5. RECOVERABLES MARKET SURVEY

5-1 Objectives

This survey aimed to determine the present situation of recycling and recovery activities in Seoul City as well as the potential compost market. The former was carried out by questionnaires and inquiries to households, commercial establishments and police departments in Seoul City. The second considered agricultural land area, fertilizer demand and other data obtained from various agricultural concerns in Seoul City, Incheon City and Kyeonggi-Do. The results are used for planning of the optimum master plan and short term improvement project. The schedule of survey activities is shown in Fig. 5-1.

5-2 Survey Method

5-2-1 Selection of Establishments

To collect information on existing conditions and possible markets for recovered resources, a variety of establishments were selected at random, and questionnaire surveys and inquiries were carried out on them. The list of establishments is given in Table 5-1.

Fig. 5-1 Schedule of Recoverables Market Survey

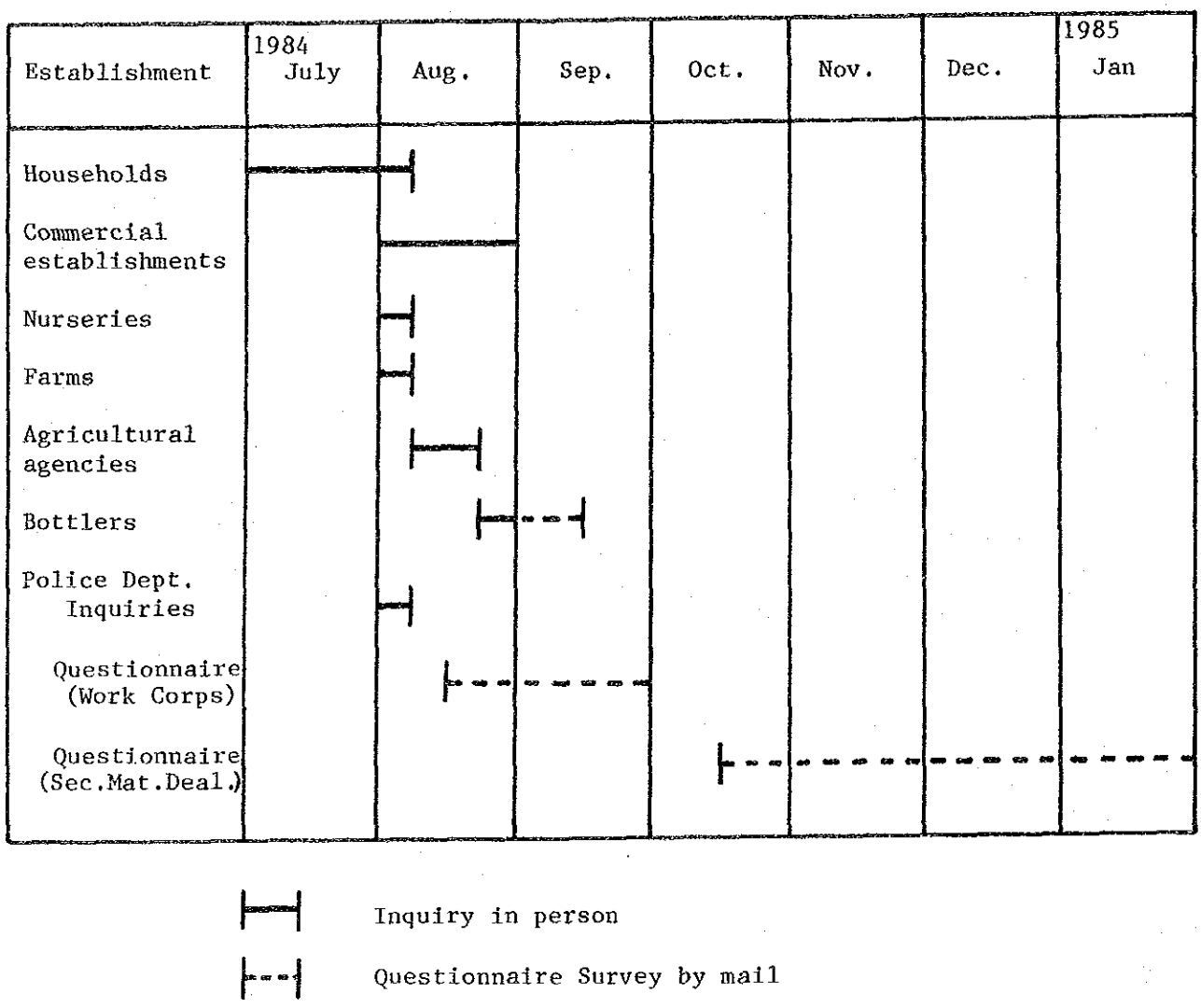


Table 5-1 Establishments for Recoverables Market Survey

Establishment	Questionnaire		Comments
	Issued	Replied	
Households	175	165	17 Gu's in Seoul + 1 in Kwachon
Markets	5	5	3 Gu's in Seoul
Shopping Centers	5	5	2 Gu's in Seoul
Hotels	5	5	3 Gu's in Seoul
Offices	5	3	2 Gu's in Seoul
Public Facilities	3	2	2 Gu's in Seoul
Seoul Police Bureau*	1 + 1	1 + 1	Security Division of Seoul City Police Bureau
District Police Departments*	23+23	23+14	Outside Duties Section, security Division of 23 district police departments
Bottlers	4	2	Oriental Brewery, Chosun Brewery, Hai Tai Confectioners, Lotte Chilsung Beverages
KRRRC	-	-	Korea Resources Recovery and Reutilization Corporation
Farms	20	20	5 each of orchards, vegetable farms, grain farms and vinyl houses in Seoul City and Kyeonggi Do
Nurseries	10	10	4 Gu's in Seoul
Agricultural Agencies	-	-	National Agricultural Cooperative Federation, Seoul Rural Counseling Office, Rural Promotion Office, Agricultural Technology Research Institute, Cheil Sugar Co., Ltd., and Kyeonggi Do Government
Mapo Gu Office	-	-	Situation of recycling at Nanjido landfill site and briquet ash brick production information.

* Surveyed twice

5-2-2 Questionnaires and Inquiries

Questionnaires were prepared and were either used when making inquiries to expedite the procedure or mailed to save time and energy because of similarities to already inquired establishments. The questionnaires presented hereafter were translated into Hangul when they were actually used. The questionnaire surveys to households and commercial establishments (markets, shopping centers, hotels, offices and public facilities) were handled by Gu offices.

In addition, inquiries were made to Mapo Gu office to obtain information on materials recycling situation at Nanjido landfill site and brick production which has stopped operations.

QUESTIONNAIRE FOR HOUSEHOLDS

1. Name of Ku

2. Name of Dong

3. Kind of house

   Independent house

   Traditional Korean house

   Apratment

   Tenement house

4. Household situation :

   Number of persons _____
   Number of families _____
   Number of males _____
   Number of females _____
   Number over 55 years old _____
   Number under 18 years old _____

5. Income range (per month)

Under W50,000	300,000 - 500,000
50,000 - 100,000	500,000 - 1,000,000
100,000 - 200,000	1,000,000 - 1,500,000
200,000 - 300,000	Over 1,500,000

6. Amount of solid waste generated per day _____

7. Solid waste storage method :

Plastic bucket	Dust box
Metal can	Dust chute
Wooden box	Container
Other receptacle	Others
Sack or bag	

8. Type of solid waste collection :

   Public collection
   Private collection
   Self-disposal

9. If public or private collection

   Number of collections per week _____
   Time of collection _____
   Collection fee per month W _____

10. What do you think about the collection fee?

    Cheap Reasonable Expensive

11. Do you pay tip? Yes No

    If yes, how much do you pay per month? W _____

12. If self-disposal, what method?

Dump on own premise	Burn
Dump outside of premise	Sold
	Other

13. If sold, fill in the following table

Material	Quantity kg/mon	Selling price W/kg	Sold to
Newspaper			
Magazine			
Cardboard			
Other paper			
Plastic sheets			
Plastic containers			
Other plastics			
Glass bottles			
Glass cullet			
Ferrous metals			
Non-ferrous metals			
Food waste			
Nightsoil			
Others			

14. If the City asks for separation of waste into the following categories, will you cooperate?

    Briquet ash and others? Yes No
    Briquet ash, combustibles and noncombustibles? Yes No
    Briquet ash, food waste, paper, glass, plastics, etc? Yes No

15. If the city asks you to bring your waste to a nearby designated location on collection day, will you cooperate? Yes No

16. Any comments? _____

THANK YOU VERY MUCH FOR YOUR COOPERATION

QUESTIONNAIRE FOR MARKETS AND SHOPPING CENTERS

1. Name _____
2. Address _____
3. Kind of business _____
4. Type of establishment:
   - Single house
   - Inside building
   - Others
5. Establishment with residence?
6. Total floor area _____
7. Administrative floor area _____
8. Selling floor area _____
9. Average number of workers per day _____
10. Average number of customers per day _____
11. Annual gross sales _____
12. Business hours _____
13. Amount of solid waste generated per day _____
14. Solid waste storage method:
    - Plastic bucket
    - Metal can
    - Wooden box
    - Other receptacle
    - Sack or bag
    - Dust box
    - Dust chute
    - Container
    - Others
15. Type of solid waste collection:
    - Public collection
    - Private collection
    - Self-disposal
16. If public or private collection,
    - Number of collections per week _____
    - Time of collection _____
    - Collection fee per month W _____
    - What do you think of the collection fee? Cheap Reasonable Expensive
    - Do you pay tip? Yes No
    - If yes, how much per month? W _____
17. If self-disposal, what method?
    - Dump on own premise
    - Dump outside of premise
    - Burn
    - Sell
    - Others
18. If sold, fill in the following table.

Meterial	Quantity kg/mon	Selling Price W/kg	Sold to
Newspaper			
Magazine			
Cardboard			
Other paper			
Plastic sheets			
Plastic containers			
Other plastics			
Glass bottles			
Glass cullets			
Ferrous metals			
Non-ferrous metals			
Food waste			
Nightsoil			
Others			

19. If the city asks for separation of waste into the following categories, will you cooperate?
    - Briquet ash and others? Yes No
    - Briquet ash, combustibles and noncombustibles Yes No
    - Briquet ash, food waste, paper, glass, plastics, ecc.? Yes No
20. If the City asks you to bring your waste to a nearby designated location on collection day, will you cooperate? Yes No
21. Any comments? _____

THANK YOU VERY MUCH FOR YOUR COOPERATION.

QUESTIONNAIRE FOR HOTELS

1. Name _____
2. Address _____
3. Kind of business _____
4. Total floor area _____
5. Administrative floor area _____
6. Number of rooms _____
7. Number of beds _____
8. Average number of workers per day _____
9. Average number of customers per day _____
10. Annual gross sales _____
11. Amount of solid waste generated per day _____
12. Solid waste storage method:

Plastic bucket	Dust box
Metal can	Dust chute
Wooden box	Container
Other receptacle	Others
Sack or bag	

13. Type of solid waste collection:
    - Public collection
    - Private collection
    - Self-disposal
14. If public or private collection,
    - Number of collections per week _____
    - Time of collection _____
    - Collection fee per month W _____
    - What do you think of the collection fee? Cheap Reasonable Expensive
    - Do you pay tip? Yes No
    - If yes, how much per month? W _____
15. If self-disposal, what method?
    - Dump on own premise
    - Dump outside of premise
    - Burn
    - Sell
    - Others
16. If sold, fill in the following table.

Meterial	Quantity kg/mon	Selling Price W/kg	Sold to
Newspaper			
Magazine			
Cardboard			
Other paper			
Plastic sheets			
Plastic containers			
Other plastics			
Glass bottles			
Glass cullets			
Ferrous metals			
Non-ferrous metals			
Food waste			
Nightsoil			
Others			

17. If the city asks for separation of waste into the following categories, will you cooperate?
    - Briquet ash and others? Yes No
    - Briquet ash, combustibles and noncombustibles Yes No
    - Briquet ash, food waste, paper, glass, plastics, etc.? Yes No
18. If the City asks you to bring your waste to a nearby designated location on collection day, will you cooperate? Yes No
19. Any comments? _____

THANK YOU VERY MUCH FOR YOUR COOPERATION.

QUESTIONNAIRE FOR OFFICES

1. Name _____

2. Address _____

3. Kind of business _____

4. Type of establishment:

   Single house

   Inside building

   Others

5. Establishment with residence?

6. Total floor area _____

7. Business hours _____

8. Number of workers per day _____

9. Average number of customers/clients per day _____

10. Annual gross sales _____

11. Amount of solid waste generated per day _____

12. Solid waste storage method:

Plastic bucket	Dust box
Metal can	Dust chute
Wooden box	Container
Other receptacle	Others
Sack or bag	

13. Type of solid waste collection:

   Public collection

   Private collection

   Self-disposal

14. If public or private collection,

   Number of collections per week _____

   Time of collection _____

   Collection fee per month _____

   What do you of the collection fee? _____

   Do you pay tip? _____

   If yes, how much per month? _____

15. If self-disposal, what method?

   Dump on own premise

   Dump outside of premise

   Burn

   Sell

   Others

16. If sold, fill in the following table.

Meterial	Quantity kg/mon	Selling Price W/kg	Sold to
Newspaper			
Magazine			
Cardboard			
Other paper			
Plastic sheets			
Plastic containers			
Other plastics			
Glass bottles			
Glass cullets			
Ferrous metals			
Non-ferrous metals			
Food waste			
Nightsoil			
Others			

17. If the city asks for separation of waste into the following categories, will you cooperate?

   Briquet ash and others? Yes No

   Briquet ash, combustibles and noncombustibles Yes No

   Briquet ash, food waste, paper, glass, plastics, etc.? Yes No

18. If the City asks you to bring your waste to a nearby designated location on collection day, will you cooperate? Yes No

19. Any comments? _____

THANK YOU VERY MUCH FOR YOUR COOPERATION.

QUESTIONNAIRE FOR PUBLIC FACILITIES

1. Name _____

2. Address _____

3. Kind of business _____

4. Type of establishment:

   Stadium
   Park
   Others

5. Total area _____

6. Average number of visiters per day _____

7. Amount of solid waste generated per day _____

8. Solid waste storage method:

Plastic bucket	Dust box
Metal can	Dust chute
Wooden box	Container
Other receptacle	Others
Sack or bag	

9. Type of solid waste collection:

   Public collection
   Private collection
   Self-disposal

10. If public of private collection,

    Number of collections per week _____

    Time of collection _____

    Collection fee per month W _____

    What do you think of the collection fee? Cheap Reasonable Expensive

    Do you pay tip? Yes No

    If yes, how much per month? W _____

11. If self-disposal, what method?

    Dump on own premise
    Dump outside of premise
    Burn
    Sell
    Others

12. If sold, fill in the following table.

Meterial	Quantity kg/mon	Selling Price W/kg	Sold to
Newspaper			
Magazine			
Cardboard			
Other paper			
Plastic sheets			
Plastic containers			
Other plastics			
Glass bottles			
Glass cullets			
Ferrous metals			
Non-ferrous metals			
Food waste			
Nightsoil			
Others			

13. If the city asks for separation of waste into the following categories, will you cooperate?

    Briquet ash and others? Yes No
    Briquet ash, combustibles and noncombustibles Yes No
    Briquet ash, food waste, paper, glass, plastics, etc.? Yes No

14. If the City asks you to bring your waste to a nearby designated location on collection day, will you cooperate? Yes No

15. Any comments? _____

THANK YOU VERY MUCH FOR YOUR COOPERATION.

QUESTIONNAIRE FOR SEOUL POLICE BUREAU

(on Self-Support Work Corps)

1. Total number of self support work corps in Seoul
2. Total number of corps members
3. Total number of workshops
4. Owners of workshops
5. Area of workshops
6. Income of members (into summer and winter)
7. Source and amount of income of corps leader
8. Collected amounts and unit prices for each collected material into summer and winter
9. Provisions supplied to corps members
10. Inventory of secondary materials dealers

QUESTIONNAIRE FOR SEOUL POLICE BUREAU

(on Secondary Materials Dealers and Itinerant Buyers)

1. Total number of registered and non-registered secondary materials dealers and itinerant buyers
2. Registration conditions and method
3. Total number, areas and owners of workshops
4. Quality upgrading process
5. Methods of payment for buying and selling

QUESTIONNAIRE FOR DISTRICT POLICE DEPARTMENT

(on Self-Support Work Corps)

1. Number of members in corps
2. Number of workshops
3. Owner of workshops
4. Area of each workshop
5. Income of members (into summer and winter)
6. Source and amount of income of corps leader
7. Collected amounts and unit prices for each collected material into summer and winter
8. Provisions supplied to corps members

QUESTIONNAIRE FOR DISTRICT POLICE DEPARTMENT

(on Secondary Materials Dealers and Itinerant Buyers)

1. Inventory of secondary materials dealers and itinerant buyers (see separate sheet)
2. Relationship between and organization of secondary materials dealers and itinerant buyers
3. Conditions for registration
4. Area of each workshop
5. Owner of workshops
6. Sellers and payment method
7. Buyers and payment method
8. Quality upgrading process

Secondary Materials Dealer Name	Material	Spring				Summer			
		Buy		Sell		Buy		Sell	
		Amount (kg/mon)	Unit Price (W/kg)	Amount (kg/mon)	Unit Price (W/kg)	Amount (kg/mon)	Unit Price (W/kg)	Amount (kg/mon)	Unit Price (W/kg)
Itinerant Buyer Name									

Secondary Materials Dealer Name	Material	Autumn				Winter			
		Buy		Sell		Buy		Sell	
		Amount (kg/mon)	Unit Price (W/kg)	Amount (kg/mon)	Unit Price (W/kg)	Amount (kg/mon)	Unit Price (W/kg)	Amount (kg/mon)	Unit Price (W/kg)
Itinerant Buyer Name									

QUESTIONNAIRE FOR BOTTLERS

1. Kind of material recycled
2. Flow of material processing
3. Quantity handled per month
4. Buying price per month of recycled material
5. Selling price per month of recycled material
6. Measures taken to upgrade quality
7. End users

QUESTIONNAIRE FOR KRRRC

1. Organization of KRRRC
2. Activities of KRRRC
3. Recovered materials with :
   - Buying and selling route
   - Buying and selling prices
   - Buying and selling amounts
4. Situation of recovered materials in relation to,
   - Collection/transportation
   - Storage
   - Processing
   - Disposal

QUESTIONNAIRE FOR FARMS

1. Name
2. Address
3. Farm land area
4. Please fill in the following table

Kind of Crop	Area (a)	Planting Months	Harvesting Months	Fertilizing Months		Amount of Fertilizer Used	
				Chemical	Organic	Chemical	Organic

5. Kind of fertilizer used:
   Organic (self-produced)
   Organic (Store bought)
   Chemical
6. If self-produced, what are its contents?
7. Do you use soil conditioners? Yes No
8. Will you use compost made from municipal solid waste on your farm? Yes No
   If so, will you be satisfied with a soil conditioner? of briquet ash
   of organics
   or do you prefer a fertilizer product? Yes No
9. What type of handling do you prefer?
   Bags What sizes? 5kg 10kg 20kg Others
   Bulk
10. What would be a reasonable price for compost:
    As soil conditioner W/kg _____
    As fertilizer W/kg _____
11. Do you have space to store compost? Yes No
    If yes, how much area do you have? _____
12. Any comments? _____

THANK YOU VERY MUCH FOR YOUR COOPERATION.

QUESTIONNAIRE FOR FERTILIZER DEALERS (NURSERIES)

1. Name of firm
2. Address
3. Please fill in the following table

Product Name	Composition	Selling Unit (10 kg bag, bulk, etc.)	Unit Price ₩	Quantity sold per month

4. Will you sell compost produced from solid waste?
   - As soil conditioner?
   - As fertilizer?
5. Will you sell soil conditioner made from briquet ash?
6. What are reasonable prices?

	Buying	Selling
Soil conditioner (organic)		
Soil conditioner (briquet ash)		
Fertilizer		

7. Any comments? _____

THANK YOU VERY MUCH FOR YOUR COOPERATION.

QUESTIONNAIRE FOR AGRICULTURAL AGENCIES

(For Seoul City, Incheon City and Kyeonggi Do)

1. Inventory of farmers
2. Location of farmlands (Present and Future)
3. List of Crops with,
   - area for each
   - planting months
   - harvesting months
   - Fertilizing months (chemical and organic)
   - Fertilizing amounts (chemical and organic)
   - Prices
4. Manufacturers, distributors and shops for fertilizers and soil conditioners (chemical and organic) with,
   - Contents (composition)
   - Form of packaging
   - Selling price
   - Amount sold
5. Inventory of imported fertilizers and soil conditioners
6. Is there a demand for compost made from refuse?
   If there is, what would be an appropriate price?
7. Any opinions on briquet ash as soil conditioner?
8. Do you think the demand and production of crops will increase or decrease in the future?
9. Presently vegetables such as cabbage are unboxed and delivered to Seoul where the outer leaves are peeled off. Do you think the peeling process will be carried out at the producing center before delivery in the future?

QUESTIONNAIRE FOR ORGANIC FERTILIZER MANUFACTURER

1. Kind of organic fertilizer produced
2. Composition of products
3. Selling prices
4. Quantities sold
5. Selling territory
6. Any opinions on compost made from refuse?
7. Any opinions on briquet ash as soil conditioner?

QUESTIONNAIRE ON BRIQUET ASH

1. Composition of briquet ash
2. Effects of briquet ash as soil conditioner on various crops
3. Examples of uses of briquet ash as soil conditioner
4. Demand for briquet ash as soil conditioner
5. Other uses for briquet ash

QUESTIONNAIRE ON RECYCLING ACTIVITIES AT NANJIDO LANDFILL SITE

1. Organization of recycling
2. Number of pickers
3. Qualifications for becoming a picker
4. Living conditions
5. Method of picking
6. Method of transporting materials for selling
7. List of materials recycled
8. Amount of each material recycled
9. Selling price of each material
10. Selling route
11. Comments on present situation of recycling

5-3 Results

5-3-1 Rate of Questionnaire Reply

The replied number against the issued number of questionnaires were shown in Table 5-1. This revealed that the rates of return were very good. Though not all returned questionnaires were filled-in completely, some establishments supplied booklets, pamphlets, brochures, etc. for answering the questions and for further reference.

5-3-2 Households and Commercial Establishments

The total of 165 replies from households included one from out of Seoul City, namely Kwachon. This lone questionnaire will be used only as reference and is not reflected in the data compilations.

Since a listing of all answers from households would be irrelevant, only data pertinent for recovery planning are compiled in Table 5-2 through Table 5-6. The replies from commercial establishments are tabulated in Table 5-7 to Table 5-10. The situation of recycling at the source of waste generation for households and commercial establishments is indicated in Table 5-11.

Table 5-2

Housing Types of Participants for Household Questionnaire

Gu Name	No. of Replies	Independent House	Traditional Korean House	Apt.	Tenement House	Others
Jongro	12	1 (8)	1 (8)	9 (76)	1 (8)	-
Jung	10	6 (60)	2 (20)	2 (20)	0 (0)	-
Seongdong	12	8 (67)	1 (8)	2 (17)	1 (8)	-
Dongdaemun	14	4 (29)	3 (21)	2 (14)	4 (29)	1 (7)
Seongbug	10	8 (80)	2 (20)	0 (0)	0 (0)	-
Dobong	10	5 (50)	3 (30)	1 (10)	1 (10)	-
Yongsan	11	7 (64)	0 (0)	3 (27)	1 (9)	-
Eunpyeong	9	4 (45)	0 (0)	2 (22)	3 (33)	-
Seodaemun	8	5 (63)	0 (0)	0 (0)	3 (37)	-
Mapo	2	1 (50)	0 (0)	1 (50)	0 (0)	-
Ganseo	11	6 (55)	0 (0)	2 (18)	3 (27)	-
Guro	10	8 (80)	1 (10)	0 (0)	1 (10)	-
Yeongdeungpo	5	1 (20)	1 (20)	2 (40)	1 (20)	-
Dongjak	12	6 (50)	1 (8)	2 (17)	3 (25)	-
Gwanak	11	4 (36)	1 (9)	2 (18)	3 (27)	1 (9)
Gangnam	11	5 (46)	2 (18)	2 (18)	2 (18)	-
Gangdong	6	1 (17)	0 (0)	4 (66)	1 (17)	-
Out of Seoul	1	0 (0)	0 (0)	1 (100)	0 (0)	-
Total	165	80	18	37	28	2

Note: Values in parentheses denote percentages.

Table 5-3

Residents' Cooperativeness for Source Separation

(%)

Separation Components	Will Cooperate	Will Not Cooperate	No Reply
Briquet Ash	94	4	2
Others	(154)	(7)	(3)
Briquet Ash, Combustibles, Non-combustibles	62 (102)	36 (59)	2 (3)
Paper, Plastics, Bottles, Rage, etc.	27 (45)	71 (116)	2 (3)

Note: Values in parentheses denote absolute number of replies. Total participants = 164 households.

Table 5-4

Source Separation Possibilities into Gu's

(%)

Gu Name	Several Components			Three Components		
	Will Cooperate	Will Not Cooperate	No Reply	Will Cooperate	Will Not Cooperate	No Reply
Jongro	42	42	16	66	17	17
Jung	0	100	-	90	10	-
Seongdong	58	33	8	75	17	8
Dongdaemun	14	86	-	86	14	-
Seongbug	0	100	-	30	70	-
Dobong	30	70	-	60	40	-
Yongsan	27	73	-	45	55	-
Eunpyeong	33	67	-	67	33	-
Seodaemun	50	50	-	88	12	-
Mapo	0	100	-	50	50	-
Ganseo	27	73	-	27	73	-
Guro	30	70	-	70	30	-
Yeongdeungpo	0	100	-	80	20	-
Dongjak	50	50	-	75	25	-
Gwanak	18	82	-	45	55	-
Gangnam	27	73	-	27	73	-
Gangdong	17	83	-	83	17	-

Note: Several Components = Paper, Plastics, Bottles, Rags, etc.
Three Components = Briquet Ash, Combustibles, Non-combustibles

Table 5-5

Residents' Cooperativeness for Station Storage

(%)

Gu Name	Will Cooperate	Will Not Cooperate	No Reply
Jongro	8	0	92
Jung	30	70	0
Seongdong	33	17	50
Dongdaemun	14	72	14
Seongbug	0	70	30
Dobong	20	40	40
Yongsan	64	18	18
Eunpyeong	44	44	11
Seodaemun	25	0	75
Mapo	50	50	0
Ganseo	9	73	18
Guro	40	0	60
Yeongdeungpo	20	40	40
Dongjak	50	33	17
Gwanak	36	36	27
Gangnam	27	0	73
Gangdong	17	50	33

Table 5-6

Degree of Cooperativeness for Source Separation by House Type

Separation and Storage	Cooperation	Independent House	Traditional Korean House	Apartment	Tenement House	Others	Total
Briquet Ash, Combustibles and Non-combustibles	Yes	47	11	24	20	1	103
	No	31	7	13	7	1	59
	No Reply	2	-	-	1	-	3
Paper, Plastics, Bottles, Rags, etc.	Yes	19	3	11	12	1	46
	No	59	15	26	15	1	116
	No Reply	2	-	-	1	-	3
Station Storage	Yes	25	6	6	8	1	46
	No	29	8	9	11	1	58
	No Reply	26	4	22	9	-	61

Table 5-7 Information on Markets

Name	Pyonghwa	Namdaemun	Pangsan	Yongsan	Majang Dong
Total floor area (m^2)	24,704	66,000	23,336	28,467	132
Administrative space (m^2)	-	49,500	-	26,893	99
Selling floor area (m^2)	22,647	29,700	-	22,859	99
Ave. no. of workers/day	-	26	1,500	1,800	10
Ave. no. of customers/day	10,000	35,000	10,000	12,000	250
Annual gross sales (W)	-	-	5,000,000	-	-
Business hours	12 hrs	8 hrs	8:00-21:00	8 hrs	12 hrs
Daily waste generation rate(t)	5.0	-	2.75	90	0.5
Storage method	Dust chute	-	Dust chute	Plastic buckets	Plastic bucket
Collection type	Private	Dump on Premise	Public	Dump on premise	Private
Collection/week	7	-	7	-	7
Collection time	4:00	-	21:00	-	5:00-6:00
Collection fee per month (W)	715,000	-	330,000	-	35,000
Collection fee opinion	Reasonable	-	Reasonable	-	cheap
Tip	-	-	-	-	-
Self-disposal	-	-	-	-	-
Separation Cooperation*					
B + O	No	Yes	Yes	Yes	No
B + C + N	No	Yes	Yes	No	No
Several components	No	Yes	Yes	No	No
Cooperation on station storage	-	-	-	Yes	No
Comments	-	-	Should commission collection to private firm.	-	Need machinery for station storage.

*B : briquet ash, O : others, C : combustibles, N : non-combustibles.

Table 5-8 Information on Shopping Centers

Name	Sogong Underground Arcade	Hoehyon Underground Arcade	Itaewon Seoul Arcade	Midopa Dept. Store	Saeroma Dept. Store
Total floor area (m^2)	6,785	8,910	1,320	14,520	16,495
Administrative Space (m^2)	-	-	-	-	-
Selling floor area (m^2)	2,297	4,290	660	9,900	7,891
Ave. no. of workers/day	250	49	78	700	25
Ave. no. of customers/day	3,000	2,500	750	25,000	15,000
Annual gross sales (W)	-	-	-	-	550,000
Business hours	8:00-20:00	8 hrs	9:00-21:00	10:30-19:30	9 hrs
Daily waste generation rate (kg)	30	30	150	-	-
Storage method	Plastic bucket	Plastic bucket	Plastic bucket	Dust chute	Dust chute
Collection type	Private	Private	Private	Private	Private
Collections/week	7	7	1	7	5
Collection time	21:00	-	6:00	2:00	22:00
Collection fee per month (W)	120,000	-	28,000	400,000	45,000
Collection fee opinion	Expensive	Reasonable	Reasonable	-	Expensive
Tip	-	-	-	-	-
Self-disposal	-	-	-	-	-
Separation cooperation*					
B + O	-	Yes	-	No	Yes
B + C + N	-	Yes	-	No	Yes
Several components	-	Yes	-	No	Yes
Cooperation on station storage	No	Yes	No	No	Yes
Comments	-	-	-	-	-

*B : briquet ash, O: others, C : combustibles, N : non-combustibles.

Table 5-9 Information on Hotels

Name	Mammoth	Sunshine	Hilton	Koreana	Seoul Plaza
No. of floors	7	9	23	24	23
Administrative Space	-	7 floors	23 floors	32.868 m^2	23 floors
No. of rooms	219	80	710	282	540
No. of beds	345	70	1,120	-	1,080
Ave. no. of workers/day	44	35	720	300	46
Ave. no. of customers/day	530(Coffee shop) 172(Lodge)	-	3,000	200	150
Annual gross sales (W)	-	-	5 billion	-	-
Daily waste generation rate(t)	-	-	1.5	0.5	1.5
Storage method	Dust chute	Plastic bucket, Dust chute	Plastic bucket, Metal Can, Container	Plastic bucket	Plastic bucket, Plastic Container
Collection type	Private	Public	Private	Private	Self-Disposel
Collections/week	7	7	7	7	-
Collection time	3 hrs	6:00	5:00	6:00-7:00	7:00
Collection fee/mon	-	-	W100,000	W51,000	W200,000
Collection fee opinion	-	Reasonable	Reasonable	-	Reasonable
Tip	-	-	-	-	-
Self-disposal	-	Burn	-	-	Dump on premise
Separation Cooperation*					
B + O	Yes	Yes	Yes	Yes	Yes
B + C + N	No	Yes	No	Yes	Yes
Several components.	No	Yes	Yes	Yes	Yes
Cooperation on Station storage	-	-	Yes	Yes	Yes
Comments	-	-	-	-	Due to designated collection area of private companies, which means a monopoly, collection fee becomes high.

* B : briquet ash, O : others, C : combustibles, N : non-combustibles.

Table 5-10 Information on Offices and Public Facilities.

Name	Severance Bldg.	Tusan Bldg.	Seongdong Gu Office	Seoul National Stadium	Changchung-dan Park
Total area (m^2)	7,418	33,591	66	146,965	297,000
Business hours	10 hrs	8:00-19:00	8 hrs	-	-
No. of workers per day	300	14,000	20	-	-
No. of customers per day	80	1,000	50	5,900	6,500
Annual gross sales (W)	50,000	-	-	-	-
Daily waste generation rate(t)	0.7	1.0	0.001	2.5	1.5
Storage method	Dust chute	Plastic bucket	Plastic bucket	Dust chute	Concrete box
Collection type	Private	-	Public	Private	Private
Collection/week	5	4 - 5	2	3	2
Collection Time	1 hr	5:00-6:00	-	6:00-7:00	Noon
Collection fee per month (W)	49,000	-	-	270,000	185,400
Collection fee opinion	Reasonable	-	Cheap	Reasonable	Reasonable
Tip	-	-	-	-	-
Self-disposal	-	-	-	-	-
Separation cooperation *					
B + O	Yes	Yes	Yes	Yes	Yes
B + C + N	No	Yes	Yes	Yes	Yes
Several components	Yes	Yes	Yes	Yes	Yes
Cooperation on Station storage	-	-	-	No	Yes
Comments	Will cooperate in station collection when national policy in administered on basis of citizens' consciousness	-	-	Desire collection by Gu office	-

* B : briquet ash, O : others, C : combustibles, N : non-combustibles.

Table 5-11 Recycling Situation at Waste Generation Source

a. Mixed Paper

Source	Amount (kg/mon)	Revenue (W)	Buyer
Saerona Dept. Store	3,000	60,000	Secondary Materials Dealer
Severance Bldg.	50	-	-
Sunshine Hotel	10	-	Secondary Materials Dealer

b. Newspaper

Source	Amount (kg/mon)	Revenue (W)	Buyer
Household	3.75	50	Secondary Materials Dealer
Household	3.75	100	Secondary Materials Dealer
Household	2	500	Secondary Materials Dealer
Household	2	2,000	Itinerant Buyer
Household	4	200	-
Household	1	-	Secondary Materials Dealer
Household	1	300	-
Household	1	-	Secondary Materials Dealer
Household	3	2,000	-
Household	-	100	Secondary Materials Dealer
Household	3.75	1,000	Secondary Materials Dealer
Household	1	100	Secondary Materials Dealer
Household	1	60	-
Household	-	100/kg	Secondary Materials Dealer
Household	-	60/kg	Itinerant Buyer
Household	-	70/kg	Secondary Materials Dealer
Household	-	60/kg	Secondary Materials Dealer
Household	-	50/kg	Itinerant Buyer
Household	-	100/kg	Itinerant Buyer
Severance Bldg.	80	-	-
Hilton Hotel	2,000	-	Collection Firm

c. Magazines

Source	Amount	Revenue (W)	Buyer
Household	3.75 kg/mon	100	Secondary Materials Dealer
Household	60 pcs	500	-
Household	10 pcs	100	Secondary Materials Dealer

d. Plastic Containers

Source	Amount (kg/mon)	Revenue (W)	Buyer
Hilton Hotel	1,500	-	Collection Firm

e. Glass Bottles

Source	Amount (pcs/mon)	Revenue (W)	Buyer
Household	-	2/pc	Secondary Materials Dealer
Household	20-30	5/pc	Supermarket
Household	20	5/pc	Secondary Materials Dealer
Household	60	10/pc	Store
Household	3	5/pc	Store
Household	60	10/pc	Store
Household	5	50	Supermarket
Household	30	350	Supermarket
Household	30-40	300	Store
Household	10	100/Pc	Store
Household	20	10/Pc	Itinerant Buyer
Household	30	500	Store
Household	(2kg)	100	Store
Household	-	5/Pc	Store
Household	-	10/Pc	Store
Household	-	2-5/Pc	Store
Household	-	2/Pc	Store
Household	-	300	Itinerant Buyer
Household	-	200	-
Household	5	30	Secondary Materials Dealer
Household	20	100	Store
Household	20 (3kg)	200	Itinerant Buyer
Household	(2kg)	Exchange	Supermarket
Household	-	10	Secondary Materials Dealer
Severance Bldg.	(150kg)	-	-
Sunshine Hotel	50	-	Secondary Materials Dealer
Hilton Hotel	(2,000kg)	-	Collection Firm

f. Nonferrous Metals

Source	Amount (kg/mon)	Revenue (W)	Buyer
Hilton Hotel	1,000	-	Collection Firm

g. Food Waste

Source	Amount (kg/mon)	Revenue (W)	Buyer
Hilton Hotel	2,500	-	-
Plaza Hotel	some	-	-

Compiled from questionnaires to households and commercial establishments.

5-3-3 Recycling Activities and Organizations

The flow of recycling activities in Seoul is depicted in Fig. 5-2 and the organization of the recyclers under the police department is illustrated in Fig. 5-3. The information obtained from questionnaires and inquiries on self-support work corps is given in Tables 5-12 through 5-16.

A partial listing of secondary materials dealers and itinerant buyers is shown in Table 5-17. Information on secondary materials dealers and itinerant buyers is compiled in Tables 5-18 and 5-19.

The flow of glass recycling in Seoul is indicated in Fig. 5-4. Information on bottle recycling obtained from two bottling companies is listed in Table 5-20.

The organization chart of Korea Resources Recovery and Reutilization Corporation (KRRRC) is shown in Fig. 5-5 and information on KRRRC is listed in Table 5-21. The flow of activity is illustrated in Fig. 5-6 and the collection and processing amounts from 1981 to 1983 are given in Table 5-22.

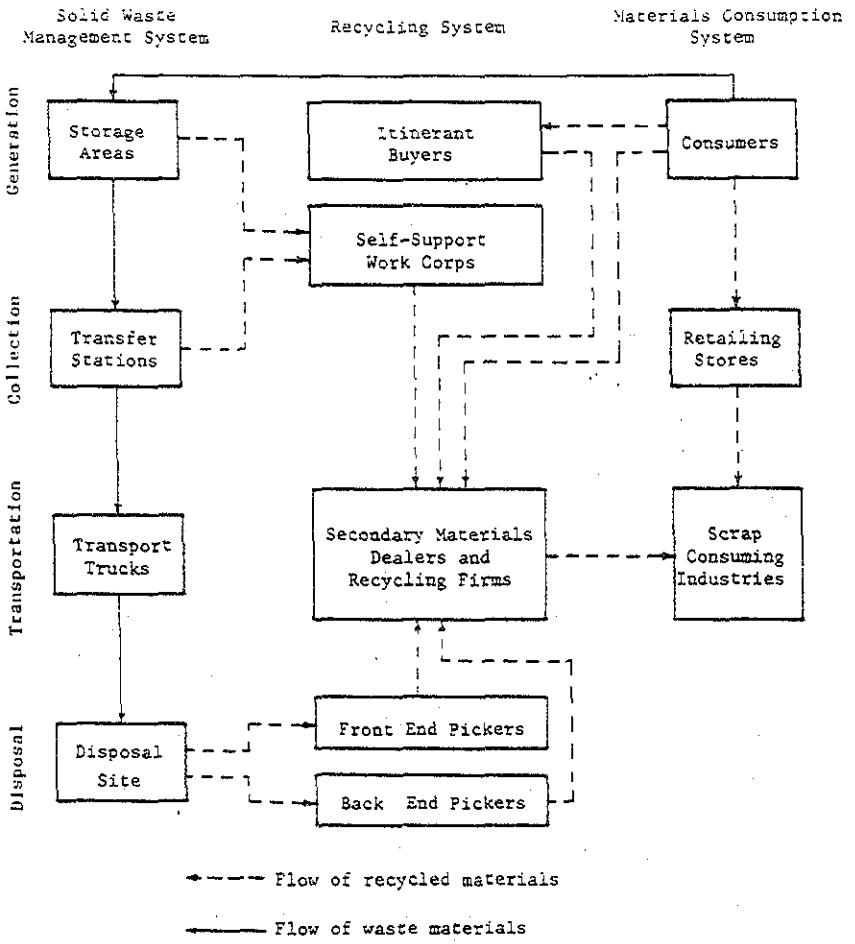


Fig. 5-2 Flow of Recycling Activities in Seoul

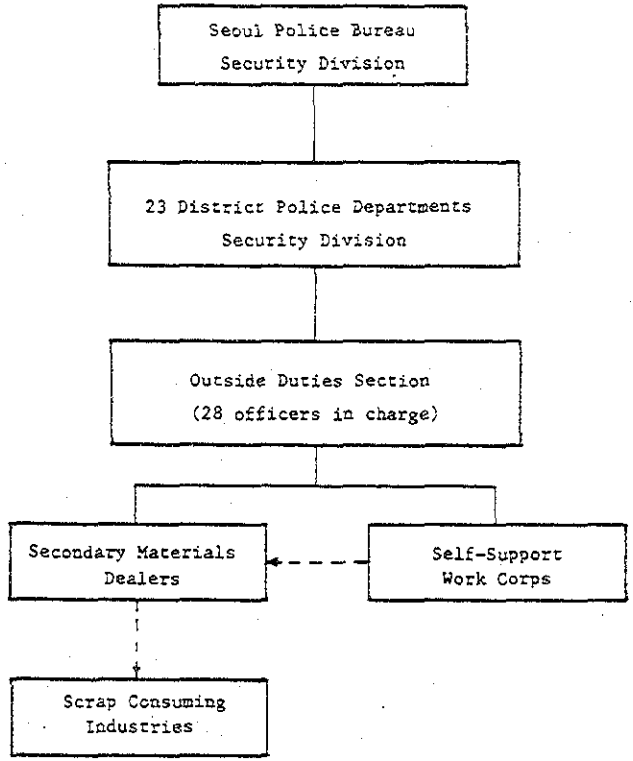


Fig. 5-3 Organization Chart of Seoul Recyclers

Table 5-12
Number of Self-Support Work Corps

District Police Department Name	Corps Number	Corps Member Number
Chungbu	1	41
Jongro	1	20
Namdaemun	2	42
Seodaemun	3	54
Dongdaemun	1	22
Yongsan	3	53
Seongbuk	2	56
Cheongryangri	3	80
Mapo	3	69
Yeongdeungpo	3	71
Seongdong	1	30
Noryangjin	2	41
Dongbu	7	145
Seobu	6	120
Bukbu	3	66
Nambu	4	61
Taeneung	4	72
Gangnam	4	93
Gwanak	2	38
Gangseu	2	36
Gangdong	3	114
Chongam	1	23
Guro	3	50
Total	64	1,397

Table 5-13
Provisions for Self-Support Work Corps

Police District having Jurisdiction	Worksnops No. Ownership	Provisions
Chungbu	2 Private	Hand carts, work clothes, caps, weighing machines
Jongro	5 Public	Work clothes
Namdaemun	4 Public	Work clothes, hand carts, baskets
Seodaemun	3 Private	None
Dongdaemun	1 Public	Work clothes
Yongsan	3 Private	Winter clothes, Underwear, sox
Seongbuk	2 Public	Work clothes, caps, shoes, daily necessities
Cheongryangri	3 Public	Work clothes
Mapo	3 Public	Hand carts, work gloves, collecting baskets
Yeongdeungpo	3 -	Work clothes, hand carts, caps,
Seongdong	1 Public	Work clothes
Noryangjin	1 Public	Work clothes
Dongbu	7 Public	Work clothes, working gear, cooking utensils, Stoves, briquets
Seobu	6 Private	Work clothes, jackets
Bukbu	3 Public	-
Nambu	5 Public & Private	None
Taeneung	4 Public	coats, sox (None this year)
Gangnam	11 Public & Private	Work clothes, caps, sox
Gwanak	2 Public	Detergents, tissue papers, soap, toothpaste
Gangseo	2 Public	-
Gangdong	3 Public	-
Chongam	1 Public	Blankets (None this year)
Guro	3 Public & Private	Hand carts, furnitures, beds, work clothes, cooking utensils

Table 5-14
Area of Workshops

Area (m^2)	Number
Less than 165	5
165 - 330	56
330 - 660	14
More than 660	3
Total	78

Table 5-15

Unit Recycling Amounts of Self-Support Work Corps

(Unit: kg/per)

Material	Summer			Winter		
	Lowest	Highest	Average	Lowest	Highest	Average
Mixed Paper	66	1,793	1,030	84	2,338	967
Cardboard	14	727	243	397	1,517	103
Printed Paper	14	228	113	75	246	130
Oil Paper	100	139	53	2	111	55
Coated Paper	-	-	128	-	-	1
Plastic Bottles	17	1,103	400	60	897	341
Plastic Film	15	367	161	9	368	135
Plastic Containers	-	-	10	-	-	10
Hard Plastics	-	-	9	-	-	5
Vinyl	-	-	(684 pcs)	-	-	(577 pcs)
Coated Floor Covering	-	-	-	-		12
Glass Cullet	31	4,767	1,070	48	2,000	904
Milk Bottles	-	-	(66 pcs)	-	-	(60 pcs)
Juice Bottles	-	-	(16 pcs)	-	-	(9 pcs)
Textile	41	792	321	15	2,399	277
Rice Bags	43	1,022	518	-	-	17.5
Glove	-	-	13	-	-	7
Rubber	13	51	31	25	107	46
Sandals	40	111	79	-	-	33
Shoes	4	353	69	6	28	32
Bones	-	-	5	-	-	5
Waste Iron	31	792	689	14	1,593	295
Cans	23	663	227	48	706	148
Stainless	5	208	100	1	128	50
Aluminum	8	69	42	7	90	33
Copper	3	14	8	1	14	6
Mixed Scrap	70	369	226	265	367	308

Table 5-16

Unit Selling Prices for Materials by Self-Support Work Corps

(Unit: ₩/kg)

Material	Summer			Winter		
	Lowest	Highest	Average	Lowest	Higher	Average
Mixed Paper	35	80	50	35	80	58
Cardboard	40	53	48	43	74	59
Printed Paper	70	80	76	-	-	80
Oil Paper	60	100	77	60	80	73
Coated Paper	-	-	40	-	-	58
Plastic Bottles	180	230	204	120	240	211
Plastic Film	21	250	96	30	250	102
Plastic Containers	-	-	100	-	-	100
Hard Plastics	-	-	55	-	-	55
Vinyl	-	-	(₩ 30/pc)	-	-	(₩ 30/pc)
Coated Floor Covering	-	-	-	-	-	30
Glass Cullet	15	23	21	20	25	24
Milk Bottles	-	-	(₩ 20/pc)	-	-	(₩ 20/pc)
Juice Bottles	-	-	(₩100/pc)	-	-	(₩100/pc)
Textile	20	50	25	20	32	25
Rice Bags	40	50	45	-	-	40
Glove	-	-	70	-	-	70
Rubber	-	-	40	-	-	40
Sandals	200	210	205	-	-	220
Shoes	200	400	248	200	350	230
Bones	-	-	30	-	-	70
Waste Iron	28	65	47	30	65	51
Cans	25	45	35	30	50	37
Stainless	120	350	216	100	350	215
Aluminum	250	850	473	200	900	471
Copper	250	1,050	853	540	1,100	854
Mixed Scrap	35	65	50	35	90	63

Table 5-17 Partial Listing of Secondary Materials Dealers

Handled Material	Dealer Name	Police District
Paper Products	Dong Young	Jongro
	Chongpa	Yongsan
	Daechon	Yongsan
	Inkyang	Seongdong
	Yu Mong	Bukbu
	Hannam	Bukbu
	Yongi	Seobu
	Saemaul	Taeneung
	Kiyong	Nambu
	Kongdan	Nanbu
	Daeyoung	Nambu
	Doksong	Nambu
	Yong Kwang	Nambu
	Taesong	Noryangjin
Plastic Products	Dong Hong	Jongro
	Hanil	Yongsan
	Yu Mong	Bukbu
	Hannam	Bukbu
	Yongi	Seobu
	Taesong	Noryangjin
Glass	Yu Mong	Bukbu
	Hannam	Bukbu
Waste Iron	Chongpa	Yongsan
	Hangang	Yongsan
	Dong Pong	Yongsan
	Kum Song	Yongsan
	Daechon	Yongsan
	Wolsung	Cheongryangri
	Cheong Ryang	Cheongryangri
	Chongrim	Cheongryangri
	Daeil	Cheongryangri
	Kongsin	Cheongryangri
	So Hung	Cheongryangri
	Honam	Cheongryangri
	Kongbuk	Cheongryangri
	Saemaul	Cheongryangri
	Daedong	Cheongryangri
	Sam Yong	Cheongryangri
	Chung Ang	Cheongryangri
	Kong Dok	Cheongryangri
	Kyongnam	Cheongryangri
	Yomun	Cheongryangri
	Iljin	Cheongryangri
	Hyok Sin	Cheongryangri
	Kong Sin	Cheongryangri
	Taechang	Cheongryangri
	Yu Mong	Bukbu
	Hannam	Bukbu
	Yongi	Seobu
	Kiyong	Nambu
	Kongdan	Nambu
	Daeyoung	Nambu
	Doksong	Nambu
	Yong Kwang	Nambu
	Hap Dong	Noryangjin
Stainless Steel	Dong Yong	Jongro
	Kum Song	Yongsan
	Daewon	Cheongryangri
Aluminum	Chongpa	Yongsan
	Hanil	Yongsan
	Daechon	Yongsan
	Oh Bok	Cheongryangri
	Yongi	Seobu
Copper	Chongpa	Yongsan
	Daechon	Yongsan
	Yongi	Seobu
Other Non-Ferrous Metals	Chongpa	Yongsan
	Dong Pong	Yongsan
	Daechon	Yongsan
	Hanil	Cheongryangri
	Jichon	Cheongryangri
	Yongi	Seobu
	Saemaul	Taeneung

Table 5-18 Information on Secondary Materials Dealers and Itinerant Buyers

District Police	No. of Sec. Mat. Dealers	No. of Itinerant Buyers	Workshop		Buying	Selling	Upgrading
			Area(m^2)	Owner			
Chungbu	0	0	-	-	-	-	-
Jongro	2	-	66-97	Private	Cash	-	-
Namdaemun	1	-	66-99	-	on-the-spot	-	-
Cheongryangri	24	-	330-660	Private	Cash	Cash	None
Yongsan	6	0	-	-	-	-	-
Mapo	0	0	-	-	-	-	-
Seongdong	1	1	264	Private	on-the-spot	Twice/mon	Drying: Winter 10% Summer 20% Spring 5% Autumn 5%
Noryangjin	2	-	83-152	-	-	-	-
Seobu	1	8	165-660	Private	-	Cash	None
Bukbu	2	2	165-264	Private	on-the-spot	on-the-spot	None
Nambu	5	-	-	-	-	-	-
Taeneung	1	-	330	Private	Cash	Cash or promissory note	None
Gangnam	0	0	-	-	-	-	-
Chongam	0	0	-	-	-	-	-

Table 5-19 Handling Rates and Unit Prices of Secondary Materials Dealers

Material	Spring						Summer					
	Handling Rate (t/mm)		Buying Price (W/kg)		Selling Price (W/kg)		Handling Rate (t/mm)		Buying Price (W/kg)		Selling Price (W/kg)	
	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average
Paper	3.5-110		50-60	52	55-70	63	3.5-120		45-60	51	55-70	62
Plastics	-	1.0	-	20	1	100	-	1.0	-	80	-	100
Vinyl	7-10	8.5	70-220	130	70-230	147	5-7	6.0	60-200	127	70-230	147
Glass Bottles	-	2.0	-	10	-	12	-	2.0	-	10	-	12
Waste Iron	1.5-120		30-65	48	30-70	55	1.0-110		30-65	47	30-70	54
Steel Cans	100-300 (pcs)		1200-2000 (per pc)	1600 (per pc)	1500-3000 (per pc)	2250 (per pc)	30-150 (pcs)		1200-2000 (per pc)	1600 (per pc)	1500-3000 (per pc)	2,250 (per pc)
Stainless steel	-	10.0	350-600	433	300-700	490	-	5.0	350-600	433	380-700	490
Aluminum	-	5.0	500-700	625	550-750	663	-	3.0	500-700	625	550-750	672
Copper	-	-	900-1000	950	930-1100	1015	-	-	900-1000	950	930-1100	1,015
Brass	-	-	800-850	817	830-870	857	-	-	800-850	817	830-870	857
Non-ferrous Metals	1.0-15		150-900	550	180-1000	603	1.0-10		150-900	550	180-1000	603

Material	Autumn						Winter					
	Handling Rate (t/mm)		Buying Price (W/kg)		Selling Price (W/kg)		Handling Rate (t/mm)		Buying Price (W/kg)		Selling Price (W/kg)	
	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average
Paper	3.6-150		50-60	53	55-70	64	2.0-150		50-60	52	55-70	64
Plastics	-	1.2	-	80	-	100	-	0.8	-	80	-	100
Vinyl	5.0-13	9.0	50-200	108	60-230	125	3.0-6.0	4.5	50-200	108	60-230	125
Glass Bottles	-	3.0	-	10	-	12	-	1.0	-	10	-	12
Waste Iron	1.5-130		30-65	48	30-70	55	1.0-110		30-60	48	30-70	55
Steel Cans	100-300 (pcs)		1200-2000 (per pc)	1600 (per pc)	1500-3000 (per pc)	2250 (per pc)	50-150 (pcs)		1200-2000 (per pc)	1600 (per pc)	1560-3000 (per pc)	2,250 (per pc)
Stainless steel	2.0-10		350-600	433	380-700	490	3.0-5.0		350-600	435	380-700	490
Aluminum	2.1-5.0		500-700	600	550-750	648	-	3.0	500-700	600	550-750	648
Copper	-	3.0	900-1000	950	930-1100	1015	-	4.0	900-1000	950	930-1100	1,015
Brass	-	-	800-850	817	830-870	857	-	-	800-850	817	830-870	857
Non-ferrous Metals	2.0-8.0		150-900	488	180-1000	545	0.7-5.0		150-900	488	180-1000	545

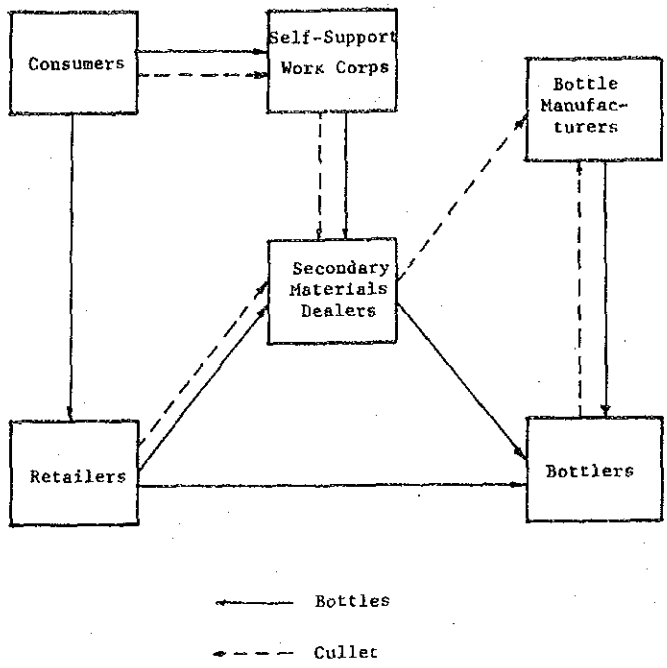


Fig. 5-4 Flow Diagram of Glass Recycling in Seoul

Table 5-20 Beer Bottle Recycling Information

Name of Factory	Bottle Size (ml)	Amount Recycled (Pcs/day)	Price		End User
			Buy (W)	Sell (W)	
Oriental Brewery	640	460,000	15	110	Liquor shops, Supermarkets, Stores
	500	690,000	20	90	
Chosun Brewery	640	1,000,000	15	100	
	500	1,000,000	20	90	

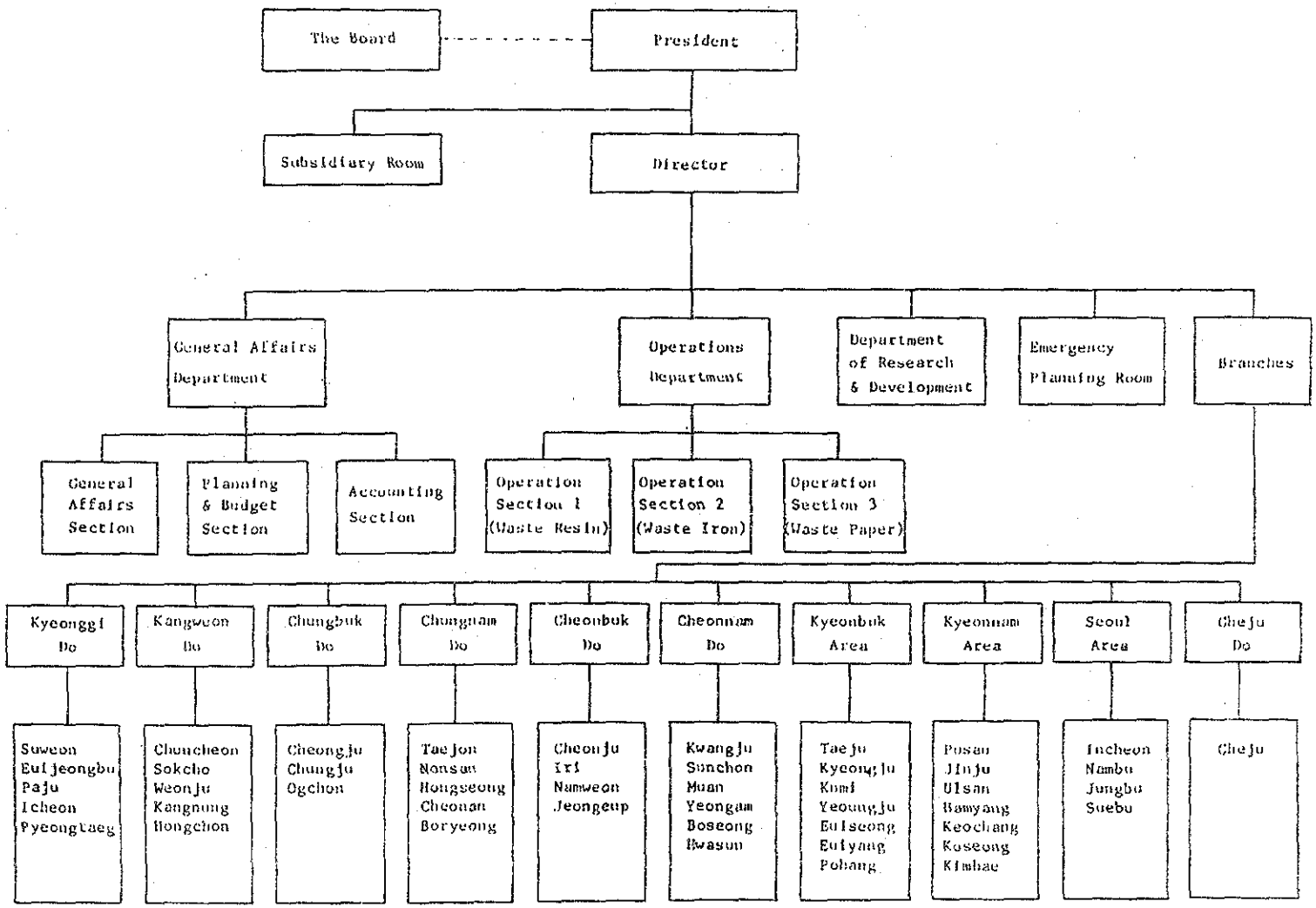


Fig. 5-5 Organization Chart of
Korea Resources Recovery and Reutilization Corporation

Table 5-21 Information on KRRRC

Item	Description
Jurisdiction Body	Office of Environment
Established	September, 1980
Recovered Material	Waste plastics (synthetic resin)
Purchase Price	W20 - W60 per kg for polyethylene plastic films
	W120 - W200 per kg for hard plastics
Selling Price	One hundredth of selling price of synthetic resins manufactured by buying manufacturer
Workshop	
Number	47 in country
Area	3,300 m^2
Incinerator	
Number	9 in country
Capacity	180 kg/hr
Operating Temp.	700 - 800°C

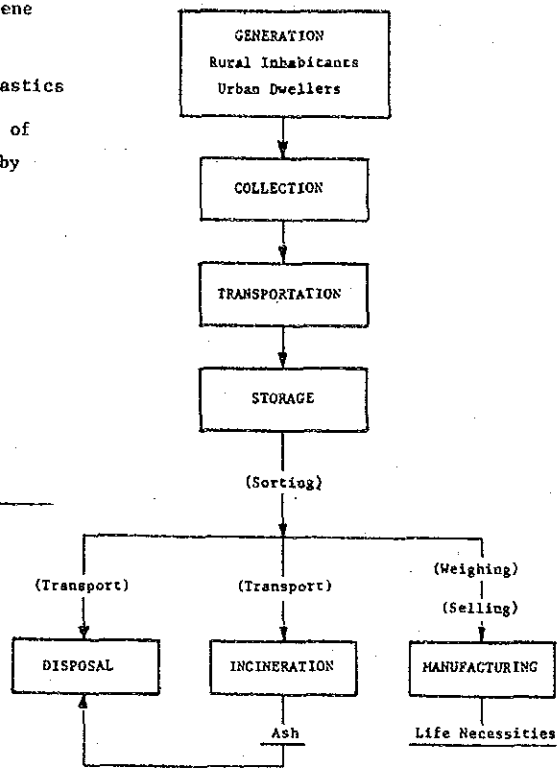


Fig. 5-6 Flow of KRRRC Activities

Table 5-22
Handling Rate of KRRRC

Year	Collected (t)	Recycled (t)	Incinerated (t)
1981	19,748	12,830	155
1982	20,572	19,877	1,330
1983	23,804	21,772	1,681

5-3-4 Agricultural Information

The results of questionnaires to farms and shops selling fertilizers or nurseries are presented in Table 5-23 to Table 5-26. The compilations of these results are shown in Tables 5-27 through 5-30. The lists of chemical and organic fertilizers available in Korea are given in Tables 5-31 and 5-32. Application data for various crops are indicated in Tables 5-33 through 5-36. Other information obtained are listed in Tables 5-37 and 5-38.

The effect of briquet ash as soil conditioner was inquired at the Agricultural Technology Research Institute in Suweon. A one-year study was carried out using soy bean as the test sample. The control sample was a product containing 6 kg/10 a of N, 82 kg/10 a of P_2O_5 and 17 kg/10 a of K_2O. The composition of the briquet ash sample is given in Table 5-39. The characteristics of the soil before the test are listed in Table 5-40. The results obtained from the test are revealed in Table 5-41. The soil with briquet ash yielded a 7% increase of the test crop.

Table 5-23 Sampling of Farms

No.	Name	Location	Total Farm Area (m^2)	Crop	Area (m^2)	Seeding Months	Harvesting Months	Fertilizing Months		Fertilizing Rate	
								Chemical	Organic	Chemical (kg)	Organic (t)
1	Ko Beong Chol	Kyeonggi Do Siheung Gun	4,950	Summer Cucumber	3,300	5/15	7/ 1- 8/10	6/15- 8/10	4/20- 5/10	500	20
				Tomato	1,650	3/10	7/20- 8/30	5/10- 8/15	3/10- 4/10	250	10
2	Choi Song Kun	Kyeonggi Do Siheung Gun	4,950	Eggplant	1,650	3/10	7/ 1-10/15	5/ 1- 9/15	April	250	10
				Pumpkin	3,300	3/10	7/ 1-10/15	5/ 1- 9/15	April	500	20
3	Lee Jong Kyun	Kyeonggi Do Bucheon Si	6,600	Chinese cabbage	3,300	Apr-Oct	-	twice/2 mon	twice/yr	900	50
				Lettuce	1,650	Apr-Oct	-	twice/2 mon	twice/yr		
				Green Leaves	1,650	Apr-Oct	-	twice/2 mon	twice/yr		
4	Jo Kyang Ha	Kyeonggi Do Paju Gun	6,600	Chinese cabbage	3,300	Dec-Apr	-	Dec end, Feb end	Sep-Oct	200	25
				Cucumber, Tomato	3,300	Apr-Jun	-	-			
5	Park Nam Sung	Gang dong Gu Jang Ji Dong	1,500	Lettuce, Pumpkin, Cucumber	1,500	Mar-Jul	Jun-Jul	Mar-Jun	Jan-Feb	80	4
6	Jong Hyo Jun	Kyeonggi Do Bucheon Si	9,240	Grapes	8,500	2/20-7/20	8/20- 9/15	2/20, 7/20, early June	Feb end	750	7.5
				Peaches	740	2/20- early July	8/20- 9/15	2/20, 7/20, early June			
7	An Ji Hyon	Kyeonggi Do Paju Gun	6,600	Apples	6,600	-	Oct-Nov	early Mar	Dec-Feb	575	15
8	Jeon Hyung Son	Kyeonggi Do Namyangju Gun	82,500	Pears	82,500	-	Sep-Oct	Apr-Jul	Jan-Mar	5,250	120
9	Kim Dok Su	Kyeonggi Do Namyangju Gun	19,800	Pears	19,800	-	Sep-Oct	3/15-Jul	12/15- 3/15	2,500	300
10	Lee Wi Hyeong	Kyeonggi Do Bucheon Si	9,900	Grapes	9,900	Mar end, early Apr, July	8/20-Sep end	July	Mar-Apr	750	25
11	Seo Kyoung Jin	Kyeonggi Do Bucheon Si	13,200	Rice	13,200	Early Apr - Sep end	Sep end	Mid-early May June	Mid-early May June	670	-
12	Kang Chang Young	Kyeonggi Do Koyang Gun	3,300	Rice	3,300	3/20-Sep	Sep-Oct	May-Jul	Jan-Mar	100	2.5
13	An Ji Heon	Kyeonggi Do Paju Gun	17,820	Rice	17,820	Apr-Sep	Oct	May-Jul	Dec-Jan	975	14
14	Heo Kyu Hae	Kyeonggi Do Paju Gun	13,200	Rice	13,300	May-Aug	20 days	May-Jul	Winter, Spring	600	1
15	Lee Myoung Woo	Kyeonggi Do Yoju Gun	3,300	Rice	3,300	6 mons.	9/15-10/30	Jun-Aug	Dec-Mar	250	5
16	Kim Byeong Kon	Kyeonggi Do Siheung Gun	3,300	Spring Mums	660	early Feb	5/15- 6/15	Mar end	11/30- 1/15	50	1
				Summer Mums	1,320	5/ 1-6/10	Sep-Oct	5/20- 6/30	4/15- 6/ 1	100	2.5
				Autumn Mums	1,320	7/25	Nov	8/20- 9/10	7/15- 7/25	100	2.5
				Winter Mums	330	8/15-9/15	2/15- 3/15	-	7/15- 8/10	-	0.8
17	Jo Seong Gab	Kyeonggi Do Bucheon Si	2,640	Lettuce, Chinese cabbage	2,640	-	-	-	-	100	0.1
18	Ho Seong Gab	Kyeonggi Do Bucheon Si	2,640	Lettuce,	-	50 days	-	-		45	0.1
				Chinese cabbage	-	45-90 days	-	once/15 days		45	0.1
				Leafy vegetable	-	20 days	-			35	0.08
19	Choi Yun Beong	Kyeonggi Do Gwangju Gun	6,600	Lettuce, Cucumber	6,600	Year round	1) Mar-Apr 2) Jul-Aug 3) Oct-Nov	-	-	3,750	125
20	Lee Yeong Sik	Kyeonggi Do Paju Gun	3,102	Chinese cabbage, cucumber	3,102	Apr-Mid May	May end	once/5 days		150	27
				Spinach, Chinese cabbage	3,102	Aug-Nov		20 days after planting			

Table 5-24 Opinions from Farmers

No.	Name	Fertilizer Used			Use Soil Conditioner	Will Use Compost		Preferred Handling	Reasonable Price(W/kg)		Compost Storage Area(m^2)	Comments
		Self produced	Bought organic	Chemical		As soil Conditioner	As Fertilizer		Soil Conditioner	Fertilizer		
1	Ko Beong Chol	-	Fowl Droppings Cow Dung Pig Dung	Complex Urea	Yes	Yes	Yes	20 kg bag	50	80	0	Lower price of fertilizer
2	Choi Song Kun	-	Fowl Droppings	Complex Urea	Yes	Yes	No	20 kg bag	500	1,000	0	
3	Lee Jong Kyun	-	MSG Organics*	Complex Urea Potassium	Yes	Yes	Yes	20 kg bag	Lower than present prices		0	
			Fowl Droppings									
4	Jo Kyang Ha	-	Pig Dung	Urea Phosphate	No	No	Yes	20 kg bag	500	1,000	0	
5	Park Nam Sung	-	Fowl Droppings	Urea Complex	Yes	No	No	20 kg bag	300	800	33	Appropriate NPK composition of fertilizer
6	Jong Hyo Jun	Manure	Fowl Droppings	Complex KCl	No	No	Yes	20 kg bag	Will decide when quality is known			
7	An Ji Hyon	Pig Dung Cow Dung Grass clippings Straw	-	Fertilizer	Yes (Lime)	-	Yes	20 kg bag	-	-	8.25	Want high quality fertilizer
8	Jeon Hyung Sou	-	Fowl Droppings Pig Dung	N,P,K	No	Yes	Yes	20 kg bag	-	-	49.5	
9	Kim Dok Su	-	Fowl Droppings	N,P,K	Yes	Yes	No	30 kg bag	-	-	23.1	
10	Lee Wi Hyeong	-	Fowl Droppings	Complex	No	No	Yes	20 kg bag	-	-	-	
11	Seo Kyoung Jin	-	Fowl Dropping	Complex	No	No	Yes	20 kg bag	40	80	-	
12	Kang Chang Young	-	Manure	Complex Urea	Yes	Yes	No	20 kg bag	50	80	0	
13	An Ji Heon	Grass Cow Dung	-	Fertilizer	No	Yes	Yes	30 kg bag	40	100	33	
14	Heo Kyn Hae	Grass Straw Pig Dung	-	Fertilizer	Yes	Yes	Yes	20 kg bag	Lower than fertilizer	same as present	4.95	
15	Lee Myoung Woo	Manure Cow Dung Straw Grass	-	Fertilizer	No	No	Yes	20 kg bag	50	100	66	
16	Kim Byeong Kon	-	Fowl Droppings	Complex	Yes	Yes	No	20 kg bag	50	100	0	
17	Jo Seong Gab	-	MSG Organics Fowl Droppings	Complex	Yes	Yes	No	20 kg bag	120	Satisfied with present price	66	
18	Ho Cheol Jae	-	MSG Organics	Complex Urea	Yes	No	-	20 kg bag	30	100	0	Manufacture a fertilizer which does not change the soil
19	Choi Yun Beong	-	Pig Dung Cow Dung Fowl Droppings	N,P,K	No	No	Yes	20 kg bag	50	100	0	
20	Lee Yeong Sik	-	Fowl Droppings	Fertilizer	No	Yes	Yes	30 kg bag	40	100	0	Product should be easy-handling, small particles

*MSG organic is residue from monosodium glutimate production

Table 5-25 Sampling of Fertilizer Shops

No.	Shop Name	Location	Product Name	Composition	Selling Unit	Unit Price (₩)	Monthly Rate Selling
1	Chong Dam Flower Shop	Gang Nam Gu Chong Dam Dong	Organic Fertilizer Fowl Droppings	Peat, N,P,K Iron	1kg bag Bag	1,000 2,000	15kg
2	Woo Jin Farms	Gang Nam Gu Chong Dam Dong	Organic Manure	N,P	1kg 500g	1,000 500	200kg
			Fertilizer Fowl Droppings	Ca, organics	200g 1kg	300 1,500	(Spring,Summer) 70kg (Spring)
3	Yuk Kyo Flower Shop	Yeongdeungpo Gu Tae Rim Dong	Pung Sam Fertelizer	Organics	5kg bag	1,000	300kg (Mar-May) 60kg (Jun-Feb)
4	Hung Nong Flower Shop	Jongro Gu Jongro 5Ga	Seng Myong Jong	N,P,K	1kg	1,000	20kg
			MSG Organic Fertilizer	N,P,K,B Organics	1kg	1,000	25kg
5	Tae Rim Flower Shop	Yeongdeungpo Gu Tae Rim Dong	Sang Wo Sang Sa	Organics	5kg bag	1,000	750kg (Mar-May) 50kg (Jun-Feb)
6	Kwang Sin Flower Shop	Dongdaemun Gu Yong Too 2Dong	Fowl Droppings Fertilizer	Fowl Dropping	500g	200	15kg
			Natural Organic Fertilizer	Organics	500g	200	15kg
			Mini-Green	Organics	1.5ℓ	500	45ℓ
			Fertilizer for Grass and Flowers	Organics	1kg	1,000	10kg
			Peat	Dead Leaves Compost	10kg	1,500-2,000	150kg
7	Jegi Nursery	Dongdaemun Gu Yong Too Dong	MSG Complex	Organics	1kg	800	20kg
			Peat	Compost	500g 1kg 5kg	100 200 1,000	15kg 30kg 150kg
8	Tae Yang Flower Shop	Yeongdeungpo Gu Tae Rim Dong	Pung San Fertilizer	Organics	2kg	500	500kg (Mar-May) 60kg (Jun-Feb)
9	Sang Woo Gardening Supply Center	Gang Nam Gu So Cho Dong	Cheil Je Dang Organic Complex Fertilizer	N,P,K	25kg	3,000	200kg
			Sang Woo Pyo Organic Fertilizer	N,P,K	5kg	400	50kg
10	Korea Gardening Supply Center	Gang Nam Gu So Cho Dong	Poong Kuk Bik Jamsu	N,P,K	20kg	3,500	400kg
			Poong Kuk Yubak Yukil	N,P,K	20kg	5,000	300kg
			Hankuk Organic Fertilizer	N,P,K	20kg	3,500	500kg

Table 5-26 Opinions from Fertilizer Shops

No.	Shop Name	Will You Sell Solid Waste Products			Opinions on Reasonable Prices (W/kg)						Comments
		As Soil Conditioner	As Fertilizer	Briquet Ash Soil Conditioner	Organic Soil Conditioner		Briquet Ash Soil Conditioner		Organic Fertilizer		
					Buy	Sell	Buy	Sell	Buy	Sell	
1	Chong Dam Flower Shop	Yes	Yes	Yes	600	1,000	600	1,000	1,000	1,600	-
2	Woo Jin Farms	Yes	Yes	Yes	400	750	200	400	1,200	1,600	-
3	Yuk Kyo Flower Shop	Yes	Yes	Yes	150	200	50	60	800	1,000	Composition of fertilizer must be appropriate
4	Hung Nong Flower Shop	No	No	No	-	-	-	-	-	-	-
5	Tae Rim Flower Shop	Yes	Yes	Yes	200	400	40	60	1,000	1,200	Fertilizer must have appropriate composition with reasonable price
6	Tae Rim Flower Shop	Yes if reaction is good			700	1,000	500	1,000	-	-	Chemical fertilizer for agricultural use should be sold in small packages
7	Kwang Sin Flower Shop	Yes	Yes	Yes	-	500	-	-	-	850	Indication of proper dosage rate and method
8	Tae Yang Flower Shop	Yes	Yes	Yes	250	400	50	100	1,000	1,500	-
9	Sang Woo Gardening Supply Center	Yes	Yes	Yes	400	700	250	500	1,000	1,500	-
10	Korea Gardening Supply Center	Yes	Yes	Yes	600	1,000	100	150	800	1,500	Will decide after seeing the products

Table 5-27 Opinions on Use of Solid Waste Products

(%)

Opinion	Yes	No	Undecided
Fertilizer Shops (10 shops)			
Sell Solid Waste Products?			
Soil Conditioner	80	10	10
Fertilizer	80	10	10
Briquet Ash	80	10	10
Farmers (20 farms)			
Buy Compost Made from Solid Waste?			
Soil Conditioner	55	40	5
Fertilizer	65	30	5

Table 5-28 Preferred Packaging of Products

Item	10kg	20kg	30kg	Others	Total
Number	1	16	3	0	20
Percentage (%)	5	80	15	0	100

Table 5-29 Preferred Prices for Products from Solid Waste

(Unit: W/kg)

Parameter	Organic Soil Conditioner		Briquet Ash Soil Conditioner		Organic Fertilizer	
	Buy	Sell	Buy	Sell	Buy	Sell
Fertilizer Shops						
No. of Replies	8	9	8	8	7	8
Lowest	150	200	40	60	800	850
Highest	700	1,000	600	1,000	1,200	1,600
Average	413	661	224	409	971	1,344
Farms						
No. of Replies		13				14
Lowest		30				80
Highest		500				1,000
Average		140				403

Table 5-30 Availability of Storage Area

Item	(m^2 of Storage Area)/(ha of Farm Area)				
	>120	120-0	0	No Reply	Total
Number	3	6	9	2	20
Percentage (%)	15	30	45	10	100

Table 5-31 List of Fertilizers

	Kind	Composition	Unit	Price (W)	Supplier
Chemical Fertilizer	Urea	N 46%	25 kg	6,230	Agricultural cooperative
	Aluminum Sulfate	N 21%	25 kg	2,780	"
	Fused Magnesium Phosphate	P 20%	25 kg	2,340	"
	Fused Superphosphate	P 20%	25 kg	2,340	"
	Potassium Chloride	K 60%	25 kg	2,150	"
	Complex	21-17-17	25 kg	5,110	"
	Complex	17-21-17	25 kg	4,950	"
	Complex	18-18-18	25 kg	4,830	"
	Slaked Lime	Lime & Mg 60%	25 kg	815	"
	Silicic Acid	(Si-Mg-Alk) 25-2-15	25 kg	885	"
	Boron	Boron 30%	2 kg 25 kg	1,200 13,000	Taeyu Chemical
	Gardening Complex	11-10-10 +3(soil)+0.3(B)	25 kg	5,350	Kyeonggi Fert. Co.
	Gardening Complex	9-12-9 +40(Organics)	25 kg	5,950	"
	Solid Complex (for Paddy)	13-10-11 +0.3(B)	25 kg	4,460	"
Organic Fertilizer	Manure	0.5-0.1-0.2	kg	15	
	Fowl Droppings	1.3-1.5-0.5	kg	25	
	Biwang Organic	Org. 50-70%	20 kg	3,500	Biwang Inc.
	Miwan Organic	"	"	"	Miwan Inc.

Source: Seoul Rural Counseling Office
Korea Fertilizer Industrial Association

Table 5-32 Organic Fertilizer from Monosodium Glutimate By-Product

Product Name	Composition	Package Unit	Price (W)	Use
Organic Fertilizer	TN:4-5, K_2O:1-2	25 kg	3,000	Base Manure
Organic Complex No.2	10-0-2	25 kg	3,600	Gardening, Grass, Tobacco
Organic Complex No.3	10-0-8+0.3(B)	20 kg	4,000	Gardening, Tobacco, Fruits
Organic Complex Special	10-8-8+0.3(B)	20 kg	4,600	Base Manure, Rice, Garlic, Gardening, Red Pepper

Source: Cheil Sugar Co., Ltd.

Table 5-33 Fertilizer Application Data for Vegetables

Crop	Seeding Month	Harvest Month	Application Period		Application Rate (kg/10a)						
					Chemical					Organic	
			Base	Additional	N	P	K	Lime	B	Manure	Droppings
Rice	Apr.	Oct.	Apr, May	Jun, Jul	11	7	8			1,200	450
Lettuce	Oct. mid	Jan.-Mar.	Oct. beg	Dec.-Feb.	20	15	10	100		2,000	
Spinach	Sep. end	Feb.-Mar.	Sep. mid	Nov.-Jan.	30	15	21	100		2,000	
Cucumber	Jan.	Apr.-May	Mar.	Mar.-Apr.	35	26	30	120		3,000	300
Pumpkin	Jan.	Apr.-May	Mar.	Mar.-Apr.	25	20	23	120		2,500	250
Raddish	Aug. end	Nov. beg	Aug. mid	Sep.	27	15	24	100	1	800	
Chinese Cabbage	Aug. mid	Nov. beg	Aug. beg	Sep.	24	20	25	2,100	1	2,500	

Source: Seoul Rural Counseling Office

Table 5-34 Manure Application Rates

(Unit:Kg/10a)

Crop	Manure	N	P	K
Red Pepper	1,000	20	20	23
Tomato	2,000	33	22	33
Eggplant	3,000	30	15	27
Cucumber	2,000	32	15	25
Melon	2,000	23	16	19
Cantaloupe	2,000	20	15	22
Watermelon	2,000	24	20	24
Pumpkin	2,000	20	16	16
Strawberry	2,000	19	15	17
Green Peas	1,000	8	11	10
Beans	1,500	10	11	12
Chinese Cabbage	1,500	25	20	25
Cabbage	1,500	30	20	24
Lettuce	2,000	20	15	20
Spring Mums	1,000	15	8	12
Spinach	1,200	25	15	15
Beet	1,000	14	5	7
Raddish	1,000	16	12	16
Carrot	2,000	20	15	17
Turnip	1,000	18	11	15
Burdock	1,000	20	15	20
Ginger	2,600	26	16	23
Green Onion	3,000	25	25	30
Onion	1,500	24	16	24
Garlic	1,500	25	20	20

Source : Rural Promotion Office

Table 5-35

Fertilizer Application Rates for Fruits

(Unit: kg/10 a)

Crop.	Age (Yr)	Chemical			Organic
		N	P	K	
Apple	1 ~ 4	2	1	1	300
	5 ~ 9	2 ~ 4	1 ~ 2	2 ~ 3	1,000
	Over 10	5 ~ 20	2 ~ 12	3 ~ 15	1,875
Pear	1 ~ 4	2	1	1	300
	5 ~ 9	3 ~ 6	3 ~ 4	3 ~ 5	1,000
	Over 10	10 ~ 25	5 ~ 18	8 ~ 25	1,875
Peach	1 ~ 2	2	1	1	300
	3 ~ 4	3 ~ 5	2 ~ 3	2 ~ 4	1,000
	Over 5	7 ~ 18	4 ~ 10	5 ~ 15	1,875
Grape	1 ~ 2	2	1	1	300
	3 ~ 4	3 ~ 5	2 ~ 3	2 ~ 4	1,000
	Over 5	7 ~ 18	4 ~ 10	5 ~ 15	1,875

Source: Rural Promotion Office

Table 5-36 Organic Fertilizer Application Rates (MSG By-Product)

(Unit: kg/10 a)

Crop		Base	Additional
Rice, Wheat, Grass		40	50 ~ 75
Potatoes		20	50 ~ 75
Corn		20	75 ~ 125
Tobacco		40	75 ~ 125
Mulberry		20	50 ~ 75
Raddish		40	50 ~ 100
Chinese Cabbage		40	75 ~ 125
Carrots, Pumpkin, Lettuce		40	75 ~ 100
Red Pepper, Onion, Garlic		60	75 ~ 150
Cucumber, Eggplant		60	100 ~ 200
Watermelon, Melon, Tomato		60	75 ~ 150
Strawberry		40	25 ~ 50
Apple, Pear	Young	1	1 ~ 3
	Mature	3	5 ~ 10
Peach, Grape	Young	1	1 ~ 2
	Mature	2	3 ~ 7
Chestnut	Young	2	1 ~ 2
	Mature	4	3 ~ 6
Persimmon, Crabapple	Young	1	1 ~ 2
	Mature	2	2 ~ 5
Orange	Young	1	1 ~ 2
	Mature	2	1 ~ 4

Source: Cheil Sugar Co., Ltd.

Table 5-37 Fertilizer Demand By Elements in 1984

(Unit: ton)

Item	Seoul City	Incheon City	Kyeonggi Do	Total
Estimated Demand	2,540	1,260	84,660	88,460
Received	2,639	1,466	103,644	107,749
Sold	1,642	936	70,626	73,204
Stock	997	530	33,018	34,545

Source: National Agricultural Cooperative Federation

Table 5-38 Planted Area of Crops in 1982

(Unit: ha)

Crop	Seoul City	Incheon City	Kyeonggi Do	Total
Rice	2,079	2,118	176,369	180,566
Other Grains	190	410	32,935	33,535
Vegetables	2,445	942	47,267	50,654
Special Crops	35	76	12,471	12,582
Fruits	141	103	9,795	10,039
Mulberry	-	-	966	966
Permanent Crops	108	30	2,050	2,188
Horticulture Crops	372	56	1,981	2,409
Others	173	265	19,791	20,229
Subtotal (excluding Rice)	3,464	1,882	127,256	132,602
Total	5,543	4,000	303,625	313,168

Source: Yearbook of Agriculture and Forestry Statistics, Ministry of Agriculture and Fisheries.

Table 5-39 Chemical Composition of Briquet Ash Sample

Element		Content
Carbon	(%)	61.8
T-N	(%)	0.13
C/N		475.4
P_2O_5	(%)	0.094
CaO	(%)	1.535
MgO	(%)	0.850
K_2O	(%)	1.109
Fe	(ppm)	7615
Mn	(ppm)	209

Table 5-40 Chemical Characteristics of Soil Before Test

Item	Surface Soil	Underground Soil
pH	6.37	5.63
Organic Matter (%)	2.0	1.5
Total Nitrogen (%)	0.105	0.080
P_2O_5 (ppm)	10	6
Ca (me/100g)	7.98	4.62
Mg (me/100g)	1.73	1.63
K (me/100g)	0.13	0.13
CEC* (me/100g)	11.13	10.15
Carbon (%)	1.16	-

*Cation Exchange Capacity

Table 5-41 Results of Tests with Briquet Ash

Item	30 days	60 days	Flowering Time	90 days	Harvest Time
Organic Matter Content in soil(%)	1.81 (1.74)	1.96 (1.95)	2.11 (1.82)	2.40 (2.03)	2.24 (2.00)
T-N Content in Soil	0.157 (0.142)	0.148 (0.130)	0.182 (0.162)	0.174 (0.158)	0.124 (0.117)
C/N Ratio	11.52 (12.25)	13.24 (15.00)	11.59 (11.24)	13.79 (12.84)	18.06 (17.09)
Microorganism Count (No./gr)	203 (291)	296 (160)	324 (238)	61 (145)	57 (118)
T-N Content in Stalks and Leaves (%)	-	-	3.06 (2.85)	-	2.77 (2.82)

Note: Values in parentheses denote those of control sample

5-3-5 Activities at Nanjido

At the Mapo Gu office, the situation of recycling at Nanjido landfill site and the production of bricks made from briquet ash at a plant located in the premise of the Nanjido landfill were questioned. The information obtained on these subjects are compiled in Tables 5-42 to 5-44.

Table 5-42 Information on Recycling at Nanjido

Item	Description
Management	Self-managed by residents
Recyclers	Apporis (front end pickers) Tipporis (back end pickers)
Population	2,517 (as of January, 1984) of these: 1,079 are apporis and 1,438 are tipporis
Households	712 (as of January, 1984)
Housing	About 450 wooden or corrugated sheet metal shacks, plus about 250 shacks for temporary use.
Working Area	According to Gu About 40-50 apporis registered to each
Premium	Paid by apporis only
Income	W300,000 to W1,000,000
Income	Apporis : over W250,000/mon Tipporis: W100,000-300,000/mon

Table 5-43 Utilities at Nanjido

Utility	Facility	Number	Note
Water Supply	Wells w/hand pump	612	50 disinfected once a month by dispensary
	Motorized	1	Serves 108 households
Sanitary Facilities	Self-treated toilets	350	
	Public toilets	None	
Fuel	Briquet	182 households	
	Firewood	620 households	Procured locally at site.
	Methane gas		Through pipes driven into fill.
Lighting	Supplied power	186 households	From Korea Electric. Co.
	Self-generated power	310 households	Diesel-driven generators,
	Others		Candles, oil, etc.
Communication	Telephone	12	Owned by preachers and merchants

Table 5-44 Information on Briquet Ash Brick Production

Item	Description
Operation Period	March, 1977 - June, 1979
Plant Area	132,330 m^2
Location	Central north section of Nanjido landfill site
Products	Exterior bricks : limestone + carbide + briquet ash (with reddish coloring)
	Interior bricks : fly ash + carbide + briquet ash
Costs	Initial : W2.1 billion
	O & M : W400 million
Owner	Puhan Development Company
Product Price	Exterior bricks : W70 each
	Interior bricks : W23 each
Planned Production Rate	Exterior bricks : 11,540 pcs/day
	Interior bricks : 51,290 pcs/day

5-4 Considerations

5-4-1 Materials

Assuming a recycling population of 4,000 persons, the annual recycling rates for broadly categorized materials are listed in Table 5-45. The average unit prices for these materials as received by self-support work corps are also shown in this table.

Table 5-45 Annual Recovery Rates and Unit Prices

Material	Unit Rate (kg/per/yr)	Total Annual Rate (t/yr)	Average Unit Price (W/kg)
Paper	16,164	64,656	60
Plastics	6,432	25,728	100
Textile	3,588	14,352	20
Glass	11,844	47,376	20
Ferrous Metals	8,160	32,640	40
Nonferrous Metals	1,440	5,760	500

The feasible unit prices for marketability are indicated below.

Material	W/kg
Paper	20
Plastics	25
Textile	20
Glass	15
Ferrous Metals	25
Nonferrous Metals	100

These are minimum prices for materials excluding paper received by self-support work corps. In 1984, the import of wastepaper caused the local market value of secondary paper to drop considerably. Moreover, the imported variety is of better quality. As a consequence, the demand for local wastepaper has drastically declined and this is reflected in the price of paper.

5-4-2 Briquet Ash

Since briquet ash occupies a large percentage of Seoul's waste, effective use of this ash is very important to reduce the load on disposal. Uses such as soil conditioner and brick manufacture material have been tried without enormous success. However, as of now, uses as filling material for land reclamation and cover material for landfill operations seem to be the most promising. Other uses need further research to determine their actual feasibilities.

5-4-3 Compost

The land area in 1982 for Seoul City, Incheon City and Kyeonggi Do totaled 11,661.84 km^2. The cultivated area of crops within these three locations is about 313 thousand hectares as was shown in Table 5-38.

The demand for chemical fertilizer was indicated in Table 5-37. However, the demand for compost is not equal to the demand for chemical fertilizer. As a rule of thumb, an annual rate of 1t/10a of compost is believed to be a fair estimate. Therefore, for the total planted area mentioned above, a potential demand rate of about 3,000,000t/yr of compost can be expected.

On the other hand, compost application to rice is not recommended because compost can rot the roots of crops planted in paddy fields. Then from Table 5-38, the total area would be about 133 thousand ha. Consequently, the actual potential demand comes to about 1,330,000t/yr. The breakdown of this amount into regions is as follows.

Seout City	:	40,000 t/yr
Incheon City	:	20,000 t/yr
Kyeonggi Do	:	1,270,000 t/yr
Total	:	1,330,000 t/yr

Since the use of compost is seasonal, availability of storage space becomes a significant factor. This availability at farms, as obtained from the survey, was shown in Table 5-30. If a storage requirement of 120 m^2 for one ha of farmland is assumed, the table indicates that only 15% of farms have enough space to store compost.

If compost is to be delivered to Kyeonggi Do, where the demand is high, the transportation costs can upset the feasibility. Other factors such as the lack of available storage space will contribute to making composting unfavorable.

However, if composting is to be considered, uses other than as soil conditioner or fertilizer need to be planned. Possibilities include using the product as fill material for land reclamation or as cover material for landfill operations. The benefits from these uses do not necessarily include financial aspects.

5-4-4 Overall

The marketabilities of briquet ash products is presently too low for feasibility. However, due to the fact that the shortage of cover materials is evident in Seoul when sanitary landfilling is carried out, these product of low marketability will serve as excellent cover materials.

As for materials, sophisticated recovery on mixed waste of Seoul City is economically unfeasible, especially on the combustible components. To alleviate this situation, the following recommendations are made.

1. Source separation of easily separatable materials such as corrugated paperboard, newspaper, magazines and glass bottles by the residents. These can be collected separately by such groups as the self-support work corps.

2. Separation of waste into briquet ash, combustibles and non-combustibles. The briquet ash can be used as cover material for landfill operations and the combustibles can be appropriately processed for volume reduction. The non-combustible components should be processed through a simple system of, for example, hand-sorting and magnetic separation. This can recover ferrous metals, non-ferrous metals, glass (cullets) and plastics.

The above recommendations should be carried out in combination for a feasible planning of resources recovery to conserve depleting resources as well as reduce the load on limited disposal capacity.

6. LEACHATE QUALITY SURVEY

6-1 Objectives

The quality of leachate at Nanjido landfill site was investigated along with its effect on a nearby stream. Samplings and analyses were conducted three times to determine seasonal fluctuations, if any. The sampling dates were as follows.

First sampling (Summer) : August 9, 1984

Second sampling (Autumn): November 28, 1984

Third sampling (Winter) : February 2, 1985

The results will be used as basic data for planning leachate treatment of the present fill as well as future ones.

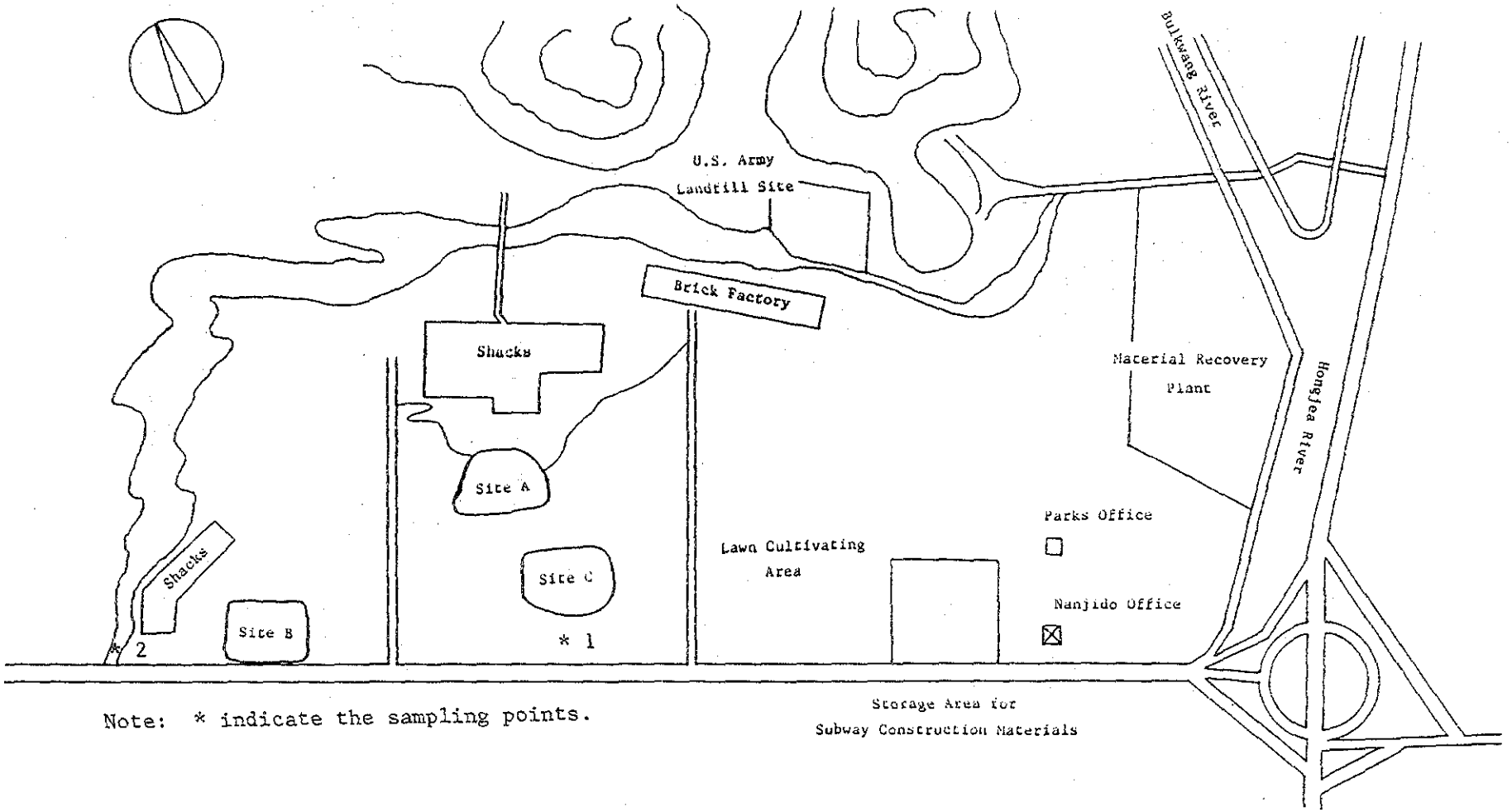
6-2 Survey Method

6-2-1 Site Selection and Sampling

Two samples were collected in plastic bottles for each survey, one in the heart of the landfill site and another from a nearby stream as reference as to the extent of contamination. The sampling points are plotted in Fig. 6-1.

6-2-2 Analysis

The collected samples were delivered to the analysis lab immediately after sampling. The chemical analysis was contracted to the chemical analysis center at KAIST. The analyzed indicators along with analytical methods are listed in Table 6-1.



Note: * indicate the sampling points.

Fig. 6-1 Location of Sampling Points

Table 6-1 Items for Leachate Analysis

Indicator	Pretreatment	Quantitative Analysis	Instrument
pH		Electrometry	pH meter with glass electrode
BOD	Cultivation	Volumetric analysis (Winkler -sodium azide method)	
COD	Treatment with $KMnO_4$ at 100 C	Volumetric analysis (Redox titration)	
SS	Filtration with fiber glass filterpaper	Gravimetric analysis	
Total Phosphorous	Acid digestion	Colorimetric analysis (Molybdenum Blue Method)	Colorimeter or Spectrophotometer
Total Nitrogen	Kjeldahl digestion (N - NH_3), then distillation	Volumetric analysis (Neutralization)	
NH_3 - Nitrogen	Distillation	Volumetric analysis (Neutralization)	
NO_2 - Nitrogen		Colorimetric analysis (α-Naphthylamine -Sulfanylacid Method)	Colorimeter or Spectrophotometer
NO_3 - Nitrogen	Reduction with Devarda (N - NH_3) distillation	Volumetric analysis (Neutralization)	
	Reduction with Zn	Colorimetric analysis (Naphthyl Ethylene Diamine Method)	Colorimeter or Spectrophotometer

6-3 Results

The analytical results for the leachate survey are indicated in Table 6-2.

6-4 Considerations

Samples were taken at a small pond near center of Nanjido, which was filled with almost raw leachate and at a nearby stream. In Sample No.1, which is regarded as leachate, BOD, COD and SS fluctuate much through seasons. Water quality is the worst in summer. However, water quality in nearby stream doesn't fluctuate much. Because leachate is diluted by the water of Han River, which is already poluted by human activities, the water quality is supposed not to vary so much.

Table 6-2

Quality of Leachate and Stream Water at Nanjido

Sample Number	Season	pH (-)	BOD (mg/ℓ)	COD (mg/ℓ)	SS (mg/ℓ)	T-P (mg/ℓ)	T-N (mg/ℓ)	NH_3-N (mg/ℓ)	NO_2-N (mg/ℓ)	NO_3-N (mg/ℓ)
1	Summer	6.8	27,000	2,700	240	30		1,600	< 0.01	0.34
2		7.7	18	17	40	10		4	1.2	0.95
1	Autumn	8.55	2,900	1,500	220	9	1,200	1,200	< 0.1	6.1
2		7.7	64	28	80	< 5	95	50	< 0.1	0.1
1	Winter	7.80	263	260	150	2	140	170	< 0.1	< 0.1
2		6.90	56	30	40	2	30	40	< 0.1	< 0.1

Note: Sample No. 1 : Leachate from pond near center of Nanjido
Sample No. 2 : Sample from nearby stream

7. REMARKS

The results obtained and the considerations made on them for the five surveys are used as basic data for proposing the optimum long term plan and the short term improvement project. However, due to the limited number of samplings within a limited period, the results cannot be used absolutely, but rather to compare and supplement existing data, or in the case where data is unavailable, the results from the basic field survey will be used with carefully considered discretion.

APPENDIX IV

FINANCIAL CALCULATION RESULTS

Case 1: Collection Fee - at present level
Self-Sustaining Degree - 30%

****
* irr = 7.98 % *
****

year	actual cash flow cost	benefit	discount factor	discounted cost	discounted benefit	net benefit
1986	-2871	0	1.000	-2871	0	-2871
1987	-9503	0	0.926	-8801	0	-8801
1988	-25779	4523	0.858	-22109	3879	-18230
1989	-4883	9047	0.794	-3878	7185	3307
1990	-4860	9047	0.736	-3575	6654	3080
1991	-4864	9047	0.681	-3313	6162	2849
1992	-4835	9026	0.631	-3050	5694	2644
1993	-5128	9004	0.584	-2996	5260	2264
1994	-11906	8983	0.541	-6441	4860	-1581
1995	-9635	8961	0.501	-4827	4489	-338
1996	-5830	8940	0.464	-2705	4148	1443
1997	-5833	8919	0.430	-2506	3832	1326
1998	-6156	8897	0.398	-2449	3540	1091
1999	-5830	8877	0.368	-2148	3271	1123
2000	-11867	8854	0.341	-4050	3021	-1028
2001	-7705	8833	0.316	-2435	2791	356
2002	-5835	8812	0.293	-1708	2579	871
2003	-5828	8792	0.271	-1580	2383	803
2004	-5846	8771	0.251	-1467	2201	734
2005	-5794	8750	0.232	-1347	2034	687
2006	-12061	8750	0.215	-2596	1883	-713
2007	-8035	8750	0.199	-1602	1744	143
2008	54344	4375	0.185	10032	808	10840
				-78420	78420	-0

Case 2: Collection Fee - at present level
Self-Sustaining Degree - 34%

****
* irr = 5.10 % *
****

year	actual cash flow cost	benefit	discount factor	discounted cost	discounted benefit	net benefit
1986	-2871	0	1.000	-2871	0	-2871
1987	-9503	0	0.952	-9042	0	-9042
1988	-25779	3991	0.905	-23340	3613	-19726
1989	-4883	7982	0.861	-4207	6876	2670
1990	-4860	7982	0.820	-3984	6543	2559
1991	-4864	7982	0.780	-3794	6226	2432
1992	-4835	7963	0.742	-3588	5910	2321
1993	-5128	7944	0.706	-3621	5610	1989
1994	-11906	7926	0.672	-8000	5326	-2674
1995	-9635	7907	0.639	-6160	5055	-1105
1996	-5830	7888	0.608	-3547	4799	1252
1997	-5833	7869	0.579	-3376	4555	1179
1998	-6156	7850	0.551	-3391	4324	933
1999	-5830	7832	0.524	-3055	4105	1049
2000	-11867	7813	0.499	-5918	3896	-2022
2001	-7705	7794	0.474	-3656	3698	42
2002	-5835	7776	0.451	-2634	3511	876
2003	-5828	7758	0.430	-2504	3333	829
2004	-5846	7739	0.409	-2390	3163	774
2005	-5794	7721	0.389	-2254	3003	749
2006	-12061	7721	0.370	-4464	2857	-1606
2007	-8035	7721	0.352	-2829	2719	-111
2008	54344	3860	0.335	18209	1293	19502
				-90415	90415	-0

Case 3: Collection Fee - at present level
Self-Sustaining Degree - 27%

****
* irr = 10.84 % *
****

year	actual cash flow cost	benefit	discount factor	discounted cost	discounted benefit	net benefit
1986	-2871	0	1.000	-2871	0	-2871
1987	-9503	0	0.902	-8573	0	-8573
1988	-25779	5026	0.814	-20981	4091	-16891
1989	-4883	10052	0.734	-3585	7381	3795
1990	-4860	10052	0.662	-3219	6659	3439
1991	-4864	10052	0.598	-2907	6007	3100
1992	-4835	10028	0.539	-2607	5407	2800
1993	-5128	10004	0.486	-2494	4866	2372
1994	-11906	9981	0.439	-5224	4380	-845
1995	-9635	9957	0.396	-3814	3942	127
1996	-5830	9933	0.357	-2082	3547	1465
1997	-5833	9909	0.322	-1879	3193	1313
1998	-6156	9886	0.291	-1789	2874	1084
1999	-5830	9862	0.262	-1529	2586	1057
2000	-11867	9839	0.237	-2807	2328	-480
2001	-7705	9815	0.213	-1644	2095	450
2002	-5835	9792	0.193	-1124	1885	762
2003	-5828	9769	0.174	-1012	1697	685
2004	-5846	9745	0.157	-916	1527	611
2005	-5794	9722	0.141	-819	1375	555
2006	-12061	9722	0.128	-1538	1240	-298
2007	-8035	9722	0.115	-925	1119	194
2008	54344	4861	0.104	5642	505	6146
				-68701	68701	-0

Case 4: Collection Fee - 30% up
Self-Sustaining Degree - 35%

****
* irr = 10.93 % *
****

year	actual cash flow cost	benefit	discount factor	discounted cost	discounted benefit	net benefit
1986	-2871	0	1.000	-2871	0	-2871
1987	-9503	0	0.901	-8567	0	-8567
1988	-25779	5040	0.813	-20950	4096	-16854
1989	-4883	10080	0.733	-3577	7385	3807
1990	-4860	10080	0.660	-3210	6657	3447
1991	-4864	10080	0.595	-2896	6001	3105
1992	-4835	10057	0.537	-2595	5398	2803
1993	-5128	10033	0.484	-2481	4854	2373
1994	-11906	10010	0.436	-5193	4366	-827
1995	-9635	9986	0.393	-3788	3926	138
1996	-5830	9963	0.354	-2066	3531	1465
1997	-5833	9939	0.320	-1864	3176	1312
1998	-6156	9915	0.288	-1773	2856	1083
1999	-5830	9891	0.260	-1514	2568	1054
2000	-11867	9867	0.234	-2778	2310	-468
2001	-7705	9843	0.211	-1626	2077	451
2002	-5835	9820	0.190	-1110	1868	758
2003	-5828	9797	0.171	-999	1680	681
2004	-5846	9774	0.155	-904	1511	607
2005	-5794	9751	0.139	-807	1359	551
2006	-12061	9751	0.126	-1515	1225	-290
2007	-8035	9751	0.113	-910	1104	194
2008	54344	4876	0.102	5548	498	6046
				-68446	68445	-0

Case 5: Collection Fee - 30% up
Self-Sustaining Degree - 45%

****
* irr = 4.72 % *
****

year	actual cash flow cost	benefit	discount factor	discounted cost	discounted benefit	net benefit
1986	-2871	0	1.000	-2871	0	-2871
1987	-9503	0	0.955	-9074	0	-9074
1988	-25779	3920	0.912	-23505	3574	-19931
1989	-4883	7840	0.871	-4251	6826	2575
1990	-4860	7840	0.831	-4041	6518	2478
1991	-4864	7840	0.794	-3861	6224	2363
1992	-4835	7822	0.758	-3665	5930	2264
1993	-5128	7804	0.724	-3712	5649	1937
1994	-11906	7785	0.691	-8230	5381	-2848
1995	-9635	7767	0.660	-6359	5126	-1233
1996	-5830	7749	0.630	-3674	4884	1209
1997	-5833	7730	0.602	-3510	4652	1142
1998	-6156	7712	0.575	-3538	4432	894
1999	-5830	7693	0.549	-3199	4221	1022
2000	-11867	7675	0.524	-6218	4022	-2197
2001	-7705	7656	0.500	-3855	3831	-25
2002	-5835	7638	0.478	-2788	3649	861
2003	-5828	7620	0.456	-2659	3476	818
2004	-5846	7602	0.436	-2547	3312	765
2005	-5794	7584	0.416	-2410	3155	745
2006	-12061	7584	0.397	-4791	3012	-1778
2007	-8035	7584	0.379	-3048	2877	-171
2008	54344	3792	0.362	19683	1373	21056
				-92125	92125	-0

Case 6: Collection Fee - 1988-1995 30% up
1996-2008 50% up
Self-Sustaining Degree - 45%

****
* irr = 6.24 % *
****

year	actual cash flow cost	benefit	discount factor	discounted cost	discounted benefit	net benefit
1986	-2871	0	1.000	-2871	0	-2871
1987	-9503	0	0.941	-8944	0	-8944
1988	-25779	3920	0.886	-22838	3473	-19365
1989	-4883	7840	0.834	-4072	6537	2466
1990	-4860	7840	0.785	-3814	6153	2339
1991	-4864	7840	0.739	-3593	5791	2198
1992	-4835	7822	0.695	-3362	5439	2077
1993	-5128	7804	0.654	-3356	5107	1751
1994	-11906	7785	0.616	-7334	4795	-2538
1995	-9635	7767	0.580	-5586	4503	-1083
1996	-5830	8940	0.546	-3181	4878	1697
1997	-5833	8919	0.514	-2996	4581	1585
1998	-6156	8897	0.483	-2976	4301	1325
1999	-5830	8876	0.455	-2653	4039	1386
2000	-11867	8854	0.428	-5082	3792	-1290
2001	-7705	8833	0.403	-3106	3561	455
2002	-5835	8813	0.379	-2214	3344	1130
2003	-5828	8792	0.357	-2081	3140	1058
2004	-5846	8772	0.336	-1965	2949	984
2005	-5794	8751	0.316	-1833	2769	936
2006	-12061	8751	0.298	-3592	2606	-986
2007	-8035	8751	0.280	-2252	2453	201
2008	54344	4376	0.264	14336	1154	15491
				-85365	85365	-0

APPENDIX V

ORGANIZATION AND INSTITUTIONAL ASPECT

APPENDIX V ORGANIZATION AND INSTITUTIONAL ASPECT

1. ORGANIZATION TO BE REQUIRED

Table 5-1 Recommended Sections and Responsibilities for Cleansing Division of City

Section	Responsibility
Planning	Long term plans related to cleansing, environmental management, research and development.
Administration	General affairs, accounting, labor, land acquisition, public information, coordination with other divisions
Operations	Training and management of Gu officials on collection and transportation, planning of collection and transportation (excluding transfer station)
Facilities Planning	Planning of transfer stations, processing plants and disposal sites and manpower arrangements
Vehicles	Management of matters related to vehicles in Gu and transfer station.

Table 5-2 Recommended Responsibilities for the Sections under Cleansing Division of Gu.

Section	Responsibility
Administration	General affairs, accounting, labor, public information, coordination with other sections Contracting with private companies, surveillance for unlawful disposal, employment of workers.
Operations	Management of collection and transportation to transfer station
Vehicles	Managements of vehicles

Table 5-3 Recommended Sections and Responsibilities for Transfer Station Office

Section	Responsibility
Administration	General affairs, accounting, coordination with other sections
Operations	Management, operation and maintenance of transfer stationed of transportation from transfer station to landfill site.

Table 5-4 Recommended Section and Responsibilities for Intermediate Processing Plants

Section	Responsibility
Administration	General affairs, accounting, coordination with other sections
First Operations	Management, operation and maintenance of processing plant
Second Operations	Management, operation and maintenance transfer station and of transportation from transfer stations to land fill site

2. STUDY FOR UTILIZATION OF PRIVATE COMPANIES

Data for the study for the utilization of private companies were taken from "Cost Estimation Associated with Cleansing in a Region and Diagnosis of Private Companies, 1984."
They are shown in following tables.

Table 5-5 Gross Sale and Profit by Administrative Gu of Private Companies

Unit:₩

YEAR	1981			1982			1983			1984		
Gu Name	Number of Company	Gross Sales	Profit	Number of Company	Gross Sales	Profit	Number of Company	Gross Sales	Profit	Number of Company	Gross Sales	Profit
Jungro	3	443,916,995	2,043,482	3	748,066,415	4,490,789	3	976,572,387	8,843,235	3	1,074,508,000	
Jung	5	1,323,415,456	976,253	6	1,857,480	50,629,983	6	1,573,200,653	△25,416,631	6	1,751,747,000	
Yongsan	6	257,913,022	△17,835,083	6	444,647,243	△ 4,617,945	6	704,379,948	△ 6,241,112	6	759,966,000	
Seongdong	2	222,924,924	△ 7,547,458	2	302,006,930	17,062,730	2	662,349,019	7,929,063	2	879,889,000	
Dongdaemun	3	255,624,123	2,188,158	3	306,393,675	△ 2,824,133	3	434,618,562	△63,355,178	3	497,550,000	
Seongbug	1	67,544,850	△ 1,727,504	1	114,096,489	713,169	2	127,060,500	△12,229,596	2	207,500,000	
Dobong	1	229,913,812	△37,384,398	2	297,315,279	△ 9,191,423	2	297,503,512	△ 426,626	2	463,647,000	
Eunpyung	1	61,200,938	4,488,507	1	89,213,458	2,301,470	1	118,802,629	△ 4,060,825	1	146,610,000	
Seodaemun	0	0	0	0	0	0	0	0	0	1	77,567,000	
Mapo	1	114,205,000	2,168,278	1	87,775,000	△ 8,855,005	1	89,666,000	7,118,930	2	166,793,000	
Gangseu	3	293,992,550	8,349,161	4	389,645,448	22,153	4	520,055,712	10,900,166	4	646,462,000	
Guro	3	387,786,985	5,983,065	5	544,789,681	2,425,767	6	885,501,013	△55,013,013	7	1,167,181,000	
Yeoungdeungpo	4	819,010,278	18,173,098	7	695,612,670	△27,099,349	8	1,314,966,750	159,020	8	1,076,613,000	
Dongjag	1	21,720,000	△ 6,677,305	2	111,614,789	△ 8,916,882	2	153,537,225	△ 8,096,577	3	241,615,000	
Gwanag	0	0	0	0	0	0	0	0	0	2	171,874,000	
Gangnam	8	1,300,382,306	10,183,062	10	2,063,410,031	△27,009,437	10	2,065,658,097	5,416,529	10	2,917,420,000	
Gangdong	5	876,557,416	△12,917,333	5	967,766,323	2,083,923	6	1,247,455,595	35,708,433	6	1,809,538,000	
TOTAL		6,476,108,655	△29,536,017	58	9,019,886,911	△ 9,784,190	62	11,171,327,602	△98,764,122	68	13,816,480,000	
MEAN		137,789,546	△ 628,426		155,515,292	△18,693		180,182,703	△ 1,592,970		203,183,529	

Table 5-6 Balance Sheet (K. Company)

Unit:W

Subject	1981		1982		1983	
	Amount of money	Ratio of composition	Amount of money	Ratio of composition	Amount of money	Ratio of composition
A. ASSETS						
I.Current asset(s)						
(1) Quick assets						
1.Cash	997,106	4.49	463,163	1.01	61,153	0.11
2.Accounts receivable	5,026,060	22.63	8,048,010	17.56	10,685,310	18.61
3.Ordinary deposit	19,485	0.09			864	0.00
(Total quick assets)	6,042,651	27.21	8,511,173	18.57	10,747,327	18.72
(2) Other current assets						
1.Prepayments	367,316	1.65				
(Total other current assets)	367,316	1.65				
TOTAL CURRENT ASSETS	6,409,967	28.86	8,511,173	18.57	10,747,327	18.72
II.Investment and other assets						
(1)Other assets						
1.Guaranty money	3,000,000	13.51	4,150,000	9.05	4,700,000	8.19
2.Securities						0.68
3.Right of telephone use	1,180,000	8.15	250,000	0.55	390,000	0.44
(total other assets)	4,810,000	21.66	4,400,000	9.60	250,000	9.31
TOTAL INVESTMENTS AND OTHER ASSETS	4,810,000	21.66	4,400,000	9.60	5,340,000	9.31
III. Fixed assets						
(i)Tangible fixed assets						
1.Tools,Furniture	777,006	3.50	1,750,097	3.82	1,740,151	3.03
2.Delivery equipment	10,211,743	45.98	31,174,769	68.01	39,575,699	68.94
Total fixed assets	10,988,749	49.48	32,924,866	71.83	41,315,850	71.97
Total assets	22,208,716	100.00	45,836,039	100.00	57,403,177	100.00
B. LIABILITIES						
I.Current liabilities						
1.Suspense receipts	19,800,000	89.15	32,800,000	71.56	34,600,000	60.28
2.Advance received			235,359	0.51	127,802	0.22
3.Accounts payable					12,114,760	21.10
4.Reserve for tax payment			309,962	0.68		
Total liabilities	19,800,000	89.15	33,345,321	72.75	46,842,562	81.60
C. CAPITAL						
I.Capital	10,000,000	45.03	20,000,000	43.63	30,000,000	50.26
II.Earned surplus						
1.Earnd surplus carried forward to the following term			7,591,284	16.56	7,509,282	13.08
2.Profit for the term	△ 7,591,284	△ 34.18	82,002	0.18	△11,930,103	△ 20.28
Total capital	2,408,716	10.85	12,490,718	27.25	10,560,615	18.40
D. TOTAL LIABILITIES AND CAPITAL	22,208,716	100.00	45,836,039	100.00	57,403,177	100.00

Table 5-7 Balance Sheet (T. Company)

Unit:W

Subject	1981		1982		1983	
	Amount of money	Ratio of composition	Amount of money	Ratio of composition	Amount of money	Ratio of composition
A. ASSETS						
I .CURRENT ASSET(S)						
1.Cash · Deposit			1,179,281	3.86	527,867	0.82
2.Securities			550,000	1.80	550,000	0.86
3.Accounts receivable			6,532,632	21.36	7,864,243	12.28
4.Suspense payments			199,990	0.65	60,000	0.09
(Total current assets)			8,461,903	27.67	9,002,110	14.05
II .INVESTMENTS AND OTHER ASSETS						
1.Right of telephone use					200,000	0.31
2.Guaranty money			2,800,000	9.16	2,800,000	4.68
(Total investments and other assets)			2,800,000	9.16	3,000,000	4.68
III.FIXED ASSETS						
(1)Tangible fixed assets						
1.Delivery equipment			20,541,015	59.71	63,381,715	79.94
2.Machinery and fixtures			609,800	1.81	609,800	0.74
(Total tangible fixed assets)			18,814,539	61.52	51,686,452	80.68
IV.DEFERRED CHARGES						
1.Organization expenses			506,400	1.65	379,800	0.59
(Total deferred charges)			506,400	1.65	379,800	0.59
TOTAL ASSETS			30,582,842	100.00	64,068,362	100.00
B. LIABILITIES						
I .CURRENT LIABILITIES						
1.Accounts payable			15,429,521	50.45	41,259,371	64.40
2.Suspense receipts			4,118,794	13.47	19,767,756	30.85
3.Advance received					22,698	0.04
(TOTAL CURRENT LIABILITIES)			19,548,315	63.92	61,049,825	95.29
TOTAL LIABILITIES			19,548,315	63.92	61,049,825	95.29
C. CAPITAL						
I .CAPITAL			20,000,000	65.40	20,000,000	31.21
II .EARNED SURPLUS						
1.Earned surplus from the Previous term					△ 8,965,473	△ 13.99
2.Profit for the term			△ 8,965,473	△ 29.32	△ 8,015,990	△ 12.51
TOTAL CAPITAL			11,034,527	36.08	3,018,537	4.71
D. TOTAL LIABILITIES AND CAPITAL			30,582,842	100.00	64,068,362	100.00

Table 5-8 Balance Sheet (CH. Company)

Unit:W

Subject	1981		1982		1983	
	Amount of money	Ratio of composition	Amount of money	Ratio of composition	Amount of money	Ratio of composition
A. ASSETS						
I CURRENT ASSETS(S)	10,474,353	34.83	14,490,690	43.50	25,724,604	35.29
1.Cash · Deposit	1,468,979	4.88	1,133,011	3.40	10,623,262	14.57
2.Bills receivable	640,000	2.13	1,753,818	5.27	—	—
3.4.Accounts receivable	7,065,987	23.50	8,770,760	26.33	6,686,270	9.17
5.Securities	390,000	1.30	390,000	1.17	—	—
6.Prepayments	909,387	3.02	1,737,175	5.22	1,134,616	1.56
7.Prepaid income taxes	—	—	705,926	2.11	—	—
8.Suspense payments	—	—	—	—	7,280,456	9.99
II. INVESTMENTS AND. OTHER ASSETS	2,540,000	8.44	3,640,000	10.93	2,870,000	3.94
1.Guaranty money	—	—	3,100,000	9.31	100,000	0.14
2.Rent guaranty money	2,000,000	6.65	—	—	2,000,000	2.74
3.Right of telephone use	540,000	1.79	540,000	1.62	770,000	1.06
III.TOTAL INVESTMENTS AND OTHER ASSETS	16,821,301	55.93	15,017,336	45.09	44,214,008	60.66
(1) Tangible fixed assets						
1.Machinery and Fixtures	652,950	1.43	788,050	1.51	1,528,750	1.65
2.Buildings	213,000	0.52	423,000	0.95	1,470,600	1.81
3.Delivery equipment	21,988,495	53.45	28,813,137	42.26	69,457,661	57.09
(Total tangible fixed assets)	16,661,301	55.40	14,897,336	44.72	44,134,008	60.55
(2) Intangible assets						
1.Licenses	160.000	0.53	120,000	0.37	80,000	0.11
(Total intangible assets)	160,000	0.53	120,000	0.37	80,000	0.11
IV. Start up costs	240,522	0.8	160,348	0.48	80,174	0.11
TOTAL ASSETS	30,076,176	100.00	33,308,374	100.00	72,888,786	100.00
B. LIABILITIES						
I.CURRENT LIABILITIES	12,544,118	41.71	12,134,968	36.43	35,270,868	48.39
1.Short payable	—	—	3,000,000	9.01	—	—
2.Accounts payable	10,380,983	34.52	3,918,587	11.76	35,270,868	48.39
3.Advance received	1,172,265	3.90	110,255	0.33	—	—
4.Suspense receipts	—	—	5,106,126	15.33	—	—
5.Reserve for tax payment	960,870	3.19	—	—	—	—
6.Accrued payable	30,000	0.10	—	—	—	—
II.FIXED LIABILITIES	2,000,000	6.65	—	—	—	—
1.Allowance for employee retirement	2.000,000	6.65	—	—	—	—
TOTAL LIABILITIES	14.544.118	48.36	12.134.968	36.43	35.270,868	48.39
C. CAPITAL						
I.CAPITAL	10,000,000	33.25	20,000,000	60.04	50,000,000	68.60
II.EARNED SURPLUS.						
1.Revenue reserve	2,000,000	6.65	4,000,000	12.01	4,000,000	5.49
2.Unappropriated earned surplus of current term						
(1)Earned surplus carried forward to the following term	541.805	1.80	927,989	2.79	△ 2,886,217	△3.96
(2)Profit for the term	2.990,253	9.94	△ 3,754,583	△ 11.27	△13,495,865	△ 18.52
TOTAL CAPITAL	15,532,058	51.64	21,173,406	63.57	37,617,918	51.61
D. TOTAL LIABILITIES AND CAPITAL	30.076,176	100.00	33,308,374	100.00	72,888,786	100.00

Table 5-9 Income Statement (K. Company)

Unit:W

Subject	1981		1982		1983	
	Amount of money	Ratin of composition	Amount of money	Ratin of composition	Amount of money	Ratin of composition
Ⅰ. GROSS SALES	105,201,985	100.00	170,412,670	100.00	236,793,706	100.00
1.Cleaning sales	105,201,985	100.00	170,412,670	100.00	236,793,706	100.00
Ⅱ. Selling expenses and general adminis trative expenses	111,125,088	105.63	169,461,041	99.44	251,526,808	106.22
1.Salaries	64,806,320	61.60	82,666,094	48.51	129,001,299	54.48
2.Bonuses	5,562,100	5.29	8,763,000	5.14	22,551,000	9.52
3.Retiring allowance			1,267,750	0.74	1,468,360	0.62
4.Welfare expenses	5,424,075	5.15	5,118,355	3.00	4,116,220	1.74
5.Car fare	891,250	0.85	1,027,475	0.60	993,990	0.42
6.Postage	90,502	0.09	381,963	0.23	681,654	0.29
7.Water expenses	435,596	0.41	815,011	0.48	920,809	0.39
8.Office supplies	359,860	0.34	298,370	0.18	115,110	0.05
9.Repairing expenses			839,300	0.49	385,410	0.16
10.Printing expenses	427,560	0.41	585,860	0.34	880,390	0.37
11.Entertainment expenses	3,073,620	2.92	3,876,588	2.28	6,067,973	2.56
12.Depreciation expenses	8,769,810	8.34	13,683,899	8.03	18,669,614	7.88
13.Advertising expenses			132,000	0.08	102,300	0.04
14.Insurance expense	839,930	0.83	3,927,049	2.30	5,261,724	2.22
15.Rent expense					330,000	0.14
16.Miscellaneous expenses	3,000	0.00	266,470	0.16	38,470	0.02
17.Taxes and imposts	956,400	0.91	1,227,019	0.72	1,726,640	0.73
18.Commission	145,000	0,14	1,906,600	1.12	1,007,600	0.43
19.Car maintenance fee	15,879,930	15.09	36,425,184	21.37	51,015,095	21.54
20.Cleaning cost	493,000	0.47			367,550	0.16
21.Supplies expense	2,967,135	2.82	6,253,05	3.67	5,826,500	2.46
Ⅲ. OPERATING INCOME	△ 5,923,103	△5.63	951,629	0.56	△14,733,102	△6.22
Ⅳ. NON-OPERATING REVENUE			335	0.00	3,407,650	1.44
1.Interest income			355	0.00	864	0.00
2.Insurance against damage expense					3,182,110	1.34
3.Arrears					224,676	0.09
Ⅴ. NON-OPERATING EXPENSES	1,668,181	1.59	560,000	0.33	457,950	0.19
1.Loss from the sale of fixed assets	1,688,181	1.59	560,000	0.33	154,000	0.06
2.Reparation of the damage					303,950	0.13
Ⅵ. NET PROFIT BEFORE TAX			391.964	0.23	△11,783,402	△4.97
Ⅶ. CORPORATE INCOME TAX			309.962	0.18	146,701	0.06
Ⅷ. PROFIT FOR THE TERM	△ 7,591,284	△7.22	82,002	0.05	△11,930,103	△5.03

Table 5-10 Income Statement (T. Company)

Unit:W

Subject	1981		1982		1983	
	Amount of money	Ratio of composition	Amount of money	Ratio of composition	Amount of money	Ratio of composition
I .GROSS SALES			13,836,772	100.00	112,273,921	100.00
1.Income			13,836,772	100.00	112,273,921	100.00
II.SELLING EXPENSES AND GENERAL ADMINISTRATIVE EXPENSES			23,194,761	167.63	120,180,008	107.04
1.Salaries			14,260,070	103.06	67,718,962	60.32
2.Carfare			181,390	1.31	642,064	0.57
3.Commission			590,849	4.27	948,754	0.85
4.Welfare expenses			575,200	4.16	3,626,195	3.23
5.Entertainment expenses			300,940	2.17	4,360,700	3.88
6.Taxes and imposts			62,040	0.45	3,570	0.00
7.Car maintenance fee			4,290,777	31.01	25,207,172	22.45
8.Repairing expenses			201,900	1.46	1,890,600	1.68
9.Supplies expenses			169,480	1.22	1,143,210	1.02
10.Office supplies			103,600	0.75	924,390	0.82
11.Water expenses			116,739	0.84	525,614	0.47
12.Insurance expenses					1,454,880	1.30
13.Printing expenses					134,000	0.12
14.Rent car expenses					1,200,000	1.07
15.Miscellaneous expenses			5,500	0.04	431,100	0.38
16.Depreciation expenses			2,336,276	16.89	9,968,787	8.88
III.OPERATING INCOME			△ 9,357,989	△ 67.63	△ 7,906,087	△7.04
IV.NON-OPERATING REVENUE			519,116	3.75	43,045	0.04
1.Interest income			519,116	3.75	43,045	0.04
V .NON-OPERATING EXPENSES			126,600	0.91	152,948	0.13
1.Amortization of organization expenses			126,600	0.91	126,600	0.11
2.Parttime loss					26,348	0.02
VI Recurring Profit			△ 8,965,473	△ 64.79	△ 8,015,990	△7.14
VII.PROFIT FOR THE TERM			△ 8,965,473	△ 64.79	△ 8,015,990	△7.14

Table 5-11 Income Statement (CH. Company)

Unit:W

Subject	1981		1982		1983	
	Amount of money	Ratio of composition	Amount of money	Ratio of composition	Amount of money	Ratio of composition
I.	45,052,897	100.00	132,213,835	100.00	107,576,100	100.00
II.SELLIVG EXPENSES AND GENERAL ADMINI STRATIVE EXPENSES	40,105,885	87.09	135,314,446	102.35	120,007,768	111.56
1.Salaries	25,182,400	54.68	89,751,315	67.89	73,958,660	68.75
2.Retiring allowance	1,430,987	3.11	2,284,790	1.73	4,951,040	4.60
3.Welfare expenses	506,530	1.10	1,378,280	1.04	709,320	0.66
4.Car maintenance fee			17,969,052	13.59	16,218,764	15.08
5.Entertainment expenses	1,188,880	2.58	2,783,962	2.11		
6.Taxes and imposts	1,628,892	3.54	2,346,346	1.78	2,199,066	2.04
7.Car fare and postage	1,004,149	2.18	1,215,755	0.92	1,154,616	1.07
8.Insurance expense	623,169	1.35	1,577,449	1.19	3,382,698	3.14
9.Supplies expense	319,920	0.69	533,551	0.40	565,506	0.53
10.Water expences	471,756	1.02	756,950	0.57	373,221	0.35
11.Printing expenses	305,600	0.66	250,470	0.19	333,650	0.31
12.Advertising expenses	437,800	0.95	201,300	0.15	211,200	0.20
13.Commission			1,145,000	0.87	697,402	0.65
14.Rent expense	1,140,000	2.48	1,230,000	0.93	415,000	0.39
15.Miscellaneous expenses	988,650	2.15	403,050	0.31	183,130	0.17
16.Miscellaneous expenses	85,500	0.19	1,626,000	1.23		
17.Repairing expenses	107,124	0.23	114,300	0.09		
18.Secret service expenses	195,930	0.43	46,200	0.03		
19.Parttime expences			679,500	0.51		
20.Depreciation expenses	4,488,598	9.75	9,021,176	6.82	14,654,495	13.62
III.OPERATING INCOME	5,947,012	12.91	3,100,611	2.35	12,431,668	11.56
IV.NON-OPERATING REVENUE	65,701	0.41	64,053	0.05	17,147	0.02
1.Interest income	65,701	0.41	64,053	0.05	17,147	0.02
V.Non-operating expenses	379,474	0.82	718.025	0.54	645,082	0.60
1.Interest expense			35,001	0.03	100,008	0.09
2.Loss on securities sold			191,750	0.14	384,900	0.36
3.Entertainment expenses	299,300	0.65	411,100	0.31	80,000	0.07
4 .Amortization of organization expenses	80,174	0.17	80,175	0.06	80,174	0.07
VI. Recurring Profit	5,633,239	12.23	3,754,583	2.84	13,059,603	12.14
VII.SPECIALLY PROFIT					696,640	0.65
1.Profit from the sale of fixed assets					696,640	0.65
VIII.SPECIALLY LOSS	1,225,164	2.66			1,132,902	1.05
1.Loss from the sale of fixed assets	1,084,193	2.35			1,132,902	1.05
2.Corporate income tax.	140,971	0.31				
IX.NET PROFIT BEFORE TAX	4,408,075	9.57	3,754,583	2.84	13,495,865	12.55
X.CORPORATE INCOME TAX	1,417,822	3.08				
XI.PROFIT FOR THE TERM	2,990,253	6.49	3,754,583	2.84	13,495,865	12.55

Table 5-12 The Total Cost Requirements for Cleansing by Gu
(Seoul City Authority)

Unit:W

Subject	Total	JUNGRO	JUNG	YONGSAN	SEONGDONG	DONGDAEMUN	SEONGBUG
I. LABOR COST							
1.Salaries and nages expense	19,120,000,838	1,272,738,250	1,275,826,030	956,901,080	1,379,975,490	1,798,146,350	1,206,147,070
2.Bonuses expense	4,791,488,834	318,949,167	319,722,967	239,800,133	345,822,900	450,616,833	302,261,367
II.EXPENSES							
1.Salaries	1,388,707,063	66,011,177	63,291,616	68,730,739	93,206,794	120,402,411	95,926,356
2.Bonuses expense of staff	449,360,000	21,360,000	20,480,000	22,240,000	30,160,000	38,960,000	31,040,000
3.Allowance for employee retirement	1,744,951,277	113,436,389	113,400,989	85,348,376	125,327,633	163,192,278	111,100,456
4.Welfare expenses	379,065,984	24,831,023	24,896,569	19,010,288	27,256,625	35,508,080	24,104,578
5.Library expense	48,902,642	2,540,081	2,121,985	2,295,126	1,835,834	5,310,526	3,730,372
6.Stationery expense	320,780,900	21,579,260	21,911,700	16,244,400	23,254,780	30,340,660	20,340,100
7.Depreciation expense	4,809,460,530	266,372,842	303,278,385	221,973,637	337,041,605	437,521,822	283,480,643
8.Automobile expense	5,972,203,633	312,012,524	354,641,315	215,802,989	521,223,716	681,944,814	349,585,451
9.Maintenance cost of hand car	297,383,900	20,327,300	20,736,300	15,214,800	21,636,100	28,261,900	18,936,700
10.Supplies expense	335,988,640	22,940,480	23,398,880	17,210,480	24,407,360	31,833,440	21,381,920
11.Insurance expense	1,088,577,276	58,313,228	60,644,412	48,040,406	76,366,820	98,214,034	64,634,388
12.Other expenses	239,064,160	13,554,880	13,036,780	12,223,280	15,314,580	17,755,080	14,175,680
13.Guaranty money	167,104,072	12,151,963	12,181,445	9,136,385	13,175,852	1,716,850	11,516,158
14.	89,544,000	5,040,000	4,200,000	4,704,000	8,148,000	3,864,000	6,720,000
III.TOTAL COST	41,242,583,749	2,552,158,564	2,633,769,373	1,954,876,119	3,044,154,089	3,943,589,078	2,565,081,239
AMOUNT OF COLLECTION(t)	8,054,875	515,250	572,122	400,782	571,559	758,048	473,616
AVERAGE COST(w/t)	5,120.20	4,953.24	4603.51	4,877.65	5,326.05	5,202.29	5,415.95

Table 5-12 The Total Cost Requirements for Cleansing by Gu (Cont'd)
(Seoul City Authority)

Unit:W

Subject	DOBONG	MAPO	SEODAEMUN	EUNPYUNG	GANGSEU	GURO	YEOUNGDEUNGPO
Ⅰ. LABOR COST							
1.Salaries and nages expense	1,494,922,470	845,177,820	818,533,580	844,051,460	1,057,409,290	1,184,833,548	822,038,890
2.Bonuses expense	374,628,700	211,802,200	205,125,133	211,519,933	264,987,567	296,920,200	206,003,567
Ⅱ.EXPENSES							
1.Salaries	109,524,164	79,608,986	74,169,863	55,132,931	82,328,548	85,048,109	74,169,863
2.Bonuses expense of staff	35,440,000	25,760,000	24,000,000	17,840,000	26,640,000	27,520,000	24,000,000
3.Allowance for employee retirement	136,689,566	79,187,400	76,375,044	76,453,311	97,209,189	108,146,733	76,667,856
4.Welfare expenses	29,617,916	17,202,045	16,463,933	16,652,916	21,057,771	23,413,891	16,539,803
5.Library expense	2,344,877	2,537,063	1,494,395	1,569,546	3,404,702	3,773,589	2,867,870
6.Stationery expense	24,960,500	14,564,600	13,614,840	14,279,720	17,719,100	19,686,040	13,711,980
7.Depreciation expense	380,393,310	161,310,346	217,272,240	191,146,422	273,910,859	318,891,899	204,789,358
8.Automobile expense	707,895,957	163,748,804	162,397,157	175,137,593	222,522,015	317,452,997	169,151,874
9.Maintenance cost of hand car	23,026,700	13,824,200	12,515,400	13,333,400	16,400,900	18,077,800	12,638,100
10.Supplies expense	25,965,920	15,651,920	14,185,040	15,101,840	18,539,840	20,419,280	14,322,560
11.Insurance expense	87,109,666	34,614,436	49,988,836	43,435,424	61,432,806	74,781,424	47,576,424
12.Other expenses	16,941,580	10,758,980	12,711,380	11,897,880	13,850,280	15,314,580	12,548,680
13.Guaranty money	14,273,353	8,069,664	7,815,268	8,058,909	10,096,026	11,312,660	7,848,736
14.	7,728,000	3,528,000	6,468,000	3,108,000	3,276,000	5,544,000	8,568,000
Ⅲ.TOTAL COST	3,471,462,679	1,687,346,464	1,713,130,109	1,698,719,285	2,190,784,893	2,531,136,750	1,713,443,561
AMOUNT OF COLLECTION(t)	620,153	365,506	339,490	367,756	468,708.2	481,666	355,868.8
AVERAGE COST(w/t)	5,597.75	4,616.47	5,046.19	4,619.15	4,674.09	5,254.96	4,814.82

Table 5-12 The Total Cost Requirements for Cleansing by Gu (Cont'd)
(Seoul City Authority)

Unit:W

Subject	DONGJAG	GWANAG	GANGNAM	GANGDONG			
I. LABOR COST							
1.Salaries and wages expense	757,836,370	995,013,900	1,214,274,340	1,196,174,900			
2.Bonuses expense	189,914,367	249,353,400	304,298,067	299,762,333			
II.EXPENSES							
1.Salaries	63,291,616	79,608,986	87,767,671	90,487,233			
2.Bonuses expense of staff	20,480,000	25,760,000	28,400,000	29,280,000			
3.Allowance for employee retirement	70,131,456	91,704,467	110,899,356	109,680,778			
4.Welfare expenses	15,181,679	19,779,464	24,040,190	23,509,213			
5.Library expense	2,464,374	1,812,260	3,942,159	4,857,883			
6.Stationery expense	12,736,060	16,413,000	20,290,520	19,133,640			
7.Depreciation expense	185,211,760	216,890,008	360,672,840	449,302,554			
8.Automobile expense	240,088,868	284,833,822	446,743,237	647,020,500			
9.Maintenance cost of hand car	11,820,100	14,969,400	18,732,200	16,932,600			
10.Supplies expense	13,405,760	16,935,440	21,152,720	19,135,760			
11.Insurance expense	42,305,442	66,964,812	70,815,404	103,339,314			
12.Other expenses	11,735,180	14,501,080	14,175,680	18,568,580			
13.Guaranty money	7,235,737	9,500,365	11,593,756	11,420,945			
14.	1,764,000	2,688,000	8,484,000	5,712,000			
III.TOTAL COST	1,645,602,769	2,106,728,404	2,746,282,140	3,044,318,233			
AMOUNT OF COLLECTION(t)	309,088	354,856	598,464	501,942			
AVERAGE COST(w/t)	5,324.06	5,936.85	4,588.88	6,065.08			

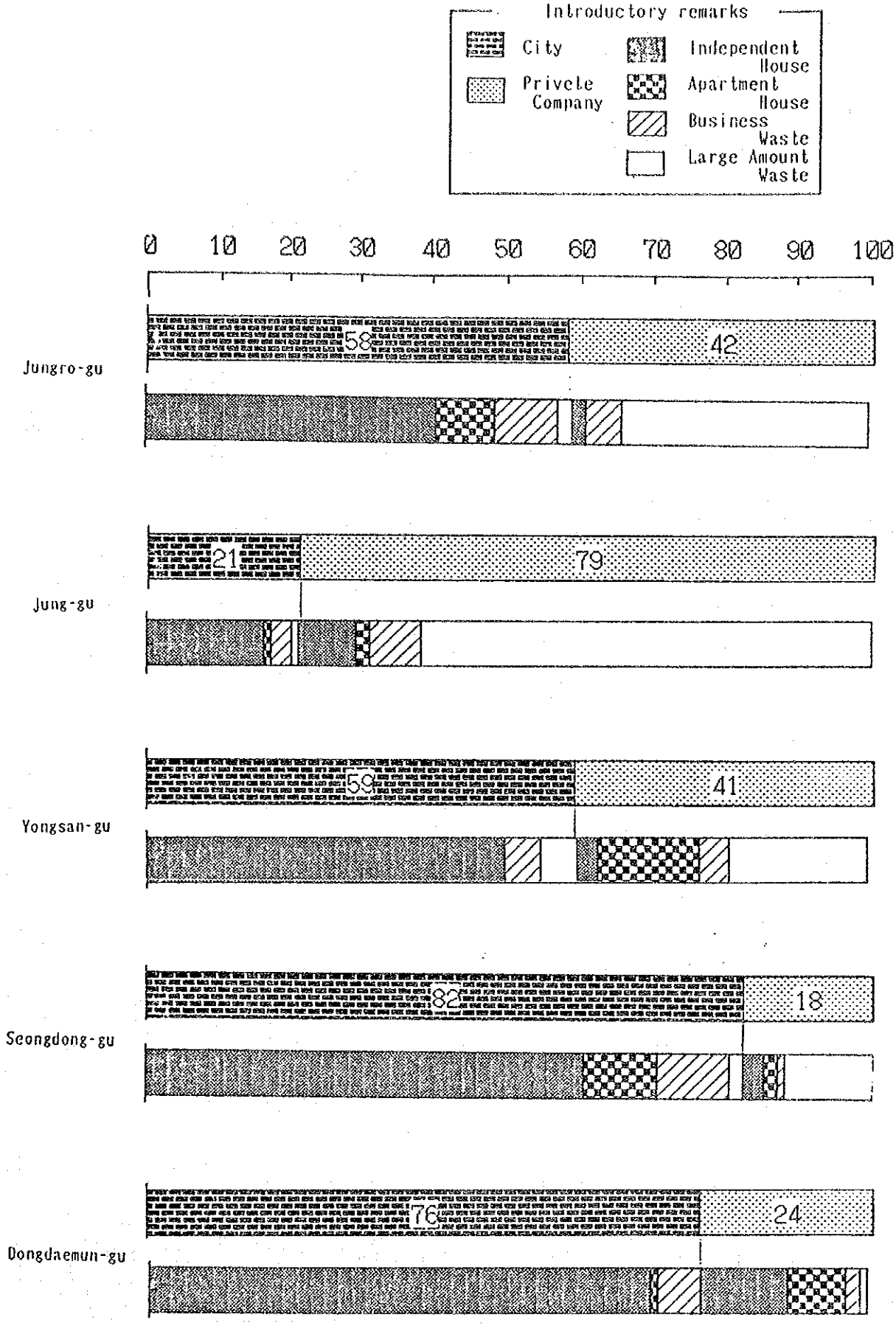


Fig. 5-1 Compositions of Collection Responsibility and of Solid Waste by Generation Source

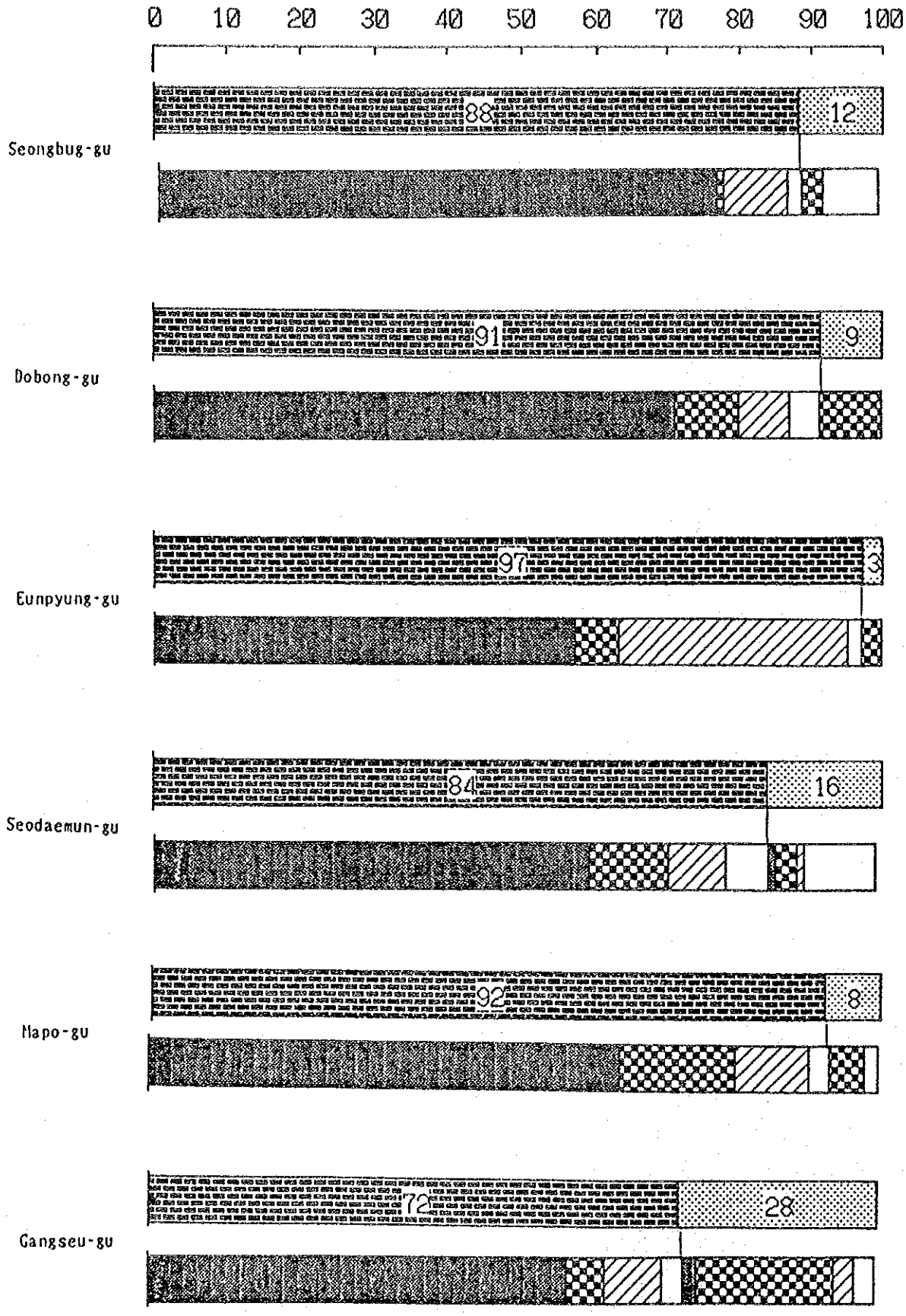


Fig. 5-1 Compositions of Collection Responsibility and of Solid Waste by Generation Source (Cont'd)

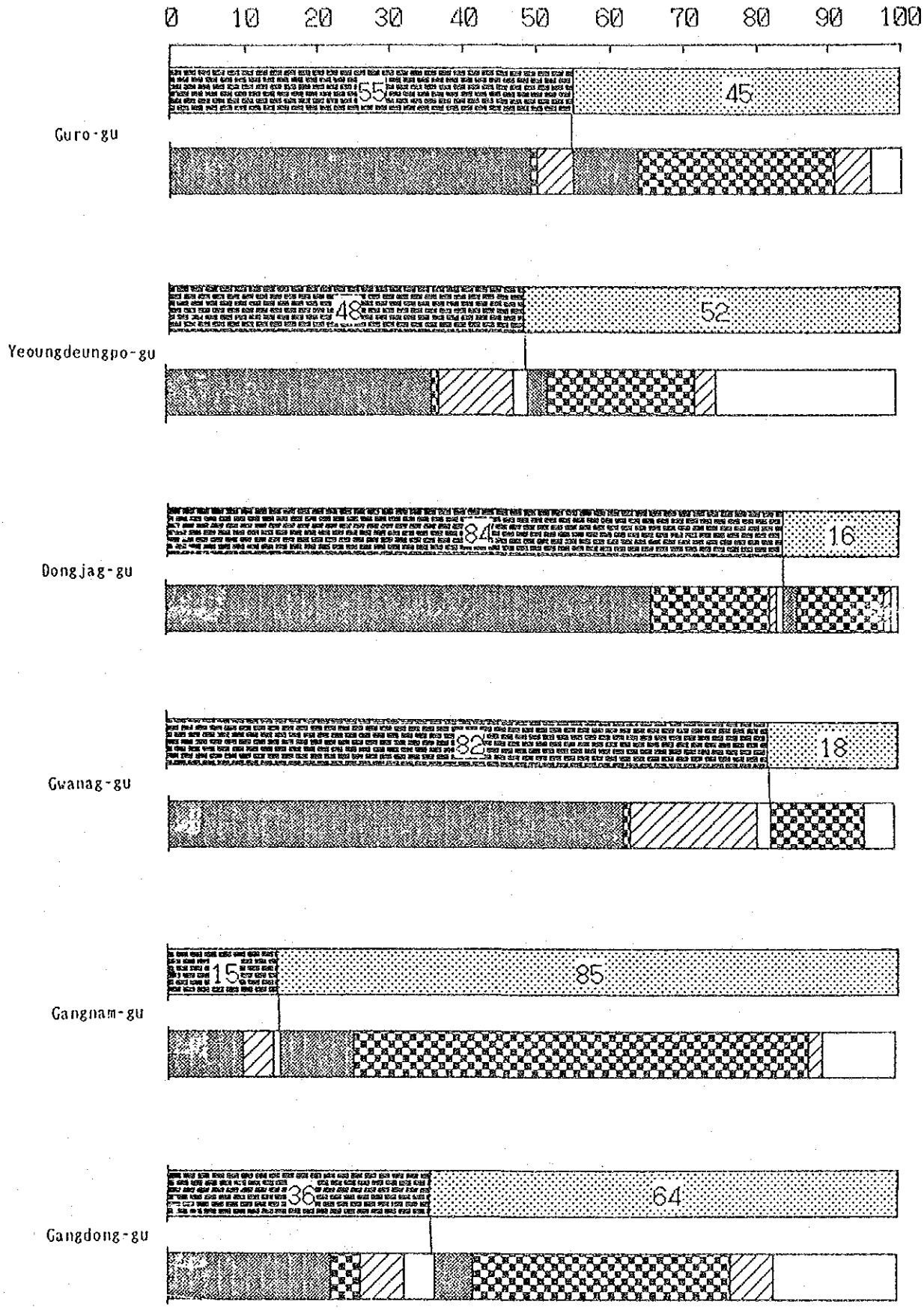


Fig. 5-1 Compositions of Collection Responsibility and of Solid Waste by Generation Source (Cont'd)

Table 5-13 Monthly Collection Amount of Solid Waste in Seoul City

Month	Self Disposal Company	City					Private Companies				
		Sub Total	Independent House	Apartment House	Business Waste	Large Amount Waste	Sub Total	Independent House	Apartment House	Business Waste	Large Amount Waste
Jan.	56860	561502	440714	36028	71608	13152	244760	37308	100400	22853	84199
Feb.	62115	533676	415026	40170	65538	12942	238432	33402	100343	22862	81825
Mar.	59080	515085	401040	42476	56572	14997	234084	31632	96078	22584	83790
Apl.	59709	464113	359654	30404	58702	15353	223163	28090	92184	19811	83078
May	67077	394682	304634	22433	55190	12425	213165	26042	89441	18370	79312
Jun.	67384	303798	226066	19752	44267	13713	211077	21931	95539	12124	81483
Jul.	65945	283591	212638	18445	41616	10892	211279	21354	92686	11812	85427
Aug.	65819	259317	192840	16772	38953	10752	210488	20655	91554	12637	85642
Sep.	67556	323811	245365	20910	43663	13873	214272	21932	92077	14214	86049
Oct.	73998	403879	303696	33224	51535	15424	227011	24164	97854	16022	88971
Nov.	73593	470720	349629	42110	59959	19022	233815	28723	99445	15995	89652
Dec.	73753	516412	385321	46303	64522	20266	235579	28751	103012	15800	88016
Total	792889	5030586	3836623	369027	652125	172811	2697125	323984	1150613	205084	1017444
Average	66074	419216	319719	30752	54344	14401	224760	26999	95884	17090	84787
Percentage	100	100	76.3	7.3	13.0	3.4	100	12.0	42.7	7.6	37.7

Table 5-14 Monthly Fluctuation Ratio to Annual Average

Month	Self Disposal Company	City					Private Companies				
		Sub Total	Independent House	Apartment House	Business Waste	Large Amount Waste	Sub Total	Independent House	Apartment House	Business Waste	Large Amount Waste
Jan.	0.86	1.34	1.38	1.17	1.32	0.91	1.09	1.38	1.05	1.33	0.99
Feb.	0.94	1.27	1.30	1.31	1.21	0.90	1.06	1.24	1.05	1.34	0.97
Mar.	0.89	1.23	1.25	1.38	1.04	1.04	1.04	1.17	1.00	1.32	0.99
Apl.	0.90	1.11	1.12	0.99	1.08	0.94	0.99	1.04	0.96	1.16	0.98
May	1.02	0.94	0.95	0.73	1.02	0.86	0.95	0.96	0.93	1.07	0.94
Jun.	1.02	0.72	0.71	0.64	0.81	0.95	0.94	0.81	1.00	0.71	0.96
Jul.	1.00	0.68	0.67	0.60	0.77	0.76	0.94	0.79	0.97	0.69	1.01
Aug.	1.00	0.62	0.60	0.46	0.72	0.75	0.94	0.77	0.95	0.74	1.01
Sep.	1.02	0.77	0.77	0.68	0.80	0.96	0.95	0.81	0.96	0.83	1.02
Oct.	1.12	0.96	0.95	1.08	0.95	1.07	1.01	0.90	1.02	0.94	1.05
Nov.	1.11	1.12	1.09	1.37	1.10	1.32	1.04	1.06	1.04	0.94	1.06
Dec.	1.12	1.23	1.21	1.51	1.19	1.41	1.05	1.06	1.07	0.92	1.04

Table 5-15 Collection Charge by Gu in 1984

Table 7-5-27 Collected Charge by Gu (1984)

unit:1000won

Gu-NAME	City											Private Company
	Independent House		Apartment House		Business Waste		Large Amount Waste		Sub Total	Disposal Fee		
	Collected Charge	Ratio	Collected Charge	Ratio	Collected Charge	Ratio	Collected Charge	Ratio	Collected Charge	Collected Charge	Ratio	Collected Charge
Total	3,648,204	92.0	703,286	79.2	1,705,280	75.6	473,136	89.8	6,529,906	3,421,153	82.3	13,816,480
Jungro	125,672	92.9	43,036	58.3	61,330	81.8	37,024	94.2	267,062	96,955	85.3	1,074,508
Jung	43,882	94.2	4,811	58.3	18,337	71.6	12,983	93.9	80,013	71,528	77.9	1,751,747
Yongsan	156,478	100.0	19,336	94.1	71,834	88.0	37,034	85.2	284,681	126,795	85.1	759,966
Seongdong	316,684	89.5	58,775	68.2	163,215	70.8	53,276	91.1	591,951	261,289	79.8	639,889
Dongdaemun	372,667	92.4	83,871	86.7	186,945	81.6	55,156	94.7	698,640	351,323	85.3	497,550
Seongbug	291,038	90.5	24,605	82.8	122,631	74.4	32,788	86.7	471,062	190,661	81.5	207,500
Dobong	380,666	94.7	79,932	80.3	152,320	75.4	35,499	89.5	648,417	288,981	83.2	463,647
Eunpyung	248,795	89.9	23,592	67.8	69,888	71.6	13,920	95.6	356,195	169,719	90.3	146,610
Seodaemun	206,941	93.1	60,319	76.7	105,713	79.6	33,295	86.9	406,269	140,013	80.4	77,567
Mapo	230,817	91.5	50,053	71.4	77,362	65.2	30,056	90.4	388,289	138,225	77.4	166,793
Gangseu	236,955	90.0	124,635	83.3	127,925	73.2	18,548	85.8	508,063	262,432	83.9	646,462
Guro	187,698	94.2	18,251	77.1	106,948	74.7	14,370	93.2	327,268	218,348	75.6	1,167,181
Yeoungdeungpo	121,873	85.6	3,415	80.7	64,725	78.0	22,169	83.4	212,183	162,036	81.7	1,076,613
Dongjag	222,975	99.6	17,844	95.8	136,985	84.6	17,157	94.7	394,961	153,965	84.1	241,615
Gwanag	256,051	91.9	32,888	78.1	147,482	75.1	29,101	90.6	465,522	180,705	83.6	171,874
Gangnam	92,517	89.8	3,622	93.5	28,295	83.4	6,174	93.9	130,609	294,624	81.7	2,917,420
Gangdong	156,495	83.6	54,299	75.1	63,343	60.0	24,586	82.6	298,722	313,552	81.7	1,809,538

3. STUDY FOR SEPARATE COLLECTION

Table 5-16 Result of Questionnaire on Separate Collection

(unit:%)

Composition		Ratio
1. Executing		32.3
2. Depend on the request by collection workers	25.7	
3. No separation		41.6
4. Others	0.4	
Total		100.0

Source: Study on Efficient Management of Municipal Solid Waste by Seoul Municipal University, March, 1983

Table 5-17 Result of Questionnaire on the Willingness in Application of Separate Collection Method

(unit:%)

Composition		Ratio
1. Cooperate even though collection charge will be raised	3.2	
2. Cooperate positively		68.4
3. Difficult because it is hard to place two waste containers		25.4
4. No need		1.6
5. No answer		1.4
Total		100.0

Source: Study on Efficient Management of Municipal Solid Waste by Seoul Municipal University, March, 1983

Table 5-18 Questionnaire about Separate Collection

Item		Yes	No	Others	Total
Two component separation	person	154	7	3	164
	%	93.4	4.3	1.8	100.0
Three component separation	person	101	59	4	164
	%	61.6	36.0	2.4	100.0
More than Four component separation	person	45	116	3	164
	%	27.4	70.7	1.9	100.0

Source: Study Team

Table 5-19 Consciousness on the Manner of Garbage Discharge

(unit:%)

Composition	Ratio
1. Vinyl bag use	68.8
2. Discharge as it is	30.3
3. Others	0.9
Total	100.0

Source: Study on Efficient Management of Municipal Solid Waste by Seoul Municipal University, March, 1983

APPENDIX VI

MINUTES OF MEETINGS

MINUTES OF MEETING
FOR
MASTER PLAN AND FEASIBILITY STUDY
ON
SEOUL MUNICIPAL SOLID WASTES MANAGEMENT SYSTEM
IN
THE REPUBLIC OF KOREA

MINISTRY OF SCIENCE AND TECHNOLOGY,
THE REPUBLIC OF KOREA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

NOVEMBER, 1983

MINUTES OF MEETING

The Japanese Preliminary Study Team organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") visited Seoul and had a series of discussions with the authorities concerned of the Republic of Korea, in particular with Ministry of Science and Technology (hereinafter referred to as "MOST").

As a result of the meetings, which were held in a most friendly atmosphere, both sides agreed upon the Scope of Work for Master Plan & Feasibility Study on Seoul Municipal Solid Wastes Management System and the Record of Meetings (attached herewith as ANNEX-I and ANNEX-II).

Seoul, November 3, 1983

For Japan International Cooperation Agency (JICA)

Masao Sago

Dr. MASAO SAGO
Leader of the Japanese Preliminary Study Team

For Ministry of Science and Technology (MOST)

Se Kwon Kim

Dr. SE-KWON KIM
Councilor for Science and Technology,
Ministry of Science and Technology
The Republic of Korea

SCOPE OF WORK
FOR
MASTER PLAN AND FEASIBILITY STUDY
ON
SEOUL MUNICIPAL SOLID WASTES MANAGEMENT SYSTEM
IN
THE REPUBLIC OF KOREA

I. INTRODUCTION

In response to the request of the Government of the Republic of Korea, the Government of Japan has decided to conduct a master plan and feasibility study on Seoul Municipal Solid Wastes Management System in the Republic of Korea (hereinafter referred to as "the Study"), in accordance with the laws and regulations in force in Japan.

The Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, will carry out the Study, in close cooperation with the authorities concerned of the Government of the Republic of Korea, in particular with the Ministry of Science and Technology (hereinafter referred to as "MOST"), which designates the Korea Advanced Institute of Science and Technology (hereinafter referred to as "KAIST") as a main cooperating agency for the Study.

The present document sets forth the scope of work with regard to the above mentioned Study.

II. OBJECTIVE OF THE STUDY

The purpose of the Study is to examine and assess the technical and economic feasibility of effective and rational solid wastes management systems for the future based on the natural and social conditions in Seoul.

The Study consists of two phases, namely the one will be carried out in 1984, as "Phase I Study - the master plan Study" for the Seoul Municipal Solid Wastes Management System (target year will be taken as about 2005 AD) including the recommendations for the short term improvement project, the other will be carried out in 1985, as "Phase II Study - the feasibility Study" about the short term improvement project for the Seoul Municipal Solid Wastes Management System (target year will be taken as 1988 AD).

III. SCOPE OF THE STUDY

1. Study Area

The Study Area will cover Seoul Municipality

2. Contents of the Study

The Study will be composed of field surveys and data collection in the Republic of Korea, and of analysis works in Japan.

The Study items to be covered by the Study are as follows :

1) Phase I Study : The Master Plan for the Seoul Municipal Solid Wastes Management System

(1) Collection and evaluation of data and information and analyses of the present municipal solid wastes management system

a. Identification of planning area
b. Wastes (physical and chemical) compositions
c. Wastes generation mechanism
d. Collection system
e. Transportation system
f. Treatment system
g. Disposal system
h. Operating system and financial institution for solid wastes management
i. Socio-economic and sanitary conditions concerning current municipal solid wastes management
j. Legislation related to municipal solid wastes management
k. Related projects

(2) Collection of data and information and analyses of future municipal solid wastes in Seoul

a. Future population
b. Socio-economic trends including city planning
c. Wastes generation mechanism
d. Disposal sites (including geological data)

(3) Preparation of the Master Plan alternatives for the municipal solid wastes management system

a. Collection systems
b. Transportation systems
c. Treatment systems
d. Disposal systems

(4) Identification of the appropriate Master Plan for the municipal solid wastes management system

a. Planning of systems, processes and facilities
b. Organizational structure for management
c. Technological, socio-economic and environmental evaluation
d. Design criteria
e. Implementation plan

(5) Proposal of a short term improvement project regarded as the first priority project for the municipal solid wastes management system

a. Collection system
b. Transportation system
c. Treatment system
d. Disposal system

2) Phase II Study : The Feasibility Study of the short term improvement project for the Seoul Municipal Solid Wastes Management System

(1) Identification of the appropriate plan for the short term improvement project

a. Identification of the project area
b. Evaluation of the project proposed in the Phase I - (5) Study
c. Planning of systems, processes and facilities
d. Design criteria

(2) Planning of facilities
a. Transfer station facilities (including preliminary design)
b. Treatment facilities (including preliminary design)
c. Disposal facilities (including preliminary design)
d. Construction schedule
e. Planning of procurement of materials and equipments
f. Manpower program
g. Environment impact assessment
h. Estimation of the cost

(3) Socio-economic and financial analyses
a. Socio-economic analyses
b. Financial analyses

(4) Analyses of organization, institution and operating system

(5) Preparation of implementation program

IV. SCHEDULE OF THE STUDY

The Study will be conducted in accordance with the tentative Study schedule shown in appendix.

V. REPORTS

JICA will prepare and submit the following reports in English to MOST in the course of the Study.

1. Inception Report
   30 copies,
   within one(1) month after beginning of the field survey(I)

2. Progress Report(I)
   30 copies,
   at the end of the field survey(I)

3. Interim Report
   30 copies,
   within two(2) months after completion of the field survey(I).
   MOST will provide JICA with their comments within one(1) month after receipt of the Interim Report through the Japanese Embassy

4. Progress Report(II)
   30 copies,
   at the end of the field survey(II)

5. Draft Final Report
   30 copies,
   within three(3) months after completion of the field survey(II).
   MOST will provide JICA with their comments within one(1) month after receipt of the Draft Final Report through the Japanese Embassy

6. Final Report
   50 copies,
   within two(2) months after receipt of the comments of the Draft Final Report

VI. UNDERTAKING OF THE GOVERNMENT OF THE REPUBLIC OF KOREA

1. For the conduct of the Study, the Government of the Republic of Korea through the Authorities concerned will undertake the following :

(1) To ensure the safety of the Japanese Study Team

(2) To exempt the members of the Japanese Study Team from taxes and duties on equipment, machinery and other materials brought into the Republic of Korea for the conduct of the Study Team

(3) To exempt the members of the Japanese Study Team from income tax and charges of any kind imposed or in connection with emoluments or allowances paid to the members of the Japanese Study Team for their services in connection with the implementation of the Study

(4) To provide the necessary facilities to the Japanese Study Team for the remittances as well as utilization of funds introduced into the Republic of Korea from Japan in connection with the implementation of the Study

(5) To secure permission for entry into the agreed identified areas in connection with the field surveys for the conduct of the Study. The identified areas should clearly be defined in the plan of operations

(6) To allow the Study Team to take all data and documents related to the Study including photographs out of the Republic of Korea to Japan in accordance with the security regulation of the Government of the Republic of Korea

2. The Government of the Republic of Korea shall bear claims, if any arises, against the member of the Japanese Study Team resulting from occuring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese Study Team.

3. MOST shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation to other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

4. KAIST, under the auspices of MOST, shall provide the Japanese Study Team with the following, at its own expense, in cooperation with other agencies concerned:

(1) Available data and information related to the Study

(2) Counterpart personnel

(3) Suitable office space with necessary equipment in Seoul

(4) Credentials of identification cards

(5) Vehicles with drivers

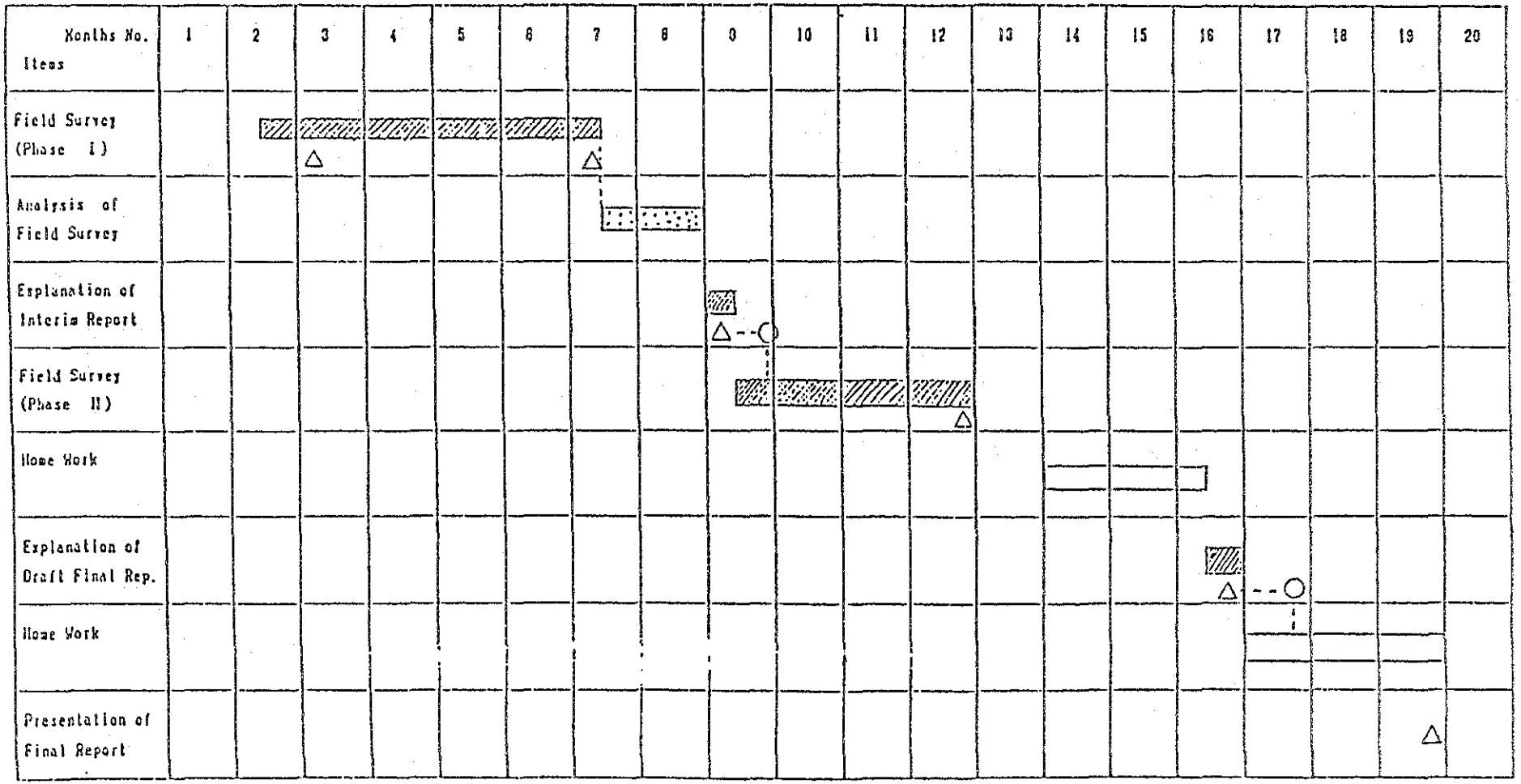
VII. UNDERTAKING OF THE GOVERNMENT OF JAPAN

1. To dispatch, at its own expense, Japanese Study Team to the Republic of Korea.

2. To pursue technology transfer to the counterpart personnel of the Republic of Korea in the course of the Study.

APPENDIX

TENTATIVE SCHEDULE



RECORD OF MEETINGS

I. The items agreed upon between the Japanese and Korean sides during the stay of the Japanese Preliminary Study Team in the Republic of Korea are as follows :

1. The Study which the Government of the Republic of Korea requested to the Government of Japan is to make plan of comprehensive and effective solid wastes management system for capital city, Seoul.

The Study includes a master plan and a short term improvement plan. The request is urgent and appropriate.

2. The content of this Study is not limited to the application of existing technologies in Japan and furthermore covers total solid waste management system including wastes generation mechanism, collection, transportation, treatment and disposal.

3. The Study shall be conducted after reviewing the studies already completed or in progress related to solid wastes management for the city of Seoul. The Study should reflect the contents of those studies.

4. The Study is not to evaluate the Resource Recovery Project at Nanjido to be implemented by the city of Seoul starting from December 1983. The Study will be conducted with assumption of the implementation of that Project.

5. All concerned organizations (Office of Environment, the City of Seoul) do their best cooperation for the Study team to implement the Study.

6. Implementation of the Study

(1) The administrative area of Seoul including future developing area is covered as the generation sources of solid wastes.

(2) Municipal solid wastes means household solid wastes.

However, sludges from public wastes treatment facilities (night soil and sewage treatment facilities) and solid wastes generated from business activities excluding industrial wastes should be taken into consideration for proper management in the Study.

(3) The steering committee which the MOST will establish gives guide for effective progress of the Study to the Korean Study Team and reviews the Study.

The committee plays the role of coordination among the concerned parties.

(4) Japanese Study Team conducts the Study in close collaboration with Korean Study Team. Korean Study Team may be called "counterparts".

II. The Government of the Republic of Korea hopes to have a cooperation of Japanese Study Team in order to prepare, by March 1985, documents necessary for financial arrangement for the implementation of the short term improvement project proposed in the Study.

LIST OF ATTENDANTS

Date : October 24 - November 3, 1983

Dr. Se-Kwon Kim	Councilor for Science and Technology, MOST
Mr. Hee Woon Choi	Principal Investigator, KAIST
Mr. Young Myoung Kim	Senior Engineer, KAIST
Mr. Jin Ho Kim	Chief, Dep. of Parks and Environment, Seoul City
Mr. Chi Jung Yoon	Chief, Div. of Public Cleaning, Seoul City
Mr. In Yong Choi	Chief, Sec. of Sanitary Facilities, Seoul City
Mr. Jong Hyon Suh	Chief, Dep. of Water Quality Management, OOE
Mr. Kyu Eung Kim	Chief, Div. of Solid Waste Management, OOE
Mr. Eung Ki Shim	Dir. General, NEPI
Dr. Yoon Soo Suh	Dir. Dep. of Water Pollution Res., NEPI
Mr. Yang Kyun Kim	Dir. Dep. of Air Pollution Res., NEPI
Dr. Sook Pyo Kwon	Dir. Institute for Environmental Research, Yonsei University

JICA Preliminary Study Team

Dr. Masao Sago (Team Leader)

Mr. Hiromichi Sakamoto

Dr. Masaru Tanaka

Mr. Noriyuki Kawaguchi

Mr. Kazuyoshi Umemoto

Mr. Junji Ishizuka

MINUTES OF MEETING

FOR

MASTER PLAN AND FEASIBILITY STUDY

ON

SEOUL MUNICIPAL SOLID WASTES MANAGEMENT SYSTEM

IN

THE REPUBLIC OF KOREA

MINISTRY OF SCIENCE AND TECHNOLOGY,

THE REPUBLIC OF KOREA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

FEBRUARY, 1984

MINUTES OF MEETING

The Japanese Preliminary Study Team organized by the Japan International Cooperation Agency(hereinafter referred to as "JICA") visited Seoul and had a series of discussions with Ministry of Science and Technology(hereinafter referred to as "MOST"), which designated the Korea Advanced Institute of Science and Technology (hereinafter referred to as "KAIST") as a main cooperating agency for the Study, and the members of Steering Committee established and presided by MOST.

As a result of the meetings, which were held in a most friendly atmosphere, both sides agreed upon the Outline of Operation related to the basic field survey on Seoul Municipal Solid Wastes Management System and Record of Meetings(attached herewith as ANNEX-I and ANNEX-II).

Seoul, February 27, 1984

For Japan International Cooperation Agency (JICA)

Hiromichi Sakamoto

Mr. HIROMICHI SAKAMOTO
Leader of the Japanese
Preliminary Study Team

For Ministry of Science and Technology (MOST)

Se Kwon Kim

Dr. SE-KWON KIM
Councilor for Science and
Technology,
Ministry of Science and Technology,
The Republic of Korea

Outline of Operation of Basic field survey for the Seoul municipal solid wastes management system study

1. Introduction

In response to the request of the Government of the Republic of Korea, the Government of Japan has already decided to conduct a master plan and a feasibility study on Seoul municipal solid wastes management system in the Republic of Korea.

The target year of the master plan is 2005 AD and that of the feasibility study which will serve the short term improvement project is 1988. The Study which means the master plan and the feasibility study as a whole should be reasonable and practical to the Seoul municipal solid wastes disposal.

The Study is to be carried out according to the minutes of meeting signed by both parties in November, 1983. In order to supplement the existing data regarding to solid waste in Seoul a basic field survey is planned.

The present document sets forth the outline of Operation of the basic field survey.

2. Objective of the basic field survey

The Study aims to make a rational and efficient plan of solid wastes management system in Seoul munisipality taking careful analysis of the present condition and evaluation of problems of the present system into consideration, forcasting future trends from the technological and the socio-economic points of view.

Under that purpose the basic field survey is to be conducted separately to recognize the actual condition more precisely, aiming to evaluate and supplement the existing data.

3. Outline of the Survey

1) Generation mechanism of Solid Waste Survey

a. Objective of the Survey

The Survey will be done to analize the present condition of the total quantity of wastes, wastes composition, seasonal changes and regional differences.

b. Survey area

The Survey will devide Seoul Municipality into 5 blocks and handle 10 models in accordance with social activity. Total number of survey points will be around 15.

c. Survey method

(1) Number of member : 3 persons per each point

(2) Frequency :

Quality survey : 1 time per each season (3 seasons in total)

Quantity survey : 2 times per each season (6 times in total)

(3) Method : Solid wastes will be collected from sources and analyzed. Investigation by questionaires on waste generation will be done simultaneously.

d. Survey items

The quantity of total wastes, wastes per some area, the quantity of wastes per capita per area, waste(physical)compositions, regional difference, the relation with income, discharge condition etc.

2) Collection and Transportation System Survey

a. Objective of the Survey

The Survey will be done to grasp the present and future condition of collection and transportation mechanism of wastes.

b. Survey area

The Study area will cover Seoul Municipality and the field survey will be done in the 5 blocks described in (1)

c. Survey method

The Survey team will collect the data of the present condition of collection and transportation system and follow them up in practice.

d. Survey Items

Survey items will be number of collection cars, condition of operation, number of employees, the condition of transportation, the rate of direct management and private management etc.

3) Disposal System Survey

a. Objective of the Survey

The Survey will be done to grasp the condition of transportation to Nanjido disposal area, and the characterization of solid waste from 5 blocks of Seoul will be performed.

b. Survey area

Nanjido disposal area covering 5 blocks of Seoul.

c. Survey method

The Survey team will collect and analyze the present data of disposal systems of wastes and follow up the present condition.

(1) Number of members: 3 persons per each block

(2) Frequency : 1 time per each season(3 times, 15 samples in total)

(3) Method :

Weighing of quantity by scale.

Analysis of quality.

d. Survey items

Quantity of solid wastes

Quality of solid wastes (physical and chemical)

4) Survey season

January, July (late), November(late).

Each season has about one week of survey term.

5) Result of Survey

Result of survey will be reflected in reports.

6) Detail plan of the Survey

Japanese and Korean Study team will decide the detail of the survey plan.

7) The expense of this survey will be borne by Japanese Government and Korean Government in accordance with the S/W in November, 1983. However, the expenses for the vehicles directly needed to the basic field survey will be borne by Japanese Government.

ANNEX - II

RECORD OF MEETINGS

1. In Planning of Seoul municipal solid wastes management system, the Study team shall investigate giving consideration to keep the balance between the request from the purification, the preservation of urban environment and that from the effective reuse of resources.

2. The alternatives to be prepared in this project are necessary to be technologically and socio-economically proper and realizable.

3. The basic field survey is required to evaluate and supplement the existing data.

   As a result of the survey, the overall tendency of wastes generated in Seoul municipality and the problems in the present disposal system will be revealed. The detailed plan of operation of the survey should be carried out effectively in a short term.

4. The Study team should have a concrete vision related to the target of short term improvement project (in phase II Study), as soon as possible after the commencement of the Study.

LIST OF ATTENDANTS

Date : February 23 - February 27, 1984

Dr. Se Kwon Kim	Counciler for Science and Technology, MOST (Chairman of Steering Committee)
Mr. Hee Woon Choi	Principal Investigator, KAIST (Secretary of Steering Committee)
Mr. Young Myoung Kim	Senior Engineer, KAIST
Dr. Sook Pyo Kwon	Dir. Institute for Environment Research, Yonsei University (Member of Steering Committee)
Dr. Dong Min Kim	Professor of Environmental Engineering, Seoul City University (Member of Steering Committee)
Dr. Jung Wk Kim	Assistant Professor, Graduate school of Environmental Studies, Seoul National University (Member of Steering Committee)
Dr. Sung Moo Lee	Professor of chemical Engineering, Yonsei University (Member of Steering Committee)
Mr. Jong Keon Park	Chief, Division of Solid Waste Management, Office of Environment (Member of Steering Committee)
Mr. In Yong Choi	Chief, Sec. of Sanitary Facilities, Seoul City (Member of steering committee)

JICA Preliminary Study Team

Mr. Hiromichi Sakamoto(Team Leader)

Mr. Hiroshi Kitagawa

Mr. Junji Ishizuka

MINUTES OF MEETING

FOR

MASTER PLAN AND FEASIBILITY STUDY

ON

SEOUL MUNICIPAL SOLID WASTES MANAGEMENT SYSTEM

IN

THE REPUBLIC OF KOREA

MINISTRY OF SCIENCE AND TECHNOLOGY

THE REPUBLIC OF KOREA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

JUNE, 1984

MINUTES OF MEETING

The Japanese Study Team organized by Japan International Cooperation Agency visited Seoul and had a series of discussions with Ministry of Science and Technology, which designated the Korea Advanced Institute of Science and Technology as a main cooperating agency for the Study, and the members of Steering Committee established and presided by MOST.

As a result of the meetings, which were held in a most friendly atmosphere, both sides agreed upon the Inception Report on Seoul Municipal Solid Wastes Management System and Record of Meetings attached.

Seoul, June 18, 1984

For Japan International
Cooperation Agency (JICA)

Hiroshi Miyazawa

MR. HIROSHI MIYAZAWA
Leader of the Japanese
Study Team

Fusao Node

MR. FUSAO NODE
Leader of Survey Team

For Ministry of Science
and Technology (MOST)
The Republic of Korea

Hoagy Kim

DR. HOAGY KIM
Chemical Research Coordinator
Ministry of Science & Technology

H. W. Choi

MR. HEE WOON CHOI
Project manager
Korea Advanced Inst. of
Science and Technology.

RECORD OF MEETINGS

1. The Korean side stressed that selection for the best processing system for Seoul Municipal Solid Wastes should be made with considerations of the world-wide trend in waste management and available technologies, especially recycling technology.
2. The Korean side stressed the importance of technology transfer through the Study.
3. The Korean side mentioned that the landfill disposal plan at existing Nanjido Site proposed in the ADB study should be considered in the Study.
4. The Korean side requested that the utilization of briquet ash generated from Seoul city for agricultural purposes should be considered in the Study.
5. The Korean side recommended a pilot survey prior to the actual field survey for solid waste generation mechanism.
6. The Korean side requested that recommendation on the operation and organization system as well as facility planning should be made in the Study.
7. The Japanese Study Team requested strong cooperation from concerned bodies for effective study.
8. The Korean side will officially select the counterpart personnels to be sent to Japan and propose the official request to the Japanese Embassy in Korea by the end of July, 1984.

LIST OF ATTENDANTS

Dr. Hoagy Kim	Chemical Research Coordinator, MOST (Chairman of Steering Committee)
Mr. Jong Chul Kyung	Director, Technical Cooperation Bureau, MOST
Mr. Hee Woon Choi	Principal Investigator, KAIST (Secretary of Steering Committee)
Mr. Young Myoung Kim	Senior Engineer, KAIST
Dr. Sook Pyo Kwon	Dir. Institute for Environment Research, Yonsei University (Member of Steering Committee)
Dr. Dong Min Kim	Professor of Environmental Engineering, Seoul City University (Member of Steering Committee)
Dr. Sung Moo Lee	Professor of Chemical Engineering, Yonsei University (Member of Steering Committee)
Mr. Jong Keon Park	Chief, Division of Solid Waste Management, Office of Environment (Member of Steering Committee)
Mr. In Yong Choi	Chief, Sec. of Sanitary Facilities, Seoul C (Member of Steering Committee)
Mr. Chi Jung Yoon	Director, Waste Management Div. Seoul Cit
Mr. Jong Sik Ro	Chief, Clean & Collection Sec, Seoul Cit

JAPANESE STUDY TEAM

(Members of the Supervisory Committee)

Name (Field in Charge)	Present Post
Mr. Hiroshi Miyazawa (Solid Wastes Management System)	Japan Wastes Management Association
Mr. Masaru Tanaka (Sanitary Engineering)	The Institute of Public Health
Mr. Osamu Ikeda (Facilities Planning)	Ministry of Health and Welfare
Mr. Junji Ishizuka (Coordination)	Japan International Cooperation Agency

(Members of the Survey Team)

Name	Assignment
Mr. Fusao Node	Team Leader & Legislation/Organization
Mr. Norio Kanno	Solid Waste Analysis
Mr. Shoji Fujii	Recycling Materials Planning
Mr. Torao Tokozumi	Collection and Transportation
Mr. Hidetoshi Kitawaki	Intermediate Processing
Mr. Shigehisa Tazaki	Final Disposal

M I N U T E S O F M E E T I N G

FOR

MASTER PLAN AND FEASIBILITY STUDY

ON

SEOUL MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM

IN

THE REPUBLIC OF KOREA

MINISTRY OF SCIENCE AND TECHNOLOGY

THE REPUBLIC OF KOREA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

OCTOBER, 1984

MINUTES OF MEETING

The Study Team and Advisory Committee organized by Japan International Cooperation Agency visited Seoul and had a series of discussions with the Ministry of Science and Technology, which designated the Korea Advanced Institute of Science and Technology as a main cooperating agency for the Study, and the members of the Steering Committee established and presided by MOST.

As a result of the meetings, which were held in a most friendly atmosphere, both sides agreed upon the Progress Report on Seoul Municipal Solid Waste Management System and the Record of Meetings is attached.

Seoul, October 16, 1984

For Japan International Cooperation Agency (JICA)

MR. FUSAO NODE
Leader of Study Team

MR. HIROSHI MIYAZAWA
Member of Advisory Committee

For Ministry of Science and Technology (MOST), Republic of Korea

MR. HEE WOON CHOI
Project Manager
Korea Advanced Institute of Science and Technology

DR. HOAGY KIM
Chemical Research Coordinator
Ministry of Science and Technology

1. The Korean side made comments as listed below.

1) Forecast for solid waste generation

- The drastic increase of the solid waste generation rate from 1977 to 1979 in Seoul City should be referred to from socio-economic viewpoints and forecasts should reflect upon this situation.
- The future briquet ash generation rate in Seoul City should be considered in relation with fuel-use transformation planning of Seoul.
- The forecasts for waste generation rates excluding briquet ash should be evaluated in comparison with generation rates in municipalities of other countries.

2) Hazardous materials

- Environmental preservation of the final disposal site against hazardous materials should be taken into consideration.
- Control of industrial waste disposal at Nanjido should be regulated more strictly.
- These concepts should be considered into the policies for the master plan.

3) Recycling of briquet ash

- Though the use of briquet ash for agricultural purposes is appropriate, this subject should be taken up in a separate research.

4) Related projects

- The Mok Dong incineration plant, Nanjido materials recovery plant and Nanjido mounding project should be taken into account in the master plan.

5) Special refuse

- Management of refuse generated during noncontinuous, spectacular events such as the 1988 Olympic Games should be considered in the Study.

2. The Japanese side mentioned that the main purpose of the Study should be to establish the optimum master plan for the municipal solid waste management system in Seoul City and the comments from the Korean side should be reflected in the Study.

3. The Waste Management Division of the Seoul Metropolitan Government mentioned the following.

   1) Although the first priority of the Waste Management Division is life extension of Nanjido landfill site, the second is recognized as waste volume reduction as an important point for solid waste management.

   2) Separate collection of waste can be further promoted in Seoul City.

4. The Office of the Environment commented as follows.

   1) The Incheon coastal landfill plan is still under study.

   2) Whenever final disposal of waste needs to be performed outside of the waste generation administrative district, an inter-provincial conference and mutual agreement between concerned administrative parties is required.

   3) Recommendations on problems in the existing institutional arrangement arising as a result of this Study should be made.

5. Both the Korean and Japanese sides consented to the fact that since waste volume reduction is inevitable, intermediate processing is a significant and practical alternative for Seoul municipal solid waste management.

LIST OF ATTENDANTS

Korean Side

Dr. Hoagy Kim	Chemical Research Coordinator, MOST (Chairman of Steering Committee)
Mr. Hee Woon Choi	Principal Investigator, KAIST (Secretary of Steering Committee)
Dr. Sook Pyo Kwon	Director of Institute for Environmental Research, Yonsei University (Member of Steering Committee)
Dr. Sung Moo Lee	Professor of Chemical Engineering, Yonsei University (Member of Steering Committee)
Dr. Jung Wook Kim	Professor of Environmental Studies, Graduate School of Environmental Studies, Seoul National University (Member of Steering Committee)
Mr. Chi Jung Yoon	Director, Waste Management Division, Seoul Metropolitan Government (Member of Steering Committee)
Mr. Jong Sik Ro	Chief, Clean and Collection Section, Seoul Metropolitan Government
Mr. Sun Yong Lee	Office of Environment
Mr. Seoung Koo Ahn	Associate Professor of Environmental Engineering, Seoul City University
Mr. Soo Yeol Kim	Investigator, KAIST

Japanese Side

(Advisory Committee)

Mr. Hiroshi Miyazawa	Japan Waste Management Association
Dr. Masaru Tanaka	Institute of Public Health
Mr. Osamu Ikeda	Ministry of Health and Welfare
Mr. Junji Ishizuka	Japan International Cooperation Agency

(Study Team)

Mr. Fusao Node	Team Leader
Mr. Kiyoshi Miyakura	Team Member
Mr. Shoji Fujii	Team Member
Mr. Shigehisa Tazaki	Team Member

M I N U T E S O F M E E T I N G

FOR

MASTER PLAN AND FEASIBILITY STUDY

ON

SEOUL MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM

IN

THE REPUBLIC OF KOREA

MINISTRY OF SCIENCE AND TECHNOLOGY

THE REPUBLIC OF KOREA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

JANUARY, 1985

MINUTES OF MEETING

The Study Team and Advisory Committee organized by Japan International Cooperation Agency visited Seoul and had a series of discussions with the Ministry of Science and Technology, which designated the Korea Advanced Institute of Science and Technology as a main cooperating agency for the Study, and the members of the Steering Committee established and presided by MOST.

As a result of the meetings, which were held in a most friendly atmosphere, both sides agreed upon the Interim Report on Seoul Municipal Solid Waste Management System. The Record of Meetings is attached.

Seoul, January 18, 1985

For Japan International Cooperation Agency (JICA)

Fusao Node

MR. FUSAO NODE
Leader of Study Team

For Ministry of Science and Technology (MOST), Republic of Korea

H. W. Choi

MR. HEE WOON CHOI
Project Manager
Korea Advanced Institute of Science and Technology

Hiroshi Miyazawa

MR. HIROSHI MIYAZAWA
Member of Advisory Committee

Hoagy Kim

DR. HOAGY KIM
Chemical Research Coordinator
Ministry of Science and Technology

1. The Korean side gave the following suggestions.

   1) Waste generation forecasts should reflect Korea's vision for year 2000 as well as other policies and plans.

   2) A more logical explanation for proposing incineration should be provided. References to experiences in other municipalities around the world (composting, RDF, pyrolysis, etc.) including technology trends should be included in the Study.

   3) More details and early implementation of demonstration in a model area should be arranged. Moreover, this type of pilot study should be continued to accumulate data to develop and advance solid waste management technology in Korea.

2. A request was made by the Japanese side for cooperation from Seoul Metropolitan Government to intimately inform details of any related schemes pertaining to solid waste management in Seoul City for more concrete and realizable planning.

3. Both sides concurred on the concepts of the Master Plan and Short Term Improvement Project, as well as the work to be done in the subsequent stage of the Study. The suggestions made by the Korean side will be reflected in further studies.

LIST OF ATTENDANTS

Korean Side

Dr. Hoagy Kim	Chemical Research Coordinator, MOST (Chairman of Steering Committee)
Mr. Hee Woon Choi	Principal Investigator, KAIST (Secretary of Steering Committee)
Dr. Sook Pyo Kwon	Director of Institute for Environmental Research, Yonsei University (Member of Steering Committee)
Dr. Sung Moo Lee	Professor of Chemical Engineering, Yonsei University (Member of Steering Committee)
Dr. Jung Wook Kim	Professor of Environmental Studies, Graduate School of Environmental Studies, Seoul National University (Member of Steering Committee)
Mr. Jong Keon Park	Chief, Division of Solid Waste Management, Office of Environment (Member of Steering Committee)
Mr. Jong Sik Ro	Chief, Sanitary Facilities Section, Seoul Metropolitan Government
Dr. Myong Jin Yu	Associate Professor of Environmental Engineering, Seoul City University
Mr. Soo Yeol Kim	Investigator, KAIST

Japanese Side

(Advisory Committee)

Mr. Hiroshi Miyazawa	Japan Waste Management Association
Dr. Masaru Tanaka	National Institute of Public Health
Mr. Hideaki Unno	Ministry of Health and Welfare
Mr. Junji Ishizuka	Japan International Cooperation Agency

(Study Team)

Mr. Fusao Node	Team Leader
Mr. Torao Tokozumi	Team Member
Mr. Masashi Hattori	Team Member
Mr. Shoji Fujii	Team Member
Mr. Shigehisa Tazaki	Team Member
Dr. Hidetoshi Kitawaki	Team Member

M I N U T E S O F M E E T I N G

FOR

MASTER PLAN AND FEASIBILITY STUDY

ON

SEOUL MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM

IN

THE REPUBLIC OF KOREA

MINISTRY OF SCIENCE AND TECHNOLOGY

THE REPUBLIC OF KOREA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

MARCH, 1985

MINUTES OF MEETING

The Study Team and Advisory Committee organized by Japan International Cooperation Agency visited Seoul and had a series of discussions with the Ministry of Science and Technology, which designated the Korea Advanced Institute of Science and Technology as a main cooperating agency for the Study, and the members of the Steering Committee established and presided by MOST.

As a result of the meeting, which was held in a most friendly atmosphere, both sides reviewed the Draft Final Report (I) on Seoul Municipal Solid Waste Management System. The record of the meeting is attached.

Seoul, March 23, 1985

For Japan International Cooperation Agency (JICA)

MR. FUSAO NODE
Leader of Study Team

For Ministry of Science and Technology (MOST), Republic of Korea

MR. HEE WOON CHOI
Project Manager
Korea Advanced Institute of Science and Technology

DR. MASAO SAGO
Chairman of Advisory Committe

DR. HOAGY KIM
Chemical Research Coordinator
Ministry of Science and Technology

1. The following discussions were made on the report.

   1) The Korean government has policies to reduce the rate of briquet ash generation by utilizing other energy sources which will decrease the waste generation rate. In this respect, the JICA Study has considered this aspect on the safe side.

   2) Recommendations should be made on countermeasures to environmental impacts, such as noise, traffic congestions, air pollution and waste contamination, as a result of construction of processing plants.

   3) The unique recycling activities presently being carried out in Seoul City is unlikely to continue in the future. The JICA Study recommended a rational systemization of recycling.

   4) The Incheon coastal landfill project is presently not being planned by O.O.E. Therefore, the words "is planning" on p.S-7 and p.5-1 in the report should be changed to "has studied".

2. The Japanese side made the following requests.

   1) The Seoul Metropolitan Government has intentions to adopt the Nanjido mounding plan prepared by Seoul City University. The JICA Study will be adjusted in accordance with the Seoul Metropolitan Government's plan, which should be informed to the JICA Study Team in due course.

   2) The JICA Study proposed Gangdong Gu and Dobong Gu as candidates for short term improvement planning. The Seoul Metropolitan Government should make an administrative suggestion on their priority.

   3) The implementation schedule on the Short Term Improvement Project was made for the target year of 1988 as defined in the Scope of Work. However, the Study identified that the procedure for implementation of this project would make this schedule very tight. Therefore, the target year should be shifted to 1990.

4) In order to propose a more feasible Short Term Improvement Project, informations previously requested to Seoul Metropolitan Government and Ministry of Construction through MOST are indispensable for further study.

3. The Japanese side requested that comments and advises on the concepts presented in the Draft Final Report (I) as well as replies to item 2. above be given by the Korean side to the Japanese Embassy not later than April 20th, 1985 in order for the JICA Study Team to provide the optimum plan for Seoul Metropolitan Government. Otherwise, the proposed project will require further review and reconfirmation for actual implementation. The Korean side agreed to take appropriate measures on these matters.

LIST OF ATTENDANTS

Korean Side

Dr. Hoagy Kim	Chemical Research Coordinator, MOST (Chairman of Steering Committee)
Mr. Hee Woon Choi	Principal Investigator, KAIST (Secretary of Steering Committee)
Dr. Sook Pyo Kwon	Director of Institute for Environmental Research Yonsei University (Member of Steering Committee)
Dr. Sung Moo Lee	Professor of Chemical Engineering Yonsei University (Member of Steering Committee)
Mr. Jong Keon Park	Chief, Division of Solid Waste Management Office of Environment (Member of Steering Committee)
Dr. Dok Chan Kim	Associate Professor Department of Chemical Engineering Seoul City University

Japanese Side

(Advisory Committee)

Dr. Masao Sago	Tokyo Science University
Mr. Hiroshi Miyazawa	Japan Waste Management Association
Mr. Hideaki Unno	Ministry of Health and Welfare
Mr. Junji Ishizuka	Japan International Cooperation Agency

(Study Team)

Mr. Fusao Node	Team Leader
Mr. Torao Tokozumi	Team Member
Mr. Kazuhiko Denda	Team Member
Mr. Masashi Hattori	Team Member
Mr. Shoji Fujii	Team Member
Mr. Shigehisa Tazaki	Team Member
Dr. Hidetoshi Kitawaki	Team Member

M I N U T E S O F M E E T I N G

FOR

MASTER PLAN AND FEASIBILITY STUDY

ON

SEOUL MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM

IN

THE REPUBLIC OF KOREA

MINISTRY OF SCIENCE AND TECHNOLOGY

THE REPUBLIC OF KOREA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

SEPTEMBER, 1985

MINUTES OF MEETING

The Study Team and Advisory Committee organized by Japan International Cooperation Agency visited Seoul and had a series of discussions with the Ministry of Science and Technology, which designated the Korea Advanced Institute of Science and Technology as a main cooperating agency for the Study, and the members of the Steering Committee established and presided by MOST.

As a result of the meeting, which was held in a most friendly atmosphere, both sides reviewed the Draft Final Report(II) on Seoul Municipal Solid Waste Management System. The record of the meeting is attached.

Seoul, September 3, 1985

For Japan International Cooperation Agency(JICA)

Fusao Node

MR. FUSAO NODE
Leader of Study Team

Hiroshi Miyazawa

MR. HIROSHI MIYAZAWA
Member of advisory Committee

For Ministry of Science and Technology (MOST), Republic of Korea

H. W. Choi

MR. HEE WOON CHOI
Project manager
Korea advanced Institute of Science and Technology

Hoagy Kim

DR. HOAGY KIM
Chemical Research Coordinator
Ministry of Science and Technology

1. The following discussions were made on the report.

   1) Accuracy of the waste generation in future, excluding briquet ash, was discussed.

   2) Although material recovery plant is recommended to start operation from 1996 in the development phase of the Master Plan, it is possible to implement in the short term stage if Seoul City has intention to start operation earlier.

   3) Both Korean and Japanese sides have recognized the necessity to review the Nanjido mounding plan.

   4) Wastes from road sweeping should be commented in the final report.

   5) Environmental assessment on noise and dust from collection vehicles around the intermediate processing plant should be discussed in the report.

   6) Simulation work for air pollution from incineration stack should be made for the location of historical ruins and also maximum ground level.

2. The Japanese side requested comments and advices on the Draft Final Report(II) to be given by the Korean side through the Japanese Embassy not later than September 30th, 1985 in order for the JICA Study Team to reflect them on the Final Report.

3. In the closing address, both sides expressed the warmest regards on the cooperation made between the two parties, without which the joint study work could not be successful.

LIST OF ATTENDANTS

Korean Side

Dr. Hoagy Kim	Chemical Research Coordinator, MOST (Chairman of Steering Committee)
Mr. Hee Woon Choi	Principal Investigator, KAIST (Secretary of Steering Committee)
Dr. Sook Pyo Kwon	Director of Institute for Environmental Research Yonsei University (Member of Steering Committee)
Dr. Sung Moo Lee	Professor of Chemical Engineering Yonsei University (Member of Steering Committee)
Dr. Dong Min Kim	Professor of Environmental Engineering Seoul City University (Member of Steering Committee)
Mr. Yun Hwa Koh	Section Chief, Division of Solid Waste Management Office of Environment

Japanese Side

(Advisory Committee)

Mr. Hiroshi Miyazawa	Japan Waste Management Association
Dr. Masaru Tanaka	The Institute of Public Health, Ministry of Health and Welfare
Mr. Junji Ishizuka	Japan International Cooperation Agency

(Study Team)

Mr. Fusao Node	Team Leader
Mr. Kiyoshi Miyakura	Team Member
Dr. Hidetoshi Kitawaki	Team Member
Mr. Hidesumi Arai	Team Member