

REPUBLIC OF INDONESIA
MINISTRY OF PUBLIC WORKS (DPU)
DIRECTORATE GENERAL OF HOUSING, BUILDING,
PLANNING AND URBAN DEVELOPMENT (CIPTA KARYA)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT


VOLUME IV

APPENDICES

**FOR VOLUME II
MASTER PLAN REPORT**

MARCH 1985

JAPAN INTERNATIONAL COOPERATION AGENCY

SDS

85-007(1/6)

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ABBREVIATION

millimeter	mm	kilogram per	
centimeter	cm	square centimeter	kg/cm ²
meter	m		
kilometer	km	centimeters per second	cm/sec
		meter per second	m/sec
square centimeter	cm ²		
square meter	m ²	cubic meters per second	m ³ /sec
square kilometer	km ²	cubic meters per minute	m ³ /min
hectare	ha	cubic meters per day	m ³ /d
		liter per capita per day	lpcd
cubic millimeter	mm ³		
cubic centimeter	cm ³	volt	V
cubic meter	m ³	kilovolt	kV
		kilowatt	kW
milliliter	ml	revolutions per minute	rpm
liter	l		
milligram	mg	ampere	A
gram	g	kilovolt-ampere	kVA
kilogram	kg	direct current	DC
metric ton	t	altering current	AC

ORGANIZATION

DPU	Ministry of Public Works
Cipta Karya (DGCK)	Directorate General of Housing, Building Planning and Urban Development
DWS	Directorate of Water Supply
DGWRD	Directorate General of Water Resource Development
POJ	Jatiluhur Authority
DPMA	Institute of Hydraulic Engineering
DEG	Directorate of Environmental Geology
DKI Jakarta	Jakarta Municipality
PDAM Jaya	Jakarta Water Supply Enterprise
JATS	Jabotabek Advisory Team Services
JICA	Japan International Cooperation Agency
OECF	Overseas Economic Cooperation Fund, Japan

OTHERS

JMDP	Jabotabek Metropolitan Development Project
CJC Master Plan	Cisadane-Jakarta-Cibeet Water Resources Development Study
WTC	West Tarum Canal
Canal 1	Tarum Jaya Canal

MASTER PLAN FOR
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT

MI. APPENDIX MII-1

SOCIOECONOMIC DATA

SOCIOECONOMIC DATA

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A. ECONOMY OF THE STUDY AREA

1. Present Economic Activities in Jakarta

Jakarta, the Capital City of the Republic of Indonesia is the center of political and economic activities throughout the country. It is the largest city with an estimated population of 7 million and is serviced with a developed transportation system including a good road network, railroads, the Tanjung Priok seaport and the Kemayoran and Halim Perdanakusuma airports.

Economic activities in Jakarta are predominantly in the trade and service sector including public administration. This is due to the level of industrialization under development. Gross regional domestic products of Jakarta, and their growth rates and shares are shown on Tables A-1 and A-2.

The high public administration activity percentage of 11 % is explained by the existence of the central and local governments. The large share of trade at 44 % and the small share of agriculture at 1.6 % are considered normal for densely populated urban areas. The growth of the gross domestic products throughout Indonesia compared to Jakarta is shown on Tables A-3 and A-4. It is noted that the share of trade and services with public administration amounts to more than 85 % of Jakarta's GRDP, compared to only 38 % across the country. In addition, the share of Jakarta's manufacturing industry at 13.5 % is smaller than that of the national average of 14.3 %.

It is observed that Jakarta's economy relies mostly upon tertiary industries, and development of the manufacturing sector is behind the national average.

Growth of Jakarta's GRDP was 13.6 % in 1979 and 10.4 % in 1980, while that of Indonesia's GDP was 5.3 % and 9.6 % for the same years the latter of which was the highest rate. This means Jakarta is enjoying a very high growth despite the world recession. However, the highest growths in both years were interestingly recorded in the public administration sector, and the private trading sector experienced a low growth of only 3.3 % in 1980.

TABLE A-1

Gross Regional Domestic Product at 1975 Constant Prices
by Industrial Origin 1975-1979 (Million Rupiahs)

	1975	1976	1977	1978	1979	1980
Agriculture	21,738.0	17,556.3	28,093.3	26,073.1	26,407.4	26,800.6
Manufacturing	115,335.8	152,453.0	156,018.1	160,137.8	189,323.4	216,827.1
Construction	45,806.2	57,395.2	65,335.1	72,337.2	80,089.7	104,821.5
Electricity Gas and Sanitary Water	18,772.5	17,901.3	20,066.5	34,123.9	40,752.9	42,329.5
Transport and Communication	78,590.7	88,909.5	94,894.9	100,814.1	121,088.2	134,448.0
Wholesale and Retail Trade	495,207.7	562,456.9	606,926.6	649,960.1	716,862.7	740,583.1
Banking and Other Financial Institutions	94,662.8	80,462.1	98,262.3	103,813.8	129,076.2	147,551.6
Ownership of Dwellings	29,972.4	31,623.9	32,864.7	33,733.9	34,881.9	35,942.9
Public Administration	105,319.7	109,445.2	121,434.0	124,173.3	149,954.2	190,155.4
Services	31,508.9	33,976.9	36,182.9	38,976.4	38,511.6	46,921.2
	1,036,914.7	1,152,230.3	1,260,078.4	1,344,144.0	1,526,948.2	1,666,380

Source: Statistical Year Book of Jakarta 1982

TABLE A-2

Growth of GRDP, Jakarta at 1975 Constant Prices

	1975 - 76	1976 - 77	1977 - 78	1978 - 79	1979 - 80	1975 - 80	1980 share
Agriculture	- 19.2 %	60.0 %	- 7.2 %	1.3 %	1.5 %	4.3 %	1.6 %
Manufacturing	32.2	2.3	2.6	18.2	14.5	13.5	12.9
Construction							
Electricity Gas & Water	16.6	13.4	24.7	13.5	21.8	17.9	8.7
Transportation & Communication	13.1	6.7	6.2	20.1	11.0	11.3	8.0
Trade	13.6	7.9	7.1	10.3	3.3	8.4	43.9
Public Administration	3.9	11.0	2.3	20.8	26.8	12.5	11.3
Other Services	- 6.5	14.5	5.5	14.7	13.8	8.1	13.7
GRDP, Jakarta	11.1 %	9.4 %	6.7 %	13.6 %	10.4 %	10.2 %	100 %

TABLE A-3**Growth of GDP, Indonesia****At 1973 Market Prices**

	1979	1980	1971 - 80	1980 Share
Agriculture	4.0 %	5.5 %	3.7 %	31.4 %
Mining	- 0.2	- 1.2	6.7	9.5
Manufacturing	10.1	21.2	13.1	14.3
Construction, Electricity Gas & Water	7.8	11.7	14.8	6.4
Services	6.2	12.0	9.1	38.4
GDP, Indonesia	5.3 %	9.6 %	7.5 %	100 %

Source: Central Bureau of Statistics

TABLE A-4**Summary of Growth of GRDP, Jakarta**

	1975 Share	1980 Share	Average Gr/Ann
Agriculture	2.1	1.6	4.3
Manufacturing	11.1	12.9	13.5
Trade	47.8	43.9	8.4
Service	28.8	30.3	11.3
Public Adm.	10.2	11.3	12.5
Total	100 (%)	100 (%)	10.2 (%)

2. Jabotabek Metropolitan Development Plan

The Jabotabek Metropolitan Development Plan (JMDP) is an outstanding regional plan to develop the Jakarta Metropolis and adjacent Kabupatens of Bogor, Tangerang and Bekasi including Kotamadya Bogor in one concept of an enlarged metropolitan region. The planning is being undertaken in accordance with Presidential Instruction No. 13 of 1976, which calls for the Ministries EKVIN, Home Affairs and Public Works in conjunction with the Governments of the Provinces of DKI Jakarta and West Java to adjust the development planning of the Jabotabek area in accordance with certain policy principles. The guiding principles of the Presidential Instruction are summarized as follows:

- To reduce the population explosion of DKI Jakarta.
- To encourage trade and industry activities especially in areas bordering DKI Jakarta.
- To ensure harmonious development in DKI Jakarta and areas bordering directly to it.
- To develop centers of urban settlement in Bogor, Tangerang and Bekasi so that such centers may subsequently become centers of new development.
- To encourage investment in the growth centers adjacent to DKI Jakarta by promoting communication facilities, land-use regulation and social, economic and cultural facilities.
- To utilize available funds in the development budgets of DKI Jakarta, West Java and other second-level governments of the region to encourage development of the Jabotabek region.
- In this development planning process the governmental status and obligations of each of the Jabotabek localities is to remain unchanged.

Considerable efforts were made to undertake planning studies by the Jabotabek Planning Team, the Jabotabek Technical Advisory Team and their staff supported by domestic and expatriate consultants, resulting in the preparation of numerous planning reports. A very substantial basis has been conceived in these plans which gives the order of priorities and direction of future development in the Jabotabek Region. The physical zoning system was perceived to avoid over investment in the unsuitable areas due to their poor physical features. Such a zoning system is shown on Figure A-1.

Zones I through V were delineated across the Jabotabek region taking into consideration topography, drainage, risk of flooding, availability of ground water and suitability of soils. The southern half of DKI Jakarta is delineated in Zone III, where physical conditions are most suitable for development. The northern half is split into Zones I and II, in which urban development will be limited because of the high cost of constructing drainage facilities.

Figure A-2 shows an outline of the regional structural plan of the whole Jabotabek region. Development centers shown are projected to accommodate the allocated population by providing housing and working places. Detailed distribution of population to these development centers is shown in Table A-5.

To ensure this distribution planning, a number of implementation projects in addition to stated high level policy were envisaged. These projects and programs were prepared to achieve the targets set out in the Presidential Instruction. The projects and programs concerning DKI Jakarta development specifically are quoted as follows:

FOR LAND DEVELOPMENT

Guided Land Development Programme (GLD)
Staged Industrial Land Development Programme (SILD)
Urban Betterment Programme (UB)

FOR WATER RESOURCES

Formation of Water Resources Coordinating Organization for Jabotabek
Cibeet Irrigation and Flood Control Feasibility Study
Cidurian/Cisadane Water Resources Feasibility Study
Hydrogeological Study of Jabotabek Aquifers
Water Tarum Canal Increase in Capacity

FOR WATER SUPPLY

Current Programme
Urgent Rehabilitation Programme
Raw Water Improvement for Treatment Plants
Standpipe/Hydrant Programme
Leakage and Illegal Connection Survey
Distribution Rehabilitation Analysis and Zoning
Organization and Management Study
System expansion Programme
Plan System Expansion
Plan and Implement Projects for New Treatment Plants
Distribution Expansion, Zoning and Storage Project

FLOOD CONTROL & DRAINAGE

Current Flood and Drainage Programme
Development Programme
Crash Clearance Programme for Main Drains
Re-assessment of Banjir Canal and Alternatives for East Jakarta
Depok Flood Control Dam

JABOTABEK PHYSICAL ZONES

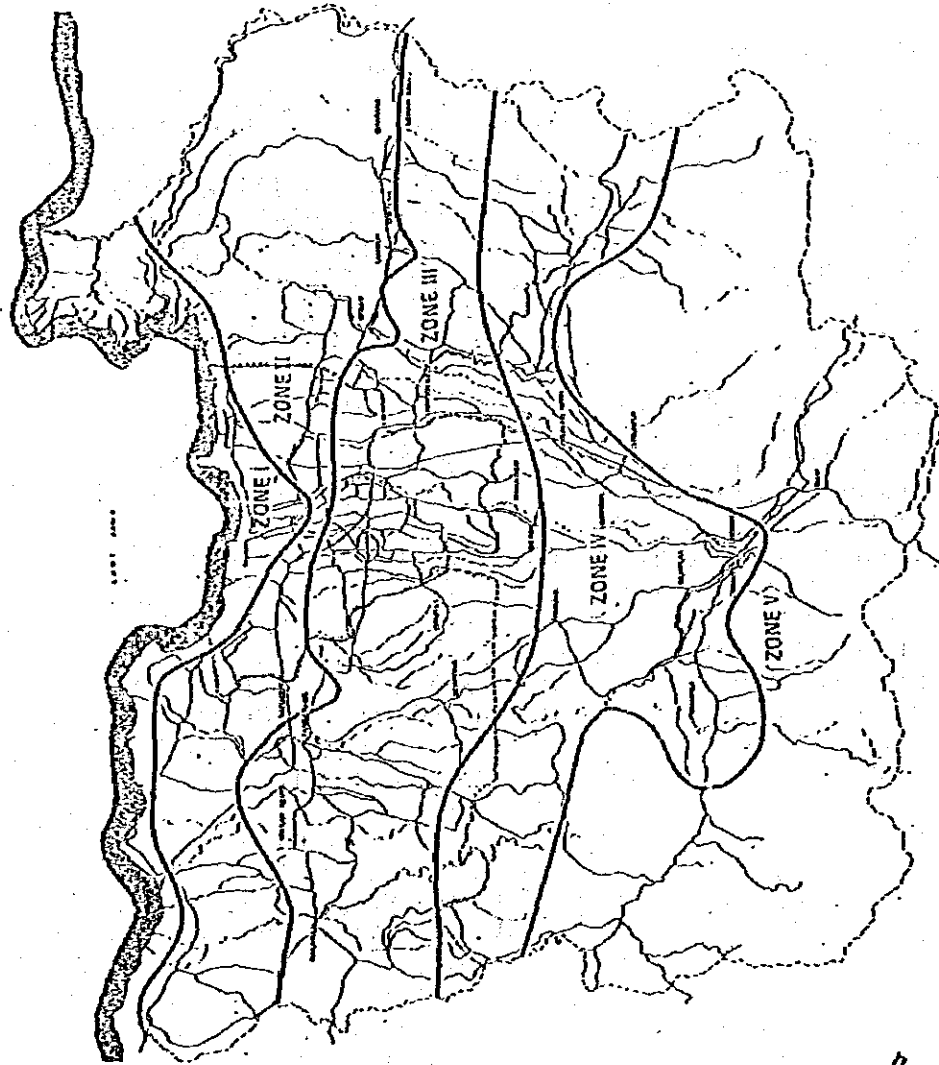


FIGURE A-1

DEVELOPMENT POTENTIAL ZONES

POLICY IMPLICATIONS

PHYSICAL CHARACTERISTICS

- I
- AVOID URBAN DEVELOPMENT
 - low lying coastal strip
 - flat, so bad drainage
 - subject to flooding
 - agriculture suited to fishponds
 - ground water saline and undrinkable
 - poor soils for building upon
 - this area encroaching on zone II as saline intrusion increases

II AGRICULTURAL INTENSIFICATION

- LIMIT URBAN DEVELOPMENT
- low lying plains
 - flat, so bad drainage
 - subject to flooding
 - excellent rice growing especially if irrigated
 - ground water fresh but easily polluted
 - poor soils for building upon

III MAJOR URBAN DEVELOPMENT AGRICULTURAL INTENSIFICATION

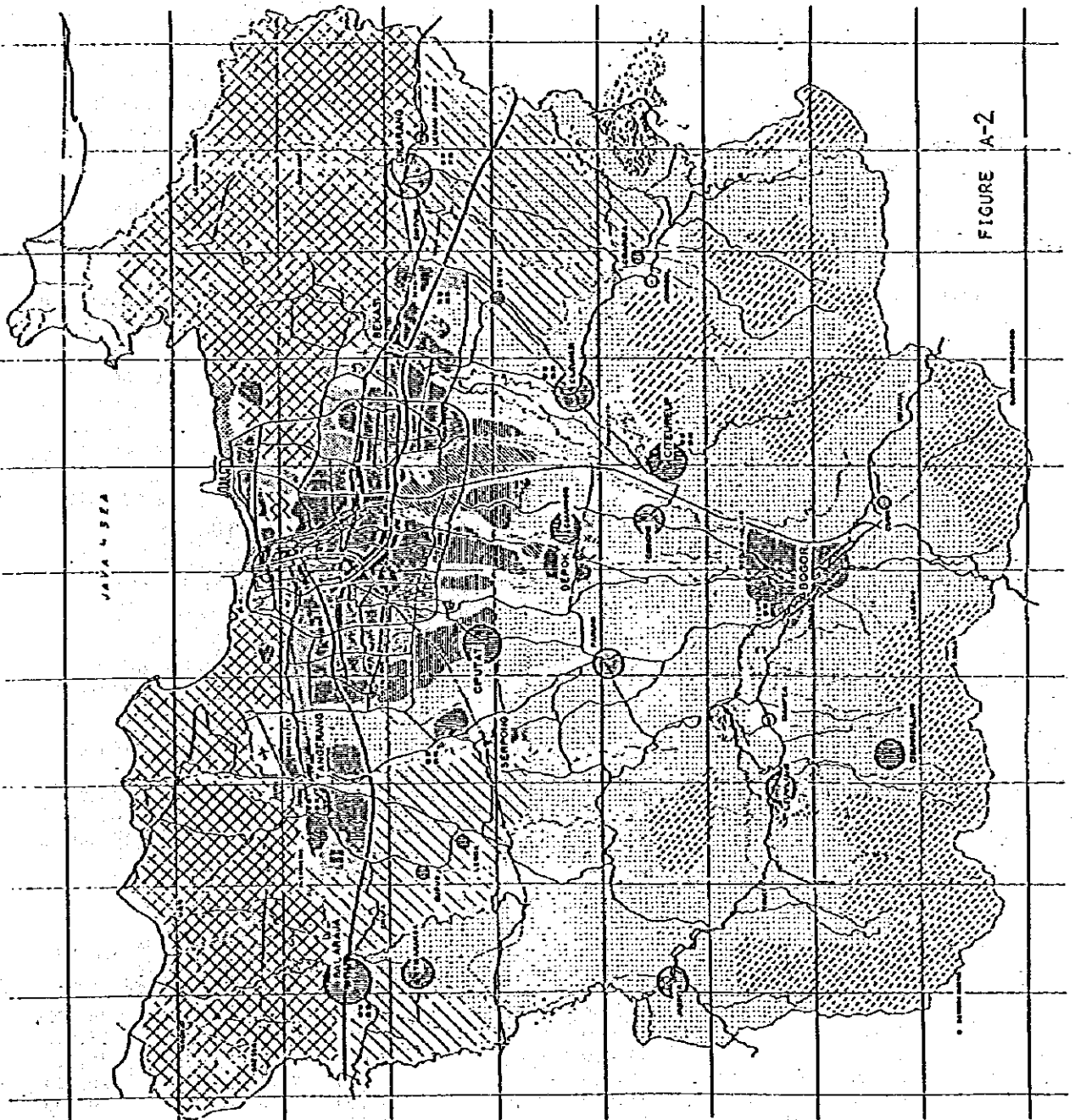
- higher lands rising from coastal plains
- reasonable gradient so good natural drainage
- low flood risk
- ground water fresh and leaching soils limit pollution
- poorer agriculture
- reasonable soils for building upon




















IV LIMIT URBAN DEVELOPMENT AGRICULTURAL INTENSIFICATION

- steeper sloping zone
- good natural drainage
- no flooding
- limited groundwater and no deep aquifers
- reasonable agriculture because more rainfall
- reasonable soils for building

V UPLAND FOREST PLANTATIONS RECREATION AND CONSERVATION

- steep mountainous zone
- rapid run off but limited by vegetation
- natural forest areas
- agriculture limited to complicated terrace constructions
- subject to rapid erosion if forests cleared



-  MAIN URBAN AREA
-  SECONDARY GROWTH CENTRES
-  SUBURBAN DEVELOPMENT WITH REGULATION AND DEVELOPMENT CONTROL
-  SPECIAL GOVERNMENT ZONE
-  MAJOR COMMERCIAL CONCENTRATION (EXISTING AND EXPECTED)
-  MAIN INDUSTRIAL AREAS AND WAREHOUSING
-  SEAPORT AREA WITH INDUSTRY AND WAREHOUSING
-  INTENSIVE AGRICULTURE AND COASTAL PLAIN PROTECTION ZONE
-  INTENSIVE AGRICULTURE (PREDOMINANTLY TECHNICAL IRRIGATION)
-  AGRICULTURE (PREDOMINANTLY BARRED)
-  UPLAND CONSERVATION ZONE
-  LAKE
-  AIRPORT CENKANGRENG
-  BILLO INDUSTRIAL PROJECT LOCATION
-  TOLLWAY
-  MAJOR URBAN ARTERIAL
-  OTHER ARTERIAL
-  SECONDARY ROAD
-  RAILWAY



OUTLINE REGIONAL STRUCTURE PLAN

FIGURE A-2

TABLE A-5

16 April 1983

Population Distribution in the Jabotabek Settlement
Hierarchy, 2005

<u>Capital City</u>		<u>Population (No.)</u>	
DKI Jakarta		12,000,000	
<u>Main Regional Sub-Centre</u>		1,000,000	
Bogor Raya			
. Kotamadya Bogor	400,000		
. Environs	600,000		
<u>Main Sub-Centre</u>		2,030,000	
. Tangerang/Batucaeper (including Cileduk)		850,000	
. Bekasi		350,000	
. Depok		400,000	
. Serpong		180,000	
. Cikarang		250,000	
<u>Secondary Growth Centres</u>		1,470,000	
<u>Kabupaten Bogor</u>		<u>Kabupaten Tangerang</u>	<u>Kabupaten Bekasi</u>
Cibinong (including Citeureup)	200,000	Balaraja	50,000
Leuwiliang	95,000	Ciputat	150,000
Parung	80,000	Tigaraksa	50,000
Jonggol	75,000	Pasar Kemis	50,000
Cileungsi	120,000	Cikupa	50,000
Parung Panjang	60,000		
Jasinga	40,000		
<u>Small Towns/Rural Centres</u>		642,000	
<u>Kabupaten Bogor</u>		<u>Kabupaten Tangerang</u>	<u>Kabupaten Bekasi</u>
Semplak	32,000	Legok	25,000
Ciawi	30,000	Curung	25,000
Ciampea	25,000	Kronjo	20,000
Cigugur	25,000	Mauk	20,000
Rumpin	25,000	Rajeg	20,000
Gunung Sindur	25,000	Sepatan	20,000
Cisarua	25,000	Teluk Naga	20,000
Ciasmara	20,000	Kosambi	20,000
Cariu	20,000	Kresiek	20,000
			Lebah Abang
			Setu
			Cibarus
			Tarunajaya
			Babelan
			Serengseng
			Tabelang
			Muara Gembong
			Cabang Bungin
<u>Village/Rural Population</u>		6,508,000	
Kabupaten Bogor		2,802,700	
Kabupaten Tangerang		1,970,500	
Kabupaten Bekasi		1,734,800	
TOTAL JABOTABEK		23,650,000	

(Source: Jabotabek Advisory Team Services)

SOLID WASTE

Current Programme

Development Programme

Collection and Disposal of Solid Waste Currently Dumped in Canals
Solid Waste Collection and Purchase of Trucks for Urban Betterment
Zones

Operation Maintenance, Management and Finance Study for Dinas
Kebersihan

SANITATION

Sewerage and Sanitation Project, Setiabudi

Flushing System for Canal and Drains

Provision of Vacuum Cars and Trucks

Micro-Drain Improvement and Pump and Sump Schemes

Provision of MCK Keci (Small Communal Latrines) for Each RT

Treatment Plant for Sludge Collected from Cesspits

TRANSPORT

Bina Marga Toll Roads Programme

GLD Off-Site Arterial Roads

Cengkareng Airport Road

Jakarta By-pass and Arterial Road Improvement

Railway Development Programme

Bus/Rail Interchange Programme

Bus Fleet Replacement/Expansion Bus Terminals T/15 Busway Projects

Traffic Engineering and Bus Priority

DKI Arterial Road Programme and Road Betterment

ECONOMIC DEVELOPMENT

Expansion of BIPIK Programmes

Mini-Industrial Estates

Service Centres

DKI Governors Fund

Small Credit Programme

Land Policy

A programme of land use and development controls, policies, and projects to form the planning framework for the proposed programme.

Institutional

A programme to improve administrative capability, strengthen inter-sectoral coordination; increase staffing in Botabek and extend training programmes.

- meet to consider Jabatabek Strategy and action recommendations.
- provide necessary budget for new staff in Kota Administratif.

(Source: JMDP, Executive Summary, I/1, June 1981)

All of the above projects and programs are, if implemented, expected to function collectively and cooperatively in forming the Capital City of Jakarta as the prime center of the Jabotabek Metropolitan Region. However, the implementation programs of those projects are to be prepared by the interested departments from the central and the local governments.

3. Jakarta Master Plan















DKI Jakarta is currently engaged in the preparation of its Strategic Development Plan (SDP) or Jakarta Master Plan (1985 - 2005), which is on the same basis as the Jabotabek Metropolitan Development Plan. This plan takes into account the key issues which influence the form of city structure including past development trends, land availability, sectoral requirements, committed program and the need to integrate development policies. The SDP provides three alternative physical plans for DKI Jakarta's development from 1985 to 2005, which incorporate, the following:

- (a) Existing trends (across DKI Boundaries)
- (b) Strong containment of growth within DKI boundaries and controls against north-south development for environmental reasons.
- (c) Guided development in an east-west direction, with controls to restrain urban development to the north and south of the city.

The SDP recommends alternative (c) in recognizing the need to safeguard the south part of Jakarta for environmental reasons, where the aquifer recharge area is located. This has become recently evident since JMDP's physical zoning system was established.

These plans include various socio-economic parameters, which form the future structure of DKI Jakarta. Among such parameters, population, employment and income, and land use plans are significantly related to the present Water Supply Master Plan. These subjects are reviewed in other sections. The land structure plans for 1980 and the future year of 2005 are shown in Figures A-3 and A-4.

LEGEND

-  Public Building
-  Compound Building
-  Shopping Centre
-  Market
-  Industry / Warehouse
-  Institutions / Agriculture
-  Agriculture
-  Gardens, Green Land and Cemetery
-  Paddy field
-  Marsh / Fish Pond
-  Household
-  Main Road / railway
-  River
-  Unused Land

PETA No. 3.1

PERUNTUKAN TANAH
TAHUN 1980

TEAM PENYUSUN
RENCANA INDUK
DKI JAKARTA 1985-2005

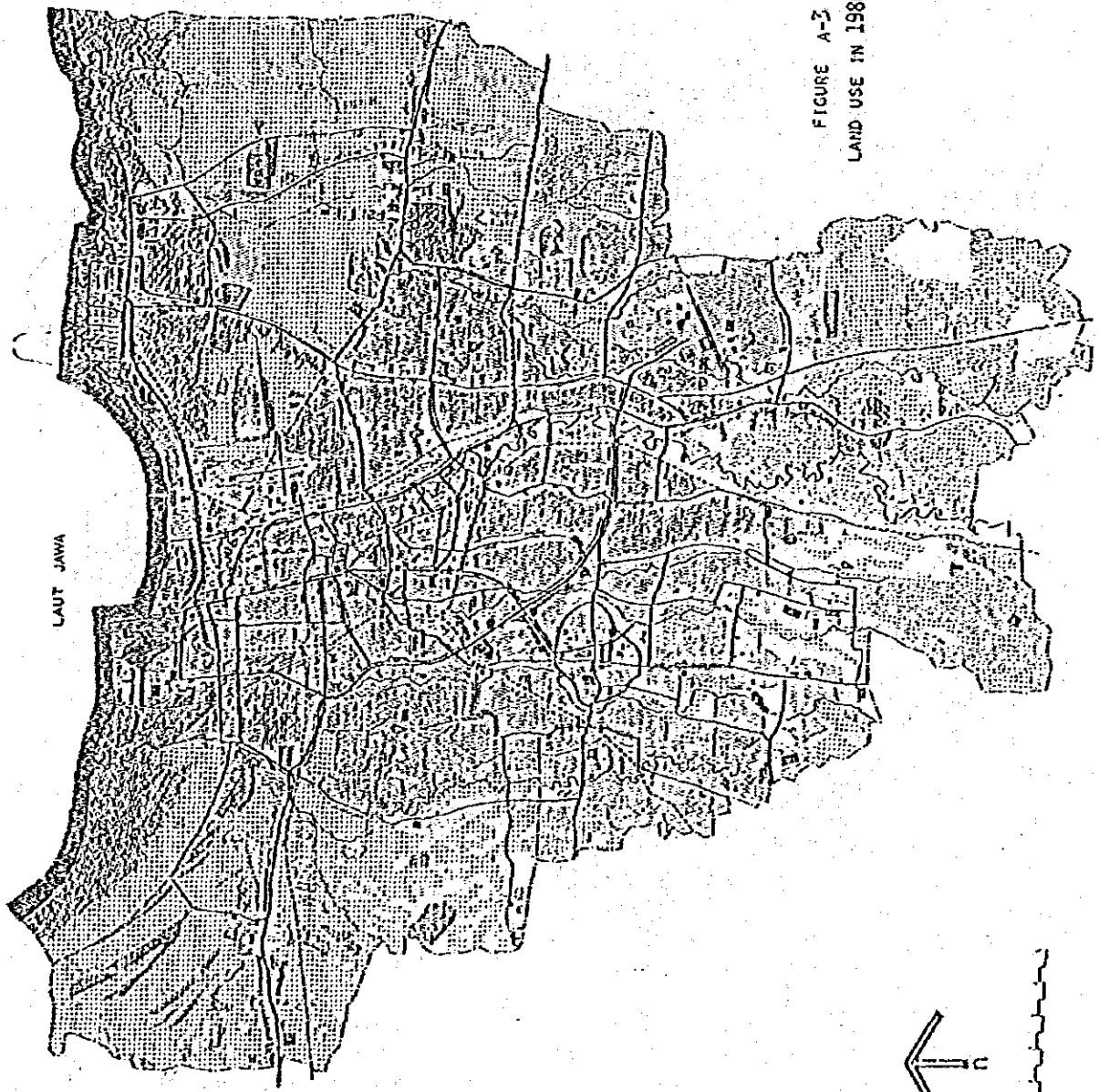
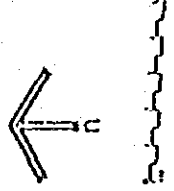























FIGURE A-3
LAND USE IN 1980




EXPLANATION

-  Utilized for commercial or trade & service development.
-  Development of Offices and Business with low density.
-  Area of mixed development for industry and Commercial.
-  Residential area with all its facilities.
-  Commercial area and Public Facility.
-  Special assignment for Government's needs.
-  Area for industrial Development.
-  Agriculture/Green with low density Residential area.
-  Heavy for agriculture area/grazing.
-  Recreation.
-  Protection area to prevent inundation.
-  Regional Commercial Center.
-  City Commercial Center
-  Surroundings Commercial Center
-  PRS : Development that get Priority.
-  Limited development by PBK : Bathing/rehabilitation.
-  Limited development by PRM : renovation.
-  RT : Recreation / Garden
-  RD : Recreation/Physical exercise.
-  RM : Recreation/Recreation forest.
-  Centers that grow at strategic.

MAP NO. 4.1.A

STRUCTURAL PLAN OF JAKARTA AREA


TEAM PENYUSUN RENCANA INDIK DKI JAKARTA 1985 - 2005

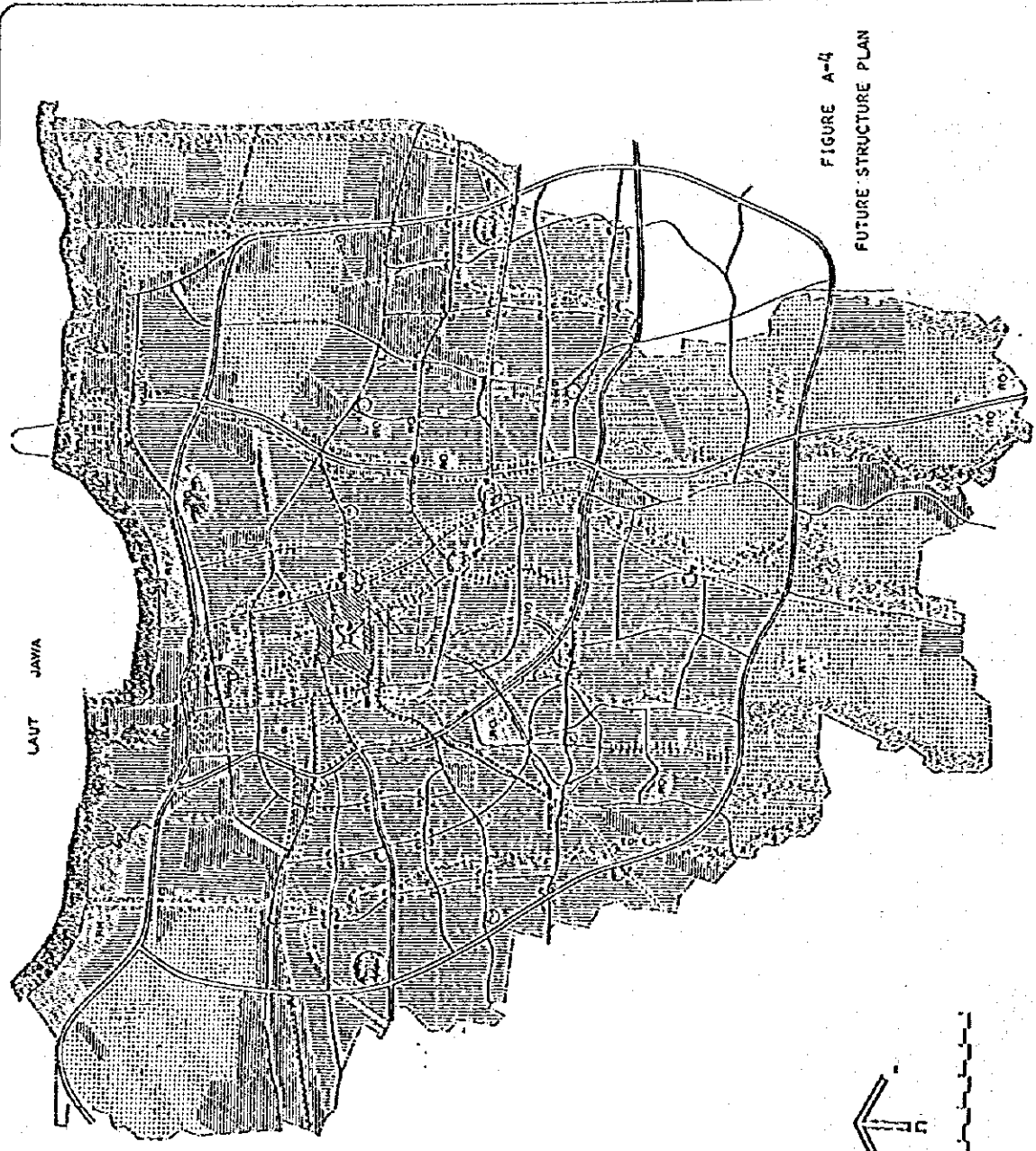
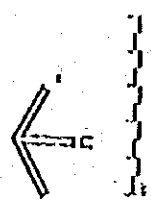


FIGURE A-4
FUTURE STRUCTURE PLAN



a. Present Land Use

A land use map in 1980 is shown on Figure A-3. Land occupations by various sectors of citizen's activities are not effectively regulated. Retailers' shops and factories of small and medium scale are scattered along the streets over the city. Governmental and private business buildings are located rather closely to the center of the city, along the directly adjacent areas of which are placed the big retailers and wholesalers. Wherever the roads exist or any type of accesses is possible, people establishes their houses and sheltering shacks. Thus the whole Jakarta has been encroached along the existing road.

On the other hand, the large scale industries are mostly collected in the Pulogadung Estate. However, a certain type of industries, which uses the large volume of water, is located close to the rivers. Foods, chemical, pharmaceutical, dying industries and the like are potentially and principally harmful to the environments. It is not observed that these problems are fully considered.

As observed in Figure B-3, population densities around the central are 5 to 6 times of those in the peripheries. This is a rather extreme bias of the population distributions in such a small area. A good pair of the transportation and the distributive housing plans will improve the situations.

b. Environmental Considerations

Since the present socioeconomic study chiefly concerns to the future plans of DKI Jakarta and environs, an anticipated risk of the water pollution in the future is also discussed here. During 25 years range of the present Master Plan, it is naturally expected that the development line will grow far away across the south, east and west boundaries, and some centers in the Botabek region will be urbanized at much higher level than that in the present Jakarta.

If functions of control and coordination of JM DP are not exercised well enough, what is expected in the water service sector is the polluted water throughout the whole Jabotabek area, the quality of which may be similar to or even worse than that of the present Pejompongan or Pulogadung intake. According to Tokyo's experience, water pollution climbs upstream by an unbelievable speed.

The earliest recognizer of this risk is Jakarta, naturally at the downstream. Upstream people will recognize it later or sooner. There will be a hazard of the localism or regionalism.

Only one solution of this problem is control and treatment of wastewater. If the concerned parties are not able to reach agreement, an enforcement by the upper level will be required.

c. Future Land Use Plan

Land use planning currently being formulated by the Jakarta Master Plan group is shown on Figure A-4 and picturized interrelations among 10 sectors as follows:

1. Housing and housing land (UB, GLD)
2. Transportation
3. Industry (SILD)
4. Trade and services
5. Flood control
6. Sewerage and solid waste
7. Water supply and water source
8. Public utilities (Electricity Gas, Telephone)
9. Public facilities
10. Green open spaces

Among various JMDP studies, 3 programs are especially concerned to the development of DKI Jakarta. Urban Betterment (UB) Programme and Guided Land Development (GLD) Programme are for the residential areas. Staged Industrial Land Development (SILD) Programme is also to be implemented in DKI Jakarta. GLD program seems most important and influential because it provides a basic methodology for the development in the east-west direction.

Outline of three programs are quoted as follows:

"Guided Land Development Programme for Jakarta (GLD)"

The objective of GLD program is to provide sufficient planned and serviced urban land in areas selected from the development strategy for city expansion and hence control land prices, order growth and assist in the establishment of low income settlements.

GLD is a government financed and implemented program intended to massively increase the supply of urban land and cater to the 70 - 80 % of the population increase who cannot be accommodated by present programs (either government sponsored or private real estate development). It is planned to accommodate some 815,000 persons in Jakarta and 570,000 persons in urban centers of Botabek between 1981 and the end of Repelita IV (1989).

It is not intended that government buy the land (except that needed for essential community facilities) nor construct housing. It would enable government to guide and regulate urban growth into preferred zones of development, at very low cost.

The concept of GLD consists of the following techniques for the specific land and community development and for employment and population growth into preferred geographical areas, which are, in Jakarta's case, West Wing and East Wing:

- To extend a grid of urban arterial roadways into the preferred areas so as to induce employment to locate there.

- To extend the network of essential urban services into those areas so as to integrate development into the overall urban structure, particularly water supply and urban drainage.
- To establish an administrative, technical, planning and financial structure so as to ensure the smooth management, planning and implementation of such growth.
- To guide the transformation of such urban fringe areas from a predominantly rural, to an urban stage of development by extending technical and financial assistance to the communities and landholders concerned.
- To relax planning and building control regulations to allow households to be able to legally acquire land rights through the private land market, and to construct houses and business for themselves.

The program in Jakarta is aimed at increasing supply of low cost urban land to assist in accommodating + 240,000 population increase per year, and to settle 815,000 population of all income groups between 1981 and 1989, and give particular assistance to those with household incomes less than Rp. 120,000 per month.

"Urban Betterment Programme for Jakarta (UB)"

The objectives of UB program is to improve environmental services in existing urbanized areas at district on drainage basin level. This program is to be designed as a successor to the successful Kampung Improvement Project (KIP).

Urban Betterment is a government financed and implemented program that would initially be concentrated in the northern areas of Jakarta. Its purpose is to introduce a coordinated program of Improvements to inter-Kampung infrastructure and socio-economic development over broader zones of the city than the individual Kampung. It would be an intermediated stage of improvement between that of the KIP program and a higher standard of environmental servicing which may be achieved by the end of this century.

The concept of the proposed UB program for northern Jakarta involves the simultaneous improvement of area wide urban infrastructure and service so as to make many of the local KIP improvements more effective and to coordinate such improvements that are interdependent, particularly health care, water supply, sanitation, drainage, solid waste disposal and flood protection. At the same time this would bring about reductions in the real costs of living presently experienced by low income households because of these inadequate services.

The four main components of improvements are:

- 1) area wide infrastructure improvements so as to reduce many of the high costs and health risks particularly to low income households, including:
 - a) clearance and flushing of main drains
 - b) Provision of public water hydrants and storage tanks
 - c) improved sanitation through septic tank emptying services, providing more frequent communal latrines and local drain improvements
 - d) collection and removal of solid wastes including purchase of disposal
 - e) small holders and pumped drainage for low lying flood prone areas
- 2) Greater health care and prevention by:
 - a) construction of additional health center and subcenter
 - b) accelerate health education programs
 - c) increased funding for nutrition program for your children
 - d) extension of immunization programs
- 3) Accelerated economic development through the increased funding BIPLK (Local Agency for Small Scale Industry) and the Jakarta Governor's Fund so as to promote support of selected small business.
- 4) Increased land area for public facilities through acquisition program that would include land readjustment techniques so as to minimize the capital costs of such acquisitions.

The program is to improve environmental conditions in Jakarta and reduce living costs for 3.9 million people in period 1981 through 1989.

"Staged Industrial Land Development Programme (SILD)"

The objective of SILD program is to encourage orderly development of industrial activities in preferred areas identified in the development strategy.

SILD is a government financed and implemented program of low cost industrial land development that would allow government to exert more positive pressure on industrialists to locate in specified areas throughout the region thereby allowing more coordination between industrial and urban growth, and to reduce the effect of extensive environmental pollution (particularly to the regions sensitive water cycle). It would be kept to minimum costs so as to be directly competitive with industrialists seeking unimproved land on the private market adjacent to national or provincial roadways, and thus ensure a high attraction rate.

The main components of the SILD program are:

- 1) minimum level of initial physical infrastructure for each project site with later improvements to be financed collectively by occupants
- 2) project management to be contracted out on a commercial basis to the private section; responsible for site selection, site planning and supervision of development works, estate management and land leasing contracts.
- 3) individual project management would be responsible to a SILD board constituted from among others Dinas Perindustrian (Local Department of Industry), Dinas Keuangan (Local Department of Finance), BKPM, BKSP Jabotabek and Bappeda (Local Department of Planning). The board would undertake program, planning and overall land allocations in each locality, financial arrangement and promotion of SILD.
- 4) capital funding would be provided through a revolving fund from the Department of Finance and development costs recuperated through land leases to industrialists.
- 5) Land acquisition through one or more means including:
 - a) acquisition of government owned land with compensation paid at market value.
 - b) expropriation of land under Law No. 20 of 1961 with due compensation at market value.
 - c) through agreement with the Governors of the Region for permission in "freeing" the land under regulation of Ministry of Home Affairs No. 15 of 1975.
 - d) purchase on lease of the land from the present land holders.

The total Jabotabek program would provide 690 hectares of developed industrial land by the end of Repelita IV (1989) and would be planned accommodate some 25,000 workers by that date.

For the other developments the following plans are quoted from the Jakarta Master Plan:

- Figure A-5 Analysis of Physical and Potential Condition
- Figure A-6 Basic Guidance for Layouts Plan
- Figure A-7 Main Development Steps
- Figure A-8 Housing Development Plan
- Figure A-9 Road and Transportation Network
- Figure A-10 Sanitation Plan
- Figure A-11 Solid Waste Handling Plan
- Figure A-12 Flood Control and Drainage Plan
- Figure A-13 Open Spaces and Recreational Area

ANALYSIS OF PHYSICAL AND POTENTIAL CONDITION.

LEGEND:

- ① - REQUIRES SUFFICIENT PIPED WATER SUPPLY, ENHANCE FLOOD CONTROL, DRAINAGE SYSTEM AND EXTENSIVE FOLDER
- ② - REQUIRES EXPENSIVE SANITATION SYSTEM
- ③ - SENSITIVES REGARD TO UPSTREAM POLLUTION

DENSE CITY AREA AND WORSE CONDITION

- ④ - HIGH PRIORITY AREA FOR PIPED WATER
- ⑤ - PRIORITY AREA FOR DRAINAGE IMPROVEMENT
- ⑥ - PRIORITY AREA FOR SANITATION
- ⑦ - TO LIMIT NEW AREA DEVELOPMENT SHORTLY

- ⑧ - SOME EAST AREA WILL HAVE GOOD PIPED WATER SHORTLY
- ⑨ - REQUIRES COSTLY DRAINAGE & FLOOD CONTROL WITHOUT FOLDER SYSTEM
- ⑩ - REQUIRES COSTLY SEWERAGE
- ⑪ - REDUCE POLLUTION IF THE DOWN STREAM AREA IS TO BE DEVELOPED

- ⑫ - GROUND WATER IS STILL POSSIBLE FOR 150 PEOPLE PER-HA
- ⑬ - RELIABLE NATURAL DRAINAGE AND LOWER COST SEWERAGE SYSTEM

- ⑭ - AVOIDS EXCESSIVE GROUND WATER EXPLOITATION
- ⑮ - AVOIDS CITY DEVELOPMENT TO PREVENT FLOOD AISK IN DOWN STREAM AREA
- ⑯ - CITY DEVELOPMENT TO THE SOUTHERN AREA WILL MAKE WORST SANITATION CONDITION IN THE NORTHERN PART AREA

PETA No.3:8

ANALISA KONDISI DAN POTENSI FISIK



TEAM PENYUSUN
RENCANA INDIK
DRI JAKARTA 1985-2005

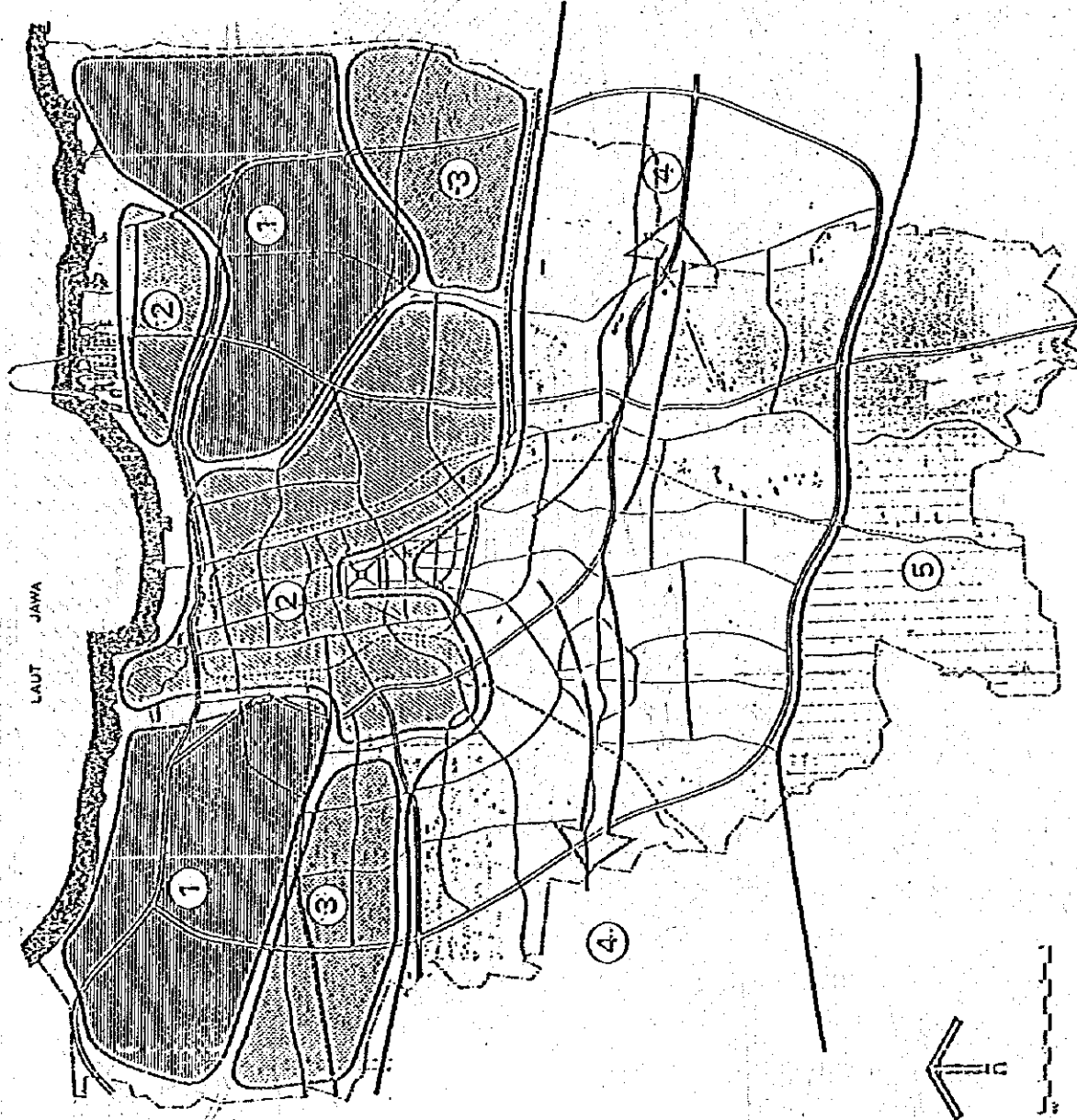
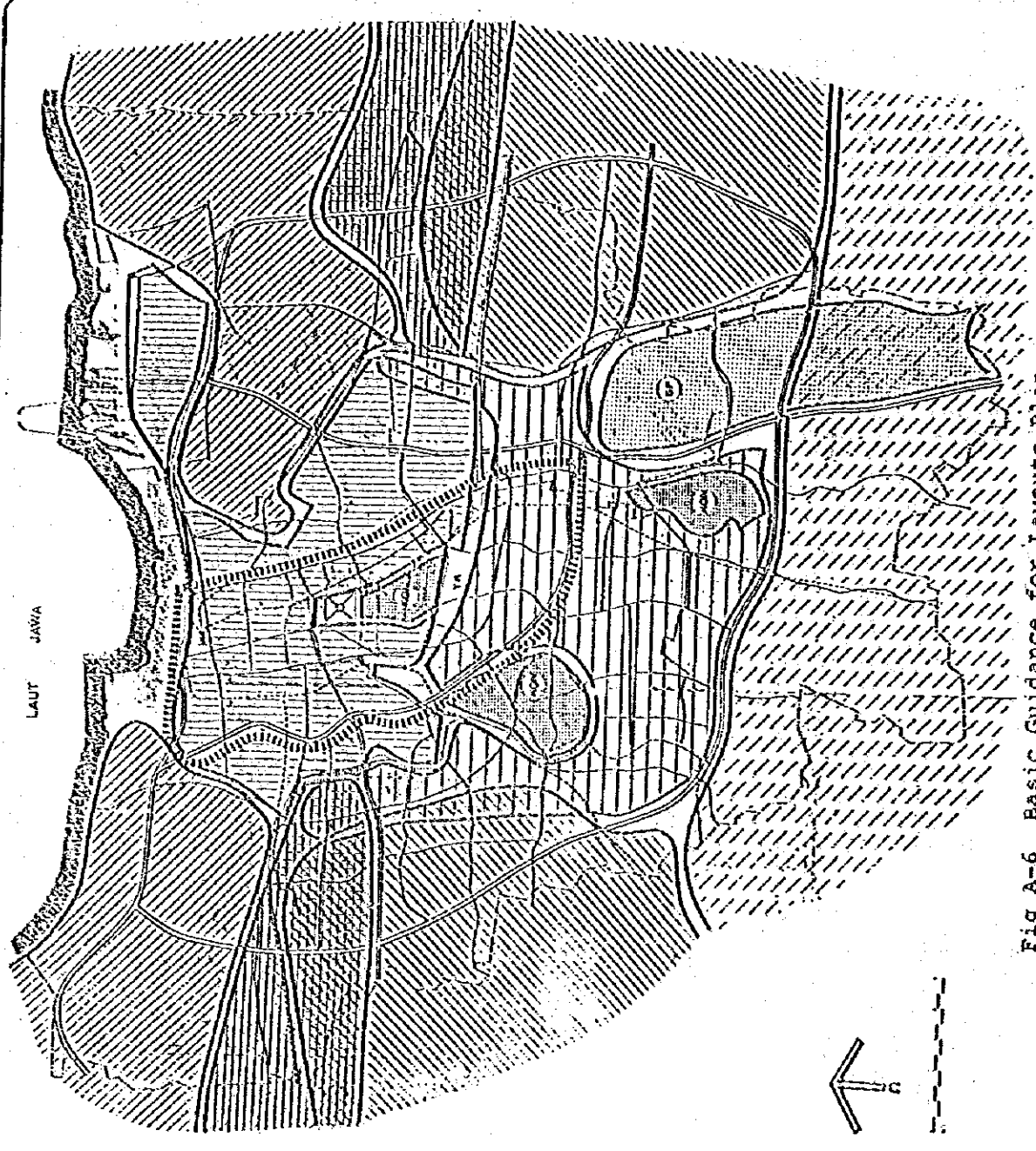


Fig A-5 Analysis of Physical and Potential Condition



LAUT JAWA

- Basic Guidance for Layout Plan**
- LEGEND :**
- To reduce/offset the growth sharply, limited investment, funds rolling over for the improvement (URT-2 project)
 - Provisions of city development all the facilities were completed with good condition.
 - Improved (material) development area.
 - Provisions area for the new residential development, with the lower cost provision, the best environment, location for residential area.
 - Priority area for small scale (50/100 person/ha) strictly controlled along the street.
 - Strict construction and controlling in low level, low development area. High building structure and volume will completed, strictly controlled along the street.
 - Limitation on new development.
 - Application of strict control to each type of development.
 - Specially government zone limited city development.
 - Limited on growth of new work places to prevent the increase of the traffic flow.

PETA No. 3.9

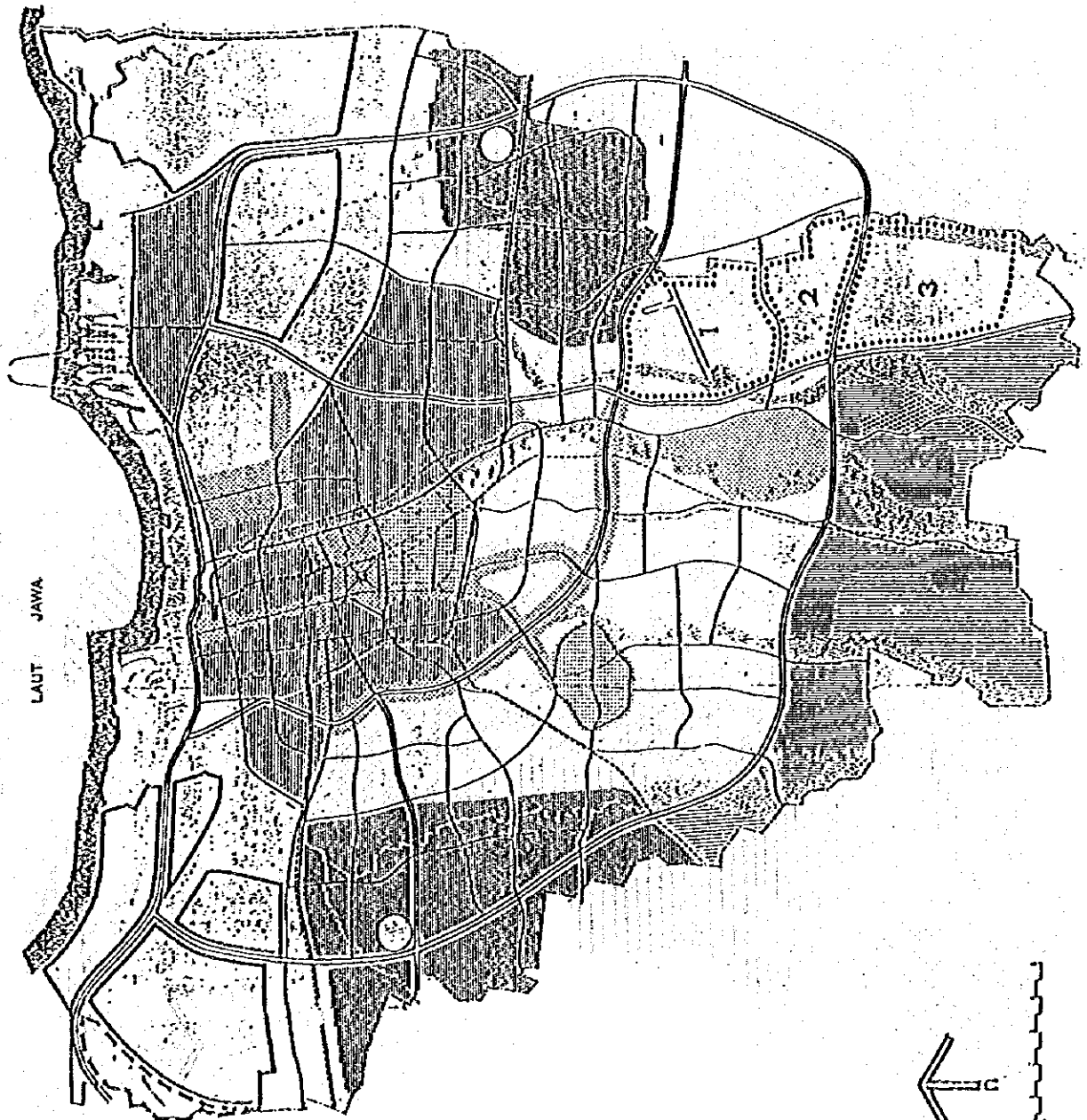
PENGARAHAN: DASAR BAGI RENCANA TATA RUANG



TEAM: PEMYUSUR RENCANA INDIK DKI JAKARTA 1985-2005

Fig A-6 Basic Guidance for Layouts Plan

LAUT JAWA



- Main Development Steps
- High priority for new district centre development
 - ▭ Reserved zone for Air Port
 - ▭ Postpone utilities area.
 - ▭ High priority for Main Air Port for Taman Mini (recreational area) for Military area.
 - ▭ Industrial Development area with strict restriction on their waste flow.
 - ▭ Low density residence area with strict restriction on waste water/ sanitation
 - ▭ Preservation on new develop ment to reserve open space
 - ▭ To be emphasized for improvement.
 - ▭ To be emphasized for social residence area (SID)
 - ▭ Strict restriction area.
 - ▭ Recreational area (UR)
 - ▭ River flow reserve area.

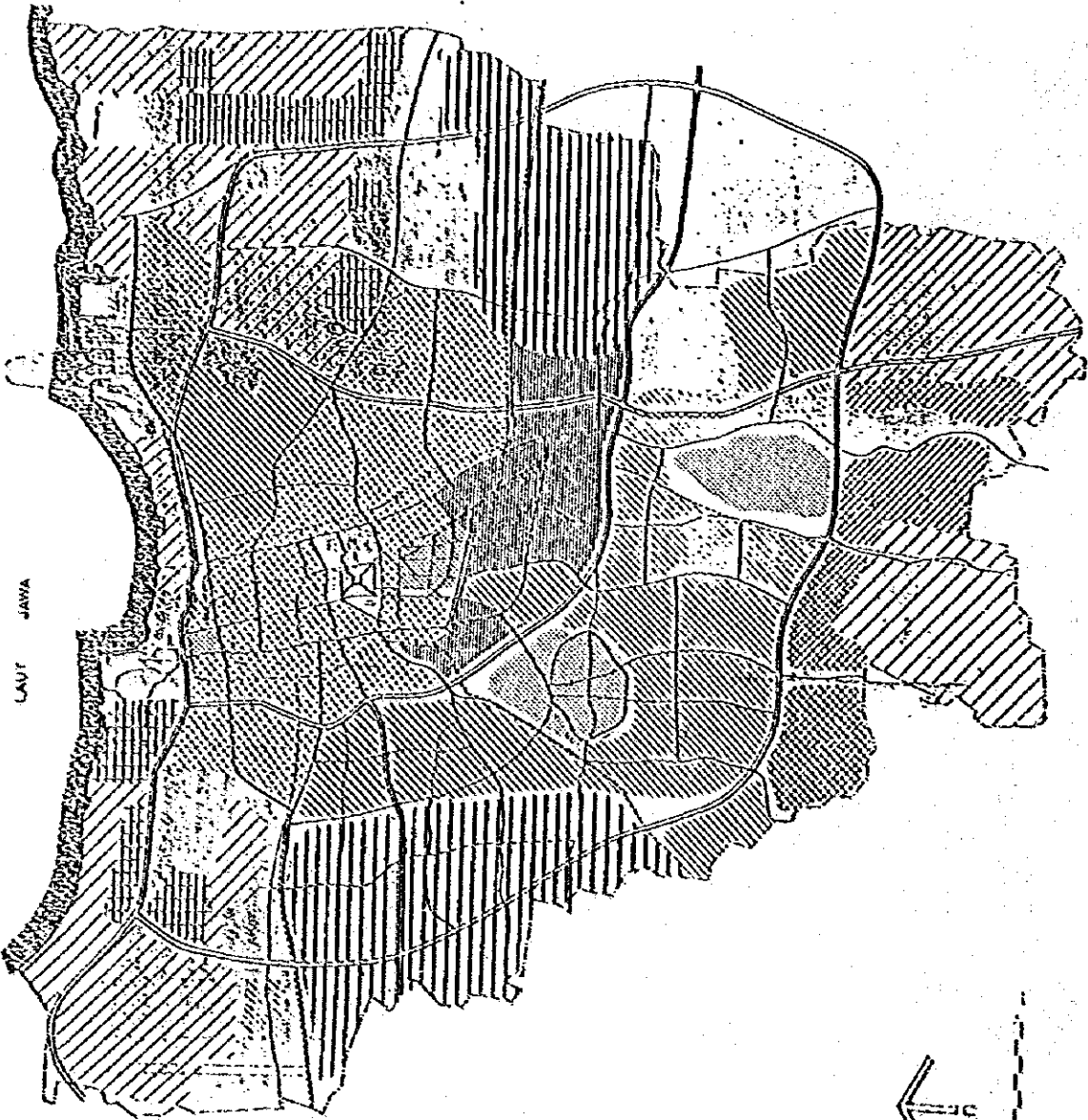
PETA No. 4.1B

RENCANA LANGKAH LANGKAH UTAMA PENGEMBANGAN








TEAM PENYUSUN
RENCANA INDUK
DKI JAKARTA 1980-2005

Fig A-7. Main Development Steps



HOUSING DEVELOPMENT PLAN

LEGENDA

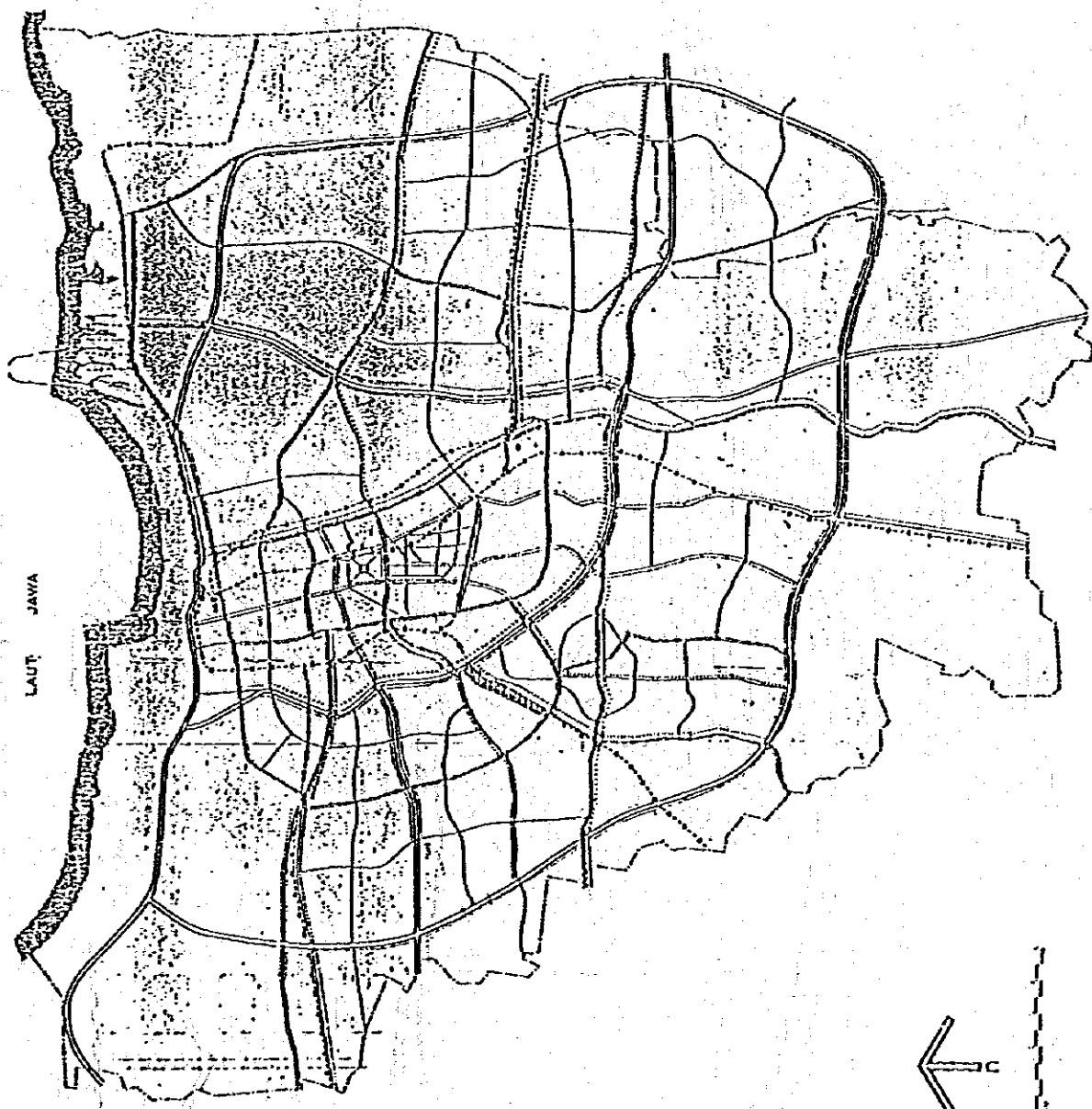
-  RECREATION
-  DEVELOPMENT (FIRST PHASES)
-  DEVELOPMENT (SECOND PHASES)
-  MEDIUM DENSITY
-  OTHER LAND DEVELOPMENT
-  DEFENSE AREA
-  LOW DENSITY AREA (50 PERMAN/HA)
-  HIGH DENSITY

PETA No.4.4G

RENCANA PENGEMBANGAN PERUMAHAN

TEAM PENYUSUN
RENCANA INDIK
OKI-JAKARTA 1983-2005

Fig A-8 Housing Development Plan



LAUT JAWA

Road and Transportation use work plan

- Toll Road
- Toll Road with collected road
- Main arterial road
- Arterial Road
- Main road in the general of activity

Public Transportation route

- Primary bus route (mainly moving bus)
- Rail Road

PETA No.4.5.F

RENCANA JALAN DAN TRANSPORTASI

TEAM PENYUSUN
RENCANA INDIK
DOK JAKARTA 1995-2005

Fig A-9 Road and Transportation Network

4.7 SANITATION PLAN

LEGEND:

CITY AREA (URBAN SETTLEMENT)

- POOR SANITATION
- SHORT TERM PROGRAM FOR RUSTLE SANITATION
- LONG TERM PROGRAMS FOR WASTE-WATER SYSTEM

TRADITIONALLY NEGLECTED AREA WITH SIMPLE SANITATION IMPROVEMENT

TRADITIONALLY DEVELOPED AREA & MODERATELY GOOD SANITATION, POPULATION DENSITY LEAST 1000 PERSONS/ha

FAIR POLLUTION AREA

HEAVILY POLLUTED WATER BODIES, CAN BE OVERCOME BY:

- FINE MESHED FLOW
- FLOWING STREAM
- PERMANENT CAN INTERCHANGE WITH SEWERAGE SYSTEM IN 2000

WATER BODIES THAT WILL BE POLLUTED IN 2000, COULD BE OVERCOME BY SIMPLE SANITATION SYSTEM

FAIR POLLUTION WATER BODIES, CAN OVERCOME BY:

- STRICT RESTRICTION FROM POLLUTION
- TO AVOID DEVELOPMENT UNFILTRATION AREA

THE DIRECTION OF FUTURE WASTE-WATER PLAN

POLLUTION EFFLUENT OF WATER HOUSE

PILOT PROJECT IN WASTE-WATER SYSTEM

PETA No.4.7

RENCANA SANITASI

TEAM PENYUSUN
RENCANA INDIK
OKI, JAKARTA 1983-2002

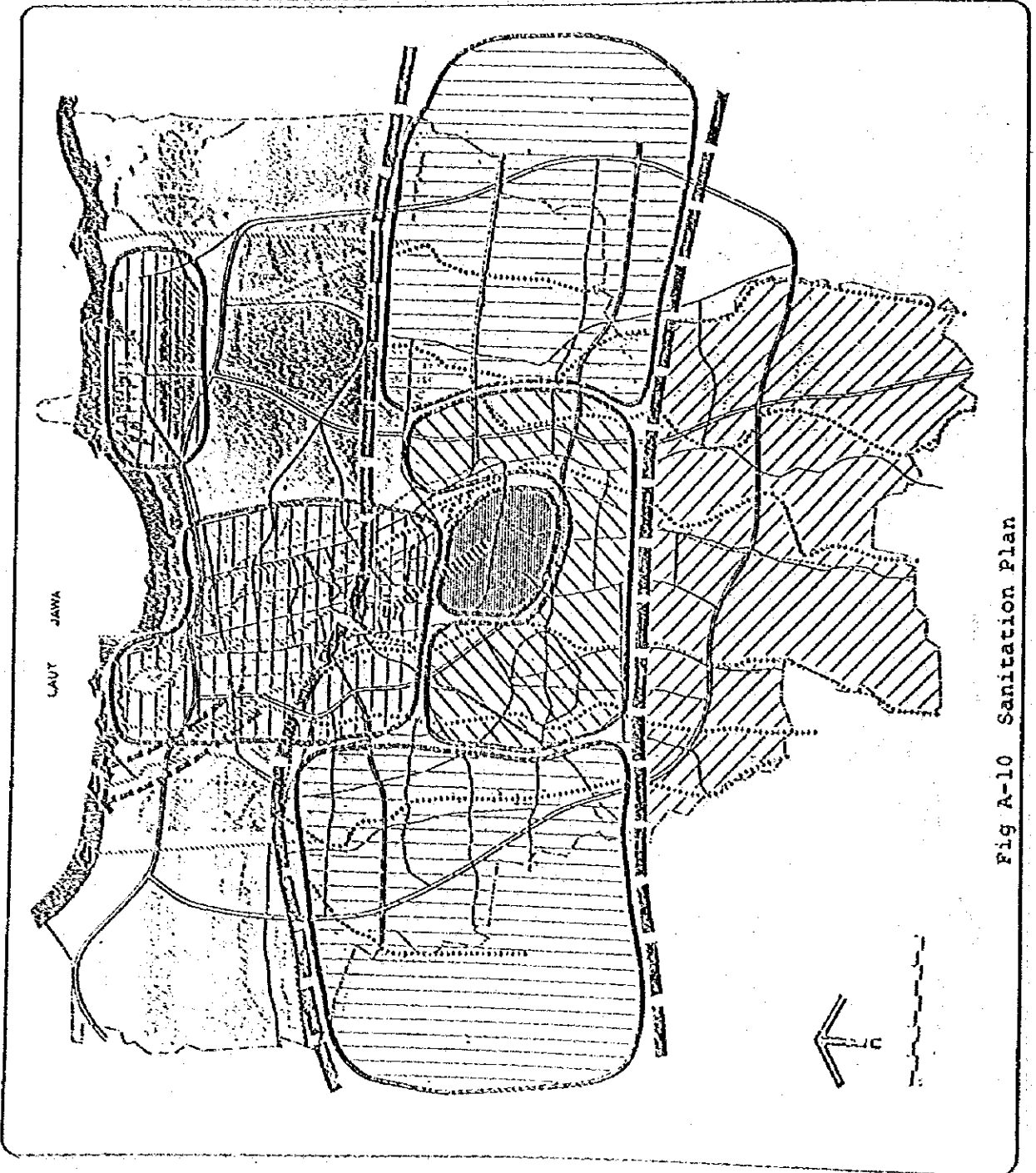
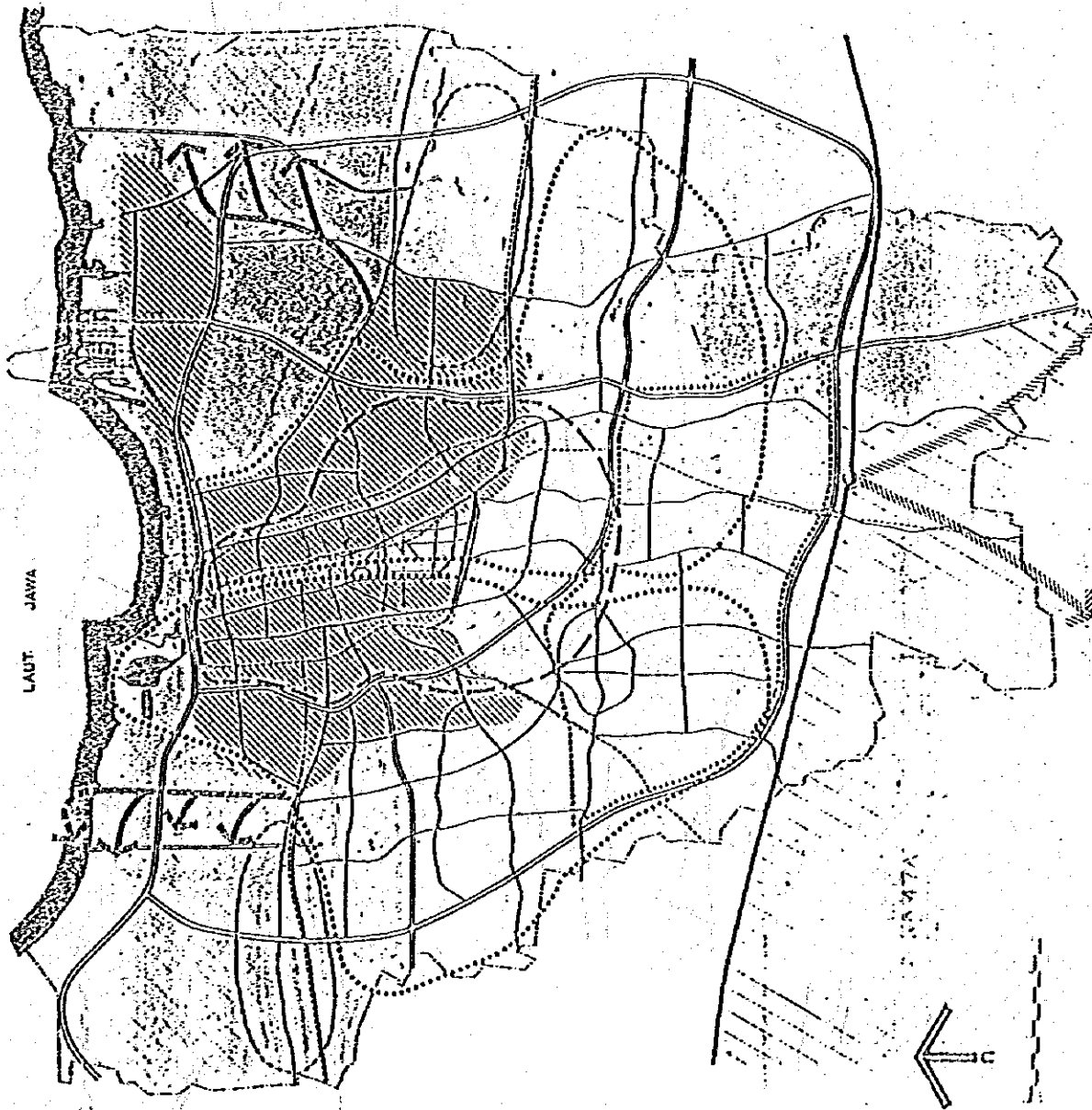


Fig A-10 Sanitation Plan

LAUT JAWA



REK. 4.7A SOLID WASTE HANDLING PLAN

S. E. G. K. M. D. I.

URB. PRIORITY AREA FOR CLEANNESS SOLID WASTE IMPROVEMENT

SANITARY LAND-FILL SITE AREA

INDUSTRIAL SOLID WASTE SOURCE, REQUIRED SPECIAL TREATMENT

COMPOSING SOLID WASTE PRODUCING AREA

PROPOSED AREA FOR INCINERATION OF SOLID WASTE

PACIFICATION AREA AGAINST ANY SOLID WASTE TREATMENT, EXCEPT FOR COMPOSING SYSTEM

SOLID WASTE TRANSPORTATION TO DISPOSAL SITE

PROPOSED SEA RECLAMATION

COMPOST FACTORY AND ITS DISTRIBUTION TO THE AGRICULTURE AREA

PETA No. 4.7A

RENCANA SAMPAH PADAT













TEAM PENYUSUN:
RENCANA INDI
DKI JAKARTA 1982-2007

Fig A-11 Solid Waste Handling Plan

1:4,000 OPEN SPACE & RECREATIONAL AREA.

L. G. E. N. D. I.

-  RESERVED AND RECREATIONAL FOREST
-  RESERVED FOREST FOR CEMPAKA-BATANG AIRPORT
-  GREEN SPACE & RECREATIONAL AREA
-  AGRICULTURE AND OPEN SPACE AREA
-  HARBOUR AND WAREHOUSE AREA
-  STRICTLY POLLUTION MONITORING INDUSTRIAL AREA
-  INDUSTRIAL AREA
-  LIMITED INTENSITY PHYSICAL CONSTRUCTION OF INFILTRATION AREA
-  GREEN BELT ALONG FLOOD CANAL & DRAINAGE CANAL
-  GREEN BELT ALONG THE STREET

PETA No: 4.10

RENCANA RUANG TERBUKA (HIJAU) DAN REKREASI

TEAM PENYUSUN
RENCANA INDIK
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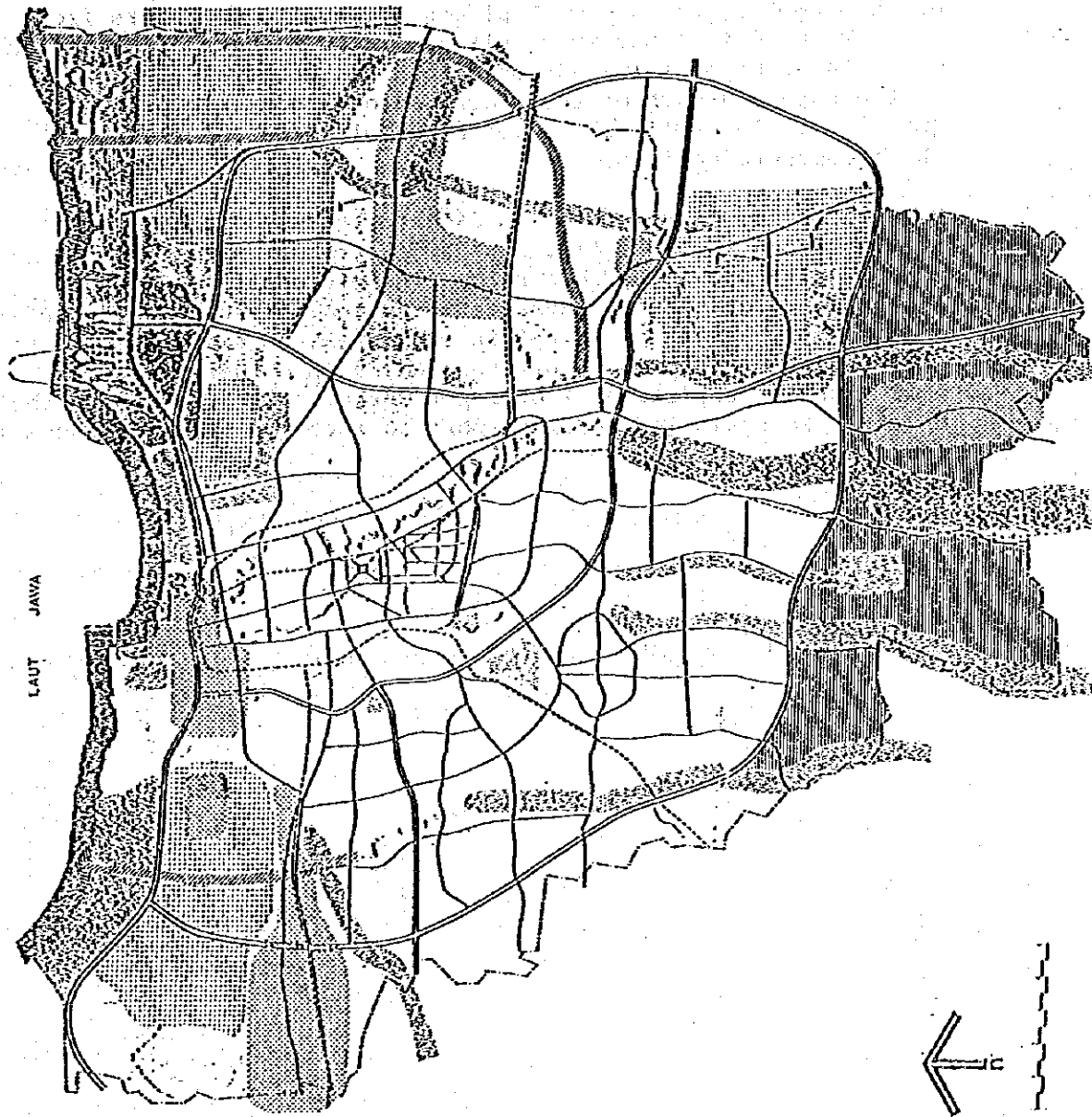


Fig A-13 Open Spaces and Recreational Area

d. Employment and Income

The 1980 census in DKI Jakarta included questions on employment and income. One of its outputs together with that of 1971 is presented in Table A-6. A noticeable decrease in number of employees is recorded in the agriculture sector and in the trade and hotel industries, while the mining and manufacturing industries achieved very high growth. It is also noted if shares of sectorwise employments are compared with those of the gross domestic products (Table A-2 and A-4), a relative productivity per worker of each industry will be known.

Based on the above census data, Jakarta's Strategic Development Planning team prepared the future work place estimated as shown in Table A-7. It is explained that the discrepancies in number of 1980 employments and work places are due to commuters from Botabek and difference in sampling. These numbers of projected work places were estimated based upon the sectorwise estimates of the future growth of the gross regional domestic product (GRDP). Table A-8 is shown for household data underlying in the income projections.

For the income distribution in Jakarta, the 1980 census data are tabulated in Table A-9. Income distribution forecast in 2005 is also shown in Table A-10. This forecast was made on the assumptions that the average income earners behave in the same manner. That is, except in such areas as a specific development project is to be executed, each earner's income will grow in proportion of GRDP per worker. In areas where the specific is evaluated and incorporated into the trend of income increase.

TABLE A-6

EMPLOYED PERSONS BY INDUSTRY

	1971 Persons	Share (%)	1980 Persons	Share (%)	Average annual Growth rate (%)
Agriculture	42,945	3.4	25,082	1.6	- 5.80
Mining	4,248	0.3	10,891	0.7	11.03
Manufacturing	117,507	9.2	221,129	13.9	7.28
Electricity, Gas and Water	7,414	0.6	10,338	0.7	3.76
Construction	89,176	7.0	92,877	5.8	0.45
Trade and Hotel	315,122	24.8	306,304	19.2	- 0.31
Trasnportation & Communication	135,432	10.6	144,768	9.1	0.74
Banking and Finance	35,441	2.8	40,812	2.6	1.58
Services	452,311	35.5	543,714	34.1	2.07
Others	73,031	5.7	200,703	12.6	11.89
T o t a l	1,272,627	100	1,596,618	100	2.55

Source : Statistical Year Book of Jakarta, 1972 and 1981

TABLE A-7
JAKARTA WORK PLACE ESTIMATES
1995 AND 2005

	1980	1995	Growth Rate 1980-95	2005	Growth Rate 1995 - 2005	Average Growth Rate 1980-2005
Agriculture	47,700	52,000	0.6 %	55,000	0.6 %	0.6
Industry	(248,500)	(496,200)	4.7	(646,600)	2.7	3.9
Large & Medium	151,000	262,500	3.8	316,400	1.9	3.0
Small	97,500	233,700	6.0	330,200	3.5	5.0
Government	258,300	402,400	3.0	546,600	3.1	3.0
Trade & Service	1,288,900	2,321,200	4.0	3,436,700	4.0	4.0
Total	1,843,400	3,271,800	3.9	4,684,900	3.7	3.8

Source : DKI Jakarta: Strategic Development Plan
Socioeconomic Parameters Base (Survey) and Forecast Data

Table A-8 NUMBER OF HOUSEHOLDS
AND AVERAGE HOUSEHOLD SIZE

District	1971		1980	
	Household	Size	Household	Size
Central	227,539	5.61	224,819	5.50
North	121,898	5.06	194,428	5.02
West	161,665	5.12	235,093	5.24
South	207,378	5.07	296,971	5.32
East	157,526	5.05	277,403	5.25
Jakarta	876,006	5.21	1,228,714	5.27

Source : 1971; Statistical Year Book of Jakarta, 1972
1980; JATS, Socioeconomic Parameters Base (Survey) and
Forecast Data

TABLE A-9

INCOME DISTRIBUTION
IN 1980

Kotamadja/Kecamatan	Group I Rp. 0 - 25,000	Group II 25,000 - 50,000	Group III 50,000 - 75,000	Group IV 75,000 - 100,000	Group V 100,000-
I. JAKARTA PUSAT	34.8 %	37.7 %	13.3 %	6.6 %	7.6 %
I.1 Kec. Gambir	35.8	32.1	13.7	7.8	10.4
I.2 Sawah Besar	36.4	35.2	14.0	6.9	7.4
I.3 Kemayoran	34.3	41.2	14.0	5.9	4.4
I.4 Senén	31.1	38.7	14.8	7.7	7.5
I.5 Cempaka Putih	34.1	39.2	12.8	6.4	7.3
I.6 Menteng	35.3	32.8	12.0	7.0	12.8
I.7 Tanah Abang	35.7	39.7	12.0	5.8	6.7
II. JAKARTA UTARA	40.5	39.5	11.2	4.8	4.0
II.1 Kec. Pulau Seribu	-	-	-	-	-
II.2 Penjaringan	43.3	37.3	9.8	4.2	5.2
II.3 Tanjung Priok	35.3	42.7	13.0	5.5	3.4
II.4 Koja	40.9	38.7	11.4	5.0	3.8
II.5 Cilincing	41.7	40.0	10.7	4.5	3.0
III. JAKARTA BARAT	41.7	36.2	10.9	5.2	5.9
III.1 Kec. Cengkareng	51.4	36.1	6.9	2.7	2.8
III.2 Grogol Petamburan	38.6	34.4	12.5	6.7	7.7
III.3 Taman Sari	33.2	36.7	15.2	7.0	7.7
III.4 Tambora	42.3	38.1	10.5	4.7	4.2
III.5 Kebon Jeruk	41.7	37.0	9.7	4.5	7.0
IV. JAKARTA SELATAN	32.7	38.9	12.5	6.6	9.2
IV.1 Kec. Tebet	36.0	32.5	12.5	7.5	11.3
IV.2 Setia Budi	33.6	43.5	12.4	5.4	5.0
IV.3 Mampang Perapatan	34.8	40.0	11.7	5.8	7.5
IV.4 Pasar Minggu	35.3	40.0	12.4	6.5	5.6
IV.5 Kebayoran Baru	37.8	29.0	11.3	6.9	14.7
IV.6 Kebayoran Lama	29.9	41.7	12.8	6.6	8.8
IV.7 Cilandak	30.2	37.5	12.1	7.2	12.8
V. JAKARTA TIMUR	31.6	40.5	13.7	7.3	6.9
V.1 Kec. Matraman	27.7	40.8	15.9	8.0	7.4
V.2 Pulo Gadung	27.6	36.3	14.7	9.3	11.8
V.3 Jati Negara	31.0	39.9	14.6	7.4	6.9
V.4 Kramat Jati	29.8	41.4	14.1	8.1	6.4
V.5 Pasar Rebo	37.8	40.8	11.3	6.1	3.8
V.6 Cakung	39.5	46.6	8.7	2.6	2.4
DKI JAKARTA	35.8	38.6	12.4	6.2	7.0

Note : Income range relates to the monthly income per employed person, although it is assumed that a household has 1.5 employed persons.

Source : Basic data taken from 1980 DKI Census, and modified by Jabotabek Advisory Team Service (JATS)

TABLE A-10

FORECAST INCOME DISTRIBUTION
IN 2005

Kotamadya/Kecamatan		Group I Rp. 0 - 25,000	Group II 25,000 - 50,000	Group III 50,000 - 75,000	Group IV 75,000 - 100,000	Group V 100,000 -
I.	<u>JAKARTA PUSAT</u>	11.9 %	22.9 %	17.8 %	11.2 %	36.2 %
I.1	Kec. Gambir	10.7	17.6	16.2	11.6	43.9
I.2	Sawah Besar	12.4	21.5	18.7	11.5	35.9
I.3	Kemayoran	13.4	28.2	21.4	11.6	25.4
I.4	Senen	10.1	21.9	18.8	12.7	36.5
I.5	Cepaka Putih	12.1	24.2	17.2	10.7	35.8
I.6	Menteng	9.8	15.0	13.1	9.9	52.2
I.7	Tanah Abang	12.8	25.2	17.0	10.4	34.6
II.	<u>JAKARTA UTARA</u>	19.5	30.6	18.0	9.6	22.3
II.1	Kec. Pulau Seribu					
II.2	Penjaringan	22.8	26.8	14.9	8.1	27.4
II.3	Tanjung Priok	15.0	33.8	21.1	11.2	18.9
II.4	Koja	17.5	30.7	18.7	10.0	23.1
II.5	Cilincing	21.8	32.9	18.1	9.6	17.6
III.	<u>JAKARTA BARAT</u>	19.0	26.2	14.6	9.0	31.2
III.1	Kec. Cengkareng	26.5	34.0	12.9	6.6	20.0
III.2	Grogol Petamburan	12.9	20.4	16.8	11.5	38.4
III.3	Taman Saru	10.7	21.0	19.5	11.7	37.1
III.4	Tambora	18.5	28.9	17.3	9.8	25.5
III.5	Kebon Jeruk	20.0	25.6	12.8	8.1	33.5
IV.	<u>JAKARTA SELATAN</u>	10.9	21.8	15.4	10.6	41.3
IV.1	Kec. Tebet	10.5	17.2	14.6	11.0	46.7
IV.2	Setia Budi	13.3	30.5	18.7	10.1	27.4
IV.3	Mampang Prapatan	11.9	23.1	14.7	9.7	40.6
IV.4	Pasar Minggu	12.9	25.7	18.1	12.2	31.1
IV.5	Kebayoran Baru	10.1	14.3	12.0	9.3	54.3
IV.6	Kebayoran Lama	9.1	21.3	15.6	10.9	43.1
IV.7	Cilandak	8.3	18.0	12.7	9.9	51.1
V.	<u>JAKARTA TIMUR</u>	14.2	27.4	16.8	10.9	30.7
V.1	Kec. Matraman	8.7	22.7	19.9	12.9	35.8
V.2	Pulo Gadung	7.2	16.7	15.4	12.7	48.0
V.3	Jati Negara	10.2	24.6	18.1	11.9	35.2
V.4	Kramat Jati	10.2	24.1	18.2	13.1	34.4
V.5	Pasar Rebo	23.0	30.4	15.9	10.2	20.5
V.6	Cakung	20.7	39.8	14.6	6.6	18.3
DKI	<u>JAKARTA</u>	14.8	25.6	16.2	10.3	33.1

Note : Income range relates to the monthly income at 1980 constant price per employed person, although it is assumed that a household has 1.5 employed persons.

Source : JATS; DKI Jakarta Strategic Development Plan, Socioeconomic Parameters Base (Survey) and Forecast Data.

e. Sanitary Condition and Incidence of Fire

As a parameter of the sanitary conditions within DKI Jakarta, a number of cases of the selected diseases (mainly water-borne diseases) is presented in Table A-11. General trend of declining number of occurrences is observed. However, growths are seen in Malaria, Typhoid fever, TBC and others.

It should be noted that figures are of those reported only. Actual numbers are told to be several times of these figures.

Incidence of fire in 1980 and 1975 - 1980 are tabulated in Table A-12 and A-13, respectively.

Table A-11 INCIDENCE AND NUMBER OF DEATH FOR SELECTED DISEASES
JAKARTA, 1975 - 1980

	1975	1976	1977	1978	1979	1980
	Case (Death)	Case (Death)	Case (Death)	Case (Death)	Case (Death)	Case (Death)
Malaria	63	266	392	147	288	514
Gastro enteritis	1,784 (118)	1,378 (267)	13,168 (137)	11,863 (94)	17,020 (105)	10,799 (73)
Cholera	214 (13)	441 (8)	521	685	1,048 (2)	423
Kusta	1,667 (6)	1,663	1,739	1,864	1,995	2,084
TBC	409	2,600	2,201	2,247	2,887	3,971
DHF	409 (63)	637 (64)	806 (72)	836 (65)	790 (49)	818 (21)
Typhoid fever	192 (11)	616 (14)	1,276 (66)	2,311 (64)	2,976 (94)	2,205
Diphtheria	137 (21)	169 (17)	148 (12)	151 (17)	490 (124)	498 (33)
Measles			15 (1)	31 (2)	20 (2)	169 (31)
Rabies	248	126	326	322	483	702

Source: Public Health Service, Jakarta

Table A-12 INCIDENCE OF FIRE, JAKARTA, 1980

	Fire Outbreak from		Burned			Dislocated		Victims		Estimated Losses (000 Rp.)
	Houses	Others	Houses	Others	Households	Persons	Dead	Wounded		
Jan.	11	12	4	21	9	27	-	1	360,465,000	
Feb.	8	13	9	17	10	51	-	1	14,326,000	
Mar.	18	26	372	37	449	1,863	1	24	560,299,000	
Apr.	21	30	302	48	343	2,062	2	2	163,495,000	
May.	12	21	12	21	13	56	3	7	54,028,500	
June	25	48	539	70	649	4,418	3	51	2,717,903,500	
July	23	37	59	55	164	520	-	1	264,194,500	
Aug.	32	36	254	64	463	1,783	3	25	438,047,000	
Sept.	21	45	71	59	119	554	-	7	861,440,000	
Oct.	19	49	38	58	51	221	2	15	78,662,000	
Nov.	7	36	-	17	4	12	-	2	202,120,000	
Dec.	12	22	11	31	23	132	-	2	538,066,000	
Total	209	375	1,671	503	2,297	11,699	14	138	6,253,046,500	

Source : Statistical Yearbook of Jakarta, 1981

Table A-13 INCIDENCE OF FIRE, JAKARTA, 1973 - 1980

Year	Fire Outbreak from:		Burned			Dislocated		Victims		Estimated losses (000 Rp.)
	Houses	Other structures	House	Others	Households	Persons	Dead	Wounded		
1973	91	174	326	-	584	2,537	6	42	387,503	
1974	104	250	676	-	1,571	8,748	13	42	11,580,050	
1975	115	298	1,069	-	2,022	7,125	6	40	1,046,924	
1976	160	203	446	-	1,084	5,576	5	37	1,158,610	
1977	181	401	1,051	628	1,779	9,578	23	89	1,537,611	
1978	138	286	663	945	1,258	5,733	29	61	2,028,331,500	
1979	181	360	670	747	1,177	5,197	5	65	8,190,115,000	
1980	209	375	1,671	508	2,297	11,699	14	138	6,253,046,500	

Source : Statistical Yearbook of Jakarta, 1981

B. POPULATION PROJECTION

For the Water Supply Master Plan up to year 2005, a demographic consideration is given to forecast from the present population with its distribution in the study area to future population growth. The projection is, more or less, affected by future development plans currently envisaged by DKI Jakarta, the principal one being the Jakarta Master Plan (or Jakarta Strategic Development Plan) currently under preparation. This population study will first review the Jakarta Master Plan in reference to background data, and then prepare population forecast to be required in the water demand projection.

1. Population Growth in Jakarta

In 1961, 1971 and 1980, DKI Jakarta conducted a detailed census in the city, and their results with intercensal estimates are shown in Table B-1. Nearly a fourfold growth was experienced from 1951 to 1981. However, the average annual growth rate has declined as shown below:

<u>Year</u>	<u>Population</u>	<u>G. Rate/a</u>
1951	1,661 ($\times 10^3$)	
61	2,907	5.76(%)
71	4,576	4.64
80	6,503	3.98

This trend of a declining growth rate is similar amongst postwar urbanized areas. These growth rates could be attributed to both natural increase and balance of in- and out-migration although there is no reliable record of migration to Jakarta. The JMDP report (T/15) in 1980 estimated that the present level of in-migration to DKI Jakarta was almost 147,000 persons per annum, accounting for approximately 55% of the total population increase in the city. This estimate is supported by the officials of DKI.

TABLE B-1

POPULATION GROWTH IN JAKARTA

Year	Persons X1,000	Growth Rate	Year	Persons X1,000	Growth Rate
1951 [*]	1,661		1966	3,639	5.10
52	1,782	7.26	67	3,807	4.60
53	1,796	0.79	68	3,982	4.59
54	1,824	1.56	69	4,274	7.34
55	1,885	3.33	70	4,437	3.82
56	1,890	0.26	1971 [*]	4,576	3.13
57	1,946	2.98	72	4,755	3.92
58	2,026	4.12	73	4,973	4.58
59	2,812	38.79	74	5,183	4.21
60	2,911	3.52	75	5,404	4.27
1961 [*]	2,907	0.15	76	5,701	5.51
62	3,022	3.98	77	5,925	3.93
63	3,154	4.38	78	6,082	2.64
64	3,302	4.67	79	6,239	2.59
65	3,463	4.88	1980 [*]	6,503	4.23
			81	6,556	0.81

Source : Statistical Year Book of Jakarta 1982.

* : Census year data

Note : Figures of intercensal estimates are explained
sometimes unreliable due to insufficient samplings.

2. Population Projection in the Jabotabek Metropolitan Development Plan and Jakarta Master Plan

The Jabotabek Metropolitan Development Planning Team has conducted a number of studies on enlarged Metropolitan Jakarta including Kabupatens Bogor, Tangerang and Bekasi, i.e., three prefectures in the West Java Province adjacent to Jakarta. This was done to ease the burden of population concentration into Jakarta and distribute it to adjoining Botabek in a manner reasonably programmed for equitable regional development.

From studies on development strategies, policy making and implementation projects planned, several population projections for the Jabotabek area have been forecasted. Natural increases of population in Jawa, Jakarta and Botabek have been developed taking into account fertility and mortality rates mainly based on the census data, which can be influenced by family planning, malnutrition and other factors. For example, estimated timing of approaching the zero population growth rate is as follows:

	Total	Rural
East Jawa	2013	1996
Central Jawa	2021	2001
West Jawa	2031	2011

(Source: JMDP Technical Report No. 15, June 1980)

The estimates of out- and in-migration trends were also made in conjunction with evaluation of the economic potential of each province, resulting in population concentration into Jakarta and urban Botabek. Population projections thus developed were adjusted for each step of alternative choices in formulating strategies for JMDP, where distributive and equitable development throughout the Region is the guidelines.

For the Jabotabek Region, three forecasts of population were made in 1980 (JMDP Technical Report No. 15) as follows:

- (1) an existing trend forecast, which shows an increasing concentration in Greater Jakarta and results in a total population of 26 million by 2003;
- (2) a modestly distributive forecast, which shows modest deconcentration to other centers, and a decline in the rate of growth of Greater Jakarta - although an increase in the absolute level of in-migration - and results in a population of 24,460,000 by 2003; and
- (3) a vigorously distributive forecast, which shows vigorous deconcentration to other centers, holds in-migration constant and results in a population of 20,790,000 by 2003.

The population of 24,460,000 was adopted with a constant level of in-migration and adjusted in the later stage for the preparation of implementation of JMDP. To achieve "modest deconcentration to other centers", "the Jabotabek Settlement Hierarchy" was established as a target of various programs proposed under JMDP. Its population distribution at the target year of 2005 is shown in Table A-5. Despite of 24.46 million population, the 23.65 million Jabotabek population has been envisaged in this Settlement Hierarchy as a result of coordinations in formulating the distribution development plan. Jakarta's target of 12 million population has been seemingly derived on basis of the perfect success of the plans.

Subsequently DKI Jakarta has been preparing its Strategic Development Plan (SDP) to pursue targets proposed in the JMDP. This work is currently being compiled in the form of the Jakarta Master Plan (1985-2005), which consists of programs already committed and newly proposed under SDP. The Master Plan Team in collaboration with the Jabotabek Advisory Team Services developed a population projection toward 2005 as shown in Table B-2. This projection was made by a component method based on the declining fertility and mortality rates with a rather constant level of migration, taking into account the economic potentials, density of urban area and the government plans for regional development.

Figures of these projected populations are in close agreement with the latest areawise population projection for 1995 and 2005 prepared by the Jabotabek Advisory Team Services. To the latter projections, census years' data for 1971 and 1980 were added and tabulated by Kecamatan subdistrict for the use in the present study. As presented in Table B-3, the total population figures in 1995 and 2005 are similar to those in the Jakarta Master Plan (Table B-2).

Since both the Jabotabek Metropolitan Development Plan - the national plan for regional development and the Jakarta Master Plan - a city master plan to formulate DKI Jakarta's development toward 2005, are in agreement on population projections, this study has adopted the population figures of the Jakarta Master Plan as the basis for population forecasting.

Table B-2

POPULATION OF JAKARTA, 1961 - 2005

Year	Pop'n (Million)	Average Growth (%)	Density per km ² (10 ³ /km ²)
1961	2.90		
71	4.50	4.49	
80	6.50	4.17	10.00
85	7.63	3.26	10.70
90	8.87	3.06	13.60
95	9.95	2.32	15.20
2000	11.00	2.03	16.80
05	12.00	1.76	18.40

Source: Jakarta Master Plan

Note: This forecast was made by component method with migration level assumed constant; mortality level by "west model life table"; and lowering tendency of fertility component from 1971 to 1980. It was also adjusted in relation to the economic development potentials and development programs.

Growth rates were checked and calculated for the water supply study.

Table B-3
POPULATION FORECASTS BY KECAMATAN
1995 & 2005

Kecamatan/Kecamatan	Area (km ²) in 1980	1971		1980		Average Growth Rate 1971 - 1980		1995		Average Growth Rate 1980 - 1995		2005		Average Growth Rate 1995 - 2005	
		Population	Density	Population	Density	Population	Density	Population	Density	Population	Density	Population	Density		
I. JAKARTA PUSAT	4,853.8	1,275,436	217	1,236,877	255	-0.34	1,350,494	278	1,408,542	290	0.6	1,408,542	290	0.4	
I.1 Kes. Gambir	757.6	170,091	198	144,802	191	-1.77	156,460	207	162,712	215	0.5	162,712	215	0.4	
I.2 Kes. Sawah Besar	563.2	146,767	158	156,871	269	-0.68	179,886	308	187,570	322	0.9	187,570	322	0.4	
I.3 Kes. Kemayoran	704.0	192,899	217	229,962	327	1.97	250,538	356	260,270	370	0.6	260,270	370	0.4	
I.4 Kes. Senen	461.0	163,244	427	135,306	294	-2.06	143,080	306	144,250	313	0.3	144,250	313	0.2	
I.5 Kes. Cempaka Putih	717.6	191,000	205	215,429	300	1.35	231,760	323	239,760	334	0.5	239,760	334	0.3	
I.6 Kes. Menteng	613.6	137,636	174	115,503	188	-1.93	129,268	211	139,920	228	0.8	139,920	228	0.8	
I.7 Tanah Abang	1,016.8	253,809	263	239,004	235	-0.67	261,482	257	273,960	269	0.6	273,960	269	0.5	
II. JAKARTA UTARA	13,208.0	608,347	63	963,915	76	5.23	1,427,289	108	1,695,558	128	2.7	1,695,558	128	1.7	
II.1 Kec. Pulau Seribu	excluded	(616,777)	63	(12,130)		-									
II.2 Kec. Pancajenean	4,323.4	197,090	84	305,133	70	4.98	439,623	102	531,493	123	2.5	531,493	123	1.9	
II.3 Kec. Tanjung Priok	2,483.0	149,776	65	233,260	96	5.05	357,260	147	409,675	169	2.9	409,675	169	1.4	
II.4 Kec. Kojaya	2,203.6	261,481	52	273,865	124	0.52	322,266	160	393,642	179	1.7	393,642	179	1.1	
II.5 Cilincing	4,258.0		-	151,657	36	-	278,160	65	363,148	85	4.1	363,148	85	2.6	
III. JAKARTA BARAT	13,196.8	828,179	61	1,231,188	93	4.50	1,980,387	150	2,618,538	198	3.2	2,618,538	198	2.8	
III.1 Kec. Cengkareng	6,058.0	93,458	14	237,711	39	10.93	393,808	65	514,948	85	3.4	514,948	85	2.7	
III.2 Grosir Petamburan	1,763.0	266,609	154	401,544	228	4.66	518,925	294	577,125	327	1.7	577,125	327	1.1	
III.3 Taman Sari	430.0	198,057	391	150,102	349	-0.57	157,531	366	161,596	376	0.3	161,596	376	0.3	
III.4 Tambora	570.2	238,480	327	270,485	474	1.41	276,047	484	279,169	489	0.1	279,169	489	0.1	
III.5 Kebon Jeruk	4,375.6	71,575	17	171,346	39	10.19	634,076	145	1,085,720	248	9.1	1,085,720	248	5.5	
IV. JAKARTA SELATAN	14,640.8	1,051,843	79	1,579,795	108	4.62	2,684,976	183	3,141,794	215	3.6	3,141,794	215	3.6	
IV.1 Kec. Tebet	958.0	209,795	224	237,306	268	2.29	315,362	329	365,600	361	1.4	365,600	361	0.9	
IV.2 Setia Budi	792.4	240,671	255	231,071	291	-0.45	273,044	344	288,020	363	1.1	288,020	363	0.5	
IV.3 Mampang Perseptan	1,860.4	125,817	68	231,436	124	7.01	446,216	240	541,860	291	4.5	541,860	291	2.0	
IV.4 Pasar Minggu	4,803.6	112,817	27	227,967	47	8.13	489,192	102	579,474	121	5.2	579,474	121	1.7	
IV.5 Kebayoran Baru	1,258.4	178,343	128	201,700	160	1.38	272,982	217	305,580	243	2.0	305,580	243	1.1	
IV.6 Kebayoran Lama	3,169.6	184,400	45	314,047	99	6.09	643,270	203	795,190	251	4.9	795,190	251	2.1	
IV.7 Cilendang	1,798.4		-	116,259	65	-	244,930	136	286,070	159	5.1	286,070	159	1.6	
V. JAKARTA TIMUR	18,549.4	794,861	52	1,456,750	79	6.96	2,506,509	135	3,134,059	169	3.7	3,134,059	169	2.3	
V.1 Kes. Matraman	480.0	165,988	318	180,070	375	0.91	198,610	414	204,050	425	0.7	204,050	425	0.3	
V.2 Kes. Pulo Gadung	1,477.0	181,897	62	255,741	173	3.86	351,532	238	382,970	259	2.1	382,970	259	0.9	
V.3 Kes. Jati Negara	3,188.0	230,505	71	404,111	127	6.44	711,600	223	881,200	276	3.8	881,200	276	2.3	
V.4 Kes. Kramat Jati	3,419.0	179,908	39	249,364	79	8.44	406,047	119	466,774	137	2.8	466,774	137	1.4	
V.5 Kes. Pasar Babo	6,175.2	86,563	16	200,385	32	9.78	462,370	75	619,754	100	5.7	619,754	100	3.0	
V.6 Cakung	3,810.2		-	147,079	39	-	376,340	99	579,311	152	6.5	579,311	152	4.4	
BKI JAKARTA	64,446.2	4,558,666	79	6,468,535	100	3.96	9,949,655	154	11,998,891	186	2.9	11,998,891	186	1.9	

Source : 1971 population taken from Statistical Year Book of Jakarta, 1972.
1980 population taken from Data Pokok Penduduk DKI Jakarta.

1995 and 2005 population projection taken from Jabotabek Advisory Team Service (JATS).
Socioeconomic Parameters Base (Survey) and Forecast Data.

Some figures were adjusted for the present study.

3. Potential High Growth Rates

As previously stated, this study uses the population estimates formulated by the Jakarta Master Plan studies which are in accord with those of the JMDP studies.

However, it is noted that the population estimates are based on annual growth rates declining from an average of 4.17% between 1971 and 1980 to 1.76% between 2000 and 2005. It is felt that this large reduction is optimistic for a 25 year period. It, also, is noted that one of the JMDP studies states "if JMDP's Distributive Development Strategy is not implemented then it is possible that DKI Jakarta's population level would reach some 18 million persons by the year 2005 (Jabotabek Advisory Team Services, Report J/2, March 1983)". The estimate of a population of 28.5 million by 2005 was made by the JMDP studies based on existing trends. The level of 12 million persons in 2005 is, therefore, assumed based on implementation of various programs and projects proposed under the JMDP and also under the Jakarta Master Plan. It is anticipated that if some of those programs under JMDP or City Master Plan are not implemented or delayed then this target population would be realized several years before 2005.

The present study assumes two alternative cases of declining the average annual growth rates, i.e., high growth rates 1 and high growth rates 2. In the high growth rates 1, it is simply assumed that the ultimate average annual growth rate between 2000 and 2005 would be 2.5% instead of 1.76% with the rate declining linearly from 4.17% between 1971 and 1980. In the high growth rates 2, it is assumed that the declining trend of average annual growth rates from 4.49% in the 1961-1971 period to 4.17% in the 1971-1980 period would continue at this rate of reduction until 2005. These two alternatives are presented in Figure B-1 and Table B-4, respectively.

Figure B-2 shows the results of the two alternatives with the basic population forecast derived from the Jakarta Master Plan. It is observed that the 2005 target population of 12 million persons could be realized 7 years earlier (high growth 1) or 8 years earlier (high growth 2).

FIGURE B-1

AVERAGE ANNUAL GROWTH RATES
ALTERNATIVES

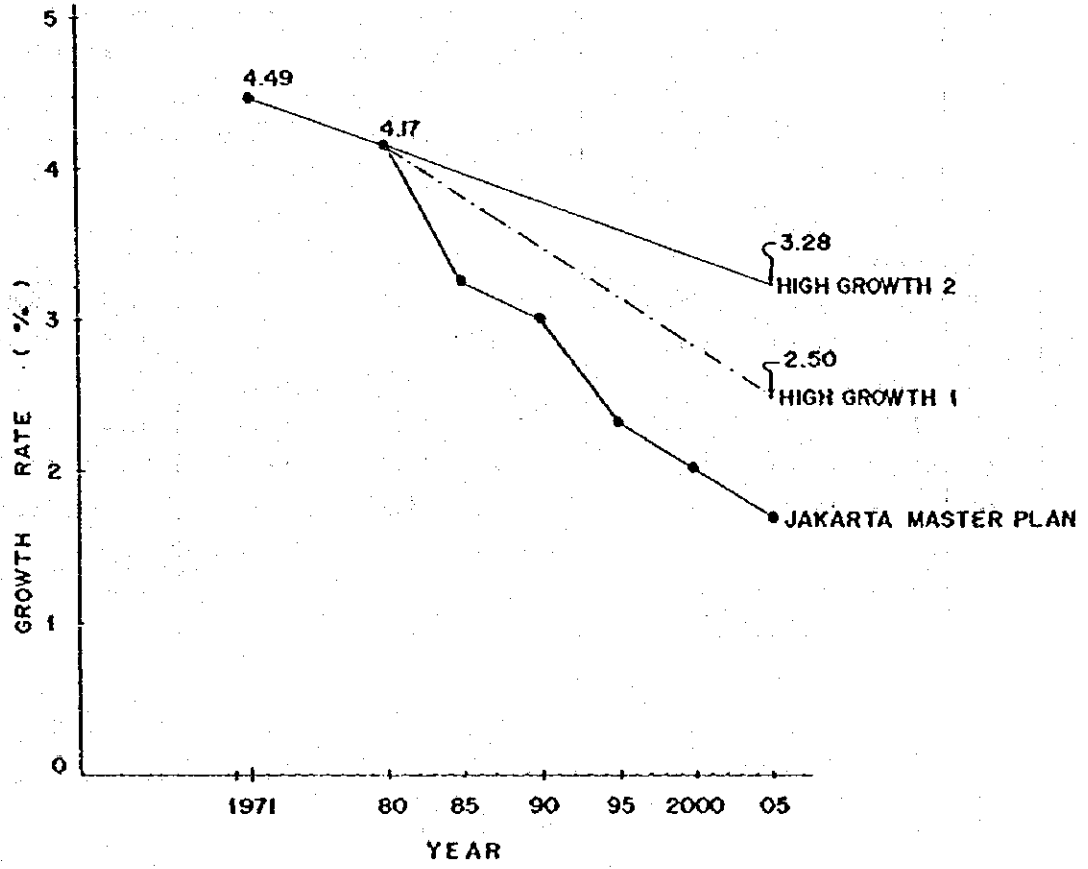
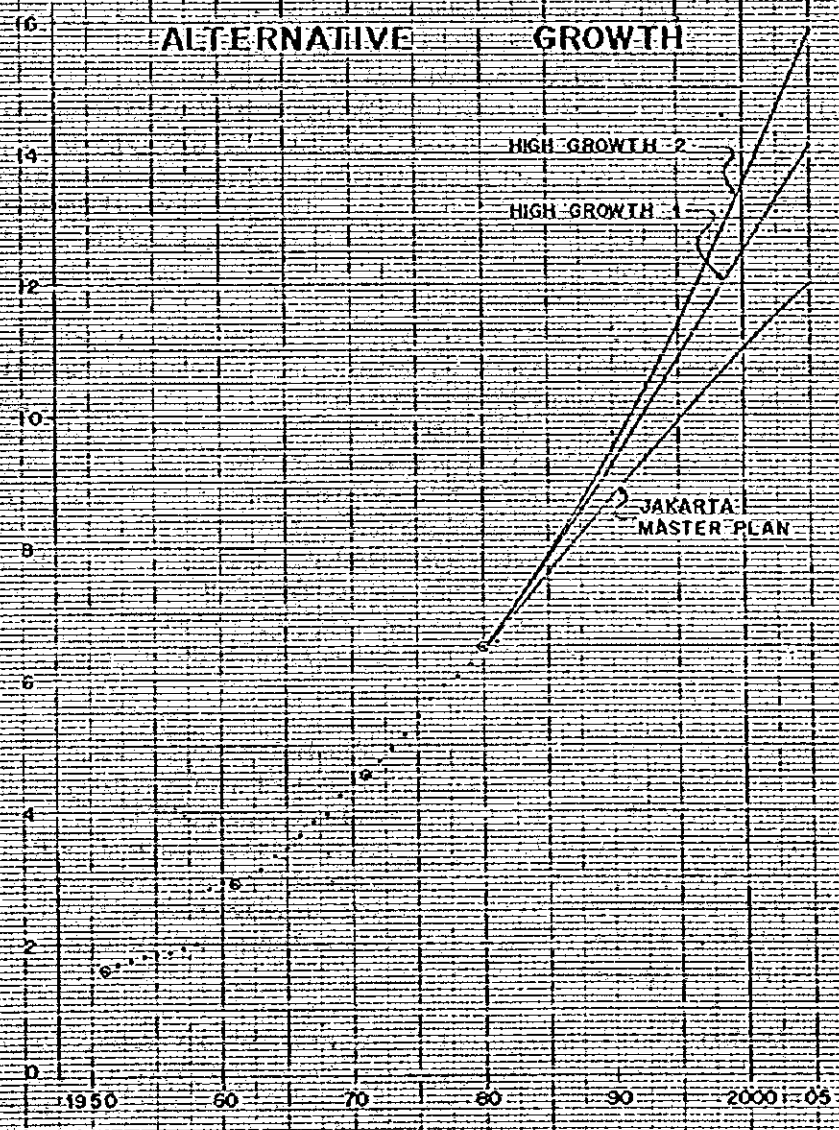


TABLE B-4

ALTERNATIVE FOR FORECAST POPULATION

	Jakarta Master Plan			High Growth 1			High Growth 2		
	GR/a	Pop'n	Density	GR/a	Pop'n	Density	GR/a	Pop'n	Density
1961		2.90							
71	4.49	4.50	79						
80	4.17	6.50	100	4.17	6.50	100	4.17	6.50	100
85	3.26	7.63	118	3.84	7.85	122	3.99	7.90	123
90	3.06	8.87	138	3.50	9.28	144	3.81	9.53	148
95	2.32	9.95	154	3.17	10.85	168	3.64	11.39	177
2000	2.03	11.00	171	2.83	12.48	194	3.46	13.51	210
05	1.76	12.00	186	2.50	14.12	219	3.28	15.87	246
	2.48 % (1980-2005 average)			3.15 %			3.64 %		

FIGURE B-2



4. Population Distribution

DKI Jakarta divides its administrative territory into five districts, i.e., Jakarta Pusat (Central), Jakarta Utara (North), Jakarta Barat (West), Jakarta Selatan (South) and Jakarta Timur (East). They are further subdivided into 30 Kecamatan (subdistricts), one of which is Pulau Seribu islands scattered north in the Java Sea and is excluded from the present study area.

Outputs of censuses at district and subdistrict level in 1971 and 1980 are shown in Table B-3 in respect to the population and density in 1971, and population, density and area in 1980. Between 1971 and 1980 DKI Jakarta expanded its administrative boundary. However, it would be still possible to compare 1971 and 1980 populations, because new territories taken in were considered relatively sparsely populated areas and would not considerably affect the total trend to be grasped by simple comparison. Figures of total populations also differ slightly from those shown earlier. This could be neglected here, because what is postulated in the present study is to perceive a gross trend in, say, 2 to 3 digits precision.

In this simple comparison it is observed that populations were decreasing in most of Central District and some other subdistricts which were, at least in 1980, populated with the densities of some 200 persons per hectare or more. Outstanding decrease seen in subdistricts Gambir and Menteng are attributed to the increase of social use of land. In gross observation, Central District which has the densest population of 225 persons per hectare seems to afford no ample space to support a rapid growth in population. North, West and East Districts, in contrast, with densities less than DKI Jakarta's average of 100 persons per hectare, have experienced a quick growth and seem to provide enough spaces for the future developments. Population density in 1980 at subdistrict level is shown on Figure B-3.

As stated earlier, Table B-3 includes population forecasts by Kecamatan in 1995 and 2005. It is observed that average annual growth rates in the Central District are smaller than 1.0%. Between 1980 and 2005 annual growth rates for the North, West, South and East Districts average 2.3, 3.06, 2.8 and 3.11%, respectively. This reflects the basic policy of Jakarta Master Plan to guide developments toward the east-west direction with restriction of urban developments in the north and south. This is seen in Figures B-4 and B-5.

In looking at the population densities in 1005, Subdistricts of Tambora and Matraman accommodate more than 400 persons per hectare, and ten subdistricts out of 29 are of more than 300 persons per hectare. The average density over the whole Jakarta is 186 persons per hectare. This is rather a high population density over a capital city of 64,000 hectares in area. For reference, Tokyo has a population density of 243 persons per hectare in 1980 within its special districts area extending only in 34,364 hectares, where the multi-storeyed apartment houses are prevalent.

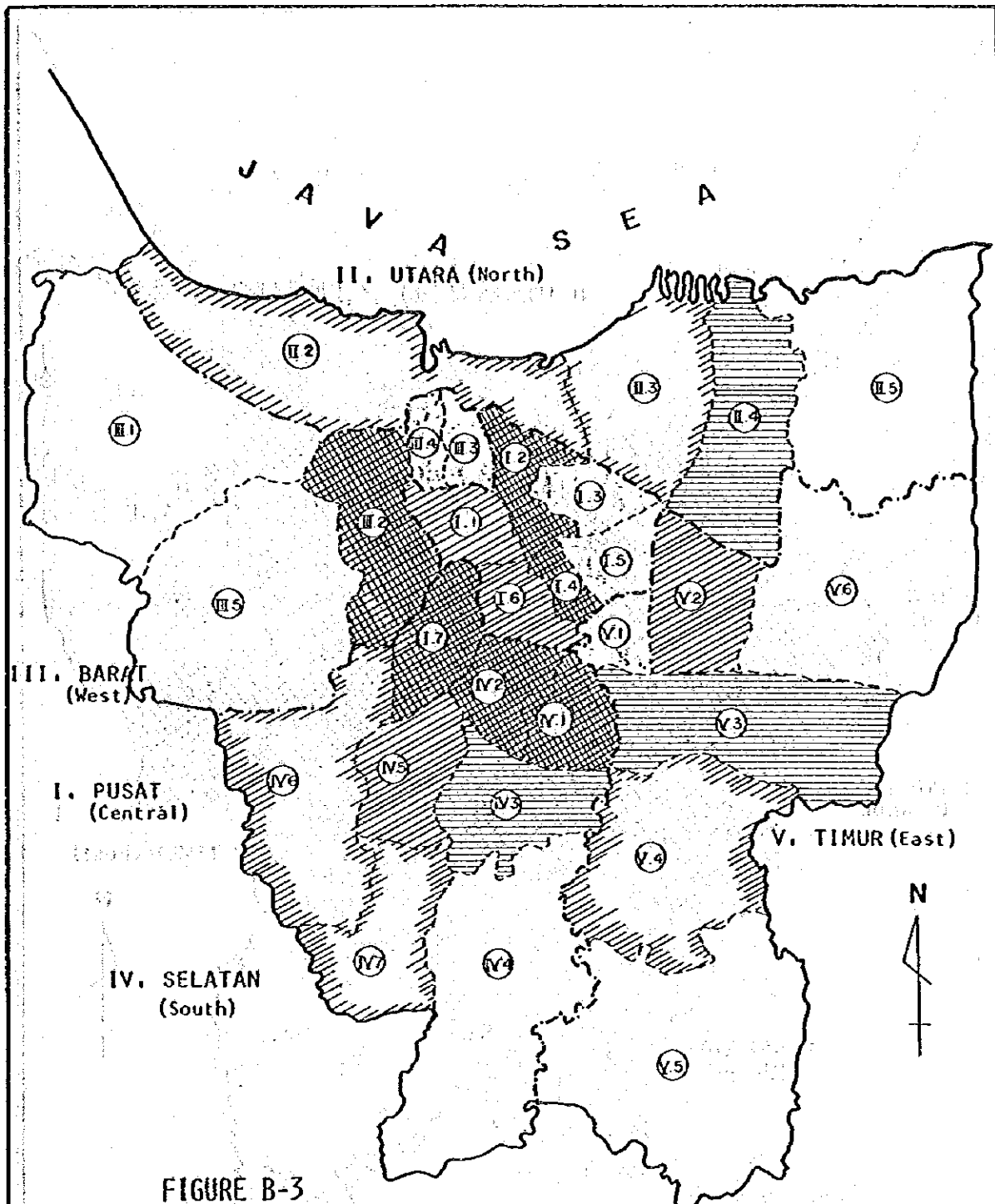








FIGURE B-3

POPULATION DENSITY (1980)

(PERSONS/ha)

	MORE	THAN	300
	200	—	299
	150	—	199
	100	—	149
	50	—	99
	LESS	THAN	49

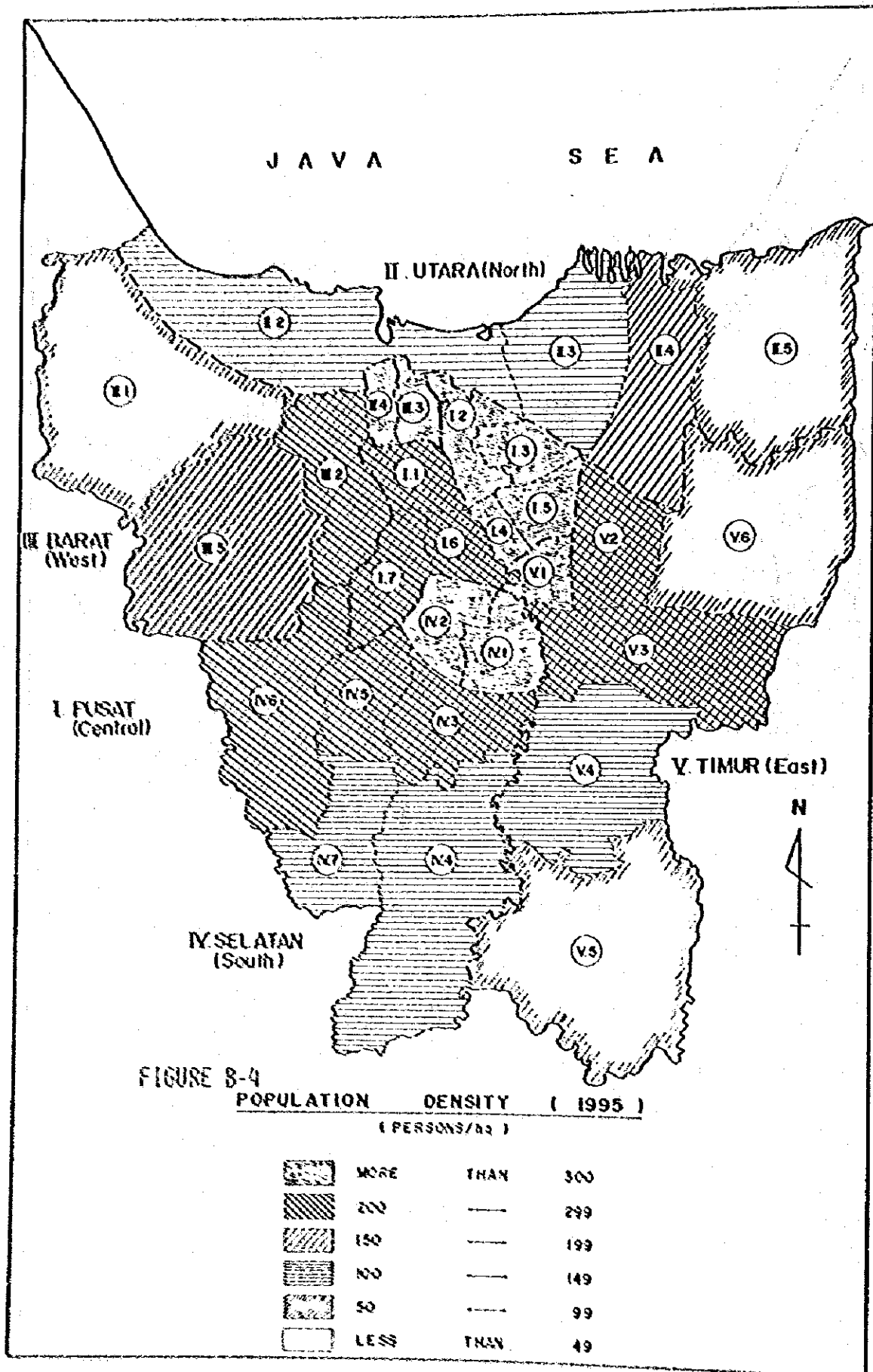


FIGURE B-4
 POPULATION DENSITY (1995)
 (PERSONS/K²)

	MORE	THAN	300
	200	—	299
	150	—	199
	100	—	149
	50	—	99
	LESS	THAN	49

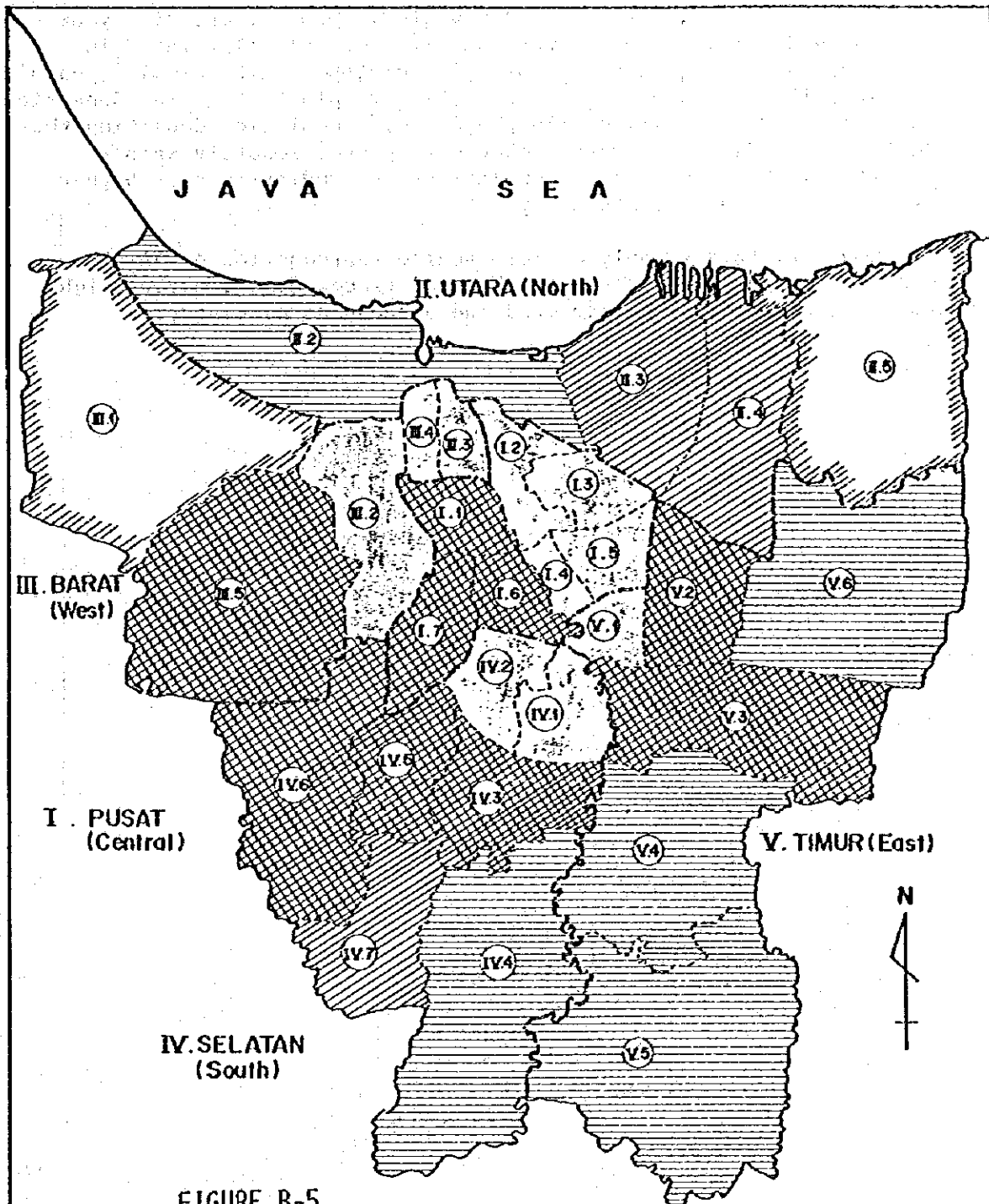


FIGURE B-5

POPULATION DENSITY (2005)
(PERSONS/ha)

	MORE	THAN	300
	200	—	299
	150	—	199
	100	—	149
	50	—	99
	LESS	THAN	49

For the use of this water supply study, projections at 5 year intervals on subdistrict basis were undertaken. As illustrated in Figure B-6, population densities of 5 districts of JATS' sampled years of 1971, 1980, 1995 and 2005 (see Table B-3) were plotted and the densities at other years were curvilinearly projected. Population densities thus projected for 5 districts were broken down proportionately into subdistricts. Table B-5 shows populations in subdistricts at 5 year intervals projected for this study.

However, this is only a micro-scaled reproduction of JATS' population forecast. In case growth trend traces other, maybe, high rates, projections must be reviewed and amended as necessary.

FIGURE B-6
 POPULATION DENSITY
 BY DISTRICT

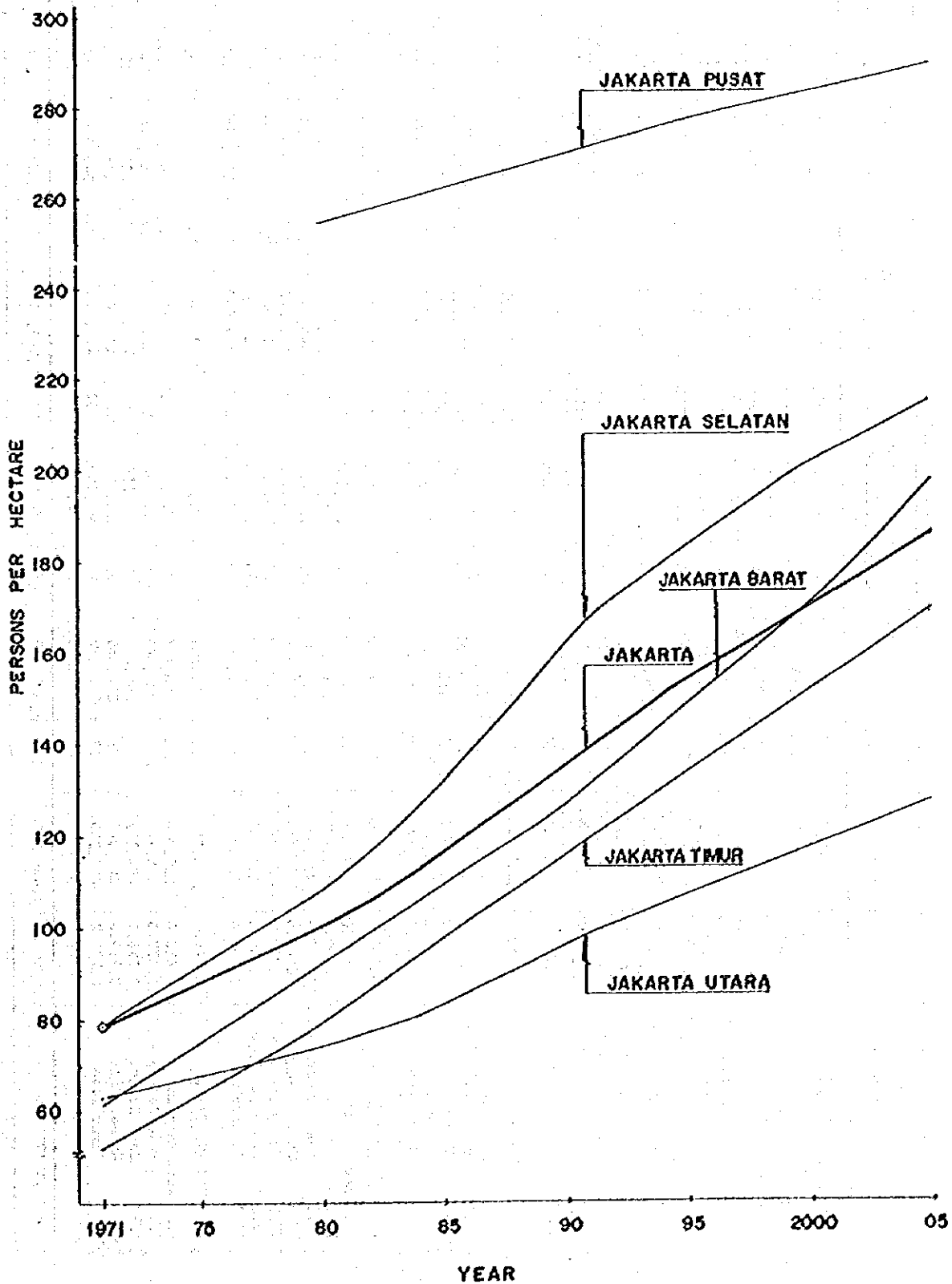


TABLE B-5

FORECAST POPULATION DISTRIBUTION
1980 - 2005

Kotamadya / Kecamatan	Area (ha) in 1980	1980 Population	1980 Density	1985 Population	1985 Density	1990 Population	1990 Density	1995 Population	1995 Density	2000 Population	2000 Density	2005 Population	2005 Density
I. JAKARTA PUSAT													
I.1 Kec. Gambir	4,853.8	1,236,877	255	1,274,749	263	1,312,622	270	1,350,494	278	1,379,518	284	1,408,542	290
I.2 Savah Besar	757.6	144,802	191	148,687	196	152,572	201	156,460	207	159,586	211	162,712	215
I.3 Kemayoran	583.2	156,871	269	164,543	282	172,214	295	179,886	308	183,728	315	187,570	322
I.4 Senen	704.0	729,962	327	736,821	336	743,680	346	750,538	356	757,397	365	764,255	370
I.5 Cempaka Putih	461.0	135,306	294	137,230	298	139,155	302	141,080	306	142,665	309	144,250	313
I.6 Menteng	717.6	215,429	300	220,873	308	226,318	315	231,760	323	235,760	329	239,760	334
I.7 Tanah Abang	613.6	115,503	188	120,098	196	124,693	203	129,288	211	134,604	219	139,920	228
	1,016.8	239,004	235	246,497	242	253,990	250	261,482	257	267,721	263	273,960	269
	13,208.0	963,915	74	1,096,264	83	1,294,384	98	1,427,289	108	1,558,544	118	1,695,958	128
II. JAKARTA UTARA													
II.1 Kec. Pulau Seribu	excluded	(12,130)											
II.2 Penjarangan	4,323.4	305,133	70	343,543	79	401,041	93	439,623	102	484,512	112	531,493	123
II.3 Tanjung Priok	2,423.0	233,260	96	268,669	111	321,683	133	357,240	147	382,854	158	409,675	169
II.4 Koja	2,203.6	273,865	124	296,236	134	329,781	150	352,266	160	372,478	169	393,642	179
II.5 Cilincing	4,238.0	133,657	36	187,796	44	241,879	57	278,160	65	318,700	75	361,148	85
III. JAKARTA BARAT													
III.1 Kec. Cengkareng	13,196.8	1,233,188	93	1,464,845	111	1,675,994	127	1,980,387	150	2,256,653	171	2,618,538	198
III.2 Geogol pecabutan	6,058.0	237,711	39	286,398	47	330,387	55	393,808	65	446,250	74	514,948	85
III.3 Taman Sari	1,763.0	401,544	228	438,155	249	471,238	267	518,925	294	544,220	309	577,125	327
III.4 Tambora	430.0	150,102	349	152,458	355	154,513	359	157,531	366	159,291	371	161,596	376
III.5 Kebon Jeruk	570.2	270,485	474	272,163	477	273,787	480	276,047	484	277,390	486	279,149	489
	4,375.6	171,346	39	315,671	72	446,069	102	634,076	145	829,602	190	1,085,720	248
IV. JAKARTA SELATAN													
IV.1 Kec. Tabet	14,640.8	1,579,795	108	1,976,508	135	2,401,091	164	2,684,976	183	2,972,084	203	3,141,794	215
IV.2 Setia Budi	958.0	257,306	268	278,139	290	300,433	314	315,342	329	334,359	349	345,600	361
IV.3 Mampang Perapatan	792.4	231,071	291	246,138	311	262,261	331	273,044	344	282,456	356	288,020	363
IV.4 Pasar Minggu	1,860.4	231,436	124	308,533	165	391,039	210	446,216	240	506,328	272	541,850	291
IV.5 Kebayoran Baru	4,803.6	227,967	47	327,736	67	422,101	88	489,192	102	545,934	114	579,474	121
IV.6 Kebayoran Lama	1,258.4	201,700	160	227,287	181	254,670	202	272,982	217	293,470	233	305,580	243
IV.7 Cilendak	3,169.6	314,047	99	432,228	136	558,713	176	643,270	203	738,751	233	795,190	251
	1,798.4	116,259	65	162,447	90	211,674	118	244,930	136	270,786	151	286,070	159
V. JAKARTA TIMUR													
V.1 Kec. Matraman	28,549.4	1,456,750	79	1,817,802	98	2,188,829	118	2,506,509	135	2,838,058	153	3,134,059	169
V.2 Pulo Gadung	480.0	180,070	375	186,486	389	192,976	402	198,610	414	201,484	420	204,050	425
V.3 Jati Negara	1,477.0	255,741	173	288,684	195	322,546	218	351,532	238	368,141	249	382,970	259
V.4 Kramat Jati	3,188.0	404,111	127	509,856	160	618,554	194	711,600	223	801,214	251	881,200	276
V.5 Pasar Rebo	3,419.0	269,364	79	316,369	93	364,687	107	406,047	119	438,129	128	466,774	137
V.6 Cakung	6,175.2	200,385	32	290,482	47	383,093	62	462,370	75	545,516	88	619,754	100
	3,810.2	147,079	39	225,925	59	306,973	81	376,350	99	463,574	121	579,511	152
DKI JAKARTA													
	64,446.2	6,468,525	100	7,630,168	118	8,872,920	138	9,949,655	154	11,004,857	171	11,998,891	186

APPENDIX MIII-1

MASTER PLAN FOR
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT

M2. APPENDIX MIII-1

WATER RESOURCES DEVELOPMENT STUDY

This Appendix MIII-1, Water Resources Development Study consists of I. Groundwater Resources in Jakarta, July 1984, and II. Water Resources Development Study, October 1983.

I. GROUNDWATER RESOURCES IN JAKARTA

GROUNDWATER RESOURCES IN JAKARTA

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1. INTRODUCTION

Since the submission of the Interim Report (of the Master Plan) in December 1983, some updated data of groundwater have been obtained from Directorate of Environmental Geology, Bandung. On the other hand, useful comments have been raised from quarters concerned. Under such circumstances, a further study has been carried out, using the obtained data and considering the comments.

This report describes the results of the study, and all the substances of the report will be incorporated in the final Master Plan to be submitted at the end of the present study.

This report covers mainly : 1) provisional calculation of recharge of groundwater in the project area, 2) comparison of the potential groundwater calculated as above and the potential groundwater requirement, and finally 3) conclusion of the study.

2. EVALUATION OF GROUNDWATER RESOURCES IN JAKARTA

Although it was expected at the beginning of the present study that the results of the groundwater study by DEG, Bandung would be given to the JICA Study Team, it was later found that the study of DEG has been merely for the purpose of training, not for specific purpose of producing a report on groundwater potential in Jakarta. However, some useful data collected by DEG was furnished to the Team. Therefore, based on these data, not necessarily enough, a provisional estimation is carried out regarding potential groundwater, as required for the planning of water supply in the project area.

The provisional evaluation of groundwater resources to define the sustainable yield are undertaken in the following steps :

- (1) Groundwater storage
- (2) Recharge amount
- (3) Sustainable yield

3. SUSTAINABLE YIELD

3.1 Groundwater Storage

Defining properly the aquifer capacity containing groundwater is one of the ways to outline groundwater storage system. Calculation was made to define the groundwater storage, assuming that the available groundwater is mainly stored in sand or gravel beds of the sediments. Total amount of groundwater in Jakarta area was calculated by Dr. S. YAMAMOTO, 1972. Following his method, the calculation is made as detailed below.

$$\text{Total Amount (TA)} = \text{Area} \times \text{Aquifer Thickness} \times \text{Porosity}$$

Case of Jakarta City :

- Area concerned : 600 km²
- Thickness of Aquifer : 300 m
- Porosity : 0.3

$$\begin{aligned} \text{TA} &= 600 \times 10^6 \times 300 \times 0.3 \\ &= 54 \times 10^9 \text{ m}^3 \end{aligned}$$

In accordance with the discussion with Directorate of Environmental Geology (DEG), Bandung, the storage coefficient (porosity) is revised as 15% considering that aquifers consist of mainly fine sands and silt. And the area concerned is 644.5 km².

$$\begin{aligned} \text{Therefore, TA} &= 644.5 \times 10^6 \times 300 \times 0.15 \\ &= 29 \times 10^9 \text{ m}^3 \end{aligned}$$

3.2 Recharge Amount

The aquifer system in Jakarta artesian basin consists of unconfined, semi-confined and confined aquifers in the depth of over 300 m. The groundwater recharge of unconfined and semi-confined aquifers are defined by the computation with the values of groundwater table fluctuation, storage coefficient (porosity) and area concerned. On the other hand, the groundwater recharge of confined aquifer is defined by the horizontal flow rate depending on the hydrodynamic characteristics of the aquifer.

A. Recharge of Unconfined and Semi-confined Aquifers

The shallow unconfined and semi-confined aquifers are easily recharged from several sources, namely, rainfall, river, canal, paddy field and others. An estimate of recharge to shallow aquifer is made on the basis of an average annual fluctuation of the water table. Fig. 1 and 2 indicate the groundwater table contours of shallow aquifer, in dry season 1983 and rainy season 1984, respectively. The annual fluctuation map (Fig. 3) has been drawn on the basis of readings taken during the above two different seasons. The broad annual fluctuation, from 0^m to 5^m has been observed in Jakarta area.

Based on the analysis of groundwater fluctuation and physiographic conditions, the Jakarta city is divided into two areas, North and South. The boundary is the East - West line crossing the two existing water treatment plants, Pejompongan and Pulogadung. The Northern area includes Zone I and Zone II; on the other hand the Southern area occupies Zone III.

Fig. 1. GROUNDWATER TABLE CONTOURS SHALLOW AQUIFER, DRY SEASON 1983

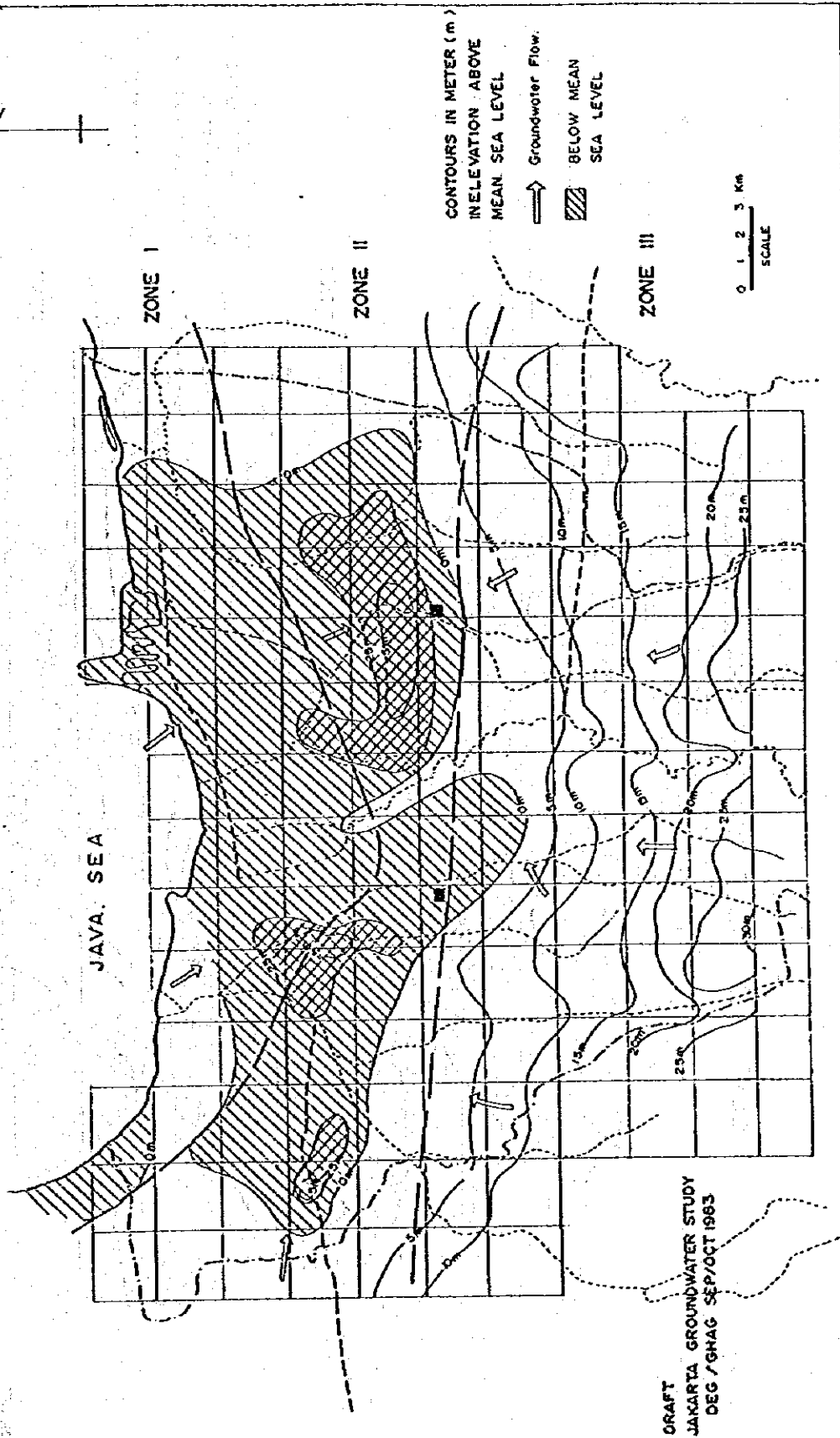


Fig. 2 GROUNDWATER TABLE CONTOURS SHALLOW AQUIFER,
RAINY SEASON 1984

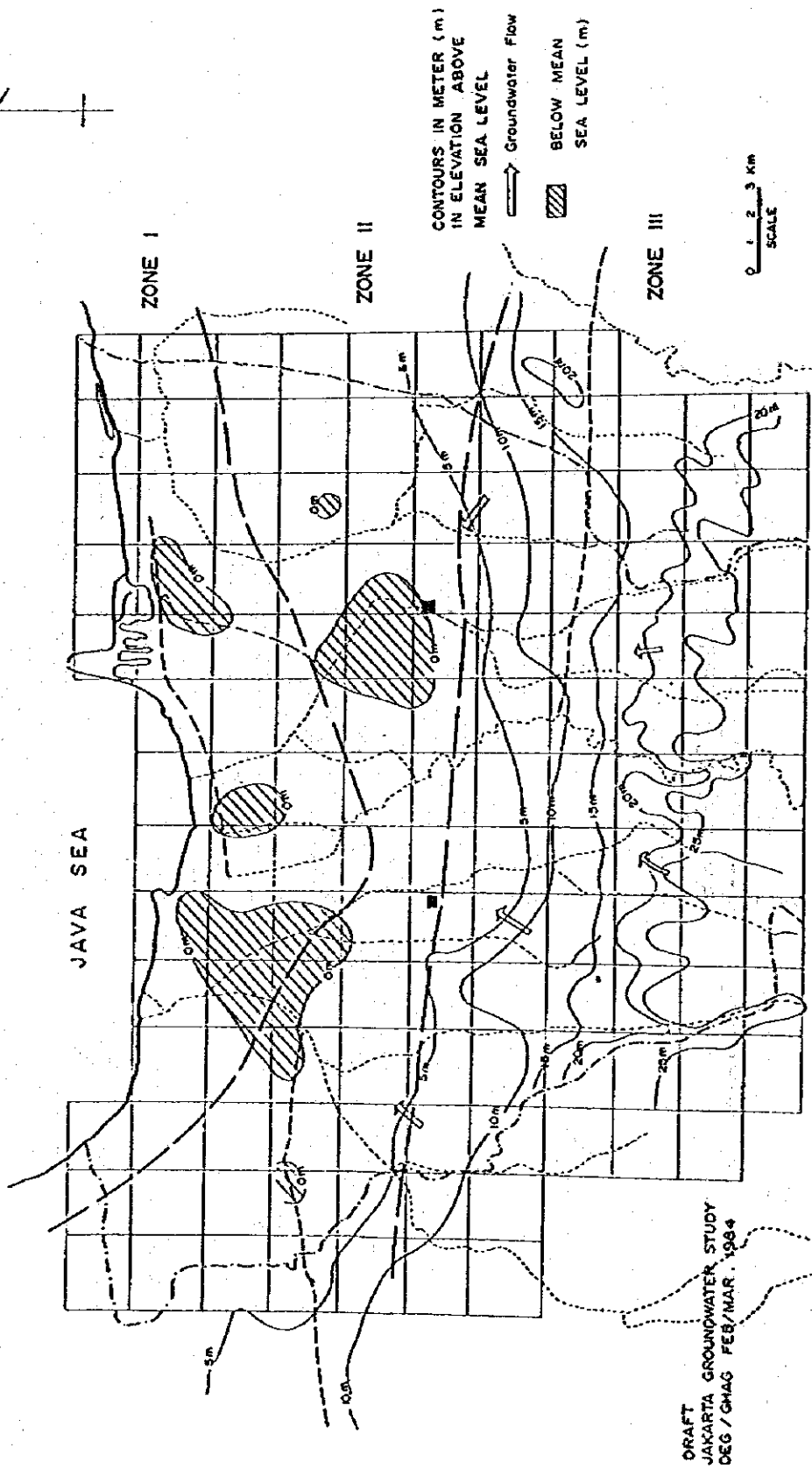
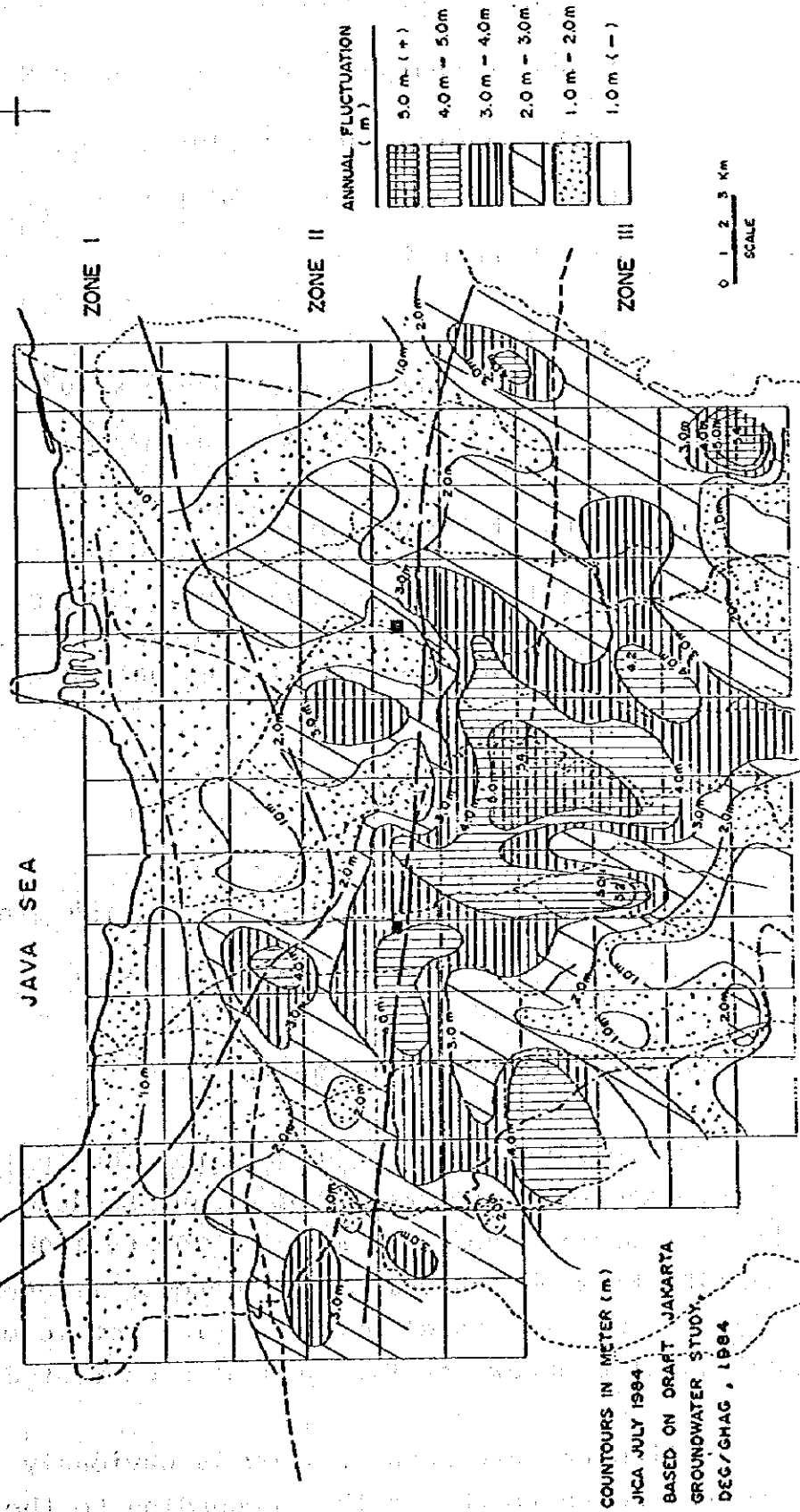


Fig. 3 AVERAGE ANNUAL FLUCTUATION OF SHALLOW AQUIFER
 DRY SEASON 1983 / RAINY SEASON 1984
 (Unconfined and Semi - Confined Aquifers)



COUNTOURS IN METER (m)
 JICA JULY 1984
 BASED ON DRAFT JAKARTA
 GROUNDWATER STUDY
 DEG/GHAG , 1984

a) North of Jakarta Area

$$\text{Annual Recharge : } R_n = F_1 \times A_1 \times S$$

$$(F_1) \text{ Average annual fluctuation} = 1.71 \text{ m/year}$$

$$(A_1) \text{ Area (Zones I and II)} = 336.9 \text{ km}^2$$

$$(S) \text{ Porosity} = 0.15$$

Therefore,

$$\begin{aligned} R_n &= 1.71 \times 336.9 \times 10^6 \times 0.15 \\ &= 86.4 \times 10^6 \text{ m}^3/\text{year} \end{aligned}$$

b) South of Jakarta Area

$$\text{Annual Recharge : } R_s = F_2 \times A_2 \times S$$

$$(F_2) \text{ Average annual fluctuation} = 2.79 \text{ m/year}$$

$$(A_2) \text{ Area (Zone III)} = 307.6 \text{ km}^2$$

$$(S) \text{ Porosity} = 0.15$$

Therefore,

$$\begin{aligned} R_s &= 2.79 \times 307.6 \times 10^6 \times 0.15 \\ &= 129 \times 10^6 \text{ m}^3/\text{year} \end{aligned}$$

B. Recharge of Confined Aquifer

Considering recharge of confined aquifer, Directorate of Environmental Geology, Bandung, prepared the piezometric contours maps of 20^m to 140^m Aquifer and 140^m to 240^m Aquifer during October - December, 1982 (Figs. 4 and 5). Based on these piezometric maps, horizontal groundwater flow has been estimated.

Horizontal groundwater flow is obviously observed from the South to the North. According to the Darcy's Law, the confined aquifer of recharge from upstream is

estimated as follows :

$$Q_h = k \times a \times b \times i$$

$$k = T/b$$

Therefore, Horizontal Recharge =

$$Q_h = T \times i \times a$$

- (Q_h) = Groundwater horizontal flows
(k) = Coefficient of Permeability
(a) = Flow length
(b) = Thickness of Aquifer
(i) = Hydraulic gradient
(T) = Coefficient of Transmissibility

a) Confined Aquifer of 20^m to 140^m

$$T = 140 \text{ m}^2/\text{day}$$

$$i = 3.6 \times 10^{-3} - 3.9 \times 10^{-3}$$

$$a = 50 \text{ km}$$

$$\begin{aligned} Q_{h1} &= 140 \times 3.75 \times 10^{-3} \times 50 \times 10^3 \\ &= 26.3 \times 10^3 \text{ m}^3/\text{day} \end{aligned}$$

b) Confined Aquifer of 140^m to 240^m

$$T = 140 \text{ m}^2/\text{day}$$

$$i \text{ (East)} = 4.9 \times 10^{-4}$$

$$i \text{ (West)} = 2.3 \times 10^{-3} - 2.5 \times 10^{-3}$$

$$a \text{ (East)} = 17 \text{ km}$$

$$a \text{ (West)} = 42 \text{ km}$$

Fig. 4 PIEZOMETRIC LEVEL CONTOURS OF DEEP AQUIFER CONFINED AQUIFER (20m - 140m) OCT/DEC. 1982

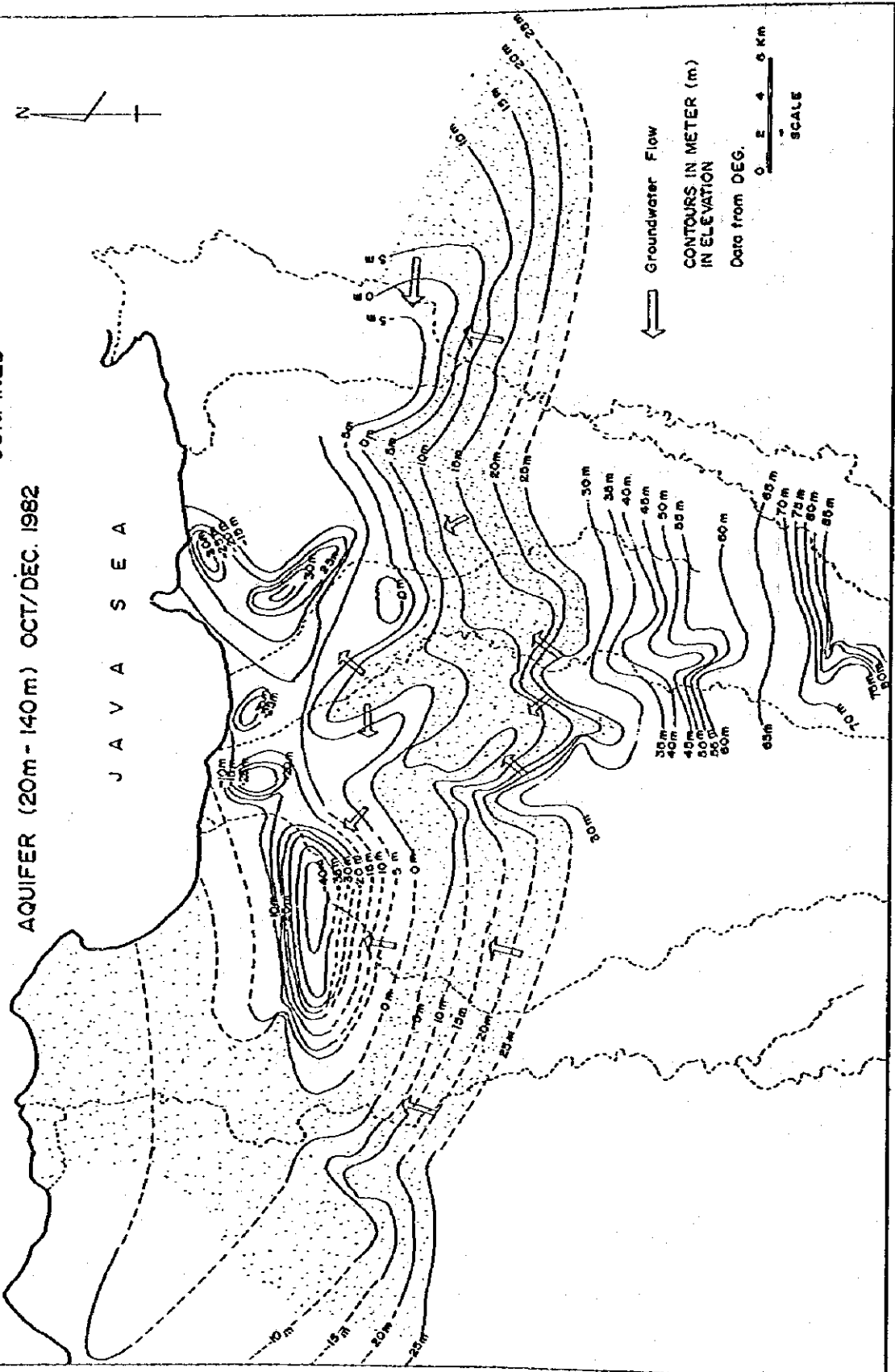
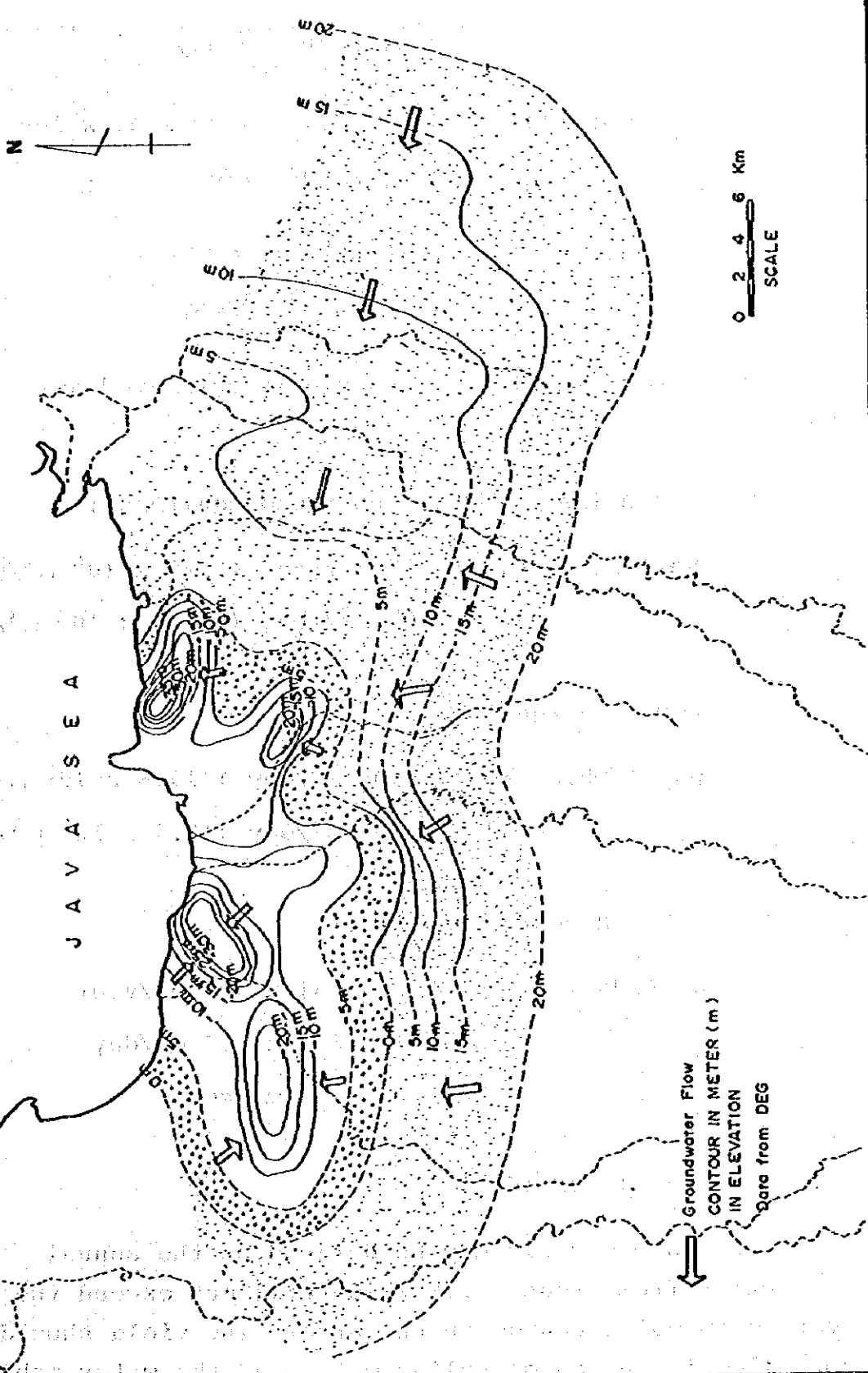


Fig. 5. PIEZOMETRIC LEVEL CONTOURS OF CONFINED AQUIFER (140m - 240m)

OCT/DEC 1982



$$\begin{aligned} Q \text{ (East)} &= 140 \times 4.9 \times 10^{-4} \times 17 \times 10^3 \\ &= 1.67 \times 10^3 \text{ m}^3/\text{day} \end{aligned}$$

$$\begin{aligned} Q \text{ (West)} &= 140 \times 2.4 \times 10^{-3} \times 42 \times 10^3 \\ &= 14.1 \times 10^3 \text{ m}^3/\text{day} \end{aligned}$$

$$\begin{aligned} Q_{h_2} &= Q \text{ (East)} + Q \text{ (West)} \\ &= 15.8 \times 10^3 \text{ m}^3/\text{day} \end{aligned}$$

Therefore, the total recharge is estimated as follows :

A. Unconfined and Semi-confined Aquifers :

$$\begin{aligned} R_n + R_s &= 86.4 \times 10^6 \text{ m}^3/\text{year} + 129 \times 10^6 \text{ m}^3/\text{year} \\ &= 216 \times 10^6 \text{ m}^3/\text{year} \quad (592 \times 10^3 \text{ m}^3/\text{day}) \end{aligned}$$

B. Confined Aquifer :

$$\begin{aligned} Q_{h_1} + Q_{h_2} &= 26.3 \times 10^3 \text{ m}^3/\text{day} + 15.8 \times 10^3 \text{ m}^3/\text{day} \\ &= 42.1 \times 10^3 \text{ m}^3/\text{day} \quad (15.4 \times 10^6 \text{ m}^3/\text{year}) \end{aligned}$$

C. Total Recharge Amount :

$$\begin{aligned} R_n + R_s + Q_{h_1} + Q_{h_2} &= 231 \times 10^6 \text{ m}^3/\text{year} \\ &= 634 \times 10^3 \text{ m}^3/\text{day} \\ &= 7.3 \text{ m}^3/\text{sec} \end{aligned}$$

3.3 Sustainable Yield

Sustainable yield may be defined as the annual extraction from groundwater which will not exceed the average annual recharge in the area. The yield should not allow intrusion of saline water and the water table and/or piezometric level should not drop so low as to cause land subsidence.

Based on the estimation of groundwater recharge for selected basin in Jakarta, groundwater potential or sustainable yield is totally 231×10^6 m³/year, 634×10^3 m³/day and 7.3 m³/sec. This figure is equivalent to 358×10^3 m³/year/km², 984 m³/day/km², and 11.4 l/sec/km², assuming that the area concerned is 644.5 km².

4. GROUNDWATER POTENTIAL REQUIREMENTS

Groundwater cannot be used as a main source of public water supply due to low potentiality, but the unserved population of piped water must depend on groundwater, and other sources, namely, river water, rain water and other surface water. The groundwater potential requirement was estimated by the present study as shown in Table 1.

Fig. 6-A illustrates the groundwater potential demand from 1980 to 2005 and the heaviest abstraction from groundwater is about 745,000 m³/day, (8.6 m³/sec) in 1990. The groundwater demand grows larger from 1980 to 1990, and decreasing gradually from 1990 to 2005 because the piped water will replace primarily the non-domestic groundwater uses. On the other hand, domestic use of groundwater may slightly increase due to the expansion of residential area.

Fig. 6-B also illustrates the groundwater potential demand from 1980 to 2005 in Zones I, II and III. The groundwater extraction of Zones I and II will decrease from 1990 to 2005, especially non-domestic use, due to strengthening of piped water in the service area. On the other hand, saline water intrusion has been observed in Zones I and II along the coastal area (Fig. 7).

Zone III will depend much on groundwater for domestic and non-domestic uses ranging from 4.2 m³/sec in 1990 to 4.5 m³/sec in 2000.

Table 1 Jakarta Groundwater Potential Requirements
(1980 - 2005)

1. Total Area

Descriptions	1980	1985	1990	1995	2000	2005
1. Domestic	231.4	312.1	364.7	372.7	401.1	389.3
2. Public	41.1	49.3	44.2	19.6	20.0	17.4
3. Industries	161.0	179.6	182.4	171.3	144.3	101.1
4. Trade & Service	123.0	140.8	154.5	162.9	152.2	129.9
Total (x 1,000 m ³ /day)	556.5	681.8	745.8	726.5	717.6	637.7
Total (m ³ /sec)	6.4	7.9	8.6	8.4	8.3	7.4

2. Zone I

Descriptions	1980	1985	1990	1995	2000	2005
1. Domestic	39.6	40.7	43.5	42.4	41.8	41.4
2. Public	9.9	9.9	8.1	0.8	0.9	1.2
3. Industries	83.9	84.8	76.3	56.5	32.8	0.4
4. Trade & Service	36.5	38.8	39.4	38.0	32.4	24.1
Total (x 1,000 m ³ /day)	169.9	174.2	167.3	137.7	107.9	67.1
Total (m ³ /sec)	2.0	2.0	1.9	1.6	1.2	0.8

3. Zone II

Descriptions	1980	1985	1990	1995	2000	2005
1. Domestic	54.4	71.0	72.3	74.7	80.2	66.2
2. Public	10.5	12.5	10.6	5.0	4.8	3.7
3. Industries	63.0	75.4	82.5	88.8	84.8	75.9
4. Trade & Service	36.2	42.0	46.8	51.0	48.7	44.5
Total (x 1,000 m ³ /day)	163.7	200.9	212.2	219.5	218.5	190.3
Total (m ³ /sec)	1.9	2.3	2.5	2.5	2.5	2.2

4. Zone III

Descriptions	1980	1985	1990	1995	2000	2005
1. Domestic	137.7	200.4	248.9	255.6	279.1	281.7
2. Public	20.8	26.8	25.4	13.4	14.3	12.5
3. Industries	14.1	19.4	23.6	25.9	26.7	24.9
4. Trade & Service	50.3	60.0	68.4	74.0	71.2	61.3
Total (x 1,000 m ³ /day)	222.9	306.6	366.3	368.9	391.3	380.4
Total (m ³ /sec)	2.6	3.5	4.2	4.3	4.5	4.4

NOTE : Groundwater Requirement Projection based on
Water Demand, JICA Study Team, 1983 - 1984

Fig. 6A GROUNDWATER POTENTIAL DEMAND

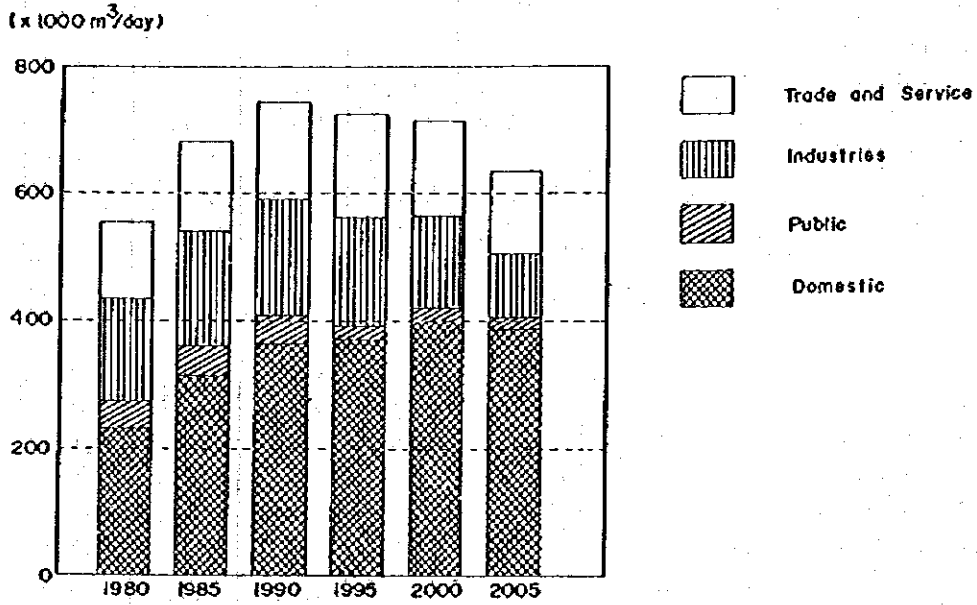


FIG. 6B GROUNDWATER POTENTIAL DEMAND

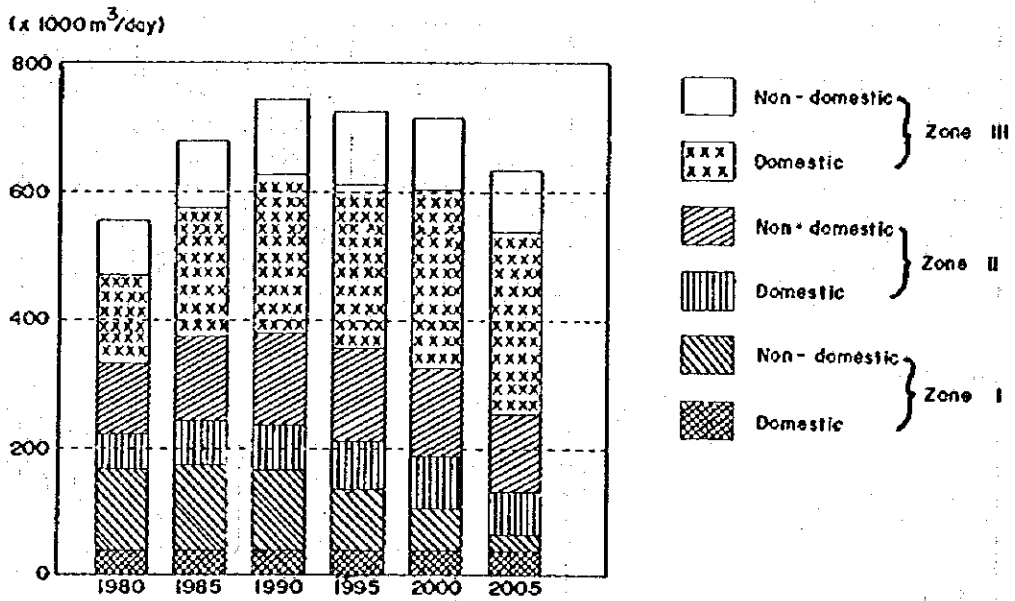
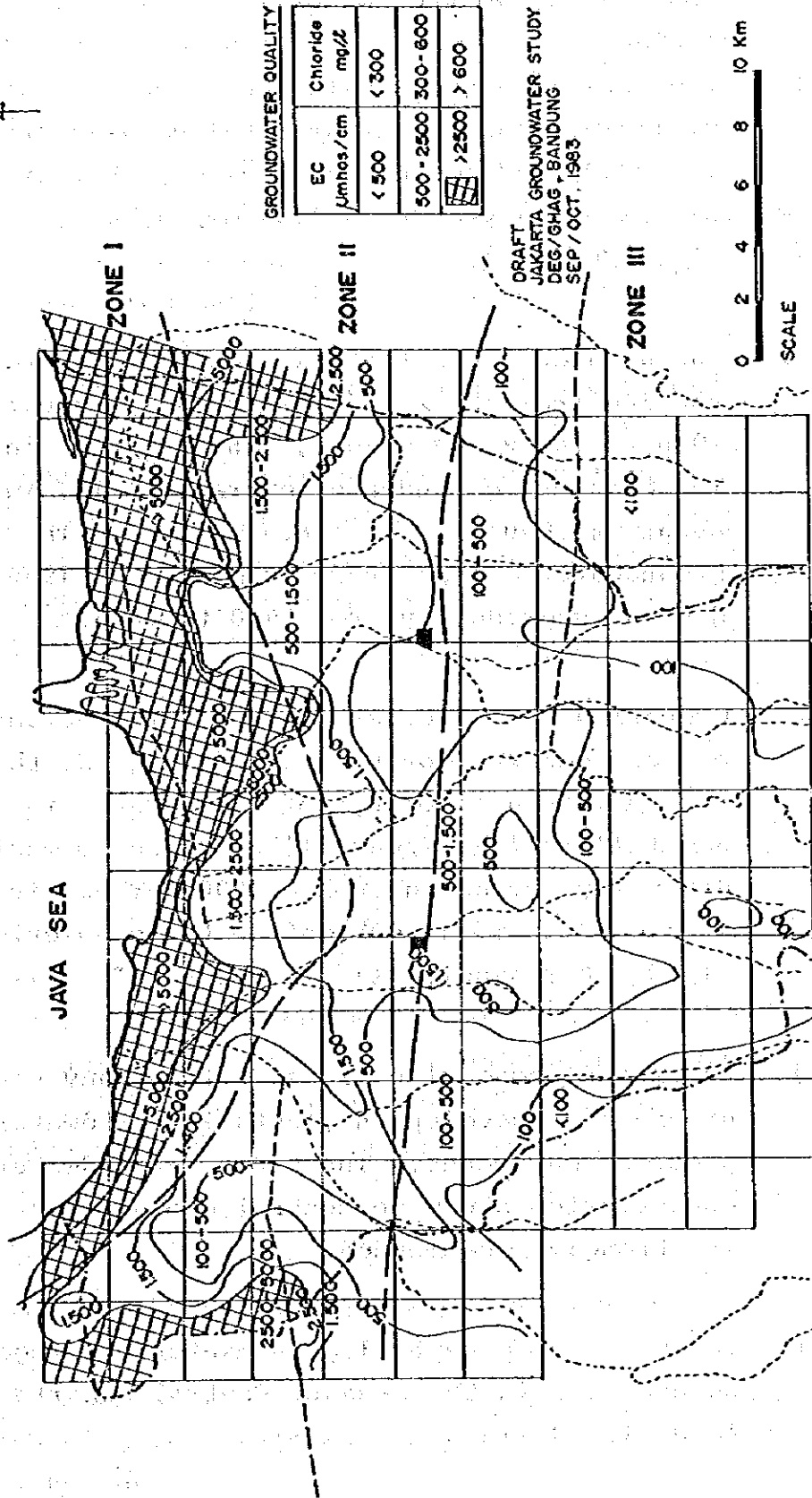


Fig. 7 SPECIFIC ELECTRIC CONDUCTIVITY OF SHALLOW GROUNDWATER
 DRY SEASON 1983



5. CONCLUSION AND RECOMMENDATION

- 1) The estimated groundwater recharge or sustainable yield in Jakarta area is totally $231 \times 10^6 \text{ m}^3/\text{year}$, $634 \times 10^3 \text{ m}^3/\text{day}$ or $7.3 \text{ m}^3/\text{sec}$, that is, $358 \times 10^3 \text{ m}^3/\text{year}/\text{km}^2$, $984 \text{ m}^3/\text{day}/\text{km}^2$, and $11.4 \text{ l}/\text{sec}/\text{km}^2$.
- 2) The groundwater potential requirements are ranging from $556 \times 10^3 \text{ m}^3/\text{day}$ ($6.4 \text{ m}^3/\text{sec}$) in 1980 to $745 \times 10^3 \text{ m}^3/\text{day}$, ($8.6 \text{ m}^3/\text{sec}$) in 1990. The heaviest groundwater extraction is, in 1990, about $745,000 \text{ m}^3/\text{day}$, ($8.6 \text{ m}^3/\text{sec}$). The groundwater demand grows from 1980 to 1990, but decreases gradually from 1990 to 2005.
- 3) Comparing the calculated groundwater potential yield and groundwater potential requirements, there is some potential shortage of groundwater in 1990 by about $111 \times 10^3 \text{ m}^3/\text{day}$, ($1.2 \text{ m}^3/\text{sec}$), maximum, gradually decreasing up to 2000. There is no shortage of groundwater in 2005 due to the completion of piped water supply.
- 4) Under the above situations, without any control of groundwater development, actual groundwater problems may occur. Therefore, groundwater conservation study to control groundwater development is strongly recommended.
- 5) The heaviest potential groundwater shortage will be expected in the area of Central Jakarta of Zones I and II.

- 6) Saline water intrusion has been observed along the coast line in Zone I. The shallow groundwater from unconfined and semi-confined aquifers can be easily obtained in Zone I at present, because the annual fluctuation ranges from only 1 to 2 m, in a shallow depth, but the water is not necessarily suited for drinking purpose. The drinking water will be obtained from public hydrant and water vendor.

On the other hand, there are annual fluctuations in Zone II ranging from 1 m to 4 m. Therefore, in dry season, some shallow wells may dry up in future depending on requirements. But people in the area will be able to get drinking water from public hydrant or water vendors, as pipe is laid there.

- 7) In Zone III, where groundwater recharge takes place, groundwater is pumped for mainly domestic use. There are no problems of groundwater, such as saline water intrusion and land subsidence. However, it is reported recently that groundwater level has lowered especially in dry season and groundwater cannot be pumped at some limited areas due to annual fluctuation. Considering the above situation, strengthening of the existing water mains have already been planned in the present study.
- 8) To prevent excessive withdrawal of groundwater, large consumers of groundwater should be induced to shift from groundwater to piped water by strengthening the regulations for control of groundwater use.

- 9) The present calculation and, further, the induction were made based on the data obtained from DEG for the purpose of knowing a general and rough picture of groundwater situation. As it is reported that a report concerning this matter is to be finalized by DEG at the end of 1985, the report should be reviewed and revised as required, referring to the DEG report.

II. WATER RESOURCES DEVELOPMENT STUDY

WATER RESOURCES DEVELOPMENT STUDY

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1. INTRODUCTION

The purpose of this working report is to review water resources conditions of both surface water and groundwater of the Jakarta Metropolis, and to analyze water resource management up to the year 2005 with particular emphasis on the Second Stage of the Jakarta Water Supply Development Project.

The main water source for Jakarta is surface water from Jatiluhur reservoirs on the Citarum river by the West Tarum Canal with 69 km length, and groundwater is a supplementary source for private use in Jakarta. The project area is situated in Jabotabek area as shown in Fig. 1.1. Exhaustive reviews have been undertaken for the areas of Jabotabek and Citarum River Basin on the basis of available information such as hydrologic statistics, meteorological statistics, well inventories and other relevant reports from governmental agencies, together with reconnaissance survey conducted by the Study Team. The review includes the following subjects.

- 1) Review of resources, both of surface water and groundwater in the Cisadane-Jakarta-Citarum River Basin, from the view point of hydrologic and hydrogeologic conditions.
- 2) Balance of water resources and utilization; availability of water for the Jakarta Metropolis.
- 3) Water management and recommendation on the available water sources for the Jakarta Water Supply Development.

Throughout this review, valuable assistance, cooperation, discussion and advice have been obtained from the various authorities and government agencies, specially Ministry of Public Works, Directorate of Cipta Karya, Directorate of Sanitary Engineering (DSE), Directorate General of Water Resources Development (DGWRD), Directorate of Planning and Programming (P3SA-CJC), Directorate Environmental Geology Bandung (DEG), The Institute of Hydraulic Engineering, Bandung (DPMA), Jatiluhur Water Authority (POJ), Bapeda DKI, and DPMA DKI.

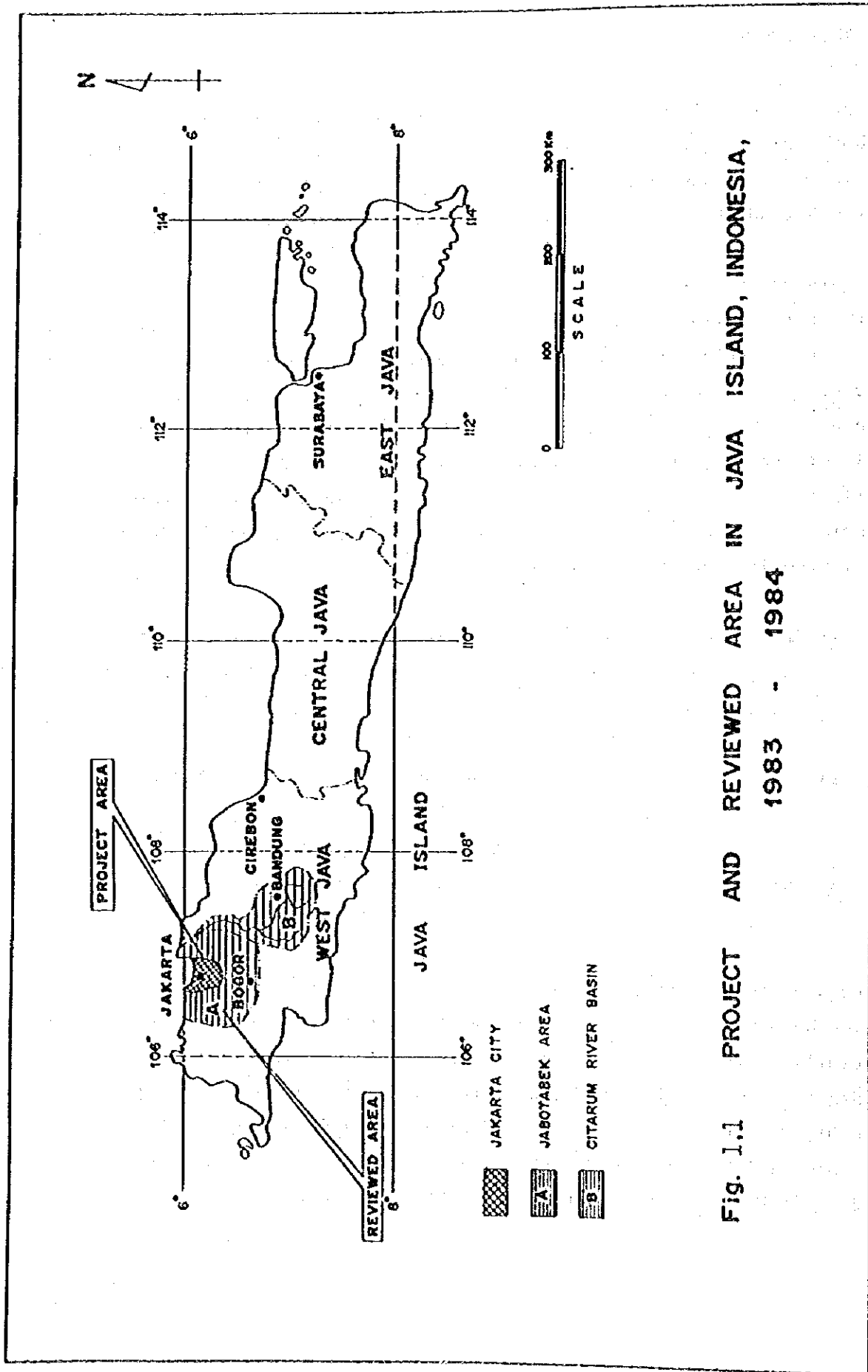


Fig. 1.1 PROJECT AND REVIEWED AREA IN JAVA ISLAND, INDONESIA, 1983 - 1984

The following publications and reports are mainly referred to in this review. Other essential basic data and technical information are listed in Attachments.

- 1) Study of Cibeet Irrigation, Flood Control and Water Supply, NEDECO, Sir Alexander Gibb & Partners and Virma Karya Consultants. Feasibility Report, March, 1983.
- 2) Study of Cibeet Irrigation Flood-Control and Water Supply, Report on Proposed Increase in Capacity of the West Tarum Canal, September 1982, NEDECO.
- 3) Cisadane-Jakarta-Cibeet Water Resources Development Plant, Coyne et Bellier Consult. Eng, Sogreah Consult, January, 1979.
- 4) Master Plan and Feasibility Study for Tangerang Water Supply, James Montgomery, SGV, August, 1977.
- 5) Jabotabek Metropolitan Development Plan Series, JMDP Team, 1980 - 1981.