

## Volume Based Waste Fee (VBMF) System for Municipal Solid Waste

Shin Lee / Yoo Gyeong Hur, University of Seoul<sup>1</sup>

### 1. Policy Implementation Period

- 1994 Piloted Volume-based waste disposal system (Commercial arcades - Jung -gu, detached housing area - Seongbuk-gu, apartments- Songpa gu)
- 1995 Volume-based waste fee system launched (The first implementation at the national level)
- 2010 Reusable VBWF bags in place
- 2013 Volume-based food waste fee system launched

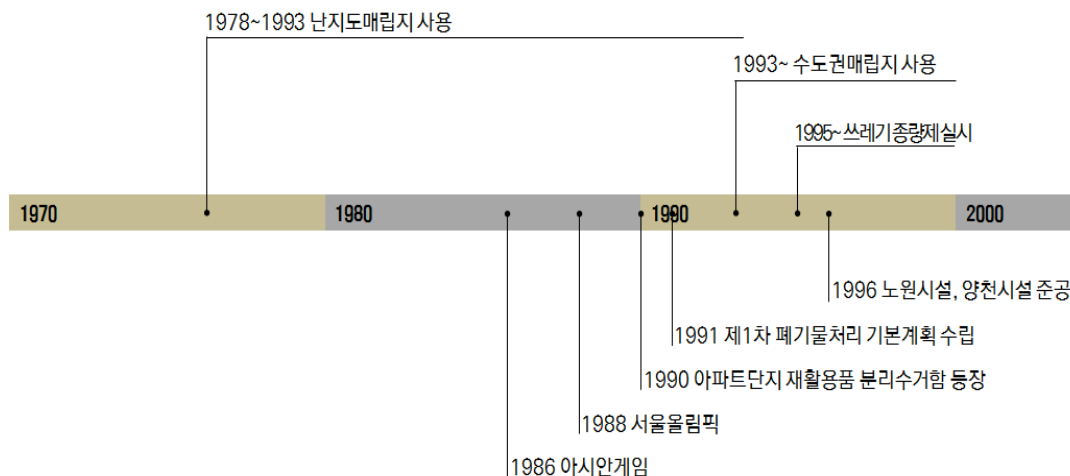


Figure1. Seoul's Waste Treatment before and after the Launching of the Volume Based Waste Fee System

Source: The Seoul Institute (2015)

<sup>1</sup> Translation by ESL®

## 2. Background Information

After 1980s Korea enjoyed unprecedented economic revitalization and abundance of industrial products based on economic development that started in earnest since 1960s and overall change in industrial structure. The amount of waste generated in the city skyrocketed due to mass production and consumption of affordable plastic products and synthetic packing material due to the development in domestic production technology.

In the meanwhile, due to the shift in the tendency of huge population, who used to flock to Seoul for living and work, started moving out to the suburb area, Seoul's neighbouring cities were turning into new towns accommodating Seoul's excess population. As a result, it got more difficult to secure landfill sites in the suburb and even impossible to do so in Seoul, which had been major waste treatment facility. Gyeonggy Province and City of Incheon were not exception in having difficulties in securing landfill sites. Government took the lead in promoting the establishment of the landfill sites (Sudokwon Landfill Site) where Seoul, Gyeonggi province and Incheon could share. However, it was not smooth at all to establish the Sudokwon Landfill Site as the sense of repulsion towards non-preferred facilities like landfills was already widespread.

While going through difficulties in securing landfill sites, Seoul established a waste treatment plan with the focus on reducing dependence on landfills in 1991. The plan mainly covered constructing 11 incineration facilities. However, even that plan was severely opposed by residents of designated facility area. Civic groups pointed out problems in the plan arguing the size and the number of planned incinerator facilities construction was excessive. So far, as a result, 4 incinerator facilities have been built in Seoul.

As an alternative to reducing waste volume to be buried, recycling policy had been promoted. In 1990, the recycling bin started to be installed in apartment complexes. Due to a level of success so the bins were installed in detached houses area as well. However, residents were not accustomed to separating recyclables from garbages so it was not unusual to find the trash from the recycling bins.

It required a huge amount of costs to construct incinerator facilities and promote recycling in order to overcome the situation where landfill sites got farther away from the downtown. In 1991, Seoul and autonomous gu (administrative district, borough) spent a whopping 280 billion KRW in waste management while residents spent only 25.4 billion KRW. Residents, who discharged the garbage, shared only 9 percent of the costs in waste management.

Due to such situations in 1980s and 1990s, government was desperate in finding ways to invite active public participation in recycling and charge the public more for the growing costs of waste treatment.

Volume-based waste charge system is a sort of solution based on 'The Polluters Pay Principle.' The theory supporting the need for the volume based waste charge system had already been raised in 1980s. However, before the volume based system was in place, waste treatment fees were levied based on the gross area of the building or on the property tax. Back then, waste treatment fees were collected as a type of tax. Table 1 below summarizes the changes of the waste charge systems up until the implementation of volume based waste charge system in 1995.

Table 1. Seoul's Waste Fee System until 1995

Year	Waste Type	Fee Grade	Basis for Fee Imposition
1980s	General Waste (Small quantity)	7	Building's Total Floor Area
	General Waste (Large quantity)	-	Weight
	Business Waste	6	Building's Total Floor Area
Early 1990s	Residential Waste	9	Building's Total Floor Area/Property Tax Amount
	Business Waste (Large quantity)	2	Weight
	Business Waste (Small quantity)	6	Building's Total Floor Area
1994 (Preparation Period )	Residential Waste	9	Building's Total Floor Area
	Business Waste (Small quantity)	6	Building's Total Floor Area
	Business Waste (Medium)	1	Volume
	Business Waste (Large quantity)	2	Volume
	Construction Waste	-	Volume
	Discarded Home Appliances	7	Type . Volume
	Discarded Furnitures	7	Type . Volume
1995 (Implemented Year)	General/Food Waste	-	Size/Number of standard Trash Bag
	Bulky Waste	-	Type/Size/Number
	Recyclables	-	Free of Charge

Source: The Seoul Institute (2015)

### **3. The Importance of the Policy**

The type of waste subject to the VBWF system is municipal solid waste (MSW) generated from households, commercial sectors and small businesses. Designated waste and industrial wastes defined by Waste Management Act are not subject to VBWF system. VBWF system is based on the 'pay-as-you-throw-principle', which charges according to the amount of discharged waste by selling mandatory standard garbage bags. People should use pre-paid garbage bag in order to discharge waste.

VBWF system has been designed to charge in proportion to the amount of discharged waste and to the costs required in the waste treatment. People are induced to reduce the waste amount on voluntary basis. Wastes discharged as recyclable goods are exempted from collection fees, thus inducing recycling from separate waste collection, which is good both for the residents and authorities. Reduced amount of discharged waste means reduced fees for the residents and also means less dependency on the incinerating facilities and landfill facilities. VBWF system is meaningful as a policy as it changes residents' patterns of waste disposal.

The efforts to change citizens' pattern of waste disposal by awareness campaign or education may be more convenient but may not gain desired results or may gain, yet, very slowly. As a way to control behaviors against environmental protection, government rules and regulations have long been resorted to but enforcement requires human resources, giving rise to high cost for the policy implementation or due to insufficient number of personnel, enforcement had not been conducted. Regulation-oriented approach may not encourage consumers to make voluntary efforts to reduce pollution lower than permissible level. On the contrary, when residents are encouraged to change their behavioral patterns by gaining economic incentives (via VBWF system) proportional to the amount of the reduced amount of discharged waste, residents are motivated to reduce the waste more. After all, VBWF is a very environmentally desirable and effective way to bring about changes in behavioral patterns of residents.

### **4. Relevance with Other Policies**

Today's waste management policy aims to reduce the waste volume based on the reduced waste generation at source and reuse of recyclable wastes. The waste management policy also plans to recover material or energy from the waste and turn them into resources. Lastly, the wastes, which had not been processed from the previous two steps, are requested to be processed safely by being incinerated and buried.

Therefore, it is very important to make a reasonable estimation and strike a balance between the amounts of waste to be generated, waste to be recovered as resources, and waste to be processed by burning or burying. Particularly, VBWF system has direct impact on other relevant waste management policies including policies on waste management facilities as VBWF system makes a huge contribution to suppressing waste in the first phase, waste generation, of the waste management policy.



Until 1980s, private sector took the lead in the recycling market whose focus had been collecting discarded papers, scrap metals and glass bottles. Recyclable wastes were collected by junk men. To the low income people, scavenging for recyclable items had been a crucial means of livelihood at the Nanjido landfill. Recycling bin installed by civic groups and Korea Resources Recovery and Reutilization Corporation (KORECO) started to appear by the time when it was hard to secure landfill site and incineration facilities had become controversial in 1990. The recycling bin started to spread across detached house area since 1992. As social conflicts got intensified over incineration facilities and waste landfill, high expectation were pinned on turning the wastes into recyclable items as alternatives to incineration and reclamation. Obviously, the separate disposal and collection of wastes and recyclables had not been settled as it was not unusual to find wastes mixed in the recycling bins or recyclables items in the waste bags. The VBWF system implemented since 1995 had solved such problems. The VBWF system implemented in Korea has been remarkably effective in settling the separate collection and disposal of voluminous papers, plastic containers and cans, which requires purchasing standard waste bags to throw away their garbage, thus waste collection fee is charged in proportion to the amount thrown away.

The government revised the Waste Management Act in 1998 saying starting in 2005 so the direct land-filling of food waste generated in urban areas would be completely banned. With the implementation of the VBWF system, residents living around waste treatment facilities including incineration and landfill site expressed opposition to the facilities, as food waste was discharged using the VBWF bags, which gave rise to the various environmental problems including creating serious foul order and harmful insects.

Meanwhile, autonomies, responsible for the MSW, faced more difficulties when supply of recyclables increased. It was not unusual to see recyclable items piled up in the regional authorities' recycling depository as there was no available market for the recycled goods. Also, due to free-fall of trade prices, private sector refused to purchase the recyclable items. Selecting and securing food waste treatment facilities were also serious headaches as residents around the would-be facility sites were deadly opposed to them and the other option of using private facilities were simply too expensive.

In the end, VBWF system had met the policy goals of waste reduction and separate disposal and collection of recyclable wastes but it generated the demand for policies such as securing markets for supply and demand of recyclable markets and establishing food waste management facilities, which led to the introduction of Expanded Producer Responsibility (EPR) in 2003 and ban on the direct land-filling of food waste in 2005.

## 5. Policy Objectives

- Reduced waste generation at source
- Settlement of separate disposal and collection of recyclable items.
- Reduced dependence on the waste processing facilities (incinerating facilities and landfill facilities)

## 6. Main Policy Contents



Volume-based Waste Fee system is a policy to charge fees in proportion to the amount thrown away. In Seoul, all wastes should be discharged in accordance with VBWF system, with the exception to the recyclable items, bulky waste and coal briquette whose discharge are otherwise specified, and fees are charged proportional to the amount discharged. Depending on the waste type, their volumes are measured differently. Wastes are divided into general wastes (or MSW) to be incinerated or buried, food waste, and recyclable waste which could be turned into resources.

General waste refers to waste to be incinerated or to be buried. Waste volume is measured through standard garbage bags, which were taken by the district, or gu, 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. General waste therefore is treated based on volume based charge system.

Food waste could be discharged in various ways. People may use standard waste bags sold by local authorities, standard plastic container equipped with electronic chip or sticker, and weight-based payment using electronic card with RFID. In the case of RFID based food waste treatment, discharger should swipe a card before gaining access to residential waste bins. The chip containing user's name and address allows the authorities monitor the weight of individual's waste. The system accumulates the fee on a monthly basis, and each household receives a monthly food waste disposal bill.

Other items such as papers, plastic packaging materials, glass bottles, scrap metals, discarded home appliances, discarded florescent lamps, used batteries and used cooking oil are classified as recyclables and should be discharged in the way prescribed by the Ministry of Environment.

Table 2. Seoul's Way to Measure and Charge IAW VBWF system

Category	General Waste	Food Waste
How to Measure	<ul style="list-style-type: none"> <li>• VBWF bags (Standard waste bags)</li> </ul>	<ul style="list-style-type: none"> <li>• RFID-based weight measuring device</li> <li>• Chip or sticker</li> <li>• VBWF bags (Standard waste bags)</li> </ul>
Types of VBWF bags	<ul style="list-style-type: none"> <li>• General use bags: 3ℓ, 5ℓ, 10ℓ, 20ℓ, 30ℓ, 50ℓ, 75ℓ, 100ℓ</li> <li>• Reusable bags : 10ℓ, 20ℓ</li> <li>• Public Use: 30ℓ, 50ℓ, 100ℓ</li> </ul>	<ul style="list-style-type: none"> <li>• General Use : 1ℓ, 2ℓ, 3ℓ, 5ℓ, 10ℓ</li> <li>*VBWF bags bigger than 20ℓ are allowed to use only during national holidays or kimchi-making season when sizable amount of discharge was unavoidable.</li> </ul>
Colors of VBWF bags	<ul style="list-style-type: none"> <li>• General use bags and reusable bags: White</li> <li>• Public use : blue</li> </ul>	<ul style="list-style-type: none"> <li>• General Use : Yellow</li> </ul>
Materials of VBWF bags	<ul style="list-style-type: none"> <li>• PE bags</li> <li>• Biodegradable bags</li> </ul>	<ul style="list-style-type: none"> <li>• PE bags</li> <li>• Biodegradable bags</li> </ul>
		

However, ordinary VBWF bags are little better than disposable trash bags which could be used only once. The Korean Government, for its part, as an effort to solve, albeit partly, such issue, allowed shopping giants such as E-mart, Home plus, Lotte mart, Nonghyup Hanaro mart, Mega mart to offer the reusable VBWF bags and customers could use them as standard trash bags.

Since 2013, food waste has been subject to volume-based waste fee system in Seoul. The chip or sticker system requires a discharger to buy a payment chip or sticker and attach it to a standard collection container to be picked up. The container serves as a disposable volume measuring device or monthly volume measuring devices. The merit of RFID system is that it accurately scales waste volume and fees are charged according to the total volume. However, RFID system could be quite complicated as it has to be equipped with weight measuring device, discharger recognition system, and volume tracking & storage devices.

When disposing large items, discharger should buy sticker from the regional authorities and place it on the item before they are picked up, or let them be picked up by garbage haulers.

#### Discharge Fees

In accordance with the VBWF system, dischargers pay partial or all costs of collecting and treating them when they throw away municipal solid waste and food waste. The amount of fee

is determined by the volume of generated wastes, which is why the system is named as volume-based waste fee system. The price of VBWF bags includes the costs of collection, treatment, manufacturing, and sales profit of the VBWF bags.

## 8. Policy Effects

### 1) Reduction of Household Solid Waste Generation

According to Seoul's statistics, the volume of waste generated in Seoul had been reduced by 8 % in 1995 and 11% in 1996 compared with that in 1994, which was tantamount to reduction of 1,1712 ton/day. Since the VBWF system has been instituted, consumers have shown changed pattern of waste generation, improved awareness of waste disposal, which well explains the cause of the reduction in statistics. For example, consumers got sensitive to over-packaging of products, brought only product part, while leaving the package materials at the sales shop, requested the collection/return of packaging material when delivered, which, in turn, affected product design. Some quarters, of course, argued the waste reduction was hardly due to the VBWF system, but due to reduced consumption of coal briquette, changes of charging basis from volume to weight, dwindled production and consumption in the wake of economic crisis that hit Korea hard in 1998 and the Government's separate implementation of relevant policy. However, reduced waste generation was a very natural consequence of the policy considering the principle of environmental policy, VBWF system. Therefore, the level of the policy effect could be controversial but it does not make sense to argue against the effect per se.

Table 3. Changes in the Waste Generation

Change	1994 (Preparation Period)	1995 (Implemented Year)	1996 (Institutionalization Period)
Generated Volume (ton/day)	15,397	14,102	13,685
Generated Volume (kg/day)	1.43	1.33	1.31

### 2) Contribution to the Settlement of Separated Disposal and Collection of Waste and Recyclable Goods

The most apparent outcome of the VBWF system is its contribution to the settlement of separated disposal and collection of waste and recyclable goods in a short space of time. In accordance with the VBWF system in Korea, discharged recyclable waste are collected by authority free of charge. Papers, plastic products and cans are sizable which means the more you discharge the recyclable items (instead of throwing them away in VBWF bags), the more you

can save.

Recycling performance (the recycled amount) in 1996 had increased by 881 ton/day compared with that in 1994. Out of overall waste treatments, the recycled volume had shown significant rise from 20.5% in 1994, to 29.3% in 1995 (the year VBWF system was introduced), to 29.5% (2 years into the introduction of VBWF system). The separate disposal and collection of wastes and recyclables had led to reduced demand for waste treatment facilities.

Table 4. Changes in the Recyclables Generation

Category	1993 (Flat Rate)	1994 (Preparation Period)	1995 (Implemented Year)	1996 (Institutionalization Period)
Waste Generation (ton/day)	16,021	15,397	14,102	13,685
Recyclables Generation (ton/day)	2,940	3,156	4,131	4,037
Recycling rate (%)	18.4	20.5	29.3	29.5

### 3) Securing Waste Treatment Costs from Profits of VBWF System

In 1991, Seoul's financial independence of the cleaning budget was as low as 9%, which was calculated by dividing the total profits from the sales of waste bag and recyclable materials, fees for the disposal of bulky waste, and penalties by the annual waste disposal cost. In other words, dischargers' share of responsibility in cleaning was very low (SMG, 1992). With the implementation of VBWF system, dischargers' share of payment had risen by 28% from 119.9 billion KRW in 1993 to 153.6 billion KRW. While the overall fees from VBWF system had risen, the charge per household had not increased. That is due to improved equity of the system. For example, monthly payment per household had risen from 2,102 KRW to 2,288 KRW. Yet, the number of households paying the fees had risen from 1.69 million to 2.97 million. The implementation of the VBWF system had improved unreasonable charging system, which led to the rise in the revenue from the VBWF system.

Table 5. Changes in Profits from the VBWF System

Category	1993(Flat Rate)	1995 (Implemented Year)	1995/1993
VBWF Revenues (million won)	119,912	153,638	1.28

### 4) Creation of Economic Benefits

In 2005, Korean government assessed the outcome of the VBWF system to commemorate the 10th anniversary of the system which had been in place since 1995. The assessment said that

one ton of waste reduction generated economic benefit of 144,071 KRW and one ton of recycled waste creates economic value of 18,901 KRW. The benefits generated from the waste reduction were due to the cost savings from waste collection and transport, and installation and operation of treatment facilities. In addition, benefits from recycled goods equaled to the total value of recycled goods subtracting the costs of collection, transport, selection and processing of the recycled goods. If those calculations were included in the outcome of Seoul's VBWF system, Seoul had created economic benefits of 96.1 billion KRW by reducing the costs in waste collection, transport and treatment and by creating market value of 6.1 billion KRW with the recyclables.

Table 6. Changes in Discharger Fees

Category	Changes (1996-1994, ton/year)	Benefits (KRW/ton)	Scale of Benefits (billion KRW/year)
Reduced Amount	-624,880	144,071	900
Recycled Amount	+321,565	18,901	61
Total Benefits	-	-	961

## 9. Challenges and Solutions

### 1) Supply of Collected Recyclable Waste

Recyclable wastes are categorized into papers, plastic containers, scrap metals (including can) and glass bottles. The VBWF system, which stipulates collection of recyclable goods for free, helped settlement of the separated discharge and collection of recyclables in a short period. In the meanwhile, recyclables had not been well utilized, which became the burden of the government. In particular, main headache was how to make use of plastic containers (made of PE, PP, PS or PVC) except PET. Even though they are designated as recyclables but those recycling infrastructure for plastic materials was inadequate. Moreover, as VBWF system virtually focused on charging plastic containers, producers were not responsible for the recyclable waste. The deposit-refund system was in place, which levied a refundable container deposit on consumers. However, that system applied to only a few limited items including paper pack, PET bottles, iron can and glass bottles. Unfortunately, many producers gave up on the deposit, so the deposit-refund system did not really help supply and utilize the recyclable wastes.

### Solutions

First of all, when it comes to the problems in the plastic containers, government offered loan on installation and operation of plastic recycling facilities to the manufacturers.

In addition, products manufactured using recycled plastics were preferentially purchased by the public sector. Also, in 2003 expanded producer responsibility (EPR), replacing the deposit-refund system, was imposed on the manufacturer to resolve insufficient recycling infrastructure

for recyclable wastes (including plastic containers), which held the manufacturer responsible for the costs of managing their products at the end of life. Also, the items subject to the EPR have been expanded to include paper pack, plastic containers, scrap metals (including iron can), glass bottles, big and small home appliances, discarded florescent lamps, and used batteries. As a result, the issue of supply and demand of collected recyclable waste had improved dramatically.

## 2) Food Waste

### Difficulties in Implementing VBWF System

Even though the VBWF system had been in place, food wastes were discharged into standard food waste bin in most autonomous districts and flat rate was levied on each household regardless of the amount discharged. Some district collected free of charge not to use VBWF bags. That's because VBWF bags made of PE (polyethylene) could function as foreign matter while the food waste is processed into animal feed and fertilizer, deteriorating product quality, which became main reasons the consumers are reluctant to purchase.

Also, autonomous districts had hard time in arguing whether it's proper to impose charge on food waste which would turn into resources, while recycable items were collected free of charge.

### Solutions

The Seoul Metropolitan Government (SMG) has instituted VBWF systems for food waste since 2013 with the goal of reducing food waste taking into account the difficulties in turning the food waste into resources and the hardships in applying expanded producer responsibility (EPR) and the generation of too much food waste.

Considering relatively heavier weight of food waste, the government has recommended authorities to adopt weight-based waste fee (WBF) system instead of volume-based system and the WBF system has reportedly reduced the food waste by ten to thirty percent. Under the WBF system, the discharged weight of food waste is recorded for each resident and the fees are levied based on the weight tracking record. The devices for WBF system has been installed only in some apartment complexes as it is costly to install and operate weight measuring devices and enough space is necessary for the installation of device. Detached houses and restaurants have widely used VBWF bags for food waste or standard waste bin tagged with chip.

### Foul Odor from Food Waste

Throughout the first year while VBWF system was in place, there had been significant amount of complaints on foul odor in many places including roads leading to the landfill facilities and waste management facilities. The foul odor was created from the food waste and it got even

more serious since the VBWF system had been introduced. That was because papers which used to absorb leachate and the foul odor from the food waste were separately discharged in accordance with VBWF system.

### Solutions

The problem of foul odor had been resolved by a massive change in the food treatment system whereby food waste have been separately disposed, collected and treated. Since 1998, the SMG has embarked on the construction of food waste treatment facilities, has secured and run 5 public food treatment facilities and also has commissioned private facilities for the food waste treatment. Starting in 2005, direct land-filling of food waste has been banned.

### 3) Waste Bags

#### Material

Broken glasses and small-size construction wastes are sharp and heavy, often causing injuries to the sanitary workers particularly during collection procedure.

#### Solution

Since 1997, special VBWF bags have been manufactured especially for wastes, which both discharger and collectors find hard to handle, including broken glasses, small-size construction wastes and etc. These bags are made of durable 'poly propylene.'

#### Environmental Issues

VBWF bags, the essence of VBWF system, is very convenient especially in big cities like Seoul as the system naturally imposes fee in proportion to the amount of generated wastes. However, many had pointed out whether it is proper to use the throw-away type VBWF bags.

#### Solution

As a way to resolve this, government recommended shopping giants including E-mart, Homeplus, Lotte mart, Nonghyup, Hanaro club, Mega mart to sell VBWF bags as shopping baskets instead of free plastics bags so shopping giants in Seoul started to follow government's recommendation. These VBWF bags are called as reusable bags which are also used as



shopping baskets in addition to its original use as VBWF bags. The prices of reusable VBWF bags are the same with those of ordinary VBWF bags.

#### 4) Negative Public Sentiment against the Implementation of VBWF System

VBWF system had been instituted with the strong support of government, cities and some academics who felt sense of crisis due to the difficulties in securing sites for waste treatment facilities, not with the support of the general public. After all, VBWF system is quite inconvenient program to the perspective of citizens, the dischargers, and many experts argued that other nations would not introduce the VBWF system for fear of reckless illegal dumping.

##### Solution

In order to overcome such a negative social atmosphere against the VBWF system, authorities had made enormous efforts to get rid of institutional stumbling blocks and explored benefits and effects as well as possible problems, and thereby secured a chance to persuade general public.

##### - Thorough Preparation

It is imperative to figure out what type of VBWF system is proper for the city during the preparation stage. Seoul selected VBWF bags as a means to measure the waste volume because it's hard to identify dischargers in this overpopulated but cramped city with lots of high-rise buildings such as apartment complexes and shopping malls.

However, it could be desirable to use waste bins for area with lots of detached houses and with roads stretching in all directions. Also, the use of waste bins could prevent the waste of throw-away VBWF bags, ward off illegal dumping by concluding contracts with the dischargers on the size of trash bins, and save waste collection fees by using automatic loading system.

##### - Cooperation with Civic Groups

In the settlement of VBWF system, civic groups in the environmental field had played a crucial role. While the introduction of the VBWF system had been discussed, civic groups were not by and large positive to the idea. They were also worried about fly-tipping not to pay charges for the wastes and were doubtful of government, arguing the government tried to shoulder the entire burden of waste reduction and turning the waste into resources to the general public. However, the civic groups started changing their attitude after they participated in the pilot projects and site monitoring in the year when the VBWF system was introduced, and ascertained publics' passion for the system. The civic groups had steadily partaken in pilot project evaluation, year one evaluation, year two evaluation, and ten year evaluation. Even nowadays, they have taken part in the progress evaluation of volume-based food waste fee system. Positive attitudes and evaluation of civic groups have made a huge contribution to changing the tone of media coverage and the public awareness of the issue.

#### 5) Illegal Dumping

When introduction of the VBWF system was considered, one of the most worrisome side effects was illegal littering not to pay waste collection charges. As worried, some threw away municipal wastes or business waste into public trash bins on the street, disposed of waste in remote area, or

discharged waste in non-VBWF bags.

### Solution

In order to prevent littering, some local authorities installed reflectors in vulnerable places, made flower garden, got rid of public waste bins in the down town. Due to such a series of efforts, the number of violations had been dramatically decreased, even though not perfectly eradicated. In addition, penalties were imposed on the violations or VBWF bags were offered to low income family free of charge.



Figure 4. Illegal Activities and Countermeasures

## 6) Legal Framework for the Institutionalization of Volume-based Waste Fee System

### - Legal Grounds for the Volume-based Waste Fee System

Legal grounds for volume-based waste fee (VBWF) system is 'Waste Management Act' and specific implementation of the act is determined by regional authorities' ordinances. The Waste Management Act includes penalties against the violators.

Each regional authority's ordinance defines specifics of the implementation which are types of waste subject to the VBWF system, ways of discharge, charge, color and materials of standard

plastic bags (VBWF bags), safety management of manufacturing and inspection of VBWF bags, how to designate shops in charge of supply, purchase and sales of the VBWF bags, rules the seller have to follow, the standard of cancelling the designated VBWF bag sales shops.

The size, material, strength and type of the standard litter bags are determined by Korea Federation of Plastic Industry Cooperation (KFPIC). The standard VBWF bags should be manufactured in accordance with the standard of KFPIC and if they fail to meet the standard, they will not pass the inspection.

To prevent the manufacturing and use of fake litter bag, seals stamped on the surface of the VBWF bags are kept by local authorities (or collection and transport agency authorized by the local authorities) and are handed over to the manufacturers only when the VBWF bags are manufactured. If fake bags are manufactured or distributed, violators will be subject to criminal penalties equivalent of fabrication of the official documents.

Table 7. Legal Framework for Implementing Seoul's VBWF System

Category	Details
Waste Management Act	<ul style="list-style-type: none"> <li>▸ Recommend the implementation of the VBWF system</li> <li>▸ Establish ordinances relevant to the implementation of the VBWF system.</li> <li>▸ Ban illegal dumping and implement regulations to impose fines to those doing illegal dumping</li> <li>▸ Revise relevant rules and regulations of the local autonomous governments: rules and regulations of the ordinance, VBWF system implementation guide, VBWF system implementation guide of food waste</li> </ul>
Regional Autonomies' Waste Management Ordinance	<ul style="list-style-type: none"> <li>▸ Contents: Designate wastes subject to VBWF system, ways of discharge, collection fees, color and material of VBWF bags, manufacturing .inspection.safety management of VBWF bags, shops for the supply, purchase, sales of VBWF bags</li> </ul>
Korea Federation of Plastic Industry Cooperation (KFPIC)	<ul style="list-style-type: none"> <li>▸ Type : VBWF bags made of PE, VBWF bags made of LLDPE , VBWF bags containing LDPE (CaCO<sub>3</sub>+HDPE)</li> <li>▸ 9 types of biodegradable VBWF bags</li> </ul>
Progress Report	<ul style="list-style-type: none"> <li>▸ Contents: Implementation, manufacturing and sales of the VBWF bags, ways and frequency of waste collection, financial independence of waste management and financial dependence allotment rate, discharge of bulky waste and collection of disposable vinyl bags, enforcement performance of illegal activities and etc.</li> </ul>
Criminal Law	<ul style="list-style-type: none"> <li>▸ If fake bags are manufactured or distributed, violators will be subject to criminal penalties equivalent of fabrication of the official documents.</li> </ul>

#### Promotion of Phased Price Rise of VBWF Bags

On August 1 2015, the prices of VBWF bags rose in 4 regional autonomies in Seoul including Yongsan-gu, Nowon-gu, Youngdeungpo-gu, Dongjak-gu. With a 20 liter VBWF bag for municipal solid waste as a basis, the price was previously determined between 340 KRW and 380 KRW but rose to 400 KRW and 490 KRW. With a 2 liter VBWF bag for food waste as a basis, the price has risen to 140-210 KRW from 50-80 KRW. The rise was not confined to a couple of autonomous districts but 14 autonomous districts had already raised the price in the first half of 2015 and other districts also had plans to raise the price.

Table 8. Basic Price of VBWF bags for General Waste and Food Waste

Category		Collection & Transport Fee	Treatment Cost	Manufacturing Cost	Sales Profit	Total	Deviation
General Waste	20L (Basic Price)	402	190	51	22	665	1.00
	20L (Currently)	308	12	21	22	363	0.55
Food Waste	2L (Basic Price)	142	149	10	4	305	1.00
	2L (Currently)	101	5	10	4	120	0.39

Seoul had good reasons to raise the price of VBWF bags. Above all, Seoul residents' share of charge included in the price of VBWF bags had been lowest among local autonomies. It cost 665 KRW to dispose of 20 liters of MSW while the price of 20 liter VBWF bag was 363 KRW, which meant Seoul residents paid only 55% of the waste treatment costs. In regards to food waste, situation was even more worrisome. The price of 2 liter VBWF bags for food waste was 120 KRW while the food waste treatment costs for that volume was 305 KRW, residents took only 39% of the cost burden.

Table 9. Nation-wide Average VBWF Bag Prices

(201, 2014 )

Category	National Average	Average of Metropolitan Cities	Seoul	Busan	Dae-gu	In-cheon	Gwang-ju	Dae-jeon	Ulsan
Price (KRW)	457	650	363	850	430	620	740	660	600

While national average price of VBWF bags was 457 KRW, the price in Seoul was 363 KRW,

80% of national average or the lowest in the nation. Even if we factor into different processing methods and costs for local autonomies, VBWF bags in Seoul were apparently cheaper than in other regions.

As the residents' share of waste treatment cost was low, district's financial strain got severer. While the price of VBWF bags had not changed a lot since 1995 (the year the system was introduced), prices kept rising, causing bigger treatment costs. In addition, profits from the sales of the VBWF bags have had a direct impact on the district's financial condition as starting in 2015 sales profits of the VBWF bags have been directly managed by the districts.

Table 10. Guidelines in the Price Raise of VBWF Bags

Category	Current Fee	Autonomies' Average	'15	'17
General waste (20ℓ)	340KRW ~ 400KRW	363 KRW	437 KRW	492 KRW
Food waste (2ℓ)	40KRW ~ 160KRW	120 KRW	133 KRW	187 KRW

To resolve such problems, Seoul announced guidelines in the price rise to make different prices of VBWF bags from districts to districts to similar level and in raising the lowest rise of VBWF bags in Seoul in phases until 2017.

In other words, the price of VBWF bags will have been raised gradually and by 2018 the prices of VBWF bags in all the autonomous districts in Seoul would be similar level. Final prices for 20 litter VBWF bags will be 492 KRW and 2 liter volume-based food waste fee bags will be 187 KRW.

To sum up, price rise of the VBWF bags mainly aims to reduce the financial burden of local districts. More fundamentally, it aims to curb waste generation at source.

People would be more discrete in discharging if the VBWF bags are more expensive, or they would go so far as not to generate unnecessary waste in the first place. To curb the waste generation, VBWF system has been instituted and for the same purpose the prices of VBWF have been raised.

#### Model Cases of Volume-Based Waste Fee System

The model cases in Dobong-gu, Seoul

Separate Disposal and Collection of Recyclable Waste

Dobong-gu (gu, administrative district) came up with 6 different guidelines depending on the housing types. Basically, the waste collection from apartment complexes made independently by residents while those living in ordinary residential area required district office to be actively

involved in the collection and disposal of wastes and recyclables.

a) Professional Collection System

Garbage collection team was organized in respective sub-districts, dong, and one cleaning personnel and one driver took a recycling waste collection vehicle together to collect the recyclable waste on the road, joined by an official in charge of waste management from the sub-districts office. In addition, they entered into a business relationship with recycling shops. Professional team members brought necessary equipment and collected recyclable materials and sold the recovered materials to the shops. The profitability was maximized and residents' involvement increased.

b) Compensation for Recyclable Materials

The Volume-based Waste Fee System represents a right way of waste separation and collection but to the perspective of residents it could be a very inconvenient system. It does not make any sense if the recyclable materials-- which residents separated from trash with much effort -- are to be collected free of charge while residents are asked to bear considerable inconveniences following the system. As compensation (toilet paper) was made for the recyclable materials, residents were motivated to participate and the compensation had a level of promotional effect in a short space of time.

c) Separation of 5 types of Recyclable Waste

Recyclable waste is separated into 5 types (newspapers, scrap paper, milk cartons, bottles, metals) and there are certain ways of discharging the recyclable waste. Collected waste, already separated into 5 types, could be sold at the recycling shops immediately upon collection.

d) Daily Collection Drive in One Single Zone

The one-size-fits-all approach was not pursued to the waste collection based on sub-districts, dong, but flexibility was added to the collection process to ensure adjustment of collection methods and schedules, etc. In other words, they divided the entire sub-district into five zones and focused on the promotional drive and thorough waste collection in one zone a day, not covering the entire five zones in a day. The sanitary workers were ordered not to collect improperly discharged garbage at the door and induced the residents to load the garbage bags onto the waste collecting truck when they hear the signature song.

e) Collection and Selling on the Same Day

As the recyclable materials were collected in the morning and sold in the afternoon, the recyclable waste selection yard were no longer necessary. The recovered recyclable materials, depending on the items, were sold directly to the private recycling shops not only to the public recycling companies. In that way, the profits from the recyclables management were

maximized and returned to the residents.

f) Implication

The key drivers for the success were 1) the active involvement of residents who were encouraged to do what they had to, 2) high proceeds from the sale of recovered recyclable materials by relevant administrative authorities, 3) return of the proceeds to the residents, and 4) efforts by the authorities to motivate residents' participation. To ensure success, intensive educational session was conducted, hosted by the head of district office. On top of that, instead of perfunctory committee gathering, public officials had face-to-face encounter with residents for promotion of the program.

## **References**

- Yoo, Ki-young (2015), Seoul Solution Waste, The Seoul Institute , ‘Waste’ section, The Seoul Institute
- Seoul Metropolitan Government, 1992, 92 Seoul City Administration
- Minister of Environment, 2011, Guide in separate discharge of recyclable resources and etc. (Ministry of Environment, Directive, No.859, 2009. 8. 18)
- Ministry of Environment, 2012. 11, Volume based Waste Fee system implementation guide
- Ministry of Environment, Resources Recirculation Bureau, (2012) Implementation guide on volume-based waste fee system for the discharge of food waste
- Sohn, Youngbae(2001), Volume-based waste fee system, Who established it and how did it go? ‘Monthly magazine waste 21’, 2(7) : 1-5
- Oh, yong-sun, 2006, A Critical Evaluation on the Effect of Environmental Improvement by Volume-based Waste Fee System, 「Korean Association for Policy Studies Newsletter」, 15(2) : 245-270
- Korea Institute for Industrial Research·Korea Environment Corporation, (2013). A study on the performance evaluation and development of volume-based food waste fee system
- Ministry of Environment·Korea Environment Institute, 2012, Modularization of Korea's economic development experience : Volume-based waste fee system
- SBS, 2015. 8. 6, The price of volume-based waste fee bags, should it be raised?