

Recycling (Smart Waste Management in Seoul)

Issues

As Seoul was rapidly developing in economic terms in the 1980s, the volume of the city's waste skyrocketed as well. As of 1991, the average daily waste generated per capita in Seoul was 3 kg, remarkably larger than Japan's 1 kg, and the UK's and Germany's 0.9 kg (Ministry of Environment, 2012). In particular, the situation at Nanjido Landfill Site, where leachate and toxic gas leaks and other environmental issues such as groundwater contamination reared their ugly heads, amplified the need to better manage the demand for waste services.

Meanwhile, siting and construction of waste treatment facilities resulted in local opposition and became more complicated in the 1990s when the local autonomy system was introduced, making the mediation of conflicts between local governments even more difficult. Though the Seoul Metropolitan Government (SMG) was able to secure the land for Sudokwon Landfill Site, use of the site was supposed to end in 2006. It soon became evident that expanding the waste treatment facilities would not meet the ever-increasing demand.

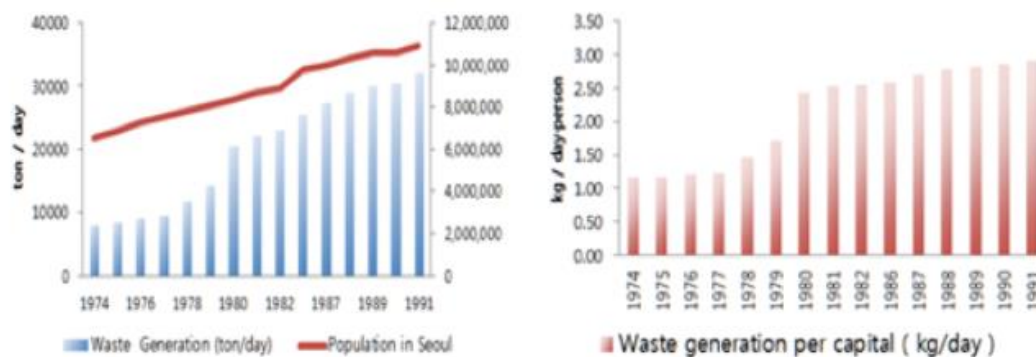


Figure 6 Trends in Waste Generation in Seoul (Left) Waste Generation Per Capita (Right)

Waste Generation (tons/day) Population in Seoul

Waste generation per capita (kg/day)

Figure 6 Trends in Waste Generation in Seoul (Left) / Waste Generation per Capita (Right)

Despite government efforts to promote recycling and reduce waste, including the enactment of supporting laws, recycling rates remained a very low 5% into the late 1990s. The low incentive for households to recycle was pointed out as one reason behind such poor participation as waste collection was charged at a fixed rate through property taxes or housing unit size, which was criticized for being illogical. The need to promote recycling while minimizing waste generation at the source surfaced as a main policy agenda.

Solution - Volume-Based Waste Fees (VBWF)



Figure 7 Standard Garbage Bag (Domestic Use)

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Officially launched in 1995, the volume-based waste fee system employs economic incentives. Based on a “pay as you throw” principle, users pay according to the amount of garbage they generate by having to purchase bags required to dispose of household waste. Implementation of the system entailed a significant change in public awareness toward waste disposal, drawing attention to such issues as the urgency to reduce waste and the costs related to waste disposal. As perceptions of the system changed, people’s behavior changed and support grew.

2.1. Planning

1) Preparation (Sept. 1992 ~ Dec. 1994)

Before full implementation, enforcement guidelines for volume-based waste fees were defined by the government. Meanwhile, public hearings took place to inform the civil service, the general public and professionals from diverse fields on the new waste management system and to gather public opinions. Over the next couple of years, the Ministry of Environment conducted a pilot project in selected areas for each metropolitan city and province. As positive results came out of these projects, other regions joined on their own. Seoul-wide participation resulted in a remarkable 40% reduction in waste and doubled the

rate of recycling. During the preparation stage, the city extensively reviewed and examined the new waste management system to solicit opinions from relevant ministries and different social sectors. Working with the media to promote the system via television and radio was the responsibility of the volume-based waste fee system headquarters and situation room.

2) Introduction (Jan. 1, 1995)

On January 1, 1995, the volume-based waste fee system launched nationwide. The previous waste collection fee was replaced with the pre-paid garbage bag mandated by the local authorities. The bags were to be filled to the dotted line and put out in front of houses and apartment buildings, and recyclable materials were to be separated into paper, glass, metal, and plastic. Households wishing to dispose of large items such as home appliances and furniture were to report to the local *dong*-district office, where they would pay an extra fee and wait for collection.

2.2. Implementation

1) Legal Framework

The legal grounds for the volume-based waste fee system was found in Article 13 and 14 of the 1991 Waste Management Act, supplemented by the 1995 revision. The guidelines from the Ministry of Environment on the volume-based waste fee system provide the framework for regional ordinances. Based on these guidelines, mayors and district office heads decide bag prices according to the type and amount of waste and are authorized to commission the manufacture, sales and distribution of the garbage bags (Korea Environment Institute, 2011).

2) Standard Garbage Bags

The price of standard garbage bags is determined by local ordinances, in consideration of the previous garbage collection fee, local government finances and the local standard of living. Whereas the previous method of waste collection used a flat-rate system, the specific financial situation of the local government is reflected in the bag pricing under the volume-based waste fee system.

Garbage bags are sold at places designated by local governments based on demand from households and businesses. Sales and distribution of bags for business purposes are commissioned to private companies.

Capacity	2ℓ	3ℓ	5ℓ	10ℓ	20ℓ	30ℓ	50ℓ	75ℓ	100ℓ
Average price (KRW)	52	72	99	187	363	547	897	1,363	1,840

Table 3 Prices of Standard Garbage Bags in Seoul (2012)

(Source: Seoul Metropolitan Government)

The composition of and materials used in standard garbage bags vary. HDPE bags are primarily for incineration plants while LDPE bags are to be transported to landfills. The standard bags also vary in color and size according to their intended purpose.

Type of bag	Bag size
Domestic waste (white)	3ℓ, 5ℓ, 10 ℓ, 20 ℓ, 30 ℓ, 50 ℓ, 75 ℓ, 100 ℓ
Food waste (yellow)	1ℓ, 2ℓ, 3ℓ, 5ℓ
Business waste (orange)	5 ℓ, 10 ℓ, 20ℓ, 30ℓ, 50ℓ, 75ℓ, 100ℓ
Public purpose (blue)	30ℓ, 50 ℓ, 100 ℓ
Construction debris, glass waste	PP or gunny sack

Table 4 Standard Garbage Bag Types & Sizes

1) Sales of Standard Garbage Bags

Since 2005, sales of garbage bags have increased, with the exception of 2007, in the wake of the global financial crisis. Starting in 2005, food waste was collected separately in special reusable containers which has significantly reduced revenues from garbage bag sales.

Year	2003*	2004*	2005	2006	2007	2008	2009
Units sold (1,000)	266,477	272,233	37,358	38,101	37,581	38,943	39,989
Sales (KRW)	125,828	118,543	30,638	31,059	30,597	35,269	38,164

Year	2003*	2004*	2005	2006	2007	2008	2009
million)							

Table 5 Standard Garbage Bag Sales in Seoul (Source: Korea Environment Institute, 2011)

2) Financial Viability of the Waste Management Budget

The financial viability of the waste management budget is protected by dividing the total revenues from the sales of garbage bags and recyclable materials, fees for the disposal of large items, and penalties by the annual cost of waste disposal as shown in the following formula.

Financial Viability Rate = (revenue from sales of garbage bags + revenue from sales of recyclable materials + large item collection fees + etc.) / annual waste management cost

The financial viability rate of Seoul's waste management budget was low as of 2009, at 34.6%. It improved by 1% between 2003 and 2004 from 35.4% to 35.4%. This implies the total spending on waste management exceeds the revenue from sales of recyclable materials and standard garbage bags and fees paid for disposal of large items. The garbage bags used for public facilities and bags subsidized for the underprivileged are purchased using local budgets. The cost for carrying waste into the final disposal facilities is also borne by local governments. In other words, revenue from fees and commissions lower than the actual costs for these services is the reason for the low financial viability rate in waste management administration. To leverage the waste management budget, a variety of measures are under consideration, including increasing the price of garbage bags.

Year	2003	2004	2005	2006	2007	2008	2009
Financial viability (%)	35.4	24.4	43.2	35.1	35.2	35.0	34.6

Table 6 Financial Viability of Seoul's Waste Management Budget
(Source: Korea Environment Institute, 2011)

2.4. Challenges

1) Illegal Dumping

As expected during the initial stages of introduction, illegal activities were common, such as using unauthorized bags and illegal private incineration and dumping. In particular, dumping of garbage in

unauthorized bags was frequent in some areas. Leaving trash in front of others' dwellings or along main streets was also common. During the first major crackdown on illegal disposal, non-compliance with the use of standard bags accounted for 83% of all reports (364,617) (Lee et al, 1996). A number of enforcement tools were employed to tackle these issues. While personnel were employed to monitor for such activities, citizen monitors were also appointed and received training on helping the public adapt to the new waste disposal requirements. To help with prevention efforts, those who failed to comply were fined, while those who reported noncompliant activities were rewarded with up to 80% of the fine levied for each instance of noncompliance (Korea Environment Institute, 2012).

2) Engaging Citizens

Separate collection of recyclable waste was first enforced in the entire districts in selected neighborhoods in Seoul in 1990, but public participation remained low until introduction of the volume-based waste fee system in 1995. In the beginning, the lack of education and public awareness caused confusion among the people as to what was recyclable and how it was to be disposed of. To change this, the government held education sessions on ways to sort recyclables, and required recycling marks on the packaging of recyclable items.

Results

3.1. Output

1) Reduction of Waste

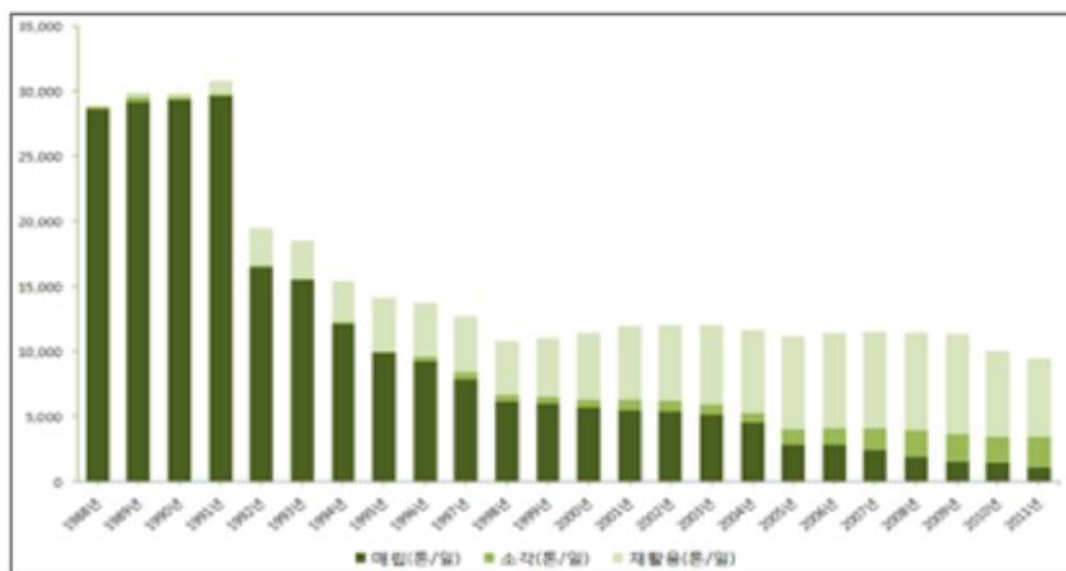


Figure 8 Trends in Waste Generation of Seoul (t/day)

(Source: Ministry of Environment)

As shown in the table above, since 1991 the amount of disposed waste has been on the decline and saw a large drop of about 17.8% in 1995 from the previous year upon introduction of the volume-based waste fee system. The jump in 1998 is the result of the city's recovery from the Asian financial crisis in 1997.

2) Increased Recycling from Collection of Separated Waste

Regulating the amount of waste generated at the source, the volume-based waste fee system has brought about a dramatic improvement in waste generation and recycling, indicating success. The new system has provided momentum to recycling: the amount of recyclable material collected daily has multiplied over 18 times in 20 years, jumping to 6,592.7 tons.

3) Generating Revenue & Reducing Costs

The benefits of the volume-based waste fee system include reduced costs from the lower amounts of landfill and incineration needed and the value of recyclable items. Of the total KRW 20.293 trillion in revenue during the fourteen years from 1995 to 2009, the reduction of waste was forty-six times greater than the increase in recycling. However, the benefits of recycling cannot be disregarded as it facilitates greater reduction of waste (Yang et al. 2012).

3.2. Outcomes

1) Diversification of Waste Treatment Methods

The methods for waste treatment underwent substantial change. To maximize efficiency in management of limited national land, the government has widened its waste management policy away from landfill. The output of such a shift was waste generation. The reduced disposal of waste, in turn, extended the life of Sudokwon Landfill Site.

2) Revitalization of the Recycling Industry & Technological Advancement

As recycling has become the norm, the recycling industry has become profitable with a stable supply of recyclable materials. Government support to revitalize the industry has led to an increased number of recycling businesses and advancements in related technology such as composting. In this way, the volume-based waste fee system has helped to revitalize the recycling industry and make it more competitive.

3) Improved Public Awareness of Waste-related Issues

One of the most significant accomplishments of the volume-based waste fee system has been the improvement of public awareness regarding consumption and waste. People have begun to opt more for environmentally-friendly products that generate less waste and have made adjustments to their general consumption behaviors. Eco-friendly consumption has become an established part of life; this involved efforts to use reusable shopping bags instead of plastic, minimize food waste, reduce packaging, and use

fewer disposable products. Furthermore, changes in consumer behavior gave rise to active second-hand markets. Improved understanding and knowledge of the burden of waste management costs also encouraged active engagement by the public in waste-related problems and waste management policies such as separation of garbage. As another benefit, residents of Seoul have become increasingly environmentally aware, showing greater understanding of the “pay as you throw” principle and actively engaging in environmental policies.

Lessons Learned

1) Impacts of Economic Incentives

The volume-based waste fee system, the first environmental policy to use economic incentives, levies a fee based on the volume of waste being disposed. This provides households and businesses an incentive to reduce their waste and encourages cooperation. By making products and services that produce significant waste more expensive, the system has curtailed greater generation of waste. The success of the volume-based waste fee system suggests that appropriate economic incentives can help encourage civic engagement as they cultivate public awareness of environmental costs.

2) Importance of Public Awareness of the Environment

The volume-based waste fee system is one example that public participation is a key factor in success of efforts to reduce waste and implement recycling policies. With the help of this growing environmental awareness, dramatic social improvement has taken place and resulted in a permanent change of behavior toward recycling and waste issues among Seoul’s households and businesses. Before implementation of such policies, instruments need to be prepared ahead of time to encourage participation, such as public education sessions and campaign.