CHAPTER 8

EXISTING CONDITION OF SEWERAGE SYSTEM/SANITATION

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8.1 General

Sewerage system is developed in part of urban area and community plants are installed in riverside low level areas in Yogyakarta Municipality. Many households out of sewerage covered area use septic tanks.

In Sleman Regency and Bantul Regency, wastewater is treated by septic tanks which installed in many houses since neither sewerage system nor community plant systems are introduced in these area. However, the installation rate is not so high at present.

Wastewater from the houses without septic tanks penetrates into ground directly or is discharged to the river nearby. These are one of the causes of river pollution.

8.2 Sewerage

8.2.1 Outline of Existing Sewerage System

The sewerage system of Yogyakarta Municipality was established by the Netherlands in the 1930s and sewer and one small-scale sewage treatment plant were built. The sewage treatment plant is not working at present.

At present, sewerage system is developed in a part of Yogyakarta Municipality with trunk sewer and Sewon sewage treatment plant which were built by Japan's Gtant Aid in 1996 and the other facilities such as another trunk sewer, sewer network and flushing pipe were constructed by Netherlands and about 60,000 persons' wastewater, equivalent to 15% of municipal population, is treated.

Operation & maintenance and construction of sewer network are conducted by Yogyakarta Environment Service Department (DLH), and Sewon sewage treatment plant is operated by Yogyakarta Municipality. Summary of sewage treatment plant is as shown below.

- Target Area: 1,250 ha (Yogyakarta 1,220 ha, Sleman 30 ha, Bantul 0 ha)
- Target Year: 2002

- Population: 110,000
- Service Connection:
  18,420 units (House Connection 17,330 units, Others 1,090 units)
- Flow Rate: 15,500 m^3/day
- Location of Sewage Treatment Plant: Sewon district, Bantul Regency

At present, target year is extended into 2012. Present and planed sewerage area is shown in Figure 8.2.1.

Although the sewer is installed in the surroundings of Gadjab Mada University in Sleman Regency, there is no connection from each house and office, and sewage is not substantially treated in Sleman Regency.

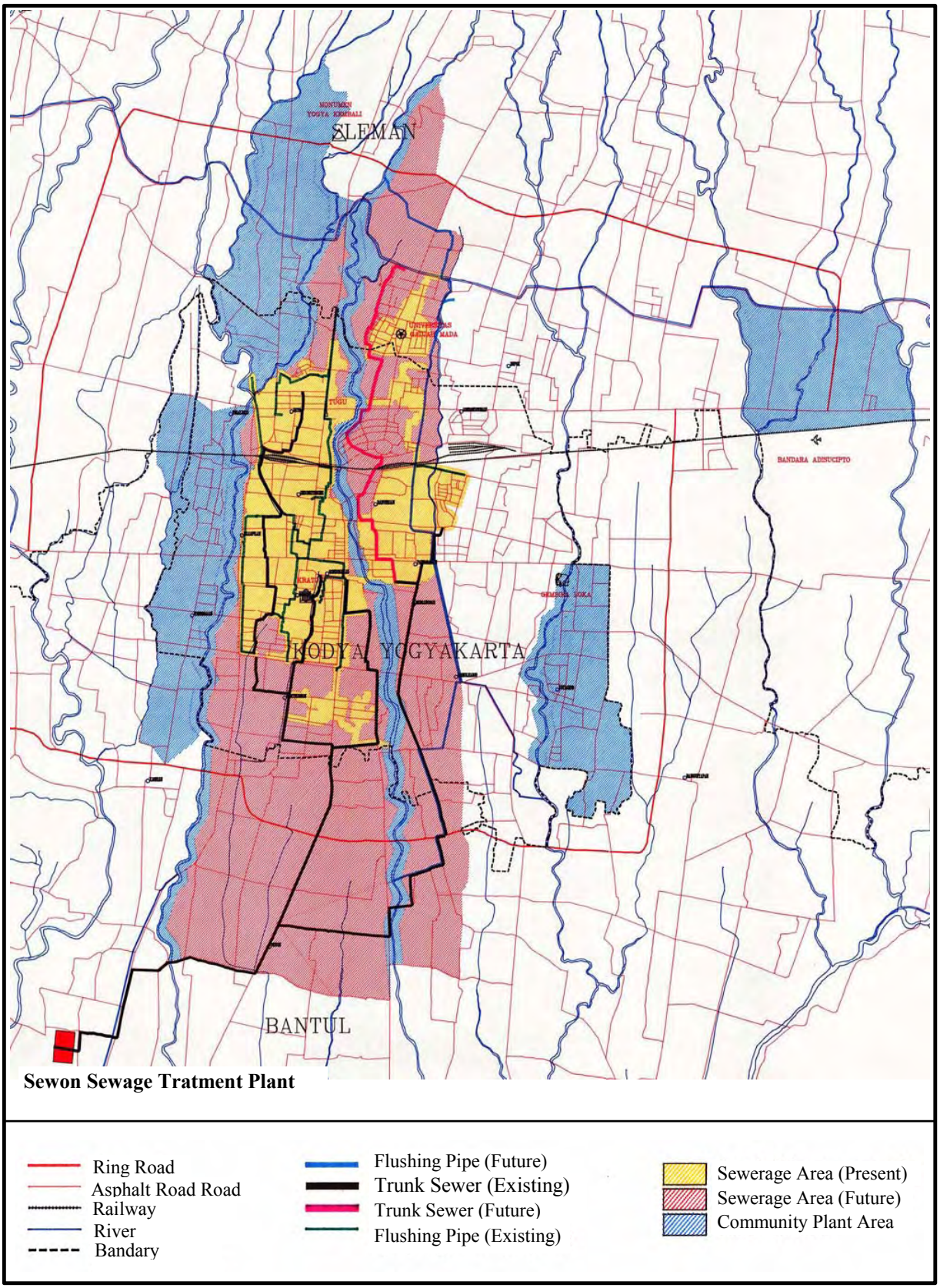


Figure 8.2.1 Sewerage Area in Yogyakarta Municipality

8.2.2 Sewer

20/30cm of oval pipe, length of about 120km as for the branch sewer is installed in Yogyakarta Municipality central part and surrounding of a Gadjab Mada university in Sleman Regency as for the trunk sewer, diameter of 600mm pipe, length of about 34km is installed in the central part of Yogyakarta Municipality and diameter of 1,000mm/1,300mm pipe length of 10km is installed from Yogyakarta Municipality to the Sewon sewage treatment plant. For the purpose of washing branch sewer using river water, flushing pipe diameter of 600mm, length of 20km is arranged in Yogyakarta Municipality and a part of Sleman Regency.

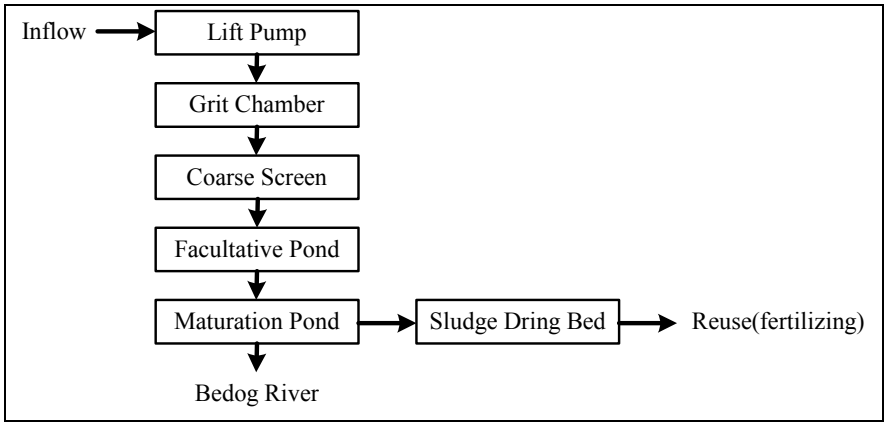
Table 8.2.1 Sewer Length by Type and Diameter

Sewer Type	Diameter	Material	Length (m)				Reference
			Yogyakarta	Sleman	Bantul	Total	
Branch Sewer	Oval Pipe 20/30cm	Concrete	113,695	5,887	650	120,232	
Trunk Sewer	ϕ 600mm	RC	33,129	967		34,096	Yogyakarta
	ϕ 1000mm, ϕ 1300mm	RC			10,092	10,092	Yogyakarta to Sewon STP
Washing Pipe	ϕ 600mm	RC	18,886	557	-	19,443	
Total			**165,710**	**7,411**	**10,742**	**183,863**	

8.2.3 Sewage Treatment Plant

(1) General

One sewage treatment plant located in Sewon, Bantul Regency built by Japan's Grant Aid in 1996 has treated wastewater of Yogyakarta Municipality. Treatment method in this sewage treatment plant is an aerated-lagoon system which has the following flow diagram, and treated water is discharged to the Bedog River.



The sewage treatment plant is working well at present. Mechanical equipment such as lift pump, aerator, sand pump and generator that are all made in Japan, are all under operation. These equipments have not been breakdown for ten years, after commencement of its operation in good condition. Outline and photos for each facility in sewage treatment plant are shown in below.

Table 8.2.2 Outline of Sewon Sewage Treatment Plant

Item		Specification
CapaMunicipality		15,500m3/day
Location		Dusun Jepit Desa Pendowoharjo Kecamatan Sewon Kabupaten Bantul
STP Area		6.7 ha
Treatment Method		Aerated Lagoon
Inlet BOD		332mg/L
Outlet BOD		30～40mg/L
BOD Removal Ratio		90 %
Discharge River		Bedog River
Target Year		2002
<Facility/Equipment>		
Lift Pump	CapaMunicipality	10.7m3/min
	Pump Head	3.5m
	Power	15kW
	No. of Pump	3set (1 stand-by included)
Grit Chamber	Specification	W 2m x L 9m x H 1.2m x 2 ponds
	Load	650 m3/m2/day
Coarse Screen	Specification	H 2.0m x Bar Interval 40mm x 2set
	Type	Manual Type
	Material	Steel
Facultative Pond	Specification	W 77m x L 70m x H 4m x 4 ponds
	Retention Time	5.5 days
	Aerator	30kW x 4sets
Maturation Pond	Specification	W 78m x L 70m x H 4m x 2 ponds
	Retention Time	1.3 days
Sludge Drying Bed	Specification	W 34m x L 232m x H 0.5m
	CapaMunicipality	4,000m3
	Sludge Volune	3,300m3/year
Power Generator	Specification	300KVA x 1set
Administration Building	Area, Content	390m2 for Generator Room, Electrical Room, Operation Room, Laboratory, Machine Room, Storage
Discharge Pipe		Concrete Pipe, φ800mm x Length 649m
		Open Channel, Width 1.4m x Depth 1.0m, Length 528m


Photo 8.2.1 Sewon Sewage Treatment Plant

(2) Treated Water Quality

Treated water BOD is an average of 18 mg/L (87% of removal ratio), and less than 30 mg/L of a planed value. The discharge river regulation value (less than BOD 50 mg/L) for the Bedog River is also satisfied. Water quality data in sewage treatment plant for the last one year is shown below.

Table 8.2.3 Water Quality Data in Sewon Sewage Treatment Plant

Year	Month	BOD (mg/L)			SS (mg/L)		
		Inflow	Outlet	Removal Ratio	Inflow	Outlet	Removal Ratio
2005	November	171	19	89%	340	39	89%
	December	162	18	89%	315	36	89%
2006	January	160	19	88%	364	26	93%
	February	149	18	88%	417	22	95%
	March	153	19	88%	330	30	91%
	April	137	17	88%	239	27	89%
	May	163	19	88%	291	28	90%
	June	128	18	86%	-	-	-
	July	146	19	87%	-	-	-
	August	118	20	83%	-	-	-
	September	132	17	87%	-	-	-
	October	145	16	89%	-	-	-
Average		**147**	**18**	**87%**	**328**	**30**	**91%**

(3) Inflow Rate

Although 2002 of the original planned target year has been passed already, the inflow of wastewater to the sewage treatment plant is 9,000m3/day, and is much less than 15,500m3/day of the planned amount of water. This is considered that connection ratio from each house and

office in the sewerage area is still low even if the branch sewer is installed. At present, the planned target year is revised to 2012.

There is a tendency that in rainy season the inflow to the sewage treatment plant increases, and in dry season it decreases. This is considered of the incorrect connection of a storm drain, roof drainage and/or infiltration of the groundwater from damaged pipe when groundwater level becomes high.

It is considered that due to breakage of the pipe because of the last earthquake, quantity of inflow in May 2006 was decreased to the ratio of 50% to 70% as compared with the same month of 2004. The inflow to sewage treatment plant from 2004 is shown in Table 8.2.4 and Figure 8.2.2.

Table 8.2.4 Sewon Sewage Treatment Plant Inflow Data (2004-2006)

Month	Inflow (m3/day)			Ratio (2005/2004)	Ratio (2006/2005)	Ratio (2006/2004)	Reference
	2004	2005	2006				
January	10,381	9,899	8,640	95.4%	87.3%	83.2%	
February	11,709	11,324	9,351	96.7%	82.6%	79.9%	
March	11,518	11,353	9,096	98.6%	80.1%	79.0%	
April	10,227	11,856	11,788	115.9%	99.4%	115.3%	
May	9,913	8,162	10,708	82.3%	131.2%	108.0%	Measurement was not done in 4 days
June	9,068	6,642	7,686	73.3%	115.7%	84.8%	Measurement was not done in 10 days
July	8,766	7,686	6,608	87.7%	86.0%	75.4%	
August	8,043	7,290	5,177	90.6%	71.0%	64.4%	
September	7,739	9,787	4,028	126.5%	41.2%	52.0%	
October	7,721	6,399	4,758	82.9%	74.4%	61.6%	
November	8,009	5,290	-	66.1%	-	-	
December	9,127	7,575	-	83.0%	-	-	

*) Earthquake was occurred in May 2006

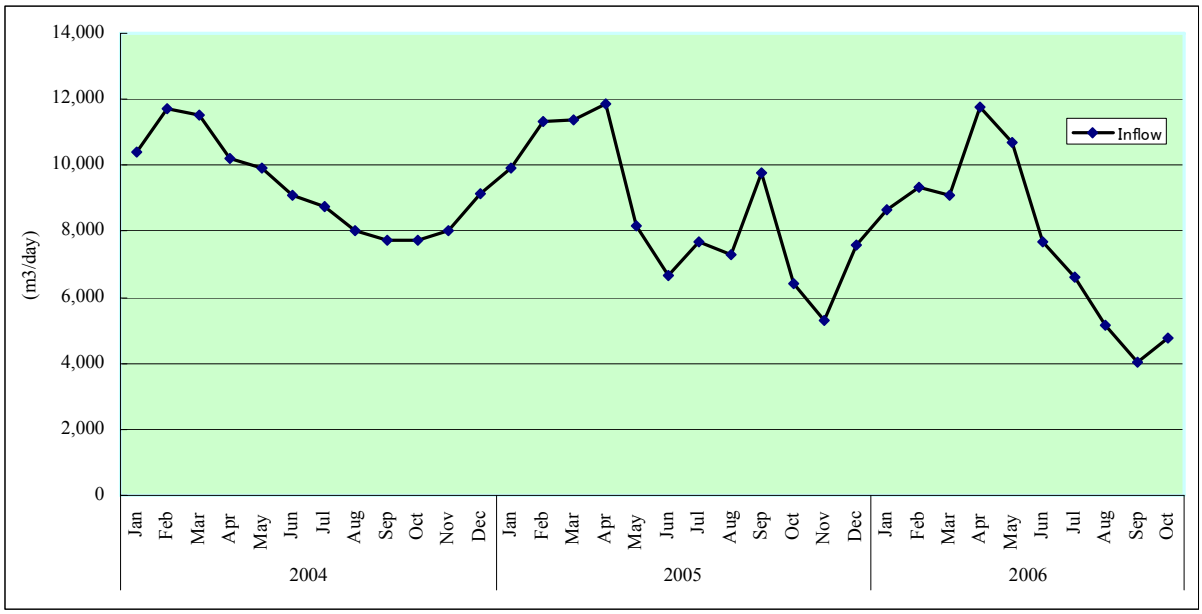


Figure 8.2.2 Sewon Sewage Treatment Plant Inflow Data (2004-2006)

8.2.4 Operation and Maintenance of Sewerage Facility

(1) Sewer

Inspection, cleaning and construction works of sewer in Yogyakarta Municipality are performed by 49 personnel of Environmental Recovery & Wastewater Management Section in a Yogyakarta Municipality environmental agency (DLH). This section is also performing control of maintenance for the community plant and sanitary facility in Yogyakarta Municipality. Organization chart of DLH is shown below.

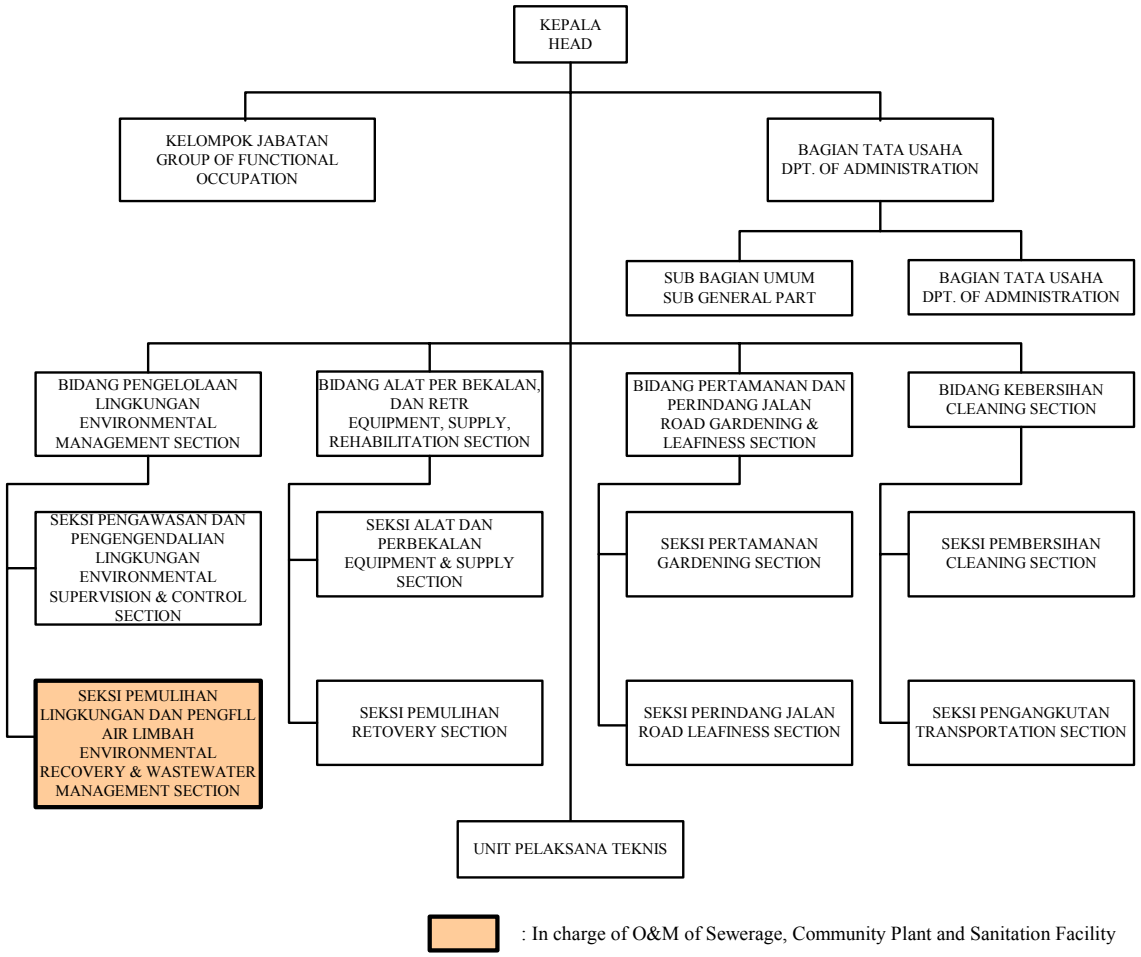


Figure 8.2.3 DLH Organization Chart

(2) Sewage Treatment Plant

Management and maintenance of a Sewon sewage treatment plant is carried out by Unit Pengelola Instalasi Pengolah Air Limbah (IPAL) Dinas Kimpraswil Propinsi DIY which is an organization of direct control of Special Regency of Yogyakarta.

Number of Staff in Sewage Treatment Plant

Day Time: 29 persons

Night Time: 2 persons

Organization Chart in Sewon sewage treatment plant is shown below.

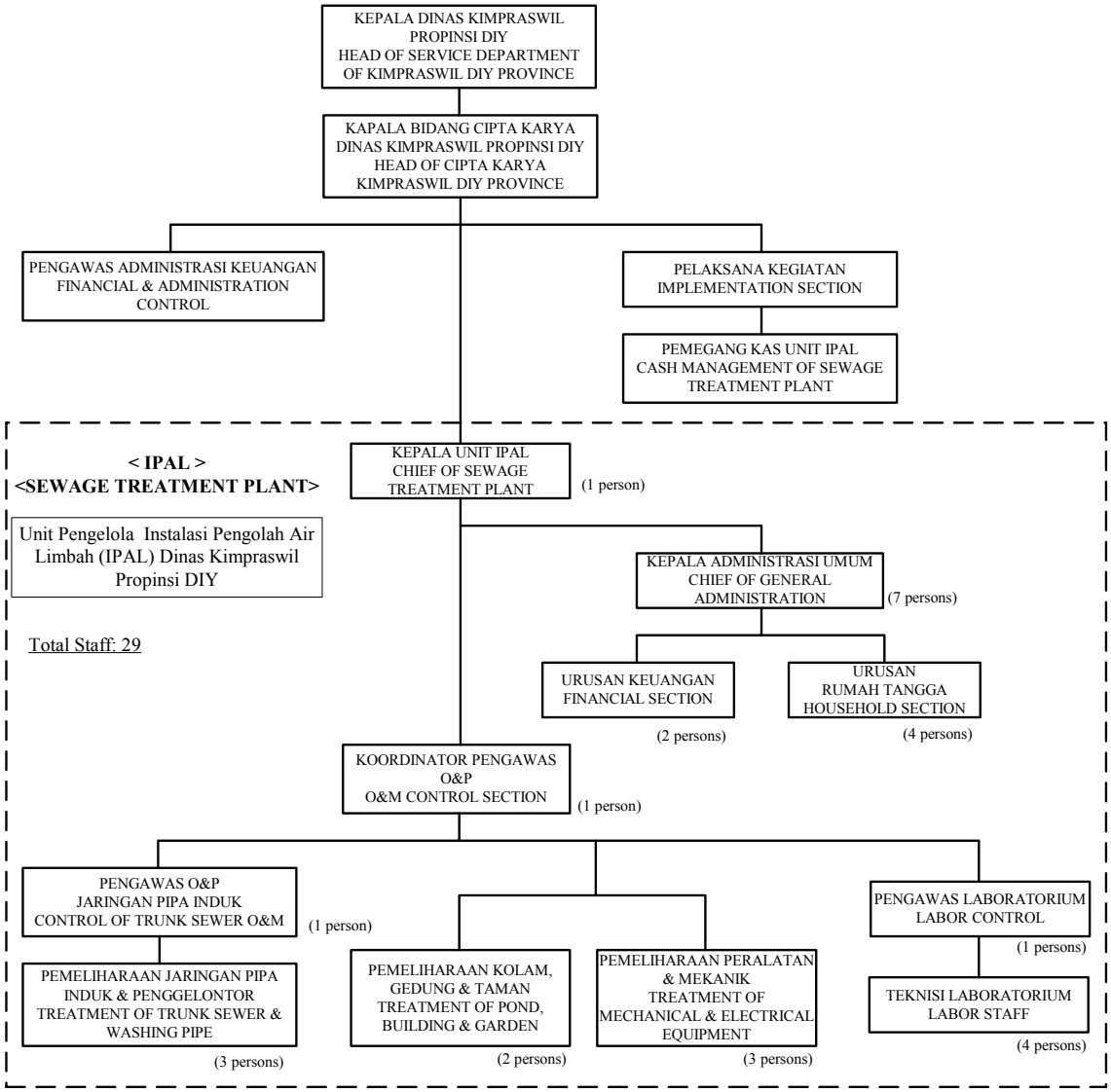


Figure 8.2.4 Sewon Sewage Treatment Plant Organization Chart

8.2.5 Financial Situation

Management and maintenance are carried out by the subsidies from Yogyakarta Municipality, Sleman Regency, Bantul Regency, and DIY, since sewer and the sewage treatment plant are not manageable only with a sewer connection tariff income as shown in the following Table. Since 2003 and 2004 were in the red, the burden charge of DIY is increased to corresponds from 2005.

Table 8.2.5 Balance Sheet of Sewerage System

mil Rp/year

Items			2002	2003	2004	2005	2006	Reference
Expense	1	Sewerage Network	167.3	217.2	179.6	150.4	unknown	
	2	Sewage Treatment Plant	462.5	572.5	703.8	705.0	710.7	Date 2006 is estimated figure
	Total O&M Expense		**629.8**	**789.7**	**883.4**	**855.4**	**710.7**	
Income	1	Revenue	83.5	85.0	93.2	90.9	unknown	Tariff Collection
	2	Subsidy						
		Kota Yogyakarta	125.0	125.0	125.0	125.0	125.0	
		Sleman	10.0	10.0	10.0	10.0	10.0	
		Bantul	10.0	10.0	10.0	10.0	10.0	
		DIY	462.5	462.5	558.8	650.0	710.0	
	Total of Income		**691.0**	**692.5**	**797.0**	**885.9**	**855.0**	
Balance			**61.2**	**-97.2**	**-86.4**	**30.5**	**-**	

Source: - DLH
- Final Reprt, Outline Strategy for Wastewater Management in the Greater Yogyakarta Metropolitan Region, July 2006, USAID
- Mini Workshop Document "Kerjasama Pengembangan Jaringan Peppipaan Air Limbah Perkotaan Yogyakarta"

8.2.6 Sewer Tariff

The sewer tariffs set up by DLH are in the Table 8.2.6, and collection of the tariff is done by DLH by a sewerage independent apart from water tariffs. There is a plan to raise the sewerage tariff and to collect a sewerage tariff together with water rates in the future.

Table 8.2.6 Tariff List

No	Type	Classification	Maintenance Fee (Rp)	Management Fee (Rp)	License Fee At registration only (Rp)
<Domestic>					
1	K1	1-5 persons	500	500	2,000
2	K2	6-10 persons	1,000	500	2,500
3	K3	11-20 persons	2,000	500	3,000
4	K4	21-50 persons	4,000	500	3,500
5	K5	More than 50 persons	8,000	500	4,000
<Non-Domestic>					
1	P1	Capital 25,000,000 Rp or less	3,000	500	2,500
2	P2	Capital less than 50,000,000 Rp	6,000	500	5,000
3	P3	Capital 50,000,000 Rp or more	12,000	500	7,500

8.3 Community Plant

8.3.1 Outline of Existing Community Plant

At present, community plant facilities have been operated in 39 sites in Yogyakarta Municipality. In Sleman Regency, although two facilities are under construction, there is no operating community plant. There is no existing and planned community plant in Bantul Regency.

8.3.2 Community Plant in Yogyakarta Municipality

39 community plants in Yogyakarta Municipality, which dotted outside of sewerage area on the riverside lowlands, operate wastewater treatment in each community area for the 1,994 number of households and for about 6,000 persons. These community plants consist of 35 to 70 households which were invested and built by the Yogyakarta Municipality and the local resident from 2000. The burden rate is 75% of Municipality, and 25% from each community.
Location and outline of community plants are shown below.

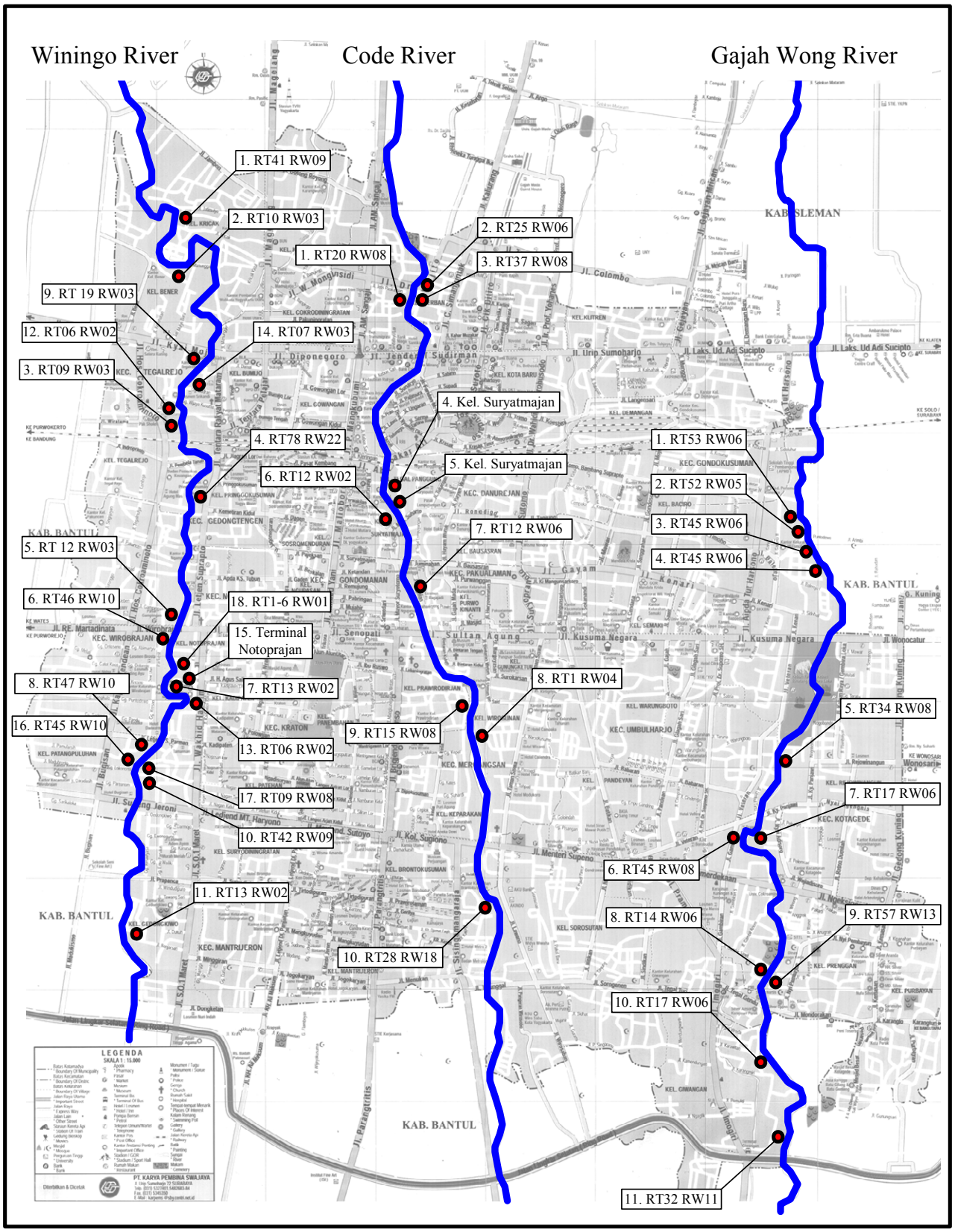


Figure 8.3.1 Location of Community Plant Facility in Yogyakarta Municipality

Table 8.3.1 Outline of Community Plant Facility

No.	Item No.		District	Sub- District	House hold	Unit	Population (2.95 per/house)	Treatment Method	Discharge River	Construction Year
<WINONGO RIVER Area>										
1	RT 41	RW 09	Tegalrejo	Kricak	45	1	133	Type-1	Winongo	2005
2	RT 10	RW 03	Tegalrejo	Bener	50	1	148	Type-1	Winongo	2005
3	RT 09	RW 03	Tegalrejo	Tegalrejo	50	1	148	Type-1	Winongo	2005
4	RT 78	RW 22	Gedongtengen	Pringgokusumo	65	1	192	Type-1	Winongo	2005
5	RT 12	RW 03	Wirobrajan	Pakuncen	45	1	133	Type-1	Winongo	2005
6	RT 46	RW 10	Wirobrajan	Pakuncen	45	1	133	Type-1	Winongo	2005
7	RT 13	RW 02	Ngampilan	Notoprajan	50	1	148	Type-1	Winongo	2005
8	RT 47	RW 10	Wirobrajan	Patangpuluhan	65	1	192	Type-1	Winongo	2005
9	RT19	RW 03	Jetis	Bumijo	50	1	148	Type-1	Winongo	2005
10	RT 42	RW 09	Wirobrajan	Wirobrajan	60	1	177	Type-1	Winongo	2005
11	RT 13	RW 02	Mantrijeron	Gedongkiwo	65	1	192	Type-1	Winongo	2005
12	RT 06	RW 02	Tegalrejo	Tegalrejo	45	1	133	Type-1	Winongo	2005
13	RT 06	RW 02	Ngampilan	Ngampilan	45	1	133	Type-1	Winongo	2005
14	RT 07	RW03	Jetis	Bumijo	50	1	148	Type-1	Winongo	2004
15	Terminal		Ngampilan	Notoprajan	35	1	103	Type-1	Winongo	2002
16	RT 45	RW 10	Wirobrajan	Patangpuluhan	55	1	162	Type-1	Winongo	2004
17	RT 09	RW 08	Wirobrajan	Patangpuluhan	54	1	159	Type-1	Winongo	2003
18	RT 1-6	RW 01	Ngampilan	Notoprajan	116	1	342	Type-1	Winongo	2000
Sub-Total					**990**	**18**	**2,921**			
<CODE River Area>										
1	RT 20	RW 08	Gondokusuman	Terban	45	1	133	Type-1	Code	2005
2	RT 25	RW 06	Jetis	Cokrodiningratan	65	1	192	Type-1	Code	2005
3	RT 37	RW 08	Jetis	Cokrodiningratan	71	1	209	Type-2	Code	2005
4	Kel. Suryatmajan		Danurejan	Suryatmajan	35	1	103	Type-1	Code	2004
5	Kel. Suryatmajan		Danurejan	Suryatmajan	35	1	103	Type-1	Code	2004
6	RT 12	RW 02	Danurejan	Suryatmajan	40	1	118	Type-1	Code	2005
7	RT 12	RW 06	Pakualaman	Purwokinanti	54	1	159	Type-1	Code	2005
8	RT 14	RW 04	Mergangsan	Wirogunan	35	1	103	Type-1	Code	2005

9	RT 15	RW 08	Gondomanan	Prawirodirjan	50	1	148	Type-1	Code	2005
10	RT 28	RW 18	Mergangsan	Brontokusuman	40	1	118	Type-1	Code	2005
Sub-Total					**470**	**10**	**1,387**			
<GAJAH WONG River Area>										
1	RT 53	RW 06	Umbulharjo	Muja Muju	50	1	148	Type-1	Gajah Wong	2005
2	RT 52	RW 05	Umbulharjo	Muja Muju	50	1	148	Type-1	Gajah Wong	2005
3	RT 45	RW 06	Umbulharjo	Muja muju	50	1	148	Type-2	Gajah Wong	2005
4	RT 45	RW 06	Umbulharjo	Muja Muju	45	1	133	Type-1	Gajah Wong	2005
5	RT 34	RW 08	Umbulharjo	Waruingboto	50	1	148	Type-1	Gajah Wong	2005
6	RT 45	RW 08	Umbulharjo	Pandeyan	50	1	148	Type-1	Gajah Wong	2005
7	RT 17	RW 06	Kotagede	Prenggan	54	1	159	Type-1	Gajah Wong	2005
8	RT 14	RW 06	Kotagede	Prenggan	35	1	103	Type-1	Gajah Wong	2005
9	RT 57	RW 13	Kotagede	Prenggan	45	1	133	Type-1	Gajah Wong	2003
10	RT 17	RW 06	Umbulharjo	Giwangan	50	1	148	Type-1	Gajah Wong	2005
11	RT 32	RW 11	Umbulharjo	Giwangan	55	1	162	Type-1	Gajah Wong	2005
Sub-Total					**534**	**11**	**1,575**			
Total					**1,994**	**39**	**5,882**			

Remarks; *(1) Population is calculated by assumption of 2.95 person/house*

(2) Treatment Method

Type-1: Baffle Reactor + Anaerobic Filter

Type-2: Digester + Baffle Reactor + Anaerobic Filter

There are two types of community plant treatments. One is the system which treats the treated wastewater from the septic tanks and the grey water (wash, a kitchen, a shower, etc.) by a Baffle Reactor and an Anaerobic Filter (TYPE-1). And the other is the system which mixes with wastewater and grey water treated by a Baffle Reactor and an Anaerobic Filter after treating toilet water by a Digester (TYPE-2). Treatment method is selected based on the facility construction costs and site area of each community. Treatment flow diagram, the standard construction drawing and the photograph of installation place are shown below.

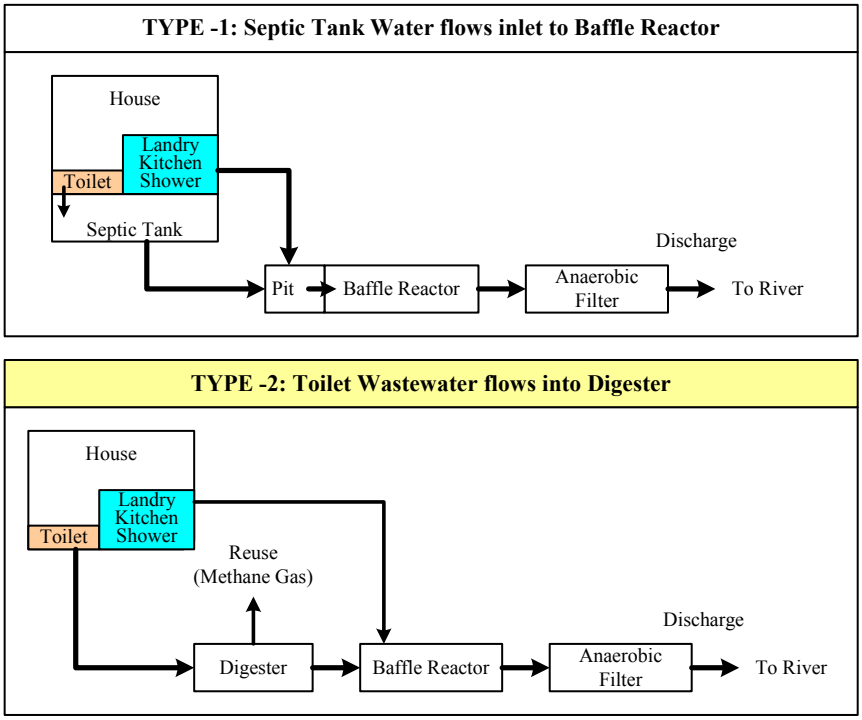


Figure 8.3.2 Type of Community Plant Treatment Flow

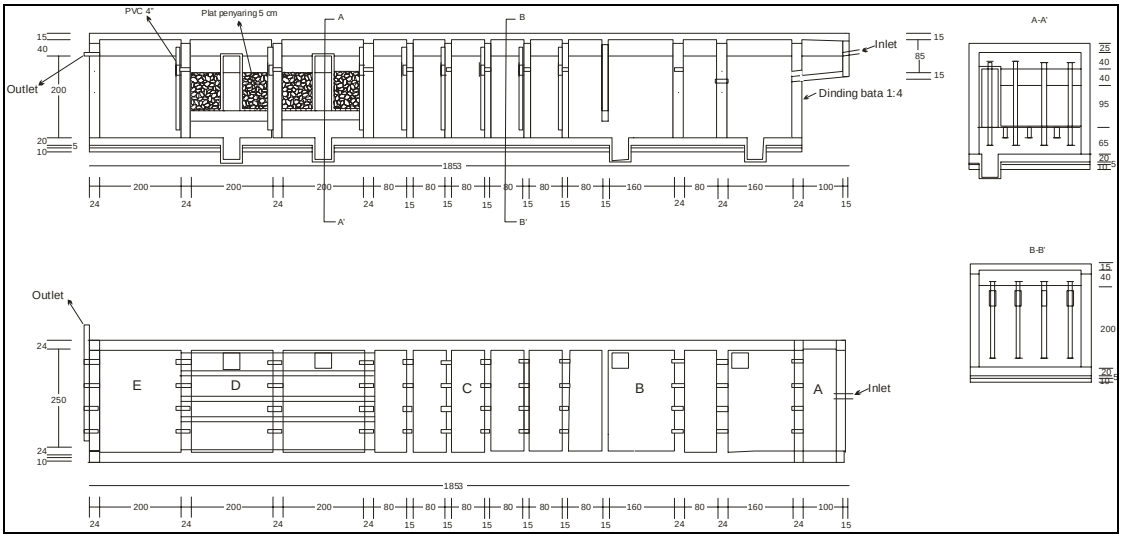


Figure 8.3.3 Community Plant Standard Structure (Type-1)

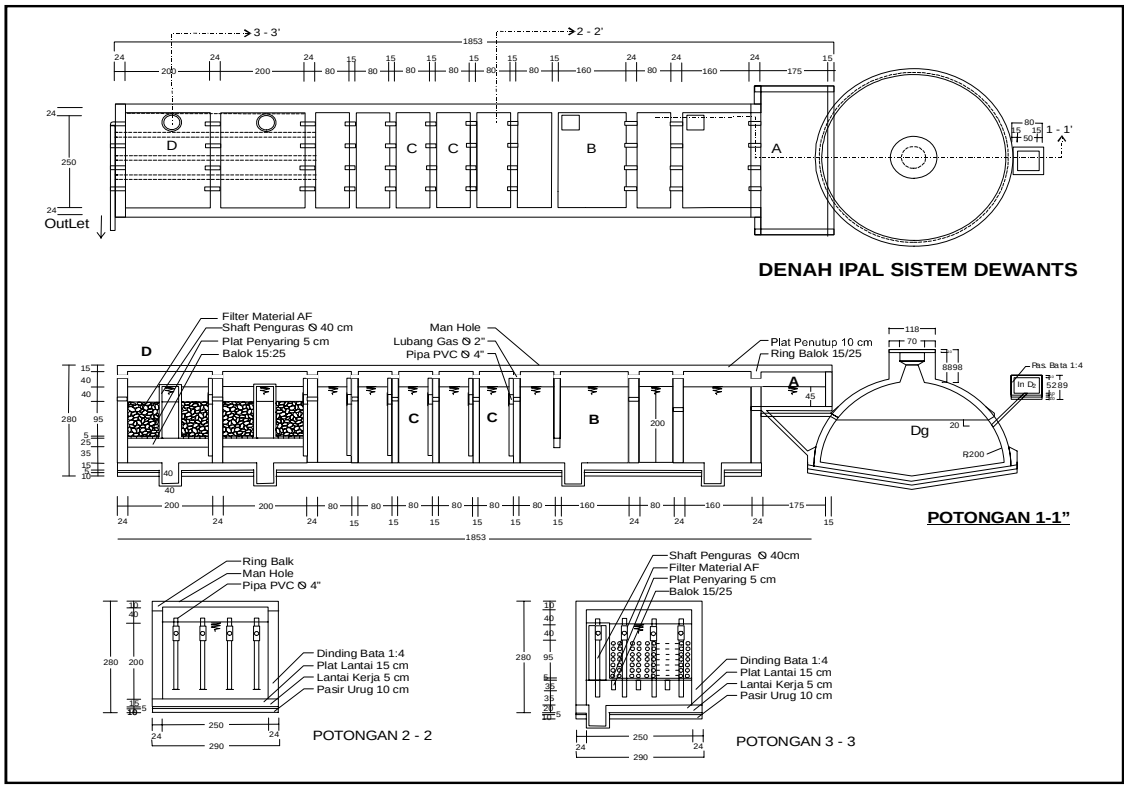


Figure 8.3.4 Community Plant Standard Structure (Type-2)

TYPE-1 **TYPE-2**

Photo 8.3.1 Community Plant in Yogyakarta

8.3.3 Operation and Maintenance of Community Plants

The representative of each community has responsibility for operation and maintenance and collecting tariff. Environmental Recovery & Wastewater Management Section in DLH which is the same department as sewerage O&M is doing overall management of each community plant.

8.3.4 Tariff Collection

The representative of each community collects the tariff, from 1,000 to 1,500 Rp/house/month uniformly every month that is not concerned with sewerage flow as the operation and maintenance expense of facilities and a representative's operational cost.

8.3.5 Community Plant in Sleman and Bantul Regency

Two community plants in Slemen Regency, one is for housing scheme and the other is for industrial complex, are now under construction.

① Community plant for housing scheme

The community plant for 90 households in Ngalik district is now under construction, having completed 70 to 80%. Operation will start from 2007.

② Community plant for industrial complex

Community plant for industrial complex is now under construction in Seyegan district.

8.4 Sanitation Facilities

8.4.1 Outline of Existing Sanitation Facilities

As on-site treatment, septic tank + leaching pit or pit latrine, is installed in the Yogyakarta Municipality, the Sleman Regency and the Bantul Regency. The installation rate of septic tank + leaching pit for individual treatment is high in a Yogyakarta Municipality and a Sleman Regency. However, in Bantul Regency, night soil which is once stored in pit latrine is discharged to the river or underground infiltration without treatment in many cases.

8.4.2 Sanitation Facility Type

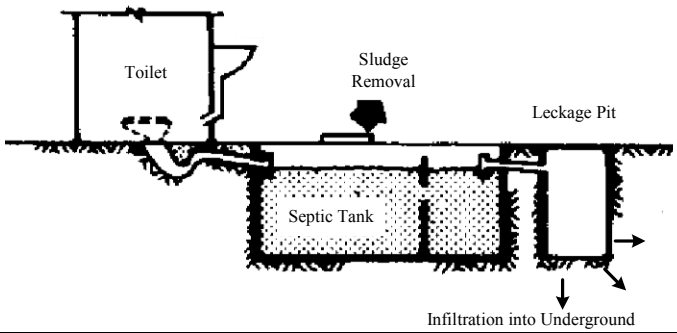
(1) Classification of Sanitation System

The toilet water discharged from each house out of sewerage area and community-plant area is classified into two cases. One is On-Site processing done as shown below, and the other is discharged to underground infiltration or a river without treatment.

Case 1　On-SiteTreatment

Underground infiltration from Leaching Pit after treated by Septic Tank

Case 1: Toilet→Septic Tank →Leakage Pit → Infiltration



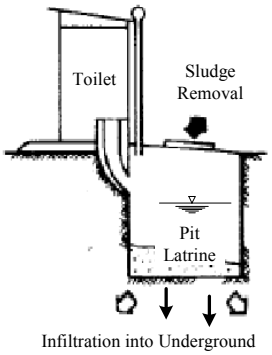
Case 2 Discharge without Treatment

CASE 2-1: Toilet water is infiltrated into underground without treatment after once storing in Pit Latrine.

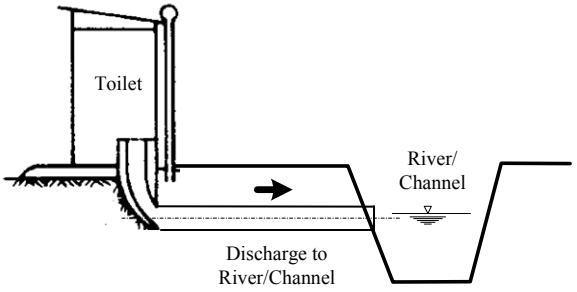
CASE 2-2: Toilet water is directly discharged to a river. This type is adopted mostly in the house near the river

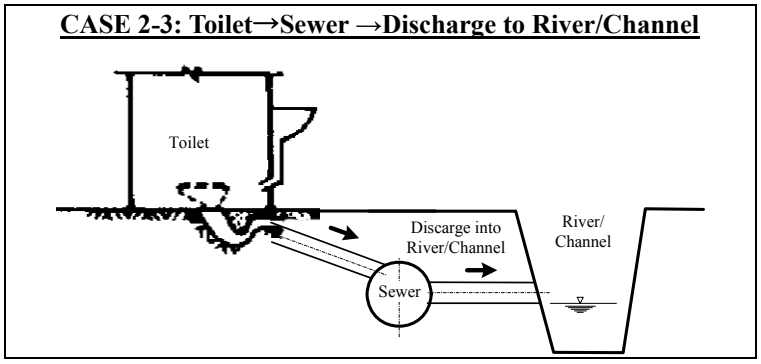
CASE 2-3: Toilet water is sent to a sewage pipe. But it is untreated and is discharged to the river etc, since the sewage pipe is not connected to the sewage treatment plant.

CASE 2-1:　Pit Latrine → Infiltration



CASE 2-2:　Toilet → Discharge to River/Channel





Since the shallow layer of the soil consists of sand and gravel and the groundwater level is also low in Yogyakarta Municipality, Sleman Regency and Bantul Regency, the treated wastewater from a great portion of Septic Tank is carried out underground infiltration. However, treated wastewater from Septic Tank installed in the house along a riverside is discharged to the river in many cases, and this causes river pollution.

(2) Septic Tank Type

Typical septic tank used in Indonesia is as shown below.

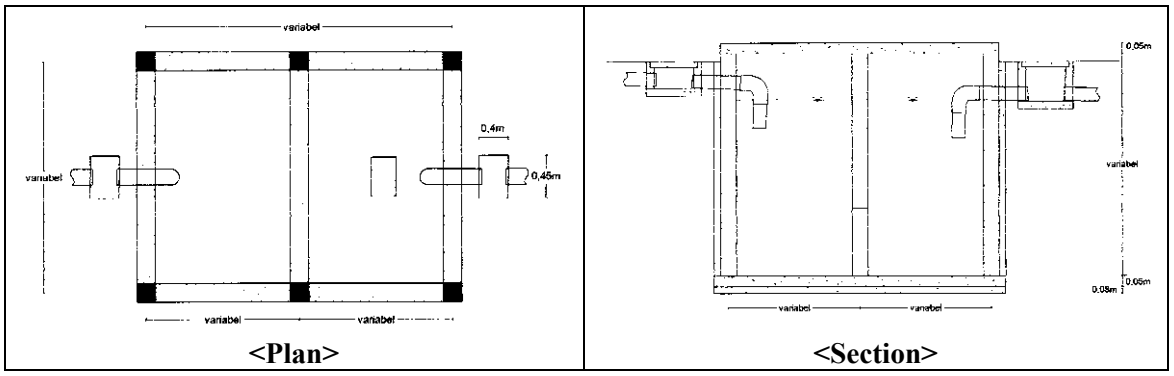


Figure 8.4.1 Septic Tank Standard Drawing

8.4.3 Sludge Disposal

Sludge from toilet and septic tank is collected and disposed by private company, which send to fertilizer plant, disposal site and Sewon sewage treatment plant. Sludge from community plant is also collected and disposed by private company, and send to fertilizer plant. Surplus sludge is sent to Sewon sewage treatment plant as well.

8.4.4 Operation and Maintenance of Sanitation Facilities

(1) Yogyakarta Municipality

Environmental Recovery & Wastewater Management Section in DLH which is same department as sewerage O&M is doing management of sanitary facility.

Removal of the septic tank and pit latrine sludge from each house is done about once in 5 to 6 years. DLH owns two vacuum cars, capabilities of $5m^3$, is conducting collection sludge work. Private companies in Yogyakarta Municipality are collecting sludge, and they own about 20 vacuum cars. Collection fee of the septic tank sludge which is different by the private companies is approximately 75,000 Rp/m^3.

(2) Sleman Regency

Kepala Dinas Kimpraswilhub Kabupatan Sleman (KDKK, Head Official of Settlement & Infrastructure in Sleman) is conducting management of the sanitary facilities of a Sleman Regency. However, removal of septic tank sludge is entrusted to the private company from each house or office directly. Organizational chart is shown below.

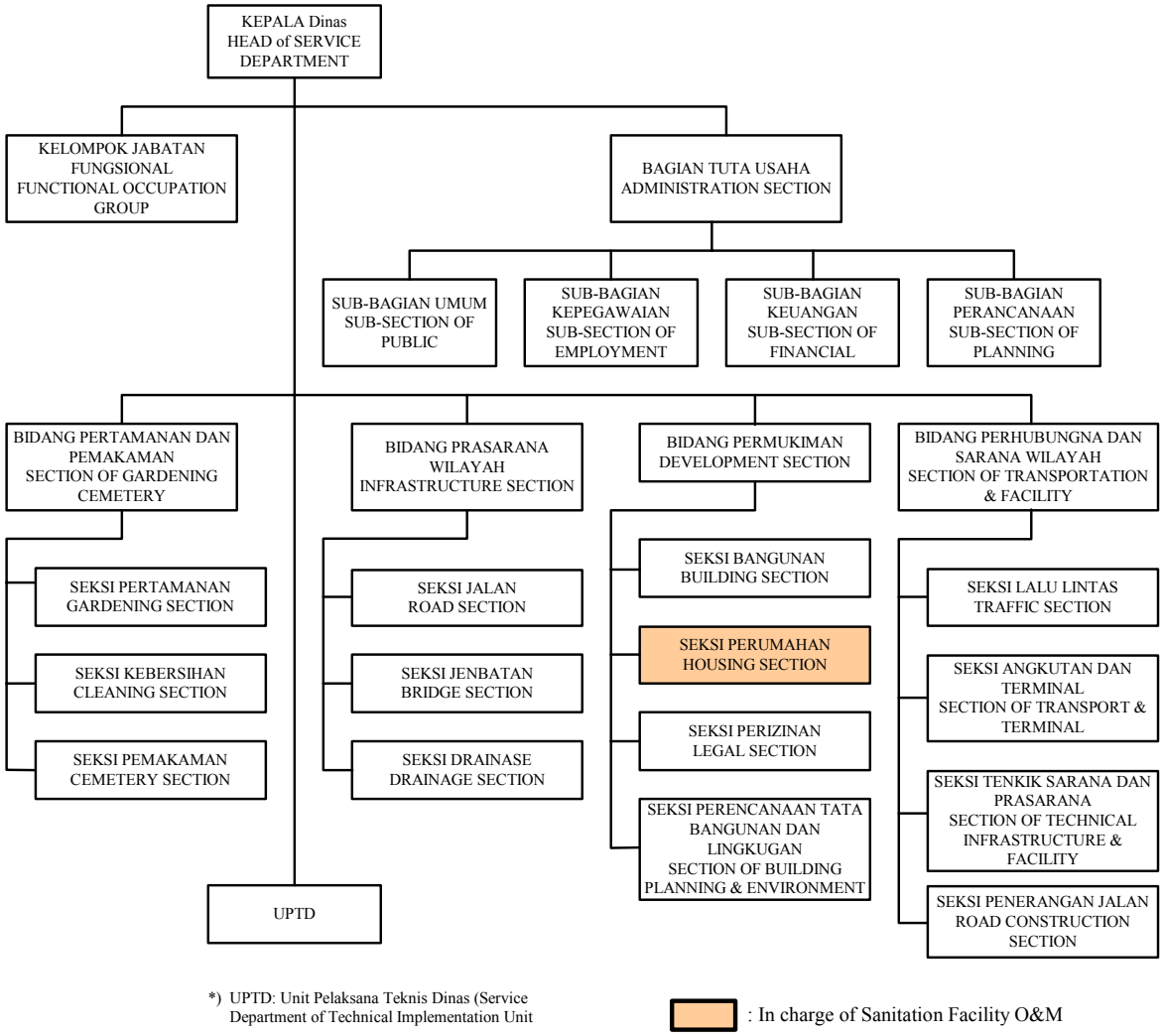


Figure 8.4.2 Organization Chart of Sanitation Facility in Sleman

Removal of the septic tank and pit latrine sludge from each house is done about once in six month to one year in urban area and 2 to 5 years in rural area. KDKK does not own any vacuum cars. There are about 15 private companies in Sleman Regency, and they are collecting sludge. Collection fee of the septic tank sludge which is different by the private companies is approximately 75,000 Rp/m^3.

(3) Bantul Regency

Operation and maintenance of the sanitation facilities of a Bantul Regency is done by Seksi Lingkungan Perumahan (SLP) of Bantul Regency. The organizational chart of SLP is shown below.

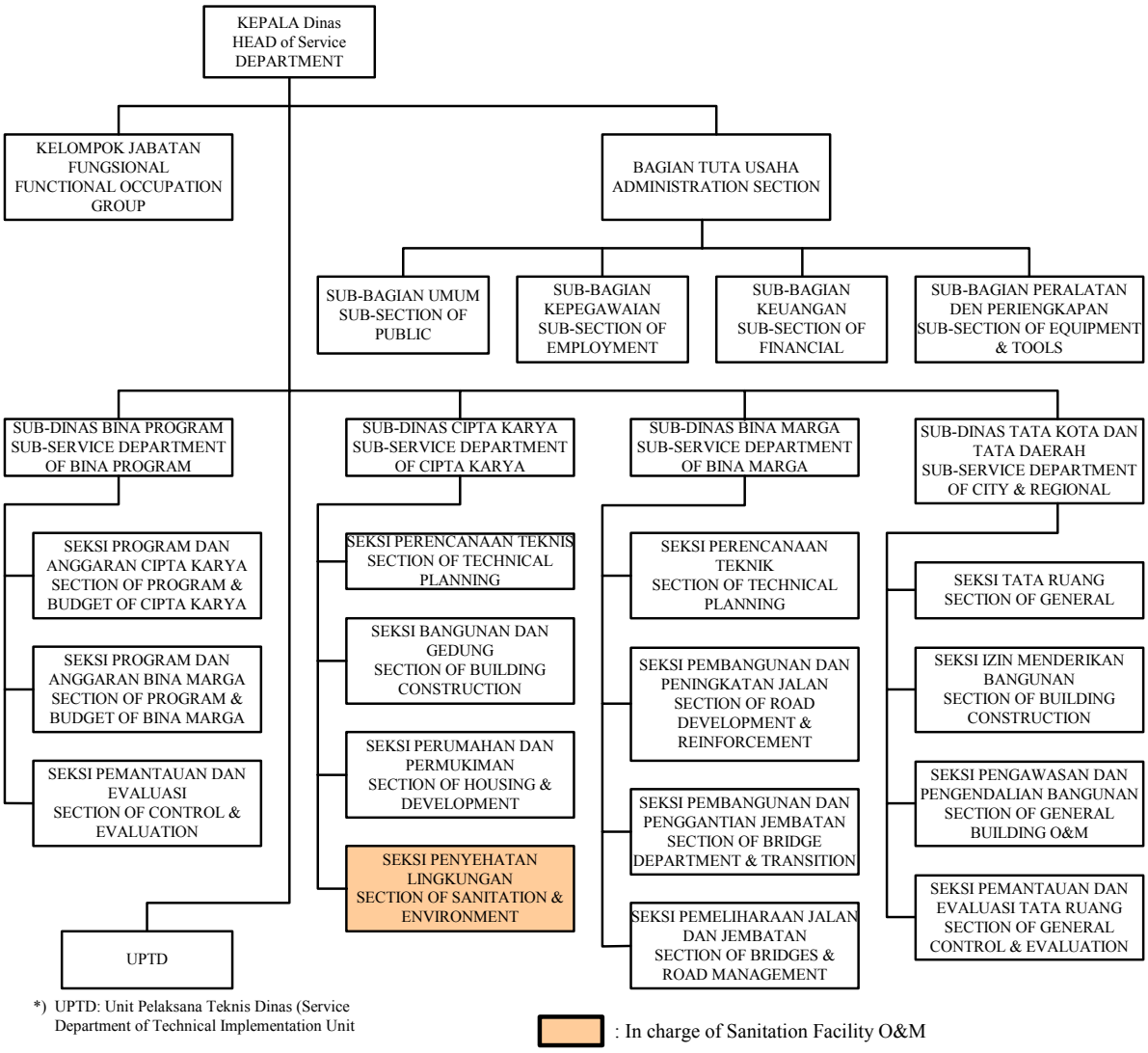


Figure 8.4.3 Organization Chart of Sanitation Facility in Bantul

Removal of the septic tank and pit latrine sludge from each house is done about once in 5 years. SLP owns three vacuum cars, capabilities of 2.2m^3, is doing collection sludge work. Beside, two in three vacuum cars are now out of order and under repairing. There are 3 or 4 private companies in Bantul Regency, and they are collecting sludge substantially besides SLP. Collection fee of the septic tank sludge which differs from company to company is approximately 75,000 Rp/m^3.

8.4.5 Restoration Support Project by Earthquake

The water and the health restoration support project in the earthquake stricken area done by JICA has been implemented for a common well, sanitary facilities and drinking water

production/distribution for the Pundong district, the Pleret district, the Imogiri district, the Dlingo district, Sewon district, and Prambanan district in Bantul Regency. In this project, 750 public lavatories (Septic Tank and Leaching Pit should put together) for 15,000 persons will be constructed by the end of 2006.

UNICEF, construction/repair/installation of the toilet of each house, a public lavatory, a common bathing and the sanitary facilities of a school are doing as a disaster restoration project. The plans of respective facilities and the present number of installation are shown below.

Table 8.4.1 Sanitation Facility Construction/Repair Progress by UNICEF

Facility	Unit	Total	Planned Total
Toilet (MCK)	number	1,855	2,827
Communal Toilet	number of toilet seats	1,794	3,823
Communal Bathrooms / Wash	number of rooms	1,349	1,781
Household Latrines Constructed/Repaired	number	7,178	10,522
Schools reached with Sanitation Facilities	number	165	2,374
Schools Toilets Constructed/ Repaired	number of toilet seats	531	729

8.5 Water Quality Analysis

8.5.1 Parameters and Location of Water Quality Survey

Water quality survey for rivers, ground waters including spring and gray water in ditches were conducted to comprehend actual situation of deterioration of water environment in the Study Area. Analysis items are water temperature, pH, EC, dissolved oxygen, BOD, coliform bacteria count and SS. 20 sampling points were selected from the Study Area based on discussion with counterpart staff. Outline of sampling points and purposes are as given below:

- The upper part (before Municipality inflow), the middle part (Municipality central part) and the downstream part (after flowing into the outskirts of Municipality) for three rivers, WINONGO river, CODE river, GAJAH WONG river, which flows through Yogyakarta Municipality.
  - <Purpose>: Investigation of river pollution that is effected by toilet water, septic tank treated water and grey water from kitchen/Landry/bathroom etc. in Yogyakarta Municipality.

- Influent water/treated water in Sewon sewage treatment plant (Sewon district, Bantul Regency)
  - <Purpose>: To grasp the water quality which flows into sewage treatment plant, and the water quality of the treated water after treatment, and to evaluate plant performance.

- Two points, before and after the discharge of sewage treated wastewater in the Bedog River.
  - <Purpose>: Investigation of the influence of the Bedog River from treated wastewater discharge.

- Septic tank treated wastewater and sallow well. (These are located in the same area and closed to each other (5 to 10m))
  - <Purpose>: Investigation of the influence of which septic tank treated wastewater after underground infiltration effects on the sallow well that is closed to water source.

- Grey water in Yogyakarta Municipality (Sample is taken from channel connected to the river in Yogyakarta Municipality)
  - <Purpose>: To grasp the water quality this generated from the kitchen/shower/laundry in each house.

8.5.2 Water Quality Regulation in the River

The water quality standard of main 3 rivers which are flowing through Yogyakarta Municipality, WINONGO River, CODE River and GAJAH WONG River is specified in the group C of Water Quality Standard in Public Water Body for Environmental Quality Standard (Fishery and animal husbandry use), shown in following Table. There is no standard about BOD in Group C.

Table 8.5.1 Water Quality Standard for Public Water Body (Group-C, partially)

Parameter	unit	Standard Value
Temperature	℃	Normal
pH		5 - 9
DO	mg/L	> 3
BOD	mg/L	Not mentioned

8.5.3 Result of Water Quality Survey

Figure 8.5.1 shows the 22 sampling points for water quality analysis and the result of the analysis is on Table 8.5.2

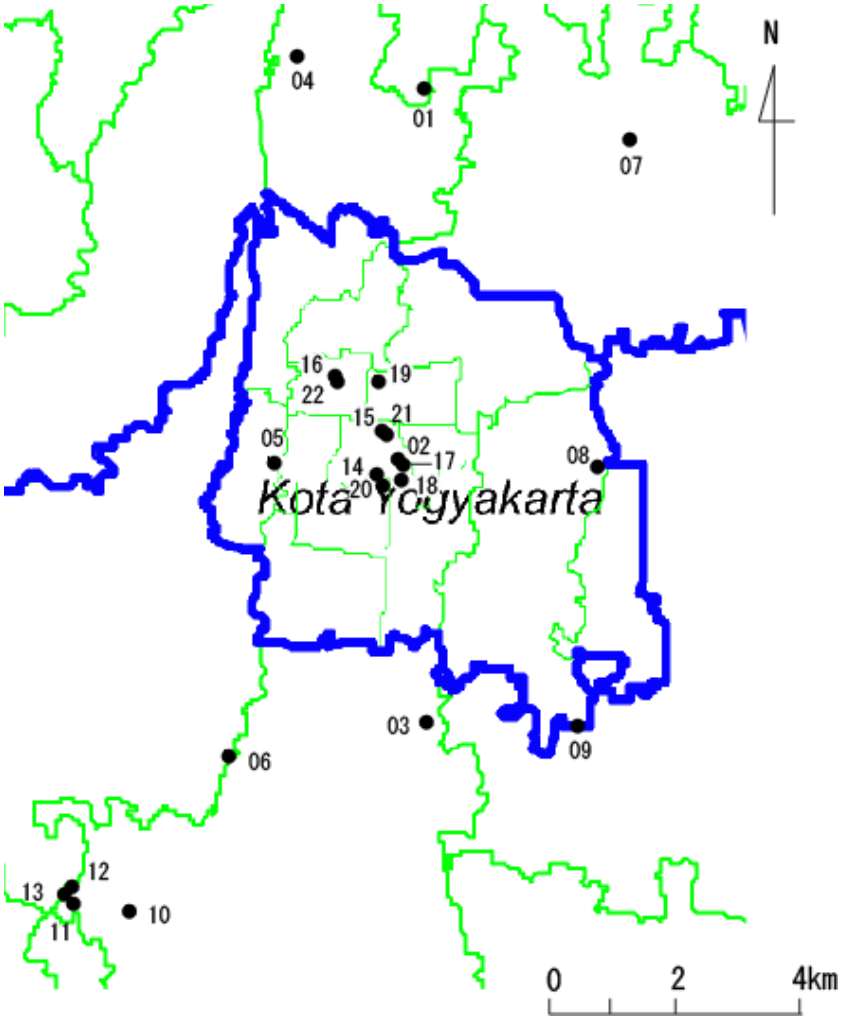


Figure 8.5.1 Location of Sampling Points for Water Quality Analysis

Summary of the result is as follows:

- Coliform were detected in all points except only one shallow well (No.20).
- Escherichia Coli were detected in all points except two shallow wells (No.20, 21).
- Values of Dissolved Oxyigen (DO) in the 3 septic tanks (No.14, 15, 16) and a ditch (No.19) were also 1.5mg/L. This value was the lowest in all.
- The highest value of Suspended Solid (SS) is 90 mg/L and it is found in a septic tank

(No.14)

- For BOD, the values in 3 septic tanks(No.14, 15, 16) were more than 100mg/L. The highest (162 mg/L) was Inflow of IPAL Sewon (No.10)
- The values of pH range from 7.8 to 9.5 (all points in alkaline state)

The result of analysis suggests the followings:

- The concentrations of BOD in the three rivers show high values (5 to 33.8 mg/l), which indicates that the rivers are polluted to a certain extent, especially for Code River (BOD standard value is set as 5 mg/l for Japanese Environmental Quality Standard, Class C). In addition, very high values (43×10^3 to 24×10^5 MPN/100ml) of Total coliform in the three rivers also show that the rivers are polluted.
- The BOD concentration of treated wastewater at Sewon sewage treatment plant is 18 mg/l (89% of removal rate) which is less than regulated discharge value (50 mg/l) and represents a good operation performance.
- The BOD concentrations of effluents from three septic tanks show high values (108.5 to 122.7 mg/l). The BOD concentrations of three sallow wells are more than 4 mg/l. In addition, Total coliform and E-coli are detected in some sallow wells, which indicate that some shallow wells may be polluted by effluents of septic tanks.

Table 8.5.2 Result of Water Quality Analysis

No.	Type of Sample	Address/ Location	Coordinates		Coliform	Escherichia Coli	Temp.	Electrical Conductivity	pH	Dissolved Oxigen	Suspended Solid	BOD
			Latitude	Longitude	CT	E-coli	T	EC		DO	SS	
			(dd'mm'ss's)	(ddd'mm'ss's	MPN/100mL	MPN/100mL	℃	ms/m		mg/L	mg/L	mg/L
01	Code River	Before YY City	S07'45'07'2	E110'22'29'3	93000	43000	29.0	38.0	8.7	6.0	6.0	33.8
02	Code River	In YY City	S07'48'05'8	E110'22'16'6	>2400000	>2400000	32.0	39.0	9.0	6.4	13.0	32.5
03	Code River	After YY City	S07'50'10'6	E110'22'31'1	>2400000	>2400000	30.0	43.0	8.5	4.7	16.0	30.0
04	Winongo River	Before YY City	S07'44'51'9	E110'21'29'1	460000	460000	30.0	34.0	8.9	5.9	8.0	8.8
05	Winongo River	In YY City	S07'48'05'1	E110'21'17'0	1100000	1100000	32.0	39.0	8.6	5.6	11.0	12.5
06	Winongo River	After YY City	S07'50'25'4	E110'20'55'6	1100000	1100000	30.0	41.0	8.3	5.9	11.0	25.0
07	Gajah Wang River	Before YY City	S07'45'31'5	E110'24'07'3	2400000	240000	28.0	41.0	8.2	6.2	4.0	12.5
08	Gajah Wang River	In YY City	S07'48'08'3	E110'23'52-0	>2400000	460000	30.0	40.0	8.8	6.0	10.0	5.0
09	Gajah Wang River	After YY City	S07'50'12'2	E110'23'42'5	240000	240000	31.0	43.0	8.5	4.8	14.0	11.3
10	Inflow of IPAL Sewon	MH before STP	S07'51'39'5	E110'20'09'0	>2400000	>2400000	29.0	56.0	8.3	3.8	70.0	162.5
11	Discharge from IPAL Sewon	Discharge from STP	S07'51'36'2	E110'19'42'3	460000	150000	31.0	52.0	9.1	6.0	14.0	18.0
12	Bedog River	Bedog Riv. before STP discharge	S07'51'30'7	E110'19'41'6	>2400000	460000	28.0	35.0	8.9	5.5	22.0	23.8
13	Bedog River	Bedog Riv. after STP discharge	S07'51'32'8	E110'19'40'4	>2400000	210000	29.0	41.0	8.9	5.0	20.0	26.3
14	Septic Tank	In YY City	S07'48'11'2	E110'22'07'1	>2400000	>2400000	33.0	80.0	9.4	1.5	90.0	122.7
15	Septic Tank	In YY City	S07'47'50'9	E110'22'09'4	>2400000	>2400000	29.0	84.0	9.2	1.5	59.0	108.5
16	Septic Tank	In YY City	S07'47'25'2	E110'21'47'2	>2400	460	28.0	82.0	9.5	1.5	55.0	116.3
17	Ditch	In YY City	S07'48'05'8	E110'22'16'6	>2400000	>2400000	30.0	54.0	8.7	2.3	51.0	53.8
18	Ditch	In YY City	S07'48'14'7	E110'22'19'0	>2400000	>2400000	31.0	44.0	9.0	4.0	34.0	30.0
19	Ditch	In YY City	S07'47'26'4	E110'22'07'6	>2400000	>2400000	30.0	79.0	8.7	1.5	19.0	71.3
20	Shallow Well	In YY City	S07'48'11'2	E110'22'07'1	0	0	30.0	58.0	8.7	4.8	8.0	4.8
21	Shallow Well	In YY City	S07'47'50'9	E110'22'09'4	9000	0	29.0	56.0	7.8	4.0	3.0	4.0
22	Shallow Well	In YY City	S07'47'25'2	E110'21'47'2	43	43	29.0	53.2	8.4	4.3	4.0	4.4

8.6 Identified Problems of Sewerage System/Sanitation

8.6.1 Sewerage

(1) Low House Connection Ratio in Sleman Regency

Although the sewerage pipe is installed in a part of Sleman Regency, wastewater in this area is not treated in Sewon sewage treatment plant, since the house connection pipe is not installed.

(2) Extension of Sewer and House Connection

Although sewage treatment plant has been operated for ten years, inflow amount is about 60% of the planned value. It is necessary to install additional sewer and house connection pipe in sewerage area.

(3) Operation and Maintenance Organization of Sewage Treatment Plant

Operation management of the sewage treatment plant is being conducted in the good condition. At present, IPAL has implemented operation and maintenance under DIY. However, this is temporarily and permanent organization hasn't been decided yet. It is necessary to determine the operation and maintenance organization of sewage treatment plant on discussion among DIY, Yogyakarta Municipality, Sleman Regency and Bantul Regency.

8.6.2 Community Plant

39 community plants in Yogyakarta Municipality is operating in good condition at present. Most of all the community plants have operated for less than 3 or 4 years, and the problem has not occurred since the facilities/equipment is new.

8.6.3 Sanitation Facility

(1) Low Septic Tank Installation Rate in Bantul Regency

Although pit latrine is installed in almost all the houses in Bantul Regency as sanitation facility, the installation rate of septic tank as On-site treatment is low compared with Yogyakarta Municipality and Sleman Regency.

(2) Influence to Shallow Well

It is anxious about the influence to shallow well, because a great portion of outflow water from pit latrine and treated water from septic tank is infiltrated into underground.

(3) Problem of Operation and Maintenance Organization

Although there are operation and maintenance organizations of sanitation facilities in Yogyakarta Municipality, Sleman Regency and Bantul Regency, most sludge collection work is not done by those organizations since they do not own enough equipment. Since private companies are entrusted from respective houses, and are collecting sludge, those organizations do not grasp all the situation of respective house facilities. Those organization should grasp the situation in their area.

CHAPTER 9

STATUS OF

ON-GOING BULK WATER SUPPLY PROJECT

CHAPTER 9 STATUS OF ON-GOING BULK WATER SUPPLY PROJECT

9.1 General and History of the DBOT Bulk Water Supply Project

Water supply requirements for Kartamantul are increasing from year to year, however sustainable water resource in Karamantul area is limited. Three PDAMs of the Kartamantul area are facing difficulties to satisfy the increasing water demand.

Under this situation, the DIY Provincial Government started to consider possibility of water transmission from spring water source in Magelang Regency as an action plan of Urban Water Supply Program in Yogyakarta. At the same time, the DIY Provincial Government agreed with private sector to design and implement the project as "DBOT Bulk Water Supply Project" (DBOT BWSP).

History concerning the DBOT BWSP is shown in Table 9.1.1 Among correspondences and agreements shown on Table 9.1.1, milestones of the DBOT BWSP are shown in Figure 9.1.1

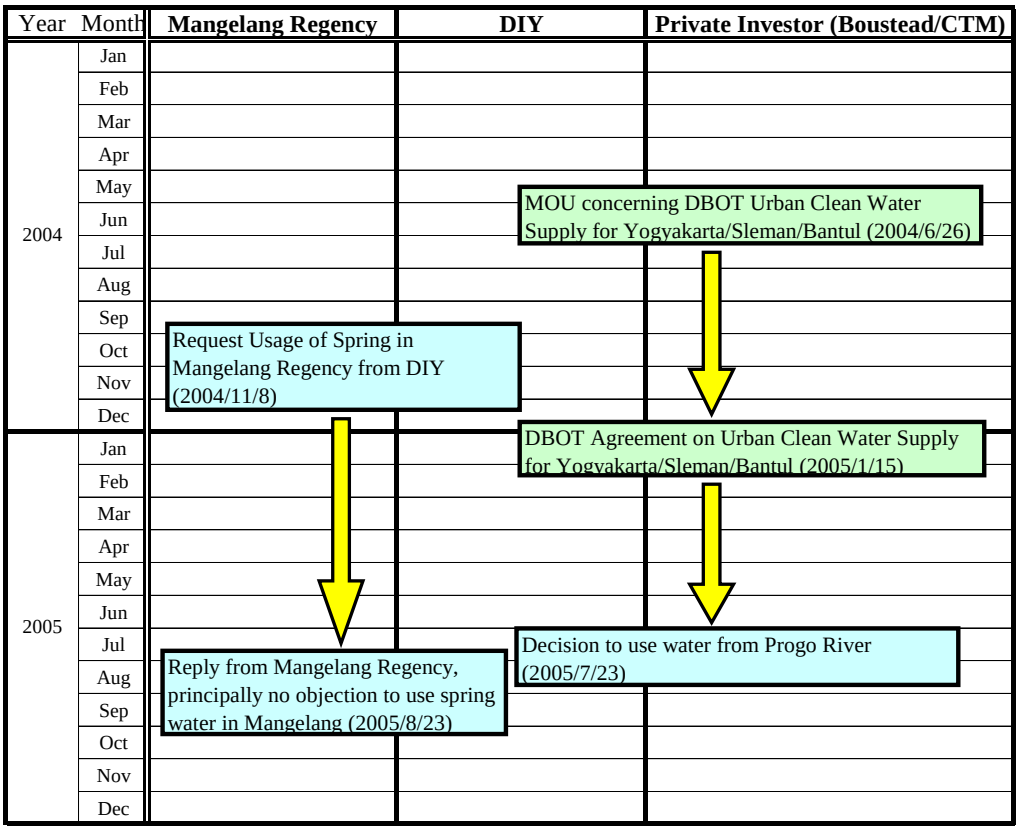


Figure 9.1.1 Milestones of DBOT Bulk Water Supply Project

Table 9.1.1 History of DBOT Bulk Water Supply Project (1/2)

Date	Type	Ref. No.	From/Between	To/Between	Contents
2001/1/24	Agreement		Yog/Sleman/Bantul		Signing of corporation between government of Bantul regency, Sleman Regency and Yogyakarta regency number: 09/PERJ/BT/2001 number: 07/PK.KDH/2001 number:04/PK/2001 about water treatment Agreement essential among others
2002/10/14	Letter	690/3356	DIY Governor	Central Java Governor	Application for clean water supply cooperation implementation
2004/3/24	Letter	690/1076	DIY Governor	Central Java Governor	Water resource use permit in Mangelang Regency
2004/6/23	Letter	539/08282	Central Java Governor	DIY Governor	Water resource use permit in Mangelang Regency
2004/6/26	Agreement	610/2517	DIY Governor	Boustead Singapore	Head of Agreement (MOU), DBOT of urban clean water supply for Yogyakarta city, Sleman regency and Bantul regency in DIY Province
2004/9/24	Recommendation	660.1/23/29/RK	KANPEDALDA		Environmental feasibility recommendation from regional environmental impact management board (KANPEDALDA), concerning study and review five water springs in Mangelang regency areas which was initiated by PT CTM as an investor
2004/10/8	Decision	41/TIM/2004	DIY Governor		Formation of study and development team for clean water supply in DIY province
2004/11/8	Letter	690/4559	DIY Governor	Mangerang Regency	Water resource use recommendation in Mangelang Regency
2004/12/31	Letter	143/706/01/2004	Mangerang Regency	DIY Governor	Application for water resource use recommendation in Mangelang Regency (cannot be issued yet while waiting for analysis study concerning water volume sufficiency, AMDAL & eternality)
2005/1/15	Agreement		DIY Governor	PT CTM	DBOT agreement of water supply for the city of Yogyakarta and the regencies of Sleman and Bantul in the province of Special region of Yogyakarta, DBOT Agreement
2005/4/14	Letter	112/ctm-pdam/IV/05	PT CTM	DIY Governor	Water treatment plant development proposal in brogo for Yogyakarta water supply sector project (YWSSP) works - as an alternative of raw water resource for urban clean water supply in Yogyakarta
2005/5/16	Letter	610/1479	DIY Governor	PT CTM	Study on raw water resource taking from Progo river (approval to conduct a study)
2005/5/30	Letter	116/ctm-pdam/V/05	PT CTM	DIY Governor	Progo river's raw water resource sufficiency study (its contents among other notification to conduct Progo river's water scale study as well as a request to determine Progo River as raw water source)

Table 9.1.1 History of DBOT Bulk Water Supply Project (2/2)

Date	Type	Ref. No.	From/Between	To/Between	Contents
2005/7/1	Letter	005/2147	DIY Governor	Boustead Singapore	Assignment of DBOT Joint Secretariat Staff of urban clean water supply in Yogyakarta
2005/7/23	Letter	690/2341	DIY Governor	PT CTM	Progo river raw water resource determination
2005/8/23	Letter	539/528/05/VII/2005	Mangerang Regency	DIY Governor	Water resource taking recommendation in Mangelang regency (its contents among other : upon water spring volume observation result has been obtained, regional government of Mangerang regency principally has no objections concerning water taking plan in the amount of 1,000 liters/second provided that Mangelang regional government Cq. PDAM Mangelang regency will organize water distribution to the border areas of Mangelang regency and DIY)
2005/8/26	Letter	690/2848	DIY Governor	Yog/Sleman/Bantul	Follow up on urban clean water supply plan in Yogyakarta (it contains water spring licensing process submission in Mangelang regency, determination of Progo river as raw water resource for Yogyakarta clean water supply plan and its action plan)
2005/8/30	Letter	118/ctm-pdam/VIII/05	PT CTM	DIY Governor	Raw water resource from Progo river (its contents among other : study result submission of Progo river water scale and notification that investor was unable to fulfill inquiry from regional government of Mangelang regency to make separate MOU for the same project)

As shown in Figure 9.1.1, the first milestone was agreement concerning Urban Clean Water Supply for Yogyakarta Municipality and Regencies of Sleman and Bantul (MOU of DBOT BWSP) in June 2004. After the agreement, the DIY Government requested usage of spring water in Mangelang Regency as a water source for the DBOT BWSP in November 2004. Since it took about 10 months for having reply and agreement from Mangelang Regency in August 2005, DIY Government decided to alternate water source to the River of Plogo in July 2005.

After the decision concerning alternation of the water source, the private sector conducted feasibility study which considered water source from Plogo River in year 2005.

9.2 Scope of the DBOT Bulk Water Supply Project

According to the explanation by DIY, this project will be implemented as DBOT system. The private sector will conduct detailed design, construction, operation and maintenance. After DBOT agreement period (25 years), the facilities (assets) which were constructed by the private sector will be transferred to the DIY Government.

The private sector should conduct study and other assessments which are required to complete feasibility study of the project before commencement of the construction work.

This agreement is for Phase I of the DBOT BWSP and definition of the phasing is defined in the contract document as follows.

> **[Abstract of the Contract Document]**
> *Phase 1 shall mean the first phase of this DBOT Agreement wihc is for the (initial) period of 25 years calculated from the Commencement of the DBOT period with an agreed minimum capacity water supply of 1,000 litre/second. and a Minimum Off Take of 1,000 litre/second. In the event of any additional requirement to fulfill the needs for Clean Water in the Project Areas occurring at any time during the Initial Phase 1 Period, such Clean Water supply shall be provided by the Second Party (private sector) in Phase 2 for the period of 25 yeas on the same terms and provisions as are applicable in respect of the Initial Phase 1 Period.*
>
> *In the event of further additional requirement to fulfill the needs for Clean Water in the Project Area occurring at any time after the commencement of the Phase 2 period, such Clean Water supply shall be provided by the Second Party in Phase 3 for a period of 25 years on the same terms and provisions as applicable in respect of the initial Phase 1 Period.*

Major construction work which will be included in the DBOT BWSP are as follows.

- Construction of WTP of which capacity is 1,000 l/sec about 3 km away from Karang Talum iriigation gate, land space required will be about 10 ha.
- Installation of raw water transmission pipe, raw water will be transmitted to the WTP by

gravity from Mataram canal

- Installation of treated water transmission pipe to reservoirs of respective PDAM, treated water from the WTP (GL around 165m) will be transmitted to PDAMs Bantul and Yogyakarta (GL around 145 – 160m) by gravity. For the PDAM Sleman, water will be pumped to the reservoir.
- Construction/expansion of reservoirs for respective PDAMs

9.3 Current Status of the Project and Issues Encountered

According to the DIY Provincial Government, EIA concerning BWSP should have been completed by August 2006 and upon approval of the EIA, detailed engineering design should have been started by private investor. However, as stated in the previous section, no significant progress of the BWSP was observed.

Since provision of detail information is precondition of the preparation of the Master Plan by the JICA Study Team which is scheduled to start from May 2007, the JICA Study Team prepared and submitted "Major Information Required concerning DBOT Bulk Water Supply Project" to the DIY Government in January 2007. List of requested major information are as follows:

- Water quantity (l/s) which will be supplied to Sleman Regency, Yogyakarta City, Bantul Regency

The JICA Study Team will calculate future water demand and the demand will be compared with the existing supply capacity. Gap or shortage of supply capacity should be fulfilled by the DBOT Bulk Water Supply Project.

Based on the calculated future water demand and Bulk Water Supply quantity, the Study will define/identify service area where should be supplied by the Bulk Water Supply.

- Exact locations of reservoirs which will be constructed at the point of supply in Sleman Regency, Yogyakarta City, Bantul Regency, together with respective capacity, ground elevation, High/Low water level

The DBOT Bulk Water Supply Project will transmit water to respective reservoirs and the JICA Study will prepare pipeline development plan downstream from the respective reservoir. To prepare pipeline plan, exact location and ground level, high/low water level of the respective reservoir are indispensable for pipeline hydraulic network analysis.

Capacity of each reservoir will be the basic information to judge whether the reservoir can absorb hourly fluctuation of water consumption.

- Water quality which will be supplied

Treated water quality at treatment plant which will be constructed under the Bulk Water Supply Project will be required and estimated residual chlorine concentration at the reservoir will be also required to study necessity of additional chlorine injection at reservoir.

- Implementation/construction schedule, timing of commencement of bulk water supply

Timing of commencement of bulk water supply will affect master plan preparation significantly. Without assurance of commencement timing, water supply master plan will be very difficult considering future water demand increase.

- Bulk water supply project implementation structure and legal/contractual status

In the Master Plan, organizational structure and system of coordination among existing three PDAMs will be discussed. For this purpose, structure or characteristics of the bulk water supply body will be required together with its legal/contractual status.

- Bulk water supply price and conditions of supply

The Master Plan will include financial forecasts and analysis. Price and condition of bulk water supply will affect these study and analysis.

It should be noted that above listed information are only major items. In the course of the Master Plan preparation, additional detail information will be required.

Unfortunately, these requested information were not provided by DIY since the DBOT Bulk Water Supply Project was derailed as described in Chapter 1.

CHAPTER 10

RESULTS OF SOCIO-ECONOMIC SURVEY

CHAPTER 10 RESULTS OF SOCIO-ECONOMIC SURVEY

10.1 Methodology of Survey

The Study Team conducted the questionnaire survey in order to grasp the living conditions of the target areas' inhabitants. The primary focus was water usage and expectations with respect to water. The methodology of the survey is described below.

(1) Target areas

The target areas of the questionnaire survey were Bantul Regency, Sleman Regency and Yogyakarta City. 60 kelurahan/desa were selected from the 10 districts of each Regency/City according to the balance of rural/urban classification. The table below shows selected District (Kecamatan) and kslurahan/desa.

Table 10.1.1 List of Target Districts and Kelurahan/Desa

	BANTUL		SLEMAN		YOGYAKARTA	
	DICTRICT	**Kelurahan/Desa***	**DICTRICT**	**Kelurahan/Desa***	**DICTRICT**	**Kelurahan/Desa***
01	Kasihan	Tirtonirmolo Tamantirto	Mlati	Tirtoadi Sendangadi	Kotagede	Prenggan Rejowinangun
02	Sewon	Pendowoharjo Bangunharjo	Gamping	Banyuraden Balecatur	Gondokusuman	Baciro Klitren
03	Banguntapan	Baturetno Potorono	Sleman	Trimulyo Caturharjo	Danurejan	Suryatmajan Tegalpanggung
04	Piyungan	Srimartani Srimulyo	Depok	Condong catur Maguwoharjo	Pakualaman	Purwokinanti Gunungketur
05	Pleret	Wonokromo Bawuran	Ngaglik	Sinduharjo Sardonoharjo	Wirobrajan	Wirobrajan Patangpuluhan
06	Bantul	Bantul Palbapang	Ngemplak	Wedomartani Umbulmartani	Gedongtengen	Pringgokusuman Sosromenduran
07	Pundong	Srihardono Panjangrejo	Pakem	Pakembinangun Hargobinangun	Jetis	Bumijo Cokrodiningratan
08	Bambanglipuro	Mulyodadi Sidomulyo	Tempel	Lumbungrejo Pondokrejo	Tegalrejo	Bener Karangwaru
09	Jetis	Canden Sumberagung	Kalasan	Tirtomartani Purwomartani	Kraton	Patehan Panembahan
10	Sedayu	Argomulyo Argodadi	Turi	Girikerto Donokerto	Mantrijeron	Mantrijeron Suryodiningratan

(2) Number of samples

The Socio-Economic Survey consists of (i) an interview survey to 60 representatives who are village heads and/or people in charge of development and (ii) a questionnaire survey targeting 1200 individual households to analyze living conditions, particularly water consumption.

- Village Profiles : 60 samples
- Household Information: 1200 samples

(3) Method of Analysis

The results of 60 interview cases were utilized for understanding the socio-economic backgrounds of inhabitants while the collected 1200 cases were processed by statistical analysis as qualitative data.

10.2 Contents of Socio-Economic Survey

(1) Village Profile

The format and collected village profiles are attached in the Appendix 10.1 The major contents of the village profile are listed below.

- Population and land size
- Industries and agriculture activities
- Public facilities and village infrastructure such as schools and health posts
- Special events and accidents in the village, such as damage due to earthquake
- Condition of water supply

(2) Household Survey

The format of the household survey is attached in the Appendix 10.2 The contents of the household survey are listed as follows.

- Members of the households
- Economic condition of the households
- Water utilization including volume of consumption and cost
- Present reputation and/or recognition of water supply system provided by public sectors
- Expectation of water supply system
- Sanitation and Health

10.3 Results of Socio-Economic Survey (Village Profile and Household Survey)

In this chapter, the results of the village profile and household questionnaire survey is synthetically analyzed. The analyzed quantitative data mainly shows the socio-economic condition and water utilization of the inhabitants while the qualitative information supplies supporting background information.

10.3.1 Profiles of Targeted Villages

The location of the selected kelurahan/desa is shown in the map below. As mentioned in Chapter 3, “Natural and Socio-Economic Condition of the Study Area,” the targeted 3 regencies have

distinctive characters due to the topography and industrial structure.

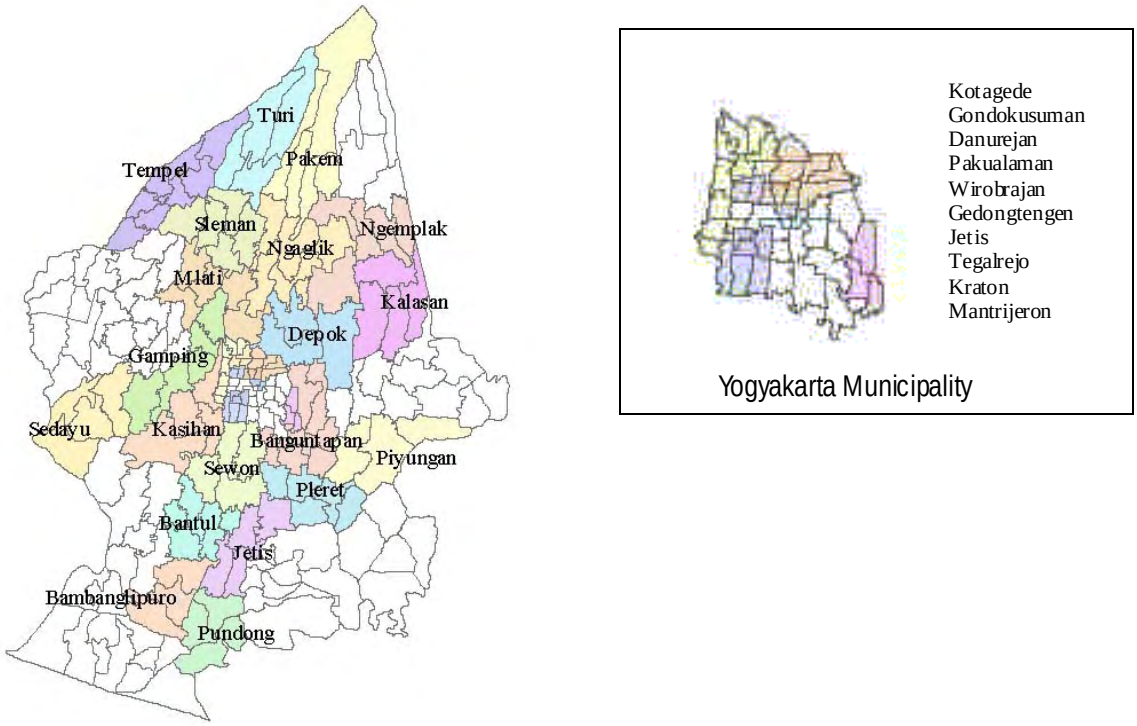


Figure 10.3.1 Location Map of the Targeted Kulurahan/desa

Table 10.3.1 Summary of Targeted Kulurahan/Desa Profile

District	Name of the City/Village	Land Size (Ha)	Population	Number of Households	Percentage of Disseminations				
					PDAM	PU	Private Well	River/ Pond	Others
BANTUL									
Kasihan	Tirtonirmolo	557	18,542	3,368	0%	0%	85%	0%	15%
	Tamantirto	578	14,887	3,209	5%	0%	80%	0%	15%
Sewon	Pendowoharjo	594	17,588	4,509	10%	0%	85%	5%	0%
	Bangunharjo	604	18,388	7,119	10%	0%	85%	5%	0%
Banguntapan	Baturetno	1,073	11,142	2,988	10%	5%	75%	10%	0%
	Potorono	613	9,331	2,157	0%	0%	99%	1%	0%
Piyungan	Srimartani	767	11,599	3,153	15%	20%	60%	5%	0%
	Srimulyo	1,096	13,850	4,510	10%	15%	70%	5%	0%
Pleret	Wonokromo	2,896	10,305	3,900	0%	0%	98%	2%	0%
	Bawuran	5,469	5,636	1,494	0%	39%	60%	1%	0%
Bantul	Bantul	5,667	15,074	4,037	40%	0%	50%	10%	0%
	Palbapang	1,178	14,195	3,790	10%	0%	80%	10%	0%
Pundong	Srihardono	544	12,175	3,146	0%	0%	95%	5%	0%
	Panjangrejo	1,686	10,254	3,170	0%	0%	99%	1%	0%
Bambanglipuro	Mulyodadi	644	11,799	4350	0%	0%	95%	5%	0%
	Sidomulyo	691	14,372	3,567	0%	0%	100%	0%	0%

District	Name of the City/Village	Land Size (Ha)	Population	Number of Households	Percentage of Disseminations				
					PDAM	PU	Private Well	River/ Pond	Others
Jetis	Canden	534	10,316	3,334	0%	0%	95%	5%	0%
	Sumberagung	974	12,451	3,170	0%	0%	97%	3%	0%
Sedayu	Argomulyo	291	13,783	3,137	25%	0%	65%	0%	10%
	Argodadi	1,473	11,165	2,270	0%	0%	97%	0%	3%
SLEMAN									
Mlati	Tirtoadi	849	8,252	2,833	10%	0%	90%	0%	0%
	Sendangadi	721	10,769	4,126	25%	1%	74%	0%	0%
Gamping	Banyuraden	400	12,219	3,342	10%	4%	86%	0%	0%
	Balecatur	931	15,363	3,766	10%	5%	85%	0%	0%
Sleman	Trimulyo	637	8,234	1,938	0%	15%	85%	0%	0%
	Caturharjo	898	13,549	3,996	0%	0%	100%	0%	0%
Depok	Condong Catur	1,089	33,897	8,740	30%	0%	70%	0%	0%
	Maguwoharjo	1,419	25,930	7,877	10%	2%	88%	0%	0%
Ngaglik	Sinduharjo	1,480	12,875	3,990	30%	0%	70%	0%	0%
	Sardonoharjo	9,649	15,351	3,027	1%	0%	89%	10%	0%
Ngemplak	Wedomartani	845	19,745	4,882	20%	0%	80%	0%	0%
	Umbulmartani	216	7,062	2,044	10%	5%	85%	0%	0%
Pakem	Pakembinangun	360	6,082	1,577	20%	10%	70%	0%	0%
	Hargobinangun	1,658	7,221	2,414	15%	20%	65%	0%	0%
Tempel	Lumbungrejo	3,309	6,097	578	0%	10%	90%	0%	0%
	Pondokrejo	363	5,318	1,432	0%	0%	100%	0%	0%
Kalasan	Tirtomartani	726	12,736	3,906	0%	0%	100%	0%	0%
	Purwomartani	1,117	30,553	7,396	50%	0%	50%	0%	0%
Turi	Girikerto	1,311	8,685	1,366	0%	20%	70%	10%	0%
	Donokerto	742	8,984	2,489	2%	12.5%	85.5%	0%	0%
YOGYA									
Kotagede	Prenggan	99	11,185	2,620	30%	0%	70%	0%	0%
	Rejowinangun	125	11,820	2,547	35%	0%	65%	0%	0%
Gondokusuman	Baciro	106	21,471	4,402	70%	0%	30%	0%	0%
	Klitren	68	17,609	2,613	75%	0%	25%	0%	0%
Danurejan	Suryatmajan	18	6,783	1,127	55%	0%	45%	0%	0%
	Tegalpanggung	35	11,736	2,936	60%	0%	40%	0%	0%
Pakualaman	Purwokinanti	33	8,973	1,880	55%	0%	45%	0%	0%
	Gunung Ketur	30	6,022	949	30%	0%	70%	0%	0%
Wirobrajan	Wirobrajan	67	10,465	2,200	90%	0%	10%	0%	0%
	Patangpuluhan	44	5,892	1,774	40%	0%	60%	0%	0%
Gedongtengen	Prinngokusuman	46	14,582	3,424	20%	0%	80%	0%	0%
	Sosromenduran	50	10,689	3,000	90%	0%	10%	0%	0%
Jetis	Bumijo	57	13,755	2,339	82%	0%	18%	0%	0%
	Cokrodiningratan	66	13,130	2,522	80%	0%	20%	0%	0%
Tegalrejo	Bener	58	5,178	1,285	60%	0%	35%	5%	0%
	Karangwaru	70	11,386	2,271	50%	20%	30%	0%	0%
Kraton	Patehan	40	8,251	1,796	30%	0%	70%	0%	0%
	Panembahan	66	13,487	3,234	60%	0%	40%	0%	0%
Mantrijeron	Mantrijeron	86	12,721	2,442	35%	0%	65%	0%	0%
	Suryodiningratan	85	12,490	2,380	30%	0%	70%	0%	0%

10.3.2 Profile of Sampled Households

The following table shows the number of samples classified by designated urban/rural classification.

Table 10.3.2 Number of Collected Samples by Urban/Rural Classification

	Urban			Rural	
	Big city	Middle city	Small city		Total
Bantul		40	280	80	400
Sleman		20	280	100	400
Yogyakarta	80	60	260		400
Total	80	120	820	180	1,200

The number of household members is 4.5 on average, and there are no large differences among the 2 regencies and 1 municipality (hereinafter called 3 regions) in this regard. Figure 10.3.2 is a histogram showing the frequency of distribution classified by the 3 regions. As the living standard improves, the size of the household in rural areas generally tends to decrease, and a migration tendency to Yogyakarta municipality is observed as well: [1]in 2005 the population growth rate of Bantul Regency was lowest, 0.91%, and that of Sleman Regency was 1.18%, whereas that of Yogyakarta was 5.50%. (refer to Chapter 3.2.2)

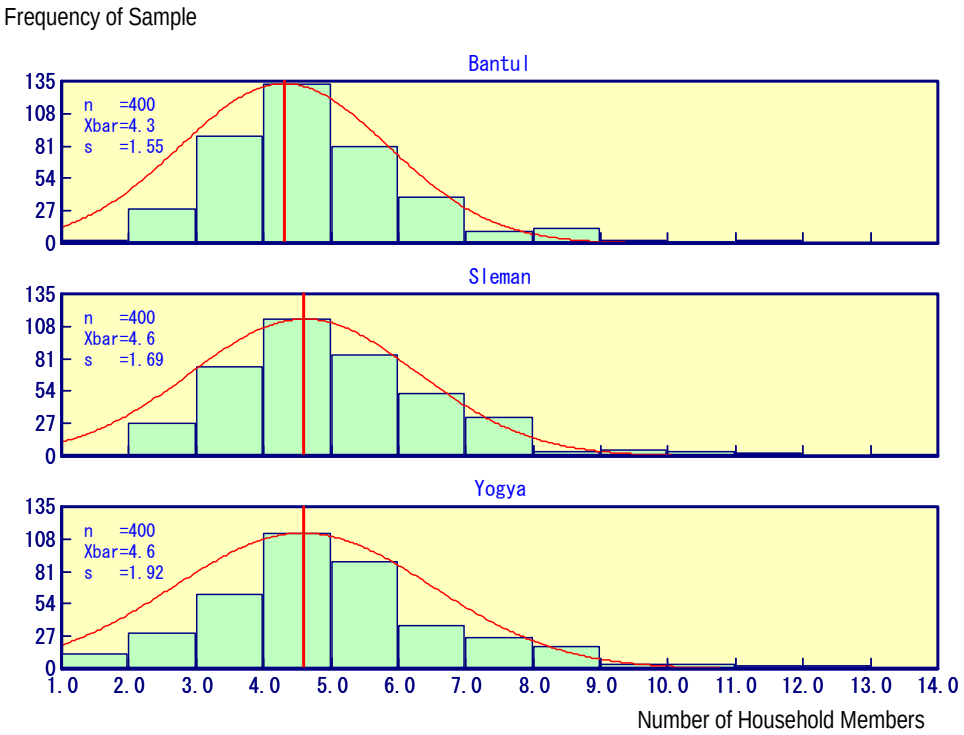


Figure 10.3.2 Number of Household Members

[1] BPS Statistics of D.I. Yogyakarta Province, 2005

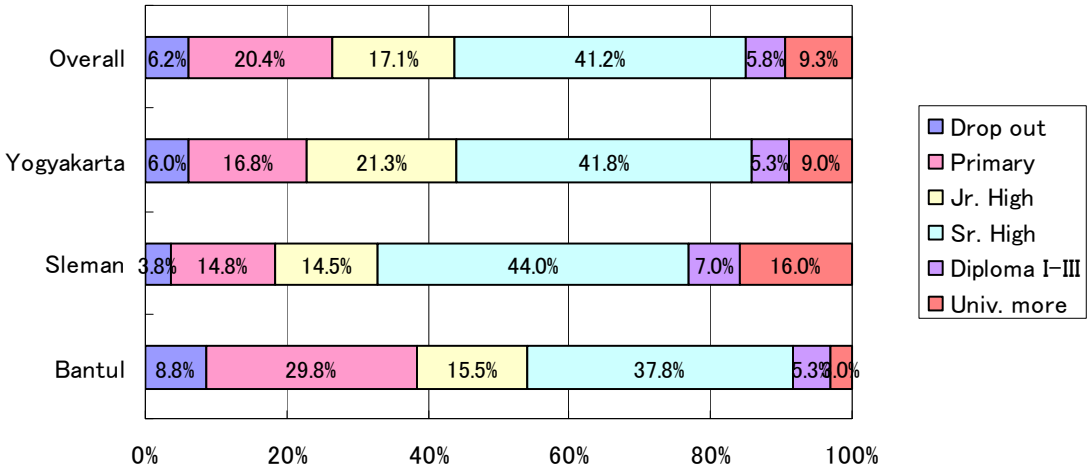


Figure 10.3.3 Education Level of the Heads of Households

Figure 10.3.3 illustrates the education level of the heads of household. 41.2% of them graduated from Sr. High, 5.8% received Diploma I-III and 9.3% have a bachelor's degree. Sleman shows the highest education level.

There are wealthy residential areas in Sleman Regency that are suburbs of Yogyakarta Municipality, and their education and income levels are higher as shown in Table 10.3.3 and Figure 10.3.4. The average monthly household income in Sleman Regency, Rp.1,706,875, is the highest among the 3 regions. The major industries in Bantul are agriculture and small scale industries, explaining the lower average monthly income of Rp.774,999 per household in that regency.

It is obvious that the highly educated households tend to have higher incomes. However, in addition, the household location relates to income level as well. Focusing on the variance of income level, Sleman's incomes are very scattered. In other words, the wealthy households have significantly influenced the averages. The detailed data of expenditure and income are shown in Figure 10.3.4. These histograms indicate the structures of the living standards in each region.

Table 10.3.3 Income of Household by Education Level (Rp./month)

	Bantul	Sleman	Yogyakarta	Average
Primary drop out	482,374	758,333	682,340	606,521
Primary	686,675	998,164	783,761	789,496
Jr. High	637,500	1,299,080	1,005,800	980,737
Sr. High	822,546	1,758,210	1,268,714	1,311,857
Diploma I-III	1,373,111	2,372,321	1,700,198	1,870,921
Univ	1,495,833	2,519,792	1,810,824	2,182,199
Average	774,999	1,706,875	1,167,369	1,220,963

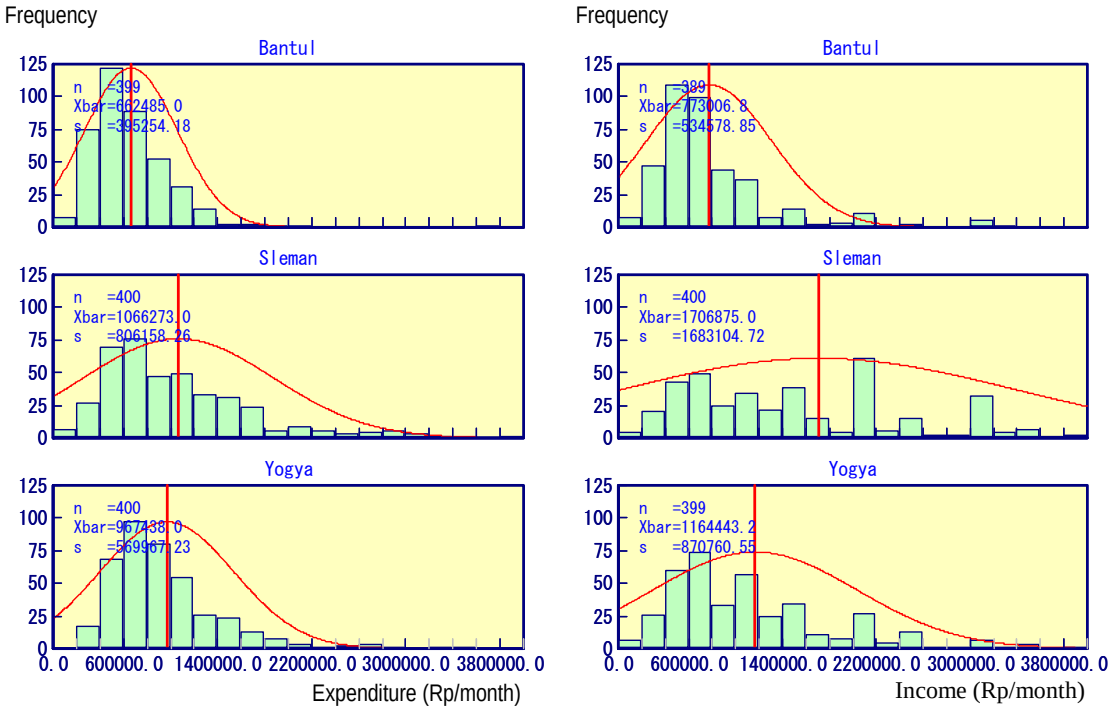


Figure 10.3.4 Expenditure and Income of Household (Rp./month)

Household income has never been researched by BPS statistics in DIY Province because the inhabitants are not expected to reveal their real income. BPS statistics has instead used expenditure data. Therefore, JICA Study Team compared the average expenditure per capita with that researched by BPS, which was shown in Figure 3.2.6 of Chapter 3, to confirm tendencies although the survey methodologies were different and the latest data was from the year 2005.

According to the Socio-Economic Survey in 2006 conducted by JICA Study Team, the average monthly expenditure per capita was Rp.216,847, consisting of Rp.124,143 (57%) for food and Rp.92,704 (43%) for non-food while the provincial average surveyed by BPS in 2005 was Rp.337,747, consisting of Rp.145,352 (43%) for food and Rp.192.365 (57%) for non-food. The expenditure dropped 35.8% and the balance of food and non-food was reversed. The average expenditure in 2006 dropped to the same level as was seen between 2001 and 2002. Since the survey methods differed in 2006 and 2005 it is hard to analyze constant tendencies, but the natural disasters in 2006 might have influenced economic activities of daily life and played a part in the drastic expenditure decrease.

In terms of the expenditure and income by regencies and cities, there is no appropriate official information to be compared with. BPS' approach was designed to determine the provincial expenditure but not the regency's expenditure, so the sample number was fit for that purpose. On the other hand, the data for regional expenditure surveyed by JICA Study Team was not collected by strict random sampling. The only clear conclusions that can be made are a) the expenditure of

Bantul Regency is lowest, b) the expenditures of Sleman Regency and Yogyakarta City have been at similar levels but Yogyakarta City's was a bit higher in previous years and c) the regency's average incomes listed above are not secured by census. The lower expenditure in Yogyakarta City in 2006 might be caused by earthquake.

Figure 10.3.5 illustrates the diffusion rate of major assets. 95% of households have television and 84% have radio. Irons are present in 87% of households, and 79% of respondents have motorcycles. 81% of respondents answered that they have their own well in their house.

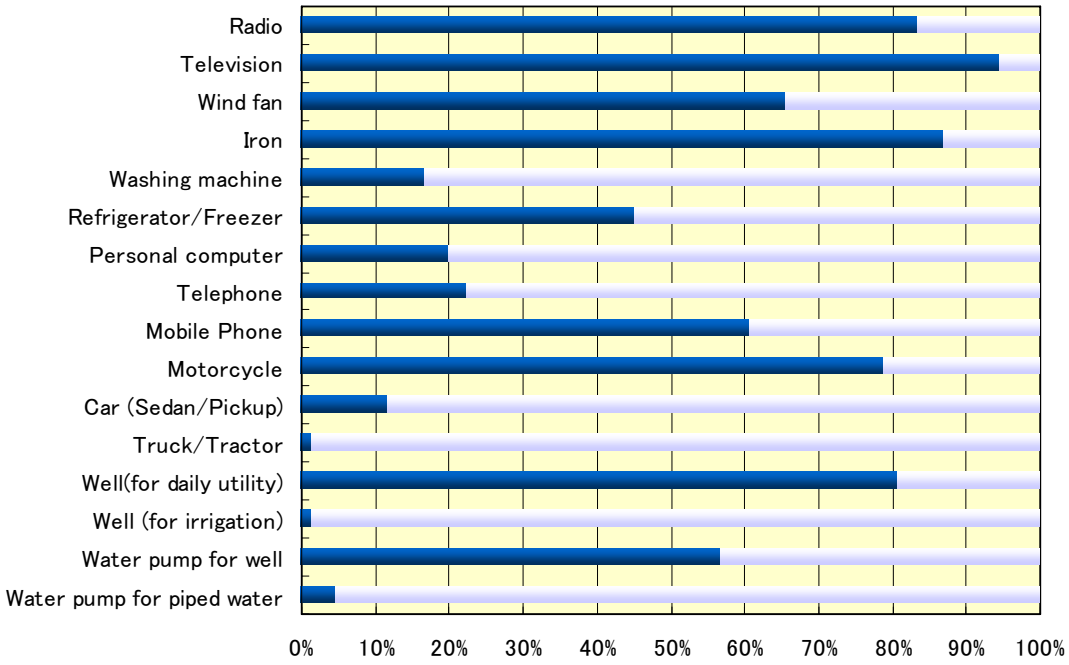


Figure 10.3.5 Diffusion Rate of Major Assets

Table 10.3.4 shows the number of respondents classified by membership in the Water Supply Systems, which consists of PDAM, PU Community Water Supply System and others. 267 respondents out of 1,200 (22.3%) were customers of PDAM and most of them were inhabitants of the Yogyakarta Municipality. 54 respondents out of 1,200 (4.5%) were users of PU Community Water Supply System. 850 respondents (70.8%) were using other systems such as private wells, springs and/or private gravity water supplies.

Table 10.3.4 Water Supply Systems of the Respondents

Regency	PDAM	PU	Both	Others	Invalid	Total
Bantul	21	19		346	14	400
Sleman	46	35	3	312	4	400
Yogyakarta	200			192	8	400
Total	267	54	3	850	26	1,200
Percentage (%)	22.3%	4.5%	0.3%	70.8%	2.2%	100.0%

With respect to basic utilities such as lighting and fuels, 99.0% of respondents' houses have already introduced the electric light. The non-electrified rate is very low in this area. Also, the most popular cooking fuel is gas stoves, present in 46.7% of houses, and next is charcoal and/or coal, in 33.5%. Living conditions have clearly improved in the last 20 years.

The Study Team asked about damage to the water supply caused by the earthquake and the answers are shown in Table 10.3.5 below. Most damage had been repaired by December 2006, but there are some respondents who have not yet recovered their water supply system. According to the survey, some of the victims cannot afford to consider the damaged community water supply facilities due to ongoing rehabilitation of their individual houses. They have managed through this time by getting water from other springs and/or neighbor's wells.

Table 10.3.5 Number of Respondents by Earthquake Damage on Water Supply

Regency	No damage	Recovered after one week	Recovered after one month	Not recovered yet	Total
Bantul	324	29	41	6	400
Sleman	376	16	4	4	400
Yogyakarta	373	16	7	4	400
Total	1,073	61	52	14	1,200

10.3.3 Domestic Water Use

(1) Types of Water Supply Utilities

Inhabitants in Yogyakarta Province use various water supply systems including well water and bottled water and use them as the situation demands according to drinking, washing and bathing. Table 10.3.6 and Table 10.3.7 indicate the general tendency of water usage for drinking and washing respectively.

Most respondents mainly use private wells of the house for their drinking water. Comparing the water usage for washing and bathing, people prefer drinking water from a well to the water supplied by PDAM. The smell and taste of chlorine for disinfection is not favorably accepted.

Table 10.3.6 Water Supply for Drinking Water

	Number of Sample				Proportion of Sample			
Drinking Water	No use	Sub	Main	Total	No use	Sub	Main	Total
Tap water supplied by PDAM	993	52	155	1,200	82.8%	4.3%	12.9%	100%
Community water supply system	1,165	10	25	1,200	97.1%	0.8%	2.1%	100%
Well of the landlord	1,114	5	81	1,200	92.8%	0.4%	6.8%	100%
Private well of the house	252	21	927	1,200	21.0%	1.8%	77.3%	100%
Water harvesting (rain)	1,195	1	3	1,199	99.7%	0.1%	0.3%	100%
River or pond	1,182	16	1	1,199	98.6%	1.3%	0.1%	100%
Bottled water	994	181	25	1,200	82.8%	15.1%	2.1%	100%

Table 10.3.7 Water Supply for Washing and Bathing

	Number of Sample				Proportion of Sample			
Washing and Bathing	No use	Sub	Main	Total	No use	Sub	Main	Total
Tap water supplied by PDAM	946	22	222	1,190	79.5%	1.8%	18.7%	100.0%
Community water supply system	1,159	11	22	1,192	97.2%	0.9%	1.8%	100.0%
Well of the landlord	1,138	5	47	1,190	95.6%	0.4%	3.9%	100.0%
Private well of the house	270	30	893	1,193	22.6%	2.5%	74.9%	100.0%
Water harvesting (rain)	1,170	12	9	1,191	98.2%	1.0%	0.8%	100.0%
River or pond	1,141	43	7	1,191	95.8%	3.6%	0.6%	100.0%
Bottled water	1,172	18	0	1,190	98.5%	1.5%	0.0%	100.0%

Figure 10.3.6 illustrates the preferences and actions regarding drinking water. 102 PDAM customers out of 267 (38.2%) have private wells in the house but 51% of them do not drink the water supplied by PDAM. 13 respondents out of 165 (7.9%) answered that they don't drink the water supplied by PDAM even though they don't have their own well. They might buy bottles of water or have a supply of water in a tank for dispensing from the private water supply companies. PDAM customers might have a credibility gap against the quality of water supplied by PDAM.

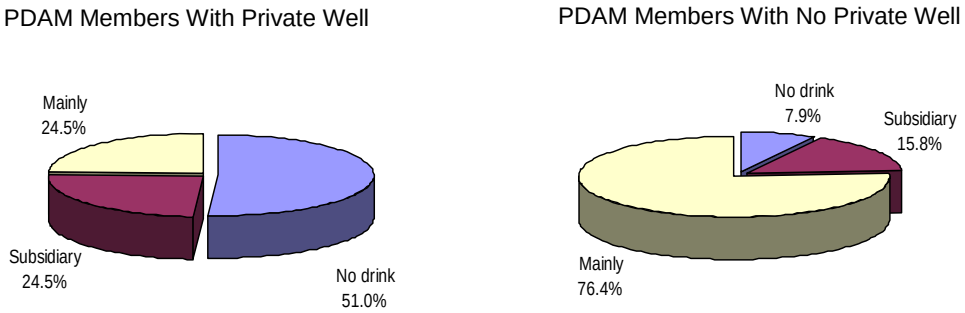


Figure 10.3.6 Preference on Drinking Water of PDAM Customers by Status of Well

(2) Quantities of Water Consumption

According to the survey regarding the quantities of water usage, the highest frequency of water use per person per day was 100 – 199 liters which comprises 27% of respondents, as shown in Figure 10.3.7 below.

The average water consumption recorded was 325.5 liter per person per day since some people use large quantities of water, though that usage includes non-domestic water usage such as for restaurants, factories, etc. The majority, 57%, use less than 299 liters per day.

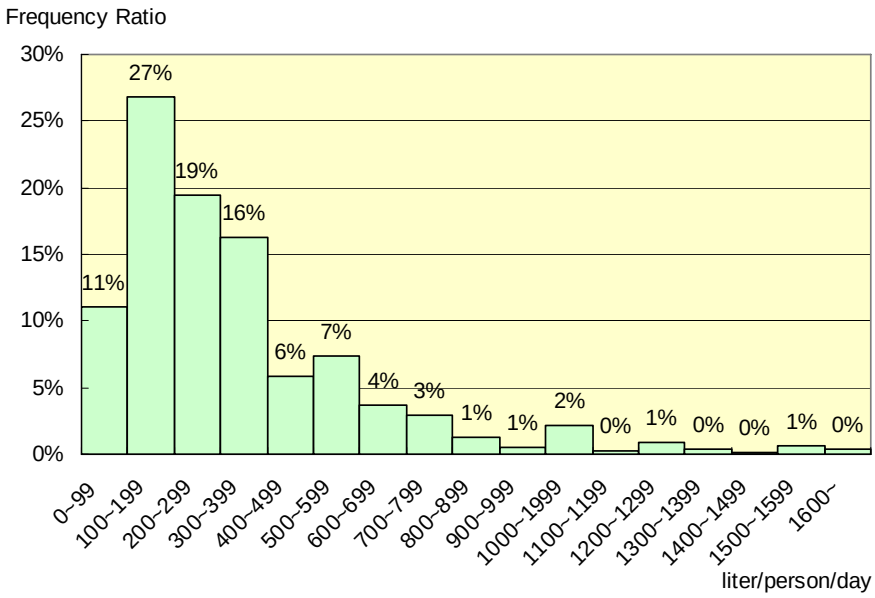


Figure 10.3.7 Quantity of Water Usage Per Person Per Day

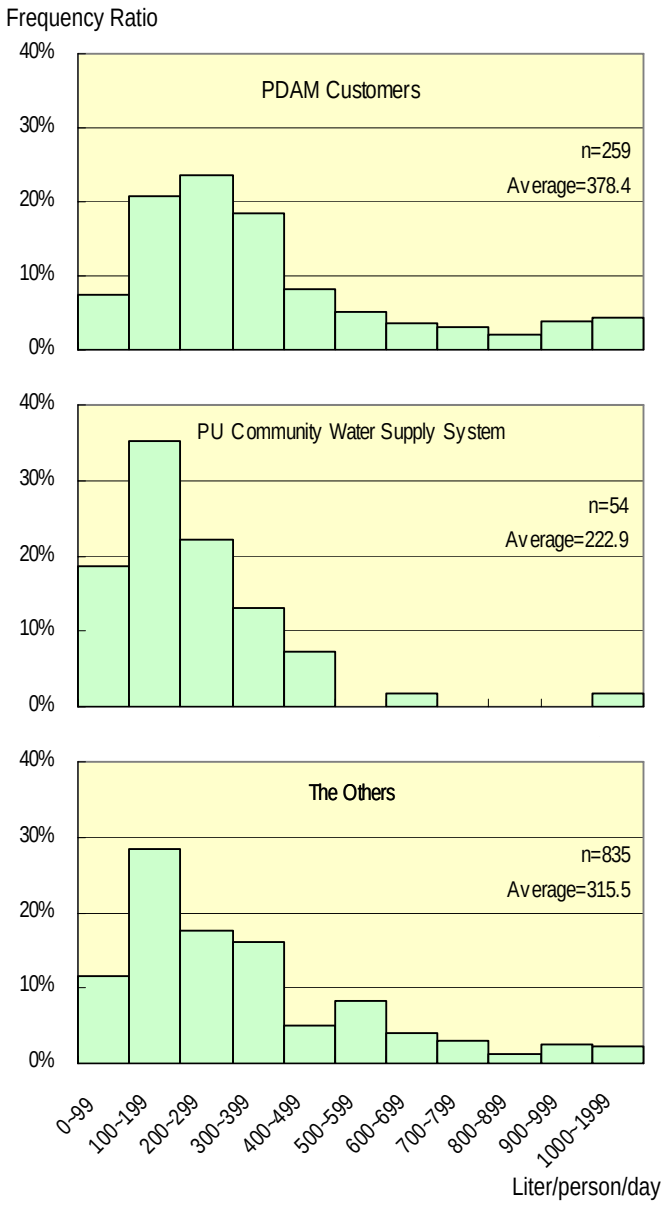


Figure 10.3.8 Water Usage by Customers

Figure 10.3.8 illustrates the frequency ratio of water consumption, as in Figure 10.3.7, but divides it by the three types of inhabitants consisting of PDAM customers, users of PU community water supply system, and the others.

According to the analysis, the PDAM's customers use rather larger amount of water, on average 378.4 liter per person per day. One of the reasons they use more water might be the convenience of connected pipelines. It is also notable that 102 households out of 267 (38.2%) have their own individual wells in parallel with PDAM's water supply system. When focusing on water consumption supplied by PDAM, the average is 261.5 liter per person per day, which is 116.9 liters less than the total average of water consumption.

Water consumption from PDAM's water supply system is illustrated in Figure 10.3.9.

In terms of PU Community Water Supply System, the quantity of consumption is smaller than that of PDAM customers and the others. 35.2% of respondents using the PU system consume 100 – 199 liter per person per day.

The average water consumption of the other respondents who do not use a public water supply system is 315.5 liters per person per day whereas the majority, 28.5%, uses between 100 and 199 liters per person per day.

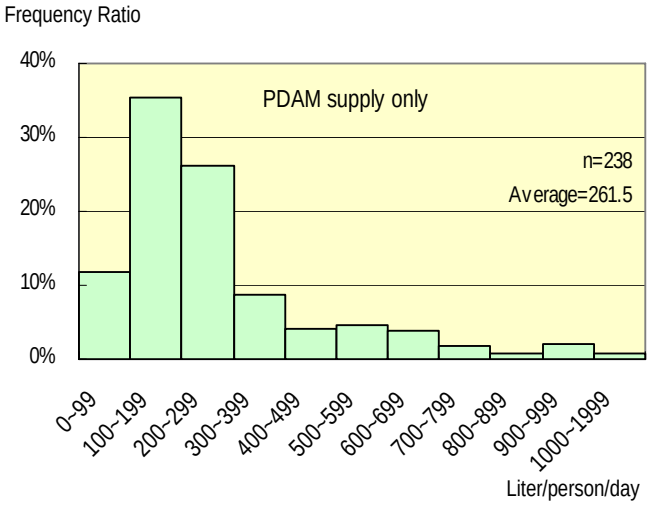


Figure 10.3.9 Water Supplied by PDAM

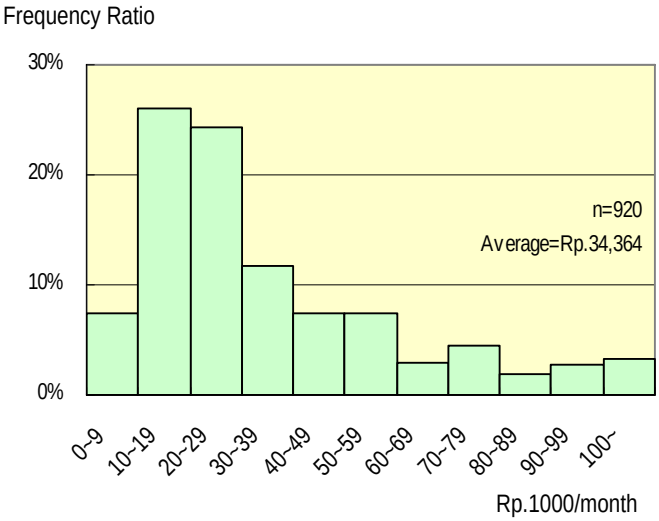
The unit water consumption, from 100 liters to 199 liters per person per day, seems to be a large amount of water compared to that of all other developing countries. It might be influenced by their customs and lifestyles.

The local socio-economists in Yogyakarta appointed the particular background of water consumption as follows.

- Taking bath twice a day
- Using hand cooper for flushing toilet
- Using water but not toilet paper for cleaning
- Washing clothes every day
- Using water for 5-times-pray to God
- Pouring water on the garden and potted plants

(3) Cost of Water Consumption

In terms of the cost of water consumption, 920 respondents out of 1,200 answered the questions. Some of the respondents answered the cost is "Zero" but in order to make analysis easier, the respondents who haven't paid for water were eliminated from calculations as invalid samples.



	Valid sample	Average Cost (Rp.)	Standard Deviation
Bantul	236	22,387	19319.79
Sleman	365	36,171	37884.71
Yogya	319	41,158	33096.74
Overall	920	34,364	33122.82

Figure 10.3.10 Monthly Cost of Water Consumption per Household

The overall monthly cost of water consumption per person is Rp.8,431 on average. The water consumption cost accounts for 4.00% of the expenditure and 3.53% of the income.

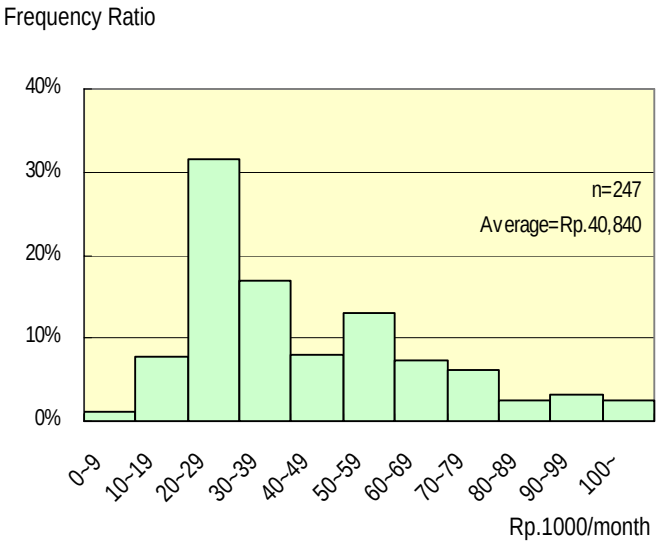


Figure 10.3.11 Monthly Payment for PDAM

When confining our attention to the payment to PDAM, the average monthly tariff for PDAM water is Rp.40,840 per household. In other words, the average cost per person is Rp2,093. However, the variance of the data is similar to that of quantity, i.e. a small number of households paying much cost influences the average. As shown in Figure 10.3.11, the majority of households have paid around Rp.25,000 per month.

There were 28 valid samples used regarding payment to PU Community System. The average tariff was Rp21,964 per month but the variance was higher than with the other systems, namely the payment or cost-sharing system is different in each community. The tariff is decided according to the topographic conditions and the community's policies. The details of the PU Community Water Supply System are indicated in Chapter 6.

10.3.4 Public Water Supply System

(1) Registration of Public Water Supply Systems

Most of the respondents who are registered with the PDAM Water Supply System have been signed up for more than 10 years as shown Figure 10.3.12.

There are some respondents who withdrew their membership in PDAM because the water supply service is not as good as they expected.

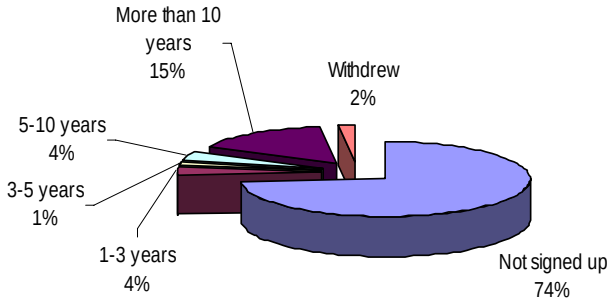


Figure 10.3.12 Registration of PDAM & PU System

(2) Initial Cost of PDAM and PU Water Supply System

PDAM customers pay the connection and meter costs at registration. The average initial cost was Rp.242,586.

On the other hand, the handling of tariffs and membership costs of PU Community Water Supply Systems vary. The details of the management system are discussed in Chapter 7. According to the survey respondents, the costs average around Rp.50,000.

(3) Impact of PDAM and PU Community Water System

In terms of the impact of the PDAM system, respondents do not recognize the positive benefits. Most of them installed the PDAM system more than 10 years ago, therefore they take the convenient water system for granted and no longer realize the significant contribution of the PDAM system. On the other hand, the customers of PU Community Water Supply System realize the benefit and appreciate the better condition of the water supply.

Figure 10.3.13 on the left shows the degrees of impact of installed systems recognized by customers. Members of PU Community Water Supply System feel that the benefits of cleaning house, cleaning body etc. are better than before. They do not complain much about the water tariff.

The degree of satisfaction is shown in Figure 10.3.13 as well. PU Community System is held in better regard than PDAM. Members complain about the quality of water supplied by PDAM because of the contamination of iron and chlorine. Also, there are some cases of complaints of unstable water pressure in PDAM systems and that the water supply is often cut off.

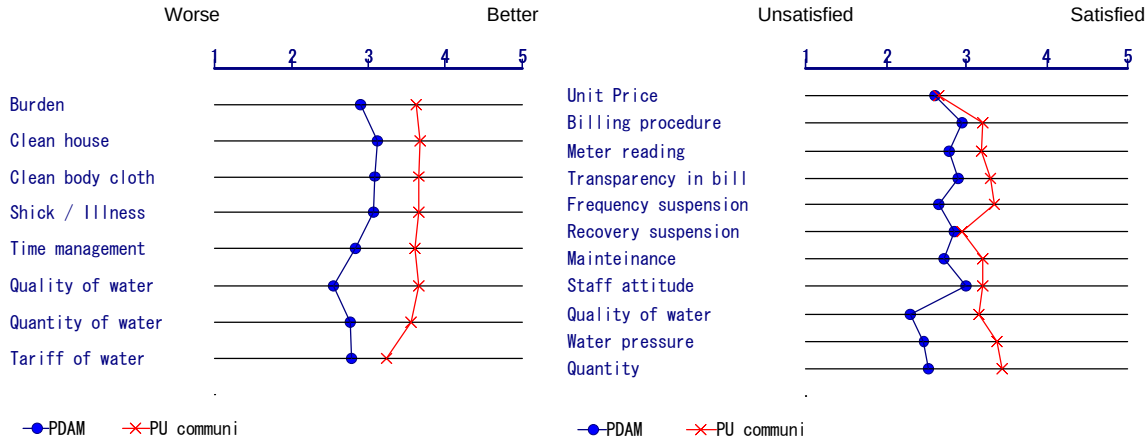


Figure 10.3.13 Degree of Impact and Degree of Satisfaction

10.3.5 Private Water Supply System and Potential Customers

As mentioned before, 850 respondents out of 1,200 (70.8%) do not use the public water supply system. They have more or less fulfilled their own water needs and have been managing water supply systems by themselves. In this section, the Study Team focuses on the taste and preference of potential customers who have not joined the membership of PDAM and PU community system.

(1) Reasons for Non-Membership in Public Water Supply System

The reasons for not registering with the public water system are listed in Figure 10.3.14. 89% of respondents indicated the reason of "enough alternative water sources". They may not feel a strong necessity for a public water supply. The second most common reason, at 56%, was the high tariff for the initial connection to the pipeline. In addition to the initial cost, the unit tariff seems expensive for people who have not paid for daily water consumption. It is notable that 44% of respondents pointed out the reason of "no water infrastructure near house". 39% indicated that they feel they have been neglected by the public water supply system.

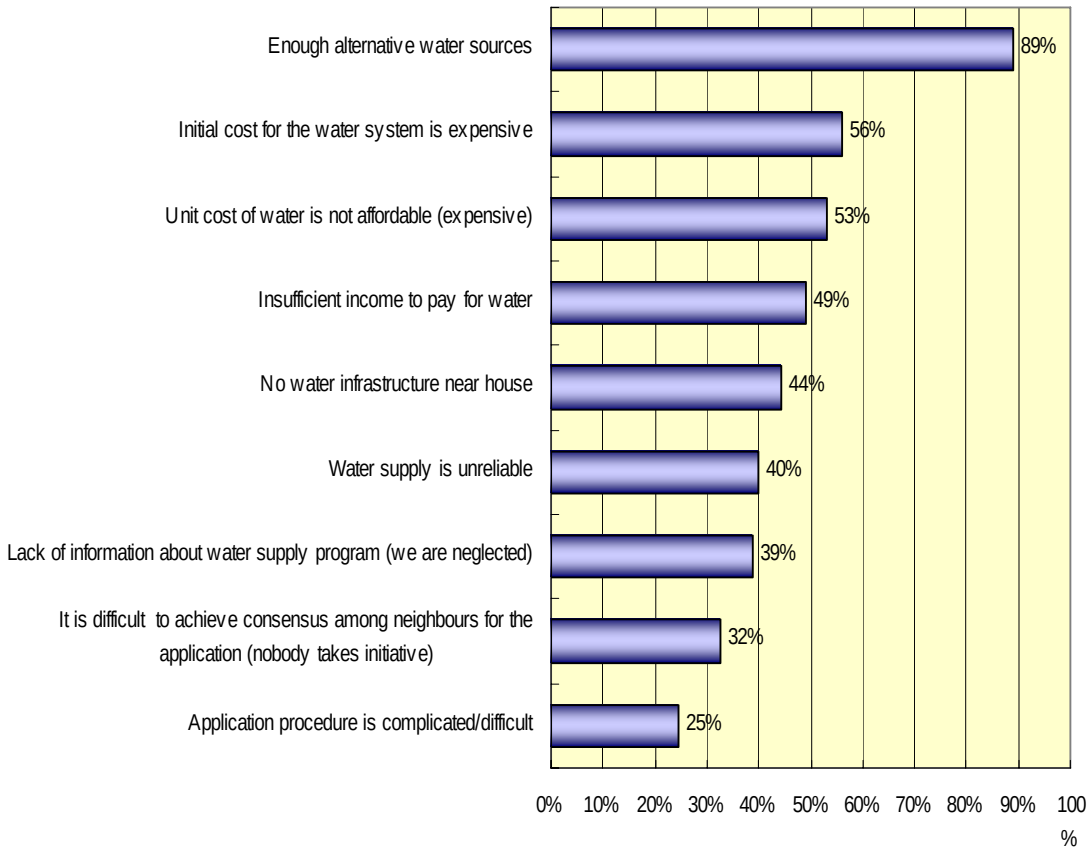


Figure 10.3.14 Reasons for Non-Membership in Public Water Supply System

(2) Opinion or Mind-set of Non-Membership Inhabitants

According to the answers to the above questions, there are some respondents suffering from the tariff of the public water supply. They indicated that they could not afford to pay for it.

In order to verify the theory of economic reason and non-registration, the Study Team checked the income level by water supply system as shown in Figure 10.3.15. An obvious economic gap between PDAM customers and the others are not observed. Therefore, it is not suitable to say that the non-membership households have lower incomes than the others do or that they cannot register due to the high tariff. The main reason for non-membership then is not the economic condition. It is recognized that the public water supply is generally affordable.

Table 10.3.8 indicates the non-membership respondents' expectations of the modern public water supply system.

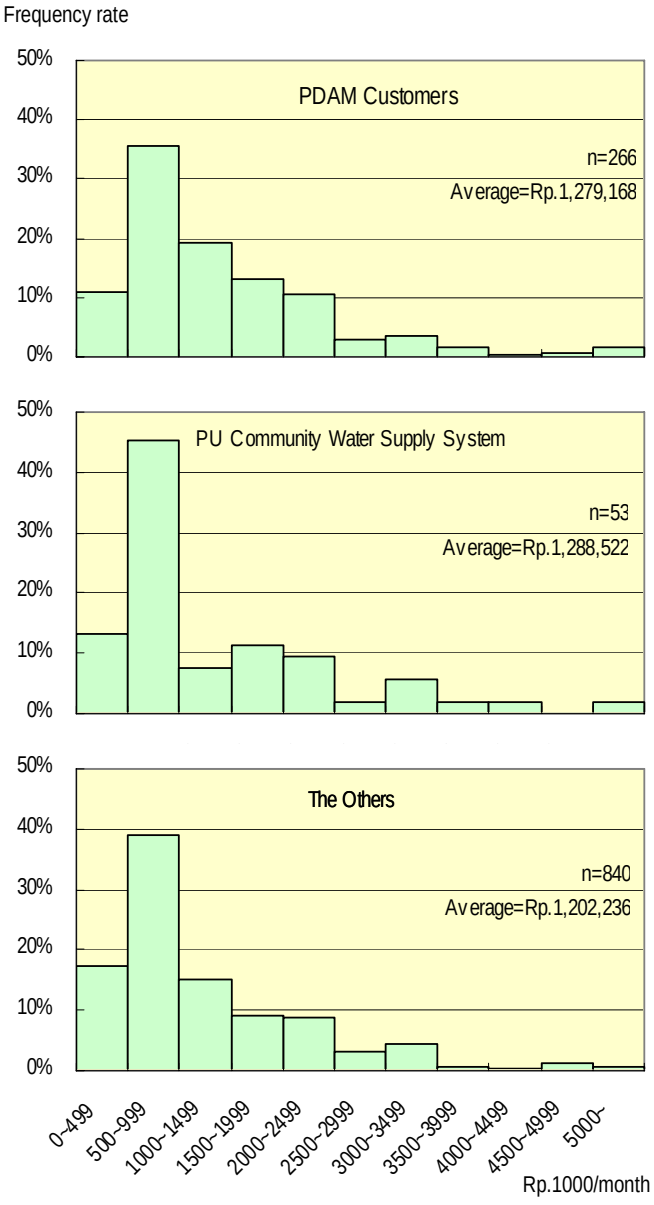


Figure 10.3.15 Monthly Household Income by Status of Water Supply

Table 10.3.8 Expectations of the Public Water Supply System

	Not expect	Some extent	Expect	Total
Reduce burden of housekeeping	22.9%	53.7%	23.4%	100.0%
Keep clean house	18.7%	53.4%	27.9%	100.0%
Keep clean body and clothes	17.9%	51.8%	30.2%	100.0%
Less sickness and illness	32.9%	38.4%	28.7%	100.0%
Better time management	19.0%	55.7%	25.3%	100.0%
Better quality of water	14.4%	42.5%	43.1%	100.0%
Larger quantity of water	14.4%	49.4%	36.2%	100.0%
Lower cost of water	28.3%	45.9%	25.8%	100.0%

The greatest ratio of expectation is better quality of water, at 43.1%. The second greatest ratio is "large quantity of water" reported by 36.2%, and third is "keep clean body and clothes" at 30.2%.

In terms of expectation for some extent of improvement, "better time management" is greatest, at 55.5%. Second is "reduce burden of housekeeping" at 53.7% and third is "keep clean house" at 53.4%.

32.9% of respondents indicated that "Less sickness and illness" is not expected. 28% of respondents do not expect "less cost of water". The degree of expectation of the public water supply is not on the tariff but on good services.

The following are observations of potential customers' perceptions and situations.

- People are quality-oriented
- Sustainable water supply is significant
- Convenient water supply for daily work is expected
- Reduction of sickness and illness are not expected
- Lower water cost is expected but not much in comparison with the other factors

Table 10.3.9 shows the opinions regarding modern pipe connection. 497 respondents out of 765 valid samples (65.0%) told that they would register if the requirements were met.

Table 10.3.9 Degree of Interest in Signing Up for Water Pipe Connection

	Number of samples			Percentage of answers		
	Yes	No	Total	Yes	No	Total
Bantul	105	97	202	52.0%	48.0%	100.0%
Sleman	245	92	337	72.7%	27.3%	100.0%
Yogyakarta	147	79	226	65.0%	35.0%	100.0%
Total	497	268	765	65.0%	35.0%	100.0%

Thus, as long as the tariff is not reasonable and/or suitable they will not willingly register in the system. The Study Team asked the willingness to pay for the initial connection and monthly payment for public water supply.

(3) Willingness to Pay

The Study Team asked about the willingness to pay for the initial connection and monthly payment for public water supply. The results are shown in Table 10.3.10 and Figure 10.3.16. As mentioned in the above explanation of data analysis, the average does not always indicate the majority and is not always representative of typical inhabitants, particularly for socio-economic analysis. The median is sometimes a more proper representative than the average.

Table 10.3.10 Comparison of Willingness to Pay and Actual Payment

	Willingness to Pay		Average of Actual Present Payment		
	Initial Cost	Monthly Tariff	Initial Cost		Monthly cost (all sources)*
			PDAM	PU	
Bantul	111,875	15,060	178,722	15,979	22,387
Sleman	296,375	23,645	361,129	166,528	36,171
Yogyakarta	427,500	27,948	231,391		41,158
Total Average	278,583	22,218	245,427	80,500	3,4364
Median	200,000	20,000	150,000	50,000	25,000

*Histogram is shown in previous Figure 10.3.10

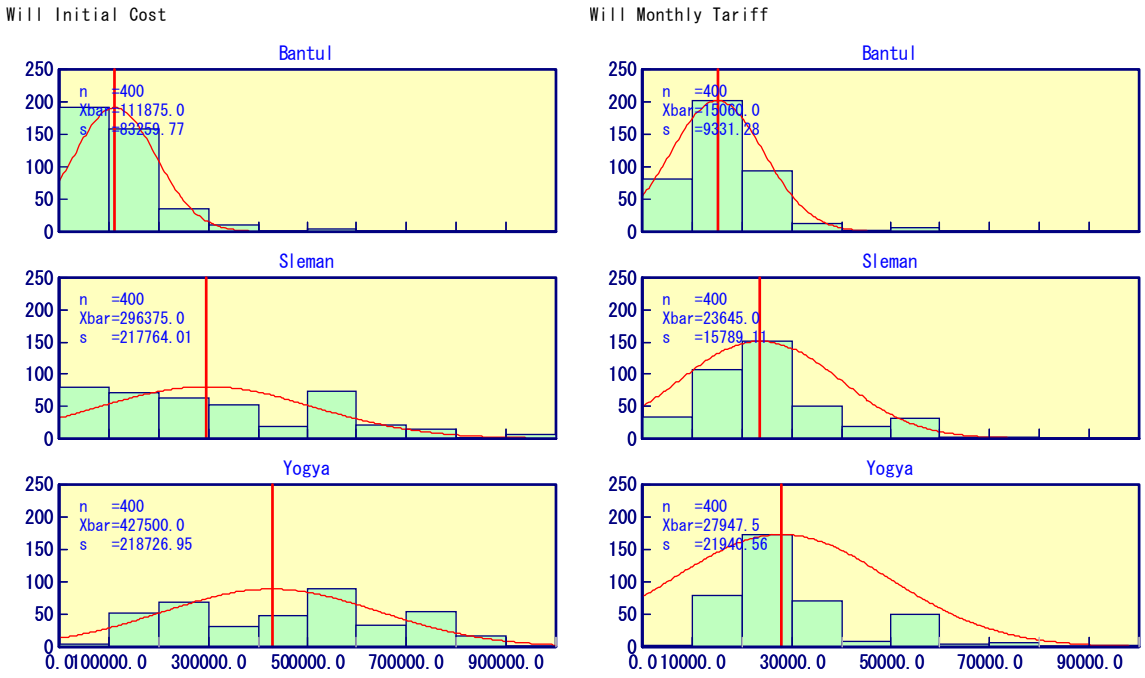


Figure 10.3.16 Willingness to Pay Initial Cost and Monthly Tariff

The willingness to pay for the initial cost of connection and registration is Rp.278,583 on average for all respondents. Comparing to the present payment of initial cost, which is Rp.242,586, the willingness to pay is rather high compared to the present level. Other than this, notable tendencies and features can be appointed.

Some of the respondents living in Sleman answered that they could afford to pay even Rp.750,000 if an installment plan were allowed. Respondents in Yogyakarta Municipality are also motivated to be introduced to good systems even if the cost should be paid by beneficiaries. In other words, the respondents proposing a higher initial cost are ready to pay for the modern convenience of a safe water supply system and contribute to the cost for construction if necessary.

The willingness to pay of respondents in Bantul is lower than in the other areas. The reasons considered are i) they have been using free water for daily use so they cannot imagine a tariff for

water, ii) their target is not an urban system but a community-based system whose present initial cost is Rp.80500 on average and iii) their living standard is lower than that of inhabitants in urban areas.

Opinions about water utility, particular in infrastructure, vary. Any obvious correlation between "Income" and "willingness to pay for initial cost", are not found. There might be other factors to be considered; i.e. topographic conditions, present water resources and even mindset about the government's role in water utility as infrastructure.

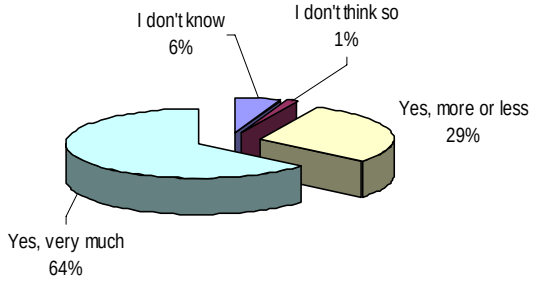
Concerning the monthly water tariff, there is more of a consensus of opinion than for the initial cost as shown in Figure 10.3.16. The average willingness to pay for monthly cost is Rp.22,218. Although there are some tendencies among regions, they have almost all accepted the present tariff.

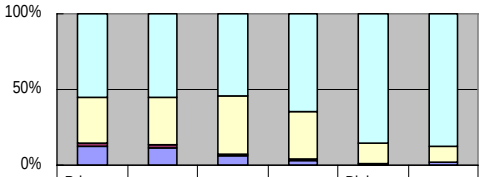
10.3.6 Health and Sanitation

(1) Consciousness and Attitude About Safe Water

A consciousness survey on sanitation and health concerning water was conducted as a part of the Socio-Economic Survey. The purpose of this sub-section is to clarify the attitudes and mindsets of the inhabitants regarding water, how they perceive the quality of the water and/or what they do to achieve water sanitation.

Figure 10.3.17 illustrates the degree of consciousness. According to the results of the analysis, 64% of respondents think that there is a correlation between water and health. The proportion of health consciousness on water is greater as education level rises; i.e. 87.5% of respondents who have university degrees or higher believe there is a close relation between water and health.





	Primary drop out	Primaty	Jr. High	Sr. High	Diploma I-III	Univ
Yes, very much	41	135	109	318	59	98
Yes, more or less	22	74	78	153	9	12
I don't think so	2	7	2	4		
I don't know	9	27	13	15	1	2

Figure 10.3.17 Consciousness Regarding Water and Health

Despite most respondents' awareness of the importance of water for health, 40% of respondents have never checked the quality of the water they use. 16.1% thinks that the water they use is not of good quality at all. Their consciousness and their attitude/actions may have same sort of gap.

The Study Team listened to complaints about chlorine odor, which affects the taste although chlorine is necessary for disinfection. Water quality has two meanings, "safety" and "taste". While the taste might be adversely affected, the smell of chlorine in the water indicates that harmful bacteria are eliminated, thus increasing the water's safety. The customers of PDAM water might not have the proper information about the technical method of disinfection.

Figure 10.3.18 illustrates another type of questions regarding the consciousness and attitude of water sanitation, asking "How much do you care about good water quality?" It is notable that 97% of respondents indicated "I use the same water but boiled for drinking".

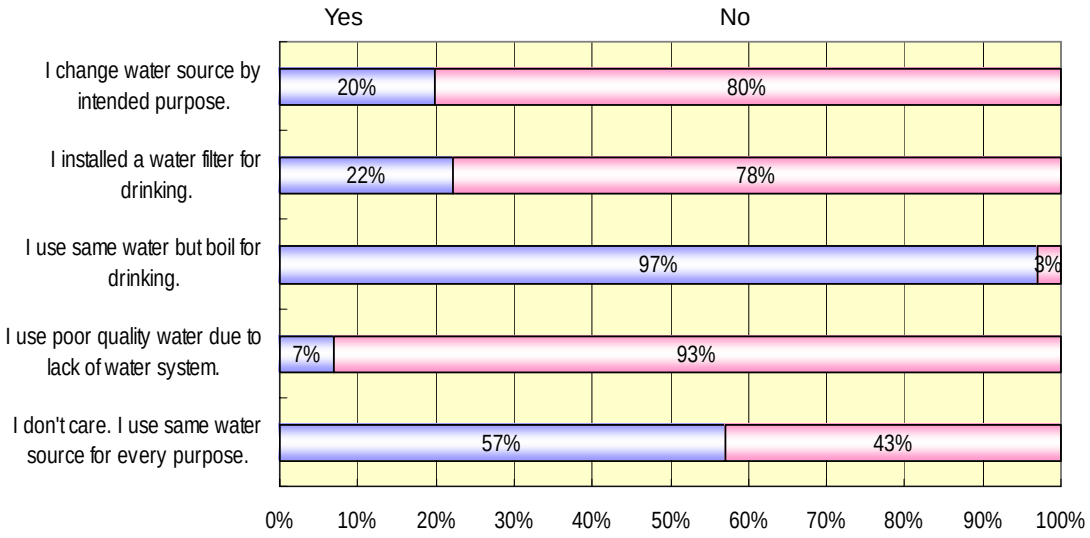


Figure 10.3.18 Consciousness and Attitude about Safe Water

22% of respondents have already introduced filters for percolation, and 7% of respondents answered they are using poor quality water due to constraints of their water system. The people are quite conscious about water quality, but their attitudes may not be based on proper technical information.

(2) Water for Toilet

In terms of the toilets in the target areas, most people (90.1%, which is 1076 samples out of 1194 valid samples) have toilets inside of their houses as shown in Table 10.3.11. 44.8% of the respondents use a simple pit latrine toilet, 46.6% use a pour-flush toilet and 8.6% answered

"others". The specific types of toilets are shown in Table 10.3.12, and the design of the toilet structure is discussed in Chapter 8.

Table 10.3.11 Location of the Toilet

	Inside my house	Shared public toilet	Neighbor's house	No designated toilet	Toilet outside	Total
Bantul	86.6%	1.3%	4.5%	0.8%	6.8%	100.0%
Sleman	97.5%	1.3%	0.0%	1.3%	0.0%	100.0%
Yogyakarta	86.2%	7.5%	0.3%	0.3%	5.8%	100.0%
Total Average	90.1%	3.4%	1.6%	0.8%	4.2%	100.0%

Table 10.3.12 Types of Toilets

		Number of Samples				Proportion (%)			
	Type of Toilet	Bantul	Sleman	Yogya-karta	Total	Bantul	Sleman	Yogya karta	Total
1	Septic Tank (treated water is infiltrated underground by using leaching pit)	155	132	84	371	39.6	33.2	21.1	31.2
2	Septic Tank (treated water is infiltrated underground from septic tank)	131	156	77	364	33.5	39.2	19.3	30.6
3	Septic Tank (treated water is discharged to sewerage pipe)	22	56	100	178	5.6	14.1	25.1	15.0
4	Septic Tank (treated water is discharged to river / channel /canal)	24	12	82	118	6.1	3.0	20.6	9.9
5	Pit Latrine (treated water is infiltrated underground)	16	11	8	35	4.1	2.8	2.0	2.9
6	Pit Latrine (treated water is discharged to sewer pipe)	6	7	5	18	1.5	1.8	1.3	1.5
7	Pit Latrine (treated water is discharged to river / channel / canal)	8	2	4	14	2.0	0.5	1.0	1.2
8	Others	29	17	39	85	7.4	4.3	9.8	7.2
	Type 1 & 5		2		2	0.0	0.5	0.0	0.2
	Type 2 & 3		1		1	0.0	0.3	0.0	0.1
	Type 3 & 6		2		2	0.0	0.5	0.0	0.2
	Total	391	398	399	1188	100.0	100.0	100.0	100.0

The average water consumption for flush toilets by the pail were recorded as 8.8 times for defecation and 4.2 times for urination. The capacity of one pail is about 1 liter, therefore, about 8 liters and 4 liters of water are used respectively. There may be a considerable number of inhabitants who use water but not toilet paper for cleaning, and this custom may be one of the reasons for the large amount of water consumption.

Tables 10.3.13 and 10.3.14 indicate the specific treatments of toilet sludge or night soil.

Table 10.3.13 Frequency of Sludge Removal

	Once in 3 months	Once in 6 months	Once a year	Once in 3 years	Once in 5 years	Once in 6 years or more	Never	Total
Number of Samples								
Bantul	5	2	36	21	24	127	157	372
Sleman	1	2	11	11	21	169	167	382
Yogyakarta	7	8	6	8	5	91	273	398
Overall	13	12	53	40	50	387	597	1152
Proportion of Samples								
Bantul	1.3%	0.5%	9.7%	5.6%	6.5%	34.1%	42.2%	100.0%
Sleman	0.3%	0.5%	2.9%	2.9%	5.5%	44.2%	43.7%	100.0%
Yogyakarta	1.8%	2.0%	1.5%	2.0%	1.3%	22.9%	68.6%	100.0%
Overall	1.1%	1.0%	4.6%	3.5%	4.3%	33.6%	51.8%	100.0%

Table 10.3.14 Person/Organizations In Charge of Sludge Removal

	Local gov't	Other public organization	Neighbor farmer	Private company	Myself	None	I don't know	Total
Number of Samples								
Bantul	5	39	3	119	24	68	107	365
Sleman		16	15	60	47	151	93	382
Yogyakarta	9	21	4	12	37	1	315	399
Overall	14	76	22	191	108	220	515	1146
Proportion of Samples								
Bantul	1.4%	10.7%	0.8%	32.6%	6.6%	18.6%	29.3%	100.0%
Sleman	0.0%	4.2%	3.9%	15.7%	12.3%	39.5%	24.3%	100.0%
Yogyakarta	2.3%	5.3%	1.0%	3.0%	9.3%	0.3%	78.9%	100.0%
Overall	1.2%	6.6%	1.9%	16.7%	9.4%	19.2%	44.9%	100.0%

Figure 10.3.19 shows the distance between well and toilet answered by the 956 respondents having private wells. 6.9% of them indicated that the distance is less than 4.9m, which is much shorter than the distance recommended by the government. However, the security of well water is not only the distance from the toilet but also the design of the toilet and depth of the well. The distance to the toilet of the next house is sometimes shorter than the distance to their own toilet. Namely, the collected data is just one of the reference points to take into consideration of the relation between toilet and well.

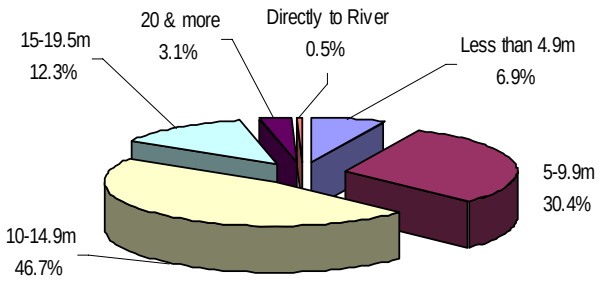


Figure 10.3.19 Distance between Well and Toilet

10.4 Findings

10.4.1 Issues to be Addressed

Considerable characteristics on socio-economic conditions illuminated through the field survey and data analysis are listed below.

(1) Living Standard

a) There are clear signs of intermediate economic development from the data and field observations; i.e. emigration to city, education levels, household assets, etc. Living standards have improved beyond those of impoverished countries.

b) Public infrastructures such as electricity and paved roads have developed over the last 20 years. Inhabitants have been enjoying increasingly convenient lifestyles.

c) Water consumption is comparably high. Inhabitants in this area value cleanliness over water conservation.

(2) Gap between Wealth and Poverty

a) The economic condition of Bantul Regancy is rather worse among the targeted regions.

b) Living standard is verified by individual background. As lifestyles diversify, the gap between wealth and poverty might widen.

c) Poverty in the city is increasing. The population growth rate of Yogyakarta City was 5.5% in 2005, and the poor families in the rural areas may tend to immigrate to the city.

(3) Water Consumption by Economic Condition and Topography

a) The quantity of water consumption is more greatly influenced by topography than economic condition.

b) Shallow wells are popular in the targeted areas. The cost for digging a well is around Rp.2,000,000 and daily water is then free.

c) People in Bantul Regency in particular have disadvantages in topographic condition.

d) Optimal water resources have been considered based on users' economic and topographic conditions, however, people wish to have a more convenient way to obtain water and enjoy good water quality.

(4) Water by Purpose of Drinking, Bathing and Agriculture

a) People make use of water for drinking and bathing in general.

b) People are conscious of water quality and most of them boil the water to kill the bacteria for drinking. They boil the water even if it contains chlorine for disinfection.

c) Water for agriculture is limited. Irrigation water is necessary in rural areas in Sleman and Bantul. Some of them buy the water for livestock. Allocation of water resources for domestic use and irrigation has to be taken into consideration.

(5) Proper Information Regarding Water Quality

a) People's consciousness about water sanitation is very high but the proper technical and/or scientific information is not provided to them enough.

b) Community Water Supply System is favorably accepted in the rural areas, the information of good practices is not shared properly.

10.4.2 Strategic Considerations from the Socio-Economic View Point

As the conclusion of this chapter, the strategic considerations to formulate the Master Plan are listed as follows.

- A ***Customer-oriented*** water distribution system is necessary, i.e. water systems for the wealthy and impoverished should be different in tariffs.
- ***Educational information*** about water quality such as taste and safety should be distributed by public relations.

CHAPTER 11

EMERGENCY PILOT PROJECT FOR RESTORATION OF EARTHQUAKE DAMAGES

CHAPTER 11 EMERGENCY PILOT PROJECT FOR RESTORATION OF EARTHQUAKE DAMAGES

11.1 Background and Purpose of Emergency Pilot Project

About 140,000 houses were collapsed and important lifelines were damaged by the severe earthquake in central Java in May 2006. In order to restore damaged water supply system and facilities especially in Bantul, Emergency Pilot Project (EPP) was implemented as part of Phase I of the Study.

The major aims of EPP are listed below.

- to restore some of damaged water supply systems in the study area
- to have lessons on how to make water supply facilities strong against disaster such as earthquake
- to analyze the effects of facility restoration and improvement of operation and maintenance

Output of the project is to be fed back to preparation of the Master Plan.

11.2 Selection of Project Sites

JICA preparatory study report nominated candidate sites for EPP, which are two PDAM units of Trimluyo and Dlingo and two community water supply system of Nawangan and Terong I in Bantul Regency. Much damaged sites are found after the preparatory study and these candidates are reviewed upon the request by GOI. The process and the results of the site selection are summarized below.

(1) Site survey and Discussion with GOI

The Study Team conducted site survey and had discussions with GOI prior to Inception Meeting in October 2006. Proposed sites and facilities for EPP from each PDAM and PU in Yogyakarta Municipality, Sleman Regency, and Bantul Regency are studied taking into account of the following criteria.

- Priority of Indonesian Side
- Urgency
- Effectiveness
- Clear demarcation with other Donors' or NGO's activities
- Feedback to planning process of the Master Plan.

(2) Agreed project sites and scope

After preliminary discussion among the GOI and the Study Team, nominated sites were surveyed. The results of discussion and site survey are summarized in Appendix 11.1 and Appendix 11.2 respectively.

The project sites and scope were finally agreed by GOI and JICA in the discussion for Inception Report.

The selected sites for EPP are as follows:

- PDAM Bantul: Unit Trimulyo, Unit Sewon, Unit Dlingo, Unit Imogiri, Unit Banguntapan, and Unit Bantul
- Community Water Supply System in Bantul Regency: Desa Mangunan (6 units) and Desa Terong (1 unit)

The agreed scope of the works is summarized below.

1) PDAM Bantul

- Unit Trimulyo: Construction of shallow well, repair of chemical building and repair of retaining wall
- Unit Sewon: Repair of pipe bridge
- Unit Dlingo: Construction of water treatment plant of 5 l/sec capacity with facility of river intake, construction of spring capture of 5 l/sec, installation of transmission pipeline to existing reservoir with transmission pump, and repair of operation building
- Unit Imogiri: Construction of pipe bridge
- Unit Banguntapan: Pipe replacement and reconstruction of operation building
- Unit Bantul: Repair of operation buildings and warehouses

2) Community Water Supply System

Desa Mangunan (6 units)

Dusun Mangunan II (Desa Mangunan): Installation of transmission pipe

Dusun Mangunan I (Desa Mangunan): Construction of shallow well, installation of intake/booster pump, replacement of transmission pipe

Dusun Cempluk II (Desa Mangunan): Construction of shallow well, installation of intake pump, replacement of transmission pipe

Dusun Mangunan (Desa Mangunan): Replacement of intake pump and transmission pipe

Dusun Kanigoro (Desa Mangunan): Replacement of Intake/booster pump, restoration of reservoir, replacement of distribution pipe, repair of public hydrant

Dusun Lumahabang (Desa Mangunan): Replacement of intake pump, replacement of transmission pipe, restoration of reservoir

Desa Terong (1 unit)

Dusun Terong I (Desa Terong): Construction of shallow well, installation of intake pump, replacement of transmission pipe, restoration of reservoir, construction of retaining wall for public hydrant, replacement of distribution pipe

The selected sites for EPP are shown in Figure 11.2.1.

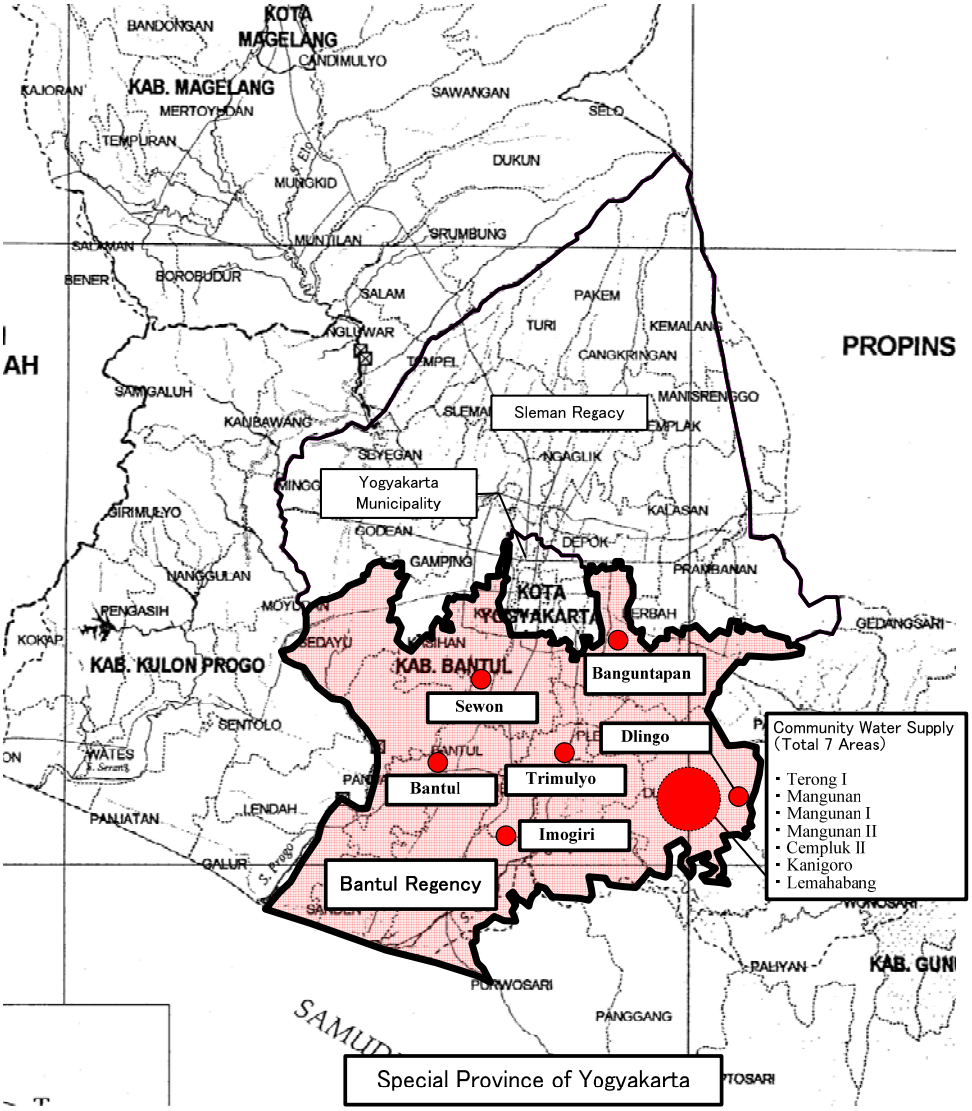


Figure 11.2.1 Location of Emergency Pilot Project

11.3 Detailed Design

Local consultant was selected and the contract was singed on October 30 in 2006 for detailed design and supervision of EPP. The design was prepared for the following three packages:

- The scope of Package 1: to construct water treatment system for unit Dlingo in Bantul PDAM.
- The scope of Package 2: to construct a shallow well and pipe bridge together with pipe laying for unit Imogiri, Sewon, Banguntapan and Trimulyo in PDAM Bantul.
- The scope of Package 3: to repair of community water supply sytems in Dlingo and to repair buildings for unit Banguntapan, Bantul, Trimulyo and Dling in PDAM Bantul.

Detailed scopes for each contract package were decided as summarized in Table 11.3.1, Table 11.3.2 and Table 11.3.3.

Table 11.3.1 Scope of Emergency Pilot Project - Package 1

Project Site	Scope of Work	
PDAM Bantul		
Unit Dlingo	Package Treatment Plant including facility of river water intake	Capacity 5 l/s
	Transmission Pump and Panel	Q10 l/s x H65m x 11kW x2 units
	Transmission Pipe	ϕ 150mm x L 760m
	Power cable	L 1,000m
	Spring Capture	Capacity 5 l/s
	Operation Building	1 L.S.
	Access Road	1 L.S.

Table 11.3.2 Scope of Emergency Pilot Project - Package 2

Project Site	Scope of Work	
PDAM Bantul		
Unit Trimulyo	Shallow Well	1.5m x 1.5m x d 5m
Unit Sewon	Pipe Bridge	GIP φ100mm x L 10m
Unit Imogiri	Pipe Bridge	GIPφ150mm x L 84m
	Distribution Pipe	GIPφ150mm x L 90m
Unit Banguntapan	Distribution Pipe	PVCφ150mm x L1200m

Table 11.3.3 Scope of Emergency Pilot Project - Package 3

Project Site	Scope of Work	
1) Community water supply system in Bantul Regacy		
Desa Mangunan		
Dusun Mangunan II	Transmission Pipe	ϕ 25mm x L66m
Dusun Mangunan I	Shallow Well	ϕ 1.0m x H 3m
	Intake Pump	Q0.75 l/s x H46m x 450W x 1unit
	Booster Pump	Q0.75 l/s x H46m x 450W x 1unit
	Sump Well	1 m^3
	Transmission Pipe	ϕ 25mm x L50m
Dusun Cempluk II	Shallow Well	ϕ 1.0 m x H 10m
	Intake Pump	Q 0.27 l/s x H 45m x 320 W x 1unit
	Transmission Pipe	ϕ 25 mm x L 1230m
Dusun Mangunan	Intake Pump	Q0.52 l/s x H 60m x 450W x 1unit
	Transmission Pipe	ϕ 25mm x L50m
Dusun Kanigoro	Intake Pump	Q0.35 l/s x H60m x 450W x 1unit
	Booster Pump	Q0.35 l/s x H60m x 450W x 1unit
	Sump Well	1m^3
	Transmission Pipe	GIP, ϕ 25mm xL120m
	Reservoir	8m^3
	Distribution Pipe	PVC, ϕ 25mm x L70m
	Public Hydrant	Platform 4 nos
Dusun Lemahabang	Intake Pump	Q0.37 l/s x H60m x 450W x 1unit
	Booster Pump	Q0.37 l/s x H60m x 450W x 1unit
	Sump Well	1m^3
	Transmission Pipe	GIP, ϕ 25mm x L240 m

		Reservoir	8m^3
Desa Terong			
	Dusun Terong I	Shallow Well	ϕ 1.0m x d 3.5m
		Intake Pump	Q0.75 l/s x H 21m x 250W x 1unit
		Booster Pump	Q0.75 l/s x H 60m x 450W x 1unit
		Sump Well	1m^3
		Transmission Pipe	GIP, ϕ 25mm xL380m
		Reservoir	8m^3
		Retaining Wall for Public Hydrant	h 1.5m x L 5m
		Distribution pipe	PVC ϕ 25mm x L70m
2) PDAM Bantul water supply system			
	Unit Dlingo	Repair of Pump House	1 L.S.
	Unit Trimulyo	Repair of Chemical Bldg. Repair of Retaining Wall	1 L.S.
	Unit Banguntapan	Reconstruction of Operation Bldg.	1 L.S. Brick structure, 48m2
	Unit Bantu 1	Repair of Operation Bldg.	1 L.S.
		Repair of Storehouse at Office	1 L.S.
		Repair of Storehouse at Plant	1 L.S.

11.4 Project Implementation

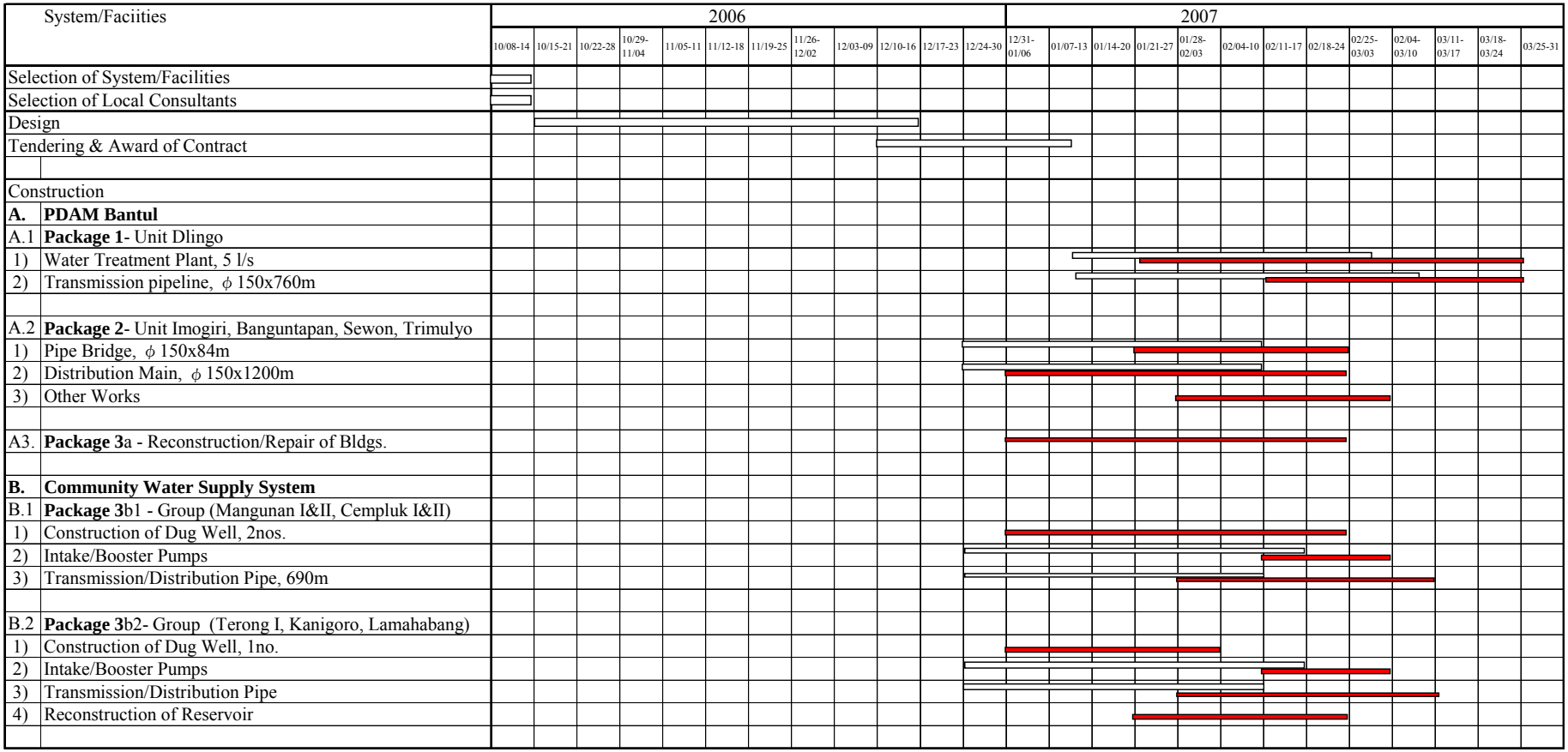
Three local contractors in the region were selected for implementation of three packages of EPP. Prior to tendering for the selection of the contractors, short list of capable contractors was provided by PU Bantul upon request by the Study Team. Three contractors were nominated for each contact package considering the technical capability, experience and financial soundness.

Nominated contractors are invited for tenders and tenders for all the packages were opened in December 2006. Contracts were signed after tender evaluation and negotiation. Construction works were started just after signing of contracts for Package 1, Package 2 and Package 3 on January 10, 2007, December 23, 2006, and December 23, 2006 respectively.

Information on contract of each package, such as name of contractors, contract schedule and contract amount, is summarized in Appendix 11-3.

Implementation Schedule is summarized in Figure 11.4.1.

Figure 11.4.1 Implementation Schedule of Emergency Pilot Project



11.5 Completion and Handover of the Project

The contractors for all the packages gave training to the operation staffs of PDAM Bantul and community water supply after completion of the construction works. Upon submission of maintenance manuals and as-built drawings, completion certificates were issued to the contractors in March 2007. The facilities were handed over to the Government of Special Province of Yogyakarta (Dinas Kimpraswil) on March 30, 2007 and then officially transferred to the local government on June 28, 2007. Documents for the handover and transmission of repaired facilities are shown in Appendix 11.4. During the official process in Indonesian side for the hand over, PDAM and community water supply organizations in Bantul used the restored facilities as trial. All the defects found during the trial operation and maintenance period were repaired by the contractors by September 2007.

11.6 Indices and Results of Project Evaluation

In order to evaluate the effects of EPP, four indices of the project evaluation were determined. Damage level of each site and facility was taken into account for selection of the indices. Baseline survey was carried out prior to the implementation and then the indices were monitored after the completion to evaluate and to analyze the effects of the project.

The selected four indices are described below.

(1) Index 1: Intake volume

1) Affects by the earthquake

Intake volume of water was decreased after earthquake. The major reasons are decrease of yield capacity of well and spring, lowering of water table, damage of pumps, and damage on transmission pipe from the water sources.

2) Repaired items

- Deepening of the existing wells, drilling of new wells and construction of new intake from spring and river.
- Installation of new intake pumps
- Repair or new installation of transmission line

3) Methods of measurement and evaluation

Intake volume of water was measured by setting ultrasonic flow meter on transmission pipeline. The effects of EPP were evaluated by comparing intake volume before and after the project. Data from PDAM or community were used to estimate the water volume where water volume could not be measured due to structural problem of intake and others.

(2) Index 2: Water pressure in distribution system

1) Affects by the earthquake

Buried pipes were damaged and some of them were appeared above ground after earthquake in unit Bantuntapan. In order to secure water supply to the downstream area PDAM installed temporary pipes of diameter 50 mm, which was much smaller than the original diameter of 150 mm. Customers in the downstream were seriously affected by low water pressure due to insufficient capacity of temporary pipes.

2) Repaired items

- Installation of distribution pipe for replacement of temporally laid pipes.

3) Method of measurement and evaluation

Water pressure was measured by using water pressure gauge, which was installed at downstream of the damaged pipes before and after the project. The results of two measurements were compared to evaluate the effects of EPP.

(3) Index 3: Number of house connection supplied

1) Affects by the earthquake

The number of supplied house connection was decreased after earthquake due to shortage of water intake volume and damage of water supply facilities, which included transmission pipes, reservoirs, distribution pipes and public stand posts. The sites, where pipe bridge was damaged or temporary pipes was used for damaged main pipe, had high possibility of supply interruption and stability of water supply system was considered as very low.

2) Repaired items

- Installation of water transmission pipes
- Installation of booster pump facilities
- Construction of reservoirs
- Installation of distribution pipes
- Repair of tanks for public stand post
- Repair of pipe bridge

3) Methods of measurement and evaluation

The number of supplied connections was estimated from the hearing results from PDAM staffs and chiefs of community water supply system. The estimated numbers of supplied connection before and after EPP were compared to evaluate the effects of the project.

(4) Index 4: Operation and maintenance of water supply facilities

1) Affects by the earthquake

Operation and maintenance activities were affected by the damage of operation buildings, pump house, chemical building and storehouses after the earthquake. The staff was facing difficulties of operation and maintenance especially on the activities below.

- Chlorine dosage
- Pump operation
- Correspondence to complain from water users
- Compiling / measurement of water consumption by consumer
- Storage in storehouses

2) Repaired items

- Repair of chemical building
- Repair of pump house
- Repair or reconstruction of operation buildings
- Repair of store houses

3) Methods of measurement and evaluation

The Study Team conducted hearing from the PDAM staff on difficulty and status of operation and maintenance. The results were evaluated and categorized into five levels as below.

- Level 1: Seriously problematic
- Level 2: Problematic
- Level 3: Middle (not good but not bad)
- Level 4: Good
- Level 5: Very good

All the above indices were monitored for each facility and effects of the project were evaluated. Table 11.6.1 summarizes these four indices and the results of evaluation on each facility. The details of evaluation on each facility are described in Appendix 11-5.

Table 11.6.1 Summary of Indices and Results of Project Evaluation

Water Supply System	Repaired Item	Water Intake Volume		Water Pressure in Distribution System		Number of Supplied Connections		*Evaluation of O/M of Water Supply Facilities		Explanation / Remarks
		Before EPP (m^3/day)	After EPP (m^3/day)	Before EPP (MPa)	After EPP (MPa)	Before EPP (nos)	After EPP (nos)	Before EPP (level)	After EPP (level)	
PDAM Bantul										
【Unit Trimulyo】	Construction of Shallow Well, Repair of Chemical bldg. and Retention Wall	295	278	—	—	—	—	2	5	Stability of Intake is increased. Office work becomes normal.
【Unit Sewon】	Repair of Pipe Bridge	—	—	—	—	0	75	—	—	Water supply of about 2.2 m^3/day to downstream becomes stable.
【Unit Dlingo】 Sub-unit Ngreboh / Sub-unit Grajekan	Construction of WTP (Intake, plant, reservoir), Spring capture , trans. pump and pipe. Repair of Office bldg.	476	971	—	—	—	—	1	5	Water can be supplied in dry season after increase of 10?/sec capacity. (5?/sec of spring water and 5?/sec of surface water)
【Unit Imogiri】	Construction of Pipe Bridge	—	—	—	—	0	260	—	—	Water supply of about 373m^3/day to downstream becomes stable.
【Unit Banguntapan】	Pipe Installation, Reconstruction of Office bldg.	—	—	0.025	0.220	0	247	2	5	Water supply of about 179m^3/day to downstream becomes stable.
【Unit Bantul】	Repair of Office bldg. and 2 warehouses	—	—	—	—	—	—	2	5	Required equipment and materials can be stored after repair of warehouses. PDAM will repair roof, which is out of the Scope.
Community Water Supply System in Bantul Regency										
【Desa Mangunan II】	Replacement of Transmission Pipe	7.1	10.0	—	—	25	40	—	—	Water supply becomes stable after the repair.
【Desa Mangunan I】	Construction of Shallow Well with Intake Pumps, Sump Well, andTransmission	0	5.2	—	—	0	70	—	—	Water supply is resumed after the repair
【Desa Cempluk II】	Construction of Shallow Well with Intake Pump, and Transmission Pipe	3.2	0 (8.4)	—	—	2	28	—	—	Water supply in dry season is resumed after the repair
【Desa Mangunan】	Installation of Intake Pump and Transmission Pipe	5.2	5.2	—	—	20	100	—	—	Water supply becomes stable after the repair.
【Desa Kanigoro】	Installation of Intake/Boost Pumps, Reservoir, and Distribution Pipe. Repair of Stand post	0	0 (7.3)	—	—	0	85	—	—	Water supply is resumed after the repair
【Desa Lemahabang】	Installation of Intake/boost Pumps, Transmission Pipe, and Reservoir	0	0 (18.9)	—	—	0	120	—	—	Water supply in dry season is resumed after the repair
【Desa Terong I】	Construction of Shallow Well with Intake/ boost Pumps, Transmission/ Distribution Pipe, abd Reservoir. Repair of Stand post	0	10.4	—	—	30	55	—	—	Water supply is resumed after the repair

Note 1) * Evaluation of Operation and Maintenance of Water Supply Facilities
Five Levels (1: Seriously problematic, 2: Problematic, 3.Middle, 4: Good, 5: Very Good)

Note 2) ( ) in column for "Water Intake Volume" shows expected usage volume in dry season. (Yield capacity x operation hour)

EPP contributed to recovery from the damage of the earthquake in all the above listed areas.

Shallow wells are constructed in Unit Trimulyo, Desa Mangunan I, Cempluk II and Terong I, while intake pumps are installed in Desa Mangunan, Desa Kanigoro and Desa Lemahabang, where intake capacity is increased and/or water becomes available during dry season. EPP also makes possible the usage of spring water and river water for water supply of unit Dlingo in dry season.

Replacement of transmission / distribution pipe and/or repair of pipe bridges in Unit Sewon, Unit Imogiri, Unit Banguntapan and seven (7) community water supply systems contribute to increase of supply stability, supply pressure and supply connections. Buildings for office, pumps and chemical feedings in Unit Trimulyo, Unit Banguntapan and Unit Bantul are repaired to normalize office works, to reduce customers' complain, to make safe the chemical feeding and to store materials, tools and equipment in proper manner.

Photographs of EPP are shown in Appendix 11.6.

11.7 Output of the Project

In addition to recovery from the damage by the earthquake, execution and evaluation of EPP gives information of required improvement, which will be useful to make water supply system strong against disaster. The major information, which will be effective for preparation of Master Plan and Action Plan, is summarized below.

Regarding PDAM

- The stability of the water supply system is relatively low due to possession of singular water source. It is desirable for the system to have plural water sources in order to increase the stability of water supply during accident, drought and other disasters.
- Buildings with adequate foundation and column were not collapsed by the earthquake. It is required to prepare proper design and to supervise the construction works in an adequate manner.
- Local contractors can be employed for procurement and construction of small sized works after disaster. However appropriate supervision on construction is required since contractors' capability of quality control and construction planning is not high.
- The control of materials, tools and equipment for the maintenance of facilities is insufficient. It will be required to strengthen capability of the control for quick supply of materials in emergency cases.
- Information of facilities is not compiled appropriately. It will be required to strengthen the asset management for preparation of master plan.
- It was observed that information is not necessarily shared in PDAM. It will be required to strengthen the information transfer system to give decision based on proper information and to control the activities at the site.
- The intention of the staff to supply potable water is not high. It is required to improve the capability of water quality control.

Several shortages are found during the execution of EPP and there is room for improvement especially in administration and capability of the PDAM staffs. It is expected to consider asset management and capacity development of PDAM for preparation of Master Plan.

Regarding community water supply

- Pipes were damaged where poor construction, such as insufficient pipe protection, was observed. It is required to improve design and construction supervision to make the system strong against disaster.
- Intake pumps were damaged because pump operation did not stop even when water was not available after the earthquake. Consideration on pump protection, such as introduction of water level limit switch, is required.
- While water user organization of community supply (WUO) executes operation and maintenance of the system, it sometimes is inadequate. It is desirable for PU and PDAM to give training and instruction to the communities on operation and maintenance, which includes water quality control and asset management.
- Community water supply systems are developed by PU but not necessarily adequate due to application of standardized design which uniformly uses pipe of 25 mm diameter. Improvement of some water supply systems is required to suit the actual condition of the site.
- Sufficient water cannot be secured from shallow well in some communities. It is required to consider construction of deep wells in such areas.
- Information of the requirements, such as water shortage and deterioration of water supply facilities, from the community does not come to outside. It is difficult to prepare recovery program from damage or development plan without information. It is necessary to make such a system that community inform any difficulty or requirement in water supply to PU, which compiles the information to seek the methods for settling the matter.

Water supply system is operated by WUO, which skill is not so high due to insufficient training or assistance from other organizations. Master Plan is expected to include capacity building of community and development of relation among the community, PDAM, PU and other relevant authorities.

CHAPTER 12

VISION OF MASTER PLAN

CHAPTER 12 VISION OF MASTER PLAN

12.1 Vision/Policy of Master Plan

At the end of the Phase 1 of the Study "Formulation of Vision/Policy and Strategy", Vision/Policy and strategy were formulated as a basis of the Master Plan.

These visions, policies, and strategies are developed taking account of national policy and development plan as well as ones of regional. On February 13, 2007, workshop was held inviting officers concerned water supply sector and development planning from various agencies such as Directorate of Water Supply Development Jakarta, DIY Provincial Government, Yogyakarta Municipal and Sleman and Bantul Regional Governments. During the workshop, how the future water supply system should be, vision and policy, and strategies to achieve the vision and policy were discussed and finally vision, policy of the Master Plan were concluded as described hereunder.

12.2 National Policy/Action Plan and the Vision/Policy of the Master Plan

National Policy which targets achievement of MDGs and National Action Plan for development of Water Supply System (*Kebijakan Dan Strategi Nasional, Pengembangan Sistem Penyediaan Air Minum, KSNP-SPAM*) are described in Chapter 4.

Visions, policies of the Master Plan shall conform to the national and regional policies and action plans. Relation of visions, policy of the Mater Plan and national and regional action plans are as shown on Figure 12.2.1.

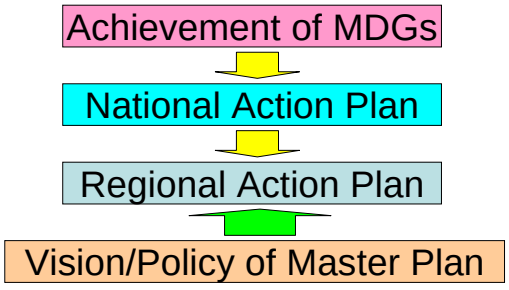


Figure 12.2.1 Relation of National/Regional Action Plans and Vision of Master Plan

As shown on figure above, Vision/Policy of Master Plan will support Regional Action Plan which complies with the national action plan to achieve MDGs.

12.3 Future Water Supply System

To develop visions, policy and strategies of the Master Plan, aspects of water supply which should be furnished to were considered. Important aspects were derived from missions of water supply and those are

- Sustainability,
- Reliability/Stability, and
- Equity.

To improve water supply system in DIY, these three aspects were considered to develop visions, policies, and strategies.

12.4 Approaches for Improvement of Water Supply System

To materialize sustainable, reliable, stable, and equitable water supply system, several approaches were considered such as

- Capacity development approach,
- Legislative Improvement approach,
- Technical Improvement approach, and
- Water resource conservation approach.

For each approach, vision and policies were identified as follows.

- Capacity Development Approach
  - Vision 1: Establishment of good customer relation
  - Vision 2: Transition to autonomous/sound provider
  - Vision 3: Coordination among PDAMs
  - Vision 4: Capacity development of PDAMs and water user association of AMD
- Legislative Improvement Approach
  - Vision 5: Legislative Improvement
  - Vision 6: Public Service Obligation
- Technical Improvement Approach
  - Vision 7: Upgrading service level
- Water Resource Conservation Approach
  - Vision 8: Secure sustainable water resources

12.5 Visions/Policies and Strategies

12.5.1 Capacity Development Approach

(1) Vision 1: Establishment of Good Customer Relation

To establish good customer relation, it is important to mature customer confidence. Without

mutual confidence, customer will never agree to increase tariff increase, and it will cause unhealthy financial condition of provider and it will affect routine operation and maintenance. Lack of adequate operation and maintenance will result in customer's complain and these chain forms vicious circle.

To mature customer confidence, following strategies will be required.

- Maintaining Transparency and Accountability
  - The utility provider should have transparency to have responsibility for its operation against customers and it means that the provider should have accountability to the customers. Specially, financial situation shall be opened to customer to explain how the water tariff from customers is disbursed.
- Well Understanding Customer Needs
  - Service quality should be continuously improved to mature customer confidence. For this purpose, customer needs should be always monitored service quality should be improved to meet customer needs.

(2) Vision 2: Transition to Autonomous/Sound Provider

The three PDAMs are water service providers 100% owned by the district governments (regency/city) and the owner governments frequently do not allow PDAMs to exercise their autonomy, especially in terms of staffing, tariffs and investments.

In order to realize efficient, reliable and sound water companies the PDAMs should be given more autonomy in terms of finance and operation aspects. There are several important strategies to attain this vision, which include:

- To become financially self-standing companies by attaining sound financial conditions. Cost-recoverable tariff setting and improvement of tariff collection operation are main measures for this.
- To improve operating performance by reducing NRW. PDAM's active addressing water loss problems by checking and fixing visible leaks is effective measures for attaining confidence and support from customers which leads to consensus building of tariff revision for financial autonomy.
- To improve staff performance based on incentives, and try to stop the use of civil servant rules and salaries is also important option to attain real independent water company with private-sector management vehicle

(3) Vision 3: Coordination Among PDAMs

This vision pursues the objective of inter-municipal cooperation of the three PDAMs under the Kartamantul initiative addressed by DIY Province Government. There are some barriers blocking inter-PDAM cooperation, including:

- Difference between Yogyakarta and Sleman/Bantul regarding customer size & distribution, cost structure, tariff policy, assets depreciation, network configulation

- Difference between Sleman and Yogyakarta/Bantul regarding needs for external water sources (difference of water source self-sufficiency)
- Existence of duplicated pipelines and overlapped customers in Sleman and Bantul areas by different PDAMs

The win-win solution for all the PDAMs should be pursued under the Kartamantul spirit by eliminating conflicts of interests and enhancing mutual benefits for PDAMs concerned. For this the following strategies are relevant and effective:

- Joint development of new water source through PPP/PSP approach
- Joint construction of new interconnected transmission and distribution lines
- Cooperation of joint work for operational performance (in areas of facility maintenance, leak reduction, tariff setting, etc)
- Sharing information and best practices between PDAMs

(4) Vision 4: Capacity Development of PDAMs and WUO of AMD

Capacity development of every PDAM and also WUO of AMD are essential for empowerment on the sustainable management and operation in order to achieve MDGs. To accomplish capacity development, following strategies will be necessary.

- Upgrading service level
  - Periodical training with allocation of budget will be needed for PDAM staff to get professional discipline in the related job area and skill in the field of water loss, and establish good customer relationship which can expect customer confidence to be matured.
- Adequate support to WUO of community
  - Management of the organization is carried out in the principle of Gotong-Royong. Empowerment should be kept continuously through technical and financial assistance from PDAM, government and donors. Periodical information route should be established.

12.5.2 Legislative Improvement Approach

(1) Vision 5: Legislative Improvement

The Local Government should improve legislative environments pursuant to Water Resource Law (UU7/2004) and Water Supply Regulation (PP16/2005) to improve water supply sector performance for the JICA Study Area. The strategies attaining this vision include:

- Put in place transparent regional water polices including independent regulatory framework
- Tariff reform putting customers not governments in control
- Civil society involvement by consulting various problems with stakeholders and customers
- Encourage PPP (Public Private Partnership) or PSP (Private Sector Participation) approach to improve quality and efficiency of service provision

- Address clear-cut division of roles of institutions by separating three major functions of policy making, regulation, and service provision
- Address poor people by pro-poor tariff setting and supporting community-based organizations for non-PDAM areas

(2) Vision 6: Public Service Obligation (PSO)

Tariff is controlled because of area monopolized utility business for the public. It is decided within the framework of socio economy and poverty consideration. Full cost recovery is severe challenge for management, especially in population scattered area. Central government is considering transparent subsidy system to public service. To comply with PSO, following strategies will be necessary.

- Adequate tariff level
  - Adequate O&M, improved transparency by disclosure of management situation and maximization of customers' confidence by equitable water supply together with upgrading service level will support periodic tariff revision.
- Sustainable operation of AMD
  - Equitable supply to the poor and adequate O&M by adequate tariff level with consideration pro-poor tariff setting is necessary.
- Government transparent subsidy system
  - Subject to above strategy, it is necessary to watch government policy development.

12.5.3 Technical Improvement Approach

(1) Vision 7: Upgrading Service Level

Service level in aspects of quantity and quality should be upgraded to achieve MDGs. To upgrade the service level, following strategies will be required to be implemented.

- Adequate/Effective Water Supply System
  - Adequate and effective water supply system will be achieved not only by technical improvement approach but also provider's capacity development approach which is described above. For preparation of the Master Plan, topographic condition of service area and location of water resources should be carefully considered. To save operation costs, gravity system should be introduced as much as possible for water transmission and distribution.
- Secure Potable Water Quality
  - Although there is a custom to boil tap water before drinking, water supply provider should supply potable, safe water to the people. Sometimes, customers complain smell of water which contains chlorine, but the necessity of disinfection or dosage of chlorine should be informed to the customers.
- Adequate/Effective Operation and Maintenance
  - For the sustainable water supply system, adequate and effective operation and maintenance are indispensable.

12.5.4 Water Resource Conservation Approach

(1) Vision 8: Secure Sustainable Water Resources

Securing water resources for water supply is the most significant issue for the preparation of the Master Plan. According to the DIY Provincial Government, potential water resources for DIY water supply system will be the River Progo and spring in Mangeran beside the existing water sources such as groundwater and spring in Sleman Regency. To secure sustainable water resources, following strategies will be necessary.

- Effective usage of water resources:
  - This strategy will include monitoring and evaluation of water resources and for this purpose, comprehensive water resource study will be required. To identify potential water resources through the study and water resource allocation should be reviewed according to the changes of water demands for domestic water supply, irrigation, commercial and industries.
- Water resource conservation:
  - Water resource cultivation area should be protected from development activities to secure quantity and quality of water resources. Benefit from water supply system should be allocated for water resource conservation such as for forestation.
  - Many people depend on shallow wells in DIY area, and water quality of shallow well will be affected by domestic wastewater. To avoid deterioration of water quality of shallow wells, improvement of adequate sanitation system will be required.