

# Strategies for Developing Responsive Solid Waste Management in Seoul City: Institutional Arrangement\*

Jung-Wk Kim\*\*

Eui-Chan Jeon\*\*\*

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\*\* Associate Professor, Dept. of Environmental Planning, Graduate School of Environmental Studies, Seoul National University.

\*\*\* Instructor (faculty), Dept. of Environmental Engineering, Dongshin University

## **I. Introduction**

### **1. Purpose and Scope of the Study**

The solid waste problem surfaced with the industrialization in 1960's in Seoul City. Before that time the solid waste was merely a trivial issue so that divisions such as Police Bureau, Social Affairs Bureau, and Health and Sanitary Bureau in the Metropolitan Government, which seem rather irrelevant, used to handle solid wastes as well as night soil in addition to their major duties. Citizens used to practice complete recycling according to the Korean tradition until 1950's. The economic development in the Republic of Korea was accomplished mainly in the manufacturing industry, which resulted in the movement of rural population to urban areas. In 1988, the urban population reached to 78 per cent of the national total from 20 per cent three decades before. And the population is so centralized to the Capital Area that one fourth of the national total population live in Seoul City and 40 per cent in the Capital Area which includes Incheon City and Kyungki Province which holds many satellite cities of Seoul. This urbanization together with the change in life pattern accompanied by the industrialization suddenly brought forth the solid waste problem. The solid waste generation reached to the level of 2.83 kg/capita-day, which is the world's largest, and the City spent 73 billion won to dispose 11 million tons of wastes in 1989. Since the waste dumping is getting very difficult due to limited space available, the solid waste became one of the main urban problems the City faces at the moment.

The strategies to solve the solid waste problems in the City should be focused on reducing the amount of solid wastes, finding efficient and economical way of collection and disposal methods, and securing the final disposal site. In order to seek the strategies, institutional arrangements such as involvement of private sectors and community-based non-governmental organizations and multi-jurisdictional approaches are necessary. This study was aimed to evaluate the existing institutional arrangements practiced in Seoul City and to recommend strategies for solving the solid waste problems. In this study, the existing arrangements for involvement of private contractors and non-governmental organizations in collecting and recycling solid wastes were reviewed and the efficiency and credibility of the services were evaluated in comparison with the governmental services. The multi-jurisdictional approach for securing waste dump site for the cities and towns in the

Capital Area was investigated also. And based on the evaluation, suggestions were made to improve the existing arrangements.

## **2. Overview of the Paper**

In this paper, the characteristics of study area related with the solid waste problems are briefly described in Chapter II. This chapter reviews with the climatic and physical constraints of Seoul City, brief history of solid waste management, characteristics of solid wastes in the City, and previous studies conducted.

Chapter III deals with the institutional arrangements in managing solid wastes in Seoul City. The existing arrangements to involve private contractors and community-based non-governmental organizations are reviewed, and the efficiencies are evaluated. And some strategies to improve the solid waste management are also suggested.

Constraints in siting facilities to manage solid wastes and multi-jurisdictional approach for managing solid waste problems are reviewed and evaluated in Chapter IV.

The results and conclusions of this study are briefly summarized in Chapter V.

## **3. Key Findings**

The solid wastes are collected both by government and private contractors in Seoul. In 1989 the private contractors collected 49 per cent of the total solid wastes in the City while the Government 51 per cent. The collecting efficiency by the private collectors was 6.77 tons/man-day while that by the Government was only 2.67 tons/man-day. The private companies were entirely dependent on the collection fees from citizens, while for the Government the collected fees satisfied only 26.4 per cent of the budget in 1989. The private collectors were much more efficient and economical due to better management of manpower and maintenance of equipment. However, it recently was observed that the service credibility of private contractors was much impaired when the welfare of the collectors was neglected. To enhance the efficiency and service credibility of private contractors, the government needs to take good care of the welfare of waste collectors and to raise the private contractors to a considerable size. The competition among private companies may be economical but it may result in poorer service to citizens because of dumping.

Since the waste recovery is not so profitable business, the recovery rate is getting lower. Therefore, the Metropolitan Government is seeking cooperation with community-based citizens organizations in solid waste management especially in collecting recyclable wastes. To reduce the amount of wastes the Government needs to offer economic incentives to citizens and dealers for recycling wastes.

Seoul City faced a serious difficulty in locating landfill site. Since other local governments in the Capital Area faced the same problem, they naturally formed a coalition and are developing a larger scale waste reclamation site in the West Coast. Seoul City, Incheon City, and Kyungki Province are involved in the project. Many satellite cities of Seoul belong to the Kyungki Province. The Ministry of Environment plays coordinator in this project. The construction of the reclamation site will be completed by 2014. The dumping site is expected to receive wastes from the Capital Areas until 2017. Since the landfill site is about 40km away from the downtown of Seoul City, a new transport system needs to be built.

## **II. Brief Description of the Study Area**

### **1. Climatic and Physical Constraints**

Seoul City is located in the latitude of 37.34N and the Westerly Wind is predominant. The annual average temperature is 11.8°C: the monthly average temperature in January, the coldest month, is -5.4°C and that in August, the hottest month, is 24.5°C. The annual rainfall is 1200mm, seventy per cent of which is precipitated during the months of June to September<sup>1)</sup>. Heavy rains above 100mm/day of rainfall intensity are frequently observed in Seoul during these summer months. It usually is dry and cold in winter and hot and humid in summer. Therefore, during winter season it is difficult to manage solid wastes because the amount of wastes increases due to coal ashes from heating, the wastes are frozen, and the roads get icy and slippery. Fifty per cent more wastes are generated in winter than in summer. Since the number of waste collectors is constant throughout the year, the service quality must be poorer in winter.

The area of Seoul City is 605.4km<sup>2</sup>. The City is divided into 22 gus and gus into 475 dongs. The City is largely divided into two regions: North Seoul and South Seoul (see Figure 1). The Han River is the dividing line. The North Seoul is the old town and is in hilly terrain enclosed by mountains. The South Seoul includes the new town developed since 1970's. More than 80 per cent of the roads are narrow roads, the widths of which are less than 10m. Thus only the handcart service is possible for about 30 per cent of the population because of the bad accessibility for truck, and even the handcart-access is not free for about 7.5 per cent of the population: bell collection or bag collection system is rendered for them.<sup>2)</sup> However, a relatively good road system is provided in South Seoul.

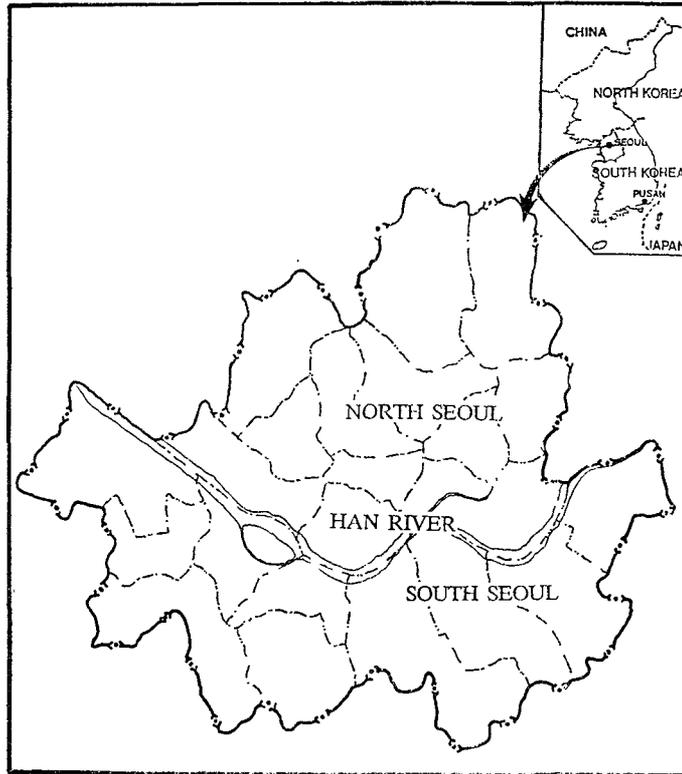


Fig. 1. Map of Seoul

## 2. Brief Chronology in Solid Waste Management

Until late nineteenth century Korean people practiced complete recycling according to the tradition; thus, there was no need for government to interfere with the wastes. During the Japanese rule from 1910 to 1945, there was a certain non-governmental organization called 'Seoul Committee' organized by Japanese, which collected solid wastes mainly from Japanese households.<sup>3)</sup> The need for waste management arised only in 1960's, and the Seoul Metropolitan Government organized the Waste Disposal Bureau in 1962.<sup>4)</sup> However, the Bureau's main duty was with the night soil, and the solid waste was not a serious issue until 1960's. The Metropolitan Govenment began to survey statistics on solid wastes only starting from 1970.

The Metropolitan Government began to implement the solid waste management plan just recently and most of the existing management systems have been developed gradually and spontaneously.

Citizens used to store wastes either in portable containers such as vinyl bag, paper bag,

and plastic bin or in fixed containers such concrete box, brick enclosure, and metal box. The fixed containers were set either indoors or outdoors.<sup>5)</sup> But the Metropolitan Government made a decree to put coal briquette ashes in portable bins and other wastes in portable vinyl bags and put them in alleysides from November, 1990. In large apartments solid wastes used to be stored in refuse cellar through garbage-chute. But from 1991 garbage-chute is not allowed in new buildings; instead waste containers should be installed outdoor. For existing apartment buildings the Metropolitan Government is seeking voluntary cooperation to close garbage-chute. According to an interview with an official in the Korea Association of Environmental Cleaning, which is the association of private contractors for collecting solid wastes, most of the apartments in Seoul closed existing garbage-chute from January, 1991. The garbage-chute is convenient for residents to dispose wastes, but unsanitary and inefficient for collection.

The wastes used to be collected mainly using handcarts and loaded to trucks in transfer stations, but gradually vehicles are replacing the handcarts except in areas with narrow alleys. Some collectors even motorized handcarts by modifying motorcycle or tractor. In privatized areas, compressible trucks became the main means of collecting wastes. The Metropolitan Government is planning to replace all handcarts to small-size vehicles in near future.

Transfer stations used to be open space in street corners. But to avoid residents' complaints and to improve efficiency, haulable containers have been replacing the open-space stations recently. As of 1991, the container transfer stations occupied 60 per cent of the total. The Government is planning to build 7 intermediate treatment plants by 1996, which at the same time will function as transfer station to final reclamation site in the West Coast.<sup>6)</sup>

For street cleaning, mechanical method began to replace manual sweeping recently. Manual sweeping covers 84.5 per cent of the streets and mechanical sweeping 15.5 per cent. However, sweeping vehicle will cover all the streets wider than 20m until 1994, and manual sweepers will work on small alleys only.<sup>6)</sup>

The open dumping is the main disposal method employed in Seoul City at present. A RDF(refuse-derived fuel) plant was built in 1987 with the Wetsern Europe technology, which was to produce pelletized fuel from incinerable wastes and composts from decomposable wastes. This plant completely failed because the composition of wastes in Seoul were much different from the Western wastes. An incinerator has been operating in Mok-

dong apartment town since 1986. This plant burns 150 tons of wastes a day, which is only 0.4 per cent of the wastes in Seoul. Starting from 1992, the Metropolitan Government is planning to close Nanjido, the only dump site for Seoul, and practice sanitary landfill in the West Coast reclamation site. At the same time, the Governemnt plans to employ other treatment methods such as incineration in the above-mentioned intermediate treatment plants.

### 3. Solid Waste Data

The solid wastes generated in Seoul City increased from 2.24 million tons in 1970 to 10.9 million tons in 1989, which is 40% of national total (see Table 1). These amounts are equivalent to 1.36kg/capita-day in 1970 and 2.83kg/capita-day in 1989, respectively. The national average in 1989 is about 2.2kg/capita-day.<sup>7)</sup>

The amount of wastes fluctuates with season: minimum in August and maximum in December. The amount in December is 1.5 to 2 times that in August. This is because of coal briquette ashes from house heating and vegetable wastes from pickling kimchi.<sup>5)</sup>

Coal briquette ashes occupy 44% of the total wastes 26%, papers 14%, rubber and plastics 6%, glasses and metals 6%, and others 4%. The composition of wastes fluctuates with season: the coal briquette ashes occupy 68.8% in winter while 10.3% in summer, and food wastes 16.8% in winter while 45% in summer.<sup>5)</sup> The chemical characteristics of wastes vary with season also. The low-heat content fluctuates from 717 to 1,414kcal/kg depending on season; thus careful pretreatments including seperation are required for incineration.

The budgets spent on managing the solid wastes in Seoul are as shown in Table 2. The unit cost 6,688 wons/ton in 1989 is considerably cheap compared to 100,000 wons/ton in U.S.A. and 120,000 wons/ton in Japan.<sup>7)</sup>

### 4. Significant Studies Conducted

**Table 1.** The Amount of Solid Wastes Generated in Seoul City

Year	Population	Wastes Generated (tons/yr)	Year	Population	Wastes Generated (tons/yr)
1970	4,502,320	2,239,175	1984	9,199,105	8,520,591
1975	6,164,288	2,990,080	1985	9,499,021	8,561,385
1980	8,107,503	7,439,430	1986	9,635,471	9,296,000
1981	8,359,838	7,676,001	1987	9,798,542	9,897,654
1982	8,669,087	7,509,521	1988	10,287,000	10,512,000
1983	8,909,710	8,061,617	1989	10,576,794	10,913,000

Source : Seoul Metropolitan Government, Seoul Statistical Yearbook, 1989.

A basic planning study was conducted for construction of two incineration plants with capacity of 600 tons/day each in 1987, but the plan has been withheld for fear of air pollution in the City. However, it was pointed out that incineration had advantage in recovering heat and reducing wastes. The benefits was estimated to be 328 wons/ton.<sup>8)</sup>

The Metropolitan Government conducted a master plan study for the management of solid wastes in 1988<sup>9)</sup>. This comprehensive study investigated current problems associated with generation, collection, transfer, transport, recycling, final disposal, and management of solid wastes, and suggested future strategies to solve the problems. Parts of the study have been reflected in the master plan of the Metropolitan Government and some of them have been implemented already.

A research project is being conducted to solve the environmental problems in Nanjido such as water pollution from leachate and refuse gas, and to plan land use after closing.

**Table 2.** Budget Spent on Solid Waste Management in Seoul City

Year	Amount of Wastes (tons/yr)	Budget (million wons)	Unit Cost (wons/ton)
1985	8,561,385	43,030	5,026
1986	9,296,000	41,242	4,437
1987	9,897,654	56,826	5,741
1988	10,512,000	69,774	6,638
1989	10,913,000	72,983	6,688

Source : Seoul Metropolitan Government, Seoul Statistical Yearbook, 1989.

### III. Institutional Arrangements in Solid Waste Amangement

#### 1. Private Sector Involvement

##### 1.1. Type of Existing Arrangements

The administrator of gu government, entrusted from Mayor of the Metropolitan Government, issues licence to private contractors to collect and transport solid wastes according to the regulations of the Solid Waste Management Law. The minimum requirements for the private contractors specified in the law are four waste collectors, 50 million wons of capital for corporate body or 80 million wons of capital for private person, 15m<sup>2</sup> office, 15 tons of waste vehicle capacity including at least one compressible waste truck, and garage for the vehicles. The administrator of gu government makes contract with private companies and assigns a certain area to each of them.

There are 85 private contractors operating in Seoul as of December, 1990. The organi-

zation and size of the private contractors differ from company to company. But generally operation division, vehicle division, and administration division are the main bodies of the private contractors.

According to the law, the administrator of gu government should issue licence to companies if they meet the minimum requirements specified in the law. But, if more companies applied than needed, then the administrator should have the companies make bidding. However, this waste collection is not a very profitable business, and thus the Metropolitan Government strongly discourages competition for fear of dumping which eventually will result in poorer service to citizens. There rarely have been any competition yet.

#### 1.2. Incentive to Involvement by Private Sector

Private contractors have to run business entirely with the waste fees collected from residents within assigned areas. Since this business is not a very profitable one, the Government does not encourage competition, but supports contractors with equipment, manpower, and financial assistance. For example if private contractors fail to collect wastes due to equipment failure or lack of manpower, the Government lends them. However, this rarely happened until 1989. As the labor cost rised sharply in 1990, the majority of the collectors in private contractors quit the job. Their average monthly salary was 405,000 won while that for collectors in the Government was 603,500 won and construction worker's daily average wage about 45,000 won. To make up for the unbalance, the Government paid 85,000 won a month from January to August and 15,000 won a month from September to December to each collectors. However, 142% of the private collectors quit the job in 1990, especially 114% from January to July, and the Government frequently had to lend manpower to private contractors. To solve this problem, the Government raised the waste fee 28.2% in 1991.

To encourage the participation of private sector in recycling of solid wastes, the Metropolitan Government plans to reimburse the external benefit caused by recycling in cash in near future. This system is expected to attract non-profit organizations such as consumer organizations and community organizations as well as enterprises.

The Government also plans to involve plastics industries and department stores in manufacturing waste bags. Stores distribute shopping bags to customers free. The Government has not decided exactly how, but it is very possible that the Government allows advertisement on condition that shopping bags are standardized to be used for waste bags afterwards.

## 2. Public and Private Provision of Solid Waste Management Services

### 2.1. Balancing of Roles

The private contractors operate in easy areas such as apartment towns, commercial areas, and residential areas in flat terrain to which truck access is free, while the Government usually operates where handcart is needed for collecting wastes due to bad accessibility. The private contractors collected 91% of large-business wastes and 69% of apartment wastes while the Government 89% of house wastes and 79% of small-business wastes in 1989 (see Table 3). The large-business is defined in the Solid Waste Management Law as the business which generates more than 300kg/day of solid wastes. In total the private contractors collected 49% of the solid wastes in the City and the Government 51%.

The waste fee is imposed based on the area of house or building regardless of the amount of wastes or the number of households except on large-businesses for which the amount is the criteria. As the labor cost arised sharply resulting in labor shortage in solid waste management, the private contractors returned less profitable areas to the Government recently. The less profitable areas are those areas where the coal briquette is the main energy source of heating, which naturally produces more wastes, or handcart is used for collecting wastes due to bad road condition. These less profitable areas usually coincide with poor to middle class towns.

**Table 3.** The Amount of Wastes Collected by Government and Private Contractors  
unit: tons/day

	Government	Private Contractors	Total
House	10,387(89%)	1,230(11%)	11,617(100%)
Apartment	1,596(31%)	3,601(69%)	5,197(100%)
Small-Business	1,902(79%)	498(21%)	2,400(100%)
Large-Business*	794(9%)	8,450(91%)	9,244(100%)
Total	14,679(51%)	14,121(49%)	28,800(100%)

Note: Large-business is defined as the one which generates more than 300 kg/day of solid wastes.  
Source : Citizens Affairs Bureau of Seoul Metropolitan Government, Operation Report of Cleaning and Collection Division '89, 1989.

### 2.2. Comparison of Efficiency and Costs

Manpower, equipment, and waste collection efficiency between the Government and private contractors are compared in Table 4.

The Metropolitan Government employed 9,521 persons in solid waste management: 5,496 collectors, 3,113 street sweepers, 809 drivers, and 103 technicians, while private contractors 2,717 persons: 2,087 collectors, 597 drivers, and 33 technicians as of June 1990<sup>10)</sup>. And

**Table 4.** Comparison of Manpower, Equipment, and Collection Efficiency between the Government and the Private Contractors.

		Government	Private Contractor
Manpower*	Waste Collector(A)	5,496	2,087
	Street Sweeper	3,113	
	Driver	809	597
	Technician	103	33
	Total	9,521	2,717
Collecting Vehicle*	8.5-ton Truck	454	187
	4- or 4.5-ton Truck	83	269
	2.5-ton Truck	118	80
	Total(B)	762	542
Other Vehicle*	Street Sweeper	54	
	Patrol	25	
	Total	79	
Efficiency	Wastes Collected(C)**	14,679 tons/day	14,121 tons/day
	Efficiency (C/A)	2.67 tons/man-day	6.77 tons/man-day
	Efficiency (C/B)	19.3 t/truck-day	26.1 t/truck-day

Note: 1) Data as of June 1990.

2) Annual average data in 1989.

Source: Citizens Affairs Bureau of Seoul Metropolitan Government, Data Field in Cleaning Division, 1990.

the Government collected 5,357,800 tons of wastes while private contractors 5,154,200 tons of wastes in 1989. Since some of the Government employees are not directly engaged in waste collection, it is not fair to compare the collection efficiency with total number of employees. Therefore, if we compare the collection efficiency from the number of pure collectors, the efficiency for the Government is calculated to be 2.67 tons/man-day and that for private contractors 6.77 tons/man-day.

The Government owned 762 collection vehicles: 454 8.5-ton trucks, 83 4- or 4.5-ton trucks, and 118 2.5-ton trucks, and private contractors 542 vehicles: 187 8.5-ton trucks, 269 4- or 4.5-ton trucks, and 80 2.5-ton trucks as of June 1990. These are equivalent to 4,506.75 tons of truck capacity for the government and 2,932.75 tons of capacity for private contractors, respectively. Therefore, if we compare the efficiency in terms of truck capacity, the efficiency for the Government is 19.3 tons of waste/truck-day or 3.26 tons of waste/tons of truck capacity—day, and that for private contractors is 26.1 tons of waste/truck-day or 4.81 tons of waste/tons of truck capacity—day.

It is not possible to exactly calculate the disadvantage the Government faces because it operates in difficult areas. However, it is still possible to conclude that private sectors are

much more efficient than the Government. It is judged that better management of manpower and maintenance of equipment are the main reasons. For example, it takes several days to repair a vehicle in the Government while private contractors repair it immediately. And the Government trucks are rarely fully loaded while the private trucks are usually overloaded<sup>11)</sup>.

The private companies are entirely run by the waste fees collected from citizens, but for the Government the collected fees satisfied only 26.4% of the budget in 1989 (see Table 5)<sup>2)</sup>. It of course should be considered that the private companies spend expenditures only on collection and transport of wastes while the Government spends on other items such as final disposal, construction of roads and transfer stations in addition to those. However, the Governmental expenditure does not include salaries paid to employees: salaries are paid from general budget. The total amount of salaries paid to the Government employees engaged in solid waste sector is about 5% of the total expenditure. Therefore it is not possible to exactly compare the cost-effectiveness between the Government and the private contractors. However, it still is possible to conclude that the private management is much more economical than the governmental management, because the gap is so obviously big.

The income of governmental collectors is about 70% of the average laborer's income, and that of private collectors is about two-thirds of that of governmental collectors.<sup>10)</sup> Therefore it may be very natural that the waste collectors make up for their low income by tips. According to a survey in 1990, 73.5% of Seoul citizens paid tips to waste collectors. Tips are paid monthly and on holidays like New year's day and Thanksgiving

**Table 5.** Revenue and Expenditure on Solid Waste Management in Seoul Metropolitan Government  
unit: million wons

Year	Revenue (A)	Expenditure (B)*	A/B
1981	4,516	26,904	16.7%
1982	5,637	30,098	18.7%
1983	5,856	32,697	17.9%
1984	9,950	37,544	26.5%
1985	11,217	43,030	26.0%
1986	11,958	41,242	28.9%
1987	13,446	56,826	23.6%
1988	12,514	69,774	17.9%
1989	19,299	72,983	26.4%

Note: This expenditure does not include wages paid to employees.

The salaries are paid from general budget.

Source: Citizen Affairs Bureau of Seoul Metropolitan Government, Operation Reports of Cleaning and Collection Division '89, 1989.

Day. According to this estimation, average citizen in Seoul City pays 2,139 wons of formal waste fee and 3,054 wons of tip every month: thus total 5,193 wons each month.<sup>12)</sup> And there were no significant differences in the amount of tips between the governmental areas and the privatized areas.

### 2.3. Monitoring and Service Credibility

The Metropolitan Government set guidelines to monitor the performance of waste cleaning service. Administrators of each dong are responsible for monitoring daily operations and required to report the evaluations every month to the administrator of gu government. The Metropolitan Government should conduct public opinion poll each quarter and examine the service level at arbitrary times, and should pay special attention to problem companies and guide them properly. And employers and employees are required to take job training courses twice a year.

The Metropolitan Government set a guideline that solid wastes should be collected from each house at least once in three days. However, the monitoring data in 1988 showed that the guideline had been violated in 21.1% of the government areas and 24.5% of privatized areas. According to the public poll conducted by the Metropolitan Government in 1989, 39.1% of the respondents preferred private service, 14.8% preferred governmental service, and the rest were not determined.<sup>13)</sup> From these results it is possible to conclude that the quality of private service is not worse at all that of the governmental service. Citizens rather preferred private service. However, this trend completely changed in 1990 as the income of private employees became substantially lower than those of government employees and other laborers. Private companies frequently failed to clean wastes due to labor shortage, and the Government received many complaints from citizens in privatized areas.

## 3. Institutional Strengthening

### 3.1. Managing Relation with Private Sector

The privatization of solid waste management is expected to reduce cost and at the same time to improve service quality through competition practiced in market economy system. However, the Metropolitan Government does not consider it justifiable to privatize the whole management system. It is true that the solid waste management offers direct benefits to an individual who receives the service, but the community gets indirect benefits also through the service rendered to an individual. Therefore, the solid waste management can be considered as a quasi-public good. And if the service is entirely privatized, poor people living in areas where waste collection is difficult are likely to pay more for the service

than rich people, which is not fair in terms of social justice. Therefore, the Metropolitan Government is planning to stick to the present dual system for the time being, which means privatization in easy, rich, and profitable areas and government control in difficult areas.

At present the Metropolitan Government rather forces the private companies to follow directions under contract than offers incentive to them. This is a kind of bureaucratism. However, the future task is to enhance the economic merits of privatization while upgrading the credibility. Through the past experiences, it is roughly known that the most important factor influencing the credibility of private service is the welfare of the waste collectors. The welfare does not simply mean income. It is true that income is the most important factor affecting the welfare of waste collectors, but their working environment is a very important factor also. For example when apartments closed garbage-chute and set containers outdoors, and residents stored wastes according to kinds so that collectors do not have to sort them before loading from January 1991, the waste collectors were cheered up and their service improved. So the Metropolitan Government continuously has to pay attention to the welfare of private employees as well as that of government employees. Another point the Government should do to upgrade the efficiency and credibility of private contractors is to let the private companies to grow in size. Most of the 85 private contractors run small-size business at present. It is believed that the efficiency and credibility will improve if the companies get bigger. Several contractors can form a corporation or can participate in a pool system for employees and equipments. In this case the Government can play the coordinator.

### 3.2. Dealing with Community-based Efforts

Until a few years ago Korean people could exercise very limited democracy, so that community movement used to be very weak. But numerous non-governmental organizations sprouted recently, many of which are deeply interested in environmental activities. It is widely recognized among Korean experts and government officials that the community-based efforts will play a very important role in managing solid wastes, especially in recycling. And many community-based non-governmental organizations themselves plan to participate in solid waste management and the Government at the same time wants to involve those organizations also. Saemaetul Women's Association, Association of Housewives Club, Korea Women's Association, YWCA, YMCA, and other consumers organizations are those. These organizations are launching campaigns for separate storing and recycling of wastes, and

the Metropolitan Government cooperates with them by distributing campaign leaflets to citizens and so on. The Government is also campaigning for citizens' cooperation using mass media and Bansanghoe meeting which is a neighborhood meeting held every month.

The main reasons for low recycling rate in Seoul are low economic incentive for recycling and inefficient and unstable market for the recovered wastes. To solve these problems the Government plans to establish waste recycling plants and to offer financial incentive and administrative assistance for recycling. The Government established detailed guidelines to organize administrative network for recycling and for the procedures to pay for returned recyclable wastes to non-governmental organizations. The Government also has a plan to assist waste dealers financially and technically. The Government is willing to assist dealers with the money equivalent to the treatment cost saved by recycling. The cost for managing 1 ton of wastes in Seoul is estimated to be 11, 500 wons. If all the recyclable wastes are recovered in Seoul City, 10 billion wons is expected to be saved in a year.<sup>14)</sup>

#### **4. Resolving Issues**

##### **4. 1. Siting Constraints**

Seoul City faces a serious problem in siting facilities dealing with wastes because of NIMBY (not in my back yard) syndrome. For example the Government tried to improve open-space transfer station and built two transfer station buildings which are of advance type. However, this attempt failed because of strong protests from residents. Citizens put up with the existing open-space transfer stations hoping that they will be removed someday, but would not allow permanent transfer stations. Thus the Metropolitan Government revised the original plan to build large-scale transfer stations and intermediate treatment plants in carefully chosen locations which will not cause nuisance to residential areas. However, the sites have not been determined yet.

The City faces even a worse problem in locating waste dumping site. As the capacity of Nanjido, the only dump site for Seoul, ran out, the Government conducted a feasibility study for 17 candidate dump sites in 1986 and finally decided to construct three landfill sites in Kyungki-do. However, the plan had to be cancelled because the residents strongly protested and the Kyungki-do Government would not allow it. This phenomenon became nation-wide since democratization a few years ago. For example, Pusan City was constructing an industrial waste treatment plant in a suburban area in May, 1990 after finishing all legal processes. However, the City had to cancel the whole project after violent protests

from residents. The mob riot in Anmyondo in November 1990 to bar the planning of radioactive waste treatment facility, which even accompanied arsens and casualties, clearly shows that even residents in remote rural areas would not allow waste treatment facilities any more.

In addition to Seoul City, Incheon City and Kyungki Province which surrounds Seoul City faced the same problem in securing waste landfill site. So it was very natural that the three governments begin to seek the solution in coalition.

Thus, any facilities related to wastes need to be located in remote area where population is scarce. And they need to be equipped with perfect pollution control facilities, which residents can trust without reservation. However, it is getting nearly impossible to find such solution in the Republic of Korea.

#### 4.2. Coalition and Other Agreements: Multi-jurisdictional Approach

As Nanjido is becoming a huge refuse mountain with height of over 40m above surrounding ground level, the Metropolitan Government finally found a reclamation site in the West Coast in coalition with Incheon City and Kyungki Province(see Figure2). The construction is expected to be completed by 2014.

Originally a certain construction company owned the licence to reclamate this area and had a future plan of its own. But the Ministry of Environment, Environment Administration at that time, persuaded the company to yield the licence for the good of the country with proper compensation.<sup>15)</sup> The Ministry of Environment coordinated this project. Agreements were made after numerous negotiations between central and local governments. The Ministry of Environment is in charge of construction of the sanitary landfill site and management afterwards, and local governments construction of transportation system. The central government subsidizes a certain portion of the cost and the remaining cost is allocated to local governments according to their share of wastes: 75.8% to Seoul City and 12.1% to Incheon City and Kyungki Province each.

The landfill site will be constructed on the area of 21 million m<sup>2</sup>. The capacity of the landfill is 410 million m<sup>3</sup> which will receive wastes until 2017. Sanitary landfill method will be practiced. Important facilities in the landfill site include leachate treatment plant, methane gas processing plant, particulates control facilities, groundwater pollution control facilities, green belt buffer zone, and others. The construction is expected to cost about 188 billion wons. In addition to the landfill site, Seoul City has to build roads for transports, which will cost 16.6 billion wons more to the City.

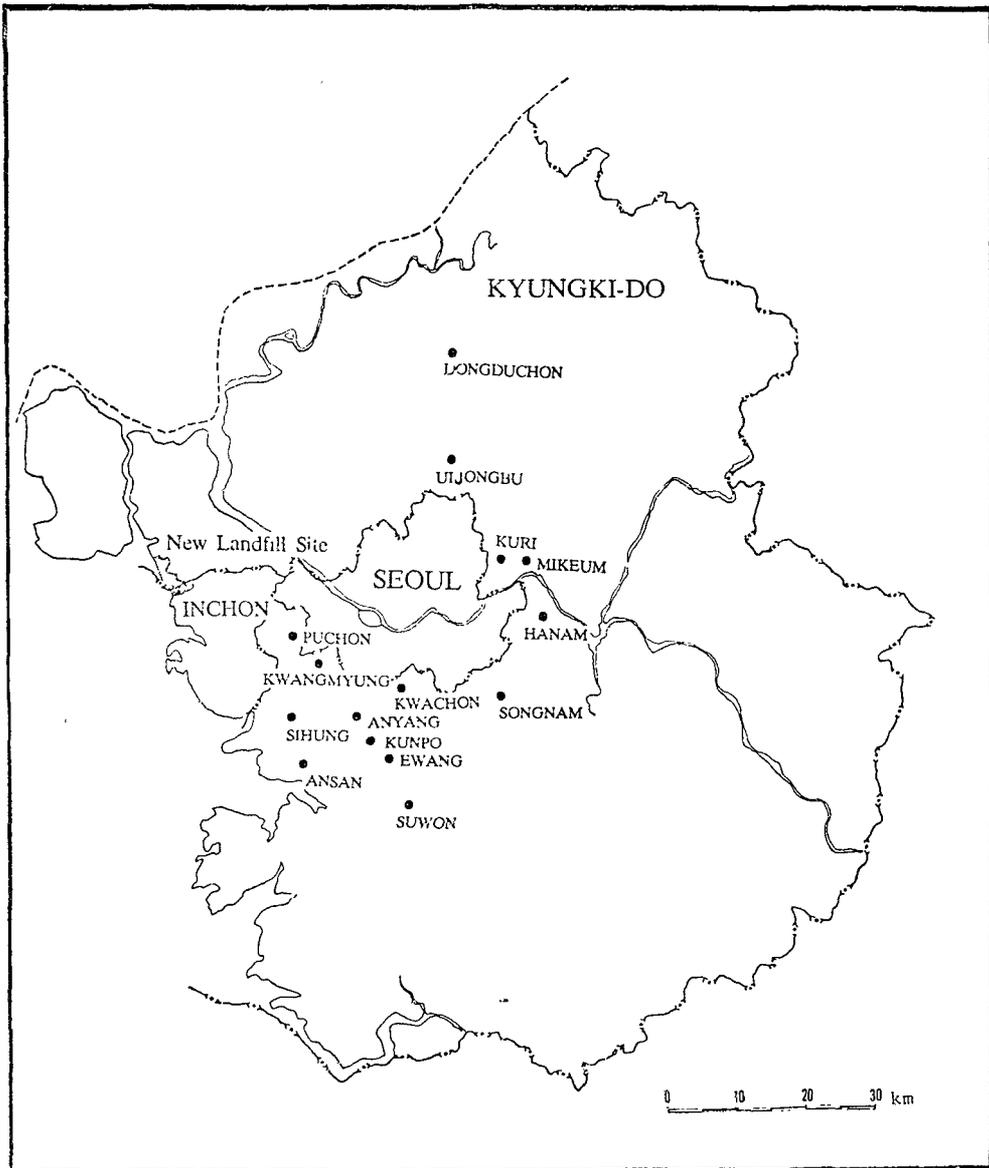


Fig. 2. Map of New Landfill Site for Capital Area

## V. Findings and Conclusions

The results of this study are summarized as follows.

The solid wastes are collected both by the Metropolitan Government and private contractors in Seoul at present. The private contractors operate in easy areas such as apartment

towns, commercial areas, and residential areas in flat terrain to which waste-truck access is free, while the Government usually operates where handcart is used for collecting wastes due to bad accessibility. The private contractors were much more efficient in performance and cost-effective due to better management of manpower and maintenance of equipment. The privatization of solid waste management is expected to reduce cost and at the same time to improve service quality. However, if the service is entirely privatized, poor people living in areas where waste collection is difficult are likely to pay more for the service than rich people, which is not fair in terms of social justice. Therefore, the present dual system is justifiable. To enhance the economic merits of privatization while upgrading the service credibility, government needs to improve the welfare of employees such as income and working environment.

Since the waste recovery is not so profitable business, the recovery rate is getting lower in Seoul. Numerous community-based citizens organizations are ready to get involved in environmental movements such as recycling of wastes. To ensure success, the government needs to offer sufficient economic incentives for recycling wastes.

Seoul City faces a serious problem in siting facilities dealing with wastes because of NIMBY syndrome. Since neighbor local governments faced the same problem, they, in coalition, solved the problem by constructing a large-scale reclamation site in the West Coast. But to avoid protest from nearby residents, the new landfill site must be equipped with perfect control facilities.

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