

FIG. 3.4-1

Planned Location of New Depo and LPS

THE STUDY ON THE SOLID WASTE MANAGEMENT IMPROVEMENT FOR SURABAYA CITY

2) Facilities to be Constructed and Unit Construction Cost

Tables 3.4-3 and 3.4-4 shows facilities to be constructed, and unit estimated construction cost per Depo and LPS respectively.

Cost of construction of a Depo is estimated to be Rp 33.6 million, and Rp 60.6 million if land has to be purchased. Cost of construction of a LPS is estimated to be Rp 9 million.

Table 3.4-3 Facilities to be Constructed for Depo and Unit Estimated Cost

Facilities to be Constructed	Unit Price per Depo or LPS	Specifications
(1) Wall	Rp. 6,300,000	70 m length
(2) Office	Rp. 12,500,000	5x5 m ² (Building)/15 m ² open terrace
(3) Drainage	Rp. 2,150,000	20 m
(4) Plant	Rp. 250,000	20 trees
(5) Gate	Rp. 1,400,000	1 gate - 6 m
(6) Concrete floor	Rp. 5,500,000	150 m ²
(7) Electricity and water pipe	Rp. 1,200,000	450 watt-220V-9 points plug 1 water pump - 2 points faucet
(8) Furniture	Rp. 1,250,000	2 desks, 4 chairs, and 1 cabinet
Sub-Total	Rp. 30,550,000	
Tax/PPN 10%	Rp. 3,055,000	
Depo Construction	Rp. 33,605,000	
Land Purchase	Rp. 27,000,000	Rp. 90,000/m ² x 300 m ²
Total	Rp. 60,605,000	

Table 3.4-4 Facilities to be Constructed for LPS and Unit Estimated Cost

Facilities to be Constructed	Unit Price per Depo or LPS	Specifications
(1) Wall	Rp. 2,550,000	25 m Length
(2) Plant	Rp. 250,000	20 Plants
(3) Concrete Floor	Rp. 3,200,000	100 m ²
(4) Drainage	Rp. 2,150,000	20 m
Sub-total	Rp. 8,150,000	
Tax/PPN 10%	Rp. 815,000	
LPS Construction	Rp. 8,965,000	

4.2.2 Rehabilitation of Depo and LPS

1) Rehabilitation Program

It is planned that 30 Depo and 34 LPS will be rehabilitated during the 4 years period from 1994/95 and 1997/98. Table 3.4-5 shows a rehabilitation program, i.e., names of Depo and LPS, items to be rehabilitated in each year, and estimated costs.

Kelurahan with higher population density receive higher priority in the time order of rehabilitation.

Tables 3.4-6 and 3.4-7 shows names of Depo and LPS by items of rehabilitation. The planned rehabilitation works include expansion (enlargement) of Depo or LPS.

Table 3.4-5 Depo and LPS Rehabilitation Program

No	Rehabilitation year	Name of Depo/LPS	Required Rehabilitation	Estimated Rehabilitation Cost	Kecamatan	Kelurahan	Population Density
1	1994/1995	Depo Nagel Dadi III	Gate	Rp. 1,400,000	Wonokromo	Ngagel Rejo	1091
2		Depo Demak	Gate	Rp. 1,400,000	Bubutan	Tembok Dukuh	637
3		Babadan/Dupak	Concrete floor	Rp. 2,200,000	Bubutan	Jepara	632
4		Pasar Kapasan	Wall	Rp. 765,000	Simokerto	Sidodadi	472
5		Pasar Harapan	Wall	Rp. 765,000	Simokerto	Sidodadi	472
6		Pegrikan	Concrete floor	Rp. 1,480,000	Semampir	Ampel	438
7		Pasar Kembang	Concrete floor	Rp. 1,480,000	Tegalsari	Wonorejo	398
8		Jetis	Entrance	Rp. 225,000	Wonocolo	Wonokromo	378
9		Pasar Kembang	Expansion	Rp. 5,705,000	Tegalsari	Wonorejo	378
10		Depo Kintamani	Entrance	Rp. 225,000	Wonokromo	Wonokromo	378
11		Depo Tambak Rejo	Electricity & water pipe	Rp. 360,000	Simokerto	Tambak Rejo	363
12		Depo Wonosari Tegal	Concrete floor	Rp. 2,200,000	Simokerto	Wonokromo	357
13		Bendul Merisi	Drainage	Rp. 430,000	Semampir	Jagir	350
14		Pucang Anom	Expansion	Rp. 5,705,000	Wonokromo	Kertajaya	332
15		Depo Kalibokor	Concrete floor	Rp. 1,480,000	Gubeng	Pucang Sewu	256
16		Depo Pacar Keling	Gate	Rp. 1,400,000	Gubeng	Pacar Keling	235
17		Tambak Boyo	Electricity & water pipe	Rp. 360,000	Tambaksari	Pacar Keling	235
18		Gubeng Masjid	Concrete floor	Rp. 2,200,000	Tambaksari	Pacar Keling	235
19		Depo Raya Dukuh Kupang	Expansion	Rp. 1,480,000	Tambaksari	Pacar Keling	232
20		Depo Bunguran	Office	Rp. 2,500,000	Karang Pilang	Dukuh Kupang	221
21		Pecindilan	Concrete floor	Rp. 2,200,000	Pabean Camlikan	Bongkaran	221
22		Depo Kayoon	Electricity & water pipe	Rp. 360,000	Genteng	Kapasari	255
23		Baratajaya	Expansion	Rp. 5,507,000	Genteng	Embong Kaliasin	196
24		Depo Pungadi	Electricity & water pipe	Rp. 360,000	Gubeng	Baratajaya	194
25		Penghela	Expansion	Rp. 5,507,000	Bubutan	Bubutan	189
26		Depo Kaiwaron	Electricity & water pipe	Rp. 360,000	Bubutan	Bubutan	189
27		Depo Kepuran	Concrete floor	Rp. 1,480,000	Gubeng	Mojo	184
28		Depo Dinoyo	Wall	Rp. 1,890,000	Tegalsari	Kepuran	174
29		Bratang Binangun	Wall	Rp. 1,890,000	Tegalsari	Kepuran	174
			Electricity & water pipe	Rp. 360,000	Gubeng	Baratajaya	172
			Concrete floor	Rp. 1,480,000	Gubeng	Baratajaya	172

No	Rehabilitation year	Name of Depo/LPS	Required Rehabilitation	Estimated Cost	Kecamatan	Kelurahan	Population Density
30		Depo Simomulyo	Electricity & water pipe	Rp. 360,000	Tandes	Simomulyo	171
31		Depo Simo Hilir	Electricity and water pipe	Rp. 360,000	Tandes	Simo Mulyo	171
32		Berdul Merisi	Concrete floor	Rp. 2,200,000	Wonocolo	Berdul Merisi	169
33		Gunung Sari	Drainage	Rp. 430,000	Wonokromo	Sawunggaling	163
34		Joyoboyo	Wall	Rp. 765,000	Wonokromo	Sawunggaling	163
35		Menanggal	Concrete floor	Rp. 1,480,000	Wonocolo	Menanggal	153
36		Keintang Baru	Concrete floor	Rp. 1,480,000	Wonocolo	Keintang	143
37		Depo Gersik	Wall	Rp. 1,890,000	Kreimbangan	Moro Kreimbangan	133
			Gate	Rp. 1,400,000			
			Electricity & water pipe	Rp. 360,000			
38		Depo Manukan Kulon	Concrete floor	Rp. 2,200,000	Tandes	Manukan Kulon	131
			Electricity & water pipe	Rp. 360,000			
39		Depo Rungkut Menanggal	Electricity & water pipe	Rp. 360,000	Rungkut	Rungkut Menanggal	121
			Gate	Rp. 1,400,000			
			Drainage	Rp. 430,000			
			Gate	Rp. 430,000			
40		Depo Manyar	Gate	Rp. 1,400,000	Sukolilo	Manyar Sabrangan	119
41		Depo Rungkut Kidul	Electricity & water pipe	Rp. 360,000	Rungkut	Rungkut Kidul	116
42		Jemur Ngawinan	Wall	Rp. 765,000	Wonocolo	Jemur Wonosari	109
43		Jemur Wonosari	Expansion	Rp. 5,507,000	Wonocolo	Jemur Wonosari	109
			Concrete floor	Rp. 1,480,000			
44		Depo Pagesangan	Electricity & water pipe	Rp. 360,000	Wonocolo	Pagesangan	103
			Gate	Rp. 1,400,000			
45		Karang Pilang	Expansion	Rp. 5,507,000	Karang Pilang	Karang Pilang	101
46		Kebraon	Expansion	Rp. 5,507,000	Karang Pilang	Kebraon	98
47		Tenggilis Tengah	Concrete floor	Rp. 1,480,000	Rungkut	Tenggilis Mejoyo	93
48		Depo Karah	Concrete floor	Rp. 2,200,000	Wonocolo	Karah	87
49		Depo Semolowaru	Concrete floor	Rp. 2,200,000	Sukolilo	Semolowaru	80
50		Depo Manukan Wetan	Electricity & water pipe	Rp. 360,000	Tandes	Manukan Wetan	78
51		Siwalankerto	Concrete floor	Rp. 1,480,000	Wonocolo	Siwalankerto	76
52		Depo Gayungsari	Office	Rp. 2,500,000	Wonocolo	Gayungan	74
			Concrete floor	Rp. 2,200,000			
53		Depo Menanggal	Office	Rp. 2,500,000	Wonocolo	Menanggal	66
54		Depo Kembang Kuning	Office	Rp. 2,500,000	Sawahan	Pakis	65
55		Depo Karang Poh	Electricity & water pipe	Rp. 360,000	Tandes	Karang Poh	56
56		Mulyosari	Concrete floor	Rp. 1,480,000	Sukolilo	Kalisari	31
57		Depo Candi Lontar	Electricity & water pipe	Rp. 360,000	Lakarsantri	Candi Lontar	18
			Gate	Rp. 1,890,000	Wonocolo	Siwalankerto	76
58		Depo Gayungsari	Office	Rp. 2,500,000	Wonocolo	Gayungan	74
			Concrete Floor	Rp. 2,200,000			

No	Rehabilitation year	Name of Depo/LPS	Required Rehabilitation	Estimated Rehabilitation Cost	Kecamatan	Kelurahan	Population Density
59		Depo Menanggal	Office	Rp. 2,500,000	Wonocolo	Menanggal	66
60		Depo Kembang Kuning	Office	Rp. 2,500,000	Sawahan	Pakis	65
61		Depo Karang Poh	Electricity & water pipe	Rp. 360,000	Tandes	Karang Poh	56
62		Aserowro	Wall	Rp. 765,000	Wonokromo	Sawang Galing	47
63		Mulyosari	Concrete floor	Rp. 1,480,000	Sukobilo	Kalisari	31
64		Depo Candi Lontar	Electricity & water pipe	Rp. 360,000	Lakarsantri	Candi Lontar	18
			Office	Rp. 2,500,000			
			Gate				

Table 3.4-6 Depo That Need Rehabilitation

Things to be rehabilitated	No	Name of Depo/LPS	Kelurahan	Kecamatan	Population density
1) Wall	1	Depo Keputran	Keputran	Tegalsari	174
	2	Depo Gersik	Moro Krembar	Krembangan	133
	3	Depo Kaliwaron	Mojo	Gubeng	184
2) Office	1	Depo Raya Dukuh Kupa	Dukuh Kupang	Karang Pilang	232
	2	Depo Kembang Kuning	Pakis	Sawahan	65
	3	Depo Candi Lontar	Candi Lontar	Lakarsantri	18
	4	Depo Gayung Sari	Gayung Sari	Wonocolo	74
	5	Depo Menanggal	Menanggal	Wonocolo	66
3) Drainage	1	Depo Demak*5	Tembok Dukul	Bubutan	637
	2	Depo Rungkut Menanggal	Rungkut Menanggal	Rungkut	121
	3	Depo Tenggilis Mejoyo	Tenggilis Mejoyo	Rungkut	93
	4	Depo Wonosari Tegal	Wonokusumo	Semampir	357
	5	Bendul Merisi	Bendut Merisi	Wonocolo	169
4) Gate	1	Depo Kalibokor	Pucang Sewu	Gubeng	637
	2	Depo Gersik	Moro Krembar	Krembangan	133
	3	Depo Manyar	Manyar Sabran	Sukolilo	119
	4	Depo Rungkut Mananggal	Rungkut Mananggal	Rungkut	121
	5	Depo Ngagel Dadi III	Ngagel Rejo	Wonokromo	1091
	6	Depo Candi Lontar	Candi Lontar	Lakarsantri	18
	7	Depo Pagesangan	Pagesangan	Wonocolo	103
5) Concrete Floor	1	Depo Demak	Tembok Dukul	Bubutan	637
	2	Depo Bunguran	Bongkaran	Pabean Cantikan	221
	3	Depo Manukan Kulon	Manukan Kulon	Tandes	131
	4	Depo Tambak Rejo	Tambak Rejo	Simokerto	363
	5	Depo Semolowaru	Semolowaru	Sukolilo	80
	6	Depo Gayung Sari	Gayungan	Wonocolo	74
	7	Depo Karah	Karah	Wonocolo	87
	8	Depo Dinoyo*10	Keputran	Tegalsari	174
6) Electricity and Water Pipe	1	Depo Manukan Kulon	Manukan Kulon	Tandes	131
	2	Depo SimoMulyo	Simo Mulyo	Tandes	171
	3	Depo Keputran	Keputran	Tegalsari	174
	4	Depo Kayon	Embong Kalias	Genteng	196
	5	Depo Balong Sari	Balong Sari	Tandes	65
	6	Depo Manyar Wetan	Manyar Wetan	Tandes	78
	7	Depo Dinoyo	Keputran	Tegalsari	174
	8	Depo Pirngadi	Bubutan	Bubutan	189
	9	Depo Gersik	Moro Krembar	Krembangan	133
	10	Depo Pacar Keling	Pacar Keling	Tambaksari	235
	11	Depo Kintamani	Wonokromo	Wonokromo	378
	12	Depo Simo Hilir	Simo Mulyo	Tandes	171
	13	Depo Karang Poh	Karang Poh	Tandes	56
	14	Depo Rungkut Kidul	Rungkut Kidul	Rungkut	116
	15	Depo Candi Lontar	Candi Lontar	Lakarsantri	18
	16	Depo Pagesangan	Pagesangan	Wonocolo	103
7) Entrance	1	Depo Numgiram*8	Bongkaran	Pabean Cantikan	221

Table 3.4-7 LPS That Need Rehabilitation

Things to be rehabilitated		Name of Depo/LPS	Kelurahan	Kecamatan	Population density
1) Wall	1	Asem Rowo	Asem Rowo	Tandes	47
	2	Manukan Wetan	Manukan Wetan	Tandes	78
	3	Gunung Sari	Sawung Galing	Wonokromo	163
	4	Babadan/Dupak	Jebara	Bubutan	632
	5	Pasar Kapasan	Sidodadi	Simokerto	472
	6	Jemur Ngawinan	Jemur Wonosari	Wonocolo	109
2) Concrete floor	1	Pegirikan	Ampel	Semampir	438
	2	Pucang Anom	Kertajaya	Gubeng	332
	3	Bratang Binangun	Baratajaya	Gubeng	172
	4	Penghela	Bubutan	Bubutan	189
	5	Pasar Tembok	Tembok Dukuh	Bubutan	637
	6	Rungkut Harapan	Kali Rungkut	Rungkut	214
	7	Pacar Keling	Pacar Keling	Tambaksari	235
	8	Tambak Boyo *1	Pacar Keling	Tambaksari	235
	9	Pasar Gubeng Masjid *2	Pacar Keling	Tambaksari	235
	10	Joyobojo	Sawung Galing	Wonokromo	163
	11	Simo Hilir	Simo Mulyo	Tandes	171
	12	Pasar Harapan	Sidodadi	Simokerto	472
	13	Mulyosari	Kalisari	Sukolilo	31
	14	Jemur Wonosari *3	Jemur Wonosari	Wonocolo	109
	15	Siwalankerto	Siwalankerto	Wonocolo	76
	16	Menanggal	Menanggal	Wonocolo	153
	17	Ketintang Baru	Ketintang	Wonocolo	143
	18	Tenggilis Tengah	Tenggilis Mejoyo	Rungkut	93
	19	Jetis *4	Wonokromo	Wonocolo	378
3) Drainage	1	Pasar Gubeng Masjid *2	Pacar Keling	Tambaksari	235
	2	Kali Rungkut	Kali Rungkut	Rungkut	214
	3	Rungkut Harapan	Kali Rungkut	Rungkut	214
	4	Ketintang Baru	Ketintang	Gayungan	143
	5	Siwalankerto	Siwalankerto	Wonocolo	176
	6	Kedurus	Kedurus	Karang Pilang	123
	7	Kemlaten	Kebranon	Karang Pilang	96
4) Entrance	1	Pasar Kembang	Wonorejo	Tegalsari	398
5) Expansion	1	Baratajaya	Baratajaya	Gubeng	194
	2	Pecindilan	Kapasari	Genteng	255
	3	Kebranon	Kebranon	Karang Pilang	98
	4	Karang Pilang	Karang Pilang	Karang Pilang	101
	5	Tambak Boyo *1	Pacar Keling	Tambaksari	235
	6	Bendul Merisi	Jagir	Wonokromo	350
	7	Jemur Wonosari*3	Jemur Wonosari	Wonocolo	109
	8	Jetis *4	Wonokromo	Wonokromo	378

Note : *n shows the same LPA.

2) Facilities to be Rehabilitated and Estimated Cost

Facilities to be rehabilitated and unit estimated cost are shown in Table 3.4-8. Number of rehabilitation works planned for each year is shown in Table 3.4-9

Table 3.4-8 Facilities of Depo and LPS to be Rehabilitated and Estimated Unit Cost

Items	Unit Cost of Rehabilitation of Depo	Unit Cost of Rehabilitation of LPS
1. Wall	(30 %) Rp 1,890,000	(30 %) Rp 765,000
2. Office	(20 %) Rp 2,500,000	-
3. Drainage	(20 %) Rp 430,000	(100%)Rp 2,150,000
4. Gate	(100%)Rp 1,400,000	-
5. Concrete floor	(40 %) Rp 2,200,000	(40 %) Rp 1,480,000
6. Electricity & Water pipe	(30 %) Rp 360,000	-
7. Entrance	(10 %) Rp 630,000	(10 %) Rp 225,000
8. Expansion	-	(70 %) Rp 5,705,000
9. Plant	(100%) (Rp 250,000)	(100%) (Rp 250,000)

Note: Percentages indicated in parenthesis show those of the estimated rehabilitation costs to the costs of new construction.

Table 3.4-9 Number of Rehabilitation Works by Item and Year

Items to be Rehabilitated	1994/95	1995/96	1996/97	1997/98	Total
1. Wall	2 (1.53)	3 (5.67)	3 (3.42)	1 (0.77)	9 (11.39)
2. Office	0 (0)	1 (2.5)	0 (0)	4 (10)	5 (12.5)
3. Drainage	2 (0.86)	4 (8.6)	4 (5.16)	2 (2.58)	12 (17.2)
4. Gate	2 (2.8)	0 (0)	3 (4.2)	2 (2.8)	7 (9.8)
5. Concrete floor	9 (15.48)	6 (10.32)	6 (10.32)	6 (11.04)	27 (47.16)
6. Electricity & Water Pipe	2 (0.72)	6 (2.16)	4 (1.44)	4 (1.44)	16 (5.76)
7. Entrance	1 (0.225)	1 (0.63)	0 (0)	0 (0)	2 (0.86)
8. Expansion of LPS	4 (22.04)	1 (5.51)	1 (5.51)	2 (11.01)	8 (44.06)
9. Tree planting	36 (9)	36 (9)	36 (9)	36 (9)	144 (36)
Total	52.65	44.39	39.05	47.645	183.735

Note: Figures in parenthesis () indicate estimated costs in million Rupiah.

4.2.3 Improvement of Asemrowo Workshop

In order to increase the maintenance capacity of Asemrowo Workshop, it is planned that KMS will make the following improvements in the year 1994/95:

- a) Remodeling of the Workshop
- b) Procurement of tools and equipment for maintenance and repair.

1) Remodeling of the Workshop

A main idea of the remodeling is to divide the workshop into two parts; maintenance area on the east side of the workshop, and car parking area on the west side. Fig. 3.4-2 shows the remodeling plan.

Needless to mention, removal of abandoned trucks is the prerequisite for carrying out the remodeling. Remodeling works include the following:

- a) Construction of a fuel pump station
- b) Pavement of vehicle passage
- c) Remodeling of the building

a. Construction of a Fuel Pump Station

It is planned that a fuel pump station will be constructed next to the car washing area as indicated in Fig. 3.4-2

b. Pavement of Vehicle Passage

A vehicle passage will be provided on the west side of parking area as indicated in Fig. 3.4-2.

The passage will be paved. The paved area will be about 4 m wide and 30 m long.

c. Remodeling of the Building

The existing building needs some restructuring and repair works. KMS should prepare a detailed plan for the remodeling.

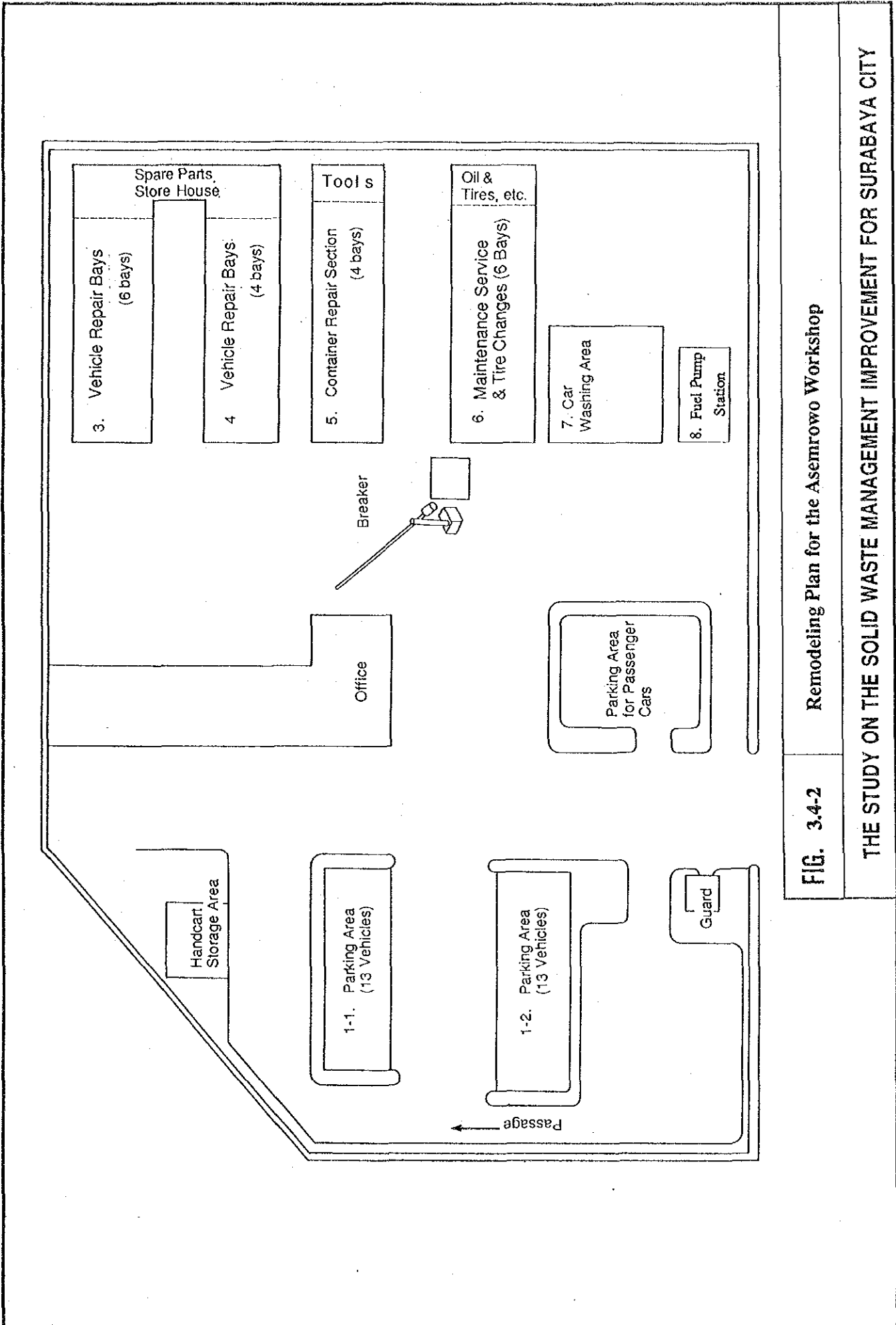


FIG. 3.4-2 Remodeling Plan for the Asemrowo Workshop



2) Procurement of Tools and Equipment for Maintenance and Repair.

Asemrowo Workshop is not equipped with adequate tools and equipment for maintenance and repairs. For example, the Workshop does not have equipment such as gauges that are needed for measuring the accuracy and appropriateness of repairs and adjustments made.

The items listed in the Table 3.4-10 are recommended as basic equipment and tools necessary for carrying out proper and effective maintenance and repairs. A total procurement cost is estimated to about Rp 102 million in 1992 price.

Although most of the listed equipment are relatively simple and easy to use, the adequate training on the usage of those equipment should be provided.

Table 3.4-10 Recommended Equipment and Tools for Maintenance and Repairs.

No.	Item	Quantity	Amount (unit : Rp1,000)
A	For engine overhaul : 9 kinds	9	3,410
B	For chassis repair : 12 kinds	33	16,339
C	For repair of electric systems : 3 kinds	5	1,160
D	General tool : 35 kinds	52	35,716
E	For Measurement (Gauge) : 11 kinds	16	2,520
F	Air Equipment : 3 kinds	6	3,233
G	For Vehicle Washing : 1 kinds	1	20,457
H	For Oil and Grease : 3 kinds	15	6,005
I	For Welding and Cutting : 17 kinds	35	13,454
	Total 94 kinds	172 sets	102,294

4.3 Investment Costs Needed for Depo/LPS Construction, Rehabilitation, & Asemrowo Workshop Improvement

The total cost needed for the implementation of the programs shown in Chapter 4 is estimated to be about Rp 1,608 million in 1992 price as shown below:

1) Construction of new Depo (24) and LPS (12):	Rp 1,157,100,000
2) Rehabilitation of the existing Depo (30) and LPS (34);	Rp 183,735,000
3) Improvement of Asemrowo Workshop:	Rp 267,004,180
Total:	Rp 1,607,839,180

Table 3.4-11 Investment Costs Needed for Depo/LPS Construction, Rehabilitation, & Asemrowo Workshop Improvement

Unit: Rupiah in 1992 price

Description	Investment Amounts	
	Item Cost	Total
1. Construction of New Depo and LPS		
1.1 Construction of 24 new Depo*1	Rp 1,049,520,000	
1.2 Construction of 12 new LPS*2	Rp 107,580,000	
Sub-total		Rp 1,157,100,000
2. Rehabilitation of the Existing Depo and LPS		
2.1 Rehabilitation of 30 Depo*3	Rp 66,110,000	
2.2 Rehabilitation of 34 LPS*4	Rp 117,625,000	
Sub-Total		Rp 183,735,000
3. Improvement of Asemrowo Workshop		
3.1 Remodeling of Asemrowo Workshop	Rp 164,721,000	
3.2 Procurement of tools & equipment for maintenance and repair	Rp 102,294,180	
Sub-total		Rp 267,004,180
Total		Rp 1,607,839,180

*1: $(Rp\ 60,605,000/Depo\ \&\ land\ \times\ 9\ Depo) + (Rp\ 33,605,000/Depo) \times 15\ Depo$
 $= Rp\ 545,445,000 + Rp\ 504,075,000 = Rp\ 1,049,520,000$

*2: $Rp\ 8,965,000/LPS \times 12\ LPS = Rp\ 107,580,000$

*3: See Table 3.4-13.

*4: See Table 3.4-14.

Annual Investment

Annual investment amounts are shown in Table 3.4-12. Detailed costs are shown in tables 3.4-13 and 3.4-14.

Table 3.4-12 Annual Investment Costs Needed for Depo/LPS Construction, Rehabilitation, & Asemrowo Workshop Improvement

Unit : Rp. Million in 1992 price

Year	Construction of Depo & LPS			Rehabilitation of Depo/LPS (4)	Improvement of Asemrowo Workshop (5)	Total Cost (3)+(4)+(5) = (6)
	Building Construction Cost (1)	Land Purchase Cost (2)	Total Cost (1)+(2)= (3)			
1994/95	228.525	81.0	309.525	52.650	267.004	629.179
1995/96	228.525	0.0	228.525	44.390		272.915
1996/97	228.525	135.0	363.525	39.050		402.575
1997/98	228.525	27.0	255.525	47.6450		303.170
Total	914.10	243.0	1,157.10	*183.735	267.004	1,607.839

* See Table 5.2-9 for details of the amount Rp 183.735.

Table 3.4-13 Detailed Costs of Rehabilitation of Depo

Items	Unit Cost (1)	No. of Depo to be Rehabilitated (2)	Total Cost (1) x (2) = (3)
1. Wall	Rp 1,890,000	3	Rp 5,670,000
2. Office	Rp 2,500,000	5	Rp 12,500,000
3. Drainage	Rp 430,000	5	Rp 2,150,000
4. Gate	Rp 1,400,000	7	Rp 9,800,000
5. Concrete floor	Rp 2,200,000	8	Rp 17,600,000
6. Electricity & Water pipe	Rp 360,000	16	Rp 5,760,000
7. Entrance	Rp 630,000	1	Rp 630,000
8. Expansion	Rp 5,705,000	0	0
9. Plant	(Rp 250,000)	48	Rp 12,000,000
Total	-	91	Rp 66,110,000

Table 3.4-14 Detailed Costs of Rehabilitation of LPS

Items	Unit Cost (1)	No. of Depo to be Rehabili- tated (2)	Total Cost (1) x (2) = (3)
1. Wall	Rp 765,000	6	Rp 4,590,000
2. Office	Rp 2,500,000	0	0
3. Drainage	Rp 2,150,000	7	Rp 15,050,000
4. Gate	Rp 1,400,000	0	0
5. Concrete floor	Rp 1,480,000	19	Rp 28,120,000
6. Electricity & Water pipe	Rp 360,000	0	0
7. Entrance	Rp 225,000	1	Rp 225,000
8. Expansion	Rp 5,705,000	8	Rp 45,640,000
9. Plant	(Rp 250,000)	96	Rp 24,000,000
Total	-	137	Rp 117,625,000

Chapter 5. F/S Component 4: Procurement of Heavy Equipment

5.1 Background and Outline of the Project

Heavy equipment is used for operation of landfill in final disposal sites (LPA). At present, KMS have 7 bulldozers, 2 compactors and 1 wheel-loader.

Of the 7 bulldozers, only one bulldozer is considered in good conditions, 5 of them are seriously damaged. Most of the damages occurred to the undercarriage. Some of the damaged bulldozers can be operational through overhaul, but some are not worthwhile to overhaul. It is necessary to replace them with new ones. A new bulldozer is also needed for the planned LPA in Benowo.

Types and quantities of heavy equipment to be procured or overhauled during the SUDP period are shown in the table below.

<u>EQUIPMENT</u>	<u>QUANTITY</u>	<u>PLACE OF USE</u>
1. New bulldozer:	3	Keputih LPA
2. New rotary screen:	1	- ditto -
3. Bulldozer overhaul:	4	- ditto -
4. Landfill compactor:	2	- ditto -
5. Wheeled loader overhaul:	1	- ditto -
6. New bulldozer*1:	1	Benowo LPA
7. New excavator*2:	1	- ditto -

*1: 1 units of new bulldozer marked with *1 will be used for landfill operation in Benowo.

*2: 1 unit of new excavator marked with *2 will be used mainly for loading cover materials into open dump trucks in Benowo LPA.

The above items 1 - 5 will be used for the LPA in Keputih, while items 6 and 7 will be used for the planned LPA in Benowo. The former items (1 - 5) are identical with a plan contained in the Addendum to Solid Waste Management Sector Report of IUIDP.

5.2 Procurement Schedule

Procurement schedule is shown in the following table.

Table 3.5-1 Heavy Equipment Procurement Schedule

Equipment	Total Units	'93/94	'94/95	'95/96	'96/97	'97/98	98/99
1. New bulldozers to be used in Keputih	3	0	1	1	1	0	0
2. Rotary screen	1	1	0	0	0	0	0
3. Bulldozer overhaul	4	2	2	0	0	0	0
4. Landfill compactor overhaul	2	1	1	0	0	0	0
5. Wheeled loader overhaul	1	0	0	0	1	0	0
6. New Bulldozers to be used in Benowo LPA	1	0	0	0	1	0	0
7. New Excavator to be used in Benowo LPA	1	0	0	0	1	0	0
Total	13	4	4	1	4	0	0

Note: Item 7 (new excavator) will be used mainly for loading cover materials into open dump trucks in Benowo LPA.

5.3 Investment and Operation/Maintenance Costs

It is estimated that a total of Rp 1,895,000,000 will be needed for the procurement and overhaul of necessary heavy equipment as shown in the table below.

Table 3.5-2 Investment for Heavy Equipment

Unit: Rupiah in 1992 price

Equipment	Unit Price (1)	Quantity (2)	Costs (1) x (2) = (3)
1. New bulldozer to be used in Keputih LPA	Rp 300,000,000	3	Rp 900,000,000
2. Rotary screen	Rp 15,000,000	1	Rp 15,000,000
3. Bulldozer overhaul	Rp 100,000,000	4	Rp 400,000,000
4. Landfill compactor overhaul	Rp 100,000,000	2	Rp 200,000,000
5. Wheeled loader overhaul	Rp 50,000,000	1	Rp 50,000,000
6. New bulldozers to be used in Benowo LPA	Rp 300,000,000	1	Rp 300,000,000
7. New excavator to be used in Benowo LPA	Rp 230,000,000	1	Rp 230,000,000
Total	-	13	Rp 1,895,000,000

Note: The above prices include the value added tax (PPN).

Annual investment schedule is shown in the table below.

Table 3.5-3 Annual Investment and Operation/Maintenance Costs for Heavy Equipment

Unit: Rupiah in 1992 price

Year	Investment Amount	Operation/Maintenance Costs
1993/94	Rp 215,000,000	0
1994/95	Rp 500,000,000	Rp 26,900,000
1995/96	Rp 300,000,000	Rp 89,400,000
1996/97	Rp 880,000,000	Rp 126,900,000
1997/98	0	Rp 236,900,000
1998/99	0	Rp 236,900,000
Total	Rp 1,895,000,000	Rp 717,000,000

Chapter 6. Project Summary

This chapter contains a project implementation plan, economic and financial evaluation, and project justification.

6.1 Project Implementation Plan

1) Agency Responsible for the Project Implementation

KMS will be responsible for the project implementation. The Cleansing Department in KMS will be the major department in charge of the project execution.

2) Project Components to be Implemented

It is planned that KMS will implement the following components of project in order to strengthen KMS' capacity and the means to manage solid waste during the SUDP Period.

1. Procurement of waste haulage vehicles, containers, and handcarts (Refer to Chapter 2)
2. Construction of sanitary landfill site in Benowo (Refer to Chapter 3)
3. Construction and rehabilitation of Depo/LPS & Improvement of Asemrowo Workshop (Refer to Chapter 4)
4. Procurement of heavy Equipment (Refer to Chapter 5)

3) Period of Project Implementation

KMS will implement the project during the seven (7) financial years 1992/93 - 1998/99. It is anticipated that KMS would actually commence the implementation in 1993/94 as the project preparation would be completed in 1993.

4) Physical Plan

The project implementation schedule is shown below. Types and quantities of equipment to be procured and works to be constructed are summarized in Table 3.6-2. Project implementation schedule is proposed as shown in Fig. 3.6-1.

Fig. 3.6-1 Implementation Program of F/S Project

Project Component	Fiscal Year					
	93/94	94/95	95/96	96/97	97/98	98/99
1. Procurement of Waste Haulage Vehicles, Containers, & Handcarts						
1.1 Vehicles						
1.2 Containers						
1.3 Handcarts						
2. Construction of Sanitary Landfill Site in Benowo						
3. Construction and Rehabilitation of Depo/LPS & Improvement of Asemrowo Workshop						
4. Procurement of Heavy Equipment						

5) Training

The implementation of F/S project components such as construction of a sanitary landfill require skills and knowledge of higher level than currently used. It is therefore advised that KMS will utilize some programs available both in Indonesia and abroad.

CIPTA KARYA established a central training center called Water Supply and Environmental Sanitation Training Center in Bekasi, and the Center offers various training courses for municipal officials involved in solid waste management, for example, advanced final disposal method, effective collection and haulage system and management. These courses are inexpensive and available for every municipality. Besides this type of training in Indonesia, there are some training programs offered by JICA that includes the SWM course as a scheme of accepting trainees on grant basis. These programs and scheme are useful and worth consideration for KMS.

6) Project Cost

Total project cost comprising of four (4) components is estimated to be Rp 41,784 million of which the investments will amount to Rp 33,581 million, and the operation and maintenance costs will amount to Rp 8,203 million as shown in the following table.

Table 3.6-1 F/S Project Cost Summary

Unit: Million Rupiah in 1992 price

Components of Project	Investment (1)	Operation & Maintenance (2)	Total (1) + (2) = (3)
1. Procurement of waste haulage vehicles, containers, and handcarts	6,644.4	5,275.7	11,920.1
2. Construction of sanitary landfill site in Benowo	23,434.0	2,049.0	25,483.0
3. Construction and rehabilitation of Depo/LPS & Improvement of Asemrowo Workshop	1,607.8	160.8	1,768.6
4. Procurement of heavy Equipment	1,895.0	717.0	2,612.0
Total	33,581.2	8,202.5	41,783.7

Note: The above-shown prices include the value added tax (PPN).

The total project cost Rp 41,784 million corresponds 363 % of Rp 11,500 million, 1992/93 KMS' cleansing budget; and 37 % of Rp 112,700 million 1992/93 KMS' total budget excluding one of the budget items "cash and calculation", over which KMS has no control. (This budget item is nominally included in the KMS budget.)

Tables 3.6-3 and 3.6-4 shows annual investment amounts, while Table 3.6-5 and 3.6-6 show annual operation and maintenance costs.

7) Source of Finance

It is expected that all the planned projects will be financed by a bilateral assistance organization with the scheme of soft loan. The prime borrower will be the Government of Indonesia, through which KMS will acquire the loan on the conditions that will be agreed between the Government of Indonesia and KMS.

6.2 Economic and Financial Evaluation

1) Methods of Evaluation

There are the following two levels of financial and economic evaluation carried out in connection with the F/S project:

- a. Evaluation of each F/S project component such as waste haulage equipment, sanitary landfill facility, etc.
- b. Evaluation of F/S project as a whole

For the first level of the evaluation, the Least Cost Method (Principle) has been used that are generally applied for the evaluation of municipal SWM projects. The reason for not using profitability indices such as the net present value, benefit-cost ratio, internal rate of return is that it is not possible to measure, in the monetary units, the direct benefits of the SWM services which is the improvement of cleanliness and sanitary conditions of the city.

For the second level of the evaluation, both KMS' and Surabaya citizens' financial burdens arising from the implementation of the F/S project and other expenditures were examined in terms of ratios of annual net SWM cash expenditures (Project expenditures minus loan revenues plus repayment of loans) relative to projected KMS budget and Gross Regional Product (GRP) of Surabaya respectively.

2) Evaluation

a. Financial Evaluation of F/S Project Components

Through the application of the least cost method (principle), the least cost equipment and facilities were chosen given that the chosen equipment will perform required functions, and satisfy national regulations, standards and guidelines and other requirements as agreed by the Indonesian Side. The least cost equipment as chosen in the above manner is the most cost-effective equipment. Reasons for choosing specific waste haulage, equipment and disposal facilities are given in the relevant section that explain respective project components.

b. Financial Evaluation of F/S Project as a Whole

(1) Financial Evaluation (KMS' Financial Burden)

Degree of the KMS' financial burden arising from the implementation of the F/S project components and other are carefully examined in the Main Report Part 3 Chapter 7. The estimated annual net cash expenditures (SWM expenditures minus the expected loan revenues plus loan repayments) arising from both the four (4) F/S project components and all non-F/S expenditures will range from 9.1 % to 10.7 % of the projected KMS' total budget during the F/S project implementation period of 1992/93 - 1998/99 assuming that KMS' annual budget will grow at the same growth rates as recorded during the past 5 years (10.8 %/year in real term). The average ratio during the F/S project implementation period is 9.9 %, which is lower than the corresponding average ratio (about 11 %) during the past three (3) years. (Refer to Table 7.) The corresponding ratio after 1998/99 will be lower than those to be experienced during the F/S project implementation period as the KMS budget would increase faster than the rates of increases of the sum of the cash expenditures and loan repayments.

(2) Economic Evaluation (Citizens' Financial Burden)

At present, the annual sum of SWM expenditures spent by KMS and citizens community group (RT/RW) is about Rp 20 billion per year (Rp 12 billion by KMS and Rp 8 billion by RT/RW in 1992), which is about 0.5 % of the Gross Regional Product (GRP) of Surabaya, Rp 4,100 billion (1990).

Assuming that the KMS budget would grow at the same rate as recorded during the past five (5) years (10.8 %/year on average), and the GRP Surabaya will grow as fast as the KMS budget, the corresponding ratio of the annual net SWM expenditures relative to the GRP will decrease in the future as the ratios of such expenditures to KMS budget are expected to decrease.

As a conclusion, the implementation of the F/S project will not cause both KMS' and citizens' financial burden to increase in terms of ratio of net SWM cash expenditures relative to either KMS budget or GRP.

6.3 Project Justification

The F/S project comprising of the four (4) project components have been carefully prepared in order to improve KMS' s capacity and the means to manage solid waste. The F/S project has been planned to satisfy the following conditions and criteria.

1. All the national standards and guidelines with respect to solid waste management and environment.
2. Legal environmental assessment procedure (AMDAL)

A legal environmental assessment (AMDAL) was carried in connection with the construction of sanitary landfill in Benowo. The AMDAL executed was accepted and authorized by the Government of Indonesia. Refer to Appendix 5 : Notification of AMDAL Evaluation by the East Jawa AMDAL Commission.

3. Cost-effectiveness

In the preparation of the projects, the priority was given to the cost-effectiveness through the application of the least cost method as explained in Section 7). The equipment and the works planned are those that would perform required functions in safety and sanitary manner at the least costs.

4. Appropriateness of Sizes of the Project Cost

Appropriateness of the project costs is examined in terms of ratios of the net SWM each expenditures (including the F/S project expenditures and all other SWM expenditures) to the projected KMS budget and Gross Regional Product (GRP of Surabaya). The ratios during and after the F/S project period are expected to be not more than the current ratios as shown in Section 7). Therefore, it is judged that the financial burden arising from the implementation of the F/S project would be manageable for KMS and appropriate for the citizens of Surabaya.

Table 3.6-2 F/S Project Annual Implementation Program

Projects	Total Quantity	93/94	94/95	95/96	96/97	97/98	98/99
1. Procurement of waste haulage vehicles, containers, & handcart							
1.1 7 GVW Arm-roll trucks serving for 8 m3 containers	26	7	4	6	0	9	0
1.2 14 GVW Arm-roll trucks serving for 14 m3 containers	39	18	0	6	0	15	0
1.3 Open dump trucks	5	3	1	0	1	0	0
Sub-total of trucks (1.1+1.2+1.3)	70	28	5	12	1	24	0
1.4 8 m3 containers	89	39	44	6	0	0	0
1.5 14 m3 containers	130	122	0	2	1	3	2
Sub-total of containers (1.4+1.5)	219	161	44	8	1	3	2
1.6 1 m ³ Handcarts	256	85	86	0	0	0	0
1.7 1.5 m ³ Handcarts	94	31	32	0	0	0	0
Sub-total (1.6+1.7)	350	116	118	0	0	0	0
2. Construction of sanitary landfill site in Benowo (94/95 - 96/97)							
2.1 LPA (Lump-sum)	1			0.8	0.2		
3. Construction and rehabilitation of Depo/LPS & Improvement of Asemrowo Workshop							
3.1 Construction of Depo	24	0	6	6	6	6	0
3.2 Construction of LPS	12	0	3	3	3	3	0
3.3 Rehabilitation of Depo	30						
3.4 Rehabilitation of LPS	34						
3.5 Improvement of Asemrowo Workshop							
3.5.1 Remodeling of Asemrowo Workshop	Lump-sum						
3.5.2 Procurement of tools & equipment	Lump-sum						
4. Procurement of heavy Equipment							
4.1 Bulldozers	4	0	1	1	2	0	0
4.2 Rotary screen	1	1	0	0	0	0	0
4.3 Excavator	1	0	0	0	1	0	0
4.4 Overhaul of Bulldozer	4	2	2	0	0	0	0
4.5 Overhaul of Landfill compactor	2	1	1	0	0	0	0
4.6 Overhaul of Wheeled loader	1	0	0	0	1	0	0
Sub-total	13	4	4	1	4	0	0

Table 3.6-3 Annual Investments of the Project

Unit: Million Rupiah in 1992 price

Projects	92/93	93/94	94/95	95/96	96/97	97/98	98/99	Total
1. Vehicles, Containers & Handcarts								
1.1 Vehicles (3 types)	0	2,041.7 (28)	253.1 (5)	815.4 (12)	50.7 (1)	1,734.9 (24)	0	4,895.8 (70)
1.2 Containers (2 Type : 8 & 14 m ³)	0	1,210.0 (161)	264.0 (44)	52.0 (8)	8.0 (1)	24.0 (3)	16.0 (2)	1,574.0 (219)
1.3 Handcarts (2 types: 1 & 1.5 m ³)	0	57.9	57.8	58.9	0	0	0	174.6
Sub-total of Item 1 (1.1 + 1.2 + 1.3)	0	3,309.6	574.9	926.3	58.7	1,758.9	16.0	5,644.4
2. Construction of Sanitary Landfill in Benowo	0	0	0	18,335.0	3,693.0	1.0	1,405.0	23,434.0
3. Depo/LPS construction & rehabilitation & Asemrowo Workshop Improvement								
3.1 Construction of Depo/LPS	0	0	309.5 [81.0] {228.5}	228.5 [0] {228.5}	363.6 [135] {228.5}	255.5 [27] {228.5}	0	1,157.1 [243] {914.1}
3.2 Rehabilitation of Depo/LPS	0	0	52.7	44.4	39.0	47.6	0	183.7
3.3 Asemrowo Workshop Improvement	0	0	267.0	0	0	0	0	267.0
Sub-total of Item 3 (3.1 + 3.2 + 3.3)	0	0	629.2 [81] {548.2}	272.9 [0] {272.9}	402.6 [135] {267.6}	303.1 [27] {276.1}	0	1,607.8 [243] {1,364.8}
4. Procurement of Heavy Equipment	0	215.0	500.0	300.0	880.0	0	0	1,895.0
Grand Total (1 + 2 + 3 + 4)	0 [0] {0}	3,524.6 [0] {3,524.6}	1,704.1 [81] {1,623.1}	19,834.2 [0] {19,834.2}	5,034.3 [135] {4,899.3}	2,063.0 [27] {2,036.0}	1,421.0 [0] {1,421.0}	33,581.2 [243] {33,338.2}

Notes:

1. The above-shown investment amounts include the value added tax (10% of original prices).
2. Figures in brackets [] indicate cost (million Rupiah) needed for purchase of land.
3. Figures in { } indicate cost (million Rupiah) excluding cost of land purchase.
4. It is assumed that cash expenditures will be not be required for land acquisition of the planned sanitary landfill in Benowo.

Table 3.6-4 Annual Investments of the F/S Project with 8 % Annual Inflation

unit: Million Rupiah (nominal)

Projects	92/93	93/94	94/95	95/96	96/97	97/98	98/99	Total
1. Vehicles, Containers & Handcarts								
1.1 Vehicles (3 types)	0	2,205.0 (28)	295.2 (5)	1,027.2 (12)	69.0 (1)	2,549.1 (24)	0	6,145.5 (70)
1.2 Containers (2 Type : 8 & 14 m ³)	0	1,306.8 (161)	307.9 (44)	65.5 (8)	10.9 (1)	35.3 (3)	25.4 (2)	1,751.8 (219)
1.3 Handcarts (2 types: 1 & 1.5m ³)	0	62.6 (116)	67.4 (116)	74.2 (118)	0	0	0	204.2 (350)
Sub-total of Item 1 (1.1 + 1.2 + 1.3)	0	3,574.4	670.5	1,166.9	79.9	2,584.4	25.4	8,101.5
2. Construction of Sanitary Landfill in Benowo	0	0	0	23,097	5,024	1.5	2,230	30,352
3. Depo/LPS construction & rehabilitation & Asemrowo Workshop Improvement								
3.1 Construction of Depo/LPS	0	0	361.0 [94.5] (266.5)	287.8 [0] (287.8)	494.7 [183.7] (311.0)	375.4 [39.7] (335.7)	0	1,518.9 [317.9] (1,201.0)
3.2 Rehabilitation of Depo/LPS	0	0	61.5	55.9	53.1	69.9	0	240.4
3.3 Asemrowo Workshop Improvement	0	0	311.4	0	0	0	0	311.4
Sub-total of Item 3 (3.1 + 3.2 + 3.3)	0	0	733.9 [94.5] (639.4)	343.7 [0] (343.7)	547.8 [183.7] (364.1)	445.3 [39.7] (405.6)	0	2,070.7 [317.9] (1,752.8)
4. Procurement of Heavy Equipment	0	232.2	583.2	377.9	1,197.2	0	0	2,390.5
Grand Total (1 + 2 + 3 + 4)	0	3,806.6 [0] (3,806.6)	1,987.6 [94.5] (1,893.1)	24,985.5 [0] (24,985.5)	6,848.9 [183.7] (6,665.2)	3,030.7 [39.7] (2,991.0)	27.1 [0] (27.1)	42,914.7 [317.9] (42,596.8)

Notes:

1. The above-shown investment amounts include the value added tax (10% of the original prices).
2. Figures in brackets [] indicate cost (million Rupiah) needed for purchase of land.
3. Figures in { } indicate cost (million Rupiah) excluding cost of land purchase.
4. It is assumed that cash expenditures will be not be required for land acquisition of the planned sanitary landfill in Benowo.

Table 3.6-5 Annual Operation and Maintenance Costs of the F/S Project

Unit: Million Rupiah in 1992 price

Projects	92/93	93/94	94/95	95/96	96/97	97/98	98/99	Total
1. Vehicles, Containers & Handcarts								
1.1 Vehicles & Containers	0	451.7	632.2	685.2	987.4	987.3	1,531.9	5,275.7
1.2 Handcarts (2 types: 1 & 1.5 m ³)	0	0	0	0	0	0	0	0
Sub-total of Item 1 (1.1 + 1.2)	0	451.7	632.2	685.2	987.4	987.3	1,531.9	5,275.7
2. Construction of Sanitary Landfill in Benowo	0	0	0	0	683.0	683.0	683.0	2,049.0
3. Depo/LPS construction & rehabilitation & Asemrowo Workshop Improvement								
3.1 Construction of Depo/LPS	0	0	31.0	22.9	36.3	25.5	0	115.7
3.2 Rehabilitation of Depo/LPS	0	0	5.3	4.4	3.9	4.8	0	18.4
3.3 Asemrowo Workshop Improvement	0	0	26.7	0	0	0	0	26.7
Sub-total of Item 3 (3.1 + 3.2 + 3.3)	0	0	63.0	27.3	40.2	30.3	0	160.8
4. Procurement of Heavy Equipment	0	0	26.9	89.4	126.9	236.9	236.9	717.0
Grand Total (1 + 2 + 3 + 4)	0	451.7	722.1	801.9	1,837.5	1,937.5	2,451.4	8,202.5

**Table 3.6-6 Annual Operation and Maintenance Costs of the F/S Project
with 8 % Annual Inflation**

Unit: Million Rupiah (Nominal)

Projects	92/93	93/94	94/95	95/96	96/97	97/98	98/99	Total
1. Vehicles, Containers & Handcarts								
1.1 Vehicles & Containers	0	487.8	737.4	863.2	1,343.3	1,450.7	2,430.9	7,313.3
1.2 Handcarts (2 types: 1 & 1.5 m ³)	0	0	0	0	0	0	0	0
Sub-total of Item 1 (1.1 + 1.2)	0	487.8	737.4	863.2	1,343.3	1,450.7	2,430.9	7,313.3
2. Construction of Sanitary Landfill in Benowo	0	0	0	0	929.0	1,004.0	1,084.0	3,017.0
3. Depo/LPS construction & rehabilitation & Asemrowo Workshop Improvement								
3.1 Construction of Depo/LPS	0	0	36.2	28.8	49.4	37.5	0	151.9
3.2 Rehabilitation of Depo/LPS	0	0	6.2	5.5	5.3	7.1	0	24.1
3.3 Asemrowo Workshop Improvement	0	0	31.1	0	0	0	0	31.1
Sub-total of Item 3 (3.1 + 3.2 + 3.3)	0	0	73.5	34.3	54.7	44.6	0	207.1
4. Procurement of Heavy Equipment	0	0	31.4	112.7	172.6	348.1	375.9	1,040.7
Grand Total (1 + 2 + 3 + 4)	0	487.8	842.3	1,010.2	2,499.6	2,847.4	3,890.8	11,578.1

Chapter 7. Financial Plan for the Entire SWM Services during the Feasibility Study (F/S) Project Period 1992/93 - 1998/99

1) Total SWM Expenditures and Revenues

a. Total SWM Expenditures

It is estimated that the total SWM expenditures during the projects period of 1992/93 - 1998/99 will be Rp 139,640 million, of which Rp Rp 41,784 million (30 %) is the sum of the investments and operation & maintenance costs related to the four (4) feasibility study components and, and the remaining Rp 97,856 million (70 %) is the other expenditures. Refer to Tables 3.6-10 and Table 3.6-11 for annual details of non-F/S expenditures and the entire SWM expenditures.

b. Financial Sources and Revenues

Of the estimated total SWM expenditures of Rp 139,640 million, it is expected that Rp 30,308 million (22 %), all the investment for the F/S components (except for the land acquisition cost of new Depo - Rp 243 million and the value added tax : Rp 3,037.7 million) will be financed by bi-lateral loan, and Rp 12,208 million (9 % - used for construction and land acquisition for the new LPA* in the east part of Surabaya) will be financed by the loan of the Indonesian Government, which will be critically important to KMS. Concerning this type of government loan, KMS officials expressed their wish the financing should be executed on the grant basis by the central government. Though the offer does not comply with the basic policy of CIPTA KARYA at present, further discussions seem to be still necessary in GOI to expand the financial capability of local government.

- * The planned sanitary landfill LPA in the east part of Surabaya will have an area of 120 ha, and waste receiving capacity of 8,400,000 ton, which is equivalent to the amount of waste to be incinerated and reduced by an incinerator with the same capacity as the Keputih incinerator for more than 160 years.

The remaining Rp 97,124 million (69 %) will be financed by KMS, of which Rp 44,336 million is expected to be covered by the revenue of the sanitary retribution, and the remaining Rp 52,788 by KMS' general budget as shown in the table below.

Table 3.6-7 Total SWM Costs and Sources of Finance 1992/93 - 1998/99

Unit: Million Rupiah in 1992 price

	Investment (1)	Operation/ Maintenance (2)	Total (1) + (2) = (3)
1. The 4 F/S components	33,581.2	8,202.5	41,783.7 (30 %)
2. Other Expenditures	12,208.0	85,648.0	97,856.0 (70 %)
3. Total (1 + 2)	45,789.2	93,850.5	139,639.7 (100 %)
4. Bi-lateral Loan revenue	30,307.5	-	30,307.5 (22 %)
5. The Indonesian Government Loan	12,208.0	-	12,208.0 (19 %)
6. Net Expenditures [3 - (4 + 5)]	3,273.7	93,850.5	97,124.2 (69 %)
7. Net Revenue of the Sanitary Retribution	-	-	44,336.0 (31 %)
8. The Remaining to be Covered by the General KMS Budget (6 - 7)	-	-	52,788.2 (38 %)

Note : Item 4 Bi-lateral loan revenue (Rp 30,307.5 million) is estimated in the following manner: Rp 33,581.2 (Item 1) - Rp 243 million (Land purchase cost - See Table 4) - Rp 3,030.7 million (Estimated sum of the value added tax) = Rp 30,307.5 million. Sum of the value added tax is estimated as follows : (Rp 33,581.2 million - Rp 243 million) x 1/11 = Rp 3,030.7 million.

Note: A value 1/11 derives as follows: Value added tax (10%) + (Original price 100% + Value added tax 10%) = 1/11

Revenue Forecasts

As for the forecast of the revenue of the sanitary retribution, it is assumed that KMS will be able to increase the net revenue (revenue after deducting handling charges) from Rp 3,340 million (1991/92) to Rp 5,744 in 1993/94 through KMS' planned increases of the rates of the sanitary retribution (Refer to Table 2.7-7 of this report for details of the forecast.) It is also assumed that the revenue of the sanitary retribution will thereafter increase by 7 % per year on average through increases in number of payers, and reduction of handling charges by utilizing PLN tariff collection offices as collection points of the sanitary retribution, and through application of volume based-rates of sanitary retribution to business establishments.

2) Ratios of Net SWM Expenditures (Excluding Loan Repayments) to KMS' Total Budget During 1992/93 - 1998/99

It is estimated that the share of the net SWM expenditures during the project period (Gross expenditure Rp 223,396 million - Total loans Rp 127,532 million = Rp 95,864 million) ranges from 7.7 % to 10.6% of the estimated total KMS' budget averaging at 8.7 % as shown in the following table. The average 8.7 % is lower than a corresponding average ratio of 11 % during the 3 years 1989/90 - 1991/92.

Table 3.6-8 Ratios of Net SWM Expenditures (Excluding Loan Repayments) to KMS' Total Budget

Unit: Million Rupiah in 1992 price

Projects	92/93	93/94	94/95	95/96	96/97	97/98	98/99	Total
A. Total SWM Expenditures including both F/S Projects & other expenditures	11,952.0	16,527.3	13,955.2	35,648.2	25,460.8	19,418.5	16,677.8	139,639.7
B. Bi-lateral Loan Revenue	0	3,204.2	1,475.6	18,031.1	4,453.9	1,850.9	1,291.8	30,307.5
C. The Indonesian Government Loan	0	0	0	3,542.0	6,933.0	1,733.0	0	12,208.0
D. Net Expenditures (A - B - C)	11,952.0 (10.6%)	13,323.1 (10.7%)	479.6 (9.0%)	14,075.1 (9.2%)	14,073.9 (8.3%)	15,834.6 (8.4%)	15,386.0 (7.4%)	97,124.2 (8.9%)
E. Net Revenue of the Sanitary Retribution	3,500.0 (3.1%)	5,744.0 (4.6%)	6,144.0 (4.4%)	6,544.0 (4.3%)	6,944.0 (4.1%)	7,380.0 (3.9%)	8,080.0 (3.9%)	44,336.0 (4.0%)
F. The Remaining to be Covered by the General KMS Budget (D - E)	8,452.0 (7.5%)	7,579.1 (6.1%)	6,335.6 (4.6%)	7,531.1 (5.5%)	129.9 (4.2%)	8,454.6 (4.5%)	306.0 (3.6%)	52,788.2 (4.9%)
G. KMS' Total Budget	112,700 (100%)	124,872 (100%)	138,358 (100%)	153,300 (100%)	169,857 (100%)	188,201 (100%)	208,527 (100%)	1,095,815 (100%)

Note: It is assumed that KMS' total budget will increase by 10.8 %/year in real term, the same percentage as in the past.

3) Repayment of Loans

The proposed total loan amount to be made available for KMS is Rp 169,333 million on nominal base, of which Bi-lateral loan will be Rp 37,087 million, and the remaining Rp 131,526 million will be the loan of the Indonesian Government.

Repayment schedules are shown in Tables 3.6-12, 3.6-13 and 3.6-14 below. The following loan conditions are assumed.

1. Annual interest rate will be 10.5 %.
2. There will be 10 years grace period during which only interest will be paid.

3. Period of repayment of the principle will be 20 years from 2002.
4. Bi-lateral loan will be made available to KMS through the Indonesian Government in Rupiah.

The interest rate 10.5 % is attractive rate for KMS considering that KMS' total nominal budget has grown by 19.7 % per year on average during the past seven (7) years from 1985/86 - 1992/93, and that it may be expected that KMS budget will increase by the same growth rate in the future.

The total cumulative repayment amount (both principals and interest) of the both loans will be Rp 450,061 million on nominal base, which corresponds to only 0.4 % of Rp 125,402,291 million, KMS' total cumulative budget on nominal base during the period 1992/93 - 2021/22, the end of the loan repayment.

4) Ratios of Aggregate SWM Cash Expenditures to KMS' Total Budget

As shown in Table 3.6-9, the ratios of the aggregate SWM cash expenditures (sum of the net expenditures and loan repayments) to KMS' total budget range from 9.1 % to 10.7 % during the period 1992/93 - 1998/99. The average is estimated to be 9.9 %, which is lower than the current ratio of about 11 %.

It is estimated that the corresponding percentages after 1998/99 will be lower than those to be experienced during the F/S project period as the KMS budget would increase faster than the rates of increases of the sum of SWM cash expenditures and loan repayments.

It is therefore concluded that the financial burden arising from the SWM is manageable for KMS during the entire master plan period.

Table 3.6-9 Ratios of Net SWM Cash Expenditures and Loan Repayment to the Total KMS Budget

Unit: Million Rupiah (Nominal)

Year	Ratio of Net SWM Cash Expenditures to Total KMS Budget (1)	Ratio of Total Loan Repayments to Total KMS Budget (2)	Total (1) + (2) = (3)	KMS Budget (Nominal Million Rupiah) (4)
1985/86			7.4 %	31,700
1986/87			6.5 %	36,700
1987/88			6.5 %	50,400
1988/89			6.9 %	59,800
1989/90			12.0 %	62,100
1990/91			10.7 %	74,700
1991/92			11.3 %	99,400
1992/93	10.6 %	0.0%	10.6 %	112,700
1993/94	10.7 %	0.0%	10.7 %	134,902
1994/95	9.0 %	0.2%	9.2 %	161,478
1995/96	9.2 %	0.3%	9.5 %	193,289
1996/97	8.3 %	1.5%	9.8 %	231,367
1997/98	8.4 %	1.8%	10.2 %	276,946
1998/99	7.4 %	1.7%	9.1 %	331,504
Average During 1992/93 - 1998/99			9.9 %	

Note: Annual net SWM cash expenditures (N) are defined as follows:

$$N = a + b + c - d$$

where,

- a: Annual F/S projects expenditures
- b: Annual operation and maintenance costs related to F/S projects
- c: All other annual non-F/S projects expenditures
- d: Annual revenue of the bi-lateral loans and Indonesian Government loan

Table 3.6-10 Other SWM Expenditures (Other Than Those Related to the F/S Project)

Unit: Million Rupiah in 1992 price

Projects	92/93	93/94	94/95	95/96	96/97	97/98	98/99	Total
1. Haulage								
1.1 O & M of the existing trucks	1,328	610	238	45		0	0	2,221
1.2 Payment to contractor	1,788	2,509	2,952	3,414	3,800	4,224	4,680	23,367
1.3 Total (1.1+1.2)	3,116	3,119	3,190	3,459	3,800	4,224	4,680	25,588
2. Street Sweeping								
2.1 Personnel expenditure	1,458	1,336	1,215	1,094	972	850	729	7,654
2.2 Equipment	88	81	74	66	59	52.0	44	464
2.3 Payment to contractor	926	986	1,047	1,108	1,168	1,229	1,290	7,754
2.4 Total (2.1+2.2+2.3)	2,472	2,403	2,336	2,268	2,199	2,131	2,063	15,872
3. Cost Related to Heavy Equipment								
3.1 O & M of Heavy equipment	228	228	228	228	114	57	0	1,083
3.2 Personnel expenditure	18	18	18	18	9	4	0	85
3.3 Total (3.1+3.2)	246	246	246	246	123	61	0	1,168
4. Costs Related to LPA in the East								
4.1 Construction	0	0	0	0	(6,933)	(1,733)	0	8,666
4.2 Land purchase		0	0	3,542	0	0	0	3,542
4.3 Sub-total (4.1+4.2)	0	0	0	3,542	(6,933)	(1,733)	0	12,208
4.4 O & M	0	0	0	0	0	683	683	1,366
4.5 Total (4.3 + 4.4)	0	0	0	3,542	6,933	2,416	683	13,574
5. Incineration								
5.1 Operation	966	966	966	966	966	966	966	6,762
5.2 Repair & equipment	0	936	171	173	472	1,785	840	4,337
5.3 Repayment of principal & interest	4,400	4,129	3,868	3,606	3,344	3,083	2,821	25,251
5.4 Payment to Consultants & others	120	120	120	120	120	120	120	840
5.5 Total of Item 5.	5,486	6,151	5,125	4,865	4,902	5,954	4,747	37,230
6. Administration	632	632	632	632	632	632	632	4,424
Total (1+2+3+4+5+6)								
a. Investment for LPA	(0)	(0)	(0)	(3,542)	(6,933)	(1,733)	(0)	(12,208)
b. All other costs	11,952	12,551	11,529	11,470	11,656	13,685	12,805	85,648
c. Total (a + b)	11,952	12,551	11,529	15,012	18,589	15,418	12,805	97,856

Note: Amounts in the parenthesis () indicate investments needed for the construction of sanitary landfill in the east part of Surabaya.

Table 3.6-11 Total SWM Expenditures Including Both F/S Project and All Other SWM Expenditures

Unit: Million Rupiah in 1992 price

Projects	92/93	93/94	94/95	95/96	96/97	97/98	98/99	Total
A. The 4 Feasibility Study Components								
A.1 Procurement of vehicle, container & handcart	0	3,309.6	574.9	926.3	58.7	1,758.9	16.0	6,644.4
A.2 Construction of Sanitary landfill in Benowo	0	0	0	18,335.0	3,693.0	1.0	1,405.0	23,434.0
A.3 Depo/LPS Construction & Rehabilitation	0	0	629.2	272.9	402.6	303.1	0	1,607.8
A.4 Procurement of Heavy Equipment	0	215.0	500.0	300.0	880.0	0	0	1,895.0
A. Total (A.1+A.2+A.3+A.4)	0	3,524.6	1,704.1	19,834.2	5,034.3	2,063.0	1,421.0	33,581.2
B. O & M for the four (4) Feasibility Study Projects								
B.1 O/M for A.1	0	451.7	632.2	685.2	987.4	987.3	1,531.9	5,275.7
B.2 O/M for A.2	0	0	0	0	683.0	683.0	683.0	2,049.0
B.3 O/M for A.3	0	0	63.0	27.3	40.2	30.3	0	160.8
B.4 O/M for A.4	0	0	26.9	89.4	126.9	236.9	236.9	717.0
B. Total O/M for A	0	451.7	722.1	801.9	1,837.5	1,937.5	2,451.8	8,202.5
Total (A + B)	0	3,976.3	2,426.2	20,636.1	6,871.8	4,000.5	3,872.8	41,783.7
C. SWM Costs except for Items A & B								
C.1 Haulage	3,116	3,119	3,190	3,459	3,800	4,224	4,680	25,588
C.2.1 Cost related to the existing LPA	246	246	246	246	123	61	0	1,168
C.2.2 Costs Related to LPA in the East	0	0	0	3,542.0	6,933.0	2,416.0	683.0	13,574.0
C.2 (C.2.1 + C.2.2)	246	246	246	3,788.0	7,056.0	2,477.0	683.0	14,742.0
C.3 Depo & LPS	0	0	0	0	0	0	0	0
C.4 Heavy equipment (Costs of this item is included in Item. C.2.1)								0
C.5 Street Sweeping	2,472	2,403	2,336	2,268	2,199	2,131	2,063	15,872
C.6 Incineration	5,486	6,151	5,125	4,865	4,902	5,954	4,747	37,230
C.7 Administration	632	632	632	632	632	632	632	4,424
C. Total of Item C								
a. Investment for LPA	0	0	0	3,542	6,933	1,733	0	12,208
b. All other costs	11,952	12,551	11,529	11,471	11,656	13,685	12,805	85,648
c. Total (a + b)	11,952	12,551	11,529	15,012	18,589	15,418	12,805	97,856
D. Grand Total (A + B + C)								
a. Investment (A+ C.a)	0	3,524.6	1,704.1	23,376.2	11,967.3	3,796.0	1,421.0	45,789.2
b. All other costs (B + C.b)	11,952.0	13,002.7	12,251.1	12,271.9	13,493.5	15,622.5	15,256.8	93,850.5
c. Total (a + b)	11,952.0	16,527.3	13,955.2	35,648.1	25,460.8	19,418.5	16,677.8	139,639.7

Table 3.6-12 Bi-lateral Loan Borrowing and Repayment Schedule

Unit: Million Rupiah (Nominal)

Year	Borrowing Amount (1)	Repayment of Principal (2)	Repayment of Interest (3)	Repayment Total (2)+(3)=(4)
1992/93	0	0	0	0
1993/94	3,461	0	0	0
1994/95	1,721	0	363	363
1995/96	22,714	0	544	544
1996/97	6,059	0	2,929	2,929
1997/98	2,720	0	3,565	3,565
1998/99	2,050	0	3,851	3,851
1999/00	0	0	4,066	4,066
2000/01	0	0	4,066	4,066
2001/02	0	0	4,066	4,066
2002/03	0	1,941	4,066	6,007
2003/04	0	1,936	3,862	5,798
2004/05	0	1,936	3,659	5,595
2005/06	0	1,936	3,456	5,392
2006/07	0	1,936	3,252	5,188
2007/08	0	1,936	3,049	4,985
2008/09	0	1,936	2,846	4,782
2009/10	0	1,936	2,643	4,579
2010/11	0	1,936	2,444	4,380
2011/12	0	1,936	2,236	4,172
2012/13	0	1,936	2,033	3,969
2013/14	0	1,936	1,830	3,766
2014/15	0	1,936	1,626	3,562
2015/16	0	1,936	1,423	3,359
2016/17	0	1,936	1,220	3,156
2017/18	0	1,936	1,016	2,952
2018/19	0	1,936	813	2,749
2019/20	0	1,936	610	2,546
2020/21	0	1,936	407	2,343
2021/22	0	1,936	203	2,139
Total	38,725	38,725	66,144	104,869

Table 3.6-13 The Indonesian Government Loan Borrowing and Repayment Schedule

Unit: Million Rupiah (Nominal)

Year	Borrowing Amount (1)	Repayment of Principal (2)	Repayment of Interest (3)	Repayment Total (2)+(3)=(4)
1992/93	0	0	0	0
1993/94	0	0	0	0
1994/95	0	0	0	0
1995/96	4,462	0	0	0
1996/97	9,432	0	469	469
1997/98	2,546	0	1,459	1,459
1998/99	0	0	1,726	1,726
1999/00	0	0	1,726	1,726
2000/01	0	0	1,726	1,726
2001/02	0	0	1,726	1,726
2002/03	0	822	1,726	2,548
2003/04	0	822	1,640	2,462
2004/05	0	822	1,554	2,376
2005/06	0	822	1,467	2,289
2006/07	0	822	1,381	2,203
2007/08	0	822	1,295	2,117
2008/09	0	822	1,208	2,030
2009/10	0	822	1,122	1,944
2010/11	0	822	1,036	1,858
2011/12	0	822	949	1,771
2012/13	0	822	863	1,685
2013/14	0	822	777	1,599
2014/15	0	822	690	1,512
2015/16	0	822	604	1,426
2016/17	0	822	518	1,340
2017/18	0	822	432	1,254
2018/19	0	822	345	1,167
2019/20	0	822	259	1,081
2020/21	0	822	173	995
2021/22	0	822	86	908
Total	16,440	16,440	25,231	41,671

Table 3.6-14 Aggregate Bi-lateral & Indonesian Government Loans Schedule
Unit: Million Rupiah (Nominal)

Year	Borrowing Amount (1)	Repayment of Principal (2)	Repayment of Interest (3)	Total Repayment (2)+(3)=(4)	Ratio to KMS Budget (4)/(6)=(5)	KMS Budget (6)
1992/93	0	0	0	0	0.0 %	112,700
1993/94	3,461	0	0	0	0.0 %	134,902
1994/95	1,721	0	363	363	0.2 %	161,478
1995/96	27,176	0	544	544	0.3 %	193,289
1996/97	15,491	0	3,398	3,398	1.5 %	231,367
1997/98	5,266	0	5,024	5,024	1.8 %	276,946
1998/99	2,050	0	5,577	5,577	1.7 %	331,504
1999/00	0	0	5,792	5,792	1.5 %	396,810
2000/01	0	0	5,792	5,792	1.2 %	474,982
2001/02	0	0	5,792	5,792	1.0 %	568,553
2002/03	0	2,763	5,792	8,555	1.3 %	680,558
2003/04	0	2,758	5,502	8,260	1.0 %	814,628
2004/05	0	2,758	5,213	7,971	0.8 %	975,110
2005/06	0	2,758	4,923	7,681	0.7 %	1,167,207
2006/07	0	2,758	4,633	7,391	0.5 %	1,397,147
2007/08	0	2,758	4,344	7,102	0.4 %	1,672,385
2008/09	0	2,758	4,054	6,812	0.3 %	2,001,844
2009/10	0	2,758	3,765	6,523	0.3 %	2,396,208
2010/11	0	2,758	3,480	6,238	0.2 %	2,868,261
2011/12	0	2,758	3,185	5,943	0.2 %	3,433,308
2012/13	0	2,758	2,896	5,654	0.14%	4,109,670
2013/14	0	2,758	2,607	5,365	0.11%	4,919,275
2014/15	0	2,758	2,316	5,074	0.09%	5,888,372
2015/16	0	2,758	2,027	4,785	0.09%	7,048,381
2016/17	0	2,758	1,738	4,496	0.05%	8,436,912
2017/18	0	2,758	1,448	4,206	0.04%	10,098,984
2018/19	0	2,758	1,158	3,916	0.03%	12,088,484
2019/20	0	2,758	869	3,627	0.03%	14,469,915
2020/21	0	2,758	580	3,338	0.02%	17,320,488
2021/22	0	2,758	289	3,047	0.01%	20,732,624
Total	55,165	55,165	91,375	146,540	0.12%	125,402,291

Note: It is assumed that KMS' total budget will increase by 11.7 % per year on nominal base, which is same as an average annual growth percentage during the past 7 years.

PART 4.

RECOMMENDATIONS

PART 4. RECOMMENDATIONS

This part presents major recommendations deriving from the current study.

1. Construction of 2 Disposal sites (LPA) in Benowo and the East Part of Surabaya

KMS should construct two (2) LPA; one in Benowo and the other in the east part of Surabaya as planned and shown in this report. The construction of 2 (two sites) would enable KMS to save waste haulage costs by over Rp 6.4 billion/year on average throughout the master plan period from 1993 to 2010. The waste haulage cost under the case with only one LPA in Benowo would be 2.2 times costlier than the case with the 2 LPA.

2. Application of Sanitary Landfill

KMS should apply the sanitary landfill. The open dumping, though cheaper than the sanitary landfill, would not be suitable to the City of Surabaya that has won honorable Adipura 5 times and a few other international environmental awards. From both environmental and economic view points, the sanitary landfill is the most appropriate waste disposal method for KMS among other methods including open dumping, sea reclamation, incineration, composting. It is estimated that the cost of the sanitary landfill is about one twelfth (1/12) of the incineration cost and a half of the sea reclamation cost.

3. Acquisition of Land for Sanitary Landfill in Benowo and East Part of Surabaya

It is crucial for KMS to acquire a land (150 ha in total) in Benowo; about 40 ha by 1994 and the remaining 110 ha by 2002 both in order to construct sanitary landfill sites as planned. It is also necessary for KMS to acquire land (120 ha in total) in the east part of Surabaya; 14 ha by 1995, 31 ha by 1999, and 75 ha by 2005.

4. Increase of Waste Haulage Coverage

KMS should do the following in order to increase waste haulage coverage:

- a. Provide all Kelurahan with Depo and LPS

- b. Provide small containers where Depo or LPS cannot be placed.
- c. Provide low-income RT/RW with handcarts.
- d. Rehabilitate some Depo and LPS as planned.

5. Increase of Waste Haulage Efficiency

KMS should do the following in order to increase waste haulage efficiency:

- a. Use more contractors.
- b. Use larger containers (14 m³ and 8 m³).
- c. Provide all Depo and LPS with containers.
- d. Improve vehicle maintenance through
 - (1) Introduction of daily checking of vehicles and of regular maintenance and repair,
 - (2) Quicker procurement of adequate spare parts,
 - (3) Removal of abandoned vehicles and containers from Asemrowo workshop,
 - (4) Remodeling and improvement of Asemrowo workshop.
- e. Reduce crew of arm-roll trucks from the current 2 (1 drivers & 1 assistant) to 1 driver.

6. Increase of Efficiency of Street Sweeping

KMS should do the following in order to increase the efficiency of street sweeping:

- a. Reduce sweeping frequency wherever possible.
- b. Use more contractors.

7. Shift of Waste Haulage Responsibility from KMS to Generators of Large Waste Amount

It is recommended for KMS to transfer the waste haulage responsibility from KMS to generators of large waste amount (2.5 m³ or more each day) in order to save costs. KMS would be able to save over Rp one billion/year on average throughout the master plan period from 1993 to 2010 if it shifted the responsibility as planned (A proposed target is to gradually increase the self-hauled-waste from the current 8 % to 25 % of the total waste generation by 2000.)

8. Increase of Use of Contractors for Waste Haulage and Street Sweeping

It is recommended that KMS will increase the use of contractors for both waste haulage and street sweeping in order to save costs. KMS would be able to save 1,173 million/year on average throughout the master plan period from 1993 to 2010 if it increased the use of contractors as planned. A policy is that KMS will haul a constant waste amount same as the current level, while all the remaining and incremental waste should be hauled by contractors. As a result, the ratio of waste hauled by contractors would increase from the current 30 % to 73 % by 2010 in terms of waste haulage amount. A target of street sweeping is to increase contractors' sweeping service from the current 50 % to 75 % by 2000 in terms of length of streets swept.

9. Regular Revision of Rates of the Sanitary Retribution

It is recommended that KMS will revise rates of the sanitary retribution every three (3) years, and increase the revenue of the retribution so as to increase the cost recovery ratio. The current ratio is as low as 27 %. A proposed target cost recovery ratio is 44 % in 2000, and 54 % in 2010.

10. Use of PLN' (electric company) Tariff Collection Points

It is recommended that KMS would use PLN' tariff collection points as collection points of the sanitary retribution. Through the use of PLN' tariff collection points, the revenue of the sanitary retribution would substantially increase because 1) number of payers will increase, and 2) the handling charges paid by KMS will decrease to 5 % of the gross revenue from the current average of 15 %. At present, KMS pays 26 % of the sanitary retribution revenue collected through RT/RW to RT/RW and persons involved in the collection of the retribution, and 10 % of the retribution collected through the Municipal Water Authority (PDAM) to PDAM as handling charges related to the fee collection.

11. Application of Volume-Based Fee Rates to Business Waste

At present, the rates of the sanitary retribution does not depend on the volume of waste discharged. It is recommended to apply volume-based fee rate to business waste like the Municipal Cleansing Company (PDK) of Bandung. The application of this method would 1) enable KMS to increase revenue of the sanitary retribution, and 2) provide business establishments an incentive to reduce waste generation volume, which are good from environmental view point.

12. Waste Amount Reduction

KMS should do the following:

- 1) Promotion for the reduction of weight of agricultural products coming into markets by such means as removing nutshell of agricultural products before bringing them into the city
- 2) Supports of scavengers. A proposed target is to increase the waste recycling amounts so that it will be constant at 11 % in terms of share to the total waste generation in Surabaya

13. Establishment of an Independent Cleansing Authority (Perusahaan Daerah Kebersihan Surabaya - PDKS)

It is recommended that KMS will establish an independent cleansing authority like PDK Bandung. Through the establishment of such authority, the SWM service efficiency (cost effectiveness) would increase, and cost recovery ratio will increase. It is important to realize that even after establishment of the authority, KMS' supports of the authority are required in the such areas as 1) law enforcement and 2) finance.

14. Establishment of a Disposal Section

It is recommended that the existing cleansing department of KMS would be reorganized so as to establish a disposal section specializing in the planning and operation of waste disposal, which are increasingly important.

15. Government' Financial Assistance for KMS in Construction of Sanitary Landfill

Land acquisition for LPA is not easy job for most local governments including Surabaya. They are also hesitant in constructing a sanitary landfill which is a few times costlier than the open dumping. However, the sanitary landfill is necessary in order to meet the sanitary standard shown in the national guideline, and to avoid the environmental pollution problems that would become more and more serious in the future. It makes sense for the Central government to provide local governments with financial assistance (grant or low-interest loans) to promote construction of sanitary landfill.

16. Study on Measures to Encourage Supply of Land for Landfill

It is recommended that KMS and the Central Government should study on measures to encourage supply of land for landfill because the land acquisition is always difficult for local governments. Possible measures worth studying include the following:

- 1) A measure to encourage the supply of land for disposal sites is to provide land sellers with exemption of tax imposed on the land sales.
- 2) Development of a system "Landfill Completion and Land Exchange" whereby local government will acquire land for new landfill sites through the exchange of land of the completed landfill sites with new land.
- 3) Acquisition of land for landfill on lease base
- 4) Development of alternate uses of land after completion of landfill (People would be more acceptable to the construction of landfill sites if they knew that the land will be converted into green parks or used for residential or commercial or industrial development purposes.

17. Improvement of Operation of the Incinerator and Effective Use of the Incinerator

KMS should do the following:

- 1) Select more suitable waste, and take measures to keep waste drier in the pit.
- 2) Install air-preheater to promote drying process of waste in the furnace
- 3) Use incinerator for incineration of medical waste as already implemented recently.

18. Improvements of the Regulations related to Sanitary Management

The existing regulations of KMS regarding sanitary management (Surabaya Municipal Regulation No.4/1980, Decision of Mayor of Surabaya Municipality No.251/1987, and other related regulations) have some deficiency and inconsistency as explained below. It is recommended that KMS will improve the regulations so as to eliminate these deficiency and inconsistency.

Problems related to the Regulations

a. Deficiency in the Regulations

There are some deficiencies in the regulations as shown below:

- e.g. 1: There are no regulations stipulating which section is responsible for waste disposal at final disposal sites. Neither are there stipulations concerning which section is directly responsible for the matters arising if final disposal sites bring about environmental pollution.
- e.g.2: In the regulations related to sanitary management in Surabaya City, there are no articles regarding the using/hiring of and supervision upon private contractors for street sweeping and waste haulage to final disposal sites. Concerning the supervision upon the private contractors, in reality it is done by the Waste Disposal/MCK & Night Soil Section, instead of the Planning & Supervision Section.

Inconsistency between the Regulations and Execution

The following inconsistencies may be observed:

- e.g.1: According to Surabaya Municipal Regulation No.4/1980 concerning "Organization of Cleansing Department in Surabaya Municipality", waste haulage from waste containers or other places (Depo/LPS, public places) is the responsibility of the Waste Disposal/MCK & Night Soil Section; whereas, in reality it is the Haulage Section that takes such responsibility.
- e.g.2: According to the same Regulation, the Construction & Execution Section is responsible for the determination on new location for disposal sites. However, in reality it seems that the Section is not requested to perform such responsibility.
- e.g.3: According to the Regulation, the Planning & Supervision Section has the responsibility to propose improvement of the organization of Cleansing Department. Nevertheless, in reality this Section has never made such proposals.

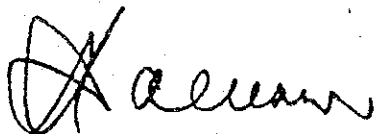
- e.g.4: According to the Regulation, the Evaluation & Report Section has the responsibility to propose improvements of sanitary management system after making analysis on evaluated data. However, it seems that such proposals have never been made.
- e.g.5: According to the same Regulation, supervision/inspection upon sanitary tasks/activities is the responsibility of the Planning & Supervision Section; in reality, however, four Sections take part in such responsibility, i.e. Waste Disposal/MCK & Night Soil Section, Planning & Supervision Section, Evaluation & Report Section, and Haulage Section. This is concluded from the fact that each of those Sections assigns several staff respectively as field supervisors. And one more thing which is not less important is the fact that the responsibility for such supervision/inspection is formally taken by the Waste Disposal/MCK & Night Soil Section, instead of the Planning & Supervision Section.
- e.g.6: According to Decision of Mayor of Surabaya Municipality No.273/1991 concerning "Execution Guidelines on Wet & Dry Wastes Separating Collection System in Surabaya Municipality", every citizen of Surabaya has the obligation to separate wet and dry wastes prior to discharge/collection. Wet waste should be discharged into waste containers with yellow color, while dry waste should be discharged into waste containers with blue color. Nevertheless, in reality, the waste separation is not done at the time of either discharge or collection.

APPENDICES

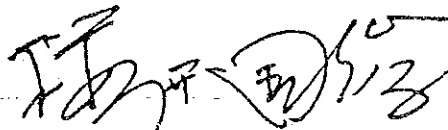
APPENDIX 1. Scope of Work

SCOPE OF WORK
FOR
THE STUDY ON
THE SOLID WASTE MANAGEMENT IMPROVEMENT FOR
SURABAYA CITY
IN
THE REPUBLIC OF INDONESIA
AGREED UPON BETWEEN
MINISTRY OF PUBLIC WORKS
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

MARCH 19, 1991
JAKARTA, INDONESIA



IR. SOENARJONO DANOEDJO
DIRECTOR GENERAL OF
HUMAN SETTLEMENTS,
MINISTRY OF PUBLIC WORKS



DR. KUNITOSHI SAKURAI
LEADER,
PRELIMINARY STUDY TEAM,
JAPAN INTERNATIONAL
COOPERATION AGENCY

I. INTRODUCTION

In response to the request of the Government of the Republic of Indonesia, the Government of Japan has decided to conduct the Study on the Solid Waste Management Improvement for Surabaya City in the Republic of Indonesia (hereinafter referred to as "the Study"), in accordance with the laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programmes of the Government of Japan, will undertake the Study, in close cooperation with the authorities concerned of the Government of Indonesia.

The Directorate General of Human Settlements, Ministry of Public Works (hereinafter referred to as "CIPTA KARYA") shall act as the counterpart agency to the Japanese study team and also as the coordinating body in relation with other relevant organizations for the smooth implementation of the Study.

The present document sets forth the Scope of Work for the Study.

II. OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. to formulate a master plan for the improvement of the Solid Waste Management (hereinafter referred to as "SWM") of Surabaya City.
2. to conduct a feasibility study for the first priority project based on the master plan.

III. STUDY AREA

The study area covers Surabaya city and its surrounding urban areas.

IV. SCOPE OF THE STUDY

In order to achieve the above objectives, the Study will cover the followings:

1. Basic Study

- (1) Data collection, Review of previous studies and Reconnaissance
 - a. Data on physical condition such as climate, topography, geology, etc.
 - b. National policy and development plan related to the SWM
 - c. Social and economic conditions and statistics
 - d. City development plan and land use
 - e. Road-traffic system
 - f. Legislation and institutional aspects of the city
 - g. Financial condition of the city
 - h. Review of on-going projects related to the SWM
 - i. Present condition of the SWM (technical systems)
 - Discharge
 - Collection
 - Transfer
 - Transportation
 - Treatment
 - Disposal
 - Street sweeping
 - Composting
 - Resource recovery (other systems)
 - Administration
 - Institution
 - Legal
 - Participation of community and private sector
 - Finance
 - j. Environmental pollution related to the SWM
 - k. Social impact of the solid waste problem
 - l. Health condition

(2) Field survey

- a. Amount of solid waste and its composition
- b. Geology, water quality and land use in existing dumping area and future landfill site
- c. Public consciousness on the SWM
- d. Preparation of pilot test

2. Analysis of collected data and field survey

- (1) Present condition of the SWM
- (2) Identification of the problems
- (3) Analysis of the problems

3. Formulation of the Master Plan(M/P)

- (1) Determination of basic criteria for the formulation of the M/P
- (2) Preparation of alternatives for future system components of the SWM
- (3) Evaluation of the alternatives from the viewpoint of public health, technology, economy, society, institution, environment and finance
- (4) Selection of the best alternatives and formulation of the M/P
- (5) Implementation schedule of the M/P
- (6) Identification of the first priority project

4. Feasibility Study(F/S) on the first priority project

- (1) Confirmation of the planning framework
 - a. Target year
 - b. Planning area
 - c. Service level
 - d. System components
- (2) Supplemental basic study
- (3) Conduct of pilot test and its evaluation
- (4) Examination of system components
 - a. Technical examination
 - b. Preliminary design of facilities
 - c. Investigation of necessary equipments
 - d. Planning of institutional and human resources development
 - e. Cost estimation
- (5) Project evaluation
 - a. economic
 - b. social
 - c. environmental
 - d. institutional
 - e. financial
- (6) Project implementation plan

V. SCHEDULE OF THE STUDY

The Study will be carried out in accordance with the tentative schedule attached in Annex.

VI. REPORTS

JICA will prepare and submit the following reports in English to the Government of Indonesia.

1. Inception Report:
Thirty(30) copies at the beginning of the first work in Indonesia.
2. Progress Report(1):
Thirty(30) copies at the end of the first work in Indonesia.
3. Interim Report(1):
Thirty(30) copies at the beginning of the second work in Indonesia.
4. Progress Report(2):
Thirty(30) copies at the end of the second work in Indonesia.
5. Interim Report(2):
Thirty(30) copies at the beginning of the third work in Indonesia.
6. Progress Report(3):
Thirty(30) copies at the end of the third work in Indonesia.
7. Draft Final Report:
Thirty(30) copies within three(3) months after completion of the third work in Indonesia.

The Government of Indonesia will present their comments to JICA within thirty(30) days after the receipt of the Draft Final Report.

8. Final Report:
Sixty(60) copies within two (2) months after JICA's receipt of the said comments on the Draft Final Report.

VII. UNDERTAKINGS OF THE GOVERNMENT OF INDONESIA

1. To facilitate smooth conduct of the Study, the Government of Indonesia shall take necessary measures:

- (1) to secure the safety of the JICA study team,
- (2) to permit the members of the JICA study team to enter, leave and sojourn in Indonesia for the duration of their assignment therein, and exempt them from alien registration requirements and consular fees,
- (3) to exempt the members of the JICA study team from taxes, duties and any other charges on equipment, machinery and other materials brought into Indonesia for the conduct of the Study,
- (4) to exempt the members of the JICA study team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the JICA study team for their services in connection with the implementation of the Study,
- (5) to provide necessary facilities to the JICA study team for the remittances as well as utilization of the funds introduced into Indonesia from Japan in connection with the implementation of the Study,
- (6) to secure permission for entry into private properties or restricted area for the conduct of the Study,
- (7) to secure permission for the JICA study team to take all data and documents (including photographs) related to the Study out of Indonesia to Japan in accordance with the Indonesian regulations,
- (8) to provide medical services as needed. Its expenses will be chargeable on members of the JICA study team.

2. The Government of Indonesia shall bear claims, if any arises, against the members of the JICA study team resulting from, occurring 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 wilful misconduct on the part of the members of the JICA study team.

3. CIPTA KARYA shall, at its own expense, provide the JICA study team with the followings, in cooperation with relevant organizations:

- (1) Available data (including maps) and information related to the Study
- (2) Counterpart personnel
- (3) Non-technical assistant personnel
- (4) Suitable offices with necessary equipment and furniture in Surabaya and also in Jakarta
- (5) Credentials or identification cards
- (6) Appropriate number of vehicles with drivers

VIII. UNDERTAKINGS OF JICA

For the implementation of the Study, JICA shall take the following measures:

1. to dispatch, at its own expense, the study team to Indonesia,
2. to pursue technology transfer to the Indonesian counterpart personnel in the course of the Study.

IX. CONSULTATION

JICA and CIPTA KARYA will consult each other in respect of any matter that is not agreed upon in this document and may arise from or in connection with the Study.

Handwritten signature and initials, possibly 'KS'.

TENTATIVE STUDY SCHEDULE

ANNEX

MONTH DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
	PHASE-I (M/P STUDY)									PHASE-II (F/S STUDY)										
WORK IN INDONESIA																				
WORK IN JAPAN																				
REPORT PRESENTATION																				

IC/R: Inception Report IT/R: Interim Report F/R: Final Report
P/R: Progress Report DF/R: Draft Final Report

APPENDIX 2. Minutes of Meetings on March 19, 1991
for the Scope of Work

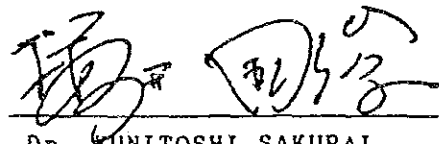
MINUTES OF MEETINGS
FOR
THE STUDY
ON
THE SOLID WASTE MANAGEMENT IMPROVEMENT
FOR
SURABAYA CITY
IN
THE REPUBLIC OF INDONESIA

MARCH 19, 1991
JAKARTA, INDONESIA



Ir. SOENARJONO DANOEDJO

DIRECTOR GENERAL OF
HUMAN SETTLEMENTS,
MINISTRY OF PUBLIC WORKS,
THE REPUBLIC OF INDONESIA



Dr. KUNITOSHI SAKURAI

LEADER
PRELIMINARY STUDY TEAM,
JAPAN INTERNATIONAL
COOPERATION AGENCY

In response to the request of the Government of the Republic of Indonesia, the Japanese Preliminary Study Team (hereinafter referred to as "the Team") was sent to Indonesia by the Japan International Cooperation Agency (hereinafter referred to as "JICA"), to discuss, with the authorities concerned of the Republic of Indonesia, the Scope of Work for the Study on the Solid Waste Management Improvement for Surabaya City in the Republic of Indonesia (hereinafter referred to as "the Study").

The members of the Team headed by Dr. Kunitoshi SAKURAI stayed in Indonesia from March 10 to 20, 1991. During their stay in Indonesia, the Team carried out field reconnaissance in the Study Area, received available information and held a series of interviews with officials and local technicians.

The Team also had discussions with the Directorate General of Human Settlements, Ministry of Public Works (hereinafter referred to as "CIPTA KARYA"), on the Scope of Work to be undertaken by both CIPTA KARYA and JICA for the successful execution of the above-mentioned Study. A list of those who attended these discussion meetings is shown in the Annex.

The main items which were discussed by the Team and CIPTA KARYA are as follows:

1. The items agreed upon between the Japanese and Indonesian sides:
 1. The Team proposed a draft Scope of Work, which was discussed in detail and agreed upon.
 2. Both sides confirmed that there are ongoing strong efforts by CIPTA KARYA and Surabaya City at national and local government levels respectively for the improvement of municipal solid waste management, and that the Study will constitute a significant contribution to these efforts.
 3. The JICA Study Team shall pay a due attention to the historical development of solid waste management in Surabaya

City including the intensive promotion of public participation in solid waste management as well as the improvement efforts based on the financial assistance of the World Bank.

4. In the case of the basic study, the Study Area consists of Surabaya City and its surrounding urban areas while the Master Plan formulation covers as the Study Area the whole area under the jurisdiction of Surabaya City. The Master Plan Study Area shall include, however, the future landfill sites and their environs even in the case of their siting outside Surabaya City. In that case, the amount of the waste to be brought into by other local governments will be taken into account in the planning of final disposal sites.
5. The type of solid wastes to be studied is limited to those wastes which are handled by the Cleansing Department (Dinas Kebersihan) of Surabaya City. They include household waste, cottage industry waste, market waste, street sweeping waste, commercial waste, and the household and office waste generated by industries. Although non-hazardous industrial wastes and sludges generated by other municipal services are not included in Study wastes, general recommendations on their management shall be worked out in the Study.

In addition, Indonesian side requested that the Study would make recommendations on the coordination to be achieved between hazardous waste management system to be established by the Environmental Impact Management Agency (BAPEDAL) and the Provincial Government of East Java and the municipal solid waste management system of Surabaya City, although hazardous solid wastes generated by industries are not included either in the Study wastes. The Team took note of this request.
6. The target year of the Master Plan is set for the year 2010.
7. The selection of the first priority project shall be done through a series of meetings between Japanese and Indonesian

sides, and it will be finalized at the time of submission of Interim Report(2). With the objective of confirming and improving the technical, institutional and financial feasibility of the first priority project, a pilot test shall be carried out at the Feasibility Study stage as mentioned in IV.4.(3) of the Scope of Work. The contents of the pilot test shall be discussed and agreed upon later by both sides at the time of the submission of Inception Report, Interim Report(1) and Interim Report(2).

8. The identification of future landfill site(s) shall be completed by Surabaya City by the time of submission of the Progress Report (2). The identification shall be conducted following the guidelines of site selection to be submitted by the JICA Study Team together with the Inception Report. These guidelines shall be prepared taking into account the existing CIPTA KARYA's guidelines.
9. Basic study on environmental pollution related to the existing solid waste management, which is mentioned in IV.1. (1).j of the Scope of Work, shall be carried out taking into account the existing Indonesian guidelines on Preliminary Environmental Evaluation Report (PEL) and Environmental Evaluation Study (SEL). As for the new facilities to be proposed by the Study, serious efforts shall be made by the JICA Study Team to evaluate environmental impacts to be caused by them, taking into account the guidelines on Preliminary Environmental Information Report (PIL) and Environmental Impact Analysis (ANDAL).
10. To guarantee the smooth conduct of the Study and promote technology transfer through on-the-job training, CIPTA KARYA shall designate the following counterpart:
 - (1) Two co-leaders who will work as the counterpart to the JICA Study Team Leader (part time, one from CIPTA KARYA and the other from Surabaya City).

- (2) Two officers (one from CIPTA KARYA on part time basis and the other from Surabaya City on full time basis).
 - (3) Other staffs of Surabaya City (ad-hoc basis).
11. CIPTA KARYA shall organize and preside a steering committee which would consist of the representatives of the Directorate for Programme Development, the Directorate for Environmental Sanitation of CIPTA KARYA, Surabaya City and other organizations concerned from central and local governments in order to guarantee the efficient and effective conduct of the Study. CIPTA KARYA shall also organize and preside a technical committee made of technical staffs of the organizations concerned. This technical committee shall assist the steering committee on technical matters.
 12. Dinas Kebersihan of Surabaya City shall put into practice, if necessary and convenient, the interim recommendations of the Study by its own resources even before the end of the Study.
- II. The approach proposed by the Team concerning the treatment and final disposal method in the Master Plan:
1. With the objective of overcoming the ever increasing difficulty in the acquisition of lands for landfills, Surabaya City is constructing a 200 ton/day incinerator. This is a highly laudable initiative for better solid waste management.
 2. Experiences in Japan show, however, that the adaptation of incineration technology to local conditions such as waste characteristics will require at least 10 years of try and error efforts. As such Surabaya City is requested to carry out this important but time consuming work of adaptation patiently using the 200 ton/day plant as a pilot plant and getting the technical advice of the Agency for the Assessment and Application of Technology (BPPT).

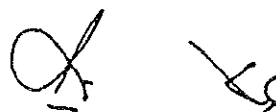
3. Therefore, the basic approach of the Master Plan is to dispose of all the wastes except the wastes destined for the 200 ton/day incinerator by landfilling and upgrade its method gradually from actual open dumping to sanitary landfilling. Once the time is ripe technically and financially, the Master Plan can be modified with little difficulty for the construction of the second and the third incinerators. This modification will not make the landfills unnecessary but prolong their life alleviating the burden on Surabaya City in the acquisition of future landfill sites. If something happens to the pilot incineration plant during the adaptation period, the landfills still will be able to accommodate the wastes originally destined for that plant. It can be said, therefore, that the Master Plan will be very flexible.

III. The items raised by CIPTA KARYA:

1. To pursue technology transfer as stated in VIII.2 in the Scope of Work, CIPTA KARYA requested JICA to hold a seminar in Surabaya in conjunction with the submission of Draft Final Report.
2. CIPTA KARYA also requested JICA to train four Indonesian counterpart personnel in Japan under the Japanese Technical Cooperation Scheme.
3. CIPTA KARYA stated that they would do the best to provide the JICA Study Team with the vehicles mentioned in VII.3.(6) of the Scope of Work. Because of the expected difficulty, however, they requested JICA to consider the self-provision of necessary vehicles.

IV. The discussions held on the topic of solid waste analysis:

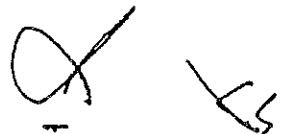
1. The Team clarified that it is JICA's policy to use the locally available analytical facilities as much as possible. As such the Team requested CIPTA KARYA to facilitate the use



of some analytical equipment of its Water Supply and Environmental Sanitation Training Center in Bekasi by the JICA Study Team. The Team also clarified that, in the case of locally not available equipment, the JICA Study Team will bring them into Indonesia and leave them in Bekasi Training Center after the Study, if Indonesian side requests.

2. CIPTA KARYA requested JICA to hold a short seminar on solid waste analysis in Bekasi Training Center within the framework of the Study. CIPTA KARYA suggested the Study's second work in Indonesia as the timing of the seminar.

Annex: List of Attendants

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Annex

List of Attendants

1st meeting: CIPTA KARYA, March 11, 1991

(Indonesian Side)

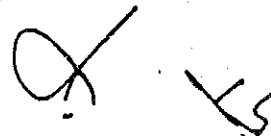
- Mr. Soeratmo Notodipoero
Secretary of Directorate General CIPTA KARYA
- Mr. Darmawan Saleh
Director of Environmental Sanitation (PLP)
- Mr. Prijono Salim
Head of Sub Dit. of Foreign Aid Administration (ABLN)
- Mr. Boediman Arif
Head of Sub. Dit. of Solid Waste, PLP
- Mr. Jacob Ruzuar
Chief of Technical Planning Section, Sub Dit. of Solid Waste
- Mrs. Dwi Meinita
Staff of Sub Dit. of Foreign Aid Administration, Bina Program
- Mr. Hideo Azuma
JICA Expert on Solid Waste Management, PLP

(Japanese Side)

- Dr. Kunitoshi Sakurai (Team Leader)
Environmental Health Development Specialist, JICA
- Mr. Shigenobu Ohbayashi (System Planning)
Senior Researcher, Department of Sanitary Engineering,
Institute of Public Health, Ministry of Health and Welfare
- Mr. Kazumi Ohkawa (Administration of Waste Management)
Sub-chief of Waste Control Section, Public Cleansing
Department Environmental Bureau, Sapporo City
- Mr. Toshiyuki Ezuka (Coordinator)
Staff, 2nd Development Study Division, Social Development
Study Department, JICA
- Mr. Teruyoshi Kumashiro
Staff of JICA Jakarta Office

2nd meeting: Surabaya City, March 12, 1991

(Indonesian Side)



Mr. Benjamin Hilly : BAPPEDA, TKII
Mr. Jacob Ruzuar : CIPTA KARYA, PLP
Mr. Eddy Indrayana : Head of Cleansing Department, Surabaya City
Mr. Rayas Satyyadharna: Cleansing Department, Surabaya City
Mr. Cholik : ditto
Mr. M. Anshar : BAPPEDA TKI
Mr. Fatchul Muiz : Public Works TKII
Mr. Farich Amin : East Java Province, PLP
Mr. Magenda Aridiwinata: Project Manager, East Java Province, PLP
Mr. Hideo Azuma : JICA Expert, PLP

(Japanese Side)

Dr. Kunitoshi Sakurai
Mr. Shigenobu Ohbayashi
Mr. Kazumi Ohkawa
Mr. Toshiyuki Ezuka

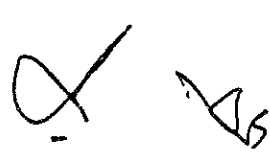
3rd meeting: CIPTA KARYA, March 16, 1991

(Indonesian Side)

Mr. Boediman Arif : PLP
Mr. Jacob Ruzuar : PLP
Mr. Rezeki : Bina Program
Ms. Saptorini : Bina Program
Mrs. Dwi Meinita : Bina Program
Mr. Hideo Azuma : JICA Expert, PLP

(Japanese Side)

Dr. Kunitoshi Sakurai
Mr. Shigenobu Ohbayashi
Mr. Kazumi Ohkawa
Mr. Toshiyuki Ezuka



APPENDIX 3. Persons Involved in the Study

Appendix 3 Persons Involved in the Study

1. Indonesian Side

A. Steering Committee:

1. Mr. Rachmadi B.S. : Director General of Human Settlements, Ministry of Public Works.
2. Mr. Saad Basaib : Head of Bureau of Social Welfare, BAPPENAS.
3. Mr. Nabiel Makarim : Deputy I, Environmental Impact Assessment Agency (BAPEDAL).
4. Mr. Darmawan Saleh : Director of Environmental Sanitation, Ministry of Public Works (DPU).
5. Mr. P. Sidabutar : Director of Development Programme, DGHS, Ministry of Public Works (DPU).
6. Mr. Soedarsono Soekardi : Director of Urban Development, Ministry of Home Affairs.
7. Mr. Yusuf Anwar : Director of Foreign Fund, Ministry of Finance.
8. Mr. Gembong Priyono : Head of Bureau for International Cooperation, DPU.
9. Mr. Didie Herkamto : Agency for Assessment and Application of Technology (BPPT).
10. Mr. Chusen Chasbullah : Head of BAPPEDA, Surabaya City
11. Mr. Eddy Indrayana : Head of Cleansing Department, Surabaya City

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1. Mr. Deka Paranoan : Sub. Dir. of Solid Waste, Directorate of Environmental Sanitation, DPU.
2. Mr. Dwityo Akoro S. : Staff of Sub. Dir. of Solid Waste, PLP.
3. Mr. Rayas Satyadharma : Staff of Cleansing Department, Surabaya City.

4. Mr. Cholik : Staff of Cleansing Department, Surabaya City.
5. Mr. Boni Tobogu : Staff of Cleansing Department, Surabaya City
6. Mr. Benyamin Hilly : BAPPEDA, Surabaya City
7. Ms. Biempi Harbi Maharani : Urban Planning Department, Surabaya City
8. Ms. Saptorini : Directorate of Development Programme, DPU
9. Mr. Bambang Heruhadi : BPPT (Agency for Assessment and Application of Technology)
10. Mr. Masnelyarti Hilman : BAPEDAL
11. Mr. Akio ISHII : JICA SWM Expert

C. Counterparts:

1. Mr. Cholik (Part Time) : Cleansing Department, Surabaya City
2. Ms. Erna (Full Time) : Cleansing Department, Surabaya City
3. Ms. Dahlia Erawati (Part Time) : Staff of PLP for East Java Province
4. Mr. Rudi Lesmono (Full Time) : Staff of PLP for East Java Province

D. Counterparts of Ad Hoc Base:

1. Collection : Mr. Suwito, Garbage Collection Division
Cleansing Dept., Surabaya City
2. Disposal : Mr. Sugiri, Planning & Monitoring
Division, Cleansing Dept. Surabaya City
3. Vehicle Maintenance : Mr. W.J. Pattikawa, Haulage Division,
Cleansing Dept. Surabaya City
4. Finance : Mr. Suryanto, Evaluation Division,
Cleansing Dept. Surabaya City

2. Japanese Side

A. JICA Advisory Committee:

1. Dr. Masaru TANAKA : Chief of Solid Waste Engineering
(Chairman of the Committee) Department,
The Institute of Public Health
2. Dr. Kunitoshi SAKURAI : Professor of Urban Engineering in
(Treatment & Disposal) Faculty of Engineering, Tokyo University
3. Mr. Yoshiaki ISHIKAWA : Director of Construction Section,
(Waste Administration) Plant Construction Division,
Bureau of Public Cleansing,
Tokyo Metropolitan Government

B. Study Team:

1. Mr. Kihachiro URUSHIBATA : Team Leader (PCI)
2. Mr. Kiichiro SAKAGUCHI : Organization & Institution/Project
Evaluation Analyst (EX)
3. Mr. Shin'ichi SUZUKI : Waste Collection Planner (EX)
4. Mr. Ramli : Organization & Institution Analyst (EX)
5. Mr. Shunsuke Aoyama : Intermediate Treatment Planner (EX)
6. Mr. Minoru Murata : Equipment Maintenance Expert (EX)
7. Mr. Norio Kan'no : Waste Quality Analyst (PCI)
8. Mr. Masafumi Aikawa : Final Disposal Planner (PCI)
9. Mr. Akinori Sato : Environment Analyst (PCI)
10. Mr. Kazuhiro Nakaishi : Facility Designer (PCI)

Abbreviations:

Ex: EX Corporation

PCI: Pacific Consultants International

APPENDIX 4 Appropriate Type and Size of
Mini Container Truck

Appendix 4. Appropriate Type and Size of Mini Container Trucks

1) Chassis and Body

There are three (3) candidate types of trucks that may be used to haul waste from small containers: 1) the Front End Loader (FEL) truck, 2) the current REL compactor truck, and 3) the bottom opening container truck.

The bottom opening container truck is not recommended as it is very costly. A hydraulic crane, one of the important components of a bottom opening container truck, is an expensive import item. The cost was estimated to be Rp. 12.25 to 17.25 million in 1986 price in an ADB report "Solid Waste Improvement Program" (Feb. 987). Its cost is now expected to be more than Rp. 20 million. In addition, maintenance and repair cost will be also expensive because imported materials have to be used. Hence, this type of truck can not be recommended. The FEL truck and the REL truck is discussed hereafter.

In view of the same reason discussed in Chapter 1 in part I of the Supporting Report 10 GVW truck updated from 7 GVW cannot be recommended. The following table shows the appropriate combination between chassis and body capacity.

Table 4-1 Truck Type and Its Appropriate Body Capacity

	FEL Truck		REL Truck	
	7 GVW	14 GVW	7 GVW	14 GVW
Weight of chassis and equipment	3.5 ton	8.0 ton	4.8 ton	9.5 ton
Payload	3.5 ton	5.0 ton	2.2 ton	4.5 ton
Body capacity	8 m ³	16 m ³	6 m ³	14 m ³
Body size: L	3.6 m	4.2 m	3.0 m	3.7 m
[inside] W	1.9 m	2.1 m	1.9 m	2.2 m
H	1.2 m	1.9 m	1.2 m	1.9 m
Container size	0.6 m ³	1.0 m ³	0.6 m ³	1.0 m ³

2) Reliability of Operation

The introduction of the FEL truck in Indonesia is very new. There are three FEL trucks having operating in Central Java since 1991. The technology of the FEL truck made by the local manufacturer is still in the process of development. Thus, the reliability of the FEL operation is very uncertain. The following table shows the comparison between REL and FEL in operation and maintenance.

Table 4-2 The Comparison between REL and FEL in Operation and Maintenance

	REL Trucks	FEL Trucks
Reliance on Operational	Although the compaction is very poor, there is much experience in the REL operation.	There are only three in Indonesia and, they are in the process of development, there are some questions on the operation of FEL.
Safety for Driving	No Problem.	There may be no problem but the front view become smaller due to FEL arms.
Handling of Hospital Waste	No Problem.	FEL trucks may not be suitable for handling of hospital waste because there is a possibility that medical waste is spilled when it is loaded into the truck body.
Maintenance	Compared to FEL trucks, REL trucks are complicated in the body. 7 hydraulic cylinders of 4 different types usually make the truck maintenance difficult.	For the daily maintenance, a maintenance hole was made under the drivers' sheet because the truck cabin cannot be opened due to FEL arms. Only 2 hydraulic cylinders are required which make the maintenance cost lower than that of REL trucks.

3) Cost of FEL and REL trucks

The unit haulage cost by type of a FEL and a REL truck is shown in Table 1.3. The FEL trucks are relatively cheaper than the REL trucks. Among two FEL trucks, 16 m³ FEL trucks with 14 GVW chassis are the cheapest, while 14 m³ REL with 14 GVW chassis is the cheapest among three REL trucks.

Table 4-3 Unit Cost Comparison Between FEL truck and REL truck

Type of Truck	Truck Purchase Price	Cost of Containers Needed per Truck			Total cost	Waste Amount Hauled by a truck/year	Unit Haulage Cost per Ton
		Unit	Unit price	Cost			
	(1)	(2)	(3)	(4)=(2)x(3)	(5)=(1)+(4)	(6)	(7)=(5)+(6)
8 m ³ FEL with 7 GVW	49,000,000	12	500,000	6,000,000	55,000,000	867 ton	63,347
Recommended 16 m ³ FEL with 14 GVW	83,300,000	14	600,000	8,400,000	91,700,000	1,686 ton	54,389
Current 6 m ³ REL with 7 GVW	72,000,000	12	500,000	6,000,000	78,000,000	867 ton	89,965
Current 10m ³ REL with 14 GVW	86,300,000	9	600,000	5,500,000	91,700,000	1,084 ton	84,594
Recommended Current 14 m ³ FEL with 14 GVW	119,300,000	16	600,000	9,600,000	128,900,000	6,070 ton	66,892

Note: Waste amount hauled by a truck/year =

(Capacity of container) x (Unit number (2)) x (bulk density 0.33) x 3 trips/day (310 days)
 where, 8 m³ FEL and the current 6 m³ REL use 0.6 m³ containers and the current 10 m³ REL and recommended 16 m³ REL use 1 m³ containers.

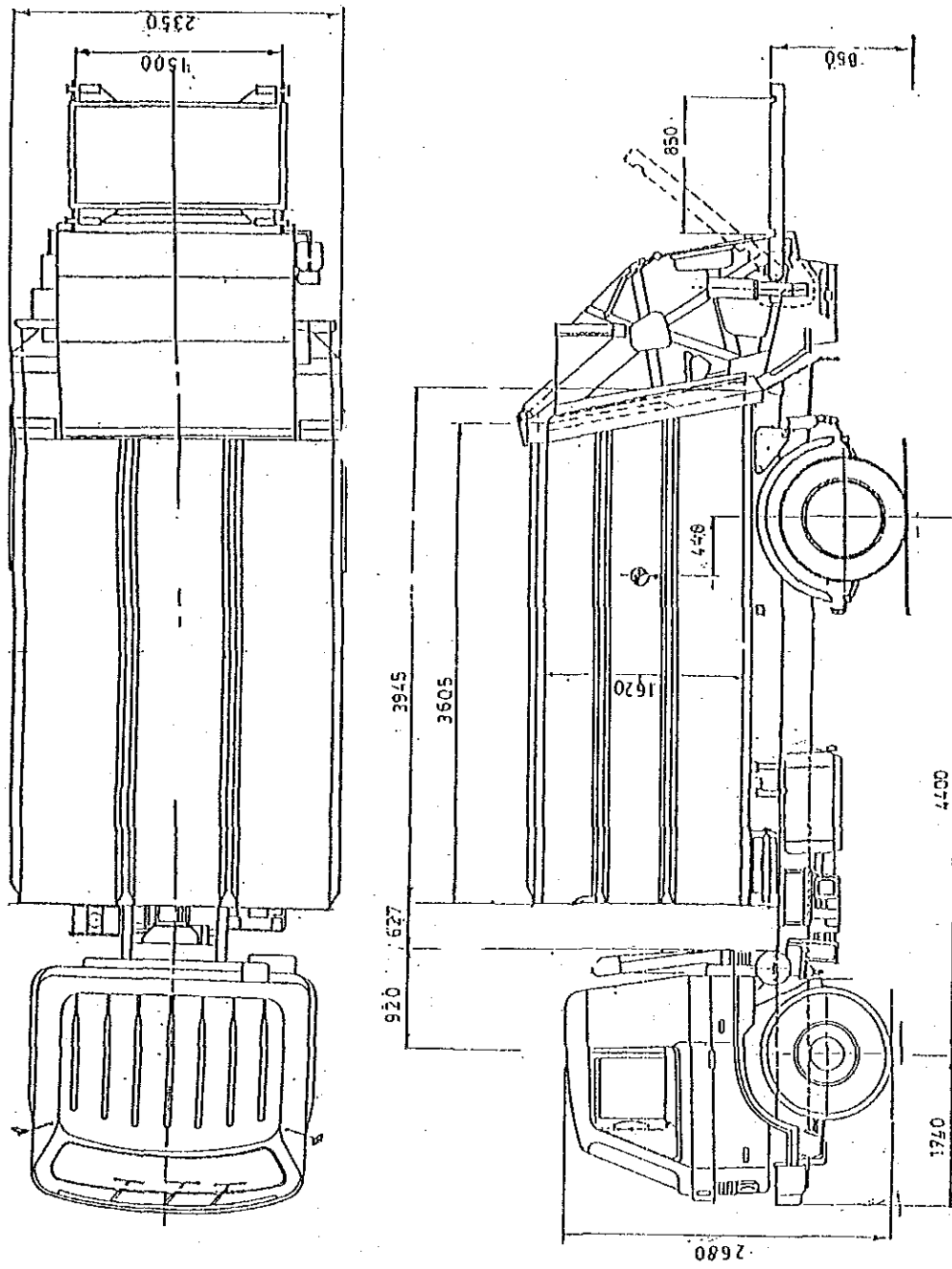
4) Road Condition

The current major mini container truck is 10 m³ REL truck with 14 GVW chassis. 14 m³ REL is larger than 10 m³ REL by only about 20 cm in length and 32 cm in height. The total length of 16 m³ FEL truck is less than 14 m³. Thus, there is no problem in the operation of both 14 m³ REL and 16 m³ FEL truck from the point of view of the road condition.

5) Conclusion

There are some advantages and disadvantages with both 14 m³ REL and 16 m³ FEL trucks. A FEL truck is very economical compared to a REL truck. However, there are some questions on the operational reliability of a FEL because it is still in development stage.

It may be safe to use REL trucks in the beginning since the REL trucks have been used for some years in Surabaya. In addition, there are many local manufactures in Surabaya and Jakarta that manufacture REL trucks. However, it is worth constructing a "FEL prototype" by utilizing the experience gained in the Central Java because FEL trucks will save costs for both contractors and KMS if it is successfully operated.



Source : PT. WIRA GULFINDO SARANA

FIG. 4-1

THE EXAMPLE OF 14 M³ REL COMPACTOR TRUCK

THE STUDY ON THE SOLID WASTE MANAGEMENT IMPROVEMENT FOR SURABAYA CITY



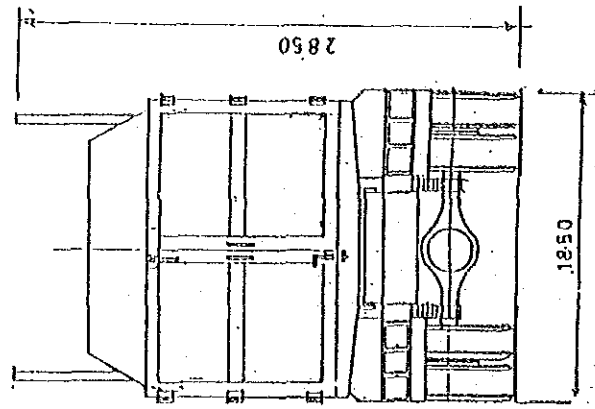
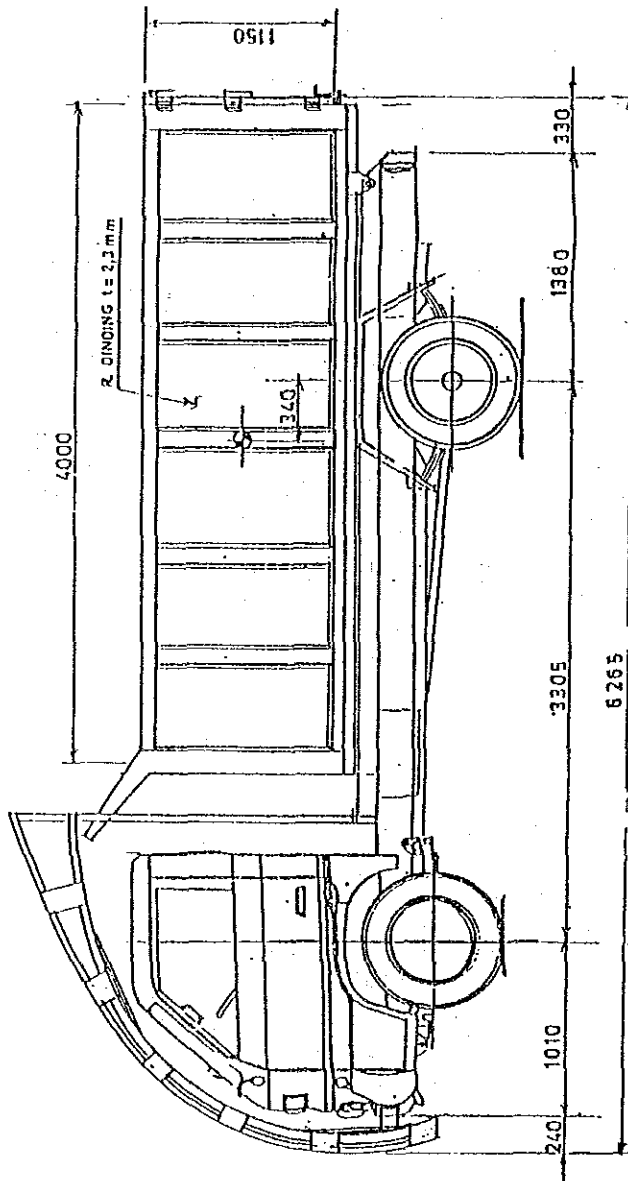
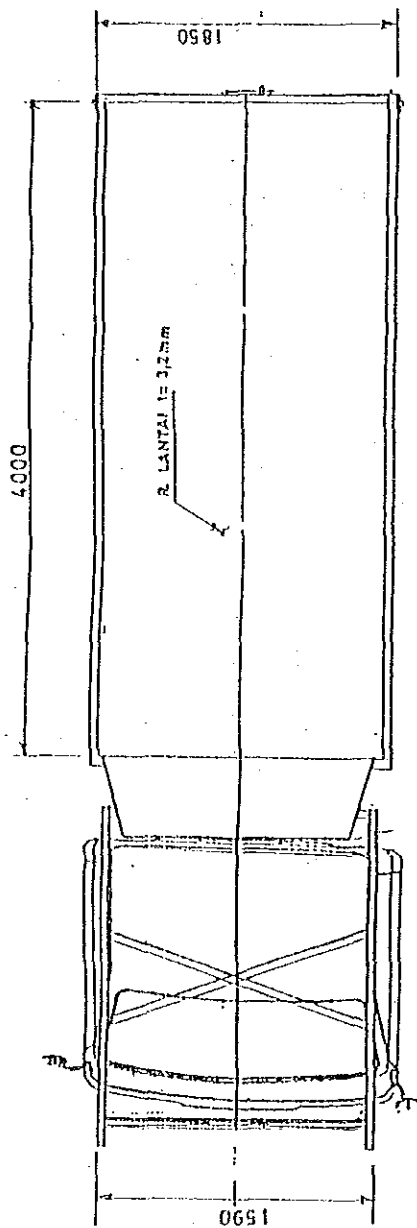


FIG. 4-2

THE EXAMPLE OF 16 M³ FEL TRUCK

THE STUDY ON THE SOLID WASTE MANAGEMENT IMPROVEMENT FOR SURABAYA CITY

Source : PT. WIRA GULFINDO SARANA

APPENDIX 5. Notification of ANDAL Evaluation Result



**GUBERNUR KEPALA DAERAH TINGKAT I
JAWA TIMUR**

SURABAYA, 7 Januari 1993

Nomer : 660/16/201.3/93 Kepada
Sifat : P E N T I N G
Lampiran : - Yth. Sdr. Kepala Dinas Kebersihan
Perihal : Penilaian Analisis Pemerintah Kotamadya Da-
Dampak Lingkungan erah Tingkat II Surabaya
(ANDAL) di

S U R A B A Y A

Sehubungan dengan pengajuan atas berkas dokumen ANDAL Rencana LPA Baru didesa Romo Kalisari Kecamatan Benowo Kotamadya Daerah Tingkat II Surabaya, yang saudara sampaikan ke Komisi AMDAL Propinsi Daerah Tingkat I Jawa Timur, maka dapat disampaikan hal-hal sebagai berikut :

- A. Penulisan disusun berdasarkan Surat Keputusan Departemen Pekerjaan Umum Republik Indonesia.
- b. Materi dapat diterima dan hal-hal yang harus saudara diperhatikan adalah ;
 1. Agar memperhatikan dampak sosial budaya yang mungkin timbul akibat kegiatan rencana LPA Baru tersebut, terutama dampak negatifnya.
 2. Tetap memperhatikan estetika lingkungan setelah menjadi LPA Baru.
 3. Menangani limbah cair dan harus membuat bak pengolah limbah cair dan memperhatikan nilai ambang batasnya.
 4. Menangani pencemaran udara seperti bau, debu dan lain-lain.
 5. Mengadakan penghijauan baik didalam maupun di sekitar LPA Baru.

6. Arus lalulintas umum yang berada pada jalur jalan baik yang menuju atau dari LPA Baru tidak boleh terganggu akibat kegiatan LPA, sehingga tidak terjadi kemacetan lalulintas.

C. Berdasarkan uraian tersebut diatas ANDAL Rencana LPA BARU di Benowo dapat disetujui dan segera menyusun RKL dan RPLnya.

Demikian untuk menjadikan maklum.

GUBERNUR KEPALA DAERAH TINGKAT I



Tembusan :

Yth. Sdr. Walikotamadya Kepala
Daerah Tingkat II
Surabaya di Surabaya.

RENCANA

PEMBUKAAN DAN PENGOPERASIAN

LOKASI PEMBUANGAN AKHIR SAMPAH

DI KELURAHAN ROMO KALISARI - KECAMATAN BENOWO

KOTAMADYA SURABAYA

LAPORAN AKHIR

STUDI ANDAL
RENCANA LPA BARU DI BENOWO

DINAS KEBERSIHAN
PEMERINTAH KOTAMADYA DAERAH TINGKAT II SURABAYA

Dengan dibantu oleh :

Direktorat Penyehatan Lingkungan Pemukiman
Direktorat Jenderal Cipta Karya - Departemen PU

Lewat Team Teknis

JICA STUDY TEAM on SOLID WASTE MANAGEMENT
IMPROVEMENT FOR SURABAYA CITY

November - 1992

Surabaya, January 7, 1993

To Mr.

Head of Dinas Kebersihan

Pemerintah Kotamadya Daerah

Tingkat II Surabaya, Surabaya

No.: 660/16/201.3/93

Status: URGENT

**Evaluation of Environmental Impact Assessment (ANDAL Study)
Proposed New Final Disposal Site (LPA) Benowo**

In accordance with the presentation of ANDAL Document for the Proposed New Final Disposal Site at Benowo, Surabaya Municipality, which have submitted the Document to AMDAL Commission, we can bring forward the following items:

- a. This ANDAL Study is based on Decision Letter of Department of Public Works of the Republic of Indonesia (Surat Keputusan Department Pekerjaan Umum Republik Indonesia).
- b. The ANDAL Study Report is acceptable and needs your specific attention to the following issues:
 1. The negative impact on Social-Cultural affairs which is liable to be affected by the operation of new disposal site.
 2. Being advised to pay attention on the aesthetic environment after development of new disposal site.
 3. Handling leachate and construction of leachate retention ponds and to control its limited state.
 4. Handling air pollution such as dust, smell, etc.
 5. Establish green belt by planting trees around the disposal site area.
 6. The traffic disturbance or congestion caused by the waste trucks.

- c. Based on the above issues, Benowo AMDAL Study Report is available and can be approved. AMDAL Commission suggested to prepare The Environmental Management and Monitoring Plan (RKL and RPL) as soon as possible.

Thus for making an announcement.

Governor of the First Level Province,
East Jawa

Signature

SOELARSO

c.c.

Sincerely yours, Mr. Mayor of the Second Level
Province of Surabaya, Surabaya

PROPOSED OPERATION

ON NEW FINAL SOLID WASTE DISPOSAL SITE

AT ROMO KALISARI - BENOWO DISTRICT

SURABAYA CITY - INDONESIA

FINAL REPORT

ENVIRONMENTAL IMPACT ASSESSMENT
(ANDAL STUDY)

DINAS KEBERSHIAN
PEMERINTAH KOTAMADYA DAERAH TINGKAT II SURABAYA

Support by :

Direktorat Penyehatan Lingkungan Pemukiman
Direktorat Jenderal Cipta Karya - Departemen PU

and The Technical Team :

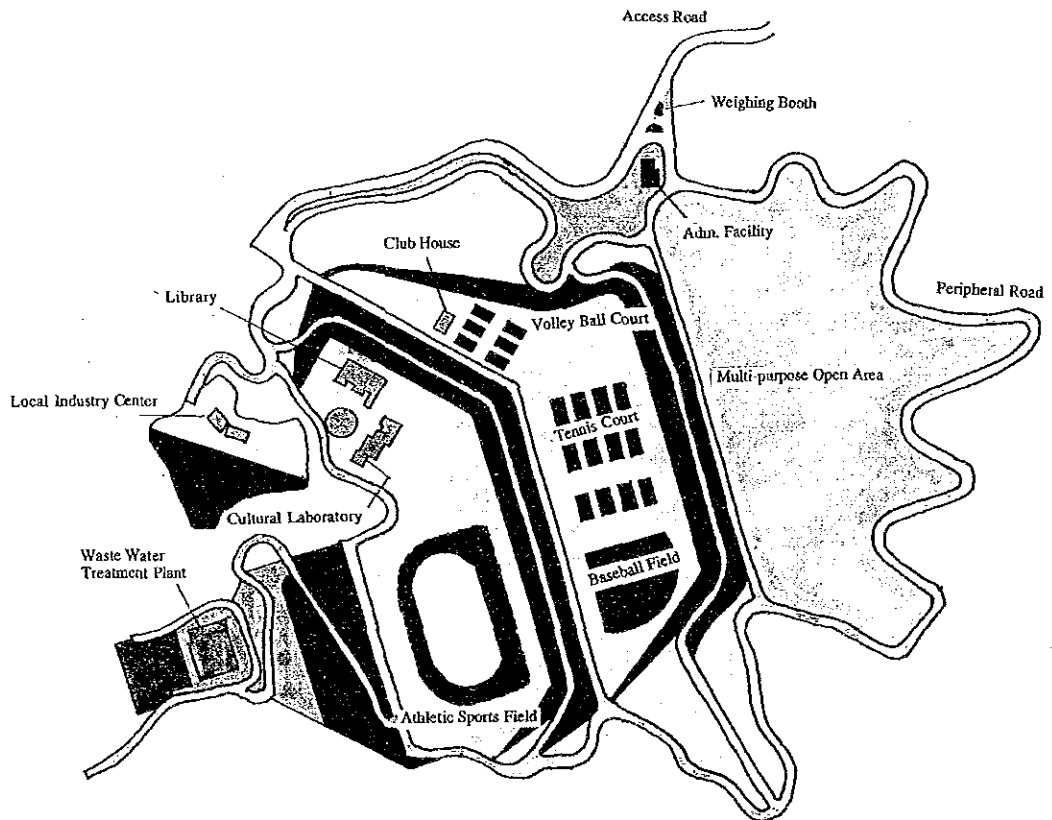
JICA STUDY TEAM on SOLID WASTE MANAGEMENT
IMPROVEMENT FOR SURABAYA CITY

November - 1992

**APPENDIX 6. Examples of Land Use Conversion
from Final Disposal Site**

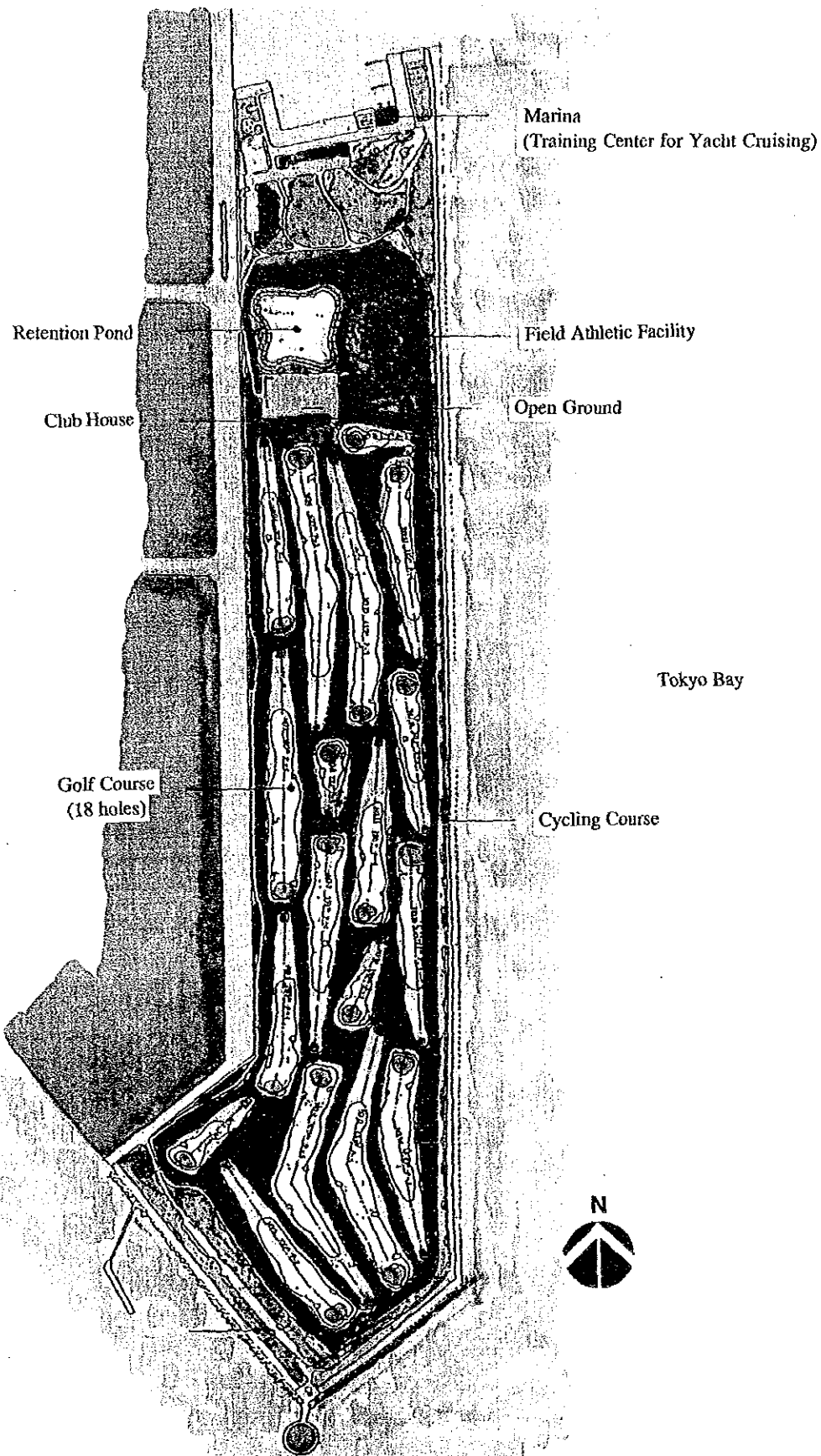


Present Situation (Aug. 1990)



(HINODE Inland Waste Landfill Site, SWM Union in Tokyo Suburban Municipalities)

Integrated Public Facilities on Former Disposal Site



(Fifteenth Reclamation Lot on the Tokyo Bay, Tokyo Metropolitan Govt.)

Golf Course on Former Disposal Site

**APPENDIX 7. Example of Recovered Gas Usage
at Final Disposal Site**

Appendix 7. Example of Recovered Gas Usage at Final Disposal Site

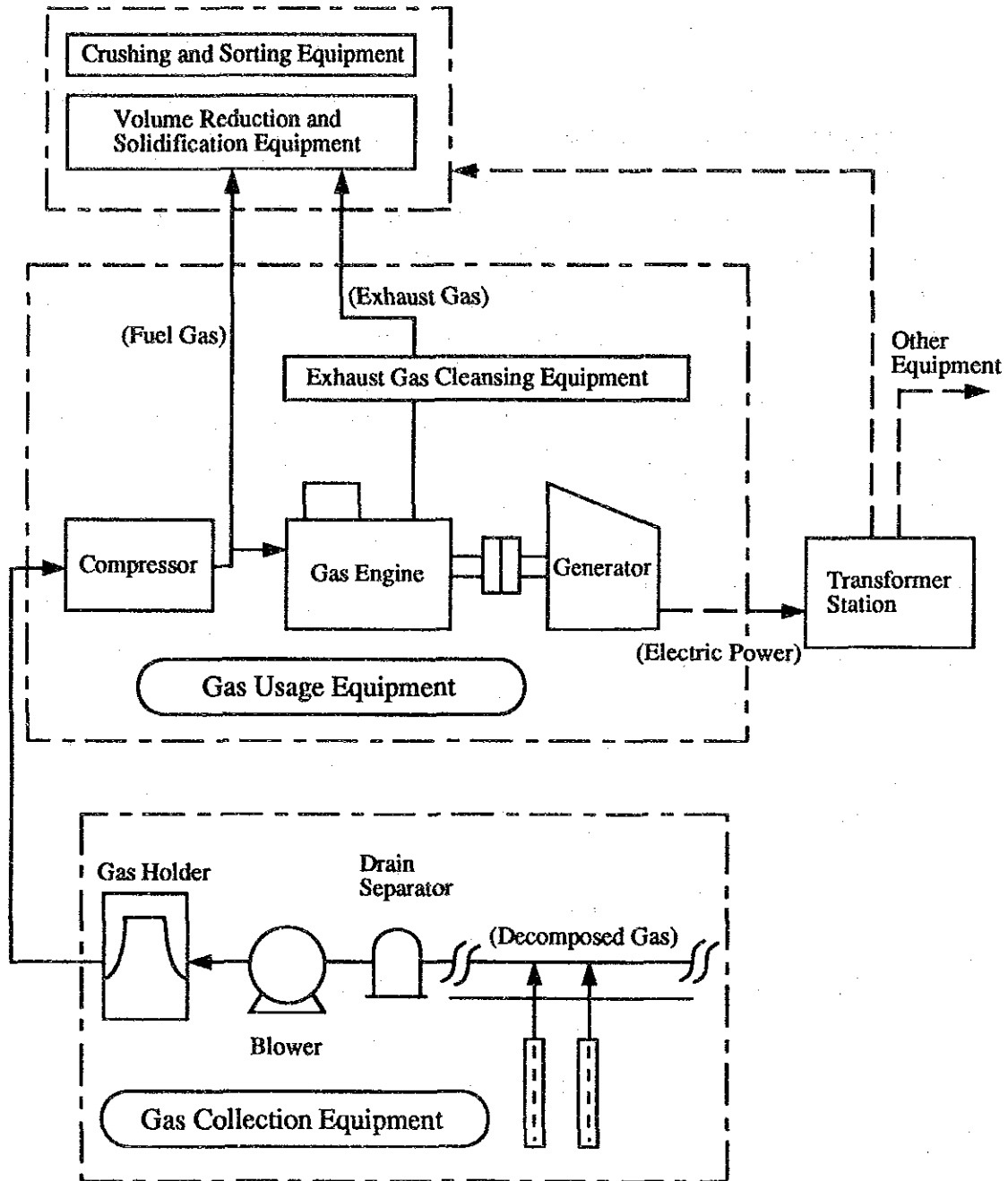
The simplest way of recovered gas usage is to use the gas as a heat source of some facilities installed in the final disposal site. This type of primitive usage usually does not bring so much benefit as the initial cost required to install collection equipment. Usage for power generation has been applied in developed countries based on the consideration on economical balance. An example of this type of usage is explained by referring to the announcement of Tokyo Metropolitan Government, in the Annual Report of Solid Waste Management issued by Cleansing Dept. in 1990.

Recovered gas usage system of Tokyo Metropolitan Government is applied to both heat source and power source in a series of disposal plants. The recovered gas, that contains methane by 50 to 60% in average, has a heat value of about 4,500 kcal /Nm³. The gas collected at the final disposal site is transferred to the power plant and treatment plants by induction fan through pipe network.

Power plant has three generators driven by gas engine with the rated capacity of 320 kw each. The electricity is supplied to the treatment plants next to the final disposal site as a part of their power source. The exhaust gas of gas engine and gas itself are also supplied to the plants for their heat demand. The annual output of gas usage is summarized in the table below.

Annual Output of Gas Usage

Year	Total Gas Volume (1,000 Nm ³)		Power Output	
	Power Plant	Treatment Plant	Rated Capacity	Annual Total
1989	3,264	300	960 kw	5,634 Mwh
1990	2,265	365	960	4,339



(Sea Reclamation Disposal Site inside the Central Breakwater)

Flow of Gas Usage System of Tokyo

**APPENDIX 8. List of References
to the Current Study**

Appendix 8

List of reference to the Current Study

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JICA