

THE GOVERNMENT OF THE REPUBLIC OF INDONESIA

THE STUDY ON URBAN DRAINAGE
AND
WASTEWATER DISPOSAL PROJECT
IN
THE CITY OF JAKARTA

MASTER PLAN STUDY
SUPPORTING REPORT
VOLI

MARCH 1991

JAPAN INTERNATIONAL COOPERATION AGENCY

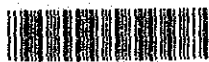
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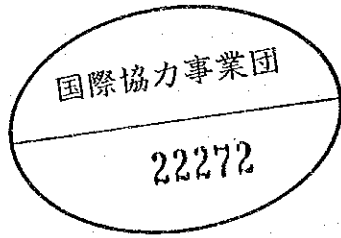
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SUPPORTING REPORT
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JAPAN INTERNATIONAL COOPERATION AGENCY



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ABBREVIATIONS

AIT	Asian Institute of Technology
B/C	Benefit Cost Ratio
BAPPENAS	National Planning and Development Board
BAPPEDA	Regional Planning and Development Board, DKI Jakarta
BPPT	Agency of Assessment and Application of Technology
BOD	Biochemical Oxygen Demand
CIPTA KARYA	Directorate General of Human Settlement
Cl ⁻	Chloride Ion
cm	Centimeters
COD	Chemical Oxygen Demand
Dept.	Department
DKI	Jakarta Metropolitan Government
DO	Dissolved Oxygen
EIRR	Economic Internal Rate of Return
ENSIC	Environmental Sanitation and Information Center of AIT
FC	Fecal Coliform Density
Fig.	Figure
g/cd	Gram per Capita per Day
ha	Hectares (10,000 m ²)
hrs	Hours
HWL	High Water Level
JICA	Japan International Cooperation Agency
JFCP	Jakarta Flood Control Project
JSSP	Jakarta Sewerage and Sanitation Project
JUDP	Jakarta Urban Development Project
kg/d	Kilogram per Day
Kec.	Kecamatan
Kel.	Kelurahan
KIP	Kampung Improvement Project
KKC	Kokusai Kogyo Co., Ltd.
km	Kilometers
km ²	Square Kilometers
kw	Kilowatt
kwh	Kilowatt-hour
lcd	Litter per Capita per Day
m	Meters

m ²	Square Meters
m ³	Cubic Meters
m ³ /s	Cubic Meters per Second
m ³ /d	Cubic Meters per Day
mg/l	Milligram per Litter
mm	Millimeters
MPN	Most Probable Number
MSL	Mean Sea Level
MWL	Mean Water Level
NEDECO	Netherlands Engineering Consultants
NH ₄ -N	Ammonia Nitrogen
NK	Nippon Koei Co., Ltd.
NPV	Net Present Value
NWL	Normal Water Level
OECD	Overseas Economic Cooperation Fund (of Japan)
PCI	Pacific Consultants International
PEI	Project Economy Institute, Inc.
P4L	Cities and Environmental Research and Development Center, DKI Jakarta
p.p.	Priok Pile
ppm	Parts per Million
%	Percent
P3O	Center for Oceanological Research and Development
RBC	Rotating Biological contactor
R.C.	Reinforced Concrete
Rd.	Road
Rp.	Rupiah (Indonesian Currency) US\$=approximately Rp.1850
SS	Suspended Solids
TEC	Tokyo Engineering Consultants
T-P	Total Phosphorus
TS	Total Solids
TVS	Total Volatile Solids
WHO	World Health Organization

APPENDIX A

SOCIO-ECONOMIC CONDITIONS

APPENDIX A SOCIO-ECONOMIC CONDITIONS

1. Administrative Area

The Study Area of approximately 650 km² is divided into five (5) regions (Wilayah) of Central Jakarta (Jakarta Pusat), North Jakarta (Jakarta Utara), West Jakarta (Jakarta Barat), South Jakarta (Jakarta Selatan) and East Jakarta (Jakarta Timur). The five (5) regions are divided into 30 districts (Kecamatan) and further sub-divided into 260 sub-districts (Kelurahan). The Seribu Island covers one (1) Kecamatan with four (4) Kelurahans. Therefore, the Study Area consists of 29 Kecamatans and 256 Kelurahans.

The number of Kecamatan and Kelurahan, and land area covered by the respective Wilayahs of the Study Area are shown below.

Wilayah	Nos. of Kecamatan	Nos. of Kelurahan	Area (ha)
Jakarta Pusat	7	44	4,935
Jakarta Utara	4	31	13,943
Jakarta Barat	5	52	12,889
Jakarta Selatan	7	64	14,616
Jakarta Timur	6	65	18,766
Total	29	256	65,149

The administrative boundaries of the Wilayah, Kecamatan and Kelurahan of the Study Area are shown in Fig. A.1.

2. Population

2.1 Existing Population

The city of Jakarta has been undergoing a rapid population increase in the recent years. According to the national population census and mid-term census, the population of Jakarta city has increased from 4.6 million in

1971 to 6.5 million in 1980 and 8.0 million in 1985 with an average annual growth rate of 4.05%. The population in 1988 was 6.8 million on registered population basis. However, the actual population including non-registered people is estimated at 8.8 million by BAPPEDA, DKI, Jakarta.

The population of the Study Area in 1988 is determined to be 8.8 million by excluding the population of the islands off shore the Bay of Jakarta.

The average population density of the Study Area in 1988 was 134.9 person/ha. The population density by Kelurahan ranges from 3.8 person/ha in Kamal Muara to 1,165.6 person/ha in Kali Baru. The number of Kelurahan by population density distribution is shown below.

<u>Population Density</u> (person/ha)	<u>Nos. of Kelurahan</u>
More than 501	36
401 - 500	21
301 - 400	23
201 - 300	41
101 - 200	57
Less than 100	<u>78</u>
	256

The existing population and population density by Kelurahan are shown in Table A.1. The regional distribution of the existing population density by Kelurahan is shown in Fig. A.2.

2.2 Future Population

The future population of the Study Area in 2005 is estimated to be 12.0 million by the DKI Jakarta Structure Plan 2005. This plan also distributes its population for eight (8) development districts as shown below. For the division of the development districts, see Fig. A.3.

Development District	Population (thousand)			Share of Population Increase (3)/(4)X100(%)
	(1) 1980	(2) 2005	(3)=(2)-(1)	
North - West	251	689	438	8.0
North	2,020	2,411	391	7.1
North - East	187	664	477	8.6
Tanjung Priok	542	897	355	6.4
West	485	1,937	1,452	26.3
Central	1,393	2,128	735	13.3
East	1,060	2,187	1,127	20.4
South	530	1,075	545	9.9
Total	6,468	11,988	(4) 5,520	100.0

The population of the Study Area in 2010 is determined to be 12.8 million by extrapolating the population growth from the year 2005 upto the year 2010 (See Fig. A.4). This population of 12.8 million is also distributed for the above eight (8) development districts by allocating the population increase between 1988 and 2010 for the respective development districts in proportion to the share of each development district for the population increase between 1980 and 2005 determined in the Jakarta 2005 Plan.

The results are shown below.

Development District	1988 Pop. (thousand)	Share of Pop. Increase (%)	Pop. Increase between 1988 and 2010 (thousand)	2010 Pop. (thousand)
North - West	371	8.0	321	693
North	2,527	7.1	285	2,812
North - East	330	8.6	345	675
Tanjung Priok	670	6.4	257	927
West	764	26.3	1,056	1,819

Central	1,732	13.3	534	2,266
East	1,551	20.4	819	2,370
South	841	9.9	397	1,238
<hr/>				
Total	8,786	100.0	4,014	12,800

The eight (8) development districts cover the following numbers of Kelurahan.

<u>Development District</u>	<u>Nos. of Kelurahan</u>
North - West	13
North	67
North - East	13
Tanjung Priok	14
West	22
Central	54
East	37
South	<u>36</u>
	256

The population of each development district is broken down into its respective Kelurahans through the following calculation procedures.

- (1) Habitable land area of the Kelurahans in 2010 is estimated, based on the future land use map prepared in the Jakarta 2005 Plan. All lands other than green land, swamp, farm and are considered to be habitable.
- (2) The population increase in a development district is distributed among all of its Kelurahans in proportion to the area of habitable land.
- (3) The population of each Kelurahan in 2010 is determined by adding the respective population increase between 1988 and 2000 to the population in 1988.

The population and population density in 2010 by Kelurahan are estimated as shown in Table A.2.

The average population density of the Study Area is 196.5 person/ha. The population density by Kelurahan is in the range of 4.3 person/ha in Kamal Muara and 1,193.8 person/ha in Kali Baru. The numbers of Kelurahan by population density distribution is shown below.

<u>Population Density (Person/ha)</u>	<u>Nos. of Kelurahan</u>
More than 501	48
401 - 500	24
301 - 400	35
201 - 300	54
101 - 200	56
less than 100	<u>39</u>
	256

The regional distribution of the population density in 2010 by Kelurahan is shown in Fig. A.5.

3. Land Use

3.1 Existing Land Use

The latest available land use map is the one prepared by the Mapping and Land Measurement Office, DKI Jakarta in 1983. Further, the latest statistical data of the land use in 1988 is available. In these maps and statistical data, the land use of the Study Area is classified into four (4) patterns : (1) residential use (2) commercial and institutional use (3) industrial use (4) other uses.

The land use patterns of the Study Area in 1983 and 1988 are compared as shown below.

Land Use	1983		1988	
	Area (ha)	Ratio (%)	Area(ha)	Ratio(%)
Residential	30,078	(46.4)	37,907	(58.2)
Commercial & Institutional	6,342	(9.8)	9,292	(14.3)
Industrial	2,216	(3.4)	2,610	(4.0)
Others	26,235	(40.4)	15,340	(23.5)
Total	64,872 ^{<1}	(100.0)	65,149 ^{<1}	(100.0)

<1: This difference resulted from the change of the administrative boundary.

The Study Area has undergone a rapid urbanization during the recent five (5) years (1983 - 1988). The residential use increased from 30,078 ha or 46.4% to 37,907 ha or 58.2%, and the commercial and institutional land use increased from 6,342 ha or 9.8% to 9,292 ha or 14.3%. On the contrary, other land uses including green land, swamp area and farm land decreased from 26,235 ha or 40.4% to 15,340 ha or 23.5%.

The land use patterns in 1988 by Kelurahan are shown in Table A.3.

The main features of the existing land use in the Study Area are summarized below.

- (1) Residential areas are widely distributed over the whole Study Area. Number of such typical residential Kelurahans as where the residential area covers more than 80% of the total area counts 78. Share of the residential use by Kelurahan is shown in Fig. A.6.
- (2) Commercial and institutional areas are concentrated in the central part of the Study Area as shown in Fig. A.7. Number of the Kelurahans where the commercial and institutional use constitutes more than 40% is 17.

- (3) Approximately 50% of the industrial areas are located in the northern coastal area. Number of the Kelurahan where the industrial use constitutes more than 20% is 11 as shown in Fig. A.8.
- (4) Other areas covering green land, swamp and farm land are mainly distributed in the western, eastern and southern fringes of the Study Area.

3.2 Future Land Use

In this Study, the future land use pattern of the Study Area in 2010 is assumed to be the same as that in 2005 estimated by the Jakarta 2005 Plan. The land use patterns in 1988 and 2010 are compared as shown below.

Land Use	1988		2010	
	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)
Residential	37,907	(58.2)	38,232	(58.7)
Commercial & Institutional	9,292	(14.3)	11,241	(17.3)
Industrial	2,610	(4.0)	6,383	(9.8)
Others	15,340	(23.5)	9,293	(14.2)
Total	65,149	(100.0)	65,149	(100.0)

Increase of the commercial and institutional, and industrial areas in the future will be large. However, the area of the residential use will remain almost as it is. A large area of the farmlands and swamps will be converted into the commercial and institutional, and industrial areas.

The land use pattern in 2010 by Kelurahan is shown in Table A.4.

The main features of the future land use in the Study Area are summarized below.

- (1) The residential land use pattern of the Study Area will considerably change as shown below although no significant change in total area is expected.

Share of Residential Use	Nos. of Kelurahan	
	1988	2010
0 - 40%	37	32
41 - 80%	141	174
80 - 100%	78	50
	256	256

A considerable number of typical residential Kelurahan will be converted into mixed land use consisting of residential, commercial and institutional, and industrial ones.

Share of the residential use by Kelurahan is shown in Fig A.9.

- (2) The commercial and institutional areas will further concentrate in the central part of the Study Area as shown in fig. A.10. Number of the Kelurahan where the commercial and institutional use constitutes more than 40% will increase from 17 in 1988 to 28 in 2010.
- (3) The industrial areas will concentrate mainly in the northern and eastern parts of the Study Area as shown in Fig. A.11. Number of the Kelurahan where the industrial use comprises more than 20% will increase from 11 in 1988 to 27 in 2010. The following nine (9) Kelurahan are considered as the typical industrial Kelurahan where the industrial use constitutes more than 50%.

<u>Wilayah</u>	<u>Kelurahan</u>	<u>Share of Industrial Use (%)</u>
Jakarta Utara	Tanjung Priok	69
	Kali Baru	65
	Sungai Bambu	62
	Sukapura	57
	Koja Utara	54
	Penjaringan	53
Jakarta Timur	Rawa Terate	78
	Jatinegara	65
	Cakung Barat	65

4. People's Income Level

4.1 Questionnaire Survey

The total number of samples for the survey was 2,560 on household basis. The Study Area consists of 256 Kelurahan and 10 samples were allotted to each Kelurahan.

Households were classified into 6 groups , represented by 6 types of houses as shown below.

- 1: Permanent (A) : Two-story very good house by good construction material with a garage for more than two cars and a large home garden
- 2: Permanent (B) : One or two-story good house by good construction material with a garage for one or two car and a large home garden.
- 3: Permanent (C) : One or two-story medium class house by medium good construction material with a small garage and home garden
- 4: Permanent (D) : Low-cost house by cheap material with a small home garden and no garage. Flats supplied by public housing company
- 5: Semi Permanent : Some part of house is made by wood. With a small home garden and a low cost fence
- 6: Temporary : Almost all part of house is made by wood. No home garden

One sample was assigned to Permanent (A) and Permanent (B) types of houses, respectively, while two samples were assigned to Permanent (C), Permanent (D), Semi-permanent and Temporary types of houses, respectively in each Kelurahan. Surveyors visited houses, asking householders or other persons concerned a series of questions related to

household expenditure in accordance with a fixed form of questionnaire. The survey was conducted in November, 1989 for two (2) weeks.

The final objective of the income level survey is to know the financial capacity or paying ability of Jakarta citizens in connection with the new construction of on-site sanitation and sewerage facilities under this project.

4.2 Income Class Composition

Households were classified into three (3) categories, i.e. High, Middle and Low Income Classes according to house types. High Income Class is those having either a Permanent (A) or Permanent (B) type of houses. Middle Income class has either a Permanent (C) or Permanent (D) type. Those having either a Semi-permanent or Temporary type fall under Low Income Class.

In the JICA study project entitled "Arterial Road System Development Study in Jakarta Metropolitan Area" undertaken in 1986, a sampling field survey was carried out to know Kelurahan-wise composition of the three (3) income classes. The number of samples reached 45,735. As the total number of Kelurahan at that time was 232, excluding island Kelurahans, the average number of samples per Kelurahan works out to 197.

The present Kelurahan-wise composition of the three (3) classes was estimated based on the above-mentioned data, making necessary modifications arising from the changes in the number and demarcation of Kelurahans. Actually, several Kelurahans with common characteristics were grouped together and given the same income class composition.

It was found out that the composition of High, Middle and Low Income Classes across the Study Area is 3.9%, 48.6% and 47.5%, respectively.

4.3 People's Existing Income Level

As a result of the sampling questionnaire survey, it was revealed that the average per capita income per month for High, Middle and Low Income Classes is Rp. 115,189, Rp. 57,527 and Rp. 29,298, respectively.

The average number of per household members of High, Middle and Low income classes was found out to be 6.3, 5.9 and 5.2, and their corresponding net average monthly income was Rp. 725,691, Rp. 339,409 and Rp. 152,350. Also the average per capita income per month, the average number of household members and the net average monthly household income across the Study Area are calculated respectively at Rp.46,637, 5.6 and Rp. 261,167.

In order to estimate Kelurahan-wise average income, Kecamatan-wise and income class-wise income was combined with the Kelurahan-wise income class compositions. The results are shown in Table A.5, Table A.6, Table A.7 and Fig. A.12.

Out of 256 Kelurahans, 62 or 24.2% have the average per capita per month income in the range of Rp. 45,000 to Rp. 49,999. 50 or 19.5% belong to the Rp. 50,000 to 54,999 brackets and 49 or 19.2% to the Rp. 40,000 to Rp. 44,999 brackets. That is to say, 161 Kelurahans or 62.9% have the average per capita per month income ranging between Rp. 40,000 and Rp. 54,999. 50 or 19.5% have the income levels of less than Rp. 40,000, and 45 or 17.6% have the income levels of more than Rp. 55,000.

The Kelurahan Gondangdia has the highest average per capita per month income of Rp. 69,673. Other Kelurahans with the income levels of more than Rp. 60,000 are Menteng, Tanjung Duren, Tomang, Kayu Putih and Pulo Gadung. The three (3) Kelurahans of Kamal, Tegal Alur and Pengadungan have the lowest average per capita per month income of Rp. 30,409. Other Kelurahans with the income levels of less than Rp. 35,000 are Tanah Tinggi, Johar Baru, Galur, Kampung Rawa, Rawa Sari, Cilincing, Marunda, Sukapura, Rorotan, Angke, Jembatan Besi and Kali Baru.

Kecamatan-wise, Cilindak leads others with the average per capita per month income of Rp. 58,110. Next comes Pulo Gadung with Rp. 57,436. Other Kecamatan with the income levels of more than Rp. 53,000 are Sawah