

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

DIRECTORATE GENERAL OF HUMAN SETTLEMENTS  
MINISTRY OF PUBLIC WORKS  
AND  
JAKARTA WATER SUPPLY ENTERPRISE

THE STUDY ON THE REVISE  
OF  
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT

FINAL REPORT

Volume 1

EXECUTIVE SUMMARY

MAY 1997

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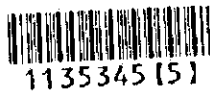
**Volume 1**

**EXECUTIVE SUMMARY**

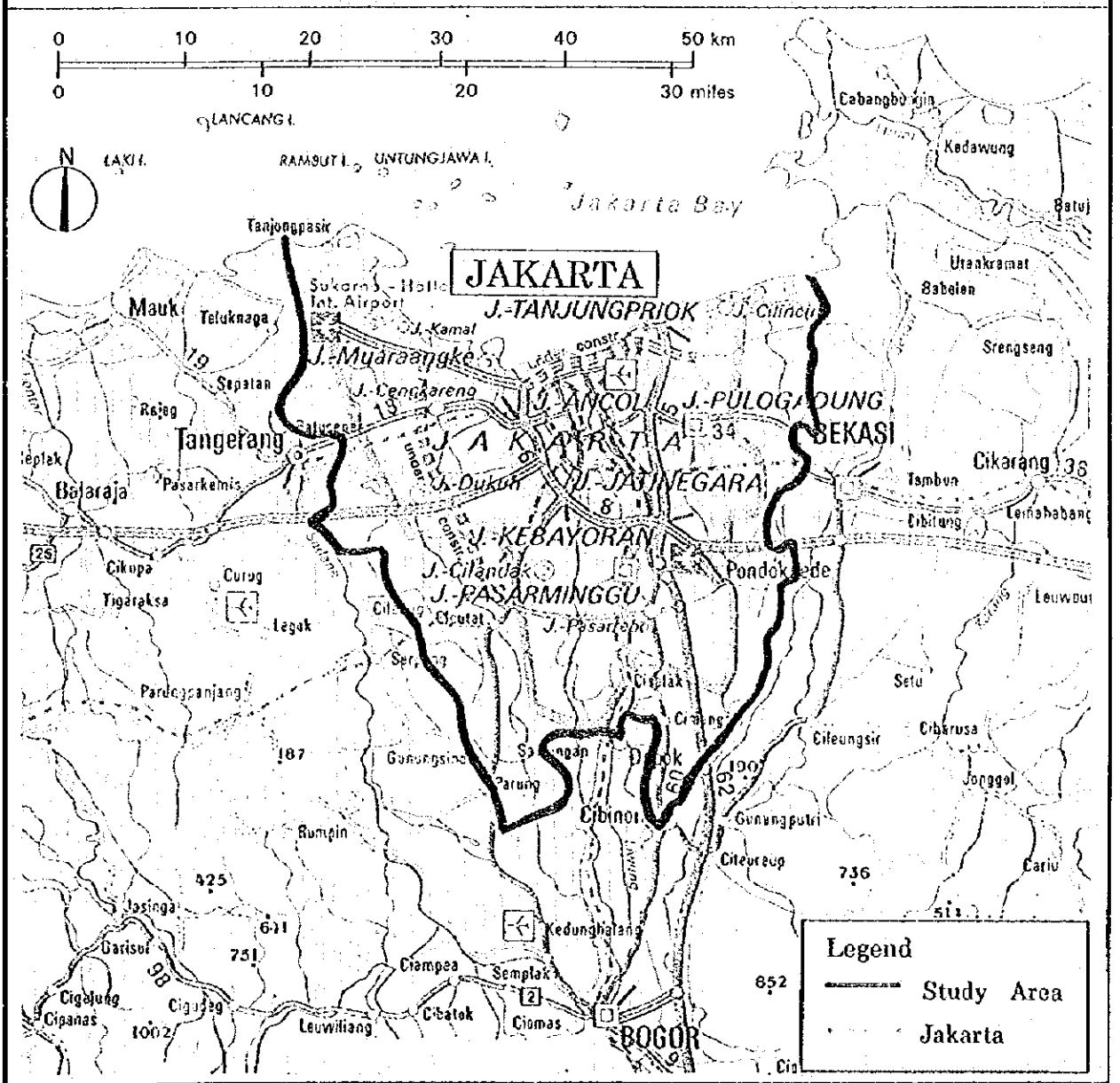
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**GENERAL LOCATION MAP OF STUDY AREA**

## PREFACE

In response to the request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the Study on the Revise of Jakarta Water Supply Development Project in the Republic of Indonesia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team headed by Mr. Koichi Iwasaki, Nihon Suido Consultants Co., Ltd. associated with Nippon Koei Co., Ltd., six times between July 1995 to November 1996.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

May, 1997



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Kimio Fujita  
President

Japan International Cooperation Agency

May, 1997

Mr. Kimio Fujita  
President  
Japan International Cooperation Agency  
Japan

Dear Mr. Fujita,

Letter of Transmittal

We are pleased to submit herewith the Final Report of the Study on The Revise of Jakarta Water Supply Development Project in Indonesia.

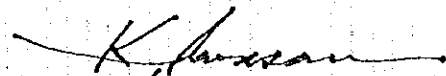
The Study was commenced in July 1995 and completed in May 1997 through the discussions with the officials of the Government of the Indonesia and the field investigation.

The Final Report consists of five volumes consolidating the two progress reports, interim report, and the draft final report; Volume I - Executive Summary Report succinctly describes the study and recommendations; Volume II - Main Report which covers not only physical development plans; the master plan and feasibility study of the priority project, but also institutional and financial strengthening plan for the water supply enterprise; Volume III/IV - Annex which includes detailed analysis and relevant information; and Volume V - Drawings covering drawings of preliminary design.

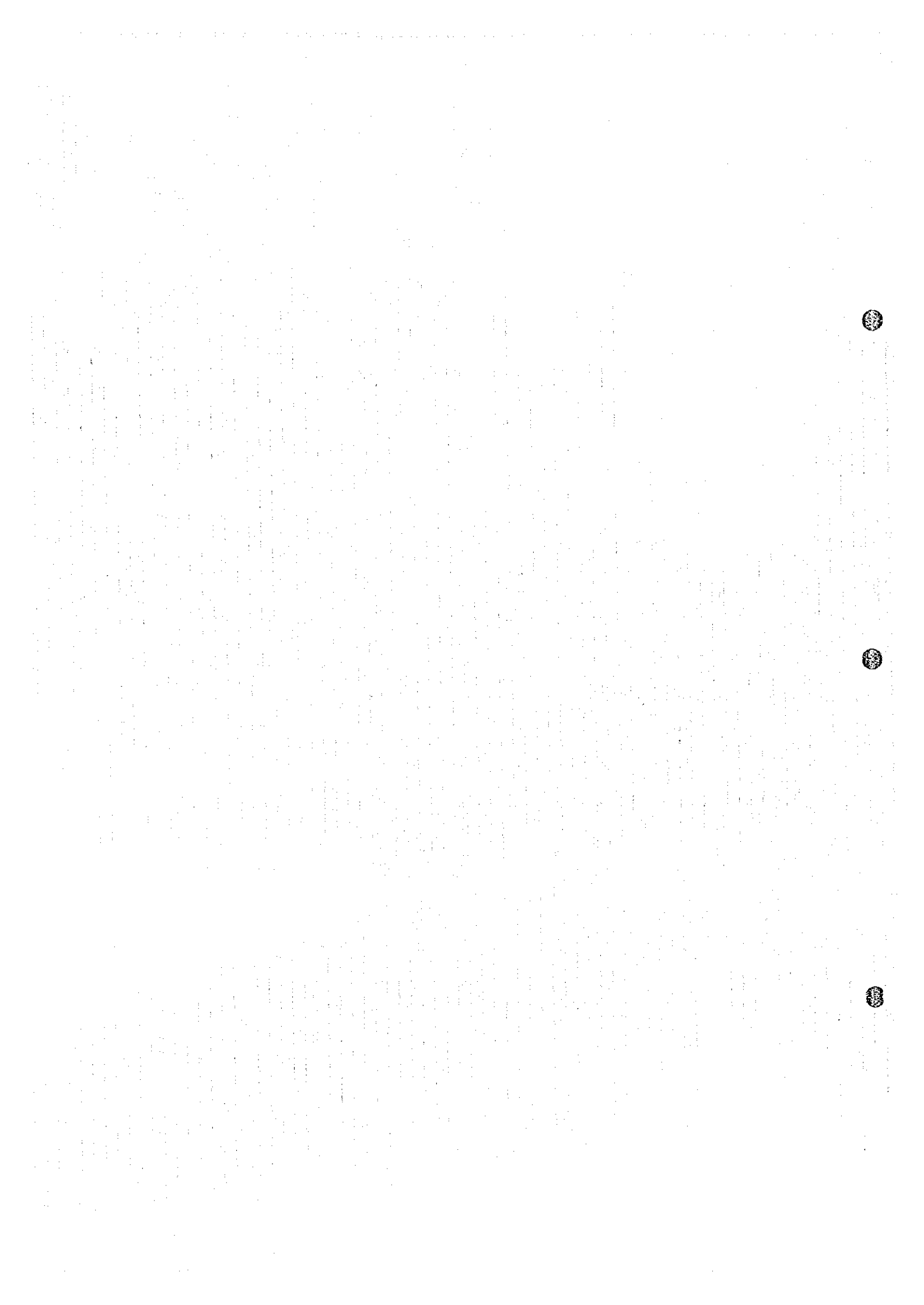
We hope that the implementation of the proposed projects would greatly contribute to the improvement of water supply condition in the study area.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs, the Ministry of Health and Welfare and OECF. We also would like to show our appreciation to the officials of the Cipta Karya and PAM JAYA, the JICA Indonesia Office, and the Embassy of Japan in Indonesia for their kind cooperation and assistance throughout our study.

Very truly yours,



Koichi Iwasaki  
Team Leader for the Study on  
The Revise of  
Jakarta Water Supply  
Development Project in  
Indonesia





DIRECTORATE GENERAL OF HUMAN SETTLEMENTS  
MINISTRY OF PUBLIC WORKS  
AND  
JAKARTA WATER SUPPLY ENTERPRISE

**FINAL REPORT**

OF  
THE STUDY ON  
THE REVISE OF  
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT

**Vol. 1**  
**EXECUTIVE SUMMARY**

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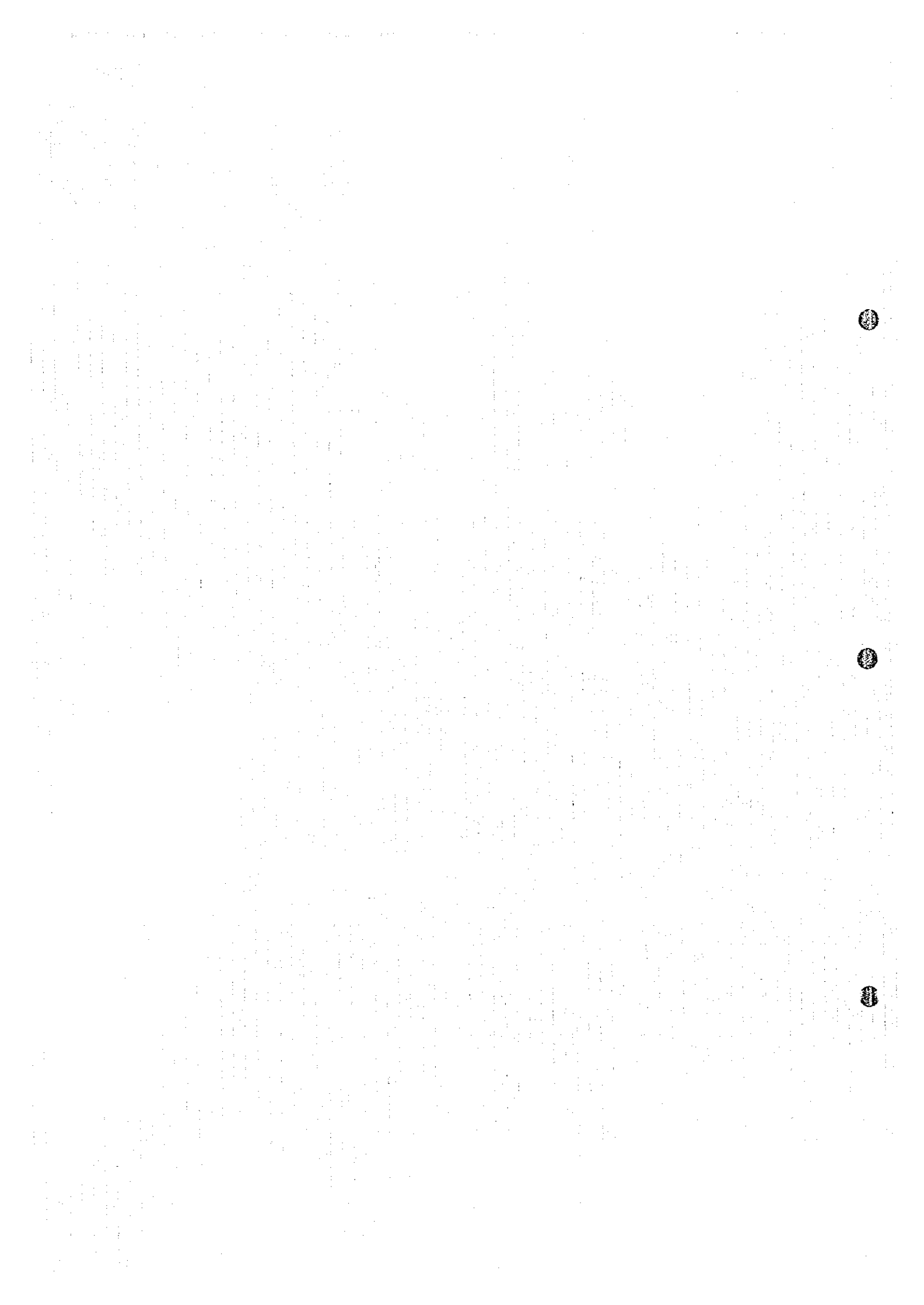
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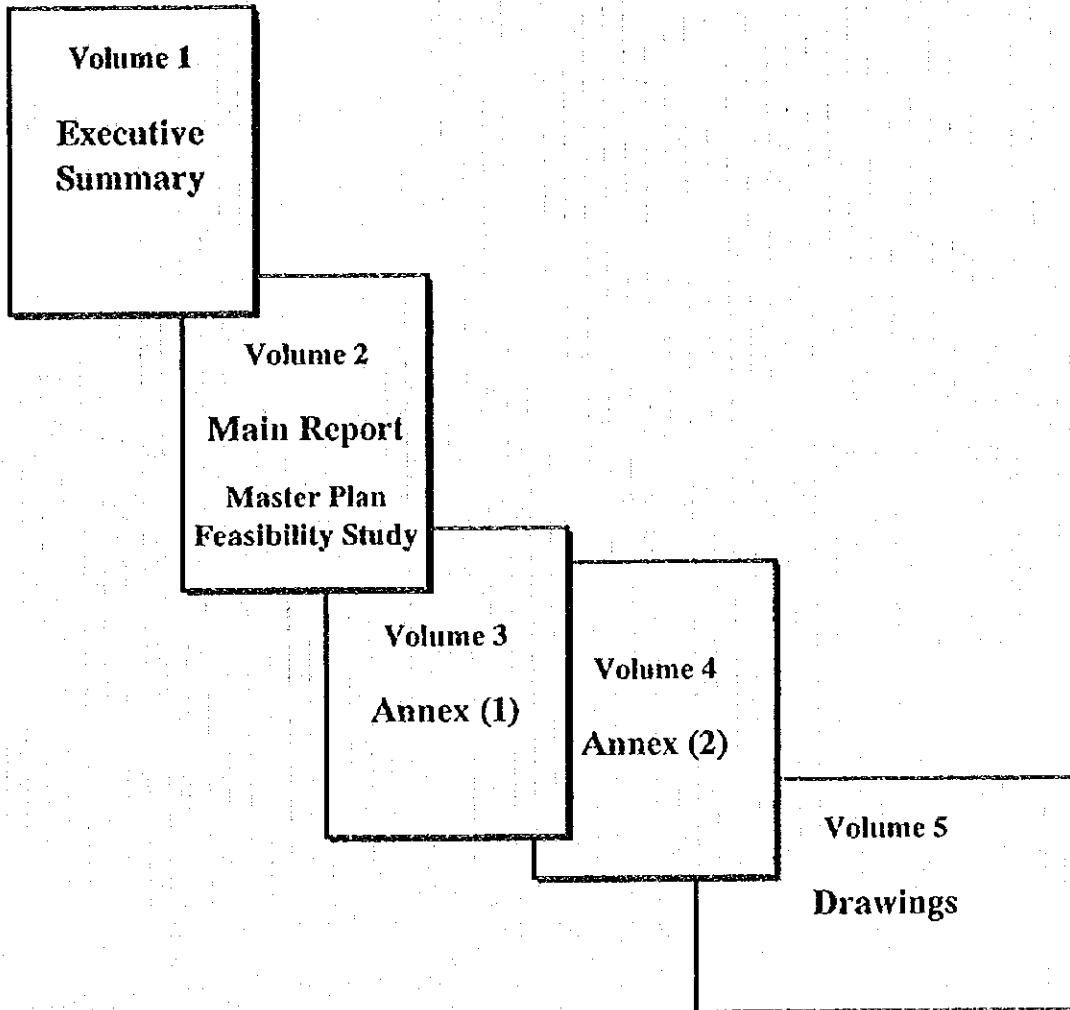
## ABBREVIATIONS

BAPEDAL	Badan Pengendalian Dampak Lingkungan Environmental Impact Management Agency
BAPPENAS	Badan Perencanaan Pembangunan Nasional National Development Planning Board
BOOT	Build Own Operate Transfer
BOTABEK	BOgor, TAngerang and BEKasi
Cabang	Branch (of an organization)
Cipta Karya	Directorate General of Human Settlements, MPW
Daerah	A region
DGWRD	Directorate General of Water Resources Development (within MPW)
DJCK, DGHS	Direktorat Jenderal Cipta Karya Directorate General of Human Settlements (within MPW)
DKI	Daerah Khusus Ibu Kota Indonesia City of Jakarta(Special Capital District of Jakarta)
EIA	Environmental Impact Assessment
GOI	Government of Indonesia
GOJ	Government of Japan
GRDP	Gross Regional Domestic Product
HRD	Human Resources Development
IBRD	International Bank for Reconstruction and Development(The World Bank)
IEE	Initial Environmental Examination
JABOTABEK	JAKarta, BOgor, TAngerang and BEKasi
JICA	Japan International Cooperation Agency
JMDPR	JABOTABEK Metropolitan Development Plan Review
JUDP	JABOTABEK Urban Development Project
JWRMS	JABOTABEK Water Resources Management Study
JWSDP-MP	Jakarta Water Supply Development Project (Master Plan)
JWSSP	Jakarta Water Supply Sector Project
Kabupaten	District-administrative subdivision of a province
Kecamatan	District-administrative subdivision of a kabupaten
Kelurahan	District-administrative subdivision of a kecamatan
KEPPRES	Keputusan Presiden, Presidential Degree
MOF	Ministry of Finance
MOH	Ministry of Health
MOHA	Ministry of Home Affairs
MOU	Memorandum of Understanding
MPW	Ministry of Public Works
NRW	Non-Revenue Water
NWSSP	National Water Supply Sector Project
OECF	Overseas Economic Cooperation Fund, Japan
PAM JAYA	Jakarta Water Supply Enterprise
PC	Primary Cell (Water Distribution Network)
PDAM	Perusahaan Daerah Air Minum, Local Government Water Enterprise

<b>PDM</b>	<b>Primary Distribution Main (Water Distribution Network)</b>
<b>PERUMNAS</b>	<b>Perumahan Nasional, National Housing Authority</b>
<b>PIU</b>	<b>Project Implementation Unit</b>
<b>PJSIP</b>	<b>PAM JAYA System Improvement Project</b>
<b>POJ</b>	<b>Perum Otorita Jatiluhur</b>
<b>PSP</b>	<b>Private Sector Participation</b>
<b>S/W</b>	<b>Scope of Works</b>
<b>TOR</b>	<b>Terms of Reference</b>
<b>UFW</b>	<b>Unaccounted-For Water</b>
<b>USAID</b>	<b>US Agency for International Development</b>
<b>Wilayah</b>	<b>Area or region</b>
<b>WTC</b>	<b>West Tarum Canal</b>
<b>WTP</b>	<b>Water Treatment Plant</b>



The Study on the Revise of  
Jakarta Water Supply Development Project  
**Compilation of the Report**



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# SUMMARY

## SUMMARY

### 1. Purpose of the Study

- 1) To formulate a master plan on the development of water supply for the City of Jakarta (DKI Jakarta) to the year 2019, through the review of the progress after the Master Plan of 1985, the analysis of the new requirements for water supply, the assessment of the managerial situation of Jakarta Water Supply Enterprise (hereinafter referred to as "PAM JAYA"), and the assessment of the possibility of private sector involvement.
- 2) To conduct a feasibility study for the priority project(s) identified in the master plan.
- 3) To transfer technology on planning methods and skills to the counterpart personnel of PAM JAYA as well as Directorate General of Human Settlements, Ministry of Public Works (hereinafter referred to as "Cipta Karya") through daily study activities.

Y E A R																								
1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>MASTER PLAN to Year 2019</b>																								
<b>FEASIBILITY STUDY to Year 2003</b>																								
Expansion of Buaran Treatment Plant (Buaran III), 5,000 l/sec Construction of New Cipayung Treatment Plant, 5,000 l/sec																								

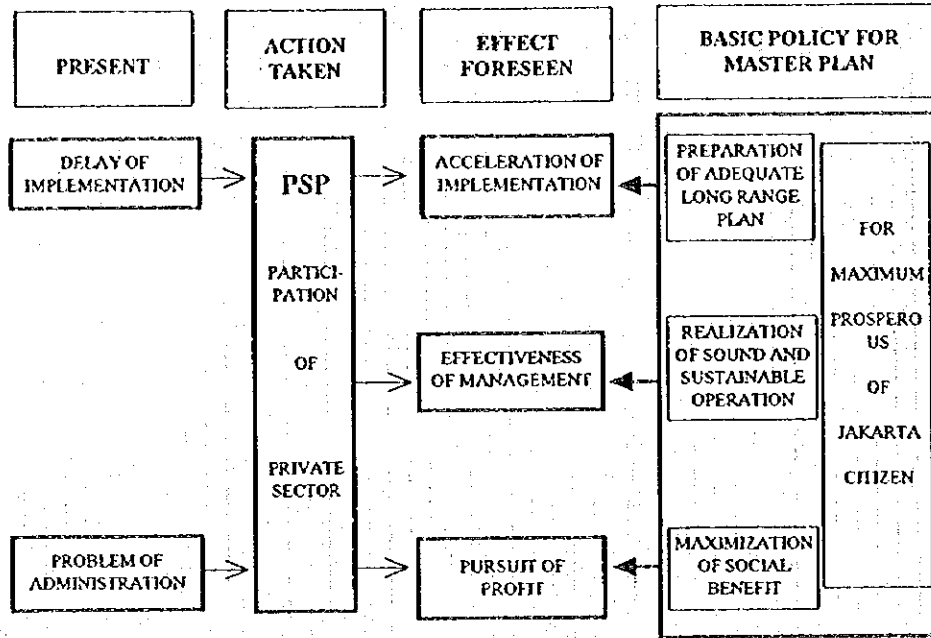
## 2. Key Figures of the Revised Master Plan

Key Figure	Unit	1995	2000	2005	2010	2015	2019	
<b>Population in the Study Area</b>	x 1,000							
Jakarta		8,800	9,400	10,097	10,795	11,492	11,950	
Fringe Area		2,300	2,800	3,300	3,800	4,300	4,600	
<b>Total</b>		<b>11,100</b>	<b>12,200</b>	<b>13,397</b>	<b>14,595</b>	<b>15,792</b>	<b>16,550</b>	
<b>Service Area</b>	km2	316	435	505	715	837	871	
					Whole JKT Ciledug Cipondoh	Pondok Gede Ciputat Pamulang Pondok Aren	Limo Jatiasih	
<b>Population in the Service Area</b>	x 1,000							
Jakarta		5,500	7,100	8,397	10,126	11,492	11,950	
Fringe Area		0	0	0	1,000	2,400	2,700	
<b>Total</b>		<b>5,500</b>	<b>7,100</b>	<b>8,397</b>	<b>11,126</b>	<b>13,892</b>	<b>14,650</b>	
<b>Domestic Per Capita Consumption</b>	lpcd	156	162	168	174	180	185	
<b>Served Population 1)</b>	x 1,000							
Jakarta		3,000	4,700	6,497	8,195	9,692	10,150	
Fringe Area		0	0	0	400	1,200	2,000	
<b>Total</b>		<b>3,000</b>	<b>4,700</b>	<b>6,497</b>	<b>8,595</b>	<b>10,892</b>	<b>12,150</b>	
<b>Service Ratio 2)</b>	%							
Jakarta		55%	66%	77%	81%	84%	85%	
Fringe Area		0%	0%	0%	40%	50%	74%	
<b>Total</b>		<b>55%</b>	<b>66%</b>	<b>77%</b>	<b>77%</b>	<b>78%</b>	<b>83%</b>	
<b>UFW Ratio</b>	%	53.5%	40.0%	30.0%	28.0%	26.0%	25.0%	
<b>Water Demand (Day- Maximum base)</b>	m3/sec							
Jakarta		13.2	16.6	21.3	28.7	37.4	40.1	
Fringe Area		0.0	0.0	0.0	1.3	4.1	6.8	
<b>Total</b>		<b>13.2</b>	<b>16.6</b>	<b>21.3</b>	<b>30.0</b>	<b>41.5</b>	<b>46.9</b>	
<b>Quantity of Groundwater Consumption</b>	m3/sec							
Jakarta		9.7	11.5	7.7	5.4	3.1	3.1	
Fringe Area		1.9	3.0	3.9	2.6	1.4	1.4	
<b>Total</b>		<b>11.6</b>	<b>14.5</b>	<b>11.5</b>	<b>8.0</b>	<b>4.5</b>	<b>4.5</b>	
<b>Water Resource Available</b>	m3/sec	16.1	18.9	23.9	36.0	44.8	51.5	
<b>Production Capacity</b>	m3/sec	15.4	18.2	23.2	33.2	42.5	46.9	
<b>Water Quality Improvement</b>				Potable at all treatment plant	Potable at the end of distribution system	Potable at customer tap		
<b>Implementation Schedule</b>				Year 2005 Part 1, 2nd Phase, 2nd Stage Buaran III 5,000 l/sec	Year 2008 Part 2, 2nd Phase, 2nd Stage Cipayung I 5,000 l/sec	Year 2011 Part 1, 1st Phase, 3rd Stage Cisadane II 5,000 l/sec	Year 2015 Part 2, 1st Phase, 3rd Stage Cipayung II 9,300 l/sec	Year 2019 2nd Phase, 3rd Stage Cisadane III 5,000 l/sec
<b>Investment Cost Required (Unit : Million)</b>	<b>Total Cost</b> F/C (Yen) 197,565 L/C (Rp.) 4,026,548 Total (Yen)		54,967 986,743 101,952	47,740 1,000,973 95,409	30,885 771,260 67,617	40,659 754,281 76,579	23,314 513,291 47,756	

Note : 1) Served population including indirect served population, 7.6 person/connection, 380 person/Public Hydrant in 1995

2) Service ratio in the Service Area, including indirect served population

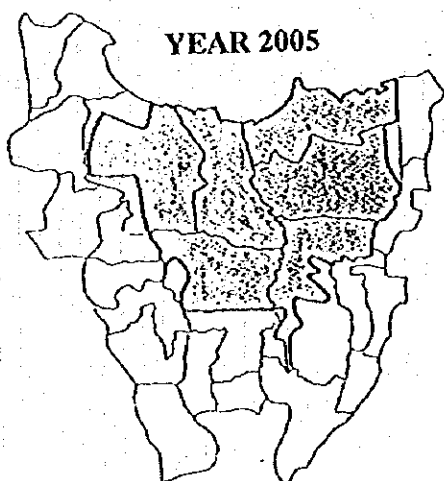
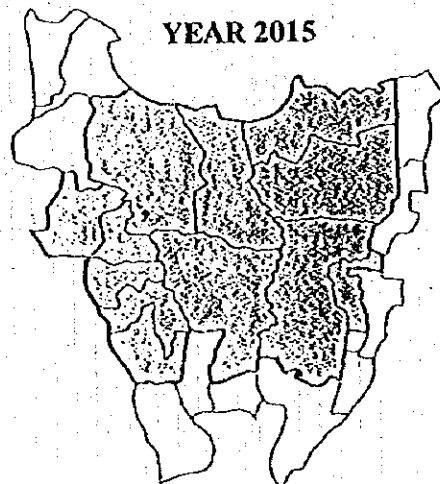
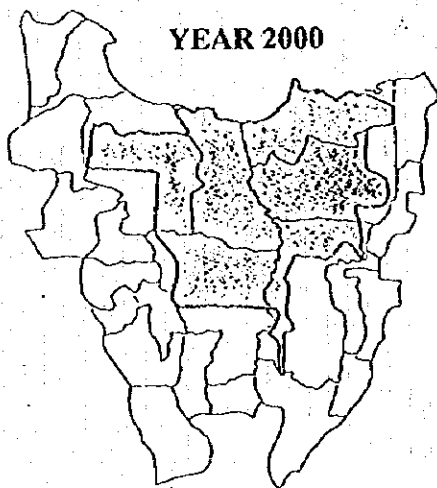
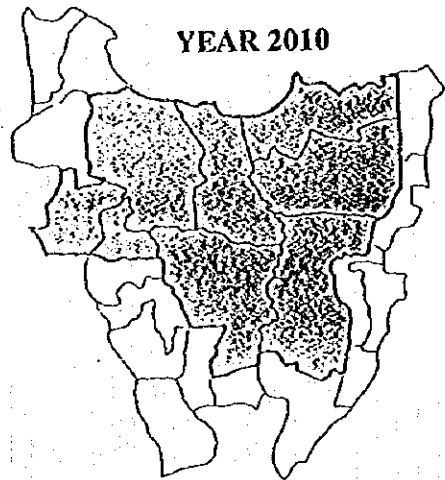
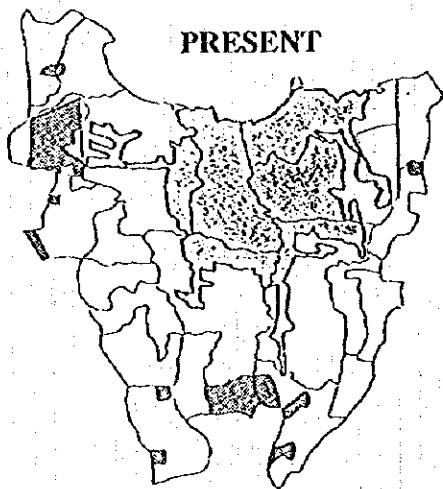
### 3. Basic Policy and Approach of the Study



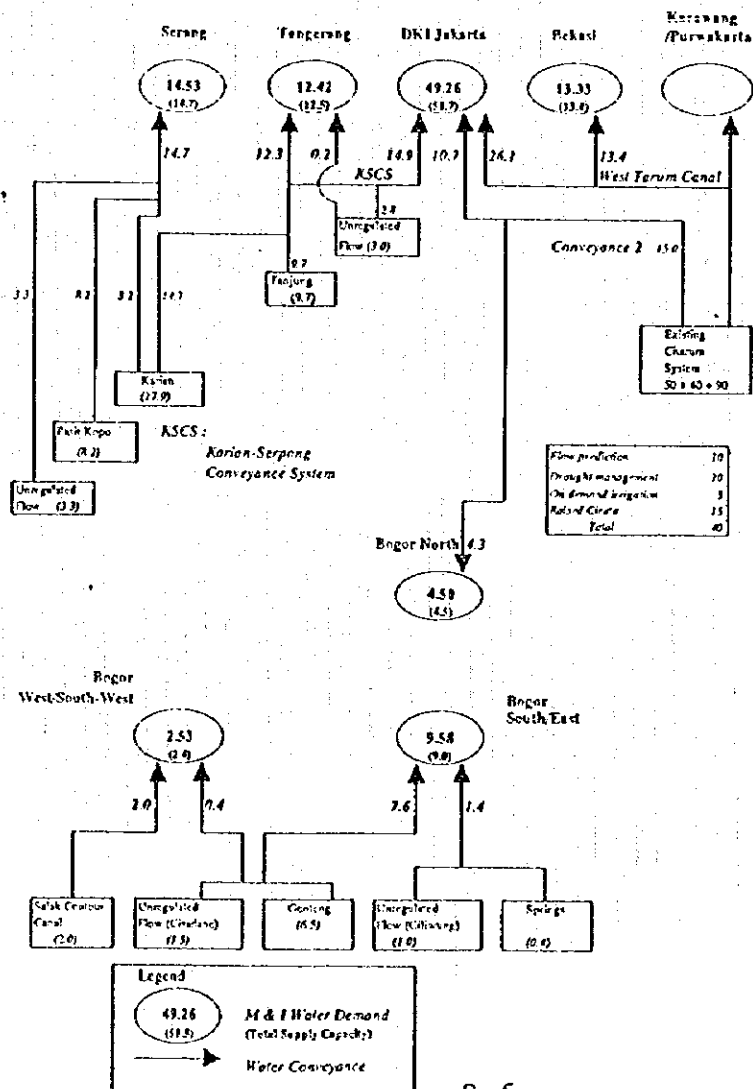
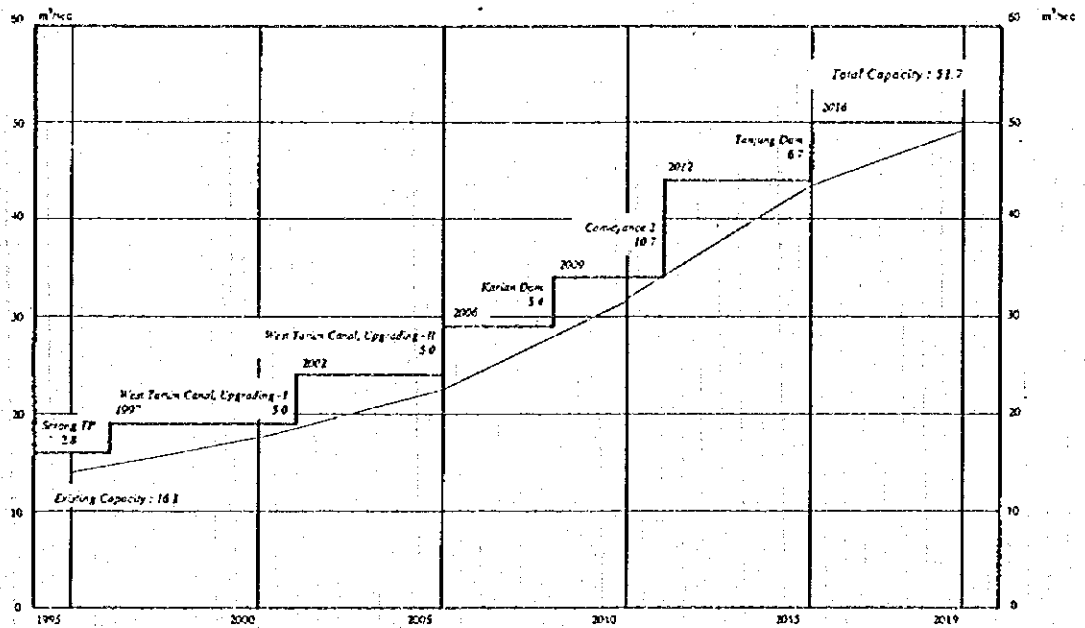
### STRATEGY FOR PREPARATION OF THE MASTER PLAN

BASIC POLICY		BASIC CONCEPT	FUNDAMENTAL MEASURE	PRIORITY		
				URGENT	MID	LONG
FOR MAXIMUM PROSPEROUS OF JAKARTA CITIZEN	PREPARATION OF ADEQUATE LONG RANGE PLAN	IMPROVEMENT OF WATER SUPPLY CONDITION	SERVICE COVERAGE		○	○
			STABILITY OF SERVICE	○	○	
			SAFETY AND HIGH QUALITY	○	○	
	SUSTAIN- ABILITY OF SOUND OPERATION	IMPROVEMENT OF ADMINISTRATION	EFFECTENCY OF SERVICE		○	○
			SOUNDNESS OF SERVICES		○	○
			IMPARITY OF SUPPLY TO THE CITIZEN	○	○	○
	MAXIMIZING SOCIAL BENEFIT	IMPROVEMENT OF ADMINISTRATION	EXPANSION OF SERVICE AREA		○	○
			INCREASE OF SERVICE RATIO	○	○	
			ACCELERATION OF SYSTEM DEVELOPMENT AND IMPROVEMENT	○	○	
			ACQUISITION OF STABLE AND SUSTAINABLE WATER SOURCES	○	○	○
			STRENGTHENING OF SYSTEMS AGAINST ACCIDENT AND DISASTER		○	○
			REALIZATION OF DRINKABLE WATER SUPPLY (incl. ACQUISITION OF GOOD QUALITY RAW WATER)		○	○
			ESTABLISHMENT OF ADEQUATE MONITORING SYSTEM OF SERVICES		○	○
			REDUCTION OF UNACCOUNTED FOR WATER	○	○	
			IMPROVEMENT OF SERVICE MANAGERIAL CAPACITY INCLUDING PARTICIPATION OF PRIVATE SECTOR	○	○	
IMPROVEMENT OF HUMAN RESOURCES CAPABILITY OF PAM LAYA	○	○	○			
ACQUISITION OF APPROPRIATE FUND & ESTABLISHMENT OF TARIFF SYSTEM AFFORDABLE TO CONSUMER	○	○	○			
ESTABLISHMENT OF LAW, REGULATION AND ORGANIZATION FOR SUPERVISION OF SOUND OPERATION	○	○	○			

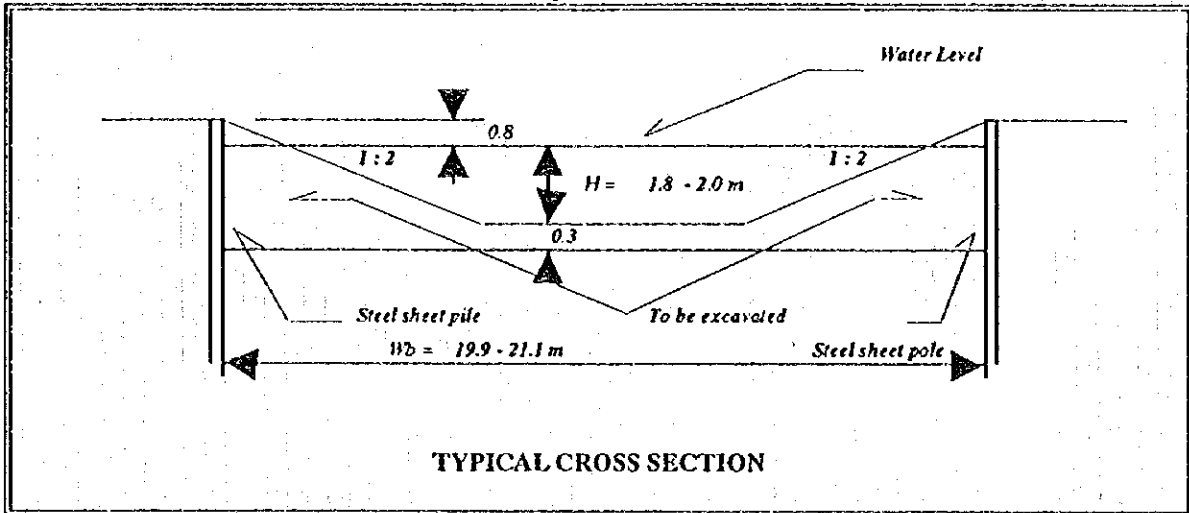
4. Service Area Expansion



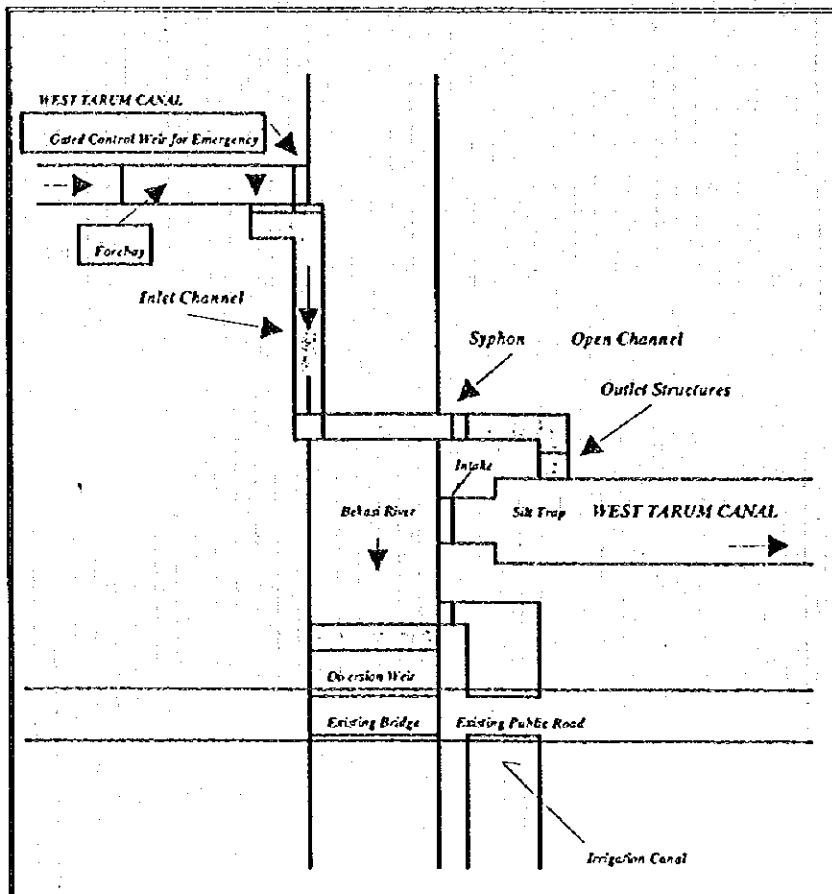
## 5. Water Resources Development



6. Upgrading West Tarum Canal

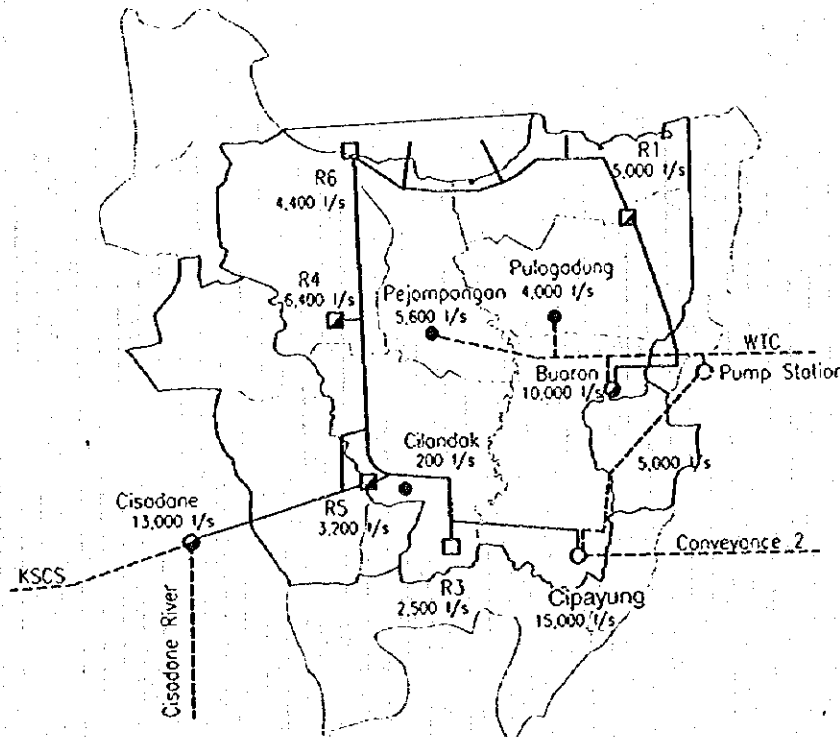


7. Isolation of West Tarum Canal from the Bekasi River





## 8. Proposed Water Supply System in Year 2019



### LEGEND :

- Expansion of Treatment Plant
- Proposed Treatment Plant
- Existing Treatment Plant
- ▣ Expansion of Distribution Center
- Proposed Distribution Center
- Raw Water
- Treated Water Transmission

## 9. Total Costs Required until Year 2019

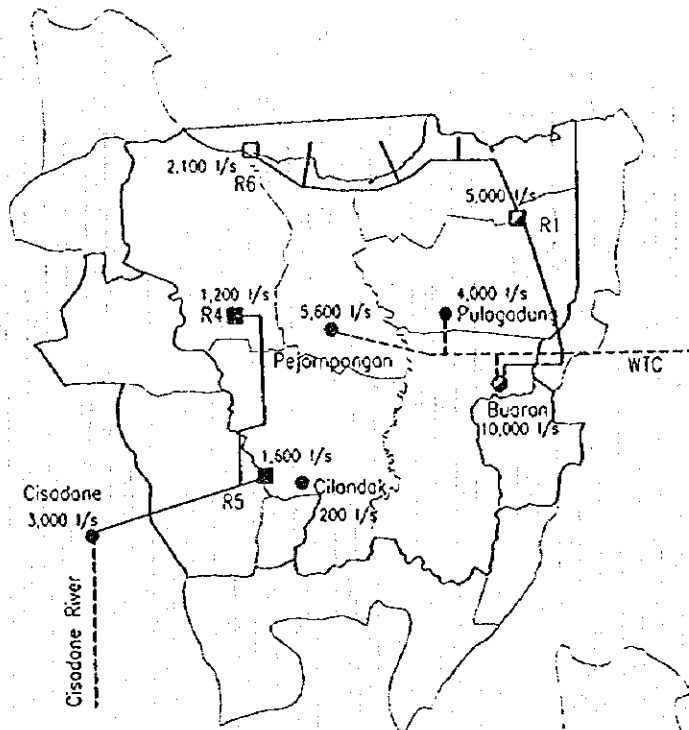
Unit: Million

Descriptions	TOTAL COSTS		
	I/C Yen	L/C Rp.	Equivalent Yen
<b>I Construction Cost</b>	<b>167,857</b>	<b>2,900,972</b>	<b>305,999</b>
1.1 Treatment Plant	28,841	593,881	57,121
Buaron III	6,726	115,479	12,225
Cipayung I	4,709	86,753	8,840
Cipayung II	8,032	180,747	18,639
Cisadane II	4,687	105,451	9,708
Cisadane III	4,687	105,451	9,708
1.2 Distribution Center	3,294	204,654	13,039
DC-R1 II (2,000 l/s)	390	16,434	1,173
DC-R1 III (0 l/s)	—	14,886	707
DC-R3 I (800 l/s)	156	16,799	956
DC-R3 II (1,300 l/s)	253	17,186	1,071
DC-R3 II (400 l/s)	78	310	93
DC-R4 II (2,600 l/s)	741	36,596	2,484
DC-R4 III (1,000 l/s)	195	17,601	1,033
DC-R4 IV (1,200 l/s)	234	17,756	1,080
DC-R4 IV (400 l/s)	78	310	93
DC-R5 II (1,600 l/s)	312	27,127	1,664
DC-R6 I (2,100 l/s)	409	37,869	2,212
DC-R6 I (800 l/s)	156	619	185
DC-R6 I (1,500 l/s)	292	1,161	347
1.3 Raw Water Transmission	7,608	54,332	10,195
Pipe to Cipayung	5,660	21,640	6,690
Pump Station	1,948	32,692	3,505
1.4 Treated Water Transmission Pipe	41,668	150,611	49,316
R1 - R6	7,203	31,993	8,726
Cisadane - R3, R4	9,666	41,276	11,632
East - R3, R5, R4, R6	24,799	87,342	28,958
1.5 Distribution Main (Primary)	54,848	421,596	74,924
1.6 Service Main (Secondary/Tertiary)	31,588	1,455,898	101,403
<b>2 Engineering Services (D/D, S/V)</b>	<b>11,746</b>	<b>87,028</b>	<b>15,890</b>
<b>3 Land Acquisition Cost</b>	<b>0</b>	<b>672,500</b>	<b>32,024</b>
<b>4 Sub-Total</b>	<b>179,603</b>	<b>3,660,498</b>	<b>353,912</b>
<b>5 Physical Contingency</b>	<b>17,962</b>	<b>366,048</b>	<b>35,393</b>
<b>6 Total</b>	<b>197,565</b>	<b>4,026,548</b>	<b>389,305</b>

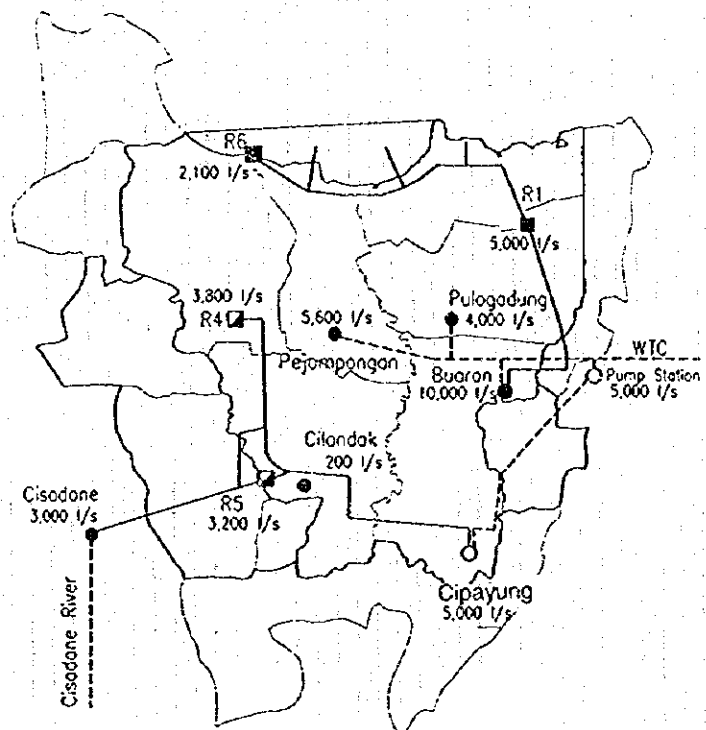
Exchange Rate : 1 Yen = Rp. 21 00

# 10. Proposed Water Supply Facilities for the Priority Project

PRIORITY PROJECT PART I  
PROPOSED WATER SUPPLY SYSTEM IN 2005



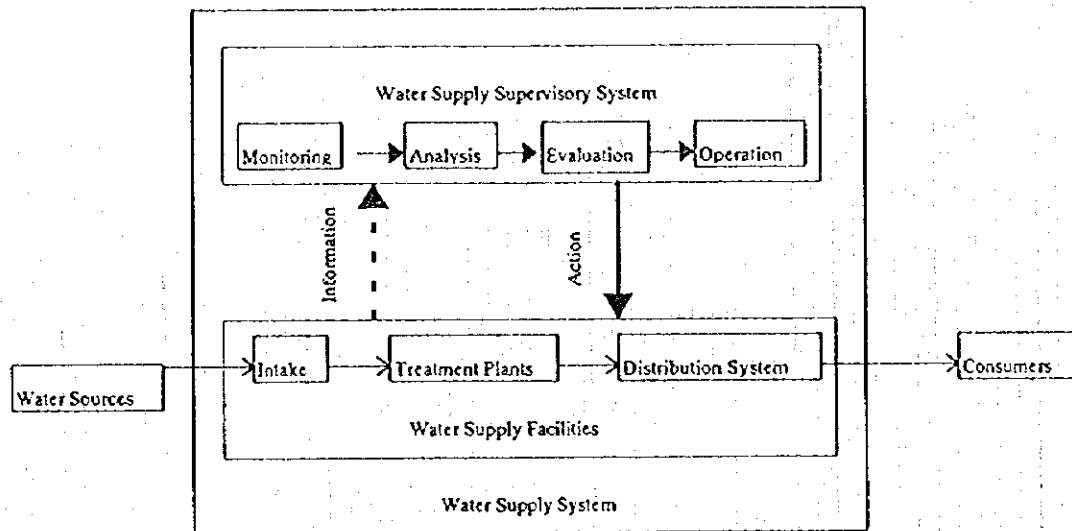
PRIORITY PROJECT PART 2  
PROPOSED WATER SUPPLY SYSTEM IN 2008



**LEGEND :**

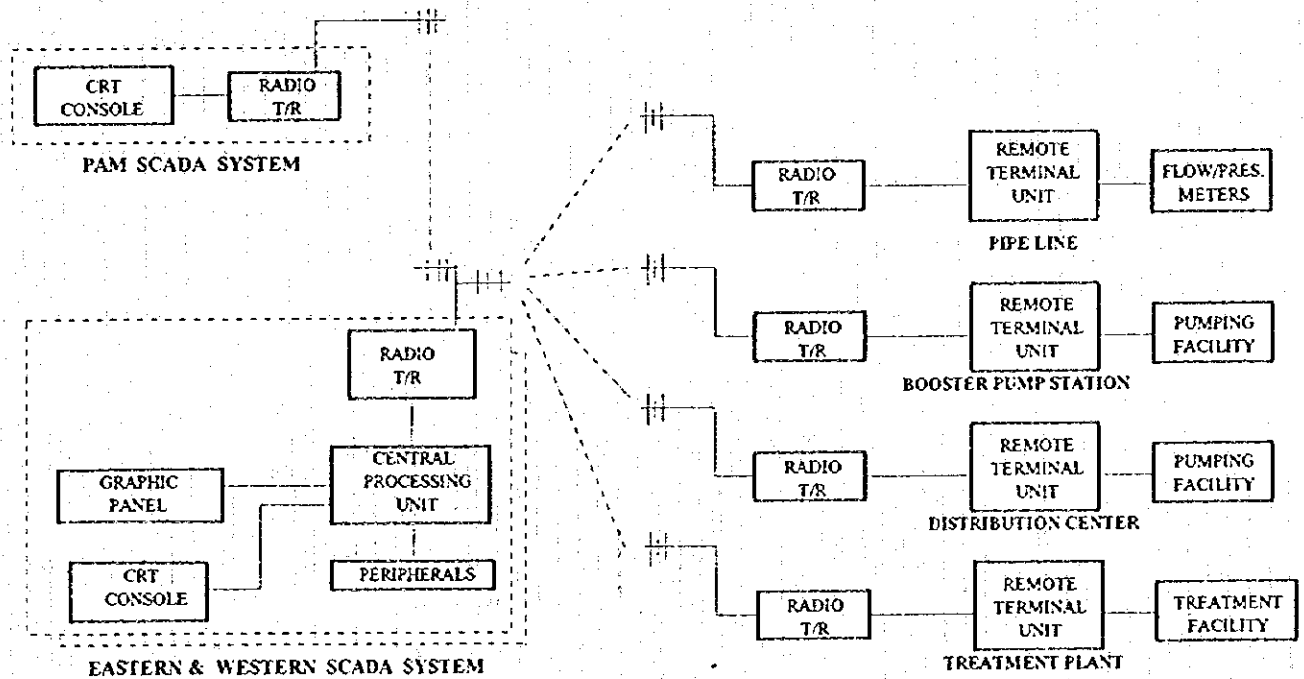
- |                                |                                    |
|--------------------------------|------------------------------------|
| ● Expansion of Treatment Plant | ◻ Expansion of Distribution Center |
| ○ Proposed Treatment Plant     | ■ Existing Distribution Center     |
| ● Existing Treatment Plant     | --- Raw Water                      |
|                                | — Treated Water Transmission       |

## 11. Concept of Management of Water Supply Facility Operation



! Note: Operation includes operation, maintenance and rehabilitation

## 12. PAM SCADA System



Note: T/R Transmitter & Receiver

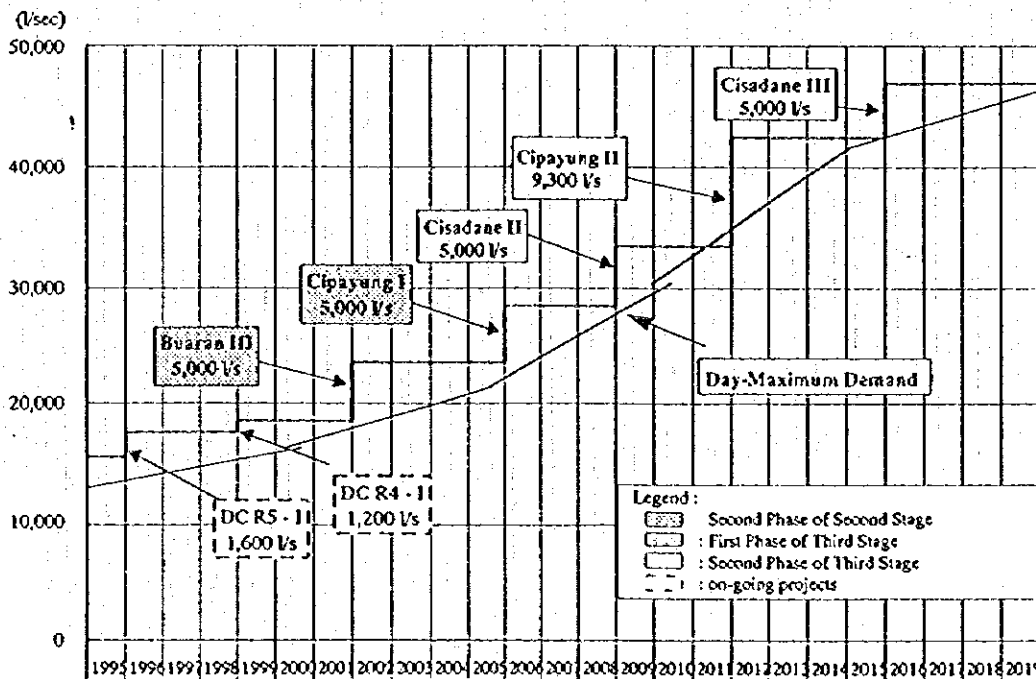
### 13. Costs Required for the Priority Projects

Unit : Million

	Foreign Currency Yen	Local Currency Rupiah	Total Equivalent Yen
<b>2nd Phase, Part One</b>	<b>54,967</b>	<b>986,743</b>	<b>101,952</b>
Buaran III Treatment Plant	6,726	115,479	12,226
Distribution Center R1 II	390	16,434	1,173
Distribution Center R6 I	409	37,869	2,212
Treated Water Transmission Main R1 - R6	7,203	31,993	8,727
Primary Mains	24,639	171,096	32,787
Service Mains	7,336	340,276	23,539
Engineering Services	3,268	21,392	4,284
Land Acquisition Costs	0	162,500	7,738
Physical Contingency	4,996	89,704	9,266
<b>2nd Phase, Part Two</b>	<b>47,740</b>	<b>1,000,973</b>	<b>95,409</b>
Cipayung Treatment Plant	4,709	86,753	8,839
Distribution Center R4 II	741	36,596	2,484
Distribution Center R5 II	312	27,127	1,604
Raw Water Transmission Pipeline	7,608	54,332	10,195
Treated Water Transmission Pipeline R5, R4	13,078	46,838	15,310
Primary Mains	8,750	80,100	12,566
Service Mains	5,363	248,812	17,212
Engineering Services	2,838	17,418	3,667
Land Acquisition Costs	0	312,000	14,857
Physical Contingency	4,341	90,997	8,675

Exchange Rate: 1 Yen = 21Rp.  
1996 Price.

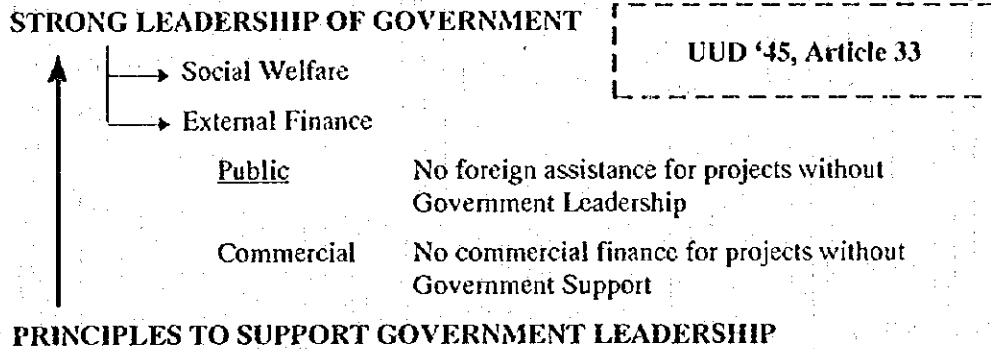
### 14. Implementation Schedule



15. Water Supply Development with PSP

**Water Supply Development with PSP**

PREREQUISITE FOR SUCCESS



FUNDAMENTAL WATER ACT

**NECESSARY FUNCTIONS FOR EXECUTION**

- Administrative Structure
- Legal Framework
- Structure of Finance

**TARGET WITHIN 5 YEARS**

- a) Establishment of Fundamental Water Act
- b) Review of Administrative Structure
- c) Review of Legal Framework
- d) Management Improvement of Water Supply Entity

16. Proposed Risk Assignment

PROPOSED RISK ASSIGNMENT			REMARKS
Type of Risk	Main assignee of Risk		
	Public	Private	
<b>Construction risk</b>			
Cost overrun risk		X	D/D, S/V, Budgetary arrangement are Private Sector's responsibility
Delays in construction risk		X	Construction works and S/V are Private Sector's responsibility
Completion risk		X	Construction works and S/V are Private Sector's responsibility
Land acquisition risk	X		Procurement of land itself or assistance for procurement is Public Sector's responsibility
Capacity shortfall risk		X	Capacity and quality of constructed facilities are Private Sector's responsibility
Environmental risk		X	Environmental impacts should be minimized by contractor, Private Sector
<b>Operating risk</b>			
Raw water shortage risk	X		Raw water quantity should be secured by Public Sector
Raw water quality risk	X		Raw water quality should be guaranteed by Public Sector
Water demand shortage risk		X	Promotion should be executed by Private Sector
Treated water quality risk		X	Operation of water supply facilities is Private Sector's responsibility
Technology risk		X	Required technology level should be maintained by Private Sector
System maintenance risk		X	Operation of water supply facilities is Private Sector's responsibility
Public liability risk		X	Social benefit should be maximized by Private Sector under S/V of Public Sector
Tariff setting risk	X		Tariff should be decided by Public Sector
<b>Credit risk</b>			
Public sector credit risk		X	Project feasibility should be carefully checked by Private Sector
Private sector credit risk	X		Public Sector should carefully select contractor
<b>Country risk</b>			
Legal risk	X		Private Sector will not be able to control the risk
Change in law risk	X		Private Sector will not be able to control the risk
Approval risk	X		Public Sector's assistance is indispensable
Economic risk	X		Private Sector will not be able to control the risk
Currency risk	X	X	Both sides should pay attention
<b>Force majeure risk</b>			
Natural disaster risk	X	X	Not controllable
Civil disturbance risk	X		Private Sector will not be able to control the risk
Political risk	X		Private Sector will not be able to control the risk

17. Mitigative Measures for Risk

MITIGATIVE MEASURES FOR RISK		Main assignee of Risk		MITIGATIVE MEASURES
Type of Risk	Public	Private		
<b>Construction risk</b>				
Cost overrun risk		X		Careful Detailed Design/Supervision by Contractor
Delays in construction risk		X		Careful Detailed Design/Supervision by Contractor
Completion risk		X		Completion test to contractor
Land acquisition risk		X		Careful site selection
Capacity shortfall risk		X		Selection of experienced contractor/Employment of proven technology
Environmental risk		X		Assistance by public sector in environmental regulatory information
<b>Operating risk</b>				
Raw water shortage risk		X		Guarantee by public sector/Establishment of bulk water supply company
Raw water quality risk		X		Guarantee by public sector/Establishment of bulk water supply company
Water demand shortage risk		X		Careful Feasibility Study/Control of groundwater abstraction
Treated water quality risk		X		Selection of experienced contractor and proven technology
Technology risk		X		Employment of proven technology
System maintenance risk		X		Employment of experienced operator/Training
Public liability risk		X		Confirmation of obligation/Monitoring by public sector
Tariff setting risk		X		Speeding-up of approval process by public sector/Agreement of timely revision system
<b>Credit risk</b>				
Public sector credit risk			X	Careful F/S by private/Guarantee letter
Private sector credit risk		X		Selection of experienced operator/Guarantee bond
<b>Country risk</b>				
Legal risk		X		Government guarantee/Legal support and coordination by public sector
Change in law risk		X		Government guarantee/Legal support and coordination by public sector
Approval risk		X		Assistance by public sector/Careful preparation by private sector
Economic risk		X		Careful F/S by private sector
Currency risk		X	X	Government guarantee/Exchange rate hedging with bank
<b>Force majeure risk</b>				
Natural disaster risk		X	X	Insurance/Allocation to all parties
Civil disturbance risk		X		Government guarantee
Political risk		X		Government guarantee

18. Functions of Public Sector

Type of Risk		Main assignee of Risk		ROLE OF PUBLIC SECTOR		
		Public	Private	PAM JAYA	OTHER GOVERNMENT AGENCIES	
<b>Construction risk</b>						
Cost overrun risk			X			
Delays in construction risk			X	Monitoring		
Completion risk			X	Observation		
Land acquisition risk		X		Procurement	X	Assistance
Capacity shortfall risk			X	Observation		
Environmental risk			X	Assistance	X	Approval
<b>Operating risk</b>						
Raw water shortage risk		X		Monitoring/Coordination	X	Guarantee
Raw water quality risk		X		Monitoring/Coordination	X	Guarantee
Water demand shortage risk			X	Forecasting/Planning		
Treated water quality risk			X	Quality check for monitoring		
Technology risk			X	Quality check for monitoring		
System maintenance risk			X	Research		
Public liability risk			X	Planning/Research		
Tariff setting risk		X		Review	X	Approval
<b>Credit risk</b>						
Public sector credit risk			X	Coordination	X	Guarantee
Private sector credit risk			X	Keep Guarantee Bond		
<b>Country risk</b>						
Legal risk		X		Coordination	X	Legal support/Guarantee
Change in law risk		X		Coordination	X	Legal support/Guarantee
Approval risk		X		Coordination	X	Legal support/Guarantee
Economic risk		X		Coordination	X	Legal support/Guarantee
Currency risk		X				
<b>Force majeure risk</b>						
Natural disaster risk		X				
Civil disturbance risk		X		Coordination	X	Legal support/Guarantee
Political risk		X		Coordination	X	Legal support/Guarantee
				Overall coordination between East and West	X	Coordination



ROLE SHARING DERIVED FROM RISK ASSIGNMENT

Type of Risk	Main assignee of Risk		ROLE SHARING	
	Public	Private	Public Sector	Private Sector
<b>Construction risk</b>				
Cost overrun risk		X		Detail Planning, D/D, S/V, Budgetary arrangement
Delays in construction risk		X		S/V
Completion risk		X		Execution of completion tests
Land acquisition risk	X			Assist Public Sector
Capacity shortfall risk		X		Completion of project implementation
Environmental risk		X		Execute necessary measures to reduce impacts
<b>Operating risk</b>				
Raw water shortage risk	X			Measurement and payment of raw water
Raw water quality risk	X			Check raw water quality (routine)
Water demand shortage risk		X		Promotion for increasing customer
Treated water quality risk		X		Check treated/distributed/top water quality (routine)
Technology risk		X		Maintain suitable technology level/assign qualified engineer.
System maintenance risk		X		Maintain suitable technology level/assign qualified engineer.
Public liability risk		X		Effort for max. of social benefit under plan of PAM
Tariff setting risk	X			Review proposal from private/approval of new tariff
<b>Credit risk</b>				
Public sector credit risk		X		
Private sector credit risk	X			Issuance of Guarantee Bond
<b>Country risk</b>				
Legal risk	X			
Change in law risk	X			
Approval risk	X			
Economic risk	X			
Currency risk	X	X		
<b>Force majeure risk</b>				
Natural disaster risk	X	X		
Civil disturbance risk	X			
Political risk	X			

## 19. Financial Analysis for the Priority Projects

The FIRR for the proposed projects works out at 9.17 percent. In order for the project to be financially feasible, this rate (9.17%) should be larger than the rate at which the water supply enterprise is able to borrow money. Provided that the private consortia are able to obtain Rupiah at the borrowing rate between 9 and 10 percent as PAM JAYA can currently do through such public funds as OECF and IBRD, this project is acceptable.

## 20. Economic Analysis for the Priority Projects

The EIRR of this proposed project is estimated at 9.16 percent. With the current opportunity cost of capital of somewhere between 8 and 10 percent, if this tangible benefit is combined with intangible economic benefits explained below, the proposed project is economically viable and acceptable.

## 21. Recommendations - Immediate Actions Required

### *Water Resources*

#### (1) Engineering works of upgrading of West Tarum Canal for financing arrangement

Requirement of the upgrading of the West Tarum Canal, Phase I-I, for the DKI Jakarta water supply system will be in 2002 after five (5) years from the beginning of 1997 and that for Phase I-II will be in 2006 after further four (4) years. Under such time schedule, necessary procedure for preparation of detailed design for financing arrangement should immediately commence to avoid delay of the completion of the scheme.

#### (2) Detailed environmental impact investigation and study

The SRCCIWR has made the preliminary environmental analysis and recommended to take the following immediate action :

- 1) Establishment of environmental monitoring and management unit (EMMU) consisting of environmental unit (EU) and environmental monitoring and management committee (EMMCC) to successfully execute the resettlement of local residents in the affected area by the proposed scheme.

2) Necessary procedures for commencement of environmental impact assessment.

(3) Establishment of comprehensive coordination and management committee of water sources and supply

As previously stated, it is suggested to take necessary action on establishing a comprehensive coordination and management committee on water sources and supply as soon as possible.

(4) Establishment of law and regulation on groundwater conservation and management

The Study preliminarily proposed the management and control plan on abstraction of groundwater in the DKI Jakarta as mentioned in Section 3.6.4. However, as implementation of the management and control plan needs national and local law and regulation, action on its procedures is recommended to be taken as soon as possible.

#### *Water Supply Facilities*

(1) Completion of Cisadane System

Cisadane System includes Cisadane Water Treatment Plant, treated water transmission pipe to Distribution Center R5, and Distribution Center R4. Construction works of the treatment plant and R5 have been completed except the treated water transmission pipeline. It is recommended to expedite the installation works of the transmission pipeline in order to receive water from the Cisadane Treatment Plant.

(2) Implementation of PJSIP II Project

To reduce NRW and to improve distribution system, Phase II of PJSIP Project (PJSIP II) is recommended to be implement as scheduled from 1996. According to the information from the PAM JAYA, construction works of Distribution Center R4 and treated water transmission pipeline from Tangerang to the R4 are included in the PJSIP II.

It should be noted that, in this study, the results of PJSIP II Project, such as reduction of NRW, addition of service mains, expansion of service area, treated water transmission pipeline to R4, and Distribution Center R4 are considered as existing system of the Jakarta Water Supply System. Unless the PJSIP II Project is implemented as schedule, the basis of the Master Plan becomes different.

(3) Arrangement for Acquisition of Land Space Required

Land space required for facilities included in the 2nd Phase of the Second Stage is recommended to be arranged and acquired. Facilities required newly or additional land space are listed below in the order of priority.

Immediately Required

- Buaran III Treatment Plant, for expansion (Addition), 15ha
- Distribution Center R6 (New), 6ha
- Cipayang Treatment Plant (New), 45ha
- Distribution Center R4, for expansion (Addition), 7ha

Required in future (for Third Stage)

- Cisadane Treatment Plant (Addition), 30ha
- Distribution Center R3, (New), 3ha

(4) Arrangement for Electric Power Allocation

New facilities or expanded facilities required electric power. PAM JAYA is recommended to discuss with authorities concerned to allocate additional power to water supply facilities.

(5) Engineering Service for Detailed Design

Construction works for the Part 1 of the 2nd Phase of the 2nd Stage should be started from the beginning of 1999. Prior to the construction works, engineering services on detailed design works for expansion of Buaran Treatment Plant (Buaran III), Distribution Center R1 and R6, treated water transmission pipeline, and expansion of distribution system are required. This engineering service should be conducted from 1997.

(6) Budgetary Arrangement

Budgetary arrangement for recommended actions listed above is immediately required for both foreign currency portion and local currency portion.

*Institutional Framework*

1. The *strong leadership of the government* to guide and regulate the private-driven operation and development of the Jakarta Water Supply System.
2. Preparation of *fundamental water law* to establish and announce the state principles of water supply service to support the execution of the government leadership.

3. Review of *administrative and organizational structure*, and *role sharing* among the agencies involved to guide the water supply system to work smoothly in line with the basic guidelines set forth in the fundamental water law.

4. Review of *legal systems* for water supply operation and development to regulate the water supply system into sound operation in line with the guidelines set forth in the fundamental water law.

5. *Stronger involvement of BAPPENAS* in the preparation of private participation in national infrastructure development and to check and supervise those programs in terms of contents and progress, and guide them to be consistent with or not to hinder smooth implementation of the national development plan.

#### ***Organization and Management***

- 1) Work analysis such as allocation of duties and responsibilities among sections and bureaus and between individuals are performed by management consultants.
- 2) Based on the analysis above, detailed job description of each staff should be prepared and required staff should be assigned in accordance with his/her skills and expertise.

Regulatory roles of PAM JAYA will necessitate further strengthening its managerial capabilities as well as staff skills. Strengthening skills and abilities of all levels of personnel in the organization should be done through effective training.

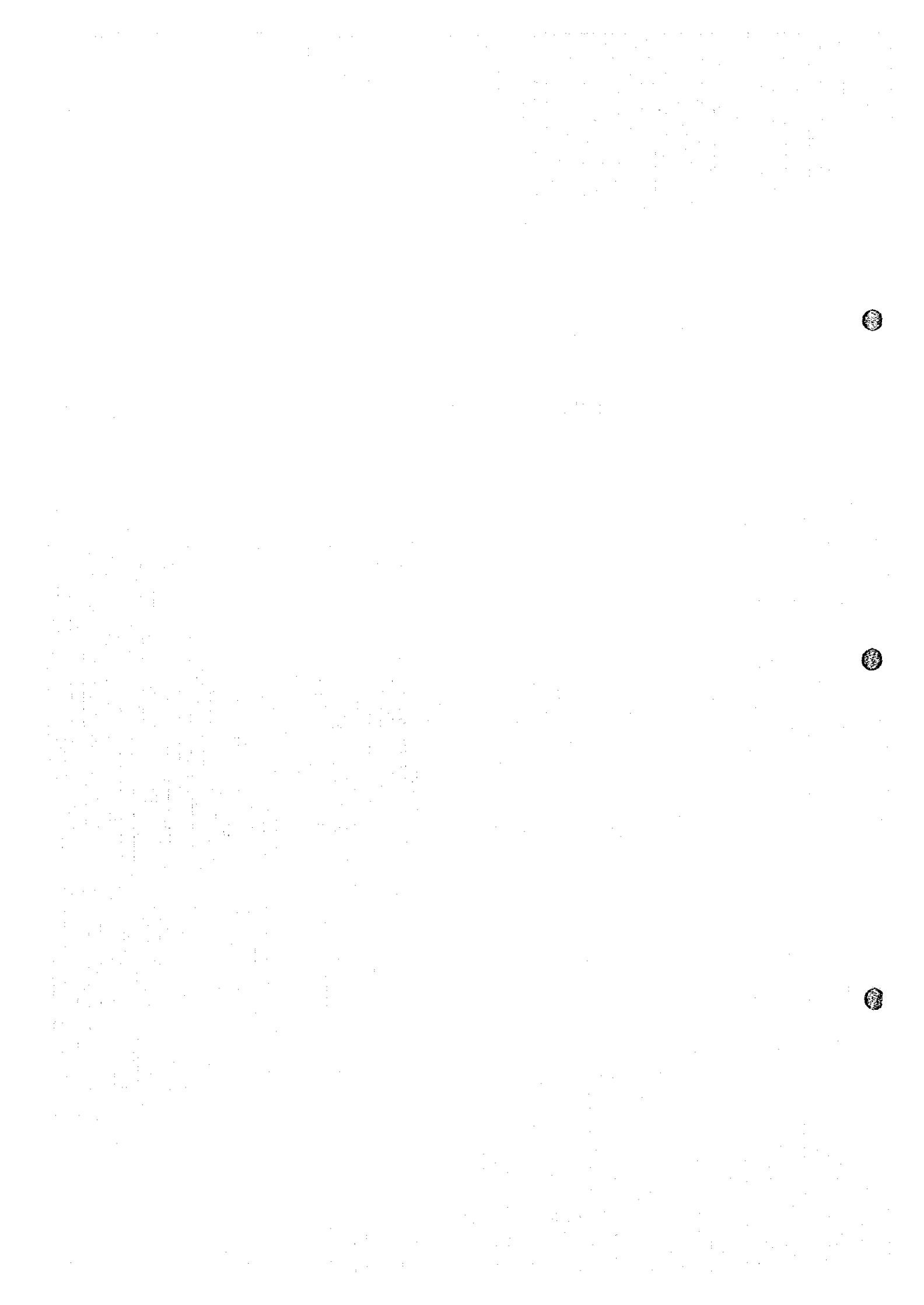
#### ***Finance***

As most likely agreed between PAM JAYA and the private consortia, the fees to be charged by the consortia will be linked to an index of the cost elements of the consortia and will be adjusted semi-annually. However, considering the present tariff approval process of PAM JAYA, which generally takes more than one year, PAM JAYA water tariff would be unable to be revised as frequently as fees of the consortia. If the tariff remains unchanged for three years (as the current practice), it is probable that the semiannually increasing fee would result in PAM JAYA's insufficient cash flow to meet its requirement such as debt service, operating expenses and contribution to PEMDA DKI. This may cause PAM JAYA to borrow additional loans and/or to ask the government for subsidies. In order to avert the unfavorable circumstance, if the indexed fee significantly increases to such an extent that PAM JAYA cannot cover its requirements, fee should be reviewed by taking into account financial projection of both PAM

JAYA and the consortia. On the other hand, PAM JAYA should use more open and transparent procedures and calculation methods in determining tariff as recommended.

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# EXECUTIVE SUMMARY





## EXECUTIVE SUMMARY

This Executive Summary is prepared to understand a framework of the revised Master Plan to the year of 2019 and to summarize the results of the Feasibility Study for the priority projects which are indentified in the Master Plan.

The Summary focuses on explanation of the Master Plan and Feasibility Study. Any details concerning the Master Plan and Feasibility Study and explanation about General Condition of the Study Area and Existing Condition are described in the Main Report and Annex of the Report.

This Exective Summary is consist of two parts, one is a summary of the Master Plan and the other is a summary of the Feasibility Study.

### **PART I : MASTER PLAN**

#### **MP-S1 INTRODUCTION**

From 1983 to 1985, Master Plan and Feasibility Study for Jakarta Water Supply Development Project was conducted by Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan (GOJ). Based on the results of the Master Plan and Feasibility Study, water supply facilities have been expanded to meet not only domestic but also industrial and commercial water demand, and such expansion work was expected to significantly improve water supply conditions and thereby support the continuous development of the capital city Jakarta.

Against such expectation, however, water supply conditions in Jakarta have not been satisfactorily improved, and the problem of water shortage has still remained as a serious hindrance to the sustainable development of Jakarta. The existing constraints in water supply are considered to have resulted from the delay in the implementation of planned projects such as construction of new treatment plants and raw water transmission mains, and the unexpected

increase of water demand due primarily to rapid urbanization, change of living standards and industrial structures.

Under the circumstances, the Government of Indonesia (GOI) requested GOJ to conduct the Study on the Revise of Jakarta Water Supply Development Project to review the 1985 Master Plan. In response to the request, GOJ had decided to conduct the Study, and JICA dispatched the Study Team for execution of the above Study in July, 1995. The Inception Report prepared by the Study Team was discussed for a mutual understanding between the Study Team and GOI during the inception meeting held at the start of the study period. The Report was mutually agreed except for these two points as described below.

- Expansion of Study Area to include fringe area of DKI Jakarta
- Consideration of concept on Private Sector Participation

JICA agreed the requests of GOI to include the above two points into the Scope of Works.

## **MP-S2 PURPOSE OF THE STUDY AND STUDY AREA**

### **S2.1 Purpose of the Study**

The purpose of the Study are:

- 1) To formulate a master plan on the development of water supply for the City of Jakarta (DKI Jakarta) to the year 2019, through the review of the progress after the Master Plan of 1985, the analysis of the new requirements for water supply, the assessment of the managerial situation of Jakarta Water Supply Enterprise (hereinafter referred to as "PAM JAYA"), and the assessment of the possibility of private sector involvement.
- 2) To conduct a feasibility study for the priority project(s) identified in the master plan.
- 3) To transfer technology on planing methods and skills to the counterpart personnel of PAM JAYA as well as Directorate General of Human Settlements, Ministry of Public Works (hereinafter referred to as "Cipta Karya") through daily study activities.

## S2.2 Study Area

Original Study Area was only DKI Jakarta, however, during the Inception Meeting, expansion of the Study Area was requested by the Cipta Karya. The Study Area was finally concluded to include Kecamatan from fringe area of DKI Jakarta listed below:

Tangerang		Bekasi		Bogor	
1.	Kosambi	9.	Jakasampurna	14.	Limo
2.	Teluknaga	10.	Jaliasih	15.	Beji
3.	Batuceper	11.	Pondok Gede	16.	Cimanggis
4.	Cipondoh	12.	Bekasi Barat	17.	Sawangan
5.	Ciledug	13.	Tarumajaya		
6.	Pondok Aren				
7.	Ciputat				
8.	Pamulang				

The Study Area including 17 Kecamatan from its fringe area are shown on the **Figure-S2.1** and **Figure-S2.2**.

## MP-S3 SCOPE OF WORKS

Original Scope of Works for the Study on the Revise of Jakarta Water Supply Development Project which was agreed between the JICA Preparatory Study Team and GOI on February 10, 1995 are shown in **Annex-M/M**.

As mentioned in the previous sections, the original Scope of Works had been modified to expand the Study Area including fringe area of DKI Jakarta and to consider Indonesian side's plan of Private Sector Participation to the Water Supply Sector.



## MP-S4 BASIC POLICY AND APPROACH OF THE STUDY

[Bumi, air dan kekayaan alam yang terkandung di dalamnya dikuasai oleh Negara dan dipergunakan untuk sebesar-besar kemakmuran rakyat. (Earth, water and natural riches contained in it are controlled by the Government and used for the prosperity of people as great as possible.)) is said in Chapter 33(3) article 14 "Social Welfare" of the Constitution of Indonesia. Basic requirement for water supply service is to supply clean and sufficient water at a reasonable price, and this is considered the same principle as the Constitution says.

On the other hand, the government policy set forth in Pelita VI is to eliminate the burden of the government funding for public investment. For instance, the Book IV says [Dalam penyediaan dan pengelolaan air bersih perkotaan, peluang dan iklim bagi peran serta usaha swasta dan masyarakat akan dikembangkan (Opportunity for participation of public and private sectors will be developed in order to supply and manage water in city areas.) in Chapter 38 "Perumahan dan pemukiman (Residence and Housing)".

In line with the government policy, PSP, Private Sector Participation, is planned to be adopted by Jakarta water supply system. In general, participation of private sectors in a water supply business reduces government funding, accelerates project implementation and improve efficiency of management. On the contrary, it tends to force the business to seek for profit rather than to seek for public welfare.

Considering the policies defined in the Constitution and Pelita VI and the current trend of PSP, the basic policy is defined in the study as "to prepare a most appropriate plan which will, on a sustainable basis, realize the maximum prosperity of Jakarta citizens from the standpoint of water supply". Or, it can also be expressed as "to contribute to the improvement of public health and welfare to the extent possible through water supply service in Jakarta". The basic policy defined here is shown on Figure-S4.1.

In order to realize the ultimate objective of the basic policy successfully, both existing water supply conditions and PAM JAYA's current administrative performance need to be improved. For the betterment of existing water supply conditions, there exists a need to increase (1) service coverage and to improve (2) stability and (3) safety of water supply. For the improvement of PAM JAYA's current administrative performance, it is necessary to increase (4) efficiency and

(5) soundness of the PAM JAYA's administrative operation.

The needs above mentioned are considered as the basic concepts for the realization of the basic policy, as well as for the purpose of undertaking the present study.

Considering the situation of current water supply condition in Jakarta mentioned above and a long span of time until the target year, fundamental measures to be taken to actually materialize the above five basic concepts have been developed as shown in Figure-S4.2.

Figure-S4.1 BASIC POLICY FOR THE MASTER PLAN

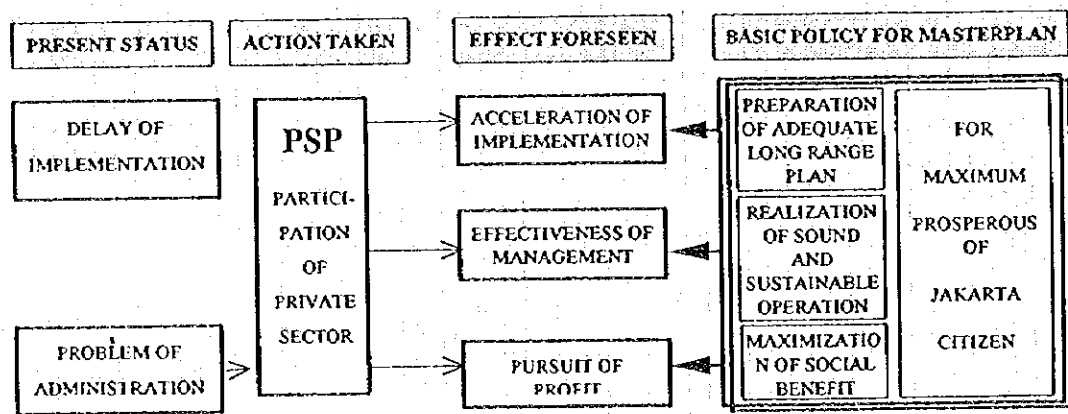
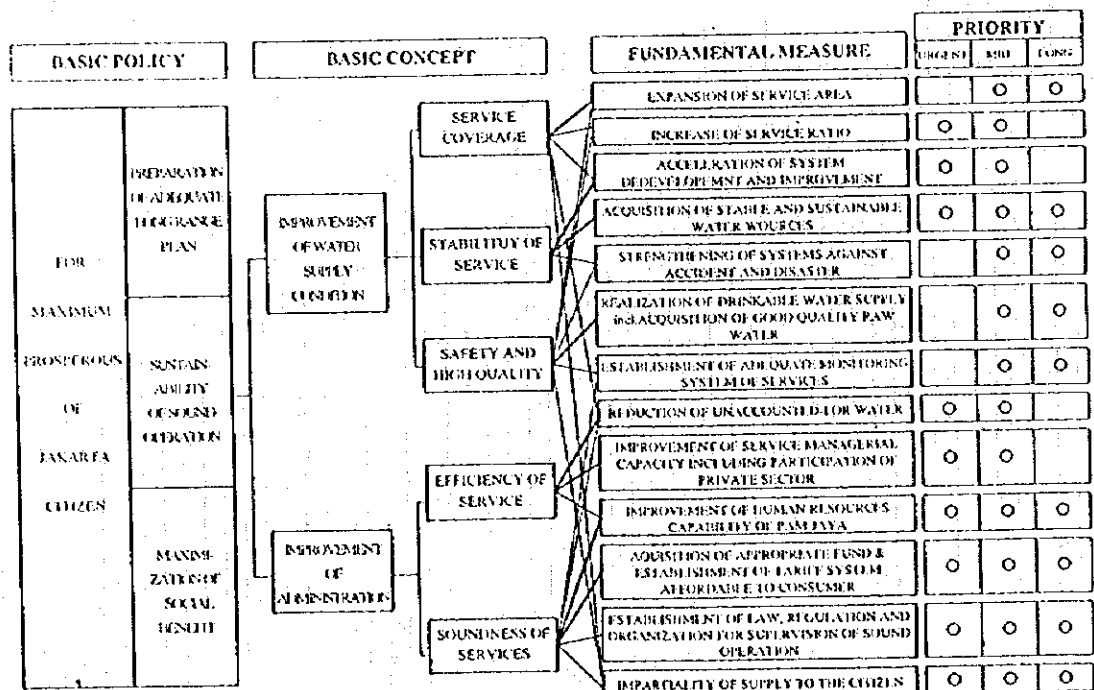


Figure-S42 STRATEGY FOR PREPARATION OF THE MASTER PLAN



## MP-S5 FUTURE POPULATION

As the first step of the formulation of the Master Plan, population in the Study Area is forecasted. Population in DKI Jakarta, 17 Kecamatan from the fringe area, and Water Front City was forecasted separately using past population data in each area and by introducing statistical equations.

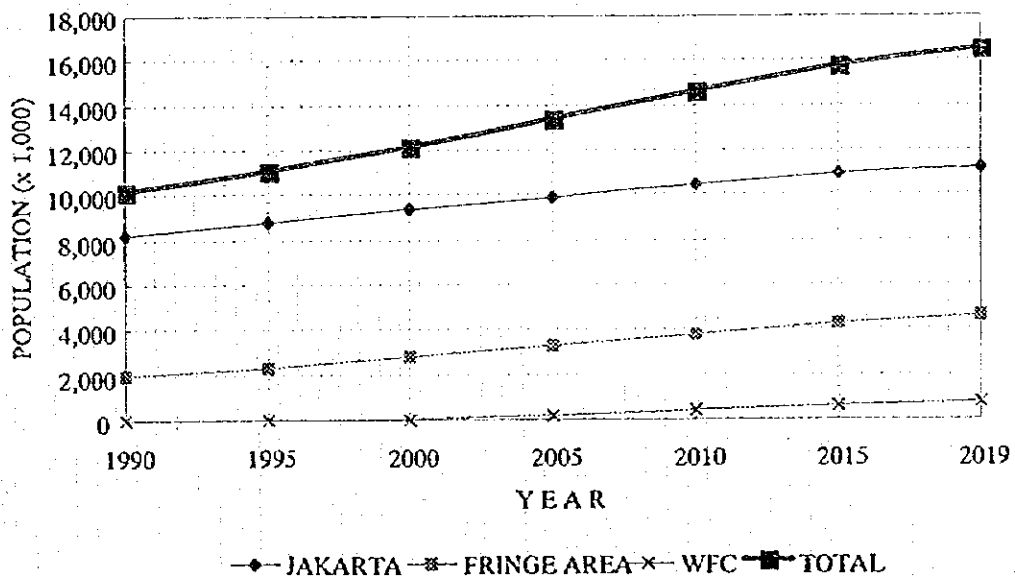
Forecasted future population is summarized on Table-S5.1 and on Figure-S5.1.

**Table-S5.1 FUTURE POPULATION IN THE STUDY AREA**

YEAR	DKI JAKARTA (x 1,000)	FRINGE AREA (x 1,000)	WFC* (x1,000)	TOTAL (x 1,000)
1995	8,800	2,300	0	11,100
2000	9,400	2,800	0	12,200
2005	9,900	3,300	197	13,397
2010	10,400	3,800	395	14,595
2015	10,900	4,300	592	15,792
2019	11,200	4,600	750	16,550

\* WFC: Water Front City  
 Figures show future population in new reclamation area only.

**Figure-S5.1 POPULATION FORECAST DKI JAKARTA, FRINGE AREA, TOTAL IN STUDY AREA**



## MP-S6 SERVICE AREA

The expansion plan of the service area was prepared and shown on Figure-S6.1(1) and (2). The service area expansion plan by year 2000 was prepared taking into account of on-going PJSIP Project. The service area plan of year 2005 covered the area proposed by JWSSP Study. By 2010 service area was planned to expand to all over the Jakarta and to Kecamatan Pondok Aren and Kecamatan Cipondoh in Kotamadya Tangerang. Housing Estate areas in Kecamatan Pondok Gede in Kabupaten Bogor and Kecamatan Ciputat, Pamulang and Pondok Aren in Kabupaten Tangerang were planned to be covered by service area by 2015. Service area was also planned to expand and to cover Housing Estate areas in Kecamatan Limo in Kabupaten Bogor and in Kecamatan Jatiasih in Kabupaten Bekasi by the target year of 2019.

Population in the future service area, in accordance with the expansion plan of service area, was estimated based on the future population forecast stated in the previous Section MP-S5 and shown in Table-S6.1.

Table-S6.1 FUTURE TOTAL POPULATION  
IN THE SERVICE AREA

YEAR	WEST JAKARTA (x 1,000)	EAST JAKARTA (x 1,000)	TOTAL OF JAKARTA (x 1,000)	FRINGE AREA (x 1,000)	WFC* (x 1,000)	TOTAL (x 1,000)
1995	4,800	4,000	8,800	1,400	0	10,200
2000	5,000	4,400	9,400	1,700	0	11,100
2005	5,300	4,600	9,900	2,100	197	12,197
2010	5,500	4,900	10,400	2,400	395	13,195
2015	5,700	5,200	10,900	2,700	592	14,192
2019	5,900	5,300	11,200	2,900	750	14,850

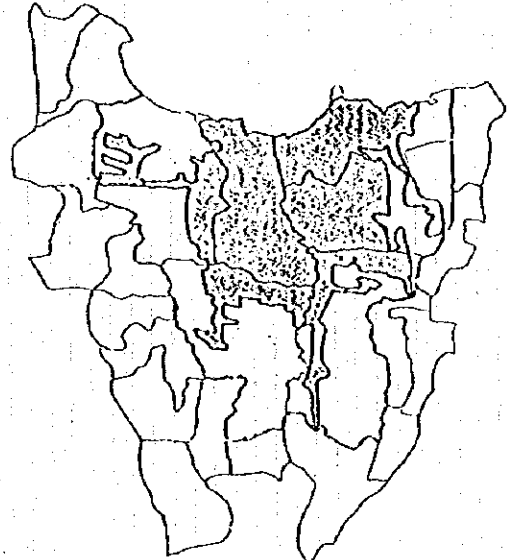
\* WFC: Water Front City

Figures show future population in new reclamation area only.



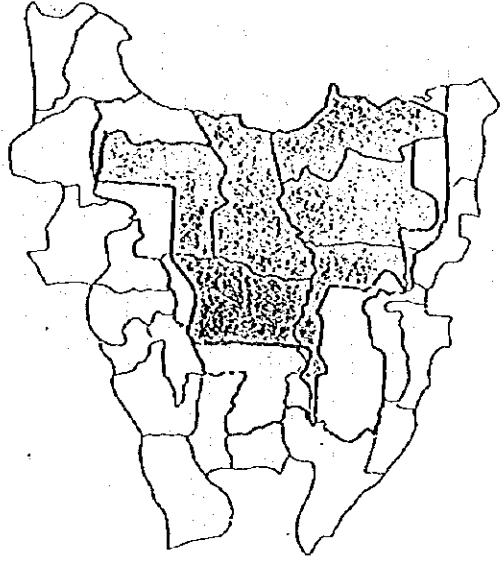
Figure-S6.1(1) SERVICE AREA EXPANSION

PRESENT  
(A=316km<sup>2</sup>)



by PAM JAYA

2000  
(A=435km<sup>2</sup>)



2005  
(A=505km<sup>2</sup>)

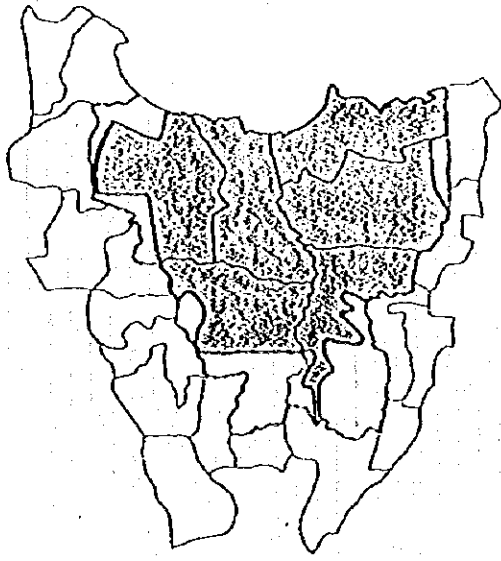
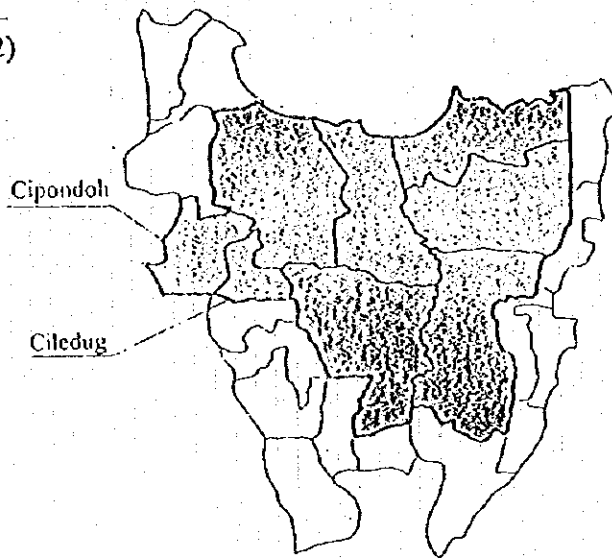


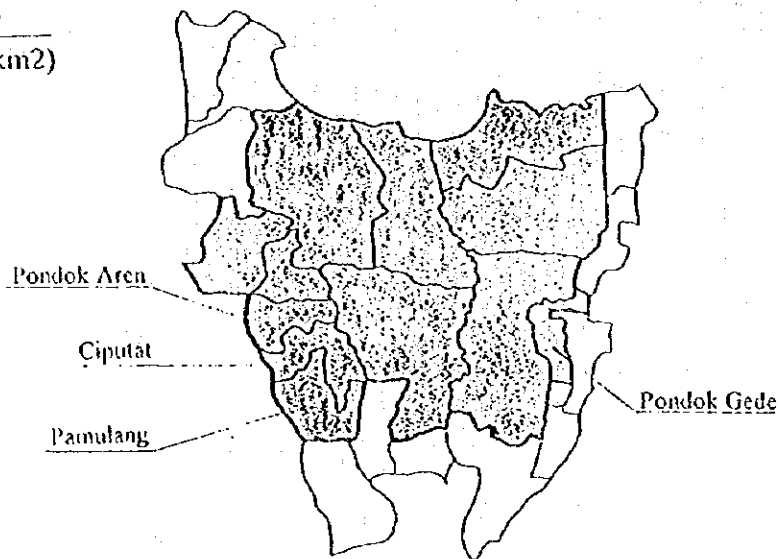
Figure-S6.1(2) SERVICE AREA EXPANSION

2010  
(A=715km<sup>2</sup>)



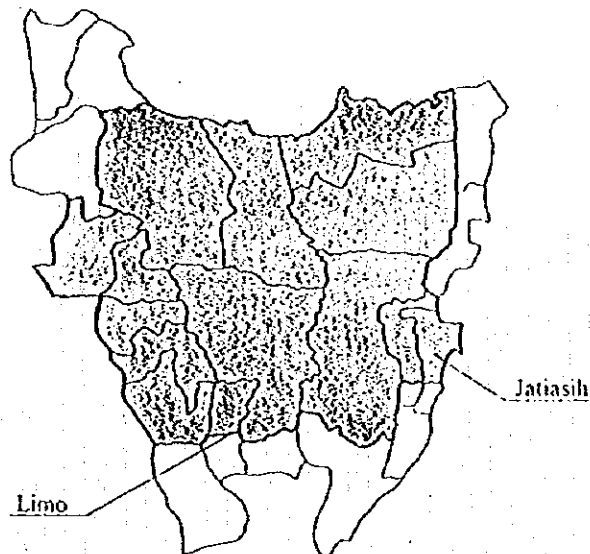
Include :  
Ciledug and  
Cipondoh

2015  
(A=837km<sup>2</sup>)



Include :  
Pondok Gede  
Ciputat  
Pamulang  
Pondok Aren

2019  
(A=871km<sup>2</sup>)



Include :  
Limo  
Jatiasih

## MP-S7 ESTIMATION OF FUTURE WATER DEMAND

Future water demand was estimated by introducing the concept of potential water demand. Potential water demand means the total water demand regardless of the water source.

Only two alternative water sources are available in DKI Jakarta and in fringe area, namely water supply by PAM JAYA and groundwater. Groundwater has been main water source for people live in the Study Area and also for commercial and industrial activities. It is estimated that 70 % of total water demand in the Study Area has been served by the groundwater.

However, in recent years, environmental problems caused by exceeding groundwater abstraction have been criticized. As environmental problems, land subsidence and sea water intrusion have been observed. Unless the quantity of groundwater abstraction is limited by the strong government control, the condition will be worsen and worsen. To limit the groundwater usage until the permissible level of groundwater abstraction, it is indispensable not only introduction of strict government regulation but also securing alternative water source other than groundwater for various kind of water demand.

Alternative source other than groundwater is only PAM JAYA water supply in the Study Area. Therefore, for the demand forecasting for PAM JAYA Water Supply System, amount of water demand would be switched from groundwater to PAM JAYA water supply should be included.

At the first step of the forecasting, overall total potential water demand for all category was estimated. Permissible groundwater abstraction in each year is estimated at the second step, and the balance of water demand, deduction of permissible groundwater abstraction from the total potential water demand, should be considered as water demand for PAM JAYA.

The results of future water demand estimation are shown below.

### (1) Day-Average Water Demand

Day-Average water demand means the net water demand for PAM JAYA System. Table-S7.2 shows the summary of water demand for DKI Jakarta, fringe area and Water Front City (only for new reclamation area).

(2) **Non Revenue Water Ratio**

Non Revenue Water (NEW) ratio is estimated as shown on Table-S7.1.

**Table-S7.1 NRW RATIO IN FUTURE**

YEAR	1995	2000	2005	2010	2015	2019
NRW RATIO (%)	53.5 %	40.0 %	30.0 %	28.0 %	26.0 %	25.0 %

(3) **Peak Factor**

Seasonal variation factor was estimated as 1.15. This peak factor is the same value as JWSSP Study.

(4) **Day-Maximum Water Demand**

Day-Maximum Water Demand was calculated as follows

$$(\text{Day-Average Water Demand} + \text{NRW}) \times \text{Peak Factor } 1.15$$

The result of the calculation is shown on Table-S7.2, together with number of served population, and service ratio.

**Table-S7.2 KEY FIGURES OF FUTURE WATER SUPPLY**

**Number of Served Population (x 1,000)**

YEAR	WEST JAKARTA	EAST JAKARTA	TOTAL OF JAKARTA	WEST FRINGE AREA	EAST FRINGE AREA	TOTAL OF FRINGE AREA	WATER FRONT CITY	TOTAL
1995	1,231	1,746	3,000	0	0	0	0	3,000
2000	2,216	2,486	4,700	0	0	0	0	4,700
2005	3,144	3,170	6,300	0	0	0	197	6,497
2010	3,978	3,801	7,800	370	0	400	395	8,595
2015	4,747	4,392	9,100	1,137	42	1,200	592	10,892
2019	4,908	4,496	9,400	1,889	64	2,000	750	12,150

Note : Data of WFC is not included

**Service Ratio (%)**

Y E A R	WEST JAKARTA	EAST JAKARTA	TOTAL OF JAKARTA	WEST FRINGE AREA	EAST FRINGE AREA	TOTAL OF FRINGE AREA	WATER FRONT CITY	TOTAL
1995	43	67	55	0	0	0	0	55
2000	59	73	66	0	0	0	0	66
2005	73	82	77	0	0	0	100	77
2010	78	83	80	36	0	40	100	78
2015	84	84	83	50	28	50	100	78
2019	84	84	84	77	26	74	100	83

**Day-Average Water Demand (l/sec)**

Y E A R	WEST JAKARTA	EAST JAKARTA	TOTAL OF JAKARTA	WEST FRINGE AREA	EAST FRINGE AREA	TOTAL OF FRINGE AREA	WFC*	TOTAL
1995	2,600	2,717	5,300	0	0	0	0	5,300
2000	4,524	4,152	8,700	0	0	0	0	8,700
2005	6,700	5,792	12,500	0	0	0	472	13,000
2010	9,252	7,802	17,100	828	0	800	960	18,900
2015	12,293	10,261	22,600	2,547	96	2,600	1,466	26,700
2019	13,215	10,968	24,200	4,256	152	4,400	1,927	30,500

**Day-Maximum Water Demand (l/sec)**

Y E A R	WEST JAKARTA	EAST JAKARTA	TOTAL OF JAKARTA	WEST FRINGE AREA	EAST FRINGE AREA	TOTAL OF FRINGE AREA	WFC*	TOTAL
1995	6,431	6,721	13,200	0	0	0	0	13,200
2000	8,671	7,958	16,600	0	0	0	0	16,600
2005	11,007	9,516	20,500	0	0	0	775	21,300
2010	14,778	12,461	27,200	1,323	0	1,300	1,533	30,000
2015	19,104	15,947	35,100	3,958	150	4,100	2,279	41,500
2019	20,263	16,818	37,100	6,526	233	6,800	2,955	46,900

Note : \* New Reclamation Area

Total Day-Maximum water demand, total Day-Average water demand, and NRW ratio are shown on Figure-S7.1.

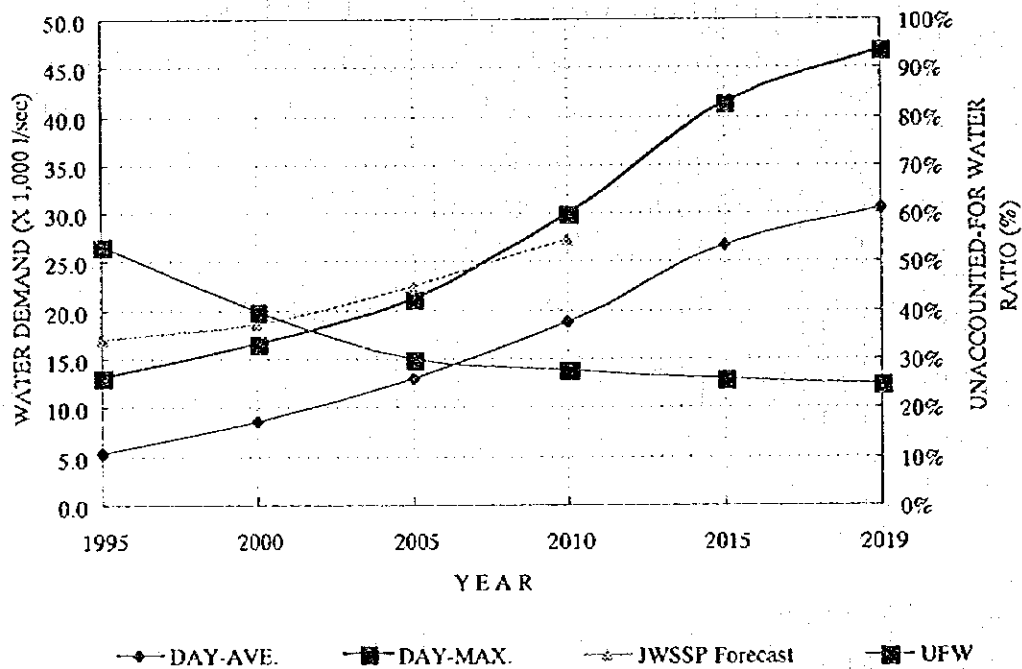
**(5) Water Demand for Kecamatan Kepulauan Seribu (1,000 Islands)**

Kecamatan Kepulauan Seribu, 1,000 Islands, is excluded from service area where is supplied water by piped system, because huge investment will be required to install under sea water transmission pipeline from main island to the 1,000 Islands.

However, it should be noted that people living in the 1,000 Islands have been struggling to find water for drinking. Water for other than drinking such as for bathing and washing is available from shallow wells in those islands. Although the 1,000 Islands are excluded from piped service area, water for drinking purpose including for cooking should be conveyed from the main island.

Total water demand for drinking was calculated as 75 m<sup>3</sup>/day (0.9 l/sec) based on per capita drinking water consumption was 5 lpcd and total population was 15,000 capita.

**Figure-S7.1 DAY-AVERAGE AND DAY-MAXIMUM WATER DEMAND FOR SYSTEM PLANNING**



**S8.1 Surface water resources development**

In order to cope with the rapidly increasing demand, the Director General of water resources development (DGWRD), the Ministry of Public works, has performed and completed the Jabotabek Water Resources Management Study (JWRMS) in 1994. The JWRMS reviewed the potential water resources identified by the previous studies and screened those. Based on the said screening, the JWRMS prepared the inventory of the surface water resources development projects/schemes and water conveyance system schemes in the Jabotabek and its surrounding area and their implantation schedule till Year 2025.

Following the JWRMS, the Study on Cijung-Cidurian Integrated Water Resources (SCCIWR) has been completed by the JICA Study Team in close cooperation with the DGWRD and in close coordination with the JWRMS Team. The SCCIWR reviewed the raw water plan recommended by the JWRMS and prepared the updated implementation schedule for raw water supply plans in the Cijung and Cidurian river basin.

The master plan study on surface water resources development to supply municipal and industrial (M&I) water uses to the DKI Jakarta was made to preliminary formulate the most attractive and favorable development plan from the scenarios and their alternatives, which were obtained by combining the dam/reservoir schemes and water conveyance schemes recommended by the JWRMS and the SCCIWR, in due consideration with the future water supply conditions to the Tangerang-Serang area.

The master plan study established two (2) scenarios ; Scenario I, Water resources development plan in case that the first implementation is proceeded and completed on schedule, and Scenario II, Water resources development plan in case that is delayed to be proceeded. For these scenarios, five (5) alternative development series, combining the Karian dam scheme in the Cidurian river basin, the Tanjung dam scheme in the Cijung river basin and the Conveyance 2 scheme, were selected and their comprehensive evaluation was conducted for Scenario I.

Prior to the comprehensive evaluation, it was studied that whether or not an immediate measure for water source before commissioning the first implementation in the said three (3) schemes is

required and that an availability for immediate measure, if necessary, was checked. As the results, the study proposed the upgrading of the West Tarum Canal in water quantity aspect as the immediate measure for water source to provide an additional 5 m<sup>3</sup>/sec.

The final section study recommended Scenario II in consideration of the present status and future view of the Karian dam/reservoir scheme as the first implementation, which was optimized by the comprehensive evaluation for Scenario I.

For the selection of Scenario II, further immediate measure is required and the further provision of water from the West Tarum Canal amounting to 5 m<sup>3</sup>/sec was proposed by the Steering Committee.

The proposed development plan in Scenario II consists of :

- Stage I - 1 : Upgraded West Tarum Canal, Phase I (2002)
- Stage I - 2 : Upgraded West Tarum Canal, Phase II (2006)
- Stage II : Karian Dam/Karian-Serpong Conveyance System (2009)
- Stage III : Conveyance 2 (2012)
- Stage IV : Tanjung Dam/Karian-Serpong Conveyance System (2016)

## **S8.2 Future Groundwater Abstraction and Management**

The groundwater study has been made in several reports since 1970's, out of which only the Feasibility Study on Cisadane River Basin Development studied and presented the provisionally recommendable permissive yield (sustainable yield) of groundwater abstraction for future water requirement in Jabotabek area employing the appropriate concept and criteria in consideration of the physical, economic and environmental aspects. In such circumstances, the this Study applied the concept and criteria in the said Feasibility Study for estimation of the permissive (sustainable) yield of groundwater abstraction for future demand in the DKI Jakarta and its surrounding areas.

The allowable amount of groundwater abstraction was defined as "Permissive (Safe or



Sustainable) Yield, which means to maximum abstraction amount without producing an undesired results, based on "Sustainable Development Concept". The factors covering the Permissible Yield consist of 1) economic consideration from basin, 2) quality of groundwater, 3) water right in and around the basin, and 4) land subsidence.

Based on the evaluated unit permissible yield and established targeted year to reduce the amount, the yearly permissible yield of groundwater abstraction was calculated as summarized below :

Year	DKI Jakarta	Fringe Area	Total
1995	9,654	1,928	11,518
2000	11,492	2,977	14,469
2005	7,659	3,864	11,523
2010	5,363	2,644	8,007
2015	3,067	1,423	4,490
2019	3,067	1,423	4,490

## **MP-S9 WATER SUPPLY FACILITIES**

### **S9.1 Basic Policy**

#### **(1) Basic Policy**

Future service area is discussed and defined in the previous section and future Water Supply System in the service area is planned based on the Day-Maximum water demand and considering concepts as follows.

- to make simple and economic system as much as possible
- to use existing facilities as much as possible  
(facilities which are under implementation are considered to be existing facilities, i.e., Cisadane Treatment Plant, Distribution Centers R4 and R5 are considered as existing facilities)
- to divide service area into two systems, west and east sides conforming to the concept of the Private Sector Participation  
(however, interconnecting facilities will be considered for emergency)
- to apply existing zoning system basically
- to supply water for each zone from one distribution center or treatment plant  
(in the case that existing capacity of distribution center or treatment plant is not enough for one zone, additional distribution center will be considered)

## (2) Zoning

DKI Jakarta area is divided into six distribution zones at present. In 1995, PAM JAYA has rearranged a new zoning system which also consists of six distribution zones, and will officially apply this new zoning from 1996. In addition to zones in DKI Jakarta, Kecamatan of Kotamadya and Kabupaten Tangerang in the service area, Ciledug, Cipondoh, Ciputat, Pamulang, and Pondok Aren, are proposed to be included in the new zone, Zone 7. Other Kecamatan of Kabupaten Bogor and Bekasi in the service area are treated to be included in the distribution zones of PAM JAYA as follows.

Kabupaten Bogor :  
Limo : Zone 5

Kabupaten Bekasi :  
Pondok Gede : Zone 6  
Jatiasih : Zone 6

The Study is, therefore, conducted based on the new zoning system consisting of seven zones as shown in Figure-S9.1. Basically, each distribution zone is considered to be independent distribution system which is supplied water from one distribution center or one treatment plant.

### S9.2 Water Treatment Facilities

Totally five alternatives were compared and proposed system is shown on Figure-S9.2. This shows overall system including existing treatment plants and distribution centers, required new/expansion treatment plants and distribution centers, and its treated water transmission systems. Table-S9.1 shows the summary of proposed new system.

Although the expansion works of the existing Buaran Treatment Plant was confirmed as the Part 1 Project, the Indonesian side pointed out other possible location of new treatment plant in Bekasi area instead of the expansion of Buaran Treatment Plant. According to the explanation by the Indonesian side, in the event of the Indonesian side encountering difficulties on additional land acquisition around existing Buaran Treatment Plant premises, there will be a possibility to shift the location of the treatment plant from Buaran to Bekasi.

## **S9.3 Distribution Facilities**

### **(1) Zoning Implementation**

As discussed in the previous section, it is necessary to establish hydraulically independent zoning system in the service area for controlling and monitoring water flow, pressure and quality properly in such a large distribution system. Based on the concept of zoning system, future distribution facilities are considered.

For zoning implementation, a treatment plant or a distribution center, as core facility of water distribution, should be constructed in each zone with enough capacity to meet water demand in the zone. To secure continuous water supply to the distribution center, treated water transmission facilities connecting treatment plants and distribution center should also be constructed.

### **(2) Preliminary Primary Pipe Network Analysis**

Preliminary Primary Pipe Network ( $\varnothing 300\text{mm}$  and more) analysis is conducted in order to formulate appropriate distribution network which support zoning system mentioned above and to decide most effective way of achieving suitable pressure level in the year 2019.

Table-S9.2 provides summary of the pipe length to be installed by diameter until the year 2009 and 2019, respectively.

Future model of pipe networks is shown in Figure-S9.3. This figure shows whole system of distribution primary mains in 2019 including existing and proposed pipelines.

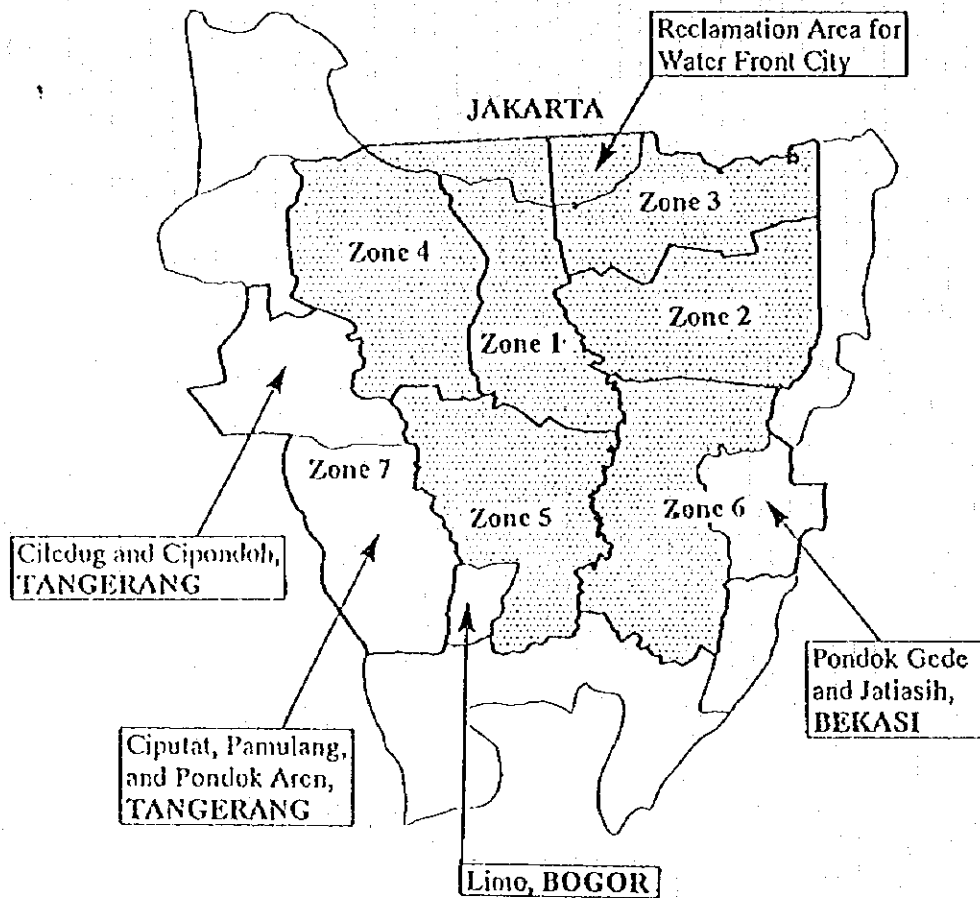
### **(3) Service Mains and House Connection**

Length of the service mains, secondary (Dia. 150 - 250 mm) and tertiary mains (Dia. 50 - 100 mm), are estimated based on the unit pipe length per connection and required length in future is shown on Table-S9.3.

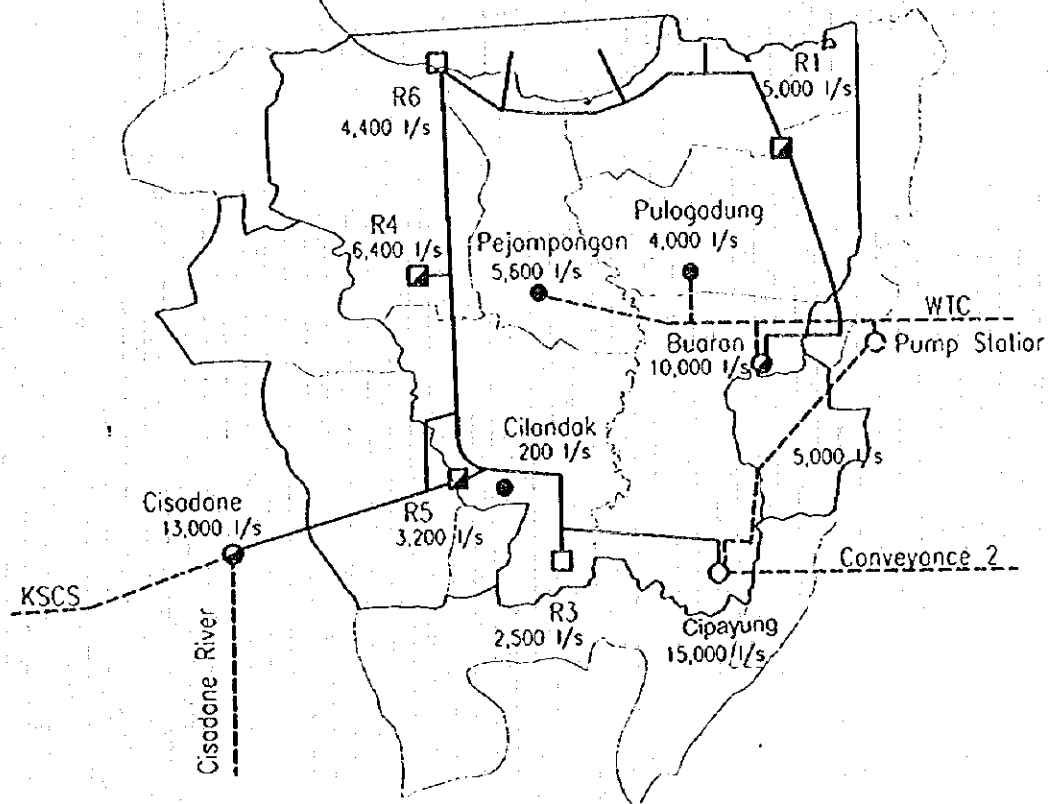
**Table-S9.3 LENGTH OF SERVICE MAIN IN FUTURE**

YEAR		1995	2000	2005	2010	2015	2019
Total Length of Service Mains	km	3,844	6,808	9,926	14,081	19,630	21,522

**Figure-S9.1 ZOING SYSTEM OF THE STUDY AREA**



**Figure-S9.2**  
**PROPOSED WATER SUPPLY SYSTEM IN 2019**



**LEGEND :**

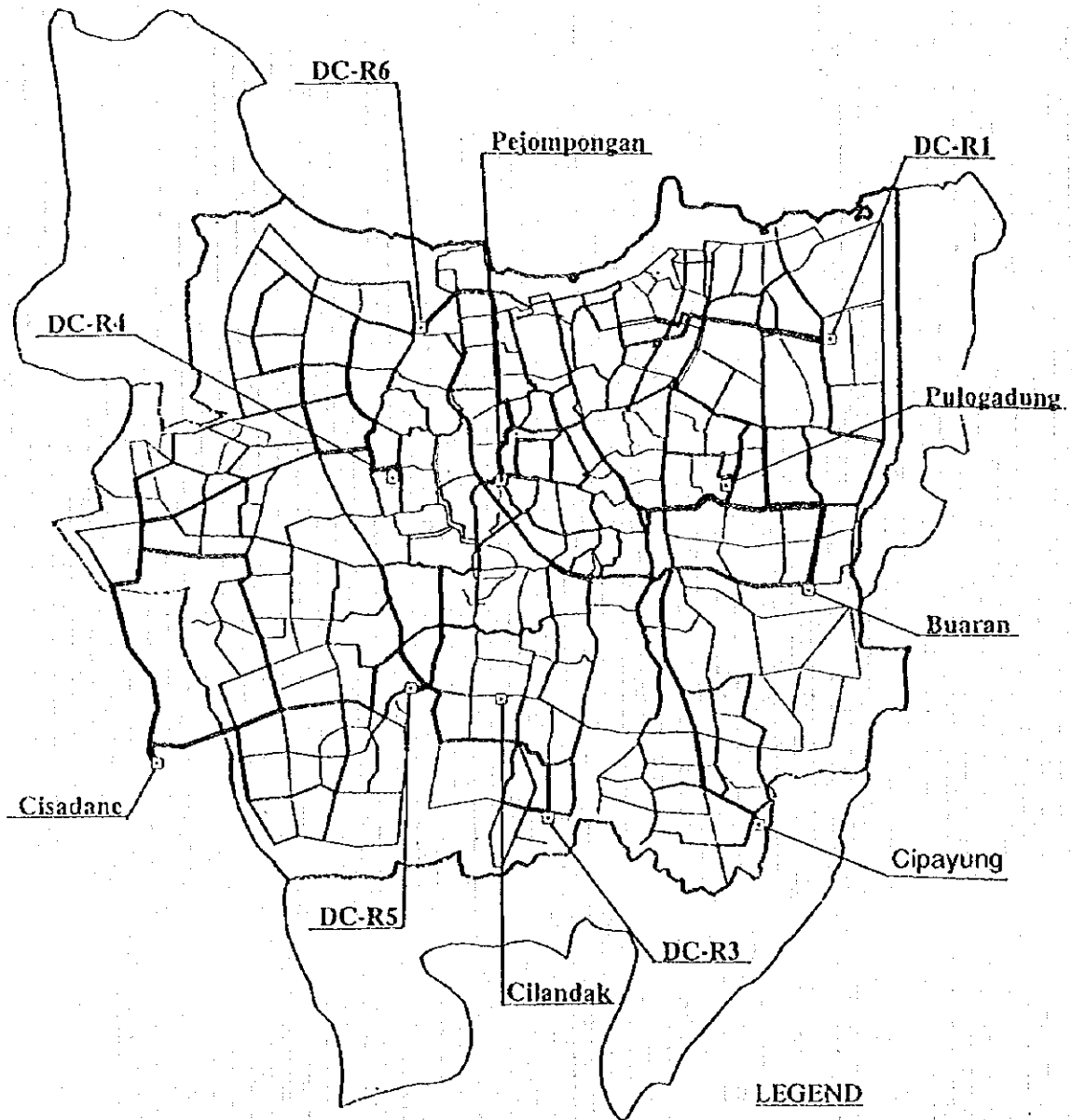
- Expansion of Treatment Plant
- Proposed Treatment Plant
- Existing Treatment Plant
- ▣ Expansion of Distribution Center
- Proposed Distribution Center
- Row Water
- Treated Water Transmission

**Table-S9.1 LIST OF PROPOSED FACILITIES**

Proposed Facilities	Capacity (l/sec)	Volume (m3)
Buaran III Treatment Plant	5,000	-
Cipayung I Treatment Plant	5,000	-
Cipayung II Treatment Plant	10,000	-
Cisadane II Treatment Plant	5,000	-
Cisadane III Treatment Plant	5,000	-
R1 II Distribution Center	2,000	19,800
R1 III Distribution Center *	0	19,800
R3 I Distribution Center	1,250	22,500
R3 II Distribution Center	1,250	22,500
R4 II Distribution Center	2,600	46,400
R4 III Distribution Center	1,300	23,200
R4 IV Distribution Center	1,300	23,100
R5 II Distribution Center	1,600	35,100
R6 I Distribution Center	4,400	50,400

\* : Construction of additional distribution basin

**Figure-S9.3 PROPOSED PRIMARY DISTRIBUTION SYSTEM (YEAR2019)  
(EXISTING AND PROPOSED PIPELINES)**



**LEGEND**

Pipe Diameter

- 150 ≤ — < 400
- 400 ≤ — < 600
- 600 ≤ — < 800
- 800 ≤ — < 1000
- 1000 ≤ — < 1200
- 1200 ≤ — ■■

- ⊕ Treatment Plant/  
Distribution Center

**Table-S9.2 BREAKDOWN OF PRIMARY MAINS PIPE LENGTH**

Diameter (mm)	Existing Length * (m)	Before 2009		Up to 2019	
		Newly required Length(m)	Accumulated Length(m)	Newly required Length(m)	Accumulated Length(m)
300	117,789	123,380	243,169	150,256	393,425
350	27,217	190	27,407	2,380	29,787
400	123,718	35,144	158,862	42,820	201,682
450	4,650	0	4,650	0	4,650
500	55,423	19,602	75,025	22,060	97,085
550	2,504	0	2,504	0	2,504
600	123,898	96,757	220,655	56,980	277,635
700	0	12,900	12,900	0	12,900
800	61,422	84,170	145,592	24,032	169,624
900	17,977	10,040	28,017	100	28,117
1000	27,126	31,254	58,380	25,163	83,543
1100	6,442	0	6,442	1,370	7,812
1200	3,590	16,930	22,520	15,340	37,860
1350	1,912	9,100	11,012	1,230	12,242
1500	640	16,392	17,032	0	17,032
1600	2,619	3,960	6,579	0	6,579
1800	2,962	8,214	11,176	7,910	19,086
2200	0	0	0	8,820	8,820
<b>Total</b>	<b>581,889</b>	<b>470,033</b>	<b>1,051,922</b>	<b>358,511</b>	<b>1,410,433</b>

Note :

\* Figures of existing pipe length are referred to JWSSP Distribution System Report in 1995. The length includes pipes to be installed by PISIP Phase 1 and Phase 2

**(4) Water Supply to Kecamatan Kepulauan Seribu (1,000 Islands)**

It is recommended to construct water terminals at main islands and PAM JAYA supply water to the water terminals periodically by boat. Candidate islands for construction of the water terminals are,

- Pulau Tidung Besar
- Pulau Untung Java
- Pulau Panggang
- Pulau Pramuka
- Pulau Kelapa

From the water terminals constructed in islands shown above, water will be served to inhabitants in the island by public hydrants and also distributed to the neighboring small islands by boat.

**S9.4 Water Quality**

Considering that treatment of raw water with the present quality by conventional rapid sand filtration is almost reaching performance limit, it is necessary to maintain the present level of

raw water quality or to improve it in the future. It is feared, however, from past trend, that quality of raw water might be more deteriorated in the future. Such measures regarding raw water, including bypass channel construction of WTC and promotion of PROKASIH shall be taken.

By implementation of the above measures, conventional method with rapid sand filtration can be applied for water treatment of future raw water. However, the following three provisions are considered necessary.

- i) Pre, post and intermediate (if necessary) chlorination shall be equipped and its operation shall be properly made introducing breakpoint chlorination methodology so as to oxidize  $\text{NH}_4\text{-N}$ , organic substance, Fe and Mn and to disinfect filtered water.
- ii) For supporting coagulation and flocculation in case poor performance of alum, possibility of Polymer dosage shall be considered.
- iii) Powdered carbon shall be equipped against sudden problem of the raw water quality.

The current treated water quality at the plant is not always potable and water in distribution system and water from the customer tap are not potable.

In order to realize potable tap water in the City, the following steps of quality improvement is planned in the Master Plan.

Step 1 : URGENT	Potable treated water from all treatment plants.
Step 2 : MID TERM	Potable water at the end of the distribution system.
Step 3 : TARGET	Potable tap water in the City.

To achieve the step-wised targets as mentioned above, necessary measures for improvement quality of water supply are summarized in the Table-S9.4. In the Table, priority for implementing the measures are also marked aiming at acquiring potable tap water at the target year of the Master Plan.



Table-S9.4 NECESSARY MEASURES FOR WATER QUALITY IMPROVEMENT OF JAKARTA WATER SUPPLY SYSTEM

ITEMS RELATED	EXISTING CONDITIONS ON WATER QUALITY	NECESSARY MEASURES FOR WATER QUALITY IMPROVEMENT	PRIORITY
QUALITY STANDARD	Potable and clean water standard. Pb & As values shall be smaller.	Standard of clean water be abandoned in future. Revision of the standard for Pb&As in the future.	○ ○
WATER SOURCES	JATILUHUR DAM CISADANE RIVER	Construction of sewerage system in upper cities Equipment of artificial aeration system in Jatulufur. Accumulation of quality data of raw water.	○ ○
RIVERS IN DKI GROUNDWATER	Quality data are not enough. More downstream poorer quality. Groundwater quality deteriorated.	Study & implement quality preservation & improvement. Promotion of PROKASIH. Shift of raw water intake to WTC. Restriction of excessive groundwater abstraction. Shifting promotion from groundwater to PAM JAYA water.	○ ○ ○ ○
RAW WATER CONVEYANCE	WEST TARUM CANAL	Quality becomes poor after Bekasi.	○ ○
CANALS IN DKI	Very poor quality(BOD=20mg/l)	Bypass channel construction of WTC. Preventive measure dumping pollutant into WTC. Shift of raw water intake to WTC.	○ ○
WATER SUPPLY FACILITIES	TREATMENT PLANT	Improvement of water quality of WTC. Strengthening chemical control incl. Cl2 and carbon.	○ ○
MINI PLANT	Plants in north poor finished water. Deteriorated pipelines much exist.	Mini plants in northern Jakarta abandoned in future. Implementation of PJSIP throughout service area.	○ ○
DISTRIBUTION PIPES	Poor quality near zone boundary. Cross connection still exists. Direct pumpage still exists. Many service pipes deteriorated.	PJSIP and Zoning of distribution network. Implementation of PJSIP throughout service area. Implementation of PJSIP throughout service area. Implementation of PJSIP throughout service area.	○ ○ ○ ○
SERVICE CONNECTION	Receiving tanks are popular in City.	Proper maintenance of receiving tanks. Direct connection to house taps in the future.	○ ○
OPERATION & MAINTENANCE	WEST TARUM CANAL TREATMENT PLANT SERVICE CONNECTION	Bypass channel construction of WTC. Application of break-point chlorination. Proper maintenance of receiving tanks. Direct connection to house taps in the future.	○ ○ ○
ANALYSIS AND MONITORING	CENTRAL LABORATORY REPORTING DISTRIBUTION PIPES	Preparation of space and equipment for Central labo. Curry out proper reporting and checking. Application of quality monitoring on pipelines.	○ ○ ○

## **MP-S10 REDUCTION OF UNACCOUNTED-FOR WATER**

### **S10.1 Necessity of UFW Reduction**

The Unaccounted-For Water (UFW) should be reduced as much as possible because UFW causes the following serious ill effects in water supply system.

- UFW is a wastage of precious water resources because the water produced at the water treatment plant does not be used effectively.
- UFW is a useless consumption of electricity and chemicals at the water treatment plant because these energy and chemicals are consumed for production of useless water.
- UFW causes water supply shortage and pollution of piped water.
- UFW sometimes causes such secondary accident as traffic accident.
- Thus UFW touch off the economical loss due to decrease of revenue.

#### **(2) UFW Reduction Program**

The target of UFW level is established as shown in Table-S10.1.

**Table-S10.1 TARGET OF UFW LEVEL**

<b>YEAR</b>	<b>2005</b>	<b>2010</b>	<b>2019</b>
<b>UFW (%)</b>	30	28	25

The target described above can only be achieved through implementation of the following major items:

- to continue steady implementation of on-going PJSIP
- to secure efficient follow up maintenance of elementary zone after completion of PJSIP by expected privatization.
- to expedite the planned zoning of distribution area by implementation of PJSIP
- to strengthen the flow / pressure monitoring at distribution system

## MP-S11 OPERATION / MAINTENANCE AND MONITORING SYSTEM

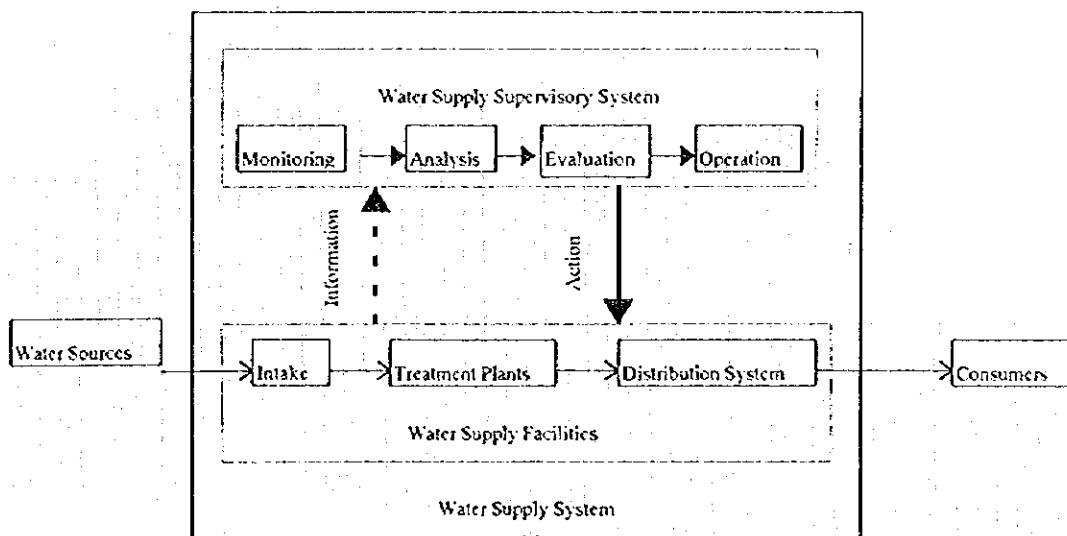
### S-11.1 Operation/Maintenance

The primary purpose of a water supply enterprise is to continuously furnish a potable water, that is, a water that may be ingested without menace to health and that is satisfactory for drinking in its physical, chemical, and biological characteristics. The responsibility of management as to the safety of water supply can be resolved in the statement that management is expected to take every precaution that would be exercised by a normal, individual who has familiarity with the management of water supply system.

Obviously, these would include such steps as: a sanitary monitoring and records of the source of supply; proper supervision, including records and checks, of the operation of treatment plant; a continuing determination of the quantities of water required to meet the demands for water consumption; and continuing monitoring of residual pressures throughout the water supply system.

A supply of potable water involves not only the source, but the collection, the treatment, the transmission, the storage, and the distribution works of the water supply system. Figure-S11.1 shows the above mentioned concept of management of water supply facilities operation including management cycle of information collection, analysis, evaluation and feed back activity.

Figure-S11.1 CONCEPT OF MANAGEMENT OF WATER SUPPLY FACILITIES OPERATION



## **S11.2 Monitoring System**

In line with the idea of overall control of whole water supply system, under the Buaran II Project (Part I of Second Stage, Jakarta Water Supply Project) the SCADA (Supervisory Control and Data Acquisition) System was already constructed as a sub-system of overall PAM SCADA System which will be constructed in the near future.

In consideration of current movement on Jakarta Water Supply System including a) PSP on PAM JAYA enterprise divides the service area, into two concession areas and b) future water supply should cover the area beyond the existing service area in Jakarta, both of which makes the system much more complex, it is very important to improve this SCADA System.

The PAM SCADA System, the central supervisory control center, will be constructed for the purpose of the following :

- a) to control overall Jakarta Water Supply System so as to even supply water to each zone, based on the data/information collected from treatment plants, transmission mains, distribution center, booster station, and distribution pipeline,
- b) to monitor whole water supply system for twenty four hours a day, and to maintain economical/optimum water supply operation through monitoring and control operation condition of whole water supply facilities,
- c) to detect leakage from pipeline by monitoring flow/pressure at strategic points of the system

The central supervisory control system by PAM SCADA System will largely contribute to the followings :

- a) to reduce UFW by continuous monitoring of flow/pressure at the strategic points of transmission trunk main, distribution trunk main, and distribution system.
- b) The continuous monitoring is able to locate the leak part of pipeline, and expedite leakage repair by informing of repair unit.
- c) to distribute water to each zone evenly in quantity and pressure by overall control by operating engineer at central station,
- d) to save consumption of electricity and chemicals at treatment plant through optimum/economical water supply operation including pressure control of pipeline,
- e) consequently the revenue will be increased

## **MP-S12 COST ESTIMATE**

The project cost of the Master Plan is calculated with breakdown of foreign (Yen) and local (Rupiah) currency portion. The total costs of Master Plan including construction cost, land acquisition cost, engineering services fee, and physical contingency, amounts to Y197,565,000,000 for foreign currency portion and Rp.4,026,548,000,000 for local currency portion, or Y389,305,000,000 equivalent. The costs are estimated at the price as of 1996 without consideration of price escalation. For the estimation of the costs, costs for previous and on-going relevant projects, namely Buaran I & II, Cisadane, and PJSIP Projects, were referred to. The project cost excludes construction cost relating raw water transmission, material and installation costs for house connections, raw water charge, operation and maintenance costs, and value added tax (VAT).

Unit cost of land is referred to Jakarta Water Resources Management Study prepared in 1994. Physical contingency is estimated at 5 % of total cost of construction cost, engineering services fee, and land cost.

## **MP-S13 FINANCIAL FORECAST**

### **S13.1 Organization, Management and Finance of Water Supply Enterprise**

Analyses of organization structure with special emphasis on interrelationship of organizational components identified various problems which hinder the economic and efficient performance of the organization and level of resource utilization. Examples of these problems are overlapping tasks among organizational components and individuals, lack of coordination, unclear hierarchical links and lack of delegation of authority.

In addition to organization structure of PAM JAYA, the study team carefully analyzed human resource management of PAM JAYA, for example, 1) training system, 2) employee benefit and incentive, 3) discipline, 4) career path system, 5) recruitment and selection system, 6) employee records. At present these systems are not effectively implemented and also unbalanced personnel distribution in terms of age, place of assignment, and specialization is observed.

In order for the new structure to achieve the effective and efficient organizational performance, PAM JAYA should lay great emphasis on such factors as structure, staff, skills and system. For instance, good organization structure does not by itself produce good performance. The overall effectiveness of the organization will be affected both by sound structural design and by the individuals filling the positions within the structure. At the same time, poor communication and coordination system make good performance impossible, no matter how good the structure may be.

Recommendations to strengthen structure, skills, staff and system are described in the master plan report by taking into consideration the above findings and results of questionnaire on managerial and organizational aspects of PAM JAYA.

### **S13.2 Financial Condition of PAM JAYA**

Overall financial condition of PAM JAYA in terms of results of operations, financial position and cash flows have been analyzed.

#### **(1) Results of Operations**

Higher levels of operating expenses such as chemical (due to inflation, new operation of Buaran I and inferior quality of raw water), personnel expenses because of significant increases in allowances, and purchase of raw water from POJ resulted in reduction of PAM JAYA's profit in 1993, which led PAM JAYA to re-increase its tariff effective June 1994. It should be noted that high unaccounted for water materially contributes to high production costs and therefore high water tariffs.

#### **(2) Financial Position**

Long-term debt to total assets ratio in 1994 suggests that PAM JAYA's creditors supplied 71.32% of the utility's total financing. Note that higher this proportion, the greater the long-term solvency risk.

### **(3) Cash Flows**

Cash flows from operating activities to capital expenditures ratio (an average of 32% of the past five years) underscores the fact that only one third of the utility's long-term investments was financed through internally generated funds.

### **(4) Depreciation Considerations**

PAM JAYA used the straight line method in accordance with fiscal regulation in accounting for depreciation and reports the amount of depreciation based on the fiscal regulation in the financial statements (for financial accounting purposes). Since the amount obtained from aforementioned income-tax procedures materially differs from where generally accepted accounting principles (useful life method) is followed, the net income based upon useful life significantly differs from that deriving from income-tax procedures (this does not represent economic usefulness of assets, therefore, distorts real profits), which, for example, also have a material effect on water tariff determination as detailed in this master plan report.

The water supply enterprise should improve financial and accounting aspects by:

- reducing operating expenses through improvement of unaccounted-for-water and through employment of the appropriate number of staff to reduce operating and administrative expenses.
- reducing or removing distribution of part of its profits to DKI to save cash flows for investment.
- using depreciation based on useful life for proper financial accounting and reporting as opposed to depreciation based on fiscal rule for tax reporting purposes.

### **S13.3 Water Tariff Determination System**

We examined how water tariffs are determined by PAM JAYA and identified some problems associated with tariff setting. For example,

- Basis of water tariffs of PAM JAYA does not include appropriate costs and provisions,

making tariff determination process unclear.

- Heavy cross-subsidization and use of depreciation based on fiscal (tax) rule in setting tariffs significantly contribute to very positive profits and cash flows for the projected years.
- PAM JAYA does not take into consideration tariff rise effects on water consumption.

Suggestions for improving water tariff determination system are presented in this master plan.

For example,

**(1) Costs to be Included**

PAM JAYA should use open and transparent procedures and calculation method in tariff setting. This can be done by including other appropriate costs and, if necessary, provisions to the extent that PAM JAYA should realize certain profits and cash inflows.

**(2) More Accurate Demand Projections**

Tariff rise effects on water consumption should be carefully taken into account when projecting water demand. Also alleviation or rebalancing of cross subsidization is of great importance to increase demand from commercial, industrial and special users.

**(3) Simplified Tariff Classifications**

More simplified tariff classification and accurate allocation of consumers to tariff categories should be done in order to eliminate ambiguity of categories and also to reduce administrative costs.

**S13.4 Billing and Collection System**

Current billing and collection system is described in this master plan. The current collection system involves significant cash transactions, thus the likelihood of embezzlement of cash receipt by staff is high. Therefore, internal control of collection (cash receipt) should be strengthened by having staff no access to cash in the collection system. Consumers' payment



at banks and/or post offices should be implemented.

### **S13.5 Publicity and Customer Service**

Water supply enterprise should promote community awareness and understanding through health education leaflets, school curricula, and radio and TV programs. In this connection, PAM JAYA should strengthen public relations activities by adding qualified personnel to a subdivision or, preferably, a division responsible for public relations.

Customer database should be developed to ensure efficient customer service and longer hours of telephone hot line should be created. In addition, renovation of cabangs and rayons should be done. More importantly, employees should acquire concept of customer service through training.

### **S13.6 Office Environment**

Working environment of field offices such as cabangs and rayons should be improved through establishment of efficient and effective filing system and introduction of computers (possibly office automation) to increase the effectiveness and efficiency of personnel.

### **S13.7 Financial Forecast of Jakarta Water Supply Sector**

This section presents financial forecast of the total water supply business in DKI Jakarta by applying the concept of business combinations or consolidations which involves bringing together a corporation and one or more incorporated businesses (in this case, PAM JAYA and two private consortia) into one accounting entity.

The objective of the forecast is to project the results of operations (profit or loss) and cash flows with a range of options incorporating different tariffs and sources of funds. In this financial forecast, fifteen scenarios are developed to examine the forecast's sensitivity to changes in the different assumptions noted above. Results of each scenario are set out in this report.

## **MP-S14 IMPLEMENTATION SCHEDULE**

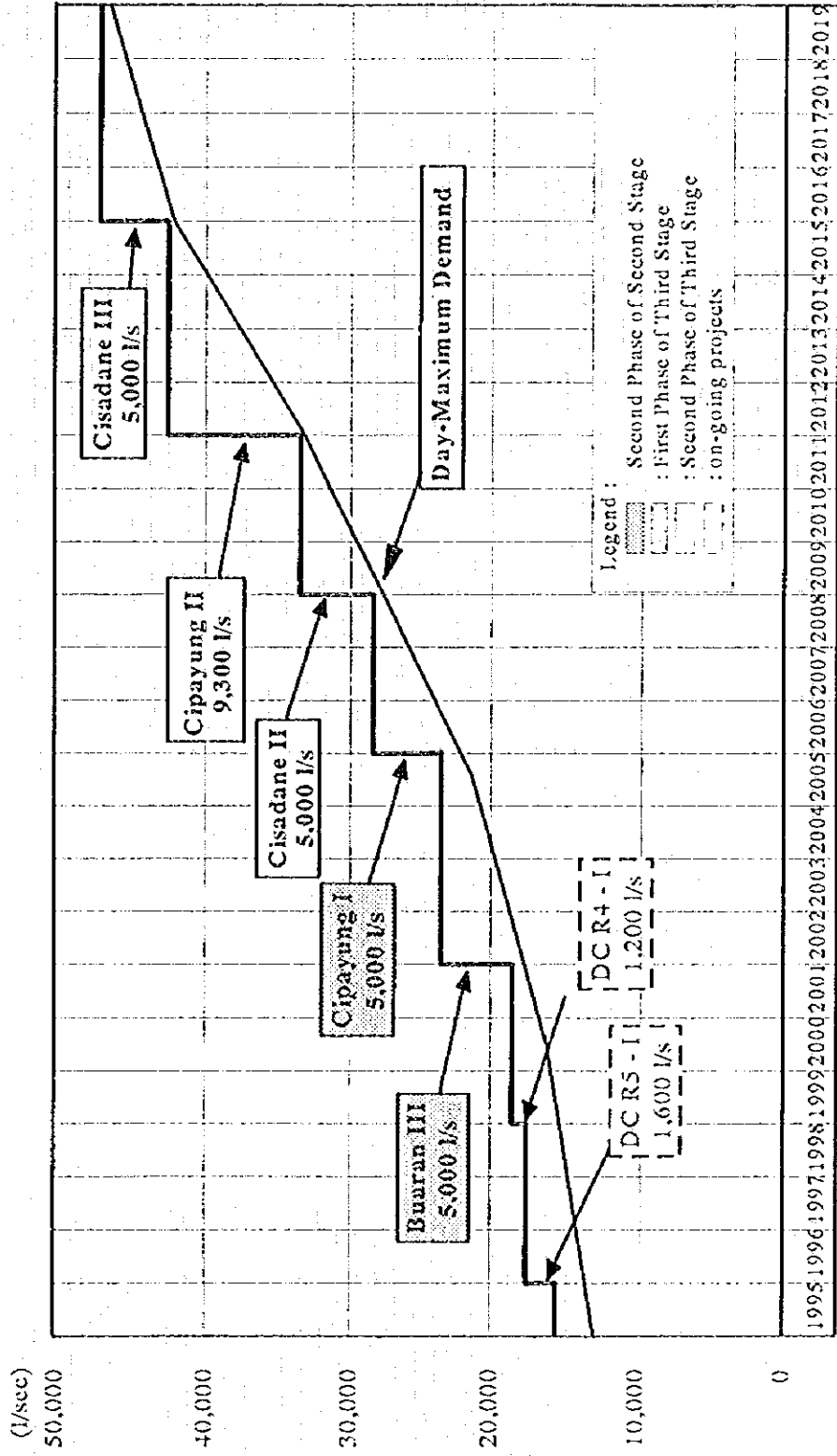
The implementation of the proposed water supply system development upto target year of 2019 for Master Plan should be planned and arranged taking into account the implementation plan of JICA 1985 Master Plan and the present conditions of the on-going projects. Stagewise development is applied in order to avoid a huge investment to execute at one time construction of facilities for the proposed system in the year 2019.

Implementation by two stages are recommended, namely the Second Stage for the target year 2008 and the Third Stage for 2019. The staging of the proposed system is considered mainly based on timing of the raw water development plan to the Jakarta and progress of the on-going projects which were recommended by JICA 1985 Master Plan. Proposed staging development plan is shown on **Figure-S14.1**.

The Second Phase of the Second Stage as the first program of the Study is proposed to be executed by two parts in its implementation, namely constructions of Buaran III Treatment Plant and Cipayung Treatment Plant. The Third Stage Program is proposed to be executed by two phases, namely constructions of Cipayung II Plant and Cisadane II and III Treatment Plants. **Table-S14.1** shows list of facilities required for each Stage.

The Second Phase of the Second Stage is proposed to be included in the Feasibility Study of this Study.

Figure-S14.1 DAY-MAXIMUM WATER DEMAND AND TREATMENT CAPACITY



**Table-S14.1 LIST OF FACILITIES REQUIRED**

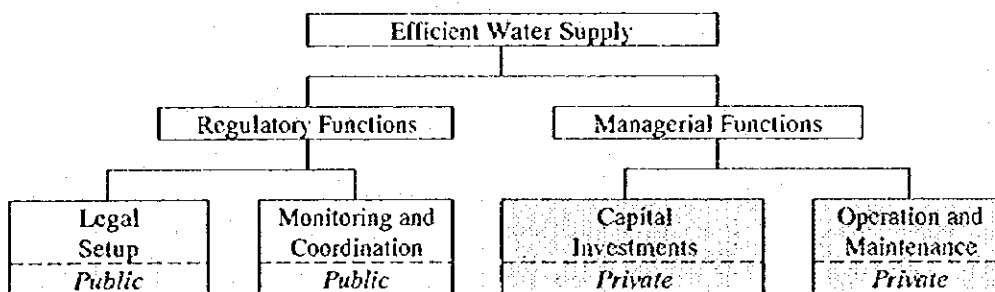
Stage	Phase	Part	Facilities Required	Capacity / Length
2nd Stage	2nd Phase	Part 1	Buaran III Treatment Plant	5,000 l/s
			R1 II Distribution Center	2,000 l/s 19,800 m <sup>3</sup>
		Part 2	R6 I Distribution Center	2,100 l/s 50,400 m <sup>3</sup>
			Treated Water Transmission R1-R6	Dia.1500 x 33.5 km
3rd Stage	1st Phase	Part 1	New East Treatment Plant I	5,000 l/s 46,400m <sup>3</sup>
			R4 II Distribution Center	2,600 l/s 35,100m <sup>3</sup>
		Part 2	R5 II Distribution Center	1,600 l/s
			Treated Water Transmission East TP - R4	Dia.2,200 x 15.5 km Dia.2,000 x 8.0 km Dia.1,800 x 11.0 km Dia.1,500 x 5.5 km Dia.1,000 x 1.5 km
3rd Stage	1st Phase	Part 1	Raw Water Transmission Pump Station	5,025 l/s x 2 places
			Raw Water Transmission to East TP	Dia.1,800 x 20.0 km
		Part 2	Cisadane Treatment Plant II	5,000 l/s
			R1 III Distribution Center	- 19,800m <sup>3</sup>
3rd Stage	2nd Phase	Part 1	R3 I Distribution Center	800 l/s 22,500m <sup>3</sup>
			R4 III Distribution Center	1,000 l/s 23,200m <sup>3</sup>
		Part 2	Treated Water Transmission Cisadane TP - R4	Dia.1,800 x 14.0 km Dia.1,200 x 15.0 km
			East TP - R6	Dia.1,800 x 10.0 km Dia.1,500 x 2.0 km
3rd Stage	2nd Phase	Part 1	New East Treatment Plant II	10,000 l/s
			R3 II Distribution Center	1,300 22,500m <sup>3</sup>
		Part 2	R4 IV Distribution Center	1,200 23,100m <sup>3</sup>
			R6 I Distribution Center	800 -
3rd Stage	2nd Phase	Part 1	Treated Water Transmission East TP - R4	l/s Dia.2,200 x 15.5 km Dia.2,000 x 8.0 km
			Treated Water Transmission East TP - R4	Dia.1,800 x 11.0 km
		Part 2	Cisadane Treatment Plant III	5,000 l/s
			R3 II Distribution Center	400 l/s -
3rd Stage	2nd Phase	Part 1	R4 IV Distribution Center	400 l/s -
			R6 I Distribution Center	1,500 l/s -
		Part 2	Treated Water Transmission R5 - R4	Dia. 700 x 2.0 km
			Cisadane TP - R5	

## MP-S15 STUDY ON COOPERATION WITH PRIVATE SECTOR

The standpoint of the Master Plan is to contemplate how to facilitate and assist maximum achievement of the social mission assigned to the Jakarta Water Supply as a public utility by means of cooperation with the private sector. Cooperation with the private sector should be introduced with special attention to keep its consistency with the social benefit, and within the regulatory framework set out by the government

In order to utilize technical, managerial and operational merits of the private sector, management, operation and maintenance including budgeting, revenue collection and administrative activities of the water supply system from the water treatment plants to the customer are undertaken by the private consortia under the concession contracts.

Based on the consideration above, desirable allocation of principal functions will be the figure shown below.



Maximum introduction of private funds for capital works should be pursued in a viable way particularly from its financial and social perspective. However, the involvement of ODA should be continuously taken into account as well to realize its full advantage as follows:

- a) Attract more private fund demonstrating that the project concerned is nationally supported.
- b) Reduce cost of fund for investment.
- c) Assure sufficient amount of long-term fund for the projects.
- d) Less difficult in fund request on the existing track.
- e) The projects are appraised from the development viewpoint; particularly,
  - ① Consistency with the overall development plan,
  - ② Consistency with the social targets including environmental consideration,
  - ③ Institutional capacity to conduct the project implementation and operation

including coordinated government leadership.

Parallel efforts for institutional capacity strengthening including development of regulatory framework is to be conducted in order to guide the private-involving water supply development to the achievement of the social mission of water service without weakening the advantages of the private participation. The issue of institutional strengthening is further discussed in the next section from the viewpoint involving administrative and legal aspects as its integral elements.

## **MP-S16 ADMINISTRATIVE FRAMEWORK**

### **S16.1 Administrative Aspect**

The administrative system is the apparatus to execute public regulation set out by the legal framework. Sound administration is essential to carry out effective as well as efficient conduct of the total development and management of the water supply system,

The present water supply system including water supply management in Indonesia is characterized as spread-over responsibility sharing involving several ministries and agencies without satisfactory coordination.

The required interdepartmental administrative structure of the water supply system should be developed and to obtain the conclusive structure regarding the administrative framework is subject to the result of further studies for the institutional development stated below, however, the following ideas would deserve consideration as hypotheses.

- PAM JAYA should have responsibility to deal with some of the regulatory functions more than ones for only performance monitoring of concessionaires and coordination. Conceivable functions which seem to suit the undertakings by PAM JAYA would be the institutional and policy-related control and evaluation of total service quality including customer satisfaction research.
- It has been already confirmed that efficient and rational water resource management system prefers the management and operation based on hydrologic and hydrogeologic drainage basin of rivers to the ones based on administrative boundaries. The JABOTABEK water resources management should also seek this way which JABOTABEK Metropolitan Development Plan has ever envisaged. In this regard, such alternatives now prevailing as establishment of bulk water supply companies (PDAB) at municipal level; financially self-sustaining authorities for comprehensive water management by the river basin; a joint

government/private sector corporation (GJBWSC by JWSSP) are to be carefully examined.

## **S16.2 Institutional Development**

The institutional development involving legal and administrative aspects must start with considering functions required to perform desirable water supply services as a total system; because, the legal system is a package of rules while the administrative framework is an apparatus to conduct the whole process of water supply carrying out all the functions necessary to achieve the social mission assigned.

The functions required to conduct the whole process of water supply from water resources until the consumers would be as follows:

- (1) Water resource development based on a comprehensive analysis of water demand
- (2) Water resource management and control
- (3) Development of drinking water facilities
- (4) Drinking water supply
- (5) Public regulation on water supply service
  - 1) Institutional and policy-related control
  - 2) Supervision on water supply services
  - 3) Technical supervision
  - 4) Financial supervision

Preferable steps for the institutional development is as follows:

- (1) Establishment of fundamental water act
- (2) System elaboration for implementation
  - 1) Review of present administration system
    - I Review of prevailing system from the following points of view.
      - a) Identify undertakers of respective functions required for total water management
      - b) Review how they are being performed
      - c) Review how each activity is coordinated and synthesized into total management
      - d) Identify functions that are not performed at all or in a satisfactory manner
      - e) Identify needed coordination that present system lacks
    - II Review of the past efforts for administrative structure development
    - III Identification of preferable administrative structure
    - IV Preparation of action program for structure development
  - 2) Review of present water regulations

The existing laws and regulations should be reviewed in the framework of the implementation of the fundamental water act concurrently with the administrative review above. The review must be conducted trying to identify inadequate, insufficient, duplicate, inconsistent and missing regulations to implement the principles expressed in the

fundamental water act.

## **MP-S17 LEGAL FRAMEWORK**

Various laws and regulations have been prepared to guide and regulate problematical areas of the water supply. They are directly dominated by the Indonesian Constitution 1945, Article 33 which prescribes social welfare.

The Master Plan suggests that as a basic component of the institutional strengthening that a fundamental water act be established bridging the both by conducting all aspects of the water supply from the viewpoint of social benefit. The act should give a normative guidance for the water supply development, management and operation with comprehensive guidelines involving technical, legal, managerial, financial and other relevant aspects.

The ministerial regulation of Public Works for "Water Supply Infrastructure and Facility Development and Management" under consideration should be carefully discussed and examined to be the foundation of this fundamental act.

## **MP-S18 EVALUATION AND RECOMMENDATION**

### **S18.1 Evaluation of Master Plan**

Master Plan for Jakarta Water Supply Development of which target year is 2019 has been discussed in the previous section. In this section, the contents of the Master Plan are reviewed comparing with basic concepts which were defined in the very beginning of the Master Plan.

Comparison of the basic concepts and proposal recommend in the Master Plan is shown on Table-S18.1. As a results of evaluation of the Master Plan, it is concluded that the Plan is satisfactorily conforming to the basic concept.



## **S18.2 Identification of Priority Project**

To meet the required future water demand, the Second Phase of the Second Stage Program as the priority project of the proposed Jakarta Water Supply System should be implemented immediately.

The Second Phase of the Second Stage as the priority project which includes two parts of implementation programs are as follows.

### **(1) Part 1, the target year 2004**

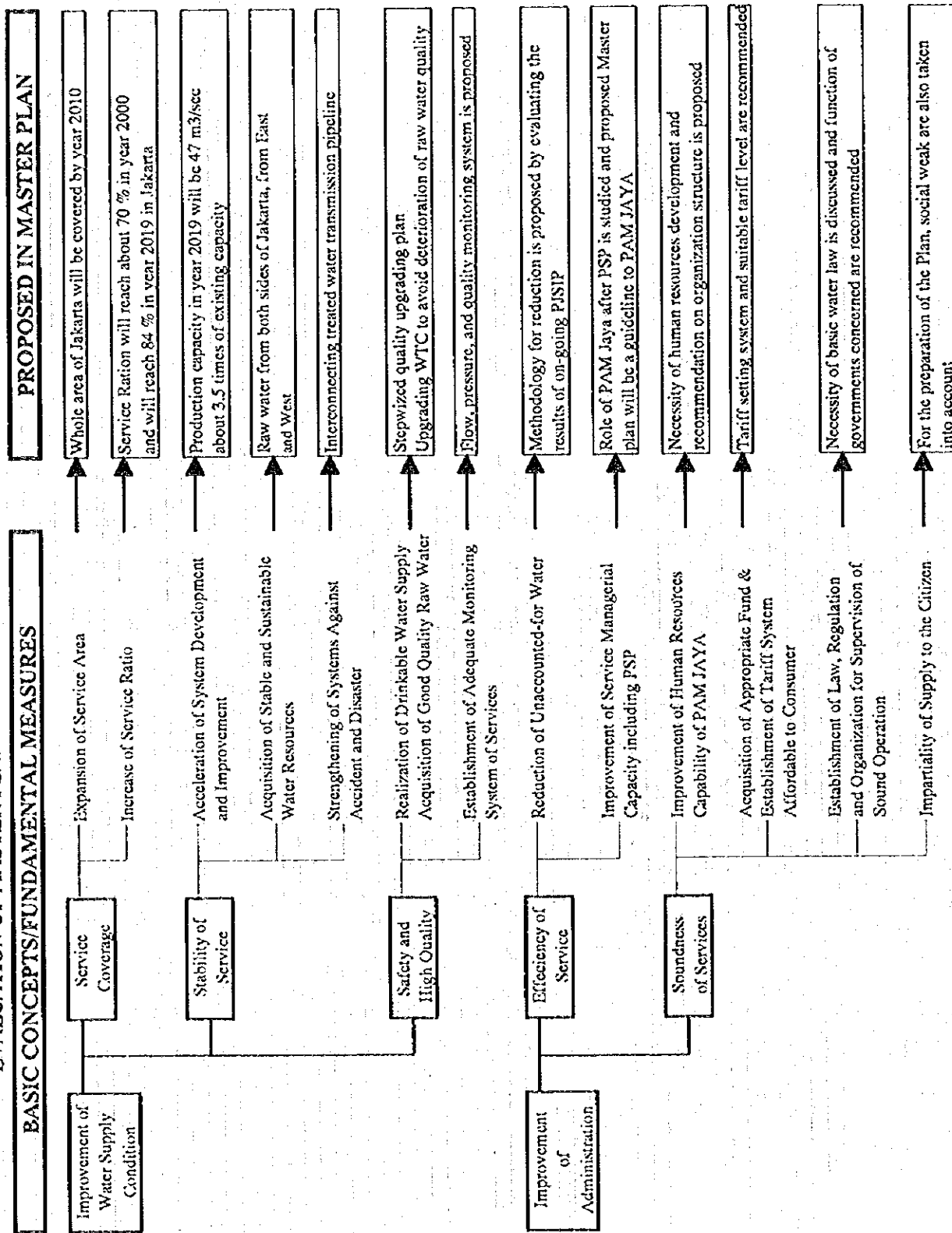
- Expansion of existing Buaran Treatment Plant with the capacity of 5,000 l/sec taking raw water from the upgraded WTC
- Expansion of existing Distribution Center R1 with the capacity of 2,000 l/sec receiving treated water from Buaran Treatment Plant (Treated water transmission pipeline will use existing transmission pipeline).
- New Distribution Center R6 with the capacity of 2,100 l/sec receiving treated water from Buaran Treatment Plant through Distribution Center R1.
- Treated Water Transmission Pipeline from Distribution Center R1 to R6 with the total pipeline length of 33.5 km.

### **(2) Part 2, the target year 2008**

- New construction of Cipayung Treatment Plant with the capacity of 5,000 l/sec taking raw water from the WTC through raw water transmission pipeline of which length will be 20.0km.
- Expansions of existing Distribution Centers R4 and R5 with the capacity of 2,600 l/sec and 1,600 l/sec, respectively, receiving treated water from Cipayung Treatment Plant.
- Treated Water Transmission Pipeline from Cipayung Treatment Plant to Distribution Centers R4 and R5 with the total pipeline length of 41.5 km.

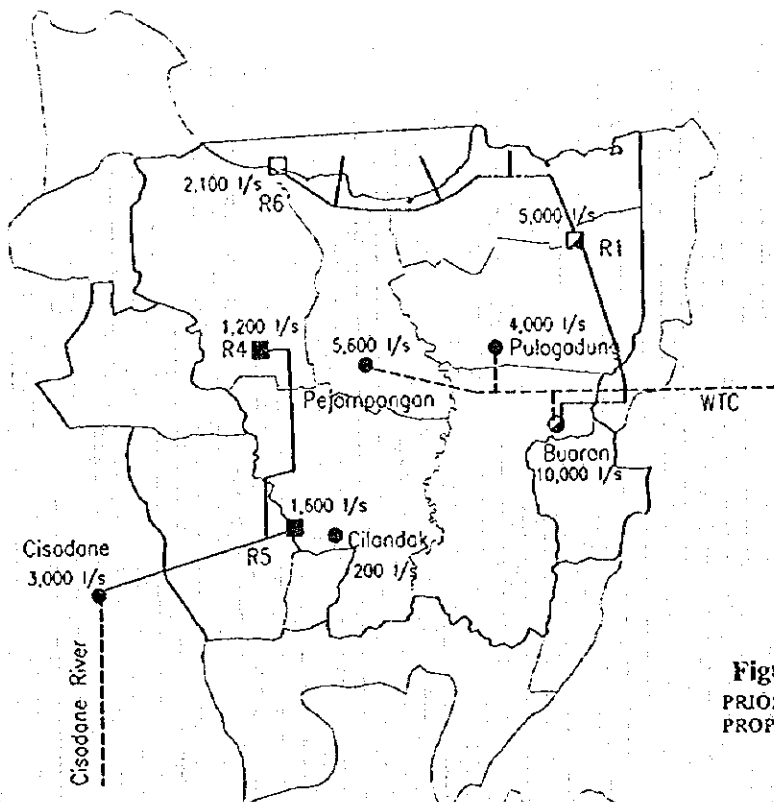
In the each program, implementation of construction of distribution mains and service mains are also included for expansion of service area. Facilities required for each part are shown on the **Figures-S18.1 and S18.2.**

**Table-S18.1 EVALUATION OF MASTER PLAN**



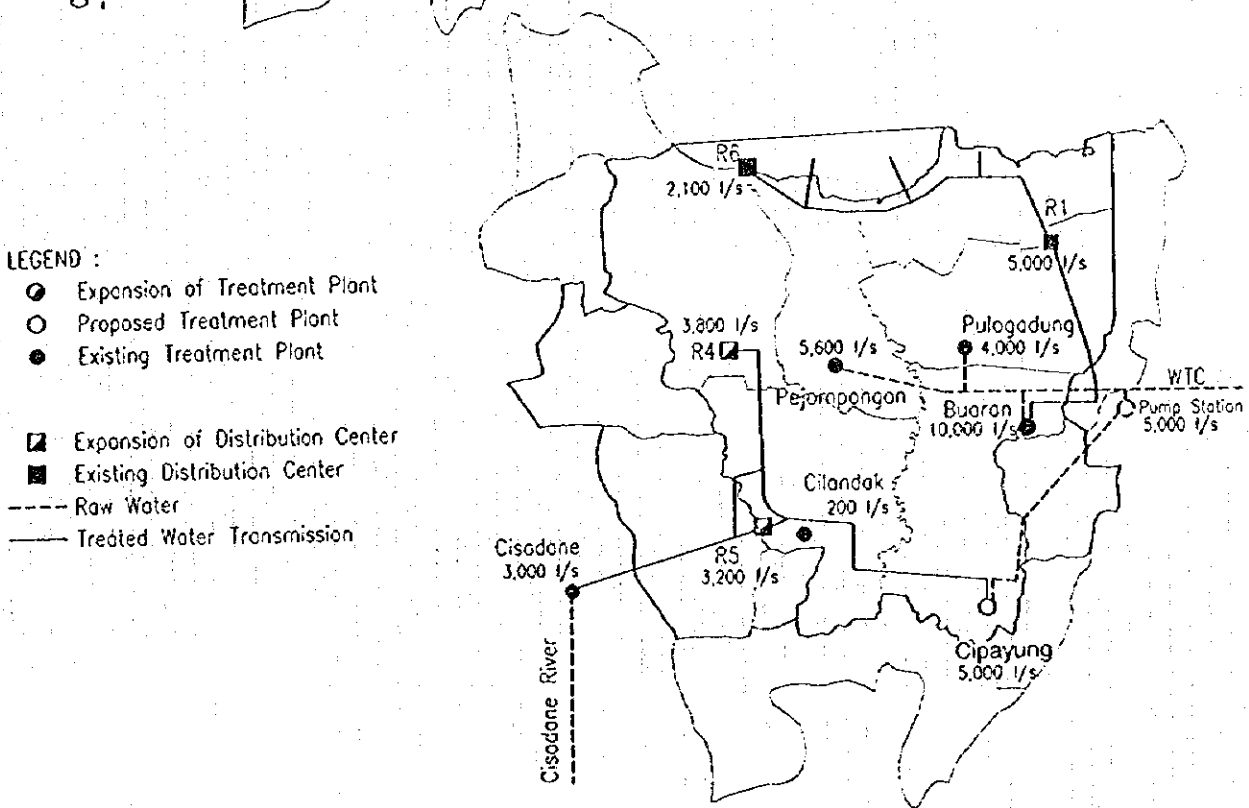
**Figure-S18.1**

**PRIORITY PROJECT PART 1  
PROPOSED WATER SUPPLY SYSTEM IN 2005**



**Figure-S18.2**

**PRIORITY PROJECT PART 3  
PROPOSED WATER SUPPLY SYSTEM IN 2008**



**LEGEND :**

- Expansion of Treatment Plant
- Proposed Treatment Plant
- Existing Treatment Plant
- Expansion of Distribution Center
- Existing Distribution Center
- - - Raw Water
- Treated Water Transmission

### **S18.3 Recommendations**

This Master Plan has been prepared by revising the previous master plan which was prepared in the 1985. During the last decade, Jakarta City has been developed even though the rate of population growth is rather lower than the rate which was estimated in 1985 master plan. Circumstances and environment are also changed from the condition in 1985. Therefore, after a decade, the 1985 master plan is reviewed and revised as this Master Plan.

It is needless to say, condition of city will change year by year and some changes are not forecasted at this time. Therefore, this Master Plan is also necessary to be reviewed and revised periodically.

According to the implementation schedule, after implementation of the priority project, 3rd Stage project (detail design works for 3rd stage) should be commenced from year 2004. To avoid delay of the project, feasibility study works for priority projects of the 3rd Stage should be conducted during year 2003 prior to the commencement of the project.

It is recommended to review and revise the Master Plan in year 2002, before starting the feasibility study, and the Plan should be adjusted to fit the situation at that time.