

STUDY  
ON  
SOLID WASTE MANAGEMENT SYSTEM  
IMPROVEMENT PROJECT  
IN  
THE CITY OF JAKARTA IN INDONESIA

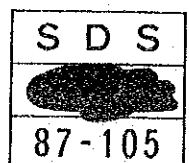
FINAL REPORT

SUPPORTING REPORT



NOVEMBER 1987

JAPAN INTERNATIONAL COOPERATION AGENCY





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国際協力事業団

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REFERENCE



## **1. Present Condition on Solid Waste Management in Jakarta**



1. Present Condition on Solid Waste Management in Jakarta

1.1 Present Condition of Waste Management, Fundamental Problems and Correction Points

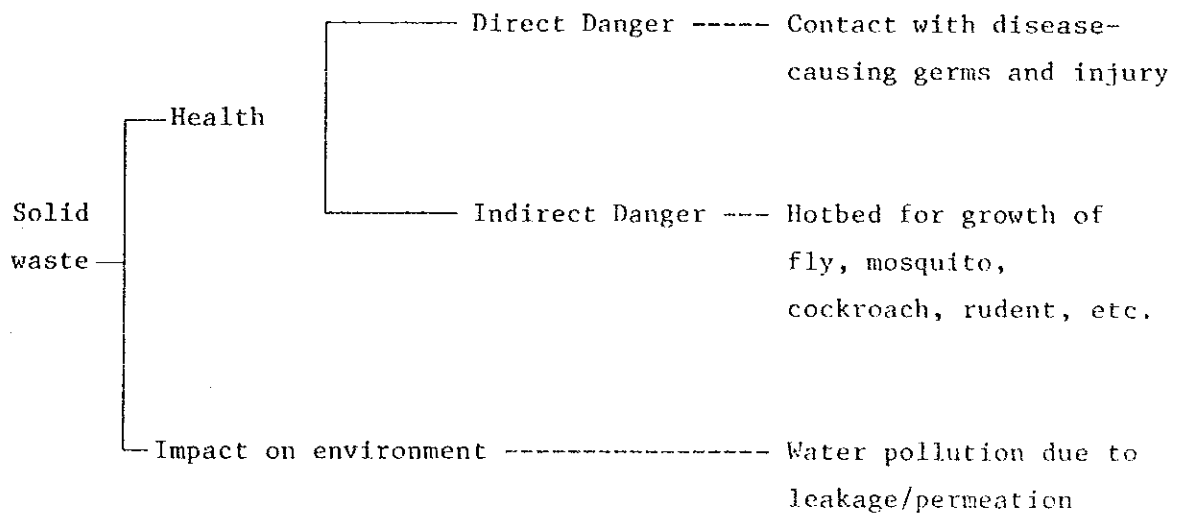
1.1.1 Present Conditions of Waste Treatment

(1) General

The fundamental of waste treatment can be summarized into the following two points in view of public health:

- 1) Immediate disposal of waste discharged from residential area
- 2) Treatment of waste as sanitarily as possible

Moreover, it has been known worldwidely that the following sanitary problems are involved in the treatment of waste:



In other words, the view point of this report is that "the waste which is a cause of damage to sanitation, environment and appearance of the city shall immediately and sanitarily be treated."

From this view point, field reconnaissance was carried out in Jakarta in order to investigate the general conditions of waste

management while paying particular attention to the following points:

- a) Is any waste scattered around housing?
- b) Is there any unsanitary disposal area adjacent to a living space?
- c) Is any waste disposed of dangerously or unsanitarily?

The results of reconnaissance are as shown in Table 1.1-1.

Table 1.1-1 General Condition of Solid Waste

Situation	Typical Site
<ul style="list-style-type: none"> <li>- Solid waste seldom or hardly ever appears both around houses and along street.</li> <li>- Household's storage for solid waste is a concrete bin in front of a house or is some vessel behind a fence.</li> </ul> <p>(See Fig. 1.1-1)</p>	<ul style="list-style-type: none"> <li>- So called "protocol area" and "Protocol Street" e.g. Kel. Gambir, Kel. Menteng, Thamrin St., Sudirman St.</li> <li>- So called "Established or (New Kampung)" and "Economy street" e.g. Taman Solo, Kel. Tomang, Kel. Pondok Indah, A section of Kec. Kebayoran Baru</li> </ul>
<ul style="list-style-type: none"> <li>- Solid Waste does not often appear around houses and along streets, but sometimes appears in ditches.</li> <li>- Household's storage for solid waste is a concrete bin or some vessel in front of a house, and also is some vessel behind a fence.</li> </ul> <p>(See Fig. 1.1-2)</p>	<ul style="list-style-type: none"> <li>- Comparatively higher income residential area. e.g. Kel. Tebet Timur</li> <li>- Newly developed housing area e.g. Perumnas Klender Kel. Tanjung Duren</li> <li>- Well arranged Kampung e.g. Pejompongan (Kel. Petamburan) Kel. Kayu Manis Melayu Kecil (Kel. Bukit Duri).</li> </ul>

Situation	Typical Site
<ul style="list-style-type: none"> <li>- Solid waste, quite often appears around a communal container and open space. But does not so often appear around a house.</li> </ul> <p data-bbox="387 703 639 732">(See Fig. 1.1-3)</p>	<ul style="list-style-type: none"> <li>- Highly dense area e.g. Kel. Kramat, Kel. Tambora</li> <li>- Low road density area e.g. Sinar Budi (Kel. Pejagalan)</li> <li>- Area applied open space system for collection e.g. Tambak (Kel. Pegangsaan)</li> </ul>
<ul style="list-style-type: none"> <li>- Solid waste very often appears on banks of canal or in canals.</li> <li>- This situation is often observed by people in general.</li> </ul> <p data-bbox="387 1155 639 1184">(See Fig. 1.1-4)</p>	<ul style="list-style-type: none"> <li>- Mostly along river and canals, especially on those at unimproved banks.  e.g. the Ciliwung River (Kel. Kebon Manggis) A Canal through Sinar Budi, A Canal between Kel. Tembora and Kel. Glodok. There are fewer clean parts on almost all canals in the City.</li> </ul>
<ul style="list-style-type: none"> <li>- Solid waste more often appears on railways than on streets</li> </ul> <p data-bbox="387 1346 639 1375">(See Fig. 1.1-5)</p>	<ul style="list-style-type: none"> <li>- Specific places located beside temporary markets. e.g. Kel. Pademangan Timur.</li> </ul>
<ul style="list-style-type: none"> <li>- Solid waste always appears on vacant spaces of land</li> </ul> <p data-bbox="387 1538 639 1568">(See Fig. 1.1-6)</p>	<ul style="list-style-type: none"> <li>- Such a place as former disposal site, swamp or basin near a river. e.g. Kel. Bangka.</li> </ul>



Fig.1.1-1 Komp Taman Solo (Kel Cempaka Putih Timur)

Good condition like this covers 7 major areas (total area approx. 32 km<sup>2</sup>) in the city.

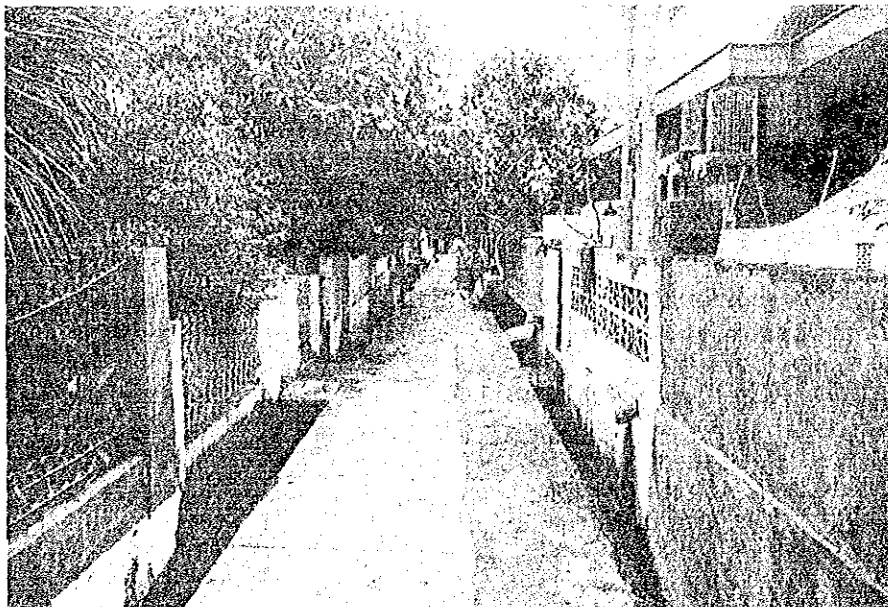


Fig.1.1-2 Perumnas Klender (kel. Klender)

Fair condition like this covers several areas (total area approx. 82 km<sup>2</sup>) in the city.



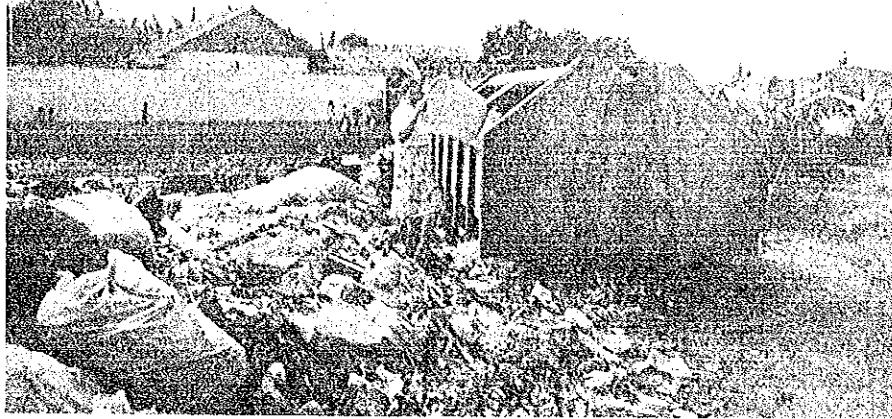


Fig.1.1-3 Sinar Budi (Kel. Pejagalan)

Negative condition around a transfer station like this is not rare, especially in the case of open space, concrete bin and sometimes communal container.



Fig.1.1-4 Ciliwung River at Kebon Manggis (Kel. Kebon Manggis)

Bad condition on banks of canal or in canals can be seen very often. Accumulation of garbage in canals become one of causes of flooding in the rainy season.

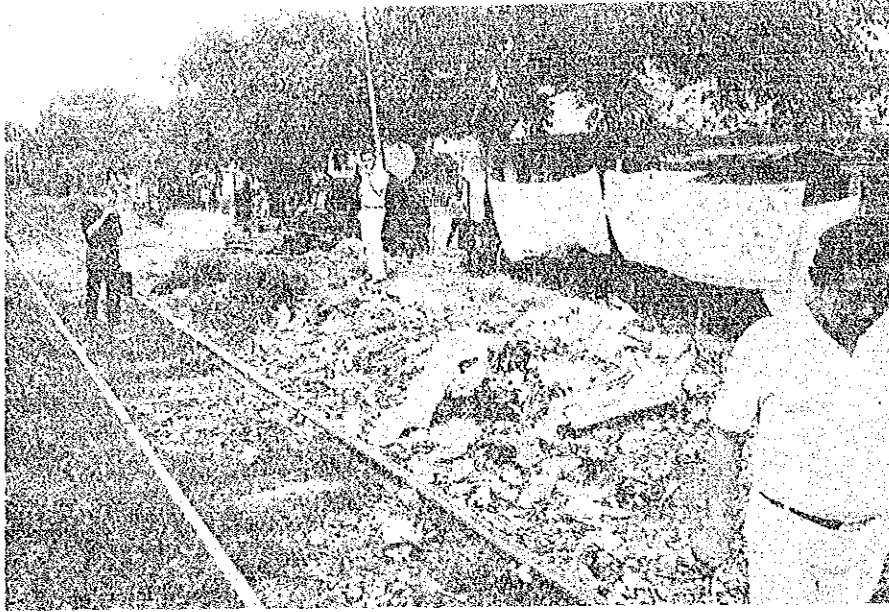


Fig.1.1-5 Rail Way at Kramat Pulo (Kel. Kramat)

Undesirable conditions on railways like this do not always appear in general. Improvement projects are being put into practice gradually.



Fig.1.1-6 Temporary Disposal Site at Kel. Pela

Undesirable conditions on some vacant places like this often appear mostly in suburban area.

## (2) Evaluation and Problematical Points

In light of the reasons that it is difficult to select the index for quantitative evaluation regarding the scattering conditions of waste in the entire area of Jakarta and it is almost impossible to readily obtain any precise observation data covering the entire city area although the quantitative index is available in some areas, the evaluation tends to be result in qualitative and subjective one.

Here, the indices for subjective evaluation are set as follows:

### a) Scatter of waste near residential area

1. Very noticeable
2. Noticeable at particular places
3. Rarely noticeable

### b) Unsanitational disposal site near residential area

1. There are a great many.
2. There are considerably many.
3. There are little.

Although conditions vary depending on the areas in the city, it can be said that Jakarta City corresponds respectively to Condition 2 of both Indices a) and b) (Refer to Note 1).

The features of the waste scattering conditions in Jakarta can be represented by the following points: Namely, in sharp contrast to the wonderful appearance along the protocol streets, wastes are scattered along narrow streets in the area behind the protocol street. By all means, it can be said to be a key task for improving the sanitation level of Jakarta City in the future, closing this gap.

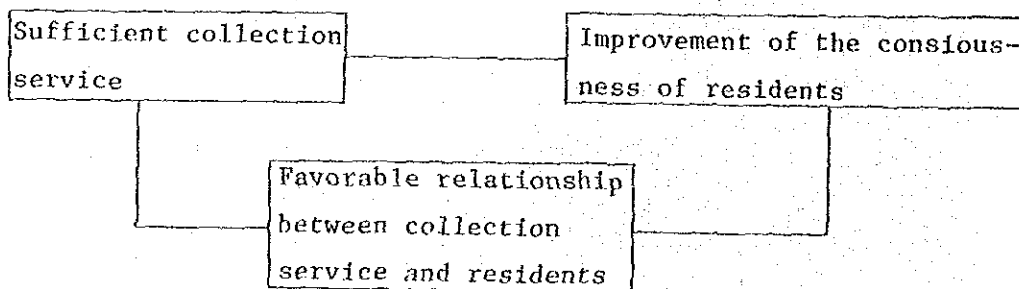
Note 1. For reference, the sanitation level of Jakarta is compared with that in the other big cities of the world as follow:

Criteria	Tokyo	Singapore	Jakarta	Cairo	Calcutta
a)	3	3	2	1	1
b)	3	3	2	2	1

Let us consider why there arises such a difference between the various cities. Judging from historical experience in industrialized countries, the following three elements can be taken into account:

1. Whether or not sufficient collection service is offered
2. Whether the relationship between collection service and residents is favorable or not
3. Whether the consciousness of residents has been so improved as to ensure this relationship

Among these elements, Item 1 takes precedence over the others. The regionwise difference in Jakarta City is also caused chiefly by the level of the service rendered. In whichever city, the service level governs the consciousness level of residents and constitutes a basis of the relationship between the collecting side and residents at the same time.



The reason that a satisfactory sanitation level has not been established in Jakarta City is considered to be in that the

above-mentioned three elements have not sufficiently been established. Not to mention, the weak financial and system conditions can be said to constitute the other major elements in addition to the above three elements.

Table 1.1-3 Present Conditions of Solid Waste Management in Jakarta and the Relevant Factors

Sanitary condition as related to wastes in Jakarta	Factor	Service	Finance	System	Residents and customs
There are many places where wastes are littered near residential areas. They are not only unsanitary but spoil the beauty of the City.		The waste collection service offered to the citizens is of an unsatisfactory level.	—	Punishments against illegal dumping of wastes are too mild and the system for applying such punishments is weak.	There are residents who are only little aware of the importance of waste collection and who are uncooperative.
Many unsanitary small disposal sites still remain near residential areas.		There are still a considerable number of areas where waste collection service is not provided.	No extra fund is available to secure equipment and manpower necessary to provide adequate waste collection service.		It has been the common method in the past as the traditional means for waste management.
Open dumping is the general practice even at the disposal sites with the exception of Srengseng Disposal Site, which are under the control of the Authority.		—	There are not enough funds for implementing sanitary landfilling.	There are no standards for facilities concerned with sanitary landfilling.	City's overall financial condition is too tight.

## 1.2 Conditions of Service Coverage

### 1.2.1 Service Coverage

Generally, the coverage of service is indicated by the ratio of the planned population served to the total population. In the case of Jakarta City, this data has not been compiled.

However, the ratio of waste collected to that generated and the ratio of area served to the total area have been prepared as summarized below:

Table 1.2-1 Waste Generated

	1) Waste Produced	1) Waste Collected	1) Rate	Area Served All area
Pusat	3,577	2,742	76.7	100
Utara	2,452	1,963	80.1	44
Barat	3,522	2,699	76.6	77
Selatan	4,184	2,427	58.0	63
Timur	4,261	2,324	54.5	71
Jakarta	17,996	12,155	67.5	75

- 1) KEADAAN STATISTIK KEBERSIHAN JAKARTA 5 WILAYAH  
 2) LAPORAN EVALUASI BULAN JANUARI 1984

Although the amount of waste collected per that of waste generated is about 68%, this data is not necessarily appropriate as the data indicating the degree of collection service rendered to residents since both the amount of waste and that of waste collected are based on rough estimation and contain waste from commercial establishments. Moreover, the same situations apply to the ratio of the area covered to the total area, and even if the ratio of covered area is low, the ratio of the population served usually becomes high. However, the data can be said to be significant to roughly recognize the general situations.

As a result of the investigation in order to recognize the service conditions a little more, the area served for waste collection is as shown in Fig.1.2-1. From this figure, about 62% of the total area is estimated to be served by Dinas Kebersihan.

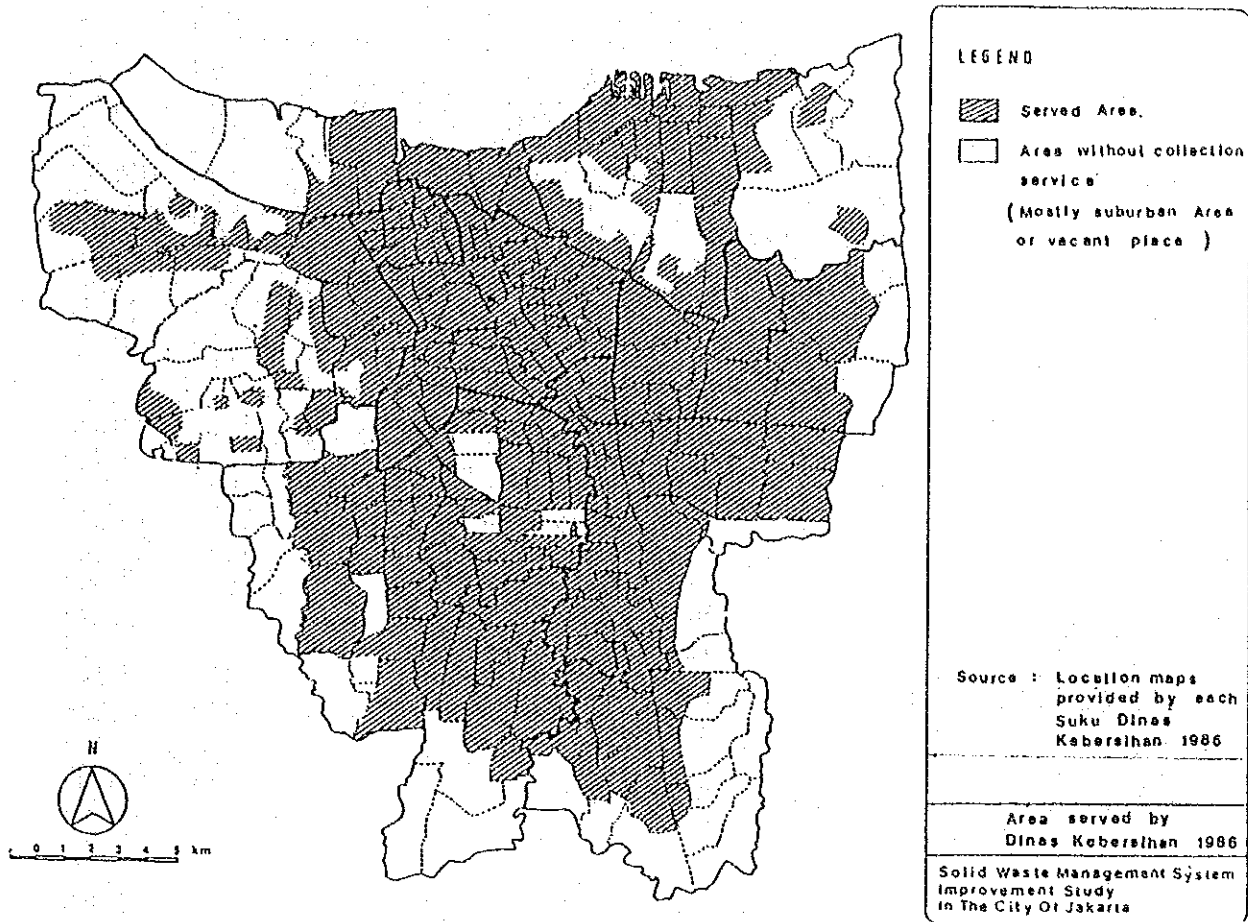


Fig.1.2-1 Area Served by Dinas Kebersihan

Note : Collection services area shared by Dinas Kebersihan and RW is  $\pm 62\%$  ( $\pm 410 \text{ Km}^2$ ) of DKI Jakarta.

Now, let us estimate the ratio of population served to the total population. This estimation has been carried out with respect to individual Kelurahan chiefly on the basis of the ratio of the number of RW served to the total number of RW while referring to the volume of waste generated and planned volume of waste collected:

$$\frac{[\text{Number of RW served}]}{[\text{Total number of RW}]} \quad \text{or} \quad \frac{[\text{Planned volume of waste collected (m}^3\text{)}]}{[\text{Population of Kelurahan} \times 2.7\ell]}$$

Note: The list of waste collection of each Wilayah by collection system were used as the basic data for calculation.

The results of this estimation are summarized as shown in Table 1.2-2.

Table 1.2-2 Present Coverage of Collection Service

Kelurahan	Coverage	Density /km <sup>2</sup>	Kelurahan	Coverage	Density /km <sup>2</sup>
Bintaro	43	4,578	Lebak Bulus	0	2,486
Pondok Pinang	0	4,748	Pondok Labu	25	5,059
Kebayoran Lama	70	16,262	Cilandak	100	6,137
Pesanggrahan	73	5,654	Gandaria Selatan	20	10,725
Petukangan Selatan	33	3,659	Cipete Selatan	38	7,072
Petukangan Utara	0	6,901	Kamal Muara	0	294
Ulujami	0	8,187	Kapuk Muara	33	422
Cipulir	100	19,292	Pejagalan	25	6,513
Grogol Selatan	100	5,323	Penjaringan	50	8,137
Grogol Utara	50	10,672	Mangga Dua Utara	17	7,284
Ciganjur	75	1,910	Pademangan Barat	67	15,357
Serengseng Sawah	5	6,433	Pademangan Timur	100	10,860
Jagakarsa	33	2,600	Sunter	20	6,213
Lenteng Agung	25	9,618	Papanggo	100	17,960
Tanjung Barat	13	4,421	Sunagi Bambu	100	15,946
Pasar Minggu	100	5,279	Kebon Bawang,	100	28,094
Jati Padang	29	12,523	Tanjung Priok	100	8,868
Ragunan	13	8,039	Kelapa Gading	55	3,915
Cilandak	33	2,917	Pegangsaan Dua	75	1,396
Pejaten	100	11,391	Tugu	100	7,293
Bangka	60	3,989	Rawa Badak	100	5,254
Kali Bata	57	8,052	Koja Selatan	100	53,474
Rawa Jati	25	14,342	Lagoa	70	26,203
Duren Tiga	100	8,433	Koja Utara	100	29,264
Pengadegan	43	17,275	Sukapura	33	1,477
Cikoko	75	14,831	Marunda	0	480
Pancoran	30	9,369	Cilincing	44	3,956
Tegal Parang	50	15,304	Semper	40	11,787
Pela Mampang	100	18,703	Kali Baru	40	15,623
Mampang Prapatan	100	25,531	Joglo	20	3,144
Kuningan Barat	100	16,100	Sukabumi Udik	14	6,838
Gandaria Utara	100	25,225	Sukabumi Ilir	67	11,321
Cipete Utara	90	30,553	Kelapa Dua	20	9,191
Pulo	100	12,300	Serengseng	0	2,950
Petogogan	100	14,154	Meruya Udik	25	2,626
Melawai	100	5,699	Meruya Ilir	25	3,756
Kramat Pela	100	16,891	Kebon Jeruk	75	8,521
Gunung	100	10,652	Duri	55	6,349
Selong	100	4,267	Kedoya	22	5,182
Rawa Barat	100	16,752	Kembangan	17	2,567
Senayan	100	20,669	Semanan	0	3,657
Karet Semanggi	100	9,218	Duri Kosambi	0	2,814
Karet Timur	50	5,794	Rawa Buaya	0	4,502
Karat Kuningan	60	20,450	Kedaung Kaliangke	75	9,749
Karet	100	34,515	Kapuk	13	6,232
Menteng Atas	60	51,761	Cengkareng	40	6,251
Pasar Manggis	100	27,496	Kali Deres	38	2,955
Guntur	100	33,976	Pegadungan	0	1,717
Setia Budi	100	18,103	Tegal Aiur	20	2,195
Menteng Dalam	100	22,091	Kamal	0	1,984
Tebet Barat	100	19,811	Palmerah	25	23,425
Tebet Timur	100	22,479	Slipi	57	22,483
Kebon Baru	100	34,996	Kota Bambu	76	41,707
Bukit Duri	100	34,735	Jati Pulo	100	33,860
Hanggarai Selatan	100	50,902	Tanjung Duren	100	28,633
Hanggarai	100	43,704	Tomang	100	14,059



Kelurahan	Coverage	Density /km <sup>2</sup>	Kelurahan	Coverage	Density /km <sup>2</sup>
Grogol	100	38,158	Gn. Sahari Sel	100	23,035
Jelambar	80	18,874	Kemayoran	100	44,943
Kali Baru	100	122,450	Kebon Kosong	100	56,784
Kuri	100	72,571	Serdang	100	40,865
Tanah Sareal	100	52,798	Harapan Mulia	100	21,587
Krendang	100	109,232	Cibubur	17	4,419
Jembatan Besi	100	178,023	Pondok Ranggon	0	1,133
Angke	100	8,709	Cilangkap	0	847
Jembatan Lima	100	44,736	Munjul	0	3,055
Tambora	100	39,478	Kelapa Dua Wetan	13	3,547
Pekojan	100	65,989	Pekayon	43	7,446
Malaka	100	11,051	Kali Sari	0	4,152
Krukut	100	55,352	Baru	50	9,675
Maphar	100	31,578	Cijantung	14	5,905
Taman Sari	100	31,921	Ciracas	88	4,748
Tangki	100	49,110	Cipayung	0	1,438
Mangga Besar	100	34,431	Setu	0	1,341
Keagungan	100	62,156	Bambu Apus	0	1,377
Glodok	100	34,033	Lubang Buaya	0	4,106
Pinangsia	100	24,307	Ceger	0	1,664
Gelora	100	2,112	Rambutan	17	6,468
Bendungan Hilir	100	32,017	Susukan	57	7,217
Karet Tingsin	100	32,574	Gedong	50	5,091
Petamburan	100	38,205	Kampung Tengah	14	7,453
Kebon Melati	100	34,129	Kukuh	0	4,479
Kebon Kacang	100	41,756	Pinang Ranti	0	5,441
Kampung Bali	100	36,264	Makasar	0	2,595
Menteng	100	23,197	Kramat Jati	100	13,756
Pegangsaan	100	32,051	Batu Ampar	0	7,769
Cikini	100	9,003	Bale Kambang	33	5,879
Gondangdia	100	67,262	Cililitan	100	19,345
Kebon Sirih	100	86,745	Cawang	50	18,194
Kenari	100	22,892	Kebon Pala	9	13,798
Paseban	100	43,279	Halim P.K.	25	2,091
Kramat	100	42,786	Cipinang Melayu	0	8,478
Kwitang	100	28,047	Kampung Melayu	100	32,388
Senen	100	32,791	Bidaracina	100	30,578
Bungur	100	22,886	Bali Mester	100	18,718
Rawasari	100	12,560	Rawa Bunga	100	36,806
Cempaka Putih Tim	100	8,766	Cipinang Cempedak	100	34,130
Cempaka Putih Bar	100	18,373	Cipinang Muara	35	9,939
Johar Baru	25	24,594	Cipinang Besar	100	22,612
Kampung Rawa	100	32,661	Pondok Bambu	33	6,639
Galur	100	40,583	Klender	50	8,028
Tanah Tinggi	100	85,842	Duren Sawit	40	6,454
Pasar Baru	100	5,380	Pondok Kelapa	0	2,773
Karang Anyar	100	59,053	Malaka	60	20,405
Kartini	100	49,275	Pisangan Baru	100	52,432
Gn. Sahari Utara	100	8,117	Utah Kayu	100	32,631
Mangga Dua Selatan	100	20,885	Kayu Manis	100	53,891
Cideng	100	20,789	Palmeriam	100	30,141
Petojo Selatan	100	22,639	Kebon Manggis	100	25,986
Gambir	100	2,040	Pisangan Timur	100	21,432
Kebon Kelapa	100	22,994	Cipinang	100	22,649
Petojo Utara	100	23,215	Jatinegara Kaum	100	7,348
Duri Pulo	100	66,027	Pulo Gakung	100	19,580

Kelurahan	Coverage	Density /km <sup>2</sup>	Kelurahan	Coverage	Density /km <sup>2</sup>
Jati Rawamangun	100	20.182			
Kayu Putih	100	9.951			
Jatinegara	40	5.505			
Rawa Terate	100	3.595			
Penggilingan	10	4.842			
Pulo Gebang	.9	2.709			
Ujung Menteng	25	2.067			
Cakung	25	2.261			

## 1.2.2 Quality of Services

### (1) System of Service

With regard to the waste collection services of Dinas Kebersihar, the two systems of waste collection should be examined. One is the direct service to residents, commercial and business facilities, and another is the indirect service wherein waste gathered to LPS by RT/RW, is collected.

Among these systems, the ratio of the direct service tends to increase year. This reflects the policy of Dinas Kebersihar intending to increase application of door-to-door service and Jali-jali service and is due to the increase of the commercial and business facilities for direct collection service.

### (2) Direct Service

The systems of direct service include door-to-door and Jali-jali services. As shown in the table below, the door-to door service can be said to be an extremely high level one among the services for discharge of waste:

Table 1.2-3 Direct Service

	Discharge position	Discharge time
Door-to-door	Concrete bin at each house	Free
Jali-jali	Waste is carried by individual up to the position of vehicle.	Waste can be discharged only when a vehicle has come.

In terms of the quality of services, the frequency of collection and services at specified time on specified day (punctuality) constitute the important items.

Although the frequency of collection is, in principle, designated to be twice a week, the date and time of collection have not been fixed. In the case of door-to-door service, slightly irregular service would not cause major effect upon the residents since waste is discharged into concrete bins. In the case of Jali-jali service, however, the irregular frequency causes a major problem for the residents since waste must be stored in each house.

(3) Indirect service

The indirect service, namely the locations of collection (LPS) can be as listed below, for example:

- 1. Open Space
- 2. Communal Concrete Bin
- LPS — 3. Handcart Pool
- 4. Communal Container
- 5. Depot

The quality of these service patterns is not high for residents since waste must be carried up to each LPS by handcart collectors employed by the residents themselves through RT/RW and the cost incurred therefore must be borne by the residents.

As for the service for discharge of waste to LPS, handcart pool and handcart-depot is restricted by the collection frequency of vehicle, while other LPS is less restricted in discharge of waste.

When the collection frequency is once a day and three times a week in the case of handcart pool and handcart-depot, the efficiency of handcart collection is so lowered that the burden of residents is increased.

The frequency of collection to LPS is determined on a case-by-case basis depending on the volume and conditions of waste to be collected.

### 1.2.3 Opinion of Residents

The results of interview with residents living in the area where waste is directly collected by Dinas Kebersihan are shown in Fig.1.2-1 and 1.2-2. In whichever cases, many residents are not satisfied with the services. Judging from this fact, it is recognized that the level of direct collection service is not necessarily sufficiently acceptable for the residents.

Fig. 1.2-1 Opinion of Residents to Door-to-door Service

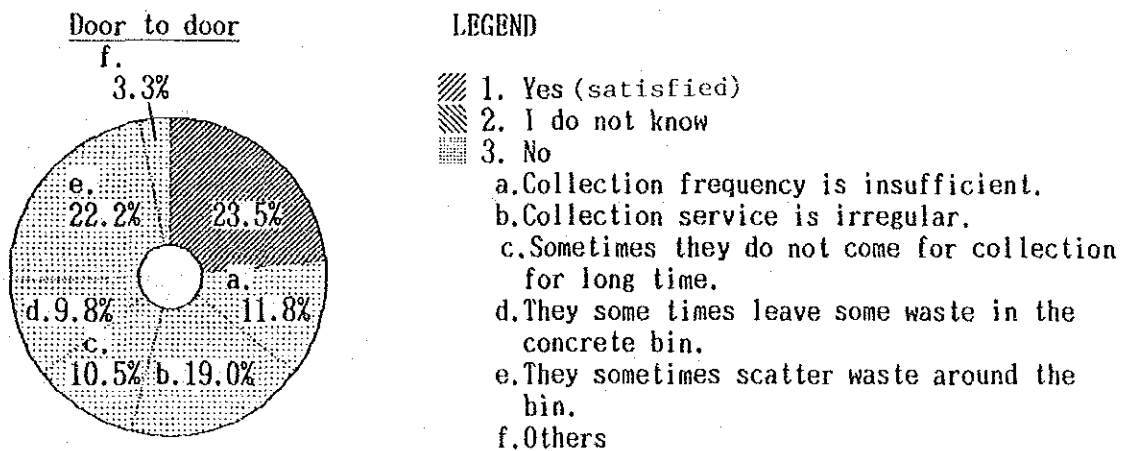


Fig.1.2-2 Opinion of Residents to Jali-jali Service

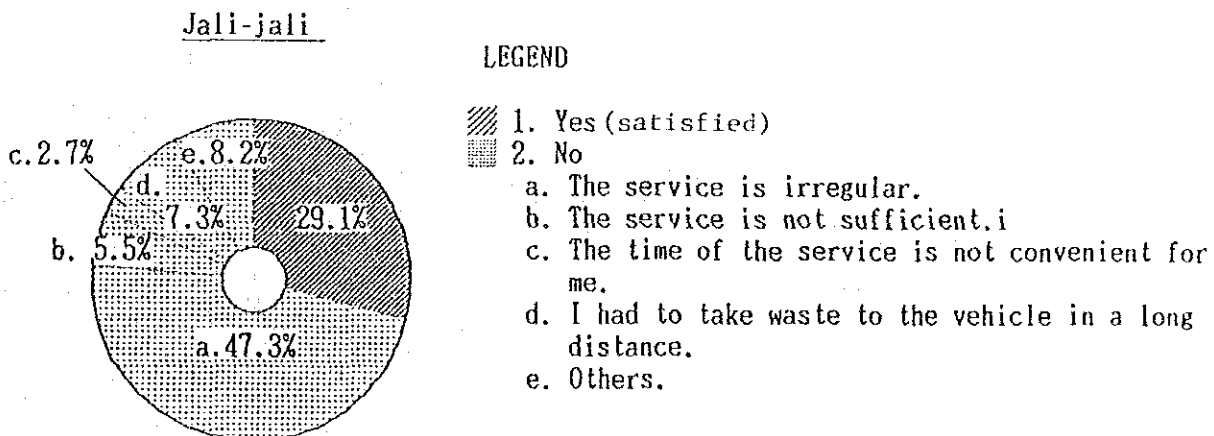
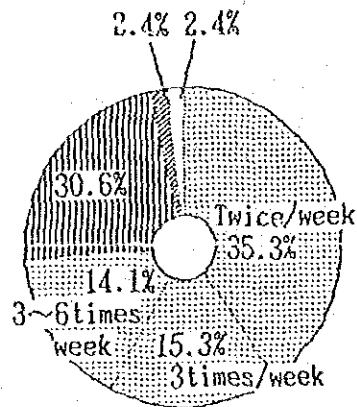


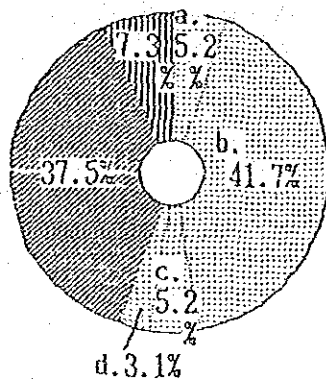
Fig.1.2-3 Frequency of Collection (Door-to-door)



LEGEND

- 1. ....a week
- 2. irregular
- 3. I do not know
- 4. NA

Fig.1.2-4 Frequency of Collection (Jali-jali)



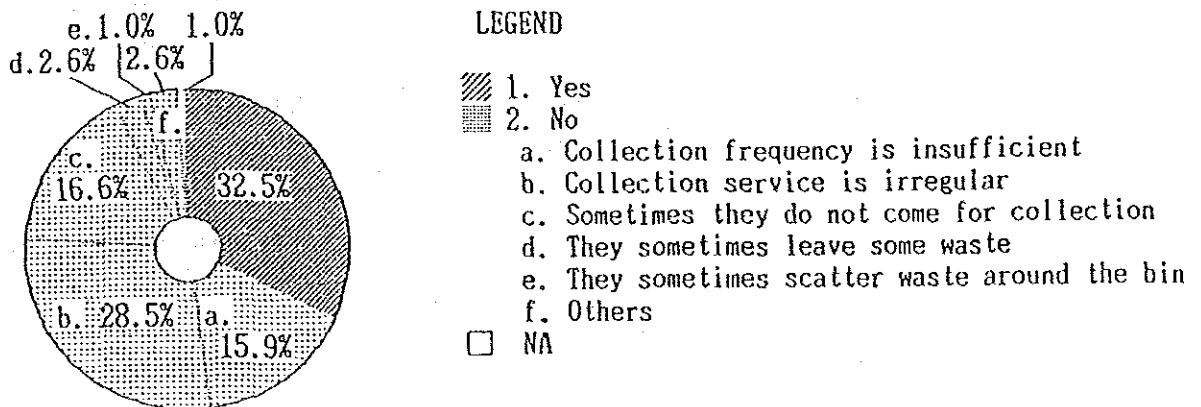
LEGEND

- 1. ....a week
- 2. irregular
- 3. I do not know
- a. Once/week
- b. Twice/week
- c. 3 times/week
- d. 4~6 times/week

Moreover, the results of asking the residents regarding the frequency of service are as shown in Fig.1.2-3 and 1.2-4. Although either the door-to-door service or Jali-jali service is, in principle, offered twice a week, this frequency has not been recognized adequately by the residents. This, in turn, indicates that a favourable relation has not been established between Dinas Kebersihan and residents.

In the case of indirect service, on the other hand, it is impossible to observe the opinion of the residents to Dinas Kebersihan since the residents do not directly contact with it. Here the results of investigating the degree of satisfaction to the handcart collection service are shown in Fig.1.2-5. From this figure, it can be recognized that the considerable residents are not satisfied with the handcart collection service as well.

Fig. 1.2-5 Opinion of Residents to Handcart Collection



As a result of hearing from the chiefs of RT/RW and part of residents, it was most impressive that they felt substantial unsatisfaction against tip, in other words, any waste is not collected unless tip is given. The fact that a tip is requested in addition to the formal charge is another major cause that the collection service of Dinas Kebersihan is not trusted by residents.

### 1.3 Collection of Waste by RT/RW

#### (1) General

Collection of waste by RW/RT is carried out where the income level is sufficient to employ handcart collectors by RT/RW.

It would be no exaggeration to mention that there are as many collection methods as the number of RT/RW.

#### (2) RT/RW

The actual situations of RT/RW are summarized in Table 1.3-1.



Table 1.3-1 Actual Situation of RT/RW in Jakarta (1986)

RW	2,201(2,119)
RT	28,001
	1,420,000
High in come	126,000(650,000)
Middle income	639,000(3,290,000)
Low income	655,000(3,360,000)
RT/RW	12.7
Persons/RT	250
Persons/RW	3,000
High/RW	217
Middle/RW	1,097
Low/RW	1,270

The level of RW which is able to employ handcard collectors belongs to the middle class, and collecting Rp.1,000 or more per month from each household.

(3) Actual situation of handcart collection

As pointed out previously, the handcart waste collection is determined according to the income level of RW. Meanwhile, considering that the area other than handcart pool and depot belongs to a low income area among the present LPS according to the actual situations of waste collection in the city, the handcart pool and depot area is deemed to be an area where handcart collection is practiced.

However, since some RW use handcart in the area where large communal containers are provided, all of the handcart pool and depot areas cannot be defined as those where handcart collection is performed.

Judging from the income level, it would be calculated that about 2,300 RW perform handcart collection. However, since some

are accepting the door-to-door service of the city, it is not said that all 2,300 RW are practicing handcart collection.

Moreover, some middle and high income RW are considered to be undertaking disposal of waste by themselves. When RW conducting door-to-door service are taken into account, the actual number of RW conducting handcart collection is assumed to be 1,000 or less.

On the other hand, about 580 RW are considered to be undertaking collection of waste by using handcarts where the volume of waste collected by RW is assumed to be roughly 7.5m<sup>3</sup>/day, and the following estimation:

Handcart pool

No. 166

Amount 2,293 m<sup>3</sup>/day

Depot

No. 62

Amount 2,105 m<sup>3</sup>/day

Based on such a calculation method, the actual conditions of handcart collection in each Wilayah are estimated as shown in Table 1.3-2.

Table 1.3-2 No. of RW executing handcart collection

	No. of RW executing handcart collection	No. of RW
PUSAT	135	389
UTARA	100	420
BARAT	80	317
TIMUR	85	545
SELATAN	180	528
TOTAL	580	2,199

Nearly 40% of RW accepting collection service are estimated to execute handcart collection by RT/RW.

The amount of waste collected with handcarts is estimated about 4,400m<sup>3</sup> per day or equivalent to 37% of the total amount of collected waste.

(4) Handcart collectors

The handcart collectors belong to the lowest class in Jakarta and earn roughly Rp.30,000 every month from RW, while the most of them are living in humble houses together with their family within the district.

With, sweeping and collection of waste as their major roles, the handcart collectors are conducting physical labour upon receiving special tip from households in the district.

The number of handcart collectors being employed per one RW is roughly 5 although it may vary depending upon the RW. Therefore, there is estimated to be about 2,900 handcart collectors in total in Jakarta. Where the number of family members is assumed to be 5, the handcart collectors are estimated to be supporting the living of about 15,000.

(5) Handcart

Although various styles of handcarts are used, the handcarts used are classified into those procured independently by the respective RT/RW and those supplied by Dinas Kebersihan as a kind of subsidy.

With a capacity of roughly 1 m<sup>3</sup> and wheel diameter of about 60 - 80 cm, handcarts are so designed as to permit easy operation by using ball bearing for the shaft.

One handcart of Dinas Kebersihan is estimated to cost Rp.35.000 - 40,000.

The number of handcarts is as listed below:

Table 1.3-3 No. of Handcarts

	Dinas	8.Container handcart	Community	Total
PUSAT	740	1,236	828	1,568
UTARA	(800)	482	(624)	1,423
BARAT	909	421	547	1,456
TIMUR	1,088		336	1,424
SELATAN	715	92	430	1,145
TOTAL	(4,252)		(2,764)	(7,016)

(6) Actual situation of handcart collection

The operating conditions of handcart are as follows:

One handcart is mostly operated by one collector.

The frequency of collection to each household is once or twice a week.

Collection service is performed in short time:

15 - 30 minutes per 6 - 10 households

1.5 minute per household

Waste collected using handcart is transported to LPS

Handcart pool of LPS: Once a day

Depot : Once or twice a day

The number of trip of handcart is one trip a day in general although it may vary depending upon the number of trip of collection vehicle.

#### Loading of waste

Loading of waste onto collection vehicle from handcart at the handcart pool or depot is performed by handcart collectors and finished in 10 or 15 minutes per one handcart.

One handcart collector takes charge of 2 RT (500 persons or 100 households) in general.

The actual working time is about one hour during early morning for waste collection plus about 30 minutes for loading to a collecting vehicle.

Although the service level to residents is high since handcart collectors visit each household to collect waste, the frequency of collection is said to be irregular and about once a week.

#### (7) Cost of handcart collection

Collection Amount : 350 kg/day

Labor cost of handcart collector:  $\text{Rp.}30,000 \div 25 \times 50\% = \text{Rp.}600/\text{day}$

Depreciation cost of handcart :

$\text{Rp.}400,000 \times 0.9 \div 4 = \text{Rp.}90,000/\text{year}$

$\text{Rp.}90,000/\text{year} \div 300 \text{ days}$

$= \text{Rp.}300/\text{day}$

$$\text{Cost per ton} = \frac{\text{Rp.}900}{0.350\text{t}/\text{day}} = \text{Rp.}2,571/\text{ton}/\text{day}$$

Monthly charge per household =  $\text{Rp.}225/\text{month}$

+  $\alpha = \text{Rp.}338/\text{month}$

Disposal fee :  $\text{Rp.}450/\text{time} \times 25 \text{ times}$

$= \text{Rp.}11,250$

## 1.4 Actual Situations of Waste Collection in the City

### 1.4.1 Waste Collection System

The waste collection system in Jakarta discussed hereunder is nearly equal to the overall waste management system. However, let us describe on further detailed collection system solely in terms of collection of waste.

Miscellaneous items involving collection of waste can be analyzed into the following items:

Seksi Kebersihan  
Kecamatan

- Execution, arrangement and instruction of vehicles
- Arrangement of and instructions to workers
- Execution and supervision
- Supervision
- Control of collected amount
- Control of service frequency
- Collection system and application plan
- Study on the required number of vehicles
- Study on required equipment
- Study on the necessity of workers
- Necessity of depot, etc.
- Negotiation with RT/RW
- Payment of wages to workers
- Control of attendance
- Collection of fee
- Control of fee
- Preparation of monthly report
- Issuance of fuel supply list
- Control of incentive

Suku Dinas Kebersihan

- Evaluation and follow-up
- Adjustment and coordination regarding planning, request, etc from branch offices
- Budget control
- Distribution
- Invoice to Dinas Kebersihan
- Management of assets
- Labor management of workers and drivers
- Management of fee collection
- Management of data
- Preparation of monthly report
- Preparation of annual report
- Minor maintenance of equipment
- Control of fuel consumption

Dinas Kebersihan

- Control and allocation of budget
- Supply of commodities, vehicles, materials and equipment, parts, etc.
- Allocation of workers
- Allocation of staff
- Evaluation of overall conditions
- Research and development
- Planning control
- Preparation of standards
- Preparation of regulations
- General management of fee
- Data management
- Preparation of annual report
- Inspection and maintenance of vehicles

As shown in the above diagram, the organization for the waste collection is comprised of the above three trees. The features of this organization are chiefly as follows.

Firstly, the Seksi Kebersihan Kecamatan Office is undertaking routine jobs and a variety of assignments including planning elements at the same time.

Secondly, the Suku Dinas Kebersihan Office is undertaking a lot of jobs duplicated with those of Dinas Kebersihan. However, this office does not have any right pertaining to execution of personnel affair, commodities, equipment and materials and is not in a position to execute its own operation of each Wilayah.

Thirdly, the Dinas Kebersihan Office has a right pertaining to execution of personnel affair, budget for commodities, equipment and materials.

Especially, the Seksi Kebersihan Kecamatan Office is undertaking the actual collection operation in the respective areas including acquisition of the financial source of incentives. The major feature of this office is that a considerable portion among its operation methods are left to the discretion of its chief.

#### 1.4.2 Waste Collection Plan of Jakarta City

##### (1) Collection service area

According to the Jabotabek Metropolitan Plan, the collection service is scheduled to be rendered to 80% of the population by 1990.

##### (2) Contact point between Dinas Kebersihan and residents pertaining to handcart collection

Although the contact point between Dinas Kebersihan and residents pertaining to handcart collection is mainly LPS at present, this contact point is planned to be changed gradually to depot in the future. Waste from each household will be transported to the respective depot on handcarts of RT/RW also in the future.



(3) Planned basic systems of waste collection

The Planned basic systems of waste collection by Jakarta City in general residential areas are as described below:

1. Household ... Each household should prepare a 60 litre waste container.
2. Handcart .... While handcarts will be supplied from DKT Jakarta, the operation, maintenance, management and repair of handcarts shall be executed under the responsibility of RT/RW.
3. Depot ..... Three types of depot are considered. The type will be determined according to the amount of waste as the respective types are indicated in Fig. 1.4-2. In principle, at least one depot shall be located in Kelurahan.

A plan to unify the conventional LPS into depot has been worked out and all the handcart pools, open space and communal concrete bins are scheduled to be abolished by 1987/89 while increasing the container and depot systems.

Meanwhile, the door-to-door service is scheduled to be provided in the districts accessible to each household.

(4) Standards for operation of collection vehicles

Although various kinds of collection vehicles are operated by Dinas Kebersihan, the standard payload capacity and round trips of these vehicles were designated in 1980 as shown in Table 1.4-3.

Open small trucks, small tippers, small compactors, etc. are applied mainly to the densely populated areas with only narrow roads.

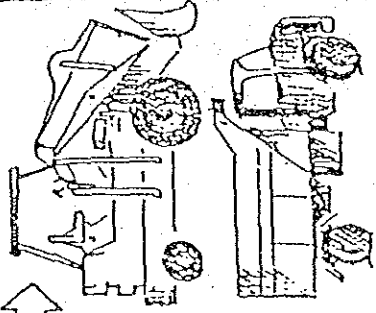
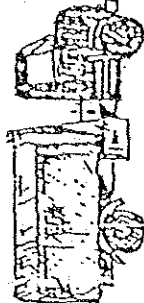
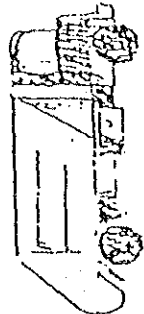
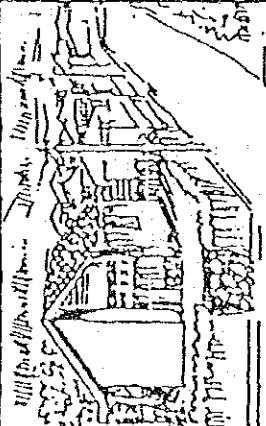
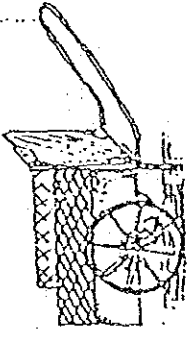
DIPO SAMPAH		
TYPE A	TYPE B	TYPE C
 <p>L. Lokasi : ± 300 M<sup>2</sup> Vol. Sampah ± 100 M<sup>3</sup> Truck Typex : 2 buah Front end Loader : 1 buah.</p>	 <p>L. Lokasi : ± 250 M<sup>2</sup> Vol. Sampah 60-80 M<sup>3</sup> Container : 4 buah Ken. Hydraulic : 1 bh</p>	 <p>L. Lokasi : ± 250 M<sup>2</sup> Vol. Sampah ± 50 M<sup>3</sup> Kon. Compaactor 2 buah</p>
 <p>Sampah dari Masyarakat ( RT / RW ) dikumpulkan oleh masing-masing, ke dalam tong sampah yang berkapasitas ± 60 liter.</p>	 <p>Dibawa dengan gerobak oleh tenaga Smdaya. - Gerobak disediakan oleh Pemerintah DKI Jakarta, sebagian besar dari Smdaya. Penyediaan oleh Pemerintah hanya satu kali, yang selanjutnya pemeliharaan, perbaikan dan penggantian menjadi tanggung jawab Smdaya.</p>	

Fig.1.4-1 Depot Collection Plan by Dinas Kebersihan

Fig. 1.4-2 Depot Plan by Dinas Kebersihan

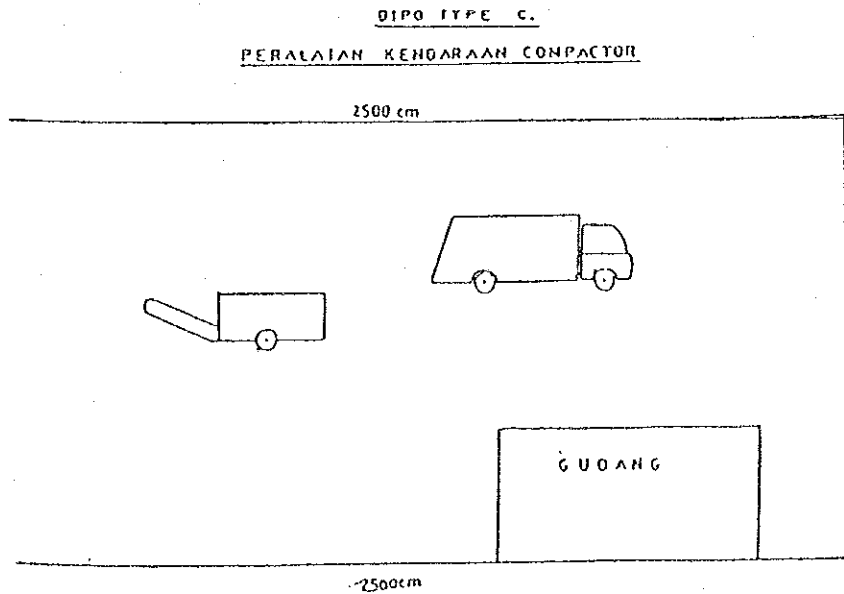
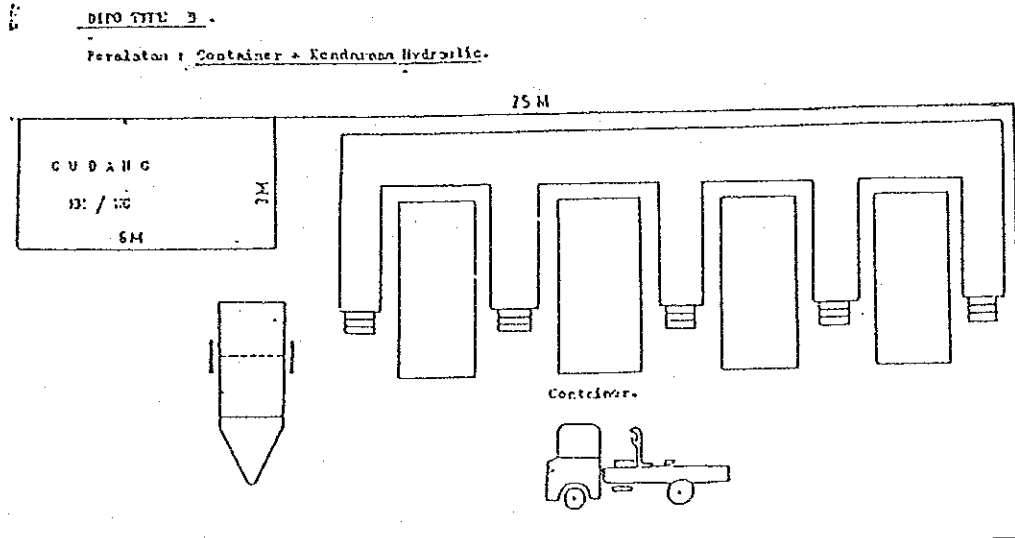
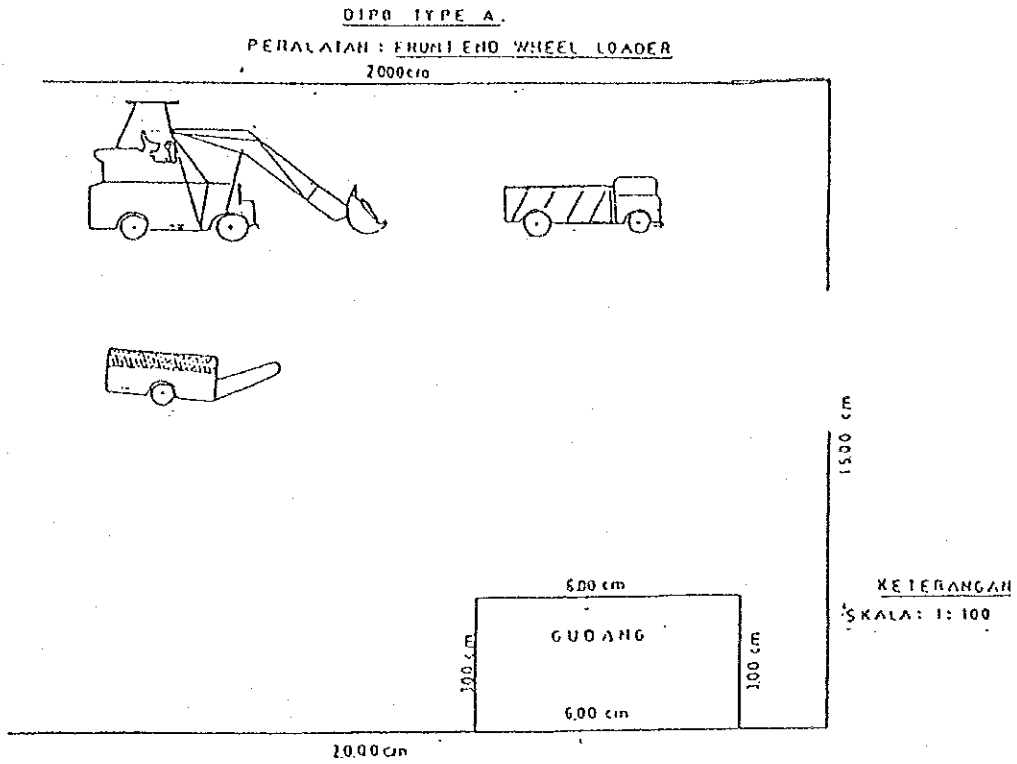


Table 1.4-1 Standard No. of Trip of Collection Vehicle

VEHICLE	CAPACITY/ CARRYING VOLUME	NO. OF TRIP
1. Open Large Truck.	10m <sup>3</sup>	2
2. Open Small Truck.	6m <sup>3</sup>	3
3. Large Tipper.	10m <sup>3</sup>	3
4. Small Tipper.	6m <sup>3</sup>	3
5. Large Compactor.	20m <sup>3</sup>	2
6. Small Compactor.	10m <sup>3</sup>	3
7. Container.	10m <sup>3</sup>	4
8. Crane.	12m <sup>3</sup>	2

Large type open trucks and tippers are mainly applied in the case of LPS.

Although compactors are applied mainly in the door-to-door service area, open large trucks are also used in some cases.

The standard operation time cycles are set as shown in Table 1.4-2 below.

Table 1.4-2 Standard Operation Time Cycle (min./trip)

	Large tipper	Small tipper	Container Truck	Large Truck Open	Small Open Truck
Frequency	2	3	4	2	3
From garage to collection area	25/1	25/1	25/1	25/2	25/3
Collection	30/2	20/3	10/4	40/2	40/3
From collection area to disposal site	40/2	40/3	40/4	40/2	40/3
Loading/unloading	5/2	5/3	5/4	45/2	30/3
From disposal site to fuel station	15/2	15/3	15/4	15/2	15/3
Refueling	10/2	10/3	10/4	10/2	10/3
From fuel station to collection area	15/1	15/2	15/3	15/1	15/2
From fuel station to garage	25/1	25/1	25/1	25/1	25/1
	265	350	415	425	485

According to the above operation time cycles, fuel is supplied every one trip, and the greater the number of trip, the more longer time is consumed. The net collection time of both large and small tippers is set slightly shorter on the assumption of mechanical loading using shovel loader, while that of large open trucks and small open trucks is set on the assumption of manual loading.

(5) Operation control of vehicles

According to the operation control system, a collection vehicle will receive four times of checking. Namely, the vehicle will be checked at Seksi Kecamatan, and upon check at LPS after collection, it will be checked at a final disposal site and fuel station.

From what LPS waste should be collected is determined with respect to each collecting vehicle, and the assignment is carried out by Seksi Kecamatan.

(6) Purchasing plan of vehicles, etc.

According to the purchasing plan of vehicles, handcarts, etc. in 1983/1984 through 1987/1988, 724 collection vehicles are scheduled to be purchased by 1987/1988. These vehicles are to be comprised of 289 tippers and remaining mechanical vehicles without any open truck.

From 1983/1984 through 1987/1988, an annual average number of vehicles to be procured is 116.

Moreover, 7,239 handcarts are scheduled to be supplied to RT/RW for waste collection by 1987/1988.

#### 1.4.3 Waste Collection System

(1) Classification of collection system

The waste collection system applied in Jakarta at present is roughly classified into a system of direct collection from each household and a system of collection at regional community. The direct collection system is further classified into the two systems, namely, a door-to-door collection and a "block" collection (Jali-jali) systems. The system of collection by regional community is called "LPS collection" and classified into five types.

Various systems of collection systems are summarized in Fig.1.4-3. Meanwhile, handcarts are placed among major roads combinedly for collecting waste on roads. In addition, 1 m<sup>3</sup> containers have been arranged in downtown since August 1986.

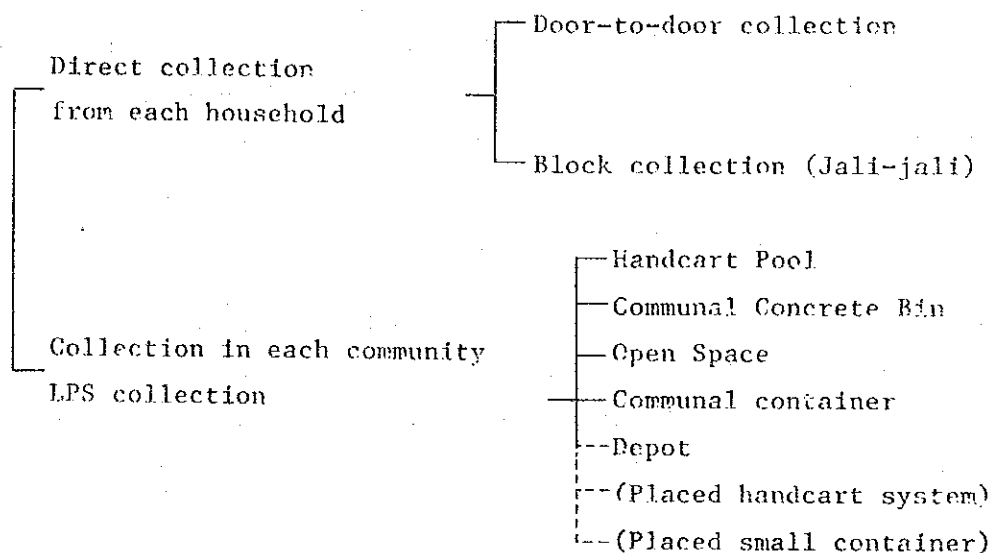


Fig. 1.4-3 Collection Systems

(2) Actual application conditions of each collection system

The number of each collection system applied for the respective Wilayah is as summarized in Table 1.4-4. Direct collection is performed at 243 places or 23.7% of 1,027 places in total. Meanwhile, the handcart system is installed at 26 places in Utara.

Table 1.4-3 No. of Back Collection System Applied

	Pusat	Utara	Barat	Timur	Selatan	Total	Remarks
LPS Container	35	53	21	36	18	163	Large Container
LPS Gerobak	46	6	37	18	45	152	Handcart pool
LPS Bak Sampah	-	38	23	98	53	212	Concrete bin
LPS Terbuka	40	26	7	4	14	91	Open space
LPS Transito Sampah	-	31	43	20	6	100	Large Container
LPS Dipo	10	14	11	16	15	66	Depot
System Jali-jali	42	32	13	9	17	113	No. of places
System Door to door	103	5	1	11	10	130	No. of places
<b>Total</b>	<b>276</b>	<b>205</b>	<b>156</b>	<b>212</b>	<b>178</b>	<b>1,027</b>	

(Source: Data from Suku Dinas Kebersihan 1986)

Collection control is performed individually by each Seksi Kebersihan Kecamatan Office. However, since a variety of collection systems are sophisticatedly adopted, it is considered very difficult to assign reasonable types of vehicles which must be changed depending upon the collection system.

Meanwhile, the placed handcart (Gerobak galvanis) system adopted in Utara is arranged chiefly along main streets. On the other hand, small communal containers have been introduced since August 1986 through the assistance of the World Bank, and arrangement of such containers has been promoted on downtown and along main streets, etc.

At Cenkareng of Barat, moreover, waste is collected with handcarts by Suku Dinas Kebersihan. However, the quantity of collected waste is extremely small.

(3) Application characteristics of collection system

The characteristics of the regions where the respective collection systems are applied (physical conditions and income level of area) and the types of applied vehicles are as summarized in Table 1.4-4.



Table 1.4-4 Characteristics of Collection System

Collection System	Area Characteristics			Vehicle
	Areal Conditions	Income Level	Others	
Door to door	High level residential with detached housing and garden, accessible to each house by vehicle Road-side commercial zone along main streets	High	Activity of RT/RW is not always strong.	Small Compactor Lange, Small Open Truck
Jali-jali	Low grade densely populated area so-called "Kampung" with only narrow roads.	Low	RT/RW can not afford to employ and maintain handcart collectors.	Small Compactor Small Tipper
Handcart pool	Kampung area Only surrounding roads are wide enough for the vehicle.	Middle	No specified place for waste is secured.	Large Open Truck Large Tipper
Communal Concrete Bin	Kampung area Communal concrete bin where wastes are collected has been secured.	Low to middle	Previously open space.	Open Truck Tipper
Open Space	Kampung area Open space for waste has been secured	Low to middle	-	Open Truck Tipper
Large Communal Container	The street is wide enough to place the container on road-side.	-	-	Arm roll
Depot	Where the depot site is secured. Mainly residential area.	Low to middle	-	Open Truck Tipper
Placed Handcart	Commercial zone along main streets	-	-	Open Truck
Placed Small Communal Container	Commercial zone along main streets	-	-	Large Compactor

(4) Special collection service

The special collection service refers to the collection service for specified facilities or the collection service for large amount dischargers. In Jakarta, the public facilities, commercial complexes, etc. belong to the facilities applicable for this service, for example.

In the case of public facilities and commercial complexes, large concrete bins are generally provided within the facility sites. When the concrete bins become full of waste, Dinas Kebersihan assigns small open trucks and tippers to the facilities for collection.

1.4.4 Actual Tripping Conditions of Collection Vehicles

(1) Waste collection vehicle

Nine types of collection vehicles are used. The number of the respective types of vehicles as of August 1986 is as shown in Table 1.4-5. The number of open trucks which are low in collection efficiency occupies 30% of the total vehicles. The mechanization ratio of vehicles is 56%.

Table 1.4-5 Number of vehicles by Wilayah

(August 1986)

		PUSAT	BARAT	SELATAN	TIMUR	UTARA	DINAS	TOTAL	1985/1986
Cargo	B	72	24	28	25	11	3	163	164
	S	30	1	18	7	2	2	60	48
Tipper	B	10	13	6	8	3	2	42	39
	S	37	42	35	35	33	7	189	183
Arm roll	B	9	10	6	8	4	2	39	21
	S	5	6	5	6	5	2	29	31
Crane	B	2	2	2	2	2	1	11	11
Compactor	B	21	23	20	23	14	0	101	10
	S	28	25	20	20	18	7	118	76
Total		214	146	140	134	92	26	752	583

Mechanization ratio

$$\frac{(\text{Arm roll} + \text{Crane} + \text{Compactor}) \times 1.0 + \text{Tipper} \times 0.5}{\text{Total number of vehicles}}$$

In contrast to the mechanization ratio of 45 % with a total number of 583 vehicles in 1985/1986, the number of collection vehicles was substantially increased, especially compactors in 1986.

(2) Procurement of vehicles

A transition of the procurement of vehicles for the past ten years until 1985 is shown in Table 1.4-6. While only a little open trucks have been procured after these trucks were procured mainly in 1975 and 1976, compactors have come to be purchased every year since 1982. Since there is a substantial fluctuation in the number of vehicles procured every year, it is desired to procure vehicles regularly at a constant rate in each year in order to maintain stable service level.

Table 1.4-6 Procurement of vehicles

Model	Year	Number	Number Number in		85	84	83	82	81	80	79	78	77	76	75	74
			Broken	Operation												
Compactor	(L)	18	9	9				6		3						
	(S)	109	2	107	20	21	42	24								
Tipper	(L)	53	0	53			28	9	11						5	
	(S)	189	0	189	105		84									
Arm Roll	(L)	28	1	27					6					6	15	
	(S)	29	0	29			29									
Cargo	(L)	293	95	198					8					61	112	17
	(S)	138	56	82							8		8	44		
					125	21	183	39	25	3	0	8	0	116	127	17

Although any standard for disuse of vehicles has not been designated, vehicles are used for seven or ten years.

All car bodies are manufactured entirely in Indonesia. Although parts mounted on chassis are also manufactured in Indonesia, the control mechanisms for compactors and cranes are imported. The standard prices of vehicles in 1985/1986 are as shown in Table 1.4-7.

Table 1.4-7 Price of Equipment for Collection

EQUIPMENT PRICE		(1985/86 Price)
Open Cargo	Small (6m <sup>3</sup> )	8,611,570.-
	Large (10m <sup>3</sup> )	15,965,950.-
Tipper (Dump Truck)	Small (6m <sup>3</sup> )	20,328,000.-
	Large (10m <sup>3</sup> )	22,000,000.-
Compactor	Small (4m <sup>3</sup> )	23,958,000.-
	Large (8m <sup>3</sup> )	30,250,000.-
	Large (10m <sup>3</sup> )	55,000,000.-
Arm Roll Truck	Small	6,032,000.-
	Large	8,510,000.-
Crane Truck	Small	33,690,000.-
	Large	51,658,000.-
Mechanical Sweeper	Small	33,000,000.-
Communal Container	Large (10m <sup>3</sup> )	2,203,750.-
	Small (6m <sup>3</sup> )	1,655,795.-
Handcart		374,893.-

Table 1.4-8 Number of Collection Vehicle

	JUNLAH PADA TAHUN					
	'80/81	'81/82	'82/83	'83/84	'84/85	'85/86
I. TRUK SAMPAH:						
Truk terbuka besar	221	221	180	180	194	190
Truk terbuka kecil	139	139	97	97	110	65
Truk Typer besar	25	25	42	48	40	40
Truk Typer kecil	-	-	-	185	185	189
Truk Compactor besar	4	4	15	15	14	9
Truk Compactor kecil	13	13	71	85	85	107
Truk Container besar	20	20	20	21	21	27
Truk Container kecil	-	-	-	20	31	29
Truk Crane	-	-	-	11	11	11
Truk Container Compactor	-	-	-	-	2	2
Jumlah Truk Sampah	424	424	427	664	693	669

(3) Payload

The records of collection vehicle payload is as indicated in Table 1.4-9.

Since a uncompacted smaller amount of waste than actual capacity is loaded in the large communal container, the actual payload of arm roll is about 50% of a tipper of the same capacity. Since overloading of waste on open truck makes it difficult to perform unloading work, a smaller amount of waste than the actual payload is loaded. The compacting ratio of compactor is roughly 2.0.

Table 1.4-9 Payload of collection vehicle

(1986)

	Capacity (m <sup>3</sup> )	* Real Capa- city(m <sup>3</sup> )	*** Average (ton)	Density (t/m <sup>3</sup> )	Density 0.33 **
Large Open truck	10	8	2.75	0.34	1.03
Large Tipper	10	12	5.73	0.48	1.45
Small Tipper	6	7.2	3.19	0.44	1.33
Large Compactor	10	-	6.05	0.61	1.85
Small Compactor	4	-	3.04	0.76	2.30
Large Arm Roll	10	8	2.82	0.35	1.06
Small Arm Roll	6	4.8	1.53	0.32	0.97

Although the first trip data are adopted in this case, it is known that the payload generally becomes smaller after the second trips. Usually, the average payload after second trip becomes by 10 to 20% smaller than that during the first trip. Therefore, it is considered appropriate to work out an allocation plan of collection vehicles taking into account an approximately 15% smaller value than that during the first trip.

The weight and capacity available per one round trip of collection vehicle can be set as follows:

Table 1.4-10 Standard payload (weight and capacity)

	Weight(t)	Volume(m <sup>3</sup> )
Large Open Truck	2.3	7
Small Open Truck	1.4	4
Large Tipper	4.9	15
Small Tipper	2.7	8
Large Compactor	5.1	15
Small Compactor	2.6	9
Large Arm Roll	2.8	9
Small Arm Roll	1.5	5

(4) Actual operation conditions of vehicle

The availability and number of round trips of vehicles are summarized as shown in Table 1.4-11. The ratio of operating vehicles is roughly 70%. The average number of round trips in the three regions is 1.49 for Pusat, 2.89 for Selatan and 2.05 for Barat.

Table 1.4-11 Real State of Operation of Collection Vehicles

		Number of Vehicle	Working Vehicle	Net Working Rate	Number of round trip	Average round trip
PUSAT (9/9/'86)	Senen	24	17		31	1.82
	Grambir	33	24		37	1.54
	Sevah Besar	24	25		35	1.40
	Menteng	33	24		34	1.42
	Champak Putih	25	10		13	1.30
	Kema Yoran	23	16		27	1.69
	Tn Abang	30	24		32	1.33
	Total	192	140	73%	209	1.49
Selatan (9/9/'86)		344	119	75%	344	2.89
Barat (12/9/'86)	Groyol Pet	34	27		51	1.89
	Tambora	44	30		71	2.37
	Taman Sari	39	30		57	1.90
	Sub Total	117	87	74%	179	2.06
Timur	Cakung	8	5			
	Matramar	21	18			
	Jatiregara	26	12			
	P.Gadung	22	16			
	Kn.Jati	11	7			
	Pasar Rabo	4	6			
	Sku Dinas	27	40			
Total	93	134	69%			

The data pertaining to waste transported to disposal site from each Wilayah are as shown in Table 1.4-12.

Table 1.4-12

Comparison between Surveyed No of Vehicles at Formal Disposal Sites and Recorded No of trip

	Srengseng			Cakung			Kapuk Kamal			TOTAL		
	No.	Trip	Ratio	No.	Trip	Ratio	No.	Trip	Ratio	No.	Trip	Ratio
PUSAT	12	12	1.0	75	138	1.84	2	3	1.5	89	153	1.72
UTARA	0	0	-	41	59	1.44	5	6	1.2	45	65	1.44
BARAT	17	22	1.29	3	3	1.0	69	109	1.58	89	134	1.51
SELATAN	39	52	1.33	0	0	-	0	0	-	39	52	1.33
TIMUR	0	0	-	30	35	1.2	0	0	-	30	35	1.20
DINAS	1	1	1.0	12	18	1.5	2	2	1.0	15	21	1.40
TOTAL	69	87	1.26	161	253	1.57	78	120	1.54	307	460	1.50

Note: The number of vehicles used for night-time collection is not included in the table above.

The number of vehicles transporting waste to the three disposal sites is much smaller than that of the vehicles expected to be regularly operated. This is particularly so in the case of Selatan and Timur.

Judging from this data about 40% of vehicles seems transporting waste to informal disposal sites throughout Jakarta (Refer to Table 1.4-13).

Meanwhile, the number of trips per vehicle is roughly 1.50, which is resultantly less than the recorded operation data.



Table 1.4-13

	Average No. of vehicles in operation (A)	No. of vehicles to disposal site (B)	$\frac{B}{A} \times 100$ (%)
PUSAT	150	39	59.3
UTARA	64	45	70.3
BARAT	102	89	87.3
SELATAN	98	39	40.0
TIMUR	94	30	31.9
DINAS	15	15	83.3
TOTAL	526	307	58.4

Note: Average No. of vehicles in operation: No. of vehicles owned x 0.7

The results of investigation on the actual operation conditions of vehicles carried out by Dinas Kebersihan with respect to two Wilayah of Pusat and Selatan are shown in Table 1.4-14. When the number of trips of arm roll vehicles detachable container trucks is excluded, 2.0 times of trips have not been attained on a average. The actual number of trips for each type of vehicle is considerably smaller than the standard time of trips.

Table 1.4-14 Standard and Accual Number of Trip

	Standard No. trips	Actual NO. of trips, Pusat	Actual No. of trips, Timur
Large Open truk	2	1.2	1.3
Small Open truk	3	1.5	2.2
Large Tipper	3	1.8	1.8
Small Tipper	3	1.7	2.1
Large Compactor	2	1.7	1.0
Small Compactor	3	1.7	1.6
Arm Roll	4	2.4	2.8

(5) Actual conditions of fuel consumption

According to the records in 1984, the daily fuel consumption per vehicle for each Wilayah is as shown in Table 1.4-15. Generally, the compactor runs 3.0 - 3.5 km per liter, and where the daily travel distance is roughly 70 km, the fuel consumption per vehicle should be approximately 20 litres. Considering that the travel distance of collecting vehicle is about 70 km in the case of Jakarta, the fuel consumption per vehicle is deemed to be considerably excessive.

Table 1.4-15 Fuel Consumption per day

PUSAT	36 ℓ
UTARA	31 ℓ
BARAT	46 ℓ
SELATAN	43 ℓ
TIMUR	45 ℓ

(6) Night-time and holiday operation

For specified large scale facilities on downtown, waste is collected during night-time and on holidays. In the case of Pusat, the ratio of night-time collection and that of holiday collection to routine collection are respectively 8.2% and 22.7%, while those in the case of Barat is 7.1% and 66.5%. This means that more than half the amount of waste is collected on holidays. This holiday collection is carried out in Taman Sari, Grogol Petamburam and Tambora where commercial, business and residential areas are densely located.

Table 1.4-16 Night-time and Holiday Collection

	Routine A	Night Collection B	Holiday Collection C	B A	C A	Remark
PUSAT	255	21trip/day	58trip/day	8.2%	22.7%	1985/1986
BARAT	197	14trip/day	131trip/day	7.1%	66.5%	1984/1986

## 1.5 Quantity of Waste Collected

### 1.5.1 Measurement of Waste

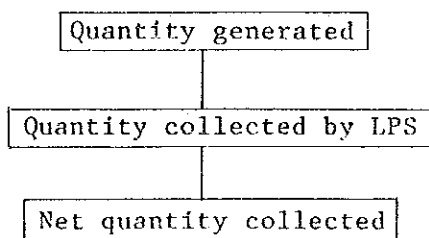
#### (1) Method of measurement

In Jakarta, the quantity of waste which is estimated on the basis of volume ( $m^3$ ) lacks in accuracy as there is no established measurement method. Nevertheless, this unit comparatively matches the actual situation as a basis of realistic data in case of collection and transportation. When the compactor trucks are used increasingly frequently, however, the measurement in terms of  $m^3$  will cause inconvenience. For controlling the labor productivity of collectors and vehicles, moreover, indication in terms of  $m^3$  will cause miscellaneous inconvenience due to lack of objectivity as control data. Therefore, the unit of the quantity of waste should be switched over to tonnage base using weigher for measurement of the quantity of waste in the future.

#### (2) Definition pertaining to the quantity of waste

In Jakarta, the quantity of waste is expressed in terms of the following three levels, namely, the quantity generated, quantity to be collected by LPS and net quantity collected.

Three levels pertaining to the quantity of waste



The quantity of waste generated is obtained according to the following formula:

$$\text{Population} \times 2.7\% \text{ or } 3.0\%/\text{capita}$$

The quantity of waste collected by LPS is roughly estimated by the Seksi Kebersihan Office.

The net quantity of waste collected is obtained by multiplying the standard payload capacity of the respective types of vehicles by the number of trips of individual types of vehicles.

As the standard payload capacity applied is shown in Table 1.5-1, the actual payload capacity of open truck, compactor and arm roll is larger than the standard payload capacity, while that of tipper is smaller than the standard capacity on the contrary.

Table 1.5-1 Design Payload

	Standard <sup>1)</sup> Volume (m <sup>3</sup> )	Design <sup>2)</sup> Volume(m <sup>3</sup> )	Design <sup>3)</sup> Weight(t)
Large Open truck	10	7	2.3
Small Open truck	6	4	1.4
Large Tipper	10	15	4.9
Small Tipper	6	8	2.7
Large Compactor	20	15	5.1
Small Compactor	10	9	2.6
Large Arm Roll	10	9	2.8
Small Arm Roll	6	5	1.5

- Note 1. The standard payload refers to the value adopted by Dinas Kebersihan.
2. Values set based on the results of investigation on payload by JICA.

(3) Waste collection capacity

The waste collection capacity is obtained according to the following three methods:

- a. Standard payload capacity  
= No. of vehicles x Standard payload capacity  
of vehicles x No. of trips of vehicles
- b. Design payload capacity (volume)  
= No. of vehicles x Design capacity of vehicles x Average No. of  
trips of vehicles
- c. Design payload (weight)  
= No. of vehicles x Design payload of vehicles x Average No. of  
trips of vehicles

"Standard payload capacity" refers to the quantity of collectable waste where the standard No. of trips is assumed to be realized, while "design payload capacity" and "design payload" refer to the collectable quantity when the designed number of trips is assumed and the same collectable quantity expressed in terms of tonnage, respectively.

The waste collecting capacity of each Wilayah in 1985/1986 and 1986/1987 obtained according to these methods are shown in Table 1.5-2.

The collection capacity was substantially increased in 1986/1987 from that in 1985/1986. The design payload capacity is about 60% of the standard payload capacity.

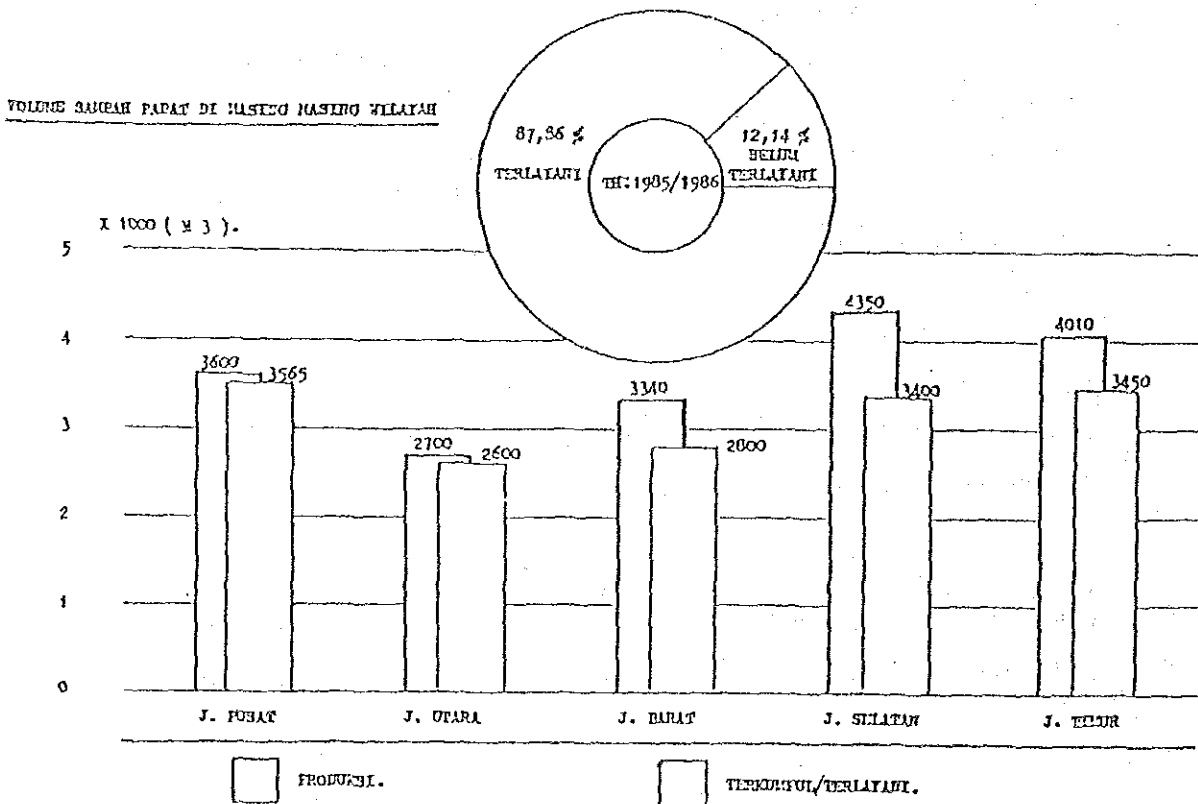
The quantity of waste collected in 1985/1986 summarized by Dinas Kebersihan is shown in Fig. 1.5-1. The total quantity of waste collected is 15,815 m<sup>3</sup>/day or equivalent to 87.9% of waste produced.

Out of 15,815 m<sup>3</sup>/day, 13,700 m<sup>3</sup>/day is from Dinas Kebersihan, 1,700 m<sup>3</sup>/day from P.D.Pasar Jaya market and 415 m<sup>3</sup> from river/canal waste by DPU. The quantity of waste collected from Dinas Kebersihan is 76% of the quantity of waste generated. This volume of 13,700 m<sup>3</sup>/day is considered to be excessively large viewing from the collection capacity of vehicles in 1985/1986.

Where the ratio of operating collection vehicle is 70%, 13,700 m<sup>3</sup>/day is equivalent to 34 m<sup>3</sup> per vehicle and corresponds to 1.5 times of 23 m<sup>3</sup> per vehicle which is the collection capacity when the standard number of trips is attained.

1985/86 standard	1985/86 Record of Dinas Kebersihan
23 m <sup>3</sup> /vehicle	34 m <sup>3</sup> /vehicle

Fig.1.5-1 Volume of Waste (1985/86) by Dinas Kebersihan



### 1.5.2 Amount of Waste Collected

(1) Amount of waste generated, collected at LPS and actually collected

The amount of waste generated, collected at LPS and net collected amount obtained at each Suku Dinas are summarized in Table 1.5-3. From this table, the actually collected quantity is largest at Selatan. When the standard payload capacity (Table 1.5-2) and actually collected amount in 1985/86 are compared, the actually collected quantity exceeds the standard payload capacity except in the case of Pusat. This indicates that the standard number of trips of collection vehicles is attained except in Pusat.

On the other hand, the ratio of actually collected amount to generation in 1985/86 is about 65%. The ratio in each area is indicated in Fig. 1.5-2.

Table 1.5-2 Standard and Design Collection Amount of Waste

	85/86			86/87		
	Standard Volume	Design Volume	Design Weight	Standard Volume	Design Volume	Design Weight
PUSAT	2,762m <sup>3</sup>	1,586m <sup>3</sup>	519 t	3,791m <sup>3</sup>	2,040m <sup>3</sup>	669 t
BARAT	1,705	1,059	349	2,897	1,735	567
UTARA	1,253	741	243	1,777	1,040	341
SELATAN	1,743	1,004	330	2,579	1,462	482
TIMUR	1,456	904	298	2,597	1,518	499
DINAS	494	271	88	494	271	88
TOTAL	9,413	5,565	1,826	14,128	8,066	2,646

Table 1.5-3 Amount of Waste Concerning Collection (1986)

	(m <sup>3</sup> )					
	** Generation	** Collection at LPS	** Accual Collection	** Gene-ration 1985/1986	1985/86 Collection	*** Remark
PUSAT	3,577	2,742	1,777	(3,577)	2,443	4/1986
BARAT	3,522	2,699	2,477	3,522	2,477	3/1986
UTARA	2,452	1,963	1,963	2,305	1,770	8/1986
SELATAN	4,184	2,427	2,876	4,148	2,687	9/1986
TIMUR	4,261	2,324	2,324	(4,261)	1,960	9/1986
TOTAL	17,996	12,155	11,417	(17,813)	11,337	

\* Not including waste collected by Dinas (Head office)

\*\* Data from Suku Dinas of each Wilayah

\*\*\* Month/year for the above data

\*\*\*\* The quantity collected in 1985/86 is from the Annual Report 85/86 of each Suku Dinas.

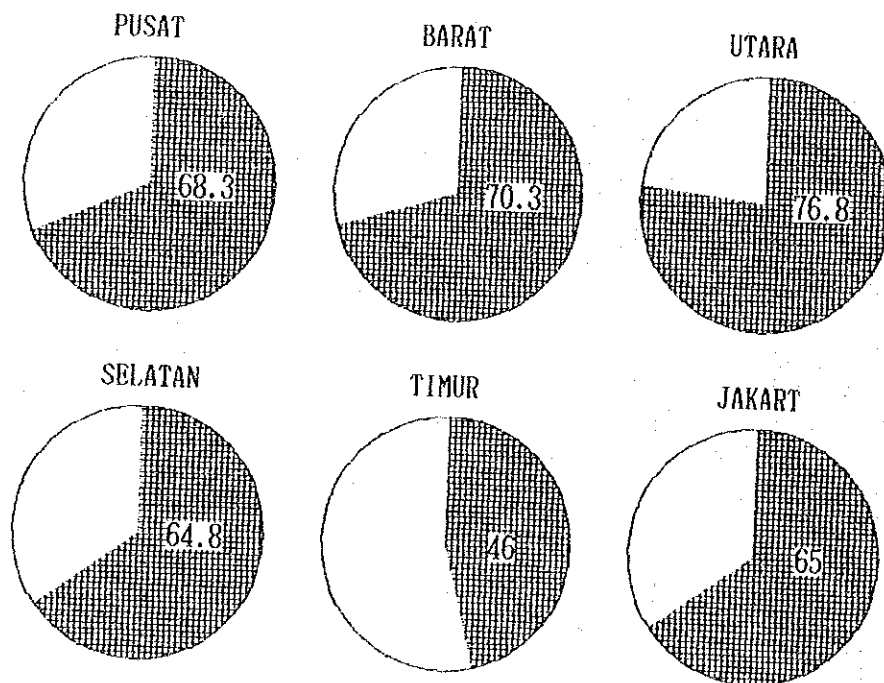


Fig.1.5-2 Ratio of Accual Collected Amount to Generation (1985/1986)



(2) Transition of the amount of waste collected

A transition of the amount of waste collected is as shown in Fig. 1.5-3. This diagram indicates that the quantity of waste collected in 1985/86 increased by 1.8 times over that in 1980/81.

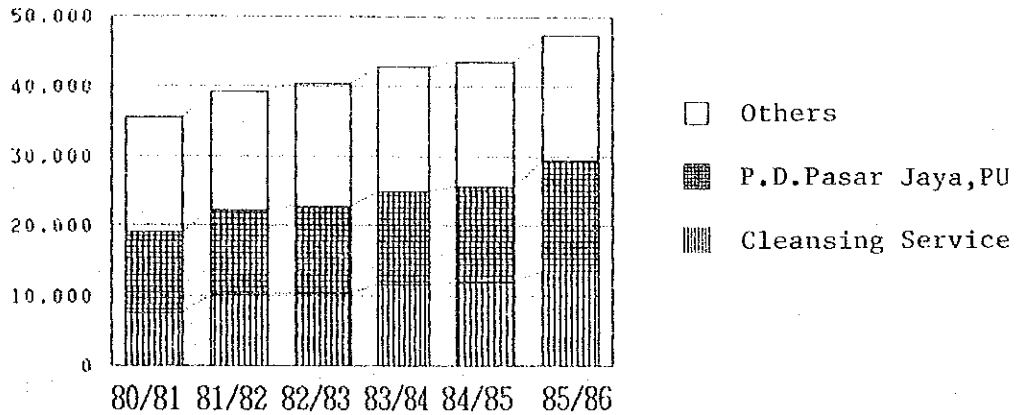


Fig.1.5-3 Transition of Amount of Waste Collected

The amount of collected waste, number of vehicles and crews are as shown in Table 1.5-4.

Table 1.5-4 Collection Amount, No. of Employee, Crew and Vehicle

	Collection Amount A m <sup>3</sup>	Number of Employee B	Number of Crew C	Number of Vehicle D	A/B m <sup>3</sup> /	A/C m <sup>3</sup> /	A/D m <sup>3</sup> /
80/81	7,600	7,127		424	1.07		17.9
81/82	10,200	7,024		424	1.45		24.0
82/83	10,300	7,010		427	1.47		24.1
83/84	11,600	6,975	1,528	664	1.66	7.6	17.5
84/85	11,863	6,913	1,385	693	1.72	8.6	17.1
85/86	13,700	6,643	1,424	669	2.06	9.6	20.4

The amount of collection per employee and per crew has been increasing year after year. The amount of collection per vehicle obtained by dividing the amount of collection by the total number of vehicles without taking into account the actual operating number is roughly 20 m<sup>3</sup> per vehicle.

(3) Amount of collection according to the respective collection systems.

The design collection amount at LPS according to individual collection systems is summarized in Table 1.5-5. The ratio of the respective collection systems throughout Jakarta is as follows: Door-to-door: 7.9%; Jali-jali: 8.5%; Handcart pool: 19.4%; Communal container: 19.0%; Communal concrete bin: 15.3%; Open space: 12.1% and Depot: 17.8%. The handcart pool, communal concrete bin and open space systems which are not desirable in view of collection efficiency occupy 46.8% of the total systems.

Table 1.5-5 Present Solid Waste Collection System in DKI Jakarta(1986) (Unit: m<sup>3</sup>)

	Door to door	Jali-jali	Hand-cart	Container	Communal Concrete bin	Open Space	Depot	Transito	Total
					Bak Sampah Bak Terbuka	Terbuka	Dipo		m <sup>3</sup>
1. PUSAT	527	280	551	336	-	432	458	-	2,584
1-1 Gambir	26	4	115	40	-	24	97	-	306
1-2 Menteng	244	12	21	24	-	92	8	-	401
1-3 Sawah Besar	140	-	20	56	-	74	160	-	450
1-4 Senen	18	18	104	77	-	16	0	-	233
1-5 Tanah Abang	69	104	94	52	-	110	161	-	590
1-6 Kemayoran	18	52	146	52	-	78	0	-	346
1-7 Cempaka Putih	12	90	51	35	-	38	32	-	258
2. BARAT	30	249	366	341	143	88	396	348	1,961
2-1 Taman Sari	0	96	171	160	43	46	0	61	498
2-2 Tambora	0	113	45	74	45	42	293	108	748
2-3 Grogol	30	40	110	85	0	0	79	128	802
2-4 Ceng Kareng	0	0	0	0	47	0	6	18	71
2-5 Kebon Jeruk	0	0	40	22	8	0	18	33	121
3. SBLATAN	111	157	795	281	477	328	619	76	2,844
3-1 Tebet	0	10	197	56	18	90	230	0	601
3-2 Mampang Prpt	12	17	27	0	190	0	0	26	272
3-3 Psr. Minggu	0	16	54	48	68	82	92	18	378
3-4 Setiabudi	0	30	197	70	13	75	78	32	495
3-5 Kebayoran Lama	50	12	70	15	21	81	60	0	309
3-6 Kebayoran Baru	26	52	208	92	129	0	159	0	666
3-7 Cilindak	23	20	42	0	38	0	0	0	123
4. TIMUR	171	22	208	289	781	486	420	40	2,417
4-1 Jatinegara	40	0	112	147	143	75	50	5	572
4-2 Pulo Gadung	100	16	0	40	248	153	173	35	765
4-3 Matraman	0	0	68	90	146	85	185	0	574
4-4 Kramat Jati	0	6	28	12	161	60	12	0	279
4-5 Cakung	0	0	0	0	0	101	0	0	101
4-6 Pasar Rebo	31	0	0	0	83	12	0	0	126
5. UTARA	100	293	373	472	409	94	212	65	2,018
5-1 Penjaringan	0	93	99	200	38	0	156	22	608
5-2 Tg. Priok	20	110	122	42	65	94	40	43	536
5-3 Koja	80	70	140	166	218	0	6	0	680
5-4 Cilincing	0	20	12	64	88	0	10	0	194
DKI Jakarta Total	939	1,001	2,293	1,719	1,810	1,428	2,105	529	11,824

The ratio of the amount collected according to these undesirable systems by LPS an each Wilayah is as listed below:

PUSAT	38.0%
BARAT	30.4%
UTARA	43.4%
SELATAN	56.3%
TIMUR	61.0%
DKI JAKARTA	46.8%

The ratio is particularly high in the case of Selatan and Timur.

### 1.5.3 Solid Waste Flow

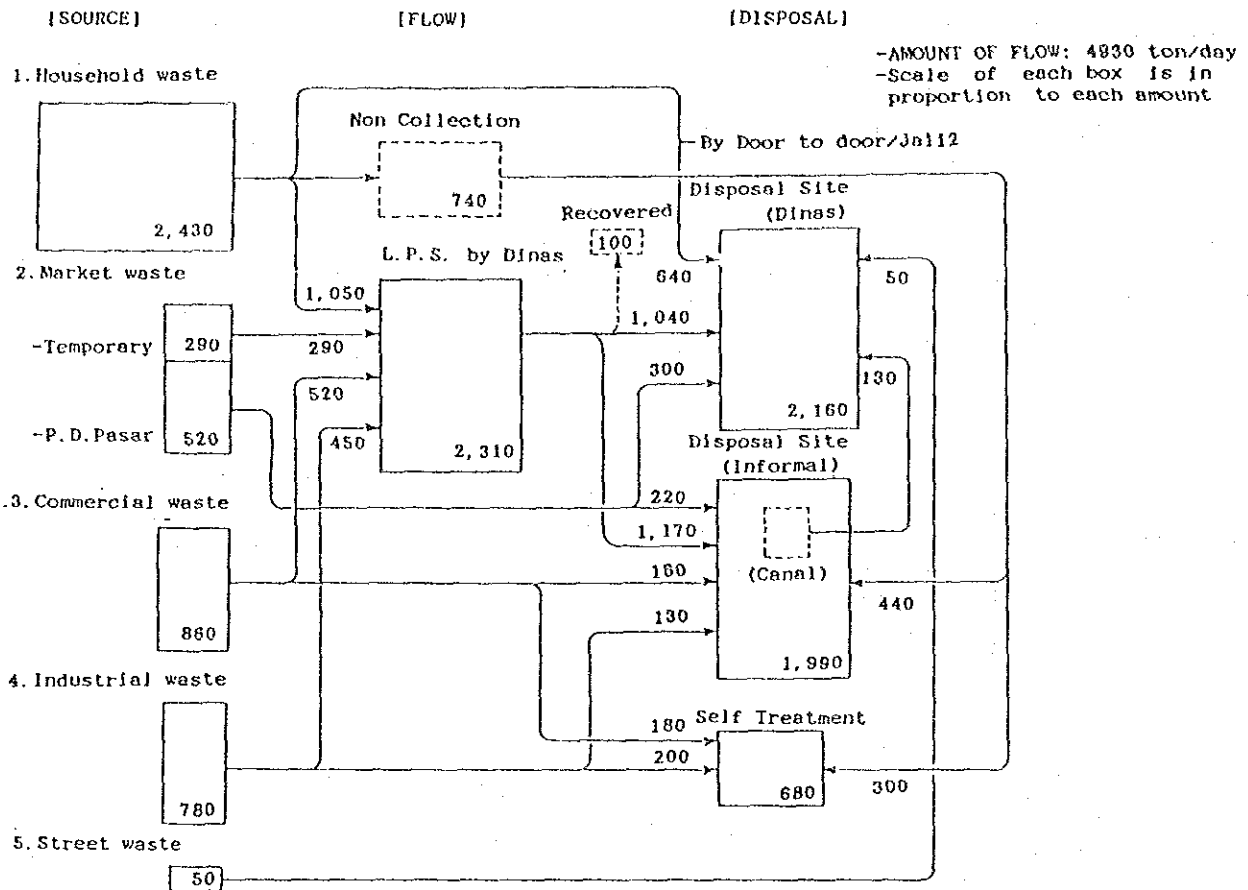
A calculation basis of solid waste flow is shown in Table 1.5-6 and a flow from collection of solid waste to disposal thereof is indicated in Fig.1.5-3. The values indicated in terms of tonnage were obtained as a result of estimation based on the results of investigation on the amount of waste executed by JICA (Refer to Chapter 2 of Supporting Report).

Table 1.5-6 Calculation Basis of Solid Waste Disposal Flow

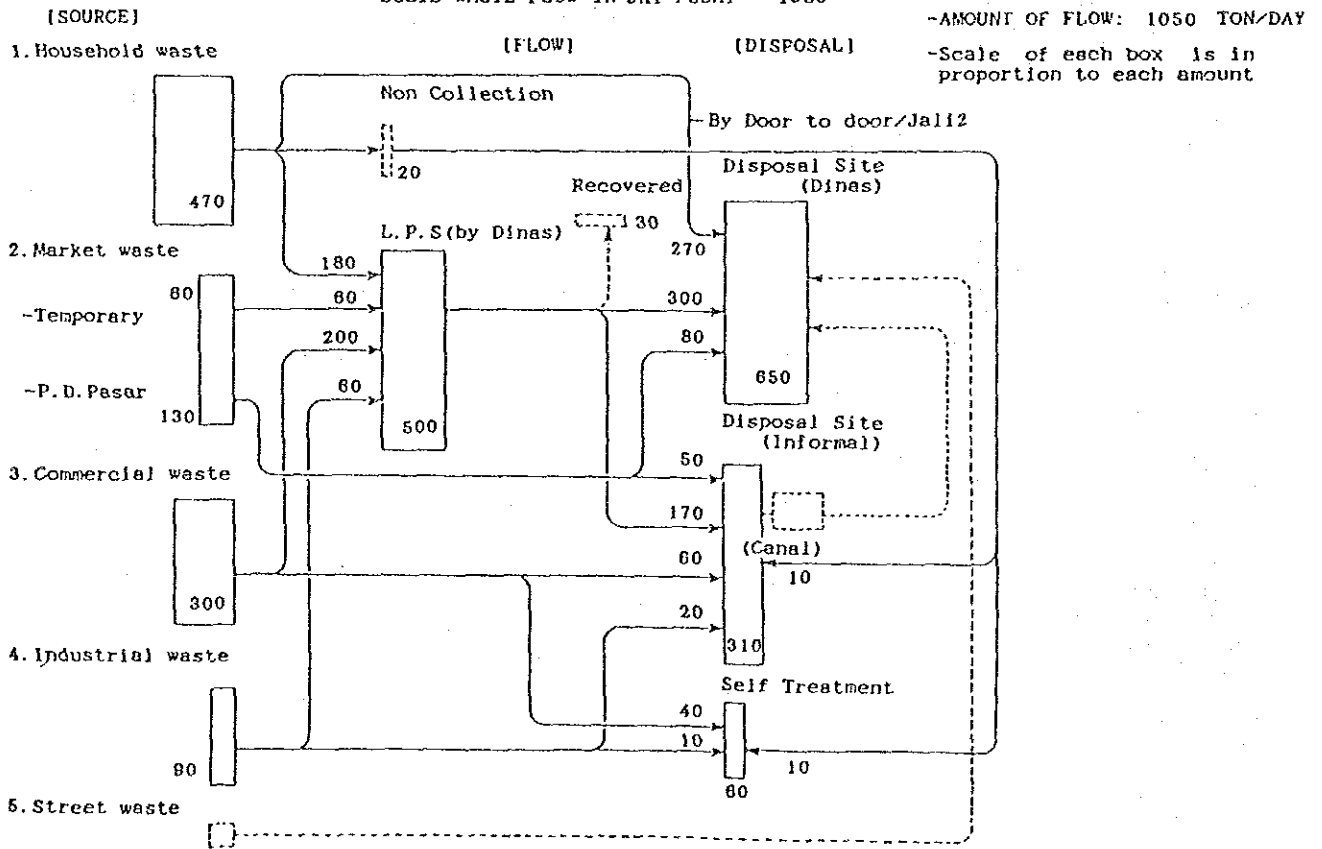
(Unit: t/d)

Main Item	Basic Data	Set Value	Calculation Results
① Amount of generated waste	a) Basic study results b) P.D. Pasar Jaya materials c) Statistical materials on population, etc.	Waste generation rate for each type of waste	o Calculated for each Kecamatan Total Waste: 4,930 Domestic: 2,430 P.D.Pasar Jaya: 520 Commercial: 1,150 Industrial: 780 Roads and Canals, etc.: 50
② Disposal volume	a) Study results on waste hauled to disposal sites and on vehicle loads	Number of vehicles delivering waste to Cakung, Srengseng and Kamal disposal sites and load for each type of collection vehicle	o Calculated for each Wilayah Total Waste: 2,160 Dinas Kebersihan: 1,680 P.D.Pasar Jaya: 300  Roads, etc.: 180
③ Amount collected by Dinas Kebersihan	a) Number of collection vehicles for each Wilayah b) Data on collection work	Canal and street waste is hauled directly to disposal sites. Collection and haulage amount for each Wilayah	o Total Waste: 2,950
④ Collection of domestic waste	a) Collection areas for each Kelurahan	Collection service coverage for each Wilayah: 75%. Waste disposal rate for Pusat is 95% and 90% for other areas	o Collected Domestic Waste: 1,690 Uncollected Domestic Waste: 740 o Collected Waste other than Domestic Waste: 1,260 Uncollected Waste other than Domestic Waste: 670
⑤ Amount of recovered reusable materials	-	As recovery is carried out by LPS, etc., the recovery rate is set at 4% of the waste collected by Dinas Kebersihan	o Collected Volume: 110 o Disposal Volume other than hauled volume by Dinas Kebersihan to 3 disposal sites $2,950 - 1,680 - 100 = 1,170$
⑥ Disposal of uncollected domestic waste	-	40% is self-disposed of and the remainder disposed of at small disposal sites	o Disposal at small disposal sites: 440 o Self-disposal: 300
⑦ Disposal of uncollected waste other than domestic waste	a) Questionnaire surveys at Jakarta, Utara, Timur and Barat	Self-haulage rate is set at 60% for Pusat and 40% for other areas	o Self-haulage: 290 o Self-disposal: 380
⑧ Other waste	-	Canal waste (130 t) and street waste (50 t) is hauled directly to disposal sites	-

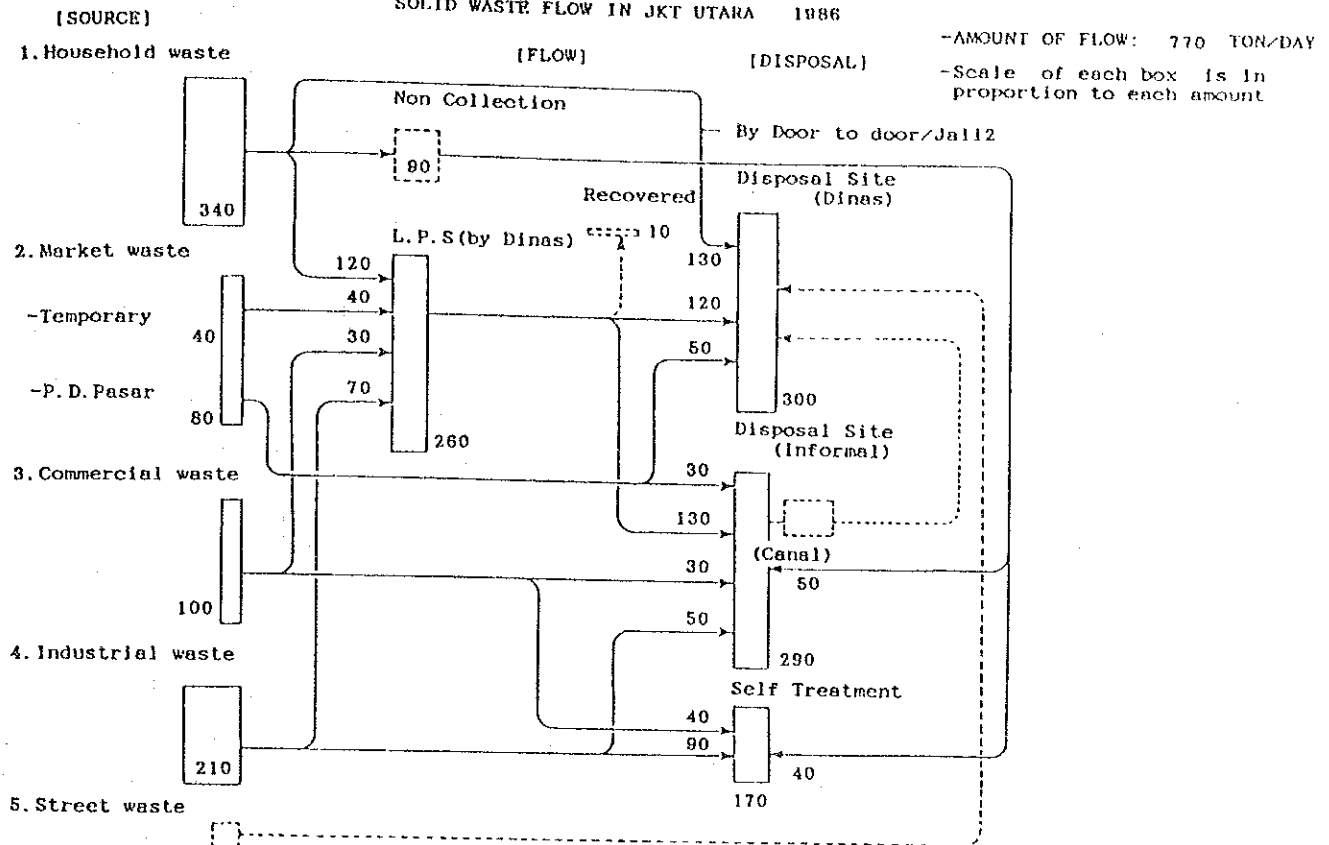
SOLID WASTE FLOW IN DKI JAKARTA 1986



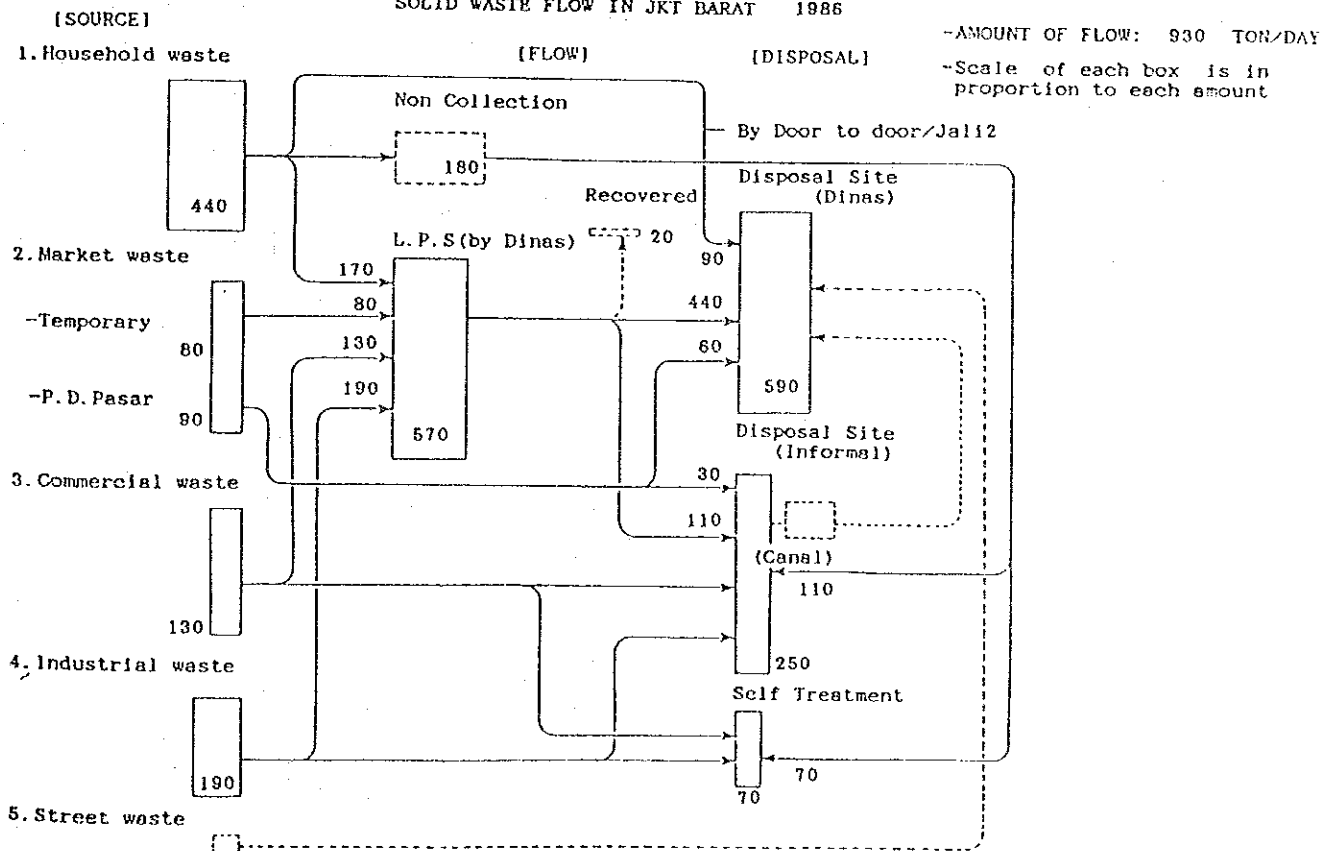
SOLID WASTE FLOW IN JKT PUSAT 1986



SOLID WASTE FLOW IN JKT UTARA 1986

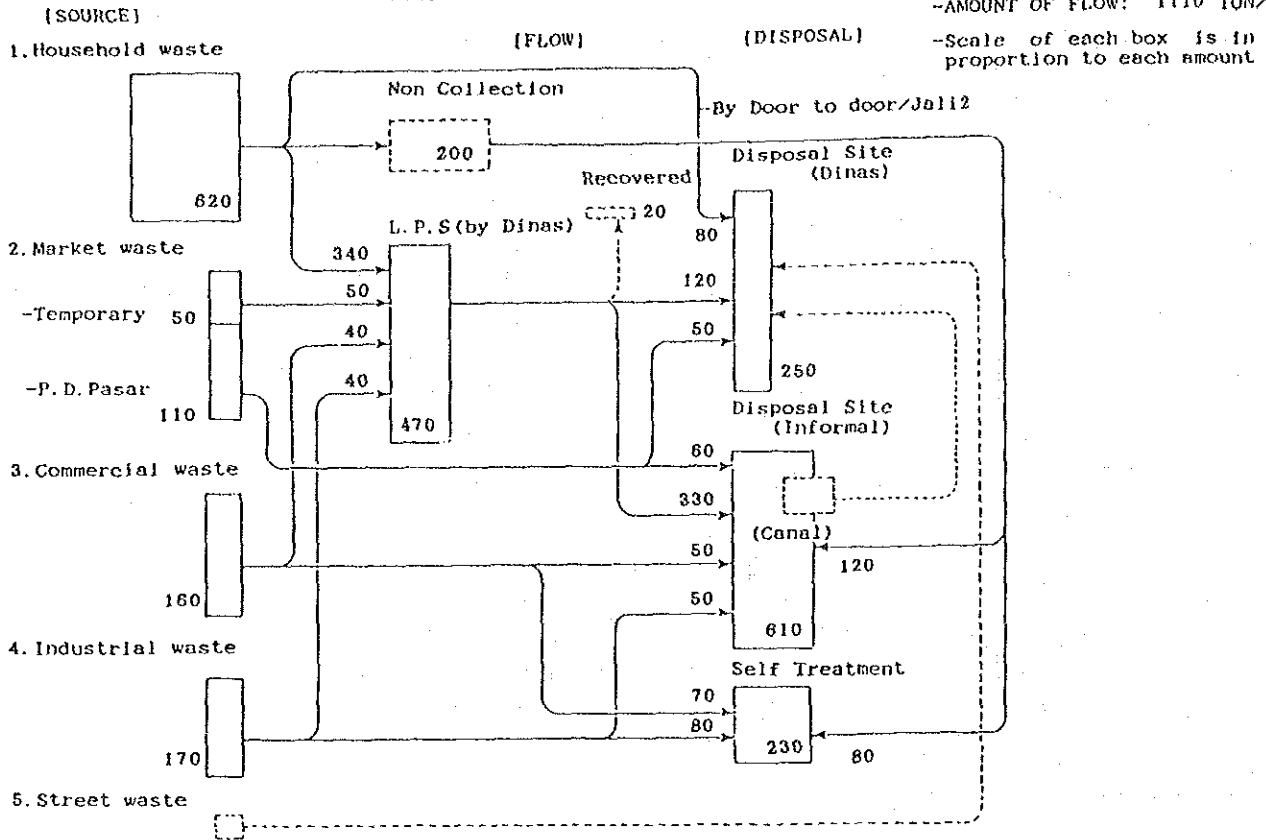


SOLID WASTE FLOW IN JKT BARAT 1986



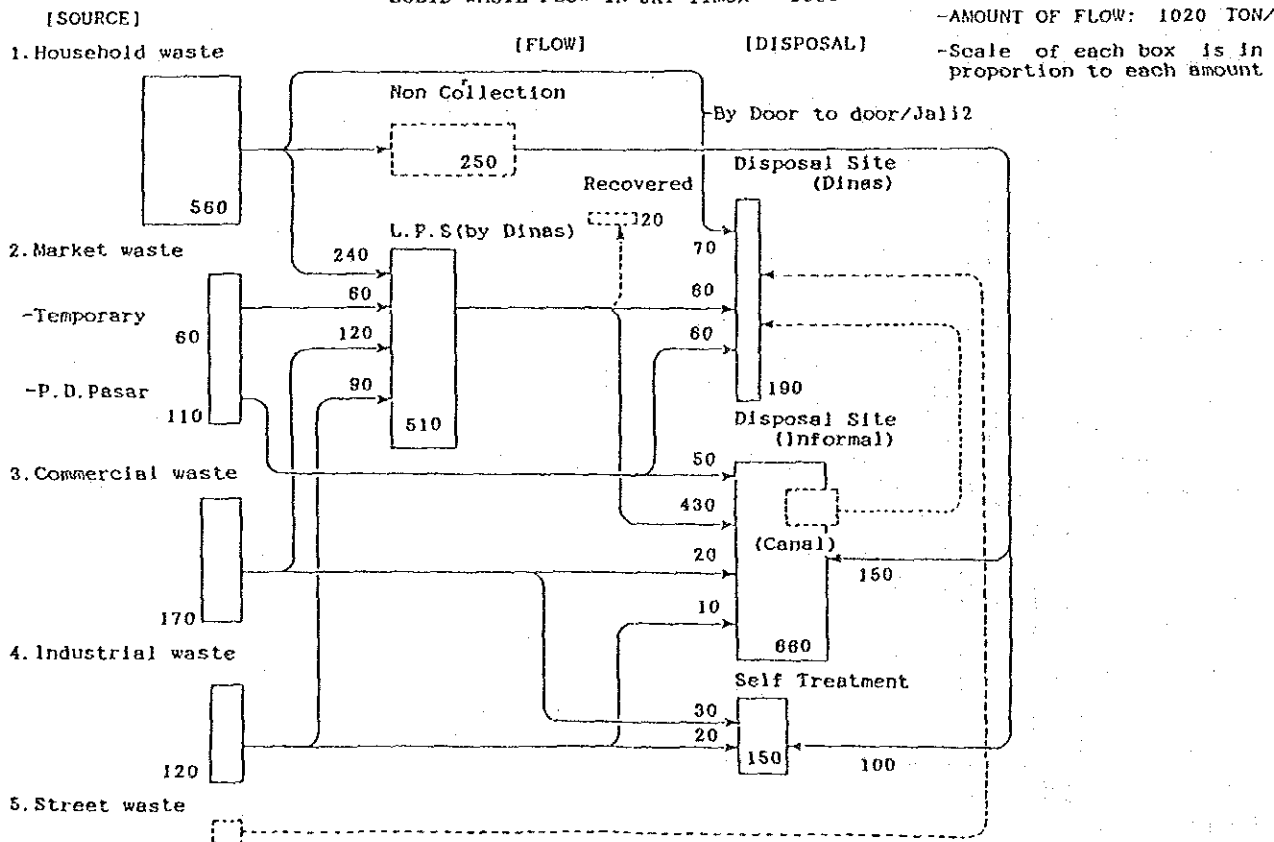
SOLID WASTE FLOW IN JKT SELATAN 1986

-AMOUNT OF FLOW: 1110 TON/DAY



SOLID WASTE FLOW IN JKT TIMUR 1986

-AMOUNT OF FLOW: 1020 TON/DAY





## 1.6 Collection Process

### (1) Movement of Collectors and Vehicles

Many collectors live in the housings of Dinas Kebersihan and commute to the collecting points by collecting vehicles assigned to the housings. The collectors living in other than the housings commute to the collecting sites by other appropriate traffic means.

In any case, the collection vehicles constitute an important traffic means for transporting collectors.

The collecting vehicles are parked separately at the parking lots within the premises of the respective Dinas Kebersihan Offices and housing. All vehicles do not leave for collection simultaneously at one time.

The collectors and collecting vehicles are required to arrive at Seksi Kecamatan Office by 8 in the morning. However, this target has not necessarily been attained due to traffic congestion of roads. To ensure control of stable collection, the collectors and vehicles should be ready for departure by the time designated by the Kecamatan Office.

The trip time is 40 to 60 minutes for Pusat and roughly 30 minutes for Selatan.

### (2) Kecamatan Office

The attendance of collectors and drivers is checked at the Kecamatan Office. Any driver receives a light oil supply slip for one day operation.

(3) Crew size

The size of crew varies depending upon the type of collecting vehicles and collection systems as the results of observation are summarized in Table 1.6-1. More collectors are required for door-to-door collection services. In case four collectors are not available, workers of RW crew sometimes assist the collectors. In the case of LPS-open space/concrete bin, two to four collectors are required per vehicle, and should only two collectors be available, handcart collectors of RW assist the collectors in some cases.

Table 1.6-1 Crew Size

Door to door	Open Truck	2~4
	Small Compactor	2~4
Jali-jali	Small Tipper	2
	Small Compactor	2
LPS	Communal container	
	Depot with container	Arm Roll 0
	Open Space Concrete Bin	Large Open truck 2~4
	Handcart Rool	Large Open truck
	Depot of handcart pool	Tipper 2
	Depot with Shovel loader	Large Tipper 0
Small Communal Container	Large Compactor 2	

Meanwhile, the results of investigating the size of crews for Pusat and Selatan are as listed below.

Table 1.6-2 Crew Size in Pusat and Selatan

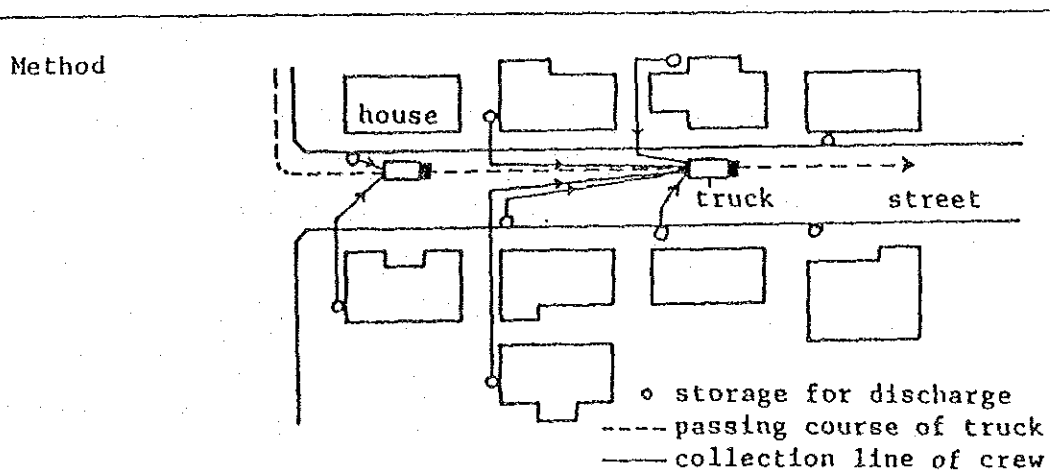
	PUSAT	SELATAN
Large Open truk	2.5	3.3
Small Open Truk	2.1	2.4
Large Tipper	1.8	1.8
Small Tipper	1.5	1.8
Large Compactor	2	1.6
Small Compactor	1.5	3.4
Container	1.0	0
Crane	0	-

In the case of LPS-Handcart pool, two collectors are generally required, and loading from handcart to collecting vehicles is performed by handcart collectors.

(4) Collection and loading

a. Door-to-door

Door-to-door collection is performed as indicated in Fig.1.6-1 below. The distance between concrete bins of each house in residential area is 10 to 20 m. In this case, one collector put waste into bamboo basket with a rake and another collector carries the basket to the collecting vehicle. In the case of open truck, one collector receives the basket on the back of the bed to load waste.



- Truck stops in front of every other house.
- Crew gather solid waste from each storage by using a rake and bamboo basket.

Fig.1.6-1 Door-to-door Collection

The time required for receiving waste from one house is about 4 minutes. The results of investigation at Cempaka Putih of Pusat are roughly as indicated below:

Table 1.6-3 Result of Survey for Collection

Collection vehicle	Small Compactor	Large Open truck	Small Open truck
Real capacity	9 m <sup>3</sup>	8 m <sup>3</sup>	5 m <sup>3</sup>
Crew	4	4	4
Collecting time	120 - 140	120 - 140	100 - 120

(min.)

The collecting time is largely affected by the number and behavior of crew. The smaller the number of crew, the longer the collecting time. In any case, loading to waste from concrete bins around each house is very inefficient.

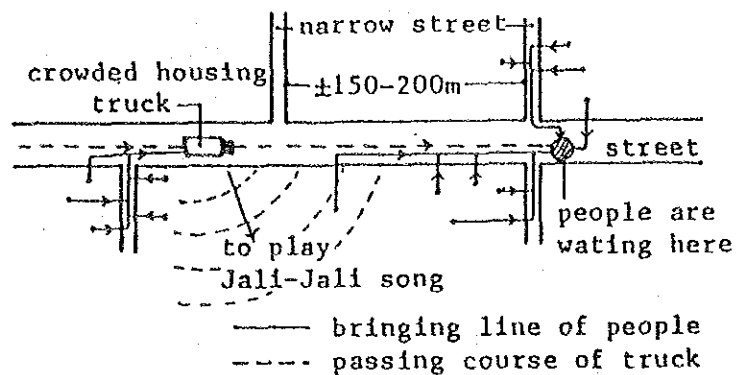
b. Jali-jali

According to the Jali-jali system, collection vehicle stops at predetermined place roughly at a fixed interval within the Kampung and residents bring waste to the vehicle. In this case, any collecting vehicle is required to stay at a place until surrounding residents have sufficiently brought waste.

In the case of open truck, waste is received from the crew on the bed and it is unavoidable for the crew to contact with waste on the bed.

Although the collecting time is affected by the payload capacity of the collecting vehicle, it is affected particularly largely by the behavior of residents. The longer the vehicle stay at a position and the more slowly it travels, then the slower the behavior of residents becomes. Therefore, residents should be requested to bring waste as promptly as possible.

Method



- Truck arrives playing the "Jali-Jali" song.
- People hear this song, and then bring a plastic bucket or bag with solid waste to the truck.
- Crew receive it and discharge solid waste into the compactor.
- Truck stops every 150 - 200 meters.

Fig.1.6-2 Jali-jali Collection

c. LPS - Open space/Communal concrete bins/Handcart pool

Loading work of waste is performed jointly by the crew and collectors of RW. The collection time is almost same between the open space, communal concrete bin and handcart pool systems.

Examples of the communal concrete bins and open space collection systems are indicated in Fig.1.6-3 and Table 1.6-4 below:

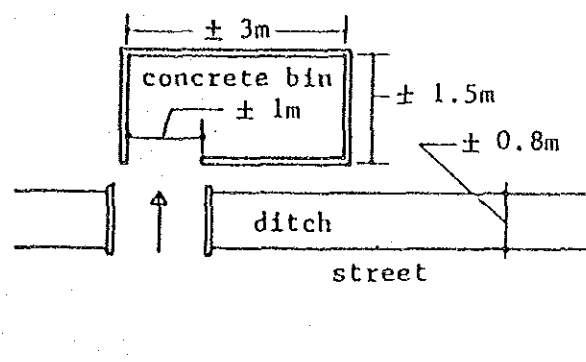


Fig.1.6-3 Plan of Open Space with Wall

Table 1.6-4 Open Space with Wall/Open Space

	Capacity M <sup>3</sup>	Area M <sup>2</sup>	Frequency of collection by truck
Open Space with Wall	+7	+10	1 - 3 times/week
Open Space	-	+10-20	1 - 2 times/week

In the case of handcart pool, five to ten handcarts gather at one place. It takes aboutn 15 minutes to make one handcart empty. Generally, a team comprised of four RW collectors load waste from two handcarts.

The results of investigating the loading time is shown in Table 1.6-5.

Table 1.6-5 Waste Loading Time

Vehicle	Large Open Truck	Large Tipper
Real Capacity	9m <sup>3</sup> ~ 10m <sup>3</sup>	15m <sup>3</sup>
Crew	2 + RW 4	2 + RW 4
Collection-Time (min.)	75 ~100min.	110~150min.

d. LPS-container and depot-container

In the case of large communal container, it is possible to load waste on vehicles in a short time, roughly within ten minutes.

However, acquisition of space for the container yard becomes a problem.

e. Depot

In the case of depot especially when shovel loader is used, the loading system is particularly different from that in the case of the LPS system. With a shovel loader, it is possible to fully fill a large tipper (10m<sup>3</sup>) within 15 minutes.

f. Small communal container

In the case of 1 m<sup>3</sup> communal container, the number of such containers is limited roughly to 18 - 20 per one large compactor. About 100 minutes is required for collection when short moving time between containers is included.

(5) Movement from collecting points to disposal sites

The distance between major points to three disposal sites is obtained as follows:

Pusat : 15 - 20 km up to Cakung Cilincing  
Utara : 8 - 15 km up to Cakung Cilincing  
Timur : 15 - 26 km up to Cakung Cilincing  
Selatan : 8 - 15 km up to Srengseng  
Barat : 5 - 15 km up to Srengseng and 10 - 16 km up to Kapuk  
Kamal

The moving speed is 20 - 30 km/hour excluding the central part of Pusat where the speed is roughly 18 km/hour.

(6) Unloading at disposal sites

The unloading time at the disposal sites varies depending on the conditions of access roads and types of vehicles.

Although the access road conditions are comparatively favorable around Kapuk Kamal and Cilincing, the access road around Srengseng is so narrow that much access time to the disposal site is required when traffic is congested due to collection vehicles. Consequently, most of the collection vehicles from Barat go to Kapuk Kamal where the access road conditions are favorable although Srengseng is nearer from the collection zone than the above disposal site.

The time required for unloading from vehicles is substantially different between the vehicles with tripping or pushing function and those without such functions as open truck.

In the case of open trucks, the collectors also go to the disposal site on the truck and unload waste manually.

The time required for unloading according to the types of vehicles are as shown in Table 1.6-6. About 15 minutes is required to access for unloading at disposal site. This is the waiting time at the entrance of the disposal site.

Table 1.6-6 Waste Unloading Time at Disposal site (min.)

	Net	Time Gross-Unloading Time
Large Open truck	30~40	45~55
Small Open truck	40~50	55~65
Large Tipper	3~ 5	20
Small Tipper	3~ 5	25
Large Compactor	5~10	20
Small Compactor	3~ 5	20
Large Arm Roll	3~ 5	20
Small Arm Roll	3~ 5	20

(7) Recess

Recess is taken in a variety of manners. According to the results of investigation, the recess time is recorded to be 60 - 120 minutes at Pusat and about 60 minutes at Selatan. The places of recess have not been fixed.

(8) Fuel supply

Fuel is supplied at specified fuel stations once a day. 15-20 minutes is required for fuel supply.



(9) Collection time

The results of investigating the time required pertaining to the collection process according to the types of vehicles are summarized in Table 1.6-7.

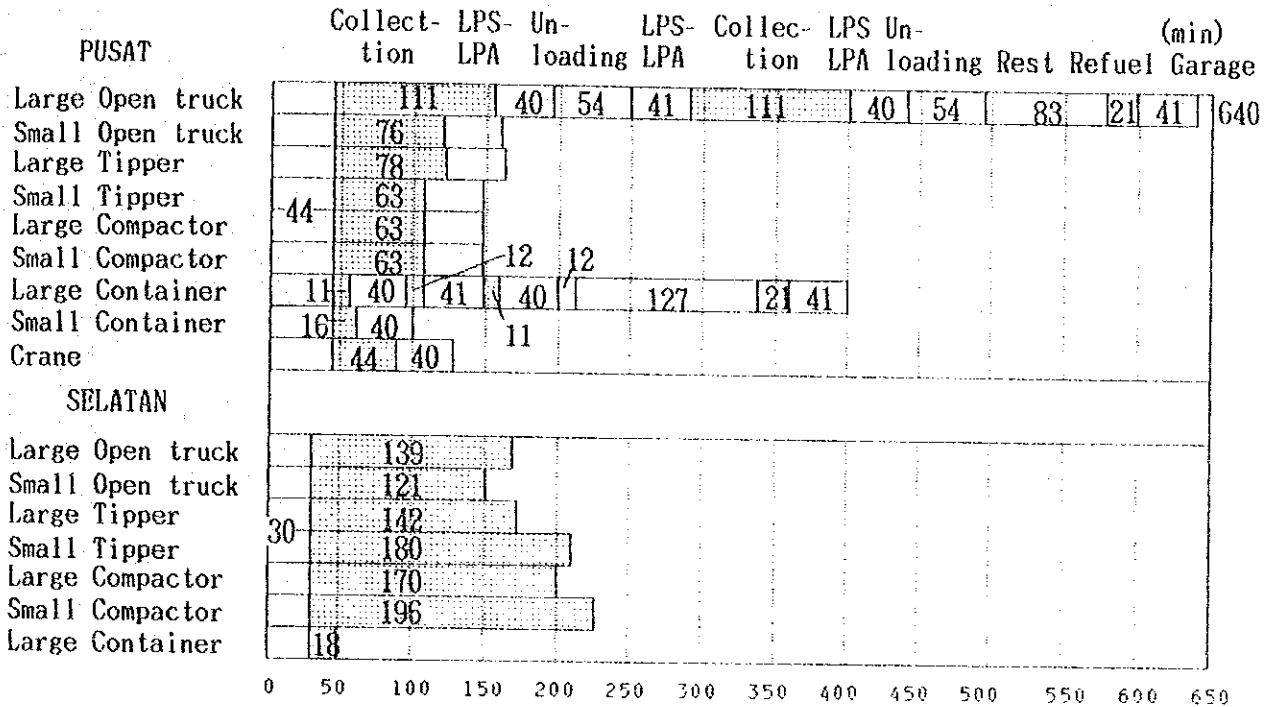


Fig.1.6-4 Working Time

Table 1.6-7 Working Time

(min)

	Working hour	For Collec- tion	LPS to LPA Hauling hour	Unload- ing hour	LPS to LPA or Pool	Refuel	Total	Trip	
PUSAT									
Large Open truck	111		54		83	21	410	1.3	
Small Open truck	76		38		112	20	427	2.2	
Large Tipper	78		13		161	20	413	1.8	
Small Tipper	44	63	40	10	41	105	21	401	2.1
Large Compactor	63		12		148	20	353	1.0	
Small Compactor	63		10		133	20	403	1.6	
Large Container	11		12		127	21	410	2.3	
Small Container	16		10		124	19	332	1.8	
Crane	44		11		148	17	408	1.9	
SELATAN									
Large Open truck	139		62		59	18	429	1.3	
Small Open truck	121		55		60	17	422	2.2	
Large Tipper	142		17		54	15	447	1.8	
Small Tipper	30	180	40	30	31	59	14	444	2.1
Large Compactor	170		10		60	20	370	1.0	
Small Compactor	190		22		56	18	420	1.6	
Large Container	18		16		40	16	289	2.8	
Small Container							403		
Crane									

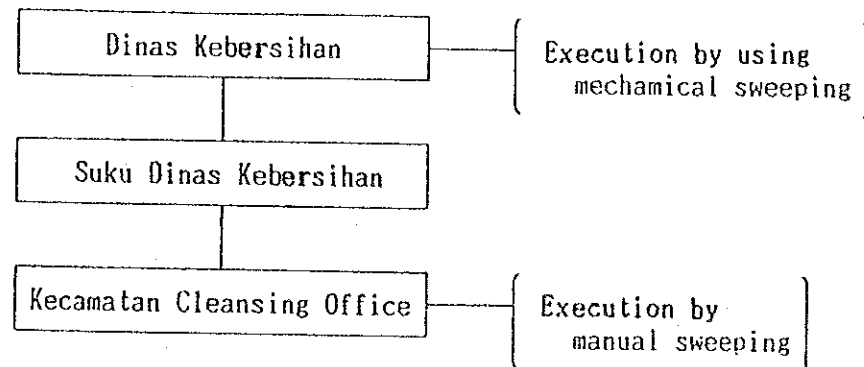
In the case of Pusat, the recess time is as much as 127 minutes and shares even 32% of an average working time of 395 minutes, while that in the case of Selatan is 55 minutes or equivalent to 14% of the average working time. Where about 100 minutes is required for a round trip to and from LPS and disposal site as at present, the net collection time should at least be within 60 minutes in order to realize at least two round trips a day.

Since an average net collection time of as much as 157 minutes is required for other than container vehicles in the case of Selatan, it is impossible to realize two round trips within the specified working hours.

## 1.7 Street Sweeping

### 1.7.1 Street Sweeping System

The street weeping system or organization is as illustrated below:



In the case of Dinas, sweeping of the protocol streets is carried out by using mechanical sweeping equipment. In addition, Dinas is undertaking establishment of the standards for street sweeping in other Wilayah, evaluation of the results of execution, supply and control of equipment and materials.

Suku Dinas Kebersihan is executing assignment of sweepers and arrangement of equipment and materials for each Kecamatan as well as management and instruction of the work.

The Seksi Kecamatan office is undertaking allocation of the volume of work to sweepers, countermeasures when any sweeper is absent, control of sweepers, supervision and inspection of the working conditions of sweepers.

Based on the importance in view of traffic, roads are classified into protocol (most important trunk road), economy (trunk road) and other streets (streets within regions).

Dinas Kebersihan places priority chiefly on the protocol streets followed by the economy streets and other streets which are required for street sweeping.

#### 1.7.2 Streets Requiring Sweeping and Frequency of Sweeping

##### (1) Streets for Sweeping

The actual conditions of street sweeping are summarized with respect to individual Kecamatan of each Wilayah as shown in Table 1.7-1.

Table 1.7-1 Actual Status of Street Sweeping

(km)

			Gambir	Menteng	Sawah Besar	Senen	Tanah Abang	Kemayoran	Cempaka Putih	Total
PUSATA	TOTAL	PROTOCOL	35,690	37,074	13,479	15,624	35,690	11,638	19,159	168,354
		ECONOMY	52,174	33,667	25,010	19,717	43,725	20,459	58,410	253,162
		OTHERA	87,864	70,741	38,489	35,341	79,415	32,097	77,569	421,516
	SWEEPING	PROTOCOL	35,690	37,074	13,479	15,624	35,690	11,638	19,159	168,354
		ECONOMY	23,358	33,667	2,700	16,116	7,700	5,000	1,100	89,641
		OTHERA	59,048	70,741	16,179	31,740	43,390	16,638	20,259	257,995
			Taman sari	Tambora	Grogol Petamb	Ceng Kareng	Kebon Jeruk			
BARATA	TOTAL	PROTOCOL	15,906	0	34,600	15,500	3,000			69,006
		ECONOMY	27,799	17,294	41,600	25,900	48,000			60,593
		OTHERA	41,097	48,600	30,000	176,200	166,300			462,197
	SWEEPING	PROTOCOL	15,906	0	17,000	12,000	3,000			47,906
		ECONOMY	3,235	13,792	3,700	8,000	9,000			37,727
		OTHERA	0	0	3,000	1,000	0			4,000
TOTAL		19,141	13,792	23,700	21,000	12,000	0	0	89,633	
				Penjarin gans	TG. Priok	Koja	Cilin cing	Kep. Seribu		
	UTARA	TOTAL	PROTOCOL	5,000	11,500	17,900	16,000	0		
ECONOMY			33,700	27,500	11,200	16,000	0			88,400
OTHERA			81,800	8,400	57,900	53,000	0			201,100
SWEEPING		PROTOCOL	5,000	11,500	17,900	4,000	0			38,400
		ECONOMY	22,000	6,000	6,400	6,000	0			40,400
		OTHERA	0	4,000	4,000	1,000	0			9,000
TOTAL		27,000	21,500	28,300	11,000	0			87,800	

			Tebet	Mampang Prpt	Psr. Minggu	Setia budi	Keby Lama	Keby Baru	Cilandak	Total
S E L A T A N	T O T A L	PROTKOL	14,500	19,000	9,000	11,500	15,000	41,250	7,750	118,000
		ECONOMY	35,700	15,500	34,000	9,475	10,000	94,100	22,500	221,275
		OTHERS	56,800	53,600	87,000	48,600	28,000	88,750	36,000	398,750
	TOTAL	107,000	88,100	130,000	69,575	53,000	224,100	66,250	738,025	
S W P E I E N G	PROTKOL	14,500	19,000	9,000	11,500	5,000	41,250	6,000	106,250	
	ECONOMY	23,500	11,500	26,000	4,400	7,000	38,000	8,000	118,400	
	OTHERS	4,000	0	0	0	3,000	0	2,000	9,000	
TOTAL	42,000	30,500	35,000	15,900	15,000	79,250	16,000	233,650		
			Jatine gara	Pulo Gadung	Matraman	Kramat Jati	Cakung	Pasar Rebo		Total
T I M U R	T O T A L	PROTKOL	17,300	15,000	24,100	15,500	5,000	7,000		83,900
		ECONOMY	6,000	8,000	0	3,500	6,000	2,000		25,500
		OTHERS	56,000	32,000	41,000	11,500	4,000	9,000		153,500
	TOTAL	79,300	55,000	65,100	30,500	15,000	18,000	0	262,900	
S W P E I E N G	PROTKOL	17,300	15,000	24,100	15,500	5,000	7,000		83,900	
	ECONOMY	0	0	0	0	0	0		0	
	OTHERS	0	0	0	0	0	0		0	
TOTAL	17,300	15,000	24,100	15,500	5,000	7,000	0	83,900		
			PUSAT	BARAT	UTATA	SELATAN	TIMUR	TOTAL		
T O T A L	T O T A L	PROTKOL	168,354	69,006	50,400	118,000	83,900	489,660		
		ECONOMY		160,593	88,400	221,275	25,500	495,768		
		OTHERS	253,162	462,197	201,100	398,750	153,500	1,468,709		
	TOTAL	421,516	691,796	339,900	738,025	262,900	2,454,137			
S W P E I E N G	PROTKOL	168,354	47,906	38,400	106,250	83,900	444,810			
	ECONOMY		37,727	40,400	118,400	0	196,527			
	OTHERS	89,641	4,000	9,000	9,000	0	111,641			
TOTAL	257,995	89,633	87,800	233,650	83,900	752,978				

(2) Frequency of street sweeping

The frequency of street sweeping is determined according to the importance of streets or roads and extent of traffic as follows:

Three times/day

Twice a day

Once a day

(3) Working time

The working time is divided into the following three categories:

Morning : 05:00 AM up to 09:00 AM

Noon : 11:00 AM up to 14:00 PM

Night : 19:00 PM up to 24:00 PM

(4) Amount of work

The amount of work is allocated to the respective sweepers on the basis of a total length of 2 km.

(5) Working Conditions

During rush hours from 6:30 to 9:00 in the morning, the work is very dangerous and sweepers are exposed to exhaust gas from cars.

Since most streets become very dark during night time, sweeping work at night is subjected to danger at all times.

### 1.7.3 Method of Street Sweeping

Street sweeping is performed by both mechanical and manual sweeping.

(1) Manual sweeping

1) Team

Street sweeping is performed on the basis of a team system with one team being comprised of eight sweepers and two handcart collectors. A sweeping street is allocated for each sweeper and the sweeper carries out sweeping of the assigned street. Therefore, all the team members do not sweep simultaneously at the same place according to this system.

2) Process

Sweepers go directly to the assigned street on foot from their homes without dropping in the office.

Brooms are placed at a specified place adjacent to the assigned street.

Dust, sand, etc. on the road side are swept and collected with a broom, and put into reserved place or loaded on 2-wheel barrow.

Waste put into reserved place is collected by other street waste collector with handcart roughly at a specific interval, and reloaded on collection vehicle.

(3) Mechanical sweeping

The most important streets among protocol streets, are swept using mechanical sweepers during night time.

1.7.4 Equipment and Materials for Street Sweeping

The following tools and devices are used for manual street sweeping:

Broom

Basket

2-wheel barrow

Handcart

Shovel



The conditions of using blooms and 2-wheel barrows among the above are summarized in Table 1.7-2 below:

Table 1.7-2 Present No. of Equipment for Street Sweeping

	Broom	Handbarrow	Small Handcart
Pusat	33,230	70	110
Barat	877	85	100
Timur	1,150	56	123
Utara		45	75
Selatan		35	
Total		291	408

#### 1.7.5 Personnel for Street Sweeping

The number of street sweepers and workers for individual Kecamatan of each Wilayah is summarized in Table 1.7-3 below:

Table 1.7-3 No.of Street Sweeper by Kecamatan

	Street Sweeper	Handcart worker	TOTAL
<b>PUSAT</b>			
Gambir	131	90	221
Menteng	174	15	189
Senen	100	79	179
Tanah Abang	113	37	150
Sawah Besar	68	49	117
Kemayoran	42	16	58
Cempaka Putih	41	8	49
Suk Dinas	24	0	24
<b>TOTAL</b>	<b>693</b>	<b>294</b>	<b>987</b>
<b>BARAT</b>			
Tamansari	124		124
Tambora	57		57
Grogol Pet	105		105
Cengkareng	22		22
Debon Jeruk	19		19
Sku Dinas	8		8
<b>TOTAL</b>	<b>335</b>		<b>335</b>
<b>TIMUR</b>			
Matraman	21	24	45
Pulo Gadung	156		156
Kremat Jati	360	396	756
Pasar Rebo	65		65
Cakung	18		18
Sku Dinas	11	4	15
<b>TOTAL</b>	<b>360</b>		<b>360</b>
<b>UTARA</b>			
Taning Priok	40	5	45
Koja	66	6	72
Penjaringan	38	6	44
Cilincing	14	2	16
Sku Dinas	12	0	12
<b>TOTAL</b>	<b>164</b>	<b>19</b>	<b>183</b>
<b>SELATAN</b>			
Tebit		36	36
Setiabudi		35	35
Manpang Prapatan		25	25
Pasar Minggu		31	31
Kebagoran Lama		46	46
Kebayoran Bam		116	116
Cilandak		23	23
Suk Dinas		78	78
<b>TOTAL</b>		<b>390</b>	<b>390</b>

### 1.7.6 Street Sweeping Survey

#### (1) Purpose

A street sweeping survey was conducted to get basic information for making a plan of street sweeping.

#### (2) Survey method

The time a sweeper took to sweep a certain distance of street and the amount of street rubbish collected was measured.

A balance scale was prepared to measure the weight of rubbish in portable plastic containers. The Survey was conducted in Jl. Let Jend. Suprpto in Cempaka Putih in the second week of September.

#### (3) Present situation

The present street sweeping situation is as follows:

- Assigned net length of road is about 1,500 m per sweeper.
- The sweeping equipment is a broom, which is made from a bundle of long fibres.
- Actual working time is from 5:00 a.m to 9:00 a.m.
- Street rubbish is put on a central reserve and small heaps are formed at regular intervals.
- Another sweeper collects the rubbish accumulated on the central reserve by using a handcart.
- Street rubbish collected by a handcart is loaded on a collection vehicle at a handcart pool.
- Sweeping is done daily, except Sunday.

(4) Result

Observation of two sweepers activity were made from 6:00 to 8:00 a.m. Waste amount swept and moving speed was measured. The result is shown in the following table.

Table 1.7-4 The result of street sweeping survey

	unit	A	B
Street length	m	56.3	56.3
Sweeping length	m	112.6	112.6
Time spent minutes	minute	13	15
Weight of rubbish	ton/M3	2.3*	6
Contents of rubbish		Dead leaf	Sand
Density	ton/M3	0.06	0.6
Moving speed	m/min	8.7	7.5
	m/h	522	450
Weight/distance	kg/km	40	107

(5) Comments

In case A, the sweeper collected the rubbish accumulated on a central reserve but did not collect sand. Therefore, the data on weight, which is marked\*, is not a reliable figure.

On the other hand, in case B, 107 kg/km is judged as a reasonable figure based on the actual situation.

The record of sweeping speed is also reasonable. Supposing a sweeper covers a distance of 1,500 m, where necessary working time corresponds to actual working time. If the standard length assigned to each sweeper is 2,000 m, as stated, it is necessary to set a figure of 4.5 hours as actual working time.

However, for manual street sweeping it is assumed that 4 hours without a break would be the work limit.

Working conditions for sweepers are obviously not good. Sweeper can not escape from car fumes and high temperatures.

Traffic congestion is quite heavy from 7:30 a.m. onwards and it was observed that work is very dangerous from 7:30 to 9:00 a.m.

Therefore, it would be better if manual sweeping finishes before 7:30 a.m.

## 1. 8 Organization of Cleansing Service - DKI Jakarta

### 1. 8.1 Configuration of the Organization

The Cleansing Service - DKI Jakarta is comprised of the following organization pursuant to the Governor Regulation No.15 set form in 1981:

The assignments are as listed below:

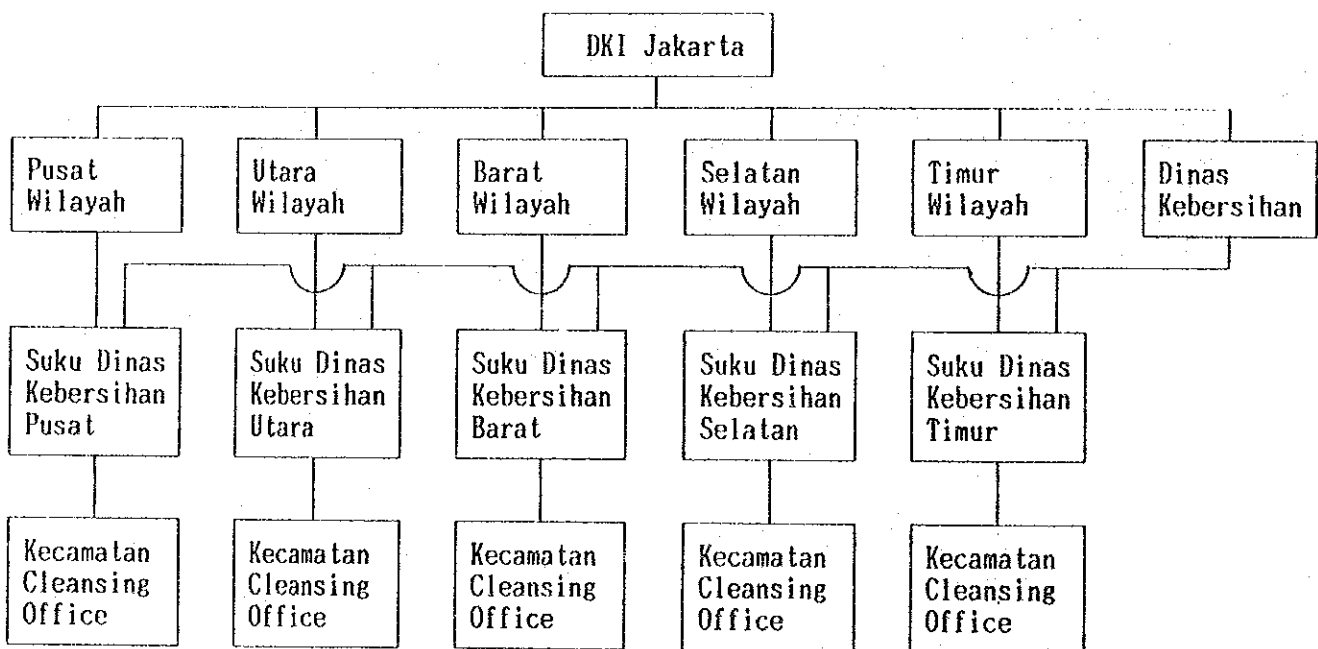
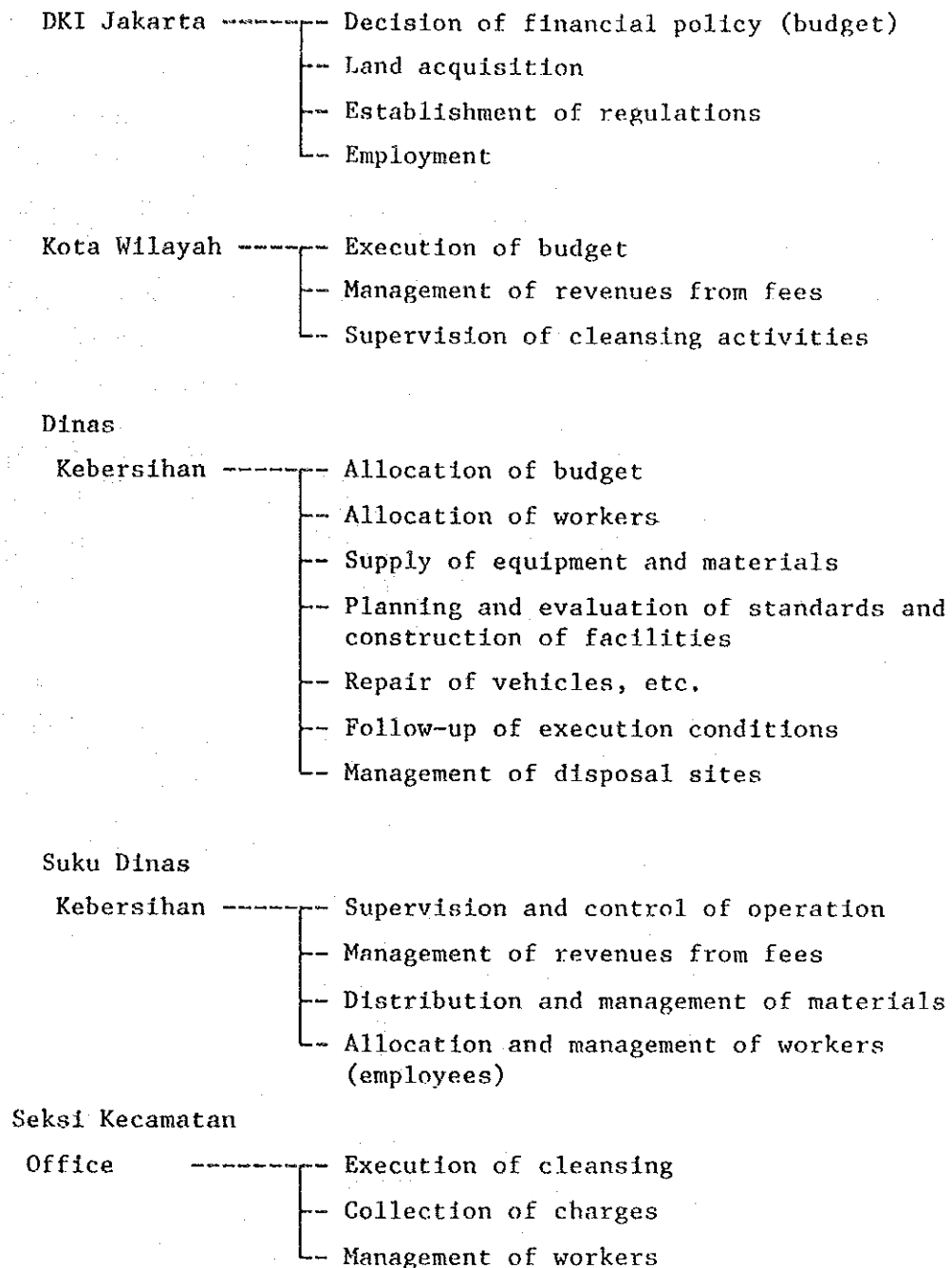


Fig.1. 8-1 Organization of Cleansing Service



The features of the basic configuration of this organization are as follows, for example. Namely, management and supervision of cleansing in each area is not executed directly by Dinas Kebersihan but by Suku Dinas Kebersihan, an intermediate management organization, while management and supervision of cleansing activities of each Wilayah is divided into Kota, Wilayah and Dinas Kebersihan.

The Cleansing Service is indicated further in detail in Fig.1.13-2. There are some duplicated portions of assignments within the organization particularly extensively between "Sub Service Solid Waste Management", "Sub Service Waste Water Management" and "Sub Service Cleanliness" and between "Sub Service Cleanliness" and "Sub Service Cleanliness Management". Also, the assignments are duplicated between "Sub Division Fuel and Vehicle Maintenance" of "Logistics Division" and "Workshop" as well as between "Administration Division" and "Personnel Division".

For Suku Dinas Kebersihan, a planning section and vehicle management (control) section are considered to be required.



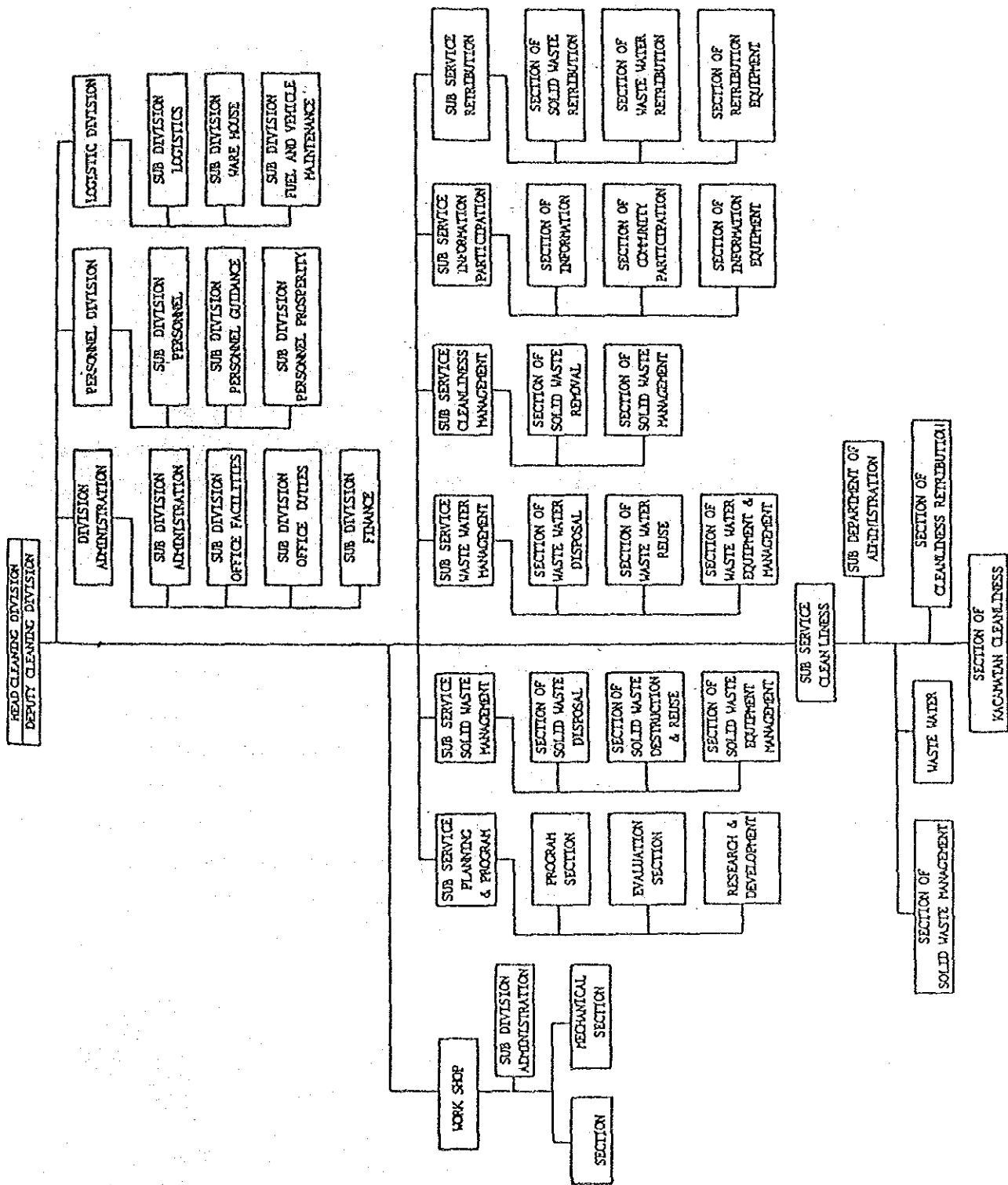


Fig.1. 8-2 Organization of Dinas Kebersihan

## 1. 8.2 Personnel (Manpower)

### (1) Personnel

#### 1) Management of Personnel and employment

The Personnel Affairs of the Government of the DKI Jakarta has the right pertaining to personnel and employment. The employees recruited by the Personnel Affairs are taken over to Dinas Kebersihan, and assigned to the respective sections of Dinas Kebersihan and Suku Dinas Kebersihan.

The Head of Dinas Kebersihan is appointed by the Mayor and entitled to appoint personnel of the respective sections. Although senior university graduate officials are transferred to the other sectors, medium or lower class employees are not transferred to other sections.

#### 2) Conditions of personnel

As the configuration of personnel according to the educational background is shown in Table 1.13-1, the ratio of university graduates to the total number of employees is only 0.3% or 1% when the number of vocational school graduates is included. Whereas, the number of senior high school graduates occupies 17.4% of the total. The number of university and vocational school graduates is concentrated in Dinas Kebersihan.

Table 1. 8-1 Configuration of manpower according to educational background

	Without Diploma	Primary School	Secondary School	High School	Bachelor of Arts	Master of Arts	Total
	208	593	63	136	6	-	906
1986/3PUSAT	924	729	146	199	9	1	2008
1986/3SELATAN	717		85	106	3	2	913
1986/3UTARA	439		37	112	3	-	591
BARAT	271	466	58	106	1	-	902
1986/4DINAS.K	767		81	432	21	20	1321
	2032	2982	470	1091	43	23	6641

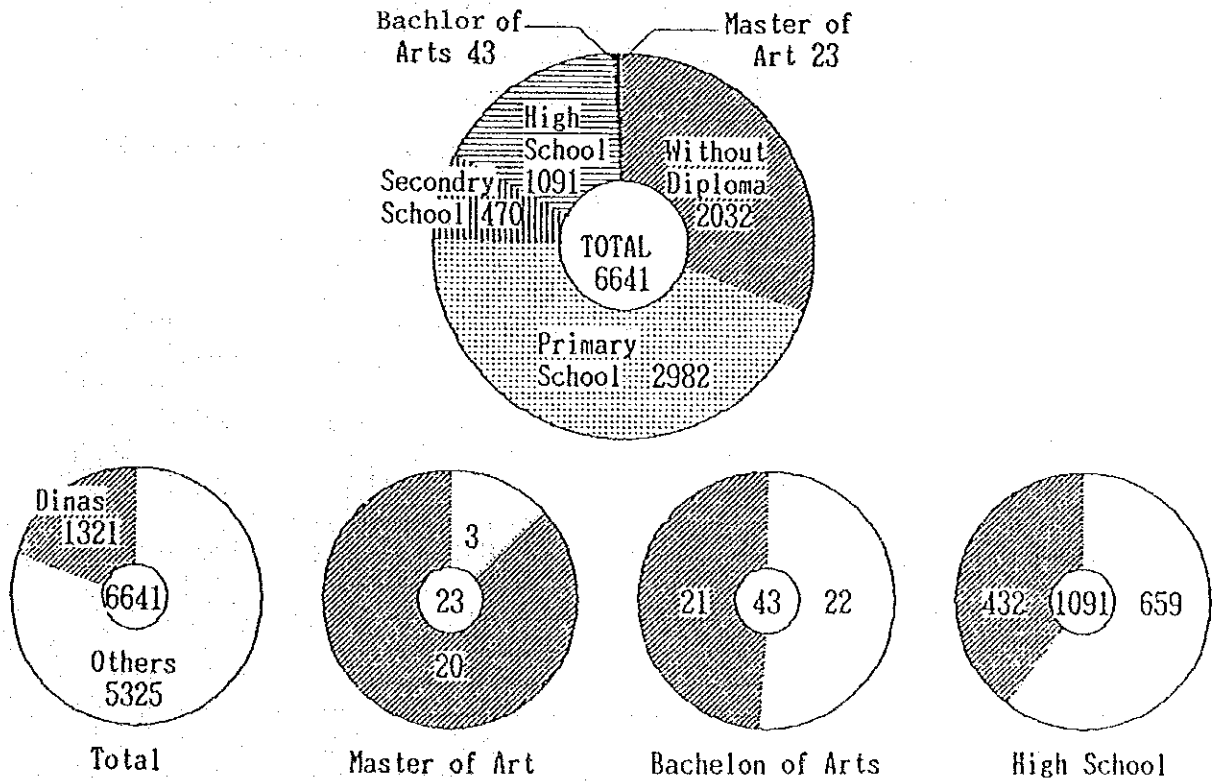


Fig.1. 8-3 Portion of Dinas Kebersihan

It is apparent that personnel is concentrated on Dinas Kebersihan.

As the educational background of crew and drivers are shown in Table 1. 8-2, their educational level is mostly elementary school or lower level.

Table 1. 8-2 Educational Level

		No Primary	Primary	Secondary	High School	Total
Pusat	Crew	214	225	20		459
	Driver	33	148	11	2	194
Selatan Timur		58	116	7	4	185
	Driver	22	4	1		64

3) Configuration by age

As the configuration of personnel according to age of each Suku Dinas is indicated in Table 1.13-3, the employees of 30s are largest in number, but those of 40s or over occupy 41.9% to the total number of employees. This indicates that the employees are getting comparatively older and older.

Table 1. 8-3 Configuration by Age of Personnel

	23-29	30-	40-	50-	TOTAL	Remerk
TIMUR	173	412	186	135	906	1986.3
SELATAN	171	382	215	145	913	1986.3
BARAT	176	290	248	188	902	1986.4
PUSAT	113	884	625	395	2017	1986.3
UTARA	66	317	143	65	591	1985/1986
TOTAL	699	2285	1417	928	5329	

Note: Excluding the personnel of Dinas Debersihan.

As the configuration of age of crew and sweepers is shown in Table 1. 8-4, the workers of Barat are specially getting older and older.

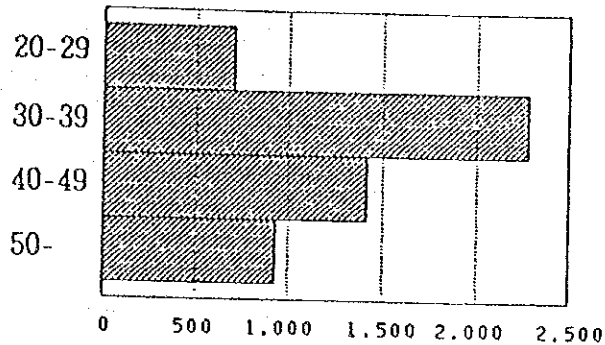


Fig.1. 8-4 Configuration of Age of Crew and Sweepers

Table 1. 8-4 Configuration of Age of Crew and Sweepers

	20-29	30-39	40-49	50-	TOTAL
Crew	28 (16.8)	40 (24.0)	48 (28.7)	51 (30.5)	167
Sweepers	47 (14.0)	71 (21.1)	119 (35.5)	98 (29.3)	335

Information on Barat only

(2) Employees Personnel

1) Transition of the number of personnel

As the transition of the number of personnel is indicated in Fig.1. 8-5, the number of personnel or employees tends to have been decreased from a peak marked in 1977, although the amount of waste collected indicated a substantial increase from 1979 through 1985.

The number of employees per 1,000 population increased to 1.87 in 1985 from 1.2 in 1977. When compared with the number of employees per population of 1,000 in the other big cities in Asia, the number of employees related to sweeping per population in Jakarta is smallest as shown in Table 1. 8-5.

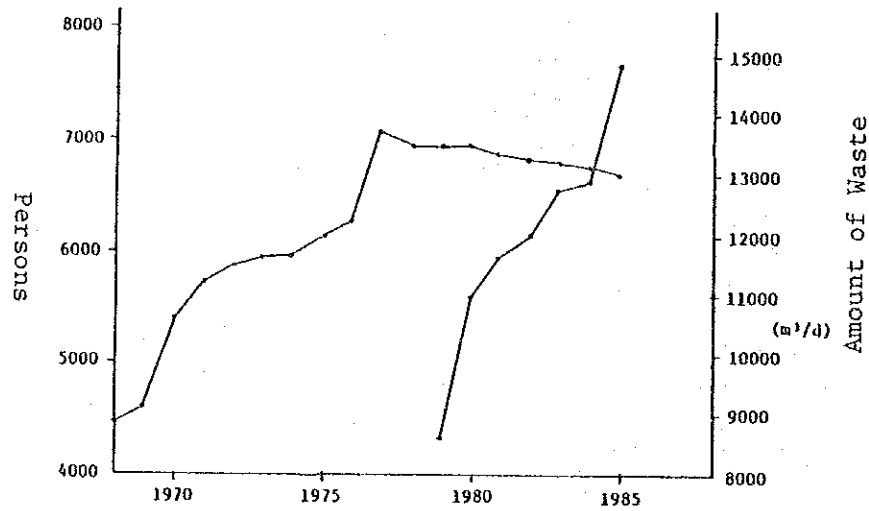


Fig.1.8 -5 Transition of No. of Personnel

Table.1. 8-5 International Comparison of Personnel

	Population	Work force	Employees /1,000	Remark
Manila	6,341,674	13,453	2.12	1981*
Bangkok	5,100,000	6,981	1.55	1981
Shanghai	12,000,000	30,000	2.50	1983
Soulu	9,200,000	8,410	0.91	1983
Tokyo	8,300,000	10,762	1.30	1984
Jakarta	7,630,000	6,643	0.87	1985

\* Including those of subcontractors

2) Configuration of employees

The configuration of employees in Jakarta is as shown in Table 1. 8-6.

Table 1. 8-6 Configuration of Employees

Chairman Staff	1281	19.0
Inspector	308	4.6
Driver	769	11.4
Crew	1,382	20.5
Sweeper	2,611	38.6
Security	130	1.9
Mechanic	212	3.1
Others	64	0.9
<b>TOTAL</b>	<b>6,757</b>	<b>100.0</b>

70.5% of the total employees are engaged in field work. When compared with the other big cities in Asia as shown in Table 1. 8-7, the outstanding features of Jakarta are that the number of crew is very small while the ratio of management personnel or officials is extremely high. The ratio of field workers to the total number of employees is as low as 70%, lowest among the five big cities.

Table 1. 8-7 Comparison of Personnel among International Cities

	Jakarta	Tokyo*	Seoul*	Bangkok	Manila*
Population	7,630,000	8,300,000	9,200,000	5,100,000	6,341,674
Driver	769	1,433	554	445	613
Crew	1,382	7,080	5,470	2,051	3,024
Sweeper	2,611	-	2,300	2,762	7,049
<b>TOTAL</b>	<b>4,762</b>	<b>8,513</b>	<b>8,324</b>	<b>5,258</b>	<b>10,073</b>
Ratio to total cleansing personnel	70.5	79.1	99.0	92.9	74.9

\* The waste collection service entrusted to private sector is not included in the case of Tokyo, Seoul and Manila.

3) Allocation of personnel (employees)

The conditions of allocating personnel to the respective districts are as shown in Table 1. 8-8. The number of personnel per population of 1,000 is 1.73 in Pusat, largest among others, while that of the other districts ranges from 0.59 to 0.75. Moreover, a large number of crew are also allocated in Pusat, and the estimated collection capacity per crew is as small as 1.56 tons in Pusat when compared with 2.2 tons or over in the other districts. The number of sweepers is also overwhelmingly large in Pusat. This indicates that personnel or employees are allocated preferentially in Pusat. The number of crews allocated is especially different between the respective districts.

Table 1. 8-8 Current Status of Solid Waste Management

	Population A	Number of vehicle B	Capacity collection C	Total Personnel D	Driver E	Crew F	Street Sweeper G
Pusat	1,236,877	214	745	2,141	215	479	1,075
Utara	963,915	92	379	592	87	172	206
Barat	1,231,188	146	634	927	98	196	422
Selatan	1,579,795	140	536	932	121	201	422
Timur	1,456,950	134	557	912	87	175	412
Dinas	*****	26	90	1,253	161	159	72
TOTAL	6,468,525	754	3,036	6,757	769	1,382	2,611
	E + F + G / D	D/A	B/E	C/F	G/D	G/A	
Pusat	82.6	1.73	1.00	1.555	0.483	8.691	
Utara	78.5	0.61	1.06	2.203	0.403	2.137	
Barat	77.2	0.75	1.49	3.235	0.425	3.428	
Selatan	79.8	0.59	1.16	2.667	0.440	2.671	
Timur	73.9	0.63	1.54	3.183	0.415	2.828	
Dinas	31.3	****	****	*****	*****	*****	
TOTAL	70.5	1.04	0.98	2.197	0.462	4.036	



### (3) Work Condition

#### 1) Type of Work and Work Condition

In Indonesia, the labour law sets working hours at less than 40 hours/week and set the minimum wages for each province.

The working conditions of each type of work in solid waste management are basically the same as shown in Table 1. 8-9

The previous study by Jakarta Pusat showed that the majority of drivers work more than 7 hours a day, though those of other workers work from 4 to 7 hours.

The working condition, especially that of crew, collectors & sweepers and inspectors at final dump sites, is very bad, and some work is very hard.

#### 2) Salary System

The salary level of employees in Dinas Kebersihan is generally lower than at private companies. For instance, in the case of mechanics, their average salary is between Rp.50,000 - Rp.100,000/month, however, mechanics in private companies get more than Rp.150,000/month.

The grade of the employees of Dinas Kebersihan and number in each grade is shown in Table 1. 8-10. The starting grade depends on previous experience. Promotion usually takes place every 4 years.

Table.1. 8-9 Work Condition

No. of Employees	Work Time	Working Day	Major Rank	Basic Salary	Incentives	Others	Comments
Chairman & staff	8.00 - 15.00 8.00 - 11.30 (Fri) 8.00 - 14.00 (Sat)	Excluding Sunday & Holiday	I/d			Rice and uniform are subsidized	
Inspector	Same as above	Same as above				Same as above	
Driver	Same as above (more than 7 hours 72%)	Same as above (6 days/week 51.5%)	I/c (64%)	Rp. 25,000 - Rp. 50,000.	Rp. 5,000 - Rp. 1,000.	Same as above	Resource: Result of enquete by Central Jakarta
Crew	Same as above (4-7 hrs. 61.1%)	Same as above (6 days/week 87.1%)	I/c	Rp. 25,000 - Rp. 50,000. (56.7%)	Rp. 5,000 - Rp. 10,000. (96.9%)	Same as above	
Sweeping & Handcart	Same as above	Same as above	I/c			Same as above	
Mechanics	Same as above	Same as above	I/d	Rp. 50,000 - Rp. 10,000.		Same as above	
Special Police	Same as above						

6605

Source: Annual Report of Dians Kebersihan  
Suk Dinas Jakarta Pusat

Table 1. 8-10 Salary Grade and Number of Employees (1984)

Grade	Number of Employees (1984)			Basic Wage (Rp/month)
	Dinas Kebersihan	Suku Dinas	Total	
I a	46	54	100	33,200 - 67,900
I b	46	221	268	43,400 - 84,000
I c	293	2,649	2,942	45,600 - 92,000
I d	312	1,792	2,104	48,100 - 100,200
II a	216	411	627	55,500 - 120,800
II b	171	244	415	66,900 - 138,400
II c	111	84	195	70,100 - 147,600
II d	28	38	67	73,600 - 157,000
III a	15	5	20	81,000 - 171,000
III b	7	3	10	84,400 - 180,400
III c	4	2	6	87,600 - 190,300
III d	2	-	2	90,800 - 200,200
IV a	-	-	-	93,200 - 220,400
IV b	1	-	1	98,700 - 231,200
IV c	1	-	1	110,400 - 253,500
IV d	-	-	-	116,800 - 265,600
<b>Total</b>	<b>1,254</b>	<b>5,504</b>	<b>6,758</b>	

Source: Dinas Kebersihan

(4) Actual conditions of workers

The results of investigation of the working and other conditions of crew and drivers carried out by Dinas Kebersihan with regard to Pusat are presented hereunder further in detail.

This investigation was carried out with regard to 196 drivers and 448 crew corresponding to over 90% of the total number of those in Pusat.

1) Age

The age of drivers is mostly 40 or over and 40% of crew are 40 or over.

Table 1. 8-11 Age of Crew/Driver

	Crew	Driver
More than 40	180	171
0-40	268	25
TOTAL	448	196

2) Status of marriage

90% of both crew and drivers are married.

3) Housing status

46.9% of drivers and 39.3% of crew live in dormitories and 29.6% of drivers and 50.9% of crew have their own homes. The number of those living in rental houses is small.

4) Education

The majority of both drivers and crew have education level or primary school or lower.

Table 1.8-12 Education Level of Crew/Driver

	Crew	Driver
No primary school (No graduated)	204	33
Primary school	225	148
Secondary school	20	11
High School	0	2
TOTAL	449	194

5) Personal status

Most of both crew and drivers are employed by the government.

6) Position/ranking

In terms of position or ranking, the majority of both crew and drivers belong to either I/C or I/D class.

Table 1. 8-13 Ranking of Crew/Driver

	Crew	Driver
I / A	5	9
I / B	33	4
I / C	261	126
I / D	149	56
II / A		1
TOTAL	448	196

7) Working hours

30.8% of crew and 77.5% of drivers are working for seven hours per day.

Table 1.8-14 Working Hours

	Crew	Driver
least than 4 hours/day	5	1
4-7/day	305	44
over 7 hours/day	138	151
TOTAL	448	196

8) Basic salary

The basic salary of the majority of both crews and drivers range from Rp.25,000 to Rp.50,000.

Table 1.8-15 Basic Salaly of Crew/Driver

	Crew	Driver
least than Rp 25,000	11	6
Rp. 25,000-50,000	254	148
Rp. 50,000-75,000	153	
Rp. 75,000-100,000	30	18
over Rp:100,000	0	24
TOTAL	448	196

9) Bonus

Any special bonus is not paid to most of drivers and drew.

10) Food/incentive

Rice is supplied to both drivers and crew.

Moreover, 96% of crew and 78.6% of drivers are receiving an incentive of Rp.5,000 - 10,000 per month mainly from Seksi Kecamatan.

Table 1. 8-16 Incentive of Crew/Driver

	Crew	Driver
least than Rp 5,000	14	0
Rp. 5,000-10,000	430	154
Rp. 10,000-15,000	4	2
over Rp:15,000	0	40
TOTAL	448	196

11) Safety

Boots, hand gloves, helmet, uniform, etc. are supplied to crew and drivers roughly once a year as required. However, these are not supplied to all of them.

Table 1. 8-17 Safety Goods for Driver/Crew

Driver		Crew	
Rain coat	50 (25.5%)	Masker, Rain coat,	281 (62.7%)
Boots	49 (25.5%)	Hand Gloves, Boots,	
Hand Gloves	49 (25.5%)	Helmet	
Helmet	48 (24.5%)	• Helmet, Boots, Rain	43 (9.6%)
		coat, Hand Gloves,	
		• Boots, Helmet	39 (8.7%)
		• Masker, helmet,	28 (6.2%)
		Boots, Hand Gloves,	
		• Boots, Rain Coat,	10 (4.0%)
		• Boots, Helmet	48 (24.5%)

## 1.9 Treatment and Disposal

### 1.9.1 Final Disposal Site

There are three disposal sites which are being used in March, 1986 in Jakarta. These are Kapuk Muara located on North-west, Sunter located in north and Srenseng located in west.

Cakung Cilincing disposal site located in east was main disposal site for east side of Jakarta in February. It was said Cakung was still used although it had been filled up. Large dump sites in Bekasi and Tangerang are planned for future dump sites.

Existing disposal site and future disposal site are shown in Table 1.9-1 and Fig. 1.9-1.

Note: In September 1986, Dinas Kebersihan is using three disposal site, Srengseng, Cakung and Kampuk Kamal where located north west of Jakarta.

### 1.9.2 Remaining Capacity

Remaining capacity of existing disposal site are about 2.2 million m<sup>3</sup>. This means, that remaining capacity is only same as 1.4 years to dispose.

$$18,000\text{m}^3/\text{day} \times 365 \text{ day} \times 0.2 \text{ t/m}^3 = 1.3 \text{ million t/year}$$
$$2.2 \text{ million m}^3 \times 0.8 \text{ t/m}^3 \quad 1.3 \text{ million t/year} = 1.4 \text{ years.}$$

There are some case that owners of the swamp area requested to Dinas Kebersihan to fill up their swamp with garbage, and Dinas Kebersihan accept it then filled the swamp. Even if it will be expected in fugure, remaining capacity is too short to prepare the disposal site in Bekasi and Tangerang under consideration of long distance from Jakarta city.



Table 1.9-1 Disposal Sites

Location		Distance (Km)	Area (Ha)*	Depth (m)	Capacity (1000m <sup>3</sup> )	Remaining Capacity	Remark
<u>Existing Sites</u>							
Kapuk Muara	Utara	15	65	3	1,950	1,365	(70%) Swamp
Cakung	Utara	20	15	3	450	-	"
Cilincing							
Pademangan	Utara	7	8	3	240	-	"
Srengseng	Barat	12	15	3	450	450	"
Sunter	Utara	10	12	3	360	360	"
Cengkareng	Barat	15	4	3	120	30	"
Sub Total			119 ha		3,160	2,205	
<u>Future Sites</u>							
Bekasi		40	100	10	10,000	10,000	Table land
Tangerang		40	100	7	7,000	7,000	Swamp
Sub Total			200 ha		17,000	17,000	
Total			319 ha		20,160	19,205	

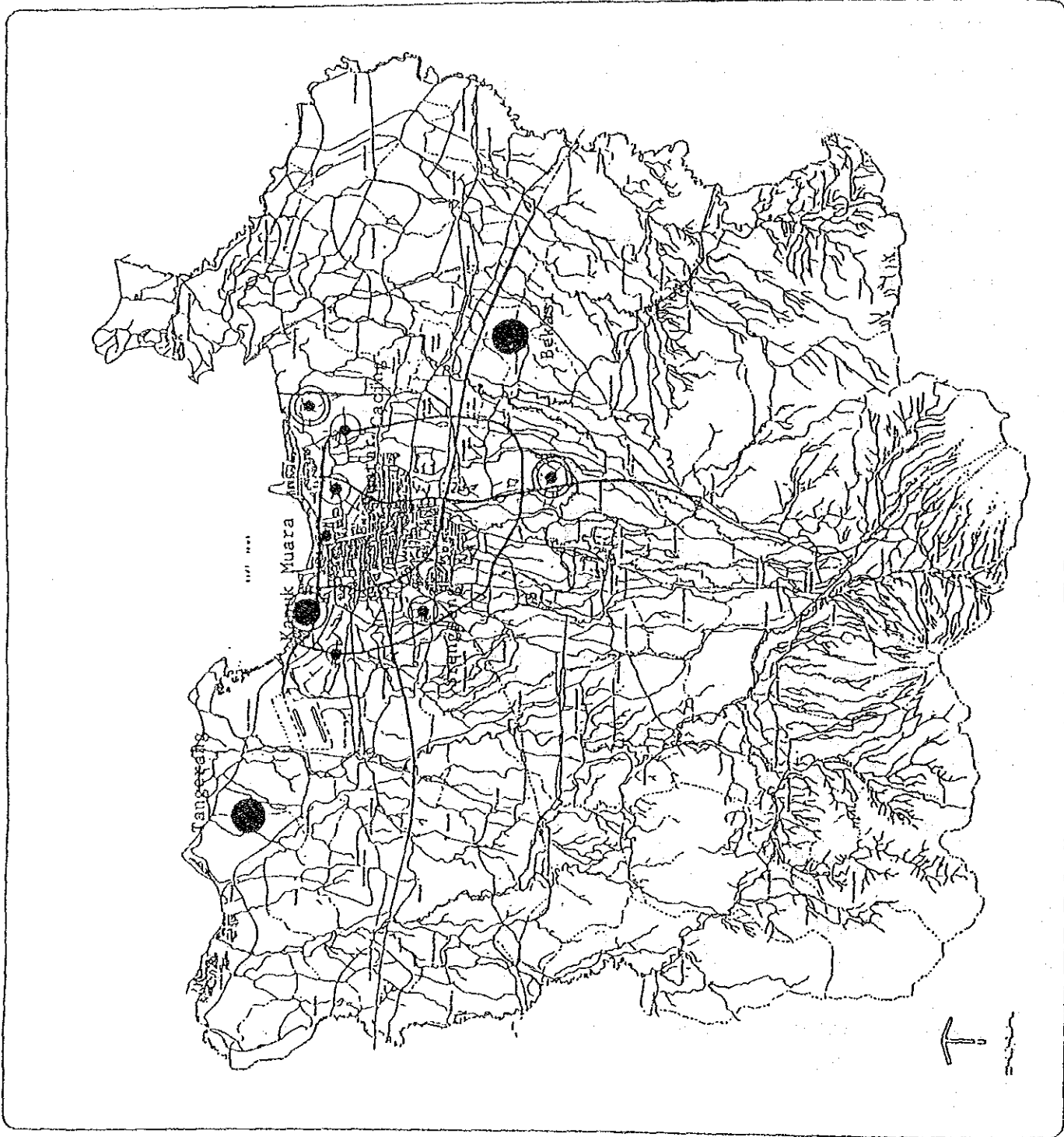
\* Hearing from Dinas Kebersihan

Table 1.9-2 Candidate Transfer Station Sites

	Distance (Km)	Area (Ha)*	
Srengseng	12	15	Swamp
Sunter	10	12	Swamp
Cilangkap	25	50	
Kanjangan	25	50	Swamp

Note: Sunter and Srengseng are used as disposal sites also.

\*Hearing from Dinas Kebersihan



LEGEND

- Future dump site
- ◐ Present dump site
- ⊙ Last dump site
- ⊕ Candidate transfer station

Fig. 1.9-1

Location of disposal sites

Solid Waste Management  
System Improvement Study  
in The City of Jakarta

## 1.10 Maintenance

### 1.10.1 Facilities, Equipment, Organization and Functions

#### 1) Workshop

Lay out of the workshop is shown in Fig. 1.10-1. Organization of the workshop is divided into 4 sections as shown in Table 1.10-1.

#### Workshop Facilities

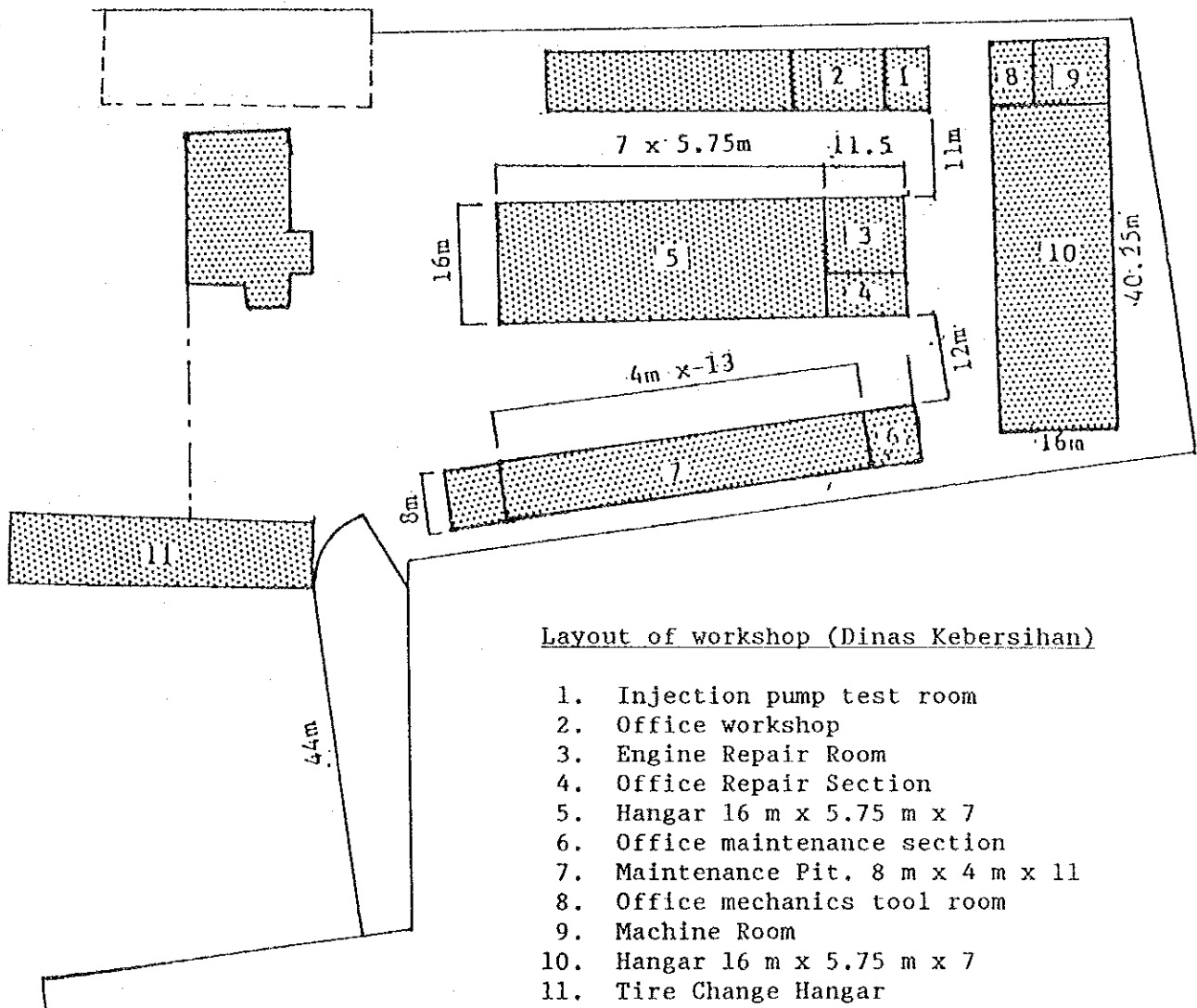


Fig. 1.10-1 Layout of Workshop

Table 1.10-1 Organization of Workshop and Equipment

Section	Person	Facilities and Equipment	Job
Administration	20 persons	Office No. 2	Administration of Workshop
Repair	114 persons Chief - 1 Staff - 12 Heavy Equipment - 8 Mechanics - 18 Grp.	Workshop No. 3,4,5,11  Crane 3 t - 1 pc. Hand tool - 19 set Jack - 5 pcs.	Repair chassis  Engine Tire Heavy Equipment
Service	60 persons Chief - 1 Staff - 11 Mechanics - 48	Workshop 1,6,7 Injection pump tester - 1 pc. Maintenance Dit - 13 pcs. Compressor - 1 pc. Hand tool - 14 set	Monthly maintenance field service
Mechanics	43 persons Chief - 1 Staff - 6 Mechanics - 36	Workshop 8,9,10 Crankshaft grinder - 1 pc. Turning Machine - 2 pcs. Bench Drill - 4 pcs. Welding Machine - 5 pcs. Scrapper - 1 pc. Frais - 1 pc.	Hydraulic Electric Welding Machining

2) Garage

There is a standard layout of the Suku Dinas Office including a garage as shown in Fig. 1.10-2.

The organization of the garage and its equipment are shown in Table 1.10-1 and the function of each section of the garage is as shown in Fig.1.10-3.

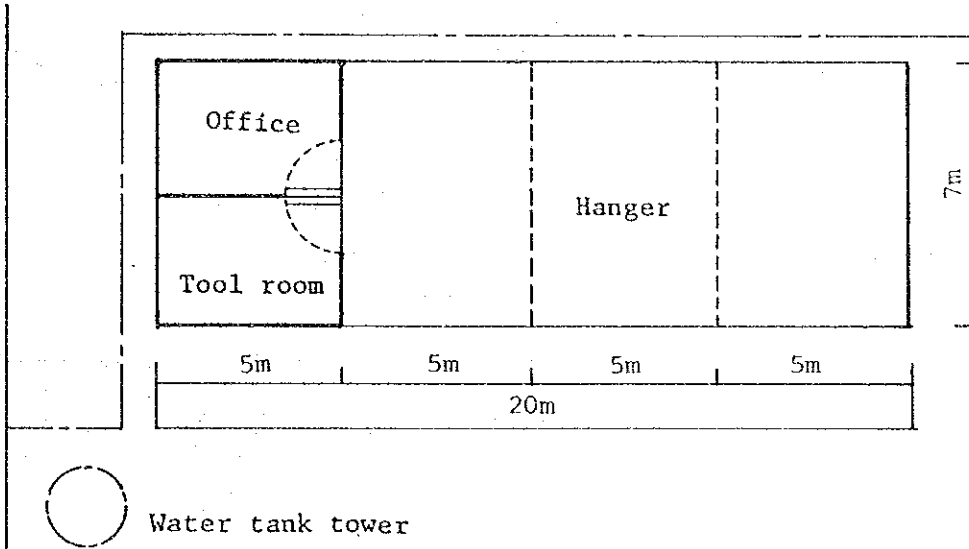


Fig. 1.10-2 Layout of Garage (Wilayah)

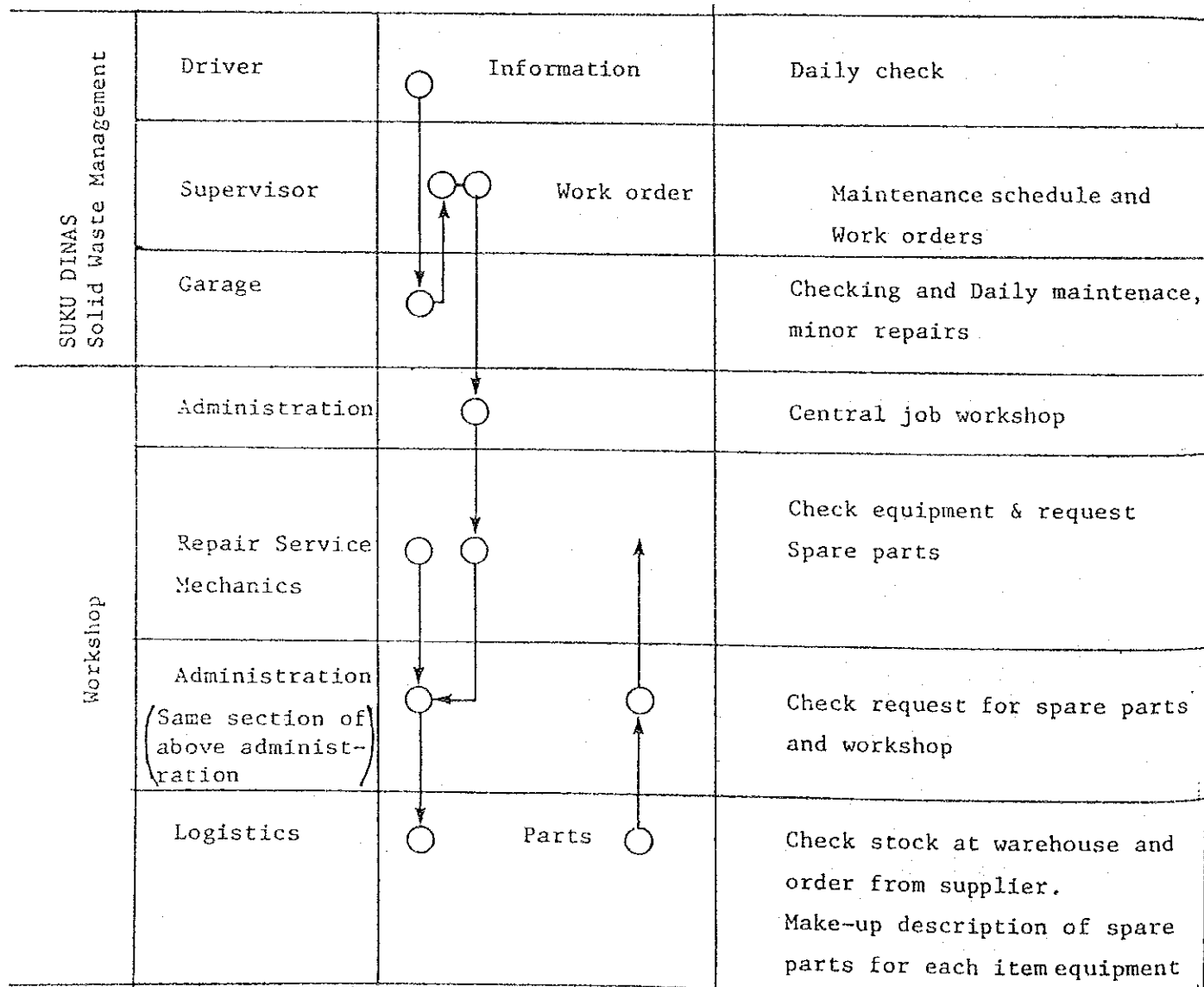
Table 1.10-1 Garage

Persons	Equipment	Job
8 persons	Jack - 2	
Supervisor - 1	Tire Changer - 1	Daily and Weekly maintenance,
Mechanics - 7	Compressor - 1 Grease Pump - 1 Hand Tool - 2 set Electric Welder - 1	Minor Repairs

3) Functions

The followings are the maintenance works of the Suku Dinas office and Workshop.

Fig. 1.10-3 Functions



1.10-2. Maintenance work

1) Maintenance Schedule

A maintenance schedule is necessary for efficient operation. Present schedule is shown in Table 1.10.2

Table 1.10-2 Present Schedule of Maintenance

Daily & Weekly	Checking and maintenance by Drier at garage of Suku Dinas Kebersihan
Monthly	Monthly checking and maintenance by section of Suku Dinas Kebersihan and by mechanics at workshop according to maintenance schedule.
Quarterly	not done
Annually	not done

2) Maintenance Costs

Maintenance costs of the collection vehicles are as shown in Table 1.10-3.

Table 1.10-3 Maintenance Costs

Lubrication A	Spare parts B	S.T.N... C	Batteries Tires D	Total E
Rp.432,963.322	Rp.417,918.855	Rp.40,300.400	Rp.297,926.040	Rp.1,189,108.674

10 months (April/85 - February/86) for 850 Vehicles

$E/850/11 = \text{Cost/Vehicle/Month}$

$Rp.1,189,108.674 \times 1/850 \times 1/11 = Rp.127,177/\text{Vehicle/Month}$

1.10.3 Vehicle and Equipment

- Number of vehicles and equipments classified procurement year is shown in Table 1.10-4.

Table 1.10-4 List of Vehicles and Equipments

Model	Year	Number	Number Broken	Number in Operation	86	85	84	83	82	81	80	79	78	77	76	75	74
					(L)	(S)	(L)	(S)	(L)	(S)	(L)	(S)	(L)	(S)	(L)	(S)	(L)
Compactor	(L)	18	9	9													
	(S)	109	2	107	20	21	42	6	24		3						
Typer	(L)	53	0	53				28	9	11							
	(S)	189	0	189	105		84								5		
Arm Roll	(L)	28	1	27						6							
	(S)	29	0	29			29								6	15	
Cargo	(L)	293	95	198						8					61	112	17
	(S)	138	56	82									8		44		
Street Sweeper	(L)	9	0	9		2			2								
	(S)	3	0	3							3						5
Shovel Dozer		37	9	22	4	4	3	3	3	13	2			1			
Bulldozer		18	1	17	6	6				5							
Wheel Loader	(L)	6	0	6		6											
	(S)	30	0	30		30											
Shovel Loader		22	4	18													17
Buck Hoe		3	0	3		2		1									
Other		2	0	2		1			1								
TOTAL		981	177	804	142	55	187	42	30	36	8	13	1	146	127	17	



1) Present condition of vehicles

Condition of vehicles and equipment is as follows:

Total Number of Vehicles	981 units	100%
Vehicles out of order	177 units	18%
Vehicles in operation	804 units	82%

Of the 804 vehicles in operation, 18% are in Condition A, 30% are in condition B, 9% are in Condition C and 43% are in Condition D.

Condition A: Maintenance necessary

Condition B: Maintenance and minor repairs necessary

Condition C: Major repairs necessary

Condition D: Overhaul necessary

2) Average Life Time

Table 1.10-5 Average Life Time of Vehicles

Years of Manufacture	80	79	78	77	76	75	74	73	72	71	70
Number of Vehicles out of order	4	1	5	9	52	4	27	4	2	64	5
Number of Vehicles in operation	36	8	13	1	146	127	17				

From these figures 56 vehicles manufactured in 1976 and 1975 are out of order, and 273 are still in operation. However, 273 vehicles are in Condition D. The average life time of each vehicles, therefore, is 10 or 11 years.

### 3) Procurement of Vehicles

Procurement of Vehicles in the past five years is as follows:

Table 1.10-6 Number of Procurement of Vehicles in Past Five Years

Year	1981/1982	1982/83	1984/85	1985/86
Number of Vehicles	20	29	239	38

The following number of vehicles is expected to be out of order and cannot be used within the years indicated in the Table 1.10-7.

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Table 1.10-7 Estimated Number of Out-of-order Vehicles

Year	1-2 years	5-6 years	7-8 years
Number of Vehicles	270	100	250

Judging from the above data, it is necessary to make an annual plan of the procurement of vehicles considering the increasing amount of waste.

#### 1.10.4 Conclusion

Maintenance and repairs are carried out through work orders. There are records of maintenance and repair work. However, these data are not well-used, since they are not properly filed.

Workshop efficiency is considered sufficient to cope with the work load of the present number of vehicles, but the present system may not be able to ensure the maintenance work when the workshop is used to its full capacity.

The capacity of the present workshop may not be sufficient when the number of vehicles increases in the future, therefore, it is recommended to improve the facilities and organization of the garage.

To ensure the use of vehicles for long periods, periodical and preventive maintenance is necessary. Maintenance to prevent chassis corrosion is necessary. This is a recurrent problem.

## 1.11 Recovering Reusable Materials

### 1) Organizational Setting

The organizational chart for solid waste recycling can be seen in Fig. 1.11-1.

From figure 1.11-1, it is clear that households can get used goods either directly from the used goods collector or through agents. But in some cases, especially for recycle goods, most of the collectors have to go through the agents before the goods are acceptable for manufacturing.

### 2) Methods of Business

Only a small portion is solid waste, which includes paper, plastic, such as bottles, etc. and also industrial waste. This kind of solid waste is ready for the recycling process. Information on the amount of this kind of solid waste and also selling prices, etc. is given in Table 1.11-1.

The background of the used goods collector is somewhat similar to that of the solid waste collector already outlined in the survey \*. Most of the used goods collectors received only elementary school education or even never went to school. They are at productive ages ranging from 20 - 40 years old, and come to Jakarta from other provinces to seek employment. In their place of origin, most of them were either unemployed or daily laborers.

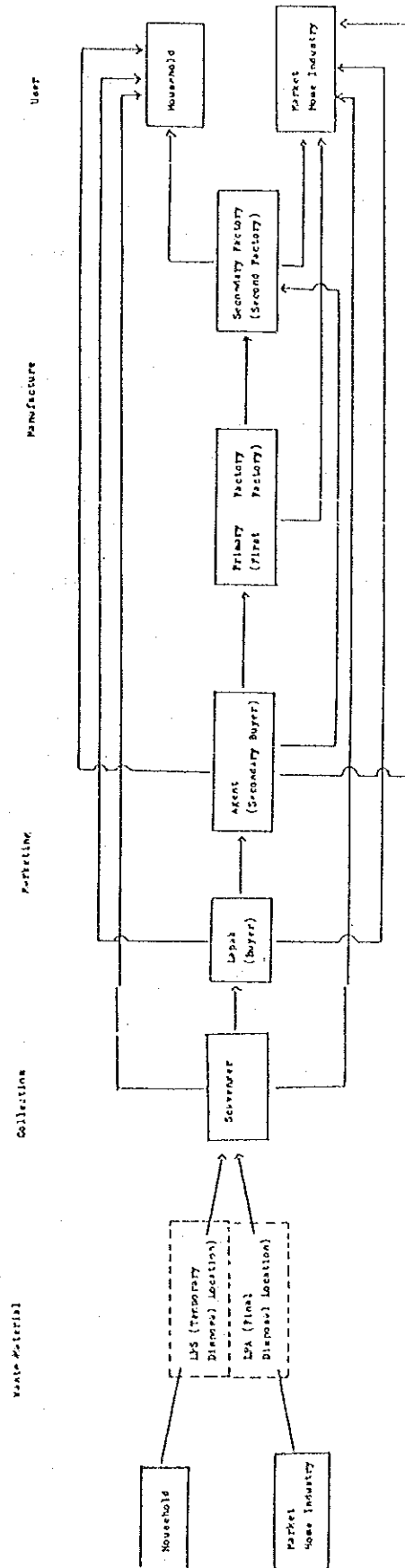
As to monthly income, the BPPT survey revealed similar findings to the survey done in the field. Most of the used good collectors received a monthly income of between Rp 30,000 to Rp 45,000. Some of them received more than Rp 100,000 a month but this was considered exceptional.

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\* See : BPPT, Study Aktivitas Pemungutan dan Pemanfaatan Barang Bekas,

Jakarta, July 1983, page 14 - 19

Fig. 1.11-1 Organizational Chart for Solid Waste Recycling



Source : BPP Technologie GmbH, 1977

Table 1.11-1 Price of Salvaged Materials

Type of Salvaged Material	Price of Salvaged Material		From Subowner to Industry Factory or Farmer	User	Necessaries	Advantages
	From Salvager to Buyer (Bank) or Second Buyer (Agent)	From Buyer (Bank) or Second Buyer (Agent) to Industry Factory or Farmer				
A. Iron / Metals - Brass - Copper (kind of old pot) - Aluminium (kind of milk: aluminium) - Others metal / Iron	Rp 500 /kg Rp 900 /kg Rp 900 /kg Rp 60 - Rp 70 /kg	Grade I: A <sub>1</sub> = 100K (the metal density 5 mm) Grade II: A <sub>1</sub> = 80K } Rp 70 /kg A <sub>2</sub> = 25K } Grade III: A <sub>1</sub> = 10K (the metal density 3 mm) A <sub>2</sub> = 40K } Rp 81 /kg A <sub>3</sub> = 74 /kg } A <sub>4</sub> = 20K } Rp 40 /kg A <sub>5</sub> = 20K } (the metal density 3 - 5 mm) Grade IV: B = 10K } Rp 10 /kg Grade V: B = 41K } Rp 10 /kg C = 27K } (thin metal) Rp 100 - Rp 125 /kg		Metal Nasion Manu facture Industry	± 150 ton/ day	Concrete Iron Flat Iron Mill Iron
	Rp 80 /kg Rp 200 /kg Rp 30 /kg Rp 300 /kg Rp 200 /kg	Rp 110 /kg Rp 225 - Rp 250 /kg Rp 100 /kg Rp 325 - Rp 350 /kg Rp 350 /kg		Paper Carton Indust ry  Plastic Manufacture Industry	± 7 ton/ day  ± 1 ton/ day	New Carton Board  Phil Plastic Sandal Plastic etc
	Rp 60 - Rp 80 /kg		Rp 20 - Rp 30 /kg	Chicken Breeder	± 10 ton/day	Chicken Food
	Rp 15 - Rp 20 /kg Rp 10 Rp 50 - Rp 60 /kg		Rp 20 - Rp 37 /kg	Piste, Glass, Lamp Beverage, Medicine Bottle Industry	± 5 kw/ day	Piston Components for Piston Glass, Beverage Bottle, Medicine Bottle, etc Factory
D. Bone			Flower Farmers (Took from sawing mill)	± 5 - 7 bag/day	Vegetation Manure	
			Farmer (took from waste truck vehicles)	± 15 - 20 truck/day	New Tobacco  Vegetation Manure	
E. Glass / Bottle / Plate - White Glass - Green Glass - Bottles						
F. Saw-dust						
G. Snus Cigarette - Clean Tobacco - Dirty Tobacco						
H. Packet Waste						

Table 3.1-11 Price of Salvaged Materials

Source : Technica Faculty, University of Pancasila report, 1982

### 3) Salvaging Activity

- According to the BPPT report, the number of scavengers was approximately 10,000 in the year 1982. They are low educated and unskilled.
- They salvaged mainly at LPS but also from houses and markets selecting metal, glass, paper, plastic and so on.
- Average income of a scavenger was Rp. 1,500 day (Rp. 500 - 3,000/day) in 1982 and it was twice the minimum wage Rp 750/day in Jakarta at that time.
- Average amount salvaged in one day is about 26 kg/person. Therefore, total amount was estimated as 260 t/day and about 7% of the solid waste generated in DKI Jakarta.
- Most of the salvaged material is sold to Lapak (small buyer) as shown in Fig. 1.11-2.

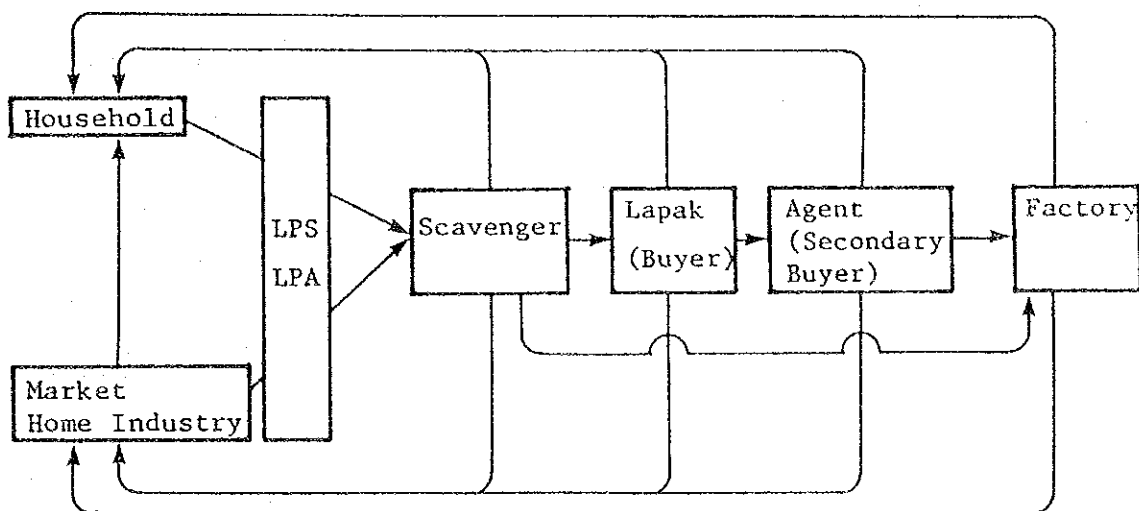


Fig. 1.11-2 Recycle Route of Salvaged Material

- The price of salvaged materials depends on their quality; such as cleanliness and dryness and also depends on their market price.
- According to the newspaper and interviews with scavengers who are working at the Sunter disposal site, price is as follows.

Table 1.11-2 Price of Salvaged Material

	From Scavenger		From * Buyer	From * Second Buyer
	Base hearing	Base news- paper		
Metal	25	-	50	54
- Tin	-	25	-	-
Glass	15	-	25	-
- Bottles	-	50	-	-
- Glass (pieces)	-	-	-	-
Paper	30	-	-	-
- Carton board	-	50	50	50
Plastic	-	-	55	-
- Bin	100	-	-	-
- Sheet, Bag	-	12.5	-	-
Aluminium	-	-	300	340

\* According to BPPT report.

#### 4) Demand for Compost

- According to the study of PT. Pupuk Kujang, compost will be valued Rp. 10,000 per ton maximum.
- Assuming the market area of Jakarta is to have a 100 km radius, the demand for compost will be 74,000 ton/year as shown in Table 1.10-3 on condition that the price is not more than Rp. 10,000 per ton.



- This demand is equal to the amount produced at the treatment plant which has a compost capacity of about 800 ton/day, when the amount of compost produced is 25% of the treated amount of solid waste.

Table 1.11-3 The Assumption on Demand of Compost in the Areas of DKI-Jakarta, Tangerang, Bekasi, Bogor and Cianjur Regencies (in the 1982)

No.	Location	Commodities	Area of cultivation (ha) or production year (truck)	The assumption of compost demand, 10-15% of potentiality (in ton)
1.	Tangerang	1. Crops	2,920	7,434
		2. Fruits	7,565,745 trunks	7,588
		3. Vegetation	2,885	4,972
		4. Adorning Plants	49	49
		Sub total	5,854	20,043
2.	D.K.I Jakarta	1. Fruits	3,891	1,745
		2. Vegetation	11,420	15,008
		Sub total	15,311	16,753
3.	Bekasi	1. Vegetation	1,978	4,000
		2. Crops	1,650	3,588
		Sub total	3,628	7,588
4.	Bogor	1. Vegetation	2,105	3,480
		2. Crops	9,390	22,671
		Sub total	11,495	26,151
5.	Pacet & Cianjur	1. Vegetation	2,118	3,250
Final Total			38,406	73,785

- Note:
1. The result of analysis of the available data.
  2. The demand of compost fertilizer is calculated as follows:
    - for the vegetation plant it is based on 10 to 20 tons/hectre/year.
    - for the crops it is calculated on the base of 10 tons/hectre/year.
    - for the adorning plants and fruits it is calculated on the base of 10 tons/hectre/year.
  3. The demand of compost is assumed 15% of total fertilizer consumed for the vegetation.
  4. The demand of compost is assumed 10% of total fertilizer consumed for the fruits and adorning plants.

## 1.12 Institutional Framework

### 1) Legal Background of Cleansing Service - DKI Jakarta

The legal and historical background of Dinas Kebersihan (Department of Cleansing Service) in DKI Jakarta follows in Table 1.12-1.

Table 1.12-1 Legal Aspects

Date	Introduced by	Description
1953	President	Law No. 18/1953 Duty and responsibility of Local Government for Public Works.
1961	President	Law No. 2/PNPS/1961 Law concerning "the Government of Greater Metropolitan Jakarta Special Territory".
1964	President	Law No. 10/1964 Law concerning "Change the name from the Greater Metropolitan Jakarta Special Territory to the Capital city of Jakarta".
Sept. 1965	Governor	Declare establishment of 'KOMANDO KEBERSIHAN (Command of Cleansing)' for cleansing service.
Dec. 1967	Governor	Regulation concerning "Change the organization and name from "Command of Cleansing" to "DINAS KEBERSIHAN, DAERAH KHUSUS IBUKOTA JAKARTA (Department of Cleansing Service in Jakarta Metropolitan Special Territory),
1972	Governor	Regulation No. 3/1972 Regulation concerning "Prohibition of illegal discharge and disposal".
1974	President	Law No. 5/1974 Law concerning the Local Government.
1976	Governor	Regulation No. B VII-1498/a/1/1976 Regulation concerning Cleansing Service for Community and citizen.
1977	Minister of Home Affairs	Regulation No. 363/1977 Regulation concerning the Organization and Responsibility of Local Government.

Table 1.12-1 Legal Aspects (Cont'd)

Date	Introduced by	Description
1979	Governor	Regulation No. 8/1979 (Section 9 - Article 22) Regulation concerning "Retribution on Cleansing Service".
Dec. 1981	Governor	Regulation No. 15/1981 Regulation concerning the Organization and the activity of sanitation management in the Department of Cleansing in DKI Jakarta.
Jun. 1982	Minister of Home Affairs	approval No. 061.131-820 Approval of the Regulation No. 15/1981 by Governor, with partial correction.

2) The tasks and Responsibility of Cleansing Service - DKI Jakarta

In accordance with Regulation No. 363/1977 by the Minister of Home Affairs, with Regulation No. 15/1981 by the Governor and others, the Tasks and Responsibility of cleansing service in DKI Jakarta are instituted as follows.

- a. In the activity of sanitation management, there are three components which are directly integrated with each other.

These are:

- . Community, Citizen and discharger
- . Chief of local government
- . Cleansing service department

- b. Tasks and responsibility of the community, citizens and others who produce and discharge waste;

- . To collect generated waste at some place which has already been prepared by each person or group
- . To collect solid waste from abovementioned places; to take the waste to L.P.S. (Temporary Transfer Station) in an effort to be self-supporting.
- . To coordinate with other groups and authorities.

3) Tasks and responsibility of Head of Kelurahan and Head of Kecamatan and mayor.

- . To control and to care for the people in their region with relation to environmental sanitation management.
- . To coordinate their people in preparing locations for temporary waste disposal, etc, in accordance with technical direction from cleaning service (for example, to build depot/waste transfer station).

4) Tasks and responsibility of the department of Cleansing Service

- . Sweeping/cleansing of solid waste from main roads.
- . Transporting/disposal of solid waste from temporary disposal sites to final disposal sites which have been decided.
- . To give direction and information to society to establish co-operation in maintaining environmental cleanliness.
- . To manage revenue collected for solid waste management.
- . To cooperate with other agencies to decrease the environmental pollution caused by solid waste, dirty water and gas/smoke.

