but also due to the increased profits from the sale of incineration heat and other byproducts (e.g., scrap metal, incineration heat, recyclables), which were KRW 19,804 per ton before joint use but had risen to KRW 27,363 in 2012.

Table 9 - Changes in Incineration Facility Productivity Before & After Joint Use Agreement

Category	Before (2005)	After (2012)
Operation rate (%, against normal operation days)	37	85
Operation cost (KRW/ton of waste received)	90,509	69,355
Sales of byproducts (KRW/ton of waste received)	19,804	27,363

Energy Recovery from Incineration Heat

The latent heat (lower heating value) of municipal waste brought to the incineration facilities in Seoul is 2,762 kcal per kilogram. Seoul's incineration facilities are capable of recovering 74% of incineration heat on average; some of the recovered heat is used for facility operation but is mostly sold to the district heating facilities in the adjacent facilities. Energy sales in 2006, before joint use, were of 561,411 Gcal; in 2012, after joint use had begun, sales went up 1.3 times to 1,269,336 Gcal. Before joint use, recovered heat was available to supply heating and hot water to 52,000 households. Joint use however helped the recovery rate grow, increasing the number of supplied households by more than 50,000. The main fuel used in city gas is LNG, meaning that incineration heat to supply heating and hot water results in less LNG being needed. In terms of the environment, it would mean less carbon dioxide and other greenhouse gas emissions from the use of LNG. The reduction of greenhouse gases before joint use (2006) was 27,000 tons but after joint use began in 2012, it was 60,000 tons. In terms of annual emissions by Seoul city buses, this reduction is tantamount to the annual emissions of 540 buses.

Table 10 - District Energy Displacement Before & During Joint Use of the Incineration Facilities

	Before (2006)	During (2012)	Remarks
Incineration heat sales (Gcal)	561,411 (1.0)	1,269,336 (2.3)	· Annual heating/hot water consumption per household: 10.9 Gcal
City gas displacement (LNG ㎥)(Household)	59,597,770㎥ 51,506 households	134,749,045㎥ 116,453	· LNG 1 N㎥ = 9,420 Kcal · Annual heating/hot water consumption per household: 10.9 Gcal
Greenhouse gas reduction (tons CO2)(No. of city buses)	26,725 tons 239 buses	60,426 tons 540 buses	· LNG 1 N㎥ = 2.23 kg CO2 · Greenhouse gas emissions from Seoul city buses: 112 tons CO2

Significance of Seoul's Experience

Waste, a Valuable Urban Energy Source

Cities generate a massive amount of waste. However, waste treatment facilities are not welcome in cities where land is needed for many other things, whether it is a treatment facility that requires a large area or an incineration facility that requires a relatively smaller area. Seoul chose the latter, as it does not require much land. Because it was in connection with land development programs, the city secured the site with relative ease and was able to use incineration heat as the source of district heating. Any remaining capacity at the incineration facilities was shared by adjacent districts, which limited the number of required incineration facilities and enhanced facility productivity. Today, Seoul's incineration facilities recover 74% of the latent heat from waste. What is not used by the facilities is sold to the district heating suppliers in the form of heat and electricity, sufficient to supply heating and hot water to 116,000 households.

Food waste however must be separated out as it works against energy recovery from other waste and generates odor – one of the principal reasons that nearby residents do not welcome incineration facilities. When recycled, food waste can be used as fertilizer or to produce bio-gas (i.e., methane).

Accuracy in Waste Volume Forecast – a Must to Contain Facility Numbers & Resolve Conflicts

Both incineration and food waste facilities are designed for 10 – 25 years of use. The latest incineration facilities are equipped with cutting-edge incinerators, pollution-prevention facilities, and automatic controllers, and require a minimum of KRW 300 million per ton in investment. Operational costs are also prohibitive as the facility needs a skilled workforce, energy and chemicals, and parts replacement, etc. Upon making decisions on the size of an incineration facility, it was impossible to predict future policy changes and the city experienced considerable difficulties due to the unused capacity. It fortunately found a solution through joint use by adjacent districts, but social conflict and the waste of administrative resources were significant over time. Some of the most influential policies that helped Seoul reduce waste were: the volume-based waste disposal

fee system that urged people to recycle; the Expanded Producer Responsibility; food waste recycling; and the decreased use of coal briquette ash due to changes in the choice of fuel. In the meantime, conflicts over landfill sites forced the city to process its waste within its own boundaries, making the demand for incineration facilities even higher. Such policy changes have a far-reaching impact on the volume of waste and how it is processed, and must be considered when projecting future waste volumes.

Reasonable Division of Responsibilities between the 25 Gu District Offices and the City of Seoul

For the purpose of administration, large cities have administrative boundaries. Seoul is comprised of 25 gu districts for convenience. Such boundaries however are undesirable when it comes to securing facilities that are shunned by the people, such as a landfill or incineration facilities. Logically, it is better to have one for each district, but even if this were possible, conflict would be inevitable. Smaller facilities can mean installation and operation costs are higher.[20] Moreover, the reliability of pollution-prevention facilities may not be guaranteed. This is why many incineration facilities and landfills are installed and operated by larger administrative authorities, whether in Seoul, Tokyo, or Paris. Another similarity Seoul has with other cities is that district offices are in charge of collecting, transporting and recycling waste, as these offices are in direct contact with the people, making it easier to receive their cooperation in waste segregation and collection.

While the roles of the district offices and the higher level administrative authorities are clearly divided and defined, the opinions and demands of district offices should be the fundamental foundation when it comes to answering the demands for the facility or selection of the site. The facility size and location, especially locations for joint use, should be determined by the district, which is more likely to have an accurate picture of the waste management demand and to better understand resident opinions. The reason it took 7 years to build the Gangnam facility, from selecting a construction company to completing construction, is because conflict continued over facility capacity and location even after the construction contract had been awarded. Contrary to this, the Mapo facility had already worked out its capacity and location for joint use and site before awarding the construction contract, requiring 3.5 years to build.

20. Generally, the ideal capacity for an incineration facility is 400 tons/day for economical installation and operation.

Figure 7 - Bottom-up Approach: Procedure for Construction of an Incineration Facility

Request from district office for installation of a facility	· Facility capacity (400 tons/day or more, considering energy recovery efficiency) · Consent forms from joint users · Site(s) secured for facility
Development of a basic plan	· Area for joint use · Quality and quantity of waste · Division of roles between joint users
Announcement of plan for site selection; selection of potential areas	· Site selection committee formed · Accessibility and location of residences examined · Site stability (size, earth type, risk of flooding, landslide, cracking, etc.) · Potential restrictions (historical heritage, school, military installation, height restrictions, protected water source area, etc.)
Recruit candidate sites	· Propose possible assistance to local community and affected areas · Review environmental impact on site
Site selected & announced	· Consent obtained from residents in affected areas (2/3 consent in the case of the Hanam facility) · Consent obtained from residents in corresponding wider area when there are no specific affected areas (2/3 consent in the case of the Hanam facility)
Construction company chosen (basic design, impact assessment)	· Review of basic design · Assessment of technical and construction performance · Review of project cost
Information sessions for residents	· Details provided on basic design and impact assessment results · Opinions collected from residents
Detailed designs done & construction started	· Incorporate resident opinions · Areas identified that will be affected within 2 years of waste processing facility installation, resident council organized, environmental impact evaluation
Pilot & pre-performance tests conducted	· Have the resident representatives or designated organizations to be present · Follow-up on any abnormalities found
Construction completed & operations started	· Facility performance tests conducted · Dioxin levels measured · Environmental impact assessment

Efforts to Win the Trust of Local Residents

Local residents are sensitive about incineration facilities because they can lead to lower property values, emission of pollutants from incineration, damage to the environment and health, and traffic congestion from the number of garbage trucks going to and from the facilities.

Property values do tend to decrease. The effect is more pronounced when conflicts, such as protests, are

known on the outside; without conflict, the effect on property value dissipates. Even so, the possibility for lower property values is a potential anxiety for residents, and is seen as one of the burdens caused by the incineration facilities. Seoul has therefore provided compensation through financial assistance with heating, housing maintenance, leases, fees for public-use facilities, and medical checkups. From 1996 to 2013, the Resident Assistance Fund accumulated per household is KRW 13.56 million.

Seoul has some measures in place to protect areas near the facilities from pollutant emissions. First of all, waste is monitored by resident representatives to ensure it does not include water, food waste, or toxic materials before going to the incinerators. If any are found, the waste is rejected, and the corresponding truck may be denied access for a specific period of time. Emissions are measured in real time and displayed to the public. Any chemicals such as dioxin that cannot be measured in real time are collected for 3 or more months with the appropriate device. Since 2000, Seoul has held health impact assessments to identify impact on the environment and health. As of 2014, the 10th survey is underway.

These measures are in place, not because the facilities are problematic, but to earn the trust of the residents, and can be applied to food waste processing facilities and landfill as well.

Improvement to the Legal Framework

Various laws, ordinances and agreements are in place so as to ensure that incineration facility sites are selected in a logical manner, that a fund is created to provide assistance to local residents, and that the residents in turn take active part in the operation of incineration facilities.

In South Korea, the installation of incineration facilities is pursuant to the Promotion of Installation of Waste Disposal Facilities & Assistance, etc. to Adjacent Areas Act, which stipulates the requirements for waste processing facility plans in various large-scale development projects; the procedure for site selection; the process of securing the facility site and construction; matters to be negotiated with local residents; assistance for residents; and methods of operation, etc.

The City of Seoul Ordinance on the Promotion of Resource Recovery Facility Installation & Assistance for Surrounding Areas contains information on operation of the incineration facilities, such as waste handling and receiving fees; utilization of the Resident Support Council and the Resident Monitoring Agents; and commissioned operation of the incineration facilities and facilities for public use.

The City of Seoul Ordinance on the Assistance Fund for Areas Adjacent to Resource Recovery Facilities also stipulates how the fund is to be created and used in compensation to the residents of affected areas, among many other things, to ensure transparent and objective use of the fund.

As for matters besides installation and operation of the incineration facilities and assistance to residents in the adjacent areas, the City of Seoul and the Resident Support Council reach agreement before decisions are made. Examples of what they deal with include joint use area of the incineration facilities, restrictions on waste receiving, standards, and time.

Incineration facilities are expensive to build and operate. If operated incorrectly, they can harm the environ-

ment and health, but they are undeniably critical to any city. These facilities require laws, ordinances and regulations on installation, operation, and resident assistance to be able to function well. Important matters can also be determined by way of agreement with residents.

Table 11 - Legal Framework for Municipal Waste Incineration Facilities in Seoul

Legislation Etc.	Description
Promotion of Installation of Waste Disposal Facilities & Assistance, etc. to Adjacent Areas Act	· Installation of the waste processing facility is to be reflected in the development of plans pursuant to the Framework Act on National Land. · The plan for site selection is to be developed when installing/operating the waste processing facility. · A site selection committee is to be organized when desiring to construct a waste processing facility. · Compensation to be given and restrictions imposed on the waste processing facility site. · The scope of the affected areas. · Organization and functions of the Resident Support Council. · Creation of the Resident Assistance Fund. · Assistance from the head of the wider area administrative authorities for the installation of waste processing facilities.
City of Seoul Ordinance on Promotion of Resource Recovery Facility Installation & Assistance for Surrounding Areas	· Waste handling and receiving fees are to be collected. · Management and operation of the incineration facilities can be commissioned. · Resident Support Council/Resident Monitoring Agent. · Eligible users of the public-use facilities, commissioned facility operation.
City of Seoul Ordinance on the Assistance Fund to Areas Adjacent to Resource Recovery Facilities	· Creation of the Resident Assistance Fund. · Use of the Resident Assistance Fund. · Target area of the Resident Assistance Fund. · Management and operation of the Resident Assistance Fund: council, meetings, etc.
Agreements between the City of Seoul and the Resident Support Council	· Waste receiving area. · Permitted waste properties; consequences for violations. · Waste receiving hours.

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6. Citizen Adoption of Forest & Park Facilities

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Policy Area: Environment

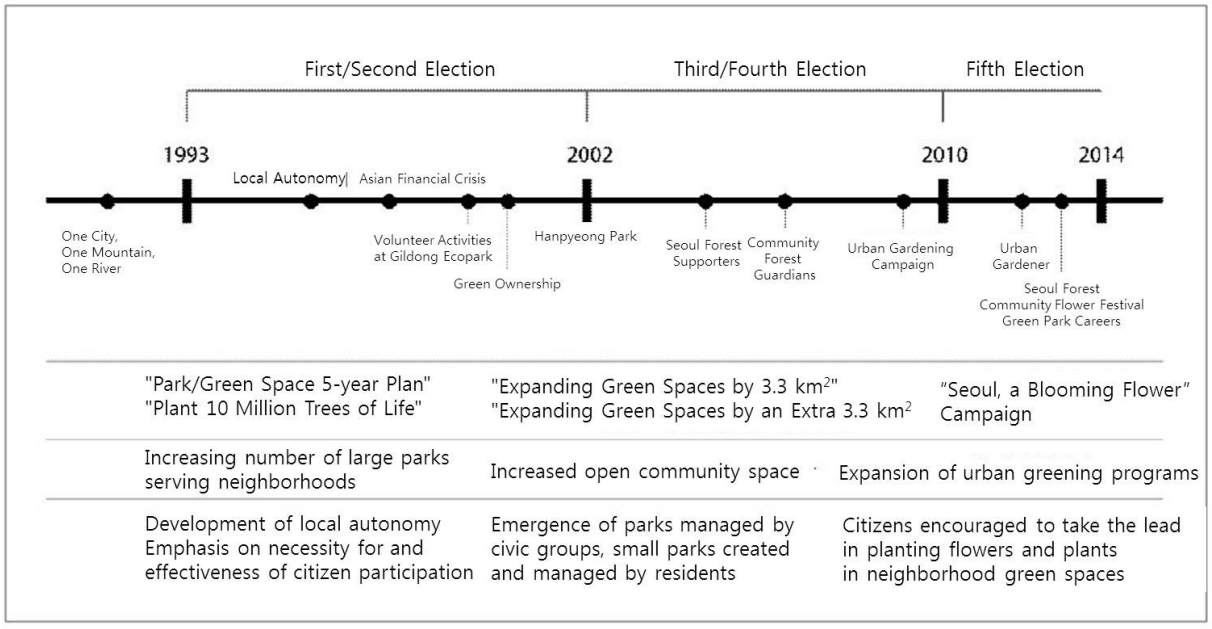
Background

The public sector is very limited in its ability to employ the staff necessary for proper management of urban parks and spaces, meaning these areas are not managed and maintained at all times. The frequency at which such maintenance is conducted should depend on the use of the surrounding land, but the shortage of manpower and funds have led to garbage piling up, and trees and plants withering and dying. Each district office works under different conditions, resulting in different outcomes. It was against this backdrop that people began calling for a policy that involves individuals, companies, the elderly, and students to assist with management and let the citizenry, not the government, lead the way in resolving these problems.

In August 2012, the 8th Pacific Rim Community Design Network Conference was held, with "Green Community Design" as its theme, introducing examples where citizens were active in turning their communities green. For such publicly-participated projects to grow from simple one-stop measures to lasting policy, innovative ideas and models were needed to minimize trial and error and meet the demands of the people.

In 2003, Seoul introduced a citizen-involved park management system for the creation and management of Seoul Forest where Seoul Green Trust participated in creation and management of Seoul Forest. With the objective of becoming 'A green city created by its citizens', Seoul has since applied this new management concept to its urban greening programs. In 2012, the mayor mentioned in the Mayor's Hope Diary the idea of having urban parks and green spaces adopted by residents. The adoption program was introduced the following year, pursued by the Park & Green Space Policy Department.

Figure 1 - History of Citizen Participation in the Management of Parks in Seoul



Necessity for Park & Green Space Management by Citizens

With residents involved, areas can be reached that government administration has failed to address. For instance, during a drought in 2012, street-side trees were slowly dying, so the gu district offices attached water bags to water the trees. If in this situation there had been a program for citizens to get involved, costs would have been reduced and damage to plants and trees would have been less severe.

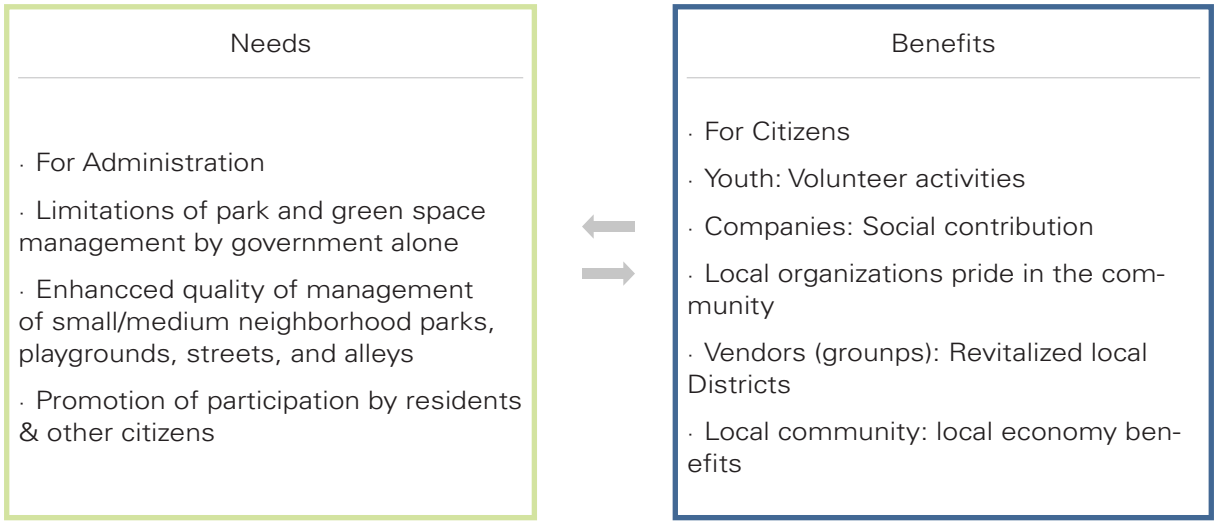
Figure 2 - Garbage Dumped Beside Trees & on Green Areas

Figure 3 - Watering Trees during the Drought in 2012

If residents were allowed to participate in the management of parks and green spaces, they could fill the needs that governments cannot address properly. The government would be able to divert money to more essential areas, reduce its costs, and enjoy greater benefits.

Responding to this need, Seoul initiated the 'Adopt a Tree' and 'Adopt a Park' programs in 2012. From the administrative perspective, citizen participation is useful and even necessary as it will enhance the quality of parks, green spaces, and management of the local environment and revitalize the local culture. Residents also have an opportunity to contribute to society, help boost the local economy, and develop greater pride in the beauty of the local community.

Figure 4 - Necessity for & Benefits of Adoption Programs for Parks & Green Spaces



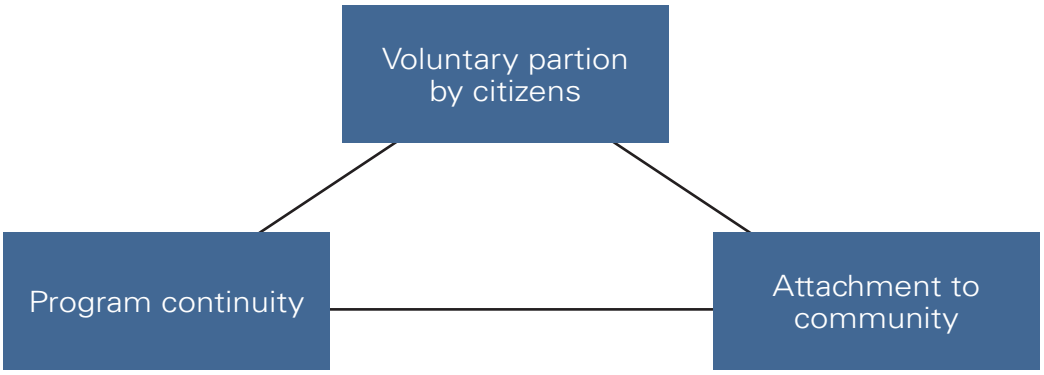
Adoption of Trees, Plants, & Park Facilities

Residents would donate their time and effort to work with the government in targeting trees, plants, and park facilities where the government is unable to pay adequate attention, as well as other areas where citizens would like to be involved. While residents can "adopt" certain trees, plants, and parks, they do not have ownership, making such programs different from other activities where participants are compensated in any form for the time they give.

Expected Benefits of Park & Green Space Adoption Programs

If these programs prove successful, the quality of park, green space and overall environmental management will increase. There is also potential to advance the local culture. Citizen participation will be especially effective in those areas that are not taken care of due to the lack of manpower. Participating citizens will also have the opportunity to watch over and care for the local environment, helping them develop pride in and a sense of belonging to the neighborhood, with adoption of small local parks particularly resulting in positive responses from local residents. People who participate in the process of maintaining a park feel affection for the place, which in turn motivates them in their management of the park.

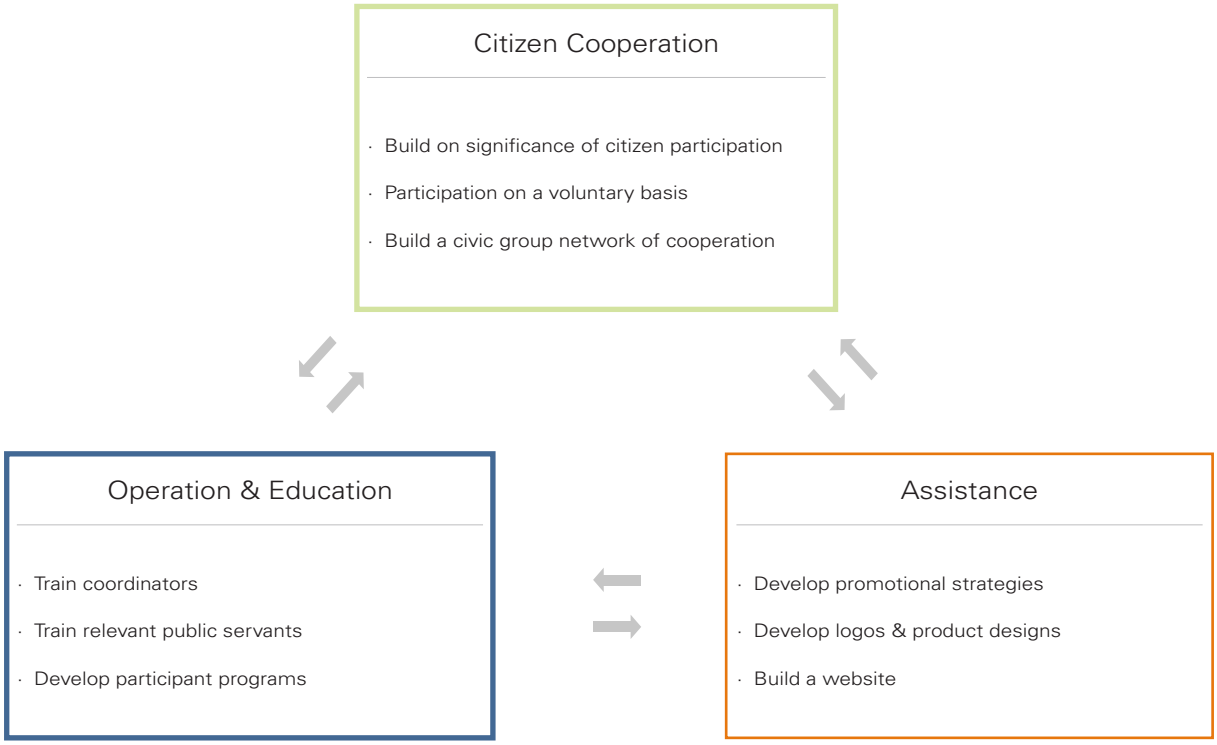
Figure 5 - Synergy Created by Adoption of Park & Green Spaces



Elements of Success

For the system to enjoy long-term success, voluntary participation by citizens is critical, and for that to happen, an affection for the place they adopt is necessary, as is consistency. The current adoption programs are far more comprehensive as they embrace elderly employment programs, student volunteer programs, and adoption by civic groups, individuals, and companies, all of which can be personalized by giving the program a friendly, unique name.

Figure 6 - Requirements for Park & Green Space Adoption Programs



Citizen Participation Similar to the Adoption System

<Seoul Green Trust's Management of Seoul Forest>

Similar to the "Adopt" system, this approach also involves citizen participation and has 2 types of programs: donation and volunteer works.

Tree Adoption

This program supports maintenance of the trees at Seoul Forest. Participants donate to support the existing trees or the planting of new trees at Seoul Forest, and signs at the trees denote the names of the supporters (300,000 KRW/tree). This gives people something to remember their gift by, to mark a gift for others, or celebrate an event.

Forest of Sharing

Forest of Sharing was implemented between 2003 and 2005 as a way to create Seoul Forest, until it was opened to the public. Participants donated a certain amount and attended tree-planting ceremonies. The individuals, organizations, and companies who participated in creating the Green Area Fund and the Forest had their names etc. displayed at "their" trees (KRW 300,000 per 3.3 ㎡).

Some participants adopted a designated area at Seoul Forest and pledged to manage the area on a voluntary basis. The concept of adoption was chosen for the Forest of Sharing program because it does not mean ownership but focuses on continued management and care for the Forest. Companies involved in the adoption send personnel to maintain their areas 6 times a year (20 persons) and display promotional banners on the tree tags. Initial cost of sponsorship is KRW 15 million per 330 ㎡; in the following year, they pay KRW 1.5 million per 330 ㎡ for management and a 3-year membership.

Adopt a Site

'Adopt a Site' is a regular volunteer program carried out each season. Details vary according to environmental factors and park status. Seoul Forest Supporters are corporate members who have opened a membership account for KRW 1.5 million and continue to participate in the forest management programs each season.

Figure 7 - Forest of Sharing Certificate & Adopt a Tree Program / Adopt a Site Activity / Seoul Forest Homecoming Day (From Left to Right)

Responsible Green Management (Green Owner System 2000 – 2009)

The Responsible Green Management program was designed to manage street trees, green spaces, community squares, and parks, etc. through voluntary participation. Individuals, organizations or schools who signed up for the program were designated as site or technical support managers, with the central government assisting local government with the basic materials for maintenance activities, identifying "excellent" activities, and giving awards. This program was run for 10 years, peaking in 2004 and 2005. However, funds were insufficient and the program was pushed behind other policies in priority in 2009.

Table 1 - Green Owner System

	Description	
Targets	· Neighberhood green spaces including trees on the street, protected trees in parks, and community squares	
Green Owners	· Individauls, organizations(environmental, social, religious, etc.), schools, companies, etc.	
Appointment of Green Owners	· Letter of Appointment from local authorities sent to applicants	
Assistance with Activities	· From local government budgets for parks and green spaces in accordance with local goverment situation(if available funds are insufficient, funding can be sourced from trees/plants follow-up management fund) · Basic items provided(garbage bags, tools)necessary for maintenance activities	
Activities	Site Green Owners	· Cleaning green spaces and parks, weeding, wating, fertilizing, tagging plants/trees, planting flowers, taking care of support poles, checking and reporting problems with facilities, keeping things in oreder, etc. · And work that requires expertise(e.g.,facility repairs, planting flowering plants) can be done after receiving technical training provided by the local government
	Technical Support Green Owners	· Technical advice and support on effective maintenance · Support with technical expertise(e.g., plant selection, flowerbed design, managing trees under protection, pruning)

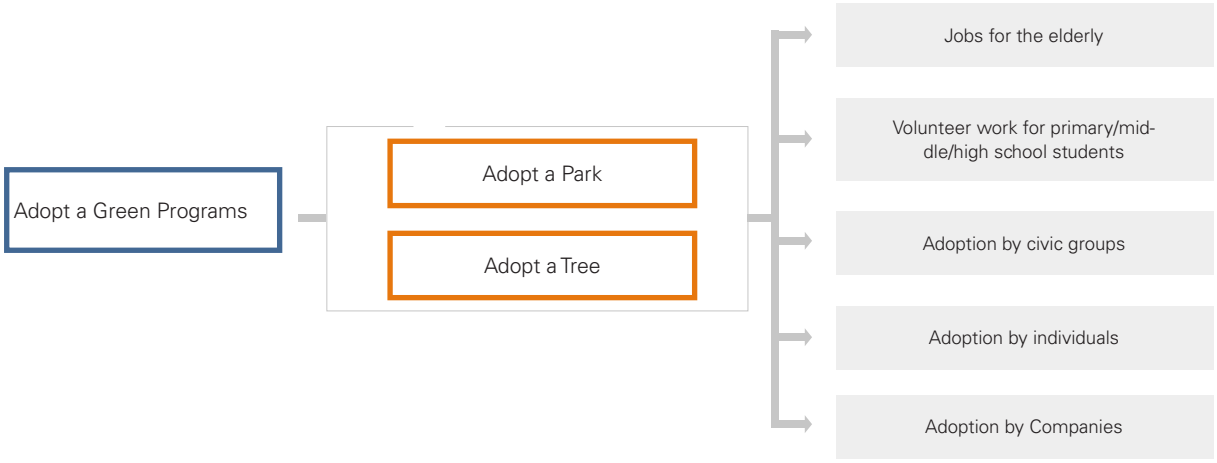
source : Green Seoul Bureau, Seoul Metropolitan Government. 2012.

The 'Adopt a Green' Program as one of the Adoption Programs

Adopt a Green

As part of the park and green space adoption program, the "Adopt a Tree" program was piloted in 2012. In the following year, it was expanded to cover parks – the 'Adopt a Park' program. This allows organizations and individuals to adopt a park, tree or green area. Upon signing an agreement, participants maintain their designated trees or green spaces.

Figure 9 - Seoul's 'Adopt a Green' Program, Sub-programs, & Activity Types



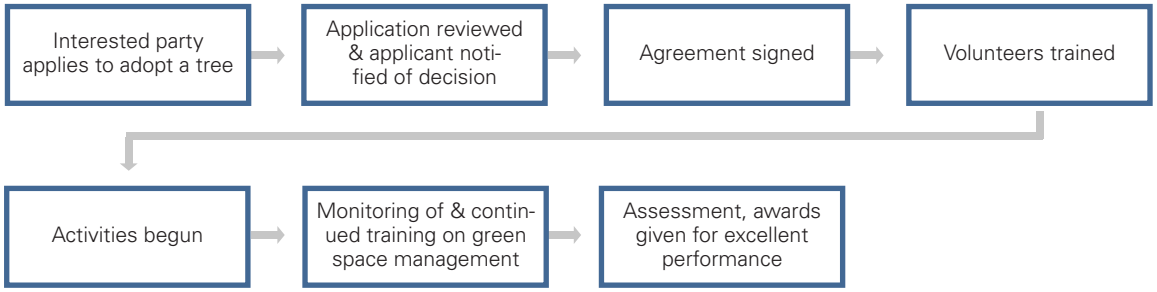
There are 5 types of activities. The first is part of the effort to create jobs for senior citizens, who clean and beautify the street trees and are paid based on 40 hours of work per month. The second type gives opportunity to students to be involved in learning more about the environment and making a contribution. The hours worked are officially recognized as volunteer activities. The third type is management by civic groups, while the fourth and fifth types are management by individuals and companies, respectively. Of these, the first two are different in their intended purpose and need to be separated from the rest in the future.

While the job program for senior citizens pays wages for hours worked, adoption by school volunteer programs, individuals, civic groups, companies, religious entities, local associations, and educational institutions (kindergartens, daycare centers) do not involve compensation, with participants signing up because they are willing to work without payment.

Adopt a Tree

The Adopt a Tree program is where citizens and organizations adopt and care for a tree on the street or in a green strip, and is open to schools, individuals, groups, companies, and senior citizens. As part of the jobs for senior citizens program, there is no fixed contract period and senior citizens are employed during designated periods. Religious or senior citizens groups can also participate. Applicants sign a year-long agreement with the local government or program office, which may be extended after an annual assessment.

Figure 10 - Procedure for Participation in the Adopt a Tree Program



Main activities include caring for damaged facilities, removing garbage, weeding, and watering the trees. "Adopt a Tree" signs are installed to indicate the responsible individual or group, and garbage bags, gloves, tongs, and other cleaning supplies are provided. The activity hours are officially recognized as volunteer hours, and the activities may be promoted externally or featured by the media. Adopt a Tree also provides education on the ecosystem.

As a pilot program in 2012, Adopt a Tree was pursued by Seonsa Primary School in Gangdong-gu and by Hanyang University High School in Seongdong-gu on the streets in front of the schools. Senior citizens were also hired for the job program and were engaged in the activities for 4 months.

Figure 11 - "Adopt a Tree" Activities in 2012

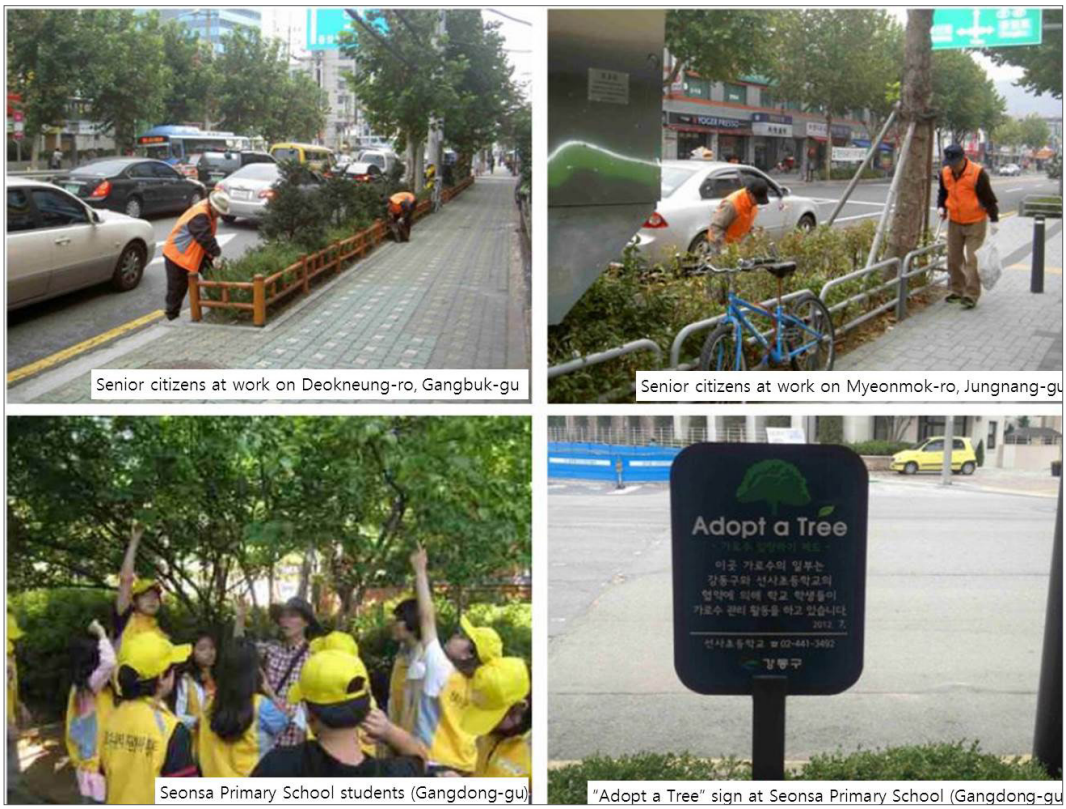


Table 2 - Adopt a Tree Pilot Programs in 2012

Participants	Target Areas for Adoption	Segment Length	Adoption Period
Seonsa Primary School (Gangdong-gu)	Olympic Avenue	220m (4,478 trees)	Jul, 2012-Jun. 2013
Hanyang University High School (Seongdong-gu)	Majo-ro	840m (2,724 trees)	Oct. 2012 - Sep. 2013
Senior Citizens	32 streets/roads, such as jongno-3-ga	100km	Aug. 2012-Dec.2012
Total	34	101km	1 year

Adopt a Park

The Adopt a Park program provides opportunity to the citizens of Seoul to manage their own areas of parks and green spaces, thereby raising environmental and community awareness and establishing a sustainable management system on a voluntary basis. In the program, a park is adopted by a local organization which will clean and beautify it by planting additional trees and flowers. In this way, the program seeks to instill pride and a sense of community ownership.

Religious groups, schools, companies, senior citizens' groups, and individuals can participate in the Adopt a Park program. As with Adopt a Tree, participants sign an agreement with the local government or program office. The agreement, which contains details on the period, activities and their duration, is a year long and may be extended after an annual assessment. Adopt a Park participants clean their designated park areas, beautify garden beds, and clean up graffiti, etc. They report any damaged or potentially dangerous park facilities and those that no longer operate the way they were intended. The frequency of activities is determined (e.g., weekly, monthly, quarterly) through consultation with participants, who then submit an Application for Park Management Activity 7 days before the desired date, and a Report on Park Management Activity upon completion of each activity.

Figure 12 - Procedure for Participation in the Adopt a Park Program

· Selection of group's desired park

· Applications made at the park and Green Space Department of the area's local govement or at the park and Green Space Program Office

Adopt a Park group activities are assessed each year. If the results are found to be insufficient, the agreement will not be renewed. The agreement may be terminated if a group fails to comply with rules on park use or management during the agreement period, or if the group requests termination.

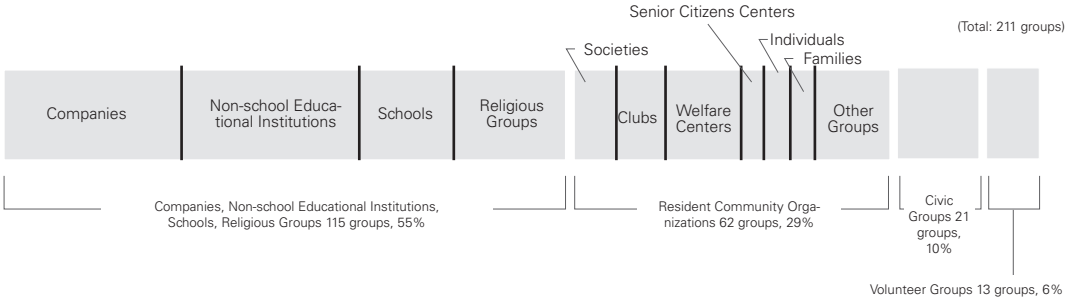
At the park, a sign board is installed to indicate groups responsible for park management, and cleaning supplies are provided. Adopt a Park activities can also be officially acknowledged as volunteer work. When a

participating group wishes to hold a cultural or talent event, the park may be used as the event venue. The group's activities may be promoted externally or featured by the media, and the program also provides education programs on the ecosystem, and events such as flower planting.

Adoption Program Outcomes

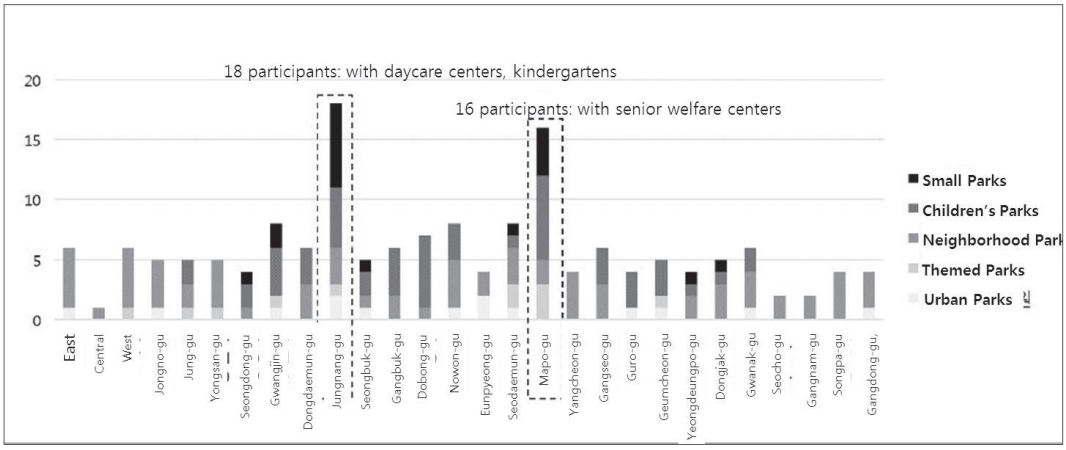
Up to date, 21 groups are in the Adopt a Park program and have adopted 163 parks – 7% of all parks managed by Seoul. Urban parks or themed parks have higher adoption rates, while most neighborhood parks suffer from a lack of participation. Large parks, themed parks, and urban parks have other programs besides Adopt a Park, making it easier for them to find interested organizations. Applicants in the Adopt a Park program include daycare centers and kindergartens (38, the highest), companies (36), schools (16), religious groups (24), societies (7), clubs (5), welfare centers (18), senior citizens' centers (4), individuals (7), and "others" (16).

Figure 13 - Participating Groups in the Adopt a Park Program (As of December 2013)



Interested parties can apply to participate in the Adopt a Park program through the local government or program office. The gu district with the highest number of adopted parks is Jungnang-gu, followed by Mapo-gu.

Figure 14 - Adopted Parks by Gu District (As of December 2013)



Activity Frequency in the Adopt a Park Program

Many participants are involved in the Program on a monthly basis, with a substantial number of people working weekly. Daily participation is rare.

Participating local companies offer expert management and significant levels of activity, but companies or, for instance, daycare centers, only work during a specific time or on a monthly basis, which is not of great help. Community groups have not shown much interest and generally did not submit activity reports on a consistent basis.

Resident Satisfaction with Citizen Participation in Park Management

Site inspections were conducted on 3 outstanding examples (Odong Neighborhood Park, Choan Ecopark, and Bangyi Neighborhood Park) of the Adopt a Park program, and a survey given to which 118 participants responded. The results demonstrated overall satisfaction by the participants and also included areas for improvement.

Most responding program participants live within walking distance of the park, and many have been longtime residents of the area.

Generally, participants were very satisfied with the program, feeling that the park had improved in terms of cleanliness, safety and the overall atmosphere after the Adopt a Park program had begun.

Table 3 - Survey on Effects of Participation Program on Park (N=117) Average (%),

Category		Completely Disagree	Disagree	About the Same	True	Very True	Average
safety	The park has become a safer place for children to play	-	4(3.4)	33(28.0)	41(34.7)	40(33.9)	3.99
Complaints	There are fewer complaints about the park.	-	4(3.4)	36(30.5)	43(36.4)	35(29.7)	3.92
Cleanliness	The park is cleaner than before.	-	5(4.2)	24(20.3)	45(38.1)	44(37.3)	4.08
Number of Users	There are more park users than before.	-	4(3.4)	41(35.0)	37(31.6)	35(29.9)	3.88
Overall Environment	The park is more pleasant than befer	1(0.8)	1(0.8)	27(22.9)	49(41.5)	40(33.9)	4.06
Satisfaction with the Park							3.98

Source: Yuk Eun-jeong (2014)

Most individual participants stated that they clean the park and wish to be involved in such activities as planting trees and flowers and creating vegetable gardens, revealing a diverse range of activity interest. According to the survey, participants felt that the park had become more pleasant, cleaner and safer after they began participating. They were more positive about the quality of the park.

It was found that satisfaction was higher in participants i) who were more attached to the park and the neighborhood; ii) who had proactive group leaders; and iii) who were more motivated about program activities. The sense of achievement and an adequate level of labor from the activity also contributed to the high satisfaction level, as did the opportunity to get together with neighbors and meet new people.

Figure 15 - Activities by Civic Groups (Photo: Yuk Eun-jeong (2014))

(Odong Neighborhood Park: Odong Friendship Meeting/ Choan Ecopark: Haedeung Sharing / Bangyi Neighborhood Park: Tale, Town, & Flowers)

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7. Low-Emission Vehicle Program

Writer : Seoul Institute Dr. Yu-Jin Choi

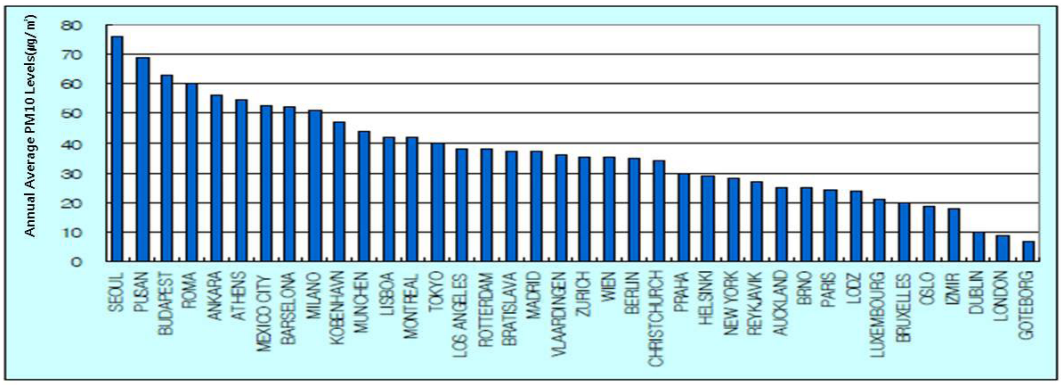
Policy Area: Environment

Background

Into the 1990s, air pollution surfaced as a social issue, especially in large cities where people were taking a greater interest in finding fundamental solutions to the deterioration of air quality caused by the prevalence of vehicles.

According to a 2002 OECD report, Seoul's fine particle (PM10) level between 1998 and 2000 was the worst of all OECD member large cities: 2 to 3 times higher than London or Paris. Within South Korea, Seoul was higher than other Korean cities such as Busan, Daegu, and Daejeon.

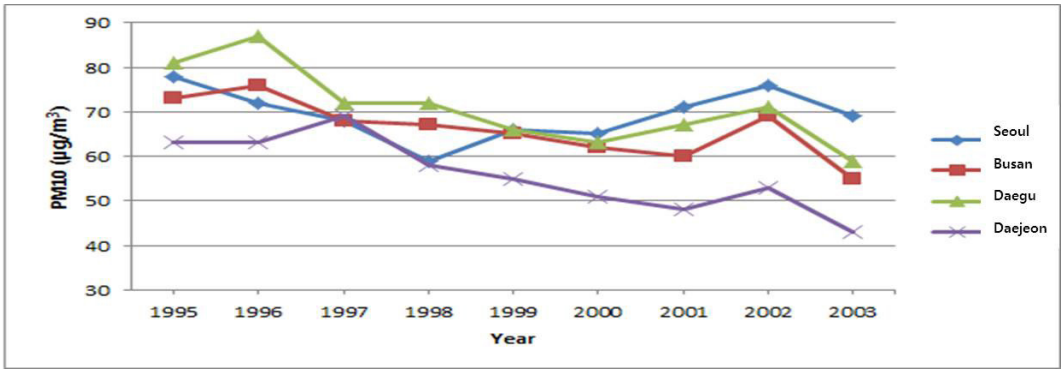
Figure 1 - Annual Fine Particle (PM10) Averages in Large Cities of OECD Countries



Note: Displays air pollution levels of recent years (mainly 1998 – 2000) in all 38 "A Group" cities (large cities with 5 – 10% of the national population) in OECD countries
Source: OECD Environmental data 2002

Source: Ministry of Environment, 2011, Interim Evaluation & Study of the Low Emissions Program for Diesel Vehicles Operating in the Capital Area.

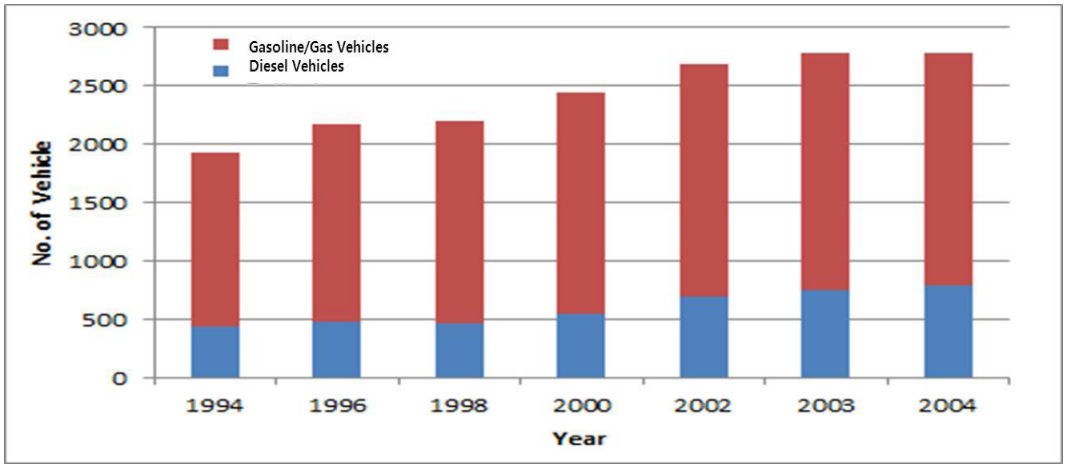
Figure 2 - Annual Fine Particle (PM10) Averages of Seoul & Other Korean Cities



Source: Ministry of Environment, 2005, Annual Report: Air Quality & Environment (2004).

At the time, the number of vehicles registered in Seoul was growing by 10% or more each year, owing to the rapid industrialization and growth in income. In 1980, there were 200,000 vehicles in the city, but by 2000, this had risen more than 10 times to 2.4 million vehicles, ever worsening the pollution. Diesel-powered vehicles particularly – known to have better mileage than gasoline-driven vehicles and less expensive in terms of fuel due to industry and energy policies – steadily grew. In 2004, 28% of the registered vehicles in Seoul were diesel-powered.

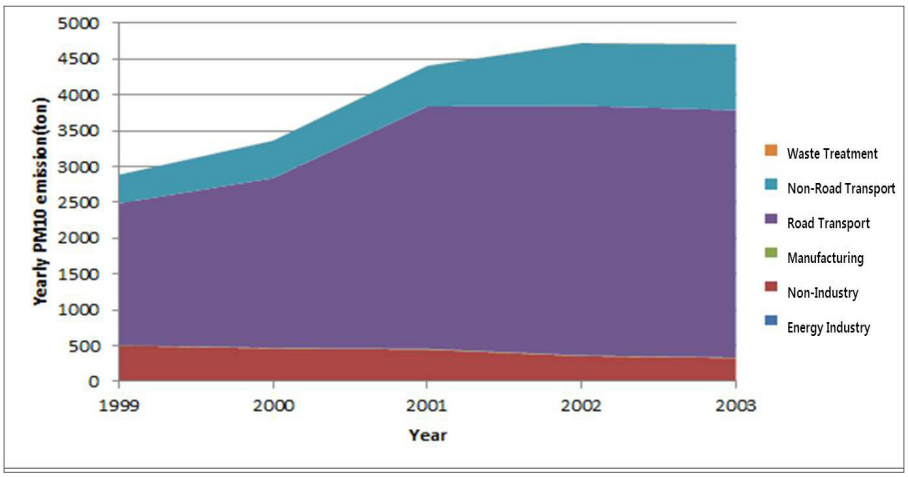
Figure 3 - Number of Registered Vehicles in Seoul by Fuel Type



Source: Seoul Metropolitan Government, 2013, Seoul's Environment, Environment White Paper 2012.

Due to their method of fuel combustion, diesel engines produce finer particles than gasoline engines, and diesel vehicles were targeted as one of the major sources of fine particles. Considering the Euro 4 standards (reinforced emission requirements for manufactured vehicles) were introduced in South Korea in 2006, it can be assumed that diesel vehicles manufactured according to the previous emission standards added significantly to the emission of fine particles in Seoul.

Figure 4 - PM10 Emission Levels in Seoul by Emission Source



Source: National Institute of Environmental Research, 2005, National Level of Air Pollutant Emissions.

People began demanding that the environment should be made more pleasant for the upcoming 2002 World Cup. Accordingly, studies were conducted and policies adopted on the use of zero- or low-emission vehicles. As mentioned above, discussions were held on encouraging lower emissions from diesel-powered buses, trucks and other vehicles, and relevant programs were implemented.

Programs in the City of Seoul included replacing diesel city buses with CNG-powered buses and reducing emissions from older medium and heavy duty trucks and other vehicles.

Program Summary

Distribution of CNG City Buses

Introduction

In the US and other countries, governments, research institutes, organizations and automobile manufacturers studied alcohol fuels (e.g., ethanol, methanol), LPG, natural gas, electricity and hydrogen in attempts to replace conventional gasoline fuels. The technology however was not yet sufficiently advanced for electricity and hydrogen to be commercially available. On the other hand, alcohol, LPG and natural gas were deemed more practical in the mid- to long-term, with natural gas considered the next alternative fuel due to its stability, long-term supply, economics, and low environmental impact.

Natural gas produces fewer pollutants than gasoline or diesel, and is generally deemed safe, less likely than other fuels to lead to fire or fuel tank explosion, and lower in toxicity. Sufficient supplies could be secured with relative ease, estimated to last approximately 250 years (on the condition that a 100% switch to natural gas was made and was used at the same rate as oil consumption in 1989).

Natural gas was also more affordable than oil, and due to lower emissions than diesel or gasoline, the government decided to develop and encourage the use of CNG vehicles. From 2000, a policy supporting CNG buses was actively pursued to improve the air quality in Seoul and other large Korean cities.

Assistance Policies & Systems

Assistance Policies

- Subsidies/loans to cover the difference in price over diesel buses
- Assistance with installation of fuel stations: KRW 700 million per station in the form of long-term loans or subsidies from the national coffers
- Loans/subsidies from the national and city budgets; tax exemptions; fuel price regulation
  - Exemption from VAT, acquisition tax, and environment improvement charges
  - Exemption from corporate tax for the costs of fuel station construction
  - Natural gas price to be kept at a certain level below diesel prices to allow for additional profit
  - City Gas industrial electricity rates to apply to power bills for fuel stations installed/operated by bus companies to allow those companies to benefit

Special Assistance to Promote CNG Buses in Seoul before the 2002 World Cup

- Temporary, conditional assistance for those that stopped using their vehicles ahead of the World Cup, until May 2002 (one month prior to the World Cup opening)
- Subsidy of up to KRW 8.5 million: KRW 300,000 per month per bus for those operators who gave up their diesel vehicles (1994 or newer) and switched to natural gas during "the period of early termination."

Special Plan to Promote the Introduction of CNG Buses in Seoul after the 2002 World Cup

- Laid the legal and institutional framework for expanded use of CNG city buses
  - Permission for fuel stations at the bus company garage, parking lots, and development-prohibited areas
  - Relaxed distance requirements for CNG fuel stations from residential apartments, places of business, etc.

Timeline in Seoul

- 1999: Pilot CNG city bus project
  - Outcome: 15 CNG buses, 3 fuel stations installed
  - Assistance: full amount loan for fuel stations; loan/subsidy to cover price difference over diesel buses
  - Program cost: national budget (KRW 2.1 billion) + city budget (KRW 2.1 billion)
- 2000: Program launched in earnest
  - Outcome: 480 CNG buses, 13 fuel stations installed
  - Program cost: national budget (KRW 8.9 billion) + city budget (KRW 10.9 billion)

- 2000 –
  - 46 fuel stations to be installed by 2010
  - Town buses, cleaning vehicles, etc. to be included in the CNG vehicle replacement program
  - Assistance with replacement to be funded on a 50:50 basis from national and city budgets; assistance according to car type, displacement, tonnage, etc.

Table 1 - Replacement Assistance by Vehicle Type (2014)

	City Bus	Town Bus	Chartered Bus	Public Bus	Cleaning Vehicle
Subsidy/ KRW 1,000 (50:50 national/ city budget)	18,500	16,000	18,500	18,500	27,000: 5 ton 42,000: 11 ton

Figure 5 - CNG Fuel Station

Table 2 - CNG Vehicle Distribution in Seoul (2013)

	Total	Natural Gas Vehicle Distribution (No. of Vehicles)					
		Until 2008	2009	2010	2011	2012	2013
Total	10,376	6,147	1,757	1,173	590	467	242
City Buses	8,750	5,414	1,396	1,044	396	332	168
Town Buses	1,049	487	214	85	100	100	63
Cleaning Vehicles	523	246	147	44	48	27	11
Tour Buses, etc.	54				46	8	
Program cost	350,996	215,158	49,818	37,636	19,328	16,326	12,716
(KRW 1 million)							

Low Emission Devices for Older Diesel Vehicles

Introduction

The capital area, which includes Seoul, Incheon, and Gyeonggi-do, is affected by the same atmosphere. To improve air quality, the Special Act on the Improvement of Air & Environment for Seoul Metropolitan Area was enacted in December 2003. The aim of this Special Act was to improve the air to the OECD city average of PM10 40μg/㎥ and NO2 to 22 ppm, to enable visibility of the Incheon coastline from Nam Mountain on a clear day. Investment of KRW 4 trillion was planned, which would include funding from the national coffers and local governments, over the 10 years from 2005 to 2014. Some 90% of the total budget for the low emissions program for older diesel vehicles was targeted to bring down the emission.

Target & Procedure

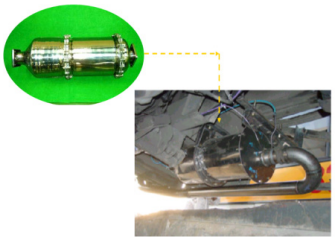
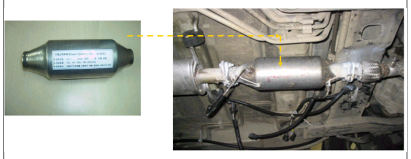
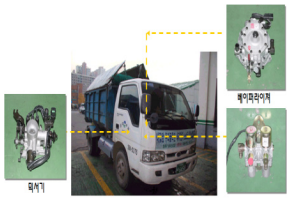
Of the diesel vehicles (excluding compact and passenger cars) registered in the metropolitan Seoul area, any vehicle that outlived the warranty period for particulate matters as stipulated in the Clean Air Conservation Act was prescribed as a "Particular Diesel Vehicle", to which emission requirements were strengthened.

Particular Diesel Vehicles could be used only once they satisfied the emission requirements in a complete test; if not, one of the following had to be chosen: retesting; installation of diesel particulate filters (DPF, p-DPF, DOC); engine retrofit for zero emissions; or removal of that vehicle from use.

For those vehicles choosing to add a diesel particulate filter, their smoke concentration had to meet the filter conditions; if not, the vehicle had to go through maintenance and testing until the concentration level met the conditions. Those vehicles that were to be terminated early need to have the smoke concentration come within the scope of the emission requirements of the operating vehicle.

Generally, medium to heavy duty vehicles need DPFs (Diesel Particulate Filters); medium-sized vehicles need p-DPFs (Partial Diesel Particulate Filters) or retrofit for zero emissions (LPG engine). For small vehicles, DOCs (Diesel Oxidation Catalyst) or retrofit for zero emissions (LPG engine) were necessary until 2009, with DOCs replaced by small p-DPFs from 2010 on.

Figure 6 - Types of Low Emission Devices for Older Diesel Vehicles

		
DPF	DOC	LPG Engine Retrofit
Traps and burns gas emissions with exhaust gas heat or other heat source (Emissions reduced by 80%)	Reduces gas emissions by pushing them through a catalyst-coated filter (Emissions reduced by 25%)	Diesel engine replaced with an LPG engine (Emissions reduced by 100%)

Support & Benefits

For those vehicles fitted with filters or retrofitted with zero-emission engines, 70 – 95% of the expenses were financed from the national and city budgets. As for early termination of Particular Diesel Vehicles, assistance was provided to eligible vehicles within an 80% range of the vehicle's residual cost within limits set by vehicle type.

Of this financial assistance, a portion for maintenance and management was deposited with the Korean Association for Automotive Environment. The device manufacturers would carry out maintenance, submit supporting documentation, and claim the costs, after which the Association was to verify the documentation and reimburse the manufacturer. For DPFs, the cost of maintenance covered by the Association included KRW 300,000 for annual cleaning and KRW 10,000 for call monitoring for the duration of the 3-year warranty. Those vehicles that participated in the low emissions program were given benefits such as exemption from environment improvement charges and the complete test. After filters were installed or the vehicle retrofitted, the vehicles had to be operated for a minimum of 2 years.

Follow-up after Fitting of Low Emission Devices

Follow-up is the most important factor in reducing diesel vehicle emissions. The City of Seoul was fully aware of this importance at the start of its low emissions program. It encouraged device manufacturers and formed its own follow-up inspection team to check filter operation on vehicles. Those vehicles that did not pass a performance test were required to improve the device, or remove the device if necessary.

Vehicles fitted with a filter could be serviced free of charge by the device manufacturers for the duration of a 3-year warranty. Vehicles fitted with DPFs could have their filters cleaned free of charge once a year at one of the 40 cleaning centers in the capital area, if the device continued to perform properly.

Except for accidents, force majeure, fire, theft, or inoperability, the vehicles must be in operation for at least 2 additional years. When the vehicles are taken out of use, the filtering devices must be returned to the Korean Association for Automotive Environment. Unless it was unforeseen or unavoidable, devices were not to be

removed during the mandatory 2 years of operation. Otherwise, all financial assistance had to be returned. This also applied if the devices were not returned to the Association.

Each device manufacturer has an after-sales customer service center and cleaning center that address device issues, complaints, and the need for improvements. Upon encountering a difference of opinion between the vehicle owner and the manufacturer during the after-sales servicing process, the City of Seoul intervenes to mediate.

The city also has its own inspection team that checks DPF performance. When the team finds any fitted device that emits 10% or more exhaust gas, the manufacturer is required to remove the device and return the subsidy.

In most cases, a DPF is proven to underperform and then removed because the vehicle in question did not meet the required conditions during its operation; in some other cases, the underperformance was caused by inadequate follow-up by the manufacturer and/or maintenance by the vehicle owner. Theoretically, a DPF reduces emissions by 80% or more. Even after the device is fitted, the vehicle owner should do his or her part to maintain this emissions reduction. When the device is removed, the benefits are also canceled. Owners are then subject to the environment improvement charge and mandatory emissions inspections, while the manufacturer is required to return the subsidy.

Timeline

Pilot Program

- 2003: Pilot program for LPG engine retrofit
  - Outcome: 135 vehicles (130 cleaning vehicles for public use, 5 vans for public use)
  - Assistance: full cost
  - Program cost: 50:50 by the City of Seoul and LPG Vehicle Distribution Council
- 2004: Pilot low emission program for diesel vehicles in operation
  - Outcome: 880 vehicles (vehicles for public use and city buses)
  - 280 vehicles (DPF); 150 vehicles (DOC); 450 vehicles (LPG retrofit)
  - Assistance: full cost
  - Program cost: DPF (100% from the national budget), DOC and LPG retrofit (50:50 from the national and city budgets)

Main Program

- 2005
  - Outcome: 12,130 vehicles
  - 7,789 vehicles (DPF); 1,490 vehicles (DOC); 2,814 vehicles (LPG retrofit); 37 vehicles (early termination)
  - Assistance: full cost

- Program cost: 50:50 from the national and city budgets

- 2006 –
  - Assistance: 70 – 95% of the device cost
  - Program cost: 50:50 from the national and city budgets

Mandatory Implementation

- 2008
  - Target: Particular Diesel Vehicles that are 3.5 tons or heavier in total weight and 7 years or older
  - Assistance: 70 – 95% of the device cost
  - Program cost: 50:50 from the national and city budgets
- 2009
  - Target: Particular Diesel Vehicles that are 2.5 tons or heavier in total weight and 7 years or older
  - Assistance: 70 – 95% of the device cost
  - Program cost: 50:50 from the national and city budgets

Table 8 - Low Emission Program Performance (2003 – 2013)

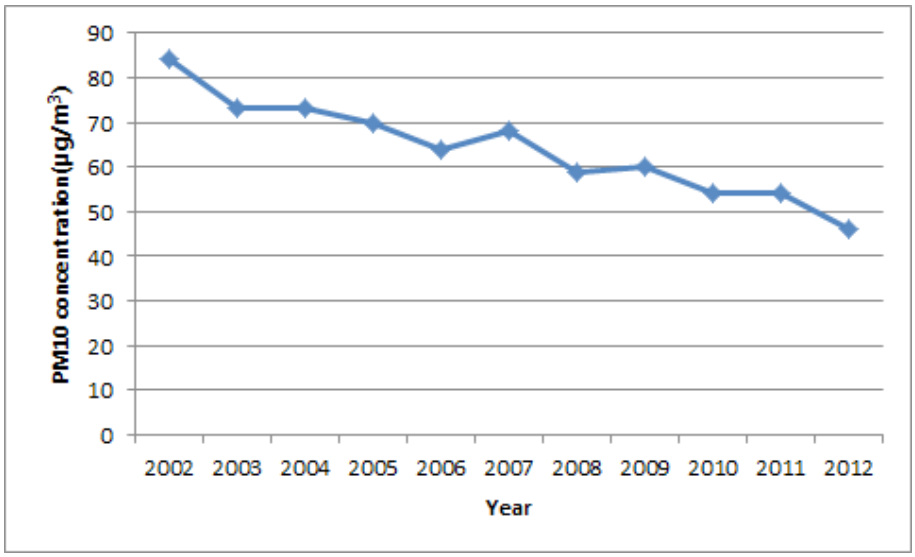
	Low Emission Program Outcome (No. of Vehicles)										
	Total	2003 – 2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Executed Amount (KRW 100 million)	7,351	41	720	1,189	1,262	948	893	800	570	472	456
(City budget)	-3,654	0	-360	-594	-631	-474	-446	-400	-285	-236	-228
Total (No. of Vehicles)	265,591	1,015	12,130	39,038	54,291	36,099	34,866	30,825	24,114	16,401	16,812
LPG Retrofit	68,111	585	2,814	8,714	14,285	16,452	14,027	7,922	2,074	961	277
Device/ Filter	142,907	430	9,279	29,715	34,201	9,796	11,709	17,461	14,961	7,617	7,738
Early Termination	54,573	-	37	609	5,805	9,851	9,130	5,442	7,079	7,823	8,797

Outcome & Implications

Benefits

Since the low emissions program was initiated in 2000, PM10 emissions from automobiles have decreased by 4 – 22% in Seoul. The PM10 levels measured at Seoul's roadside air quality monitoring network have steadily dropped since 2005, reaching 46μg/㎥ in 2012. This is even lower than the annual average standard of 50μg/㎥; air quality has been improved beyond the standard, not just at general air quality monitoring stations (41μg/㎥ as of 2012), but also at roadside. Moreover, the number of days when the density is higher than 100 μg/㎥ has decreased, while low-density days have increased. Pollution from fine particles is gradually lessening. In addition, the number of vehicles reported by people for serious emissions has fallen considerably. While the low emissions program is not the sole contributor to these improvements, it remains one of the largest.

Figure 7 - PM10 Levels at Seoul Roadsides



Source: Seoul Metropolitan Government, 2013, Evaluation Report on the Air Quality in Seoul in 2012.

Challenges

The low emissions program carried out so far has aimed to reduce fine particle levels. While it has proven effective to a certain extent in reducing such emissions, Seoul's nitrogen dioxide (NO_2) level remains above environmental standards and is not showing visible signs of improvement. Considering that a substantial percentage of NOx is produced by diesel vehicles, the low emissions program should focus on NOx as well as fine particles. The City of Seoul therefore launched a pilot project for PM-NOx filter devices to be installed on 44 older construction vehicles and heavy duty trucks in 2013. Should effectiveness be verified, the program will be pursued in earnest from 2015.

Figure 8 - PM-NOx Device on Bus: Before & After

Working principle: A DPF is attached to the exhaust vent pipe to reduce the fine particle emissions while injecting ammonia at the back to turn NOx into N_2 and H_2O and removing nitrogen compounds.

The city is also considering expanding the use of environmentally-friendly CNG hybrid buses which are highly fuel-efficient, cutting fuel consumption by 34.5% over regular CNG buses and saving approximately KRW 108 million in fuel over a 9-year operational period. Hybrid models were also found to emit 30% less in air pollutants. The city expects to introduce a "priority subsidy" and other incentives towards the purchase of hybrid buses.

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8. Integrated Energy Supply Program

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Policy Area: Environment

1. General

Background & Overview: Integrated Energy Supply in Seoul

The supply of integrated energy to apartment complexes in Korea began in Seoul. South Korea is highly dependent on other countries for its energy, and the supply of integrated energy is essential as it promotes energy conservation on a large scale to preserve the environment and reduce the burden on citizens.

When the Energy Use Rationalization Act was enacted in 1980, it included stipulations on the supply of integrated energy, but the method was very unfamiliar and required prohibitive investment in the early stages, making it impossible for ordinary entities to participate.

Being an extremely overpopulated city, Seoul was in dire need of residential apartments and needed to disperse its concentrated population. With the development of new residential land, Seoul became the first city in South Korea to adopt an integrated energy supply.

Toward the end of 1982, plans were devised to create a new built-up area in Mok-dong, something which was kept under wraps to prevent real estate speculation, under leadership of the late Kim Jae-ik (killed in the Aung San terror bombing incident), the former Senior Secretary to the President for Economic Affairs.

Provision of energy to La Défense (on the outskirts of Paris, France) was used as the benchmark for an integrated energy supply model.

As Seoul was the first South Korean city to adopt this model, the Ordinance on the Construction & Operation of the Integrated Energy Supply System was passed in 1983, and the Korea Energy Management Corporation (KEMCO), an institution designed to save energy, was commissioned with the task. Construction began in November 1983.

However, KEMCO had no experience to assist it in its new responsibility. For supervision, a reputable engineering company was selected in Europe, and the Design-Build method was used to choose a construction company. Construction finished in 1987.

Supply of Integrated Energy to Existing Apartments in Seoul

In 1984, the City of Seoul benchmarked overseas use of integrated energy in Copenhagen (Denmark), Helsinki (Finland), and Paris (France) for its integrated energy system in Mok-dong, convinced that the program could be applied to existing apartment complexes. Accordingly, the city and the central government jointly participated in the integrated energy project targeting 38,000 apartment units in Yeouido, Dongbu Ichon-dong, and Banpo. For this, a separate legal entity (today's Korea District Heating Corporation) was set up, the city's share of which was 27% (approximately KRW 3 billion).

The KDHC initiated construction in November 1985, with work progressing smoothly until November 1987. Before the Olympics in 1988, all heating piping was complete.

1991 – 1994: Replacement of Fuel with LNG & Concurrent Servicing; Expansion of District Heating to Existing Apartments

From 1991 to 1994, apartment complexes were to shift from bunker C fuel to LNG, depending on their size and age, pursuant to the Environment Minister's decree. Accordingly, apartments in Gangnam, Seocho, and Songpa that adopted the central heating system lodged a request with the City of Seoul and the Ministry of Energy & Resources that district heating be expanded beyond Mok-dong, Yeouido, Ichon, and Banpo.
Furthermore, Seoul decided to supply integrated energy as was being done in the new areas of Mok-dong when it set up a body in charge of new site developments in Gayang, Banghwa, and Deungchon (Gangseo-gu), Daechi and Suseo (Gangnam-gu), and Shinnae (Jungnang-gu), and began to build apartments for lease.
The supply of integrated energy rose substantially as a result of the Environment Minister's decree mandating the switch to LNG and as new development sites expanded in Seoul.
By 1995, integrated energy was supplied to a total of 170,000 households in Mok-dong, Gayang, Deungchon, Banghwa, Nowon, and Jungnang; with the supply of integrated energy to the newly developed cities in the Seoul metropolitan area such as Bundang, Pyeongchon, Ilsan, Bucheon, and Jung-dong, the coverage of district heating was expanded to include 120,000 households in the Bundang-Seoul and the Daechi-Gangnam-Seocho-Banpo-Ichon-Yeouido lines. A decade ago, Seoul was already supplying district heating to some 290,000 households.

Nanjido Landfill Site Rises as a Key Commercial Center

The City of Seoul began a project to transform Nanjido, a landfill for some 30 years, and its environs into an attractive commercial and residential area with a park. The city benchmarked Orange County, Los Angeles (USA) where a landfill became a commercial/residential area that would later be a desired LA location.
In 2000, Seoul extracted the landfill gas and used it to fuel the integrated energy facilities as a way to stabilize the foundation and remove odor. Gradually, integrated energy began to upgrade the quality of life for Seoul residents.
As of the end of December 2013, half a million households used district heating. Following is a history of this move.

2. District Heating Supply by Gu District Office (13 Offices in Seoul) (As of December 31, 2013)

Table 1 - Areas Supplied by the KDHC: 261,591 apartment units and 255 buildings under the jurisdiction of 7 gu district offices

	No. of Households	No. of Complexes	No. of Businesses & Public-use Buildings
Gangnam-gu	85,299	135	65
Mapo-gu	15,373	27	38
Seocho-gu	47,780	77	15
Songpa-gu	75,342	64	28
Yeongdeungpo-gu	10,024	25	97
Yongsan-gu	12,923	35	6
Eunpyeong-gu	14,850	39	6
Subtotal	261,591	402	255

Table 2 - Areas Supplied by SH Corporation: 241,051 apartment units and 258 buildings under the jurisdiction of 6 gu district offices

Category	No. of Households	No. of Complexes	No. of Businesses & Public-use Buildings
Yangcheon-gu	56,869	89	138
Gangseo-gu	52,543	59	73
Guro-gu	2,247	4	-
Nowon-gu	96,705	81	21
Dobong-gu	14,702	11	4
Jungnang-gu	14,985	16	22
Subtotal	241,051	260	258

3. 1983: Construction of a New Town in Mok-dong & the Supply of Integrated Energy

New Town in Mok-dong

In 1983, the City of Seoul selected the Mok-dong area, located 20 km to the west of the city center (City Hall), for a new site development project. The area was prone to flooding in the summer so few people lived there, making it easier to develop the site. Moreover, Mok-dong was fed by a branch of the Han River, and the

adjacent waterfront areas and basins had the potential to accommodate public sports facilities.
The framework of this plan was devised by the City of Seoul and the Office of the President (the late Kim Jae-ik as the Senior Secretary to the President for Economic Affairs).
In order to turn the flood-prone area into a new residential site for 34,500 households, the land needed a massive amount of earth. A hill in Shinwol-dong, Gangseo-gu, approximately 15 km away from the site, was used to source the required earth. On the new site, apartment housing was constructed to accommodate 2,500 households.

Progress in the Development of the Mok-dong Integrated Energy Plan

In 1983, South Korea did not have an 'integrated energy' supply system, but looked at the aforementioned European cities as benchmarks (plus Herning, Denmark). In the new town of Mok-dong, a resource recovery facility (waste incinerator) and a combined heat and power (CHP) plant were installed and a comprehensive energy supply plan established which also embraced renewable energy, such as heat from sewage.
Compared to the existing methods where individual units in apartments and commercial arcades install their own heaters, district heating required a hefty initial investment and was the subject of controversy between the program entities, including the City of Seoul. The conditions upon introducing district heating in Europe were therefore analyzed to compare with those in Mok-dong (see table below), with results showing that Mok-dong was an optimal place to introduce district heating.

Table 3 - Europe vs. Mok-dong: Introducing District Heating

	Unit	Condition	Mokdong Development Dis-trict in Seoul
Heating Degree Days	Heating Degree Days (18-18)	2,000 or higher	2,935
Heat Consumption Density	Gcal/K㎡h	20 or higher	38.2
Heat Transport Distance	Km	15 – 20 km	4.5 km
Heating Area	1,000 ㎡	1,200	4,600

Size & Location of Facilities

Incinerators and heat production facilities need to be detached from apartments, commercial arcades, and other residential and living facilities to allow easy access by vehicles carrying fuel or garbage and to minimize noise and odor from heat production. These facilities were therefore set up in the 22,000 pyeong (approx. 72,722 ㎡) area at the northern end of the Mok-dong New Town in order to pre-empt complaints from the community.
The size of the facilities should be adequate to meet the heat demand while minimizing initial investment.

Naturally, projection of demand is one of the most crucial factors. Because apartments were confirmed and sold by lot from the planning stage, it was easier to forecast the heat demand, but the buildings would be completed in different phases, even a decade after the first residents moved in. The range of building floor space ratio was great, from 300% to 900%, making accurate projections more challenging.

Despite such difficulties, the facility size was determined according to the coverage area for apartment/building heating in the Mok-dong New Town (3,367,770 ㎡) with a maximum heat load of 276.6 cal/h.

Since CHP plants require heavy investment, Mok-dong decided to limit heat production at 25% of maximum heat load, producing 20,000 kW/h in electricity and 42 Gcal in heat. Heat-only boilers were installed, taking into account peak demand in the winter months (heat-only boiler capacity: 140 tons/h × 2 units; 80 tons/h × 2 units).

Construction & Operation of Integrated Energy Facilities in Mok-dong

Back in 1983, Seoul had no experience with integrated energy systems. The City commissioned KEMCO with installation and operation of the facilities, a public organization that manages energy demand and energy conservation.

In December 1983, Seoul and KEMCO signed a commissioning agreement that KEMCO would build and operate the facilities for Seoul for the period between December 1985 and 31 December 1998.

Incinerator size was designed to handle 200 tons/day, disposing of all volume to be produced in the Mok-dong New Town. By 1996, the incinerators were changed to handle 550 tons/day.

Features of the Integrated Energy Facilities in Mok-dong

In Mok-dong, 'utility-pipe conduits' were installed for the heat production facilities and at user apartments, commercial arcades, and business buildings, instead of burying heat pipes underground. Heat pipes were then installed within the conduits so as to prevent traffic congestion or interruptions while replacing or repairing pipes in the future.

Furthermore, the insulation requirements were reinforced for the outer walls and foundations of general apartment and multi-household housing in 1983 as a way to promote effective energy conservation. The consumption in this area was therefore relatively lower than in housing built in the 1970s in Yeouido, and residents paid less for heating.

Installation & Operation of User Facilities

District heating came with automatic controllers in the machine rooms, such as plate heat exchangers and devices for external air temperature compensation. However, employees at the apartment management of-

fices had never seen such devices and were unable to operate them properly, creating a source of complaints from residents.

On June 7, 1986, the City of Seoul passed a city ordinance to have KEMCO, the supplier, maintain and manage user facilities, from machine rooms to thermal meters for each household.

From 1986 to 1992, maintenance was carried out in a redundant manner as KEMCO's responsibilities overlapped those of facility employees. Consequently, operating expenses, including labor costs, grew. During the time period under KEMCO management, apartment offices learned to operate the machinery, stabilizing the supply of heating. From April 10, 1995, maintenance and management of the resident-owned heating facilities was no longer carried out by the heat supplier but by the apartment resident representatives' council and the apartment office.

Expanded Heat Supply to Developed Sites in Gayang & Banghwa (Adjacent to Mok-dong)

In 1990, 4 years after integrated heating supply began to Mok-dong in November 1985, the City of Seoul established plans to develop new housing sites in Gayang and Banghwa and adopted Mok-dong's integrated energy model. To minimize investment in production facilities, heat-only boilers were installed, and Mok-dong and Gayang districts were connected by underground heat pipes.

By September 1992, heat was being supplied to 39,000 households in Gayang, Banghwa, and Deungchon; by 1995, this had increased to 73,600 households. As of 2013, district heating was supplied to 114,659 households in the areas under jurisdiction of the Yangcheon, Gangseo, and Guro-gu district offices.

Despite increasing heat demand in Gayang and Banghwa, additional CHP plants were not built; thus the operation rate of the heat only boilers was increased, which came with higher production costs, higher overall costs and higher heating bills.

In 2016, Seoul plans to add a CHP plant to the new development site in Magok-dong to enhance the supply from other CHP plants. GS Power will utilize waste heat from the plant and reduce production costs.

4. 1993: Integrated Energy Supply to Existing Apartments in Nowon, Seoul

Introduction

The positive effects of integrated energy (energy conservation, reduced pollution, lower heating bills, etc.) were confirmed in Mok-dong in 1985 and Yeouido, Ichon, and Banpo in 1987. Based on these outcomes, Nowon, with a concentration of apartment complexes, also adopted the system by way of the CHP plant,

including the use of waste heat from incinerators. District heating supply to Nowon began in conjunction with Shinnae sites in Jungnang-gu.
Pursuant to Seoul Mayoral Policy #456 in June 1992, the construction of integrated energy facilities was initiated, with plans to cover 102,500 households in 10 dongs (administrative zones) under the jurisdiction of 3 gu district offices, with heating supply beginning in December 1994.

Facility Size & Features

The CHP plant produced 37Mw in electricity while the incinerator disposed of 300 tons of waste a day. Learning from experience in Mok-dong, the incinerator site was located far from the housing site to pre-empt complaints from the residents.
Heat pipes measured from 20 mm to 750 mm in internal diameter; 70.5 km of heat pipers were buried (2 lines for a total of 141 km). Main heat pipes for haulage of 300mm or greater came with leak detectors for early detection and prevention of major leaks.
As with Yeouido, Ichon, and Banpo, Nowon also switched from central heating to district heating, with the apartment management offices maintaining and operating the user facilities, again potentially a cause for resident complaints. To avoid this, promotional activities were held and maintenance staffs at the apartment management offices were provided with free training at the early stages in 1995.

Effects of Integrated Energy Supply in Mok-dong & Nowon

As opposed to central heating, district heating significantly reduced energy use and air pollutant emissions (the latter by 25%). In addition to creating a pleasant environment, it allows residents to pay approximately 20% less than with central heating. The general preference for district heating is quite high.

5. 1987: Former Seoul Thermal Power Plant; Central Heating to District Heating; Integrated Energy

Introduction

Between 1982 and 1985, Seoul Thermal Power Plant, located adjacent to the Han River in Dangin-dong, Mapo-gu, Seoul, was refitted as a CHP plant to produce heat and electricity simultaneously, and plans were reviewed to switch the existing apartment heating to district heating.
In 1982, the Ministry of Energy & Resources commissioned a Danish engineering company called Bruun & Sorensen (via KEMCO) to conduct a feasibility test and create basic designs. A project entity was required

to conduct this project, but KEMCO was by its nature not-for-profit and therefore unfit for the district heating program. A separate legal entity was required.

On July 31, 1984, the South Korean government held an economic ministerial meeting in which the deputy mayor of Seoul also participated. Between 1985 and 1987, the central government planned to invest KRW 2.66 billion and the City of Seoul KRW 3 billion (for a total of KRW 5.66 billion) to create a legal entity; the Korea Electric Power Corporation contributed KRW 4.6 billion in kind for the transformation of the Seoul Thermal Power Plant. With this paid-in capital of KRW 10.26 billion, the KDHC was founded. The central government provided the payment guarantee, and a total of KRW 42.6 billion was procured for construction, with KRW 20.6 billion from the Asia Development Bank and KRW 22 billion from the Special Account Energy Fund.

Today's KDHC was therefore set up on November 1, 1985. On November 15, 1987, the district heating service began, supplying heating to 38,000 apartment households in Yeouido, Dongbu Ichon-dong, and Banpo.

Construction of Heat Production Facilities

Installed in 1968, the Seoul Thermal Power Plant was in operation for 22 years. It was then transformed to produce both heat and power. It was changed to extract steam from cross-over pipes going from central turbine to low-pressure turbine to heat the water in the heat exchanger of the DH pump station. Heated water was then pumped to Yeouido, Dongbu Ichon-dong, and Banpo at a temperature ranging between 75℃ and 115℃; heat was exchanged at the individual user level, after which the temperature would go from 65℃ to 40℃ and be recovered by the DH pump station.

In the beginning, only 375Mw were produced; after transformation of the Seoul Thermal Power Plant into a CHP system, the facility produced 283Mw of electricity and 391Gcal/h of heat.

Unlike some other types of heating, district heating requires an accumulator. An accumulator stores heat when it is not needed during power production, as peak demands for power and for heat do not always correspond. The temperature at which heat is supplied exceeds the boiling point of 100℃ and could potentially vaporize in the pipes. To prevent this, an accumulator was installed to maintain the pressure.

The capacity of the installed accumulators at the time was 20,000 ㎥, and was 36 m in height and 27 m in diameter. Temperature detectors were added at regular intervals to remotely detect temperature distribution from the top to the bottom of such accumulators.

Construction of Heat Pipe Facilities

Two rows of heat pipes were buried (for supply and recovery), each 52.3 km long. The pipes under the Han River between Mapo and Yeouido (1 km) were comprised of 3 rows (for supply, recovery, and backup). Backup pipes were added during the dry season, as the river is 10 m or deeper. The construction work entailed many difficulties as it was the first of its kind in Asia.

Heat pipes were pre-insulated; carrier pipes were steel and casing pipes were high-density polyethylene (HDPE). In between, polyurethane foam was used for insulation.

Should a leak occur in or out of the insulated pipes, it can be detected by the heat pipe monitoring cable, located at the center of the insulating materials. The non-compensated method was selected for the first time in South Korea, burying insulated pipes in the ground that do not compensate for temperature changes in the heating water. The pipes that cross the river were specially made 3-layer insulated pipes so as to prevent additional work.

In Yeouido, utility-pipe conduits had already been installed, and the existing pipes with power cables were used, adopting the compensated method. Yeouido is geographically in a loop, and loop heat pipes were used for better stability of heat supply. In Dongbu Ichon-dong and Banpo, diverging pipes were used to decrease investment costs.

Heat pipes were placed 1.2m from the ground surface; when there was storage, they were buried as close as 0.6m. If a 0.6m depth could not be met, protective measures were taken, such as using concrete pads.

Renovation of Machine Rooms at Existing Apartments & Other Buildings

With the existing central heating systems, heat was turned on intermittently (2 – 3 times/day) during the winter, with the heating circulator pumps needing repair or replacement. With the switch to district heating, new devices were installed such as plate heat exchangers, pressure controllers, and automatic devices for external air temperature compensation.

Main calorimeters were installed at some 200 machine rooms dispersed across Yeouido, Dongbu Ichon-dong, and Banpo to measure heat consumption at user point. The measurements were remotely taken and sent to the central control room at the Seoul Thermal Power Plant, enabling efficient supply of district heating in real time.

Technicians at the apartment management offices were not trained well in operation of the new devices in the machine rooms or with the 24-hour heating switch system. This resulted in excessive heating, with usage soaring by 30% in November 1987 year on year.

Experts were dispatched to 39 management offices to provide technical training on more efficient use of the heating supply, and district heating stabilized as the number of heating/circulator pumps was reduced.

Benefits

As a world first, a thermal power plant was refitted and central heating facilities switched to district heating facilities.

Generally, an integrated energy supply program is an urban infrastructure program that requires that most heat production and pipe facilities are built and installed in the early stages of the program, and the burden

from early investment is prohibitive. However, heat demand increases gradually, depending on when residents move in. As a general rule, there are operational losses for the first 5 or 6 years at least.

With the program mentioned herein however, heat was already being supplied beforehand to the target areas. There were operational losses in November and December of 1987 when the heat supply was first set in motion, but in 1988 and onwards, net profits accrued. The debt ratio was 400%, but there was no issue with the repayment of the ADB/Fund loans.

In terms of energy conservation and air quality improvement, the program was a great success. From 1988 (when the heat supply began in earnest) to 1993, district heating saved 533 TOE in energy over central heating; this translates into KRW 114.4 billion, a savings of nearly 50%. District heating also helped reduce air pollutants by 1,444,946 tons over 6 years – approximately 48% less on average per annum.

This 3-birds-with-1-stone effect was what helped 4 new cities in the capital area – Bundang, Ilsan, Pyeongchon, and Bucheon Jung-dong – to adopt the integrated energy system from the 1990s.

6. 1992 & 1996: Integrated Energy in Gangnam, Seocho, Songpa

In Gangnam and Seocho in Seoul, apartments were built mostly between 1975 and 1980 and were centrally heated. Particularly from 1990 to 1993 when the switch from bunker C to LNG became mandatory pursuant to the Environment Minister's decree, these apartments did not switch to LNG but to district heating.

In 1991, the City of Seoul reviewed district heating in its plans to develop Suseo and Daechi. As a result, a 90,000 kW CHP plant began construction in the new city of Bundang, 16 km away from Suseo. Two rows of heat pipes were installed between Bundang and Suseo, and contingency heat-only boilers installed in Suseo. This project embraced new development sites in Gangnam, Seocho, and Daechi, and supply of district heating was approved by the Minister of Energy & Resources.

As a result of this approval, district heating was supplied to the existing 85,000 households in Apgujeong and Seocho, as well as 15,000 households in the new apartments in Suseo and Daechi – about 100,000 households in total.

By 1996, Songpa faced collective complaints from the residents of the existing centrally-heated apartments in Jamsil Jugong Complex 1 – 4, waiting for reconstruction, and in Munjeong-dong, who were demanding district heating.

Korea City Gas (currently Cowon Energy) strongly objected, fearing that the demand for heating LNG would drop, but centrally-heated apartments that used LNG ultimately opted for district heating, as residents were well aware of the advantages of the new system.

Accordingly, the KDHC installed heat-only boilers at the heat sources in Suseo and Irwon. Waste heat from the incinerator covering the Gangnam area was used to supply district heating to some 120,000 households.

7. 2001: Use of Nanjido Landfill Gas & Integrated Energy Supply to Sangam, Mapo-gu, Seoul

Introduction

Seoul had plans to turn the Nanjido landfill into a park. It also planned to use the gas collected from the landfill for district heating; as for the waste heat from the incinerator (resource recovery facility) in Nanjido, Seoul reviewed plans to use it for district heating at the Sangam site in Mapo-gu (facilities related to the World Cup Stadium), and multi-household housing in Seongsan.

In line with these plans, the KDHC proposed to bury heat pipes in Seoul, connecting Ilsan (Goyang) to the Seoul Thermal Power Plant in Mapo (Seoul) and further ensuring connection to Nanjido and Sangam, ultimately winning approval and beginning construction of heat production facilities in Sangam in March 2000. These were completed by the end of November 2001, and were the first to supply district heating through the use of landfill gas.

It is worth noting that at Digital Media City (DMC) in Sangam-dong, Nanjido heat production facilities used district heating to produce cold water (4C°) which was supplied via 2 rows of pipes to the corresponding buildings, creating a new type of heating and cooling system.

To produce this cold water, an ice storage system, district cooling circulator pumps, turbo chillers, and absorption refrigerators were put in place on July 31, 2006. Heat pipes were completed between March 2000 and the end of June 2003.

8. Connecting 11 Heat Production Facilities in Metropolitan Seoul to Maximize Energy Efficiency

In 2008 and 2009, the KDHC launched commercial operation of the 530 mW CHP plants in Paju and Hwaseong, thereby completing the 99 km long main heat pipes for haulage that connect Paju - Goyang – Sangam (Seoul) – Seoul Thermal Plant - Yeouido - Dongbu Ichon-dong - Banpo - Seocho - Gangnam - Songpa - Bundang - Pangyo - Gwanggyo – Suwon Yeongtong – Hwaseong. An integrated operation center was founded to provide integrated supply of heat.

This system enables 11 facilities to maintain their heat production as economically as possible, based on data such as yearly external air temperatures, power demand in Korea, and the heat demand in corresponding areas. Some 1.01 million households in Seoul and the capital area benefit from this stable, affordable source of district heating.

As of 2013, energy savings totaled 704,643 Gcal, with residents paying 4.9% less for heating, tantamount to KRW 46.6 billion saved. The financial burden lessened, as did the burdens on air quality and the environment.

Plans for the future include wider connection of the metropolitan Seoul area, such as the 4 km segment between Yeouido and Mok-dong, or Mapo and Nowon.

9. Implications & Evaluation

Of the 10 million people in Seoul, 2 million use district heating, supplied by 2 public organizations, one of which is the City of Seoul.

So far, integrated energy has helped decrease energy use by 30% per annum and reduced carbon dioxide emissions by 40% and pollutants (e.g., nitrogen oxide) by 25%.

Compared with individual heating where separate heaters are installed for each household, district heating users pay 20% less in heating per year.

Those apartments adopting district heating since 1989 have thermal meters and temperature controllers at home, allowing residents to save more energy as they see fit. More households are able to control their home environment, as is often the case in advanced nations.

In the meantime, Mok-dong and Nowon have a small CHP plant (less than 100 MW), and pay approximately 8% more (in winter) than those homes that are connected to a large CHP plant (100MW or greater). Comparatively, this results in a chronic operational loss.

The City of Seoul therefore plans to address these issues by securing heat from larger adjacent plants via heat pipes as soon as possible.

10. Overseas Applicability

For the 32 years between 1983 and February 2015, South Korea has had a wealth of experience with integrated energy. This can be invaluable in applying the system in major central and western Asian cities.

As a first step, Seoul would do well to invite civil servants from cities in Uzbekistan, Kyrgyzstan, Sri Lanka, India, and Bangladesh and share its experience of the last 3 decades.

In the meantime, Seoul may also consider new land site development projects in overseas cities and invest in their integrated energy infrastructure. These projects can be funded by payments in minerals and other resources in kind, or through loans procured from the IBRD or the ADB.

9. Restoration Plans for Cheonggye Stream & the City Center (2002 – 2006)

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Policy Area: Environment

Background

Cheonggye Stream: Past & Present

With the birth of the Korean dynasty of Joseon and its decision to move its capital to the current location in October 1394, Seoul has served as the nation's political, economic, social, and cultural hub for over 600 years. Cheonggye stream is 10.92 km long and is made up of branches of water from nearby mountains and valleys, cutting across the city from west to east. Throughout time, it has been closely related to the formation of history, culture, and the daily lives of Seoul residents.

The construction work to uncover the covered Cheonggye stream began in 1958; by 1961, in 4 different projects, the pavement was removed from a total of 2,358.5m. At the time, the stream was full of rubbish, responsible for an overpowering stench as well as blighting the city landscape. With the lack of inner-city roads to accommodate the growing number of cars, building roads around the stream was seen as a way to improve the situation.

An overpass (5.65 km long, 16 m wide) was built over Cheonggye Stream Road between August 1967 and August 1971, and the stream was fully uncovered by December 1977. A project that had begun in 1958 to uncover the stream was finally completed after almost 2 decades.

After the construction of Cheonggye Overpass, Cheonggye Stream Road and its vicinity witnessed a boost to commerce and business, starting from retail and wholesale markets, which became the driving force behind the city's industrial development.

Now that 30 – 40 years have passed since the construction, the buildings built near the overpass have deteriorated and are in need of complete overhauls and rebuilding. Furthermore, diverse and complex industrial networks were in the locality, but the deteriorated buildings and poor environment led to a decrease in de jure population, which in turn stunted local development.

Push Factors behind the Cheonggye Stream Restoration

Congestion in the City & Excessive Through Traffic

Before the restoration, the Cheonggye stream area had a 5.4 km long structure for the uncovered Stream; the 5.86 km long Cheonggye Overpass; and an 11 km long extension of intersecting pipes. Traffic volume was more than 168,000 cars daily (a heavy concentration), 62.5% of which were just passing through.

Environmental Degradation, Air Pollution, & Noise

Air pollution measurements near Cheonggye Stream Road revealed a very poor situation. General pollutants, except for fine dust (PM10), exceeded the Seoul average; nitrogen oxide levels exceeded Seoul's air quality standards. Of the carcinogenic volatile organic compounds (VOC), benzene levels were especially

high. Demands grew louder for improvements to be made to the area.

Damage to Historical Heritage

Under the Cheonggye stream structure remains Gwanggyo and other items of ancient heritage. Supyogyo was moved to Jangchungdan Park, and only a part of its original structure can be seen. According to historical records, the stream was embanked on either side for better waterway control, and there are records about stonework as well. However, it is believed that much of such ancient stonework was lost during the uncovering of Cheonggye stream.

Reduced Competitiveness

Such issues as traffic, air pollution, and building deterioration in the Cheonggye stream area, significantly dulled the competitive edge of the Gangbuk center. In the past decade, the de jure and employed population dropped by 50,000 and 80,000 respectively; the number of business headquarters is only 63% of those in Gangnam.

Gangbuk center redevelopment plans failed to attract private capital; the vulnerable urban industrial structure became one of the major causes of Seoul's degrading competitive edge as the hub for Northeast Asia. Gangbuk's finance and business functions (12.5%) fell far short of the sub-center in Gangnam (27.0%). In Gangbuk, small, non-urban traditional manufacturing businesses were heavily concentrated, while knowledge-based industries in particular did not grow as had been hoped.

Low Growth Potential of the Northeastern Zone

When Seoul is viewed in 5 geographic zones, the Northeastern Zone had relatively fewer jobs, and its inbound against outbound travel was 0.8 – the lowest in Seoul. Because of the spatial mismatch between housing and jobs, the average daily distance traveled is the longest (at 34.6 km) with a travel time of 64.2 minutes – the highest of all 5 zones. Due to such inconvenience, area real estate is the cheapest in Seoul, 17.3% less than the city average.

Pull Factors behind the Cheonggye Stream Restoration

Restoration of Natural Environment & Improvement of Quality of Life

The key to restoring Cheonggye stream was to create an eco-friendly environment: clean and habitable for life in and around the water. On either side of the restored Cheonggye stream, 2-lane (one-way) roads would be built, a bridge that would connect the north side of the stream to the south side, and bicycle and pedestrian paths by the riverside, providing space for leisure and rest. With the Cheonggye Stream Restoration Program, plans were developed to expand the green belts to 1 million pyeong (approximately 3.3 km^2) in area and secure access roads to the Han River.

Restoration of Historical & Cultural Heritage

The restoration of Cheonggye stream is meaningful in that it boosts the sense of pride that residents have in the city as the center of history and culture. Excavating and restoring historical relics in the Cheonggye stream area signifies that Seoul was and is indeed the center of history and culture. Historical and cultural restoration goes hand in hand with Cheonggye stream restoration as the latter provides a place to rest and relax (as a park area) and admire and experience some history and culture.

Promotion of Economic Revival

Taking advantage of Seoul's geopolitical benefits (Seoul can be reached within 3 hours by air from some 43 cities with 1 million or more in population), the Cheonggye Stream Restoration Program has the potential to assist the city in becoming one of the most important hubs in Northeast Asia where conditions and environment are favorable for multinational companies and other businesses.

Some parts of the Cheonggye stream area are to be designated as foreign investment zones, providing tax benefits and "one-stop" services on business permits. Other measures under consideration include building international schools, international communities, and employment assistance for spouses of employees with multinational companies.

Shift to More Sustainable Development

Seoul has a blueprint for use of the city resources for tourism, which includes restoring Cheonggye stream and building public squares and a cultural/tourism belt within the boundaries of the ancient Four Gates of the city. Based on these programs, the city aims to achieve the following:

- Create "history zones" to boost history education in a more natural setting;
- Expand the commercial zones and improve public awareness of the benefits of pedestrian traffic over vehicle traffic;
- Increase the city's competitiveness by reinforcing the tie between commerce and restoration of its historical heritage;
- Revive traditional culture, restore damaged historical assets, and return those alienated; and
- Make the city center more environmentally-friendly, with natural waterways and eco-friendly spaces.

To respond to rising demands and the shift from physical development-oriented approaches of the past to a sustainable development approach, restoration of the stream also sought to reflect the voiced desires of residents of Seoul who want the city to return to its old, environmentally-friendly ways. The restoration was deemed significant as it reminded the public and the nation of the importance of a natural environment.

Development of a Future-oriented Urban Environment

Restoration of the stream was the city's attempt to prepare for a new era where the significance of a natural environment is recognized. "Future-oriented" refers to an urban environment where nature is at peace with the local community. Restoration of the stream is the starting point where the community begins to find

ways to coexist with nature and make the city greener.

Public Voices and the Cheonggye Stream Restoration

Role of the Media

The media can promote the necessity for and direction of the programs for successful implementation and effective conflict management. It can promote positive aspects while correcting misinformation to help clear up negative views. Ultimately, the media can help facilitate program implementation. In the Cheonggye Stream Restoration Program, the media was utilized to raise public awareness and deliver accurate, objective information.

Voting & Public Discussion

The Cheonggye Stream Restoration Program involved a voting process, opening the door to public discussion. Because of this, the voting process value as a policy was acknowledged.

As stream restoration became one of the core issues in Seoul mayoral elections, the candidates engaged in fierce debate, the process of which tested the feasibility of the policy. The core focus of the debate was placed essentially on the basic direction of the restoration program and on the resolution of issues (finance and other general matters such as vendors, traffic, etc.) that may arise.

Table 1 -The Cheonggye Stream Restoration Program: Views of Seoul Residents

Category		Ratio
Ideal Image of Surrounding Environment after Cheonggye Stream Restoration	Environment/Eco-friendly Streets	59.60%
	Cultural/Artistic Streets	24.20%
	Shopping/Fashion Streets	10.20%
	Finance/Business Streets	4.00%
Most Important Element to Consider in Cheonggye Stream Restoration	Environment & Ecosystem	39.40%
	Pleasant Space to Rest & Relax	25.80%
	Cityscape	22.80%
	Revival of Local Economy	11.20%
Greatest Stumbling Block to Cheonggye Stream Restoration	Opposition by Small Vendors	31.80%
	Traffic Congestion	31.40%
	High Cost of Restoration	27.80%
	Lack of Willingness by the City of Seoul	6.40%
	Opposition by Residents	2.20%

Cheonggye Stream Restoration Program: The Process

Under leadership by the Civic Committee for the Restoration of Cheonggye Stream, opinions on the restoration project were collected from the general public, relevant experts, and interested parties. Feasibility tests were conducted and basic plans were developed which involved a careful review of the restoration methods and approaches.

Restoration required close cooperation between the city government and relevant local district offices. Each of the 4 gu district offices – Jongno-gu, Jung-gu, Seongdong-gu, and Dongdaemun-gu – installed a temporary body related to the restoration to develop a system for collaboration, such as through a city/gu district council, and to discuss details (preliminary tests, resident opinion surveys, etc.). In addition, 25 other gu district offices also joined in the efforts to promote the program to the public, provide adequate employee training, and so forth.

Development of Governance & Assignment of Roles

Cheonggye Stream Restoration Headquarters

In the early days, the Cheonggye Stream Restoration Headquarters was under the Vice-Mayor 2nd for Administrative Affairs, comprised of one headquarters and 2 teams. The director of the headquarters was of Class Ga (commensurate with Class 1), and the head of the countermeasure organization of each field was held concurrently by the director or chief of the corresponding office. In consideration of the program schedule, a temporary body was set up which would later become a regular organization.

On July 2, 2002, the Cheonggye Stream Restoration Headquarters began its work with the election of the new mayor. On July 13, 2002, one Administrative or Facility Director (Class 2 or 3) was added to the office of the Headquarters Director to facilitate the restoration program. As for the staff of Class 4 or lower, the job series would be partially altered and 4 staff members would be added as needed over the course of the program after assigning 33 members in Phase 1. On July 20 a new position was added, "Special Advisor for the Cheonggye Stream Restoration Program", to be placed directly under the mayor. The Headquarters would be placed under the Vice-Mayor 2nd for Administrative Affairs, with the Special Advisor concurrently holding the position of Headquarters Director. The original organization of 1 headquarters and 2 teams was altered to 1 headquarters, 1 department, and 3 teams to assist restoration planning.

The fact that the City of Seoul continued to reinforce the Headquarters organization indicates that it emphasized the role of the Headquarters in carrying out the program, to reinforce the governance system.

The Headquarters appointed a permanent committee under the city council to enact an ordinance that would enable installation of the Civic Committee and secure a budget, endeavoring in different ways to maintain good relations with the city council. In response, the City of Seoul requested 3 of 9 committees under the Seoul City Council to operate and manage the permanent committee related to stream restoration. On July

18, 2002, the city paid a visit to the head of the Operating Committee and explained the restoration program, asking for matters to be discussed and adjustments to be made at the city council.

Civic Committee for the Restoration of Cheonggye Stream

On September 12, 2002, the Civic Committee was established pursuant to Ordinance #4032 "City of Seoul Ordinance on the Establishment & Operation of the Civic Committee for the Restoration of Cheonggye Stream".

The Civic Committee was led by 2 chairpersons – the mayor and a chairperson from the private sector – and 3 deputy chairpersons. The Committee's responsibilities included deliberation and decision-making on program plans, and was comprised of a main committee of 30 civic representatives from different backgrounds to review and pass resolutions at the top level; a planning committee (15 members) to mediate between subcommittees and determine what items needed to be brought to the main committee; and working level subcommittees comprised of experts to study, investigate, deliberate, and decide on matters in their respective fields.

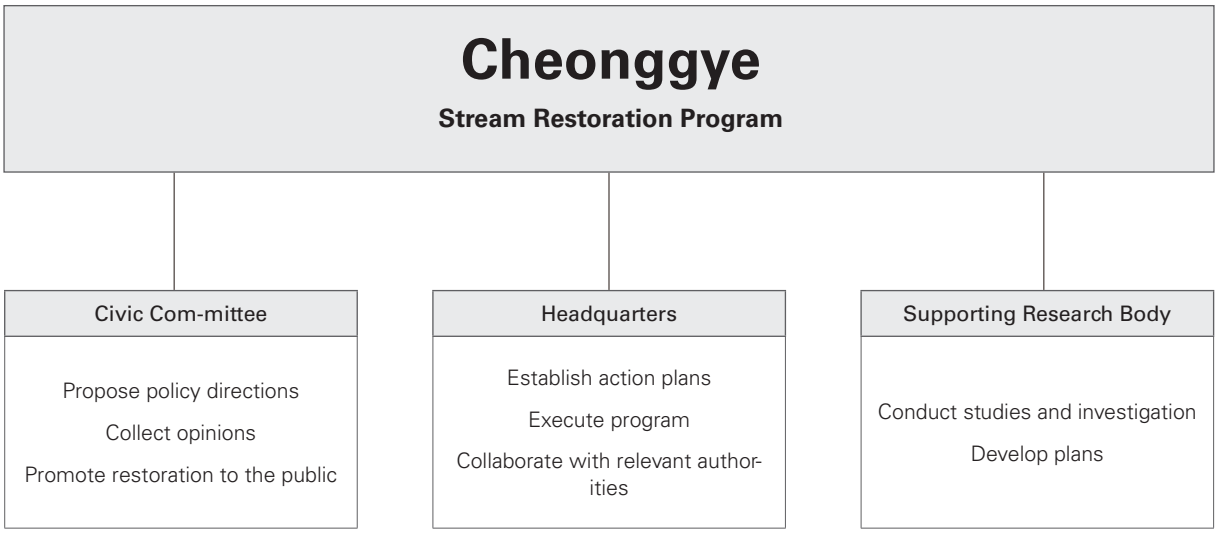
Supporting Research Body for the Restoration of Cheonggye Stream

The Supporting Research Body for the Restoration of Cheonggye Stream was a temporary organization of the Seoul Development Institute, founded in order to work with industry, academia, government, and research bodies to conduct studies, analyze data, and develop basic plans for the success of the stream restoration. It was launched on July 1, 2002 and was active for 36 months until June 30, 2005.

The research body held various discussions and debates (debate on the restoration held by the Research Institute for National Security Policy, the Ahnmin Forum debate, Cheonggye Stream Restoration Seminar for the Future of Seoul, International Symposium on Cheonggye Restoration,
etc.) to promote stream restoration.

Once or twice a month, the research body held an experts' seminar or meeting (on air pollution and its damage to the human body, restoration program process management, and conversion of environmental elements in financial terms) to seek advice as needed. While conducting various studies, the research body was engaged in activities to promote and deliver accurate program information based on academic research, both nationally and internationally.

Figure 1 - The Cheonggye Stream Restoration Program: The Process



Source: Cheonggye Stream: Dreams & Hope of Seoul (2003), Seoul Metropolitan Government.

Conflict Resolution

Traffic

Some of the greatest conflicts of the restoration program involved traffic and vendors. Of these, the traffic issue was used most significantly to lambast the program. It was claimed that restoring the Cheonggye roads and overpasses, the main pillars of the urban transportation system, to give way to a natural waterway would precipitate congestion. Some traffic experts and civic groups were opposed to the restoration program, fearing that it might cause inconvenience for residents. As part of a resolution to potential issues in the restoration, an option was developed to be implemented alongside the restoration program that would allow modification of the public transit system and minimize congestion and confusion.

During actual restoration work, there was potential for the construction to undermine the business activities of the local vendors. To minimize any such interruption, plans were developed to create a space where vendors could park or load/unload freight. Various other actions were also taken to resolve potential problems related to traffic.

Vendors

Local surveys and research were conducted to learn more about the status of the commercial and business zones in the restoration area to facilitate effective response to potential complaints. Furthermore, the Cheonggye Stream Promotion Center was opened, and an onsite customer center installed at Dongdaemun Market which provided consulting to some 7,200 people. Promotional activities were held and opinions gathered at-site as well. One conflict resolution example from the restoration program was the "4,200 Meetings". Through this event, and as soon as the Cheonggye Stream Restoration Headquarters began operations, its

executives and staff began to visit the commercial districts, relevant groups, and the site to brief interested parties on the program and receive their input.

The official negotiating body was the Policy Council, providing a channel of conversation between the City of Seoul and the merchants' association in the Cheonggye area. It was a practical body that helped negotiate on public interest issues such as compensation, reaching agreements, and operation and management after completion. The Council also played a significant part in conflict resolution.

Table 2 -The Cheonggye Stream Restoration Program: Vendor Issues & Resolutions

Minimize business interruption	· Limit construction work to width of Cheonggye Stream Road · Secure 2 lanes on either side of Cheonggye Stream Road and space for business. · Build a parking lot at Dongdaemun Stadium, operate free shuttle buses during construction.
Revive commerce in and around Cheonggye Stream area	· Provide financial assistance for building remodeling and work conducted to improve the environment at traditional markets (up to KRW 800 million). · Provide loans for redevelopment conducted to modernize the market (up to KRW 10 billion). · Provide loans for management and stability of small companies and vendors (KRW 360 billion in the following 4 years).
Help businesses desiring to move	· Provide administrative and financial assistance to vendors to move to their desired regions. · Pursue plans to develop a distribution site (approx. 150,000 pyeong / 3.3㎡) in Munjeong District.

History & Culture

Although different opinions were heard and collected, restoration of historical and cultural heritage was not to be decided on solely by the City of Seoul. Consequently, the Cultural Heritage Administration decided to lead heritage restoration upon completion of studies on the Cheonggye stream restoration area.

Division of Jobs & Collaboration

In a modern society with complex demands on leadership to meet various conflicts and challenges, one ideal type of leadership that is equipped with appropriate mechanism, requirements, and developments would be transformational in its nature.

Transformational leadership best promotes organizational effectiveness and provides the role and mechanism for resolving the complicated conflicts of modern society. Democratic, creative, and entrepreneurial types are the leaders best able to provide these things. In pursuing the Cheonggye Stream Restoration Program, the leadership model that was in effect in the process of conflict management was pushed ahead with 2 main systems – political (the mayor and Headquarters) and governance (the Civic Committee) – driven by collaboration and division of responsibilities.

Summary of the Cheonggye Stream Restortation

Nature of the Restoration

The Seoul city government sought to return to the city a restored Cheonggye stream and its natural waterway – a source of life – and help the ecosystem in the urban climate to return to self-sustainability. Based on the following directions, the restoration program aimed to be a "space creation" program where the city's residents can enjoy the 'vivacity of a friendly Seoul'.

1) There are 3 major axes of time to confer diversity on the restored areas: history (tradition), culture (modernization), and nature (future);
2) "History" and "tradition" were the key starting points over the next 2 km segment; from 2 km to 4 km "culture" and "modernization" would be the main themes; and from 4 km onward "nature" and "future" are the key ideas; and
3) These 3 segments include 8 points of key vistas, to which the ecosystem/street modules are applied.

Figure 2 - Cheonggye Stream

Introduction to the Cheonggye Stream Restoration Program

- Period: July 2003 – December 2005 (2 years 6 months)
- Spatial Scope: The 5.84 km segment from a point on the Cheonggye Stream Road (Sejong-ro – Dongdaemun – Shindap Railroad) in front of the Donga Daily building to Samil Road and its surroundings
- Time Scope: Starting year (2003), interim target year (2008), long-term target year (2013)
- Cost: Before restoration began, construction was estimated to cost KRW 349,423,000,000; however, this increased during construction due to design change, price changes, and additional tasks.

Table 3 - The Cheonggye Stream Restoration Program: Costs

(Unit: KRW 1 million)

	2002	2003	2004
Total	354,400	357,692	379,307
Design	12,700	2,097	2,097
Construction (Fa-cilities)	331,200	345,063	366,358
Compensation (Land Purchases)	-	2,706	2,706
Supervision	9,900	7,226	7,546
Installations	600	600	600

Sequence

The sequence for the Cheonggye Stream Restoration Program consisted of: feasibility tests on the program and development of a basic plan; expert advice and public opinion for open discussion on the restoration; basic and detailed designs for the restoration; removal of Cheonggye Road and Overpass; then the restoration itself.

To facilitate the restoration plans, the City of Seoul formed a collaborative network of citizens, experts, and interested parties, thereby ensuring effective conflict-resolution and management of the construction.

Figure 3 - The Cheonggye Stream Restoration Program: Sequence

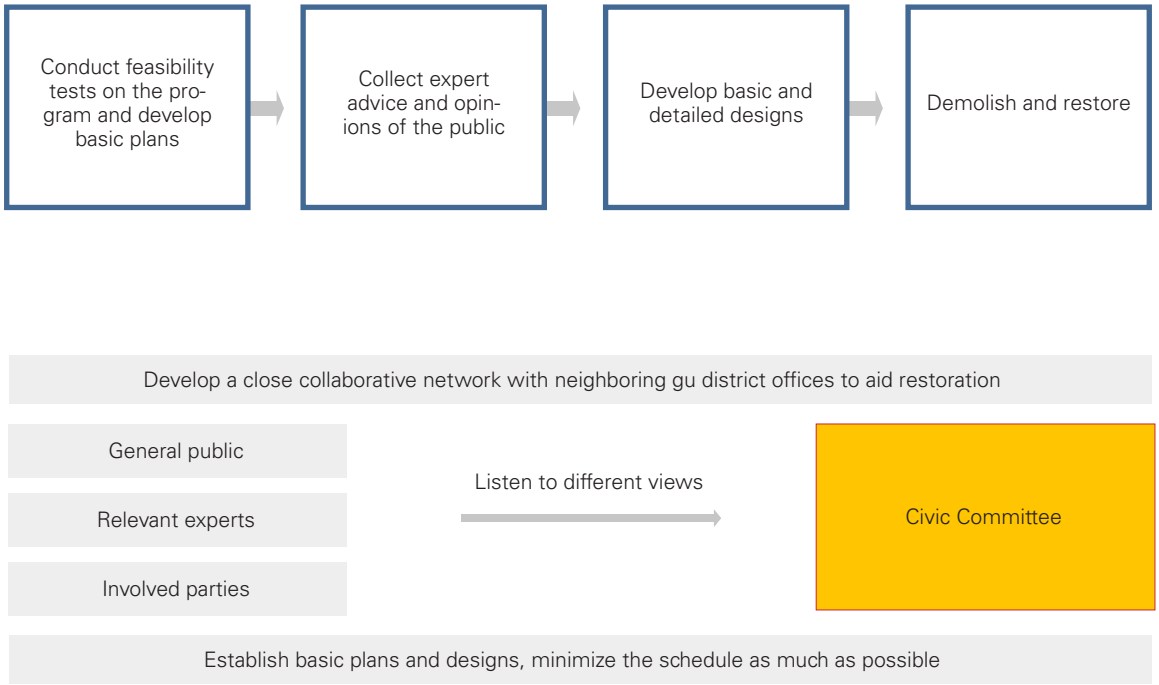


Figure 4 - The Cheonggye Stream Restoration Program: Sequence

Benefits & Evaluation of Outcome

Benefits

• Program Monitoring

Changing Public & Vendor Awareness

A survey on the Cheonggye Stream Restoration Program indicated that 7 out of 10 responding Seoul residents (66.8%) thought positively of the program, saying that it had been carried out as planned. A majority (77.6%) also thought future developments would be positive. However, some pointed out a greater loss in sales as the restoration program reduced demand. Metal/machining, manufacturing, and retail/wholesale were particularly affected by this loss in sales and overall reduction of the market for their goods.

Urban Planning

Land, construction and transaction prices in the stream area after the restoration were affected by the overall sluggishness in the market of 2004. Considering that land transactions and construction on and around Tehran Avenue in Gangnam dropped significantly, the city center and the Cheonggye area were less affected by the fluctuations of the market and tended to maintain the status quo, proving more competitive in relative terms.

Urban Industry

According to an analysis on the effect of the restoration on industrial activities in the stream area, the chang-

es in operating profit and loss were most prominent while changes in business methods, size, and logistics were relatively minimal. No conspicuous change was observed in terms of rent and land prices.

Traffic

Monitoring in the morning and afternoon on city center roads as part of the traffic LOS analysis 5 months before and after restoration, showed that average travel speeds remained similar at "E" and "F" respectively. It was also found that the standard deviation of daily speed changes gradually decreased and traffic patterns entered a stable phase despite the ongoing construction.

In terms of bus users (the number of transport card uses), there was no noticeable change immediately after restoration but had risen by 11% year on year after the public transit system was modified. The number of metro and subway users rose by 6.0% in all of Seoul, and by 13.7% in the city center.

A survey of vendors operating near the stream indicated that most complaints were related to the new parking space for business owners, demonstrating a strong demand for more such facilities on Cheonggye Road.

Environmental Change

Monitoring of air in the Cheonggye area and other areas in Seoul showed that general air pollutant concentration was on the decrease overall. Compared to the period between July and October of 2002, the concentration of fine dust fell from 60㎍/㎥ to 55㎍/㎥ in the monitored area despite the construction. The removal of Cheonggye Overpass helped limit the number of vehicles entering the city center by 2.3% while helping increase the use of public transport such as buses (up by 1.4%) and metro/subway (up by 4.3%; 430,000 on daily average). Restoration was found to have had a positive impact on air quality and the environment in general.

Measured temperatures also dropped by 10% ~ 13% when water flowed in Cheonggye Stream. For instance, when the temperature was 30℃ on a summer day, the area would be cooler by 3 to 4℃. Before restoration, the average temperature near the Stream was 5℃ or more greater than the Seoul average, but the removal of the overpass opened up a wind path which, combined with the presence of flowing water, dropped the ambient temperature.

The major factors that brought the average temperature down around the stream include water flow, reduced number of vehicles, and the natural wind corridor after the removal of the overpass. As the aquatic plants and trees planted in the area grow, the green zone is likely to expand, substantially mitigating the "heat island" effects.

Analysis of "before and after" showed that wind speed was slightly greater after the restoration, commonly identified on the roads by or in the areas near the stream. The waterway had been covered for use as a road, but now the uncovered waterway helps create a waterfront wind corridor through which cool air moves.

Evaluation of Outcomes

• Transformation of the Urban Paradigm: Domestic

The Cheonggye Stream Restoration Program was not simply recovery of a natural stream by a local government. It has changed the paradigm across many fields, helping Seoul, the face of South Korea, become a more eco-friendly city where people come first. With the success of this program, the City of Seoul was one step closer to becoming a regional hub and financial center for Northeast Asia.

Pedestrian/Public Transit-Orientation

The restoration was a major driver behind the transportation policy paradigm shift from a supply/vehicle-oriented approach to one that is more people/public transit-oriented.

Spread of the Urban Restoration Movement with a Focus on Waterways

Restoration programs began to focus on rivers with the start of the Cheonggye Stream restoration and soon led to efforts to restore other streams, such as Seongbukcheon, Jeongneungcheon, and Hongjecheon. Moreover, studies were begun in earnest to restore all other streams in Seoul with a particular focus on the environment. As a result, real estate prices in the surrounding areas soared, encouraging local residents to take a more positive interest in and cooperate with the programs.

The effect of the Cheonggye Stream Restoration Program on the improvement of urban waterways was not confined to Korea. Many major cities around the world were positively affected. From Tokyo, local experts and city councilmen visited Cheonggye stream for their plan to restore Shibuya stream. Civic groups, experts, and administrative officials from Osaka also used Cheonggye stream as their reference for their "City of Water" project utilizing streams, rivers, and the ocean.

Balanced Development of Gangbuk and Gangnam with a Focus on Sustainability

The success of the Cheonggye Stream Restoration Program led to a gradually spreading revival from the stream area across Gangbuk, which is noteworthy. The changes near the stream include: (1) increased rent and land prices; (2) increased lot sales of apartment units; and (3) changing commercial arcades from a dilapidated concentration of shops into a redeveloped district.

• Achievements of the Cheonggye Stream Restoration Program: Overseas

Birth of the New Korean Wave

The social effect of such a great transformation as the Cheonggye Stream restoration attracted the attention of cities around the world. In particular, Japan analyzed Cheonggye stream history thoroughly and decided to use it to spark a revival in political leadership and social reform that had been sluggish due to bursting of the economic bubble in the past decade.

From January 2003 to the end of 2004, the number of countries who sent representatives to visit the Cheonggye Stream Exhibition Center reached 19, many of whom were from Japan, China, and the US. A total of 2500 official visitors arrived for 120 different visits. By continent, Asia accounted for the majority – 92 visits from 9 countries – at 88% of the total, followed by 7 from the EU (7%), and 5 from the US (5%). Analysis of the nature of the visiting groups from Japan indicated that the visit was more than a simple tour; they visited with special interest, to use the visit for a thorough analysis.

Future Challenges

New Start after the Cheonggye Stream Restoration

The Cheonggye Stream Restoration Program was completed in September 2005, but this represented a new beginning rather than the end. Upstream of Cheonggye, Baegundong and Jungnang streams could also be restored to connect to the source of Cheonggye stream, while interest grew in restoring a dozen branches of water on either side of the stream. The restoration program will only be fully completed when the natural waterways of Seoul are identified and widened to allow Cheonggye stream run naturally.

Seoul, a Global Eco-friendly City

The Cheonggye stream restoration was designed according to 3 major axes of time: history (tradition), culture (modernity), and nature (future). Over time, the restored Stream will be abundant with natural flora, offering Seoul a natural ecosystem at the heart of the city.

Modern but Traditional Seoul

Reduction in noise and pollution completes the requirements for a residential area. With the addition of other facilities (e.g., shopping, educational, cultural and recreational), an urban residential area can easily meet the demands of both the younger and older generations, the elderly, and foreign residents. Reborn as a new city, Seoul will be able to breathe vitality into the old, fatigued city center, encourage balanced regional development, and become a global city that exudes a 600-year old historical charm, tradition, and culture as well as financial and economic vivacity.

The Korean Brand: Cheonggye Stream

The commercial districts around Cheonggye stream are comprised of a business district in Mugyo-dong, an electronics/communications and redevelopment district at Seun Arcade, and a clothing/fashion district in Dongdaemun. Up and running for 24 hours a day, these districts will redefine the key functions of the city. The commercial districts around the stream will go through industrial restructuring, logistical improvements, and e-commerce transformation to become one of the most competitive centers of business in the 21st century.

In the future, Cheonggye stream will be improved far beyond its presence existence as a simple stream to become the brand that represents South Korea.

Q&A

How many visitors does Cheonggye stream see?

- By the end of 2013: 18,264,000 people/year

What are some statistics of the Cheonggye Stream Restoration Program?

- Construction: KRW 384.4 billion (USD $384 million (1$ ≒ 1,000₩)
- Stream Flow: 120,000 tons/day
- Maintenance: KRW 1.8 billion/year

What are the chief elements behind the success of the Cheonggye Stream Restoration Program?

- Participation by residents: This was the driving force behind the program, providing public discussions on the issue and justification for the project.
- Leadership: Strong leadership facilitated the resolution of different issues (e.g., traffic congestion, restoration of cultural heritage, and compensation for vendor operating losses) via the event called the "4,200 Meetings".
- Planning: Appropriate responses were made to deal with the elements of success/failure and pursue the Cheonggye Stream Restoration Program.

Epilogue

Shift to a more sustainable city paradigm: Recently, the international community has been working to universally promote the concept of environmentally healthy and sustainable development by adopting preservation with development. The Cheonggye Stream Restoration Program was in line with this recent trend, adopting a novel 21st century paradigm of urban management, going from a development/vehicle-oriented approach to a more people/environment-oriented approach.

Recovery of the Ecosystem: People are becoming significantly more interested in improving their quality of life. Consequently, the latest trends are reflected in universal adoption of environmentally-friendly urban design. The Cheonggye Stream Restoration Program was designed to bring back the natural water flow to Cheonggye stream, help the ecosystem recover, and make Seoul an environmentally-friendly city.

Removal of the Cheonggye Overpass and Risks of Uncovering the Stream: Covering Cheonggye Stream was an action from the development era with a great emphasis on efficiency and effectiveness. The structures

covering the stream were put in place in 1958. The Cheonggye Overpass was also 30 – 40 years old, its cement crumbling and rebar corroding. The structural hazards they created endangered safety.

Restoration of Historical and Cultural Space: The Cheonggye Stream Restoration Program also restored some historical heritage – Gwangtonggyo, Supyogyo, etc. – from the past Joseon dynasty, strengthening a sense of pride in people.

Balanced Regional Development: The areas near Cheonggye stream were mostly occupied by buildings that were 40 – 50 years old, contributing to the reduction of de jure population and degradation of the cityscape. Furthermore, the imbalance between Gangbuk and Gangnam was one of the problems that Seoul needed to resolve to realize balanced development. The restoration of Cheonggye stream can turn the surrounding areas into centers of international finance, business and high value-added industries, thereby sharpening the region's competitive edge. The deteriorating areas in the vicinity would also be subject to development and therefore have higher potential for growth. Such vitality in Gangbuk and the addition of high value-added industries to the Cheonggye stream area will help Seoul achieve better balance in its development.

External Evaluation of the Cheonggye Stream Restoration Program

New Globalized Korean Wave

The New Korean Wave, kindled by the success of the Cheonggye Stream Restoration Program, is unique in its global reach. At the 9th Venice Biennale in Italy, newspapers such as La Nuova and Gazzettino explained in detail why the Cheonggye stream program won "The Best Public Administration Award", adding that the city's intervention in changing the waterfront scene breathed life into the city.

The success of the program helped make Seoul the choice of the WHO (World Health Organization) for designation as a Healthy City in 2004. Such international attention on the Cheonggye Stream Restoration Program seems to be one of the signs that the "Korean Wave," which until then had mainly spread only within Asia, was finding a home in other regions of the world as well. Just as South Korean corporations like Samsung, LG, and POSCO are enjoying increased influence in world markets, this new trend is likely to be the touchstone for Seoul's competitiveness as a global city.

Overseas Award: Venice International Architecture Exhibition 2004

The Cheonggye Stream Restoration Program was invited to be displayed at the Venice International Architecture Exhibition, an internationally authoritative exhibition of culture and art. It was an apt opportunity to promote Seoul's proud history, culture, and the city's willingness to restore its urban ecosystem. At the event the program won Best Public Administration (featured by Italian TV and radio stations, as well as the UK's BBC), reconfirming the world's interest in the restoration.

International Media Attention

- Award, 'Cities on Water', the 9th Venice Architecture Biennale (Sep. 12, 2004)
- Award, the Civil Engineering Conference in the Asian Region (Jul. 3, 2007)
- Environmental Award, Japan Society of Civil Engineers in 2006 (May 25, 2007)
- Honorary Special Citation Award, UN Habitat (United Nations Human Settlements Programme) in 2009
- Reuters, UK (Oct. 1, 2005): The covered stream was restored as part of the city's environmental projects.
- Asahi Shimbun, Japan (Oct. 1, 2005): Seoul city center, alive with a stream – old overpass removed.
- Sina, China (Oct. 2, 2005): Cheonggye Stream is officially opened.
- Sam, Taiwan (Oct. 2, 2005): Seoulites celebrate the restoration of Cheonggye Stream.
- AP, USA (Oct. 3, 2005): Seoul restores its covered river after 50 years.
- Le Figaro, France (Oct. 12, 2005): Seoul, in the midst of a new war...
- NHK, Japan (Oct. 30, 2005): Live report from Cheonggye Stream.

Table 4 - International Media Coverage

Media Outlet	Date	Description
Yonhap News English	2003.6.26	· Focus on the leadership of Mayor Lee behind the Cheonggye Stream Restoration Program · Shift from development-oriented approach to a sustainable, environmentally-friendly paradigm through the Cheonggye Stream Restoration Program.
International Herald Tribune	2003.7.2	· Start of the Cheonggye Stream Restoration Program. Seoul, a city with brand value. · Resolution of traffic and vendor conflicts via promotional activities and discussion. · A program with a greater focus on the environment and the economy at the same time.
THE ASIA WALL STREET JOURNAL	2003.7.11	· Interviews on the restoration program with the Seoul Mayor, a Munhwa Daily reporter (Kim Yong-ok), and vendors near the Stream. · Transformation from an industrial city to an eco-friendly city. A new "green" city is born.
World Today Asia BBC News (UK)	2003.7.16	· Start of the Cheonggye Stream Restoration Program: changing into a beautiful, eco-friendly city. · No city that disregards the importance of environment can be a global city.
Radio France Internationale (France)	2004.5.9	· Introduction to Seoul, priority environmental issues, and a full-scale urban readjustment project that has entered its execution stage. · Environmental policies that consider both environment and economy.
Financial Times (UK)	2004.5.22	· Seoul, polluted with exhaust, undergoes a green revolution; an interview with the mayor. · Charming Seoul, a good city to live: about the Cheonggye Stream Restoration Program, Seoul's green projects, etc.
CNBC "Asia Market Warp" and "Business Center"	2004.7.2	· Interview with the mayor on the Cheonggye Stream Restoration Program.
Xinmin Weekly (China)	2004.11.1	· Mayor Lee Myung-bak: a former CEO runs Seoul like a company. · The Cheonggye Stream Restoration Program based on collection of various opinions and discussion. · No more ordinary projects.

TV Asahi Broadcasting Station (Japan)	2004.10.21	· The back alleys of Seoul, the starting point of the Korean Wave.
Asahi Shimbun (Japan)	2004.12.21	· The Cheonggye Stream Restoration Program as part of the environmental and city redevelopment programs. · Nature comes alive in Seoul.
Sankei Shimbun (Japan)	2004.12.29	· Cheonggye stream, the symbol of a new environmentally-friendly city: to be restored by October 2005. · Winner of the Best Public Administration Award in 2004 at the Venice International Architecture Exhibition, well-known in urban planning and construction.
Yomiuri Shimbun (Japan)	2005.1.13	· The restoration program is featured in the "Trend" section. · The restoration program serves as a role model for the restoration of Nihonbashi. · Cheonggye stream, viewed from the perspective of the Korean Wave (other than on TV and in film).

Cheonggye Stream Promotion/Culture Center

Cheonggye Stream Promotion Center

As part of the options to promote the program to the general public, the Cheonggye Stream Restoration Headquarters built the Promotion Center to exhibit the past, present, and future of the stream. However, more than just a promotional center, it also served an educational purpose, providing information on the environment and safety, and was a place where residents could lodge complaints.

On average, 300 people visited the Promotion Center on a daily basis. As of August 2005, 300,000 people had visited the center in total; of them, 3,000 visitors on 200 different occasions came from other nations.

In September 2002, the Headquarters took the input it had received from residents on the restoration and incorporated them into a new website: (http://www.metro.seoul.kr/kor2000/chungaehome/seoul/main.htm) to introduce the program to more people.

Figure 5 - Cheonggye Stream Promotion Center

Figure 6 - Inside the Promotion Center

Cheonggye Stream Cultural Center

The Cheonggye Stream Cultural Center was built to effectively exhibit a wealth of information such as the history and culture surrounding Cheonggye stream and its environs, to preserve and display the city's cultural resources related to the program, to provide space for various academic activities, and to assist the making of the Cheonggye Stream Maintenance Office.

Organizations & Contact Information

- 2002: at the time of pursuing the program to restore Cheonggye stream, the Cheonggye Stream Headquarters of the Seoul Metropolitan Government was launched.
- 2005: After the program was completed, overall management was carried out by the River Management Department (Seoul Metropolitan Government) (02-2133-3891~3).

The Cheonggye Stream Management Office of the Seoul Metropolitan Facilities Management Corporation maintains the facilities (02-2290-6801, 6840, 6851).

- Contact: Cheonggye Stream Management Team, River Management Department, Office of Urban Safety

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10. Urban Environment of Seoul

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Description of General Polity : Environment

Background of Establishment of Environmental Policy

Overview of the Environmental Policy

The space where human life, animals and plants are living consists of atmosphere, water and soil. Environmental policy refers to the comprehensive measures including all laws, systems, organizations, financial resources and governance to control the discharge of pollutants, to purify the polluted parts and to monitor the status in order to prevent the media from being contaminated.

The environmental policy areas of Seoul can be classified into Environmental Pollution Control, Water Supply, Sewage System, Waste Management and Parks & Landscape. You can find the start point of environmental policies by area by taking a look at the changes of administrative organizations of Seoul and environment-related laws and regulations.

Water supply projects began in the Japanese colonial era and the relevant organization existed in 1945 when Korea was liberated from colonial rule. The waste management system was set up in 1950, when the Korean War was started, to take care of the sanitary issues. The administrative organization for sewage system management was established in 1961, and the operation of public sewage treatment facilities got started in 1976. The civil construction department of Seoul City began the works for parks & landscape in 1963, and an exclusive organization was made in 1973. The management organization for atmosphere pollution, water pollution and emission source control was established in 1968, the last among the 5 environmental policy areas.

According to the thorough amendment and enactment of the related laws and regulations in the early 1990s, the environmental policy area came to have the current classifications of water quality, atmosphere, waste materials, soil, underground water, noise & vibration, toxic substance management, parks & landscape, water supply, sewage system, etc. In the 2000s, the area was subdivided further into energy, response to climate change, bad smell, asbestos, etc.

Table 1 - Changes in Seoul Environmental Management Policy Areas

Classification	Sectors of the Environmental Management Policy
The 2000s and the present	Water Supply, Waste Management, Sewage System, Parks & Landscape, Atmosphere, Water Quality, Soil, Underground Water, Noise & Vibration, Harmful Chemical Substance, Environmental Dispute Conciliation, Environmental Effects Evaluation, Bad Smell, Asbestos, Energy, Response to Climate Change
The 1990s	Water Supply, Waste Management, Sewage System, Parks & Landscape, Atmosphere, Water Quality, Soil, Underground Water, Noise & Vibration, Harmful Chemical Substance, Environmental Dispute Conciliation, Environmental Effects Evaluation
The 1980s	Water Supply, Waste Management, Sewage System, Parks & Landscape, Atmosphere, Water Quality

The 1970s	Water Supply, Waste Management, Sewage System, Parks & Landscape, Atmosphere, Water Quality
The 1960s	Water Supply, Waste Management, Sewage System, Parks & Landscape, Atmosphere, Water Quality
The 1950s	Water Supply, Waste Management
The 1940s	Water Supply

Environmental Management Policies and Their Background

When Korea was liberated from Japanese colonial rule in 1945, there was no Korean government and Korea was in serious financial difficulties. In spite of this poor situation, drinking water was supplied to the people continuously through the water supply plant constructed during the colonial era. In the situation of the outbreak of the Korean War in 1950, the waste management as a public cleaning project began in order to restore the destroyed city and to improve sanitary conditions.

Korea in the early 1960s was in a politically chaotic situation due to the fraudulent presidential election on March 5th in 1960, the April revolution on April 19th in 1960, and other political issues. The chaotic state was finished with the military coup on May 16th in 1961. The 5-year economic plan of the government started in 1962 to overcome deep-rooted poverty. The light industry led the growth of the Korean economy in the 1960s and the steel and heavy chemical industries did the same in the 1970s. The Gyeongbu (Seoul to Busan) express way which was completed in 1970 took the lead in development of the distribution industry in Korea. The rural population flocked to the cities in order to find better jobs. The construction of new urban districts in Yeouido and Yeongdong in the late 1960s took place to solve the problem of housing shortage, signaling the start of urbanization of Seoul. However, there emerged a dark shadow of environmental pollution from behind such industrial development and urbanization. That was the reason why the sewage system projects and pollutant discharge management to control atmosphere and water quality were started in the 1960s.

With the rapid development of scientific technologies in the 1970s, the mass production of cars and consumer electronics began and plastic started to replace the heavy, weak and corruptible materials such as paper, wood, glass, metal, etc. Oil consumption rapidly increased as petroleum was used as materials in cars and other products. But the first oil crisis in 1973 and the second one in 1978 served as important events to increase momentum to think about energy efficiency and alternative energies. In the 1980s, Korea introduced district heating system for the efficient use of energy. The development of the plastic industry not only contributed to the improvement of living convenience and the cost reduction of product manufacturing, but also mass-produced wastes as a side effect. At that time, Nanjido turned into a mountain 100m in height after just 15 years since that place was used as a waste landfill. As the garbage quality got worse, the wastes, which

used to be used as fill materials for the land development areas in the 1970s, were degraded into troublesome garbage.

The endeavor for economic growth that started in the 1960s came to fruition in the 1980s and 1990s. Cars, color TV, refrigerators, washing machines, air conditioners, etc. became necessities for each home. While hosting the 1986 Asian Games and the 1988 Seoul Olympics, the global positioning of Korea had risen and the people developed higher self-esteem. As the interest in and expectation of life quality and the environment were increasing, the environmental management area was further subdivided into atmosphere, water quality, waste, parks & landscape, ecology, drinking water, underground water, soil, noise & vibration and harmful chemical substances.

On the other hand, high expectations regarding life quality and the environment became factors to oppose the construction of various social welfare facilities as well as sewage treatment facilities, waste landfills, waste incinerators, nuclear waste treatment facilities, nuclear power plants, power-transmission towers, etc., making it difficult to secure social infrastructures. The IMF financial crisis in 1997 forced the country into economic depression and really hurt the people's pride. With the hope for the new millennium in 2000 and successful hosting of the World Cup games in 2001, the Korean economy was revitalized and the environmental management was able to maintain the stance of the 1990s.

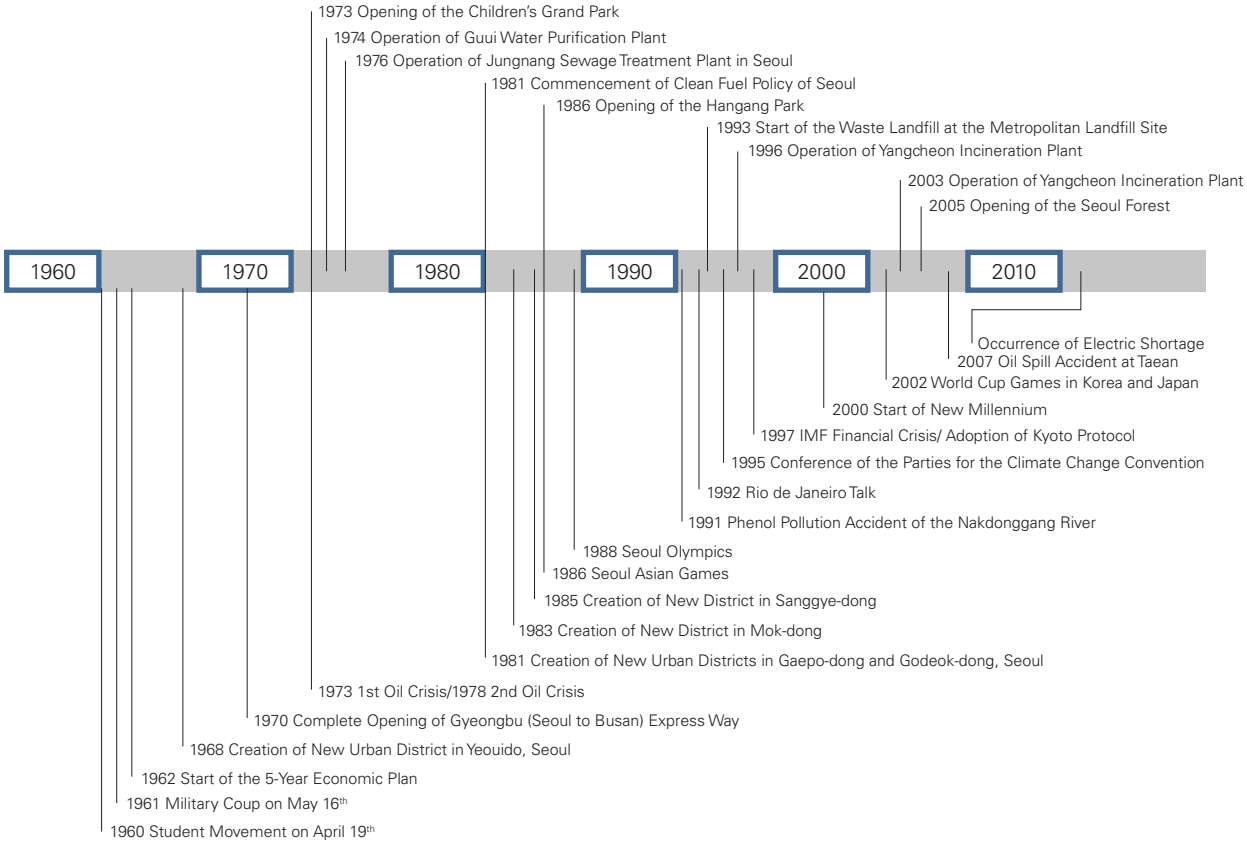
One of the key features of environmental management in the 2000s was the addition of energy and response to climate change to the existing environmental area. Since the 1990s, the earth has experienced abnormal climate phenomena such as frequent typhoons, heavy rain, heavy snow, heat waves, tropical nights, droughts, melting polar ice, etc. There was a variety of opinions about what was the main reason. Some insisted the environmental pollutants that human beings emitted caused global warming and others stated that those were natural phenomena of climate. But everyone agreed on the fact that the abnormal phenomena occurred frequently. To solve the problems, the related countries established a joint international response system through the Rio de Janeiro Talk[1] in 1992, the United Nations Climate Change Conference in 1995[2]

1. It is the summit talk held in Rio de Janeiro, Brazil where 175 country summits participated in June 1992 to discuss the global environment and preservation issues. During the talk, the "Rio Declaration on Environment and Development" and the "Agenda 21" were adopted, 3 agreements of "Climate Change Convention", "Convention on Biological Diversity" and "Forest Protocol" were made as the concrete measures and "UN Commission on Sustainable Development" was established in UN in order to fulfill the agreements. State officials from 114 countries and over 7,900 private environmental groups participated in the talk.

2. It was held to discuss concrete implementation methods including regulations on greenhouse gases, financial support, technology transfers, consideration of the countries in special situations, etc. to prevent global warming by controlling the emission of greenhouse gases such as carbon dioxide, methane, CFC, etc. which had been contained in the Climate Change Convention adopted by the UNCED with the representatives from the countries at Rio de Janeiro in 1992. The first Conference of the Parties was held in Berlin, Germany in 1995 and the Berlin Mandate was adopted that declared the protocol on the greenhouse gas reduction targets after 2000 will be adopted in the third Conference of the Parties to be held in 1997.

and adoption of Kyoto Protocol in 1997[3]. Such activities are represented by energy, energy rationalization, alternative energy, response to climate change, green growth, etc. in the Korean environmental management and classified into the areas of energy and response to climate change in the environmental policy of Seoul.

Figure 1 - Main Environmental Management Projects of Seoul and the Social Background



3. The Kyoto Protocol that was adopted in the third Conference of the Parties for the Climate Change Convention in Kyoto, Japan in 1997 and became effective on February 16th, 2005 was the concrete implementation plan for the Climate Change Convention in order to regulate and prevent the global warming. Its formal name is the Kyoto Protocol to the United Nations Framework Convention on Climate Change. The emission of 6 kinds of greenhouse gases including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), fluorocarbon (PFC), hydrofluorocarbon (HFC) and fluorinated sulfur (SF6) will be reduced. The non-tariff barriers would be applied for the countries that do not reduce the emission of such greenhouse gases. For the flexible implementation of greenhouse gas reduction of the countries directly involved in the Convention on Climate Change, emission trading, joint implementation and clean development mechanisms were introduced.

Development of Environmental Policy

Legal System

We can see the structure of administrative organizations of Seoul and the development process of environmental policy areas of Seoul through the national laws and ordinances of Seoul.

The first ordinance of Seoul in the environment area was the ordinance on water supply enacted in 1949. The first law of the Korean government in the environment area was the Water Supply and Waterworks Installation Act enforced in 1961, 12 years after the ordinance of Seoul. In the case of sewage system, Seoul enacted an ordinance on special account installation for the sewage system in 1965, one year ahead of the governmental law. Since then, however, the central government enacts laws and regulations and Seoul establishes the ordinances to determine detailed things necessary for such enactment. When Korea was liberated from Japanese colonial rule in 1945 and went through the Korean War beginning in 1950, the national system had not yet set up. Therefore, cities took the initiatives in implementing the projects necessary for basic living necessities of citizens including drinking water supply, public cleaning and sewage system. Since the 1960s when the national system was structured, the central government has led the selection of issues and agendas in the environment area and established relevant systems.

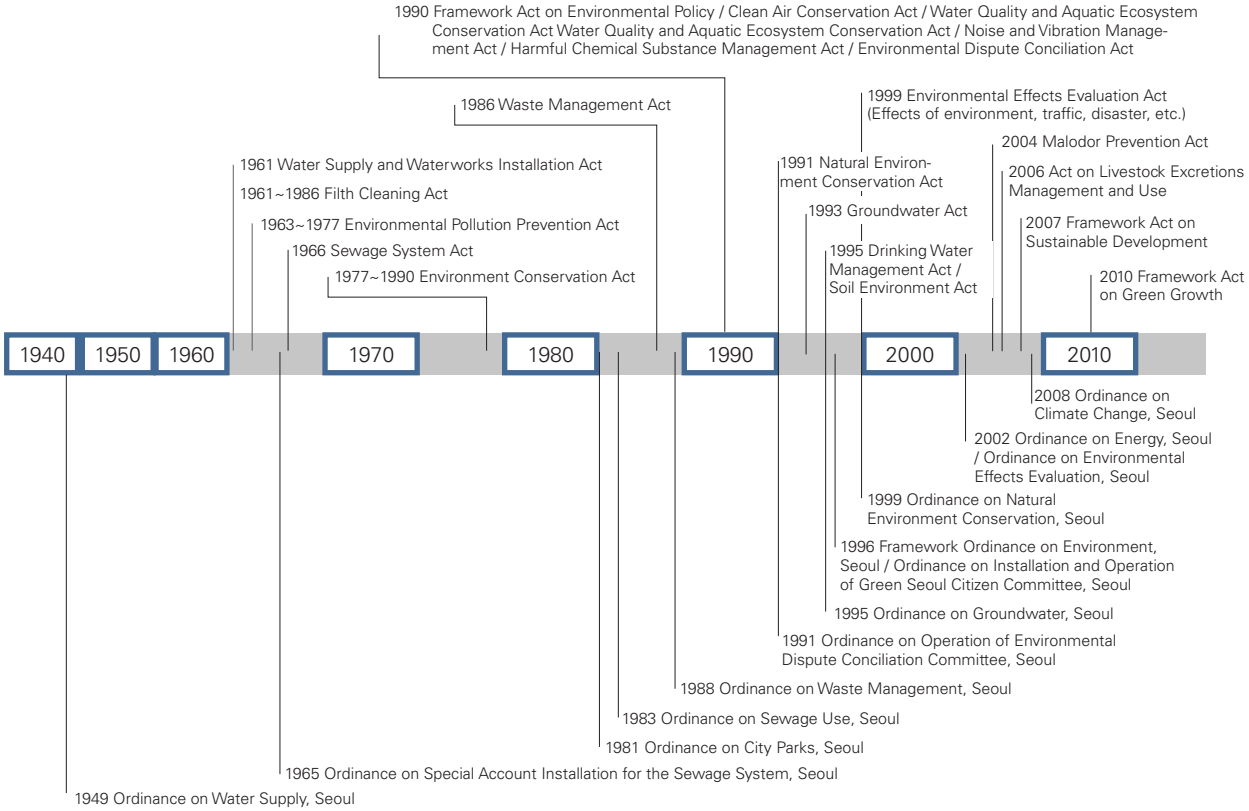
We can see the development process of environmental policy by area through the revision history of relevant laws and regulations. The first environmental policy of Seoul was on the water supply (the Water Supply and Waterworks Installation Act in 1949) and garbage cleaning followed (the Filth Cleaning Act in 1961). Policies on the emission of pollutants causing atmosphere and water contamination appeared during the 5-year economic development plan in the mid-1960s (the Environmental Pollution Prevention Act in 1963) followed by the area of collection and purification of sewage and waste water (the Sewage System Act in 1966). In the 1970s, the Environmental Pollution Prevention Act was revised to become the Environment Conservation Act, the environmental policy area being expanded, technical measures being introduced and various regulations being enacted. During the 1970s and the 1980s, the amount of waste increased rapidly as a result of economic growth, appearance of plastic products and increase in income. In that period, the laws and regulations related to waste management, divided into the Filth Cleaning Act and the Environment Conservation Act, were integrated into the Waste Management Act (enacted in 1986).

In the 1990s, the environmental management was subdivided by the environmental media, the environmental effects evaluation system was introduced to estimate and minimize the effects of large-scaled development projects on the environment and the government started to mediate possible disputes. The overall area

of environmental management was specialized and expanded dramatically. In the early 1990s, basic laws such as the Framework Act on Environmental Policy (enacted in 1990), the Natural Environment Conservation Act (enacted in 1991), etc. were legislated to set the management directions in the main environmental areas and the individual management laws for water quality, atmosphere, waste materials, aquatic ecosystems, noise & vibration, harmful chemical substance, underground water, drinking water, soil, bad smell, etc. in order. The Environmental Dispute Conciliation Act was enacted in 1990 in order to mediate the disputes occurring among the nation, people and enterprises over environmental damages. The Environmental Effects Evaluation Act was legislated in 1999 in order to break the existing environmental management methods that used to control and monitor environmental pollution which occurred within the regulation level. According to the act, the effects on the environment shall be evaluated in the stage of project preparation in the case of government projects and private sector projects over a certain scale to reduce the negative influences by taking measures like project modification, establishment of prevention plans, etc. which implementation shall be evaluated after completion of such projects.

In the 2000s, energy and response to climate change has emerged as the agenda in the environmental management area. The main tasks were to develop the technologies to reduce the emission of greenhouse gases including carbon and methane gas, to develop the technologies to increase energy efficiency, to produce energy in new ways and to set conditions for developing such technologies. The central government enacted the Framework Act on Sustainable Development in 2007 and the Framework Act on Green Growth in 2010, and Seoul established the Ordinance on Energy in 2002 and the Ordinance on Climate Change in 2008.

Figure 2 - Development Process of Environment Related Laws and Regulations



Administrative Organization

The environmental administrative organization of Seoul has been steadily expanded in keeping pace with the increased administrative demands, subspecialized and extended environmental areas, and so on. In 1945, when Korea was liberated from Japanese colonial rule, Seoul had just one department for water supply as the environmental administrative organization. In the 1950s, Seoul came to have 2 departments by adding the waste management work. There were 5 departments in 1961 when the sewage system area was added, 8 departments in 1968 when the environment preservation area was added and 14 departments in 1973 when the parks & landscape projects and the sewage system projects began in the environmental policy areas. The number of departments taking care of environmental policies was reduced to 7 in the 1980s, but was expanded again to 16 in 1996 as the environmental management system was subspecialized and the related regulations and systems were improved in the early 1990s. The areas were expanded to cover energy, response to climate change, eco-friendly transportation, etc. in the 2000s, bringing the total number of departments in Seoul to 20 in 2012.

The total number of public officials in Seoul was 40,267 as of 2012, consisting of 10,118 in the Seoul city government and 30,149 in the 25 autonomous districts. Of them, the total number of public officials working in

the environmental policy area was 5,914, which consisted of 241 in the climate environment division, 604 in the blue city bureau, 365 in the city safety office, 2,036 in the water supply project division and 2,668 in the autonomous districts, making up 15% of the whole manpower of the Seoul City.

Table 2 - Changes of Environmental Administrative Organization of Seoul

Year	Organi-zation (Dept.)	Environmental Pollution Control	Waste Manage-ment	Sewage System	Water Supply	Parks & Land-scape
1945	1				Water Supply Dept.	
1950	2		Sanitation Dept.		Water Supply Dept.	
1961	5		Same as above	Sewage Dept.	Biz. Service Dept. Facility Dept. Water Supply Dept.	
1963	7		Same as above	Same as above	Biz. Service Dept. Cashier Dept. Accounting Dept. Water Source Dept. Water Supply Dept.	
1968	8	Health Dept.	Same as above	Same as above	Biz. Service Dept. Accounting Dept. Water Source Dept. Water Supply Dept. Facility Dept.	
1969	9	Health Dept. 1	Same as above	Same as above	Biz. Service Dept. Accounting Dept. Water Source Dept. Water Supply Dept. Facility Dept. Electric Generation Dept.	
1973	14	Environment Dept.	Cleaning Dept. 1 Cleaning Dept. 2	Admin-istrative Dept. Facility Dept.	Same as above	Landscape Dept. Green Belt Dept. Park Dept.
1979	12	Environment Dept. 1 Environment Dept. 2	Cleaning Dept.	Sewage Dept.	Biz. Service Dept. Accounting Dept. Water Resource Facility Dept. Water Supply Dept. Electric Generation Dept.	Same as above

1981	7	Environment Dept.	Cleaning Dept.	Same as above	Biz. Service Dept. Water Supply Dept. Water Source and Electric Generation Dept.	Parks & Landscape Dept.
1983	9	Same as above	Same as above	Administrative Dept. Processing Dept.	Same as above	Park Dept. Green Belt Dept.
1989	12	Same as above	Same as above	Same as above	General Affairs Div. Facility Div. Management Div. Production Div. Water Supply Div.	Park Dept. Landscape Dept. Green Belt Dept.
1992	15	Same as above	General Affairs Div. Project Div. Planning Div. Facility Div.	Same as above	Same as above	Same as above
1993	14	Environment Dept.	Same as above	Same as above	Same as above	Park Dept. Green Belt Dept.
1996	16	Planning Dept. Atmosphere Dept. Water Quality Dept.	Management Dept. Recycling Dept. Facility Dept.	Same as above	Same as above	Park Dept. Green Belt Dept. Planning Dept.
1998	15	Same as above	Management Dept. Facility Dept.	Sewage Dept. Flood Control Dept.	Same as above	Same as above
2003	16	Environment Dept. Atmosphere Dept. Water Quality Dept.	Cleaning Dept.	Same as above	General Affairs Div. Management Div. Facility Div. Production Div. Water Supply Div. Tab Water Div.	Park Dept. Landscape Dept. Democracy Park Seoul Forest
2007	20	Environment Dept. Water Quality Dept. Energy Dept. Project Dept. Management Dept. Transportation Dept.	Resource Recycling Dept. Clean City Dept.	Same as above	Same as above	Same as above

2008	18	Energy Dept. Low Pollution Dept. Transportation Dept. Environment Dept. Water Management Dept. River Dept.	Environment Dept. Resource Recycling Dept. Clean City Dept.	Planning Dept. Facility Dept.	Management Div. Production Div. Water Supply Div. Facility Div.	Planning Dept. Park Dept. Landscape Dept. Natural Ecology Dept.
2009	18	Environment Dept. Climate Dept. Atmosphere Dept. Environmental Cooperation Dept. Water Management Dept. River Dept.	Same as above	Same as above	Same as above	Same as above
2010	18	Environment Dept. Climate Dept. Atmosphere Dept. Transportation Dept. Water Management Dept. River Dept.	Resource Recycling Dept. Living Environment Dept.	Same as above	Same as above	Same as above
2012	20	Environment Dept. Energy Dept. Climate Dept. Transportation Dept. Water Management Dept. River Dept.	Same as above	Same as above	Management Div. Billing Div. Production Div. Water Supply Div. Facility Div.	Planning Dept. Park Dept. Landscape Dept. Natural Ecology Dept. Disaster Prevention Dept.

Governance

Until the 1980s, Seoul City had planned and implemented the environmental policies in the aspect of administration. Beginning in the 1990s, however, there appeared lots of difficult projects that could not be solved just with the administrative power. For example, agreement with the citizens was required to build unpleasant facilities such as waste incinerators, expert knowledge was necessary for the projects of new and renewable energy, automotive fuel, etc. in the energy area, and cooperation with citizens and enterprises was required in the area of energy, tap water, reduction of wastes, and purchase of eco-friendly products. Also, international cooperation projects increased as climate change related issues could not be solved just with the efforts of a city or a country.

The representative internal cooperation projects of Seoul are the Green Seoul Citizen Committee and the Seoul Action 21. For the international cooperation projects, Seoul joined ICLEI and C40.

Green Seoul Citizen Committee

The Green Seoul Citizens Committee was inaugurated on November 22nd, 1995 to reflect on the development-oriented policies and to address the environmental concerns in Seoul through the spontaneous participation of the citizens as the local autonomy era began, emphasizing the life quality of citizens.

The committee, an organization established based on the Framework Ordinance on Environment, implemented autonomous and independent activities through civil participation. It took the type of governance in which various entities in the public area (Seoul City), market area (enterprises) and spontaneous area (civil society) work together. It performed the functions as a policy advisory group and a subject of practical implementation of policies while sharing the vision on the sustainable future of Seoul and making the social systems together.

The key roles of the committee are to evaluate and advise on the issues on integration and adjustment of preservation and development in the aspect of sustainable civic administration, to evaluate and advise on the sustainability of the policies, plans and systems proposed by the mayor, to fulfill the "Seoul Agenda 21" and its implementation state, to suggest directions and give advice to facilitate the autonomous district agenda 21, to develop the citizens' coalition model and attract voluntary participation from the citizens and the enterprises to address climate change, to carry on the activities to improve environment through cooperation of the citizens and the enterprises, to give advice for the establishment and adjustment of comprehensive environmental education plan and to support the development of training materials for education programs, and so on. In addition, the committee participates in the environment conservation program to attract cooperation of the citizens and enterprises and performs the activities to facilitate the eco-friendly consumer culture of the citizens.

The committee's main projects are evaluation on the sustainability of Seoul's policies, monitoring of implementation state of Seoul Action 21, support to the public contest for selection of citizens participation methods, organization and operation of citizens coalition for the Seoul Agenda 21, organization and operation of the green start of autonomous districts, etc.

Seoul Action 21

The "Seoul Agenda 21" refers to the local agenda 21 made by Seoul. In 1992, the Rio de Janeiro Environment Conference recommended each local government to make up its own agenda 21 as an action plan for environment conservation in local units to facilitate the global environment preservation. The Seoul City included

the local agenda 21 of Seoul made with the citizens in the "3 Year Administrative Operation Plan (1996~1998) which was planned to be declared and submitted to the United Nations. The "Green Seoul Citizen Committee of Seoul City" launched on November 22nd, 1995 was the basis of creating the local agenda 21 of Seoul. The "Preparatory Committee for Seoul Agenda 21" was organized with 12 participants consisting of civic group members, experts and officials of Seoul City and the committee discussed facilitating system, operating methods, writing schedules, etc. of the "Seoul Agenda 21" through 18 meetings and public hearings. The draft of "Seoul Agenda 21" was prepared in 1997 and confirmed through opinion collection procedures like workshops, public hearings, etc. The "Seoul Agenda 21" was announced on June 5th, 1997 to celebrate the 25th World Environment Day. Its revised version was announced in March 2000.

In order to achieve the activity objectives in the 8 areas of the "Seoul Agenda 21" including vision, issues, basic principles, activity targets, indicators, status and problems, improvement goals and action plans, and to contribute to the changes of situations and the sustainable development of Seoul, it was required that the vision and activity targets of the "Seoul Agenda 21" should be closely connected to the administration of Seoul. In this connection, Seoul City converted the "Seoul Agenda 21" to the "Seoul Action 21" to express its practice clearly and to approach the citizens more intimately.

The Seoul Action 21 was an important plan corresponding to the era of governance in the aspect that it was an action plan for the sustainable development of Seoul established through the participation of various persons concerned. The Seoul Action 21 suggested things that would preserve the environment and increase the life quality of Seoul citizens and what would later become the things that future generations enjoy during their lives.

There were 7 areas, 34 activity targets and 580 action plans in the "Seoul Action 21." In order to make the action plans to be settled in the civic life, Seoul City has hosted public contests for the practice of the Seoul Agenda 21 for non-profit private organizations.

Table 3 - Activity Targets of the Seoul Action 21

No.	Area	Vision	Activity Targets
1	Environment Management	Clean Water, Blue Sky, Pleasant Seoul	· 1-① Expand the space for plants by securing more areas with rainwater permeating soil. · 1-② Improve water quality of rivers and make water always flow in the rivers. · 1-③ Conduct campaigns for water conservation. · 1-④ Reduce fine dust generated by the vehicle emission gas. · 1-⑤ Reduce the indoor air pollution. · 1-⑥ Make Seoul clean.
2	City Planning	Seoul as a Pleasant Ecological City Built by the Citizens' Participation	· 2-① Make Seoul an ecologically oriented city. · 2-② Increase the number of parks within 5 min. on foot distance from any place. · 2-③ Activate town gardening of the citizens by allocating 1% of citizen autonomy budget. · 2-④ Develop beautiful city evaluation index and apply them to city management.
3	Consumption	Sustainable Consumption, Seoul as a Safe Place for Living	· 3-① Reduce waste. · 3-② Reduce food wastes. · 3-③ Purchase eco-friendly products and services positively. · 3-④ Make sustainable consumption a way of life.
4	Transportation	Pedestrian-friendly Street, Seoul with the Beloved Public Transportation	· 4-① Use public transportation actively. · 4-② Enhance the level of traffic culture. · 4-③ Supply green transportation and facilitate use of them. · 4-④ Reduce traffic accidents. · 4-⑤ Improve the pedestrian environment.
5	Industry Economy	Prosperous Seoul in Cooperation of the Citizens and the Enterprises	· 5-① Increase the number of ecofriendly industry clusters. · 5-② Reduce the amount of CO2 emission to prevent climate change. · 5-③ Decrease the unemployment rate. · 5-④ Make Seoul a good city even for foreigners in doing business.
6	Health	Lively and Health Seoul with the Sound Lifestyle	· 6-① Reduce the smoking rate. · 6-② Maintain healthy weight. · 6-③ Have sound drinking culture. · 6-④ Relieve stress. · 6-⑤ Manage mass feeding to keep it safe and sanitary.
7	Social Equity	Seoul without Barriers and with the Spirit to Share the Joy	· 7-① Make Seoul a city where people can live in safety and happiness during their old age. · 7-② Make Seoul a city where wheelchairs can access everywhere. · 7-③ Make Seoul a city where anyone can live in a pleasant house in comfortable way. · 7-④ Make Seoul a city that ensures equality between men and women. · 7-⑤ Help people to enjoy culture and arts in order to give energy to their lives. · 7-⑥ Make Seoul a city that is filled with the sound of children's laughing.

ICLEI Activities

In May 1999, Seoul City became a full member of International Council for Local Environment Initiatives (ICLEI – Local Governments for Sustainability), which had been founded in 1990 aiming to build up the environmentally autonomous capacity of local governments. In the "ICLEI World Congress" held in Belo Horizonte, Brazil in June 2012, Won-soon Park, the Seoul Mayor, was elected as the chairman of World Mayors Council on Climate Change (WMCCC), which is a gathering of leaders of the major cities around the world. He has contributed a lot in developing and implementing useful and substantive policies and alternatives to improve the competence to respond to climate change. In October of the same year, the opening ceremony of East Asian Headquarters of ICLEI and seminars were held. The local governments from 6 countries including Korea, China, Japan, Taiwan, Mongolia and North Korea shared their opinions and discussed how to response jointly to environmental issues at the events. Also, the joint conference of WMCCC and World Executive Committee of ICLEI was held to discuss the future activity scope, membership system, articles of association, etc. of WMCCC and to agree on the "Declaration of the Seoul Local Government on Energy and Climate" which had been designed to facilitate the substantive policies and set the clear goals in responding to climate change. In addition, Seoul participated in the "Local Action Project for the Biological Diversity", an international cooperation project of ICLEI, to submit its assessment report on the biological diversity of Seoul, established action plans to increase the biodiversity and facilitated such plans actively for the related programs.

C40 Activities

C40 Climate Leadership Group is a voluntary consultative body organized by the world's largest cities in order to recognize the seriousness of climate change and to respond to it. The body was proposed by Ken Livingstone, an ex-Mayor of London in 2005 and launched in London to face the reality that the cities taking up just 2% of the global area emitted more than 80% of the greenhouse gases, which are the main cause of global warming, and to take measures against such reality. Seoul joined the body in July 2006 shortly after the tenure of the 4th mayor elected by popular vote began. Seoul participated in the 2nd General Meeting in New York in May 2007 to sign on an MOU to host the 3rd C40 Summit in Seoul , joined the C40 Steering Committee in April 2008, hosted the 3rd C40 Summit in Seoul in May 2009, participated in the Carbon Disclosure Project in February 2011, participated in the C40 Steering Committee in New York in April 2011, introduced eco-friendly transportation policy of Seoul in the 4th C40 Summit in Sao Paulo in May 2011, participated in the C40 Steering Committee in London in October 2011, accepted the position of chairman of the Asian region for the Carbon Disclosure Project and participated in the C40 Steering Committee in Rio de Janeiro in June 2012.

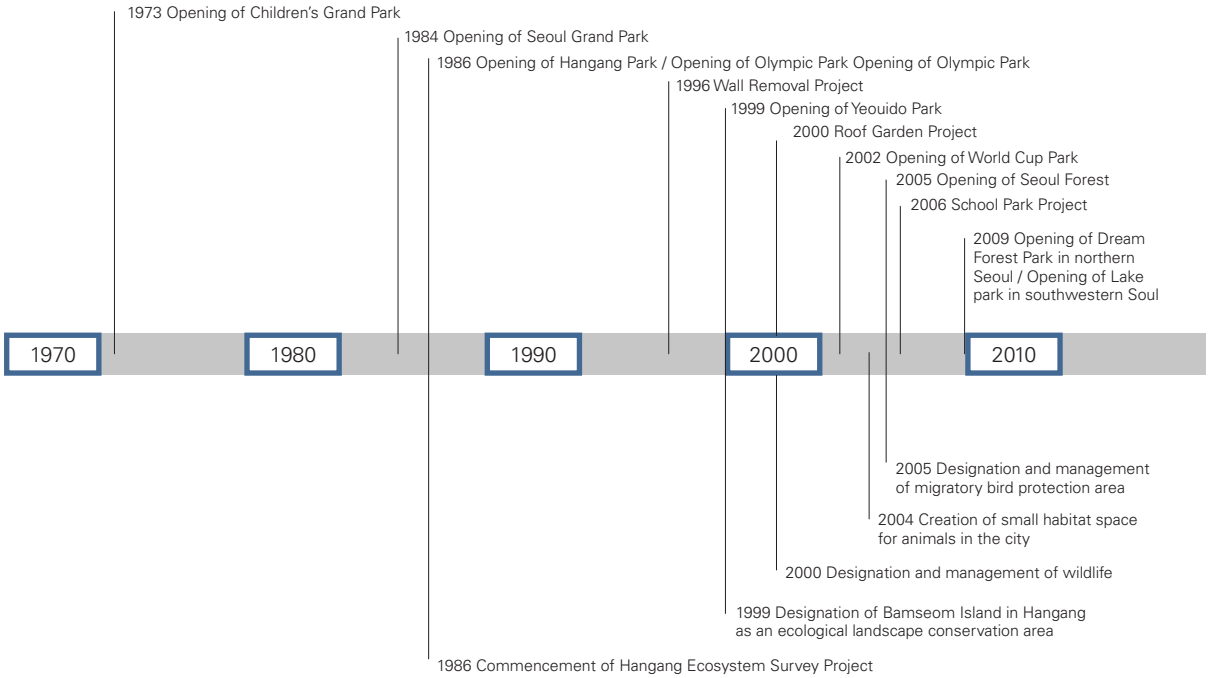
Important Policies and the Contents

Parks & Landscape

Main Projects in Parks & Landscape Area by Period

The parks & landscape area is largely divided into healthy green, ecological preservation and creation of parks. In the parks & landscape area of Seoul, most of the projects were the creation and expansion of parks in the beginning stage, and still lots of energy are invested in such projects. The representative ones are Children's Grand Park completed in 1973, Seoul Grand Park in 1984, Hangang (Han River) Park in 1986, Yeouido Park in 1999, World Cup Park in 2002, Seoul Forest in 2005 and Dream Forest Park in northern Seoul in 2009. The wall removal project in 1996, the roof garden project in 2000 and the school park project in 2006 were facilitated to create small parks in the surrounding areas. The activities to ensure a healthy ecosystem began with the survey of the Hangang ecosystem in 1987, but the actual projects got started in the late 1990s. Some examples of projects are designation of Island Bamseom in Hangang as an ecological landscape conservation area in 1999, designation and management of protected wild animals by Seoul in 2000, creation of small habitat space for animals in the city in 2004 and designation and management of migratory bird protection area in 2005.

Figure 3 - Main Projects in Parks & Landscape Area by Period



Designation of Ecological Landscape Conservation Area

Seoul city, with abundant biodiversity designates and manages the areas which have ecological importance and special value for conservation in order to protect them systematically from being artificially contaminated and damaged. Seoul has designated 17 places of 4,807,327㎡ in total as ecological landscape conservation areas; 1 area (Bamseom Island in Hangang) in 1999, 1 area (Dunchon-dong) in 2000, 4 areas (Tancheon, Bangi-dong, Amsa-dong and Jingwan-dong) in 2002, 2 areas (Godeok-dong and Wonteo Vally of Mt. Cheonggyesan) in 2004, 1 area (Heoninneung) in 2005, 3 areas (Mt. Namsan, Samyukdae of Mt. Bulamsan and Backyard of Changdeokgung Palace) in 2006, 2 areas (Mt. Bongsan and Mt. Inwangsan) in 2007 and 3 areas (Downstream of Seongnaecheon, Mt. Gwanaksan and Baeksasil Valley) in 2009. In the places designated as ecological landscape conservation areas, it is strictly prohibited to capture, harvest, transplant, damage or kill wild animals and plants, to install explosives, traps, snares, nets, trap pits, etc. or spray or inject toxic chemicals, agricultural pesticides, etc. with the purposes of capturing or killing wild animals and plants, to change the structure of rivers, lakes, ponds, etc. and bring increase or decrease of water level and water quantity, and to commit collection of soil and stones, water reclamation and making fires. In the case of violating any of the prohibited acts, a penalty of less than KRW 2 million is charged.

Figure 4 - Bamseom Island in Hangang That Was Designated as an Ecological Landscape Conservation Area for the First Time

View of Bamseom Island

Migratory Birds in Bamseom Island

Designation and Management of Protected Wildlife

Seoul designates the species with high scientific and ecological value for conservation among the wildlife that are gradually disappearing in Seoul as protected wildlife. The protected wildlife are designated based on the recommendation made through the Hangang ecosystem survey, forest ecosystem survey, etc. conducted by Seoul City, and the recommendations of environmental organizations and professional agencies. The designation process goes through citizen consultation and expert advice via Internet. As a result, 35 species of wildlife including swallows, toads, roe deer, etc. were designated and announced for the first time on November 15th, 2000. On October 25th, 2007, 14 species of wild animals and plants including squirrels, onychodactylus fisheri were added to the protected wildlife.

Table 4 -Designation Status of Protected Wildlife

Kind (Species)		Designated in Nov. 2000 (35 Species)	Designated in Oct. 2007 (14 Species)
Mammalia	5	Roe Deer, Badger, Hedgehog, Weasel	Squirrels
Birds	11	Great Spotted Woodpecker, Yellow-rumped Flycatcher, Kingfisher, Swallow, Oriole, Chickadee	Dendrocopos Kizuki, Dendrocopos Leucotos, Grey-Faced Woodpecker, Reed Warbler, Black Capped Kingfisher
Amphibi-ans, Reptiles	7	Toads, Salamanders, Dybowski's Frog, Red-bellied Frog, Lined Grass Lizard, Small Stringy Snake	Onychodactylus Fisheri
Fishes	4	Yellow Puffer, Microphysogobio Jeoni, Roughskin Sculpin, Repomucenus Olidus	
Insects	12	Dorcus Titanus Castanicolor, Luehdorfia Puziloi, Pseudothemis Zonata, Large Dragonfly, Migratory Locust, Mole Cricket, Rhoenanthus (Potamanthindus) Coreanus, Dalla Torre	Rhyothemis Fuliginosa, Papilio Maackii, Muljarus Japonicus, Cybister Brevis
Plants	10	Acanthopanax Seoulensis Nakai, Epimedium Koreanum NAKAI, Drosera Rotundifolia L., Cypripedium Macranthum Sw., Forsythia Saxatilis Nakai, Patrinia Saniculaefolia, Buckler Fern	Pear-leaf Selliquea Fern, Bladderwort, Glechoma Grandis Kuprian

Creation and Expansion of Parks

Everyone wants to live in pleasant environments with clean air, clean water, warm sunlight and green spaces. The metropolitan city of Seoul with over 10 million people is getting bigger and larger, and the life quality of citizens is not enhanced significantly. More than 76% of the parks & landscape of Seoul is forest area which is concentrated in the outskirts of Seoul. Thus the space that can be used for citizens' leisure and relaxation during their daily life is not enough, and in particular, the amount of green space in the downtown area is seriously insufficient.

In order to address the lack of green and park spaces, Seoul constructed Children's Grand Park in 1973, Seoul Grand Park in 1984, Hangang Park in 1986, Yeouido Park in 1999, World Cup Park in 2002, Seoul Forest in 2005, Dream Forest Park in northern Seoul in 2009, and so on. At the same time, Seoul made efforts to create small parks in the neighboring areas and working spaces through the wall removal project in 1996, the roof garden project in 2000 and the school park project in 2006. As a result, Seoul came to have city parks totaling 170㎢ of area, which is 28% of the whole area of Seoul. According to the classification by type, urban nature parks make up 38.56% of the whole park area, natural parks 23.21%, neighborhood parks 25.45%, children's parks 1.29% and cemetery parks 1.40%.

Figure 5 - Examples of Representative Neighborhood Parks in Seoul

Children's Grand Park (Completed in 1973)

Hangang Park (Completed in 1986)

World Cup Park (Completed in 2002)

Seoul Forest (Completed in 2005)

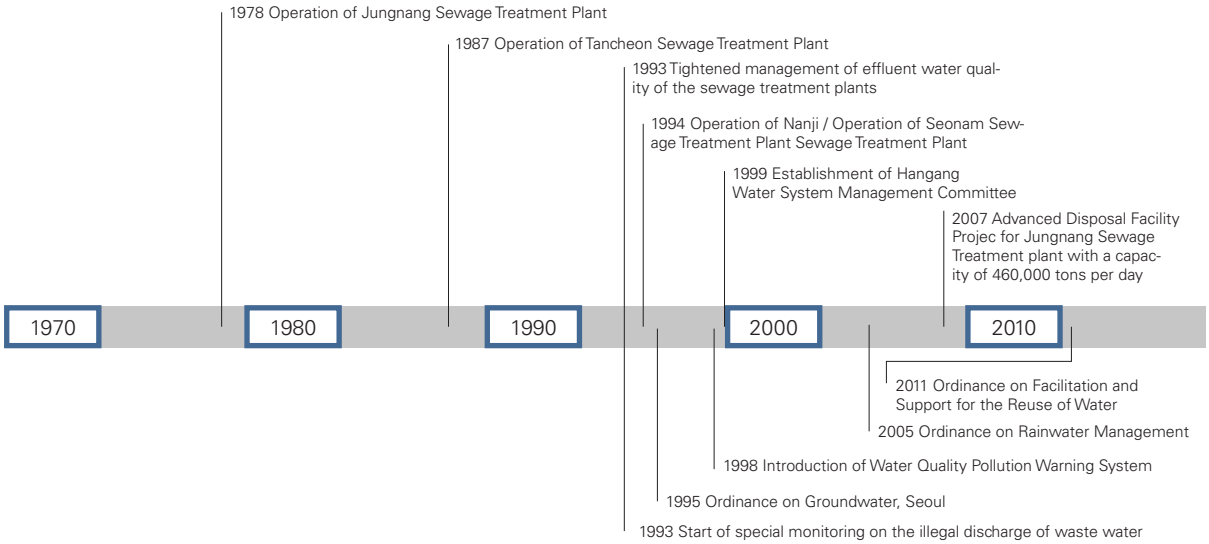
Water Management

Main Projects for Water Management by Period

Seoul's water management area is divided into public sewage treatment, water quality monitoring for Hangang and its branches, underground water management, rainwater management and waste water discharging source management. The public sewage treatment was started in 1978 when the Jungnang sewage treatment plant began its operation. Tancheon sewage treatment plant was constructed in 1987, Nanji sewage treatment plant and Seonam sewage treatment plant in 1994. The performance of sewage treatment plants has been gradually improved to discharge the treated sewage water with less than BOD 20 /L since 1993. As the management of effluent water quality was tightened since 2000, the BOD level of a part of treated sewage water of the Jungnang sewage treatment plant is maintained to be less than 10 /L. The water quality monitoring for the Hangang and its tributaries began in the early 1980s. At that time, however, the monitoring was done through occasional survey methods. The water quality monitoring by measuring the specific places and items on a regular basis began in the 1990s. Underground water management began in the 1990s. In the 2000s, the rainwater management (an ordinance enacted in 2005) and the water utilization promotion project (an ordinance enacted in 2011) began. The waste water discharging source management was started when

the Environmental Pollution Prevention Act was legislated in 1963 and gradually strengthened as the Environment Conservation Act and the Water Quality Conservation Act were enacted respectively in 1997 and 1990. Because of the increasing unauthorized, illegal and expediential discharges of waste water during nights, holidays and the rainy season, monitoring of the waste water discharging facilities is carried on frequently.

Figure 6 - Main Projects for Water Management by Period



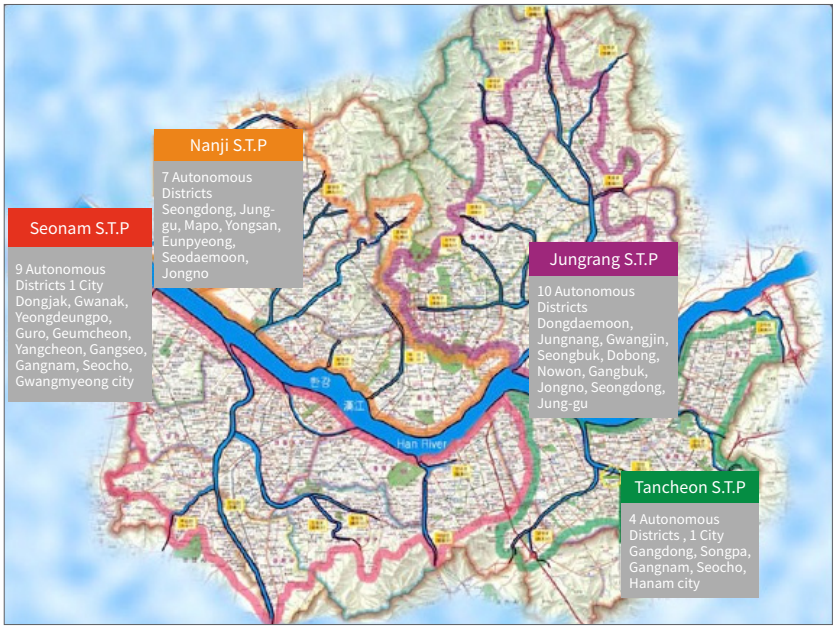
Sewage Treatment

As the contamination of public waters caused by sewage emerged as a social problem, Seoul constructed the Cheonggyecheon (stream) sewage treatment plant that could dispose of 150,000 tons of sewage per day in 1976 for the first time in Korea. It built the Jungnang sewage treatment plant with 210,000 tons of disposal capacity in 1979 and continued to construct the Seonam, Nanji and Tancheon (stream) sewage treatment plants. In order to secure the financial resources used for the sewage treatment projects, Seoul started imposing a sewage fee in 1984 on the basis of polluters pay principle.

Seoul started enlargement constructions of the 4 sewage treatment plants in 1992 to cope with the sewage amount increase according to the changes of overall city conditions. With the project to enlarge the sewage disposal capacity by 2.7 million tons per day completed in 1998, the total facility capacity reached 5.81 million tons per day. As the regulations on the standard of effluent water from the sewage treatment plants have been steadily tightened, Seoul also has facilitated the projects to upgrade the existing facilities to meet such trends. However, the construction of new advanced disposal plants required enormous expenses. So, Seoul selected a way that gives priority to the improvement of the existing facilities to increase their capacity first, and then adds new advanced disposal plants later if their capacity is insufficient. According to the scheme, Seoul completed a phase 1 project to introduce the advanced disposal facilities to the Jungnang sewage treatment plant with a capacity of 460,000 tons per day in 2007, and conducted constructions for the Tancheon, Seonam and Nanji sewage treatment plants to compensate their existing facilities.

The whole length of sewage pipes, that lead the sewage from the discharging sources to the sewage treatment plants, reached 10,487km as of the end of December 2012. The sewage pipes in Seoul used to be constructed and expanded focusing on rainwater treatment since Seoul became the capital city 600 years ago until the modern era. The sewage leaked into the outside to contaminate underground water, soil and rivers due to the broken pipes, defective joints, etc. In the meantime, large amounts of underground water flowed into the sewage pipes so that the sewage treatment plants came to process relatively clean water, lowering the efficiency of the facilities. To cope with such situations, Seoul started in 1992 to install certain kinds of endoscopy cameras (CCTV) inside the sewage pipes for detailed investigation based on which Seoul facilitated the repair and maintenance of the sewage pipes.

Figure 7 - Main Waterways and the Public Sewage Treatment Plants of Seoul



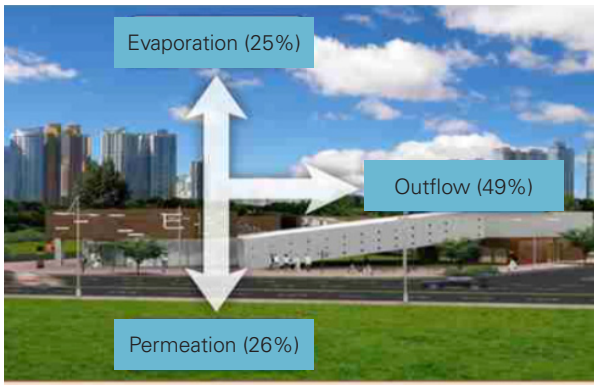
Rainwater Management

Since 1962, when urban development began in earnest in Seoul, the rainwater started to flow into the rivers at the same time as the impervious areas where rainwater could not permeate into the underground broadened. Thus the areas along rivers and streams and the low-lying ground suffered from flood damages habitually in the case of localized torrential downpours. The bottoms and sides of the rivers paved with concrete could make the downstream of rainwater rapid to prevent floods, but it lowered the level of underground water and depleted the fresh spring water. Accordingly, it became difficult to secure water resources during the dry season, frequently resulting in the state of urban heat island caused by the dry rivers and streams.

To cope with this situation, Seoul started rainwater management projects in the 2000s. First, systems were prepared through enacting the ordinance on water management in 2005, the ordinance on facilitation and

support for the reuse of water in 2011 and establishment of basic plan for water management in 2013, and the projects to collect and use rainwater have been facilitated. As of 2012, there are 141 places for rainfall storage and permeation facilities including Mt. Mangwusan rainfall storage, Gangil district rainfall storage, etc. totaling a capacity of 339,662㎥. There are 490 places of rainwater recycling facilities including the new office building of Seoul City Hall, Dongdaemun Design Plaza, Gangnam Segokrienpark, etc. totaling a capacity of 107,671㎥. Seoul supported the installation expenses for 125 rainwater recycling facilities (capacity: 2,020㎥). Seoul has also recommended the installation of rainwater permeation and recycling facilities for the projects controlled under the environmental effects evaluation. In the case of large scale housing land development projects, it is mandatory to install rainwater management facilities.

Figure 8 - Rainwater Moving Route of Seoul and an Example of Rainwater Management Project



Rainwater Moving Route of Seoul (2010)

Rainwater Recycling Facility in a Park

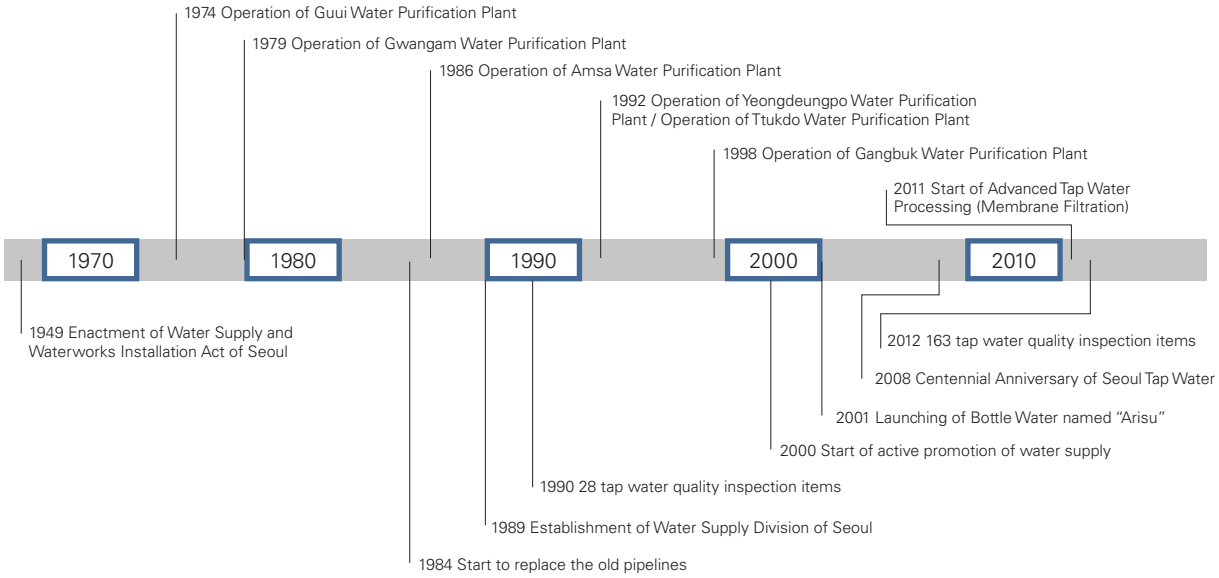
Water Supply

Main Projects of Water Supply by Period

The water supply area can be largely divided into tap water production, maintenance of distribution pipelines, tap water quality management, etc. The water supply system was introduced to Seoul in 1908 in the late Joseon Dynasty by an American technician named Henry Collbran, and Seoul celebrated the centenary of the operation of the water supply system in 2008. In 1949, the Water Supply and Waterworks Installation Act of Seoul was legislated. Since the construction of Guui water purification plant in 1974, 6 plants including Gwangam, Amsa, Yeongdeungpo, Ttukdo and Gangbuk have been built and operated. Seoul introduced the membrane filtration process for better water taste in 2011. The projects of water distribution pipeline maintenance were started in 1984, replacing 13,122㎞ of the total deteriorated pipelines 13,668㎞ in length until 2012. Thanks to the replacement of the old pipelines, the water flow rate of Seoul tap water had been remarkably increased from 72% in 2000 to 94.5% in 2012. The quality management of tap water is conducted by quality management of water supply sources, expansion of inspection items, indoor tap water quality check, etc. In particular, the number of tap water inspection items has been continuously increasing from 28

in 1990 to 163 in 2012.

Figure 9 - Main Projects of Water Supply by Period



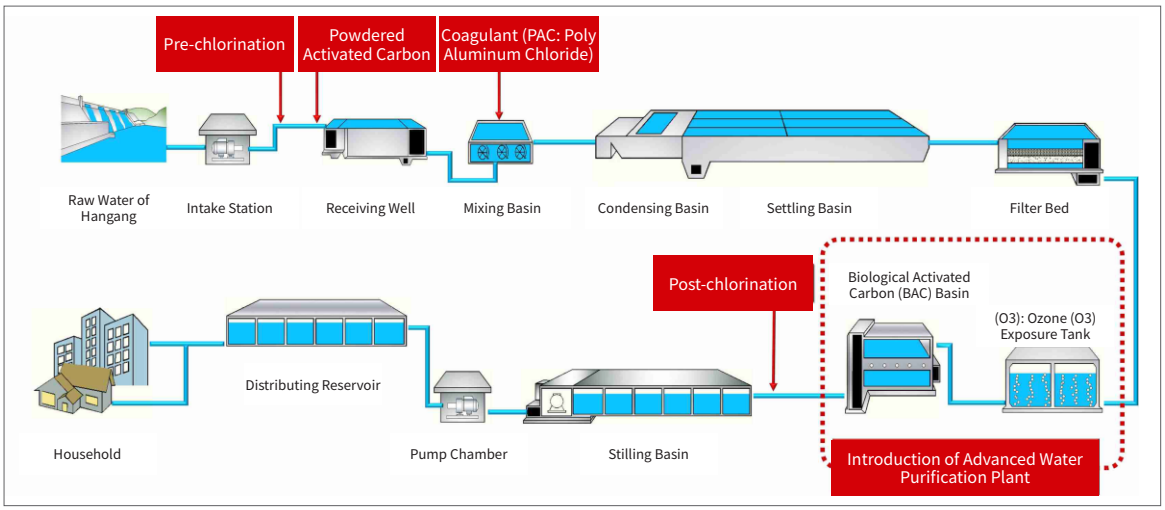
Production of Tap Water

The first water supply system was the water purification plant constructed at Ttukdo reservoir which was completed on September 1st, 1908 by the two Americans named Collbran and Bostwick under the permission of Emperor Gojong on the water supply system project. At that time, the production capacity was 12,500 tons per day and the water supply population was 125,000. Three purification plants (Ttukdo, Noryangjin and Guui whose total capacity was 150,000㎥ per day) were operated in 1946 and 5 (Ttukdo, Noryangjin, Guui, Bogwangdong and Yeongdeungpo whose total capacity was 2.17 million ㎥ per day) in 1977. In 2004, Seoul closed the deteriorated and low competitive water purification plants including Guui 1 & 2, Noryangjin, Sinwol, Seonyu and Bogwangdong. Currently, 6 plants including Gwangam, Amsa, Guii, Tgukdo, Yeongdeungpo and Gangbuk are in operation.

As of 2012, the water purification and production capacity is 4.35 million ㎥ per day, and the water supply population is 10.44 million, recording 100% supply rate.

Prior to 1992, there was no reserve in capacity for water supply plants, causing difficulties in water supply operation. However, sufficient purification facilities were ensured in 1998 and stable water supply has been possible without places with no running water since then. In 2012, the amount of tap water used in Seoul reached 1.20 billion tons, which means 3,216,000 tons per day on average.

Figure 10 - Tap Water Production and Feeding Process of Seoul



Maintenance of Feeding Pipes

The total length of distribution water pipe installed in Seoul is 13,801㎞. Seoul replaced 13,122㎞ of the total deteriorated pipelines 13,668㎞ in length by 2012, and it was going to replace all the pipelines except the old ones in the redevelopment project areas (43㎞). The effects of the water distribution pipeline maintenance can be checked by the water flow rate. The water flow rate means the ratio of the amount generating revenue of the total amount produced in the purification plants. Therefore, high water flow rate means the reduction of the amount of leaked tap water. The water flow rate was increased remarkably from 72% in 2000 to 94.5% in 2012. As the water flow rate was increased, the budget for the raw water, chemicals, powers, etc. was reduced enough to contribute to the improvement of water supply management. In 2012, the water flow rate was increased by 1.0% and it realized the reduction of KRW 6.842 billion (based on the sales unit price).

Air Quality Management

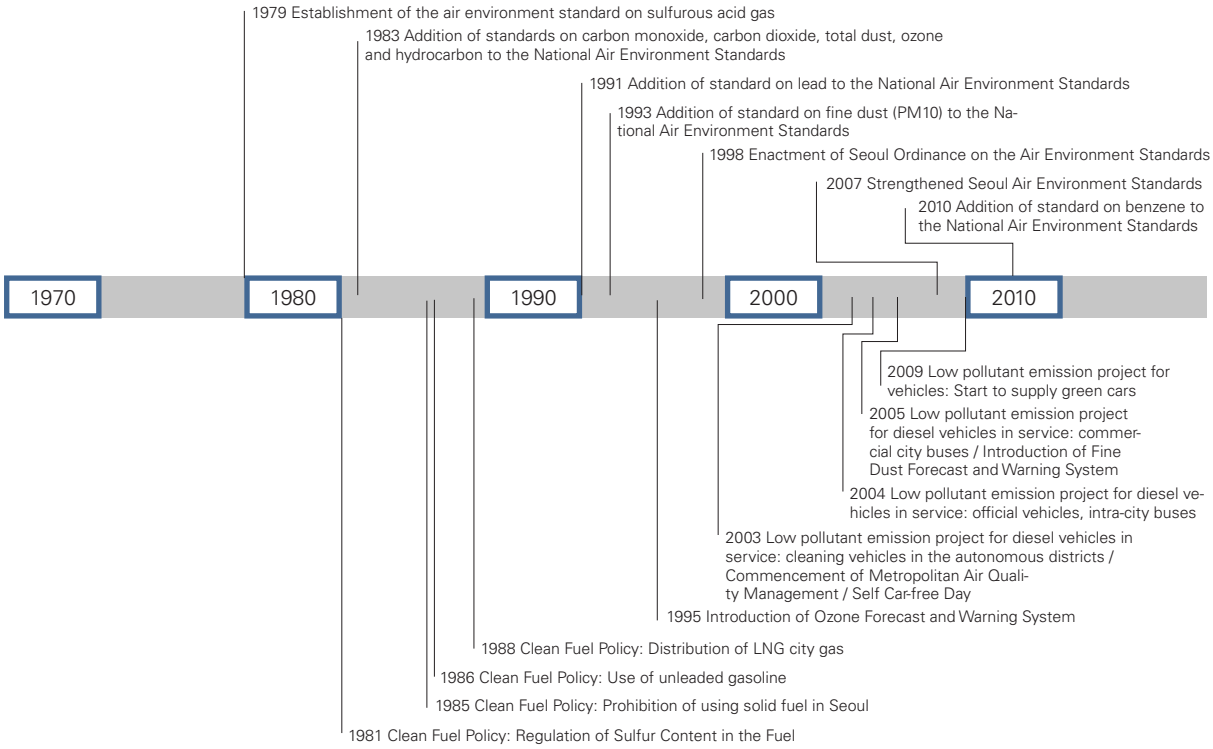
Main Projects of Air Quality Management by Period

Air quality management area is largely divided into environment standard establishment, fuel control, low pollutant emission vehicle projects, transportation demand management, establishment of air quality management basis, etc. Seoul has started to establish the air environment standards from 1979 first on sulfurous acid gas, followed by the standards on carbon monoxide, nitrogen dioxide, total dust, ozone, hydrocarbons, lead and fine dusts in consecutive order. The standard on benzene was added in 2010. Seoul City has applied its own air environment standards since 1998. Seoul began its fuel control with the regulation of the sulfur content in 1981, followed by the regulations and policies on prohibition of solid fuels and use of unleaded gasoline. Seoul started distribution of LNG city gas in 1998. In order to suppress the emission of pollutants from cars, Seoul started the low-emission vehicle projects for the diesel vehicles in service in cooperation

with metropolitan areas in 2003 and began to supply the green cars such as electric automobiles in 2008. To restrain the demands on vehicle uses, Seoul introduced Self Car-free Day system in 2003.

For the systematic implementation of air quality management, Seoul is running the air quality measuring posts. Seoul introduced ozone warning system in 1995 and fine dust forecast and warning system in 2005 to help citizens prepare for such situations.

Figure 11 - Main Projects of Air quality by Period



Low Pollutant Emission of Vehicles

The low pollutant emission projects of Seoul consist of the low pollutant emission project for the operating diesel vehicles, the green car supply project and the expansion of natural gas stations. Seoul began the low pollutant emission project for operating diesel vehicles in 2003 by replacing the 135 diesel engines of the 2.5-ton official garbage trucks with LPG engines as a pilot project. In 2004, it conducted more pilot projects such as attachment of emission reduction devices to around 880 official vehicles and intra-city buses. With the low pollutant emission projects having been conducted for the city buses and the commercial vehicles in earnest from 2005, Seoul had applied its policies for 248,779 units of vehicles in total by the end of 2012; attachment of DPF for 82,115, engine modification to LPG for 67,834, attachment of DOC for 53,054 and early scrapping for 45,776 vehicles. Seoul had interest in supply of electric automobiles as a fundamental solution for air pollution. Since 2009, Seoul has facilitated the supply of green cars and established the infrastructure

of gas stations to be used as a testbed for electric vehicles. Seoul also has implemented proof projects with the 'electric two-wheeled vehicle" as a start, followed by low speed electric vehicles, modified electric vehicles, high speed electric vehicles, electric buses, hydrogen fuel cell vehicles, on-line electric vehicles, etc. It established recharging stations in public facilities such as city hall, autonomous district offices, parks, etc. In particular, Seoul developed a "Smart Recharging System" that allows the payment for charging to meet the requirements of the electric vehicle users.

Self Car-free Day

The self car-free day campaign is a kind of civil movement that the citizens decide autonomously a car-free day during the week from Monday to Friday and do not drive their cars on that day. It was started with the name of "Self Car-free Day" in July 2003. The targets of the self car-free day were to restrain the operation of non-business cars with less than 10 seats and encourage people to use public transportation instead, to make the air of Seoul clean and pleasant and to improve the air quality to the level of advanced countries. The paper sticker attachment method was introduced first in July 2003 and the electronic tagging method was adopted in January 2006, which replaced the existing paper sticker method in July 2007, realizing a unified operation. As of 2012, 1,080,793 vehicles are participating in the self car-free day campaign.

Figure 12 - Self Car-free Day

The self car-free day campaign is a civil movement that citizens decide autonomously a car-free day during the week from Monday to Friday and do not drive their cars on that day.

It is strongly recommended to join the self car-free day campaign and use public transportation in order to save energy in the long era of high oil prices, to ease heavy congestion and to make air clean and pleasant.

Air Quality Forecast and Warning System

The ozone warning system was introduced in July 1995 to minimize the impact of ozone on human health and living environment, to raise the citizens' concerns for air pollution and to enhance the level of environmental awareness by issuing warnings promptly to the citizens when the ozone (O3) concentration is measured to be higher than a certain standard. The ozone warnings are issued for 5 areas including downtown, northwest region, northeast region, southwest region and southeast region of Seoul in consideration of the moving

route of air pollutant. In the case that the ozone concentration measured in a measuring station exceeds the standard level, ozone warning, alert and alarm are issued according to the set standards by the region where the relevant measuring station is located.

Table 5 - Ozone Warning Issuance Criteria and Items Required for the Citizens

Stage	Issuance Criteria	Items Required for the Citizens
Warning	In the case that ozone concentration in air in the morning is more than 0.12ppm	· Abstain from outdoor exercise. · The elderly, children and patients abstain from outdoor activities. · Refrain from unnecessary driving of cars and use public transportation.
Alert	In the case that ozone concentration in air in the morning is more than 0.3ppm	· The elderly, children and patients abstain from outdoor activities. · Abstain from outdoor learning in kindergartens and schools. · Vehicles are advised to pass around the region where the alert is issued.
Alarm	In the case that ozone concentration in air in the morning is more than 0.5ppm	· The elderly, children and patients should not do outdoor activities. · Kindergartens and schools are advised to close. · Vehicles are advised not to enter the region where the alarm is issued.

There are three categories of fine dust forecasts, warning, alert and alarm in the fine dust forecast and warning system. As the air pollution level got higher and the citizens' interest in fine dust got increased due to the rapid growth of vehicles, Seoul introduced the fine dust forecast and warning system for the first time in Korea on February 1st, 2005 in order to minimize the damages to the citizens' health and to contribute to pollution reduction. The fine dust forecast is created by estimating the dust concentration of tomorrow and announced to the citizens for their reference in outdoor activities. The forecast categories are Good (0~30㎍/㎥), Normal (31~80㎍/㎥), Possible Influence on the Sensitive Persons (81~121㎍/㎥), Bad (121~200㎍/㎥), Very Bad (201~300㎍/㎥) and Dangerous (300㎍/㎥~). The forecast is disseminated using the forecast computer systems after referring to the weather forecast of Korea Meteorological Administration and its accuracy. Also, a detailed forecast is made by time (morning, day time, evening and midnight) in cases that the average concentration for 2 hours is estimated to be higher than the level of "Possible Influence on the Sensitive Persons." When the fine dust concentration is higher than certain levels, a warning or alarm is issued to recommend and facilitate people to refrain from going out and doing outdoor classes, to close schools, to abstain from driving, to stop construction generating dusts and to wash the roads using water.

Table 6 - Criteria on Issuance and Release of the Fine Dust Warning and Alarm

Classification	Issued When	Released When
Warning	Fine dust concentration more than 200 ㎍/㎡ per hour on average continued over 2 hours	Fine dust concentration is less than 100㎍/㎡ per hour on average
Alarm	Fine dust concentration more than 300 ㎍/㎡ per hour on average continued over 2 hours	Fine dust concentration is less than 200㎍/㎡ per hour on average

Waste Management

Main Projects of Waste Management by Period

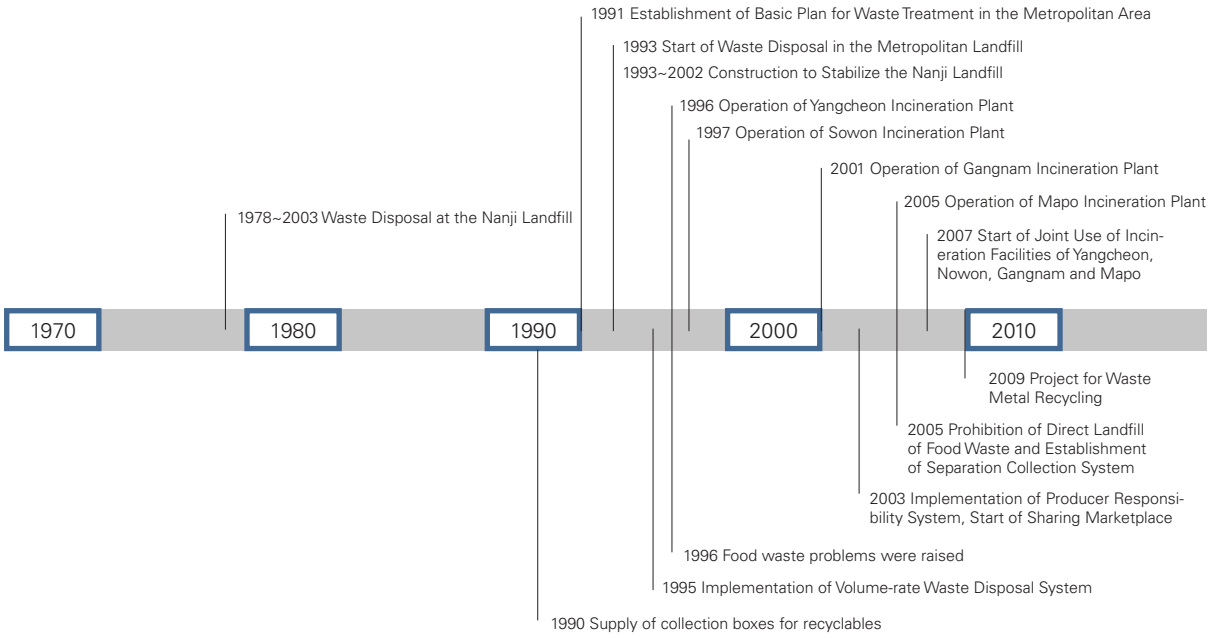
The waste management area of Seoul is largely divided into the construction of treatment facilities, separate collection of recyclables and food waste, introduction of volume-rate waste disposal system (pay-as-you-throw) and promotion of reuse.

The first waste treatment facility in Seoul was the Nanji Landfill which was used from 1978 to 1993. Since 1993, wastes have been treated at the metropolitan landfill site which was constructed jointly by the central government and the Seoul Metropolitan Government in the city of Incheon. The first waste incineration facility with high-tech features was the Yangcheon incinerator constructed in 1996. Since then, Nowon facility in 1997, Gangnam facility in 2001 and Mapo facility in 2005 were constructed respectively. Aside from the Mapo facility, which was built to dispose of household waste from Mapo-gu, Jung-gu and Yongsan-gu, the other 3 facilities started to process household waste generated from the neighboring autonomous districts from 2007 and the Mapo facility also expanded its coverage to the other areas in addition to the existing districts.

The collection of recyclables in Seoul began in 1990 in apartment complexes and then was extended to single-family homes and business sites. The purity of the recyclables was not high because a lot of garbage was mixed in. To cope with this situation, Seoul introduced the volume-rate waste disposal system. The garbage fee was charged depending on the amount of waste produced, and the collection of recyclables was performed for free. The volume-rate waste disposal system contributed a lot to the settlement of separate collection of recyclables. But another problem has occurred. The garbage from which the recyclables were separated was filled with enough perishable food waste to cause filthy water and bad smell, and it was difficult to find the source of demand on the recyclables increased in a short time. Because the landfill of food waste was prohibited beginning in 2005, food waste began to be collected separately. The expanded producer responsibility system, introduced in 2003 helped find and secure the source of demand on the recyclables.

In addition, Seoul opened the sharing marketplace from 2003 to support the exchange of second-hand goods. Seoul also began a waste metal resource recycling project in 2009 to collect metals, plastic, etc. by disassembling small home appliances such as mobile phones, electric fans, telephones, etc.

Figure 13 - Main Projects of Waste Management by Period



Construction and Joint Use of Incineration Facilities

In 1991, Seoul established a plant to construct 16,500-ton capacity incineration facilities in 11 places in Seoul. In 1992, a project was commenced to construct 4 incineration facilities over 13 years; in Yangcheon in 1996, Nowon in 1997, Gangnam in 2001 and Mapo in 2006. The total processing capacity of the 4 facilities were 2,850 tons per day.

However, the utilization level of the facilities was so low that the operation rate of Yangcheon facility was 33%, Nowon facility 19%, Gangnam facility 24% and Mapo facility 59% as of the daily operating capacity in 2005. Seoul began area broadening projects from 2001 to use those facilities with the neighboring autonomous districts. Yangcheon, Nowon and Gangnam facilities, which had been planned to treat the waste of their own districts, began to receive waste from the neighboring autonomous districts and the Mapo facility, which had been planned to treat the waste of Mapo-gu, Jung-gu and Yongsan-gu, began to receive the waste from more autonomous districts according to the area broadening projects implemented.

The key issue was to get the consent of the resident support and consultative groups of the 4 regions that had incineration facilities. In case of Gangnam facility, Seoul had around 160 meetings with the resident groups until reaching an agreement on the joint use of the facility on May 7th, 2007. It took 9 years in the case of Yangcheon facility to reach an agreement on the joint use of the facility. After having around 150 meetings with the resident groups, the joint use of the 4 facilities was agreed on May 10th, 2010.

The achievement of the joint use was great. First, the number of autonomous districts using the 4 incineration facilities was greatly increased. In spite of the completion of Gangnam and Mapo facilities, the number of autonomous districts using the facilities was just 6, but the use of incineration facilities was expanded to 20 autonomous districts with the agreement of joint use of Yangcheon facility in 2010. As Dongdaemun-gu joined the joint use in 2012, along with Gwanak-gu in 2013, the number of autonomous districts using the 4 facilities was 22 as of 2014. With the joint use of the incineration facilities available, the operation rate was improved from 19~59% (33% of all facilities) in 2006 to 77~92% (85% of all facilities) in 2012.

Table 7 - Construction Overview of Seoul Incineration Facilities

Classification	Yangcheon	Nowon	Gangnam	Mapo
Facility Capacity	400 tons/day (2 incinerators)	800 tons/day (2 incinerators)	900 tons/day (3 incinerators)	750 tons/day (3 incinerators)
Construction Period	Dec. 1992 ~ Feb.96	Dec. 1992 ~ Jan.97	Dec. 1994 ~ Dec.01	Dec. 2001 ~ May.05
Land Space	14,627㎡	46,307㎡	63,813㎡	58,435㎡
Construction Cost	KRW 32. 1 Bil.	KRW 74.3 Bil.	KRW 115.5 Bil.	KRW 171.2 Bil.
Type of Incinerator	Stoker Type	Stoker Type	Stoker Type	Stoker Type + Rotary Kiln
Air Purification Facility	· Wash Tower · Semidry Reaction Tower · Bag Filter · SCR Catalyst Tower	· Electric Precipitator · Wet Wash Tower · Bag Filter · SCR Catalyst Tower	· Wash Tower · Semidry Reaction Tower · Bag Filter · SCR Catalyst Tower	· Semidry Reaction Tower · Bag Filter · SCR Catalyst Tower · Police Filter
Subsidiary Facilities	· Swimming Pool · Fitness Center · Reading Room · Auditorium	· Swimming Pool · Fitness Center · Cultural Lecture Room · Reading Room	· Swimming Pool · Fitness Center · Cultural Lecture Room · Reading Room	· Sauna · Fitness Center · Driving Range · Reading Room

Separate Collection of Recyclables

The waste emitted by residents is divided into household waste and recyclables. Clothing or other items may be added depending on the region. The recyclables are divided into paper packs, glass bottles, metal cans (cans made of steel, aluminum and others) and synthetic resins (plastic, PET bottles and Styrofoam) on which there are the separate disposal marks according to government guidelines. The Seoul Metropolitan Government added used clothing and beddings as recyclables and started collecting them autonomously from March 1999.

The recyclables should be discarded using transparent vinyl bags and put in front of the door of each household for collection at the specified date and time designated by the autonomous districts. The collected

amount by the autonomous districts makes up 10~15% of the entire amount of recyclables in Seoul. 85~90% are reported to be collected by private companies. The discarding locations are in front of the door, in vehicles and at designated points. In the case of Seoul, the apartment complexes use designated points and most of the other households use the places in front of doors.

The collected recyclables are then transported to sorting facilities and divided into paper, plastic, glass, metal and debris. The recyclables are sold and the debris is treated in the incineration facilities or buried in landfill. 14 sorting facilities are operated by the autonomous districts of Seoul, and the others are consigned to private companies. The expanded producer responsibility introduced in 2003 has greatly contributed to securing demand for low value items such as plastic containers, etc. The producers should collect some of their packaging materials from the distributed products and the amount of obligatory processing is increasing each year.

Scrap Metal Recycling Project

Seoul started the scrap metal reuse project from June 11th, 2009 for the first time in Korea. With this as a momentum, the Ministry of Environment and the Ministry of Trade, Industry and Energy along with other ministries established and announced policies on scrap metal recycling while Seoul had been leading the industry. To implement the scrap metal recycling, Seoul revised the Ordinance on Waste Management in June 2009 to remove the disposal fee for used small home appliances. It also supplied 6,165 collection boxes exclusively to collect used small home appliances in community centers and apartment complexes. In the case of detached houses, it was permitted to put used small home appliances in front of doors on the day designated for recycling.

Seoul had treated 8,820 tons of waste home appliances and 1.41 million units of used mobile phones from 2009 to December 2012. The collected materials were sold to earn KRW 6,968 million, of which KRW 758 million was donated to the Community Chest of Korea and the Seoul Scholarship Foundation. Seoul established the SR Center to process used home appliances and mobile phones, and offered stable jobs to 53 socially disadvantaged people such as the disabled, homeless people, etc. Seoul collects used home appliances and mobile phones through joint campaigns with the autonomous districts and the SR Center disassembles them primarily by materials and sells them to metal resources collection companies. In the case of used mobile phones, the rare metals and so on are collected through melting process after detaching batteries.

Table 8 - Overview of Seoul SR Center

Classification	Description
Location	(Within car service center) 73-36 Songjeong-dong, Seongdong-gu, Seoul
Building Area	1st Ground Floor, 810㎡ (general steel frame structure)
Purpose of Building	Workspaces, Warehouses, Offices, Meeting Rooms, Lounges, Shower Rooms, etc.
Processing Capacity	3,600 tons of the used home appliances /year 700,000 units of used mobile phones /year
Recruited Manpower	53 people in total (low-income 19, disabled 6, single parents 3, homeless 7, the elderly 6, Ordinary people 12) * Authorized as a social enterprise by the Ministry of Labor in December 2011

Outcomes of Policy Implementation

Parks & Landscape

Parks & landscape policies of Seoul are implemented in two axes; ecological conservation and expansion of parks & landscape. Having concentrated on expanding the park areas, Seoul created Hangang Park, World Cup Park, Seoul Forest and Dream Forest Park in northern Seoul, etc., resulting in an increase of park area. The park area was increased by around 12% from 152㎢ in 1995 to 170㎢ in 2011. The share of park area in Seoul was increased by around 4% from 24.2% in 1995 to 28.1% in 2011.

Table 9 - Park & Landscape Management Results of Seoul

Classification	1995	2002	2005	2009	2011
Seoul Area (㎢)	627	605	605	605	605
Parks Area (㎢)	152	158	164	169	170
Parks Area (%)	24.2	26.1	27.1	27.9	28.1

Water Quality

Waterways in Seoul consist of the Hangang (River) and the several tributaries flowing into the Hangang. Therefore, the water quality of Hangang going through Seoul depends on the water quality of Hangang river water before it reaches Seoul, the water quality of the tributaries flowing into the Hangang and the water quality of effluent water from the 4 sewage treatment plants. Since the 1990s, the central government has exerted their efforts to improve the water quality of Hangang and its tributaries in cooperation with the auton-

omous districts along the Hangang and the non-governmental water quality monitoring organizations. However, it was not easy to improve the water quality as shown in the water quality of Jamsil whose BOD was 2.0 mg/L in 1995 and 1.9 mg/L in 2008. Thanks to the stepwise results of the advanced sewage treatment plants projects which began in 2007, however, the water quality has been improved dramatically so that the BOD of Jamsil area, the upper region of Hangang, became 1.1 mg/L, the BOD of Noryangjin area became 2.8 mg/L and the BOD of Gayang area, the lower region of Hangang, became 2.7 mg/L in 2011.

Table 10 - Biological Oxygen Demand (BOD) of Hangang (mg/L)

Classification	1995	2002	2005	2008	2011
Jamsil	2.0	1.8	1.4	1.9	1.1
Noryangjin	3.8	3.3	3.1	4.0	2.8
Gayang	4.4	3.4	2.9	3.6	2.7

Tap Water Production Capacity

The main concern of Seoul regarding the water supply projects in the 1990s had been how to ensure sufficient production facilities to supply water for living water, commercial water, industrial water and public water (fire-fighting water, etc.). In the 2000s, the main objectives were to reduce the leakage amount, increase the water flow rate (supplied amount/produced amount x 100) and to produce high quality tap water. As a result, the water flow rate which had been merely 61.9% in 1995 was greatly improved to 93.5% in 2011. As the water flow rate was enhanced, the total production in 2011 could be reduced to reach 66% of the production amount of 1995. In order to increase the water quality, the number of water quality inspection items, which had been 53 in 1995, was increased approximately twice in 2011 to 155.

Table 11 - Tap Water Management Status of Seoul

Classification	1995	2002	2005	2008	2011
Production Amount (Mil. Ton)	1,810	1,379	1,278	1,211	1,187
Water Flow Rate (%)	61.9	79.2	88.0	91.7	93.5
No. of Water Quality Inspection Items	53	105	145	145	155

Status of Air Quality

To suppress the pollutant emission to improve the air quality of Seoul, Seoul has implemented various policies such as prohibition of solid fuels, improvement of fuel quality, low pollutant emission of diesel vehicles, self car-free day, etc. However, the remarkable achievement was the fine dust (PM10) control. The fine dust concentration, which was 68μg/㎥ in 1997, was reduced to 41μg/㎥ in 2012. In the case of nitrogen dioxide, etc., however, the improvement was slower. The concentrations of ultra fine dust (P㎡.5), nitrogen dioxide, etc. are likely to emerge as new goals in air quality management.

Table 12 - Air Quality Status of Seoul

Classification	1997	2001	2005	2009	2012
Fine Dust (μg/㎥)	68	72	58	54	41
Sulphur Dioxide (ppm)	0.011	0.005	0.005	0.005	0.005
Nitrogen Dioxide (ppm)	0.032	0.037	0.034	0.035	0.030

Waste Management

The core areas of waste management in Seoul were the construction of incineration facilities and the expansion of recycling. The main projects were the construction of 4 incineration plants and establishing the joint use of them with the neighboring autonomous districts, implementation of separate collection of the recyclables by implementing the volume-rate waste disposal system, and separate collection and recycling of food waste. As a result, the recycling rate, which had been 33.5% in 1997, was significantly improved to 65% in 2012, and the incineration rate, which had been 4.6% in 1997, was also improved to 27% in 2012 (The burning heat was taken back as energy). On the contrary, the frequency of landfill use was dramatically decreased from 61.9% in 1997 to 8% in 2012.

Table 13 - Household Waste Management Results of Seoul

Classification	1997	2001	2005	2009	2012
Recycling (%)	33.5	47.5	64.3	67.0	65.0
Incineration +Energy Recycling (%)	4.6	6.9	10.2	18.8	27.0
Landfill (%)	61.9	45.7	25.5	14.2	8.0

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11. Roof Gardening Support Project for Private Buildings

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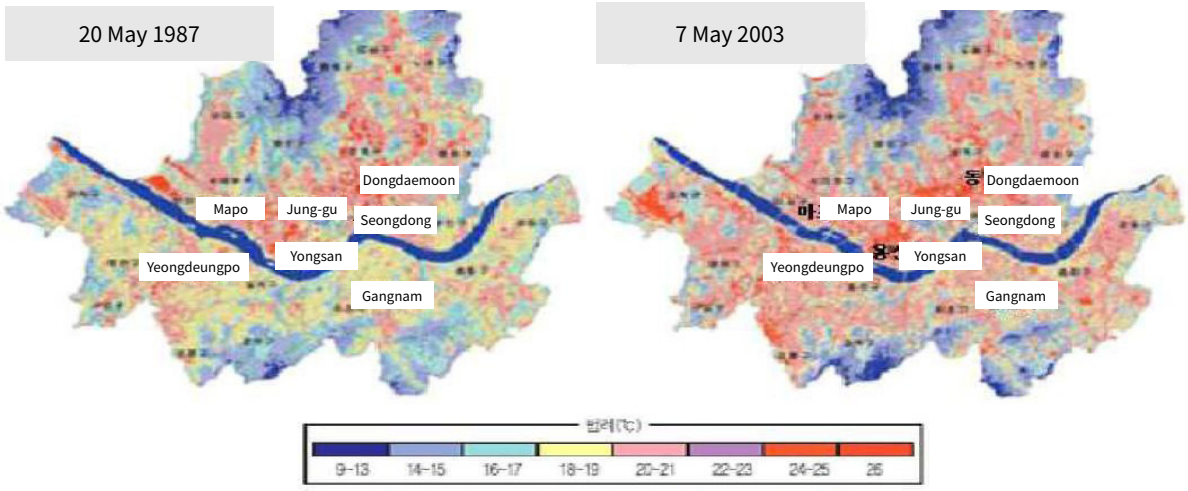
Policy Area : City Park

Background of Roof Gardening Project

The highly urbanized modern cities are suffering from problems caused by the increasing heat island effects, especially in dense downtown areas. While the annual average temperature is getting higher because of the greenhouse effect, the heat island effect causes city temperatures to increase even more, as a result, energy use in the buildings is increasing. It is necessary to take proper measures against increasing urban temperatures and to improve energy efficiency. Because the highest proportion of energy consumption occurs in buildings, management of temperature increases in buildings and energy control are needed.

Most of the surface areas of the buildings in downtown are covered with concrete and cement. Thus, surface enhancement of the buildings is an important mean to mitigate urban heat island effects. Seoul has made several attempts to create and expand green spaces. Roof gardening and wall greening are parts of green space expansion projects that Seoul has actively promoted. Especially, roof gardening can lower the temperature inside buildings in the microclimate aspect, resulting in relaxation of the urban heat island effects. The necessity of roof gardening is increasing because it reduces the amount of energy used in the buildings and the rainwater run-off rate by lowering the heat flow rate.

Figure 1 - Satellite Pictures of Heat Island Effects



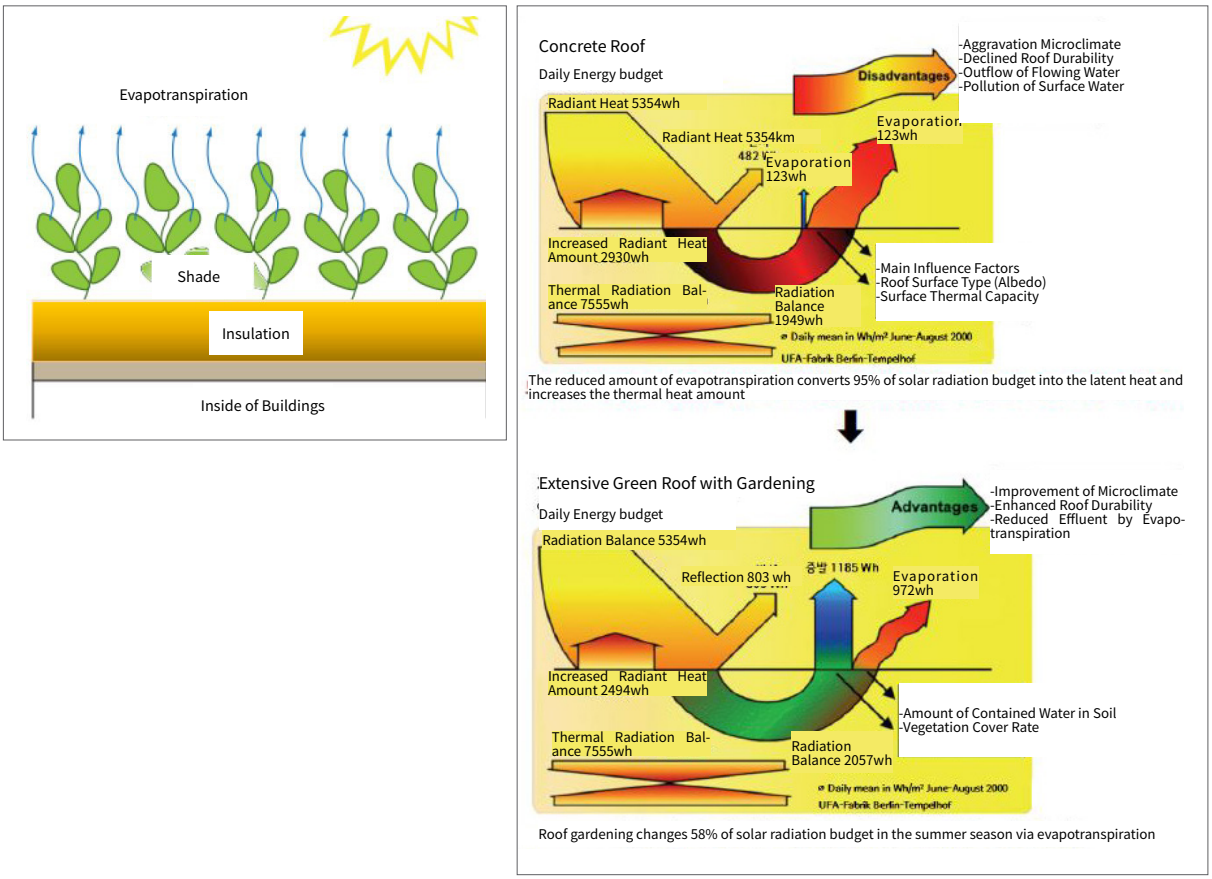
Heat Island Mitigating Effects of Roof Gardening

The roof gardening project is well worth enough in that it is possible to secure more neighborhood green spaces in downtown areas without separate land compensation. It is also effective in mitigating the urban heat island phenomenon, expanding habitat space for plants and improving air quality.

Roof gardening creates shade on building surfaces. The soil for tree planting prevents direct contact of sun-

light on the surfaces of buildings. The shade lowers the surface temperature and reduces the heat transfer to the inside of buildings. Accordingly, the heat emitted to the air again is reduced, which then lowers the temperature around the buildings. The surface temperature of the buildings with green spaces is measured to be lower by 11℃ to a maximum of 25℃. A certain study showed the surface temperature of green buildings can be decreased by up to a maximum of 20℃. In addition, the rainwater stored in soil lowers the temperature of buildings or areas surrounding them through the process of evaporation or evapotranspiration by vegetation. While roof tops without gardens release 95% of the solar radiation energy into the air, roof tops with gardens can have solar radiation energy reduced by 58% through the process of evapotranspiration, resulting in the mitigation of the urban heat island effects.

Figure 2 - Process of Mitigating Heat Island Effects by Roof Gardening



Source : Kohler (2002) was quoted and revised

According to the results of the relevant studies, the surface temperature of the buildings with roof gardening is lower than that of concrete by a maximum of 32℃ in summer, which shows the effectiveness of roof gardening in mitigating the heat island phenomenon. Even with vegetation covering with light weight roof gardening, a satisfactory temperature reducing effect can be obtained.

Table 1 - Existing Studies and the Temperature Reducing Effect of Roof Gardening

Literature	Applied Type	Classifications	Time	Temp. Difference between the Surfaces of Roof Garden and Concrete	Temp. Difference between the Ceiling Surfaces with Roof Garden and without it
Hyeon-su Kim and Others(1999)	Light weight	Depth of Soil 9.6㎝+ Vegetation	Daily Maximum in Summer	-16℃	
Yeoung-hwan Song(2001)	Light weight	Depth of Soil 20 ㎝+No Vegetation	Daily Maximum in Summer	-5.5℃	-6.7
Sang-tae Lee, Jin-seon Kim (2004)	Light weight	Vegetation Block 10 ㎝+Soil Addition 1㎝	Daily Maximum in Summer	-16.4℃	-1.2
		Vegetation Block 10 ㎝+Soil Addition 1㎝	Daily Maximum in Winter	+1.7℃	4.1
Dong-geun Lee and others (2005)	Light weight	Depth of Soil 10㎝+ Vegetation	Daily Maximum in Summer	-3.7~8.4℃	Max. -2.4
		Depth of Soil 20㎝+ Vegetation			Average -1.3
Seung-hwan Oh (2007)	Light weight	Depth of Soil 10㎝, No Vegetation	Daily Maximum in Summer	-9.3℃	
		Depth of Soil 10㎝, Vegetation		-21.1℃	
		Depth of Soil 15㎝, Vegetation		-22.0℃	
		Depth of Soil 20㎝, Vegetation		-22.7℃	
Won-ju Kim (2009)	Heavy weight	Soil + Multi-layer Vegetation	Daily Maximum in July and August	-32.0℃	
			Maximum in July	-17.4℃	

Environmental Effects of Roof Gardening

In addition to the effect of mitigating the urban heat island phenomenon, roof gardening has several positive effects in terms of the environment. Because of city surfaces paved with the impermeable materials such as concrete and asphalt, the amount of rainwater that directly flows into the sewage system has increased to cause flooding in the cities. Roof gardening is effective in preventing urban flooding by reducing the impermeable spaces, storing rainwater for a while and reducing rainwater outflow. Also, roof gardening provides the urban environment with green space by which habitat space can be secured and the urban ecosystem can

be restored. The soil layer created through roof gardening absorbs sound waves to reduce noise. The gardens absorb carbon dioxide, sulfur dioxide gas, nitrogen compounds, benzene, dusts and heavy metals and emit oxygen to create the effect of air purification.

Economic and Social Effects of Roof Gardening

The soil layer created by roof gardening protects the waterproof layer of buildings, preventing the concrete from being deteriorated by acid rain and ultraviolet rays, therefore improving the durability of the structures. Thanks to the mixed effects of solar radiation blocking, latent heat by the evapotranspiration of the vegetation area and the physical insulation by the soil layer, the heat conductivity becomes lower than roofs without gardens, and a significant effect on building cooling, heating and energy saving can be attained. The obligatory landscaping spaces on the ground can be replaced with roof gardening areas while securing green spaces in the cities and improving the quality of environments and landscapes. The buildings with good roof gardening can expect higher rental income because they have comfortable green spaces.

Roof gardening can improve the city landscape as well as the appearance of buildings by creating green spaces on the roofs and shielding poor roof landscapes. Deserted roofs can be used as spaces for rest, recreation, education or urban agriculture cultivating various vegetables and fruits. The newly created spaces can give spiritual comfort to people and ultimately enhance the comfort of residential environments.

Investigation on Awareness of Roof Gardening

According to investigation results, awareness of and requests for the environmental functions and the necessity of roof gardening was high. More citizens demanded roof gardening for the buildings where they live. However, concerns about the burden of the costs necessary for the installation of roof gardens, difficulties of follow-up management and safety of buildings were analyzed as factors to hinder the implementation of roof gardening.

Table 2 - Effects of Roof Gardening

Environmental Effects	Reduction of Environmental Pollution	· Absorption of CO2, NO2 and SO2, and emission of O2 · Adsorption of pollutants · Excellent purification effect	Direct Effects
	Restoration of Urban Ecosystem	· Conservation of soil ecosystem · Supply of habitats and food for birds, insects, etc. · Formation of moving ways and creation of resting places for birds, insects, etc.	
	Climate Modification	· Control of temperature and humidity, suppression of rise in temperature · Prevention of reflection and windshield effect · Prevention of city flooding by storing the rainwater for a while	
Ecological & Psychological Effects	· Decoration, good appearance and improvement of landscape · Fatigue recovery and creation of comfort · Various kinds of hobbies such as flower planting, vegetable harvesting, etc. · Shielding, concealing and sound insulation effects		
Economic Effects	· Thermal insulation of the buildings · Cost saving for air conditioning and heating [Expectations for the Energy Saving in Air Conditioning and Heating by Roof Gardening] Energy Saving Cost KRW 164.48 billion KRW 188.4 billion KRW 253.32 billion Energy saving effect on air conditioning and heating (TOE) · TOE energy price conversion standard: 1TOE=$146 (based on 1 barrel=$20) · In a case where roof gardening is implemented for 30% of total buildings in Korea		Direct Effects
Realization of Low Environmental Load Regions	· Air purification in regions · Improvement of urban and regional climate (reduction of heat island phenomenon, prevention of excessive drying, etc.) · Resource saving (Creation of resource saving society by reducing the energy load)		Effects of Realization of Sustainable Regions
Realization of Recycling Cities and Regions	· Reduction of rainwater outflow		
Realization of Cities and Regions Coexisting with Nature	· Improvement of city nature · Improvement of regional appearance · Increase of urban and regional amenity (psychological stability, fostering of emotion) · Creation of space for leisure		

Source: The Seoul Metropolitan Government (2007)

Roof Gardening Project of Seoul

Potential

The total area of Seoul is 605km², of which the urbanized area is 364km², taking up 60% of the entire area. The rooftop area totals 166km², taking up 46% of the total urbanized area. The available area for the diffusion roof gardening is estimated to be 55km², meaning the roof garden has potential for utilization of city space.

Roof Gardening Project

To implement roof gardening, Seoul facilitated a project named "Creation of 100,000 Green Roofs" in cooperation with the Green Seoul Citizen Committee. The project began in earnest by designating 32,172m² (9,732 pyeong) in 55 places as the priority project areas. Seoul had created roof gardens on around 130 public and private constructions from 2000 to 2007. Seoul established a short-term plan to secure an area of 100,000 pyeong for roof gardening by 2010.

In the beginning stage, newer buildings completed within the last 10 years were allowed to participate in the project, but all buildings over 99㎡ (30 pyeong) in area with structural safety secured could join the project beginning in 2007. Priority was given to buildings which citizens had easy access to, multiple-use buildings with high community value and the constructions in regions with insufficient parks & landscape like downtown areas.

Beginning of Roof Gardening Project

Seoul started again the roof gardening project for public buildings to lead the roof gardening for private buildings and created 3,348m² in 4 places in 2005. Seoul also has increased the supply rate of roof gardening through roof garden academy, monitoring, planning, and promotion to convey the roof gardening technology and information about maintenance. Seoul introduced a matching fund method to implement roof gardening for private buildings. The city invested KRW 2.8 billion over 5 years starting in 2002 to support roof gardening projects and created 17,680m² of green spaces in 46 places by 2006.

Plans and Support Expenses of Roof Gardening Project

Following roof gardening for public buildings, Seoul facilitated roof gardening for areas viewable from Namsan, where a lot of tourists and citizens visit to improve the city's appearance, to meet public interest and requests and to expand roof gardening. In March 2007, 128 private buildings applied for roof gardening sup-

port. Through the deliberation of the 100,000 Green Roof Promotion Committee consisting of civilians, an area of 26,238m² in 36 places, including Nasvil Building in Jongno were selected as project buildings. Seoul supported around 50% of the costs for design and construction of gardens for the selected buildings unless they had special problems after a safety inspection by relevant service companies.

Seoul established a roof gardening plan in 2011. The total budget was KRW 11,229 million of which KRW 7,706 million was for public buildings and KRW 3,523 million was for private buildings. Of the budget for public buildings, KRW 4,654 million was for facility construction, KRW 19 million was for facility and additional cost and KRW 3,033 million was for subsidies to support the capital of autonomous districts. In the case of private buildings, buildings which had more than 99m² of roof gardening area were allowed to apply for the project to get expense support. KRW 2,920 million was planned to support private capital, KRW 6 million for office management and KRW 3 million for administrative work. Additional applications of around 13,000m² of area were made as the object of the project in 2011 and Seoul paid around KRW 3~5 million for building safety diagnoses per building.

In the case of public buildings, Seoul supported the total costs for city owned buildings. For other buildings, support was given if the building owners took over 30% of the total project cost.

In the case of private buildings, the rate of support was different depending on whether they are in areas viewable from Namsan or not. For roof gardening facilitation areas viewable from Namsan, 70% of design and construction costs were supported, a maximum of KRW 126,000/m² for light weight structures and a maximum of KRW 150,000/m² for mixed or heavy weight structures. For the other areas, 50% of the design and construction costs were supported. Roof gardening for private buildings was installed on 102 buildings in 2009. In the cases of supporting 50% of the design and construction costs, KRW 90,000/m² for light weight structures mainly with grass and flowers and KRW 108,000 was paid in subsides for mixed or heavy weight structures where trees were planted and resting places were made.

Budget Securing for Roof Gardening

To facilitate roof gardening, Seoul has tried to improve institutions by suggesting revisions of the Building Act and to secure the budget to support the citizens. Seoul had applied for a contest for green funds (lottery funds) from the Korea Forest Service to receive KRW 675 million, which was used for roof gardening of 6 public buildings totaling 2,090m² in area, including Eunpyeong Municipal Hospital. The money was provided by the green fund operated by the green fund management group under the Korea Forest Service for the area of "City Forest Creation." It meant that the roof gardening project of Seoul was externally recognized and admitted to having positive ecological effects and value.

In systematic and organic cooperation with the Green Seoul Citizen Committee, the Korea Association of Artificial Ground Greening, presses, enterprises, academies, civic groups, etc., Seoul has facilitated the roof gardening campaign named "Creation of 100,000 Green Roofs."

Effects of Roof Gardening Project

Effects of Roof Gardening Project

Seoul started the roof gardening project in 2002 and by 2013, had created roof gardens in 661 places (278,242 ㎡) by investing KRW 59,338 million. The roof gardening project resulted in bringing about several positive effects. Thanks to 60~70% solar radiation reduction, roof gardening lowered the surface temperature of buildings and suppressed temperature increase to save energy. Also, roof gardening took on the role of an ecological stepping stone in the city center and provided space for relaxation, leisure and environmental education of the citizens.

Table 3 - Results of Roof Gardening Creation and Budget Amount

Year of Creation	Budget (KRW Million)			Amount of Creation (Places, Area)		
	Total	Private	Public	Total	Private	Public
Total	59,338	24,059	35,269	661 Places 278,242㎡	386 Places 148,898㎡	275 Places 129,344㎡
2002	640	640	-	11 Places 5,455㎡	11 Places 5,455㎡	-
2003	640	640	-	10 Places 3,322㎡	10 Places 3,322㎡	-
2004	320	320	-	9 Places 2,670㎡	9 Places 2,670㎡	-
2005	430	280	150	6 Places 3,970㎡	6 Places 3,970㎡	(Commenced in 2005 & Completed in 2006)
2006	580	280	300	14 Places 5,611㎡	10 Places 2,263㎡	4 Places 3,348㎡
2007	5,588	1,783	3,805	62 Places 24,154㎡	25 Places 11,218㎡	37 Places 12,936㎡
2008	12,323	4,803	7,520	106 Places 59,221㎡	64 Places 33,297㎡	42 Places 25,924㎡
2009	9,662	3,323	6,339	120 Places 47,001㎡	73 Places 25,091㎡	47 Places 21,910㎡

2010	11,229	3,323	7,906	108 Places 49,838㎡	59 Places 23,061㎡	49 Places 26,777㎡
2011	8,810	5,585	3,225	101 Places 40,649㎡	55 Places 21,219㎡	46 Places 19,430㎡
2012	5,010	2,350	2,650	69 Places 22,515㎡	50 Places 13,541㎡	19 Places 8,974㎡
2013	4,106	732	3,374	45 Places 13,836㎡	14 Places 3,791㎡	31 Places 10,045㎡

Seoul held an event at the "Chorokttеul (the Green Garden)" which was created on the roof of the Seoul City Hall Seosomun Annex 3. Through the Green Garden tour with commentary, Seoul explained cautions in design and construction of roof gardens, maintenance methods and promoted the roof gardening project. In 2006, kindergarten students and children accompanied by their parents, general citizens and neighboring office workers were invited to attend the green garden tour with commentary to see and feel the wildflowers and smell the scent of grass in the heart of Seoul. The Green Garden was created in an area of 300m² (around 90 pyeong) in 2000 as a pilot project. In 2007, there were around 120 kinds of plants, including 43 kinds of planted wildflowers like naturally grown dandelions, evening primrose, etc. The garden was also home to around 40 kinds of insects such as beetles, crickets, etc.

Figure 4 - Green Garden of Seoul City Hall Annex

Figure 5 - Green Garden Tour with Commentary

The roof's gardening project was applied to public buildings like public offices and public parking lots starting with Jung-gu Community Health Center in 2004 and followed by Beoti public parking lot, Jangchung public parking lot, Sindang 3-dong public parking lot, Gwanghui-dong Community Service Center, Sindang 6-dong public parking lot, Sindang 6-dong Community Service Center, Dongsan public parking lot, the workplace childcare center of Jung-gu Office, etc. The roofs of Jungbu Police Station, Jungbu Tax Office, Seoul Electric Power Transmission Center of KEPCO (Korea Electric Power Corporation) and National Theater are known to have beautiful gardens thanks to the roof gardening project of Seoul.

Figure 6 - Roof of the Jung-gu Public Parking Lot

Figure 7 - Korea Testing and Research Institute for Chemical Industry

Figure 8 - Roof of the Gangnam-gu Office

Figure 9 - Wolgok Social Welfare Center

In the case of private buildings, roof gardening was installed at Sangnokwon of Dongguk University and the Shinsegae main buildings in 2005, Kukdo Hotel and Gyeseong Girls High School in Myeongdong in 2007. Seoul and Jung-gu Office supported 70% of the construction costs for private buildings in Hoehyeon-dong, Myeongdong, Pil-dong, Jangchung-dong and a part of Sindang 2-dong which was viewable from Namsan. Seoul also supported the costs for the construction of gardens on private buildings including the Sangah building in Hoehyeon-dong, Hakrim building, Manhae building, Dongguk Building, Student Center, Hyehwa building, Academic and Cultural Center of Dongguk University, Taepyeongno Center (Taepyeongno 1-ga) of Choseon Media, Han Suites Building (Yejang-dong), Star Building (Pil-dong 1-ga), Shinyeong Building (Chungmuro 1-ga), Songgye Building (Sindang 2-dong), etc.

Figure 10 - Roof of the Korea UNESCO Center

Figure 11 - Bethel Montessori Nursery School

Figure 12 - Roof of the Dongguk Building of Dongguk University

Figure 13 - Roof of the Student Hall of Dongguk Univesity

Prizes Awarded to the Roof Gardening Project

- Award of "Administration Area" from the 1st Korea Artificial Greening Prize" (23 Feb. 2010)
- The Roof Garden of Dongguk University was awarded the "Gold" prize in the World Best Roof Garden Award from the Shanghai World Roof Gardening Contest (8 May 2010)
- "Achievement Award" from the Korea Artificial Greening Association (28 Feb. 2013)

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12. Fancy Children's Parks Tailored for Citizen Customers

Written by : Won-Ju Kim, Researcher, the Seoul Institute

Policy Area : City Park

Background of Creation of Fancy Children's Parks Tailored for Citizen Customers

The creation of fancy children's parks as a part of park & landscape policy projects during the term of the 4th Mayor elected by popular vote was to rebuild the old children's parks to become new 'Fancy Children's Parks.' The residents and children were encouraged to participate in the processes of planning, construction, and management of the parks. Eco-friendly materials were used in consideration of children's safely.

Children's Park in Narrow Areas and Sluggish Remodeling Projects

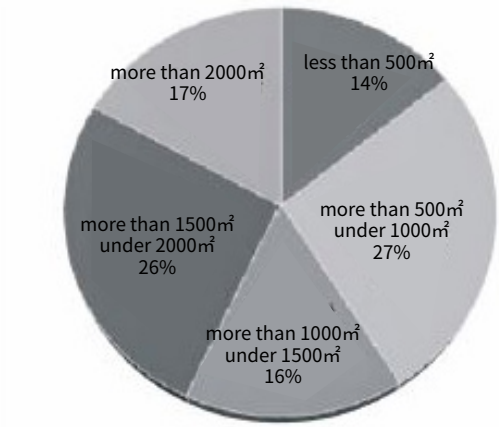
There are 2,119 city parks in Seoul of which 1,297 are children's parks for children ages 2 to 12 with disposition distance of less than 250m. While the total area of city parks is 115.94km², the area of children's parks is 2.22km², making up only 1.91% of the entire park area. The size of children's parks in Seoul is various, from a minimum of 11m² to 20,820m². Small parks for children less than 1,500m² in the area make up the majority of children's parks (around 57%).

Table 1 - Status of Parks in Seoul

Type of Park	Total	City Park											Natural Park	Other Park
		Sum	Urban Natural Park	Living Area Park			Theme Park							
				Neighborhood Park	Children's Park	Small Park	Sports Park	Cemetery Park	Culture Park	History Park	History Park	History Park		
No. of Parks (Places)	2,714	2,119	20	392	1297	346	4	4	39	11	5	1	1	594
Area (㎢)	169.12	115.94	65.56	44.06	2.22	0.46	0.13	2.42	0.59	0.44	0.04	0.05	39.35	15.84

Source: The Seoul Metropolitan Government, Status of Parks, 2013 (reorganized)

Figure 1 - Area Developed for Children's Parks



Lots of the facilities of children's parks were unable to attract children's attention practically because they were extremely run down and monotonous. In addition, a significant portion of the children's parks was converted to senior citizens' community centers, daycare centers, physical training facilities, etc., making it difficult for the children's parks to fulfill their original functions for children.

In order to improve the situation of the children's parks, Seoul has facilitated children's park renewal projects including 'Creation of Resident Participation Children's Parks,' 'Children's Park Improvement Tailored to the Living Area,' etc. since 1994 based on its 'Modernizing Plan for the Children's Parks.' But the park remodeling projects in the beginning stage had focused on the appearance of facilities such as replacement of existing old facilities with modern ones and introduction of unusual shapes of playing facilities. As a result, the usage rate of children's parks was still low because substantial improvement had not made and the management had been insufficient.

Table 2 - Timeline of the Children's Park Remodeling Project of Seoul

Period	Description
Before 1994	· Redevelopment of 22 parks using the example based on the 'Modernizing Plan for the Children's Parks' à Currently implemented by the autonomous district.
1995~2005	· Change of project names to 'Children's Parks Filled with Green,' 'Reorganization of Resident Participation Children's Park,' etc. · Facility upgrade for around 520 parks was planned but was not implemented.
After 2005	· Remodeling projects are in the process of implementation and changing the project names to 'Creation of Children's Parks Tailored to the Living Area,' 'Creation of Fancy Children's Parks', etc.

Main Age Groups and Use Types of the Children's Park

Of the people who used the children's parks, the 8-13 years olds group made up 38%, 14-20 were 23% and 31-40 were 16%. According to the analysis, children and adolescents mainly used the playing facilities in the parks, child caregivers, and elderly people used the bench facilities and middle-aged people used physical training facilities. Of the people using the parks, students made up 64% and park users that were not children made up the majority, which means the children's parks functioned as rest areas like neighborhood parks for local residents rather than children.

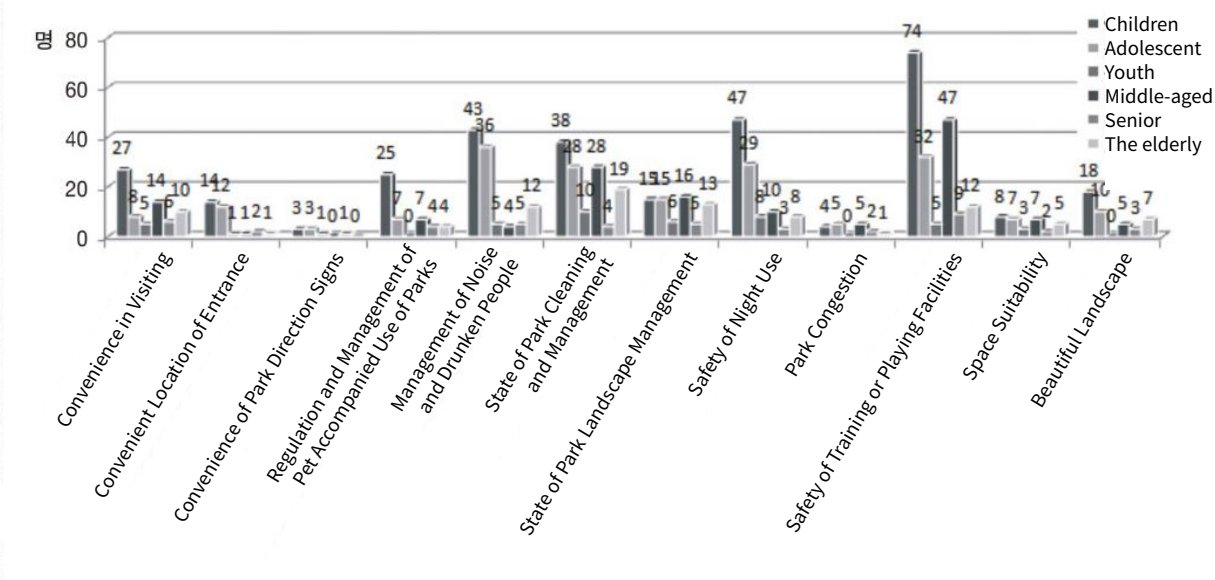
Low Satisfaction and Safety of Children's Park Users

The number of personnel allocated to the management of children's parks was 2 to 10 people, a small group who could not manage a relatively large number of parks properly. In most cases, there was no assigned manpower for parks less than 1000m² in respective area.

The number of child safety accidents increased from 146 in 2004 to 307 in 2006 (Korea Consumer Agency, 2008). The main causes were broken parts of timber or rust spots in the playing facilities. It implied that there were problems regarding facility safety. The users were more exposed to incidents because guidance facilities necessary for safety management were not installed in the parks or the regulations for safety prevention were not enough. In addition, less than half of the parks (49.6%) had signs or posts which contained information about the managing entities and only 24% of such notices had the contact information for the managing departments. It led to lower safety of the children's parks.

According to the surveys, not only safety but also user satisfaction of the children's parks was low. The main causes of low user satisfaction were the monotonous playing facilities and the insufficient subsidiary facilities. The users wished that the subsidiary facilities such as toilets, which showed the lowest satisfaction, drinking fountains and trash cans would be improved, and facilities for the disabled, the elderly, the infirm and children would be improved. Children wished that there would be sufficient playing facilities and floor pavement for safety. In addition to improving the facilities, the users wanted prevention of noise in the parks, no admittance of drunken people and pet management to ensure the safety of parks in the night time.

Figure 2 - Importance Suggested by the Park Users by Age



Main Content and Progress of Creation of Fancy Children's Park

Expansion of the Concept of Fancy Children's Park

According to the existing children's park system, parks were separated into children's parks and children's playgrounds. The users of both children's parks and children's playgrounds were unspecified local residents, but the children's parks were managed by the park service department under the autonomous districts on the basis of the Act on the Urban Parks and Green Space. The children's playgrounds were managed by private management offices on the basis of the regulation on housing construction standards.

In order to help the children use the playing facilities in safe and convenient ways and to establish an effective safety management system based on the act on safety management of playing facilities, Seoul integrated separated management of the children's parks and the children's playgrounds. Seoul planned to redevelop the existing children's parks, but expanded the concept of fancy children's park to cover the children's playgrounds considering that 56% of Seoul's population lived in the apartments and they used the playgrounds in the apartment complexes.

Selection of Project Places for Fancy Children's Parks

The places for the fancy children's parks were selected among the 1,063 children's parks in Seoul, giving priority to areas with poor living conditions, residential areas with dense child population, parks whose rede-

velopment had been completed more than 10 years ago and the areas that were not against the various urban development projects or were not planned places for parks.

The project to create fancy children's parks for 304 children's parks in 25 autonomous districts has been commenced. Based on the project plans, Seoul started to develop the existing simple and old children's parks into "Theme Playing Parks" and "Regional Community Spaces" to be able to foster children's dreams, creativity, and imaginations. In the process of park development, children and residents directly participated in the projects.

Development Strategy

Seoul established the following development strategy for the creation of fancy children's parks;

Seoul develops pilot models by type in a new paradigm first, and then expands the models to other places in the future. To this end, Seoul forms an advisory committee, prepares the design ideas and concrete plans through an idea contest for college students, a design contest for experts, etc. and has consultations with the Seoul Design Center, the Seoul Foundation for Arts and Culture, etc.

As a part of this strategy, in particular, Seoul plans to have discussions with children through special classes in the schools and to invite parents to collect their opinions.

For design, Seoul holds design workshops and expands the possibilities for civil participation via the introduction of a citizen and customer supervising system.

With an aim to create pleasant and safe parks, Seoul has to use eco-friendly materials. When installing sand playgrounds, safety from dog ascaris and heavy metal pollution will be considered.

Themes shall be assigned to the park designs and the park designs shall be made in accordance with these unified themes.

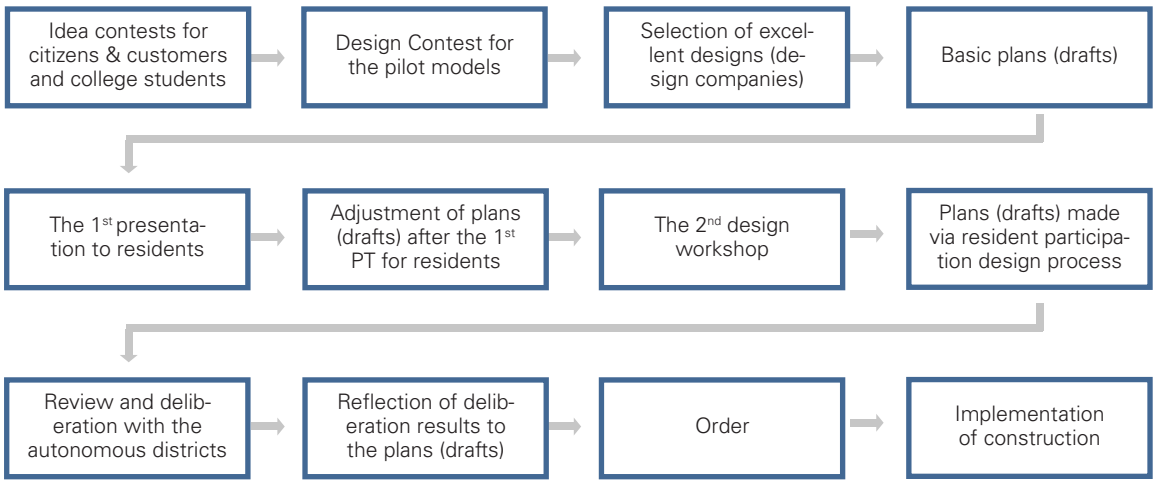
Budget for the Fancy Children's Park Project

During the project period from 2008 to 2010, Seoul redeveloped 304 places, a fourth of the 1,278 places in total by investing KRW 147.2 billion (KRW 100.1 billion from the Seoul Metropolitan Government and KRW 47.1 billion from the autonomous districts).

Implementation of Fancy Children's Park Project

The old children's parks were redeveloped to become fancy children's parks during a period of about 3 years from March 2008 to May 2011. According to the "Child Playground Facilities Safety Supervision Law" enacted on January 27th, 2008, the parks were redeveloped to put top priority on the safety of children.

Figure 3 - Process of the Fancy Children's Park Redevelopment Project



Establishment of Plan for Children's Park Improvement Project

On September 12th, 2007, in order to address the users' increasing complaints about the children's parks, low usage rate by children and above all, the necessity to improve the safety of the old playing facilities unsuitable for safety management standards, Seoul announced by the Mayor's Instruction No. 179 the children's park project plan which had been facilitated to review the integrated methods to improve the children's parks and to implement the remodeling of entire playgrounds in all autonomous districts.

Decision of Names and Status Investigation of the Target Places

In October 2007, Seoul held the investment assessment for the fancy children's park project, established the general improvement plan for the children's parks and decided the project name to be "Fancy Children's Parks Tailored for Citizen Customers". It also investigated the target locations for the project in the 25 autonomous districts.

Formation of Advisory Committee

In February 2008, Seoul formed an advisory committee for the implementation of fancy children's park project and investigated if the project is contradictory to the urban development project in order to select the target locations for the children's park project.

Idea Contest for Citizen Customers and College Students

On March 5th, 2008, Seoul held an idea contest for citizen customers and college students based on the basic directions according to the "Development Plan of the Fancy Children's Park Tailed for Citizen Customers," It was planned to collect the citizens' ideas and opinions on the problems and complaints they felt while using the children's parks and on the facilities that citizens wanted to introduce. The ideas of college students on space organization, design and playing facilities, park character, etc. were used in planning and making guides for the pilot model contest.

Prize Contest for the Pilot Model

Seoul selected 10 representative locations for the contest through the advisory committee meetings for site selection.

Selection of Excellent Designs (Design Companies)

The best works for the 10 pilot model locations were selected. The prize winner for each pilot model location was to be granted the opportunity to design 9 more locations so that a prize winner for a location would take responsibility for planning and designing 10 locations in total. Five design companies were awarded the best of the pilot model for 2 locations each, so each company was responsible for planning and designing 20 places.

Basic Plan (Draft)

Based on the pilot models, the design companies established their basic plans for 20 locations.

1st Presentation to Residents

Seoul held presentation sessions for the local residents. The events were held for children in grades 4 to 6 in primary schools as a part of inquiry instructions in social studies. The children presented their opinions in the forms of pictures and texts using the titles "Playground that I want to make" and "Please make our parks in this way," The experts announced the basic plans (drafts) to children and residents to collect their responses and opinions on the experts' plans.

Figure 4 - The 1st Presentation for Residents and Children's Opinions

The 2nd Design Workshop

The adjusted plans (drafts) made based on the opinions raised in the presentation sessions were explained during the design workshop held in the children's parks.

Figure 5 - The 2nd Design Workshop

Plans (Drafts) Made via Resident Participation Design Process

The plans (drafts) were adjusted again in consideration of the acceptable opinions among the ones that were suggested by children and residents through their participation.

Review and Deliberation with the Autonomous Districts

The autonomous districts reviewed the plans (drafts) established through the resident participation design process to create the agenda and to calculate the necessary budget. The expert advisory committee, the Urban Public Park committee and the Korea Community Safety Testing Institute deliberated about the creativity of facilities, space construction, and relevant regulations.

Reflection of the Deliberation Results to the Plans (Drafts)

The final designs (drafts) were decided by considering the opinions suggested through the review and deliberation with the autonomous districts.

Order and Implementation of Construction

Orders were placed for the implementation of construction. The representative residents, the supervisors from the Seoul Metropolitan Facilities Management Corporation and the construction advisory committee members participated in the enforcement of construction.

Effects of the Fancy Children's Park Project

Results of the Fancy Children's Park Project

The total area of the redeveloped 304 places was 425,436㎡, that was almost twice the area of Yeouido Park (229,539㎡). Because regions in poor living environments were preferentially selected, the fancy children's park project was able to contribute to the improvement of regional green spaces, playgrounds, rest areas, supply of community spaces, etc.

Table 3 - Redevelopment Status of the Fancy Children's Parks

Name of Autonomous District	No. of Children's Parks	Fancy Children's Parks	Name of Autonomous District	No. of Children's Parks	Fancy Children's Parks
Jongno	24	3	Mapo	55	13
Jung-gu	22	1	Yangcheon	71	12
Yongsan	32	3	Gangseo	125	20
Seongdong	33	8	Guro	25	11
Gwangjin	35	15	Geumcheon	41	13
Dongdaemun	52	4	Yeongdeungpo	32	4
Jungnang	44	21	Dongjak	34	8
Seongbuk	36	6	Gwanak	70	25
Gangbuk	40	9	Seocho	84	4
Dobong	39	24	Gangnam	61	6
Nowon	92	36	Songpa	82	13
Eunpyeong	47	16	Gangdong	64	19
Seodaemun	44	10	Total	1,284	304

The fancy children's parks created with various themes in new concepts were favorably received because the features of the parks were expected to increase children's interests and develop creativity and imagination. In the case of Wau Fancy Children's Park, the pictures painted by the children in fifth grade from Hongik Elementary School attached to Hongik University were made into tiles and installed in the park, which made the children feel pride and affection. The children's works from Seogang Elementary School were also installed in the Changjeon Fancy Children's Park.

Figure 6 - Kkachi Fancy Children's Park -Exciting Space Travel

Figure 7 - Seockchon Fancy Children's Park – Adventures of Robinson Crusoe

Figure 8 - Boram Fancy Children's Park

Figure 9 - Hagye Fancy Children's Park – Playground of Fairy in the Forest

Figure 10 - Siny Fancy Children's Park – Smurf Village

Figure 11 - Hodori Fancy Children's Park – Concentric Circles

Prizes Awarded to the Fancy Children's Park Project

The fancy children's park project passed the preliminary in the area of "Promotion of Civil Participation to Policy Decisions" of the UN Public Administration Prize, 2010. That means the project was recognized as an administrative activity which established a new system to encourage the citizens' participation.

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13. Clean Fuel Supply Project

Written by: Yu-Jin Choi, Researcher, the Seoul Institute

Policy Area: Environment

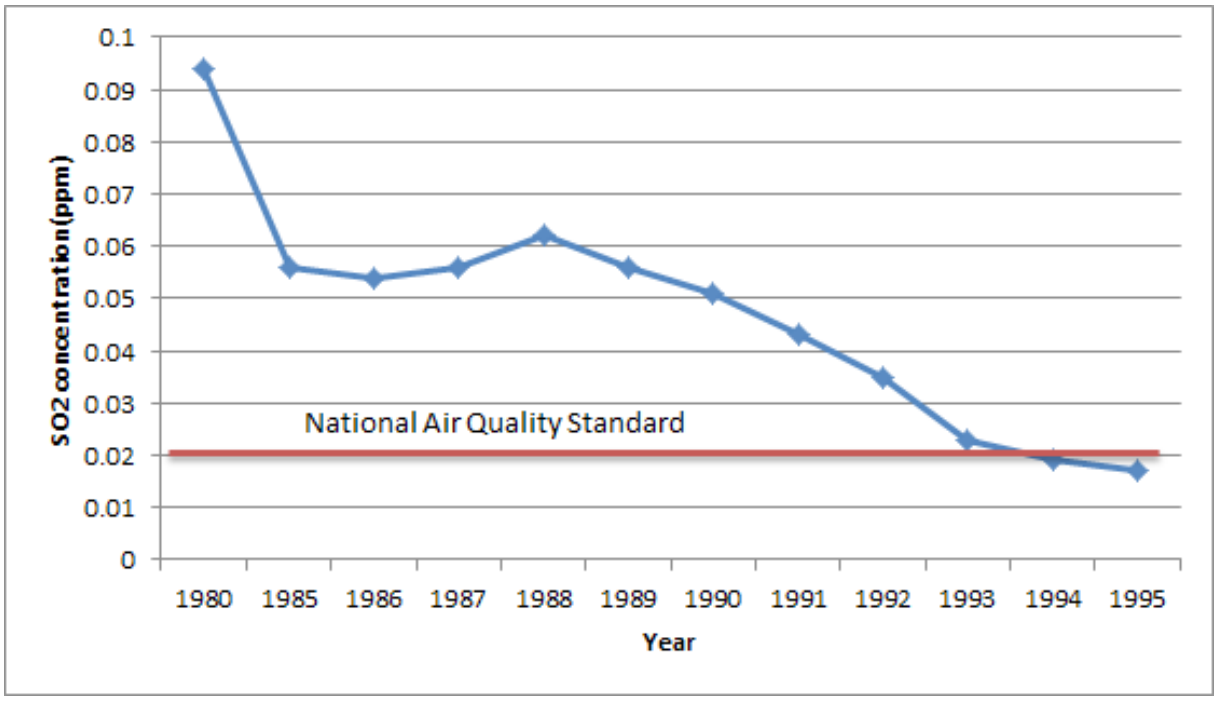
Background of Introduction of the Clean Fuel Supply Project

Due to industrial development, growth in population and the consequentially increased use of fossil fuels in the 1970s and 1980s, the air pollution in Seoul has fallen into a serious condition. In particular, SO2 pollution in Seoul reached the highest level, more than four times of the national environment standards in 1980, and even more than 2 times the standards in 1990.

The main energy source in the 1960s was cheap coal that made up around 40% of the total energy consumption at that time. After the 1970s, petroleum replaced coal and became the main energy source because the use of oil was increased dramatically as the heavy chemical industry was developed, and the standard of living was greatly improved.

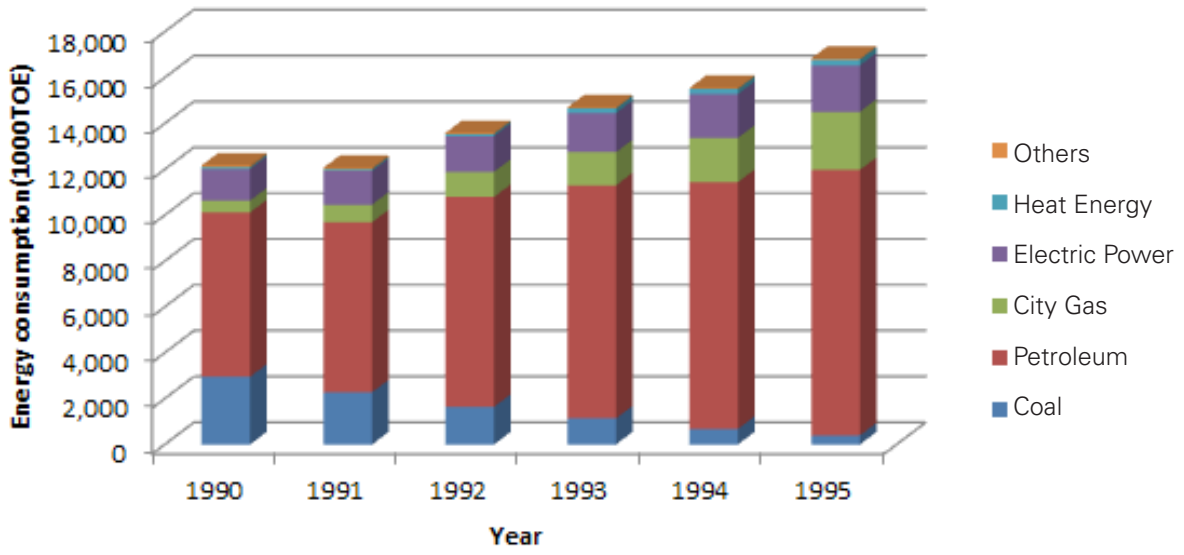
The major emission sources of SO2 were fossil fuels such as coal and petroleum. The sulfur content of fossil fuels was relatively higher than city gas and LPG. The SO2 concentration was still very high, because around 70% of the households in Seoul used coal briquettes as heating fuel in the 1990s. Accordingly, the Seoul Metropolitan Government and the central government planned to expand the supply of clean fuels and to introduce various projects in order to reduce SO2 emission.

Figure 1 - Changes in the Annual Average SO2 Pollution in Seoul



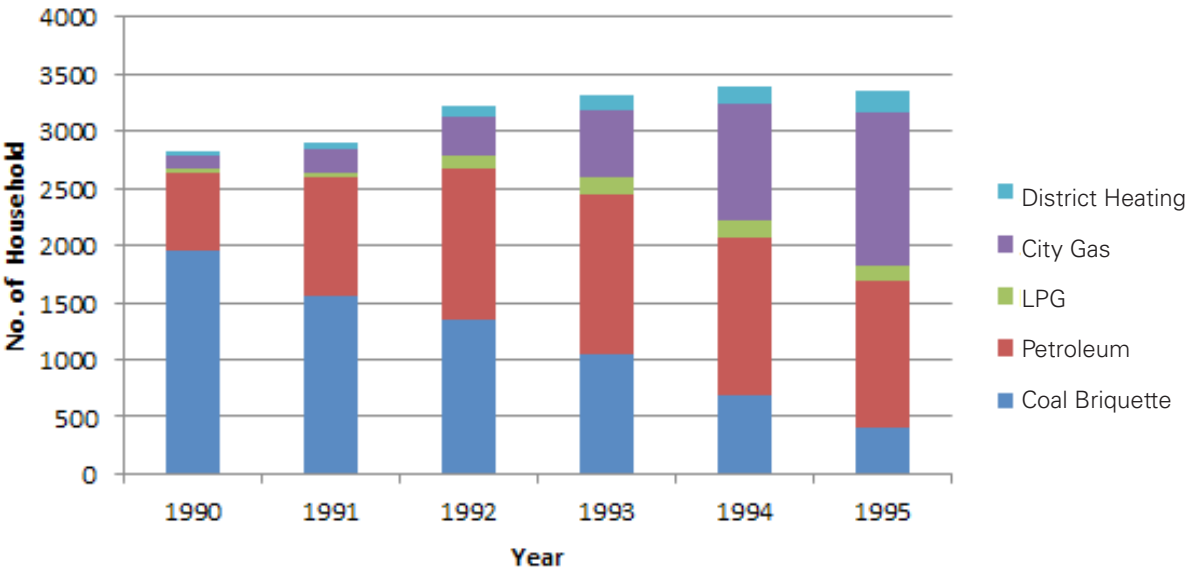
Source: The Seoul Metropolitan Government, Analysis of Air Pollution, 1995 and 1996

Figure 2 - Change of Fuel Consumption of Seoul by Fuel



Source: http://www.kesis.net/ Korea Energy Economics Institute, Energy Statistics

Figure 3 - Change of Number of Households by Heating Fuel in Seoul



Source: The Seoul Metropolitan Government, White Paper on Energy, 2002 and 2003

Main Contents of the Clean Fuel Supply Project

Supply Expansion of Low Sulfur Oil

To reduce the SO2 emitted by using fuel fundamentally, Seoul introduced the standards for sulfur content of diesel and heavy oil and applied them in the areas of Seoul for the first time in Korea in 1981. The standards have been strengthened several times and the applied areas were continuously expanded. As a result of the strict standards, only heavy fuel oils satisfying the criteria of sulfur content of less than 0.3%, and diesel satisfying the criteria of sulfur content of less than 0.1% are currently supplied.

Table 1 - Change of Sulfur Content of Heavy Oil and Diesel

	Heavy Oil	Diesel
1981	1.6%	0.4%
1993	1.0%	0.2%
1997	0.5%	0.1%
2001	0.3%	0.1%

Source: Ministry of Environment, Annual Report on Air Environment, 2004 and 2005

Regulations to Prohibit the Use of Solid Fuels

In order to reduce the emission of air pollutants, Seoul and the Metropolitan cities introduced an institution in 1985 for the first time to prohibit the use of solid fuels such as coal, coke, combustible waste, etc. Since then, the applied areas have been gradually expanded.

Mandatory Use of Clean Fuel

From 1988, it became mandatory to use LNG as a clean fuel in the facilities for business uses (including commercial and public ones) in which boiler capacities were more than 2 tons in total. The compulsory use of clean fuel or diesel was then expanded to facilities with boiler capacities of more than 1 ton in 1990, 0.5 ton in 1991 and 0.2 ton in 1994. In the case of apartment complexes adopting the central heating method, the use of clean fuel was mandated in 1990 for the first time for houses with an average area of more than 35 pyeong (115.7㎡). The mandatory use of clean fuel or diesel has been expanded to apartment complexes with an average area of over 30 pyeong (99.2㎡) in 1991, 25 pyeong (82.6㎡) in 1992 and 12.1 pyeong (40㎡) in 1997.

Table 2 - Expansion of Facilities Mandated to Use Clean Fuel or Diesel

	Boiler Capacity	Area of Apartment	Power Plant
1988	More than 2 tons	-	
1990	More than 1 ton	Over 35 pyeong	
1991	More than 0.5 ton	Over 30 pyeong	All power plants
1992	-	Over 25 pyeong	Cogeneration plants for business uses
1994	More than 0.2 ton	-	
1995	-	Over 21 pyeong	
1996	-	Over 18 pyeong	
1997	-	Over 12.1 pyeong	

Source: Ministry of Environment, Annual Report on Air Environment, 2004 and 2005

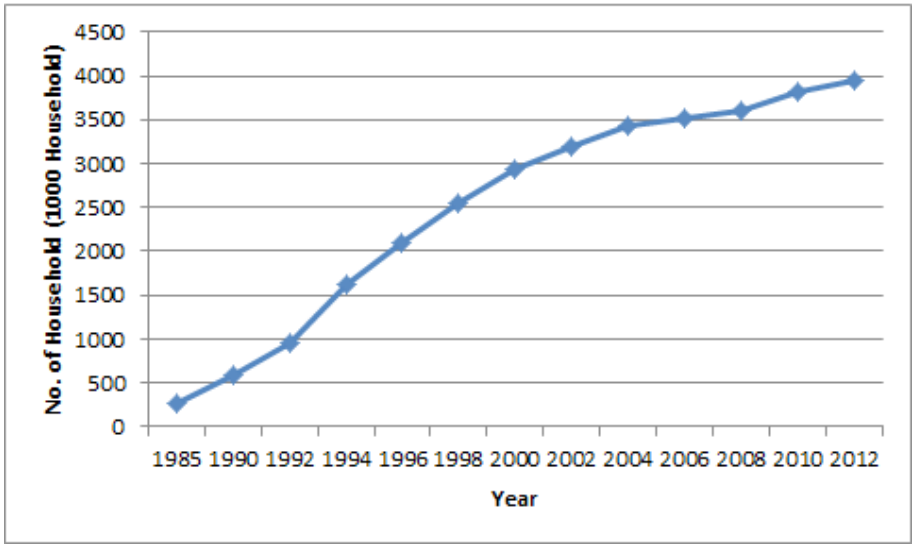
Supply Expansion of City Gas (LNG) to General Houses

Overview

Thanks to the policy to make the use of LNG and clean energy obligatory that was introduced in the late 1980s, the pipeline network of city gas was able to accommodate 260,000 households in 1985, and expanded year by year since then. The households that had used coal briquettes and petroleum in the past started using city gas with relatively less air pollutants emission as heating fuel, the main fuels were switched to cleaner fuels. Thanks to those efforts in Seoul, around 95% of households in Seoul are using city gas as heating fuel.

Seoul implemented various policies to expand the supply of city gas as clean fuel by introducing a system that imposes a part of cost on the city gas bills in order to secure the investment resource for the city gas suppliers, financing funds for the old pipeline replacement construction made for the stable city gas supply and adopting the financing system for the city gas users.

Figure 4 - Change of the Number of Households Using City Gas in Seoul



Source: The Seoul Metropolitan Government, White Paper on Energy, 2008, 2007

Fund Raising and Operation for City Gas Project

- Enactment of Ordinance: Enactment of the ordinance on installation of city gas project fund of Seoul in 1992
- Purpose of Fund Raising: To provide low interest loan to the city gas suppliers to cover a certain amount of the natural gas infrastructure installation cost necessary for the quick expansion of city gas supply
- Use of the Fund
  - Loan for the installation of pipes and monostat facilities to provide city gas to residential facilities, public facilities and social welfare facilities
  - Loan for the installation of pipes to provide city gas to public bath facilities planning fuel conversion
  - Loan for the installation of compressed natural gas stations for city buses and the related pipes
- Beneficiary of the Fund: Those who conduct business suitable for the purposes of fund as the general city gas providers
- Fund Raising Method: Contribution from the general account of Seoul and earnings generated by operating the fund
- Fund Operation and Management
  - Fund Operator: Energy Management Team of the Seoul Metropolitan Government
  - Fund Management: Consignment management (Woori Bank, Kookmin Bank)
  - Loan Limit: Up to 80% of the city gas supply facilities installation cost
  - Repayment Conditions: Level repayment in 5 years with a 3 year grace period
  - Loan Interest: Annual interest of 4.5% (annual lending interest rate of 3.8%)
- Loan Process
  - City Gas Supplier: Submission of loan application to the Mayor
  - Mayor: Review of construction results → Decision of loan amount → Notification of loan handling bank to

the city gas supplier

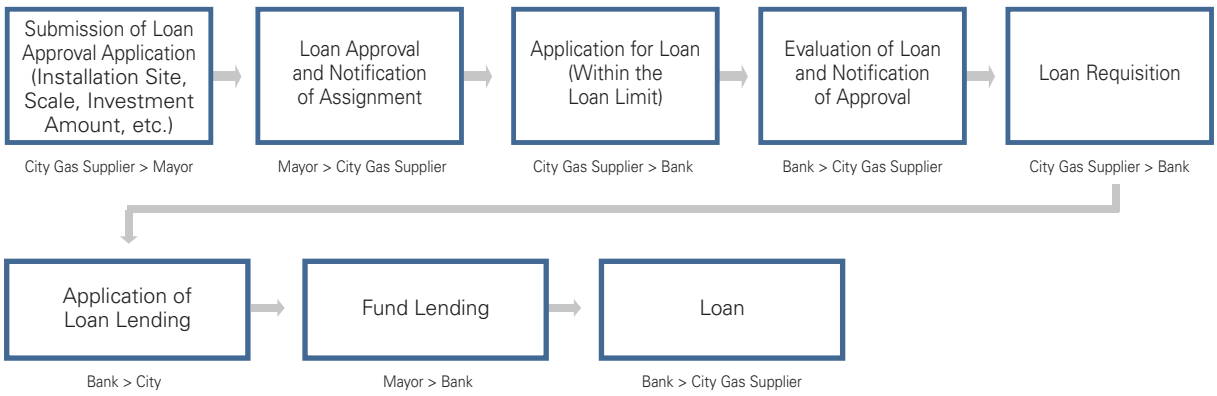
- Loan Handling Bank: Review of construction details, etc. → Fund Lending (← Seoul City) → Loan (→City Gas Supplier)

Figure 5 - Amount of Fund and Loan Process

(Unit: KRW Million)

Year / Item	Sum	94	95	96	97	98	99	2000	2001	2002	2003	2004	2005	2006	2007
Sum	114,766.5	22,679.4	14,101.9	15,0026.5	10,846.2	10,310.8	5,793.5	7,480.7	8,366.8	5,565.8	5,195.1	3,238.5	1,898.1	2,232.9	2,030.3
Contribution from General Account	48,000	10,000	10,000	10,000	5,000	3,000	-	-	-	-	-	-	-	-	-
Loans from the Treasury Investment and Loan Institutes	10,000	10,000	-	-	-	-	-	-	-	-	-	-	-	-	-
Earnings from Fund Operation	66,766.5	2,679.4	4,101.9	5,026.5	5,846.2	7,310.8	5,793.5	7,480.7	8,366.8	5,565.8	5,195.1	3,238.5	1,898.1	2,232.9	2,030.3

Source: The Seoul Metropolitan Government, White Paper on Energy, 2008, 2007

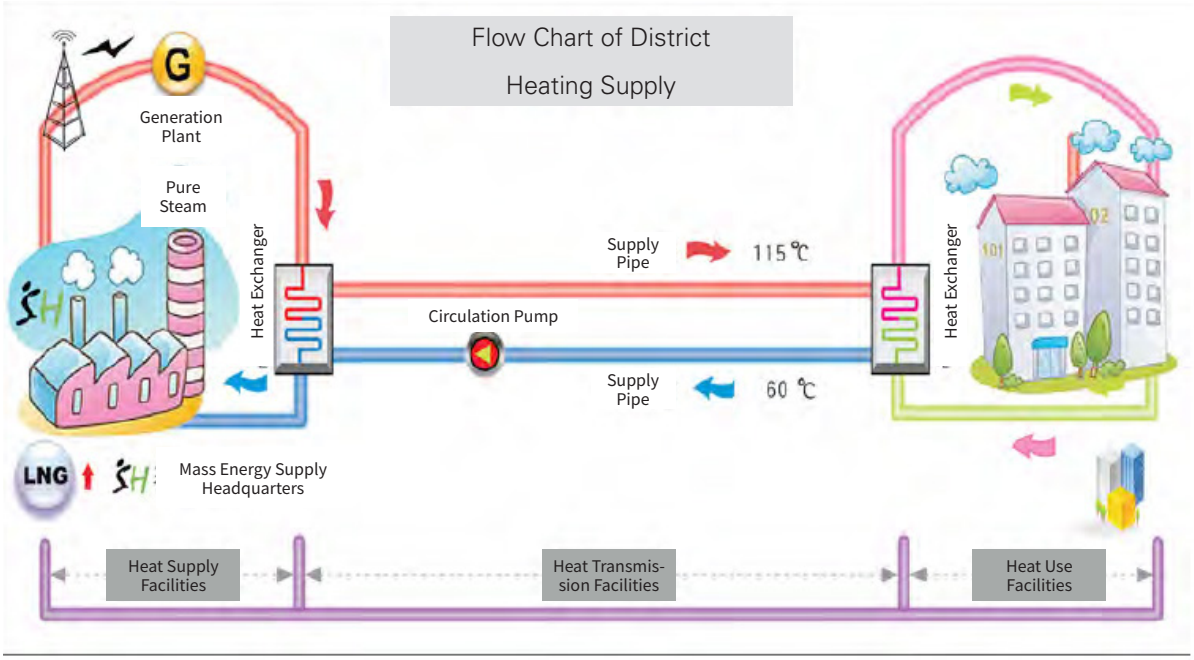


Expansion of Mass Energy (District Heating) Supply

Overview

The Mass Energy project aims to supply the energy (heat or heat & electricity) produced by one or more concentrated energy plants (cogeneration plants, heating-only boilers, resource recovery facilities, etc.) collectively to numerous users in residential areas, commercial areas or industrial complexes.

Figure 6 - Flow Chart of District Heating Supply



Source: The Seoul Metropolitan Government, White Paper on Energy, 2011 and 2012

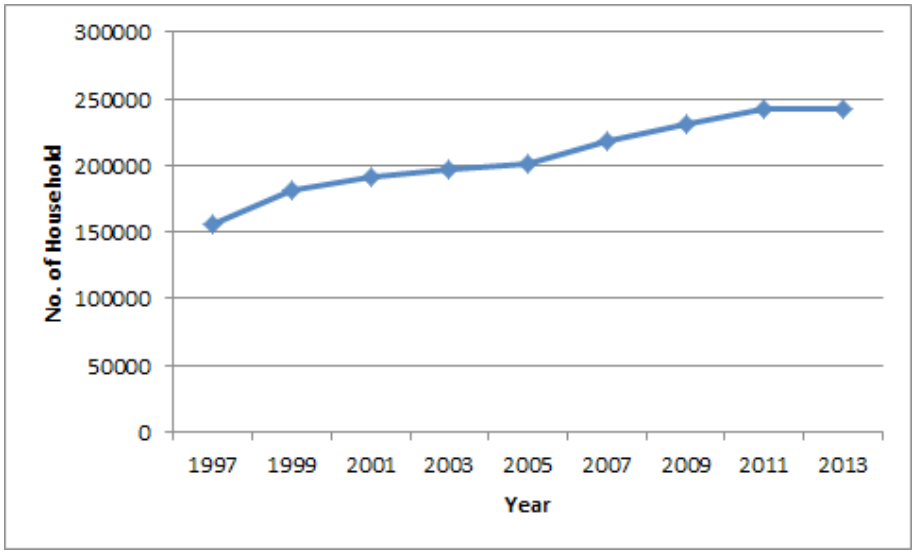
Project Process

When confirming the development plan for the Mok-dong new town in 1983, the Seoul Metropolitan Government adopted the heating method for the first time in Korea in which a portion of electric energy is provided from the cogeneration plants and the residual heat is used as the source of district heating for the new town. In order to implement this heating method, Seoul installed the "Mok-dong District Development Office" exclusively for the development of Mok-dong new town and made a business consignment agreement for the entire construction project and operation with the Korean Energy Management Corporation which was able to provide professional and specialized technical manpower. Seoul also consigned the design, construction, supervision and facility operation for the Mass Energy supply project to the SH Corporation. Under the scheme, the cogeneration plants in Gangseo region and Nowon region were constructed.

In 1984, Seoul provided around 26,000 households with heat. The number of households using the group

heat energy provided by Seoul exceeded 240,000 in 2013.

Figure 7 - Change of the No. of Households Using the Group Heat Energy Provided by Seoul



Source: The Seoul Metropolitan Government, White Paper on Energy, 2013 and 2014

Process of Gangseo Region Project

- May 1983: Confirmation of New Town Development Plan in Mok-dong (Adoption of District Heating Method)
- Oct. 1983: Submission of Mass Energy Supply Project Plan (Draft) for Mok-dong Area
- Dec. 1983: Public Announcement of the Ordinance on Implementation and Consignment of Mass Energy Supply Project
- Dec. 1983: Consignment Agreement for the Mass Energy Supply Project for Mok-dong (Consignee: Korea Energy Management Corporation)
- Mar. 1984: Commencement of Design Service Contract
- Aug. 1984: Acquisition of Permission for Heat Supply Project

  - Supply Target: 26,629 Households in the New Towns in Mok-dong and Sinjeong-dong

  - Facility Scale: Heat Transmission Pipe (20㎞), Cogeneration Boiler (1 Unit of 100 tons/h and Turbine/Generator 21㎿), Heating-only Boiler (2 Units of 140 tons/h, 2 Units of 80 tons/h and 3 Units of 10 tons/h)

  - Project Period: Dec. 1983 ~ Dec. 1987

  - Project Budget: KRW 36,199 million
- Nov. 1984: Commencement of Construction of Waste Incinerator (Completed on Dec. 31st, 1986◦ Jan. 1985: Commencement of Construction of Cogeneration Plant (Completed on Dec. 31st, 1987)
- Oct. 1985: Commencement of Construction of Heat Transmission Facilities (Completed Nov. 30th, 1987)
- Nov. 1985: Start of the 1st Phase Heat Supply (Mok-dong Apt. 1 District, 1,882 Households)
- Aug. 1990: Confirmation of Mass Energy Supply Project for Gayang and Banghwa,Apt. 1 District

  - Supply Target: 24,314 Households in Gayang and Banghwa Apt. 1 District

- Facility Scale (Linked to the existing Mok-dong Cogeneration Plant): Heating-only Boiler (2 Units of 110 tons/h), Heat Transmission Pipe (31.6㎞), 1 Site of Booster Pump Site

- Project Period: Aug. 1990 ~ 30 Nov. 1993

- Project Budget: KRW 30,603 million

- Apr. 1993: Confirmation of Mass Energy Supply Project for Deungchon and Banghwa Apt. 2 District

  - Supply Target: 14,365 Households in Deungchong and Banghwa Apt. 2 District

  - Facility Scale (Linked to the existing Mok-dong Cogeneration Plant): Heating-only Boiler (1 Unit of 110 tons/h, Heat Transmission Pipe (11.4㎞)

  - Project Period: Apr. 1993 ~ 10 Jan. 1995

  - Project Budget: KRW 8,961 million

Process of Nowon Region Project

- Oct. 1991: Service Agreement for the Basic Plan for the Mass Energy Supply Project in Nowon Region
- - Use of Burning Heat from the Sanggye Resource Recovery Facility
- Jun. 1992: Confirmation of Mass Energy Supply Project for Nowon Region

  - Supply Target: 104,968 Households in Nowon-gu, Dobong-gu and Jungnang-gu

  - Facility Scale: Cogeneration Boiler (1 Unit of 150 tons/h and Turbine Generator 37,000㎾), Heating-only Boiler(4 Units of 150 tons/h), Heat Transmission Pipe (80㎞)

  - Project Budget: KRW 80,760 million

  - Project Period: Jun. 1992 ~ Dec. 1996

- Jul. 1993: Permission for Mass Energy Project
- Dec. 1993: Commencement of Construction of Nowon Cogeneration Plant
- Dec. 1993: Commencement of Construction of Heat Transmission Pipe Installation
- Dec. 1994: Start of Heat Supply (3,420 Households in Gongneung 1 Land Development District)
- Dec. 1996: Completion of Nowon Cogeneration Plant
- Oct. 2009: Completion of the Fuel Cell (2.8MW) Generation Plant in the Nowon Cogeneration Plant

Figure 8 -Status of Consignment for the Mass Energy Supply Project

· Dec. 20th, 1983 ~ Dec. 31st, 1998 (Consignor: Seoul Mayor, Consignee: Korea Energy Management Corporation)

· Jan. 1st, 1999 ~ Dec. 31st, 2001 (Consignor: Seoul Mayor, Consignee: Seoul Energy)

· Jan. 1st, 2002 ~ Present (Consignor: Seoul Mayor, Consignee: SH Corporation)

Dec. 31st 2013

Classification	Gangseo Region (Mok-dong Cogeneration Plant)	Nowon Region (Nowon Cogeneration Plant)
Location (Site Area)	Mok-dong Seo-ro 20 (Mok-dong 900), Yangcheon-gu, Seoul (53,302.4㎡)	99 Deongneung-ro 70 gil (Sanggye-dong), Nowon-gu, Seoul (24,356.7㎡)
Service Area	9 dongs in 3 districts (Gangseo-gu, Yangcheon-gu, Guro-gu)	11 dongs in 3 districts (Nowon-gu, Dobong-gu, Jungnang-gu, Uijeongbu)
No. of Target Households	114,659 Households (211 Buildings)	127,545 Households (47 Buildings)
Facility Capacity	· Turbine Generator: 30.2MW · Cogeneration Boiler: 100 tons (1 Unit) · Cogeneration (low pressure) Boiler: 150 tons (1 Unit) · Heating-only Boiler: 770 tons (7 Units) · Heat Transmission Pipe: 88.4km x 2 lines	· Turbine Generator: 37MW · Cogeneration Boiler: 150 tons (1 Unit) · Heating-only Boiler: 600 tons (4 Units) · Heat Transmission Pipe: 85.2km x 2 lines
Start of Heat	Nov. 20th, 1985	Dec. 8th, 1994

<Mok-dong Cogeneration Plant>

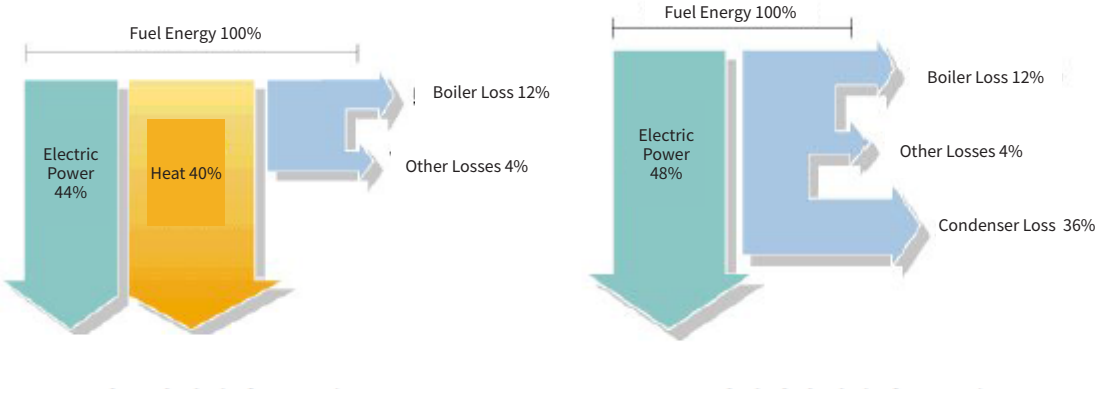
<Nowon Cogeneration Plant>

Source: The Seoul Metropolitan Government, White Paper on Energy, 2013 and 2014

Project Effects

- Large amount of energy reduction due to the enhanced energy use efficiency (20~30%)
- Reduction of SOx, NOx and fine dust emissions thanks to the air environment improvement because of the reduced fuel use and concentrated environmental management
- Contribution to solving the power plant site problems and to reducing the power transmission loss
  - Relaxation of the peak load power in the summer season by supplying the district heating
- Decrease petroleum dependency through fuel diversification and increased use of unused energy such as the waste heat from resource recovery facilities and landfill gas

Figure 9 - Efficiency Comparison of the Existing Generation Method and Cogeneration Method



<Existing Generation Method: Efficiency 48%> <Cogeneration Method: Efficiency 84%>

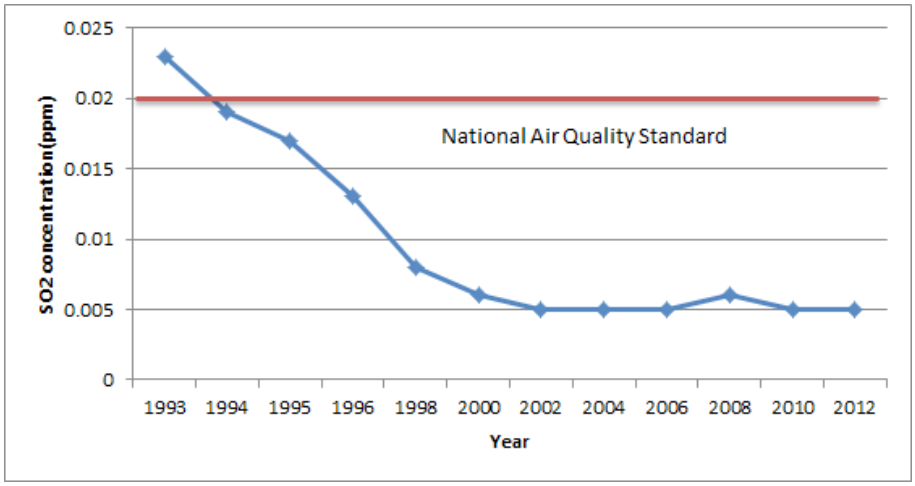
Source: The Seoul Metropolitan Government, White Paper on Energy, 2008, 2007

Conclusion and Implications

Project Effects

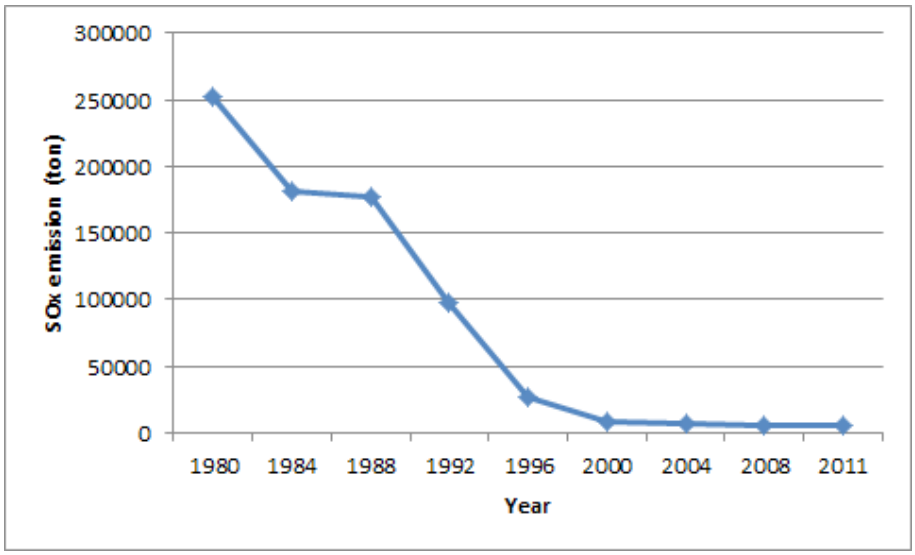
Thanks to the various policies and projects facilitated by the Seoul Metropolitan Government and the central government to provide clean fuel that emits low air pollutants, the SO2 concentration in Seoul has been remarkably reduced. SO2 concentration has been lower than the national environmental standards since 1994 and has been maintained at a very low level of around 0.005ppm stably since 2000.

Figure 10 - Change of SO2 Concentration of Seoul



Source: The Seoul Metropolitan Government, Analysis of Air Pollution of Seoul, 1995 and 1996; the Seoul Metropolitan Government, Evaluation Report on Seoul Air Quality, 2012 and 2013

Figure 11 - Change of SOx Emission in Seoul



Source: The Seoul Metropolitan Government, Environment of Seoul in 2000, White Paper on Environment, 2000; http://airemiss.nier.go.kr/ (National Institute of Envionmental Research, Air Pollutant Emission Quantity)

Future Tasks

The SO2 pollutant which was one of the main causes of air contamination in Seoul until the early 1990s have been rapidly reduced thanks to Seoul's policy to supply various kinds of clean fuels and to expand such supply actively, no longer being a cause for concern. However, the NO2, fine dusts, etc. that are generated by using the fossil fuels like gasoline, diesel, etc. still remain major air pollution problems in Seoul. In addition, LNG, which had been regarded as a clean fuel, is not free from climate change issues attracting global interests in the aspect of air quality, because it emits greenhouse gases such as carbon dioxide.

In order to address these limits, Seoul prepared and implemented plans to expand the use of new and renewable energy including geothermal heat, sunlight, solar heat, fuel cells, etc. Specifically, Seoul has focused on expansion of facilities related to sunlight, fuel cells and geothermal heat and on heat generation using wastes. As a result, the total production of new and renewable energy in Seoul has increased nearly three times from 78,000 TOE in 2003 to 233,000 TOE in 2012. Nonetheless, the production amount of new and renewable energy in Seoul is just 2.6% of the nationwide production amount of new and renewable energy and makes up only 1.5% of the entire energy consumption of Seoul. As Seoul facilitates the introduction of sunlight generation facilities as a part of policy for "Reduction of One Nuclear Plant," the weight of solar generation is expected to increase significantly.

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14. Pay as you throw system of Seoul

Written by: Ki-Yeong Yu, Researcher, the Seoul Institute

Policy Area: Waste Management Area (Municipal Solid Waste Management)

Background and Implementation Status of Pay as you throw system

How to Implement the Pay as you throw system

The amount of daily waste[1] emitted from 10.3 million citizens, 4 million households and 780 thousand businesses in 2012 was 9,189 tons per day, 0.88kg per person. All daily wastes should be discarded according to the regulations of the 25 autonomous districts. To discard the general waste (to be sent to incineration facilities or landfills), you should buy and use the standard waste bags sold by the relevant autonomous districts. To discharge food waste, you should buy and use the standard waste bags or use the chip or RFID based system. In the case of large sized waste, you have to buy stickers from the relevant autonomous districts and attached them to the waste before discarding them, or you can hand such wastes over to specialized waste collection agents. (Ministry of Environment, Nov. 2012; Resource Recirculation Bureau, Ministry of Environment, Nov. 2012) The items that can be recycled to create resources or have value of resources like paper, scrap metal, large home appliances, small home appliances, fluorescent lamps, batteries, cooking oil, etc. should be separated and discarded according to the methods regulated by the government. (Minister of Environment, 2011)

In the case of the general waste and food waste, the discarders bear the whole or a part of expenses for waste collection and treatment and the cost depends on the amount of the discarded waste. That is why the waste fee in Seoul is called pay as you throw system. The measuring method for general waste and food waste is different. The measuring method for general waste is the standard bags which are made according to the quality standards[2] set by the government. The waste discarders can buy the bags in desired sizes at designated stores (such as convenience stores, laundries, etc.). The expenses for waste collection, treatment and production of bags and the commission for the stores are included in the price of the bags, granting the nature of marketable securities to the bags.

The measuring method for food waste are either an RFID based waste weighing system, chips (or stickers) or standard waste bags, more various than the method for general waste. RFID based waste weighting system is used to measure the weight of waste and impose consequential fees. An advantageous trait of this

1. Waste is divided into daily waste and industrial waste in Korea. Industrial waste refers to the large amount of waste, recycling items, intractable things or toxic substances discarded during business activities from the companies and are classified into massive daily waste (wastes over 300kg per day from business entities), wastes from waste disposal facilities (wastes discharged from the business site operating environmental pollution prevention facilities), construction wastes (over 1 ton per day from construction sites) and designated wastes (toxic wastes or infectious wastes). Discarders of industrial waste are responsible for the treatment of such waste. Any waste that is not industrial waste is considered daily waste which includes waste that is small in volume, non-hazardous nature, local governments' handling responsibilities, etc.

2. Korean Plastic Standard, enacted on Dec. 17th, 1993, KPSM 1000

system is accurate weighing of the discarded waste. But the devices have disadvantages at the same time, because the system has a complicated configuration consisting of weighing devices, discarder recognition system and storing devices to save the discarders and results of weight measurement. Chips or stickers are used with the standard containers. Daily volume measuring and monthly volume measuring are all available with this solution.

Except for recycling products, large sized waste and used coal briquettes that are allowed to be discarded using other routes, all wastes discarded in Seoul must be made according to the volume-rate disposal system without exception and the corresponding fees must be paid. If you do not pay the fees when you discard your waste, it is a violation of the waste management law or ordinances of the local government, and is subject to the penalties of those laws or ordinances.

Table 1 - Measuring Methods of Pay as you throw system in Seoul

Classification	General Waste	Food Waste
Measuring Methods	· Standard Bags	· RFID based Weighing System · Chips or Stickers · Standard Bags
Kinds of Standard Bags	· General: 3ℓ, 5ℓ, 10ℓ, 20ℓ, 30ℓ, 50ℓ, 75ℓ, 100ℓ · Reuse: 10ℓ, 20ℓ · Public: 30ℓ, 50ℓ, 100ℓ	· General: 1ℓ, 2ℓ, 3ℓ, 5ℓ, 10ℓ * Over 20ℓ can be used when large amount of wastes is discharged in holidays, Kimchi-making season, etc.
Colors of Standard Bags	· General and Reuse: White · Public: Blue	· General: Yellow
Materials of Standard Bags	· PE Bag · Biodegradable Bag	· PE Bag · Biodegradable Bag
Examples	 Standard Bags for General Waste	 RFID Based Waste Weighing System

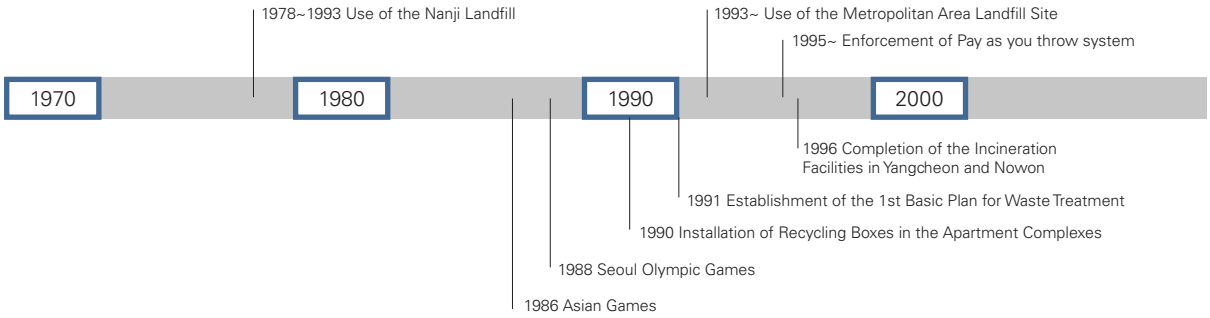
Background of Introduction of Pay as you throw system

In the late 1980s and early 1990s, the whole society of Korea was filled with high public esteem and vitality due to the successful hosting of Asian Games in 1986, Seoul Olympic Games in 1988 and continuous economic development. There were lots of products on the market and plastic products were produced in mass volume thanks to the development of production technologies. Lots of products led to increased amounts of waste. Meanwhile, Seoul, the capital city of Korea, could not secure the space for landfills to treat wastes any more while the space of Seoul was being expanded to the outskirts of the city.

As the capacity of Nanji Landfill (operated from 1978 to 1993) was reaching its limit, the central government led a project to establish new waste treatment facilities in the metropolitan area to treat the waste from Seoul, Incheon and Gyeonggi-do (province) in 1989. But it was very difficult to move forward because of the strong opposition from the residents living the areas near the expected sites for facilities. The Seoul Metropolitan Government also planned to build 11 incineration facilities to treat all daily waste from Seoul, but encountered opposition from neighboring citizens and strong voices of the civil societies concerned about excessive facility construction. In 1996, Seoul managed to complete the construction of incineration facilities in Yangcheon (400 tons per day) and Nowon (800 tons per day), and just 4 more facilities (2,850 tons per day) could be built after that. In order to address the issues of waste which had increased in quantity and had deteriorated in quality, the government started to have interest in waste recycling as an alternative mean.

Recycling boxes had appeared in the apartment complexes of Seoul in 1990, and began to be provided to detached house areas the next year. However, the citizens were not familiar with the separate discarding for recyclables. In the case of the detached house areas, half of the collected recyclables was general garbage. On the other hand, the changes in the waste management system costed a lot of money, using landfills a long distance away, constructing incineration facilities, separating the waste into general garbage and recyclables to be collected in different ways, etc. As shown in the data from 1991, the financial expense spent in the waste management was KRW 280 billion and the fee revenue was only KRW 25.4 billion, covering just 9% of the total costs. Most of the expenses for waste treatment were taken by the general account budget, and the part paid by the citizens, the waste generators, was very small. (The Seoul Metropolitan Government, 1992)

Figure 1 - Main Waste Management Projects before and after the Introduction of Pay as you throw system



In this situation, the government started seeking methods to reduce the amount of waste fundamentally (waste reduction), to lower the dependence on the incineration facilities or landfills by establishing the separate discarding of recyclables (promotion of recycling), and to charge the citizens who generate waste for the involved costs of the waste management (securing financial resources for waste management), and selected the pay as you throw system as an alternative. Entering the 1980s, the necessity of introducing the pay as you throw system had been raised in a corner of academic circles (Environmental Planning Institute, Graduate School of Environment of the Seoul National University, 1983; Jeong-jeon Lee, 1991). However, the fees for waste disposal in Seoul had been collected in a kind of tax form based on the building areas or property taxes which had nothing to do with the amount of waste produced before the pay as you throw system was introduced in 1995 (Ki-young Yu and Jae-cheon Jeong, 1995). The pay as you throw system taken as the waste disposal fee system through establishment of social atmosphere, creation of implementation conditions, pilot projects, etc. has gone through changes and development until it reached its current form.

Table 2 - Waste Disposal Fee Systems of Seoul When Introducing the Pay as you throw system

Period	Kinds of Waste	Fee Rates	Basis of Charging Fees
In the 1980s	General Waste (Small Amount)	7	Total Ground Area of Buildings
	General Waste (Large Amount)	-	Weight
	Business Site Waste	6	Total Ground Area of Buildings
In the Early 1990s	Household Waste	9	Total Ground Area of Buildings /Amount of Property Tax
	Business Site Waste (Large Amount)	2	Weight
	Business Site Waste (Small Amount)	6	Total Ground Area of Buildings
1994 (Just before the Introduction of Pay as you throw system)	Household Waste	9	Total Ground Area of Buildings
	Business Site Waste (Small Amount)	6	Total Ground Area of Buildings
	Business Site Waste (Normal Amount)	1	Volume
	Business Site Waste (Large Amount)	2	Volume
	Construction Waste	-	Volume

1994 (Just before the Introduction of Pay as you throw system)	Home Appliance	7	Kind, Volume
	Furniture	7	Kind, Volume
1995 (Enforcement of Pay as you throw system)	General Waste/Food	-	Size/Number of Standard Bags
	Large Waste	-	Kind/Size/Number
	Recyclable Items	-	Free

Process of Introduction and Settlement of Pay as you throw system

Preparation Stage (1992~1994)

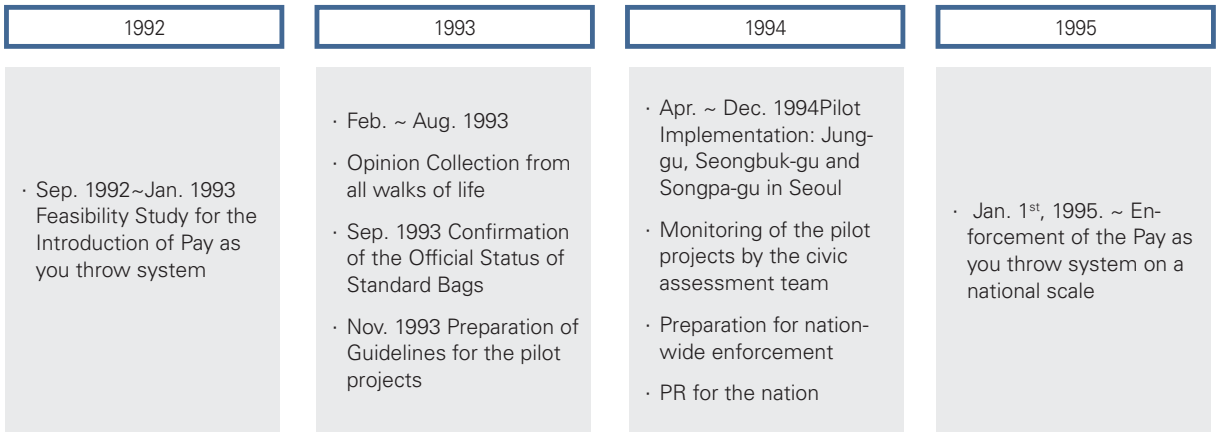
The pay as you throw system was introduced in 1995, however the preparation started in the early 1990s and the practical arrangement began in 1992 with the government at its center. First, the survey and research to verify the validity of the introduction of pay as you throw system had been conducted by Korea Society of Waste Management from September 1992 to January 1993. The main contents of the survey and research were relevant amendment of legislations, enforcement measures, expected effects, ripple effects, etc. In 1993, the government began the process of opinion collection from all walks of life regarding the introduction of pay as you throw system. Public hearings and meetings with private organizations consisting of relevant experts, cleaning companies, etc. (Feb. ~ Jul. 1993), meetings with the consumer groups, groups of housewives and waste bag manufactures (Jul. 1993), meetings with the managers of the urban and provincial cleaning departments and opinion collection of the waste subcommittees (Jul. ~ Aug. 1993) were held during the process. Inquiry about the opinions of related organizations and institutes on the legal status of standard waste bags was also conducted (Sep. 1993). The result was that the waste bags could be regarded as official documents as long as the positions of mayor or district heads as well as the marks of the city hall or the autonomous district offices were on the bags, and that it would be considered forgery of official documents if anyone forges and sell the bags.

One year before the pay as you throw system was introduced in country-wide, pilot projects were conducted in 33 cities, counties and districts (Apr. ~ Dec. 1994). In Seoul, Jung-gu as a commercial area, Seongbuk-gu as a detached housing area and Songpa-gu as an apartment area participated in the pilot projects (The Seoul Metropolitan Government, 1994). Before that, the central government announced the implementation measures of the pay as you throw system, including the amounts of the waste fees, how to distribute the standard bags, how to treat the expected increase of recyclables, etc. (Nov. 1993). During the pilot projects, the

government concentrated on finding the waste discarding status, standard waste bags, degree of citizens' participation, flow of the community opinions, etc. The government assembled a civil assessment team consisting of 7 civic groups including YWCA, YMCA, Green Korea United, the Korean Federation of Environmental Movement, etc. and 165 monitoring agents to provide the ability to assess and report the status of the projects. There were big concerns about negative factors, such as illegal waste dumping, however the positive assessment was dominant due to the 40% reduction of waste amount, 100% increase of recyclables collection, reduced cleaning cost, social expansion of awareness about waste reduction, inspiration of self-confidence of the officials, etc.

Based on the problems that appeared during the implementation of pilot projects, the government made "Guidelines of Pay as you throw system" (Sep. 8th, 1994) to enforce the system on a national scale. On November 7th, 1994, the government held a meeting with the related urban and provincial officials to conduct an interim evaluation on the project implementation of the local governments. On December 7th of the same year, the government issued guidelines of how to fix the problems that were discovered during the interim inspection such as the basic plans to handle the expected rapid increase of regional processing of recyclables, emergency transportation period setting against the emission of large amount of waste just before the enforcement of pay as you throw system at the end of the year, the reinforcement of manpower to facilitate the pay as you throw system, etc. In addition, the government processed the revision and amendment of related ordinances, management of waste bag manufacturing, designation of the stores to sell the bags, public relation activities, etc. in preparation for the introduction of pay as you throw system on January 1st, 1995. In particular, the government carried out a public relation campaign to ease the citizens' complaints of "why we should pay for waste disposal?" via media outlets such as TV commercial programs, advertisements in the daily press, TV talk shows, etc. and made and distributed promotion materials like VTR tapes, PR books, posters, etc. (Ministry of Environment and Korea Environment Institute, 2012)

Figure 2 - Main Projects in the Process of Introducing the Pay as you throw system



Introduction Stage (1995)

The pay as you throw system was implemented nationwide as of January 1st, 1995. As a result of the implementation of the system, the previous waste collection fee was replaced with the value of waste bags and the bags could be used in the region that was printed on the bag. General waste was to be placed in bags purchased from the designated stores up to the dotted line and discarded in the front of houses. The recyclables were separated into paper, bottles, cans and plastics and then discarded. The large waste like refrigerators and cabinets were collected after prior notification by phone call to the administrative organizations containing address, name, kind and size of the waste, the confirmation of the visiting officials and the issuance of the bill for disposal fees. In consideration of low-income people, the coal briquette ashes were allowed to be discharged without using the standard bags. For the protected groups under the livelihood protection law and other poor people authorized by the heads of local governments, around 60ℓ of standard bags were provided for free or the purchasing price was reduced (Ministry of Environment, May 1997). In the beginning stage of the system, the citizens seemed to not adapt to the implementation of the volume-rate waste disposal methods. There were many cases where the citizens could not distinguish recyclables from general household waste. Out of selfishness, citizens dumped household trash prior to the enforcement of pay as you throw system. They especially discarded large waste like cabinets, refrigerators, etc. at the same time to intensify the confusion. However, these things happened often only in the early stages, and became stabilized as time went by.

In April 1995, the government had an evaluation meeting 100 days after the implementation of pay as you throw system. During the period, a survey of 1,000 households was conducted and the results showed that the citizens appeared to almost fully adapt to the system in a month after the implementation. 98.6% of the respondents had evaluated that they practiced the system well, and the capacity of the most widely used standard bags was 10ℓ, 5ℓ and 20ℓ in order. The improvement and complement points proposed in the evaluation meeting were strength and convenience of the standard waste bags, application of the system to the wastes in public places, enhancement of convenience for separate collection of recyclables by showing the recycling mark, timely collection of recyclables, prohibition of collection of recyclables that were mixed with the waste, prohibition of excessive packaging of disposable products and preparation of its basis, initiative practice of the system in government organizations, preparation of the criteria for penalty enforcement, establishment and expansion of recycling networks, securing the appropriate price of standard bags, linkage of allotment/deposit for the pay as you throw system, supply and promotion of system related information, etc.

Development Stage (After 1996)

Many things that concerned the government and caused inconvenience to the citizens regarding the imple-

mentation of pay as you throw system. However, the system was recognized to have lots of positive effects, including the practical reduction of the amount of waste, facilitation of separate disposal of recyclables and expansion of social awareness on waste reduction from when it began in 1995 through its 20-year anniversary in 2015. In the meantime, the pay as you throw system has been developed and changed continuously.

First, the most troublesome problem in the beginning stage was how to handle the collected recyclables. It was resolved by enacting the producer responsibility regulation in 2003. The recyclables are divided into paper, plastic containers, scrap metal (including cans) and glass bottles. Under the pay as you throw system, the amount of collected recyclables increased but the demand for recyclables was the same. The producer responsibility regulation had been executed using the deposit system for a limited number of items including paper packs, PET bottles, iron cans, glass bottles, etc. However, the system did not work well enough to be of help to increase the demand for manufacturing, because many manufacturers gave up the deposit. Thus, the government decided to convert the deposit system to an expanded producer responsibility scheme, which required the producers to treat the recyclables. Additionally, the relevant items were greatly expanded to include paper packs, plastic containers, scrap metal (including cans), glass bottles, large sized home appliances, small sized home appliances, fluorescent lamps and batteries. As a result, the supply and demand of recyclables were dramatically improved.

In 1997, the government started to make and provide waste bags exclusively for waste that was difficult for both discarders and collectors to handle. The special waste bags were used to hold broken glasses, small amounts of construction waste, etc. that are sharp and heavy enough to cause physical damage, especially in the process of collection. The special bags were made of tough and easy-to-handle materials (poly propylene) different from those used for the general waste bags.

The standard waste bag, as the core method for implementing the pay as you throw system, was a very convenient tool for measuring the amount of waste in a large city like Seoul, Korea where it is difficult to identify the discarders. But many people pointed out repeatedly that the waste bags were disposable products and became waste after a single use. In order to address the problem, the government recommended selling standard bags for goods transport at large supermarkets (E-mart, Homeplus, Lotte mart, National Agricultural Cooperative Federation or Nonghyup Hanaro Club and Mega Mart). The large supermarkets located in Seoul began to sell the standard bags in 2010. The bag was called the reusable bag, consumers could use it as a standard waste bag, and the price of the reusable bag was same as the standard bag selling at other stores.

The most innovative development was the introduction of the weight-rate waste disposal system to weigh food waste. Many autonomous districts could not apply the principle of pay per disposal system properly in the case of food waste. Most of the districts used the standard boxes for the food waste, and imposed the

same fees to all households regardless of the amount of waste. Some districts collected food waste free of charge. There were reasons for their methods. The material of standard bag was polyethylene, which would become foreign material in the process of food waste treatment, lowered the quality of feed or compost made from the food waste, and made the feed or compost consumers reluctant to buy. The districts were confused because they were not sure of the validity of imposing fees for the collection of food waste that could be treated only using the garbage recycling methods, while they were collecting the recyclables free of charge. However, too much food waste was generated, and it was difficult to turn the food waste into recycled resources and to apply the expanded producer responsibility scheme while taking care of the food waste. Thus, the government decided to introduce the weight-rate waste disposal system in order to reduce the amount of food waste. The Seoul Metropolitan Government also enacted the system in 2003 (The Seoul Metropolitan Government, https://seoulsolution.kr).

The government recommended that the system should operate not on the basis of volume, but on the basis of weight when treating food waste because food waste is heavier than general waste. As a result of this change, it was reported that food waste was reduced by 10~30% (Korea Institute of Industrial Relations and Korea Environment Corporation, Dec. 2013). By using this system, the amount of food waste is recorded by each individual when the food waste is discarded. Based on the recorded information of each individual, the monthly fees are imposed. However, this system is currently only operated in a portion of apartment complexes, because the installation and operation of the weighing system costs a lot and requires space for the installation. For detached houses and restaurants, the standard bags or standard tanks with chip attached are generally used. (Resource Recirculation Bureau of the Ministry of Environment, Nov. 2012)

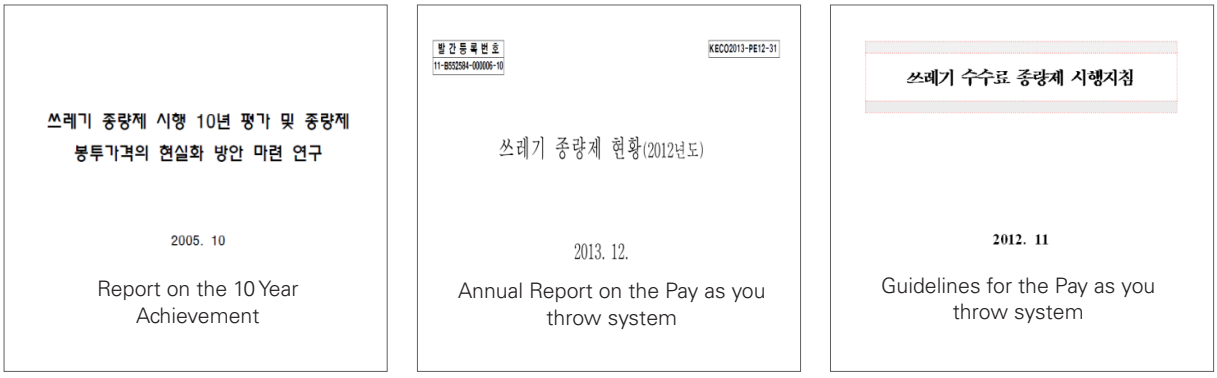
Table 3 - Methods and Features of Food Waste Disposal Systems

Recognition of Discarder	Electronic Tag/Electronic Card	NA	NA
Measuring Unit	Weight	Volume	Volume
Storing Container	Individual Container	Individual Container	Bag + Base Container
Imposition of Fees	By Household/Restaurant	By Household	By Household
Payment of Fees	Deferred Payment	Advance Payment	Advance Payment
Waste Reduction Effect	9~31%	14%	13%
Remarks	 RFID based Weighting System	 Chip Attached to the Standard Tank	 Standard Bag

Source: Resource Recirculation Bureau of the Ministry of Environment (Nov. 2012), Korea Institute of Industrial Relations and Korea Environment Corporation (Dec. 2013)

As described above, the meter-rate based waste fee system has been steadily developed. During the process, the government made big efforts to develop the system by implementing periodic status and problem monitoring. It found and evaluated the degree of system settlement, inconvenient factors when discarding the waste, items to improve in the system, things to improve in the related cleaning system and things to improve in the recycling market. In the beginning stage, the government evaluated the achievement of the system every year and held an evaluation meeting in 2005 to look back the achievement of the system over the first 10 years. In 2004, it started to investigate the results of standard bag sales by the local government, waste treatment facilities, how to secure the financial resources for cleaning, response performance against illegal waste dumping, etc. and to issue the results of the investigation as a government report. The guidelines for the waste disposal system established in the early stage have been amended many times in 1997, 2001, 2003, 2006, 2008, 2009, 2010 and 2012.

Figure 3 v- Sourcebook Regarding the Achievement Monitoring of Waste Disposal System and Improvement of the Implementation Methods



Acceleration of Waste Reduction

According to the statistics of Seoul, in 1995 when the pay as you throw system was implemented, the amount of waste was reduced by 8% compared with the previous year and 11% in 1996 compared with two years before. In the beginning stage of the system, large waste was discarded in large quantities because it was free at that time. Therefore, the amount of waste discharged in the 2nd year, 1996, can be assumed to be more accurate. So the actual percent of waste reduction was about 11%, which equaled an amount of about 1,712 tons per day. The average capacity of the 4 incineration facilities in Seoul is 700 tons per day[3]. In other words, the amount of waste reduced was equal to the capacity of 2~3 incineration facilities.

Of course, there were different arguments for the reduced wastes. According to an opinion, other factors

3. Yangchoen Facility: 400 tons/day, Nowon Facility: 800 tons/day, Gangnam Facility: 900 tons/day and Mapo Facility: 750 tons/day

besides the pay as you throw system such as the rapidly reduced use of coal briquettes and the regulatory policy on disposable items and product packaging affected waste reduction (Yong-seon Oh, 2006). On the contrary, another study showed that even when the other factors are considered, it was the waste disposal system that clearly brought about the reduction in waste (Kwang-ho Jeong et al, 2007). The controversial evaluations above were not on the waste reduction itself, but on the size of the system's effect. The citizens became more sensitive to exaggerated packaging when choosing products, took only the products, leaving the packing materials, and requested to return the packing materials of delivered products. These reactions of the consumers influenced manufactures and were reflected in product design. After the introduction of pay as you throw system, it was obvious that there were changes in the consumption pattern and those changes were admitted by all.

Table 4 - Change of Waste Amount before and after the Enforcement of Pay as you throw system

Classification	1994 (Preparation)	1995 (Enforcement)	1996 (2nd Year)
Generation Amount (tons/day)	15,397	14,102	13,685
Generation Amount (kg/day)	1.43	1.33	1.31

Facilitated Separation of Recyclables and Early Adaptation of Waste Separation

The outstanding results of the pay as you throw system included the facilitated separation of recyclables and early adaptation of waste separation habit in a short period of time. The amount of recyclables increased by 881 tons per day in 1996 compared to 1994. The proportion of recycled waste of the total amount of processed waste was 20.5% in 1994, 29.3% in 1995 (enforcement of the system) and 29.5% in 1996, showing a rapid increase of 9% in 1996 (2nd year) compared with that in 1994. There were different evaluations of the waste reduction effects, but everyone agreed on the adaptation of separate disposal of recyclables. The facilitated separation of recyclables led to the reduced demand for the waste treatment facilities. Because the average capacity of the incineration facilities in Seoul was 700 tons per day, the separation of recyclables contributed to the reduction of 1.3 incineration facilities worth of waste.

Table 5 - Change of Recycled Waste Amount before and after the Enforcement of Pay as you throw system

Classification	1993 (Fixed Ratio)	1994 (Preparation)	1995 (Enforcement)	1996 (2nd Year)
Waste Amount (tons/day)	16,021	15,397	14,102	13,685
Recycled Amount (tons/day)	2,940	3,156	4,131	4,037
Recycling Rate (%)	18.4	20.5	29.3	29.5

Securing the Waste Management Expenses with Fees

The financial independence rate (appropriation scale by the income from fees, etc. compared to the expenses for waste management) in 1991 was just 9%, meaning that the expense burden of the waste discarders was very low (The Seoul Metropolitan Government, 1992). It is for this reason that the pay as you throw system was introduced. With the pay as you throw system, the fees paid by the waste discarders increased from KRW 119.9 billion in 1993 to KRW 153.6 billion in 1995 (growth rate: 28%), and there was a more desirable aspect. The total income from the fees got bigger without increasing the burden per household while maintaining fairness in charging the burden of fees. In other words, the monthly fee per household before the introduction of the pay as you throw system was KRW 2,102, and KRW 2,288 after the system introduction, showing little difference except that the waste discarding sources who were paying the waste fees were expanded from 1,690 thousand households to 2,970 thousand households. In conclusion, the introduction of pay as you throw system was effective in improving the unreasonable fee structure and increasing the fee income.[4]

Table 6 - Change of Waste Fees according to the Enforcement of Pay as you throw system

Classification	1993 (Fixed Ratio)	1995 (Enforcement)	1995/1993
Fee Income (KRW Mil.)	119,912	153,638	1.28

Creation of Economic Benefit

In 2005, the government evaluated the 10-year performance of pay as you throw system that was introduced in 1995. According to the evaluation, 1 ton of waste reduction created a benefit of KRW 144,071 and 1 ton of waste recycling created a benefit of KRW 18,901. The benefits of waste reduction came from the reduced cost for waste collection and transportation, installation of treatment facilities and operation of such facilities. The benefits of recycled waste were the values earned after deducting the cost for collection and transportation, sorting, processing, etc. from the total value of the recyclable items (Korea Institute of Industrial Relations and Korea Environment Corporation, Dec. 2013). In the case of Seoul, it seemed that the cost for waste collection, transportation and processing was reduced by KRW 90 billion and the recycling created KRW 6.1 billion of economic benefits, KRW 96.1 billion in total per year if the government evaluations above were applied to the performance of pay as you throw system in Seoul.

4. Before the volume rate waste disposal system was introduced, the waste fee was imposed based on the scale of houses and the amount of property taxes. Therefore, the fees were the same regardless of the number of households in a building or housing.

Table 7 - Change of Fees According to the Enforcement of Pay as you throw system

Classification	Increase/Decrease Amount (1996-1994, ton/year)	Benefit per Unit (KRW/ton)	Scale of Benefit (KRW Bil./year)
Reduction	-624,880	144,071	90
Recycling Amount	321,565	18,901	6.1
Total Benefits	-	-	96.1

Meaningful Experience of Seoul

Thorough Preparations

The volume-rate waste fee collection system is inconvenient to citizens as the waste discarders. Even the experts opposed the introduction of the system, saying that foreign countries hesitated its introduction out of concern for possible illegal waste dumping. In Korea, the introduction of pay as you throw system was made with the support of the government, cities and some scholars fearing the difficulties in securing the waste treatment facilities, not with the support of the majority of people. To cope with this negative atmosphere, it was necessary to remove the institutional obstacles in advance, to create an amicable social atmosphere for the system, to find the effects and the problems through implementing pilot projects and to persuade the people of the benefits. In particular, it was imperative to find the system implementation methods suitable to each city in during preparation stage. In the case of Seoul, it was not easy to identify the waste discarders because there were many high-rise buildings such as apartments and shopping centers and the city space was small and narrow. That was the reason why Seoul took the standard waste bag as the method to measure the amount of waste. However, it was desirable to use baskets only for the waste in regions with many detached houses and developed roads because it was possible to prevent the waste of disposable standard bags and illegal dumping by making an agreement with all dischargers on the size of waste baskets and to reduce the waste collection cost by introducing the automated basket loading vehicle system.

Cooperation with the Civil Society

The civil society in the environmental field played a large role in adapting the pay as you throw system in Korea. When the system introduction was in the middle of discussion, the civil society did not have a favorable opinion of the system. It expressed concerns about illegal waste dumping to avoid paying the waste fees and signs of uneasiness about the intention of government to shift the responsibilities for waste reduction and waste recycling to the people. However, the society started to see the positive sides of the system after participating in the site monitoring activities and ensuring the citizens' active participation during the periods

of pilot project and the 1st year of project implementation.

The civil society has taken part in the evaluations for the pilot project and the first, second and tenth years of the system implementation persistently. Even now it is involved in the process of assessment for the implementation of the food waste disposal system. The positive evaluation from the civil society has contributed greatly to the change of the attitude of the mass media and the national consciousness.

Securing the Disposal Paths for the Increased Amount of Recyclables

The separate discarding of recyclables free of charge was implemented in a short time. How to process the collected recyclables became the task of the government. The biggest headache was how to handle plastic containers (PE, PP, PS and PVC materials) other than PET containers. While they were designated as recyclables, there were not enough infrastructures equipped to treat plastic products. In addition, the producers were not responsible for the treatment of waste plastics because the waste charges[5] were imposed on most of the plastic containers. The issue was solved in 2003 when the government gave financial support to help the plastic recycling operators install and operate the relevant facilities, made the public sectors purchase recycled plastic products preferentially, and to impose the obligation to collect and process recyclables which had weak treatment basis in the market (including the plastic containers) to the manufacturers (Extended Producer Responsibilities Scheme).

With the introduction of pay as you throw system, an unplanned recycling item was added. Because of the serious bad smell from the landfills, lots of complaints were raised one year after the system's introduction. The same complaints were made about the roads to the waste treatment facilities. The cause of the problems was food waste. The large amounts of papers acted as buffers in standard bags, absorbing the leachate and blocking the smell of the food waste to some degree, but the papers were classified as one of the recyclable items. The main cause of the bad smell was the fact that papers were no longer discarded with general waste[6]. The problem was resolved by collecting the food waste separately and changing the treatment system on a large scale. Landfill of all food waste was prohibited from 2005. The government started the construction of food waste treatment facilities in 1998. Seoul has 5 public facilities to treat food waste in five places now. The remaining food waste is processed using private facilities.

5. A system to impose the cost for treatment (incineration or landfill) of the items with no recycling infrastructure on the manufacturers

6. The food waste content was 50~60% of the household wastes and around 30% of the city waste. The food waste in Korea generate the leachate and bad smell because there are lots of fermented products and surplus produce that are discarded in the process of preparation of food materials.

Prevention of Illegal Acts

When reviewing the system introduction, the most concerning side effect was illegal waste dumping to avoid paying fees. Actually, many people dumped household or business side trashes in public street wastebaskets or in secluded spots or desolate places and discarded the waste without using standard waste bags. In order to prevent illegal waste dumping, reflectors were installed and places used for illegal dumping were changed into flower gardens. Some districts removed the wastebaskets on downtown streets. The illegal dumping was reduced a lot, but not eliminated though. In the meantime, the systems to impose penalties for committing illegal acts and to supply standard bags to the low-income class free of charge were prepared.

Figure 4 - Cases of Illegal Dumping and Corresponding Measures

Illegal Waste Dumping in Suburbs (http://waste21.or.kr)

Disposal Using Non-standard Bags (http://waste21.or.kr)

Creation of Flower Beds (http://dong.jungnang.seoul.kr)

Installation of Reflectors (http://www.cpdc.re.kr)

Revision of Legislation

The enforcement basis of pay as you throw system is the waste management act. The detailed implementation methods are authorized to the local governments by their ordinances. The waste management act also deals with the penalties for illegal dumping to avoid the fees.

Each district covers the specific regulations on how to enforce the system in its own ordinance. It regulates the kinds of waste under the application of the pay as you throw system, discharging methods, fees, kinds/colors/materials of the standard bags, supervision of standard bag manufacturing and safe management, designation of the stores to sell standard bags, guidelines for standard bag sellers, criteria on the cancellation appointment of standard bag sellers, etc.

The size, material, strength and kind are determined based on the Korean Standard on Plastic Products. All specifications of standard bags are subject to the standard and standard bags made against the standard cannot pass the inspection. To prevent the counterfeiting of bags, the seals for printing on the surface of standard bags were kept by the autonomous districts and handed over to the manufacturers only when they produced standard bags. In the case that a person makes and distributes counterfeit bags, the person would be punished according to the regulation on the fabrication of official documents under criminal law.

Table 8 - Legal Systems Related to the Enforcement of Pay as you throw system of Seoul

Classification	Description
Waste Management Act	· Recommendation on the Enforcement of Pay ayou throw system · Legislation of OrdinanceRelated to the Enforcement of Pay ayou throw system · Prohibition of Illegal Dumping and Imposition of Penaltieon Illegal Dumping · Revision of the RegulationRelated to the AutonomouDistricts: Ordinance and Regulations, Guidelinefor the Enforcement of Pay ayou throw system, Guidelinefor Discarding Food Waste and Fees
Ordinance on the Waste Management of the Autonomous Districts	· Contents: Waste Subject to the Pay ayou throw system, How to Discard the Waste, Fees, Kind/Color/Material of the Standard Bags, Supervision of Standard Bag Manufacturing and Safe Management and Designation of the Storeto Sell the Standard Bags
Korea Standard on Plastic Products	· Kinds: Standard Bagin PE Material, Standard Bagin LLDPE material and Standard Bag-Containing Calcium Carbonate · 9 Kindof Standard Bagin Generation and Disintegration Natures
Reports on the Performance	· Contents: Enforcement Status, Statuof Standard Bag Manufacturing and Sales, Waste Collection Method and Collection Cycles, Financial Independence Rate in Cleaning and Rate of Burden, Discharge of Large Waste and Collection of Disposable Vinyl Bags, Illegal Dumping Regulation Performance, etc.
Criminal Law	· Manufacturing and distribution of counterfeit standard bagcorrespond to the fabrication of the official documents

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