

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

FINAL REPORT



NOVEMBER 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

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ON
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PREFACE

In response to the request of the Government of the Republic of Indonesia, the Japanese Government has decided to conduct a study on the Solid Waste Management System Improvement Project in the city of Jakarta and entrusted the study to the Japan International Cooperation Agency (JICA).

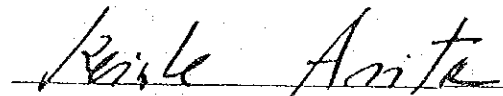
JICA sent to Indonesia a study team headed by Mr. Koomi NODA and consisted of Yachiyo Engineering Co., Ltd., associated with EX Urban & Environmental Research Institute Co., Ltd., from January to March 1986, July to September 1986 and January to March 1987.

The team had discussions on the Project with the officials concerned of the Government of Indonesia and conducted a field survey in the whole area of DKI Jakarta. After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for development of the Project and contribute to the promotion of friendly relation between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of Indonesia and DKI Jakarta for their close cooperation extended to the team.

November, 1987



Keisuke ARITA

President

Japan International Cooperation Agency



CAMPAIGN CAR



PILOT STUDY

DOOR TO DOOR COLLECTION - PLASTIC CONTAINER



PILOT STUDY

COMMUNAL CONTAINER - CRANE TRUCK



PILOT STUDY

MOVABLE CONTAINER - COMPACTOR CAR



BASIC FIELD SURVEY



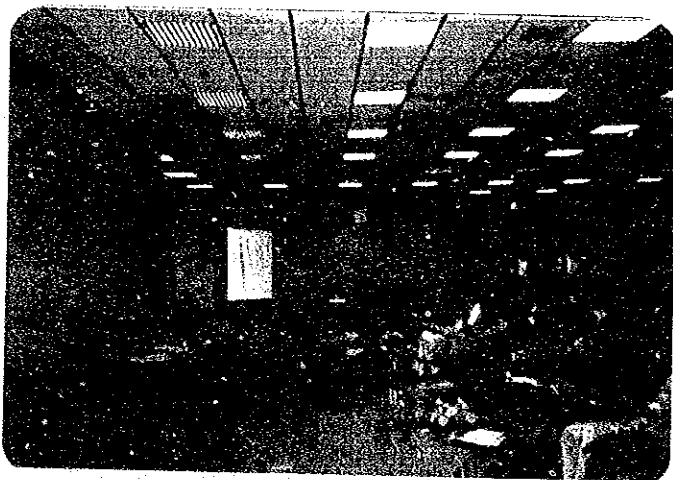
BASIC FIELD SURVEY



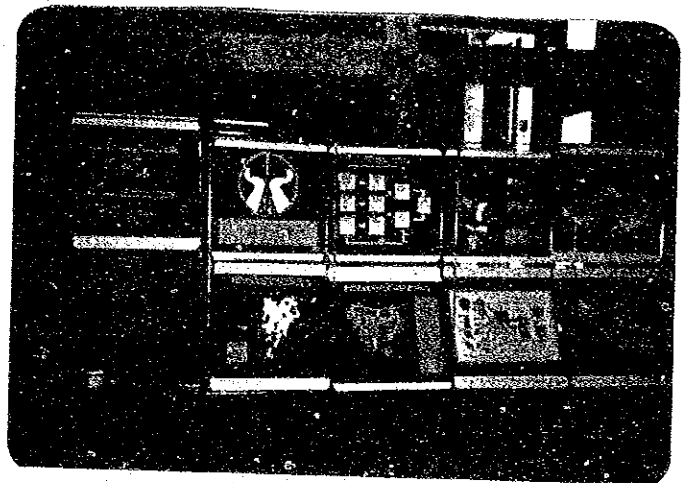
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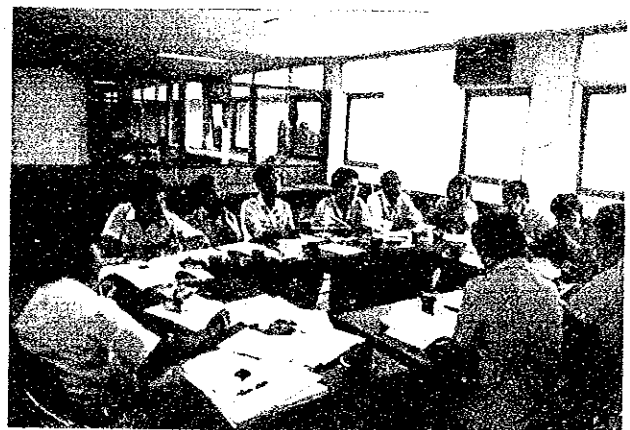
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SEMINAR ON GENERAL SOLID WASTE
MANAGEMENT ISSUES AT D.P.U.



STEERING COMMITTEE MEETING
AT CIPTA KARYA



TECHNICAL MEETING
AT DINAS KEBERSIHAN

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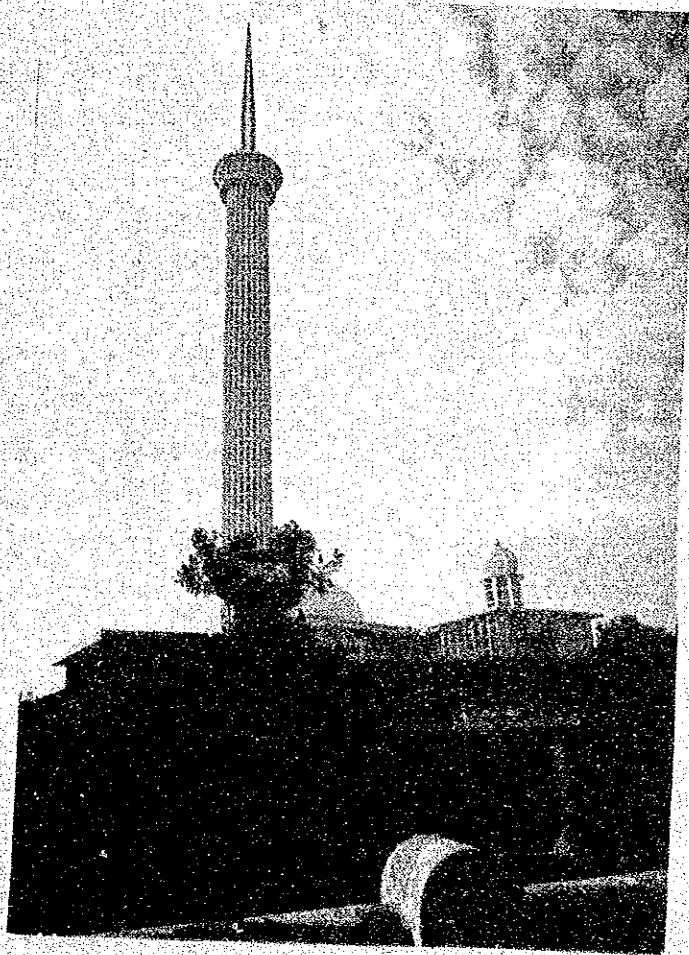
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GLOSSARY

WORD	DESCRIPTION
DKI JAKARTA	JAKARTA local government which is equal to state level.
Wilayah	District. DKI Jakarta consists of 5 Wilayah, Pusat, Utara, Barat, Timur, Selatan.
Kecamatan	Smaller district. About 6 Kecamatan compose 1 Wilayah.
Kelurahan	Ward. About 8 Kelurahan compose 1 Kecamatan. Population is about 30,000 people.
RT/RW	Local community organization. RW is composed of about RTs. RT/RW is not official governmental organization but community which is important for urban life. Activities for RT/RW includes security, cleaning, culture, religion, etc.
Squatter	Illegal occupants who mainly live along canals or railways.
Kampung	Area in the city where characteristics of village is kept. Generally population density is high (400 - 500 persons/ha) and income level is low. Roads inside Kampung are narrow (1.5 - 3 m) for pedestrian only. Houses are small.
P.D.Pasar Jaya	Public market company managing public markets. It transports waste from the public markets to the final disposal sites by itself.
Domestic waste	Solid waste generated by households.
Market waste	Solid waste generated by markets.
Commercial waste	Solid waste generated by shops, hotels, offices, etc.
Industrial waste	Solid waste generated factories, manufactures etc.
Canal waste	Solid waste in rivers and canals.
Door to door	Direct collection to each household by collection vehicle.
Jali-Jali	Collection that residents bring waste to collection vehicle by themselves.

WORD	DESCRIPTION
LPS	Space for transferring of waste from handcarts for primary collection to vehicle for secondary collection. LPS includes the following; <ul style="list-style-type: none"> - Handcart pool ... Road side - Concrete bin/Open space .. Special collection space - Container ... 6 or 10 m³ container - Depot ... Exclusive area for transferring
LPA	Final disposal site
Depot	Exclusive area for transferring of Dinas Kebersihan.
Dinas Kebersihan (S.D.K.)	Cleansing Department of DKI Jakarta.
Suku Dinas Kebersihan (S.D.K.)	District cleansing division (Wilayah unit)
Seksi Kecamatan (S.K.)	Local cleansing office (Kecamatan unit)
Dinas PU	Department of Public Works of DKI Jakarta.
Dinas Pertamanan	Department of garden
Walikota	Mayor of Wilayah
Camat	Head of Kecamatan
Lura	Chief of Kelurahan

INTRODUCTION



INTRODUCTION

1. Background of the Study

Jakarta, the capital of the Republic of Indonesia, has a population of some 7.3 million, daily producing almost 4,900 tons of urban solid waste.

With rapid urbanization, Jakarta is becoming a most important city in the ASEAN region in terms of social, economic and political activities. It is estimated that the population will rapidly swell to some 10 million by 1995 and 12 million by 2005.

In addition to this population pressure, a wide distribution of densely populated residential areas with numerous narrow paths called "Kampung" will cause more serious problems in the city's conservation in terms of a satisfactory living environment and beautiful scenery if the conventional solid waste management is relied on in the future.

The importance of the proper management of urban solid waste to preserve an acceptable living environment and to secure urban space for economic activities is increasing each year.

These problems have already been pointed out in the REPELITA-IV (1984/85 - 1988/89), the Jabotabek Metropolitan Development Plan and the Jakarta Master Plan 2005, as well as the urgent implementation of targets and measures suggested.

Although the IBRD, ADB and other organizations have so far extended technical cooperation to improve the urban solid waste management, the subject areas of the studies have been limited and so far a study covering all of Jakarta has not yet been conducted.

Against this background, the Ministry of Public Works, in cooperation with the Jakarta Municipal Government, requested that the Japanese Government conducts the Study on Solid Waste Management System Improvement Project for Jakarta.

2. Objectives of the Study

The present study has the following objectives to bring about the improvement of the solid waste management system in Jakarta.

- i) Clear presentation of a desirable solid waste management system in the future and preparation of a Conceptual Master Plan which is technically, financially and socially feasible.
- ii) Selection of first priority projects based on the Conceptual Master Plan and implementation of a feasibility study.

3. Scope of the Study

1) Subject Area

Although the subject area in the Conceptual Master Plan is Jakarta, the survey on a possible location for a final disposal site has been extended to include the Jabotabek Metropolitan Region.

Jakarta Pusat was approved as the subject area of the Feasibility Study by the Steering Committee in January, 1987, consisting of the following projects.

- i) Construction of a sanitary landfill site at Bekasi
- ii) Construction of a transfer station at Sunter
- iii) Construction of a sub-workshop
- iv) Improvement of the waste collection system
- v) Improvement of the street sweeping

2) Solid Waste to be Studied

The solid wastes to be studied are from house holds, commercial activities, markets, industrial activities, hospitals, rivers, parks and streets.

Of these, that waste generating from public markets, parks and rivers will be collected by the present system, i.e. collected and transported by the P.D.Pasar Jaya, Dinas Pertamanan and the Dinas PU, transferred and then finally disposed by the Dinas Kebersihan.

With regard to industrial and hospital waste, that which is currently disposed of by the Dinas Kebersihan will, in principle, continue to be so. The remainder, however, will be dealt with by the dischargers of the waste.

3) Target Years

The target years of the Conceptual Master Plan and the Feasibility Study are 2005 and 1995 respectively.

4. Progress of the Study

The field survey on the present conditions commenced in January, 1986 based on the Scope of Work (Attachment 1) concluded by the Republic of Indonesia and JICA.

The progress of the major work since starting the study is given below.

Phase 1 (January, 1986 - June, 1986)

The following work was implemented including submission and agreement of inception report, centering on the study and analysis of Jakarta's current solid waste management, the study to determine a basic policy for the future management system and the preparation of a study plan for Phase II.

- i) Study and analysis of current socio-economic conditions
- ii) Study of local conditions, such as urban planning
- iii) Study and analysis of current solid waste management system

- iv) Reconnaissance of candidate sites for pilot study and basic field survey
- v) Study of present status of related projects
- vi) Analysis of current situation and extraction of problems
- vii) Examination of basic policy for future solid waste management system
- viii) Formulation of pilot study plan
- ix) Formulation of basic field survey plan
- x) Submission of Progress Report (I) and Interim Report (I)

Phase II (July, 1986 - September, 1986)

The basic policies for the collection, transportation, treatment and disposal system suggested in Phase I were further elaborated based on the pilot study, basic field survey and the studies on candidate transfer station and final disposal sites. This Phase was executed as the basic study for the preparation of the Conceptual Master Plan in Phase III and included the following work.

- i) Submission of Interim Report (I)
- ii) Implementation and evaluation of pilot study
- iii) Implementation of basic field survey on waste amount and quality
- iv) Study on selection of final disposal site
- v) Study on selection of transfer station site
- vi) Social education and public relations activities
- vii) Submission of Progress Report (II)

Phase III (October, 1986 - December, 1986)

Based on the information acquired in the Phase I and II studies, the Conceptual Master Plan was prepared and the following works undertaken to determine the first priority projects.

- i) Determination of planning specifications
- ii) Determination of planning targets
- iii) Study on future system of collection, intermediate treatment and final disposal

- iv) Preliminary design of future system
- v) Study on organizational, financial and social education and institutional aspects.
- vi) Completion of Conceptual Master Plan
- vii) Selection of first priority projects
- viii) Submission of Interim Report (II)

Phase IV (January, 1987 - October, 1987)

The feasibility study for the first priority projects selected in Phase III is being undertaken in this Phase. The subject projects are those with a target year of 1995 and a target area of Jakarta Pusat. The work being implemented is as follows:

- i) Collection and analysis of supplementary data
- ii) Study and determination of various criteria for project plan
- iii) Study on system combination to be adopted in project plan
- iv) Submission of Progress Report (III)
- v) Preliminary design of main facilities
- vi) Study on required materials and equipments
- vii) Project cost estimation
- viii) Organizational and project management plans
- ix) Study on institutional and social educational aspects
- x) Project evaluation
- xi) Implementation plan
- xii) Submission of Draft Final Report
- xiii) Submission of Final Report

5. Study Results

The survey results have been compiled as the Final report, consisting of the Main Report and the Supporting Report. In addition, a summarized version of the Main Report has also been prepared.

The Main Report comprises Part I, II and III has the following contents.

Part I; The natural, social and economic conditions of the study area and the current conditions of solid waste management and problems are pointed out.

Part II; The goal and target of the Conceptual Master Plan are set up and alternative solid waste disposal systems, considered to be feasible among various systems, are presented.

Through a cost comparison of these alternatives, the most economical one is selected and possible institutional and organizational frame works to support the project management for the selected system are examined.

The feasibility of the project, determined through the above-mentioned process, is further examined in terms of its technological, social, economic and financial aspects and the examination results integrated to form the Conceptual Master Plan 2005.

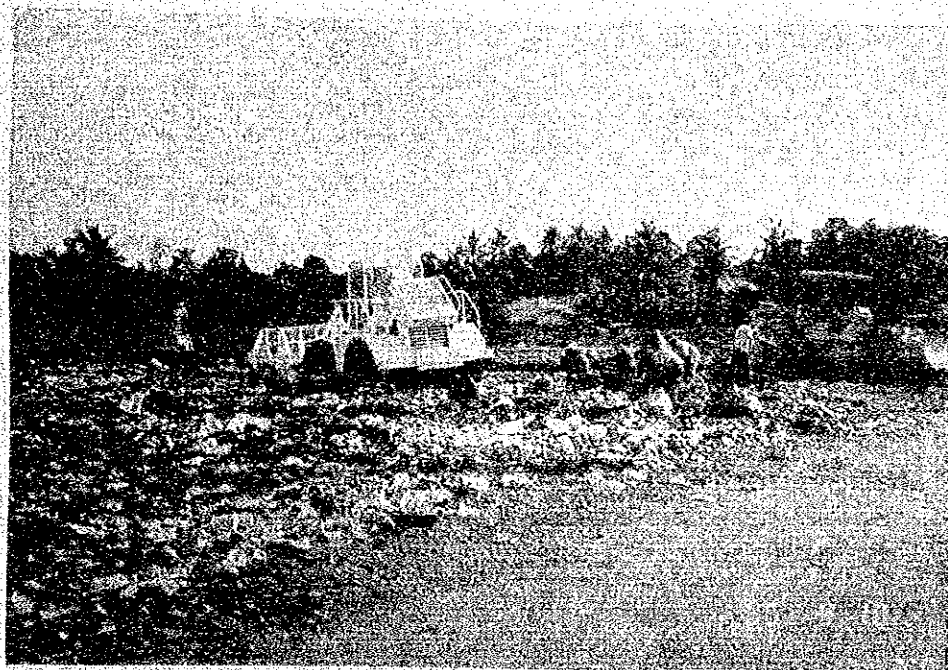
Part III; The basic plans are made for the first priority projects, in turn selected from the Conceptual Master Plan established in Part II, and the investment costs and maintenance/operation costs for these projects are calculated.

These projects are evaluated from the social, economic, technological and financial aspects. Following the subsequent verification of the feasibility of the projects, the implementation schedules for them are proposed.

The Supporting Report contains detailed data and information on the current conditions which are not described in the Main Report and the results of the several studies undertaken during the preparation of the Conceptual Master Plan and the Project Plan for reference purposes.

This study was performed with the strong cooperation of the Technical Committee under the supervision of the Steering Committee and the JICA Advisory Committee during the study period. The study organization is shown in Attachment 2 at the end of this report.

PART I PRESENT CONDITIONS



CHAPTER 1 PRESENT CONDITIONS OF THE STUDY AREA



CHAPTER 1 PRESENT CONDITION OF THE AREA STUDIED

1.1 Description of the Area Studied

1.1.1 General

Jakarta is the capital city of the Republic of Indonesia. It is the centre of commerce, trade and culture as well as government. It is located in West Java, with latitude $6^{\circ} 12'$ South and longitude $106^{\circ} 48'$ East.

Jakarta is a part of the Jabotabek region which consists of Jakarta, Bogor, Bekasi and Tangerang.

Northern part of the city faces to Java Sea, while eastern part to Bekasi, western part to Tangerang and southern part to Bogor.

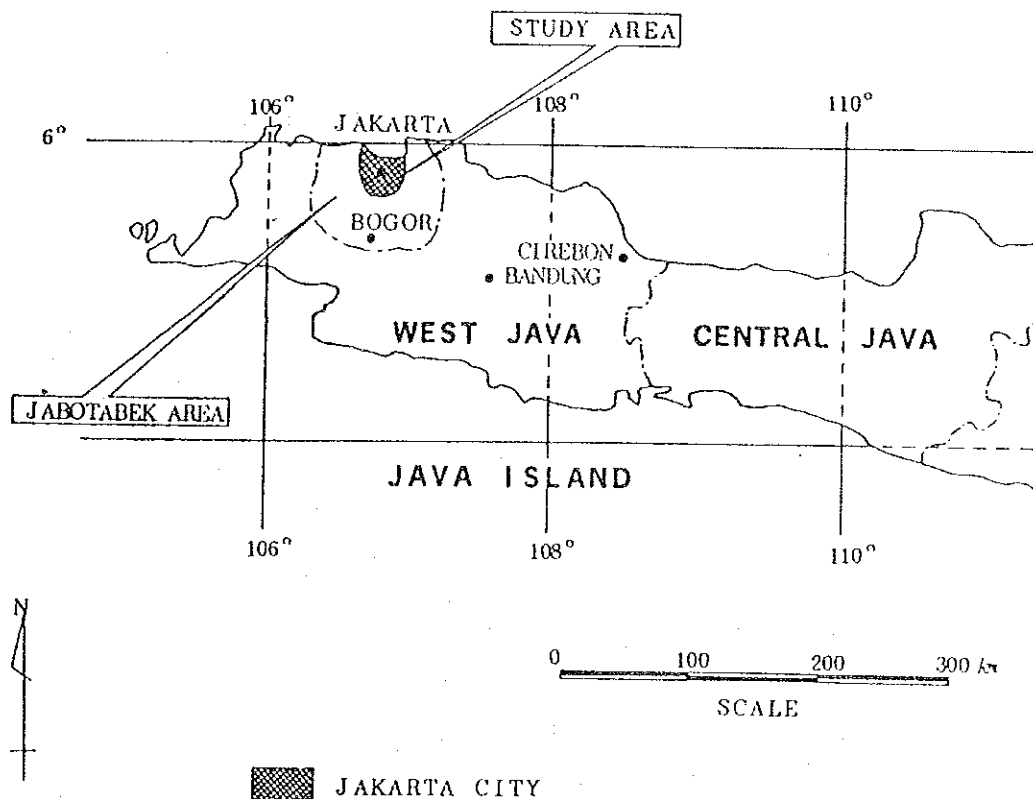


Fig. 1-1-1 Study Area

1.1.2 Climate

The city of Jakarta is located in a tropical zone, which has a rainy season from November to April and a dry season from May to October.

Mean temperatures in Jakarta are within the range of 26°C to 28°C throughout the year, and humidity is from 73% to 83%.

The yearly rain fall is 1,900 mm, 70% of which is in the rainy season. In January and February monthly rain fall exceeds 300 mm.

According to the data of Department of Perhubungan Badan Meteorologi dan Geofisika, last 15 years maximum rainfall for a single day was 203.9 mm on January 17, 1977, maximum rainfall for a given month was 728 mm in January 1979.

Jakarta is influenced by the West monsoon winds from November till April and by the East monsoon winds from May till October.

1.1.3 Geography

Jakarta is situated on a seaside plain with an altitude ranging from 0 m to 50 m. Parts of the area are below sea level.

The southern part consists of an alluvial layer, which stretches about 10 Km south of the shore line.

Towards south land ascends gradually until it reaches Puncak area, 60 Km from the sea.

1.1.4 Social and Economic Aspects

The population of Jakarta was estimated as 7.3 million in 1984. The growth rate has been 2.7% since 1981.

The main economic activities in Jakarta are in the trade and service sectors including financial services.

Recent economic activity has slowed down, because of the decline in oil prices.

1.1.5 Administration

The city of Jakarta is called the Special Province of Jakarta or DKI (Daerah Khusus Ibukota) Jakarta. The city area covers 650 Km². It is divided into 5 Wilayah (Municipality). A Wilayah is divided into Kecamatan (30 Kecamatan in total) and a Kecamatan consists of Kelurahan (260 Kelurahan in total).

A Kelurahan is the smallest administrative unit. The city is headed by a Governor, a Wilayah (Municipality) by a Wali Kota (Mayor), a Kecamatan by a Camat, and a Kelurahan by a Lurah.

RW and RT are not governmental administrative units, but community organizations similar to Japanese "Chonaikai" and "Tonarigumi".

PART I

1.2 Socio-economic Factors

1.2.1 Economic Factors

1) Economy of Jakarta

The growth rate of the Jakarta economy is higher than that of the national economy.

In the past 3 years, the average growth rate of the Jakarta economy has been 10% per year based on 1980 prices.

Economic activities in Jakarta are predominantly in the trade and service sectors including banking and other financial intermediaries.

The composition of the GDP indicates that banking and other financial intermediaries, services and electricity, gas and water supply are centralized in Jakarta.

2) Income

Based on the 1980 census in DKI Jakarta, the average income of employee and the average income of household were 42,600 Rp/month and 76,700 Rp/month respectively.

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3) Finance in Jakarta

The trend of finance is shown in Table 1-2-1.

Table 1-2-1 Trend of Finance of Jakarta

(Billion Rp)

	80/81	81/82	82/83	83/84	84/85	85/86*	86/87
Revenue							
from Central Government(a)	54.2	76.9	87.0	90.0	97.0	126.7	
from Region (Jakarta)	128.5	140.6	170.5	221.7	286.7	292.6	
U.K.P**	18.7	23.7	33.1	58.6	-	-	
Sub Total	201.5	241.2	290.6	370.3	383.2	419.3	
Expenditure							
Routine	78.6	91.6	105.6	123.7	143.3	186.0	
Development	78.2	88.2	92.1	100.8	156.3	232.8	
U.K.P	17.8	23.3	26.6	37.2	37.9	53.7	
Sub Total	174.6	203.7	224.3	261.7	337.5	427.5	
Balance	26.9	37.5	66.3	108.6	45.7	-8.2	
Budget of Central Government (C/G)	(b) 10,560	13,900	15,600	16,560	20,560	23,050	21,420
Share of Revenue from C/G in Budget of DKI (a/b)(%)	0.51	0.55	0.55	0.54	0.47	0.55	
Share of Revenue from Region in GRDP (%)	3.2	2.7	2.9	3.1	3.6	3.4	

* Means budget after reassessment.

** Calculation and Finance Matters.

Source: Financial Dept. of DKI Jakarta, Dinas Pendapatan Daerah

PART I

From the above data, characteristics of finance are summarized as follows:

Revenue and expenditure were balanced before 1984/85, though the increase rate of expenditure exceeds that of revenue.

Revenue of the region, including regional taxes, is almost 60% of total revenue.

Routine expenditure is almost 50% of the total expenditure.

The budget of the central government has declined from 1985/86 to 1986/87 because of a fall in oil prices.

4) Tax System and Utilities Charging System

(1) Regional Tax System

The tax system in Indonesia consists of three major groups as follows:

Direct taxes to the central government

Indirect taxes to the central government

Regional taxes to DKI Jakarta

All of these depend on voluntary payment, and collection of fees from business establishments and high income class is comparatively well implemented.

However, collection from the low income class is not thorough.

(2) Water Supply

The water supply is served by PAM (Water Supply Authority). The fee is collected by the door to door collectors. The charging standard consists of three major items.

PART I

Usage : The usage fee depends on volume of water multiplied by the unit price according to the using subject.

Meter protection fee : Basic fee depends on size of pipe and meter.

Administration fee

Basically the using fee is calculated with a gradual increase, which is advantageous to the small user.

(3) Electricity

Electricity is provided by the State Electric Company (PLN).

The fee is collected through bills.

The charging fee depends on utility subject, contract KVA and consumption (KWH). The electricity fee varies between the normal users and small users as in Kampung.

From the table of Electricity Standard Tariff (1986), the tariff per KVA is calculated Rp. 130 for normal use and Rp. 42 for small use.

1.2.2 Social Factors

1) RW and RT

(1) Organization of Administrative Service

The Indonesian administrative service is divided into public and private organization (Fig. 1-2-1).

The public organization having a pyramid style is composed of DKI Jakarta, Wilayah, Kecamatan and Kelurahan.

The private organization is composed of the RW (Rukun - Warga) and the RT (Rukun - Tetangga).

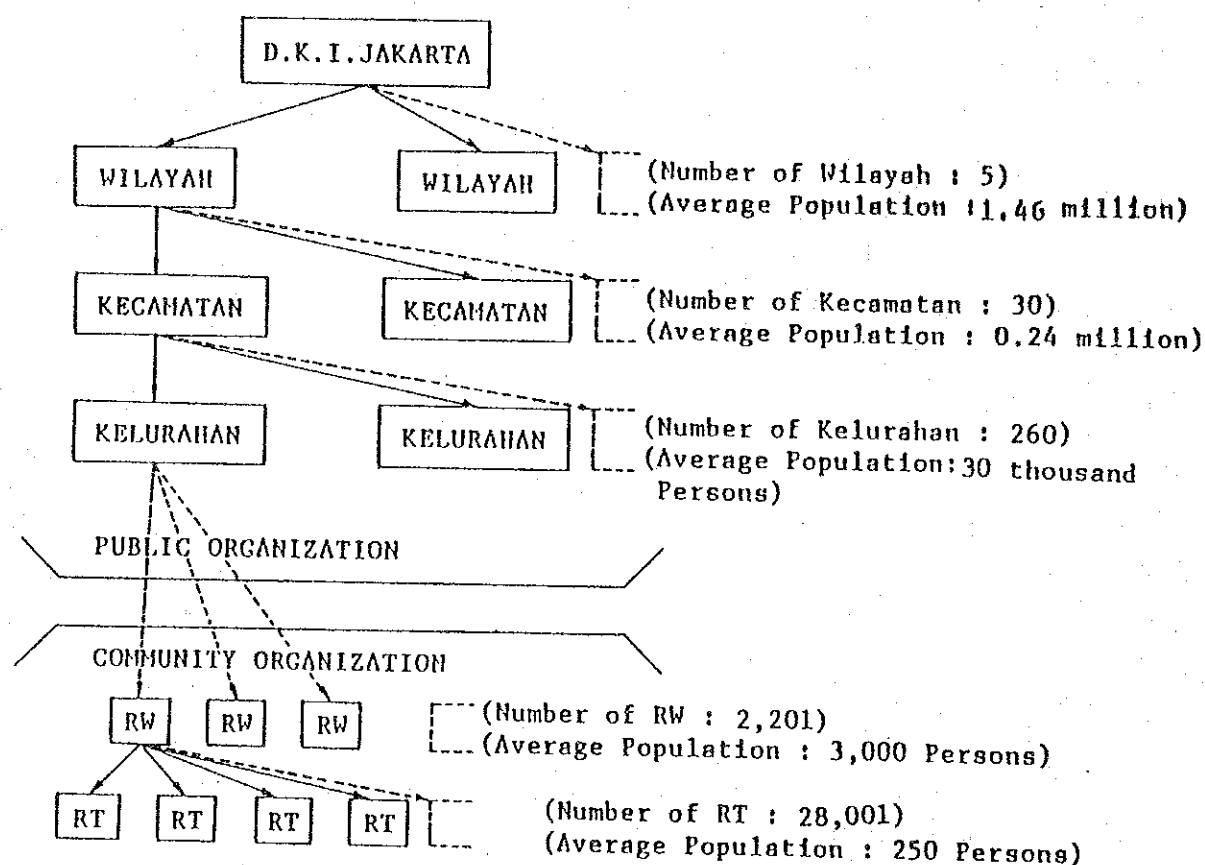


Fig. 1-2-1 Organization of Administrative Service

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(2) Organization of RW and RT

The management of the RW and RT is carried out by the Committees Fig. 1-2-2.

The Chief of RW is elected by the voting of RT Chiefs.

Committee members in the RW are appointed by the Chief of RW.

The Chief of RT is elected by the voting of heads of households in the RT.

Committee members in the RT are appointed by the Chief of RT.

As usual, the Chiefs of RT and RW are educated senior people.

(3) Activities of the RW and RT

Some of the activities which are put into practice in the RW and RT are concerned with the following:

- Security
- Cleaning
- Arts and Sports
- Religion
- Family Planning
- Development

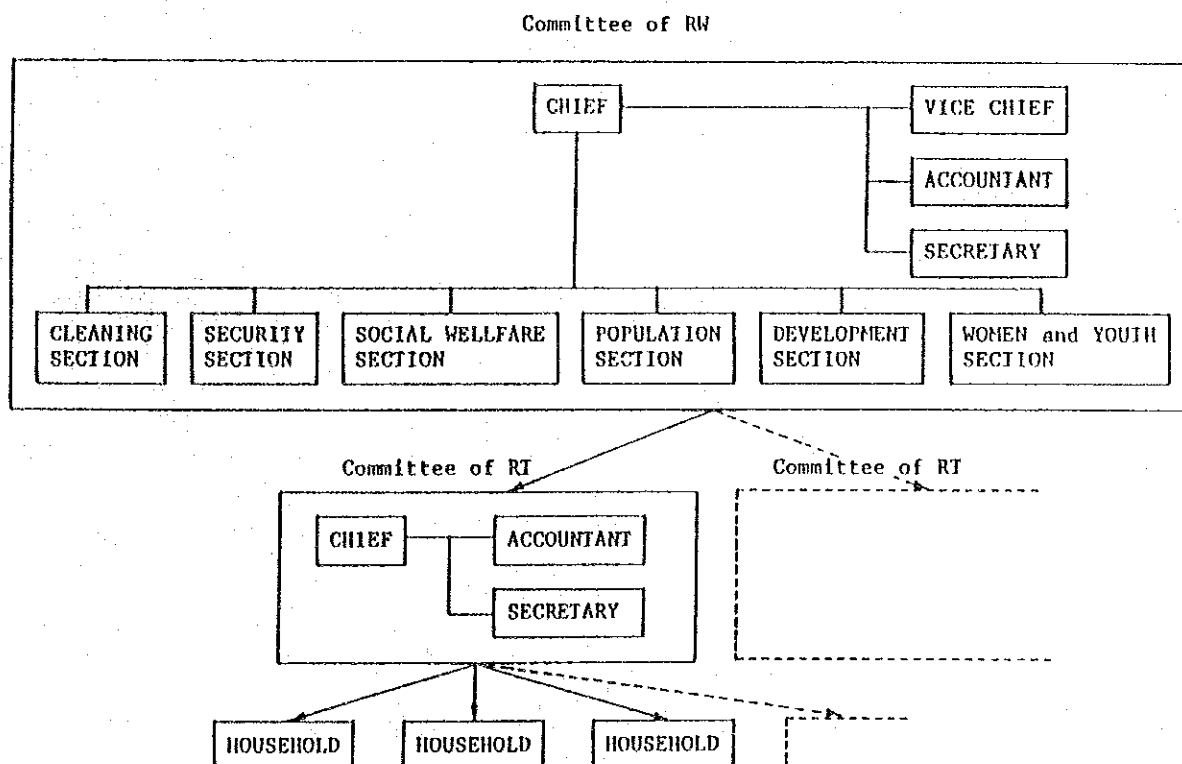


Fig. 1-2-2 Organization of RW and RT

PART I

(4) Contribution

Money for activities is contributed by each household to the committee.

The amount of money contributed by each household varies according to the economic situation of each household.

Usually Rp. 1000 - Rp. 2000 is the average amount of contribution from each household.

The contributed money is mainly used for security and cleaning activity carried out by workers employed through the committee of the RW.

2) Population

The population of Jakarta was estimated as 7.3 million in 1984.

*) 7.3 million is the estimated figure based on the 1980 Population Census and 1984 Population Registration.

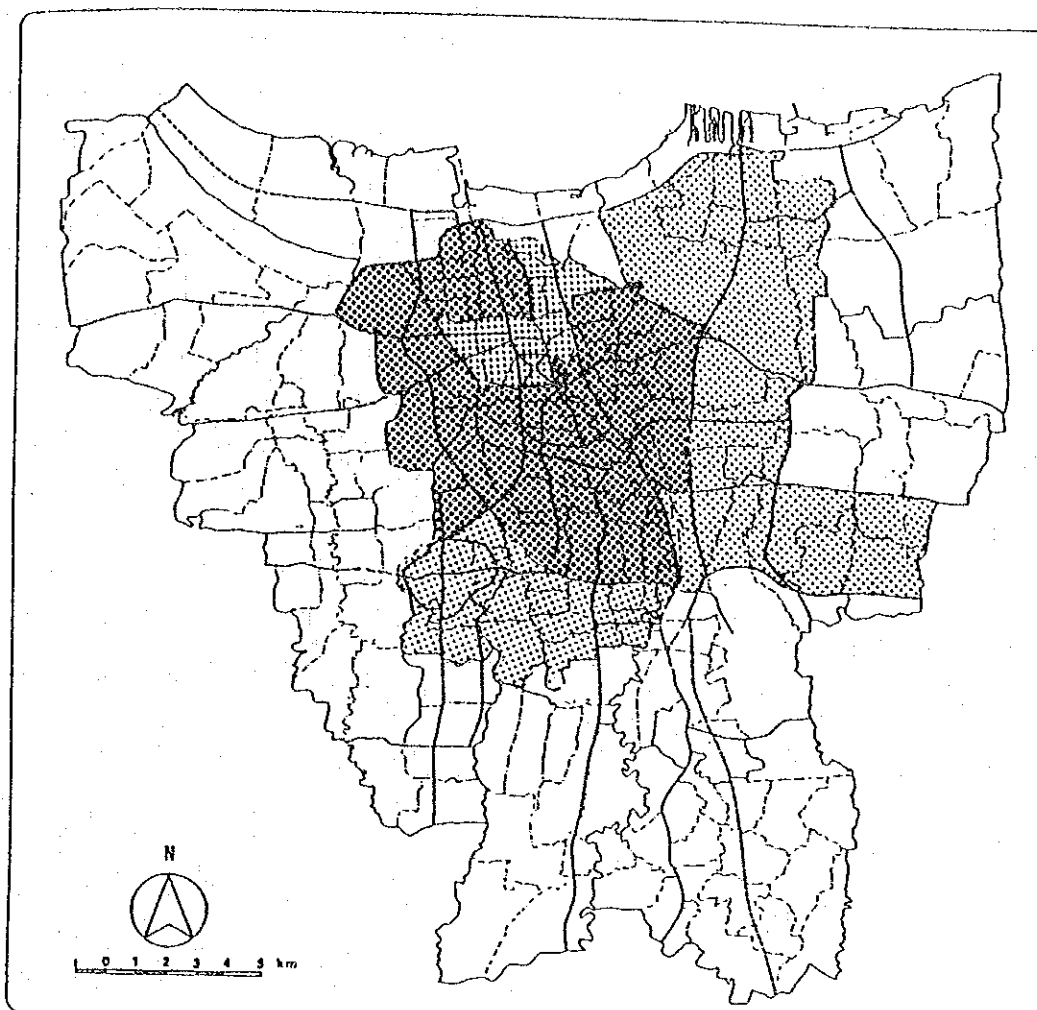
The population density of Jakarta was 111 persons per hectare in 1984.

The population growth rate declined from 1964 to 1984, for example average annual growth rate was 4.3% (1961-1970), 4.1% (1971-1980), and 2.7% (1981-1984) respectively.

The population growth rate is shown in Fig. 1-2-4. The proportion of population in the Central Municipality against Jakarta as a whole decreased from 24.3% (1972) to 16.6% (1984), while those of West and East Municipality increased.

The population density in the central area of Jakarta was higher than 200 persons per hectare.

On the other hand, the population densities of suburban area were lower than 100 persons per hectare Fig. 1-2-4.



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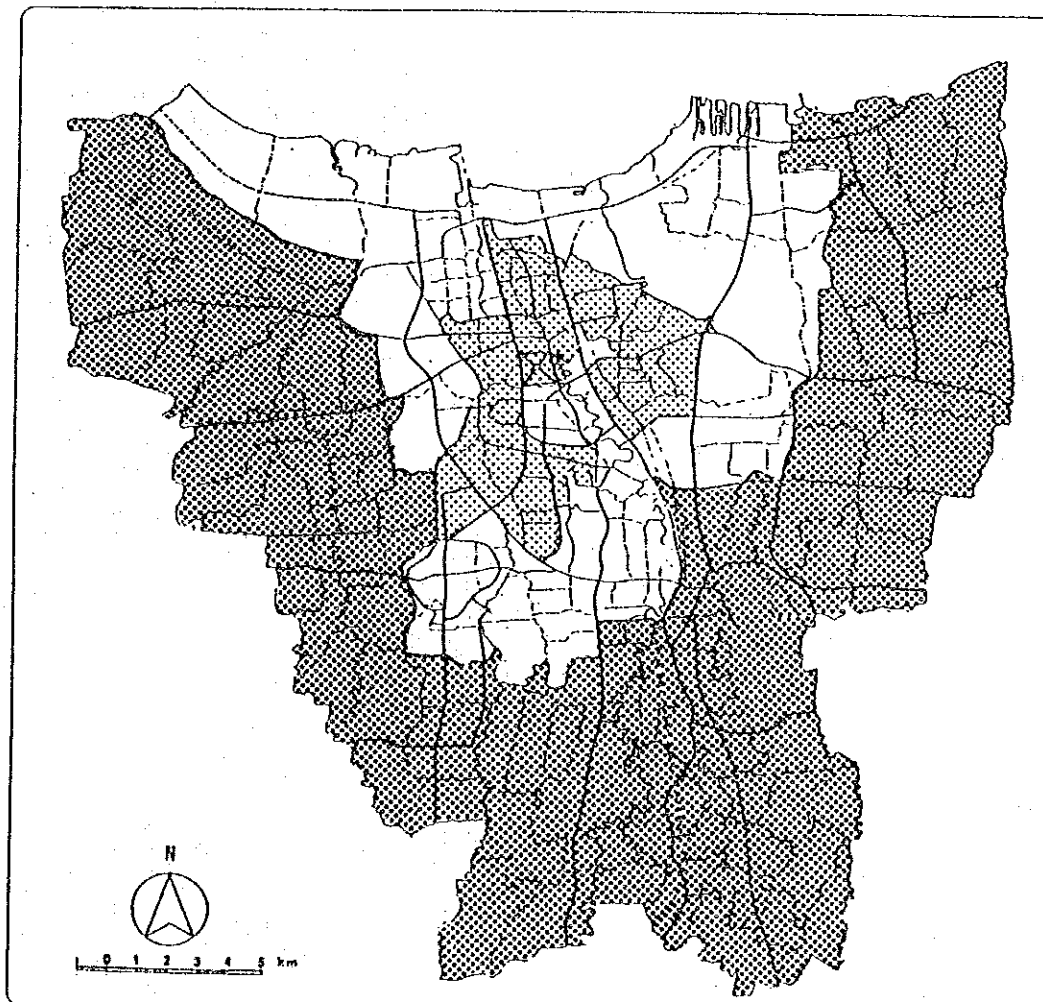
-  more than - 200
-  100 - 200
-  less than - 100

Fig. 1-2-3

Population Density 1984

Solid Waste Management System
Improvement Study
In The City Of Jakarta

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

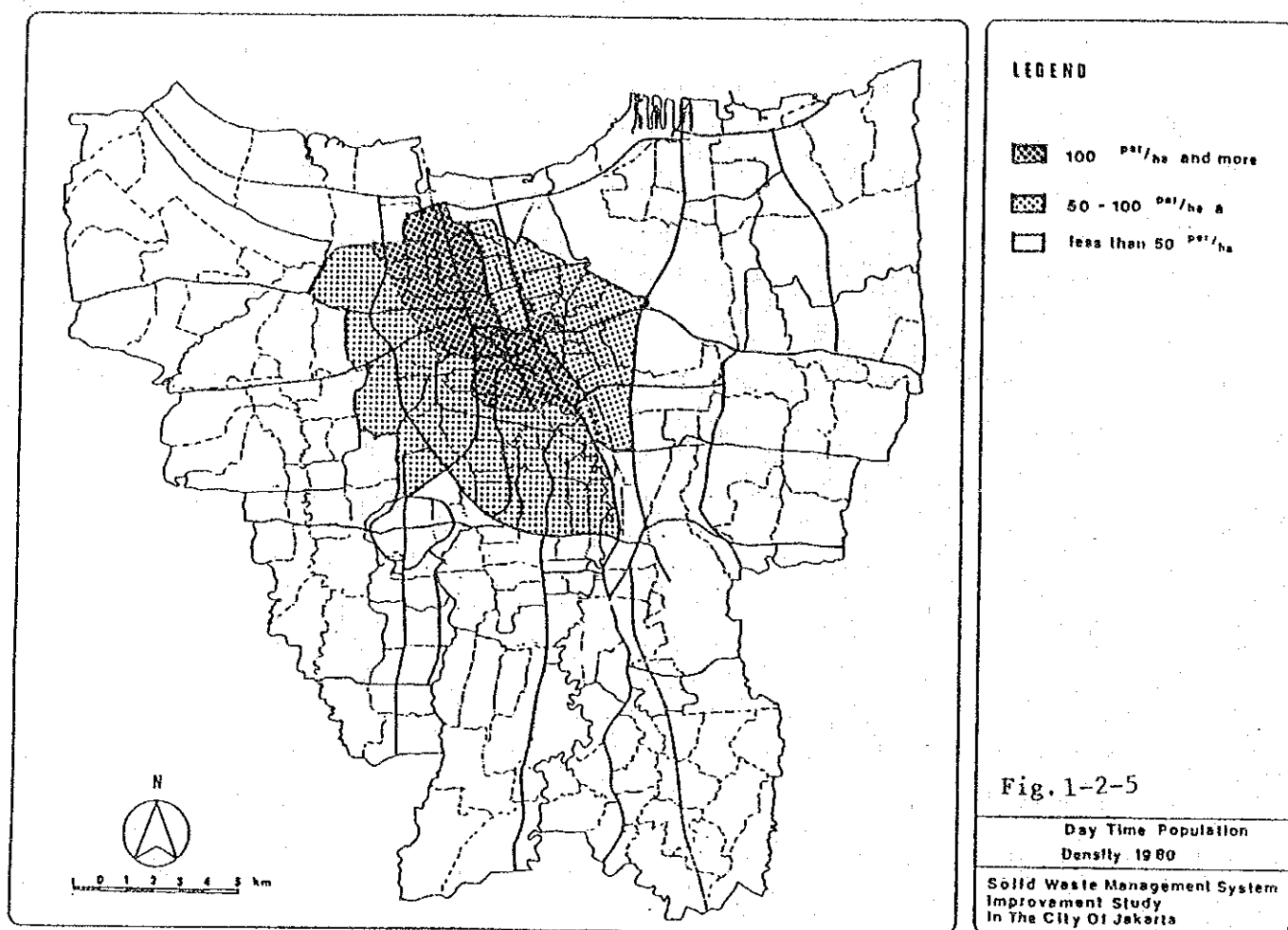
-  more than 10%
-  0 - 10%
-  Decrease

Fig. 1-2-4

Population Growth Rate
1980 - 1984Solid Waste Management System
Improvement Study
In The City Of Jakarta

PART I



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3) Employment

The working population and the rate of employment were 1.9 million and 26.4% respectively based on the Population Census in 1980.

The leading industry in Jakarta is tertiary industry occupying 75.9% of the total employment (Table 1-2-2).

Areas of the highest density of the working population are found in Central and West Municipalities (Fig. 1-2-5).

Table 1-2-2 Employment by Industry in 1980

Primary Industry	Secondary Industry	Tertiary Industry	Total
36,922 persons (1.9%)	427,892 persons (22.2%)	1,462,820 persons (75.9%)	1,927,634 persons (100.0%)

Source: Population Census 1980

1.3 Area Factors

1.3.1 Existing Land Use

1) Land Use in Jabotabek

Approximately, 10% of the total land area is an urban and rural residential area.

Swamp and waste land which are suitable as final disposal sites total 16,300 ha and occupy 2.4% of the total land area (Table 1-3-1).

Table 1-3-1 Land Use Composition In Jabotabek, 1982

Residential Land	Cultivate Land	Forest	Swamp and Waste Land	Others	Total
72,700 ha 10.6%	306,700 ha 44.9%	264,200 ha 38.7%	16,300 ha 2.4%	23,600 ha 3.5%	683,500 ha 100.0%

2) Land Use in DKI Jakarta

60% of the total area in Jakarta is already occupied as a built-up area (Table 1-3-2)

The characteristics of land use in each Municipality are as follows:

- Jakarta Pusat : Approximately 97% of the total land area is a built-up area.
- Jakarta Utara : Swamp and Waste land occupies 32.2% of the total land area.
- Jakarta Timur/Barat : Approximately 40% of the total land area is farm land which is anticipated to be urbanized in the near future.
- Jakarta Selatan : Approximately 70% of the total land area is urbanized already.

Existing land use map is shown in Fig. 1-3-1

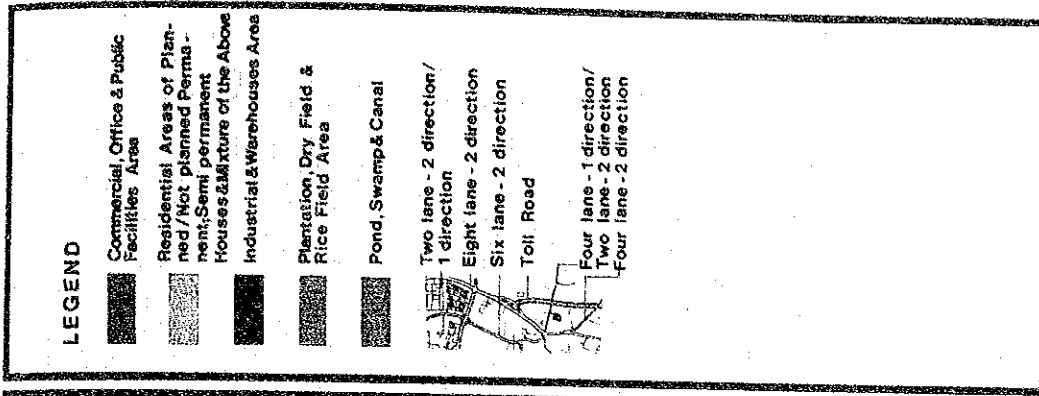


Fig. 1-3-1
Existing Land Use

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Table 1-3-2 Land Use Composition in DKI Jakarta 1982

	Residential	Industrial	Public and Commercial	Others	Total
Jakarta Pusat	3,003 ha (63.1%)	14 ha (0.3%)	1.62 ha (33.9%)	131 ha (2.7%)	4,408 ha (100%)
Jakarta Utara	3,187 (22.6)	978 (6.9)	1,232 (8.7)	8,723 (61.8)	14,120 (100.0)
Jakarta Barat	6,248 (49.3)	286 (2.3)	601 (4.7)	5,541 (43.7)	12,676 (100.0)
Jakarta Selatan	8,975 (61.9)	210 (1.5)	1,288 (8.9)	4,024 (27.7)	14,498 (100.0)
Jakarta Timur	8,630 (46.0)	727 (3.9)	1,596 (8.5)	7,821 (41.6)	18,773 (100.0)

1.3.2 Public Facilities

1) Roads

The existing road network in DKI Jakarta is the radial-ring shaped pattern and is as follows:

- Concerning ring roads, intra urban tollway (South-East Arc and North-South Link) where tolls have not yet been collected, have the function of distributing regional traffic.
- Concerning radial road, 13 major roads concentrate on the CBD.
- According to road statistics, the total length of roads in DKI Jakarta in 1984 was 3,510 Km and the road ratio was 3.4%.

Since the road network in DKI Jakarta does not meet traffic demands, there is excessive concentration of traffic on the major roads as shown Fig. 1-3-2

Eight major roads connect DKI Jakarta with each City in the BOTABEK Region as shown Fig.1-3-3.

2) Water Supply

Jakarta Water Supply Authority supplies water to 44% of the total area and 26% of all households in 1984.

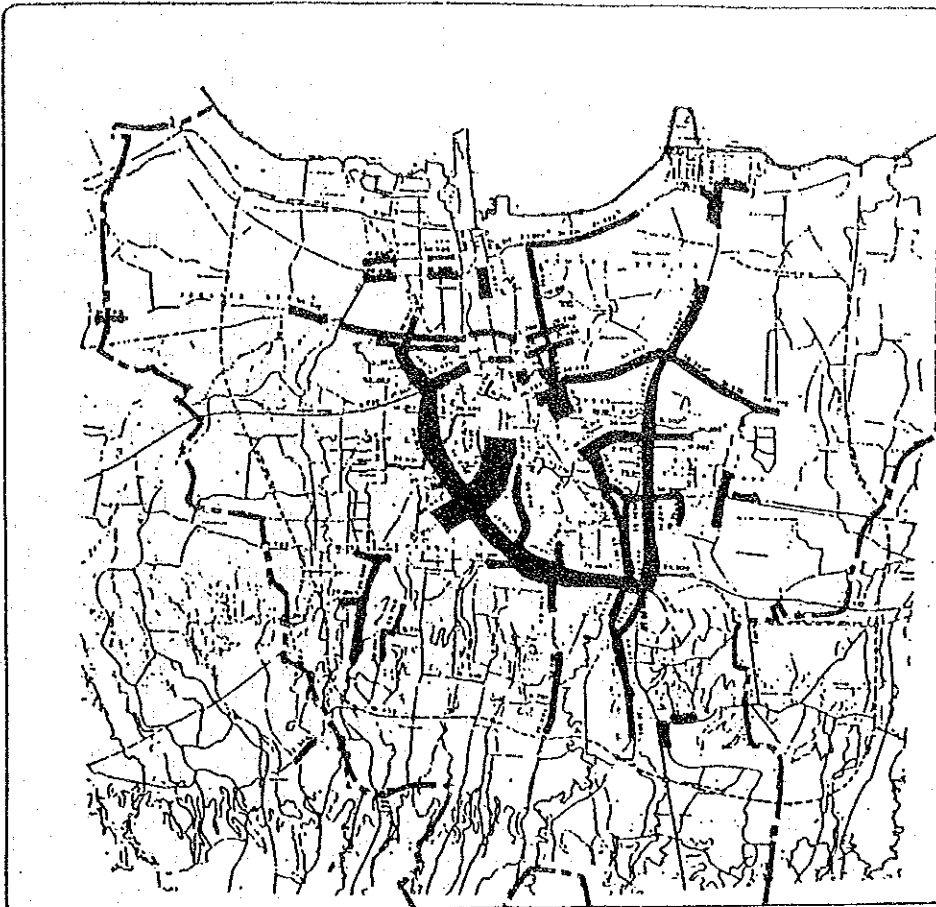
3) Sewerage

Most domestic and industrial waste waters are discharged directly into drains and other available waterways.

Most domestic sewerage are treated individually.

4) Electricity

PLN (National Electricity Authority) supplied electricity to 80% of all households in 1984.



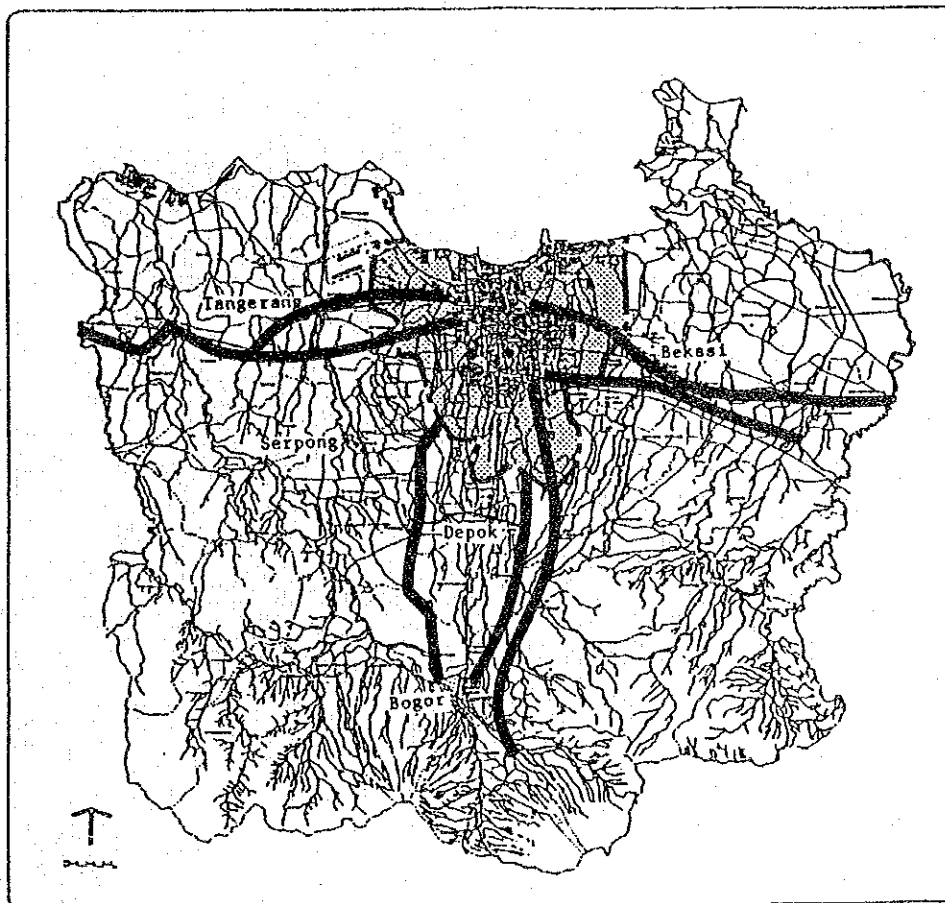
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Source : ARSDS

Fig. 1-3-2

Traffic Volume in Jakarta

Solid Waste Management System
Improvement Study
In The City Of Jakarta



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Source : JMDP

Fig. 1-3-3

JABOTABEK
Road Network

Solid Waste Management
System Improvement Study
In The City of Jakarta

1.3.3 Related Plans and Projects

Related plans and projects on socio-economic aspects and conditions of area are Pelita (National Five Year Plan), Five Year Plan of DKI Jakarta, JABOTABEK Metropolitan Development Plan, Jakarta Master Plan, Kampung Improvement Project, Urban Betterment Program and Guided Land Development Program. These are listed in Fig. 1-3-4. The last five are described, in the Supporting Report.

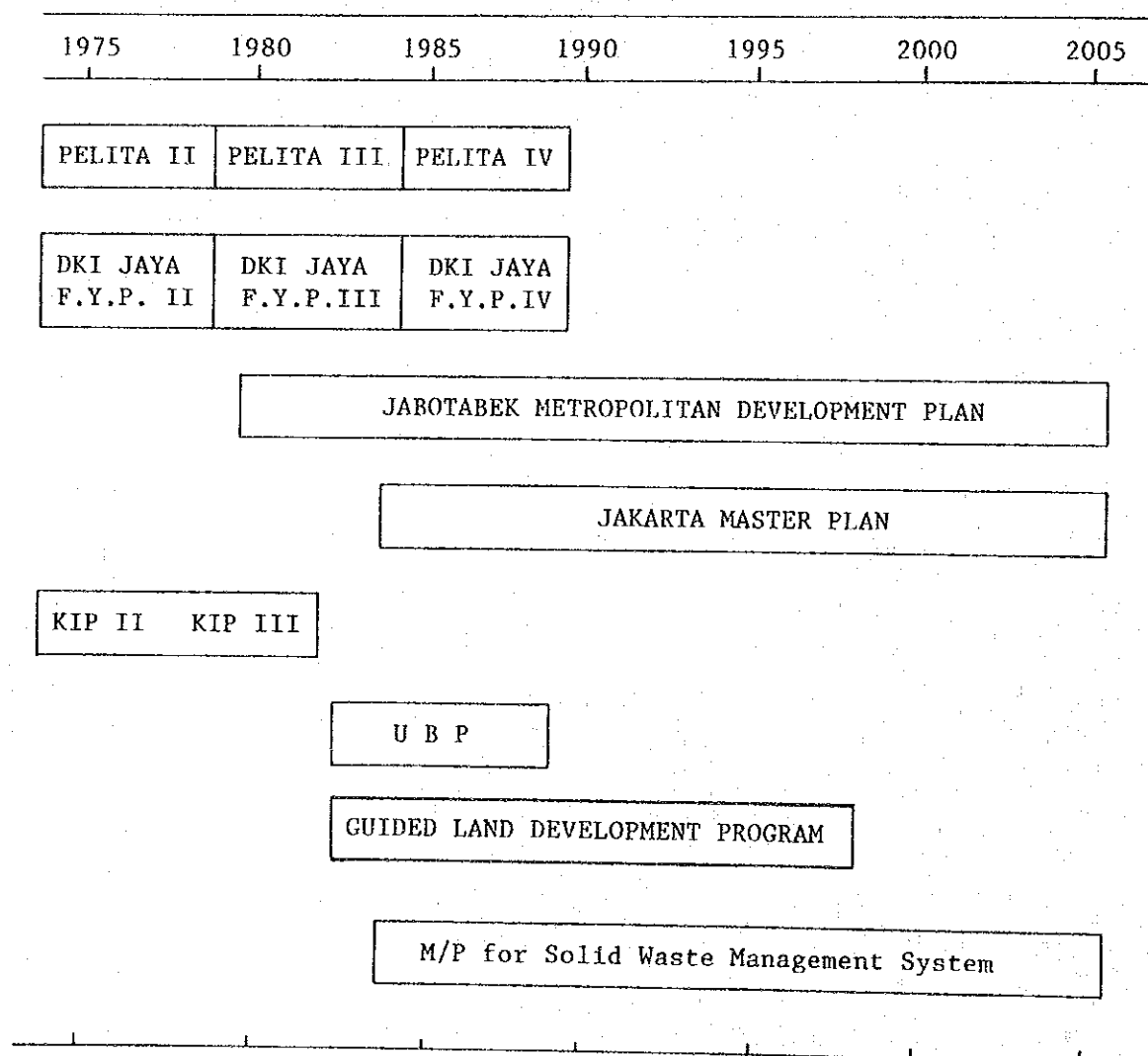
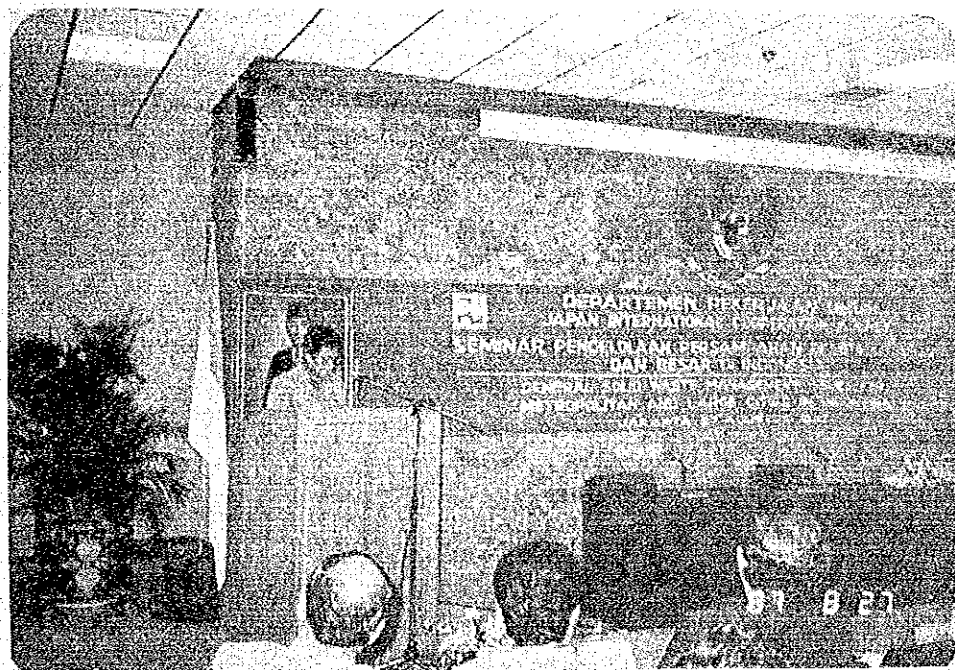


Fig. 1-3-4 Related Plans and Projects

CHAPTER 2 CURRENT CONDITIONS AND PROBLEMS OF SOLID WASTE MANAGEMENT IN THE CITY OF JAKARTA



CHAPTER 2 CURRENT CONDITIONS AND PROBLEMS OF SOLID WASTE MANAGEMENT
IN THE CITY OF JAKARTA

2.1 Current Conditions of Solid Waste Management

2.1.1 General

1) Sanitary situation

Jakarta is one of the most beautiful cities in South-east Asia as long as it is seen from Protocol streets. But once one walks inside the city, one will find a fairly large number of unsanitary areas, such as those littered with waste, and small disposal sites are found around residential areas, resulting in an undesirable situation with regards to the public health of the residents.

Only a very small amount of the waste collected by the city is disposed of by sanitary landfilling. For the most part, the waste is disposed of by open dumping at the disposal sites or at temporary dump sites without a sanitation control.

2) Service level

It is estimated that the solid waste collection services offered by the Dinas Kebersihan and RT/RW are available to approximately 86% of the total population. Those areas which are not provided with the Dinas Kebersihan collection services are mostly at the far end of Jakarta (see Fig. 2-1-1 and Table 2-1-1).

The quality of the collection services appears to be unsatisfactory to the residents due to the fact that although in principle collection should take place twice a week, it is not always carried out.

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Collection Service

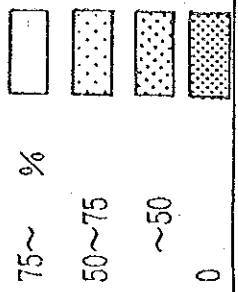


Fig. 2-1-1

Status of Solid Waste

Collection Service Provided

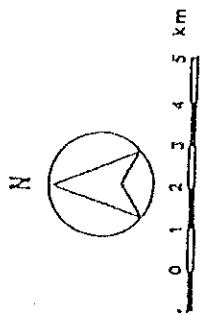
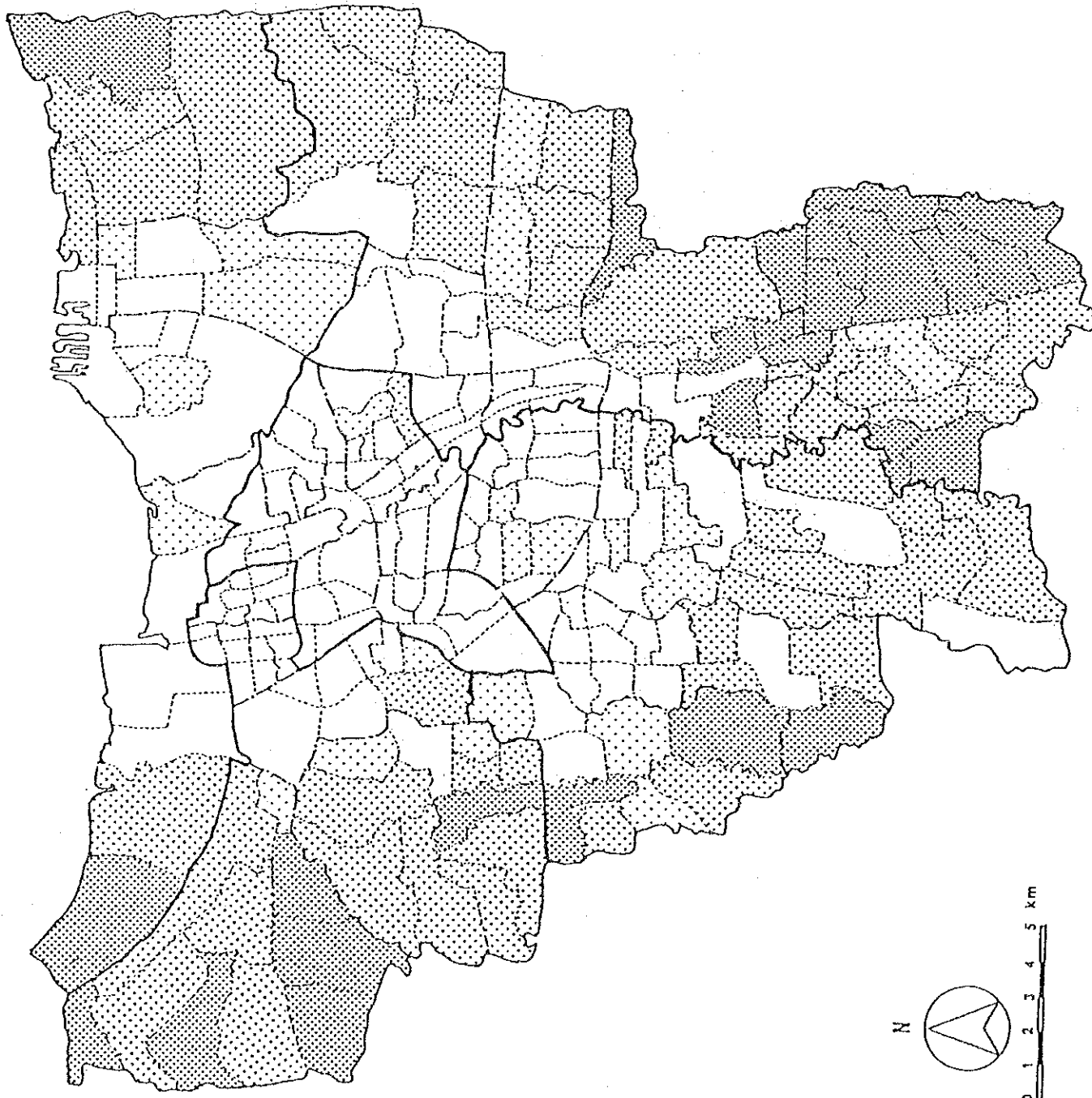


Table 2-1-1 Waste Collection Services

(1985/86)

	Total population (persons)	Population served by Dinas (persons)	%	Population served by others (persons)	%	Total population served (persons)	%
PUSAT	1,395,584	1,395,584	100.0	0	0.0	1,395,584	100.0
UTARA	1,026,338	830,307	80.9	1,027	0.1	831,334	81.0
BARAT	1,488,150	959,857	64.5	282,748	19.0	1,242,605	83.5
SELATAN	1,742,367	1,301,548	74.7	137,648	7.9	1,439,196	82.6
TIMUR	1,647,561	1,036,316	62.9	336,102	20.4	1,372,418	83.3
TOTAL	7,300,000	5,523,612	75.7	752,525	10.4	6,281,137	86.0

3) Waste flow

Fig. 2-1-2 shows the flow of the current solid waste disposal system. The disposal of waste at informal disposal sites following 1,990 t/day is noticeably high. In effect, the city collects and hauls 2,960 t/day, some 60% of the total amount of waste generated per day.

The basis for the calculation of the above flow is as shown in Table 2-1-2.

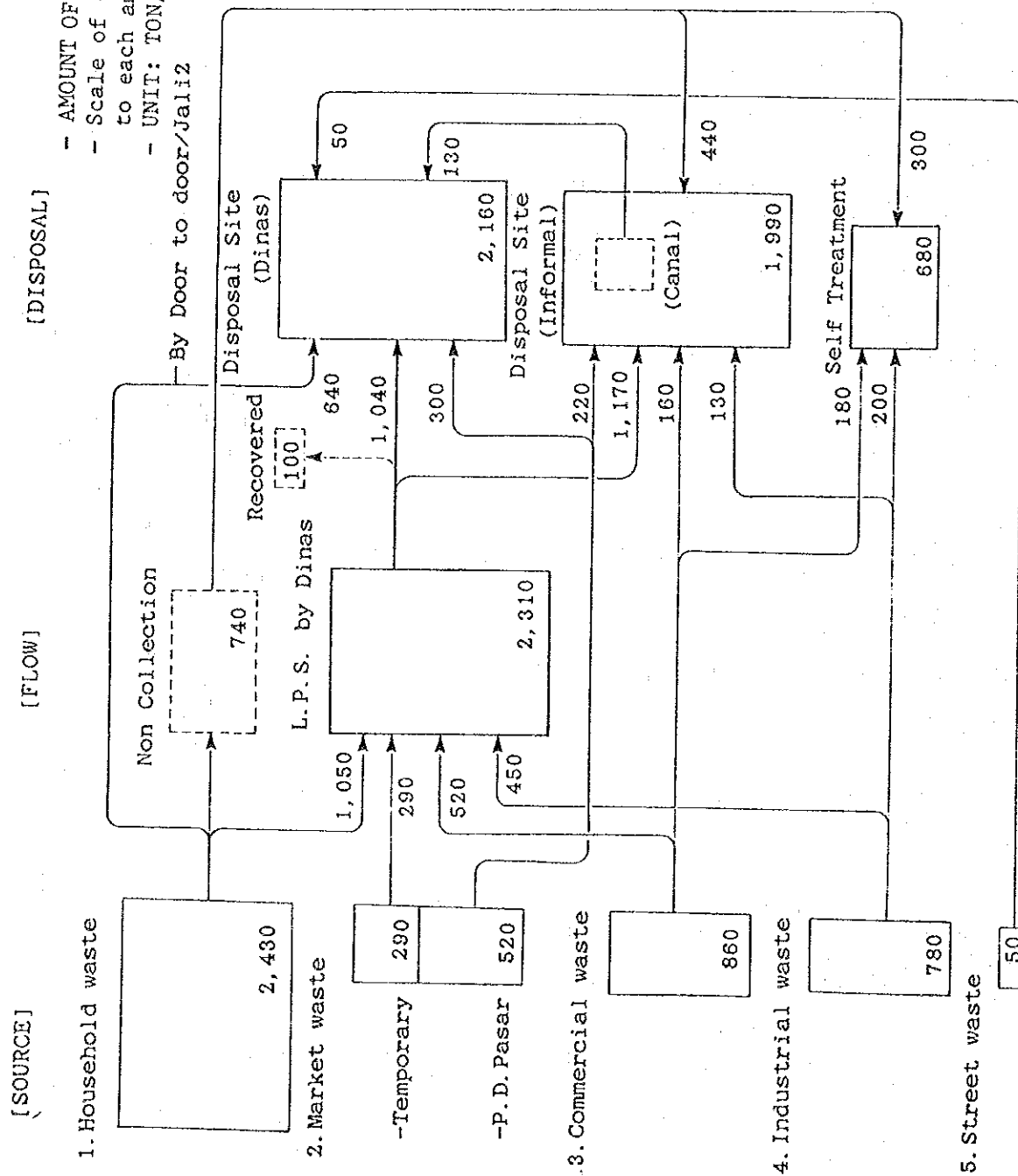


Fig. 2-1-2 Solid Waste Flow in DKI Jakarta in 1986

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Table 2-1-2 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	-

4) Current amount of waste generated

The total waste amount generated in Jakarta in 1985 is estimated about 4,930 tons per day. The amount by Wilayah and by generating source are as shown in Table 2-1-3.

Table 2-1-3 Amount of Waste Generation by Wilayah by Generating Source (- indicates amount which will be dealt with for the whole City of Jakarta)

Unit: t/day

Wilayah	Household	Markets		Commercial	Factory	Street	Total
		Temporary	P.O. Pasar				
1. Jakarta Selatan	620	50	110	160	170	—	1,110
2. Jakarta Timur	560	60	110	170	120	—	1,020
3. Jakarta Pusat	470	60	130	300	90	—	1,050
4. Jakarta Barat	440	80	90	130	190	—	930
5. Jakarta Utara	340	40	80	100	210	—	770
DKI. Jakarta	2,430	290	520	860	780	50	4,930

Note: Data used as a base for estimation are (1) the results of the basic field survey conducted by the JICA Study Team during August-September, 1986 and (2) annual reports of Dinas Kebersihan. Although not used as base, figures obtained by the survey (in April 1982) of the Applied Science and Technology Agency (BPPT) were also referred to.

5) Current waste quality

A survey of domestic and commercial wastes in both the dry season (August 1986) and rainy season (February 1987) were made for the same area. The results were as per Tabel 2-1-4.

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As shown in the table, the remarkable difference in waste quality between the dry season and the rainy season is the increase of wood/leaf during the rainy season. Their increase of close to 2.5 times in the wastes of the high income group and almost three times in commercial wastes are particularly noteworthy. Another notable difference is the increase in percentage of paper during the rainy season in the wastes of the middle and low income groups.

Table 2-1-4 Compositions of Domestic Waste and Commercial Waste by Kind
(on a dry base)

Unit: %

Kind	Domestic wastes								Commercial wastes	
	High income		Middle income		Low income		Average		Dry season	Rainy season
	Dry season	Rainy season	Dry season	Rainy season	Dry season	Rainy season	Dry season	Rainy season		
1. Plastic	7.30	6.20	8.70	11.50	12.90	10.10	9.63	9.27	13.00	9.30
2. Paper	17.80	12.40	15.30	24.30	17.30	17.90	16.80	18.20	25.00	18.90
3. Textile	2.60	3.60	8.80	10.50	5.10	2.30	5.50	5.47	2.30	5.30
4. Wood/Leaf	13.30	32.30	9.60	10.60	11.90	15.20	11.60	19.37	7.50	20.70
5. Garbage	15.10	11.60	10.90	12.50	11.10	13.40	12.37	12.50	17.50	16.90
6. Other >5mm	15.60	10.80	7.70	10.40	10.40	14.90	11.23	12.03	10.70	14.10
7. Other <5mm	14.00	11.10	18.50	5.70	12.70	9.70	15.07	8.83	14.00	5.10
Sub-total	85.70	88.00	79.50	85.50	81.40	83.50	82.20	85.67	90.00	90.30
8. Metal	4.20	2.80	2.40	4.50	4.10	2.50	3.57	3.27	4.30	0.60
9. Glass	3.00	4.50	3.80	5.00	3.90	4.30	3.57	4.60	4.80	1.30
10. Stone	7.10	4.70	14.30	5.00	10.60	9.70	10.67	6.46	0.90	7.80
Sub-total	14.30	12.00	20.50	14.50	18.60	16.50	17.80	14.33	10.00	9.70
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

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The reason why "others" in the rainy season shows a decrease than in the dry season is believed to be attributable to improved sorting skill at the time of sampling.

The estimated physical composition and chemical composition of domestic waste and commercial waste are as per Tabel 2-1-5.

Moisture content characteristically increase by 7-10% during the rainy season than during the dry season in both domestic and commercial wastes, while ash content was roughly halved. Although the low level calorific value become lower by around 100 kcal/kg on average, it was lower by almost 300 kcal/kg in the case of wastes of the low income group. As this fact has a considerable influence on the seasonal difference in calorific value of waste as a whole, that is, between the dry season and the rainy season, it calls for attention.

Table 2-1-5 Estimated Physical and Chemical Composition of Domestic Waste and Commercial Waste

Unit: %

Unit: %										
Description	Domestic wastes								Commercial wastes	
	High income		Middle income		Low income		Average			
	Dry season	Rainy season	Dry season	Rainy season	Dry season	Rainy season	Dry season	Rainy season	Dry season	Rainy season
1.Moisture Content(%)	56.88	64.07	52.40	62.59	52.83	63.61	54.03	63.42	47.95	54.40
2.Volatile(%)	26.83	28.54	26.52	28.85	29.82	26.90	27.72	28.10	35.50	36.97
3.Ash Content(%)	16.29	7.39	21.07	8.56	17.35	9.49	18.23	8.48	16.50	8.63
4.C/N ratio	30.83	33.70	29.92	31.40	33.85	31.20	31.50	32.10	34.78	31.90
5.Low cal. Value (kcal/kg)	987	999	1,085	1,095	1,309	983	1,127	1,025	1,620	1,514

2.1.2 Technical Aspects

1) Waste collection and haulage system

(1) Collection methods

The methods of waste collection are classified as follows.

— Door-to-Door

— Jali-Jali

— (Handcart) LPS
(Transferring Place)

— Open Space, Handcart Pool,
Communal Concrete Bin

— Communal Container

— Depot

The ratio of each collection method is as shown in Fig. 2-1-3 where the large share of the inefficient transfer method can be observed. The ratio of the direct collection by Dinas Kebersihan (door-to-door and Jali-Jali) is approximately 15%.

There is a total of 942 LPSs throughout Jakarta and their breakdown by types is as shown in Table 2-1-6.

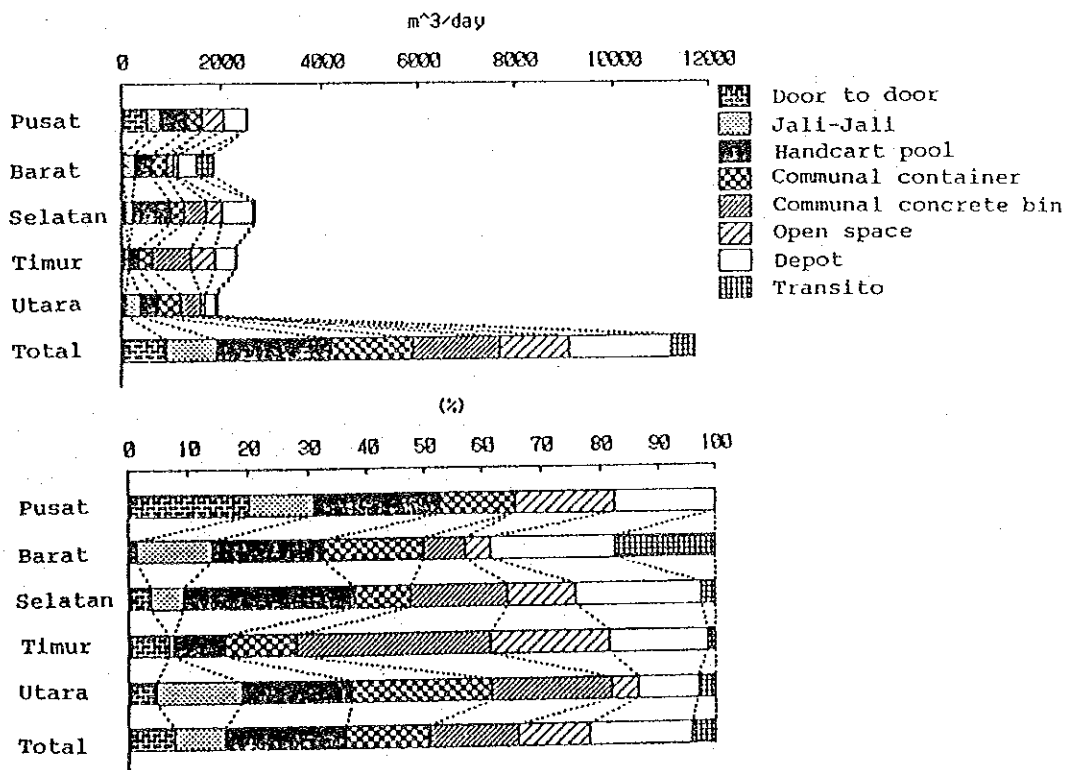


Fig. 2-1-3 Distribution of Collection Method

Table 2-1-6 Number of LPS by Type

(Sept.'86)		
Type	No.	Ratio (%)
Depot	62	6.0
Communal Concrete Bins	123	13.1
Handcart Pool	166	17.6
Open Space	244	25.9
Communal Container	347	36.8
Total	942	100.0

The concrete bin, handcart pool and open space types of LPS which have a poor transferring efficiency account for 56% of the total. Depots consist of the following 4 types and those without transferring equipment account for 56% of all.

(Sept.'86)		
Depot	Compactor Container	2 Depots
	Shovel Loader	8 Depots
	Communal Container	17 Depots
	No Equipment	35 Depots

(2) Collection equipment

Table 2-1-7 gives details of collection vehicles. Cargo with poor collection efficiency accounts for 30% and the mechanisation ratio (*) of the vehicles is 40%. Compactor vehicles have been increasingly introduced in recent years.

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Table 2-1-7 Collection Vehicles (Sept. 1986)

(Units)

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

B : Big, S : Small

$$(*) \text{ Mechanisation Ratio} = \frac{\text{Arm Roll} + \text{Crane} + \text{Compactor}}{\text{Total Number of Vehicles}}$$

2) Street sweeping

Street sweeping consists mainly of manual sweeping which is partially supplemented by mechanical sweeping using 7 sweeping vehicles.

Table 2-1-8 shows the current status of street sweeping.

Table 2-1-8 Current Status of Street Sweeping

(Sept 1986)

	Total length (km)	Swept length (km)	%
Protocol	490	444	90.8
Economy	496	196	39.5
Others	1,469	111	7.6
TOTAL	2,455	751	30.7

3) Treatment and disposal

The city operates 3 disposal sites; Cakung Cilincing, Srengseng and Kapuk Kamal managed by the Dinas Kebersihan. The pilot project for sanitary landfilling has commenced in September 1986 at the Srengseng site.

Although the Suku Dinas Kebersihan also uses informal disposal sites, detail informations are not clear in full. At the community level, each community is estimated to be using some 1,000 of small informal site.

The flow of solid waste to the disposal sites is shown in Fig. 2-1-4. Of the total number of disposal sites only some 5% employ the sanitary landfilling method.

2.1.3 Operational Aspects

1) Collection and haulage

(1) Vehicle operation

According to the data on vehicle operation, 85% of the total number of collection vehicles are always serviceable and some 70% of the total number are in operation every day.

(2) Vehicle turn-over

According to the survey result in Jakarta Pusat, the actual number of trips is not met to the standard.

LEGEND

—— To the disposal site
(controlled by DINAS)

||||| To the disposal site
(temporary)

—— Boundary of Wilayah

--- Boundary of Kecamatan

○ Generation amount of
each Wilayah

□ Disposal amount at each
temporary disposal sites

△ Self treatment amount

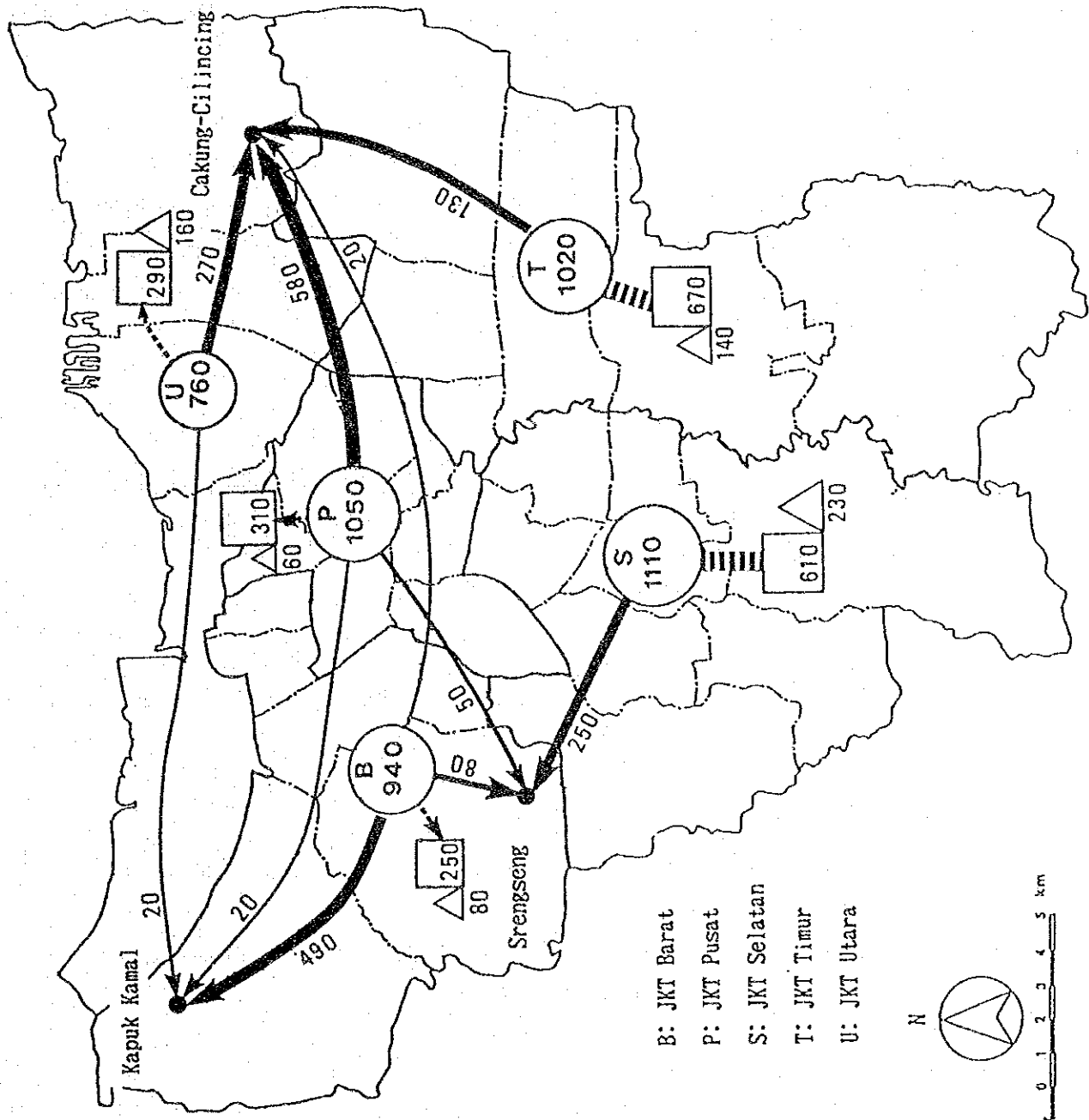
● Location of the disposal
sites controlled by Dinas

Unit: Tonnage/day

NB Whole amount of recovered
reusable material is esti-
mated 100t/day in Jakarta.

Fig. 2-1-4 Solid waste flow from
each Wilayah, 1984

Solid Waste Management System
Improvement Study
in The City Of Jakarta



B: JKT Barat
P: JKT Pusat
S: JKT Selatan
T: JKT Timur
U: JKT Utara

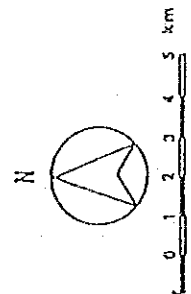


Table 2-1-9 Operation Record of Collection Vehicles

(Jakarta Pusat)

Type	Size	Standard No. of trips	Actual result
Open Cargo	Large	2	1.2
Open Cargo	Small	3	1.5
Tipper	Large	3	1.8
Tipper	Small	3	1.7
Container		4	2.4
Compactor	Large	2	1.7
Compactor	Small	3	1.7

According to the data on operation, the average number of trips made by collection vehicles is 1.5 - 1.7 in every Wilayah. In general, some 60% of the total number of collection vehicles satisfy the standard number of trips.

(3) Crew

The number of crew members per collection vehicle is generally low, i.e. 2.24 in Pusat, 1.87 in Utara, 1.34 in Barat, 1.44 in Selatan and 1.31 in Timur.

(4) Operation control

Although the operation of each collection vehicle is recorded daily, there is an insufficient control of the collected waste's weight, collection time, driving mileage and vehicle maintenance.

(5) Street sweeping

a. Work hours

In general, the actual working hours are as short as only 4 hours, from 5:00 a.m. - 9:00 a.m.

b. Work control

As the work is carried out in the early morning or late evening, it is difficult to achieve efficient control.

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c. Work standard

The standard length of streets subject to sweeping by a single sweeper is given as 2,000 m.

(6) Treatment and disposal

a. Control of Collection Vehicles at Disposal Sites

The check and control of collection vehicles arriving at disposal sites by the Dinas Kebersihan are insufficiently conducted.

b. Check on transported waste amount

The amount of waste transported by the collection vehicle at the disposal site is not checked.

c. Control of informal disposal sites

No specific regulations concerning informal disposal sites are currently enforced.

2.1.4 Institutional Aspects

1) Organization

The administrative structure relating to solid waste management is as follows.

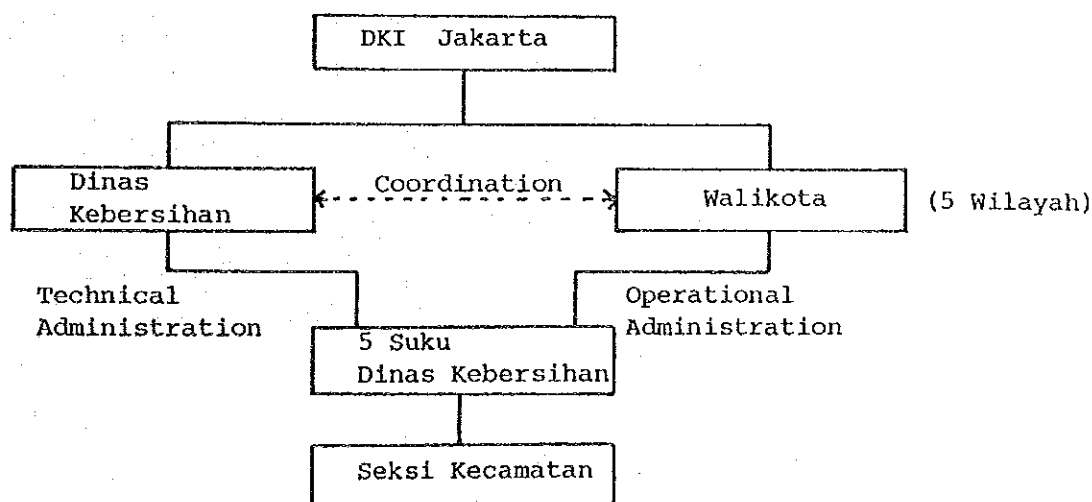


Fig. 2-1-5 Administrative Structure

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DKI Jakarta has authority over financial provisions, land acquisition, worker employment and the nomination of the top officials of the Dinas Kebersihan.

The Walikota is responsible for the personnel control of the waste collecting work.

The Dinas Kebersihan is responsible for technical administration. It administers project planning and appraisal, purchase and supply of collection vehicles, worker distribution, repair of vehicles and actual operation.

The Suku Dinas Kebersihan administers solid waste collection, street sweeping and the collection of fees.

The Seksi Kecamatan conducts the despatch of collection vehicles, crew assignment and fee collection.

2) Structure of Dinas Kebersihan

Fig. 2-1-6 shows the structure of the Dinas or Suku Dinas Kebersihan. All the sub-sections are juxtaposed to one another.

3) Personnel

Of the 6,084 employees of the Dinas Kebersihan, only 23 (0.38%) are university graduates. 75% of the total number and in particular almost all drivers and street sweepers are either elementary school graduates or lack any formal education.

Administrative staff account for some 22% of the total number of employees and are mostly working in the Dinas Kebersihan.

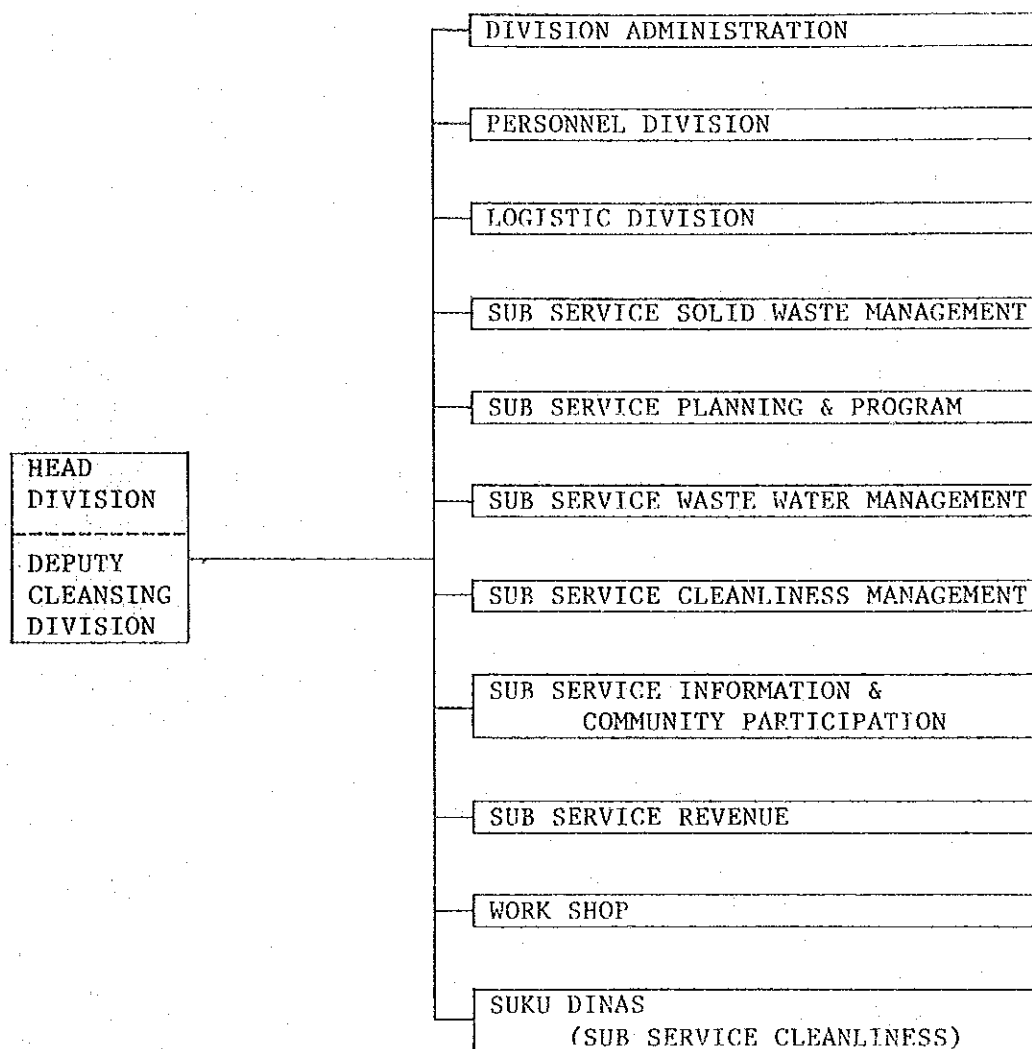


Fig. 2-1-6 Structure of Dinas Kebersihan

4) Current conditions of solid waste management system

The current conditions of the solid waste management system are shown in Table 2-1-10. The number of employees per 1,000 population is 0.83 and the collection amount per crew is 2.13 t/day. Among all workers, street sweepers constitute the highest ratio of over 40% in each Wilayah.

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Table 2-1-10 Current Situation of Solid Waste Management System

Population	A :	7,300,000 persons
Generated Waste Amount	B :	3,522 t/d
Number of Vehicles	C :	754 units
Collected Waste Amount	D :	3,036 t/d
Total No. of Employees	E :	6,084 persons
Staff	F :	1,058 persons
Drivers	G :	775 persons
Collection Crew	H :	1,424 persons
Street Sweepers	I :	2,550 persons
Inspectors	J :	277 persons
No. of Vehicles/1,000 Population C/A	:	0.103
Collection Ratio D/B	:	0.862
No. of Employees/1,000 Population E/A	:	0.83
Collection Amount/Crew D/H	:	2.13 t/persons
Ratio of Street Sweepers to No. of Employees I/E	:	0.419

5) Responsible body for each type of solid waste

Table 2-1-11 shows the responsible body for each type of solid waste generated in Jakarta.

The Dinas Kebersihan deals mostly with domestic and commercial waste. The collection of that waste generated at P.D. Pasar Jaya, canals and gardens is conducted by the relevant management authority and final disposal is carried out by the Dinas Kebersihan.

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Table 2-1-11 Responsible Body for Each Type of Solid Waste

Type of Waste	Primary Collection	Transportation	Treatment & Disposal	Execution Body
Domestic Waste	Dinas K	Dinas K	Dinas K	Dinas K
	RT/RW	Dinas K	Dinas K	
	RT/RW	Dinas K	Self-Disposal	
			Self-Disposal at Source	
Market Waste	Dinas K	Dinas K	Dinas K	Dinas K
	P.D.Pasar	P.D.Pasar	Dinas K	P.D.Pasar
Commercial Waste	Dinas K	Dinas K	Dinas K	Dinas K
	Self-Haulage	Self-Transportation	Dinas K	
	(Private Company)	(Private Company)	Self-Disposal	
			Self-Disposal at Source	
Industrial Waste	Dinas K	Dinas K	Dinas K	Dinas K
	Self-Haulage	Self-Transportation	Dinas K	Each Factory
			Self-Disposal	
			Self-Disposal at Source	
Canal Waste	D.P.U.	D.P.U.	Dinas K	D.P.U.
Garden Waste	Dinas Pertamanan	Dinas Pertamanan	Dinas K	Dinas Pertamanan

Dinas K = Dinas Kebersihan

2.1.5 Financial Aspects

Although the fee collection system has been formally established and a target figure is set for each year, the actual ratio of fees collected in the total budget is currently as low as 3%. The collection of fees is carried out by the Seksi Kecamatan except in Jakarta Utara. The financial flow of solid waste management in Jakarta is shown in Fig. 2-1-7.

The total budget is Rp.17.5 billion Rp and per capita expenditure is Rp.2,500 per year. As other projects in the city of Jakarta are given higher priority, it is difficult to expect increased budget from the general account for solid waste management.

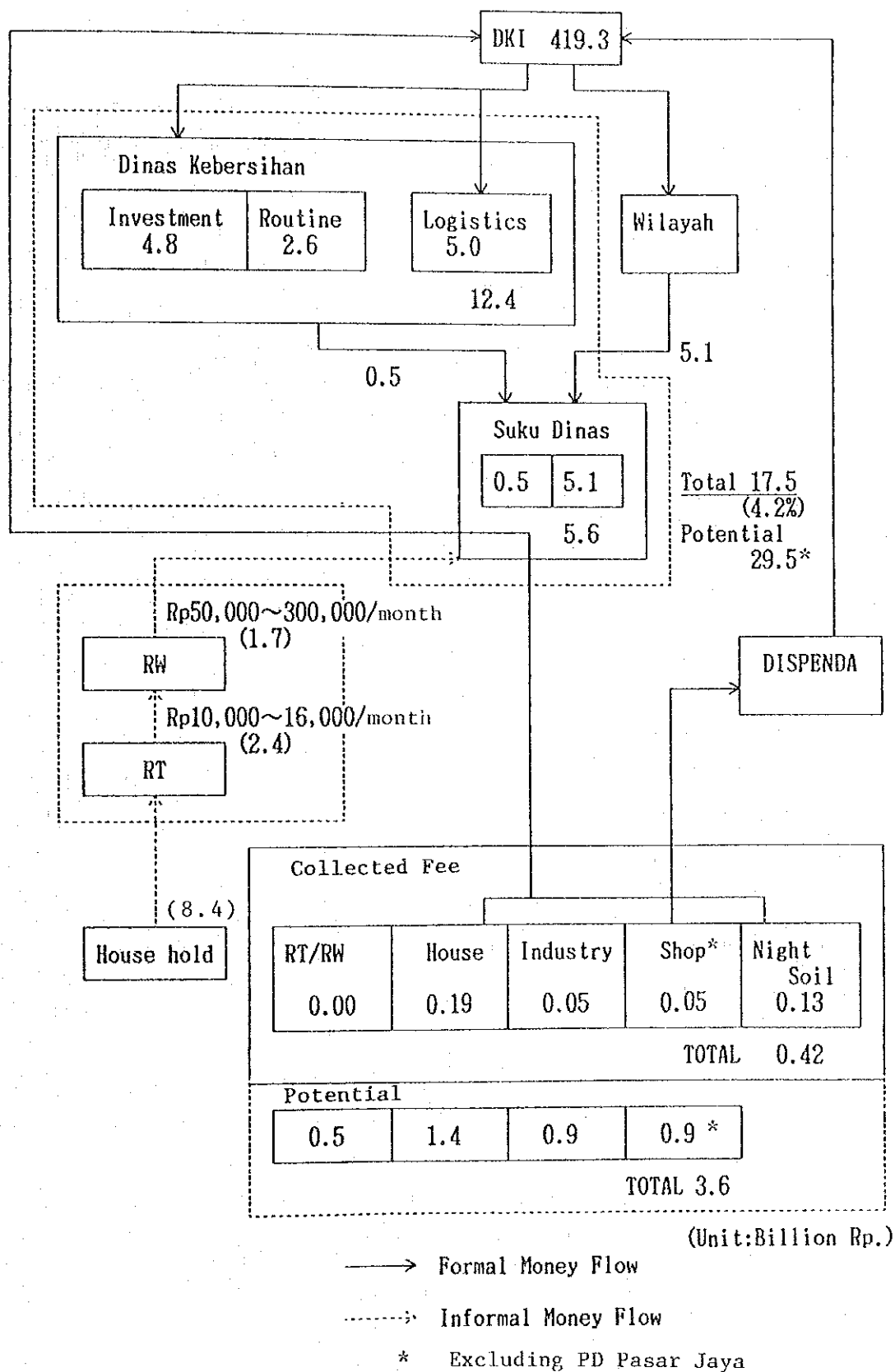


Fig. 2-1-7 Outline of Financial Flow and
Solid Waste Management Budget (1985/1986)

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2.1.6 Citizen Participation

Assisting the official collection activities, the collection of solid waste using handcarts is carried out by the RT/RW, covering 70% of the city's total population.

Judging from the results of the collection experiment, the potential for citizen participation is apparently high.

In low income Kampung areas, waste is tend to be illegally thrown away, because collection vehicles cannot access due to narrow roads and because community activities concerning cleansing are low. Especially the areas along canals, those are causes of canal waste.

In addition, pamphlets, etc. are prepared by the city and campaign groups are organized to carry out public relation activities in order to improve the residents' awareness of the importance of solid waste management.

Various efforts should be made to increase the consciousness of sanitation particularly among low income people.

2.1.7 Regulation

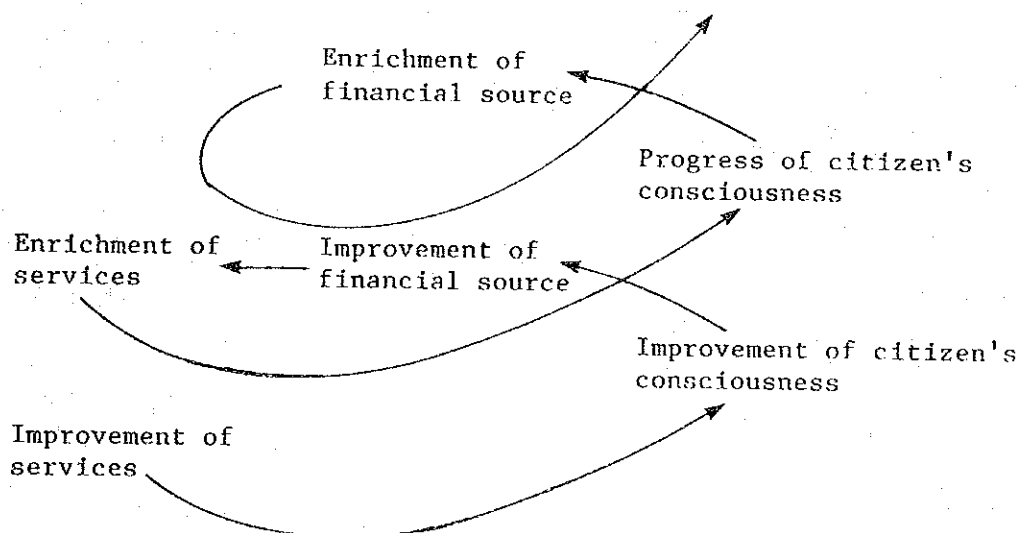
Although the basic institutional frame work concerning cleansing is established, standards for operations concerning the control of private sector and private disposal sites, criteria for the punishment for illegal disposal and standards for the discharge of wastes are insufficient.

2.2 Problems of the Current Situation and Factors to be Considered in the Future

2.2.1 Current Problems

The problems relating to solid waste management in Jakarta are listed and classified in Fig. 2-2-1 and the underlying causes for each type of problem are given in Table 2-2-1.

The basic problems arise mainly from insufficiency of collection services, poor citizen's consciousness and insufficient financial source. Among these, the solving of insufficiency of the services should be given priority because the following spiral development would be formed from the starting point of the services:



In order to improve the services, it is indispensable to prepare necessary equipment and facilities and to establish the operation control system for efficient operation, which are observed as weak points in the current solid waste management in Jakarta. These weak points prevent development to the next stage. On the other hand, understanding of the municipality which is necessary for investment in equipment and facilities and the improvement of the operation control system is not sufficient. Thus the improvement should be made by strengthening of the organization, regulations, finances and citizen's participation.

Fig. 2-2-1 Current Problems Relating to Solid Waste Management in Jakarta

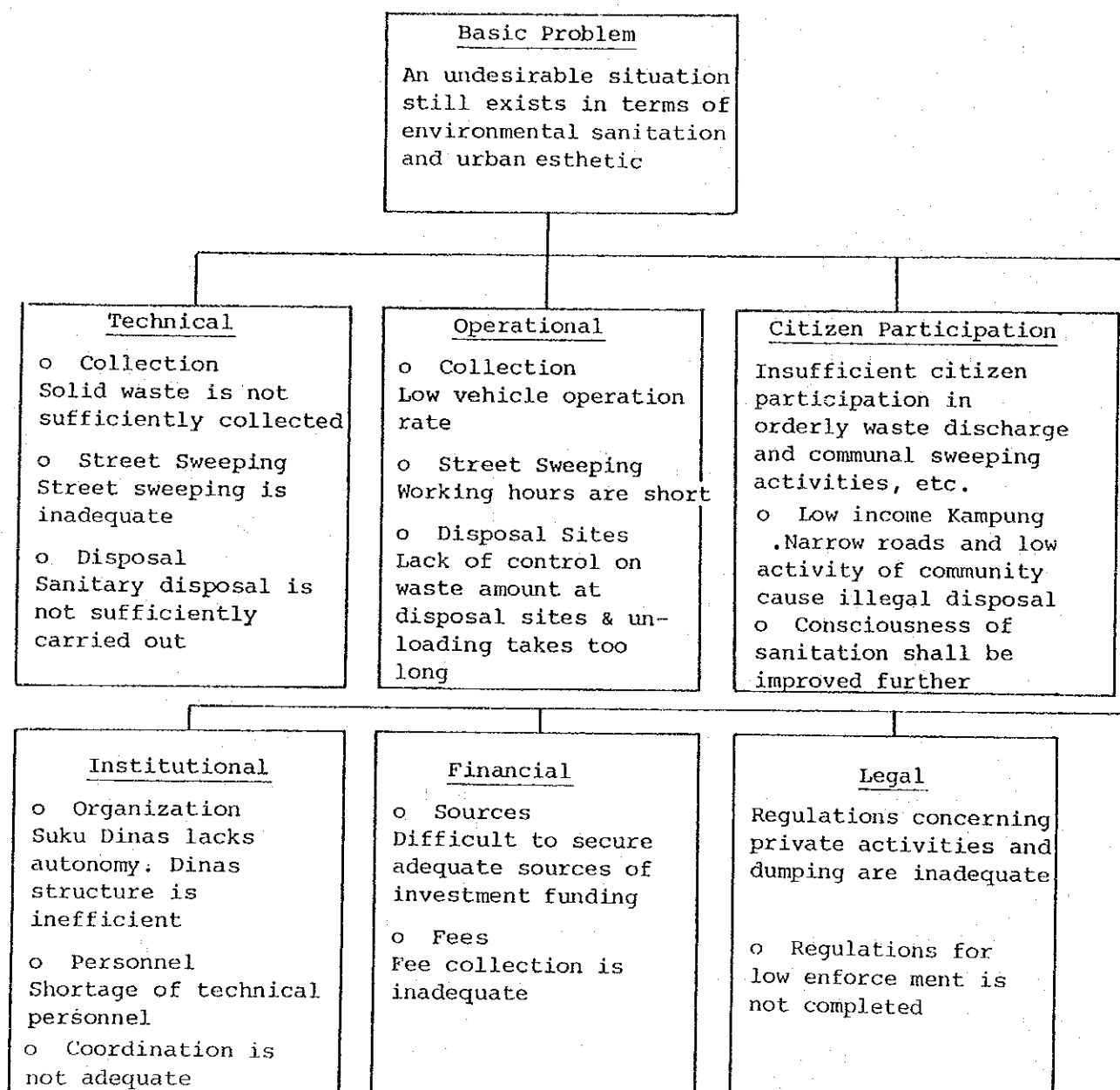


Table 2-2-1 Problems Relating of Solid Waste Management

Item	Problem	Analysis
Basic Problem	<ol style="list-style-type: none"> 1. Undesirable situation still exists in terms of environmental sanitation and urban esthetic 2. Uncollected litter is scattered in some places 3. Small disposal sites with sanitation problems are scattered 	<ol style="list-style-type: none"> 1. Waste collection and disposal services are inadequate 2. Citizens' cooperation is inadequate 3. Sufficient funds to integrate the above are unavailable
Technical Aspect	<p><u>Collection</u> Solid waste is not adequately collected</p> <p><u>Street Sweeping</u> Streets where regular sweeping is desirable are not adequately swept</p> <p><u>Final Disposal</u> Sanitary disposal is not adequately carried out</p>	<ol style="list-style-type: none"> 1. Such inefficient collection methods as open spaces, handcart pools and concrete bins still largely remain 2. Equipment for efficient collection is lacking 3. The mixture of various collection systems prevents efficient operation <ol style="list-style-type: none"> 1. Shortage of sweepers 2. Inefficient street sweeping method <ol style="list-style-type: none"> 1. Inadequate understanding at governmental level 2. Lack of funds 3. Shortage of technicians
Operational Aspect	<p><u>Collection</u> 1. Number of collections made by each vehicle is low</p> <p>2. Low operational rate of vehicles</p>	<ol style="list-style-type: none"> 1. Long transportation time due to long distances and traffic congestion 2. Inadequate control of working hours

- Continued

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Item	Problem	Analysis
Institutional Aspect		3. Lack of control of weighing amount of waste collected 4. Inadequate vehicle maintenance 5. Service period of vehicles is too long
	<u>Street Sweeping</u> Short working hours and low productivity	1. Inadequate control of working hours 2. Lack of transport vehicles for efficient sweeper deployment
	<u>Final Disposal</u> 1. Lack of control of waste amount at disposal sites 2. Unloading of waste takes too long	1. Inadequate check of vehicles arriving at disposal sites 2. Inadequate provision for efficient dumping of waste
	<u>Organization</u> 1. Suku Dinas incapable of dealing with local waste problems 2. Inefficient structure of Suku Dinas	1. Administrative division of Suku Dinas is weak due to over-concentration of capable personnel in Dinas. Suku Dinas lacks sufficient authority 2. Responsibilities of various sections of Dinas overlap and there is no section to efficiently organize them
	<u>Personnel</u> 1. Shortage of workers 2. Low worker quality 3. Shortage of technical personnel	1. Worker shortage is not dealt with due to lack of recruiting authority 2. Difficulty to secure capable personnel due to lack of recruiting authority

- Continued

PART I

Item	Problem	Analysis
Financial Aspect	<u>Sources</u> Insufficient investment funding for equipment and facilities <u>Fees</u> Low rate of fee collection	1. City lacks sufficient financial capability 1. Inadequate understanding among citizens 2. Weak motivation for fee collection as fees collected cannot be immediately used for solid waste management 3. As fee collection conflicts with the tipping system, it is disliked by collection workers
Legal Aspect	<u>Regulations</u> Inadequate regulations concerning private activities and dumping of waste	1. No clear responsibility clause exists relating to dumping of waste 2. There are no standards or regulations concerning private disposal sites 3. There are no legal provisions concerning waste discharge by citizens
Citizen Participation	Inadequate citizen participation in orderly waste discharge and communal sweeping, etc.	1. Low understanding of solid waste problems by citizens 2. Citizens are not provided with either sufficient education or information

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2.2.2 Factors to be considered in the Future

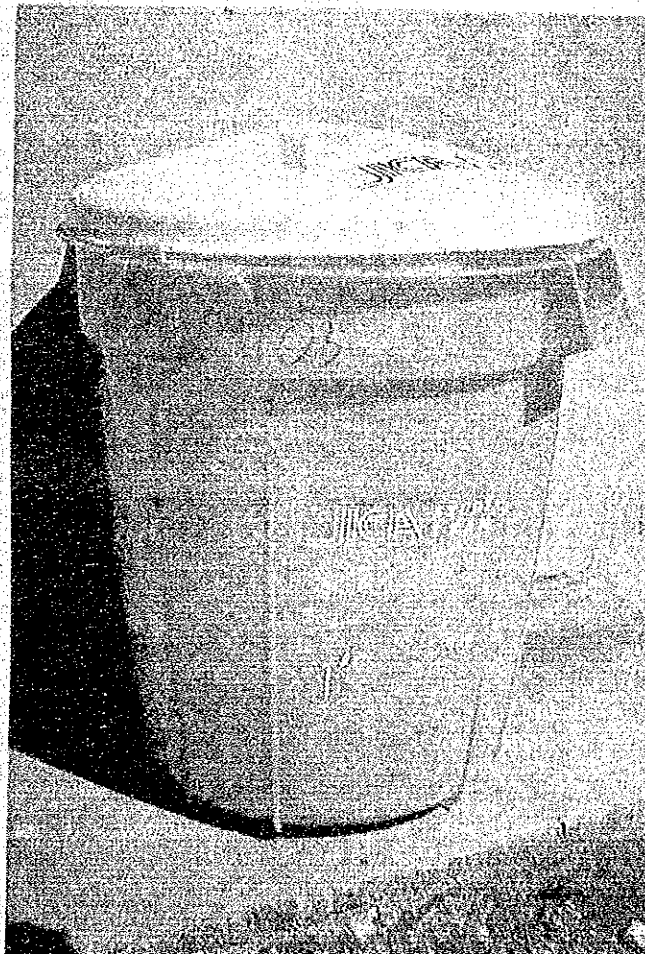
If the current tendency in solid waste management in Jakarta persists, it is forecasted that it will not be able to keep up with the future urbanization of Jakarta.

The following may be enumerated as the factors which are likely to have a large impact on the collection and treatment of solid waste in the future.

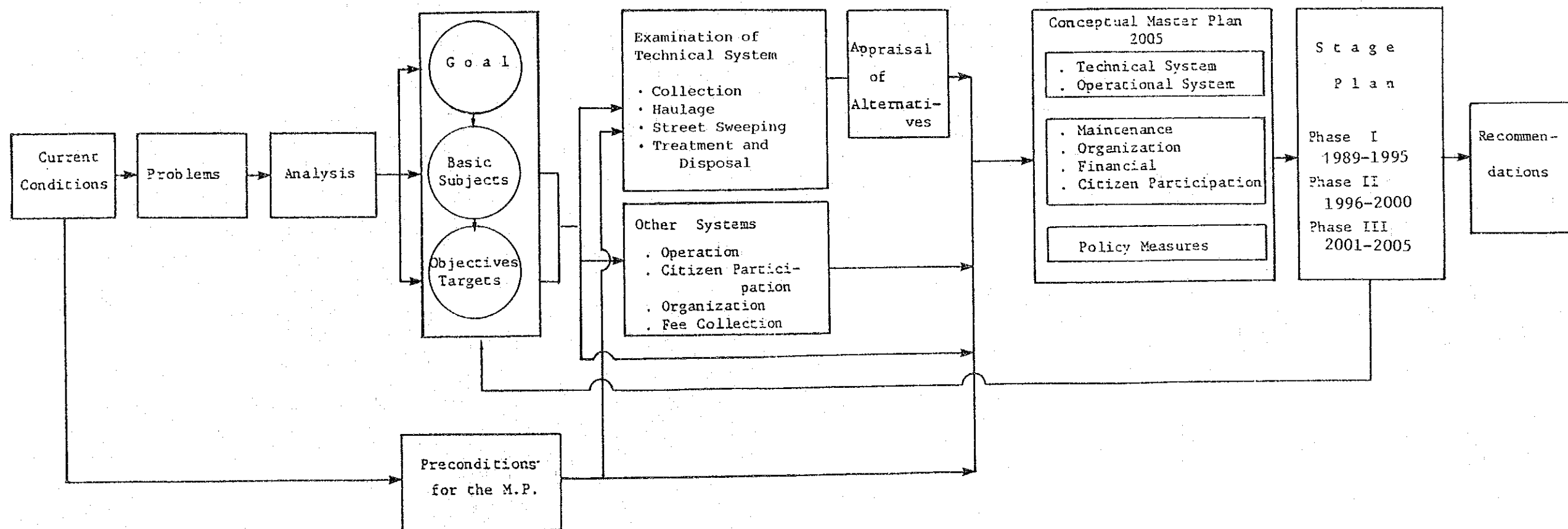
- a. The amount of waste will increase with the increase in population, expansion in business activities and improvement in living standards.
- b. The disposal sites will eventually be located further away as it will become difficult to secure disposal sites within the city of Jakarta.
- c. As an improvement in the road traffic conditions is beyond hope, the running efficiency of vehicles for collection and haulage will remain at a low level.
- d. The rise in the cost of solid waste management is inevitable due to the relative rise in manpower costs and other reason, but not much of an increase in financial resources for waste management can be expected from the city's budget.
- e. As urbanization advances within the city of Jakarta, the acquisition of land for transfer stations and treatment facilities within the city is anticipated to become difficult rapidly.

It is required to establish a rational and efficient cleansing organization to cope with future problems and to solve the current ones.

PART II CONCEPTUAL MASTER PLAN



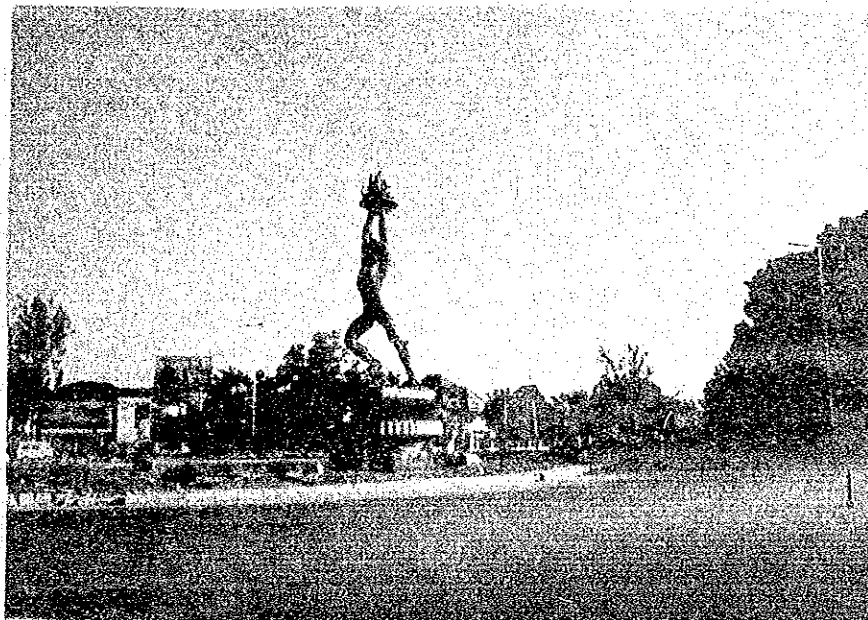
Introduction



Process of the Conceptual Master Plan

CONCEPTUAL MASTER PLAN

CHAPTER 1 FUTURE GOAL



CHAPTER 1 FUTURE GOAL

1.1 General

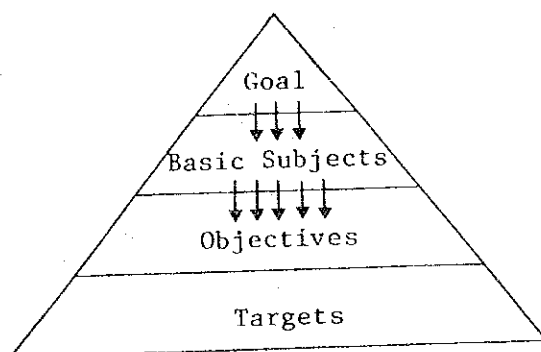
The framework for future solid waste management in Jakarta comprises such concepts as the goal, basic subjects, objectives and targets.

The goal is the general concept of solid waste management which Jakarta should achieve in the future.

The basic subjects are the basic strategical concepts to achieve this goal.

The objectives are the concrete strategical concepts which derive from the basic subjects while the targets show the quantitative aspects of the objectives.

Fig. 1-1-1 Framework for Future Solid Waste Management



1.2 Goal

Securing high environmental sanitation at an affordable level for Jakarta as an international, central city in Southeast Asia.

It is required that Jakarta achieves the high environmental sanitation standard in order to match its status as a central, international city in Southeast Asia and the conscious effort of all Jakarta's citizens will be necessary to achieve this standard.



Fig. 1-2-1 Goal

1.3 Basic Subjects/Objectives/Targets

1) Basic subjects

(1) Desirable solid waste flow

The fast removal of waste from residential areas and its sanitary disposal are prerequisites for an adequate environmental sanitation standard in Jakarta. The solid waste flow shown in Fig. 1-3-1 Should be achieved by the year 2005 satisfying the above

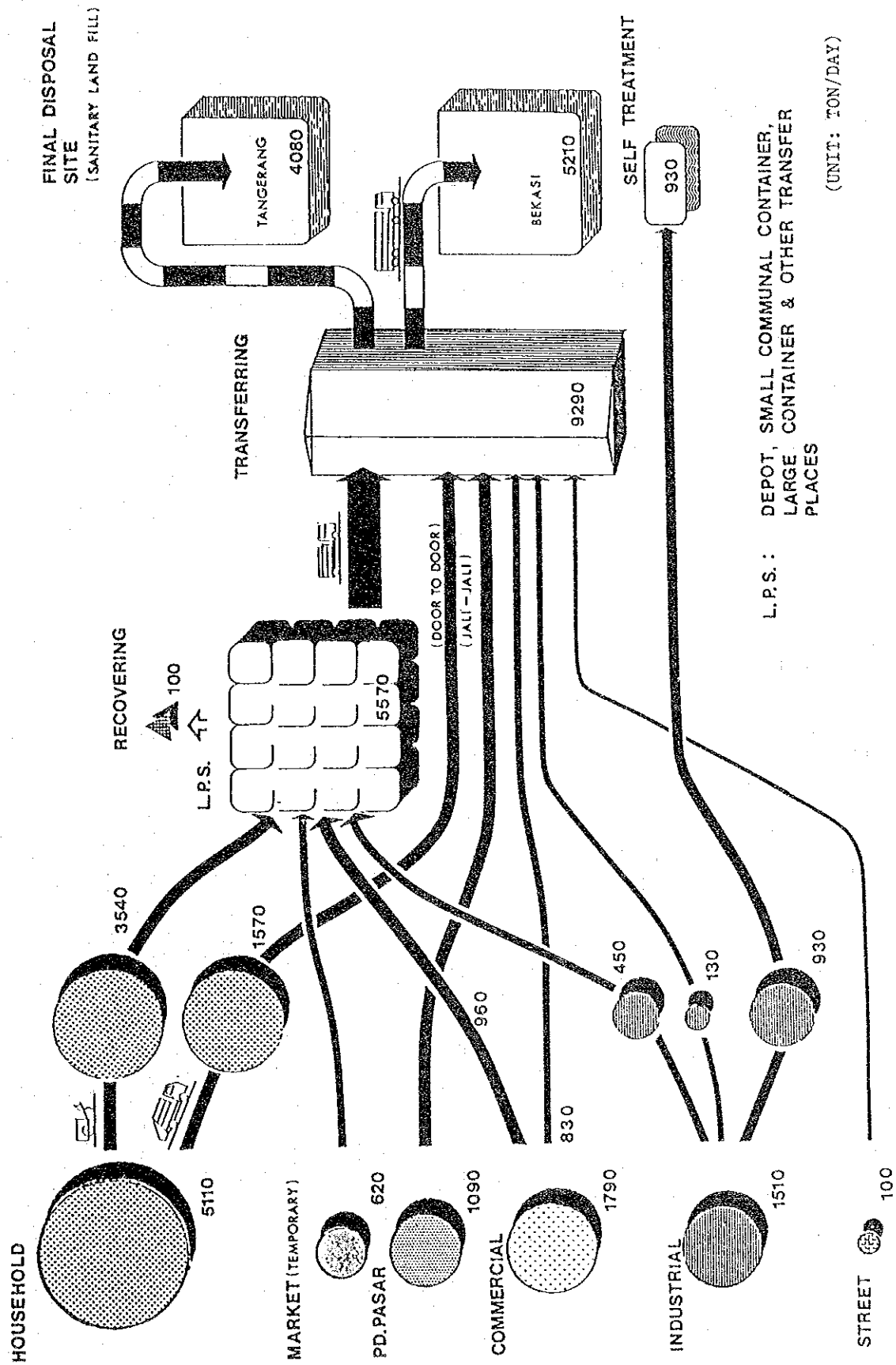


Fig. 1-3-1 DESIRABLE SOLID WASTE FLOW IN 2005

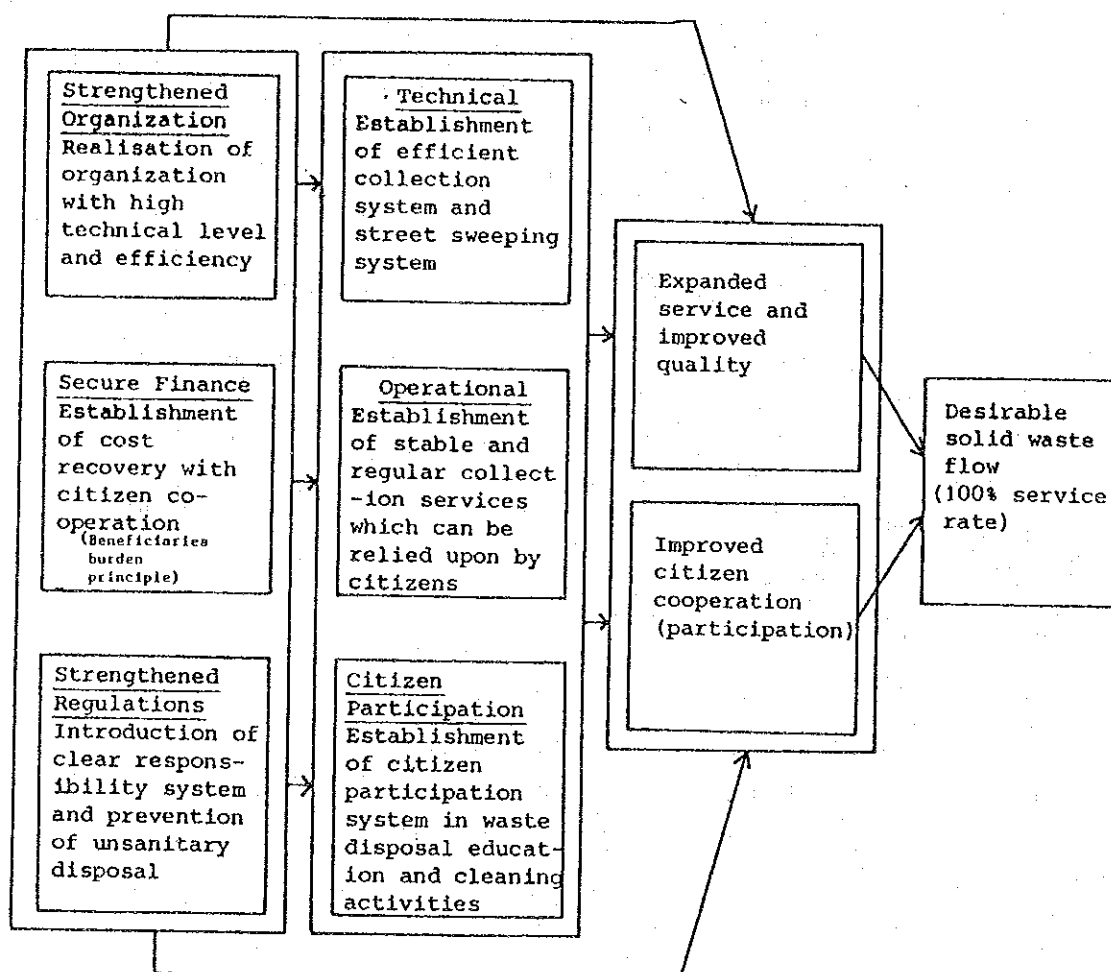
requirements with full cooperation between the authorities and the citizens. The service rate must be improved from the current 86% to 100% by the same year to achieve this solid waste flow.

(2) Strategical requirements

Extended services, improvement of the service quality and the establishment of citizen' participation will be indispensable for the control of the desirable solid waste flow conceived in a) above.

The concrete strategies shown in Fig. 2-3-2 should be completed to achieve the two above-mentioned basic subjects.

Fig. 1-3-2 Strategical Requirements



2) Objectives and targets

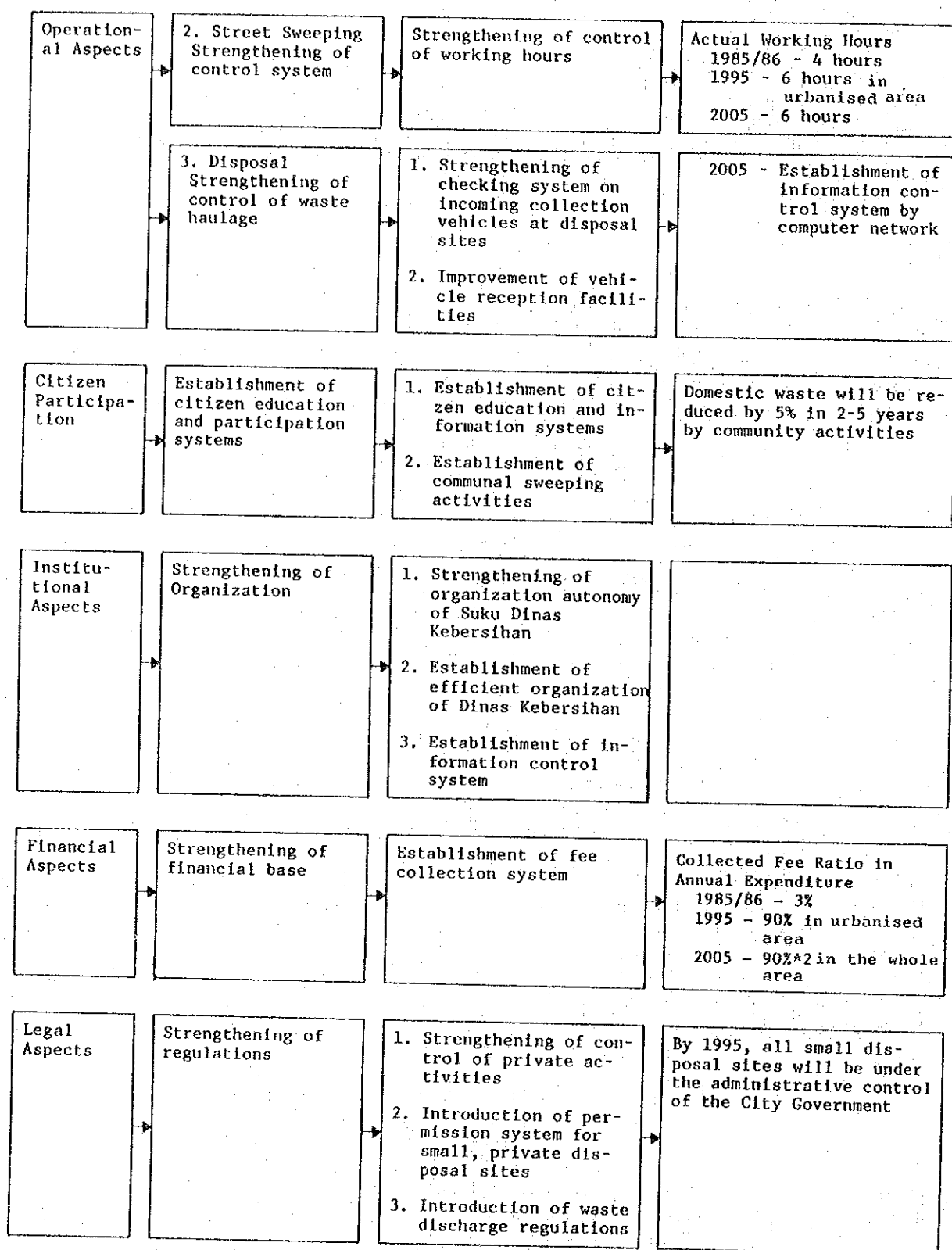
Based on the strategical requirements described in (2) above, the concrete objectives and targets to be achieved by the year 2005 are shown in Table 1-3-1.

Table 1-3-1 Strategical Requirements/Objectives/Targets

Item	Strategical Requirements	Objectives	Targets
Technical Aspect	1. Waste Collection o Establishment of efficient waste collection system o Establishment of efficient haulage system	1. Vehicle mechanisation 2. Substitution of inefficient transfer system by efficient system 3. Simplified collection system 4. Provision and improvement of transfer stations	Vehicle Mechanisation Ratio 1985/86 - 40% 1995 - 100% in urbanised area 2005 - 100% in the whole area Provision Ratio of LPS Transfer Facilities 1985/86 - 30% 1995 - 100% in urbanised area 2005 - 100% in the whole area
	2. Street Sweeping Establishment of efficient street sweeping system	1. Introduction of adequate sweeping frequency 2. Establishment of efficient sweeping method	Basic Frequency 1985/86 - daily 1995 - twice a week in urbanised area 2005 - twice a week in the whole area
	3. Disposal Establishment of adequate disposal system	1. Provision of sanitary landfilling 2. Introduction of facility standards	Sanitary Landfilling Ratio 1985/86 - 5% 1995 - 100% in urbanised area 2005 - 100% in the whole area
Operational Aspect	1. Waste Collection	1. Strengthening of control of working hours 2. Control of weighing waste 3. Strengthening of vehicle maintenance at Suku Dinas level	Waste Weighing Ratio 1985/86 - 0% 1995 - 100% excepting Barat and Timur 2005 - 100% Vehicle Operation Rate 1985/86 - 70% 1995 - 100% in urbanised area 2005 - 100% in the whole area

- Continued

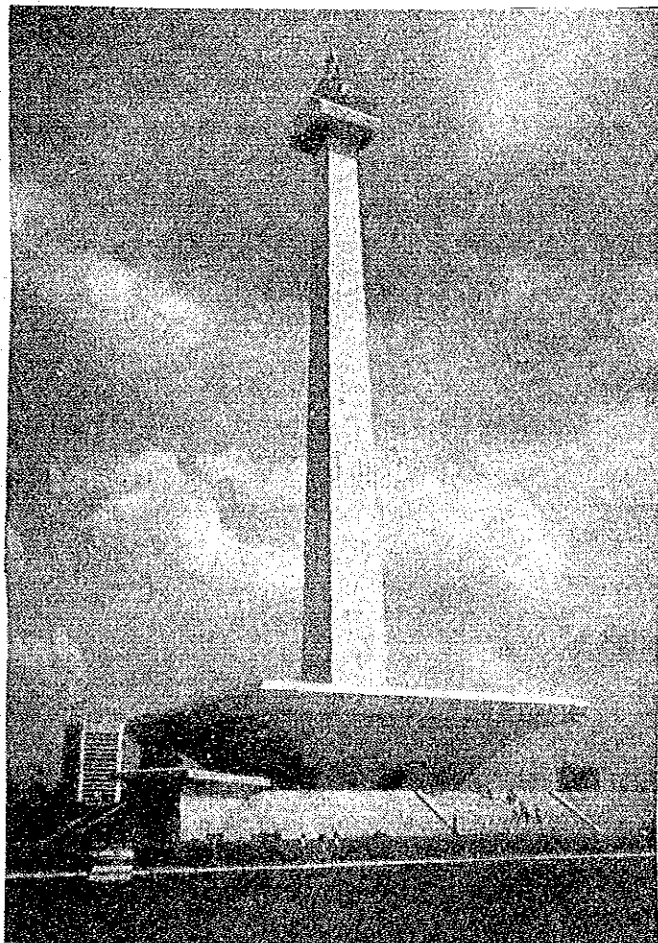
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*1 15% of vehicles are in workshop for maintenance.

*2 10% of expenditure is used for street sweeping and other public cleansing, the costs of which are not covered by beneficiaries.

CHAPTER 2 PRECONDITIONS FOR THE MASTER PLAN



CHAPTER 2 PRECONDITIONS FOR THE CONCEPTUAL MASTER PLAN

2.1 Study Area

The study area of the Conceptual Master Plan covers the city of Jakarta, excluding the Pulau Seribu area. The location of the study area is shown in the Fig. 2-1-1.

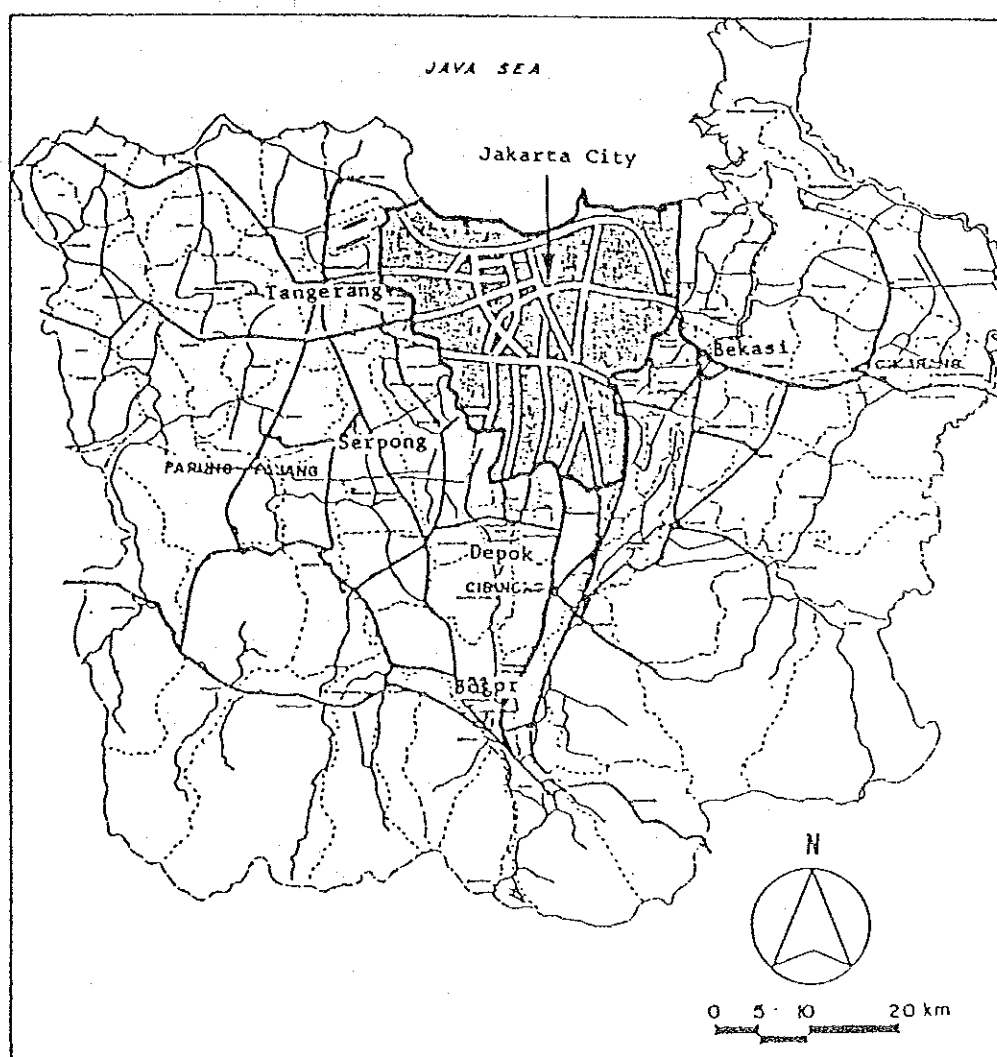


Fig. 2-1-1 Study Area

2.2 Future Social and Urban Conditions

1) Population

In the year 2005, the estimated population is predicted to be 12 million based on the Master Plan DKI (Table 2-2-1).

Table 2-2-1 Population Trends-Jakarta

(Persons)

1984	1995	2005
7,300,000	9,950,000	12,000,000

Source: 1984 population is estimated based on the 1980 Population Census and the 1984 Population Registration

: 1995 and 2005 populations are from the Master Plan DKI

2) Employment

Projected employment by industry upto 2005 for Jakarta is indicated in Table 2-2-2.

Table 2-2-2 Employment by Industry

(Persons)

	1984	1995	2005
Primary Industry	41,000	52,000	55,000
Secondary Industry	511,000	738,000	1,001,000
Tertiary Industry	1,734,000	2,481,000	3,629,000
Total	2,286,000	3,271,000	4,685,000

Source: Estimated figures are based on the 1980 Population Census and the Master Plan DKI

3) Income

Based on the Master Plan DKI, the income distribution according to the ratio of each income group in 1984 and 2005 is shown in Table 2-2-3.

Table 2-2-3 Monthly Income Level by Households

Income Level	(Households)		
	1984	1995	2005
High Income	126,000	354,000	781,000
RP 200,000 -	(8.9%)	(17.0%)	(27.5%)
Average: RP 391,000			
Medium Income	639,000	1,050,000	1,363,000
RP 55,000 - 200,000	(45.0%)	(50.5%)	(48.0%)
Average: RP 109,000			
Low Income	655,000	676,000	696,000
RP - 55,000	(46.1%)	(32.5%)	(24.5%)
Average: RP 33,000			

Source: 1984 income is estimated based on the 1980 and 2005 figures in the Master Plan DKI.

: 1995 and 2005 income is from the Master Plan DKI.

Note : 1980 prices

4) Urban development policy

- . According to the Master Plan DKI 2005 which was authorized in 1984, urban growth priority will be given to D.R. West and D.R. East while development in D.R. North West and D.R. South will be restricted (Fig. 2-2-1).
- . As a part of the Action Programs under the Master Plan, the Urban Betterment Program was started in 1985 with the objective of redeveloping the Kampung area and improving the solid waste management system (Fig. 2-2-2).
- . Based on the Guided Land Development Program which is part of the Action Programs, new development paying special attention to the

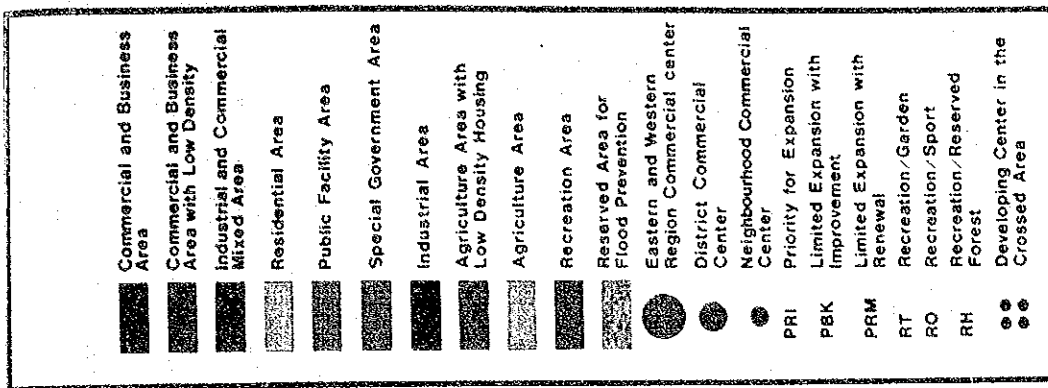
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preferred Indonesian life style and social system is under consideration

5) Future road network

. Road development in DKI Jakarta will be implemented in compliance with the development policy to strengthen the east-west radial road and the outer-link road (Fig. 2-2-3).

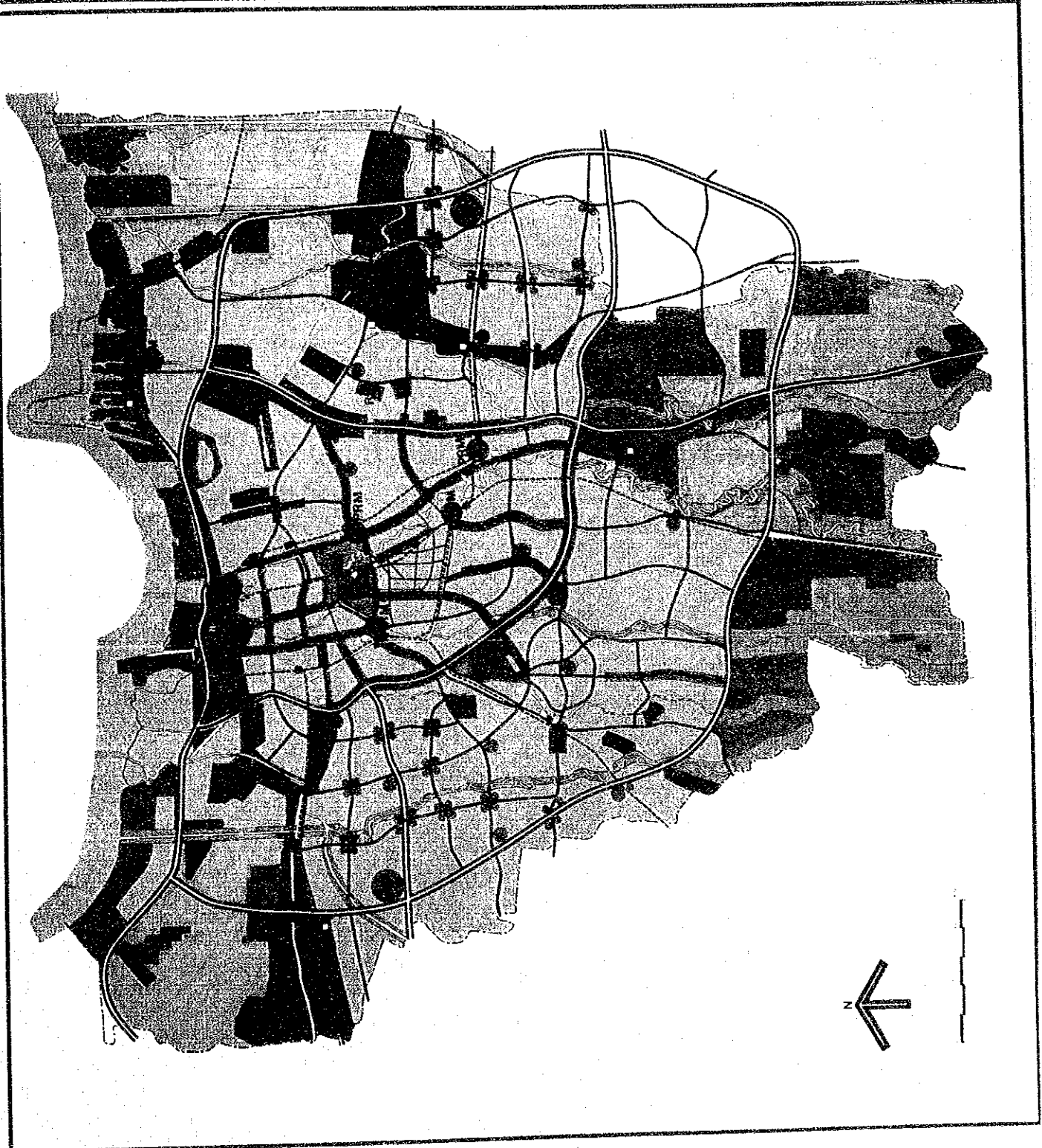
. It is forecast that traffic congestion will not accelerate in the future in the road development policy.

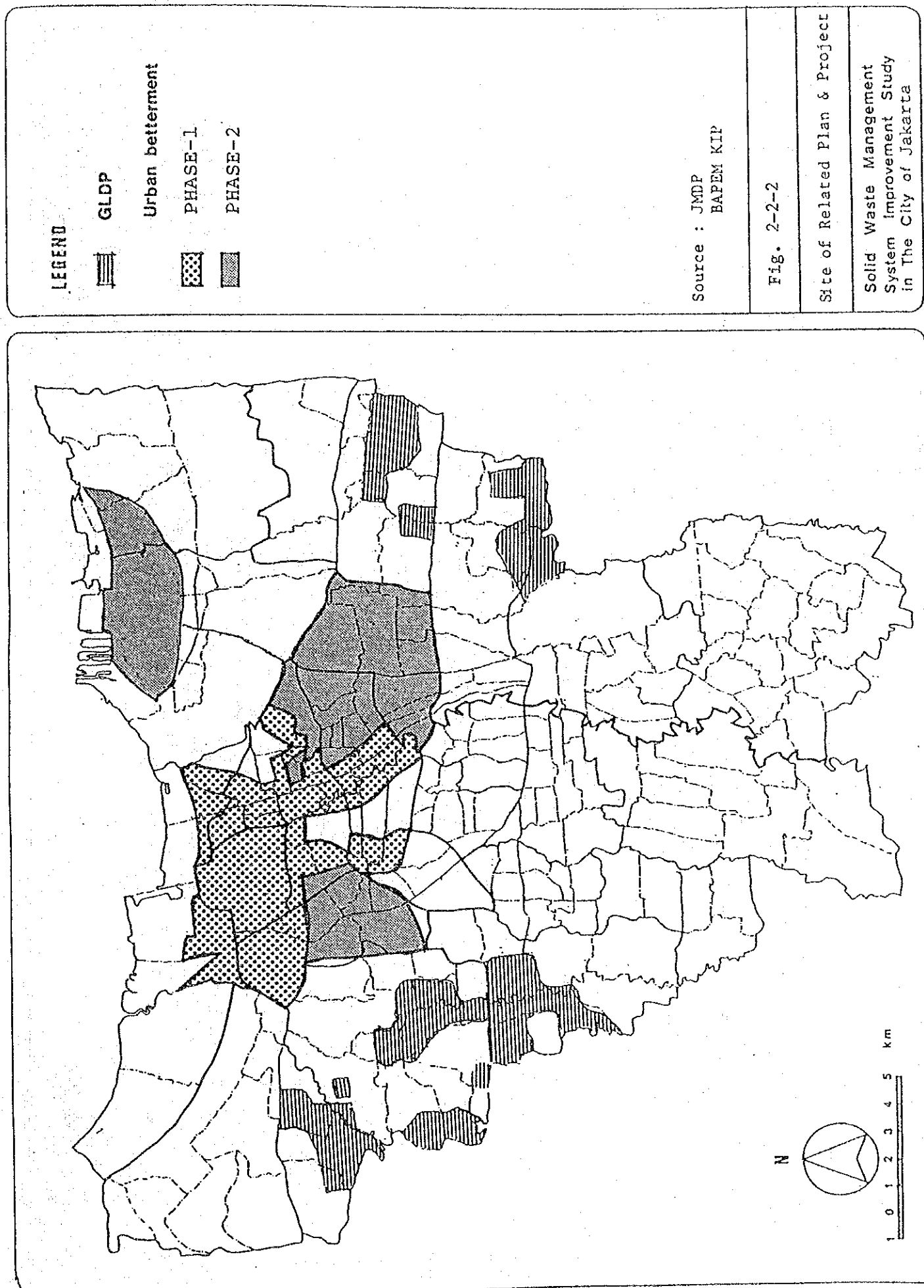


SOURCE : DKI JAKARTA
MASTER PLAN 2005

Fig.2-2-1

Future Land Use





LEGEND

- Existing Road
- - - Road Under Construction
- Future Road

Source : Tata Kota DKI

Fig. 2-2-3

Arterial Road Network

Solid Waste Management
System Improvement Study
in The City of Jakarta



6) Future perspective of RT and RW

The community organization of RT/RW is expected to continue in the future. The function of RT/RW is indispensable and it would be financially quite difficult to replace RT/RW by a public organization. The reasons why RT/RW will continue to exist are as follows:

- a. RT/RW functions as a social security organ at the grass roots level and actively provides social services eg. maintenance of the community's the security, collection of solid waste and organizes artistic, sports and religious activities, religion etc. RT/RW contributes to making life in the community easier and more secure through these grass roots services and activities. From a political and administrative viewpoint, it would be unwise to discontinue such services.
- b. The activities of RT/RW are maintained by contributions from households. The financial situation, manpower, education level and status of each household are taken into consideration in view of activity assignment. It would be difficult for a public organization to take over the same sort of functions.
- c. The activities and services of RT/RW are considered to be manifestations of the spirit of Gotong Royong. While some believe that Gotong Royong at the grass roots level will disappear as the economy of the country develops, it has been traditionally earnestly upheld in Indonesia and as economic growth upto the year 2005 is projected to be less than 5% per year, it is believed that Gotong Royong will continue to play an important role in providing social services to the community.
- d. RT/RW functions as a coordinator between the formal line of administration and the informal activities of the community which is rather important, for instance, in the case of the election campaigns.

RT/RW as an integral part of Indonesia's social structure and will continue to exist in the year 2005 due to the above reasons.

2.3 Financial Preconditions

The economic growth upto 2005 is foreseen as shown in Table 2-3-1. The adoption of the JICA Team Case (I) is assumed for the implementation of this plan.

It is assumed that Jakarta's regional revenue in 2005 will have been increased from the present level in accordance with the growth rate of Case (I).

Assuming the revenue from the Central Government in 2005 to be the same as the current level, the total of Rp.820 billion will be Jakarta's minimum revenue in 2005 to be used as a financial precondition for the plan.

Table 2-3-1 Future Perspectives of GRDP in Jakarta

	(%)		
	1980 - 1985	1985 - 1995	1995 - 2005
Master Plan 2005	9.5	8.0	7.0
* JICA Team Case (I)	8.0	5.0	5.0
JICA Team Case (II)	8.0	8.5	7.0
		-88/89	
Financial Group of DKI (medium)	10.0	9.0	
UI (low)	8.0	7.06	

Source: Master Plan DKI 2005, Financial Dept. of DKI Jakarta.

Table 2-3-2 Estimated Finance in 2005 (constant price in 1985)
(billion Rp.)

Case	Finance scale	Comments
Revenue from Central Government	126.7	
Revenue from Region	693.0	
* Total	<u>819.7</u>	double of 1985

* Calculated by Study Team

2.4 Estimated Amount and Quality of Waste

2.4.1 Estimated Amount of Waste

The amount of waste is estimated by Wilayah for the following:

- domestic waste
- market waste *1
- commercial waste
- industrial waste *2
- street waste
- canal waste
- waste from Bekasi and Tangerang

*1 The waste from the markets which is collected by P.D. Pasar Jaya was not studied, except for its final disposal. The waste from temporary markets was studied in detail, including its collection, haulage and final disposal.

*2 Only general recommendations are given in the Conceptual Master Plan for industrial and hospital waste which is managed by Dinas Kebersihan.

The estimated overall amount of waste generation by source, Wilayah and target year is as follows.

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- 1) The amount of waste by Wilayah and its sources are summarized in the Table 2-4-1.

Table 2-4-1 Estimated Amount of Waste

1985

(Unit: t/day)

Wilayah *1	Domestic	Market *2	Commercial	Industrial *3	Street	Total
Pusat	470	190	300	90	-	1,050
Utara	340	120	100	210	-	770
Barat	440	170	130	190	-	930
Selatan	620	160	160	170	-	1,110
Timur	560	170	170	120	-	1,020
Total	2,430	810	860	780	50	4,930

1995

Wilayah	Domestic	Market	Commercial	Industrial	Street	Total
Pusat	520	280	430	130	-	1,360
Utara	510	170	140	300	-	1,120
Barat	720	240	190	270	-	1,420
Selatan	1,070	240	220	240	-	1,770
Timur	950	240	250	180	-	1,620
Total	3,770	1,170	1,230	1,120	70	7,360

2005

Wilayah	Domestic	Market	Commercial	Industrial	Street	Total
Pusat	620	410	620	180	-	1,830
Utara	670	250	210	400	-	1,530
Barat	1,080	360	270	360	-	2,070
Selatan	1,410	340	330	330	-	2,410
Timur	1,330	350	360	240	-	2,280
Total	5,110	1,710	1,790	1,510	100	10,220

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Note *1 Market waste is as shown below.

(t/day)	1984	1995	2005
a). Temporary Market	290	420	620
b) P.D. Pasar Jaya	520	750	1,090

*2 "Industrial waste" is composed of that which is dealt by Dinas Kebersihan, self-transportation and by self-treatment.

(t/day)	1984	1995	2005
a) dealt by Dinas Kebersihan	450	450	450
b) self-transportation	130	130	130
c) self-treatment	200	540	930

*3 Canal waste is produced by illegal discharging by residents and people engaged in commercial activities. Therefore, the amount of canal waste is already included in the generation amount of household waste and commercial waste.

The amount of canal waste to be collected is as follows.

(t/day)	1984	1995	2005
Canal waste	130	130	130

*4 Waste from Tangerang and Bekasi

Table 2-4-2 Amount of Waste from Tangerang and Bekasi

(t/day)	1984	1990	1995	2005
Tangerang	140	280	530	1,260
Bekasi	80	170	340	880
Total	220	450	870	2,140

2.4.2 Estimated Quality of Solid Waste

The quality of waste is estimated for the following:

- domestic waste
- market waste
- commercial waste
- industrial waste

The projected waste composition by source is as shown in Table 2-4-3 and 2-4-4.

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1) Domestic waste

Table 2-4-3 Projected Composition of Domestic Waste

(Dry base)

	1986	1995	2005	% growth/annum
Plastic	10%	12%	14%	2%
Paper	17	19	21	1
Textile	5	5	5	0
Wood/Leaf	12	11	10	-1
Garbage	23	21	19	-1
Others	15	14	12	-
Sub Total	82	82	81	-
Metal	4	5	7	5
Glass	4	5	6	3
Stone	10	8	6	3
Sub Total	18	18	19	-
Total	100	100	100	
Moisture Content	54%	51%	48%	-3%
Volatile	28	30	32	-
Ash Content	18	19	20	-
C/N ratio	32	33	35	-
Low cal. value (kcal/kg)	1,100	1,300	1,500	

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2) Market and commercial waste

Table 2-4-4 Projected Composition of Market and Commercial Waste
(Dry base)

	1986	1995	2005	% growth/annum
Plastic	13%	15%	17%	2%
Paper	25	27	30	1
Textile	3	3	3	0
Wood/Leaf	7	6	5	-1
Garbage	28	25	21	-1
Others	14	12	9	-
Sub Total	90	88	85	-
Metal	4	5	7	5
Glass	5	6	7	3
Stone	1	1	1	-
Sub Total	10	12	15	
Total	100	100	100	
Moisture Content	48%	46%	43%	-3%
Volatile	36	37	39	-
Ash Content	16	17	18	-
C/N ratio	35	36	37	-
Low cal. value (kcal/kg)	1,600	1,700	1,800	

3) Industrial waste

The composition of industrial waste can be considered to be similar to market and commercial waste.

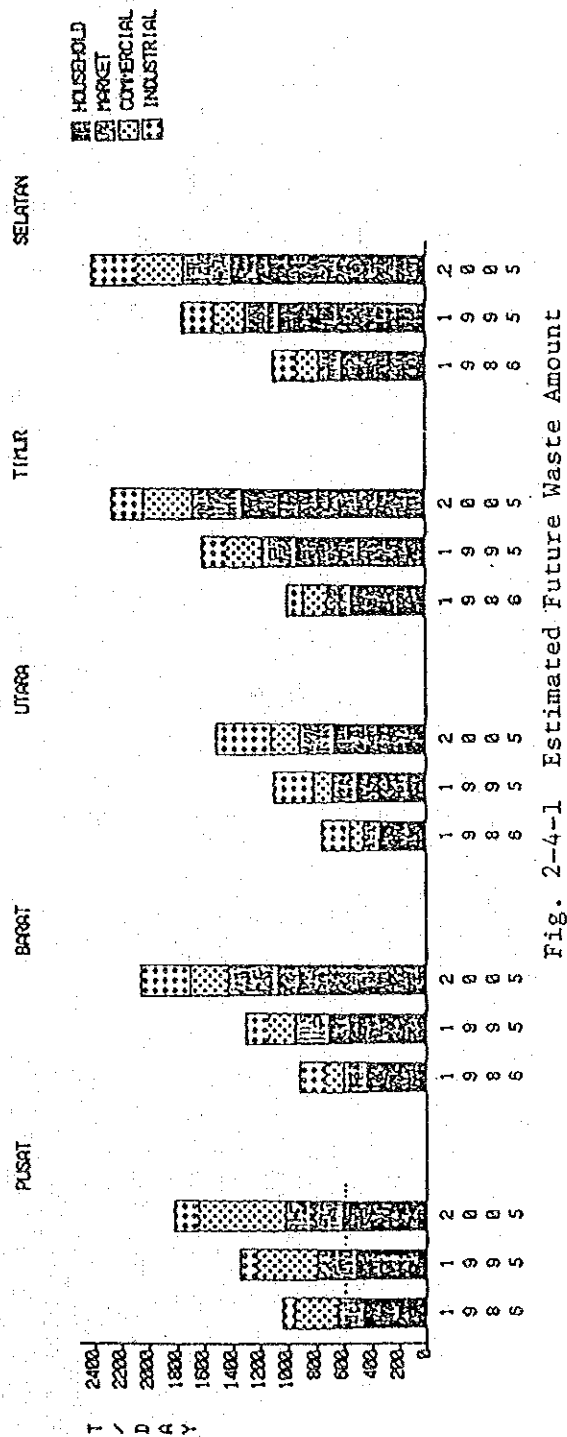


Fig. 2-4-1 Estimated Future Waste Amount

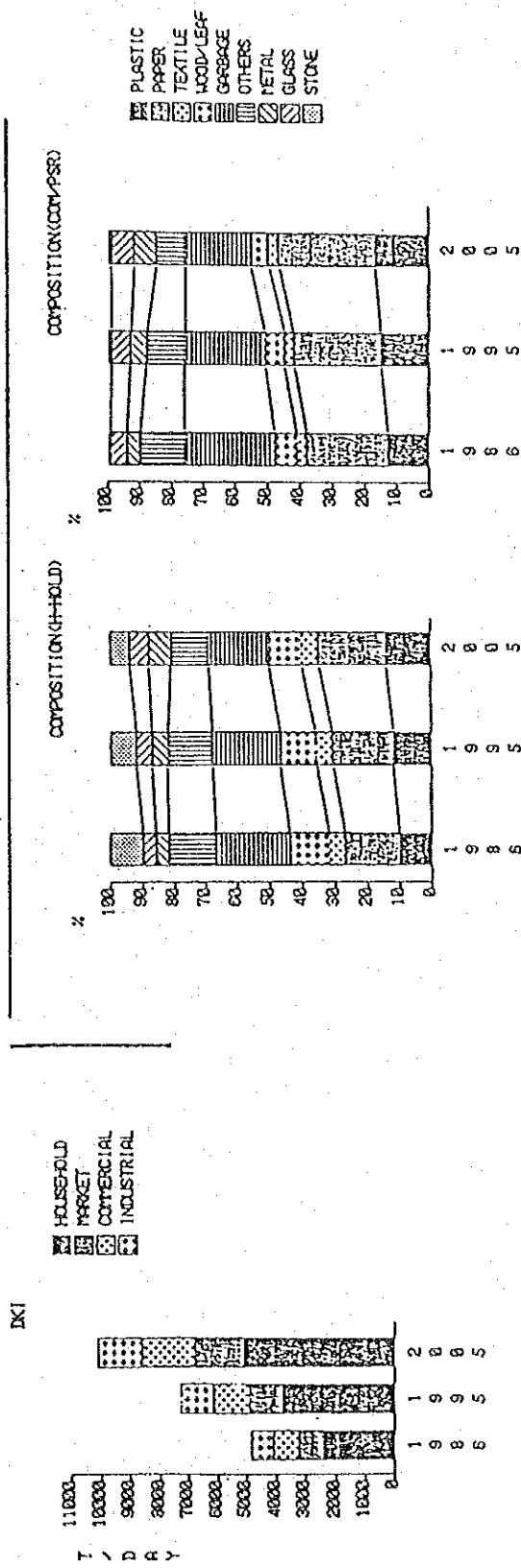


Fig. 2-4-2 Estimated Future Waste Composition (dry base)

