Directorate General of Human Settlements, Ministry of Public Works

DKI Jakarta

PD PAL JAYA

THE PROJECT FOR CAPACITY DEVELOPMENT OF WASTEWATER SECTOR THROUGH REVIEWING THE WASTEWATER MANAGEMENT MASTER PLAN IN DKI JAKARTA IN THE REPUBLIC OF INDONESIA

FINAL REPORT

(MAIN REPORT)

MARCH 2012

JAPAN INTERNATIONAL COOPERATION AGENCY

YACHIYO ENGINEERING CO., LTD.
JAPAN ENVIRONMENTAL SANITATION CENTER
WATER AGENCY INC.

GED
JR
12-058

Directorate General of Human Settlements, Ministry of Public Works

DKI Jakarta

PD PAL JAYA

THE PROJECT FOR CAPACITY DEVELOPMENT OF WASTEWATER SECTOR THROUGH REVIEWING THE WASTEWATER MANAGEMENT MASTER PLAN IN DKI JAKARTA IN THE REPUBLIC OF INDONESIA

FINAL REPORT

(MAIN REPORT)

MARCH 2012

JAPAN INTERNATIONAL COOPERATION AGENCY

YACHIYO ENGINEERING CO., LTD.
JAPAN ENVIRONMENTAL SANITATION CENTER
WATER AGENCY INC.

Currency Conversion Rate

USD 1.00 = JPY 79.87、USD 1.00 = IDR 8,570

JPY 1.00 = IDR 107.38、IDR 1.00 = JPY 0.00931

(Average of end of March 2011 to August)

Photo (1/4)

Only one wastewater treatment plant currently operated in Jakarta (Setiabudi WWTP).

The 1st JCC meeting held in December 2010.

Influent channel into the existing Setiabudi WWTP.

One of flood control gates in the Jakarta city.

On-site sludge is discharged into receiving tank at the existing sludge treatment plant.

Condition of flood in Jakarta city after heavy rain.

Photo (2/4)

Residential areas along one of the rivers in Jakarta.

Observatory survey of the factory of septic tank.

Drainage is contaminated by sewage and solid wastes in Jakarta.

Gray water flowing into drainage from septic tank.

Condition of solid wastes accumulated in the Pluit pond.

Dumping areas of solid wastes are found along rivers.

Photo (3/4)

Inside of the existing manhole.

Field survey for the existing pipe line.

Existing Duri Kosambi sludge treatment plant.

Site survey of candidate sites for new WWTP.

Site survey of candidate sites for new WWTP.

The 2nd JCC meeting held in July 2011.

Photo (4/4)

Condition of the individual treatment plant.

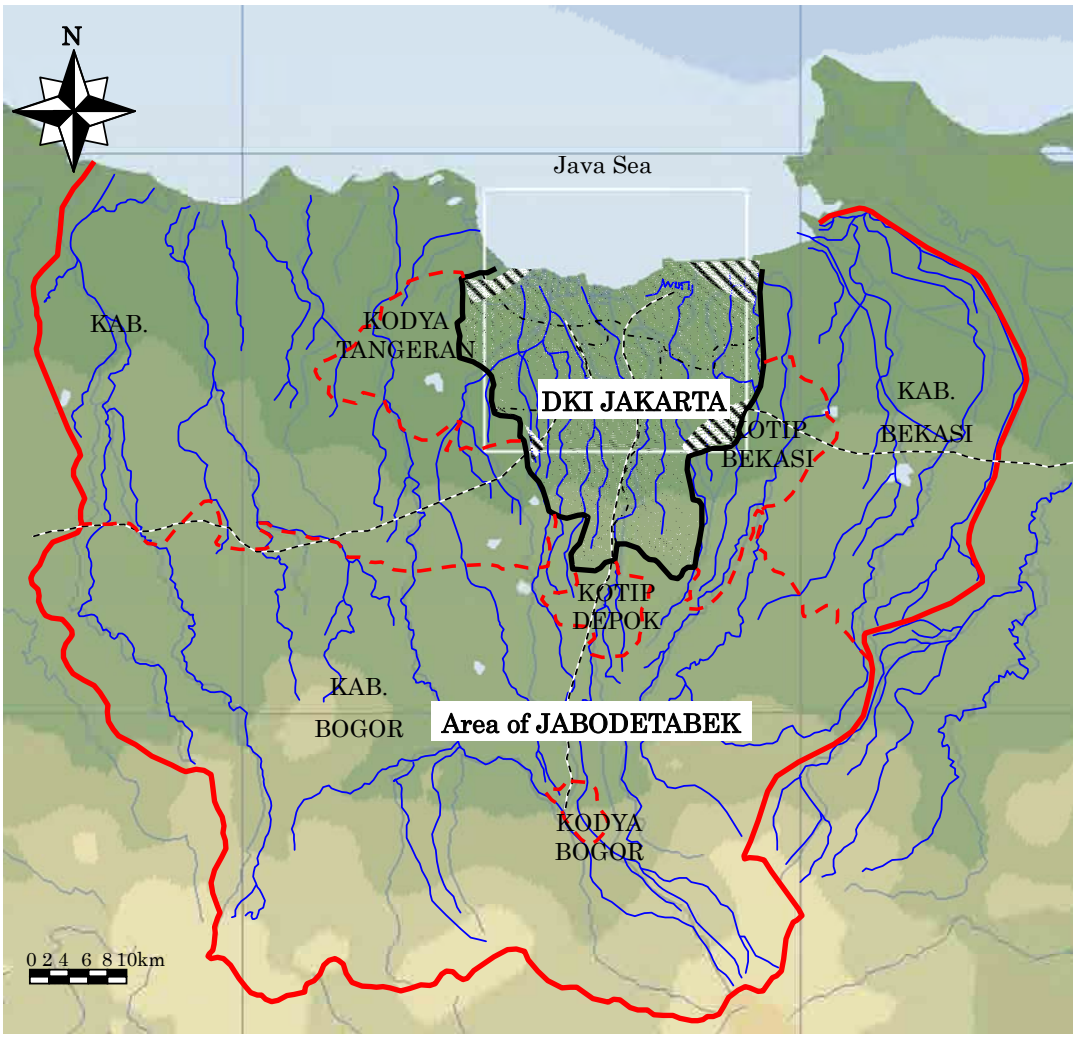
Condition of septic tank in the slum area.

Survey for septic tank of one of the residents in slum area.

Meeting for Draft Final Report explanation held in February 2012.

Seminar for the outcomes of the Project held in March 2012.

Seminar for the outcomes of the Project held in March 2012. One of C/P members is making a presentation.



Location Map of Study Area

List of Report

Main Report (English)
Main Report (Japanese)
Main Report (Indonesia)

Summary Report (English)
Summary Report (Japanese)
Summary Report (Indonesia)

Supporting Report (English)

PART-A (Not applicable: no figures and tables are included.)
PART-B DATA AND INFORMATION
PART-C FUNDAMENTAL PLANNING AND DESIGN CONSIDERATIONS
PART-D FORMULATION OF MASTER PLAN
PART-E ECONOMIC AND FINANCIAL EVALUATION
PART-F EVALUATION BY ENVIRONMENTAL SOCIAL CONSIDERATIONS
PART-G INSTITUTIONAL CONSIDERATIONS
PART-H ENVIRONMENTAL EDUCATION AND PUBLIC CAMPAIGN ACTIVITIES FOR WASTEWATER SECTOR
PART-I CAPACITY BUILDING FOR COUNTERPART ORGANIZATIONS
PART-J (Not applicable: no figures and tables are included.)
PART-K (Not applicable: no figures and tables are included.)

Japan International Cooperation Agency

Directorate General of Human Settlements, Ministry of Public Works
DKI Jakarta
PD PAL JAYA

The Project for Capacity Development of Wastewater Sector Through Reviewing the Wastewater Management Master Plan In DKI Jakarta

THE NEW MASTER PLAN

March 2012

Yachiyo Engineering Co., Ltd.
Japan Environmental Sanitation Center
Water Agency Inc.

The New Master Plan

Contents

The New Master Plan (M/P) for Improvement of Wastewater Management in DKI Jakarta

Chapter 1 Purpose, Period and Vision for the New M/P

1.1 Purpose for Formulating the New M/P

The purposes for formulating the New M/P for improvement of wastewater management in DKI Jakarta are as follows:

- Development of sewerage system could not proceed as planned and the coverage remains as low as less than 2%, although Cipta Karya of Ministry of Public Works formulated a master plan featuring drainage, sewerage and sanitation development in DKI Jakarta for the target year of 2010 through "the Study on Urban Drainage and Wastewater Disposal Project in the City of Jakarta" under JICA development study (hereinafter referred to as the "Old M/P").
- More than 90% of the domestic wastewater is currently being discharged into public bodies (rivers and sea) or underground through septic tanks without treatment. This causes the deterioration of water quality of surface water and groundwater as well.
- Due to the poor water quality of the surface water, water supply sources have to be obtained from the remote areas outside of DKI Jakarta and it leads to the high water tariff and excessive extraction of groundwater which is considered as the main cause of a large scale land settlement in the region. Moreover, the poor water quality also causes the water-borne disease in the region.
- Sewerage facilities such as wastewater treatment plants require relatively large area to construct treatment facilities. However, it is getting more difficult to find such a large land in DKI Jakarta due to the rapid economic growth in the near future. It is important to secure the lands for the sewerage facilities based on the New M/P.

1.2 Period

The New M/P proposes development plans for improvement of wastewater management in DKI Jakarta for the following development years and prioritized projects as the short-term development plan.

(Year) 2012 2020 2030 2050

Short-term Development Plan	Medium-term Development Plan	Long-term Development Plan
Prioritized Projects are proposed.	**Facility plans are proposed.**	**Facility plans are proposed.**

1.3 Vision

Vision for the New M/P is set as follows:

[Vision]

"Create sustainable water cycling society in DKI Jakarta"

Improve the current river water quality up to the level that river water can be used as water sources for water supply system in DKI Jakarta by the year 2050.

Chapter 2 Current Situation and Improvement Targets

2.1 Current Situation of Sewerage and Sanitation in DKI Jakarta

Figure S2-1 shows the current situation of treating & discharging wastewater in DKI Jakarta. Also, Figure S2-2 and 3 explain the current situation of mass balance for BOD and SS basis in the region respectively.

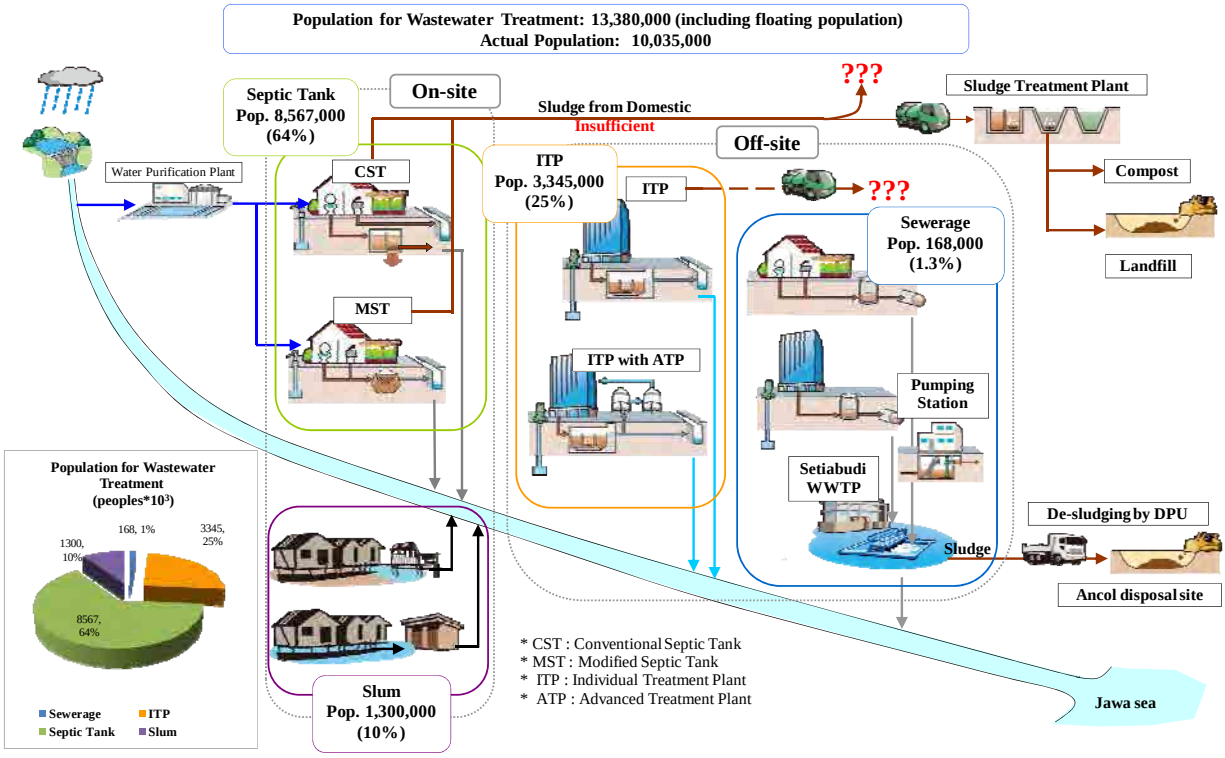
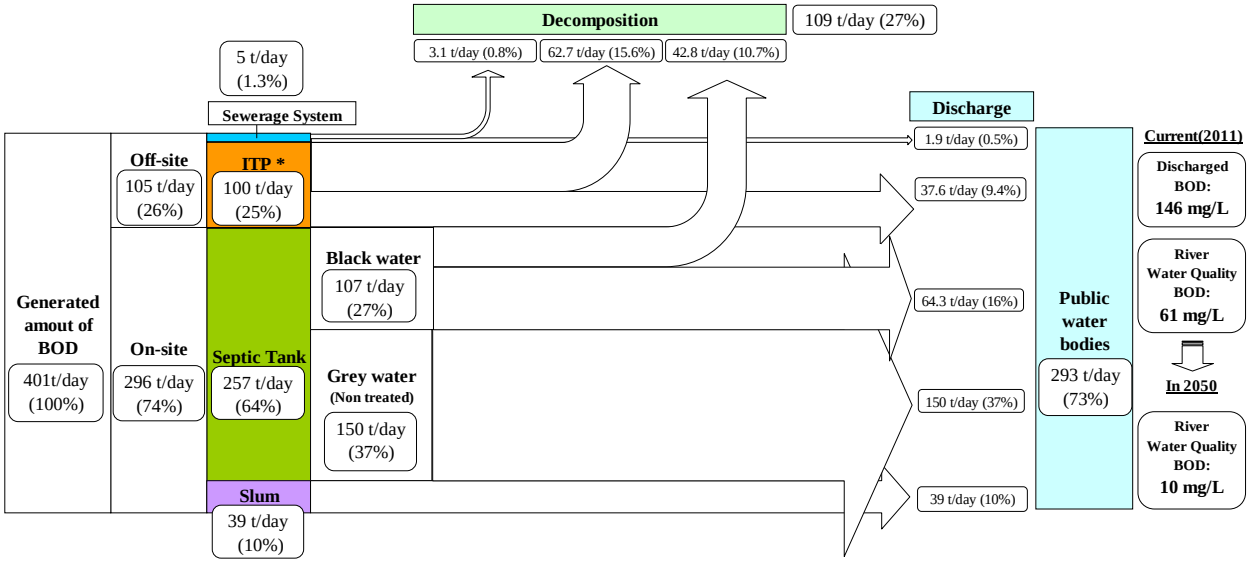


Figure S2-1 Current Situation for Wastewater Discharge in DKI Jakarta



* ITP : Individual Treatment Plant

Figure S2-2 Current Situation of Mass Balance for BOD Basis

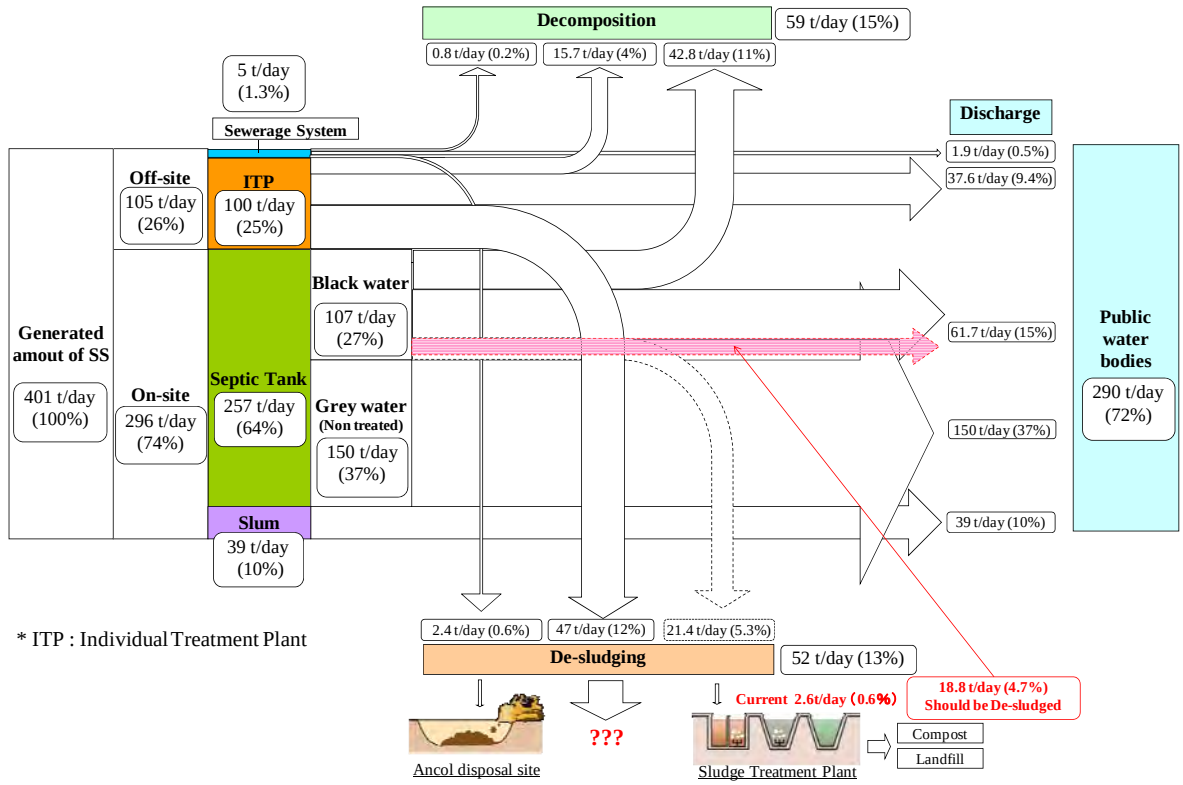


Figure S2-3 Current Situation of Mass Balance for SS Basis

More than 70% of the generated amount of BOD is being discharged to public water bodies (including groundwater). Meanwhile, more than 70% of the generated amount of SS is also discharged to public water bodies. It is clear that this situation is deteriorating river water quality in DKI Jakarta as well as worsening groundwater quality.

2.2 Improvement Targets

In order to fulfill the vision mentioned above, the following targets are proposed in the New M/P:

Table S2-1 Improvement Targets for Wastewater Management in DKI Jakarta

Item		Unit	Short-term Plan			Medium-term Plan	Long-term Plan
			Y2012	Y2014	Y2020	Y2030	Y2050
Design Population		1,000PE	12,665	12,665	12,665	12,665	12,665
Administration Population		1,000PE	10,035	10,361	11,284	12,665	12,665
Off-site	Facility Coverage Ratio	%	2	7	20	40	80
	Service Coverage Ratio	%	2	4	15	35	80
	Served Population	*1,000PE*	*168*	*387*	*1,685*	*4,478*	*10,166*
On-site	On-site Treatment Ratio	%	85	96	85	65	20
	Served Population for On-site	*1,000PE*	*8,567*	*9,974*	*9,599*	*8,188*	*2,500*
	Regular Desludging Coverage ratio	*%*	*0*	*20*	*50*	*75*	*100*
	Change CST to MST (MST/(CST+MST))	*%*	*2*	*16*	*25*	*50*	*100*
Slum areas	Open Defecation Ratio	%	13	0	0	0	0
	Open Defecation Population	*1,000PE*	*1,300*	*0*	*0*	*0*	*0*
River Water Quality (BOD)		mg/L	61	54	33	24	10

Chapter 3 Formulation of the New M/P to Achieve the Targets

3.1 Demarcation between Off-site and On-site Areas

The demarcation between off-site and on-site areas is shown below:

System	Area to be Applied
Off-site System	Applied to all the DKI Jakarta area
On-site System	Applied to the areas where off-site system development is technically difficult

3.2 Development Stages

The proposed projects in the New M/P will be implemented in the following three (3) stages:

Development Plan	Period	Remark
Short-term development plan	2012 to 2020	Implemented as the priority projects
Medium-term development plan	2021 to 2030	Population reaches to it maximum
Long-term development plan	2031 to 2050	Population will be kept to the same level

3.3 Sewerage Zones and Prioritized Project Areas for Each Target Development Year

Sewerage zones for each target development year have been determined as shown below:

Priority	Zone No.	Target Development Year
1	**1**	Short-Term Plan: Year 2012 to 2020
2	**6**	
3 to 6	**4, 5, 8 & 10**	Mid-Term Plan: Year 2021 to 2030
7 to 14	**2, 3, 7, 9, 11, 12, 13 & 14**	Long-Term Plan: Year 2031 to 2050

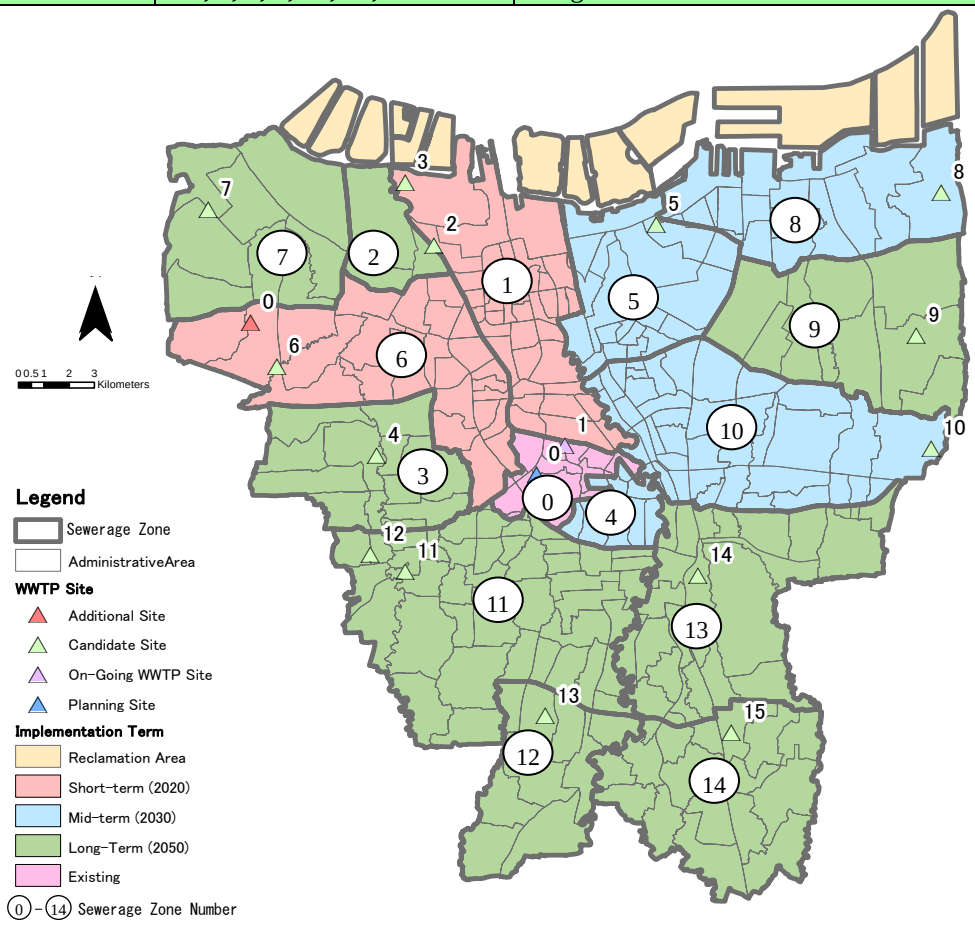


Figure S3-1 Sewerage Zones for Each Target Development Year[1]

[1] The zoning and each target development year are subject to change after the detailed examination in feasibility study (F/S).

3.4 Summary of Off-site and On-site System Development Plans

The summary of the New M/P is as shown in Table S3-1 below:

The projects for the Short-Term development plan (sewerage Zone No.1 and No.6 and sludge treatment facilities to support the introduction of regular desludging) are considered as the prioritized project. The facility plans were prepared for these prioritized projects.

Table S3-1 Summary of the New M/P

No.	Item	Unit	Short-Term (2020)	Mid-Term (2030)	Long-Term (2050)	New M/P (2050)
1	Sewerage Zone		No.1 & No.6	No.4, 5, 8 & 10	No.2, 3, 7, 9, 11, 12, 13 & 14	14 Zones
2	Project area	ha	10,775	15,301	37,328	63,404
3	Design population	PE	2,702,454	3,735,294	5,905,620	12,343,368
4	Coverage ratio (for each zone)	%	80	80	80	80
5	Coverage ratio (for whole DKI)					
	(1) Facility coverage ratio	%	20	40	80	80
	(2) Service coverage ratio	%	15	35	80	80
6	Design wastewater flow		(Unit wastewater × Design Pop. × Coverage Rate = 80%)			
	(1) Unit wastewater	LCD	Daily average: 200LCD, Daily maximum: 267LCD			
	(2) Daily average wastewater flow	m^3/day	433,000	598,000	946,000	1,977,000
	(3) Daily maximum wastewater flow	m^3/day	577,000	798,000	1,261,000	2,636,000
7	Secondary & tertiary sewer					
	(1) Diameter	mm	φ200～φ300	φ200～φ300	φ200～φ300	
	(2) Length of pipeline	km	1,486	2,043	4,741	8,271
8	Main sewer					
	(1) Diameter	mm	φ350～φ800	φ350～φ800	φ350～φ800	
	(2) Length of pipeline	km	241	471	1,203	1,915
9	Trunk sewer					
	(1) Diameter	mm	φ900～φ2,200	φ900～φ2,400	φ900～φ2,400	
	(2) Length of pipeline	km	39.5	36.4	82.0	157.9
10	Relay pumping station					
	(1) Place	unit	1	3	9	13
	(2) Lifting capacity	m^3/min	172	27～83	10～194	
11	WWTP					
	(1) Place	unit	2	3	8	13
	(2) Capacity (daily maximum wastewater)	m^3/day	264,000～313,000	62,000～331,000	32,000～337,000	2,636,000
12	Sludge Treatment Facilities (On-site sludge)					
	(1) Improvement of Existing STP	No.	1			1
	- Capacity	m^3/day	450	-450 (Integrated to WWTP)		0
	(2) New Construction of STP	No.	1			1
	- Capacity	m^3/day	600			600
	(3) STP at WWTP (capacity for on-site sludge)	m^3/day	1,720	1,920		3,640

Note:
1. Sewerage Zone No.0 (the existing sewerage zone) and the reclamation area are not included in the above table.
2. Figures in the above table are subject to change after the detailed examination in F/S.

3.5 Improvement Plan for Off-site and On-site Systems

(1) Off-site System

The design daily average wastewater flow and the design daily maximum wastewater flow of proposed WWTPs are shown in Table S3-2.

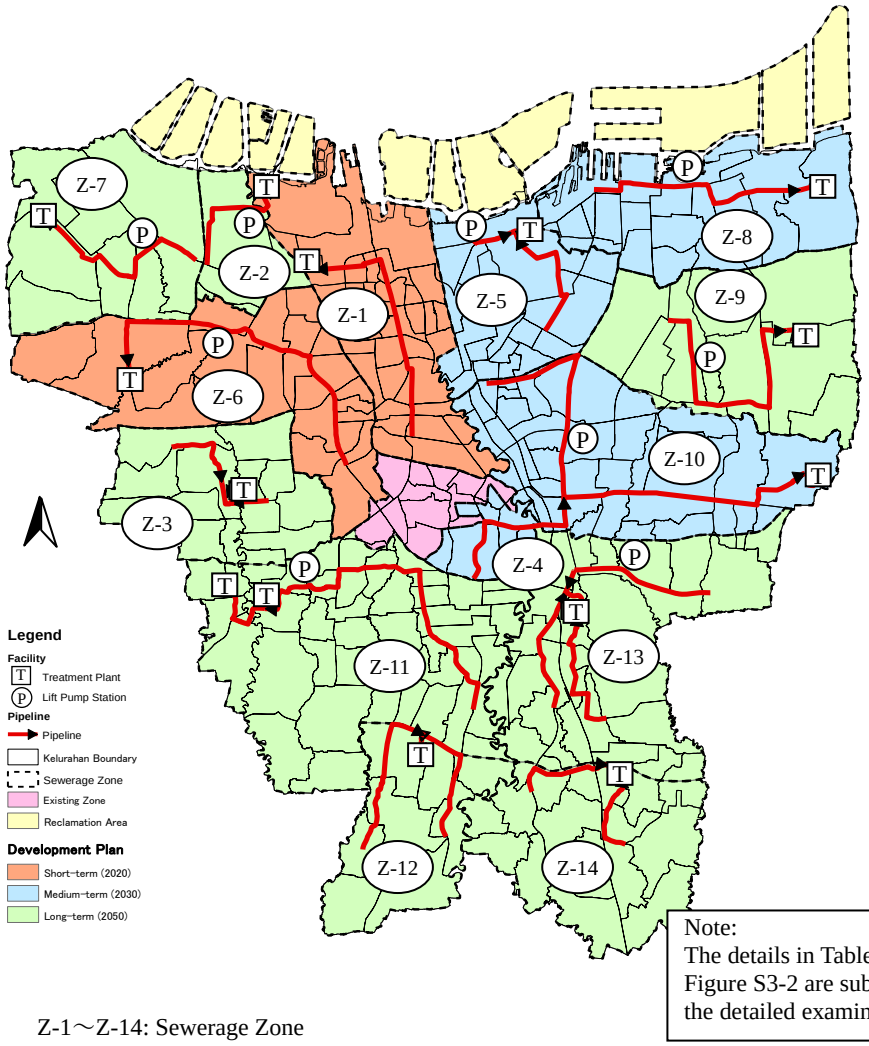
Table S3-2 Design Wastewater Flow for WWTPs in the New M/P

Development Plan	Sewerage Zone	Daily Average (m^3/day)	Daily Maximum (m^3/day)
Short-term	1	198,000	264,000
	6	235,000	313,000
Medium-term	4, 5, 8 & 10	47,000～248,000	62,000～331,000
Long-term	2, 3, 7, 9, 11, 12, 13 & 14	24,000～253,000	32,000～337,000
Total		1,977,000	2,636,000

Main sewer facilities in each sewerage zone per development plan are shown in Table S3-3 and the general layout of main sewerage facilities are shown in Figure S3-2.

Table S3-3 Main Sewer Facilities in Each Sewerage Zone per Development Plan

Sewerage Zone	Area (ha)	Lateral Pipe (no.)	Sewer Pipeline (m)					Relay Pump Station (no.)
			Secondary/ Tertiary Sewer	Main Sewer	Trunk Sewer (Jacking)	Trunk Sewer (Shield)	Total	
[Short-Term Development plan: 2012～2020]								
1 & 6	10,775	232,908	1,485,951	240,878	16,795	22,694	1,766,318	1
[Medium-Term Development plan: 2021～2030]								
4, 5, 8 & 10	15,301	326,877	2,043,273	470,962	20,942	15,442	2,550.619	3
[Long-Term Development plan: 2031～2050]								
2, 3, 7, 9, 11, 12, 13 & 14	37,328	1,324,671	4,741,416	1,203,205	63,917	18,078	6,026,616	9
Total	63,404	1,324,671	8,270,641	1,915,044	101,654	56,214	10,343,553	13



Note:
The details in Table S3-4 & S3-5 and Figure S3-2 are subject to change after the detailed examination in the F/S.

Z-1～Z-14: Sewerage Zone

Figure S3-2 Layout Plan for Main Sewerage Facilities in Each Sewerage Zone

(2) On-site System

The New M/P proposes to connect as much households as possible to the sewers by 2050, thereby reducing the harm of septic tanks. In the meantime, it proposes to minimize the harm of septic tanks until houses are connected with sewers by following measures as shown in Table S3-4.

Table S3-4 Outline of Improvement Plan for On-site System

Issues to be Solved	Measure
On-site desludging is implemented on an on-call basis only. Sludge accumulates in the tank and the effective treatment capacity decreases. This leads to deterioration of the treatment function and the leaking of sludge out of the system, which then causes environmental pollution of rivers and underground water sources.	Introduce the regular desludging system in DKI Jakarta.
Conventional septic tank treats black water (wastewater from toilet) only. Grey water (domestic wastewater from kitchen, etc., other places than toilet) is discharged without treatment and is polluting public water bodies.	Replace with modified septic tanks that treat both black water and gray water.
Individual Treatment Plant (ITP) of commercial buildings and office buildings are not appropriately operated and desludging is rare. Some ITPs do not meet the effluent standard set by DKI Jakarta (2005).	Operate ITP appropriately and perform desludging based on stronger ITP management.
Weak institutional arrangement	Improve the institutional arrangement.

[Estimated generated sludge volume is as follows: (unit: m^3/day)

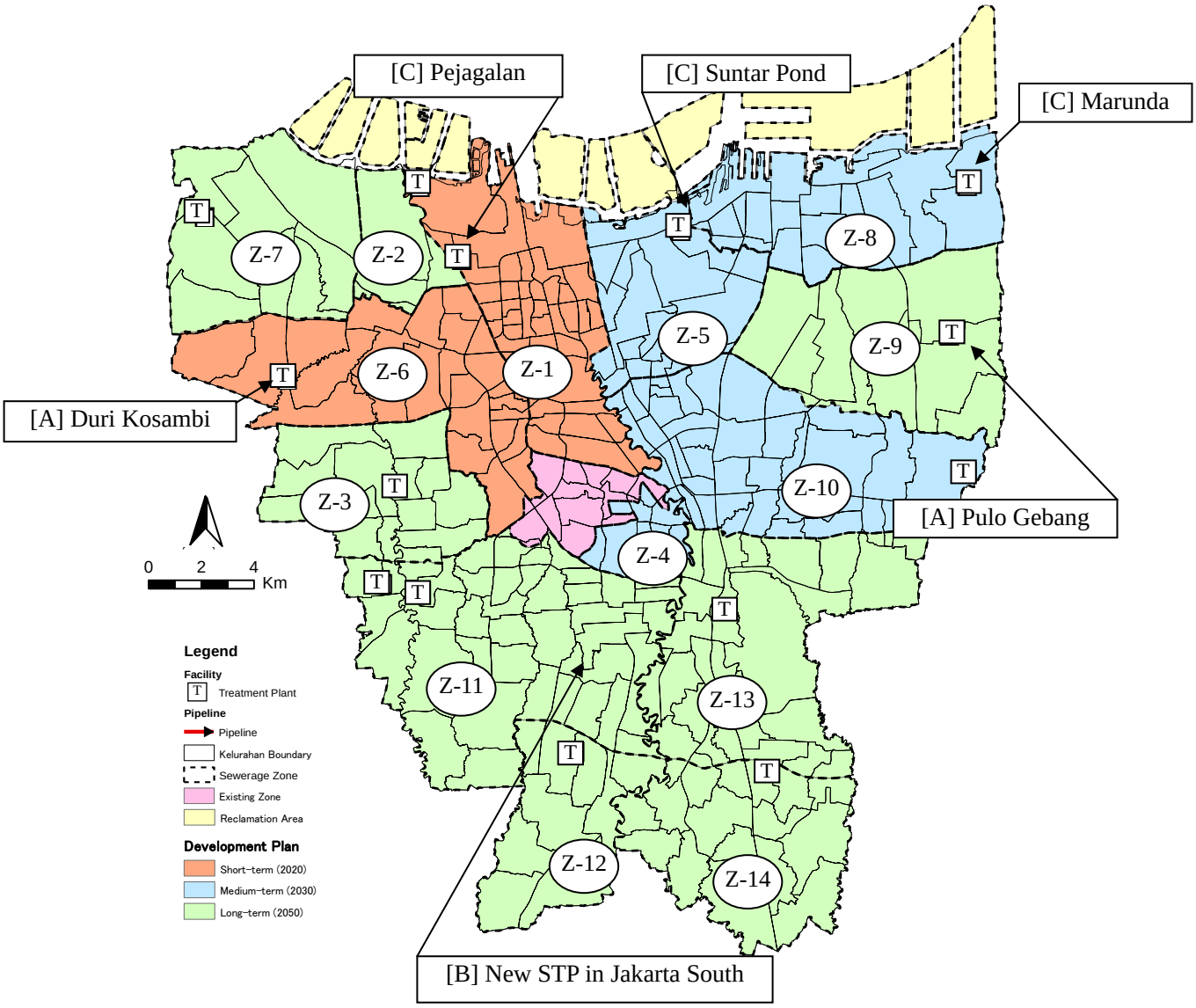
Year	2012	2014	2015	2020	2025	2030	2035	2040	2045	2050
CST	257	307	354	544	495	403	298	183	77	0
MST	0	620	679	960	1,366	1,638	1,723	1,660	1,433	1,000
ITP	0	457	530	866	1,418	1,847	1,731	1,385	808	0
Sludge(total)	257	1,385	1,564	2,370	3,279	3,887	3,752	3,229	2,317	1,000
Capacity	600	450	1,050	1,050	600	600	600	600	600	600
Co-treatment	0	934	514	1,320	2,679	3,287	3,152	2,329	1,717	400

The facility improvement plan to support the Improvement Plan for on-site system is shown in Table S3-5 and the location of each method of Improvement is shown in Figure S3-3.

Table S3-5 Outline of Facility Improvement Plan for Sludge Treatment[2]

Method for Improvement	Outline of Improvement Plan
[A] Existing sludge treatment plants (STPs)	[Short-term plan] • Integrating Duri Kosambi STP with newly constructed WWTP: Up to 950 m^3/day • Rehabilitation and expansion of Pulo Gebang STP: Up to 450m^3/day [Medium-term plan] • Integrating Pulo Gebang STP with newly constructed WWTP: Up to 940m^3/day
[B] Constructing a new sludge treatment plant (STP) in the southern area of DKI	• Capacity of new STP: 600 m^3/day
[C] Co-treatment of septic sludge at WWTPs	• Off-site WWTPs to be constructed under the short- and medium-term plans receive and treat septic sludge (sludge from on-site facilities). [Receiving WWTP] • (Zone No.1)-Pejagalan WWTP: Up to 790 m^3/day • (Zone No.5)-Suntar Pond WWTP: Up to 410 m^3/day • (Zone No.8)-Marunda WWTP: Up to 570 m^3/day

[2] The estimated volume of sludge collected from on-site system and the facility improvement plan are subject to change after the detailed examination in F/S.



Z-1～Z-14: Sewerage Zone

Figure S3-3 Layout Plan for Facilities related to Improvement of Sludge Treatment

Chapter 4 Prioritized Projects for Short-Term Development Plan

4.1 Outline of the Prioritized Projects

(1) Off-site System

Outline of the prioritized project proposed in Zone No.1 and No.6 is as shown in Table S4-1 below:

Table S4-1 Outline of Prioritized Projects for Off-site System in Zone No.1 and No.6

No.	Item	Unit	Zone No.1	Zone No.6
1. General				
1-1	Project area	ha	4,901	5,874
1-2	Design population	PE	1,236,736	1,465,718
1-3	Coverage ratio	%	80	80
1-4	Served population	PE	989,389	1,172,574
1-5	Unit wastewater flow	LCD	Daily average: 200, Daily maximum: 267	
1-6	Design wastewater flow		Unit wastewater flow × Served population	
	- Daily average	m^3/day	198,000	235,000
	- Daily maximum	m^3/day	264,000	313,000
2. Sewerage System				
2-1	Sewers			
(1)	Secondary & tertiary sewer			
	- Diameter	mm	φ200～φ300	φ200～φ300
	- Length of pipeline	km	657	829
(2)	Main sewer			
	- Diameter	mm	φ350～φ800	φ350～φ800
	- Length of pipeline	km	86	155
(3)	Trunk sewer			
	- Diameter	mm	φ900～φ2,200	φ900～φ2,400
	- Length of pipeline	km	15.5	24.0
2-2	Relay pumping station			
	(1) Place	unit	0	1
	(2) Lifting capacity	m^3/min	--	172
2-3	WWTP			
	(1) Place	unit	1	1
	(2) Capacity (daily maximum wastewater)	m^3/day	264,000	313,000

Note: Figures in the above table are subject to change after the detailed examination in F/S.

(2) On-site System

The contents for on-site system improvement to be conducted during the short-term development plan are as follows:

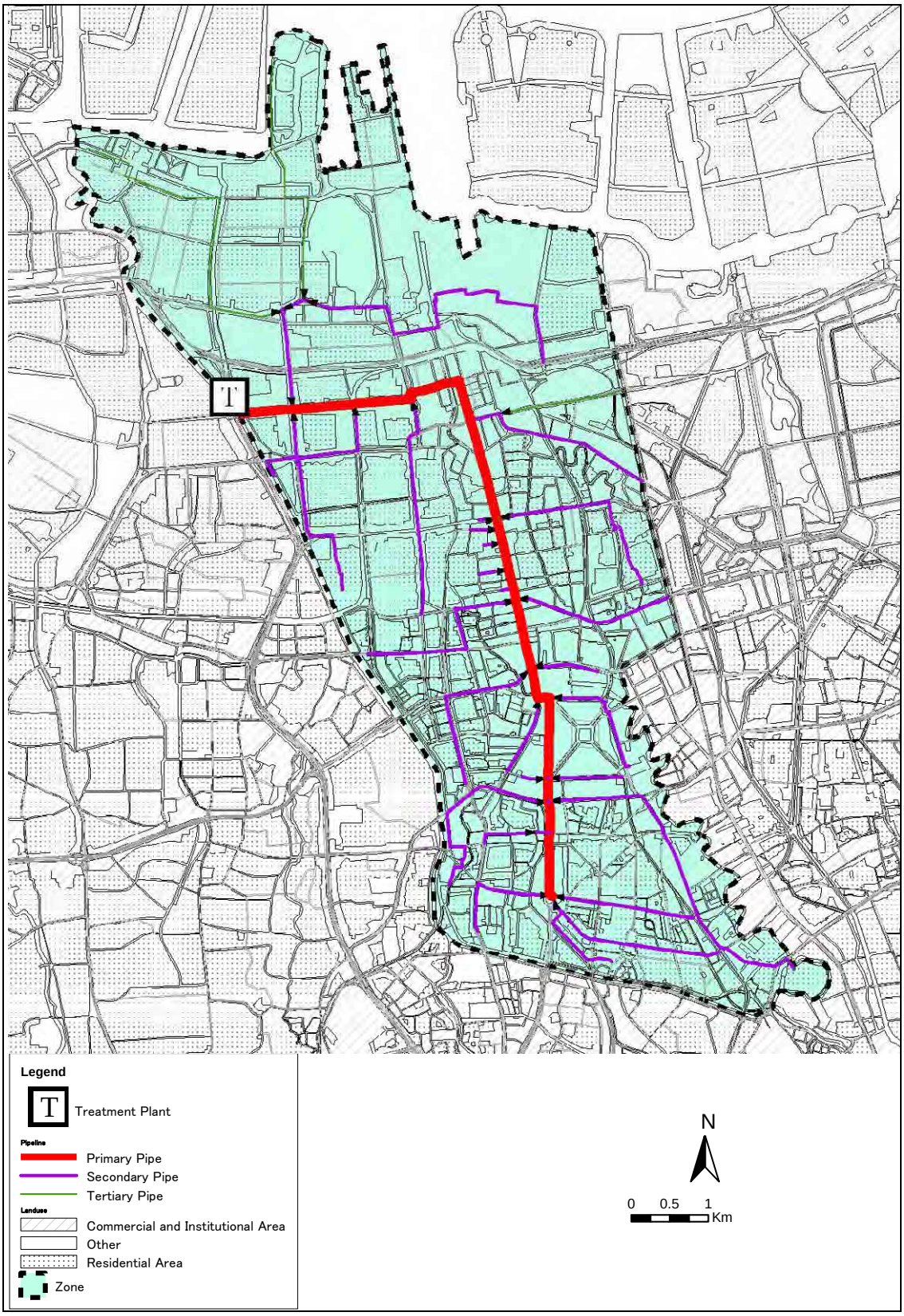
Table S4-2 Outline of On-site System Improvement as the Prioritized Project

No.	Item	Unit	Quantity
Sludge Treatment Plant (STP) – Rehabilitation & New Construction			
(1)	Integration to new WWTP	No.	1
	- Treated at new WWTP	m^3/day	930
	Improvement	No.	1
	- Capacity	m^3/day	450
(2)	New Construction	No.	1
	- Capacity	m^3/day	600
(3)	Treated at new WWTP	m^3/day	790

4.2 Facility Plan for Off-site System

(1) Sewerage Facilities in Sewerage Zone No.1

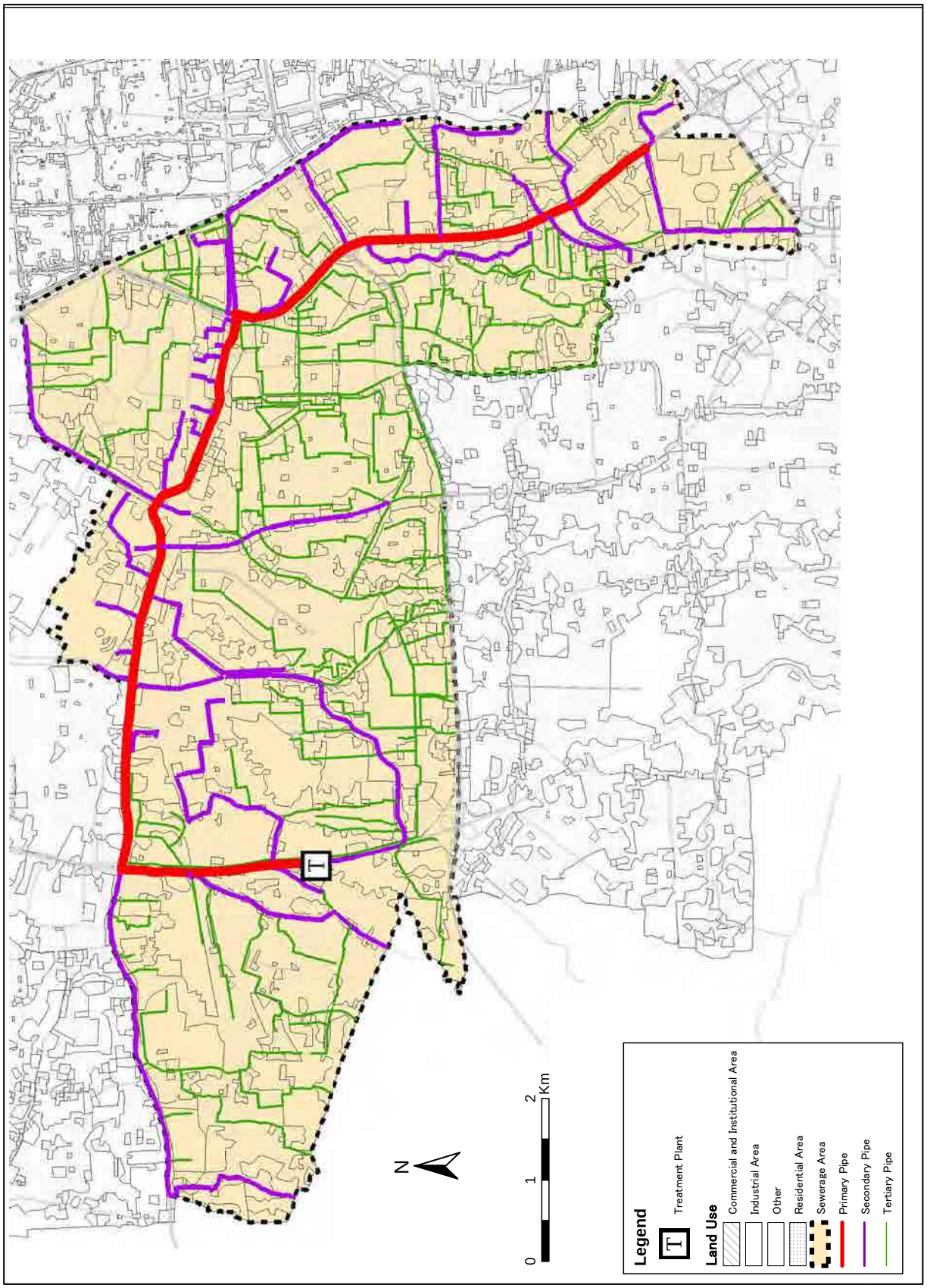
[Sewer Pipeline Route and Location of WWTP]



Note: Pipeline routes and the zone boundary are subject to change after detailed examination in F/S.

(2) Sewerage Facilities in Sewerage Zone No.6

[Sewer Pipeline Route and Location of WWTP]



Note: Pipeline routes and the zone boundary are subject to change after detailed examination in F/S.

4.3 Facility Plan for On-site System

The new STP will be located in the southern Jakarta area.

(1) Necessary size of the land: 1.5ha (0.4ha for buildings and 1.1ha for parking and green area)

(2) Criteria for selecting the land is as follows:

1) To support the efficient regular desludging operation, new STP should be located in the convenient place for the transportation of the sludge collected from any part of southern Jakarta area.

*Sludge collected from central, northern, western, eastern Jakarta will be treated at the newly built WWTPs in the short-medium term plans.

2) No flood, no land slide, close to the water body, open land with good sun shine, good geological structure and soil condition.

3) Land acquisition is easy. No environmental problem (beauty and odor aspect).

4.4 Institutional Framework

DKI's institutional framework for wastewater management should be reviewed and restructured based on the following principles.

(1) It is necessary to establish an institutional framework capable of overseeing the current and future water environment of DKI Jakarta overall, and of managing and supervising both wastewater and sludge treatment in an integrated manner.

(2) It is necessary to manage both off-site system and on-site system in an integrated manner so that the wastewater management budget is spent in the most efficient way by coordinating and modifying wastewater management planning as the system evolves.

(3) The anticipated framework must have authority and functions concerning budgets, preparation of legislation, planning, construction, operation, and preparation of regulations and guidelines that fit existing government institutions.

ANNEX

A1. Cost Estimation for Implementing the Projects proposed in the New M/P

A1.1 Total Cost for the Projects

Table A1-1 shows the result of the cost estimation for implementing the whole projects proposed in the New M/P including construction cost for the short-term, medium-term and long-term development plans. The project cost has been estimated in local currency and foreign currency. Direct construction cost has been estimated for the following items:

[Off-site (sewerage system)]

- ✓ House connection
- ✓ Collection sewer line (secondary & tertiary sewer, sewer main and trunk sewer)
- ✓ Lift pump station
- ✓ Wastewater treatment plant
- ✓ Facility replacement

[On-site]

- ✓ Integrating Duri Kosambi STP with newly constructed WWTP
- ✓ Rehabilitation and expansion of Pulo Gebang STP
- ✓ Integrating Pulo Gebang STP with newly constructed WWTP
- ✓ Construction of a new STP in South Jakarta
- ✓ On-site sludge treatment facilities added to newly constructed WWTPs
- ✓ Facility replacement

As indirect costs, the following items have been considered:

- ✓ Indirect construction cost
- ✓ Engineering cost
- ✓ Physical contingency
- ✓ Land use cost (However, he land use cost is not accounted with assuming the sites of facilities are owned by public.)

The cost for capacity development of the Indonesian side organizations is considered to be included in the engineering cost.

Table A1-1 Total Construction Cost for Off-site and On-site System Development

Unit: Million IDR

development contents			Construction cost			Remarks
			Initial construction cost	Facilities replacement cost (2013-2050)	Total	
A. Short-term plan						
(1)	Zone No.1	Development of sewerage system	5,192,315	1,079,250	6,271,565	
		On-site sludge treatment facilities	131,904	68,590	200,494	Co-treatment of On-site sludge
		Sub-total	5,324,219	1,147,840	6,472,059	
(2)	Zone No.6	Development of sewerage system	7,110,408	1,357,898	8,468,307	
		Integration Duri Kosambi STP with newly constructed WWTP	155,279	80,745	236,025	Co-treatment of On-site sludge
		Sub-total	7,265,688	1,438,644	8,704,331	
(3)	Rehabilitation and expansion of Pulo Gebang STP		24,390	0	24,390	
(4)	Construction of a new STP in south area		42,100	20,275	62,375	
		Total of Short-term plan	12,656,397	2,606,758	15,263,155	
B. Medium-term plan						
(1)	Zone No.4	Development of sewerage network	636,325	0	636,325	
(2)	Zone No.5	Development of sewerage system	3,586,678	570,552	4,157,230	
		On-site sludge treatment facilities	68,457	28,752	97,208	Co-treatment of On-site sludge
		Sub-total	3,655,134	599,304	4,254,438	
(3)	Zone No.8	Development of sewerage system	4,856,836	794,711	5,651,547	
		On-site sludge treatment facilities	95,171	39,972	135,143	Co-treatment of On-site sludge
		Sub-total	4,952,008	834,683	5,786,691	
(4)	Zone No.10	Development of sewerage system	7,639,771	1,322,893	8,962,664	
		Integration Pulo Gebang STP with newly constructed WWTP	156,949	65,919	222,868	
		Sub-total	7,796,720	1,388,812	9,185,531	
		Total of Medium-term plan	17,040,187	2,822,798	19,862,985	
C. long-term plan						
(1)	Zone No.2	Development of sewerage system	1,158,206	0	1,158,206	
(2)	Zone No.3	Development of sewerage system	3,701,406	24,508	3,725,914	
(3)	Zone No.7	Development of sewerage system	3,967,381	23,963	3,991,345	
(4)	Zone No.9	Development of sewerage system	4,333,679	18,550	4,352,229	
(5)	Zone No.11	Development of sewerage system	8,643,992	56,387	8,700,380	
(6)	Zone No.12	Development of sewerage system	3,253,732	0	3,253,732	
(7)	Zone No.13	Development of sewerage system	5,624,321	0	5,624,321	
(8)	Zone No.14	Development of sewerage system	3,674,569	21,449	3,696,018	
		Total of Long-term plan	34,357,286	144,858	34,502,144	
		Grand total	64,053,869	5,574,415	69,628,284	

A1.2 Capital Investment Considerations

From 2013 when construction is expected to start for short, medium and long-term sewerage development projects and on-site sludge treatment plants development projects, the approximate total construction cost that must be capital-invested and financed by 2050, which is the long-term development year, is as given in Table A1-2 and Table A1-3.

Table A1-2 Total Capital Investment Cost required for Short, Medium and Long-term Sewerage Development Projects

<Initial Construction Cost>

Unit : Million IDR

Items			Cost		
			Local currency	Foreign currency	Total
A. Construction Cost			41,185,186	10,631,889	51,817,074
	a. Direct Construction Cost		36,447,067	9,408,751	45,855,818
	(1)House Connection Cost		4,694,090	0	4,694,090
	(2)Collection Sewer Line	Tertiary and Secondary	10,144,598	0	10,144,598
		Main	9,990,725	0	9,990,725
		Trunk	1,273,268	1,273,268	2,546,535
		Conveyance	603,690	2,414,758	3,018,448
		Sub-total	22,012,280	3,688,026	25,700,306
	(3)Lift Pump Station	Civil/Architect Works	233,930	0	233,930
		Mecanical Facility	37,429	149,714	187,143
		Electrical Facility	23,391	23,391	46,781
		Sub-total	294,749	173,105	467,854
	(4)Wastewater Treatmment Plant	Civil/Architect Works	7,496,784	0	7,496,784
		Mecanical Facility	1,199,485	4,797,942	5,997,427
		Electrical Facility	749,678	749,678	1,499,357
		Sub-total	9,445,948	5,547,620	14,993,568
	b. Indirect Construction Cost	13% of Direct Construction Cost	4,738,119	1,223,138	5,961,256
B. Engineering Cost		7% of Direct Construction Cost	2,551,295	658,613	3,209,907
C. Physical Contingency		5% of the sum of Direct Construction Cost and Indirect Construction Cost	2,059,259	531,594	2,590,854
D. Land Use Cost			0	0	0
Total			**45,795,740**	**11,822,096**	**57,617,835**
E. Value Added Tax		10%	4,579,574	1,182,210	5,761,784
Grand Total			**50,375,314**	**13,004,305**	**63,379,619**

<Facility Re placement (2013-2050)>

Unit : Million IDR

Items			Cost		
			Local currency	Foreign currency	Total
A. Construction Cost			1,192,197	3,116,512	4,308,710
	a. Facilities Replacement Cost (Direct Construction Cost) (from 2013 to 2050)	Mecanical Facility	567,645	2,270,578	2,838,223
		Electrical Facility	487,397	487,397	974,795
		Sub-total	1,055,042	2,757,976	3,813,018
	b. Indirect Construction Cost	13% of Direct Construction Cost	137,155	358,537	495,692
B. Engineering Cost		7% of Direct Construction Cost	73,853	193,058	266,911
C. Physical Contingency		5% of the sum of Direct Construction Cost and Indirect Construction Cost	59,610	155,826	215,435
Total			**1,325,660**	**3,465,396**	**4,791,057**
D. Value Added Tax		10%	132,566	346,540	479,106
Grand Total			**1,458,226**	**3,811,936**	**5,270,162**

Table A1-3 Total Capital Investment Cost Required for Short, Medium and Long-term On-site Sludge Treatment Plants Development Projects

<Initial Construction Cost>

Unit : Million IDR

Items			Cost		
			Local currency	Foreign currency	Total
A. Construction Cost			343,172	208,073	551,245
	a. Direct Construction Cost		303,692	184,135	487,827
	(1) Civil and Building works		242,393	0	242,393
	(2) Mechanical facilities		16,812	184,135	200,948
	(3) Electrical facilities		44,486	0	44,486
	b. Indirect Construction Cost	13% of Direct Construction Cost	39,480	23,938	63,418
B. Engineering Cost		7% of Direct Construction Cost	21,258	12,889	34,148
C. Physical Contingency		5% of the sum of Direct Construction Cost and Indirect Construction Cost	17,159	10,404	27,562
D. Land Use Cost			0	0	0
Total			**381,589**	**231,366**	**612,955**
F. Value Added Tax		10%	38,159	23,137	61,295
Grand Total			**419,748**	**254,503**	**674,250**

<Facility Re placement (2013-2050)>

Unit : Million IDR

Items			Cost		
			Local currency	Foreign currency	Total
A. Construction Cost			71,018	177,728	248,747
	a. Facilities Replacement Cost (from 2013 to 2050)	Mecanical Facility	14,360	157,282	171,642
		Electrical Facility	48,488	0	48,488
		Sub-total	62,848	157,282	220,130
	b. Indirect Construction Cost	13% of Direct Construction Cost	8,170	20,447	28,617
B. Engineering Cost		7% of Direct Construction Cost	4,399	11,010	15,409
C. Physical Contingency		5% of the sum of Direct Construction Cost and Indirect Construction Cost	3,551	8,886	12,437
Total			**78,969**	**197,624**	**276,593**
D. Value Added Tax		10%	7,897	19,762	27,659
Grand Total			**86,865**	**217,387**	**304,252**

A2. Economic and Financial Evaluation

A2.1 Economic Evaluation

Whether the projects of the M/P are optimal distribution of resources from the standpoint of the national economy or not is verified by calculation of Net Present Value (NPV), Benefit/Cost Ratio (B/C Ratio) and Economic Internal Rate of Return (EIRR).

The targets of economic analysis are sewerage (off-site) plans and on-site plans of short-term plan (2012 - 2020) and medium-term plan (2021 - 2030).

Concretely, as for off-site, projects of zones No.1 & No.6 (short-term) and No.4, No.5, No.8 & No.10 (medium-term) are set as target of the analysis. As for on-site, development of new on-site sludge treatment plant in South area, rehabilitation and expansion of existing STP, and integration with newly constructed WWTPs, and co-treatment for on-site sludge at off-site WWTPs are set as the targets.

As a result of economic analysis, NPV, B/C and EIRR were as given in Table A2-1.

Table A2-1 Results of Economic Analysis

Cost/benefit ratio (B/C ratio)	1.07
*Net Present Value (NPV)	1,234,803 Million IDR
Economic Internal Rate of Return (EIRR)	13.9 %

*Discount rate of project = 12%

From the above table, B/C ratio exceeds 1.0 and NPV exceeds zero. Also, since EIRR was 13.9%, which excess 12% established as capital opportunity cost that indicates limited profitability related to capital for public construction, the project is considered economically feasible.

(1) Financial Evaluation

Financial analysis was conducted to evaluate whether or not the project established by the New M/P is financially feasible. The results of financial analysis are evaluated by calculating Net Present Value (NPV), Benefit/Cost Ratio (B/C Ratio) and Financial Internal Rate of Return (FIRR).

Sewerage projects (off-site) are targets of financial analysis.

Zones No.1 and No.6, which are priority projects of the New M/P, are targets of financial analysis. The analysis is conducted to evaluate whether the projects are financially feasible for repayment of 35% of the construction cost, assuming 35% of the construction cost is procured by loan, and the rest 65% is no need to be repaid because it depends on subsidies. Table A2-2 shows the results of financial analysis.

Table A2-2 Results of Financial Analysis (Summary)

Evaluation Items	Unit	Zone No.1		Zone No.6		Zone No.1 and Zone No.6		Evaluation Criteria
		Case1	Case2	Case1	Case2	Case1	Case2	
B/C Ratio	-	0.71	1.83	0.40	1.03	0.54	1.38	B/C Ratio>1
	Evaluation	N.F.F.	F.F.	N.F.F.	F.F.	N.F.F.	F.F.	
NPV	Mill. IDR	-1,397,280	4,028,732	-3,677,844	175,741	-5,075,124	4,204,473	NPV>0
	Evaluation	N.F.F.	F.F.	N.F.F.	F.F.	N.F.F.	F.F.	
FIRR	%	No solution	9.66%	No solution	1.57%	No solution	5.79%	FIRR>r
	Evaluation	N.F.F.	F.F.	N.F.F.	F.F.	N.F.F.	F.F.	r=1.15%
Financial Evaluation		**N.F.F.**	**F.F.**	**N.F.F.**	**F.F.**	**N.F.F.**	**F.F.**	

Note: F.F. = Financially Feasible, N.F.F. = Not Financially Feasible

The results of financial analysis show that all projects of zone No.1 and zone No.6 require gradual increase of sewerage tariff, and that sewerage system project profitability can be secured by raising the tariff by 30% every 3 years from 2016, and eventually raising up approximately to 3 times level of the current level in stages through the 4 times revisions by 2025 (case 2).

In addition, the results of analysis for both Zone No.1 and Zone No.6 as a single business were as given in the table. The results show that FIRR can be secured 5.79% if sewerage charge is increased.

The Project for Capacity Development of Wastewater Sector
Through
Reviewing the Wastewater Management Master Plan in DKI Jakarta

FINAL REPORT
MAIN REPORT

Table of Contents

Appendices

List of Tables and Figures

PART-A INTRODUCTION

PART-B DATA AND INFORMATION

PART-C FUNDAMENTAL PLANNING AND DESIGN CONSIDERATIONS

PART-D FORMULATION OF MASTER PLAN

PART-E ECONOMIC AND FINANCIAL EVALUATION

PART-F EVALUATION BY ENVIRONMENTAL SOCIAL CONSIDERATION

PART-G INSTITUTIONAL CONSIDERATIONS

PART-H ENVIRONMENTAL EDUCATION AND PUBLIC CAMPAIGN ACTIVITIES FOR WASTEWATER SECTOR

PART-I CAPACITY BUILDING FOR COUNTERPART ORGANIZATIONS

PART-J ACTION PLAN FOR IMPLEMENTATION OF PRIORITIZED PROJECTS

Abbreviations

A2O	Anaerobic Anoxic Oxic Process
ADB	Asia Development Bank
AMDAL	Environmental Impact Assessment (*Analisis Mengenai Dampak Lingkungan*)
ANDAL	Environmental Impact Analysis Report (*Analisis Dampak Lingkungan*)
APBD	Regional Income and Expenditure Budget (*Anggaran Pendapatan dan Belanja Daerah*)
APBN	Indonesian National Income and Expenditure Budget (*Anggaran Pendapatan dan Belanja Negara*)
ASP	Activated Sludge Process
ASRT	Aerobic Solids Retention Time
ATP	Affordability To Pay
BAPPEDA	Regional Planning and Development Board (*Badan Perencanaan Pembangunan Daerah*)
BAPPENAS	National Planning and Development Board (*Badan Perencanaan Pembangunan Nasional*)
BBWS CC	Central Hall of River Management of Ciliwung – Cisadane (*Balai Besar Wilayah Sungai Ciliwung – Cisadane*)
BLUD	Regional Public Service Board (*Badan Layanan Umum Daerah*)
BLUPAL	Public Service Board for Wastewater Management (*Badan Layanan Umum Pengelolaan Air Limbah*)
BOD	Biochemical Oxygen Demand
BOO	Build Own Operate
BOT	Built Operate Transfer
BTO	Built Transfer Operate
BPAL	Wastewater Management Board (*Badan Pengelolaan Air Limbah*)
BPKD	Regional Finance Management Board (*Badan Pengelola Keuangan Daerah*)
BPLHD	Regional Environment Management Board (*Badan Pengelolaan Lingkungan Hidup*)
BPMP	Investment Board (*Badan Penanaman Modal dan Promosi*)
BPS	Central Bureau of Statistic (*Badan Pusat Statistik*)
BW	Black Water
B/C	Benefit/Cost
CA	Capacity Assessment
CAD	Computer Aided Design
CBP	Concrete Batching Plan
CBS	Community-Based Sanitation approach
CD	Capacity Development
CFU	Colony Forming Unit
COD	Chemical Oxygen Demand
C/P	Counterpart
CSS	City Sanitation Strategy
CST	Conventional Septic Tank
DB	Data Base
DBJ	Development Bank of Japan
DBO	Design Build Operate
DESD	Directorate of Environmental Sanitation Development
DF/R	Draft Final Report
DGHS	Directorate General of Human Settlements, Ministry of Public Works (*Direktorat Jenderal Cipta Karya*)
DGSP	Directorate General of Spatial Planning, Ministry of Public Works
DHS	Down-flow Hanging Sponge
DK	Cleansing Agency (*Dinas Kebersihan*)
DKI	Special State Capital of Jakarta (*Daerah Khusus Ibukota Jakarta*)
DPU	Public Works Agency (*Dinas Pekerjaan Umum*)
DP2B	Building Supervision and Control Agency (*Dinas Penertiban dan*

	Pengawasan Bangunan)
DTR	Spatial Planning Agency (*Dinas Tata Ruang*)
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
FPU	Final Polishing Pond
F/R	Final Report
F/S	Feasibility Study
FY	Fiscal Year
GDP	Gross Domestic Product
GIS	Geographical Information System
GW	Gray Water
HWL	High Water Level
HRT	Hydraulic Retention Time
IC/R	Inception Report
IEE	Initial Environmental Examination
IMB	Building Construction Permit (*Izin Mendirikan Bangunan*)
IRR	Internal Rate of Return
ISSDP	Indonesia Sanitation Sector Development Program
ITP	Individual Treatment Plant
IT/R	Interim Report
IWK	Indah Water Konsortium Sdn Bhd
JBIC	Japan Bank for International Cooperation
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
JSSP	Jakarta Sewerage and Sanitation Project
JWDP	Jakarta Wastewater Development Plan
KA-ANDAL	Executive Summary of the Project (Terms of Reference of ANDAL) (*Kerangka Acuan Analisis Dampak Lingkungan Hidup*)
KLH	Ministry of Environment (*Kementrian Lingkungan Hidup*)
KMB	Feasibility of Building Utilization Permit (*Kelayakan Menggunakan Bangunan*)
KPI	Key Performance Indicator
KRK	Keterangan Rencana Kota
LWL	Low Water Level
MBBR	Moving Bed Bio-film Reactor
MBR	Membrane Biological Reactor
MCK	Communal Place for Bathing, Washing and Toilet (*Mandi, Cuci, Kakus*)
MLSS	Mixed Liquor Suspended Solids
M/M	Minutes of Meetings
M/P	Master Plan
MPW	Ministry of Public Works
MRT	Mass Rapid Transit
MST	Modified Septic Tank
NPV	Net Present Value
ODA	Official Development Assistance
OJT	On-the-job Training
O&M	Operation and Maintenance
PDAM	Local Water Supply Enterprise (*Perusahaan Daerah Air Minum*)
PDM	Project Design Matrix
PD PAL JAYA	Regional Company of Wastewater Management of DKI Jakarta (*Perusahaan Daerah Pengelolaan Air Limbah Jakarta Raya*)
PFI	Private Finance Initiative
PI	Performance Indicator
PJ	Project
PO	Plan of Operation
PPMK	Community of Kelurahan Empowerment Program
PPP	Public-Private-Partnership
PPSP	Acceleration of Urban Sanitation Development Program (*Program Percepatan Pembangunan Sanitasi Permukiman*)
PST	Primary Settling Tank

RBC	Rotating Biological Contactor
R/D	Record of Discussions
RDTR	Detailed Spatial Plan (*Rencana Detil Tata Ruang*)
RKL	Environmental Management Planning Document (*Rencana Pengelolaan Lingkungan*)
ROT	Rehabilitate Operate Transfer
RPL	Environmental Monitoring Planning Document (*Rencana Pemantauan Lingkungan*)
RT	Smallest Community Group (*Rukun Tetangga*)
RTLB	Blok Plan (*Rencana Tata Letak Bangunan*)
RTO	Rehabilitate Transfer Operate
RTRW	Provincial Spatial Plan (*Rencana Tata Ruang Wilayah*)
RTRWN	National Spatial Plan (*Rencana Tata Ruang Wilayah Nasional*)
RTRW Kabupaten	Regency Spatial Plan (*Rencana Tata Ruang Wilayah Kabupaten*)
RTRW Kota	Municipal Spatial Plan (*Rencana Tata Ruang Wilayah Kota*)
RW	Community Group (*Rukun Warga*)
SANIMAS	Community Based On-site System (*Sanitasi untuk Masyarakat*)
SD2PB	Building Supervision and Control Sub-Agency (*Suku Dinas Penertiban dan Pengawasan Bangunan*)
SER	Shadow Exchange Rate
SBR	Sequencing Batch Reactor
SIDA	Swedish Agency for International Development
SIPPT	Permit of Land Use and Designation (*Surat Izin Penunjukan dan Penggunaan Tanah*)
SLF	Certificate for Sustainability of Functions (*Sertifikat Laik Fungsi*)
SOP	Standard Operating Procedure
SP3L	Principle Approval Letter of Land Acquisition (*Surat Persetujuan Pembebasan & Penguasaan Lahan*)
SPPL	Statement Letter of Environmental Management (*Surat Pernyataan Pengelolaan Lingkungan*)
SRT	Solid Retention Time
SS	Suspended Solid
SSA	Sewerage Services Act in Malaysia
SV	Sludge Volume
TTPS	National Sanitation Technical Team (*Tim Teknis Pembangunan Sanitasi*)
TPUT	Consideration Team for Land Affairs (*Tim Pertimbangan Urusan Tanah*)
UASB	Up-flow Anaerobic Sludge Blanket
UKL	Environmental Management Plan (*Upaya Pengelolaan Lingkungan*)
UPL	Environmental Monitoring Plan (*Upaya Pemantauan Lingkungan*)
UPLS	Management Unit of Septic Tank's Waste (*Unit Pengelolaan Limbah Septic Tank*)
UPT-PAL	Technical Management Unit - Wastewater Management (*Unit Pengelola Teknis - Pengelola Air Limbah*)
USDP	Urban Sanitation Development Program
UV/VIS	Ultra-Violet/Visible Sepctrophotometry
VGF	Viability Gap Funding
WOPs	Water Operators Partnership
WSIA	Water Services Industry Act
WSP	Water and Sanitation Program
WTP	Willingness To Pay
WWTP	Wastewater Treatment Plant

Units

℃	Degree Celsius
ha	Hectare
IDR	Indonesian Rupiah

km	Kilometer
L	Liter
L/min	Liter per minute
L/sec	Liter per second
LCD	Liter per Capita per Day
m	Meter
mg/L	Milligram per liter
min	Minute
mm	Millimeter
m^2	Square meter
m^3	Cubic meter
m^3/day	Cubic meter per day
m^3/sec	Cubic meter per second
No(s).	Number(s)
NTU	Nephelometric Turbidity Units
ohm m	Ohm meter
%	Percent
USD	U.S. (United States) Dollar

PART-A INTRODUCTION

PART-A INTRODUCTION

A1 Background of the Project

Jakarta, officially the Special Capital City of Jakarta (hereinafter referred to as “DKI Jakarta or DKI”), is the Capital of the Republic of Indonesia with a massive population of 9.74 million (Spatial Plan of DKI Jakarta for 2030). The rapid population growth from the 1980's through 1990's as a result of socio-economic activities and repeated flooding as result of topographical condition of a flat alluvial fan in DKI Jakarta make the people suffer from water pollution. In 1991, the JICA and Directorate General of Human Settlements in the Ministry of Public Works (hereinafter referred to as “DGHS”) jointly formulated a master plan featuring drainage, sewerage and sanitation development in DKI Jakarta for the target year of 2010 through “the Study on Urban Drainage and Wastewater Disposal Project in the City of Jakarta” (hereinafter referred to as the "Old M/P"). However, the development of sewerage system could not proceed as planned and the coverage remains as low as 2%. While on-site treatment has made some progress, the treatment of sludge is insufficient, making on-site treatment less effective overall. Meanwhile, the Government of Indonesia plans to improve the coverage of the sewerage service to 20% by 2014 in 15 major cities nationwide, including in DKI Jakarta. To achieve this target, the DGHS plans to revise the Old M/P 1991 and secure the Japanese loan to improve the sewerage service in DKI Jakarta to accelerate the similar improvement in the sewerage service throughout the Indonesia.

According to a counterpart agency, Old M/P 1991 was not implemented because it failed to undergo the DKI Jakarta approval process. The lack of the administrative organization which supervises the management of wastewater and sludge in DKI Jakarta in integrated manner is also considered as a cause for its non-implementation. In DKI Jakarta, there is no organization equivalent to the Sewage Bureau of Tokyo Metropolitan Government. PD PAL JAYA, a public corporation established for the operation and maintenance of the facilities built under the World Bank’s JSSP, is obliged to surrender 40% of its profit to DKI Jakarta as same as other public corporations under Economic Board of DKI Jakarta and, therefore, it is unable to use its profit for re-investment. Since PD PAL JAYA does not have the direct access to the DKI Jakarta Budget as it is not a department/agency of DKI Jakarta, it is difficult for PD PAL JAYA to make a plan, to apply for the budget based on the plan and to implement the investment project as planned. Other issue is that, even though Cleansing Agency of DKI Jakarta is in-charge of two sludge treatment facilities, it has been unsettled issue until now that which organization of DKI Jakarta is in-charge of managing septic tanks on which 90% of DKI Jakarta population are dependent. These institutional problems are considered to be a factor which has been preventing the taking up of Old M/P 1991 in the DKI Jakarta’s administrative process.

Under these circumstances, the Government of Indonesia made a request to the Government of Japan for the provision of technical cooperation, which is called as the Project for Capacity Development of Wastewater Sector through Reviewing the Wastewater Management Master Plan in DKI Jakarta (hereinafter referred to as the "the Project"), to assist the enactment of a sewage act and to produce a new master plan (hereinafter referred to as the "New M/P"). In June, 2010, the JICA signed the R/D with the Indonesian side with a view to implementing the requested technical cooperation. In this R/D, the requested assistance for the enactment of a sewage act is referred to as "Output 1" to be produced by a long-term expert assigned by the JICA. The revision of the Old M/P to produce the New M/P is referred to as "Output 2" which should be conducted along with the work to enact the said sewage act. In the case of urban wastewater, collaboration with “the Project for Capacity Development of Jakarta Comprehensive Flood Management in Indonesia”, a technical cooperation project of the JICA running in parallel with the Project, is necessary while incorporating the results of a series of JICA technical cooperation projects which have been implemented since 1997.

In this project, improvement and development plan for off-site and on-site systems in DKI Jakarta has been proposed after the Old M/P is reviewed and the prioritized projects are selected. For storm water drainage, since MPW and DKI Jakarta has a policy to discharge it through the drainages and rivers, it has been determined that the New M/P shall deal with only wastewater through off-site system (sewerage).

For the organization for management of sewerage (storm water drainage and wastewater treatment), the function of wastewater management was transferred from Public Works Agency of DKI Jakarta (DPU) to Regional Environmental Management Board of DKI Jakarta (BPLHD) in 2008. Accordingly, BPLHD has become the responsible agency for wastewater management in general and DPU has a responsibility only for storm water drainage. The overall structure for management of sewerage and sanitation is as shown in B1 of PART-B.

A2 Objectives of the Project

A2.1 Introduction of the Project

The Project has two (2) outputs. JICA short term expert team (hereinafter referred to as "JICA Expert Team") deals with Output-2 (formulation of the New M/P). Output 1 will be produced by the JICA long-term expert (Team Leader/Sewerage Policy Adviser).

The overall goal, project purpose, output and objectively verifiable indicators to evaluate the achievement are shown in Table A2-1 "the Project Design Matrix (PDM) of the Project". The activities of Phase-1 (Plan of Operation: RO) and the progress to achieve the above are shown in Table A2-3.

Table A2-1 Project Design Matrix (PDM) of the Project

Narrative Summary	Objectively Verifiable Indicator
[Overall Goal] 1. Proper policy, system and plan in wastewater sector are established. 2. DKI Jakarta has enough capacity to improve wastewater sector conditions.	1-1 Domestic Wastewater Law is enacted. 1-2 Regulations and standards related to Domestic Wastewater Law are enacted. 2-1 Finance is prepared. 2-2 Revised wastewater management master plan is implemented.
[Project Purpose] Capacity of Ministry of Public Works and DKI Jakarta in formulation of wastewater sector policies and wastewater management plans is enhanced.	1-1 Draft Domestic Wastewater Law is submitted to the parliament. 1-2 Draft Regulations and standards related to Domestic Wastewater Law are submitted to MPW. 2. An action plan of the implementation of the revised Wastewater Management Master Plan in DKI Jakarta is developed (with information on timeframe, target, organization/section in charge, sources of the budget for each work item).
[Output] 1. Domestic Wastewater Law and its regulations are prepared. 2. The wastewater management master plan in DKI Jakarta is revised.	1-1 Draft Domestic Wastewater Law is developed. 1-2 Regulations and standards related to Domestic Wastewater Law are developed. 2-1 Revised wastewater management master plan is approved in DKI Jakarta.

Source: Excerpt from Record of Discussions signed on 17th June 2010

A2.2 Necessity for Development of Wastewater Law and the related Regulations as Output-1

Under the national development plan of Indonesia (from 2010 to 2014), MPW has prepared the Strategic Plan for the Ministry of Public Works 2010-2014. In this plan, MPW has set target sewerage coverage ratio as 20% in 15 big cities including in DKI Jakarta. The strategic plan also includes five (5) outputs in wastewater treatment field as follows:

(1) Improvement of access to wastewater treatment facility by either off-site system or on-site system
(2) Increase in involvement of the residents and private companies in wastewater treatment
(3) Development of laws and regulations related to wastewater
(4) Capacity development of human resources and institutional strengthening in wastewater

management sector

(5) Securing budget for development of infrastructure

One of the reasons for lagging behind in the sewerage development is a nonexistence of wastewater law. DGHS has already prepared a draft of Domestic Wastewater Law according to the above mentioned plan and is now conducting activities to finalize the draft with the assistance of JICA long-term expert under Output-1 of the Project.

MPW had been requested by the parliament of Indonesia to enact a comprehensive law on sanitation in June 2011 and decided to enact "Sanitation Law" which will cover both wastewater and drainage.

The future schedule for finalizing the wastewater law is as follows:

- ✓ The first draft will be complete in June 2012.
- ✓ Preparation of an "academic text" will be finalized, which is a draft revised based on comments heard from universities, research institutions, local governments, etc., within the Project period.
- ✓ After that, discussion among related ministries/agencies will be held through "harmonization".
- ✓ The draft of the Sanitation Law is to be introduced to the parliament by the end of 2012 and the Law will be promulgated in 2013 through deliberations in the parliament.

The schedule of formulating wastewater law and the related regulations in Output-1 of the Project is as follows:

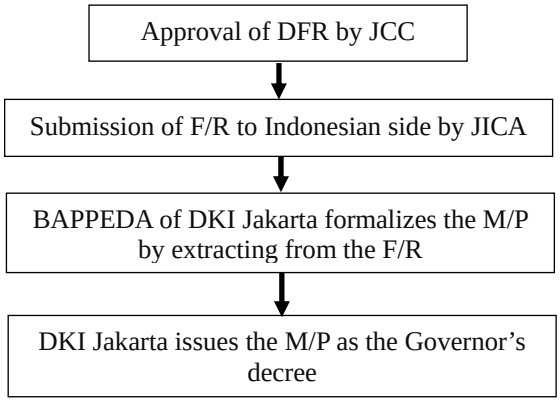
Table A2-2 Schedule of Formulating Wastewater Law and the Related Regulations as Output-1

Item for Development	Implementation Schedule
◆ Selection of the related regulations ◆ Preparation of water quality standard for wastewater discharge to sewerage ◆ Development of guidelines for master plan preparation ◆ Preparation of off-site facility standard	November 2011 to June 2012

Source: JICA Long-term Expert

A2.3 Process to Achieve Output-2

According to the Indonesian side, the reason for the Old M/P 1991 having not being implemented is that it had not been approved by DKI Jakarta. Therefore, it is indispensable that the New M/P should be approved by DKI Jakarta. The process for getting approval of DKI Jakarta is expected as follows:



Source: JICA expert team

Figure A2-1 Expected Approval Process by DKI Jakarta for the New Master Plan

JICA expert team has formulated the New M/P in close consultations with the working group of DKI Jakarta consisting of the representative of the related divisions and departments of DKI Jakarta including BAPPEDA. The New M/P includes a number of proposals requiring decision making by the top management level of DKI Jakarta for realization such as securing the sites of WWTP, reorganization of wastewater and sludge management, establishment of regular desludging system of

septic sludge, etc. Therefore, it is expected that DKI Jakarta should promote implementation of these proposals based on the New M/P.

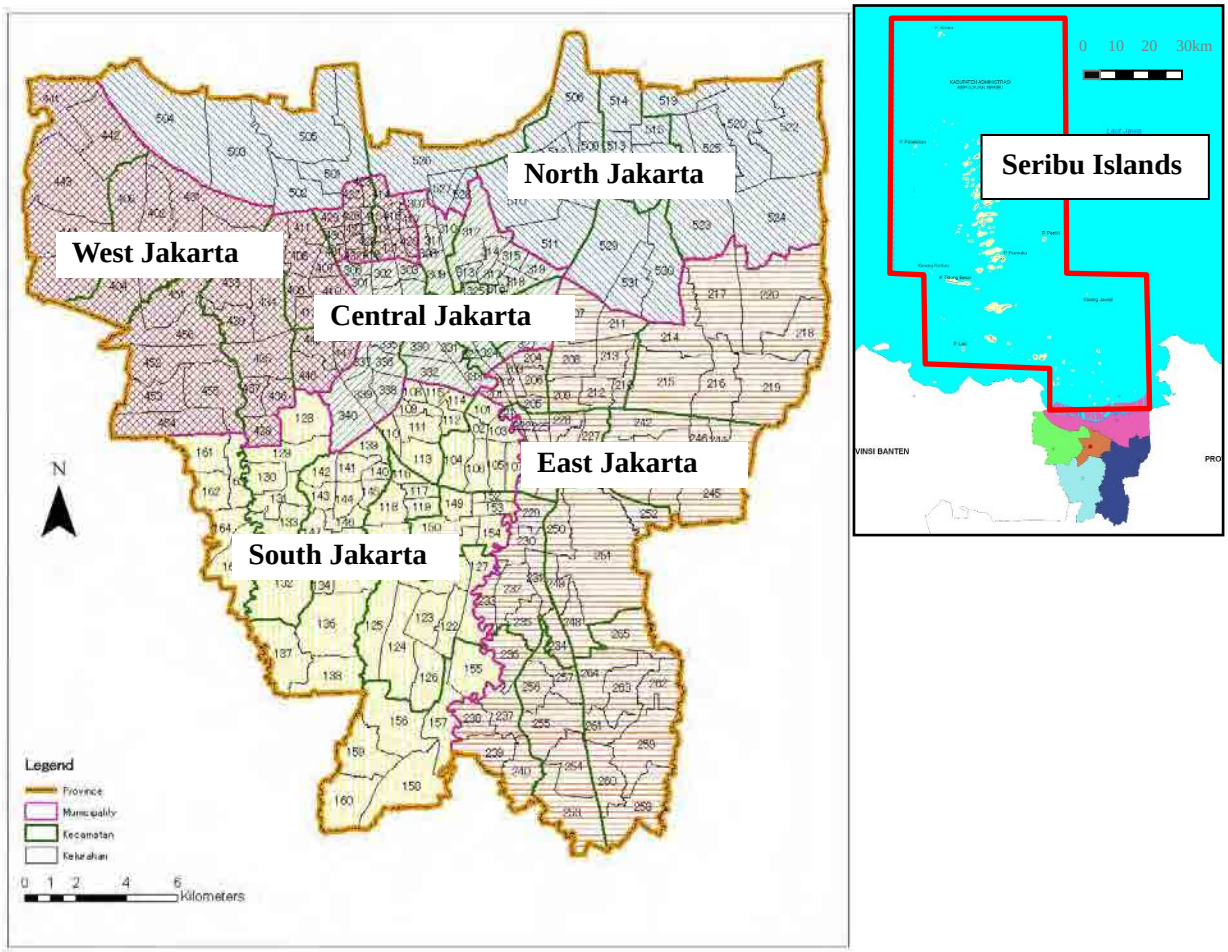
Table A2-3 Project Outputs and Activities

Output	Activity
Output-1 : Domestic Wastewater Law and its regulations are prepared	<Indicator> 1-1 Draft Domestic Wastewater Law is developed. 1-2 Regulations and standards related to Domestic Wastewater Law are developed. <Activity> 1-1 To collect and analyze basic information related to national wastewater sector, and identify institutional and technical issues based on existing data and previous study. 1-2 To select priority laws and regulations comprised norms, standards, guidelines and criteria to be developed or revised. 1-3 To develop draft of laws and regulations comprised norms, standards, guidelines and criteria that are selected in activity (1-2). 1-4 To hold a seminar with relevant organizations / stakeholders in the wastewater sector to share and discuss the result of activity (1-3). 1-5 To develop or revise laws and regulations identified in activity (1-2) based on the result of activity (1-4) and (2-2-13).
Output-2 : The wastewater management master plan in DKI Jakarta is revised	<Indicator> 2-1 Revised wastewater management master plan is approved in DKI Jakarta <Activity> 2-1 To conduct survey for reviewing the wastewater management master plan in DKI Jakarta. 2-1-1 To review the existing data and information including progress of the master plan, related plans and policies. 2-1-2 To assess capacity of wastewater sector in DKI Jakarta and PD PAL JAYA. 2-1-3 To identify flood condition and major drainage facilities. 2-1-4 To conduct site survey and data analysis. 2-1-5 To analyze socio-economic data for establishing the New M/P. 2-1-6 To identify Institutional Issues (Organizational, Financial and Human Resources related) in the relevant Organizations in sanitation and sewerage in DKI Jakarta. 2-1-7 To conduct field survey for selection of sewage treatment plant sites. 2-1-8 To conduct water quality survey. 2-1-9 To evaluate the present condition and to identify the issues. 2-2 To review the master plan. 2-2-1 To develop the basic plan for wastewater management including targets, strategies and actions. 2-2-2 To develop the frame work for wastewater management system. 2-2-3 To develop the planning data (qualities and quantity of wastewater generation). 2-2-4 To make a zoning of off-site system and on-site system. 2-2-5 To select the sewage treatment plant sites. 2-2-6 To develop alternative studies of the master plan. 2-2-7 To select the most appropriate alternative option. 2-2-8 To develop an improvement plan of the organization functions. 2-2-9 To develop an activity plan of environmental education in wastewater sector. 2-2-10 To evaluate the selected alternative option. 2-2-11 To identify priority actions to be taken for implementation of the master plan and male an action plan including implementation of a feasibility study. 2-2-12 To conduct initial environmental evaluation (IEE) 2-2-13 To publish the revised wastewater management master plan in DKI Jakarta

Source : JICA expert team

A3 Project Area

The Project Area shall be DKI Jakarta administration area shown in Figure A3-1.



Source: Prepared by JICA expert team based on the data from DKI Jakarta

Figure A3-1 Administrative Boundaries of DKI Jakarta

DKI Jakarta comprises of five (5) municipalities (*Wilayah*), 1 regency (*Kabupaten*), 44 districts (*Kecamatan*) and 267 sub-districts (*Kelurahan*) as shown in Table A3-1. The population and the density in 2010 are also shown in this table.

Table A3-1 Administration Division of DKI Jakarta (Year 2010)

No.	Municipalities	District	Sub-district	Population (PE)	Area (ha)	Density (person/ha)
1	North Jakarta	6	31	1,554,003	13,903	112
2	West Jakarta	8	56	2,345,524	12.525	187
3	Central Jakarta	8	44	952.635	4.714	202
4	South Jakarta	10	65	2,280,406	14.573	156
5	East Jakarta	10	65	2,585,628	18.990	136
	5 Municipalities Total	**42**	**261**	**9,718,196**	**64,705**	**150**
6	Seribu Islands	2	6	20,684	870	24
DKI Jakarta Total		44	267	9,738,880	65.575	149

Source: JICA expert team

Also, there exists 2,657 RWs (Rukun Warga) and 29,769 RTs (Rukun Tetangga) which mean a neighboring community.

A4 Target Year of New Master Plan

The target year of the New M/P is the year 2030. The New M/P for off-site (sewerage) and on-site

development shall be formulated for three (3) stages as follows:

- Short-term development plan: Year from 2012 to 2020
- Mid-term development plan: Year from 2021 to 2030
- Long-term development plan: Year from 2031 to 2050

Meanwhile, an action plan only for the prioritized projects of the short term plan in the New M/P shall be prepared.

A5 Definition of Terms

The terms used in the New M/P are defined as shown in Table A5-1.

Table A5-1 Definition of Terms used in the New M/P

Term	Definition
Off-site sanitation	System transporting human excreta to another location for treatment, disposal or use
On-site sanitation	System treating human excreta at the point of generation
Wastewater treatment plant (WWTP)	Facility treating wastewater from off-site system (sewerage) and discharge the treated water into river, lake and sea
Pumping station	A part of off-site facilities. Facility lifting sewage near the ground level and transfer it to the next pump station or WWTP when discharging by gravity is considered inappropriate due to the economical reason in the construction such as pipe installation depth becomes deep, topography is irregular, etc.
Sewer	A part of off-site facilities. Pipelines in general collecting and transporting sewage to WWTP and discharging points
House connection	A part of off-site facilities. Pipe connecting sewer with house inlet which is installed to collect black water and grey water from households and enterprises
Secondary & tertiary sewer	Sewer pipeline with diameters from 200mm to 300m: installed in branch roads and connected with ordinary houses or public & commercial facilities by house connection
Main sewer	Sewer pipeline with diameters from 350mm to 800mm: installed so as to discharge wastewater collected by secondary & tertiary sewer into trunk sewer
Trunk sewer	Sewer pipeline with diameters of 900mm or over which is the most essential facility for sewer: installed so as to transfer sewage to WWTP
Wastewater treatment plant (WWTP)	Facility to treat the wastewater collected through sewers and discharge the treated water to the public water bodies
Individual treatment plant (ITP)	Facility installed individually to treat wastewater of hotels, commercial buildings, hospitals, public facilities, etc. which is categorized as an off-site system
Sludge treatment plant (STP)	Facility treating sludge extracted from on-site facilities. This is categorized as on-site sanitation.
Septic tank	General term of facilities treating black water only or black water and grey water, being connected with toilet. This is categorized as on-site sanitation.
Conventional type septic tank	Method of treatment by soil layers in which treatment of wastewater mainly relies on soil layers. There is direct soaking method by pit without bottom slab. Another type is that supernatant water after primary settlement in the 1st pit is moved to the 2nd pit without bottom slab and soaked into the underground or supernatant water is discharged into the nearby rivers or drains.
Modified type septic tank	Facility to which any type of purification media or equipment is attached to the conventional type septic tank.
Public & commercial facilities	Public & commercial facilities such as hotels, schools, hospitals, commercial buildings, public facilities, etc.

Source: JICA expert team

PART-B DATA AND INFORMATION

PART-B DATA AND INFORMATION

B1 Present Conditions and Issues in Sewerage and Sanitation Sectors in Indonesia

B1.1 Total System of Management and Supervision for Sewerage and Sanitation Sectors in Indonesia

Management and supervision for storm water & wastewater and sanitation are under responsibility of the following agencies in Indonesia. However, the responsiblity of each agency is unclear. Therefore, organizational and institutional re-arrangement/reform is necessary including unification.

Table B1-1 Total System of Management and Supervision in Sewerage and Sanitation Sectors in Indonesia

Management and Supervision		Stormwater	Wastewater	
			Off-site	On-site
Ministry of Public Works	DKI Jakarta	○ (main rivers)	○	○
	Others	○	○	○
DKI Jakarta	BPLHD		○	○
	DPU	○(branches, canals)		
	PD PAL JAYA		○	○
	DK			○

Note: BPLHD: Regional Environment Management Board, DPU: Public Works Agency of DKI Jakarta, PD PAL JAYA: Regional Company of Wastewater Management of DKI Jakarta, DK: Cleansing Agency of DKI Jakarta
Source: JICA Expert Team

B1.2 Policies and Strategies

In Indonesia, both off-site system and on-site system are managed by the *Cipta Karya* (Directorate General of Human Settlement : DGHS) at the Ministry of Public Works. Therefore, the policies and strategies for off-site and on-site systems are not separated. Indonesia has "sanitation" policies and strategies which cover both off-site and on-site systems.

B1.2.1 BAPPENAS (National Planning & Development Board)

(1) Indonesia Sanitation Sector Development Program (ISSDP) 2006-2010

It can be said that the International Year of Sanitation (2008) was the starting point for the development of Indonesian "sanitation" policies. Through decentralization in 2001, local governments were given ultimate responsibility for deciding how much should be invested in "sanitation." This meant that, if a local assembly had a low level of awareness about "sanitation," no investment would be made for "sanitation." In fact, the awareness levels of local assemblies were low.

Therefore, decentralization resulted in delayed development and investment in Indonesian "sanitation" policies. However, poor "sanitation" is not just a local problem. It also affects the national economy by contributing to an increase in health care costs, decreases in foreign direct investment and tourism income. According to a WSP (Water and Sanitation Program) report, Indonesia lost IDR 560 trillion (63 billion dollars) in 2006 due to poor sanitation, which accounts for 2.3% of gross national product (GDP). Poor sanitation also hampers the improvement of Indonesia's image overseas. Therefore, in the Indonesian government, BAPPENAS took the initiative in launching the Indonesia Sanitation Sector Development Program (ISSDP) in 2006 through a partnership with the WSP and conducted awareness-raising activities for Indonesian people at all levels.

More specifically, at the central government level, the National Water Supply and Sanitation Working Group was organized by eight relevant ministries and agencies as a cross-ministerial organization. BAPPENAS became the leading agency. At the local level, urban sanitation strategies were formulated for six cities (Payakumbuh, Jambi, Banjarmasin, Denpasar, Blitar and Surakarta) using the participatory approach in the first phase of the ISSDP (which ended in September 2008). Using the methodology established in this process, the "Acceleration of Urban Sanitation Development Program

(PPSP) 2010-2014" was prepared and it was adopted at the national conference on urban sanitation strategies in April, 2009.

(2) Objectives and Content of the Acceleration of Urban Sanitation Development Program (PPSP) 2010- 2014 (Concerning Wastewater)

1) Objectives

- Open defecation will be eradicated by 2014 (Open Defecation Free).
- 80% of urban household have access to solid waste management
- Flooding in 22,500ha in 100 strategic urban areas will be reduced.

2) Main Approaches

(a) Through the development of sewage systems in 16 cities (the construction of new systems in five cities and the expansion of the systems in 11 cities), the population covered by sewage systems in urban areas will be increased to 5% and the population who have access to sewage systems will be increased to five million.
(b) SANIMAS (community-based sanitation systems) will be constructed in 226 cities nationwide.
(c) The quantity of sludge at on-site systems will be reduced by 20%1.
(d) 3R practice will be nationally implemented.
(e) Final disposal sites will be improved as sanitatary landfills to serve 240 cities.
(f) Flooding in 22,500ha in 100 strategic urban areas will be reduced.

3) Planning

(a) Urban sanitation strategies will be formulated in all 330 cities.
(b) Urban sanitation strategies will be implemented in 160 cities.

4) Investment Amount

5.5 billion dollars (of which 500 million dollars will come from the central government's Special Allocation Fund)

B1.2.2 Ministry of Public Works (MPW)

At the Indonesian central government level, the National Water Supply and Sanitation Working Group (led by BAPPENAS) was organized by eight ministries and agencies and sanitation policies are properly coordinated. Therefore, it is thought that BAPPENAS and the MPW are united behind the same policies.

B1.2.3 DKI Jakarta Government

DKI Jakarta is in an extremely difficult situation regarding the formulation of policies on wastewater. The main departments in charge of wastewater problems in the DKI Jakarta government are Regional Environment Management Board (BPLHD), Public Works Agency (DPU) and the Cleansing Agency (DK). Although the wastewater management division of the DPU had 35 community wastewater treatment systems, the division was abolished in 2008 and the management of the community wastewater treatment systems was transferred to the BPLHD and wastewater problems became outside the operational scope of the DPU. However, the 35 facilities are not being maintained because the BPLHD is essentially a regulatory department and does not have the ability to construct and manage the facilities. The main duties of the DK are the collection and treatment of solid waste. They also treat the sludge from household septic tanks, but it is not their main job. The sewerage systems are controlled by PD PAL JAYA (which is a public corporation) in some areas, but there is no department

[1] The most part of the urban sanitation in Indonesia depends on the septic tanks as the on-site wastewater facilities. Since the regular collection of the sludge has not been introduced, the sludge generated inside of the septic tanks only accumulates and, as a result, the septic tanks are actually not functioning as the wastewater treatment facilities. In order to deal with this problem, it is intended to reduce the total volume of the sludge inside the septic tanks by 20% by strengthening the collection of the sludge and to recover the treatment function of the septic tanks.

in the DKI Jakarta government which controls the technical aspects of the PD PAL JAYA's operations. In addition, although Regional Planning and Development Board (BAPPEDA) has responsibilities to prepare, control, and coordinate regional development plan, BAPPEDA has not still functioned as board which concretely coordinate the policy of the organizations involved in wastewater management. This results in a lack of unified wastewater management policies within the DKI Jakarta government and wastewater management is given low priority in the DKI Jakarta budget. In the DKI Jakarta budget, "flooding measures" and "transportation measures" are given special budgetary frameworks (as special policy expenditure budgets), but this is not the case for wastewater measures. PD PAL JAYA is treated in the same way as other public corporations which run on a self-paying basis and it does not have access to the DKI Jakarta budget.

Therefore, the most urgent tasks for the DKI Jakarta government would be to establish an organization which will control the unified wastewater management policies, secure the budget by establishing a "special policy expenditure budget" for wastewater management costs and create a system through which PD PAL JAYA can access the budget for wastewater management. It will be necessary for these measures to be incorporated into the JICA master plan and a DKI Jakarta Governor Regulation will have to be issued for the measures, in order for these measures to be established as DKI Jakarta policies.

B1.2.4 PD PAL JAYA

PD PAL JAYA is an organization established to maintain the sewerage systems constructed in a limited area of Jakarta City under the JSSP assisted by the World Bank. The company's operations include the maintenance of on-site sanitation facilities because the JSSP included some on-site sanitation facilities. Therefore, the company has personnel who have received specialized education and overseas training on sewerage and on-site systems. For this reason, it is expected that the company has a reasonable level of policy-making capabilities, but it is not being given the opportunity to utilize these capabilities because it does not have the status of a policy-making organization within the DKI Jakarta government.

B1.3 Organization and Institution

B1.3.1 Ministry of Public Works (MPW)

Ministry of Public Works consists of four directorate generals, which are Directorate General of Human Settlement (DGHS=*Cipta Karya*), Directorate General of Spatial Planning (DGSP), Directorate General of Water Resources (DGWR) and Directorate General of Highways (DGH).

DGHS has responsibility for policies on housing development, water supply and environmental sanitation sector development. In DGHS, Directorate of Environmental Sanitation Development (DESD) has authority to determine policies on wastewater management.

B1.3.2 DKI Jakarta

1) BAPPEDA (Regional Planning and Development Board)

Based on Governor Regulation No.70/2009, the main duties of BAPPEDA is preparation policy coordination, and evaluation the implementation of regional development, which is defined as follows;

a. Policy formulation of development plan, research, and development and also regional statistic.
b. Coordinating the preparation of Spatial Plan (RTRW), Regional Long Term Development Plan (RPJPD), Regional Medium Development Plan (RPJMD), and Regional Government's Work Plan (RKPD).
c. Preparation of Budgets' General Policy (KUA) coordinating with Regional Financial Management Board (BPKD).
d. Preparation of Budgets' Ceiling and Preparation (PPA) coordinating with Regional Financial Management Board (BPKD).

e. Policy coordination of planning in the field of economic development, development of infrastructures and facilities, development of communities' welfare, development of governance, development of apparatus and financial.
f. Coordination of development plan in integrated, cross country, cross regional, cross government affair, between regional government with central and between other parties.
g. Evaluation of development plan implementation.
h. Giving technical support of development planning to the regional apparatus.

2) Organization Structure

The organization of BAPPEDA for implementation of affairs stated above is consists of as follows. With respect to wastewater management, Division of City Infrastructure and Environment is directly involved with the matters.

a. Head of Board
b. Vice Head of Board
c. Secretariat of Sub-division of general, staffing, budget and program, and finance
d. Division of Communities' Welfare
e. Division of City Infrastructures and Environment
f. Division of Economy
g. Division of Government
h. Division of Development Program and Financing
i. Division of Research and Statistic
j. Division of Planning Guidance
k. Technical Implementation Unit

(2) BPLHD (Regional Environment Management Board)

1) Scope of Work

Based on Local Government Decree No. 10/2008 and Governor Ordinance 165/2009, BPLHD is mainly implementing environmental control administration indicated below.

- Draw-up of policy for environmental administration
- Monitoring related to environmental control facilities
- Wastewater management
- Control and operation of hazardous waste
- Control and evaluation of surface water
- Coordination related to reduction of pollution load and to recovery of worsened environmental field
- Improvement of organizations related to environment management and upbringing of human resources
- Technical guidance, management and supervision of environmental impact assessment (EIA)
- Management of wastewater management administration including factory wastewater (DK, PD PAL JAYA)
- Technological support to Environment Analysis Department and coordination
- Testing and analysis in laboratory related to environment control
- Guidance, proposal, licensing or monitoring, supervision and coordination for use of ground water, factory waste including hazardous substances and for recovery of surface water resources
- Strengthening of legal structure related to environment and ground water

2) Organizational Structure

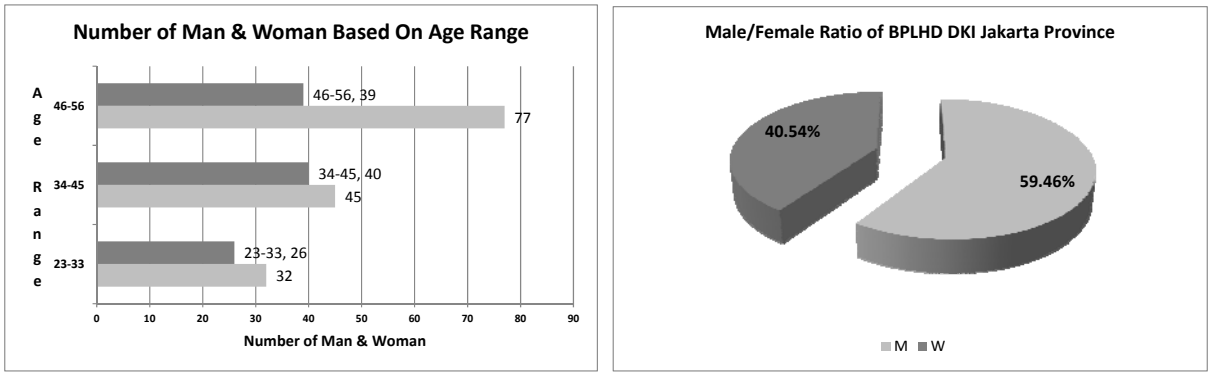
The organization of BPLHD for implementation of affairs stated above is as shown in Supporting Report (S/R) PART-B : B1.

3) Organization Personnel

The age range, man/woman ratio, educational background and major in university of 193 personnel constituting BPLHD are indicated below.

(a) Age Range and Man/Woman Ratio

When the age range of personnel is observed as divided into male and female, the number of persons belonging to the age group of 46 to 56 is the largest among males, and it decreases as the age becomes small. Among female, those belonging to the age group of 46 to 56 and of 34 to 45 are almost equal, and the number of persons decreases in the age group of 23 to 33.



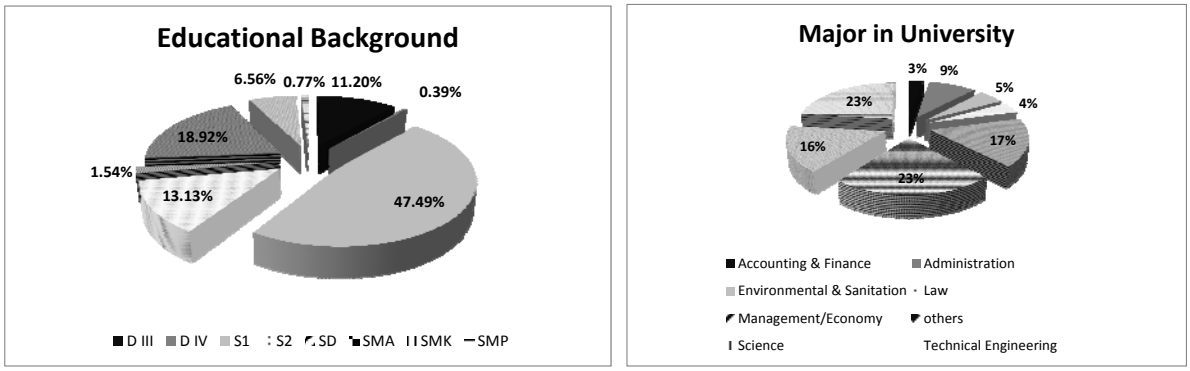
Source: JICA Expert Team

Figure B1-1 Age Range and Man/Woman Ratio of BPLHD Personnel

(b) Educational Background

When the educational background of personnel is observed, the number of university graduates (S2) is the largest (47.49%), high school graduates (SMA) are 18.92%, masters (S2) are 13.13% and diplomas (DIII) are 11.20%.

When the area of expertise is observed on university graduates and masters, technical engineers constitute 23%, management/economy specialists are 17% and science specialists are 16%.



Note: DIII,DIV: Diploma, S1:Graduate,S2:Master Degree, SD: Elementary school, SMA: High school, SMK: Vocational high school, SMP: Junior high school

Source: JICA Expert Team

Figure B1-2 Educational Background and Major in University of BPLHD's Employee

(3) Cleansing Agency (DK)

1) Scope of Work

Based on Local Government Decree No. 131/2009, Cleansing Agency is mainly performing cleaning administration indicated below.

- Draw-up of and execution of affairs plan and budget of DK
- Draw-up of technological policy related to implementation of cleaning management
- Management of solid waste and septic tanks wastewater
- Construction of infrastructure and facilities for cleaning management
- Promotion of education and training as well as community participation for improving sanitation and cleanliness of living
- Education and training regarding waste management and septic tanks wastewater
- In the field of cleaning service; provision of service, education and training, management of recommendations, draw-up of criteria and grant of permits
- Execution of laws in cleaning management
- Collection, management, storage and reporting of cleaning tax
- Construction, operation, running and maintenance of infrastructure and facilities for cleaning
- Provision of technological support to workshops in the community and region
- Management of personnel affairs, finance, assets and operation of DK
- Reporting and explanation against implementation of affairs

2) Organizational Structure

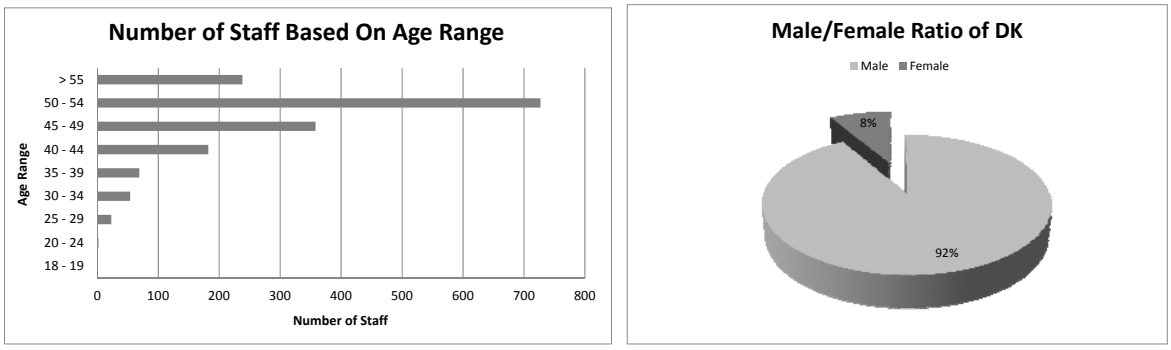
The organization of DK for implementation of affairs stated above is as shown in S/R Part-B : B1.

3) Organization Personnel

The age, educational background and field of expertise of personnel who constitute DK are as indicated below.

(a) Age Range and Man/Woman Ratio

When the age composition of personnel is observed, the number of those who belong to the age group of 50 to 54 is the largest, followed by age groups of 45 to 49 and 55 up. The number of those who belong to the younger age group is less. The male-female ratio is 92% male, 8% female.

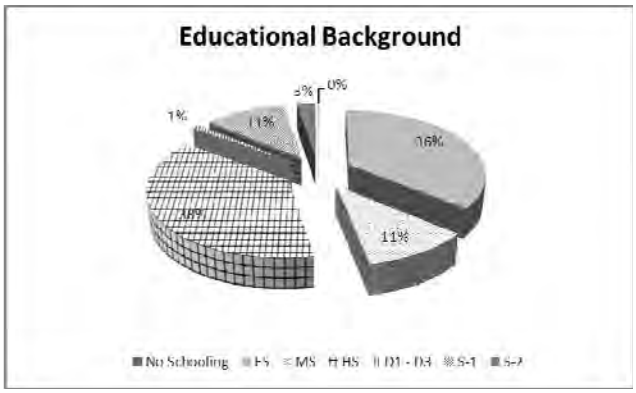


Source: JICA Expert Team

Figure B1-3 Age Range and Man/Woman Ratio of Cleansing Agency Personnel

(b) Educational Background

When the educational background composition of personnel is observed, the number of those who finished junior high school (ES) and elementary school (ES, MS) is the largest (47%), senior high school (HS) is the next (38%). University graduates and masters (SI, S2) are 14% and diploma holders (DI-III) are 1%.



Note: ES: Elementary school (SD), MS: Junior high school (SMP), HS: High school (SMA), DI-DIII: Diploma, S1:Graduate, S2:Master Degree
Source: JICA Expert Team

Figure B1-4 Educational Background of Personnel in DK

B1.3.3 PD PAL JAYA

(1) Scope of Works

PD PAL JAYA was established in 1991 under 1991 DKI Jakarta Ordinance No. 10 (The Regional Regulation of DKI Jakarta number 10/1991) with the purpose to provide sewerage water collection service through management of off-site facilities, to improve social welfare and to support policies of DKI Jakarta related to these matters. Thereafter, under 1997 DKI Jakarta Ordinance No. 14 (The Regional Regulation of DKI Jakarta number 14/1997), the affairs area of PD PAL JAYA was expanded to the whole DKI Jakarta area, and supporting of policies of DKI Jakarta was added also to management of on-site facilities besides management of off-site facilities.

Details of affairs of PD PAL JAYA are stipulated in Decree of PD PAL JAYA's Director for the Province of Jakarta, Number 31, 2010. The purpose of establishment and an overview of affairs of PD PAL JAYA are described below. The ordinance also stipulated PD PAL JAYA to support policies of DKI Jakarta in the area of on-site facilities management in addition to off-site facilities.

1) Purpose of Establishment

- Provision of sewerage water collection service through management of off-site facilities
- Improvement of social welfare through management of on-site facilities
- Supporting of policies of DKI Jakarta related to above-stated items

2) Scope of Works

(a) Affairs Related to Off-site Facilities

- Running, inspection and repair to treatment equipment (surface aeration machine) and electrical equipment of Setiabudi Treatment Plant
- Analysis of water quality of Setiabudi Treatment Plant
- Inspection and emergency response to sewerage water pipe conduits, service pipes and manholes
- O&M, monitoring and management of pumping stations
- Inspection of wastewater samples brought from customers
- Collection of sewerage fee, customer management and treatment of customer complaints
- Promotion of penetration of sewerage system
- Adjustment of short-term, medium-term and long-term plans of sewerage business
- Proposal of technological requirements and budget for sewerage facilities
- Formulation of technological plans related to repair, management and extension of sewerage facilities
- Other office duties required for company operation (finance, general affairs, etc.)

(b) Affairs Related to On-site Facilities

- Manufacturing, marketing and maintenance of improved septic tanks through subsidiaries
- Desludging and conveyance of sludge from on-site facilities such as septic tanks

The affairs of desludging and conveyance of sludge is currently are implemented on the on-call base in correspondence to requests from customers. It is planned to divide the whole area of DKI Jakarta to ten (10) service sections and to promote periodic desludging. It is further planned to perform periodic desludging about once every six months and to collect charges from customers on the monthly basis in the future.

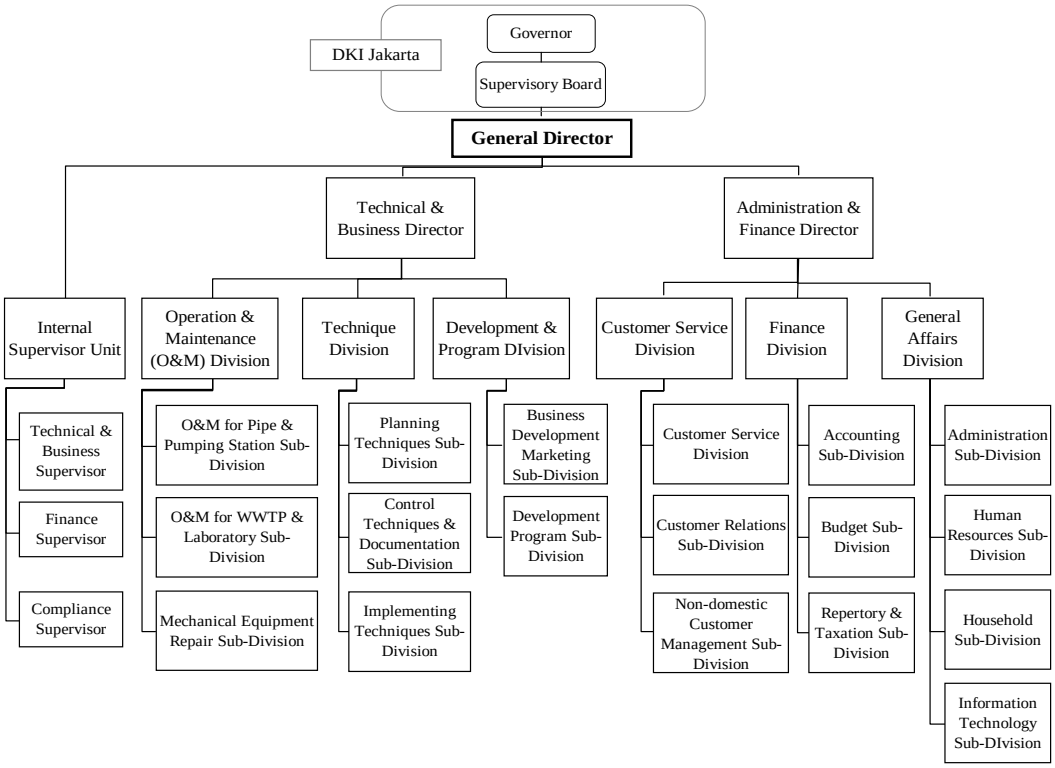
(2) Organization Structure

The off-site sanitation had been controlled until 1991 by the Waste Water Management Institution (BPAL) established based on the Public Works Minister Decree Number 510/KPTS/1987 of DKI Jakarta.

PD PAL JAYA was established based on the Regional Regulation of DKI Jakarta Number 10/1991 in 1991 to control the off-site sanitation, collect wastewater, improve the social welfare and support the policies of DKI Jakarta for these matters. The control of the off-site sanitation was transferred to PD PAL JAYA and it has been managing the stations until now.

Figure B1-5 shows the organization chart of PD PAL JAYA.

As shown, PD PAL JAYA consists of two business departments (Technical & Business Dept. and Administration & Finance Dept.), six divisions and eighteen sub-divisions.



Source: PD PAL JAYA

Figure B1-5 Organization Structure of PD PAL JAYA (As of Jan.2011)

(3) Number of Staff

Table B1-2 shows the number of staffs in PD PAL JAYA.

The total number of staffs is 106, in which Technical & Business Department accounts for 36% and Administration & Finance Department accounts for 61%. S/R PART-B : B1 shows the number of

staffs in each division and position.

Table B1-2 Number of Staffs of PD PAL JAYA

Category		Number of staff		Rate (%)
President Director		1	3	2.8%
Director		2		
Technical & Business	Operation & Maintenance Div.	18	38	35.8%
	Technical Div.	12		
	Development & Program Div.	8		
Administration & Finance	Customer Service Div.	12	65	61.3%
	Finance Div.	13		
	General Div.	28		
Internal Audit supervisor		9		
Others(contract basis worker)		3		
Total		106		100.0%

Source: PD PAL JAYA

(4) Job Description

The job details are specified by the Decree of PD PAL JAYA's Director for the Province of Jakarta, Number 31, 2010.

Table B1-3, Table B1-4and Table B1-5 shows the works for the respective divisions and subdivisions.

Table B1-3 Work Description of PD PAL JAYA (1/3)

Division/Sub-division			Work Description
Directorate of Technical & Business			
	Operation & Maintenance		
		Sub-division of Piping network and pumping station	*Operation, maintenance, emergency response, monitoring and supervision of
			*Operation, maintenance, monitoring and supervision of pumping stations
		Sub-division of WWTP and Laboratory	*Operation and maintenance of Setiabudi Ponds
			*Water quality analysis of Setiabudi Ponds
			*Operation and maintenance of laboratories
			*Analysis of wastewater sample from customers
		Sub-division of Technical equipment and Workshop	*Provision of technical equipment
			*Maintenance of operational vehicles
			*Operation and maintenance of workshops
	Technical Division		
		Sub-division of Technical planning	*Making work plans for surveys and measurements for sewerage system
			*Presentation of engineering requirements and estimated budget for work of
			*Preparation of technical plan of repairs, maintenance, and expansion of sewerage
		Sub-division of Technical control and documentation	*Collecting technical data and mapping/drawing data of sewerage system
			*Preparing the data plan for the network working and construction of sewerage system
			*Coordination with related technical agencies relating to the construction of
		Sub-division of Technical implementation	*Installation of sewage pipes, sewer pipes and inspection chambers
			*Budgeting on the construction works
			*Making work progress reports
	Development and Program		
		Marketing and business development	*Promotion of sewerage development
			*Making achievement targets
			*Making an administration process of wastewater treatment services
			*Business cooperation and marketing with other related parties
			*Business development including the asset utilization

Table B1-3 Work Description of PD PAL JAYA (1/3)

Division/Sub-division			Work Description
		Program management	*Research and development on efficiency and job performance of maintenance,
			*Preparation of short-term program, medium-term program, and long-term program
			*Evaluation and control toward the implementation of programs and work plans
			*Data collection of trend price of raw materials

Source: Decree of PD PAL JAYA's Director for the Province of Jakarta, Number 31, 2010

Table B1-4 Work Description of PD PAL JAYA (2/3)

Division/Sub-division			Work Description
Directorate of Administration & Finance			
	Customer Service Division		
		Sub-division of Customer relation ship	*Provision of service and handling of customer complaints
			*Regular surveys/monitoring of customer satisfaction
			*Arranging the program to improve the quality of customer services
		Sub-division of Management of non-domestic customers	*Billing account of sewage services for non domestic customers
			*Periodic evaluations on the level of success in payments
			*Periodic research and data evaluation for non-household of building floor areas
		Sub-division of Management of domestic customers	*Billing account of sewage services for domestic customers
			*Periodic evaluations on the level of success in payments
			*Periodic research and data evaluation for household of building floor areas
	Finance Division		
		Sub-division of Accounting	*Preparing balance sheet and income statement
			*Preparing company reports
		Sub-division of Budget	*Preparing company budget
			*Making budget request
			*Monitoring and evaluation of budget revenues and expenditures
		Sub-division of Treasury and taxation	*Reception and storage of money
			*Payment of tax and accounting records
			*Payment of salaries and other employee benefits
	General Division		
		Sub-division of Administration	*Secretarial and clerical works
			*Document preparation/administration of procurement of goods and services
			*Management of company's business documents and official documents
		Sub-division of Personnel	*Administration of staff and formation of personnel system
			*Planning of procurement/receipt, mutation and career development of personal
			*Employee welfare and pension
			*Evaluation and discipline on employees
		Sub-division of Up-keep	*Provision of facilities and infrastructure equipment of office
			*Providing cleaning and keeping security
		Sub-division of Information technology	*Making a plan for the requirement of hardware and software of computer for each work unit
			*Adjustment increased the ability of computer technology to improve the performance of company

Source: Decree of PD PAL JAYA's Director for the Province of Jakarta, Number 31, 2010

Table B1-5 Work Description of PD PAL JAYA (3/3)

Division/Sub-division		Scope of Works
Internal Supervisor Unit		
	Technical & business supervisor	*Monitoring and assessment of technical activities
		*Monitoring and assessment on wastewater treatment, both in quality and quantity
		* Monitoring and assessment on the maintenance of public sewage network and personnel pipe
		*Monitoring and assessment on business promotion and development
	Financial supervisor	*monitoring and assessment of the implementation of financial management activities and results
		*Monthly settlement of account
		*Monitoring and assessment of the implementation of customer service
		*Reporting of audit and assessment of financial activities
		*Monitoring and assessment of asset management companies
	Compliance supervisor	*Monitoring and assessment of administrative and personnel activities
		*Monitoring and assessment of compliance activities
		*Assessment and evaluation on the letter of agreement / contracts and and other legal products

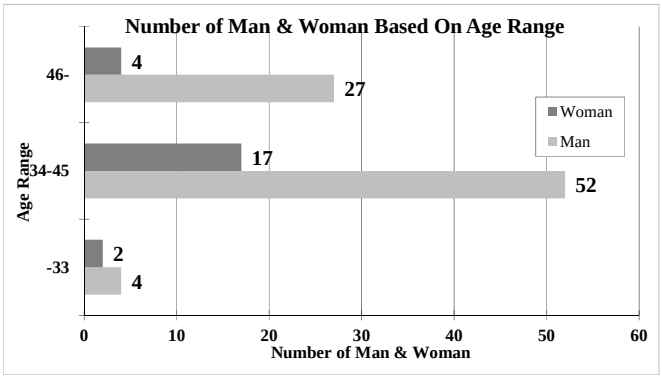
Source: Decree of PD PAL JAYA's Director for the Province of Jakarta, Number 31, 2010

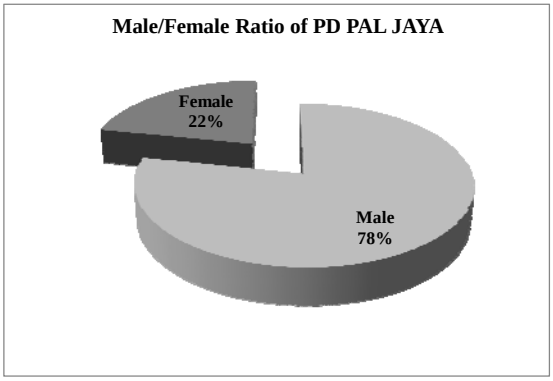
(5) Organization Personnel

The age, male/female ratio, educational background and field of expertise of 106 personnel constituting PD PAL JAYA are as follows.

1) Age Range and Man/Woman Ratio

The average age of PD PAL JAYA personnel is 43. When the age composition of personnel is observed as divided into male and female, the number of those who belong to the age group of 34 to 45 is the largest (65%). On the other hand, the number of young people of up to 33 is extremely small (6%). Furthermore, 78% are male and 22% are female.





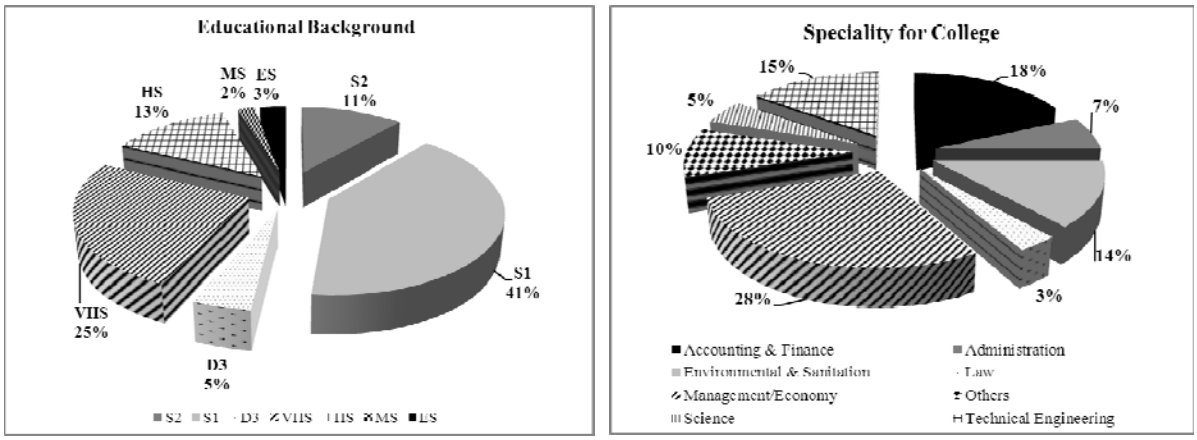
Source：PD PAL JAYA

Figure B1-6 Age Range and Man/Woman Ratio of PD PAL JAYA Personnel

2) Educational Background and Major in University

The number of university graduates (S1) is the largest (41%), followed by professional school graduates (VHS) 25%, high school graduates (HS) 13% and masters (S2) 11%.

As the field of expertise of university graduates and masters, those who specialized in management/economy is 29%, accounting/finance is 18%, technical engineer is 15% and environment/sanitation is 13%.



Note: S2:Master degree, S1:Graduate, D3:Diploma, VHS: Vocational high school (SMK), HS: High school (SMA), MS: Junior high school (SMP), ES: Elementary school (SD)

Source:PD PAL JAYA

Figure B1-7 Educational Background and Major in University of PD PAL JAYA Personnel

B1.3.4 Duty Sharing Regarding Wastewater Management

(1) Off-Site

1) Agencies Regarding Off-Site Work

The institutions related to implementation of off-site duties are three, that is, central government, DKI Jakarta and PD PAL JAYA. In DKI Jakarta, responsible agencies are BPLHD, DK and DPU. But the wastewater management department of DPU was abolished in 2008 and its affairs was transferred to BPLHD, and thus the wastewater issue was excluded from the scope of affairs of DPU. However, BPLHD is basically a regulatory government agency and does not have the capability to construct and manage the facilities. Furthermore, in addition to these three departments of DKI Jakarta, BAPPEDA that coordinates activity plans and budgets of these departments is also one of relevant institutions.

2) Responsbile Institutions for Off-Site Works

Regarding current sharing of responsibility in wastewater management related to off-site facilities, responsible institutions for each stages of off-site work starting from the decision making, master plan draw-up, construction to O&M is shown in Table B1-6.

(a) Decision Making of Commencement of Sewerage Business

The decision making body to undertake the Sewerage Works is central government and local government.

(b) Master Plan Draw-Up

The master plan is drawn-up by DGHS, MPW in the central government.

(c) Construction

- The main body for the execution of construction of wastewater treatment plant (WWTP), pumping station and primary pipe is the central government.
- The main body for the execution of construction of secondary pipe is both the central government and local government, and the demaracation of responsibitly is not clear enough.
- The main body for the execution of construction of tertiary pipe and house connection is the local government. The responsible institution was DPU up to 2008. But the wastewater management department of DPU was abolished in 2008 and the works were transferred to BPLHD and PD PAL JAYA. However, the division of authority between BPLHD and PD PAL JAYA is not clear enough.

(d) O&M

The O&M body is PD PAL JAYA.

Table B1-6 Responsible Institutions of Off-site Works(Present State)

Implementation Item	Central Government	Local Government	PD PAL JAYA	Remarks
	DGHS	BAPPEDA, BPLHD		
★ Decision-making on Sewerage Service	○	○		
★ Preparation of Master Plan	○			
★ Construction	○			
* WWTP	○			
* Pumping Station	○			
* Primary Pipe	○			
* Secondary Pipe	○	○	○	Demarcation of authority is ambiguous.
* Tertiary Pipe		○	○	
* House Connection Pipe		○	○	
★ O&M			○	

Source：PD PAL JAYA

3) Transfer of Assets Ownership Regarding Off-Site System

The owner of assets of off-site facilities is different between the time of construction and after the commencement of O&M (present time) as indicated below. Table B1-7 shows transition of owner of assets of off-site facilities.

(a) Construction Stage

- The central government owned WWTP and primary pipe.
- Whether the owner of secondary pipe is the central government or the local government was not clear enough.
- The local government owned tertiary pipe.
- Whether the owner of house connection is the central government or the local government was not clear enough.

(b) After Commencement of O&M (Present State)

- The ownership of assets of all the sewerage facilities was transferred from central government or local government to PD PAL JAYA after start-up of O&M.
- Transfer of ownership did not occur immediately after start-up of O&M (1991). But several years were needed before completion of complete transfer (1997). Therefore, the asset value was reduced in the mean time due to occurrence of failure to facilities.
- At the occasion of transfer of ownership, the central government evaluated the value of sewerage facilities at that time for transfer to PD PAL JAYA.

Table B1-7 Transfer of Assets Ownership of Off-Site System (Construction Stage and After Commencement of O&M)

Assets Owner	Central Government	Local Government	PD PAL JAYA
Construction Stage			
* Land (Setiabudi Ponds)	○		
* WWTP(Setiabudi)	○		
* Pumping Station (Kurukut and Manggarai)	○		
* Primary Pipe	○		
* Secondary Pipe	○	○	
* Tertiary Pipe		○	
* House Connection Pipe		○	○
From O&M			
* Land (Setiabudi Ponds)	○		
* WWTP(Setiabudi)			○
* Pumping Station (Krukut and Manggarai)			○
* Primary Pipe			○
* Secondary Pipe			○
* Tertiary Pipe			○
* House Connection Pipe			○

Source: PD PAL JAYA

4) Authorized Institutions for Ownership and O&M of Setiabudi Treatment Plant

As Setiabudi Treatment Plant is a treatment plant that also works for flood control, its ownership and the authority for maintenance are in the command of multiple institutions.

Regarding ownership of facilities, basins and some screening equipment are owned by the central government, and discharge pumps are owned by DPU to control the flooding. PD PAL JAYA owns surface aeration machine, screening (excluding East Setiabudi Basin) and electrical equipment, which are directly related to the sewage treatment.

The dredging of the accumulated sludge in the basins and management of the operation of pumps are the responsibility of DPU. PD PAL JAYA is responsible for the management of surface aeration machine and removal of floating material in the basins.

Table B1-8 shows ownership and O&M of Setiabudi Treatment Plant.

Table B1-8 Authorized Institutions for Ownership and O&M of Setiabudi Treatment Plant (Present)

Assets	Owner			O&M		
	Central Government	Local Government	PD PAL JAYA	Central Government	Local Government	PD PAL JAYA
	DGHS	DPU		DGHS	DPU	
Ponds (East and West)	○				○	
Screen	○*		○			○
Aerator			○			○
Effluent Pump		○			○	

*Bar screen on East Pond is owned by Central Gov.
Note: DPU=Public Works Agency, DKI Jakarta
Source：PD PAL JAYA

(2) On-Site System

Details of on-site system affairs and implementing organization in DKI Jakarta are shown in S/R Part-B : B1 , but their overview is as indicated below.

1) Dissemination of Sanitation Awareness

- Draw-up of statistical data related to waterborne communicable diseases is the responsibility of Health Agency.
- Preliminary education related to sanitation is the responsibility of BPLHD and Health Agency.
- Education & awareness dissemination activities are implemented by BPLHD, DPU and DK.

2) Environmental Protection and Monitoring

- Draw-up of river water quality standard and monitoring of septic tank effluent, SANIMAS effluent and commercial buildings' effluent is the responsibility of BPLHD.
- Measures against illegal dumping of wastewater in to rivers are the responsibility of BPLHD.
- Measures for sanitation during flooding are the responsibility of BPLHD and DPU.

3) Private Toilet

- Installations of private toilets are controlled by Housing Agency and Health Agency.
- Draw-up of guidelines and control related to installation, structure, desludging and sludge treatment of septic tanks of private individuals are the responsibility of DPU and DK.

4) Public Toilet

- Management (cleaning and desludging) of public toilets is the responsibility of DK and PD PAL.
- Draw-up of guidelines and control related to construction and management of public toilets are the responsibility of DPU, BPLHD, Housing Agency and PD PAL JAYA.
- Draw-up of guidelines and control related to installation, structure, desludging and sludge treatment of public toilets are the responsibility of MPW, BPLHD and Housing Agency.

5) Wastewater Treatment by Commercial and Industrial Facilities

- Wastewater treatment by commercial and industrial facilities is controlled and monitored BPLHD.
- Draw-up of guidelines and control related to installation, structure, desludging and sludge treatment of wastewater treatment facilities of commercial and industrial facilities is the responsibility of BPLHD.
- Monitoring of wastewater from commercial and industrial facilities is the responsibility of BPLHD.

6) SANIMAS

- Development planning, maintenance, installation, structure and desludging of SANIMAS are under the responsibility of BPLHD and DPU.

7) Desludging of Septic Tank

- Desludging of septic tanks is the responsibility of DK.
- Conveyance of septic tank de-sludged from septic tanks is the responsibility of DK.
- Grant of permit to desludging companies is the responsibility of BPLHD and PD PAL JAYA.
- Monitoring of illegal dumping is the responsibility of BPLHD.

8) Treatment Facility for Septic Tank Sludge

- Maintenance and its budget planning for sludge treatment facilities are under the responsibility of DK.
- Monitoring of wastewater is the responsibility of BPLHD and DK.

- Facility improvement planning and its budget planning are under the responsibility of DK.

B1.3.5 Evaluation of DKI Jakarta's Government and PD PAL JAYA

(1) Organizational Issues

1) BPLHD

- Wastewater management planning function of BPLHD is relatively weak. Particularly, the organization that is capable of managing and guiding the community wastewater treatment plants of private sector development (such as housing complex and shopping malls) has not been formed. Although BPLHD is examining the wastewater treatment facilities in each individual development plan under the AMDAL (environmental impact assessment) scheme, it is not evaluation or examination from the viewpoint of observation of the whole development plan.
- Control of domentic wastewater generation sources is not done. The organization is not such that is fully capable of executing control of wastewater and sludge from septic tanks of private individual, control of miscellaneous wastewater and control of wastewater from commercial buildings. Particularly in case a modified septic tank is installed, monitoring of wastewater and sludge should be conducted to collect important data for check and improvement of performance.
- It is necessary to strengthen the organization for implementation of monitoring of wastewater source. Although it is a duty for each commercial building to perform periodic monitoring twice a year, analysis is conducted by BPLHD on samples brought to their laboratory. in fact it should be the rule that sampling is made by BPLHD themselves on the field, for which it is necessary to change the organization that is capable of doing such monitoring.
- Introduction of measurement certification program is required, for enhancing objectivity and neutrality of analysis results.

2) Cleansing Agency (DK)

- Control of conveyance of de-sludge is insufficient. It is necessary to positively trace the conveyance of withdrawn sludge including sludge de-sludged by private sector operators.
- To control the sludge treatment facilities efficiently, the organization is not capable of performing field analysis, which is essential for routine O&M
- Although the job of the organization is to control sludge, it is desirable that the organization also performs affairs related to development such as recycling of wastewater and sludge.
- The budget for maintenance of sludge treatment is not allocated.

3) PD PAL JAYA

(a) Precondition for Extraction of Issues on Organizational Structure

The subjects related to PD PAL JAYA will be considered assuming that one or more sewage treatment plants and sewer network would be operated & maintained by PD PAL JAYA up on implementation of master plan in the future.

(b) Organizational Issues of PD PAL JAYA

a) O&M of WWTP and Pumping Station

i) Preparing O&M Manual and Improving Training Program

Although PD PAL JAYA have drawn up O&M inspection charts for mechanical & electrical equipment, they are limited to inspection for the normal running only. Also condieraitons for optimum upkeep of wastewater treatment system particularly biological wastewater treatment system is missing. This is due to the fact that, although PD PAL JAYA was established as a sewerage system O&M company, there was no opportunity for implementation of substantial OJT because PD PAL JAYA does not have any standard sewage treatment plant for over 20 years. In order to strengthen their O&M

capabiltiy, introduction of programs for training young and mid-career personnel is essential.

ii) Knowledge and Educational Program on Biological Treatment

One of the important parameter for daily monitoring of ITPs is "the color of activated sludge". What is to be judged and how adjustment is to be made upon observation of the color were not clear enough. It is necessary to consolidate a structure that permits understanding of activated sludge and that permits O&M of activated sludge based on common criteria for judgment (transparency, SV30, etc.), and an education system for that purpose is also needed.

iii) Secure Cost for Repair

It is necessary for PD PAL JAYA to formulate a repair plan for optimum upkeep of functions of the sewerage facilities. The government of DKI Jakarta should permit PD PAL JAYA to allocate fund for their plan repair expenses.

b) Preparation and Utilization of Registry Ledger

Acquisition and arrangement of claims such as clogging and odor and of map information containing clogging points and so forth will facilitate analysis of information on business establishment and pipe conduit areas involving problems, and such information can be used as a database for maintenance of pipe conduits. Furthermore, in conventional sewerage system pipe conduit areas, such information is also effective for formulation of reconstruction plans in the future by grasping of troubles such as deterioration. It is important to promote straightening of sewerage system ledgers by the control structure jointly organized by DKI Jakarta's sewerage system planning department and PD PAL JAYA and to make positive use of such ledgers in aspects of both of sewerage system implementation plan and O&M in the future.

(c) Water Quality Control of ITP Owned by Commercial Establishments

PD PAL JAYA is periodically sampling effluent of ITPs which are under their O&M responsiiblty to check if the water quality of the effluent satisfies the water quality stipulated in the law. If the effluent quality fails to satisfy the standard, PD PAL JAYA requests the business operator to make improvement.

ITPs of those business establishments which are not operated by PD PAL JAYA samples are analyzed by BPLHD. In case the water quality of a sample fails to satisfy the standard, BPLHD provides guidance or recommendation of improving measures. However, since sampling is performed by the business establishments themselves, it is unavoidable to state that the inspection conducted by BPLHD is only a matter of formality.

BPLHD should perform sampling of the wastewater from each ITP by themselves and should be responsible for monitoring of wastewater treatment control in the entire DKI Jakarta area. If strengthening of the BPLHD structure is hard, BPLHD should entrust substantial actions for monitoring to PD PAL JAYA. It is considered that PD PAL JAYA should perform inspection of the wastewater and guidance to each business establishment for appropriate running of the wastewater treatment plants and should bear the roles to perform wastewater sampling and analysis themselves with BPLHD authority entrusted to PD PAL JAYA. PD PAL JAYA should construct a structure that steps into guidance related to O&M in the future.

(d) Setting of Sewerage Fee

The sewerage fee is set based on the building floor area for a business establishment and based on the income level (determined from contracted electric energy) for a household. General households occupy 86% of number of customers, but 99.5% (28.5 Billion IDR (272 million JPY)) of the sewerage fee revenue comes from business establishments out of total 28.7 Billion IDR (274 million JPY). (See S/R PART-B : B1.4.3 for details.) It is because the sewerage fee is proportional to the building floor area, and in addition, the sewerage fee unit price for business operator is set at 8 times at maximum of the unit price for general households.

It is considered that sewerage fee should basically be based on the tap water consumption and ground water intake volume, using the discharged volume as a reference.

(e) For Business Establishments

Table B1-9 indicates merits and demerits of sewerage fee setup based on the building floor area. In sewage treatment, it is difficult to execute facility control unless the material balance between water volume and pollution load is clearly grasped and is constantly compared with facility design conditions. Grasp of the water volume is the fundamental of sewage treatment.

It is considered that a system for migration to basic fee and metered fee should be developed and legal change should be made finally after elapse of a certain transition period.

Table B1-9 Merit and Demerit of Sewerage Fee Based on Building Floor Area

	Merit	Demerit
Overall	・Simple system without measuring or calculation.	・Difficult to grasp sewage volume discharged into sewer pipe. (for operation of Sewer pipe and WWTP) ・Difficult to grasp material balance. ・Necessary to revise regularly on the basis of economical condition.
Commerce(User)	・Easy to pay (Annual cost can be clearly estimated.)	・Water saving effect cannot be reflected. ・Unfair system for the user with less person which has the same floor area.
PD PAL JAYA	・Easy to collect (Annual income can be clearly estimated.)	・Difficult to grasp sewage volume.

Source: JICA Expert Team

(f) For Household

Setup of sewerage fee for households is made in four stages in correspondence to the contracted electric energy. Although the volume of use in households is small compared to business establishments, since the number of households is huge, it is considered that setup of sewerage fee by basic fee and metered fee is desirable for households of medium-income level and up with stable income, also from the viewpoint of uplift of the consciousness to reduce tap water consumption and ground water consumption. However, it is considered that grasping of tap water consumption and ground water consumption of each household is difficult at least for the present from clerical, technological and economical viewpoints, and the present fee setting method that is based on the building floor area and contracted electric energy is considered to be an acceptable and appropriate method.

(g) Collection of Sewerage Fee

a) For Business Establishments

It is necessary to establish a wastewater inspection structure and fee collection system that conforms to introduction of the scheme of basic rate plus metered fee.

b) For Household

It is anticipated that the number of households connected to the sewerage system will largely increase because of expansion of the sewerage system area. Even if it is assumed that the conventional fee scheme of four stages by income level is continued, a system for increasing the collection rate and for improving the collection efficiency is needed. For the low-income level in particular, effective use of communities such as neighborhood associations is considered necessary as a method.

(h) Improving Connection Rate

a) Correspondence to ITPs Owned by Business Establishments

Over one half of business establishments owning ITPs answered, as willingness to connect to sewerage system, “It depends on judgment of economy”, and this trend is noteworthy among large-scale business establishments. The sewerage fee revenue from business establishments constitutes fundamental funds for maintenance of the sewerage system. But regarding connection to the sewerage system in the area where sewerage system pipe conduit lines would be installed in the future, the willingness of business establishments is determined in the comparison with present ITP

depreciation cost and maintenance cost. Even if business establishments are forced to make connection to the sewerage system as a rule under the sewerage system law and so forth, the economic principle will surely work and there is a possibility where it becomes a large resistance. Particularly in the past, the sewerage system was almost of no merit for a hotel or similar having an ITP and its accompanying recycling system. Therefore, it is a criterion that the sewerage fee to a business establishments is no higher than the ITP maintenance cost.

On the other hand, to make effective reuse of a part of sewage in the state where the conventional ITP and recycling system are remaining, even in case connection to the sewerage system is made by the business establishment, is considered to be a good measure in parallel with the sewerage system plan, when water shortage in DKI Jakarta during the dry season and heavy ground water extraction is taken into account.

b) Saving Cost for Connection

For a business establishments having an ITP, modification to the facilities for connection to the sewerage system may cost a lot. It is necessary to review connection cost reducing measures such as location of connection box (inspection chamber) and change to the existing ITP's connection box.

c) Negotiation with Agencies from Every Industry Regarding Condition of Sewerage Connection

DKI Jakarta and PD PAL JAYA should positively discuss matters with industries, which are main users of sewerage system, to reflect these matters to the implementation plan.

(i) O&M of ITPs within Existing On-Site Area

The following affairs can be considered as the affairs of PD PAL JAYA on the control of ITPs located in the on-site area.

- Vicarious execution of water quality inspection

  Consignment to PD PAL JAYA of ITP inspection by BPLHD

- O&M guidance

  Control of business establishment's ITP accompanying betterment of ITP control capability of PD PAL JAYA

- Implementation of F/S at the time of strengthening of sewerage system

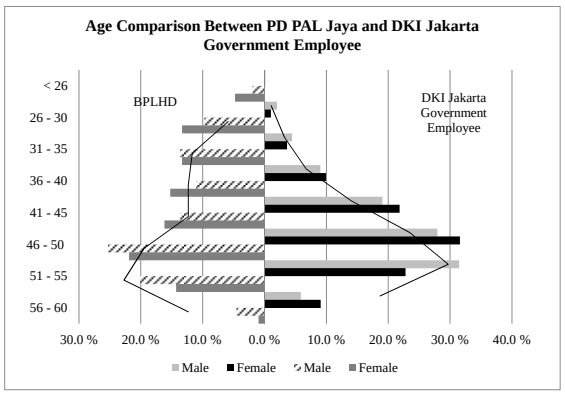
  Implementation of prior feasibility study (F/S) by PD PAL JAYA toward smooth sewerage system connection of business establishment's ITP

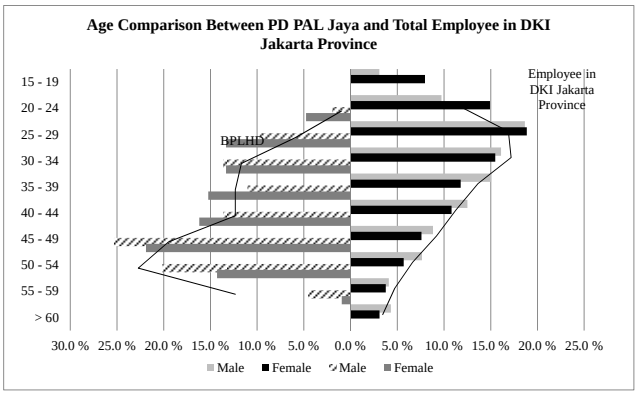
(2) Issues on Human Resources Development

Regarding human resources capability of DKI Jakarta and PD PAL JAYA, age composition, education background and field of expertise, and extract subjects should be taken into consideration for evaluation.

Regarding age composition of each organization, make evaluation upon comparison of age composition of personnel in the entire DKI Jakarta with age composition of all workers living in DKI Jakarta and with age composition of each organization have been compared. (Source: Jakarta In Figures 2009 printed by BPS (*Biro Pusat Statistik* or Central Bureau of Statistic)

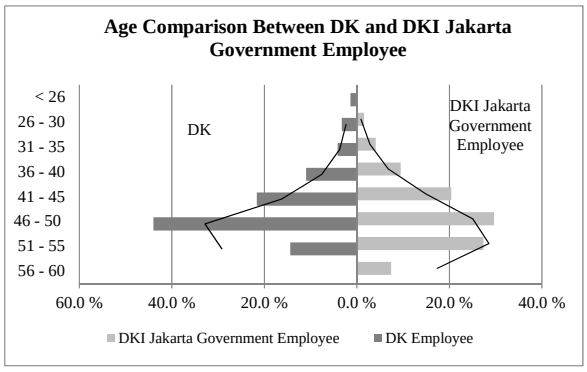
The results of comparison of age composition between BPLHD, DK and PD PAL JAYA are indicated below.

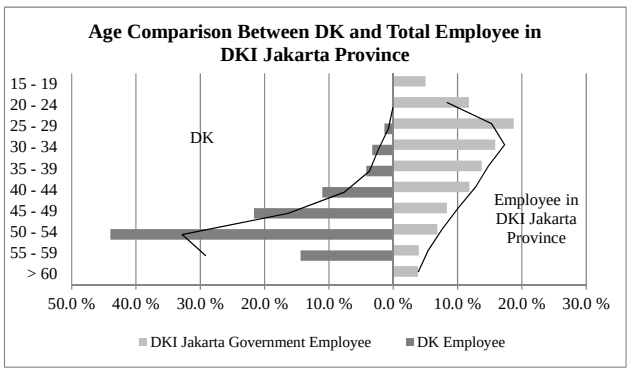




(i) Comparison with DKI Jakarta government employee (ii) Comparison with employee in DKI Jakarta province
Source: JICA Expert Team

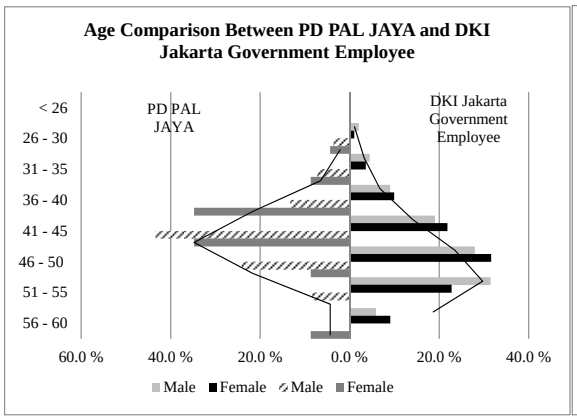
Figure B1-8 Age Range of BPLHD

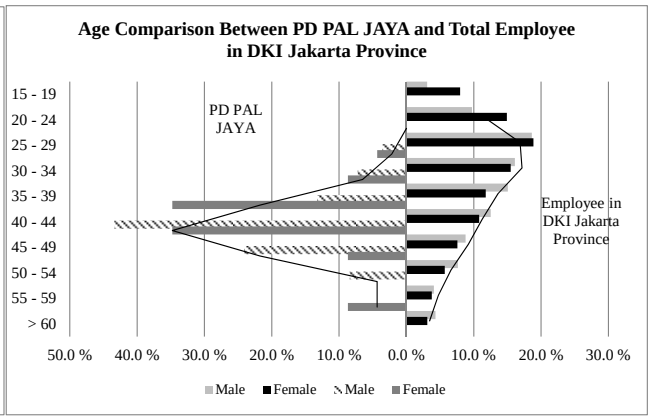




(i) Comparison with DKI Jakarta government employee (ii) Comparison with employee in DKI Jakarta province
Source: JICA Expert Team

Figure B1-9 Age Range of DK





(i) Comparison with DKI Jakarta government employee (ii) Comparison with employee in DKI Jakarta province
Source: JICA Expert Team

Figure B1-10 Age Range of PD PAL JAYA

Table B1-10 shows a comparison of age composition, educational background and fields of expertise of each organization.

Table B1-10 Comparison of Personnel Talent among BPLHD, DK and PD PAL JAYA

Item			BPLHD		DK	PD PAL JAYA	
Number of Personnel (Number of staff which directly related with wastewater)			259 (5)[*1]		1,653 (Provincial office: 13)[*2] (Sub-agency: 200)[*2]	106	
Range of Age (mode)			46-50		46-50	41-45	
Man/Woman Ratio			59 : 41		92 : 8	78 : 22	
Educational Background	Master degree, Graduate		61 %		14 %	52 %	
	Diploma		12 %		1 %	5 %	
	High school		25 %		38 %	38 %	
	Junior high school		2 %		47 %	5 %	
Specialty for College	Technical	Technical engineering	23 %	44 %	Unknown	15 %	33 %
		Environmental and sanitation	5 %			13 %	
		Science	16 %			5 %	
	Management/ Economy/ Accounting	Management / Economy	17 %	56 %	Unknown	29 %	67 %
		Accounting and finance	3 %			18 %	
		Administration	9 %			7 %	
		Law	4 %			3 %	
		Others	23 %			10%	

*1. The numbers of BPLHD's staff which directly related with wastewater is 5 persons belonging to Sub Division of Habitat Control and Environment, Division of Pollution Control and Environment based on hearing from BPLHD.

*2. The numbers of DK's staff which directly related with wastewater are 13 persons belonging to Management Unit of Septic Tank's Waste (UPLS) of provincial office, and about 200 persons to be with Section of Wastewater of Septic Tank Control, Cleansing Sub-agency respectively, based on hearing from DK.

Source: JICA Expert Team

1) BPLHD

- The age composition of personnel is of such a trend that the age group of up to 35 years old is larger than what is shown in the distribution of personnel in the entire DKI Jakarta. The reason is that employment of new school graduates was increased accompanying strengthening of functions of BPLHD in 2005.
- As the educational background of personnel, the ratio of university graduates and masters is 61% and is the highest among three organizations.
- As expertise of personnel, the ratio of engineering field is higher by about 10 points than that of PD PAL JAYA. And also the affairs related to environmental administration were increased and the function to make coordination with relevant institutions was strengthened as stated earlier. The number of young personnel is larger than those in other organizations are expected to deal with these affairs.

2) Cleansing Agency (DK)

- The number of personnel is the largest among three organization, and the personnel force is about 6 times as much as that of BPLHD and is about 16 times as much as that of PD PAL JAYA. Many of these personnel are working on the field of waste collection.
- In the age composition of personnel, the ratio of the group of 46 to 50 is large, and the largest bias is observed in the age composition among three organizations.
- The male ratio is the highest (92%). The field of waste collection is the workplace that is mainly composed of male personnel.
- The ratio of university graduates is the smallest (14%).

These facts suggest that many of human resources of DK are of high age layer and have been mostly working in the field to collect on-site sludge and solid waste. Therefore, if restructuring or switching to new duties is needed, diversion of human resources may be hard. Furthermore, because of high age layer, it is considered that expenditure of personnel pay will increase.

3) PD PAL JAYA

- Many personnel of PD PAL JAYA are younger than personnel of DKI Jakarta, and 41-45 is the center value. When a comparison is made with all workers living in DKI Jakarta including workers of private enterprises, the number of young personnel of up to 34 is small.
- As expertise of personnel, while the ratio of management/economy field is as high as 67% (higher than that of BPLHD), the ratio of engineering field is as small as 33%. It is due to the fact that PD PAL JAYA did not have any standard sewage treatment plant for over 20 years and the quantum of engineering jobs such as planning, design and maintenance of sewerage facilities is small.

It is considered that strengthening of engineering department by increase of employment and education of young people and engineering specialists is required for PD PAL JAYA to implement sewerage business in the future.

B1.4 Budget

B1.4.1 Ministry of Public Works

Since the local governments do not favor to get a loan for the construction of sewerage works as they consider that the sewerage works is not a profitable business. Financial resources such as the JICA loan for sewerage plan in DKI Jakarta will be arranged by the MPW of the central government as a grant.

However, the grant will not cover the entire project costs. “Matching grant” principle is applied. On a condition that the local government shoulder some part of the project cost, the central government will bear the same scale of cost as the grant.

In addition, the facilities for which the central government can finance are limited to the facilities that the central government can manage such as the wastewater treatment plant, main trunks and the important environmental facilities, and the facilities that the central government cannot manage such as the house connection must be covered by the local government.

Since DKI Jakarta need huge amount of the financial resources for infrastructure needs such as the subway construction and the flood control, hence, the resources the DKI Jakarta can appropriate for the wastewater management is limited.

Therefore, the amount of funding for sewerage and the decision on the cost sharing of the central government and DKI Jakarta are major issues for both sides.

B1.4.2 DKI Jakarta

(1) Total Budget of DKI Jakarta

The budget scale of DKI Jakarta for fiscal 2011 is as follows.

1) Total expenditure: 27.9 Trillion IDR (about 260 billion JPY)

2) Indirect expenditure including pay: 9.5 Trillion IDR (about 88.8 billion JPY)

3) Direct expenditure: 18.3 Trillion IDR (about 171 billion JPY)

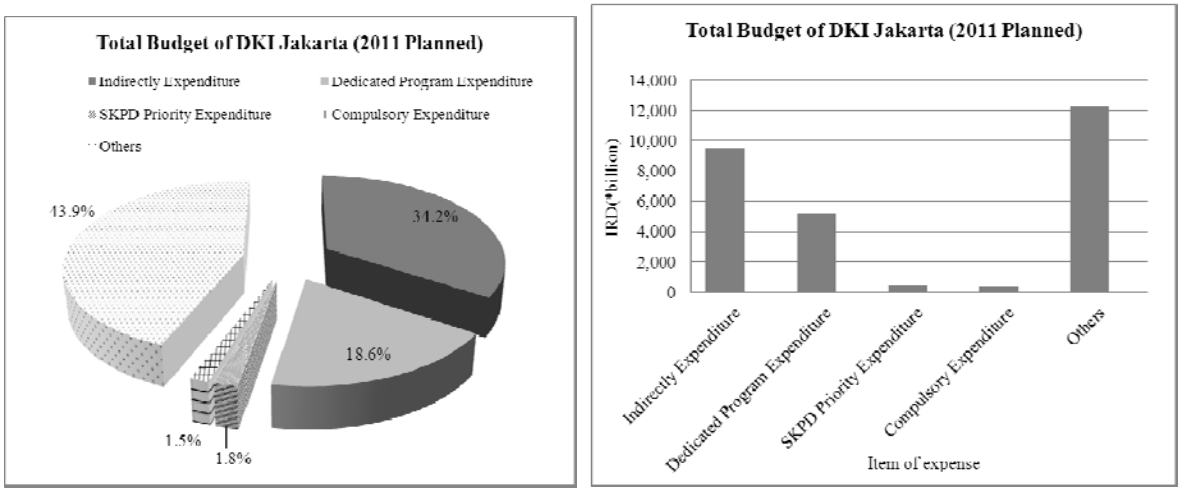
Of this direct expenditure, 5.2 Trillion IDR (about 48.3 billion JPY) is reserved for dedicated program expenditure, such as flood measures project and subway construction project, and it cannot be diverted to other expenditure.

Table B1-11 and Figure B1-11 show a breakdown of the budget of DKI Jakarta for fiscal 2011. In addition, SKPD is a work unit organized in each agency.

Table B1-11 Budget of DKI Jakarta (2011)

Item of Expenditure		Amount of budget(IDR)	Ratio
Indirectly Expenditure		9,534,312,666,561	34.2%
Directly Expenditure	Dedicated Program Expenditure	5,183,688,236,577	18.6%
	SKPD Priority Expenditure	503,610,000,000	1.8%
	Compulsory Expenditure	404,514,320,000	1.5%
	Others	12,249,681,896,927	43.9%
Total Budget		27,875,807,120,065	100.0%

Source: BAPPEDA



Source: BAPPEDA

Figure B1-11 Total Budget of DKI Jakarta (2011Planned)

(2) Environment Related Budget of DKI Jakarta

The field that is of the largest ratio in the breakdown by area of the planned budget of DKI Jakarta for fiscal 2011 is “education”, and it occupies 27% (about 7,500 Billion IDR or about 69.8 billion JPY) of all.

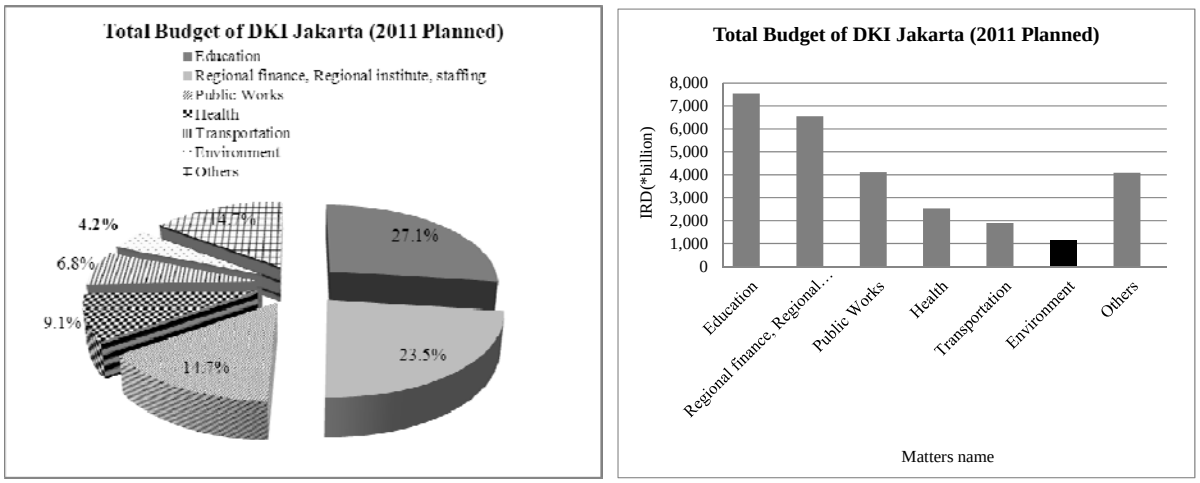
On the contrary, “environment” relevant budget is 4.2% (about 1,160 Billion IDR or about 10.8 billion JPY), and it is of the 6th largest field.

Furthermore, the public works relevant budget for both of “public works” and “transportation” is 21.5% (Public Works 14.7%, Transportation 6.8%). This public works relevant budget is claimed by DPU. But the wastewater management division of DPU was abolished in 2008, and affairs of this division were transferred to BPLHD. Therefore, the public works relevant budget does not include the budget related to wastewater management.

Two items indicated below are infrastructure strengthening items for which DKI Jakarta allocates a budget with priority.

- Flood measure
- Transportation measure (MRT (Subway), etc.)

Figure B1-12 shows a breakdown by area of the planned budget of DKI Jakarta for fiscal 2011.



Source: BAPPEDA

Figure B1-12 Budget of DKI Jakarta Sorted by Category (2011)

(3) Budget of BPLHD and DK (2011 planned)

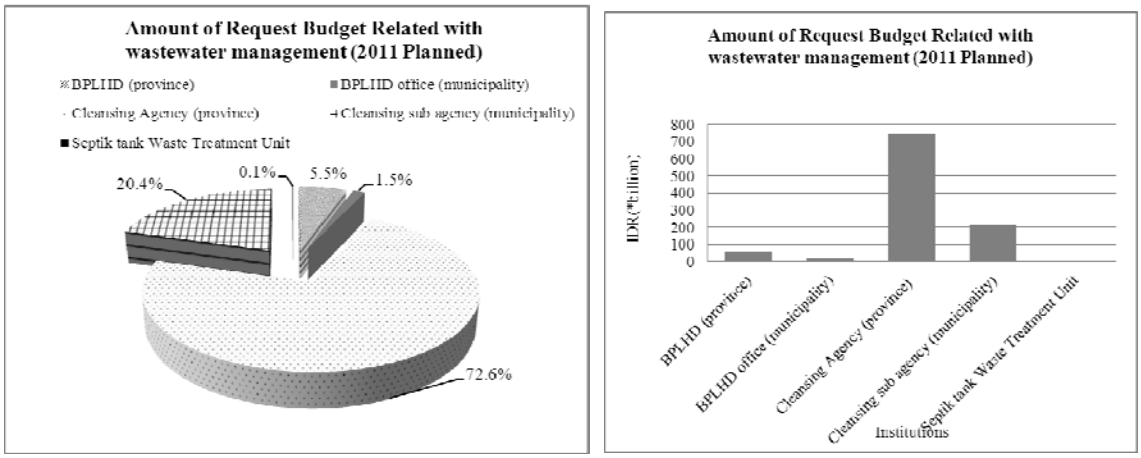
The planned budget for fiscal 2011 of BPLHD and DK, which are organizations related to wastewater management, is as shown in Table B1-12 and Figure B1-13.

The budget scale is about 71 Billion IDR (about 0.66 billion JPY) for BPLHD and about 954 Billion IDR (about 8.9 billion JPY) for Cleansing Agency (DK). The budget of DK is about 14 times higher than BPLHD. The reason is that BPLHD is a controlling government agency and DK is a business implementing institution, and thus positioning of organization is different. The number of personnel is also larger for DK and is about 6 times of personnel of BPLHD.

Table B1-12 Budget of BPLHD and DK (2011)

Institutions	Amount of budget(IDR)		Ratio	Number of Employee(Per)
BPLHD (province)	56,014,700,000	70,991,506,957	5.5%	259 (13%)
BPLHD office (municipality)	14,976,806,957		1.5%	
DK (province)	744,370,263,733	953,969,391,693	72.6%	1,653 (86%)
DK (municipality)	208,749,127,960		20.4%	
Management Unit of Septic Tank Waste	850,000,000		0.1%	
Total	1,024,960,898,650		100.0%	1,912

Source: BAPPEDA



Source: BAPPEDA

Figure B1-13 Budget of BPLHD and DK(2011)

(4) Comparison of Categorized Budget Ratio between DKI Jakarta and Tokyo Metropolitan Government

On “education”, “public works”, “welfare/health” and “environment”, which are principal items of the budget, subjective budget ratios are compared between DKI Jakarta and Tokyo.

Table B1-13 shows a comparison of budget ratios between DKI Jakarta and Tokyo.

Compared to Tokyo, DKI Jakarta is of large public works budget ratio and is of small welfare/health budget ratio. On “environment”, it is 4.2% for DKI Jakarta and is 4.8% for Tokyo, and there is no large difference in the ratio of environment relevant budget. However, since the majority of infrastructure has been strengthened and environmental measures were already taken in Tokyo, it is considered that the ratio of required environment relevant budget is small compared to Jakarta where environmental conditions are inferior. It means that it is wanted to secure a larger environment relevant budget to improve the present environmental conditions of DKI Jakarta.

Table B1-13 Comparison of Categorized Budget Ratio between DKI Jakarta and Tokyo Metropolitan

Category	DKI Jakarta (Budget 2011)*1	Tokyo Metropolitan (Budget FY2011)*2
Education	27.1%	22.1%
Public works	21.5%	17.3%
Welfare and health	9.1%	20.8%
Environment	4.2%	4.8%

Source: *1:BAPPEDA, *2:Outline of draft budget of Tokyo metropolitan FY2011

(5) Issues on Budget Regarding Wastewater Management in DKI Jakarta

Issues on for budget for wastewater management in DKI Jakarta are indicated below.

1) Even if the entire “sanitation” relevant expenditure distributed to BPLHD & DK is totaled, it is only 1 Trillion IDR (about 9.5 billion JPY). Furthermore, these budgets do not include any amount that is allocated to PD PAL JAYA.

2) Priority of the budget is given for measures against flood and transportation rather than wastewater management.

3) To set the wastewater management relevant expenditure as a priority expenditure item that cannot be diverted to other expenditures, it is necessary to position the master plan as a governor decree.

4) As is leant from the case where the waste relevant budget was reduced, it is considered that the provincial congress is of little interest on environment relevant issues.

B1.4.3 PD PAL JAYA

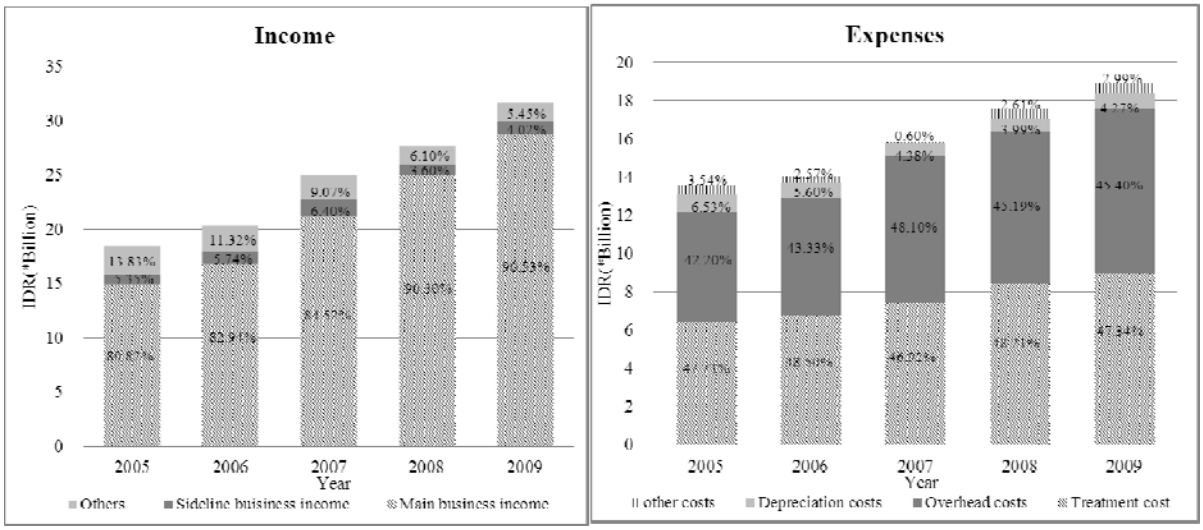
(1) Finance of PD PAL JAYA

1) Income and Expenses

Figure B1-14 shows the trend of income and expenses from 2005 to 2009. In 2009, the income of PD PAL JAYA was 32 billion IDR (300 million JPY) and the expenses were 19 billion IDR (180 million yen). Both income and expenditure are increasing every year. The average increase in ratios of income and expenses are 15% and 9%, respectively. Table B1-14 shows the trend of increase in ratio for income, expenditures, number of customers and floor area in PD PAL JAYA. According to this table, the average increase in ratio for the number of customers is only 1% in the past five years, but that ratio for the building floor area is 11%, almost the same as that ratio of income and expenses. About 90% of income is the revenue from the sewerage fees and it is about 29 billion IDR (270 million JPY).

Meanwhile, the wastewater treatment cost (O&M cost, depreciation cost for pipelines and similar items, salary for workers directly involved in wastewater treatment, allowance and welfare expense) accounts for 47% of the total expenses. The overhead costs for general affairs, accounting and sales

promotion accounts for 45% of the total expenses, almost the same as the wastewater treatment cost. S/R PART-B : B1 shows the Income, expenses, O&M cost and profits in PD PAL JAYA.



Source: Annual Report PD PAL JAYA, 2005 - 2009

Figure B1-14 Trend of Income and Expenses in PD PAL JAYA (2005 – 2009)

Table B1-14 Increasing Ratio of Income, Expenses, Number of Customers and Customer's Building Floor Area (2005 – 2009)

Items	2005	2006	2007	2008	2009	Average
Income	-	10%	23%	11%	15%	**15%**
Expenses	-	4%	13%	10%	8%	**9%**
Number of customer	-	2%	1%	-1%	3%	**1%**
Floor area	-	6%	10%	17%	10%	**11%**

Source: PD PAL JAYA

2) Breakdown of Income from Sewerage Tariff

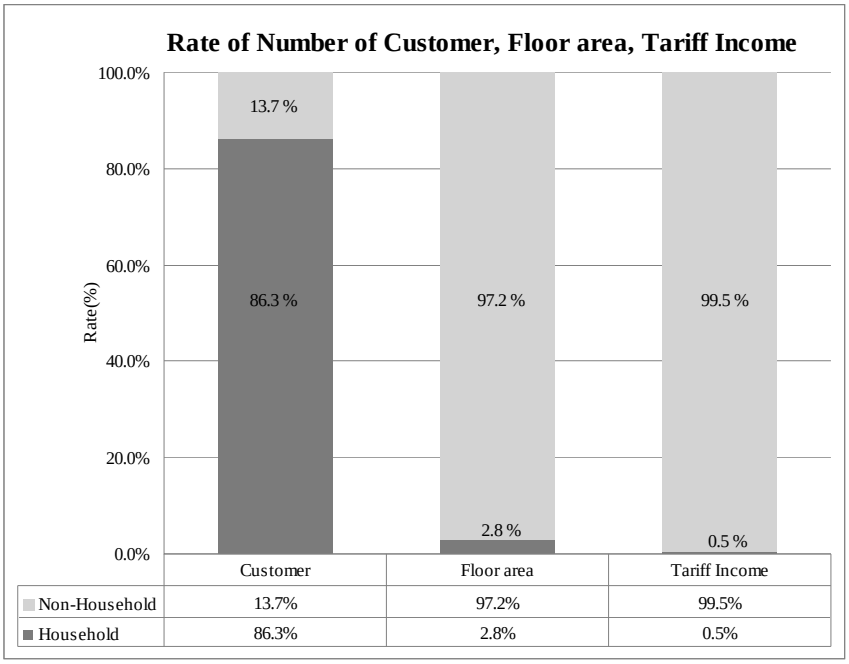
Table B1-15 shows the details of income from the sewerage charges, which account for about 90% (28.7 billion IDR (267 million JPY)) of the total income. Figure B1-15 shows the number and ratio of customers, building floor area and wastewater charges (tariff). About 99.5% (28.5 billion IDR (265 million JPY) of the total income comes from the organizations (non-household) such as business operators of large commercial facilities. Although the household accounts for 86% of the total number of customers, it accounts for only 0.5% (152 million IDR (142 thousand JPY)) of the total income. Thus the income of PD PAL JAYA is heavily dependant on the revenue from the business establishments.

In addition, it is estimated average sewerage tariff income at 4,357 IDR/m^3 (41 JPY/m^3) based on total sewerage tariff income (28.5 billion IDR (265 million JPY)) and present quantity of influent to Setiabuti wastewater treatment plant (18,032 m^3/day in 2009, hearing from PD PAL JAYA). For the detail caluculation is as given in S/R PART-E: E3.5.

Table B1-15 Breakdown of Income from Sewerage Tariff (2009)

Category of customer		Customer		Floor area		Tariff Income	
		Number	Rate (%)	Area (m^2)	Rate (%)	(Million IDR)	Rate (%)
Household		1,179	86.3%	130,216	2.8%	152	0.5%
Non-Household	Small Commercial	12	0.9%	62,328	1.3%	116	0.4%
	Large Commercial	143	10.5%	4,201,569	90.8%	27,951	97.5%
	Social	31	2.3%	231,707	5.0%	454	1.6%
	Industry	1	0.1%	400	0.0%	2	0.0%
Total		1,366	100.0%	4,626,220	100.0%	28,675	100.0%

Source: PD PAL JAYA



Source: PD PAL JAYA

Figure B1-15 Ratio of Number of Customers, Floor Area and Wastewater Tariff Income (2009)

The average wastewater tariff for non-household customers by PD PAL JAYA, which is converted to the commodity charge (4,357 IDR/m^3), is compared with the cities where commodity charge system is applied; Manila (Manila Water), Malaysia (IMK), Columbo and Hanoi (HSDC). The exchanged price per unit wastewater by PD PAL JAYA is higher than prices in other 3 cities except Manila. It means non-household customers pay higher wastewater tarrif than those in other 3 cities except Manila.

Table B1-16 Comparison of Wastewater Tariff (Non-household Customers) among DKI and Other Cities

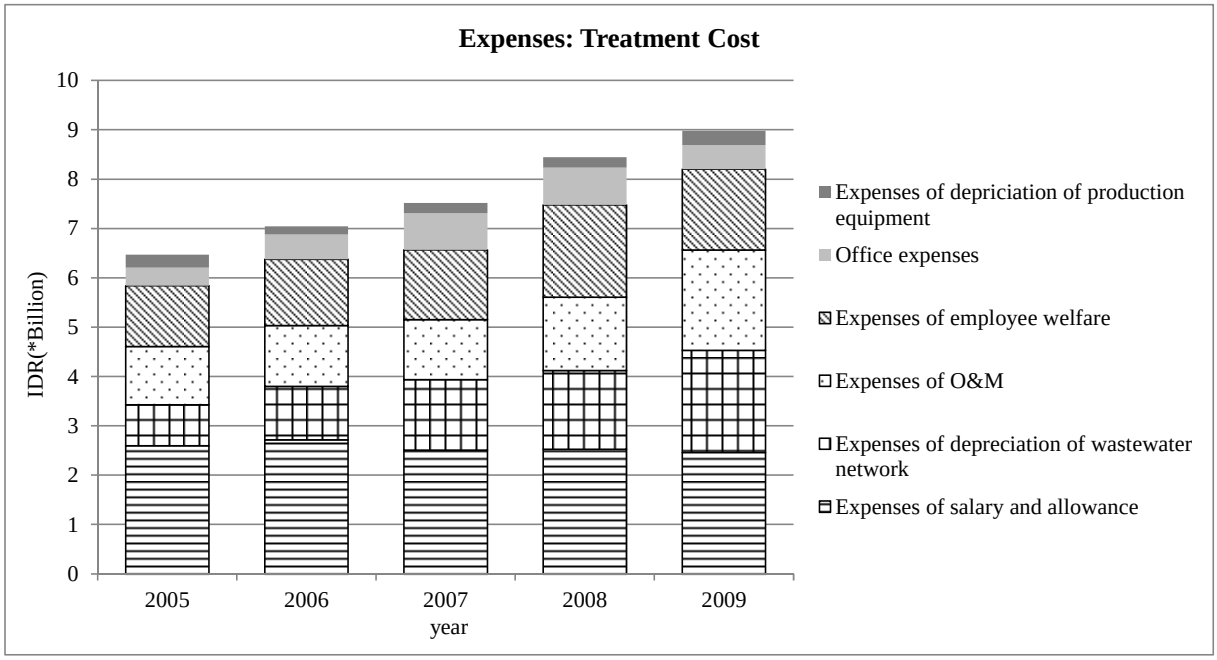
City (implementation agency)	Water volume per month from non-household customer for which the price is applied.	Commodity Charge per m^3 (local currency)	Commodity Charge per m^3 (USD)
DKI (PD PAL JAYA)	Average of household and non-household customers	4,357 IDR	0.508
Manila (Manila Water)	More than 10,000m^3	45.30Peso	0.528
Malaysia (IWK)	More than 200m^3	0.45Ringgit	0.148
Columbo	More than 10,000m^3	15SLR	0.132
Hanoi (HSDC)	Industry Facility	750VND	0.036

Source: JICA Expert Team

3) O&M Cost

The O&M cost is included in the wastewater treatment cost, which accounts for 47% of the total expenses. Figure B1-16 shows the breakdown of the wastewater treatment cost for PD PAL JAYA from 2005 to 2009. The expenses for employees' salary, allowance and welfare account for 46% of the total expenses, the highest in all expenses. The expenses for depreciation of wastewater network, etc. account for 23% and the O&M expenses account for about 23% (about 2 billion IDR (about 19 million JPY)).

The O&M expenses in 2009 accounted for 11% (2 billion IDR/19 billion IDR) of the total expenses.



Source: Financial Annual Report PD PAL JAYA, 2005 - 2009

Figure B1-16 Breakdown of Wastewater Treatment Cost in PD PAL JAYA (2005 – 2009)

This O&M cost is compared with that of Japanese wastewater treatment plants, which can treat 10,000 to 30,000m^3/day. Table B1-17 shows the ratio of O&M cost and personnel cost for wastewater treatment. In this paper, the depreciation cost, etc. are excluded for the purpose of comparison.

In Japanese wastewater treatment plants, the O&M cost is almost double of the personnel costs, but in PD PAL JAYA, the O&M cost is about 1/2 of the personnel costs for wastewater treatment. This is because the surface aerators are the only equipment that are operated and maintained by PD PAL JAYA, and so it is apparent that it needs the O&M cost much smaller than other ordinary wastewater treatment plants. When proposed Setiabudi wastewater treatment plants would be constructed and then operated and maintained by PD PAL JAYA O&M cost of PD PAL JAYA would increase.

Table B1-17 Ratio of O&M and Personnel Costs (Comparison of PD PAL JAYA and Japanese Wastewater Treatment Plant)

Items	PD PAL JAYA		Sewage Treatment Plants in Japan*
O&M cost	23%	33%	61%
Personnel costs related to treatment	46%	66%	39%
Depreciation etc.	31%	---	---

Source: The above values are based on the average ratio of the sewege treatment plants has design treatment capacities are 10,000 to 30,000 m^3/day extracted from "Sewerage Statistics in Japan, 2006".

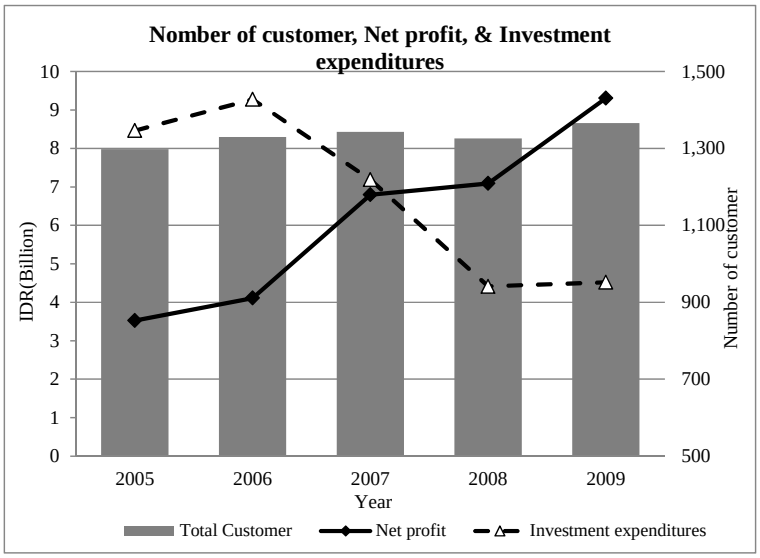
4) Profit and Loss

Since last five years, PD PAL JAYA is in profit. The profit has increased every year and reached to 9.3 billion IDR (about 87 million JPY) in 2009.

Figure B1-17 shows the comparison of net profit, investment and number of customers.

In the past five years, although the number of customers has increased only slightly, the net profit has almost tripled. The pipeline was renovated in 2005 to 2007 and so the profit decreased due to the renovation. On the other hand, investment was lower in 2008 and 2009 than in the previous years and so the net profit increased.

PD PAL JAYA also stated that when their proposed wastewater treatment plant of the Existing sewerage zone i.e. Zone 0 would be commissioned in near future, O&M cost of the sewerage system would be increased significantly and thus profit would decrease proportionally although income from sewerage tariff may increase only slightly.



Source: PD PAL JAYA

Figure B1-17 Number of Customers, Net Profit and Investment in PD PAL JAYA (2005 – 2009)

5) Capital

When PD PAL JAYA was established in 1991, the capital was 6.4 billion IDR (about 60 million JPY). The total capital including the capital transfer from the JSSP project was 22.6 billion IDR (about 210 million JPY). The central government granted the subsidies of 1.8 billion IDR (about 17 million JPY) to PD PAL JAYA from the year 1996 to 2007. No subsidies have been granted since then. The total investment by the central government is 24.5 million IDR (about 228 million JPY).

The investment by DKI Jakarta was made every year from 1992 until 1996. Since then, the investment by DKI Jakarta has been made once every two to four years and 3 billion IDR to 20 billion IDR (about 28 million JPY to 186 million JPY) was invested by DKI Jakarta each time. The investment by DKI Jakarta totals 70 billion IDR (about 652 million JPY) and is used mainly for maintenance and renovation of the pipelines.

S/R Part-B : B1 shows the History of Capital Acquisition by PD PAL JAYA.

6) Additional Funds Obtainable by PD PAL JAYA

The types of additional funds, which PD PAL JAYA can obtain, are specified by The Regional Regulation of DKI Jakarta Number 10/1991 as follows.

- Additional funds, which PD PAL JAYA can obtain
- Interests of internal funds
- Investment by DKI Jakarta

- Aid by the central government and third-party institutions such as a bank
- Loans from domestic and overseas institutions approved by the Governor of DKI Jakarta

7) Fund Flow of PD PAL JAYA

Figure B1-18 shows fund flow between PD PAL JAYA and relevant financial institutions.

It is stipulated in a local government ordinance that the profits of PD PAL JAYA obtained from business should be distributed in the following ratio.

- Refund to local government: 40%
- Reserve: 25%
- Investment in sewerage system service: 15%
- Fund for personnel education, etc.: 20%

Thus, use of profits of PD PAL JAYA is specified and particularly 40% of profits should be refunded to DKI Jakarta every year. Therefore, it is hard to invest profits in enlarging of sewerage facilities. In other words, the funds for investment in enlarging of sewerage facilities cannot be secured unless additional investment is made from DKI Jakarta.

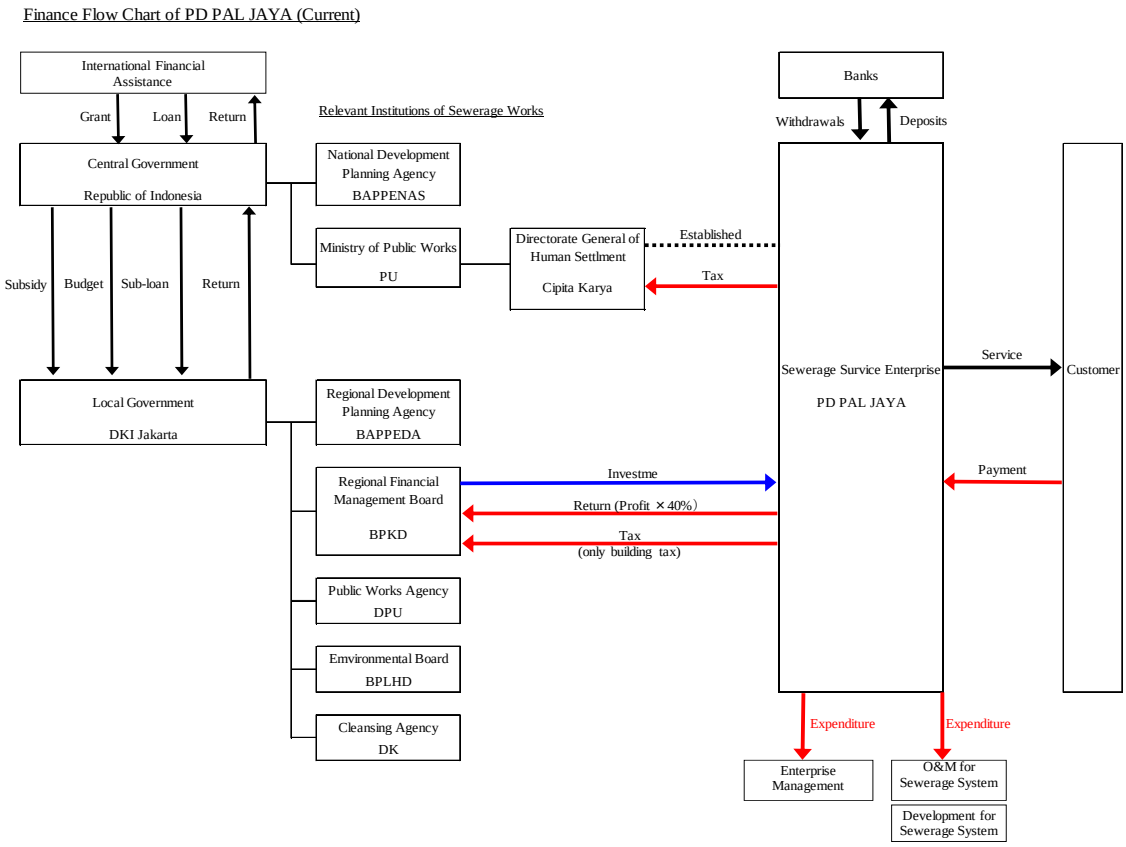
(2) Investment in PD PAL JAYA

PD PAL JAYA is performing its affairs using investment money from DKI Jakarta, which is a shareholder, in addition to the revenue from sewerage fee.

The budget for investment in PD PAL JAYA is adjusted by Economic Board in Regional Finance Management Board (BPKD), and supervision on the investment is made by Investment Board (BPMP).

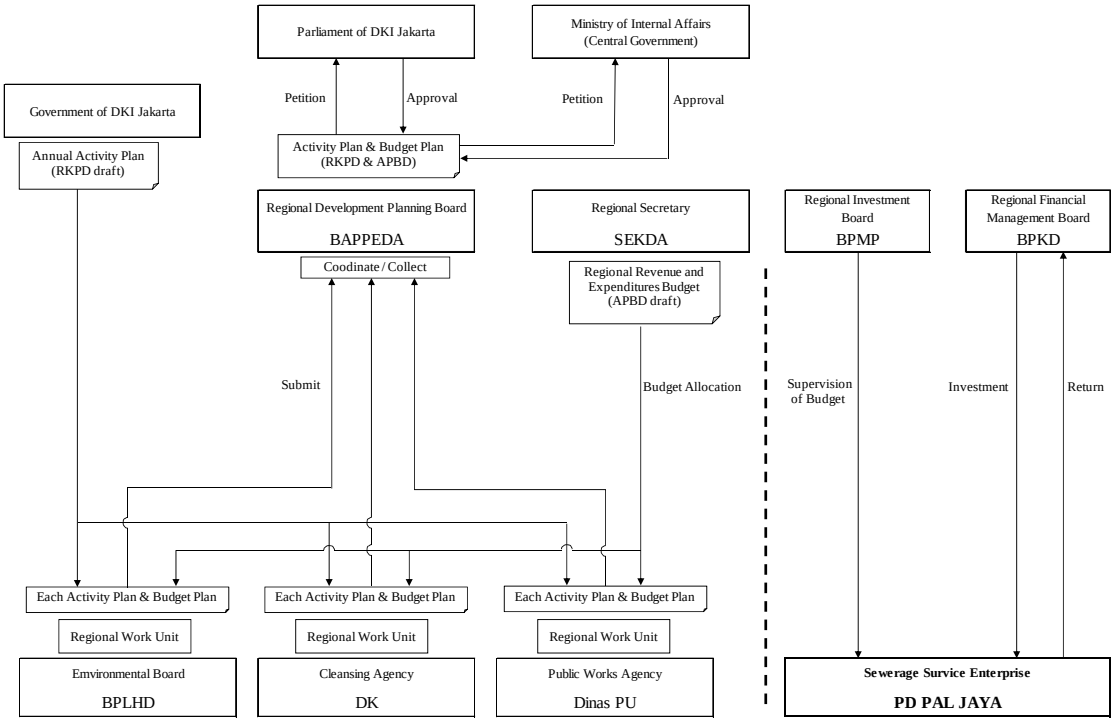
Furthermore, each institution of DKI Jakarta claims for a budget under coordination of BAPPEDA based on the business plan for each year. But it is the present situation that PD PAL JAYA has no route for direct access to the budget of DKI Jakarta.

Figure B1-19 shows the relation of PD PAL JAYA with institutions of DKI Jakarta.



Source: Hearing from PD PAL JAYA

Figure B1-18 Fund Flow between PD PAL JAYA and Relevant Financial Institutions



Source: Hearing from PD PAL JAYA

Figure B1-19 Structure Diagram in Budget between PD PAL JAYA and Institutions in DKI Jakarta

(3) Financial Issues of PD PAL JAYA

1) Characteristics of Finance

The profits of PD PAL JAYA in 2009 were 9.3 Billion IDR (about 87 million JPY), and accounts of every year have continuously been in black figure. The following factors can be considered as reasons for it.

- O&M cost of facilities is low.

The only equipment working as sewerage facilities is seven (7) surface aeration machines. The number of equipment to be managed is small, and it is apparent that the O&M cost for them is small. O&M cost will increase if PD PAL JAYA has/construct a new wastewater treatment plant with appropriate O&M.

- Ratio of revenue from business establishments customers is high.

The sewerage fee is set based on the building floor area. In the ratio of building floor area, 91% is of large-scale commercial facilities and the ratio of general households is 3% only. Furthermore, the sewerage fee unit price for large-scale commercial facilities has been set at up to 8 times compared to the unit price for general households. In addition, collection of fees from these business operator customers is made by through bank transfer as a rule and the fee collection ratio is as high as 99%. It is one of reasons why stable revenue is obtained.

2) Financial Issues

(a) Refund of Business Profit Stipulated by Regulation

As PD PAL JAYA should refund 40% of its profits to DKI Jakarta every year, it is not possible for PD PAL JAYA to direct its profits for reinvestment.

(b) Difference in Budget Requesting Process between PD PAL JAYA and DKI Jakarta

Although each institution of DKI Jakarta is permitted to make a budget request every year, the only thing PD PAL JAYA can do is to request Economic Board for investment. Judgment of investment is made based on the condition that appropriate profit-making management is implemented, and there are years in which request for investment cannot be made if Economic Board judges that no investment is needed. In practice, investment is received in a frequency of once every 2~4 years in the recent years, meaning that investment is not every year.

(c) Absence of Technical Supervisory Institution PD PAL JAYA

BPLHD and Cleansing Agency are not competent authorities for PD PAL JAYA, and therefore, the structure does not permit them to make a budget request for PD PAL JAYA.

There is no institution in DKI Jakarta that executes control and supervision ~~to~~ on PD PAL JAYA in the technical aspect. Therefore, there is no institution in DKI Jakarta that is capable of explaining necessity of investment in PD PAL JAYA.

From what were described above, it is necessary to change the structure for budget request for PD PAL JAYA in order that PD PAL JAYA having no access to budget and no technical supervisory institution is able to enlarge their sewerage system upon budget acquisition. For this purpose, it is essential that this master plan is positioned as a decree by the governor of DKI Jakarta.

B1.5 Regulations for Water Pollution

B1.5.1 Environmental Standards

(1) National Water Quality Standards (No. 82-2001)

The Government of Indonesia through Regulation No. 82 year 2001 on Water Quality Management and Water Pollution Control classified various rivers into the following four (4) categories in Table B1-18 depending on the intended use of river water.

However, it is the present status that General Plan (Presidential and/or Minister Regulations) is not established and that the categorization is unclear. In 2008, KLH (Ministry of Enviroment) prepared the General Plan for Ciliwung River. But it is not officialized because of the above reasons. This plan suggests the rivers in DKI Jakarta are categorized in to Class III.

Table B1-18 National Water Quality Standards Based on Intended Use of River Water

Parameters	Unit	Class			
		I	II	III	IV
pH	--	6 - 9	6 - 9	6 - 9	5 - 9
BOD	mg/L	2	3	6	12
COD_{Cr}	mg/L	10	25	50	100
DO	mg/L	6	4	3	0
NH_3-N	mg/L	0.5	-	-	-
Fecal Coliform	MPN/100 mL	100	1,000	2,000	2,000
Total Coliform	MPN/100 mL	1,000	5,000	10,000	10,000

Water use category:
Class I: Designation of raw water for drinking water
Class II: Designation of water for water recreation infrastructure/facilities
Class III: Designation of water for fishery and animal husbandry
Class IV: Designation of water to irrigate crops
Source: Prepared by JICA Expert Team with Regulation No. 82, 2001

(2) Provincial Water Quality Standards (Governor's Decree No. 582-1995)

The Environmental Water Quality Standards for rivers in DKI Jakarta was stipulated by the Governor's Decree No 1608 in 1988 year. The river courses were classified into four (4) groups depending on the intended use of river water. The Permissible Limit for Class A (drinking water source) was 10 mg/L as BOD, Class B & C 20 mg/L as BOD (fishery & agriculture use, respectively) and for Class D (other uses & suitable to support aquatic biota) was 30 mg/L as BOD. The target river water quality of the Study Area in old M/P 1991 was adopted as Group D i.e. 30 mg/L as BOD at least to maintain the minimum condition necessary to support the aquatic biota in the rivers.

The above Decree was amended in year 1995 (Decree No 582) stipulating only three (3) groups. The Standards according to the intended beneficial use as classified into three (3) groups are as shown in Table B1-19**.** As can be seen, the Permissible Limit for Class B (drinking water source) was 10 mg/L as BOD and Class C& D 20 mg/L as BOD (fishery, livestock & agriculture, urban business uses, respectively). In amended Decree, BOD Standards for the river water quality were made stricter reflecting provincial government's growing concern on the deteriorating water environment in DKI Jakarta. However, these standards are still very relaxed compared to their National Standards. It appeared to the JICA Project Team, as an ad hoc step, DKI adopted less strict standard through the Governor's decree. The level of pollution in the water environment of DKI Jakarta is so critical that it would require huge investment and system preparedness if national standards are adopted. The JICA Project Team has proposed to adopt Group B (drinking water source) standard for which permissible limit is 10 mg/L as BOD as the Target river water quality for the New Master Plan.

Table B1-19 Provincial Water Quality Standards Based on Intended Use of River Water

Parameters	Unit	Group		
		B	C	D
pH	--	6.0 – 8.5	6.0 – 8.5	6.0 – 8.5
BOD	mg/L	10	20	20
COD_{Cr}	mg/L	20	30	30
DO	mg/L	3	3	3
NH_3-N	mg/L	1.0	2.0	-
Fecal Coliform	MPN/100 mL	2,000	4,000	4,000
Total Coliform	MPN/100 mL	10,000	20,000	20,000

Water use category:
Class B: Designation of raw water for drinking water
Class C: Designation of water for fishery, livestock
Class D: Designation of water for agriculture and urban business
Source: Prepared by JICA Expert Team with Decree No 582/1995

B1.5.2 Wastewater Quality Standards (Governor's Decree No. 122-2005)

(1) Quality Standard of Liquid Waste

The quality Standards for liquid waste from Individual/household and communal wastewater treatment system in Table B1-20 was stipulated by the Governor's Decree No. 122 in 2005. The Standards for the communal wastewater treatment is also used as the Standards for the centralized wastewater treatment plants, which is 50 mg/L as BOD, 10 mg/L as ammonia and 50 mg/L as TSS. It is to be noted that the effluent quality of standard treatment technologies is in average of 20 mg/L or less as BOD. Therefore, by adopting 20 mg/L as BOD as the effluent standard there would involve no extra cost in sewage treatment.

Table B1-20 Quality Standards of Liquid Waste

No	Parameters	Unit	Individual/household	Communal
1	pH	--	6 - 9	6 - 9
2	$KMnO_4$	mg/L	85	85
3	TSS	mg/L	50	50
4	Ammonia	mg/L	10	10
5	Compound Blue Metillent	mg/L	2	2
6	COD_{Cr}	mg/L	100	80
7	BOD	mg/L	75	50
8	Oil & Fat	mg/L	10	10

Source: Governor's Decree No 122/2005

(2) Industrial Wastewater Quality Standards

Industrial wastewater quality standards are regulated by Decree of Ministry of Environment No. 51, Year 1995. This regulation applies for the following 21 industries. Standards for each type of industry are regulated, which are shown in PART-B of S/R.

Table B1-21 Type of Industry for Industrial Wastewater Quality Standards

1. Caustic Soda	2. Metal Plating	3. Tannery	4. Palm Oil
5. Pulp and Paper	6. Rubber	7. Sugar	8. Tapioca
9. Textile	10. Urea/Nitrogen Fertilizer		11. Ethanol
12. Mono Sodium Glutamate (MSG)		13. Plywood	14. Soft drink
15. Milk and food from milk	16. Soap, detergent and vegetable oil product		17. Beer
18. Dry Cell Battery	19. Paint	20. Pharmaceutical	21. Pesticide

Source: Decree of Ministry of Environment No. 51, Year 1995

Governor can set additional and/or stricter parameter of wastewater quality standards after receiving Minister approval. Based on this regulation, every person in charge of their industrial activities has the obligation as follows;

a. To manage the wastewater in order not to exceed the stipulated wastewater quality standards
b. To make waterproof wastewater channel so that there is no infiltration to the environment
c. To install a tool to measure flow rate and record the daily wastewater flow rate
d. Do not dilute the wastewater; including mixing used cooling water to the wastewater disposal channel
e. To check the wastewater quality periodically following the standards at least once a month
f. To separate the wastewater channel with storm water channel
g. To record the monthly production
h. To report the record of flow rate, wastewater quality concentration and monthly production at least every three months to the head of BAPPEDA, Governor, Technical Institution which is in charge of industrial activities

B1.5.3 Groundwater Quality Standard (Ministry of Health)

In case of using groundwater from deep wells and shallow wells for drinking water and household water purposes, the groundwater quality standard regulated by Ministry of Health, Regulation of

Ministry of Health No. 416-1990, is applied as shown in Table B1-22 and Table B1-23**.**

(1) For Drinking Water Use (Regulation of Ministry of Health No. 492-2010)

Table B1-22 Groundwater Quality Standard for Drinking Water Use

No.	Parameter	Unit	Standard
I	Physical		
	Electric Conductivity	µmhos/cm	
	Turbidity	NTU	5
	Temperature	^{O}C	Air temp.± 3 ^{O}C
	Total Dissolved Solid (TDS)	mg/L	1,000
	Color	Scale TCU	15
II	Chemical		
	Mercury (Hg)	mg/L	0.001
	Iron (Fe)	mg/L	0.3
	Fluorine (F)	mg/L	1.5
	Methylene Blue Active Substance	mg/L	--
	Cadmium (Cd)	mg/L	0.005
	Mg Hardness	mg/L	--
	Ca Hardness ($CaCO_3$)	mg/L	500
	Total Hardness	mg/L	--
	Chloride (Cl)	mg/L	600
	Chromium (Cr) (Total)	mg/L	0.05
	Manganese (Mn)	mg/L	0.5
	Nitrate (NO_3)	mg/L	10
	Nitrite (NO_2)	mg/L	1.0
	pH		--
	Zinc (Zn)	mg/L	15
	Sulphate (SO_4)	mg/L	400
	Lead (Pb)	mg/L	0.05
	Organic ($KMnO_4$)	mg/L	10
III	Micro Biology		
	Coli Bacteria	MPN/100mL	0
	Fecal Coliform	MPN/100mL	0

Source: Ministry of Health

(2) For Household Water Use (Regulation of Ministry of Health No. 416-1990)

Table B1-23 Groundwater Quality Standard for Household Water Use

No.	Parameter	Unit	Standard
I	Physical		
	Electric Conductivity	µmhos/cm	
	Turbidity	NTU	25
	Temperature	^{O}C	Air temp.± 3 ^{O}C
	Total Dissolved Solid (TDS)	mg/L	1,500
II	Chemical		
	Mercury (Hg)	mg/L	0.001
	Iron (Fe)	mg/L	1
	Fluorine (F)	mg/L	1.5
	Methylene Blue Active Substance	mg/L	0.5
	Cadmium (Cd)	mg/L	0.005
	Mg Hardness	mg/L	
	Ca Hardness ($CaCO_3$)	mg/L	
	Total Hardness	mg/L	500
	Chloride (Cl)	mg/L	600
	Chromium (Cr) (Total)	mg/L	
	Manganese (Mn)	mg/L	0.50
	Nitrate (NO_3)	mg/L	10
	Nitrite (NO_2)	mg/L	1

Table B1-23 Groundwater Quality Standard for Household Water Use

No.	Parameter	Unit	Standard
	pH		6.5 - 9.0
	Zinc (Zn)	mg/L	15
	Sulphate (SO_4)	mg/L	400
	Lead (Pb)	mg/L	0.05
	Organic ($KMnO_4$)	mg/L	10
III	Micro Biology		
	Coli Bacteria	MPL/100mL	50
	Fecal Coliforms	MPL/100mL	

Source: Ministry of Health

B1.5.4 Wastewater Quality Standard for Connection to Sewer Pipes in DKI Jakarta

The wastewater quality standard for connection to sewerage pipe network has been regulated by Decree of the Governor of DKI Jakarta No.1040 / 1997. The decree regulates obligation of all owners, occupants and responsible persons for each building located within areas where sewer pipe has installed must discharge their wastewater into it. Penalizations are also regulated if they violate obligation of discharging into the sewer, wastewater quality standards and inspection methods.

(1) Wastewater Quality Standards

The wastewater quality standards are defined as the maximum allowable standards for discharged wastewater into sewer pipe, and defined separately for domestic wastewater and non-domestic wastewater. The wastewater quality standards for each are shown in Table B1-24 and Table B1-25.

Table B1-24 Wastewater Quality Standards for Connection to Sewer Pipe for Domestic

No	Parameter	Standard Quality	Unit
I	Physics		OC
	Temperature	38	mg/L
	Dissolved Solid Substances	3000	mg/L
	Suspended Solid Substance (SS)	850	mg/L
II	Chemical		
	Ammonia	65	mg-N/L
	Arsenic	1	mg/L
	Total Iron (Fe)	5	mg/L
	Flouride	2	mg/L
	Free Chlorine	5	mg-$C1^2$/L
	Total Chromium	1	mg/L
	Hexavalent Chromium	1	mg-Cr^{6+}/L
	Nitrate	10	mg-N/L
	Nitrite	1	mg-N/L
	pH	5 – 9	-
	Zn	15	mg/L
	Selenium (Se)	0.05	mg-S/L
	Sulfide	2	mg/L
	Copper (Cu)	1	mg/L
	Manganese (Mn)	2	mg/L
	Phenol	1	mg/L
	Oil and Fats	20	mg/L
	Methylene Blue Active Compounds	30	mg/L
	Organic substances ($KMnO_4$)	550	mg/L
	BOD	400	mg/L
	COD (Bichromat)	600	mg/L

Source: Prepared by JICA Expert Team with Decree of the Governor of DKI Jakarta No.1040 / 1997

Table B1-25 Wastewater Quality Standards for Connection to Sewer Pipe for Non-domestic

No	Parameter	Standard Quality	Unit
I	Physics		
	Temperature	38	mg/L
	Dissolved Solid Substances	3000	mg/L

Table B1-25 Wastewater Quality Standards for Connection to Sewer Pipe for Non-domestic

No	Parameter	Standard Quality	Unit
	Suspended Solid Substance (SS)	850	mg/L
II	Chemical		
	Mercury	0.002	mg/L
	Ammonia	65	mg-N/L
	Arsenic	1	mg/L
	Total Iron (Fe)	5	mg/L
	Flouride	2	mg/L
	Kadmium (Cd)	0.05	mg-$C1^2$/L
	Free Chromium	5	mg/L
	Total Chromium	2	mg/L
	Hexavalent Chromium	1	mg-Cr^{6+}/L
	Nikel (Ni)	0.1	mg/L
	Nitrate	10	mg-N/L
	Nitrite	1	mg-N/L
	pH	5 - 9	-
	Zn	15	mg/L
	Selenium (Se)	0.05	mg-S/L
	Sulfide	2	mg/L
	Copper (Cu)	1	mg/L
	Lead (Pb)	0.1	mg/L
	Manganese (Mn)	10	mg/L
	Phenol	1	mg/L
	Oil and Fats	20	mg/L
	Methylene Blue Active Compounds	30	mg/L
	Cyanide (Cn)	0.1	mg/L
	Organic substances ($KMnO_4$)	550	mg/L
	BOD	400	mg/L
	COD (Bichromat)	600	mg/L

Source: Prepared by JICA Expert Team with Decree of the Governor of DKI Jakarta No.1040 / 1997

(2) Supervision and Evaluation

Related institutions in DKI Jakarta and PD PAL JAYA implement supervision and evaluation as following:

1) PD PAL JAYA implements supervision and monitoring of wastewater quality discharged into the sewer pipe.

2) PD PAL JAYA coordinates with related institution and reports the results of its supervision and evaluation to the Governor of DKI Jakarta.

- Monitoring and evaluation of wastewater quality discharged into the sewer pipe
- Collection and evaluation of the above data

3) The supervision is carried out periodically and if necessary.

4) If the results of supervision and monitoring indicate deviations from standard quality, PD PAL JAYA can order the owner / occupant / person in charge of buildings to reduce substances to be discharged, and can impose sanctions in accordance with applicable regulations.

(3) Authorities of PD PAL JAYA

In implementing supervision and monitoring, PD PAL JAYA has the authorities as follows;

1) Entering the area to check the wastewater generation sources

2) Taking samples of wastewater and checking the quality, or assigning the owner / occupant / person in charge of buildings to check the quality of wastewater in the laboratory of PD PAL JAYA on their own cost

3) Requesting necessary information to know the quality and quantity of wastewater discharged and in treatment processes

(4) Sanctions

Violations of the provision stipulated in Decree of the Governor of DKI Jakarta No.1040 / 1997 shall be charged with administrative sanction, such as ;

- Fine
- Closure of service pipe

B1.6 Major Issues regarding Wastewater Management

B1.6.1 Current Situation and Issues

(1) Treatment Method of Off-Site and On-Site

The present situation of wastewater treatment in DKI Jakarta is as described in Chapter 7 and Chapter 8. The coverage of sewerage system since the sewerage system master plan was established in 1991 is limited to the only 1.3% area of DKI Jakarta, and business establishments outside of the sewerage system area are operating their own individual treatment plants (ITPs) in correspondence to the water quality control of 2005, regardless of whether treatment is satisfactory or not. An overview of wastewater treatment is shown in Table B1-26.

Table B1-26 Current Situation and Issues regarding Wastewater Management of DKI Jakarta

Classification	Treatment method	Facility	Definition	Outline of facility			Relevant administration institution
				Method	Mechanical Electrical	O&M	
Off-site	Wastewater treatment	WWTP	Treatment facility for black water / gray water or both discharged from households or commercial entities connected to public sewer pipes.	Anaerobic, aerobic, and others	Exist	PD PAL JAYA	BPLHD
	Wastewater treatment for commerce	WWTP	Treatment facility for black water / gray water or both discharged from commercial entities connected to public sewer pipes.	Anaerobic, aerobic, and others	Exist	Owner and O&M entrusted company PD PAL JAYA	BPLHD
On-site	Individual and community treatment system	Septic tank	Storage equipment with anaerobic treatment function for black water, which allow some to infiltrates into underground.	Anaerobic	None	Owner and O&M entrusted company (Desludging)	BPLHD DK
		Modified Septic tank	Storage equipment with anaerobic treatment function for black water or both black water and gray water which doesn't allow some to infiltrates into underground.	Anaerobic	None	Owner and O&M entrusted company (Desludging)	BPLHD DK
		SANIMAS	Facility operated by community within slum area of city.	Anaerobic, aerobic, and others	Exist or None	Community O&M entrusted company (Desludging)	BPLHD DK
No treatment			Direct discharge into public water body				BPLHD

Source: JICA Expert Team

(2) Sludge Treatment and Disposal

Wastewater treatment converts contaminants in the water to microorganisms and treats and disposes sludge, which is produced as concentrate of microorganisms. The sludge generation volume increases

as more water is made cleaner. Sewage treatment is completed by appropriate grasp of generated sludge volume, by providing a system for treatment and collection of sludge and by positively securing sludge disposal yard. The fundamental of wastewater treatment is sludge disposal.

Indonesia in origin has been using septic tanks for the domestic wastewater treatment. It was the most effective skill in the situation where population density is small, as self-purification effect in the natural environment is expected. With respect to sludge disposal, this cultural tradition and thought is longstanding even today, and it appears that the people, society and administrative agencies of Indonesia did not pay attention to the accumulation of sludge in septic tanks. Consistent development of legal systems, regulations, punishments and construction of inspection system has not been done regarding sludge conveyance, treatment and disposal. Many people do recognize that the majority of sludge is disappearing somewhere, and there is no case where Pandora's box is opened up.

Today, however, as the population density in DKI Jakarta is close to its limit, improvement of water environment cannot be expected unless sludge disposal is looked straightly and appropriate measures are taken.

No institution that totally bears the responsibility for sludge treatment and disposal at the present time. Therefore, it is necessary to clarify the responsibility structure in this master plan.

As sludge treatment in Japan, discharge business operators, who are represented by sewerage business performed by municipal governments, treat the sludge by themselves. The sludge discharged from each discharge business operator is handled as industrial waste. Environment Ministry of the central government stipulates a ministry ordinance related to waste, with prevention of illegal dumping of waste and promotion of appropriate treatment as the purpose, and stipulates handling of waste so that the flow of waste treatment can be identified. In concrete, it is the duty of the discharge business operator to issue an industrial waste control slip (manifest) and grasp the situation of removal and disposal of the sludge by themselves and to then submit a report to the governor of the prefecture. Thus responsibility of the discharge business operator on sludge disposal is clarified.

Fundamental legislative preparations and review of sludge disposal plan in DKI Jakarta are essential using such sludge treatment and disposal responsibility structure in Japan as a reference, and this matter should be raised as a center subject of this master plan.

B1.6.2 Issues and Considerations on Master Plan

This master plan mainly aims to make a long-term wastewater management plan, however, considering the above situations, improvement of water environmental problems in DKI Jakarta can be said to depend on the target achievement under short-term plan (2020).

Although DKI Jakarta has a population of 10 million of which density is more than Tokyo, it has hardly developed infrastructure for wastewater treatment. That means simultaneous efforts by both side, on-site and off-site, will be inevitable to improve urban environment.

- Split district into on-site and off-site after preparing a reference scale.
- Accelerate the development of on-site facilities by setting proper structural standards for ITPs and septic tanks for domestic considering that the environmental standard and the sewage effluent standard are satisfied.
- Divide-up off-site districts including community treatment system, and make and implement implementation plans (short-term feasibility studies) individually to make stepwise improvement in the water environmental.

Central government and DKI Jakarta have to recognize that administrative, financial, and technical limitations such as shortage of sites for planning a sewer pipe and wastewater and sludge treatment plants have incomparably increased than other cities and they are required to do their best efforts.

Table B1-27 Issues and Consideration on Master Plan

Category	Establishment/Confirmation of Basic Concept		Technical Issues	Administrative Issues
Environmental water quality / Effluent wastewater quality	・Wastewater treatment should be based on mass-balance.	・Preservation of public water body ・Countermeasure for drainage (Combined・Separated)	・Rational Set-up ・Effluent quality ・Structure standard for modified septic tank ・Design standards for ITP ・Grasping of quantity	・Strict application (Provisional period required)
Sludge Treatment / Disposal	・Wastewater treatment finishes due to complete sludge treatment and disposal.	・Exclusion from penetration (Traditional concept)	・Grasping of Sludge M/B ・Generated Sludge amount ・Application of sludge treatment and disposal	・Strict application (Provisional period required) ・Periodic Desludging
Wastewater Treatment Planning	・Position of ITP will be defined as off-site.		・Consistency between drainage and wastewater treatment (Sewerage is based on separated system) ・Design standards for ITP	・Classification of on-site and off-site ・Dealing with ITP

Source: JICA Expert Team

B1.6.3 Basic Policies to be Considered regarding Improvement Wastewater Management

Basic policies related to laws, organizations, structures and management on improvement for present wastewater treatment are sorted out below.

(1) Development of Basic Policy and Systematic Legisration regarding Water Environment and Wastewater Treatment

Establishment of basic concept related to water environment and wastewater treatment as well as systematic strengthening of legal system related to wastewater treatment are needed. It should be established by the central government and DKI Jakarta in the preparation of wastewater law and its relevant laws that is promoted in parallel with formulation of this master plan.

In DKI Jakarta, based on the trend of population, environment and wastewater treatment should be clearly positioned as the policy with overriding priority, in addition to flood control and transportation, in the improvement of urban environment.

(2) Development of Systematic Organization regarding Water Environment and Wastewater Treatment

Regarding organizations and structures related to water environment and wastewater treatment, although departments who are in charge are as described in preceding section 10.1, their cooperating relation in the responsibility structure and mutual relations is thin. The principal cause for reaching such a situation is that discussions on and establishment of basic concept on water environment stated in paragraph (1) are one step behind due to economic growth and accompanying expansion of the gap between rich people and poor people. It is necessary, by formulation of this master plan and by fundamental review of the legal system, to enumerate concrete implementation items of administration toward preservation of the water environment and to make efforts in the development of organizational structure that generalizes these matters, scope of responsibility and organizational capabilities.

(3) Financial Support

DKI Jakarta and Tokyo are of almost the same population scale, and the area of DKI Jakarta is about the same as that of ward region of Tokyo. The environment remedy expenses in the budget scale were of the same amount in recent years

In the ward region of Tokyo, however, sewerage system has been achieved to nearly 100% and it can be considered that the majority of expenditure is the cost for upkeep of functions of sewerage system. Compared to the fact that wastewater treatment in DKI Jakarta is generally supported by individual septic tanks and ITPs operated by business establishments, the ratio of the budget scale of DKI Jakarta related to wastewater treatment should be naturally high when s development of sewerage system is taken into account.

(4) Regulation by Environmental Standards and its Management

It is doubtless that discharge of untreated wastewater from business was controlled to a certain extent by the setup of a wastewater environment standard in 2005. But monitoring structure, administrative guidance and ITP control capability involves many elements requiring improvement, and sufficient examination is required in the discussions of paragraphs (1), (2) and (3).

(5) General Countermeasures against Slums

People from mostly from outside of Jakarta are forming illegal slums in many places of DKI Jakarta, and the number of these people is said to be 3 million. It cannot be denied that human resources of this low-income layer constitute a part of the foundation for economic growth of DKI Jakarta. On the other hand, it is also a fact that from the viewpoint of water environment, their living environment itself is placed in poor conditions, and at the same time, slums scattered around river and lake area are a major obstacle in the conservation of water environment in DKI Jakarta. The fundamental measures are securing of civil minimum in local regions and promotion of regional development measures. These measures are outside of the scope of discussions on this project, but they are what should be positioned as most fundamental national policies and measures by the central government, government of DKI Jakarta and each local government. They should recognize that success of these measures makes major contribution to improvement of water environment and wastewater treatment in DKI Jakarta.

B1.6.4 Present Conditions and Issues on Organizational Structure

The component of present conditions and issues on organizational structures regarding wastewater and sludge management described in this chapter is shown on Table B1-28. Present conditions and issues on organizational structures regarding wastewater management and sludge management are shown on Table B1-29 and Table B1-30 respectively.

Table B1-28 Component of Present Conditions and Issues on Wastewater and Sludge Management

Institution	Main Business			Issues of Institution	
	On-site	Off-site			
BPLHD 259 persons (5 persosns)*1	General Management of Wastewater			Function of management is not strong.	Not only management authority but also technical faculty is weak.
	Supervision over DK	Supervision over PD PAL JAYA		Faculty to direct is very low.	
	Structure design standard	Invalid		Mismatching of structure design standard and design effluent quality	
	Monitoring and inspection of effluent quality	Monitoring and inspection of effluent quality		Inspection institution is weak.	
DK 1,653 persons (Provincial office: 13)*2 (Sub-agency: 200)*2	Collection of sludge	Invalid		On-Call only	The number of employee is many and their age is high comparatively.
	Transportation of sludge			Competition of private company	
	Treatment and disposal of sludge			Actual treated amount of sludge is very little than expected.	
PD PAL JAYA 106 Persons	Collection and transportation of sludge (on planning)	O&M	Sewer Pipe 76km	Firsthand experience is lacking.	Although business as a company is done well, technical activity is very low.
			PS 1 facility	Firsthand experience is lacking.	
			WWTP is not perfect due to using drainage respectively・	Firsthand experience is lacking. Because of not having standard WWTP.	
DPU	Invalid	Management of drainage		The authority and budget on wastewater management was transferred to BPLHD in 2008.	

*1. The numbers of BPLHD's staff which directly related with wastewater is 5 persons belonging to Sub Division of Habitat Control and Environment, Division of Pollution Constrol and Environment based on hearing from BPLHD.

*2. The numbers of DK's staff which directly related with wastewater are 13 persons belonging to Management Unit of Septic tank Waste (UPLS) of provincial office, and about 200 persons to be with Section of Wastewater of Septic Tank Control, Cleansing Sub-agency respectively, based on hearing from DK.

Source: JICA Expert Team

Table B1-29 Present Conditions and Issues on Organizational Structure of Wastewater Management

Items	Discharged district	Supervision, Inspection and Regulation	Law
Institution and current status	Public water body	BPLHD ・Inspection is done about once a year (Regulated interval : three times a year) ・Sampling is done by owner of ITP and only analyzed by BPLHD. ・Warning is conducted in the case of excess.	Governor Decree No.122/2005
	Sewerage	PD PAL JAYA ・Sampling and inspection of wastewater discharged into sewer pipe is regularly conducted by PDPAL. ・Warning is conducted in the case of excess.	Governor Decree No.1040/1997
Issues	・Monitoring of by BPLHD is a mere name. It is easy for owner of ITP to deceive inspection by BPLHD. ・Mismatching of structure design standard and design effluent quality of modified septic tank (Structure design standard is difficult to keep effluent quality)		
Tentative Countermeasure	・Reinforcement of authority and structure of BPLHD site/field visit and sampling by BPLHD ・Reinforcement of technical faculty of BPLHD Design and technical activity of on-site and off site		

Source: JICA Expert Team

Table B1-30 Present Conditions and Issues on Organizational Structure of Sludge Management

Item	Source of sludge	Supervision	Collection	Treatment /Disposal	Law
Institution	Individual Treatment Plant	(BPLHD)	DK Private Company PD PAL JAYA	Private Company	Governor Decree No.122 2005
	Septic Tank	(DK)		DK	
	Sewerage	(PD PAL JAYA)	DPU		
Issue	・There is no consistent management structure from sludge treatment to disposal. (Especially regarding sludge collected by private company from ITP) ・Desludging by DK is done only on-call. (Periodic desludging is not conducted.) ・No one can find right quantity of generated sludge. ・Some amount of sludge is discharged from septic tank into ground. ・It is deemed that sludge collected by private company is discharged to river and so on.				
Tentative Countermeasure	・Introduction of sludge management system using waste manifesto ・Operation of periodic desludging				

Source: JICA Expert Team

B2 Socio-economic conditions

B2.1 Spatial Utilization (Land Use)

B2.1.1 Spatial Utilization Control System

(1) Related Legal System on Spatial Control

Spatial control in Indonesia was systemized for the first time when the Law No.24 of 1992 on Spatial Planning was established in 1992. Based on ministerial regulations and so on, central government ministries such as the Ministry of Public Works and the Ministry of Interior had drawn up spatial plans respectively before then. However, those spatial plans had brought confusions in those enforcements by local governments because those plans had been prepared without inter-organizational coordination. Because of such situation, the Law No.24 of 1992 was established with restructuring of those old ministerial regulations and so on. Since then the spatial plans have been systematically formulated at appropriate levels in accordance with administrative hierarchies, and more specifically, the spatial plans have been classified into National Spatial Plan (RTRWN), Provincial Spatial Plan (RTRW),

Regency Spatial Plan (RTRW *Kabupaten*) and Municipal Spatial Plan (RTRW *Kota*). Regency and a municipality are institutionally standing in one administrative hierarchy.

The Law No.22 of 1999 on Regional Administration was established in the end of 1990s. And since that time, administrative system had been modified and decentralization had progressed in the every administrative hierarchy. In accordance with the progress of decentralization, review of the manner on spatial planning process and enforcement of spatial plan had become essential. Consequently, the Law No.26 of 2007 on Spatial Planning and Management was established in order to substitute for the Law No.24 of 1992.

The Law No.26 of 2007 provides that every spatial plan has 20 years' planning period, 5 years' mid-term program for objective of spatial utilization and requirement of every 5 years' re-evaluation. In comparison with the old law, the Law No.26 of 2007 has the following characteristics.

- Improved administrative hierarchy of spatial plan
- Clarified authority of each administrative hierarchy
- Classified system into general spatial plan as a guideline for preparation of medium and long term development plans and detailed spatial plan as a tool in order to realize the general spatial plan
- Provision on formulation of metropolitan spatial plan in order to implement coordinated development in an area consisting of multiple administrative areas
- Provision on formulation of spatial plan for agropolitan area in order to support improvement of rural socioeconomic conditions
- Provision of rights and responsibilities for community participation
- Adoption of new mechanism for spatial control consisting of zoning regulation, development permit, incentive and disincentive, criminal punishment and so on

The related legal system on spatial planning is tabulated as follows.

Table B2-1 Related Legal System on Spatial Planning

Law
• Law No.26 of 2007 on Spatial Planning and Management
Presidential Decree
• Presidential Decree No.4 of 2009 on Coordinating Body of National Spatial Planning
Presidential Regulation
• Presidential Regulation No.54 of 2008 on Spatial Planning in Jakarta, Bogor, Depok, Tangerang, Bekasi, Puncak and Cianjur Area
Government Regulation
• Government Regulation No.15 of 2010 on the Implementation of Spatial Planning and Management • Government Regulation No.26 of 2008 on the National Spatial Planning
Ministerial Regulation
• No.11/PRT/M/2009 on Substantial Guideline for Determination of Provincial, Regency and Municipal Spatial Plans • No.15/PRT/M/2009 on Preparation Guideline for Provincial Spatial Planning • No.16/PRT/M/2009 on Preparation Guideline for Regency Spatial Planning • No.17/PRT/M/2009 on Preparation Guideline for Municipal Spatial Planning • No.20/PRT/M/2007 on Technical Guideline for Analysis of Physical, Environmental, Economic, Social and Cultural Aspects in Preparation of Spatial Plans • No.22/PRT/M/2007 on Guideline for Spatial Planning of Landslide Prone Areas
Provincial Regulation
• Provincial Regulation on Regional Spatial Planning 2030 of DKI Jakarta

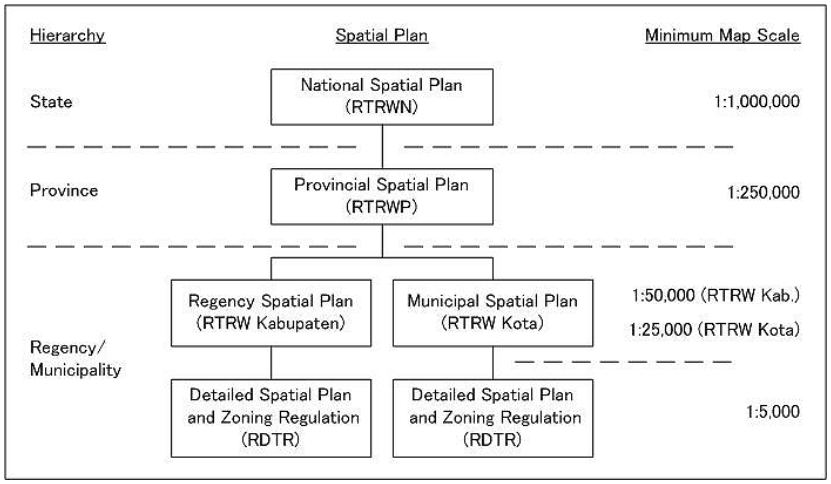
Source: Directorate General of Spatial Planning, Ministry of Public Works, et al.

Based on the Law No.26 of 2007 on Spatial Planning and Management, the Government Regulation No.26 of 2008 on the National Spatial Planning was established, and the Presidential Regulation No.54 of 2008 on Spatial Planning in Jakarta, Bogor, Depok, Tangerang, Bekasi, Puncak and Cianjur Area was established for the Jakarta metropolitan area. As for the provincial spatial plan for 2011-2030

of DKI Jakarta, it was approved by the provincial parliament on 24 August 2011.

(2) Outline of Spatial Control Administration

The following figure shows the hierarchical framework of spatial planning in accordance with the Law No.26 of 2007 on Spatial Planning and Management.



Source: Department of Spatial Planning, DKI Jakarta

Figure B2-1 Outline of Spatial Planning System

The national spatial plan, which shall be established as a government regulation and its bill shall be prepared by BAPPENAS with substantial support from DGSP of the Ministry of Public Works, will be a guiding principle for spatial planning of local government. The national spatial plan is the strategy for national spatial development and includes objectives and strategies on spatial planning, structure plan of the national spatial utilization including urban hierarchy and infrastructure network at national level, and designation of the national strategic areas in accordance with the degree of importance in terms of economy, environment and so on.

The provincial spatial plan shall be established as a provincial regulation under the editorship of BAPPEDA. The provincial spatial plan will be a guiding principle for spatial planning of regency/ municipality, and includes mutual adjustment with spatial plans of adjacent provinces in addition to the rules and regulations for its enforcement. Drawings for the provincial spatial plan shall be prepared with the minimum scale ratio of 1/250,000.

The regency/municipal spatial plan shall be established as a regency/municipal regulation. The regency spatial plan and the municipal spatial plan are defined as the same administrative hierarchy and divided into general spatial plan and detailed spatial plan. Drawings of general spatial plan are prepared with the minimum scale ratio of 1/50,000 for regency, and 1/25,000 for municipality. On the other hand, drawings of detailed spatial plan are prepared with the minimum scale ratio of 1/5,000. The general spatial plan establishes spatial structure, land use plan and strategy for its enforcement, while the detailed spatial plan which is a tool in order to realize the general spatial plan defines rules and regulations such as zoning regulation, administrative procedures of development permission, prescription of incentive and disincentive, administrative punishment.

(3) Spatial Control Administration in DKI Jakarta

1) Planning Authorities of Spatial Plan

The mainland of the province of DKI Jakarta consists of five municipalities; West Jakarta, Central Jakarta, South Jakarta, East Jakarta and North Jakarta. In Indonesia, regency is headed by a regent (bupati), while a municipality is headed by a mayor (walikota). All regents, mayors and member of representatives are directly elected for five years term. However, in case of the province of DKI Jakarta, mayors are chosen by the Governor. In addition, those five municipalities do not have parliament. Consequently, municipal spatial plans of those municipalities are included in the provincial spatial plan of DKI Jakarta.

The provincial spatial plan of DKI Jakarta is established under the jurisdiction of BAPPEDA, while the detailed spatial plan for each district (*kecamatan*) is prepared by the Spatial Planning Agency (DTR) of DKI Jakarta.

2) Management System of Spatial Utilization

The governing agency of development permit in DKI Jakarta depends on the development scale as shown in the following table.

Table B2-2 Governing Agency of Development Permit

Scale (Area) of Development	Governing Agency
5,000 m^2 ≤ Area	DKI Jakarta
500 m^2 ≤ Area < 5,000 m^2	Municipality
Area < 500 m^2	District (Kecamatan)

Source: Department of Spatial Planning, DKI Jakarta

Development of which area is 5,000 m^2 and over requires an approval on land acquisition (SP3L) and/or land utilization (SIPPT) from the Governor as described later. The secretariat of the "Consideration Team for Land Affairs (TPUT)", which is established with the Spatial Planning Agency, is the receiving office of those applications on land. TPUT, which is an ad hoc committee consisting of heads of relevant organizations to each accepted application, examines the application in terms of spatial utilization in accordance with the spatial plan, and submits a report on approval to the Governor.

Applicant of SIPPT is required to submit a block plan which shows layout of building structures with map scale of 1/1,000. Although TPUT routinely confirms the existence of facilities such as sewerage treatment plant in a block plan, they do not check any technical requirements of those facilities. In regard to the administrative procedures on SIPPT, only appropriateness of land utilization is examined by TPUT. For instance, the technical requirements of sewerage treatment facility in a large-scale development are generally examined through the process of environmental assessment.

As for development of land of which area is less than 5,000 m^2, the developer is not required to obtain SP3L and/or SIPPT. However, the developer has to submit block plan to the authority concerned and obtain their approval even if the land for development is less than 5,000 m^2. In case when a land for development is less than 5,000 m^2 and 500 m^2 and over, municipal office accepts the application. And if the land is less than 500 m^2, district (kecamatan) office will accept the application.

3) Related Legal System on Development Permitting Administration

Related legal system on development permitting administration in line with spatial plan is tabulated as follows.

Table B2-3 Related Legal System on Development Permitting Administration

Law
• Law No.28 of 2002 on Building Construction
Presidential Regulation
• Presidential Regulation No.36 of 2005 on Land Procurement for Development Implementation for Public Interest • Presidential Regulation No. 65 of 2006 on Amendment to Presidential Regulation No.36 of 2005 on Land Procurement for Development Implementation for Public Interest
Government Regulation
• Government Regulation No.36 of 2005 on Implementation of Law No.28/2002 on Building Construction
Ministerial Regulation
• No.29/PRT/M/2006 on Guideline for Technical Requirement of Building Construction • No.45/PRT/M/2007 on Technical Guidance of State Building Construction
Governor Decree/Regulation
• Governor Decree No.Da.11/3/11/1972 on Improvement of Application Procedures of Permit of Land Use and Designation (SIPPT), and Procedures of Land Acquisition for Public/Private Interest in DKI Jakarta • Governor Decree No. 540 of 1990 on Implementation Guidelines for Issuance of Principle Approval Letter for Land Acquisition (SP3L) of Parcels of Land for Urban Physical Development

Table B2-3 Related Legal System on Development Permitting Administration

• Governor Decree No. 640 of 1992 on Provision regarding Land Acquisition without Permit from the Governor of DKI Jakarta • Governor Decree No.76 of 2000 on Procedure to get IMB, IPB and KMB in DKI Jakarta • Governor Decree No. 41 of 2001 on Procedures of Acceptance of Liability from Holder of SIPPT to the Provincial Government of DKI Jakarta • Governor Decree No. 1934 of 2002 on Provision regarding Calculation of Liability for Providing of Low-cost Housing by Holder of SIPPT • Governor Regulation No. 76 of 2008 on Exception of SIPPT
Provincial Regulation
• Provincial Regulation No.7 of 1991 on Building Structure in DKI Jakarta • Provincial Regulation No.7 of 2010 on Building in DKI Jakarta
Others
• Regulation of Head of Bappenas No.3 of 2007 on Implementation Provision of Presidential Regulation No.36 of 2005 and Presidential Regulation No.60 of 2006

Source: Bureau of Spatial Planning and Environment, DKI Jakarta

4) Development Permitting Administration

Development permission in DKI Jakarta, which is roughly classified into development permission on land and development permission on building, is performed in line with the above-mentioned legal system. The development permission on land consists of "Principle Approval Letter of Land Acquisition" and "Permit of Land Use and Designation", while the development permission on building consists of "Building Construction Permit" and "Certificate for Suitability of Functions". Assuming a series of development activities starts with land acquisition, the necessary permits in sequence are as follows.

a) **Principle Approval Letter of Land Acquisition (SP3L)**: The letter gives applicant a permission to launch land acquisition for a development activity. The SP3L is only required when applicant intends to develop a land of which area is 5,000 m^2 and over, and the applicant have to complete the land acquisition within 6 months from the date of issue. The SP3L is commonly known as "Location Permit".

b) **Permit of Land Use and Designation (SIPPT)**: SIPPT certifies that intended land use of a development is in compliance with detailed spatial plan and zoning regulation. This permit is only required when the area of development is 5,000 m^2 and over.

c) **Building Construction Permit (IMB)**: IMB gives applicant a permission to construct building. Drawing and specification provided by the applicant are examined by the concerned authorities regarding restrictions on land, infrastructure development by applicant's expense, structure of building, ancillary facilities, environmental conditions and so on.

d) **Certificate for Suitability of Functions (SLF)**: SLF will be issued when construction of a building is completed, if the status of building meets requirements of IMB and technical standards. It also gives applicant a permission to use building.

SP3L is essential for a development of which area is 5,000 m^2 and over to get SIPPT, IMB and SLF in order to bring the development to completion. However, it will be unnecessary to get SP3L, if a developer intends to acquire a land of which permits have been already issued and respect those given conditions. In case when land acquisition is necessary to develop a public infrastructure by the provincial government and/or provincial agency, SP3L and SIPPT are not required. On the other hand, the central government shall obtain those permits when they develop infrastructure or public facility within the administrative area of DKI Jakarta.

In the same way, SIPPT is required to develop a land of which area is 5,000 m^2 and over. On the occasion when an applicant applies for a SIPPT, TPUT will mainly examine whether the intended spatial utilization is compliant with detailed spatial plan and zoning regulations or not. Based on the applications, TPUT confirms the project site with implementation of land survey. In this regard, the

applicant will be required to give over a portion of land to the provincial government, if it is overlapped with planned right of way in the spatial plan. As for the conformity with the spatial plan, TPUT examines building coverage ratio (KDB), floor-area ratio (KLB), green coverage ratio (KDH), number of stories and building setback, on the basis of the block plan which shall be prepared by the applicant.

Review of application document on SIPPT is implemented by TPUT in terms of conformity with spatial plan, but not for technical requirements of ancillary facilities such as wastewater treatment facility. Review of the technical requirements of those facilities will be done in the administrative procedure of IMB (Building Construction Permit), and/or environmental assessment in advance of IMB. As for land development of which area is less than 5,000 m^2, the developer is not required to obtain SIPPT. However, the developer has to submit a block plan to municipal office or district office depending on scale of the development, and obtain permission from the authority.

In regard to development permission on building, the receiving office of application differs by the type of building and scale of its land area, as shown in the following table.

Table B2-4 Governing Agency of Development Permission on Building

Type of Building and Land Area	Governing Agency
Building of which no. of aboveground stories is more than 8 and/or land with SIPPT (5,000 m^2 ≤ Land Area)	Provincial Agency of Building Control & Monitoring (DP2B)
Building of which no. of aboveground stories is between 1 and 8, with underground floor(s) and/or structures on rooftop	Sub-agency of Building Control & Monitoring in Municipality (SDP2B)
Building of which no. of aboveground stories is between 1 and 8, without underground floor(s) or structures on rooftop	Unit of Building Control & Monitoring in District (P2B)

Source: Provincial Agency of Building Control & Monitoring, DKI Jakarta

The provincial agency of building control & monitoring (DP2B) is responsible for development permission on building of which number of aboveground stories is more than 8 and/or its site area has SIPPT. According to DP2B, site surveys are generally carried out three (3) times after acceptance of application of IMB, that is, site identification shortly after the acceptance of application, confirmation of permit requirements at the start of construction work and on-site inspection at the end of construction work. However, the on-site inspection is only carried out about commercial/office building and large-scale housing development due to shortage of manpower. Except for the large-scale housing development, site survey for housing development is carried out only once, that is site identification shortly after acceptance of application. This means, housing of which on-site inspection at the end of construction work is not carried out by DP2B cannot obtain SLF.

On the other hand, sub-agency of building control & monitoring in municipality (SDP2B) is responsible for development permission on building of which site area is less than 5,000 m^2 and the number of aboveground stories is between 1 and 8 with underground floor(s) and/or structures on rooftop. As in the case of development permission administration of DP2B, on-site inspection at the end of construction work is carried out only about commercial/office buildings due to shortage of manpower.

As for the building of which area is less than 5,000 m^2 and the number of aboveground stories is between 1 and 8 without any underground floor or any structures on rooftop, unit of building control & monitoring in *kecamatan* office (P2B) is the receiving office of those applications for IMB and SLF. Although P2B examines the applications, the final decision on permission is handed to SDP2B in municipal office. According to the P2B of Kecamatan Menteng in the municipality of Central Jakarta, they have carried out necessary site surveys including on-site inspection about every permitted housing development with IMB, unlike DP2B and SDP2B. In this regard, however, the objects of inspection are mainly building itself and rainwater infiltration facility, but sewerage treatment facility such as septic tank is usually not inspected. The reason why P2B concentrates only on rainwater infiltration facility among facilities can be found in a leaflet which is available at the office of P2B and provides a simplified explanation about administrative procedures of IMB. The leaflet shows standard drawings of necessary rainwater infiltration facility by type of housing and mandates submission of application including structural drawings of rainwater infiltration facility for applicant for IMB.

5) Management of Wastewater Treatment Facilities in Development Permission Administration

As previously described, only appearance of sewerage treatment facility is visually observed in a block plan by authority through administrative procedures of SIPPT, but technical requirements for the facility are not examined at all. In addition, authority does not pay any attention to the technical requirements of sewerage treatment facility because it is commonly understood that sanitation facilities such as sewerage treatment facility are examined through administrative procedures of environmental assessment.

On the other hand, environmental assessment will be implemented for a project prior to the application for IMB, only if the conditions of the project are legally required to implement environmental assessment. In addition, environment assessment is only applied to projects which are implemented by developers, but not applied to constructions of individual houses.

In the environmental assessment system in Indonesia, the Government Regulation No.27/1999 makes environmental impact assessment (AMDAL) compulsory at project which brings a significant impact on the environment. As for a project which is not required to implement AMDAL, it will be required to submit environmental management plan (UKL) and environmental monitoring plan (UPL) to the authority, if the project brings certain degree of impact on the environment. In addition, it will be required to submit a simplified statement of environmental management (SPPL), even if the project is not obliged to implement any of AMDAL and UKL & UPL.

In DKI Jakarta, the types of projects which are required to implement the environmental assessment (AMDAL, UKL & UPL, SPPL) are regulated by the following decrees.

- Governor Decree No.2863/2001 on Types of Business and/or Activity Plans requiring AMDAL in DKI Jakarta
- Governor Decree No.189/2002 on Types of Business and/or Activity Plans requiring UKL and UPL in DKI Jakarta
- Governor Decree No.2333/2002 on Types of Business and/or Activity Plans requiring SPPL in DKI Jakarta

Wastewater is roughly classified into domestic wastewater and wastewater resulting from business/industrial activities. In this master plan, land use classification for the spatial plans of municipalities in the Provincial Spatial Planning of DKI Jakarta 2030 is reclassified into residential, commercial/institutional, industrial and other land uses. Table B2-5 shows the types of projects which are required to implement environmental assessment in accordance with the above-mentioned governor decrees.

In regard to housing, all types of housing development in protected area are required to implement AMDAL, while other housing developments out of protected area are required to implement environmental assessment. As stated earlier, however, those governor decrees are only applied to the projects implemented by developers, but not applied to constructions of individual houses.

All commercial/institutional developments are obliged to implement the environmental assessment in accordance with those types of developments. In this regard, however, even a construction of individual building is needed to submit SPPL to the authority because the owner has to submit applications including copy of environmental certificate to the authority in order to obtain valid business license within the building. As for the industrial field, all developments of industrial estate are obliged to implement AMDAL.

In regard to environmental administration on development in DKI Jakarta, BPLHD is responsible for AMDAL, while municipal office of environment (*kantor Lingkungan Hidup)* is responsible for UKL/UPL and SPPL. In the administrative procedures of development permission, applicant has to obtain necessary environmental license prior to submit application for IMB. According to BPLHD, the administrative officers pay attention especially to sewerage treatment facility, space for garbage collection and rainwater infiltration facility among needed physical facilities within the development site.

As for the construction of individual house, environmental license is not required to obtain IMB because environmental assessment is not applied to individual construction activity. In the receiving offices of application for IMB which mean DP2B, SDP2B and P2B, the administrative officers do not give any guidance on sewerage treatment facility to the applicants because they recognize that it is under control of BPLHD. In fact, the "Governor Regulation No.122/2005 on Domestic Wastewater Management in DKI Jakarta" which was established under the editorship of BPLHD is not recognized by those officers at all. In other words, the Governor Regulation No.122/2005, which was established mainly for management of discharged wastewater from individual houses, is not applicable in the authorities of building control and monitoring, although those authorities are supposed to have a need for the regulation in the administrative procedures of IMB. Furthermore, in an extreme instance, wastewater which is discharged from individual houses is completely uncontrolled.

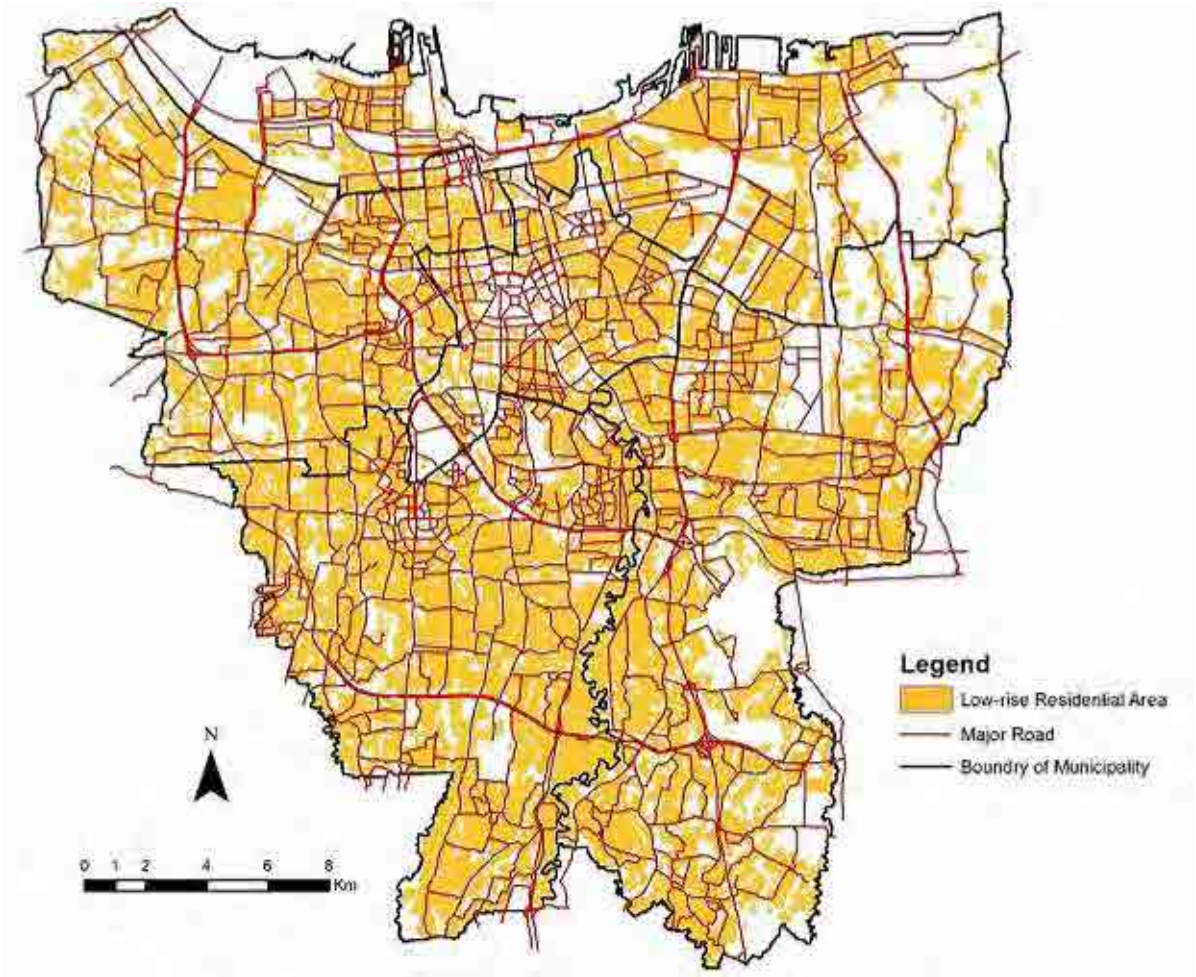
Figure B2-2 shows distribution of low-rise residential areas which are composed of one-to-two-storied houses. The total of low-rise residential areas accounts for 53.2% of the administrative area of DKI Jakarta. Since the overall residential area including mid-to-high-rise residential areas accounts for 53.4% of the administrative area of DKI Jakarta, the residential area is almost entirely occupied by the one-to-two- storied houses. Obviously, thorough strengthening of wastewater management in these dominant low-rise residential areas is the ultimate challenge for environmental improvement.

As a matter of fact, BPLHD has recognized the limited application of the Governor Regulation No.122/2005, and indicates the intention to enhance coordination among related agencies in order to promote its dissemination.

Table B2-5 Required Environmental Assessment (AMDAL, UKL/UPL, SPPL) in Housing, Commercial/Institutional and Industrial Developments

Field	Project requiring AMDAL			Project requiring UKL /UPL and SPPL		
	Type of Project	Magnitude of Project	Description	Type of Project	Magnitude of Project	
					UKL/ UPL	SPPL
Housing	Development in protected area	All of projects	- Development with resettlement - Development with population concentration - Development which brings significant change of land use - Development which causes traffic congestion during construction period - Development of infrastructure or urban facilities which makes serious impact on surroundings	Development in densely built-up area (150 residents/ha and over)	1ha ≤ Site area < 5ha	Site area < 1ha
	Development in densely built-up area (150 residents/ha and over)	5ha ≤ Site area		Development in planned horizontal residential area	1ha ≤ Site area < 5ha	Site area < 1ha
	Development in planned residential area	-		Development in planned vertical residential area	0.5ha ≤ Site area < 2ha 3 ≤ No. of aboveground stories < 4	Site area < 0.5ha No. of aboveground stories < 3
Commercial/ Institutional	Development of commercial/business building (incl. Commercial/business complex)	5ha ≤ Site area 15,000m^2 ≤ Total floor area 15 ≤ No. of aboveground stories 60m ≤ Building height 10m ≤ Depth of basement floors	- Development which shut off traffic/utility network during construction and/or in-service periods - Controlled development - Development which uses a large amount of water and discharges a large amount of wastewater - Development which brings significant change of land use - Development of which discharged wastewater harms water regime	Development of commercial/business building (incl. Commercial/business complex)	1ha ≤ Site area < 5ha 2.000m^2 ≤ Total floor area < 5,000m^2 4 ≤ No. of aboveground stories < 15 15m ≤ Building height < 60m 3m ≤ Depth of basement floors < 10m	Site area < 1ha Total floor area < 2,000m^2 No. of aboveground stories < 4 Building height < 15m Depth of basement floors < 3m
Industrial	Development of industrial estate	All of projects	Development which makes serious impact on surroundings about the following items - Land reclamation and rain runoff - Procurement/operation of heavy machinery - 90 employees/ha and more - Involving of residential facilities - 0.55-0.75l/sec/ha and more of water demand - 0.1MW/ha and more of power demand - Generation of a variety of waste and contamination - Generation of traffic	-	-	-

Source: Governor Decree No.2863/2001, Governor Decree No.189/2002 and Governor Decree No.2333/2002



Source: Spatial Planning Agency, DKI Jakarta

Figure B2-2 Distribution of Low-rise Residential Areas in the Mainland of DKI Jakarta

B2.1.2 Situation of Land Use

(1) Transition of Land Use

Urbanization in DKI Jakarta has proceeded rapidly during last four decades and the provincial area has been almost entirely urbanized in the 2000s as shown in the following figure.

1972 1983 1993 1998 2002

Source: Academic Manuscript of Regional Spatial Plan of DKI Jakarta

Figure B2-3 Transition of Urbanization in the Mainland of DKI Jakarta

As the result of the urbanization, the provincial government has faced an uphill battle for improvement of the urban environment because it is hard to find vacant land for infrastructure development such as development of sewerage treatment plant.

(2) Development Trend

Land development by public sector in DKI Jakarta has been mainly implemented by Perum Perumnas (National Housing Corporation) and Housing Agency of DKI Jakarta. Ongoing land development by

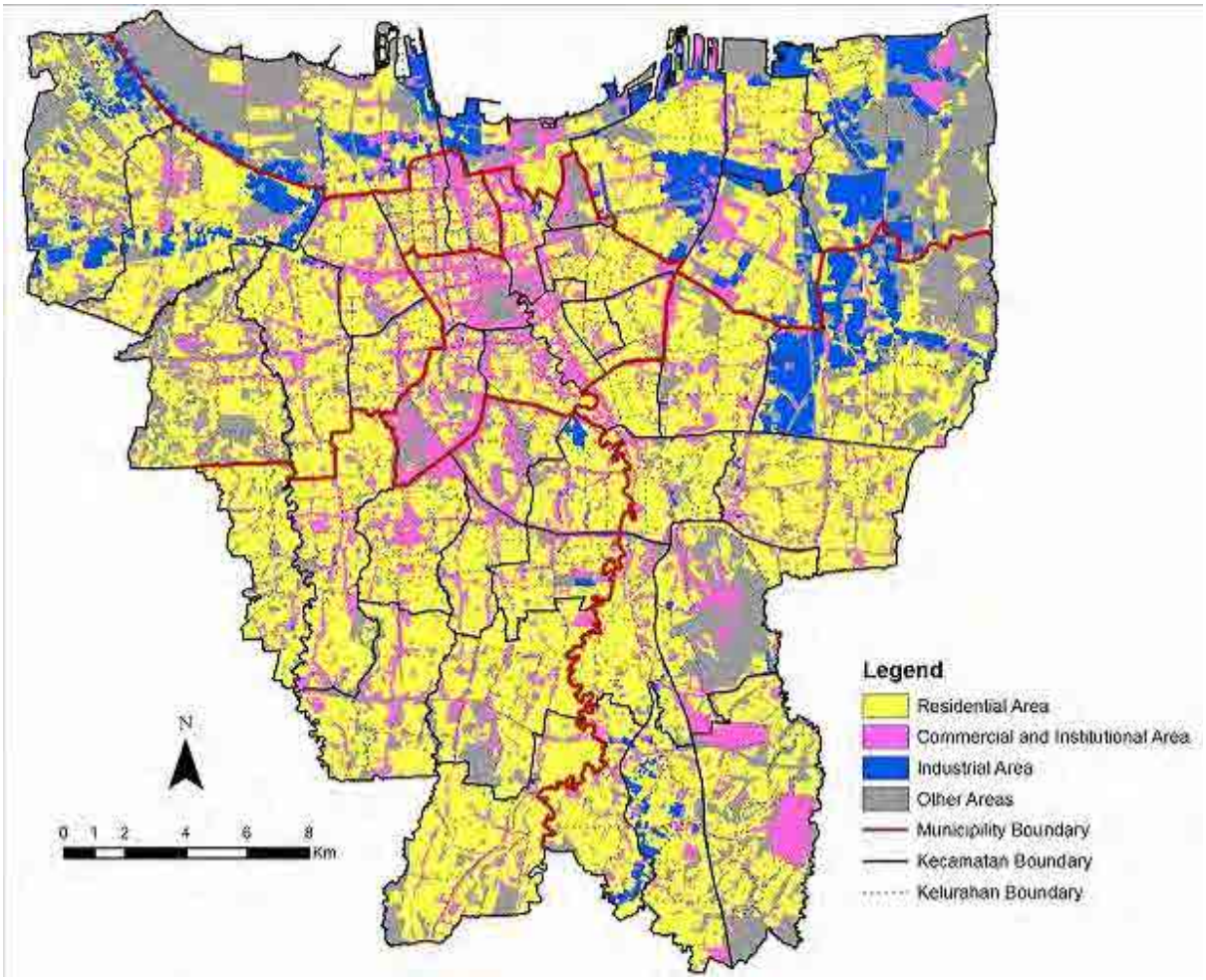
Perum Perumnas, which is mainly in charge of housing development for low-to-middle income group, is the Cengkareng Housing Development Project (340 hectares in total) in northwest part of DKI Jakarta. This development has started in the 1990s, and Perum Perumnas had directly operated the housing development in the earliest years. In recent years, however, private sector has been involved in the housing development with concession contract with Perum Perumnas. In regard to the Cengkareng Housing Development, Perum Perumnas has a serious problem of illegal occupation, especially in the areas along access roads and in the planned areas for utilities. As for the future housing development, Perum Perumnas will go ahead with the Pulogebang Housing Development Project for the next five years. The total area of the project site is 140 hectares. Of this total, approximately 100 hectares have been already developed, and the other 40 hectares have been occupied by squatters. Perum Perumnas intends to develop this occupied land through resettlement of those squatters with compensation payment. On the other hand, Housing Agency of DKI Jakarta, which is mainly in charge of housing development for low income group, has annually provided about 1,000 housing units and the size of each development site is relatively very small compared to the development sites of Perum Perumnas.

Although the public sector has faced with difficult problem of illegal occupation on public lands in various locations, the private sector is very aggressive in large-scale development of housing or commercial complex such as Kemang Village and Mega Kuningan.

(3) Land Use Status

Figure B2-4 shows the land use in 2007 of which land use classification is simplified into 4 categories, namely, residential, commercial/institutional, industrial and others. Of the entire mainland of DKI Jakarta, portions of those 4 categories are 53% of residential land use, 16% of commercial/institutional land use, 7% of industrial land use and 23% of the other land use respectively.

Commercial/institutional areas are mainly concentrated on Kota, Monas and Senayan, and also those areas are significant along arterial roads, as the results of ribbon development, especially in the center region of DKI Jakarta. Concentrations of commercial/institutional land use in three locations in the southeast region are the institution of Air Force, Taman Mini Park and the institution of Army, from north to south in order. On the other hand, industrial land uses are polarized in the northwest and northeast regions where open spaces are relatively remaining.



Source: Redrawing prepared by JICA Expert Team from the DTR's original map of land use in 2007

Figure B2-4 Land Use in 2007 of the Mainland of DKI Jakarta

B2.2 Results of Socio-Economic Survey

B2.2.1 Methodology of Socio-Economic Survey

Socio-Economic Survey was implemented to collect necessary social and economic data for revision of the Old M/P. Socio-Economic Survey consists of two surveys; one is for general public and another one is for enterprises in DKI Jakarta. In this report, only the notable results of the survey for general public are shown in order to compare to the results in the Old M/P and Review M/P 2009. All results of Socio-Economic Survey will be summarized in another report.

Socio-Economic Survey for general public was a questionnaire survey and its target area was 261 Kelurahan in 44 Kecamatan of 5 Municipalities. It was implemented from March 4th, 2011 to March 30th, 2011. In each Kelurahan, the respondents were one leader of Kelurahan and three types of residents (High-income Level, Middle-income Level and Low-income Level). Questionnaire has four types according to the respondents. The collection ratio was 100 % because the residents received, answered and submitted at the same time in one day. The final number of respondents is 1,059 persons including 261 leaders of Kelurahan and 266 residents in each income level. The criteria of income level is mentioned in 4.3.2, however, leaders of Kelurahan were requested to be responsible to select respondents. The income level for leaders of Kelurahan was set as Middle-income Level.

B2.2.2 Income Level and Population Share by Levels

In the Old M/P. the income level was set according not to the actual income, but to the structure of houses as following;

High-income Level (H-Level)	• Two-story very good house by good construction material with a garage for more than two cars and a large home garden • One or two-story good house by good construction material with a garage for one or two car and a large home garden
Middle-income Level (M-Level)	• One or two-story medium class house by medium good construction material with a small garage and home garden • Low-cost house by cheap material with a small home garden and no garage. Flats supplied by public housing company
Low-income Level (L-Level)	• Some part of house is made by wood. With a small home garden and a low cost fence • Almost all part of house is made by wood. No home garden

In the Old M/P, the above criteria was not correlation with the actual incomes in each level, therefore, the ranges of each income level were not clear. To respond to the recent various housing types and to set the objective criteria, actual incomes and population in each income level were estimated in this Socio-Economic Survey.

Based on the average incomes in each Kecamatan shown in the Old M/P and data from World Bank, the smallest income in H-Level (Standard 1) was estimated by multiplying accumulations of Consumer Price Index (CPI) and GDP growth rate per capita from 1989 to 2009. With the same calculation, the largest income in L-Level (Standard 2) was estimated. By multiplying accumulation of CPI and the average incomes in each Kecamatan shown in the Old M/P, the estimated incomes, which were higher than Standard 1, were distinguished as H-Level, those, which were lower than Standard 2, were distinguished as L-Level and others were distinguished as M-Level. The estimation result is shown in the following table. It is found that population ratio was not changed after 2010 with the criteria in this Socio-Economic Survey.

Table B2-6 Comparison between Estimation Ratio in This Study and Old M/P

		Estimation Ratio in this Study			Actual and Estimation Ratio in 1989		
Year	Unit	H-Level	M-Level	L-Level	H-Level	M-Level	L-Level
1989	(%)	8.6%	44.6%	46.8%	3.9%	48.6%	47.5%
	(person)	753,781	3,924,652	4,119,226			
2010	(%)	6.9%	44.6%	48.5%	15.1%	48.8%	36.1%
	(person)	660,826	4,285,419	4,662,055			
2020	(%)	6.9%	44.6%	48.5%			
	(person)	748,177	4,839,372	5,261,727			
2030	(%)	6.9%	45.3%	47.8%			
	(person)	812,742	5,364,323	5,664,282			

Source: Prepared by JICA Expert Team with Old M/P

Similarly, the average incomes of each income level were estimated by multiplying accumulations of CPI and GDP growth rate per capita from 1989 to 2009 with the estimation income of 2010 in the Old M/P and data from World Bank. According to this estimation, the ranges of each income level were set as the following table. The minimum range of M-Level and the maximum range of L-level are overlapped because there is not a big difference between the range of M-Level and that of L-Level. The actual income range will be explained in another report based on the answers of Socio-Economic Survey.

Table B2-7 Estimated Income Range of Each Income Level

(per household per month)

H-Level	1) Less than IDR 10,999,999	2) IDR 11,000,000 – 11,999,999	3) IDR 12,000,000 – 12,999,999	4) IDR 13,000,000 – 13,999,999	5) More than IDR 14,000,000
M-Level	1) Less than IDR 3,999,999	2) IDR 4,000,000 – 4,999,999	3) IDR 5,000,000 – 5,999,999	4) IDR 6,000,000 – 6,999,999	5) More than IDR 7,000,000
L-Level	1) Less than IDR 999,999	2) IDR 1,000,000 – 1,999,999	3) IDR 2,000,000 – 2,999,999	4) IDR 3,000,000 – 3,999,999	5) More than IDR 4,000,000

Source: JICA Expert Team

B2.2.3 People's Behavior for Water Supply

The results of people's behavior for water supply are shown in this section. In the Review M/P 2009, this item was surveyed, however, the result of this socio-economic survey cannot be compared with the result in the Review M/P 2009 because the target respondents were small and the questionnaire was not implemented according to the income level in the Review M/P 2009.

Table B2-8 shows the situation of use of water. "Leaders" in this table indicates leaders of Kelurahan. Bottled water was used mostly for drinking. This result also shows PAM water was generally used for laundry, however, only about 22% of respondents used PAM water. Regarding the water purchased from private water seller, the ratio of use for cooking was high, however, about 69% of respondents did not use this kind of water. Ratio of using well water was higher than that of using PAM and only 11% of respondents did not use the well water. The main use of well water is for laundry, bath and toilet.

Table B2-8 Use of Water

Type of Source	Utilization	Result of this Study				
		L-level	M-level	H-level	Leaders	Total
Bottled water	1) Drinking	69.6%	71.5%	70.7%	71.5%	70.8%
	2) Cooking	13.4%	15.7%	17.2%	21.1%	16.9%
	3) Laundry	0.3%	0.6%	0.6%	0.6%	0.5%
	4) Bath, toilet	0.3%	0.3%	0.6%	0.6%	0.5%
	5) Watering the plants	0.0%	0.0%	0.9%	0.3%	0.3%
	6) Selling	0.6%	1.3%	0.9%	0.6%	0.8%
	7) Not use	15.7%	10.7%	9.1%	5.3%	10.1%
PAM (City Water) Direct Connection	1) Drinking	7.0%	8.7%	6.8%	8.1%	7.7%
	2) Cooking	19.0%	20.5%	20.2%	17.7%	19.4%
	3) Laundry	20.7%	21.6%	21.1%	21.0%	21.1%
	4) Bath, toilet	19.4%	21.1%	20.0%	20.5%	20.2%
	5) Watering the plants	7.4%	8.8%	10.5%	11.8%	9.6%
	6) Selling	0.4%	0.0%	0.0%	0.0%	0.1%
	7) Not use	26.2%	19.3%	21.4%	20.8%	21.9%
Purchase from private water seller	1) Drinking	5.4%	5.6%	4.3%	9.2%	6.2%
	2) Cooking	10.5%	8.2%	7.9%	12.0%	9.7%
	3) Laundry	7.0%	4.6%	4.6%	8.6%	6.3%
	4) Bath, toilet	7.3%	4.9%	4.9%	6.8%	6.0%
	5) Watering the plants	2.2%	2.0%	2.6%	2.5%	2.3%
	6) Selling	0.3%	1.3%	0.3%	0.0%	0.5%
	7) Not use	67.2%	73.4%	75.4%	60.9%	69.1%
Self well (bore/dig/pump)	1) Drinking	8.0%	7.8%	8.4%	8.1%	8.1%
	2) Cooking	16.4%	15.4%	14.8%	15.4%	15.5%
	3) Laundry	25.0%	25.2%	23.6%	24.4%	24.6%
	4) Bath, toilet	24.3%	24.2%	23.6%	23.7%	23.9%
	5) Watering the plants	13.2%	17.1%	18.3%	18.7%	16.9%
	6) Selling	0.3%	0.1%	0.4%	0.1%	0.3%
	7) Not use	12.7%	10.1%	10.9%	9.5%	10.8%

Source: JICA Expert Team

Comparison on water use volume is shown in Table B2-9. The highest ratio in L-Level and M-Level was 201-300 L/day and that ratio in H-Level and Leaders was more than 500L/day in this Socio-Economic Survey.

Table B2-9 Water Use Volume for Household

Water Consumption per Household	Result of this Study				
	L-level	M-level	H-level	Leaders	Total
1) 0-100 L/day	9.4%	6.8%	5.3%	8.8%	7.6%
2) 101-200 L/day	21.1%	13.5%	10.2%	10.7%	13.9%
3) 201-300 L/day	26.3%	23.7%	21.8%	24.1%	24.0%
4) 301-400 L/day	15.4%	14.7%	14.3%	14.6%	14.7%
5) 401-500 L/day	8.6%	13.5%	12.0%	9.2%	10.9%
6) more than 500 L/day	12.4%	22.6%	30.8%	24.9%	22.7%
7) Unknown	6.8%	5.3%	5.6%	7.7%	6.3%

Source: JICA Expert Team

B2.2.4 People's Behavior for Sanitation

The results of people's behavior for sanitation are shown in this section. In the Review M/P 2009, this item was surveyed, however, the result of this socio-economic survey cannot be compared with the result in the Review M/P 2009 because of the same reasons mentioned in B2.2.3.

The result of installation of private toilet is shown in Table B2-10. The ratio of L-Level was about 92%, that of M-Level was 99%, and that of H-Level and Leaders was about 100%. Therefore, it is clear that more than 90% of respondents have private toilets on the whole.

Table B2-10 Installation of Private Toilet

Answer	Result of this Study				
	L-level	M-level	H-level	Leaders	Total
Having a private toilet	92.1%	98.5%	99.6%	100.0%	97.5%
Not having a private toilet	7.9%	1.5%	0.4%	0.0%	2.5%

Source: JICA Expert Team

Table B2-11 shows the answers to the question only for the respondents, who answered to have private toilets, about the final destination of wastewater from the toilet. In the results of the Socio-Economic Survey, the ratio of the septic tank was the highest in all levels.

Table B2-11 Final Destination of Wastewater from Private Toilet

Discharged to	Result of this Study				
	L-level	M-level	H-level	Leaders	Total
1) Septic tank	83.3%	79.8%	84.9%	87.7%	83.9%
2) Pit latrine	0.8%	0.8%	0.8%	0.8%	0.8%
3) Open channel	2.4%	4.2%	1.1%	1.1%	2.2%
4) Sewage pipe	3.7%	2.7%	3.0%	0.4%	2.4%
5) Pond	0.0%	0.0%	0.4%	0.0%	0.1%
6) Water basin	5.7%	5.7%	0.8%	1.5%	3.4%
7) Modified septic tank	4.1%	6.5%	9.1%	8.4%	7.1%
8) Others	0.0%	0.0%	0.0%	0.0%	0.0%
9) Unknown	0.0%	0.4%	0.0%	0.0%	0.1%

Source: JICA Expert Team

Table B2-12 shows the answers to the question only for the respondents, who answered to have private toilets, about the removal of sludge. Septic tanks was spread throughout DKI Jakarta, however, Table B2-12 shows the removal of sludge was not so frequent. The ratio of "Never remove the sludge" was the highest in al levels in the Socio-Economic Survey.

Table B2-12 Frequency of Sludge Removal

Frequency	Result of this Study				
	L-level	M-level	H-level	Leaders	Total
1) More than 1 time in a year	9.0%	9.5%	4.9%	7.3%	7.6%
2) 1 time in a year	11.4%	10.7%	11.3%	17.2%	12.7%
3) 1 time in two years	9.8%	12.2%	12.5%	6.5%	10.3%
4) 1 time in three years	3.7%	7.3%	10.9%	8.4%	7.6%
5) 1 time in more than four years	11.8%	15.3%	19.6%	20.3%	16.8%
6) Never remove the sludge	46.5%	38.5%	36.2%	32.2%	38.2%
7) Unknown	7.8%	6.5%	4.5%	8.0%	6.7%

Source: JICA Expert Team

Table B2-13 shows the answers to the question only for the respondents, who answered not to have private toilets, about the place of toilet. In the result of the Socio-Economic Survey, the ratio of MCK was the highest. The sum of this ratio and the ratio of toilets in neighboring houses was more than 90% in all levels. Therefore, it can be said that more than 90% of respondents use toilets in their usual life.

Table B2-13 Toilet Place for People Not Having Private Toilets

Place	L-level	M-level	H-level	Leaders	Total
1) Toilets in neighboring houses	9.5%	25.0%	0.0%	0.0%	11.5%
2) MCK	81.0%	75.0%	100.0%	0.0%	80.8%
3) Vacant land	4.8%	0.0%	0.0%	0.0%	3.8%
4) River, pond, open channel, drainage	0.0%	0.0%	0.0%	0.0%	0.0%
5) Others	4.8%	0.0%	0.0%	0.0%	3.8%

Source: JICA Expert Team

B2.2.5 Desire for Sewerage and Sanitation Services (Residents and Leaders)

(1) Residents' Opinions for Sewage and Sanitation Services

In the Socio-Economic Survey, the results of the questions on the sanitation condition were shown in Table B2-14. The ratio of "Very good" was not so high, but more than 80% of respondents in all levels were satisfied the present condition.

Table B2-14 Evaluation of Present Sanitation Condition

	L-level	M-level	H-level	Leaders	Total
1) Very good	4.1%	5.6%	10.1%	10.0%	7.5%
2) Good	60.9%	69.5%	68.3%	73.9%	68.3%
3) OK	18.0%	15.0%	12.7%	11.1%	14.3%
4) Not good	15.0%	8.6%	8.2%	5.0%	9.3%
5) Bad	1.9%	1.1%	0.0%	0.0%	0.8%

Source: JICA Expert Team

Table B2-15 shows the answers to the question only for the respondents, who answered to have private toilets, about the issue of private toilet. Generally, about 70% of respondents answered not have any problems. Relatively high ratios were "Clogged / stopped" in L-Level, "High price of removing the sludge" in M-Level and Leaders, and "Toilet is near the well (water source)" in H-Level.

Table B2-15 Issues on Private Toilet

Options of Answer	L-level	M-level	H-level	Leaders	Total
1) Overflow in the house	5.8%	5.4%	5.2%	6.2%	5.7%
2) Overflow outside of the house	2.9%	2.7%	2.6%	3.1%	2.8%
3) High price of removing the sludge	6.2%	5.8%	4.9%	12.0%	7.2%
4) Taking time to call a private or public company	0.8%	0.8%	1.5%	5.8%	2.2%
5) Toilet is near the well (water source)	3.3%	3.1%	7.1%	8.1%	5.5%
6) No problem	73.0%	77.0%	72.4%	59.7%	70.5%
7) Clogged / stopped	7.5%	4.3%	5.2%	5.0%	5.5%
8) Odor	0.4%	0.8%	1.1%	0.0%	0.6%

Source: JICA Expert Team

Residents' opinions for sanitation improvement were shown in the following table. In all levels, only 2% of residents answered as negative. It can be said that the awareness of sanitation improvement was high among all levels. In H-Level, more than 45% of respondents answered to bear the cost by themselves. It indicates people in H-Level have much higher awareness. The highest ratios were "I do not need to pay any money" in L-Level and "I should pay some money" in M-Level. It is found that the awareness for sanitation improvement has correlation with the income level.

Table B2-16 Residents' Opinion for Sanitation Improvement

Options of Answer	L-level	M-level	H-level	Leaders	Total
1) I want to improve by my own money	25.6%	32.3%	46.3%	47.5%	38.0%
2) I want to cooperate with the improvement work by the government even though I should pay some money.	22.6%	33.8%	34.7%	33.7%	31.3%
3) I want to cooperate with the improvement work by the government if I do not need to pay any money.	48.1%	32.3%	16.4%	17.6%	28.7%
4) I do not want to cooperate with the improvement work by the government.	3.8%	1.5%	1.9%	1.1%	2.1%

Source: JICA Expert Team

(2) Leaders' Opinions for Sewerage and Sanitation Services

In the Socio-Economic Survey, only leaders were asked about sanitation improvement and necessity of sewerage service in the community.

The following table shows the answers of the question asking the pollution of groundwater by the soak type septic tanks and the health effect for infants by using the polluted groundwater. About 70% of leaders knew about this health effect.

Table B2-17 Knowledge of Health Effect by Soak Type Septic Tank

Answer	Proportion
I know	70.1%
I do not know	29.9%

Source: JICA Expert Team

One of the preventive measures is to change into the modified type septic tanks. In the Socio-Economic Survey, the improvement cost was set as IDR 4,000,000 for one household. Under this assumption, leaders answered how much the community would bear the cost. The result is shown in Table B2-18. About 8% of leaders answered to pay the full amount and about 23% answered not to pay at all. As a whole, about 53% answered to pay the 5% to 25% of the full amount. According to Table B2-17 and Table B2-18, there was a tendency that the improvement only by Kelurahan would be difficult although most of leaders know the pollution of groundwater by the soak type septic tanks.

Table B2-18 Leaders' Opinions for Sharing Cost of Septic Tank Improvement

Options of Answer	Leaders
1) Our community can pay IDR 4,000,000 per one septic tank (the full amount)	8.4%
2) Our community can pay less than IDR 3,000,000 per one septic tank (75% of the full amount)	2.3%
3) Our community can pay less than IDR 2,000,000 per one septic tank (50% of the full amount)	14.9%
4) Our community can pay less than IDR 1,000,000 per one septic tank (25% of the full amount)	18.8%
5) Our community can pay less than ID 400,000 per one septic tank (10% of the full amount)	14.2%
6) Our community can pay less than IDR 200,000 per one septic tank (5% of the full amount)	18.0%
7) Our community cannot share the cost at all	23.4%

Source: JICA Expert Team

In the Socio-Economic Survey, leaders were asked about the necessity of sewage with the same options of answer as the Old M/P. There is a big difference in the comparison result as shown in Table B2-19. The highest ratio in the Old M/P was about 55% to answer "2) Construction of sewerage system should be started where water pollution is the most severe". On the other hand, the highest ratio in the Socio-Economic Survey was about 71% to answer "sewerage system must be constructed all over Jakarta even if it strains national budget and demands as outlay from home economy.", which was only about 34% in the Old M/P.

Table B2-19 Leaders' Opinions for Necessity of Sewerage System

Options of Answer	This Study	Old M/P
1) Sewerage system must be constructed all over Jakarta as soon as possible in order to make it clean, free from water-borne diseases and repelling odor, even if it strains national budget and demands as outlay from home economy.	70.5%	33.6%
2) Construction of sewerage system should be started where water pollution is the most severe because full costs cannot be borne at a time. As the nation and the people get richer, it should be expanded to wider areas. Gradual approach is necessary for the resolution of the existing unsanitary conditions.	18.0%	54.7%
3) Sewerage system should be constructed only where rich people reside. Average citizens, now already burdened with expensive water and electricity bills, cannot afford to it. Furthermore, they now do not feel an urgent need for it because the lack of it does not directly affect their daily lives.	1.1%	0.4%
4) The nation and the people cannot afford to such a luxury as sewerage system. On-site sanitation facilities such as individual toilets with leaching pit, soak away and septic tank, and public toilet can suffice as an alternative for it. The government should promote their installation.	10.3%	11.3%

Source: JICA Expert Team

Hence, respondents generally satisfied with the current sanitation, however, they were having a high awareness to improve the sanitation because only 2% of respondents answered not to cooperate with the improvement and the correlation between the income level and the awareness. And more than 70% of leaders understood the effect of groundwater by using the soak type septic tank, and thought that the sewerage system should be constructed in all over DKI Jakarta as soon as possible with the national budget and outlay from households. For the improvement of septic tanks, it was found that the difficulty only by the budget of Kelurahan. Therefore, it is necessary for improvement of on-site system to prepare the plan of budget allocation as the sewerage system.

B2.2.6 Willingness to Pay (WTP) and Affordability to Pay (ATP)

In the Socio-Economic Survey, respondents answered Willingness To Pay (WTP) after the explanation about the current situation of the final destination of wastewater, and the improvement effect.

In the Review M/P 2009, Affordability to Pay (ATP) was set as 1% of the income, therefore the same ratio was applied in this survey. The price of ATP was estimated as IDR 120,000, IDR 50,000 and IDR 20,000 in H-Level, M-Level and L-Level respectively. In this survey, two the question for WTP was prepared as two stages. In the first stage, the question was WTP for the price of ATP. If the respondent answered "Yes", he/she was asked about WTP for the price as 1.2% of the income. If the respondent answered "No", he/she was asked about WTP for the price as 0.8% of the income. Prices of WTP in each income level are shown as the following table.

Table B2-20 Prices of WTP in Each Income Level

	First Question	Second Question	
	1% of Average Income (same as ATP)	0.8% of Average Income	1.2% of Average Income
L-level	IDR 20,000	IDR 16,000	IDR 24,000
M-level	IDR 50,000	IDR 40,000	IDR 60,000
H-level	IDR 120,000	IDR 96,000	IDR 144,000
Leaders	IDR 50,000	IDR 40,000	IDR 60,000

Source: JICA Expert Team

Table B2-21 shows the result of respondents who had WTP for the price of ATP. Table B2-22 shows the result of respondents who did not have WTP for the price of ATP. The ratio of respondents who had WTP for the price of ATP is about 43%. Generally about 70% of these respondents showed WTP for the price as 1.2% of the income. On the other hand, about 88% of respondents, who did not have WTP for the price of ATP, did not showed WTP for the price as 0.8% of the income as well.

Table B2-21 Result of People Having WTP for the Price of ATP

	1% of Average Income	1.2% of Average Income	
	Yes	Yes	No
L-level	43.2%	61.9%	38.1%
M-level	38.7%	67.0%	33.0%
H-level	33.5%	78.7%	21.3%
Leaders	54.8%	72.0%	28.0%
Total	42.5%	69.6%	30.4%

Source: JICA Expert Team

Table B2-22 Result of People Not Having WTP for the Price of ATP

	1% of Average Income	0.8% of Average Income	
	No	Yes	No
L-level	56.8%	12.4%	87.6%
M-level	61.3%	11.0%	89.0%
H-level	66.5%	14.1%	85.9%
Leaders	45.2%	9.3%	90.7%
Total	57.5%	11.9%	88.1%

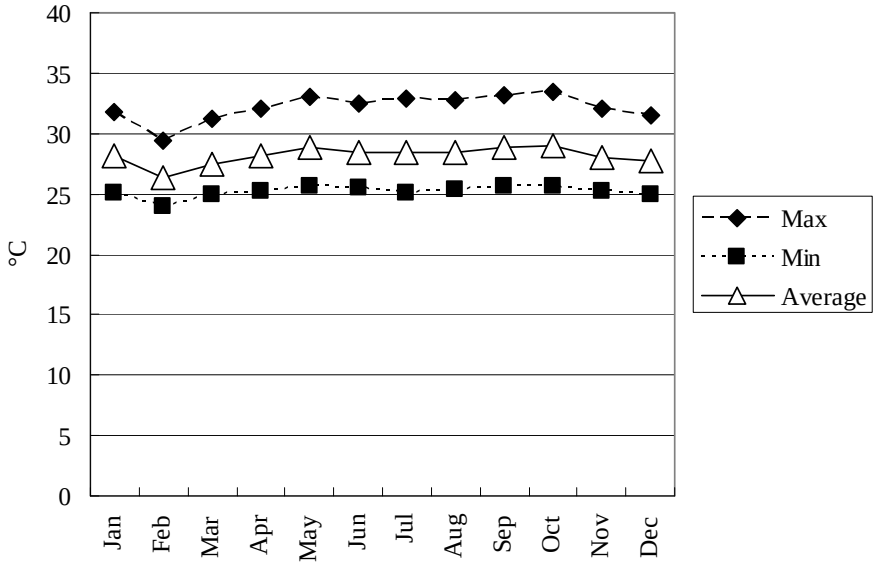
Source: JICA Expert Team

B3 Environmental Conditions

B3.1 Natural Conditions

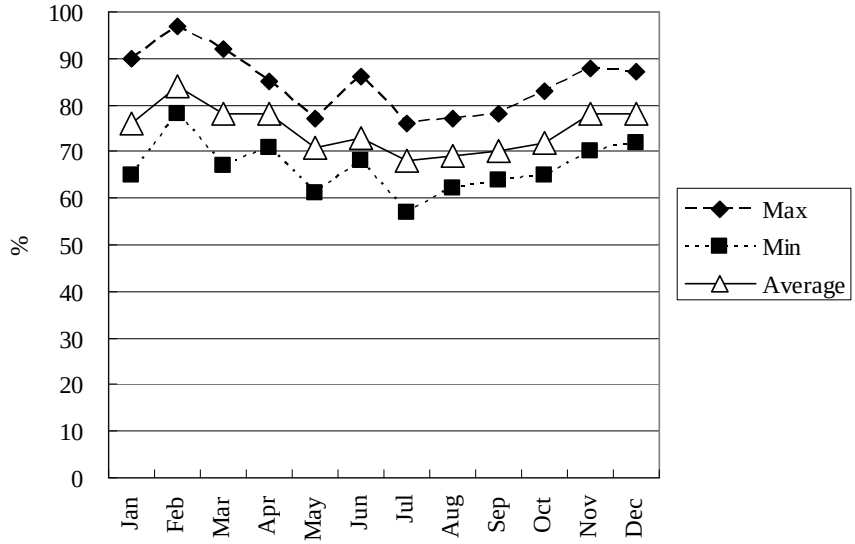
B3.1.1 Temperature, Humidity and Precipitation

Indonesia has two seasons; the dry season from June to September, and the rainy season from December to March. DKI Jakarta has also two seasons and its climate is a tropical climate. In DKI Jakarta, the annual average minimum temperature is 25 °C, the annual average maximum temperature is 32 °C and the annual precipitation is about 1,655mm (source: homepage of World Meteorological Organization). The temperature, humidity and precipitation of DKI Jakarta in 2008 are shown as following figures. In 2008, the annual average minimum temperature of DKI Jakarta is 25.2 °C, the annual average maximum temperature is 32.2 °C and the annual precipitation is about 1,909mm.



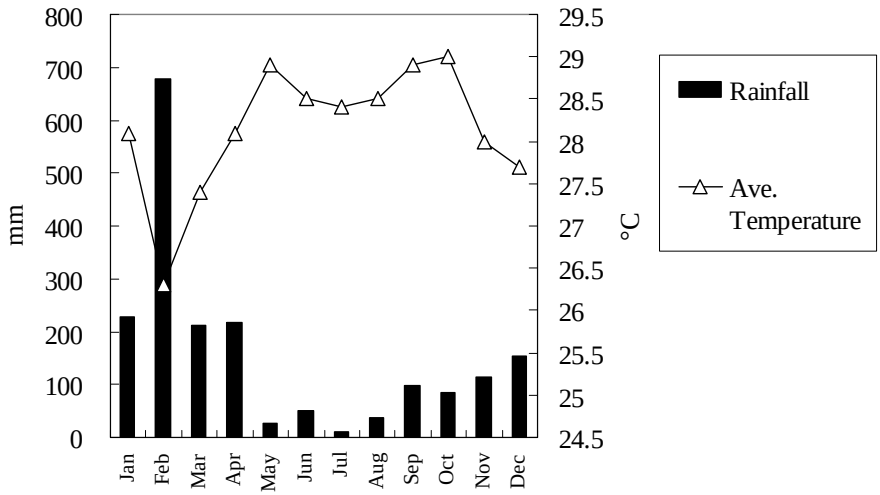
Source: Prepared by JICA Expert Team with BPS (2010) "Jakarta in Figures 2009"

Figure B3-1 Maximum, Minimum and Average Temperature of DKI Jakarta in 2008



Source: Prepared by JICA Expert Team with BPS (2010) "Jakarta in Figures 2009"

Figure B3-2 Maximum, Minimum and Average Humidity of DKI Jakarta in 2008



Source: Prepared by JICA Expert Team with BPS (2010) "Jakarta in Figures 2009"

Figure B3-3 Average Temperature and Precipitation of DKI Jakarta in 2008

B3.1.2 Outline of Geographical and Freshwater Features

The area of DKI Jakarta consists of 662.33 km^2 land area and 6,977.5 km^2 sea area, and it has more than 110 islands. DKI Jakarta is generally a lowland area with average height around 7m above the sea level, and its southern part of the land comprises alluvial layer. The land consists of Pleistocene sediment ± 50 meters below land level. In the land area, there are 19 rivers and canals for water sources, fishery and urban business, and 8 drains.

Table B3-1 Rivers and Canals in DKI Jakarta

No.	River/Canal	Length (m)	Area (m^2)	Purpose of Use
1	Ciliwung	46,200	1,155,000	Urban Business
2	Krukut	28,750	172,500	Water source of drinking
3	Mookervart	7,300	233,600	Water source of drinking
4	Kali Angke	12,810	538,200	Urban Business
5	Kali Pesanggrahan	27,300	354,900	Fishery
6	Sungai Grogol	23,600	165,200	Fishery
7	Kali Cideng	17,800	234,810	Urban Business
8	Kalibu Timur	30,200	392,600	Urban Business
9	Cipinang	27,350	464,950	Urban Business
10	Sunter	37,250	1,080,000	Urban Business
11	Cakung	20,700	414,000	Urban Business
12	Buaran	7,900	158,000	Urban Business
13	Kalibaru Barat	17,700	177,000	Water source of drinking
14	Cengkareng Drain	11,200	672,000	Urban Business
15	Jati Kramat	3,800	19,000	Urban Business
16	Cakung Drain	12,850	771,000	Urban Business
17	Ancol	8,300	240,700	Urban Business
18	Banjir Kanal Barat	7,600	380,000	Fishery
19	Banjir Kanal Timur	23,000	1,380,000	Fishery

Source: Prepared by JICA Expert Team with BPS (2010) "Jakarta in Figures 2009"

Table B3-2 Drains in DKI Jakarta

No.	Drainage	Length (m)	Area (m^2)
1	Situ	-	1,114,200
2	Waduk	-	2,308,300
3	Sungai/Kali melaui Dua Provinsi	290,860	5,325,020
4	Banjir Kanal	38,550	2,237,000
5	Sungai/Kali di DKI Jakarta	96,610	1,566,440
6	Sub Makro Drain	578,455	2,036,063
7	Mikro Drain	6,622,102	3,827,715
8	Saluran Irigasi	272,112	1,605,394

Source: Prepared by JICA Expert Team with BPS (2010) "Jakarta in Figures 2009"

B3.2 River Water Quality and Flow

B3.2.1 Results of River Water Quality Survey (JICA)

JICA Expert Team consigned the local consultant and condcucted two times of water quality analysis of the main river in DKI Jakarta in Februray and in from June to July 2011. The analysis was conducted on the basis of the standard method. Outline of river water quality survey methods are shown in Table B3-3.

Table B3-3 Outline of River Water Quality Survey Method by JICA Expert Team

No.	Item	Contents
1	Date of Measurement	1st round: 8 to 17 February 2011 2nd round: 24 June to 27 July 2011
2	Location of measurement	65 locations along the main rivers in DKI Jakarta※1
3	Items measured	Water quality items measured: 16 items※2

Table B3-3 Outline of River Water Quality Survey Method by JICA Expert Team

No.	Item	Contents
		(1) General item Water Temperature, Color, Turbidity, pH, Dissolved Oxygen (DO) **(2) Heavy metal, Organic and Inorganic** Mercury (Hg), Cadmium (Cd), Total Chromium (Cr), Ammonium (NH3), Chloride (Cl), Nitrate (NO_3), Nitrite (NO_2), Phosphorus (P) , Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD_{Cr}) **(3) Bacteria** Fecal Coliform

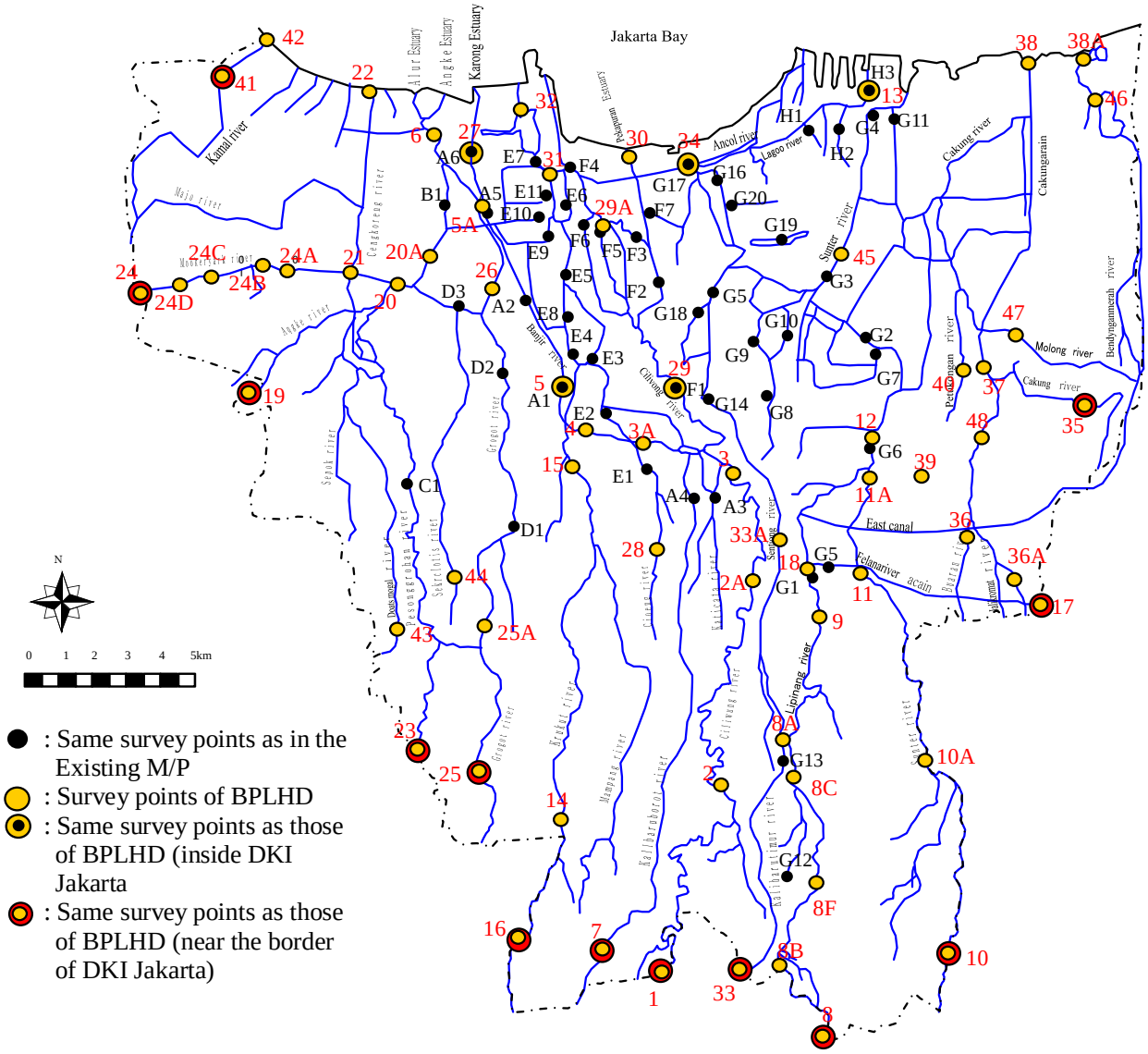
Note: 1. Refer to Figure B3-7 for locations of measurement.
2. Refer to S/R Part-B : B3 for method measured for each water quality item

Source: JICA Expert Team

The results of 1st round water quality survey conducted by JICA Expert team are shown in S/R Part-B : B3.

Monthly rainfall data for 5 years from 2006 to 2011, which JICA Expert Team collected, are shown in S/R Part-B : B3. Annual rainfall in DKI Jakarta (observing station : Central Jakarta) is approximate 2,000mm/year. The least rainfall is approximate 50mm/month in August, and the most rainfall is approximate 400 mm/ month in February.

The locations measured in this survey are shown in Figure B3-4.



Source: JICA Expert Team

Figure B3-4 Location Measured of Water Quality Survey (65 Locations)

Table B3-4 Location Measured of Water Quality Survey (65 Locations)

Sampling Points by BPLHD

No.	River Name	Location Point	No.	River Name	Location Point
1	Sungai Ciliwung	Kelapa Dua (Srengseng Sawah)	24A	Kali Mookervart	JL. Daan Mogot Pemancar (Rawa Buaya)
2	Sungai Ciliwung	Intake PAM Condet (Kampung Gedong)	24B	Kali Mookervart	JL. Daan Mogot Sumur Bor (Duri Kosambi)
2A	Sungai Ciliwung	Jl. M.T. Haryono	24C	Kali Mookervart	JL. Daan Mogot Jembatan Semanan (United Can)
3	Sungai Ciliwung	Sebelum Pintu Air Manggarai	24D	Kali Mookervart	JL. Daan Mogot Jembatan Bakrie (Kali Deres)
3A	Sungai Ciliwung	Jl. Halimun	25	Sungai Grogol	JL. Lebak Bulus
4	Sungai Ciliwung	Jl. KH. Mas Mansyur (Karet Tengsin)	25A	Sungai Grogol	Jl. Radio Dalam
5	Sungai Ciliwung **(A1)**	Jl. Gudang PLN (Kebon Melati)	26	Sungai Grogol	RS. Jiwa Grogol Jelambar
5A	Sungai Ciliwung	Jl. Teluk Gong	27	Sungai Grogol **(A6)**	PLTU Pluit
6	Sungai Ciliwung	Jembatan Pantai Indah Kapuk	28	Sungai Cideng	Jl. Patra Kuningan
7	Sungai Kali Baru	Jl. Komplek Zeni (Srengseng Sawah)	29	Sungai Ciliwung **(F1)**	Jl. Kwitang
8	Sungai Cipinang	Jl. Auri (Taman Bunga Cibubur)	29A	Sungai Ciliwung	Jl. Gajah Mada Tangki
8A	Sungai Cipinang	Jl. Pondok Gede Tol Taman Mini (Kramat Jati)	30	Sungai Ciliwung Gajah Mada	Jl. Ancol Marina
8B	Sungai Cipinang	Jl. Raya Bogor (KOMSEKO)	31	Sungai Ciliwung Gajah Mada	Jl. Raya Pluit (Penjaringan)
8C	Sungai Cipinang	Jl. Kampung Dukuh	32	Sungai Ciliwung Gajah Mada	Pompa Pluit
8F	Sungai Cipinang	Jl. Ciracas (Pemadam)	33	Sungai Kali Baru Timur	Jl. Raya Bogor (YKK)
9	Sungai Cipinang	Jl. Halim Perdana Kusuma	33A	Sungai Kali Baru Timur	Jl. Otista III (Cipinang Cempedak)
10	Kali Sunter	Pondok Rangon	34	Sungai Kali Baru Timur **(G17)**	Jl. Ancol/ Jembatan Si Manis
10 A	Kali Sunter	Jl. Hankam (Lubang Buaya)	35	Sungai Cakung	Jl. Pulo Gebang
11	Kali Sunter	Jl. Pondok Kelapa Cipinang	36	Sungai Buaran	Jl. Pondok Kelapa
11 A	Kali Sunter	Jl. Ngurah Ray (Rel Klender)	36A	Sungai Buaran	Jl. Kali Malang (Pondok Kelapa)
12	Kali Sunter	Jl. Jati negara Kaum	37	Cakung Drain	Jl. Raya Bekasi (Cakung Barat)
13	Kali Sunter **(H3)**	Bogasari (Koja Selatan)	38	Cakung Drain	Cilincing (Pos Polisi)
14	Sungai Krukut	Jl. Pondok Labu	38A	Cakung Drain / Blencong	Pantai Marunda
15	Sungai Krukut	Jl. Pejompongan (Karet Tengsin)	39	Petukangan	Kawasan PT. JIEP
16	Kali Mampang	Jl. Ciganjur (Jagakarsa)	40	Petukangan	Jl. Swadaya
17	Tarum Barat	Bekasi	41	Sungai Kamal	Jl. Raya Benda
18	Tarum Barat	Halim Perdana Kusuma	42	Sungai Kamal	Muara Kamal
19	Sungai Angke	Ciledug	43	Sungai Sepak	Jl. Pasar Bintaro (Ulu Jami)
20	Sungai Angke	Jl. Daan Mogot (Pool PPD)	44	Sungai Sekretaris	Jl. Tanah Kusir (Kebayoran Lama Selatan)
20 A	Sungai Angke	Pesing Kali Angke	45	Kali Sunter	Komplek AL Jl. Yos Sudarso (Kelapa Gading)
21	Cengkareng Drain	Rel Kereta Api (Kembangan)	46	Kali Blencong	Muara Baru (Rorotan)
22	Cengkareng Drain	Kapuk (Muara Cengkareng Drain)	47	Bekasi Tengah	PDAM Cacing (Cakung Barat)
23	Sungai Pesanggrahan	Jl. Ciputat Pasar Jum'at (Lebak Bulus)	48	Sungai Buaran	Belakang PIK
24	Kali Mookervart	JL. Daan Mogot Bir Bintang (Kali Deres)			

Sampling Points by JICA

No	River Name	Location	No	River Name	Location
A1 (5)		JEMBATAN JL.K.S.TUBUN	F5		JEMBATAN JL.TANGKI MANGGA BESAR
A2		JEMBATAN JL.KYAI TAPA	F6		JEMBATAN JL.BUMI RAYA
A3		JEMBATAN JL.BERKAH I.TEBET	F7		JEMBATAN JL.GUNUNG SAHARI
A4		JEMBATAN PAL BATU	G1		JEMBATAN JL.INSPEKSI
A5		JEMBATAN TELUK GONG	G2		JEMBATAN JL.KELAPA GANDING
A6 (27)		JEMBATAN JL.RAYA PLUIT	G3		JEMBATAN JL.PERINTIS KEMERDEKAAN
B1		JEMBATAN JL.TEGAL ALUR.KAPUK	G4		JEMBATAN JL.CIKAJANG RAWABABAK
C1		JEMBATAN CIPULIR.LEMIGAS	G5		JEMBATAN JL.JEMBATAN SRONG
D1		JEMBATAN JL.SIMPRUK	G6		JEMBATAN JL.JATINEGARA KAUM
D2		JEMBATAN NELLI MURNI	G7		JEMBATAN JL.KAYU PUTIH UTARA
D3		JEMBATAN GROGOL INN	G8		JEMBATAN JL.UTAN KAYU
E1		JEMBATAN JL.KEBON OBAT	G9		JEMBATAN JL.CEMPAKAPUTIH TENGAH
E2		JEMBATAN JL.KEBON KACANG	G10		JEMBATAN JL.CEMPAKA PUTIH
E3		JEMBATAN JL.KEBON SIRIH	G11		JEMBATAN JL.AMPERA
E4		JEMBATAN JL.JATI BARU	G12		JEMBATAN JL.RAYA BOGOR
E5		JEMBATAN JL.TANAH SAREAL	G13		JEMBATAN JL.KIWI
E6		JEMBATAN JL.ASEMKA	G14		JEMBATAN JL.SALEMBA TENGAH
E7		JEMBATAN JL.PLUIY SELEATAN	G15		JEMBATAN JL.BENDUNGAN JAGO
E8		JEMBATAN JL.SURYOPRANOTO	G16		JEMBATAN JL.PODOMORO
E9		JEMBATAN JL.K.H.MANSYUR	G17 (34)		JEMBATAN JL.PAYA ANCOL
E10		JEMBATAN JL.PETUKANGAN	G18		JEMBATAN JL.JEMB.PASAR NAMBKA
E11		JEMBATAN JL.BANDENGAN UTARA	G19		JEMBATAN JL.SUNTER
F1 (29)		JEMBATAN JL.RADEN SALEH	G20		JEMBATAN JL.DANAU SUNTER
F2		JEMBATAN JL.JEMBATAN TINGGI	H1		JEMBATAN JL.WARAKAS.TJ.PRIOK
F3		JEMBATAN JL.RAYA MANGGA BESAR	H2		JEMBATAN JL.KEBON BAWANG
F4		JEMBATAN JL.PASAR IKAN	H3 (13)		JEMBATAN JL.RAYA PLABUAN
J1 (41)		Jl Raya Benda	J8 (1)		Kelapa Dua (Srengseng Sawah)
J2 (24D)		Jl Daan Mogot Jembatan Bakrie (Kali Deres)	J9 (33)		Jl. Raya Bogor (YKK)
J3 (19)		Ciledug	J10 (8)		Jl. Auri (Taman Bunga Cibubur)
J4 (23)		Jl. Ciputat Pasat Jum'at (Lebak Bulus)	J11 (10)		Pndok Rangon
J5 (25)		Jl. Lebak Bulus	J12 (17)		Bekasi
J6 (14)		Jl. Pondok Labu	J13 (35)		Jl. Pulo Gebang
J7 (7)		Jl. Komplek Zeni (Srengseng Sawah)			

Source: JICA Expert Team

Based on the result of water quality analysis, current condition of pollution by organic matter, fecal bacteria, nitrogen and phosphorus are reported below.

It can be said that most of public water bodies in DKI Jakarta is much polluted judging from the survey results of water quality items including organic matter, fecal coliform, nitrogen and phosphate, etc. Therefore, in the evaluation of the survey results, the water quality has been compared with the water quality level of group D, which is the lowest standard in the regulation, for the area where it has been found as the most polluted.

(1) Organic Matter

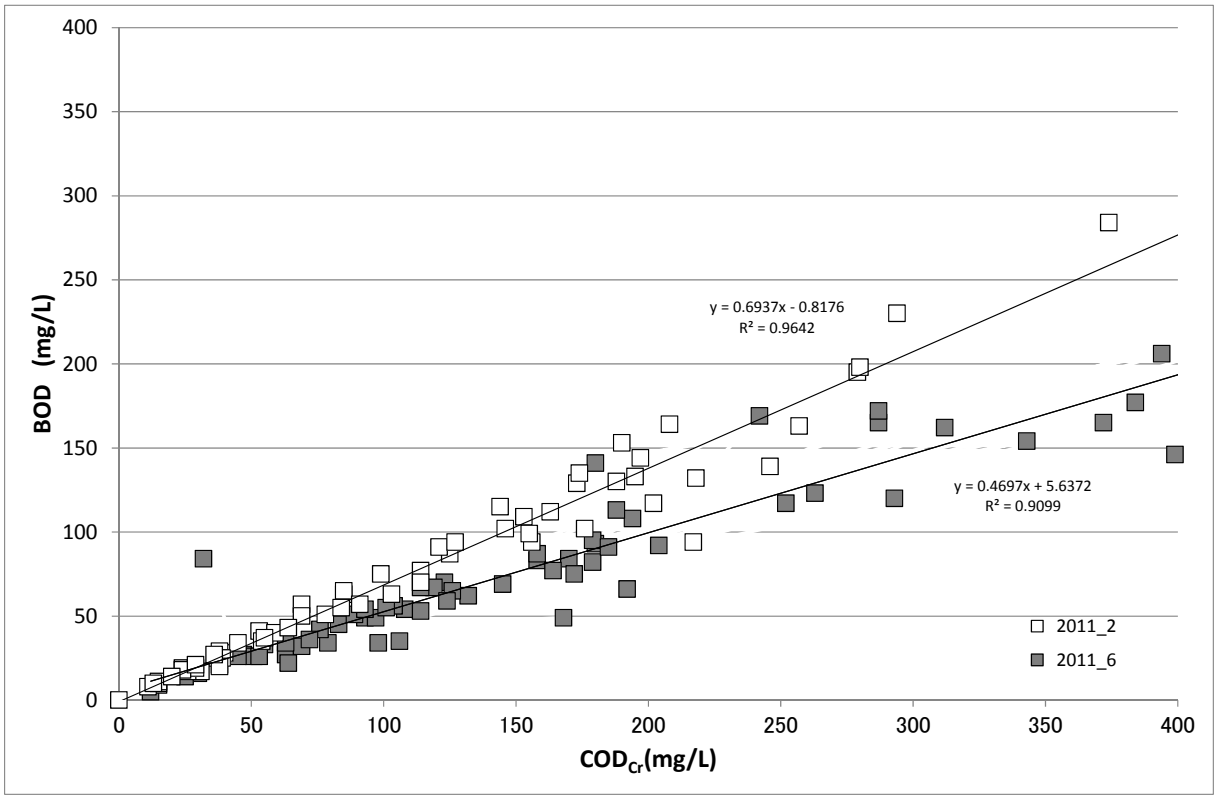
1) Relation between BOD and CODCr

BOD is widely adopted as the indicator for the water pollution by organic matters because the theory of measurement is simple. But the error of measured value is relatively high because the theory is based on the oxgen volume consumed not by complete oxidation but by decomposition of biodegradable organic matter only.

On the other hand, the accuracy of COD_{Cr} is relatively high because the theory is based on the oxgen volume consumed by complete oxidation using chemical reaction though relatively complicated method.

In order to clarify whether or not it is appropriate to apply BOD in the evaluation for pollution by organic matters, the reliability of BOD value measured in the survey has been confirmed by cheking the relations between BOD and COD_{Cr}

The relations between BOD and CODCr of the samples taken in 65 locatations along the main river in DKI Jakarta are shown in Table B3-5 .



Source: JICA Expert Team

Figure B3-5 The Relation between BOD and CODCr (Times Surveyed : 2 Times, Number of Location : 65 Locations)

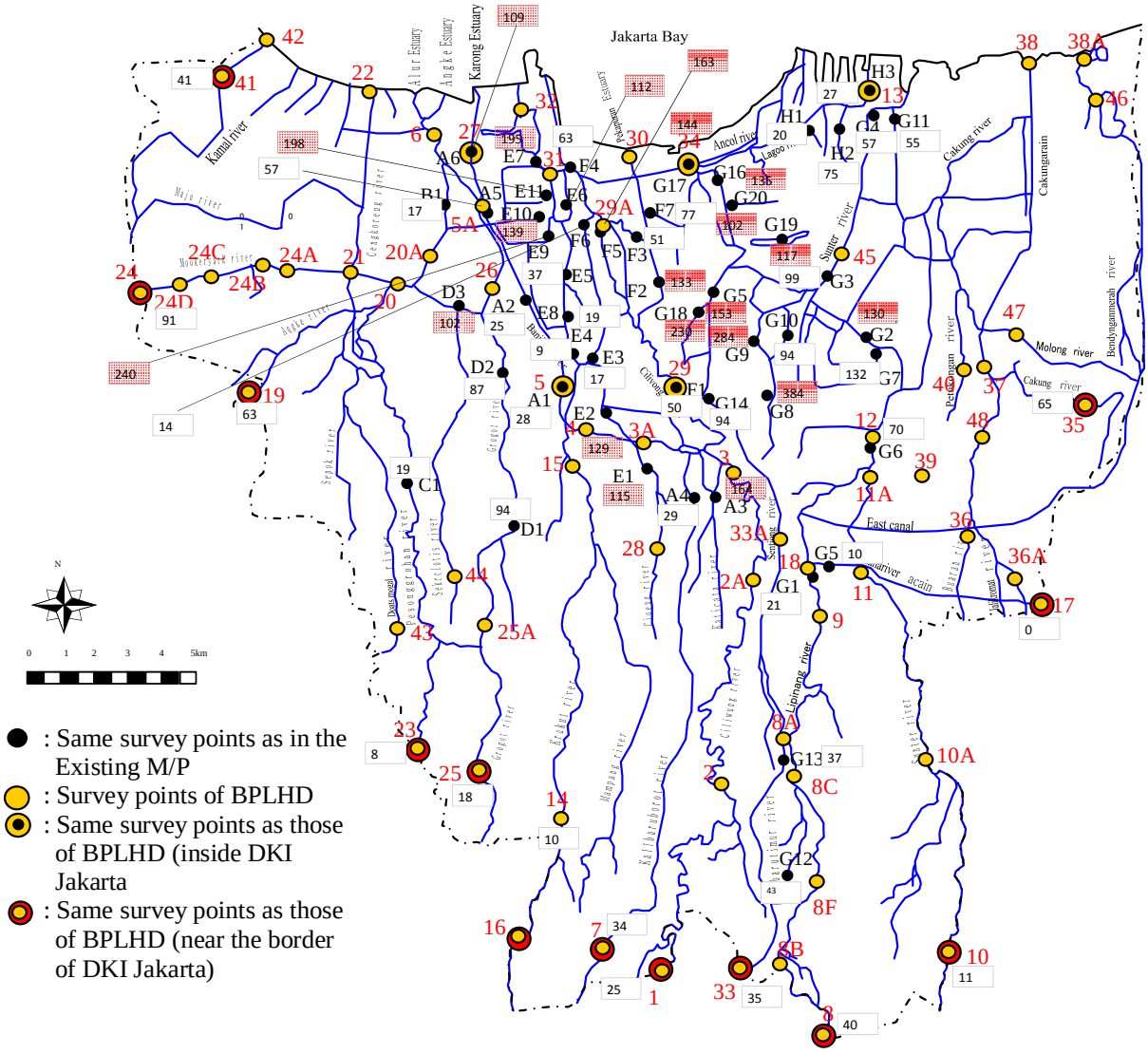
Between BOD and CODCr based on the samples analized in February 2011 (rainy season) and June 2011 (dry season) and are strong correlation and propotional relation as shown in general river although the slopes between two analysis are divergence.

Therefore, BOD is adopted as the indicator of organic pollution in this report, which is generally adopted in general river water.

2) Current Condition of Organic Matter Pollution

The results of BOD on 65 locations along the main river in DKI Jakarta conducted in February 2011 (rainy season) and in June 2011 (dry season) are shown in Figure B3-6 and in Figure B3-7 , respectively.

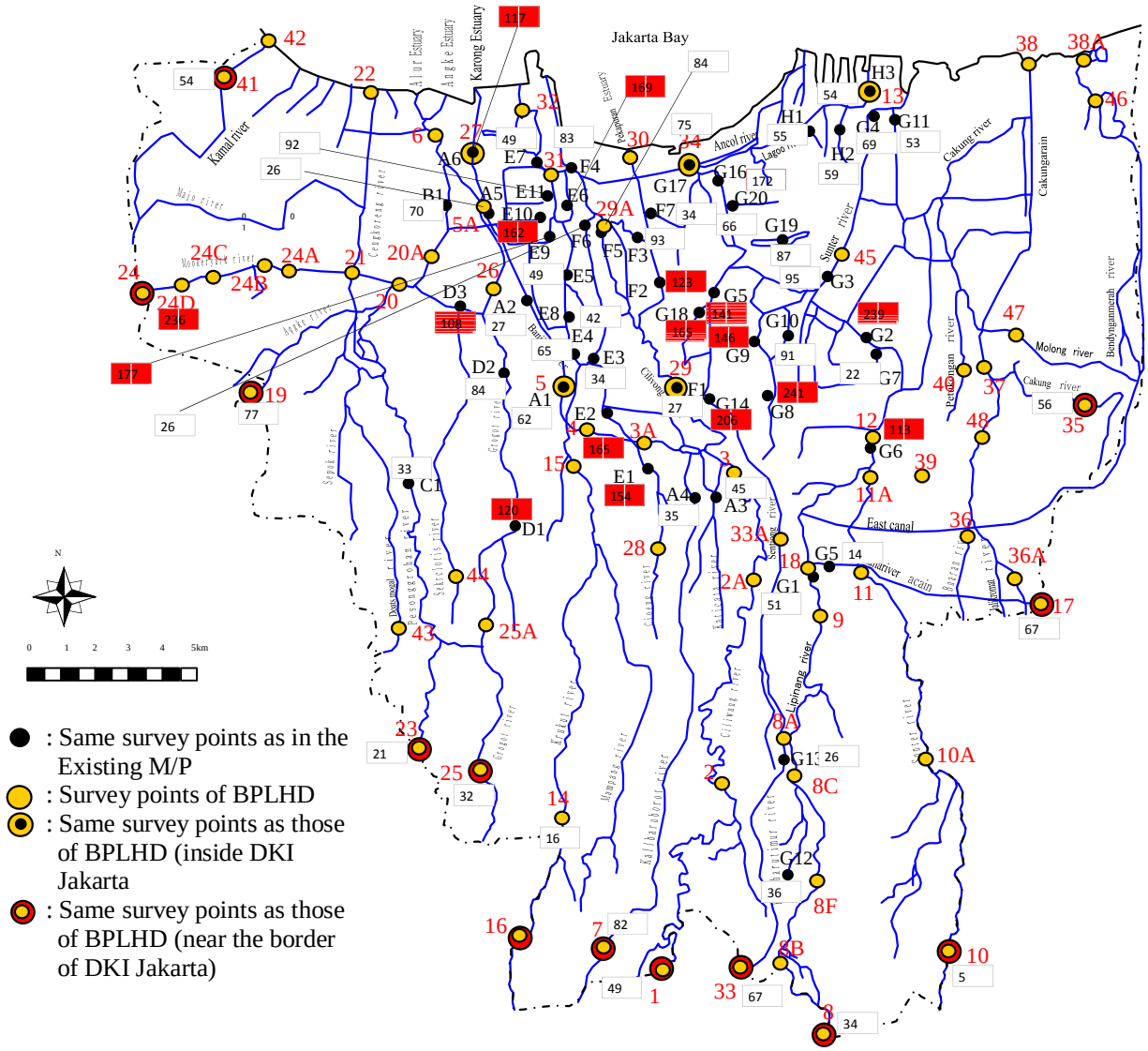
The summary of water quality survey for BOD is shown in Table B3-5.



● : Same survey points as in the Existing M/P
● : Survey points of BPLHD
● : Same survey points as those of BPLHD (inside DKI Jakarta
● : Same survey points as those of BPLHD (near the border of DKI Jakarta)

Source : JICA Expert Team
Note :The locations where BOD is 100 mg/L or more (5 times or more of water quality satndared in DKI Jakarta) are shown with red letter.

Figure B3-6 The Results of 1st Round Water Wuality Survey (Item Measured:BOD, Date of Measurement: Februaly 2011, Rainy Season)



Source : JICA Expert Team
Note :The locations where BOD is 100 mg/L or more (5 times or more of water quality standard in DKI Jakarta) are shown with red letter.

Figure B3-7 The Results of 2nd Round Water Quality Survey (Item Measured:BOD, Date of Measurement: June to July 2011, Dry Season)

Table B3-5 The Summary of Water Quality Survey (Item Measured: BOD)

	Ave.	Max.	Min.	Div.	Sample Number	Number >=20mg/L	(%)	Number >=100mg/L	(%)
2011_2	84	384	0	74	65	53	82	22	34
2011_6	83	241	5	59	65	62	95	18	28
Total	84	384	0	66	130	115	88	40	31

Source : JICA Expert Team

The results of water quality survey are summarized below.

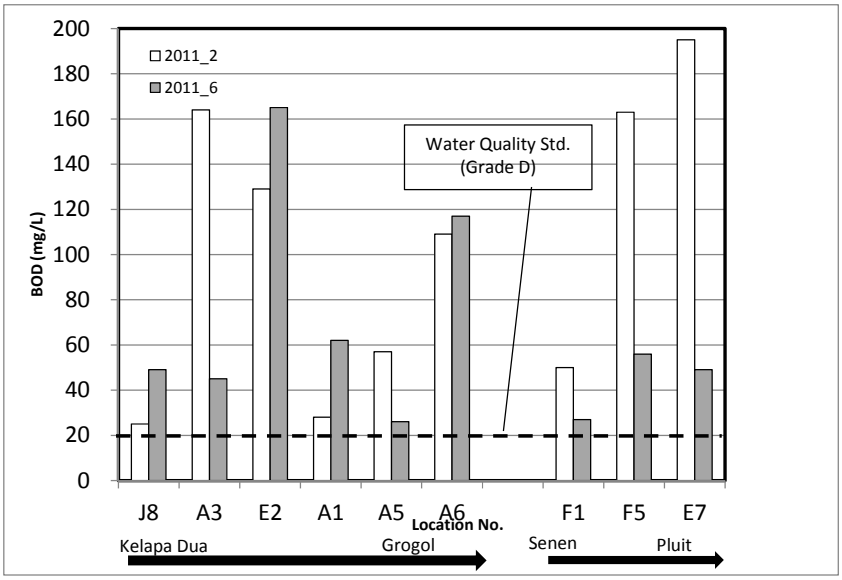
- 88% of total 130 samples (65 locations × 2 times) are 20mg/L or more, which is water quality standard (Group D) in DKI Jakarta
- 31% of total 130 samples (65 locations × 2 times) are 100 mg/L or more.
- BOD is relatively high at the north of DKI Jakarta, especially in from downstream to Jakarta Bay along the river. The locations where both BOD of two analysis are 100

mg/L or more are shown below;

- Grogol area (D3), Karet Tengsin area (E1, E2), Glodok area (E6, E9, E10), Gambir area (F2), Kelapa Ganding area (G2), Utan Kayu area (G8, G9), Kwitang area (G15, G18), Ancol area (G16)

3) Current Condition of BOD Pollution in Ciliwung River

BOD at the locations from Kelapa Dua (midstream) to Jakarta Bay along Ciliwing river are shown in Figure B3-8.



Source JICA Expert Team:

Figure B3-8 BOD at the Locations from Midstream to Jakarta Bay Along Ciliwung River

Figure B3-8 shows that the concentration of BOD tends to be increasing with close to downstream from upstram in Ciliwung river as shown by two times of water quality survey.

The reason why BOD of the sample at February 2011 (rainy season) tend to be higher than one at June 2011 (dry sesson) is assumed due to the differeces of rainfall condition at the time of sampling or specific land use conditon around the area etc.

We need more data of water sample and the further site survey for cheking land use to clarify the phenomenum.

(2) Fecal Coliform

1) Current Condition of Fecal Coliform Pollution

It is reported that fecal coliform has the strong relation with morbidity of water borne disease. The results of fecal coliform on 65 locations along the main river in DKI Jakarta conducted in June 2011 (dry season) are shown in Figure B3-9. The summary of water quality survey for fecal bacteria is shown in Table B3-6.

Table B3-6 The Summary of Water Quality Survey (Item Measured: Fecal Bacteria)

	Ave.	Max.	Min.	Div.	Sample Number	Number >=4,000MPN/100mL	(%)	Number >=10,000MPN/100mL	(%)
2011_6	4,260	16,000	170	5,630	65	14	22	11	17
Total	4,260	16,000	170	5,630	65	14	22	11	17

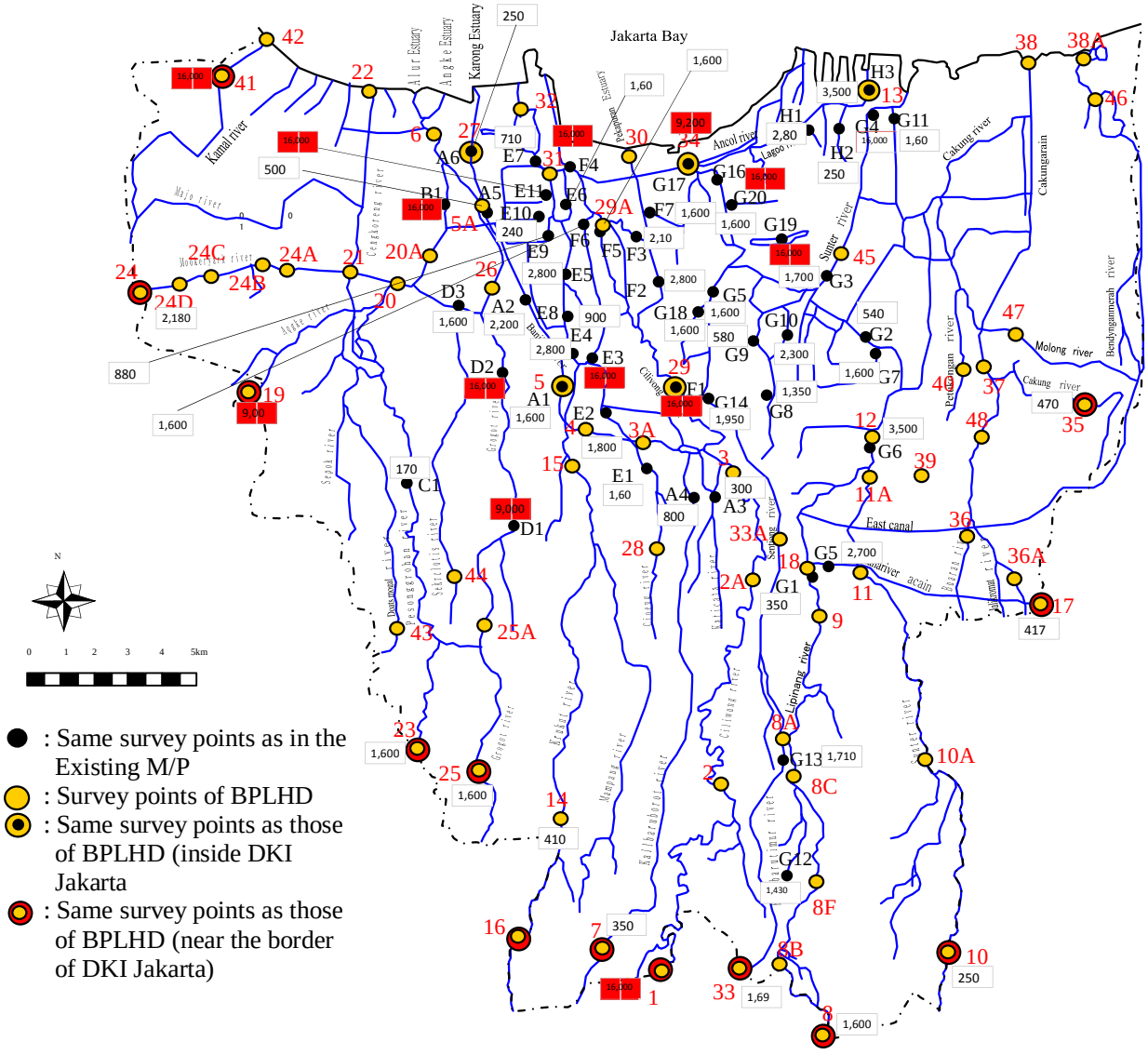
Source: JICA Expert Team

The results of water quality survey are summarized below.

- 22% of total 65 samples are 4,000MPN/100mL or more, which is water quality standard

(Group D) in DKI Jakarta.

- 11% of total 65 samples are 10,000MPN/100mL or more.
- Fecal coliform is relatively high at the north of DKI Jakarata, especially in from downstream to Jakarta Bay along the river. The locations where both BOD of two analysis are 10,000MPN/100mL or more are shown below;
- Kamal area (J1), Kedoya aera (B1), Glodok area (E11), Ancol area (E4), Kelapa Gading area (G4), Kwitang area (E1, F1), Ciganjur araa (J8).



Source: JICA Expert Team
Note: The locations where fecal bacteria is 10,000MPN/100mL or more (2.5 times of water quality standared in DKI Jakarata) are shown with red color.

Figure B3-9 The Results of 2nd Round Water Quality Survey (Item Measured : Fecal Coliform, Date of Measurement: June to July 2011, Dry Season)

(3) Nitrogen

1) Current Condition of Nitrogen Pollution

Nitrogen is one of the factor which causes eutriphication of enclosed water body (enclosed coastal

seas).

The odor is generated and the landscape is severely deteriorated near Jakarta Bay because the stagnated river flow causes accumulation and unarobic condtion of sludge on the bottom. It is assumed that nitrogen in the river results in a set of water pollution.

In addition, it is reported that nitrogen is one of the factor which causes methemoglobinemia, especially for infant. Therefore WHO sets 10mg/L as water quality standard for drinking water.

The results of total nitrogen (T-N) on 65 locations along main river in DKI Jakarta conducted in February 2011 (dry season) are shown in Figure B3-10.

※1 Total nitrogen (T-N)=Ammonium nitrogen (NH_3-N) + Nitrate nitrogen (NO_3-N) + Nitrite nitrogen (NO_2-N)

The summary of water quality survey for T-N is shown in Table B3-7.

Table B3-7 The Summary of Water Quality Survey (Item Mesured: Total Nitrogen)

	Ave.	Max.	Min.	Div.	Sample Number	Number >=10mg/L	(%)	Number >=30mg/L	(%)
2011_2	20.60	56.50	5.10	10.00	65	54	83	7	11
Total	20.60	56.50	5.10	10.00	65	54	83	7	11

Source: JICA Expert Team

The results of water quality survey are summarized below.

- 83% of total 65 samples are 10 mg/L or more, which is water quality standard for drinking water of WHO.
- 11% of total 65 samples are 30mg/L or more.
- Especially, T-N is relatively high at the north of DKI Jakarta. The locations where T-N is 30mg/L or more are shown below;

  Pluit area (E9, E10, E11), Tanjung Priok area (H3), Kwitang area (G5, G18), Karet Tengsin area (No.4)