No.

THE MINISTRY OF PUBLIC WORKS AND
THE PROVINCIAL GOVERNMENT OF YOGYAKARTA SPECIAL REGION
THE REPUBLIC OF INDONESIA

STUDY ON
REGIONAL WATER SUPPLY DEVELOPMENT PLAN
FOR
GREATER YOGYAKARTA
IN
THE REPUBLIC OF INDONESIA

Technical Report

Volume II
Main Report

March 2008

JAPAN INTERNATIONAL COOPERATION AGENCY

NIHON SUIDO CONSULTANTS CO., LTD.
and
KRI International Corp.

GE
JR
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PREFACE

In response to a request from the Government of Republic of Indonesia, the Government of Japan decided to conduct the study on Regional Water Supply Development Plan for Greater Yogyakarta in the Republic of Indonesia and entrusted to the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Takemasa MAMIYA of Nihon Suido Consultants Co., Ltd. and consists of KRI International Corp. between September 2006 and February 2008.

The team held discussions with the officials concerned of the Government of Indonesia and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

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

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Indonesia for their close cooperation extended to the study.

March 2008

Ariyuki MATSUMOTO,
Vice President
Japan International Cooperation Agency

March, 2008

Mr. Ariyuki MATSUMOTO
Vice-President
Japan International Cooperation Agency

Letter of Transmittal

Dear Sir,

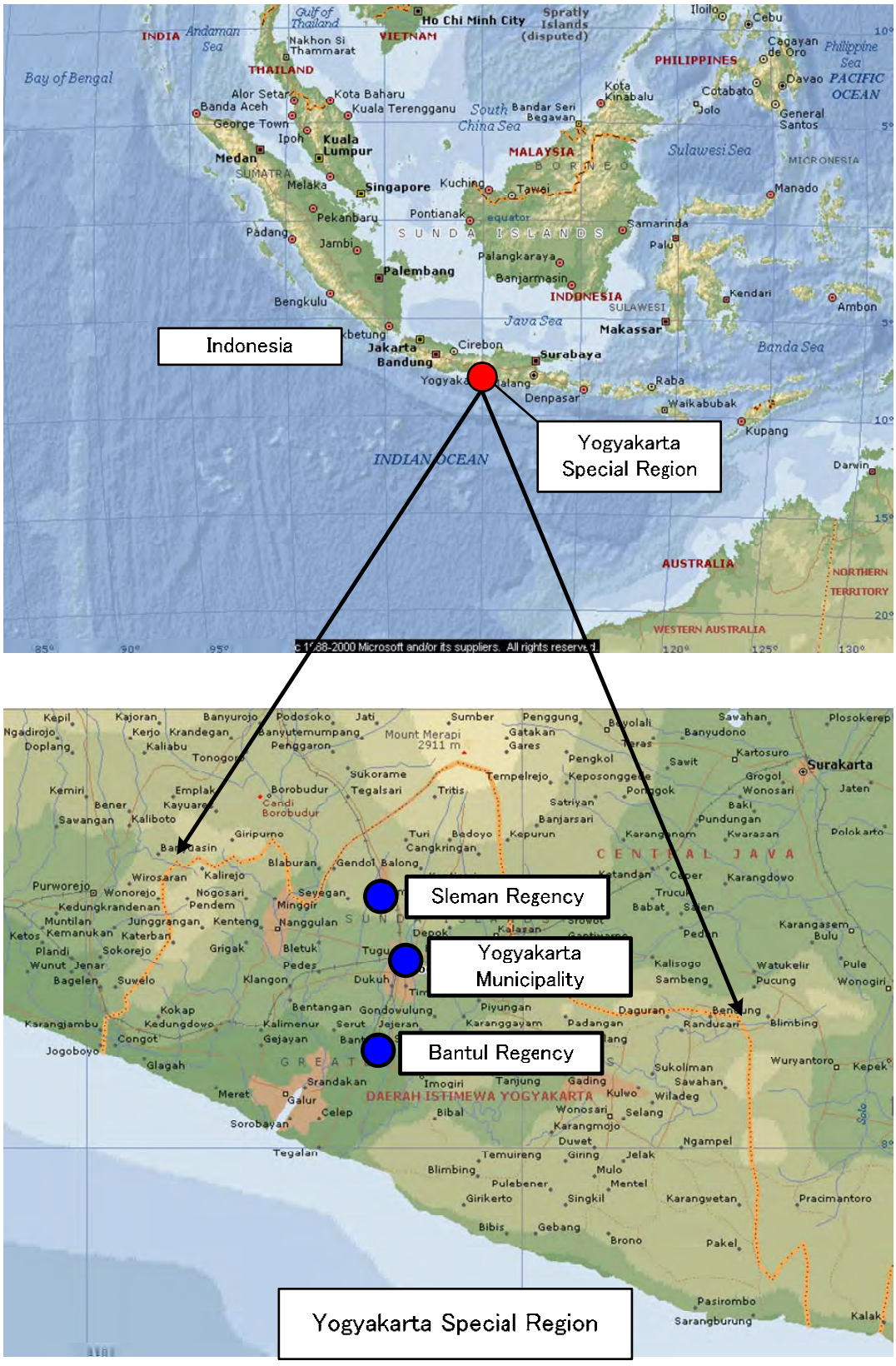
We are pleased to submit to you this Technical Report on the Study on Regional Water Supply Development Plan for Greater Yogyakarta in the Republic of Indonesia. This report incorporates the views and suggestions of the authorities concerned of the Government of Japan, including your Agency. It also includes the comments made on the Draft Technical Report by various agencies concerned of the Republic of Indonesia.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs and the Ministry of Health, Labour and Welfare of the Government of Japan for their valuable advice and suggestions. We would also like to express our deep appreciation to the relevant officials concerned of the Government of Indonesia and Provincial Government of Special Region of Yogyakarta for their close cooperation and assistance extended to us throughout our Study.

Very truly yours,

Takemasa Mamiya, Team Leader
Study on Regional Water Supply
Development Plan for Greater Yogyakarta
in the Republic of Indonesia

LOCATION MAP



JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

THE MINISTRY OF PUBLIC WORKS
AND
THE PROVINCIAL GOVERNMENT OF YOGYAKARTA SPECIAL REGION
THE REPUBLIC OF INDONESIA

STUDY ON
REGIONAL WATER SUPPLY DEVELOPMENT PLAN
FOR
GREATER YOGYAKARTA IN THE REPUBLIC OF INDONESIA

Technical Report

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Abbreviation

ADB	Asian Development Bank
AMD	Air Minum Desa (Community Water Supply)
APBD I	Anggaran Pendapatan dan Belanja Daerah Tingkat I (Provincial Budget)
APBD II	Anggaran Pendapatan dan Belanja Daerah Tingkat II (District Budget)
APBN	Anggaran Pendapatan dan Belanja National (National Budget)
ARI	Acute Respiratory Infections
AusAID	Australian Agency for International Development
BAPPEDA	Badan Perencanaan Pembangunan Daerah Tingkat-I and Tingkat-II (Development Planning Board for Provincial and District Level)
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Development Planning Board)
BDD	Bidan di Desa (Village midwife)
BHN	Basic Human Needs
BMG	Biro Meteorologi dan Geofisika (Meteorology and Geophysic Agency)
BPAM	Badan Pengelola Air Minum (Management Board for new Drinking Water Projects before being established as a PDAM
BPD	Village Representative Council
BPL	Below Poverty Line
BPPSPAM	Supporting Board for SPAM
BPS	Biro Pusat Statistik (Central Bureau of Statistics)
BPT	Break Pressure Tank
Broncaptering	Any small structure built to 'capture' a water source
Buis beton	Traditional concrete rings used to line hand-dug wells
Bupati	Kepala Kabupaten (Head of a District; sometimes called "Regent")
Camat	Kepala Kecamatan (Head of a Sub-District)
CARE	Co-operative for Assistance and Relief Everywhere (International NGO)
CCF	Christian Children's Fund
CIDA	Canadian International Development Agency
Cipta Karya	Direktorat Jenderal Cipta Karya (Directorate General of Human Settlements DGHS)
CMR	Child Mortality Rate
DATI I	Daerah Tingkat I (Provincial Government Level)
DATI II	Daerah Tingkat II (District Government Level)
DBOT	Design, Build, Operation, and Transfer
Desa	Rural village, lowest level of Government
DG	Directorate General
Dinas	Provincial or District level governmental department
DIP	Daftar Isian Proyek (List of Development Projects)
DIY	Yogyakarta Special Province
DPU	Generic term for all departments of Public Works now included in Kimpraswil
Dukun	Traditional birth attendant
DUPDA	Daftar Usulan Proyek Daerah (List of Proposed Yearly Development Projects at Tk.II)
Dusun	Sub-Village/Hamlet in rural area
EC	Electric Conductivity
EIIKK	Eastern Islands IKK Water Supply and Sanitation Project (Aus AID program)

ESWS	NTB Environmental Sanitation and Water Supply Project (Aus AID Program)
FGD	Focus Group Discussions
FIRR	Financial Internal Rate of Return
FLOWS	Flores Water Supply and Sanitation Reconstruction and Rural Development Project (Aus AID Program)
FRP	Fiber Reinforced Plastics
GIP	Galvanized Iron Pipe
GIS	Geographic Information System
GL	Ground Level
GOI	Government of Indonesia
GOJ	Government of Japan
Goton-Royong	Activity of Mutual Aid Society
GRDP	Gross Regional Domestic Product
GSP	Galvanized Steel Pipe
Hamlet	A small rural community not recognized as a Dusun
HC	House Connection (To a piped water supply system, usually metered)
HDPE	High Density Polyethylene Pipe
IBRD	International Bank for Reconstruction and Development
IEC	Information, Education and Communication
IGA	Income Generation Activities
IKK	Ibu Kota Kecamatan (Core Area of a Sub-District)
IMR	Infant Mortality Rate
Ir.	Insinyaur (The Professional title 'Engineer')
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
K. Desa	Kepala Desa (Head of a Village - Lowest official level of local Government)
Kabupaten/Kab	District/Regency (Local Government level II or Tk.II)
Kampung	General term for any sub-village or hamlet, but more commonly used in urban and rural areas
Kecamatan	Sub-District
Kelompok	An unofficial committee or group of people
Kelurahan	Urban village, the lowest administrative unit in status equal to a Desa
Kepala Desa	Head of a Village (Lowest official level of local Government)
Kepala Dusun	Head of a Hamlet
Kepala Suka	Traditional Religions Leader (In Sumba)
Keputusan	Decree
KFW	German Development Bank
KHPPIA	Kelangsungan Hidup Perkembangan Perlindungan Ibu dan Anak (Development and Protection for Mother and Child)
Kimpraswil	Same as “Cipta Karya”
KK or K/K	Kepala Keluarga (Head of a family)
Kotamadya	City-equivalent administrative status to a Kabupaten
Lb.	Labuhan (Common place name) Coastal plain behind the seashore
LBW	Low Birth Weight
LKMD	Lembaga Ketahanan Masyarakat Desa (Village self reliance organization, village development council)
LRWSS	Lombok Rural Water Supply and Sanitation Project (AusAID program)
M.A.	Mata Air (Spring)
MOH	Ministry of Health
MOHA	Ministry of Home Affairs (Dalam Negeri)

MOU	Memorandum of Understanding
MSRI	Ministry of Settlement and Regional Infrastructure
Musbangdes	Musyawarah Pembangunan Desa (Village development planning discussion)
NGO	Non-governmental Organization
NTB	Nusa Tenggara Barat (West Nusa Tenggara)
NTT	Nusa Tenggara Timur (East Nusa Tenggara)
O&M	Operasi dan Pemeliharaan (Operation and Maintenance)
O/H	Overhead (High tension electric power line)
OECF	The former Overseas Economic Cooperation Fund of Japan (now JBIC)
OJT	On-the-Job Training
P2AT	Proyek Pengembangan Air Tanah (Groundwater Development Project)
P3P	Proyek Peningkatan Prasarana Pemukiman (formerly P3AB) (Development and Management of Water Supply Construction Projects)
PAM	Perusahaan Air Minum (Water Enterprises) Generic term used for PDAM and BPAMs
PDAM	Perusahaan Daerah Air Minum (Regional Drinking Water Enterprise)
Peraturan	Regulation
PERPAMSI	Persatuan Perusahaan Air Minum Seluruh Indonesia (Indonesian Water Supply Association)
PH	Public Hydrant
PKK	Pembinaan Kesejahteraan Keluarga (Local Women's Welfare Organization)
PLN	Perusahaan Listrik Negara (National Electricity Enterprise)
PMD	Department of Community Empowerment
POKMAIR	Kelompok Pemakai Air (Name of WUO)
Polindes	Poliklinik Desa (Village health sub-center)
PPP	Public Private Partnership
Propinsi	Province (First level of local government Tk.I)
PU	Pekerjaan Umum (Public Works)
Puskesmas	Pusat Kesehatan Masyarakat (Village Health Center)
PVC	Unplasticized Pol y vinyl Chloride (Pipe)
PVP	Photovoltaic System
Rakorbang	Rapat Koordinasi Pembangunan (Project/Budget selection discussion at Tk.II)(Coordination Meeting for Development Budget Planning)
RC	RC (Reinforced Concrete)
RDWS	GOI Rural Water Supply Development Program
RESV	Reservoir
RK	Rukun Kampung (Hamlet in a rural area)
RRA	Rapid Rural Appraisal
RT/RW	Rukun Tetangga (Neighborhood)/Rukun Warga (Hamlet in an urban area)
RWSS	Rural Water Supply and Sanitation Project (ADB program)
S/W, SW	Scope of Work
Sawah	An area of irrigated land used for growing paddy
SC	Specific Capacity
Sekretaris	Secretary, as in Sekretaris Desa
SISKES	GOI Health Services Improvement Program
SPAM	Drinking Water Supply System
SSF	Slow Sand Filter (Water Treatment Plant)
SWL	Static Water Level
T	Temperature
TB	Tuberculosis
TBA	Traditional birth attendant

Tk.I	Tingkat I. The first level of local government. I.e. Province
Tk.II	Tingkat II. The second level of local government. I.e. District
TNI	Tentara Nasional Indonesia. The Indonesian armed force
TP-PKK	Women's movement Organization
U5MR	Under 5 Mortality Rate
UDKP	Usulan Kecamatan (List of Development Planning Proposals)
UFW	Unaccounted-for-Water
UNDP	United Nations Development Program
UNICEF	United Nation Children's Fund
UU	Undang Undang (Law)
VAP	Village Action Plan
VES	Vertical Electric Sounding
WSS	Water Supply and Sanitation
WSSLIC	Water Supply and Sanitation Project for Low Income Communities (World Bank program)
WTP	Water Treatment Plant
WUO	Water Users' Organization

CHAPTER 1

BACKGROUND OF THE STUDY

CHAPTER 1 BACKGROUND OF THE STUDY

The study area covers the Yogyakarta Municipality, Sleman Regency and Bantul Regency. The total administrative area is about 1,200 km^2 and the total population in 2004 was about 2,100,000. The water supply system is operated by PDAM, under the jurisdiction of the respective regional administrative bodies (i.e. the municipality and the regencies). The water supply situation is deteriorating due to population increases, lack of timely facility improvement, and ageing of the facilities. In 2004, the ratio of direct connection to PDAM in Yogyakarta Municipality was about 40 %, and was less than 10% in the Regencies of Bantul and Sleman. The direct connection ratios still remain low. The financial situation for each PDAM is weak and the PDAMs lack sufficient budgets for operation and maintenance. Outside of the PDAM service area, people rely on community water supply systems. These systems are usually supplied from groundwater or spring water.

The study area is located between the Purogo and Opaku rivers and has a rich groundwater resource. The groundwater has been used widely for domestic, industrial and commercial purposes. It is considered that this situation means that it may be difficult to further develop the groundwater resource within the study area. Therefore, the Government of the Special Province of Yogyakarta (DIY) has started preparatory work (by introducing private sector investment through the DBOT project) for a bulk water supply system.

Management capability improvement and increasing efficiencies of these PDAMs are required urgently. The vision for improvements to the water supply system includes establishing policies and strategies that target improvement, supported by development plans for water supply facilities and for capacity building to upgrade the service condition in the study area.

In response to an official request from the Government of the Republic of Indonesia (GOI), the Government of Japan (GOJ) agreed to provide technical support for the study for the Regional Water Supply Development Plan for Greater Yogyakarta ("the Study"). This support is being provided through the Japan International Cooperation Agency (JICA). JICA is the GOJ's official agency responsible for implementation of technical cooperation projects.

From 28 June to 17 July 2006, the JICA preparatory study team visited Indonesia. The scope of work for the study was agreed to on 11 July 2006. Agreed scope of work is attached in Appendix 1. Following this agreement, JICA formed the JICA Study Team by selecting appropriate consultants. The Study commenced during September 2006.

The Study was originally scheduled to be conducted in the following three phases:

- Phase I: Formulation of Policy and Strategy

- Phase II: Formulation of Master Plan
- Phase III: Formulation of Action Plan

The scope of work was mutually agreed by the GOI and JICA on July 11. In this Agreement, DIY requested to make the Master Plan in consistence with the bulk water supply project for which Yogyakarta Special Province has DBOT agreement signed on January 15, 2005.

JICA understood the above DIY's request and it would consider, as given conditions for the Master Plan, the quality and quantity of the bulk water and its delivery points, which shall be reservoirs in Yogyakarta Municipality and Regencies of Bantul and Sleman.

JICA requested and DIY agreed to keep JICA informed of the bulk water supply project in order to implement the study work effectively."

Since the DBOT project is located as upstream side of the JICA Study, from raw water intake to the reservoirs, detailed information concerning the DBOT bulk water supply project is indispensable for preparation of the Mater Plan by JICA.

Hence, the JICA requested to Indonesian side to provide sufficient authorized information for preparation of the Master Plan concerning the DBOT bulk water supply project from the stage of Phase I of the study before commencement of Phase II: Formulation of Master Plan.

At the end of the Phase I, "Progress Report No. 1" was prepared to inform the progress of the study work and findings during the Phase I which was conducted from September 2006 to March 2007 in Yogyakarta. Steering committee meeting was held on March 5, 2007 to discuss contents of the Progress Report No. 1 and the report was accepted by Indonesian side with some comments. These comments and agreements between Indonesian and Japanese sides are described in Minutes of Meeting which were signed on March 6, 2007 (Appendix 1).

In the Minutes of Meeting on the Progress Report No. 1, DIY agreed to notify in writing to JICA Indonesia Office of the latest status of water source development (DBOT bulk water supply project) by the end of March 2007.

Based on the agreement, the DIY issued a letter to JICA Indonesia office on April 5, 2007 (Appendix 1). According to the letter from the DIY, the situation of DBOT bulk water supply project had not been changed without any progress and the DIY informed that the DIY was still evaluating the problems concerning continuation of the DBOT bulk water supply project.

Under such circumstances, provision of sufficient authorized information of the DBOT project

to the JICA was difficult for Indonesian side because the DBOT bulk water supply project had been suspended and there was no progress of the DBOT project after agreement of the scope of work in July 2006.

In this context, JICA divided the Phase II into two parts such as “Part 1” and “Part 2”. The study scopes of the Part 1 were selected as they were weak link with the Bulk Water Supply Project and JICA was able to implement the study free from those unclear circumstances.

Major scope of the study of the Part 1 of Phase II are as follows.

- Projection of future population and water demand
- Evaluation of groundwater resources
- NRW survey

At the commencement of the Part 1 of Phase II, JICA and Indonesian side held a series of meetings to discuss future direction and the scope of work of the Study.

The results of the meetings were described in the Minutes of Meeting concerning Scope of Work of the Study (Appendix 1) and Indonesian and Japanese sides mutually confirmed and agreed on May 29, 2007.

In the Minutes of Meeting, following issues were confirmed by the both parties.

- The scope of the Part 2 of Phase II for preparation of Master Plan could not be commenced under the current circumstances.
- In case that the necessary information such as the location/capacity of reservoirs and water quantity and quality of bulk water were not provided by Indonesian side, the Study would be regrettably terminated with the completion of the Part 1 of Phase II.

Indonesian side requested continuation of the Study and agreed to confirm conditions for continuation of the Study which were discussed during the meeting. Indonesian side agreed to issue the document for confirmation by July 25, 2007 as described in the Minutes of Meeting.

The DIY issued a letter on July 23, 2007, unfortunately, the contents of the letter were regrettably not sufficient to fulfill the requirements stated in the last Minutes of Meeting.

Upon receivable of the letter from the DIY, the JICA decided to terminate the Study in November 2007. This Technical Report was prepared to describe and to explain all the results by the Part 1 of Phase II. In this report, although the master plan was unfortunately not prepared, the issues which should be discussed in future master plan are also listed up based on the results of analysis and field investigation of the JICA Study Team.

CHAPTER 2

OBJECTIVES OF THE STUDY AND STUDY AREA

CHAPTER 2 OBJECTIVES OF THE STUDY AND STUDY AREA

2.1 Objectives of the Study

The original objectives of the Study which were agreed on July 11, 2006 between GOI and JICA were:

- to prepare a Master Plan on Regional Water Supply Development Project in Greater Yogyakarta (Yogyakarta Municipality, Sleman Regency and Bantul Regency) with a target year 2020,
- to prepare an Action Plan for the institutional strengthening for the water supply services in Greater Yogyakarta, and
- to carry out capacity building of counterparts through the participation in the Study

However, preparation of the Master Plan was suspended because of lack of sufficient authorized information concerning DBOT Bulk Water Supply Project as described in Chapter 1. Preparation of the Action Plan was also suspended accordingly.

The Study was ended by preparation of this Technical Report and the Report includes issues to be discussed in future mater plan.

2.2 Study Area

The Study area covers Yogyakarta Municipality, Sleman Regency and Bantul Regency.

CHAPTER 3

NATURAL AND SOCIO ECONOMIC CONDITIONS

CHAPTER 3 NATURAL AND SOCIO ECONOMIC CONDITIONS OF THE STUDY AREA

3.1 Natural Conditions

3.1.1 Topography

The Study area is located at southern central Java Island in DIY which is comprised of Kulonprogo Regancy, Bantul Regency, Gunungkidul Regency, Sleman Regency and Yogyakarta Municipality. The target areas of the Master Plan Study are Bantul Regency, Sleman Regency and Yogyakarta Municipality

Table 3.1.1 Name of Capitals. Areas

Regency/Municipality	Capital	Area (km2)	Area (%)
Kulonprogo	Wates	586.27	18.40
Bantul	**Bantul**	**506.85**	**15.91**
Gunungkidul	Wonosari	1485.36	46.63
Sleman	**Sleman**	**574.82**	**18.04**
Yogyakarta	**Yogyakarta**	**32.50**	**1.02**
DIY		3185.80	100.00

Source: National Land Board of DIY

Topographically important features of the province or the study area are listed as follows.

- An active volcano Mount Merapi, as the highest mountain (2,911m) in this area rises on the north of the area and its slope extend to the south by the Indonesian Ocean.
- The study area lay between Mount Merapi and Indonesian Ocean.
- The complex system of tributary rivers are draining the Merapi slopes either to the Progo River or the Opak River
- Coastal alluvial plains of Kulonprogo and Bantul are stretching on the south.
- Volcanic and sedimentary hills dominant at the border of eastern Buntul and northern Gunungkidul.
- Old volcanic “West Progo” and limestone “Sentolo” hills of Kulonprogo is located on the west.

3.1.2 Geology

The geology of this area is complicated because of the volcanic activities that continue today and past changes in sea level. Large part of the study area is covered by alluvial deposits or volcanic sediments mainly originated from Mount Merapi. Lowland plain in the south part is covered by alluvial deposits derived mainly from the redeposited volcaniclastic materials. Important formations for water resources are the Tertiary and Quaternary deposits which consist

of alluvial deposits and volcaniclastic sediments. Because of it's high permeability, these formation act as good aquifer.

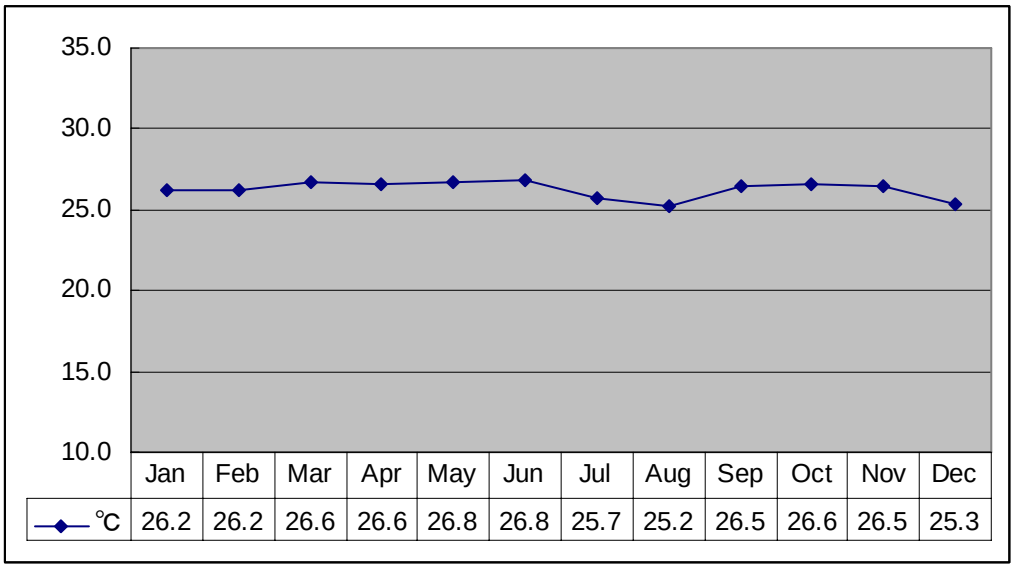
There are one really major aquifer in the study area; the Merapi granular aquifer which outcrops over most of Sleman and Bantul.

The potential of the Wates aquifer in lowland Bantul and Wates is less than the Merapi.
The Sentoio limestone outcrops in Kulonprogo and Bantul is minor in groundwater potential.

3.1.3 Climate

The climate of the study area is categorized as tropical monsoon by two seasons, the dry and rainy season. It is said that the dry season is from April until September and the rainy season is from October to March. Figure 3.1.1 stated the air temperature of a weather station which is located in the rough center of the study area.

Usually dry season is hotter than rainy season. The timing of rainy season is changing every year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
℃	26.2	26.2	26.6	26.6	26.8	26.8	25.7	25.2	26.5	26.6	26.5	25.3

Figure 3.1.1 Temperature in the Study Area (2005)
Observed at Jitengan, Balecatur, Gamping, Sleman (S07'48'59'18', E110'17'42'00)
Source: Meteorological and Geophysical Agency

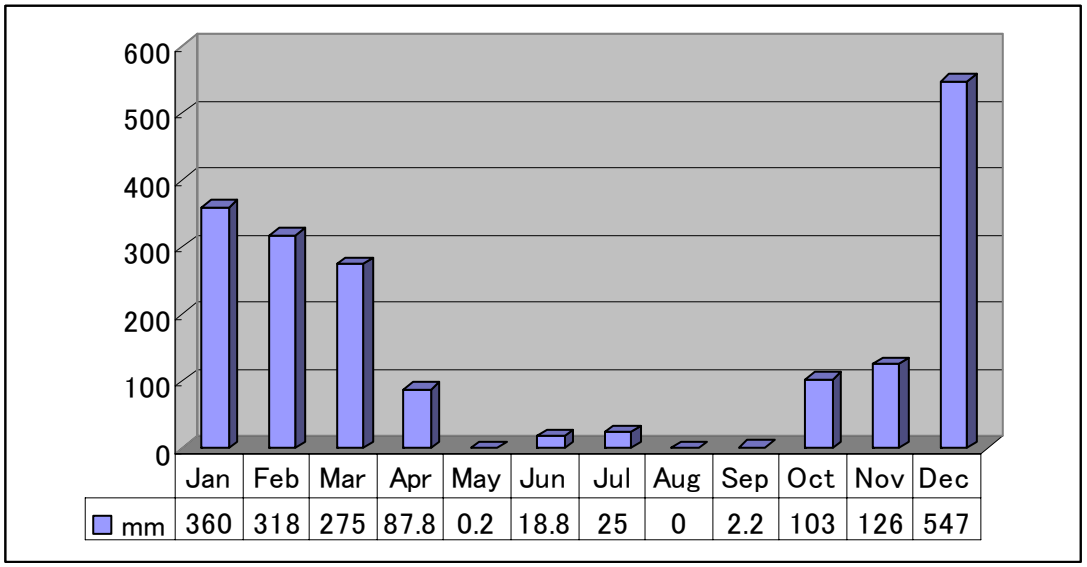


Figure 3.1.2 Rainfall in the Study Area (2005)

Observed at Jitengan, Balecatur, Gamping, Sleman (S07'48'59'18', E110'17'42'00)
Source: Meteorological and Geophysical Agency

Figure 3.1.2 illustrates the rainfall of the study area. The total rainfall was 1,862mm in 2005. The total amount of rainfall recorded in December was highest. The rice planting becomes active in this season. The dry season start from April and it seldom rains during dry season.

Due to the topographic condition, rainfalls and air temperatures are different by regency and Municipality. As shown in Table 3.1.2, the rainfall is higher in Gunungkidul and Sleman which are higher altitude areas.

Table 3.1.2 Rainfall by Regency/Municipality in 2005 (mm)

Month	Regency/Municipality				
	Kulonprogo	Bantul	Gunungkidul	Sleman	**Yogyakarta [1)]**
1. January	298-404	**267-362**	361-489	**385-521**	**330**
2. February	251-340	**271-366**	346-443	**356-482**	**343**
3. March	275-372	**246-333**	301-407	**339-459**	**293**
4. April	153-208	**100-136**	147-199	**224-302**	**135**
5. May	108-147	**57-77**	91-160	**129-254**	**124**
6. June	64-87	**41-55**	81-109	**70-94**	**6**
7. July	39-53	**28-37**	43-57	**34-47**	**35**
8. August	29-40	**13-25**	19-26	**27-36**	**0**
9. September	50-67	**32-44**	28-38	**49-66**	**10**
10. October	114-154	**82-111**	97-131	**142-109**	**19**
11. November	232-314	**185-247**	217-293	**271-367**	**225**
12. December	265-358	**223-301**	286-387	**304-412**	**36**

Source: Communications and Transportation Services of DIY
Note: 1) Data Year 2004

3.1.4 Landuse

Land use for agriculture is notable in this area. Table 3.1.3 indicates the size and proportion of the wet-land and dry-land. Dry-land is slightly increasing in recent years. Most of the remaining water short "sawah"(means paddy field in Indonesian) in the province consists of discrete spring or rain-fed areas; many in upland locations. The water short tegal land have been identified throughout the province which are suitable for irrigation.

Table 3.1.3 Area of Wet-land and Dry-land for Agriculture by Regency/Municipality

Regency/Municipality	Land Area (ha)		Total (ha)
	Wetland	Dryland	
1. Kulonprogo	10,833	47,794	58,627
2. Bantul	**15,991**	**34,694**	**50,685**
3. Gunung Kidul	7,626	140,901	148,536
4. Sleman	**23,191**	**34,291**	**57,482**
5. Yogyakarta	**121**	**3,129**	**3,250**
DIY	57,762	260,818	318,580
2004	58,050	260,530	318,580
2003	58,210	260,370	318,580
2002	58,367	260,213	318,580
2001	58,608	259,972	318,580
2000	58,858	259,722	318,580
1999	59,742	258,838	318,580
1998	59,792	258,788	318,580

Source: Agriculture Survey - VA, Regency/City of Agriculture Offices, DIY

3.1.5 Environmental Conservation

With regard to the relevant environmental conservation on natural conditions, scarce fauna/flora and development restricted area can be considered as the high priority targets in comparison to the other natural items such as topography/geology, soil erosion, groundwater, lake/river hydrological regime, and landscape taking the study object into account.

1) Scarce Fauna and Flora

In term of the natural environmental conservation/preservation, hitherto known Wild Animal Protection Law (1927), Game Law (1940) and Natural Protection Law (1941) were abandoned, and Act on the Biological Resources/Living Resources and Ecosystems to strengthen the protection on rare fauna and flora (especially, endangered species), reservation on nature reserved area such mangrove forest and sustainable management on forest was established in stead in 1990.

The following fauna and flora as shown in Table 3.1.4 were nominated to be protected within the Greater Yogyakarta area. *Geopelia Striata* and *Kepel* were nominated as the identities and the symbol of logo for the Special Region of Yogyakarta. In addition, *Puter* and *Sawo Kecik* were also nominated as the identities within the Bantul Regency.

Table 3.1.4 Nominated Fauna and Flora to be Protected in the Study Area

Classification	Fauna	Flora
Type/Kind	- Geopelia Striata (a kind of dove) - Puter (a kind of dove) - Turtle a) Green Turtle b) Hawksbill Turtle c) Olive Ridley d) Demochelys Coriacea	- Cangkring (fruit-tree) - Duwet (fruit-tree) - Gayam (tree) - Gedoya (wild plant) - Girang (fruit-tree) - Janglot (used for building material) - Kepel (fruit-tree) - Klayu (wild plant) - Mundu (fruit-tree) - Randu Alas (leaf used for drug) - Rempeni (wild plant) - Salam (fruit-tree) - Sawo Kecik (fruit-tree) - Stone Banana (for drug) - Water Jambu (fruit-tree)

*Source: Environmnetal Protection Agency, The Provincial Government of the Yogyakarta Special Regi*on

2) Development Restricted Area

According to the information of respective BAPEDA and/or BAPEDALDA in Sleman Regency, Yogyakarta Municipality and Bantul Regency, Table 3.1.5 shows the development restricted area within the Greater Yogyakarta area.

Table 3.1.5 Development Restricted Area within the Greater Yogyakarta

Name	Park	Temple	Remains etc.	Mosque	Remark
Sleman Regency	- Merapi National Park	- Abang - Barongunibo - Bany - Gebang - Grimbingan - Gupolo - Ijo - Kalangan - Kalasan - Karaton Boko - Morangan - Prambanan - Sambi Sari - Sari - Sari Sorogedug - Sejiwan - Watu Gudik	- Petilasan Kraton Ratu Boko - Monument Yogya Kembali	- Masjid Agung - Common mosques	Adisutjipto International Airport
Yogyakarta Municipality	- Gembiraloka Zoo		- Kraton Yogyakarta -Museum Sonobudoyo - Gedung Agung - Benteng Vredeburg	- Common mosques	
Bantul Regency			- Grave Imogiri	- Common mosques	

Source: JICA Study Team

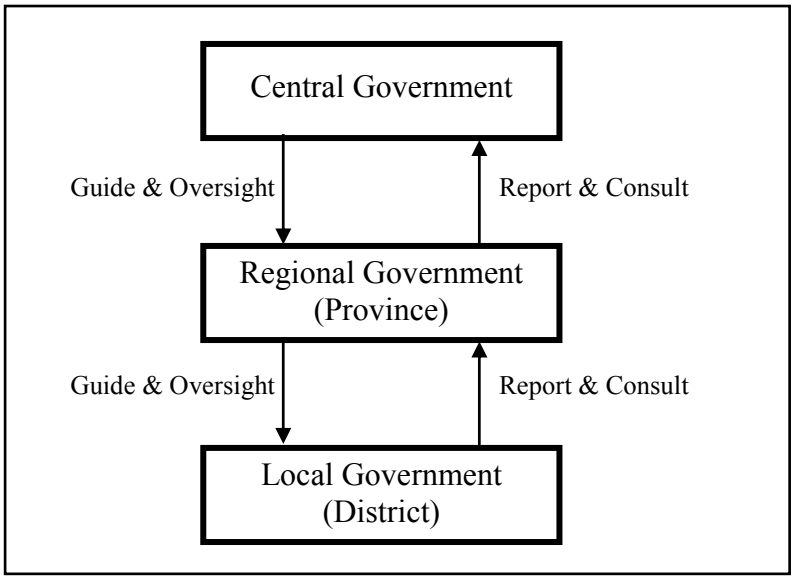
3.2 Socio Economic Conditions

3.2.1 Administrative Structure

(1) Government System and Decentralization Status

The administrative (executive) structure of the Republic of Indonesia consists of three layers: the central government, provincial government, and regency's/municipality's government. The relationship between the three-level governments is of hierarchical nature in that the lower-level government reports and consults to the higher-level government which guides and supervises (oversights) the lower one as shown in Figure 3.2.1.[1]

[1] The hierarchical nature of three-level governments was once disbanded by the previous decentralization Law No.22/1999, but then revived by the modified Law No. 32/2004.



(Source) JICA Study Team

Figure 3.2.1 Hierarchy Government Structure

At the central level, the President holds executive power and is assisted by the Vice President and Cabinet in governing the country. At the provincial level, the head of a province – *propinsi* - is the *gubernur*. Two lower government levels operate below the *propinsi*; these are *kabupaten* (regencies) and *kota* (municipalies). The head of a *kabupaten* is the *bupati*, and the head of a *kota* is the *walikota*. There are several administrative levels of government under *kabupaten/kota*; these are *kecamatan* (sub-districts), *kelurahan* (towns), and *desa* (villages). Indonesia now comprises 33 provinces and 407 regencies/municipalities. Each province and regency/municipality has its own government structure as explained later in this section.

In 1999 the country's regions were given increased autonomy with passing of two decentralization laws *Undang-Undang* 22/1999 (which provided for the decentralization of government powers and functions) and *Undang-Ungang* 25/1999 (which provided for revenue sharing and other financial arrangements between central and regional/local governments). The laws provided a new framework for governance by introducing new policies, laws, processes and procedures which give regions greater autonomy in decision-making process affecting regional development. Law 22/1999 devolved certain powers to local governments and set up regional political processes and Law 25/1999 supported decentralization by providing fiscal resources for the disposal of local governments.

Significant problems have been experienced with interpretation and implementation of these laws which did not meet many of expectations for regional autonomy. Subsequently the Government replaced the two laws with Law 32/2004 on regional government and Law 33/2004 on financial balance between central and local governments.

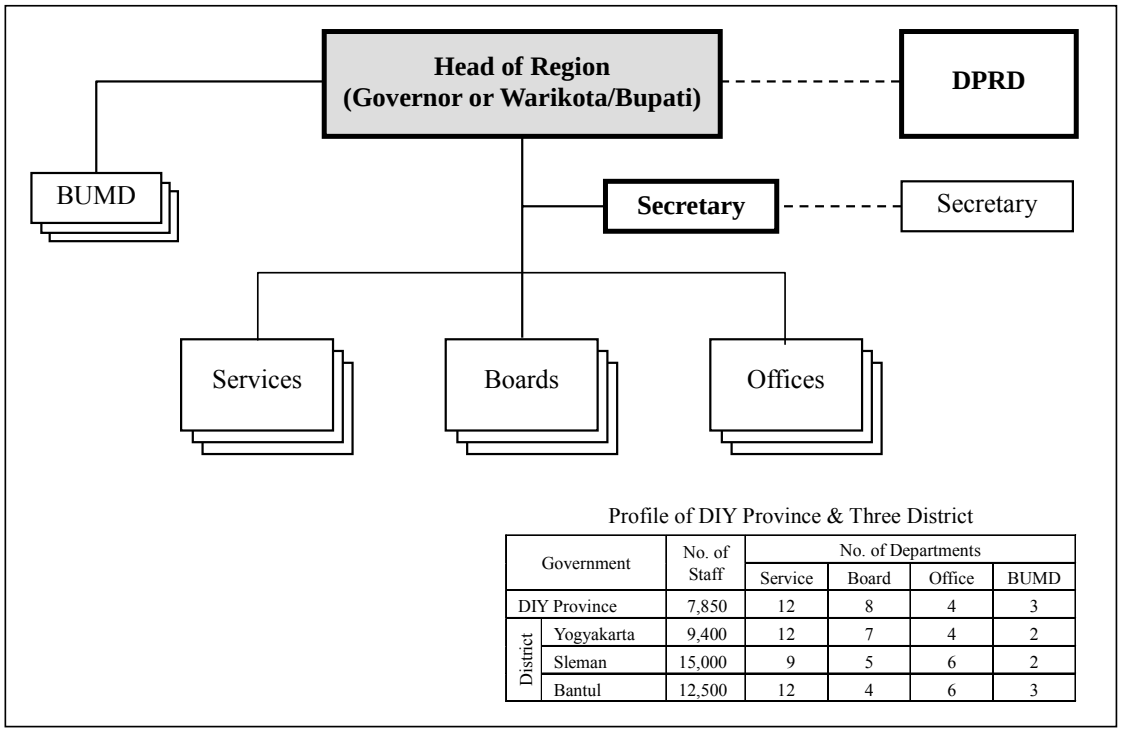
The new laws (Law 32/2004 and Law 33/2004) introduce important revisions to address failures in the 1999 versions. The new Government has not analyzed fully the implications of the changes introduced by these new laws involved with the implementation arrangements. The new laws especially seek to define more clearly the roles and responsibilities of the provincial and district governments, and the financial arrangements for revenue sharing. There is a need of new bylaws (rules and regulations) to enable the new laws to be implemented. However, as of December 2006, formulation and issuance of required bylaws is slowly progressed and delayed.

(2) DIY and District Government Structure

The DIY consists of one municipality and four regencies: Yogyakarta Municipality, Sleman Regency, Bantul Regency, Gunungkidul Regency and Kulonprogo Regency. The profile of the districts comprising the Study Area is:

- Yogyakarta Municipality consists of 14 sub-districts (Kecamatan) and 45 towns/villages (Kelurahan).
- Sleman Regency consists of 17 sub-districts (Kecamatan) and 86 towns/villages (Kelurahan).
- Bantul Regency consists of 17 sub-districts and 75 towns/villages.

The Provincial and Municipality's/Regency's Government have similar organization structures as shown in Figure 3.2.2. The Municipality's/Regency's government consists of head of Municipality/Regency (*gubernur* or *bupayi/warikota*) responsible for executive branch and the Municipality's/Regency's DPRD (House of Representative) for legislative branch. To implement administrative duties, according to coordinating of plan and job program for regional development, and provision of various public services, the head of the region has several organizations as his/her staff. They are the Secretary (*Sekretaris*), Services (*Dinas-Dinas*), Boards (*Badan-Badan*) and Offices (*Kantol-Kantol*). Besides the government departments, regional government-owned companies (BUMD) are established as a separate enterprise. Organization belonging of major institutions concerned for the JICA Study is as follows. Public works department and Health department belong to *Dinas*; Departments of planning (BAPPEDA), Finance & Budget, and Environment Control, to Badan; and PDAM, to BUMD. PDAM is a water supply service company 100 %-owned by the Municipality's/Regency's government.



Profile of DIY Province & Three District

Government		No. of Staff	No. of Departments			
			Service	Board	Office	BUMD
DIY Province		7,850	12	8	4	3
District	Yogyakarta	9,400	12	7	4	2
	Sleman	15,000	9	5	6	2
	Bantul	12,500	12	4	6	3

(Source) JICA Study Team

Figure 3.2.2 Simplified Organization Charts of DIY and District Governments

The DIY Government has 24 technical (non-secretary) departments consisting of 12 services, 8 boards, 3 offices and a regional hospital. The Province owns three separate companies: a bank, a general service and a cigar factory.

Municipality's/Regency's governments have similar department compositions to the Provincial government.

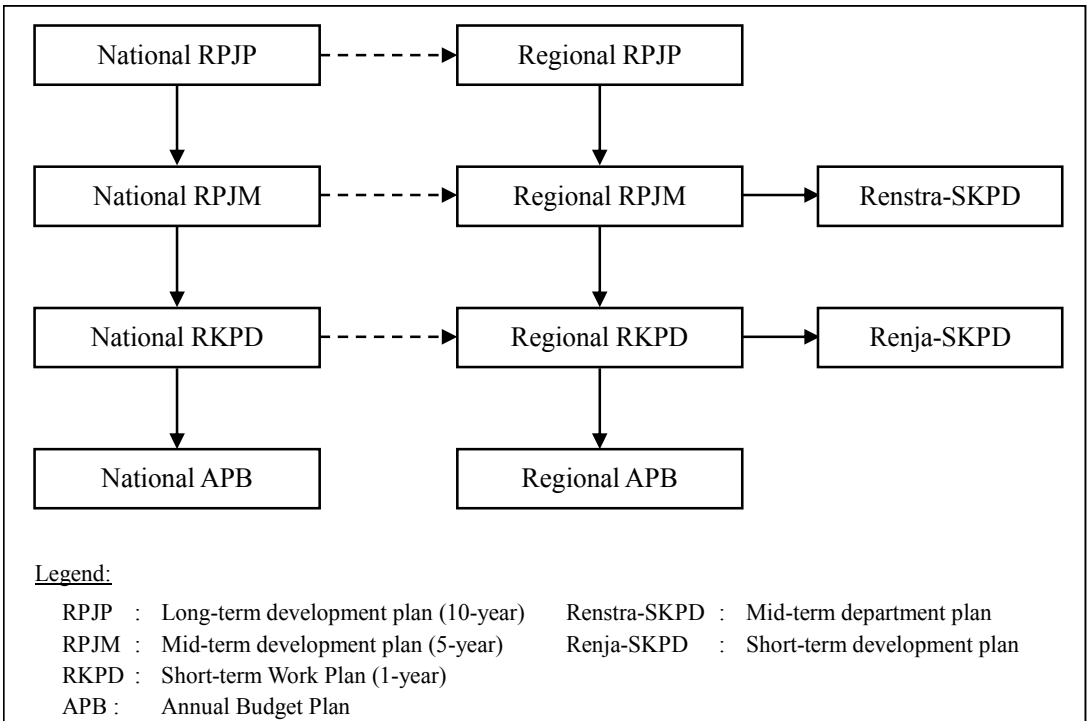
- Yogyakarta city government has 24 technical departments, including 12 services, 7 boards, 4 offices and one district hospital and owns two separate companies, including PDAM and District Bank.
- Sleman regency government has 21 technical departments, including 9 services, 5 boards, 6 offices and one district hospital and owns two separate companies, including PDAM and District Bank.
- Bantul regency government has 23 technical departments, including 12 services, 4 boards, 6 offices and one district hospital and owns two separate companies, including PDAM, District Bank and a trading company .

The coverage of provincial and district services/boards is demarcated depending on the coverage of administration:

- Development and service activities across districts are under the responsibility and authority of the Provincial government.
- Development and service activities within one district are under the responsibility and authority of the Provincial government.

(3) Regional Planning and Management System

The hierarchical structure once disbanded by Law 22/1999 was partly revived as the result of the new decentralization laws (Law 32/2004 and Law 33/2004). Regional level planning documents (PRJ) are supposed to be integrated with national level documents, including the current National Development Plan released by Bappenas. They explain the development of general policy, programs and strategy, work plans (PKPD), sources of funding and functions of monitoring and evaluation. The relation between development planning documents at the national and regional levels is shown in Figure 3.2.3.



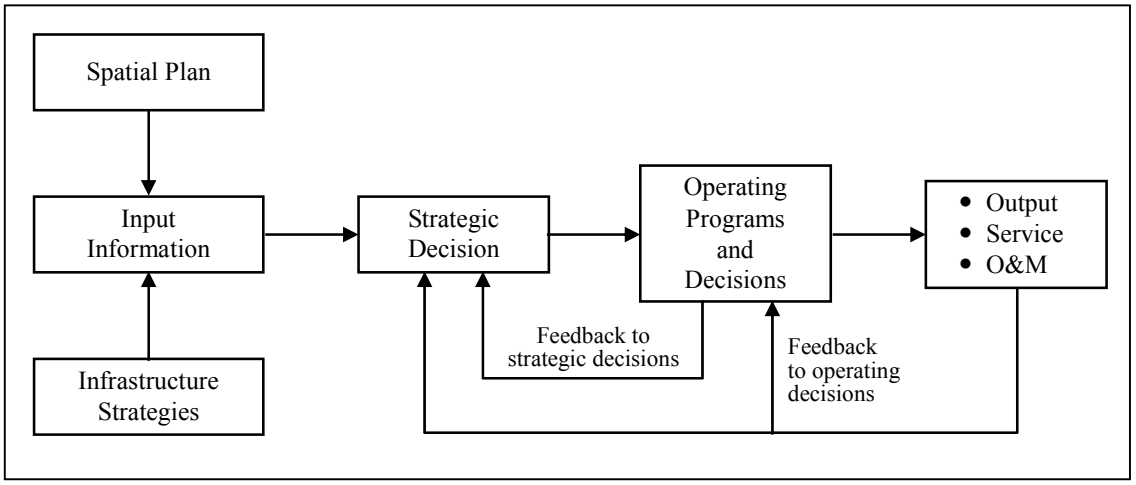
(Source) JICA Study Team

Figure 3.2.3 Planning and Management Framework Based on Law 25/2004

Regional development is a key priority policy area in the current President's administration governance program. Mid-term development plans emphasize revitalization, decentralization and regional autonomy process; rural development; and alleviation of regional development disparities. The Mid-term Development Plan (RPJM) 2004-09 issued by Bappenas states that there are eleven problems and challenges faced by Indonesia in the five-year development period. These are described in the vision and mission statements of the development plan. The vision is to realize: a safe, integrated, harmonized and peaceful society; a community, country and citizenship that prioritises law, equality and human rights; and an economy that creates job opportunities and standards of living that strengthen sustainable development outcomes. The mission is to realize safety and peace, democracy and justice, and welfare. The plan is to be implemented under two national strategies. The first aims to reform national

governance based on the national ideology *Pancasila*. The second aims to implement the charter of the basic laws for Indonesia *Undang Undang Dasa* (UUD) 1945.

Meanwhile, the new laws (Law 32/2004 and Law 33/2004) have provided an opportunity for introduction of different modalities to implement plans. The Integrated Urban Infrastructure Development Program (IUIDP) approach is one of success approaches. The IUIDP approach initiated by the Ministry of Human Settlements and Regional Infrastructure has proved effective in addressing urban infrastructure development problems. Figure 3.2.4 shows the framework for regional development planning under the IUIDP process.



(Source) ADB

Figure 3.2.4 IUIDP Planning and Implementation Process

The Indonesian government helped develop the IUIDP process and it has now been implemented at a metropolitan-wide scale in several cites, such as Jakarta, Medan and Bandung. Furthermore, the IUIDP has been applied in a regional-wide approach to Botabeck UDP, Semarang - Surakarta UDP, Yogyakarta UDP and East Java - Bali UDP in anticipating of increasing pressure from rapid urbanization. The Yogyakarta UDP includes programs proposed by the *Joint Secretariate of Kartamatul* for inter municipal cooperation on urban infrastructure management between Yogyakarta City, Sleman Regency and Bantul Regency.

(4) Finance and Investment for DIY

Based on Law 33/2004, state (central government) finances are transferred to the regional governments for implementation of decentralized functions based on tasks specified by the central government to the regional government, with due regard to fiscal stability and fiscal balance. It is a comprehensive system which funds decentralized, de-concentrated, and co-administered tasks. There are three types of allocation funds: (i) *Dana Alokasi Umum* (DAU) – general allocation funds, (ii) *Dana Alokasi Khusus* (DAK) – special allocation funds

and (iii) other grants

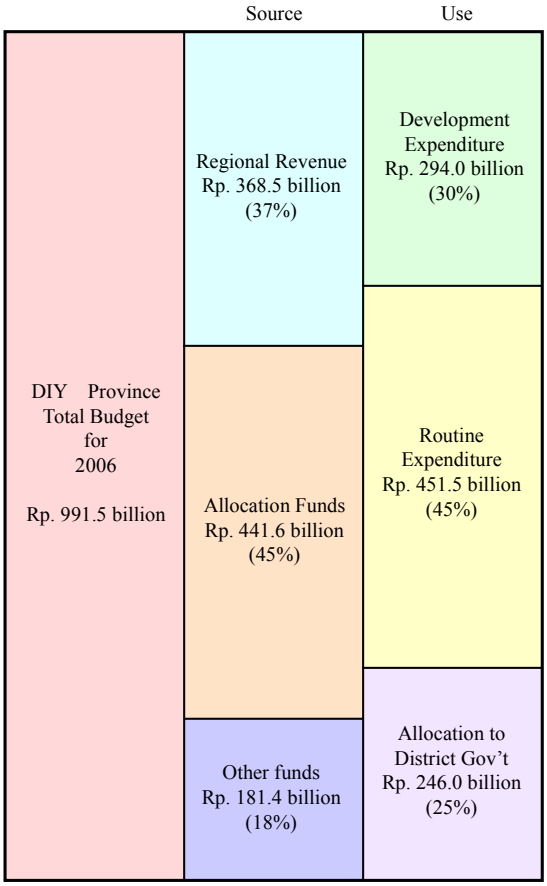
The Central government budget for 2006 amounting to Rp647.7 trillion (US$72 billion) is divided into Central government expenditure and transfer to regional governments. The state budget's allocation for regional government expenditure was Rp220.1 trillion (US$24.5 billion) of which Rp145.7 trillion (US$16.2 billion) was disbursed through the DAU, and the balance through the DAK and other grants.

The administration of regional government affairs in the implementation of decentralization is funded by the regional budget, *Anggaran Pendapatan Belanja Daerah* (APBD), which is the responsibility of, and approved by, regional governors.

There are three principal sources of regional development funds:

- Regional revenue (regional taxes, regional retributions, profits from BUND, interests revenues, etc)
- Balancing funds (natural resources revenue sharing funds, DAU, DAK)
- Other funds (regional loans, regional reserve funds, proceeds from sales of regional assets, etc)

Figure 3.2.5 shows the source/use structure of DIY budget for year 2006. The total budget of Rp. 991.5 billion was sourced from regional revenue (37%), allocation funds (44%) and other funds (18%). The share of DAU/DAK (transfer from central government) of the allocation funds is as high as 91%. The budget was allocated to development expenditure (30%), routine expenditure (45%) and allocation to district governments (25%). We can say the budget structure of DIY is not healthy in that most of the budget is eaten up by recurrent expenditures (salaries, overheads, maintenance, etc) and only 30% is able to allocate to new infrastructure investment.



(Source) DIY (Bappeda)

Figure 3.2.5 DIY Budget for 2006

Since the budget support by DAU/DAK is significantly important, details of DAU/DAK allocation mechanism are analyzed. Based on Law 33/2004, the total amount of DAU is set at, at least 26% of net domestic revenue as established in the state budget or *Anggaran Pendapatan Belanja Nasional* (APBN). DAU for a region is allocated based on the fiscal gap and basic allocation. The first gap is the difference between what a region needs to function and the capacity of the region to generate funds locally. The basic allocation is calculated based on the total salaries of the civil service in the region. The amount of DAK is determined annually in state budget (APBN) and is allocated to certain regions to finance special activities relevant to the region. The law establishes the criteria for DAK, including general criteria, special criteria and technical criteria. General criteria are established with due regard to the financial capacity of the region in regional government APBD, special criteria are established with due regard to the prevailing laws and regulations and the characteristics of the region, and technical criteria are established by the state ministry/technical department. Regions receiving DAK shall provide matching funds equivalent to an amount of at least 10% of the DAK allocation.

Presidential Decree (Keppres) 181/2000 was issued to provide for the DAU for salaries; Keppres 39/2001, *Dana Kontingensi*., later amended it. The fund is used to solve mismatches

in the financing of civil workers. Since decentralization, the transfer of civil workers from central government to local government has changed the status of central civil workers. The change has resulted in a shifting of salary payments from central to local government. However, late disbursements of DAU have led to significant cash flow problems at the district and provincial government level. Therefore, under Keppres 39/2001, the *Dana Kontingens* is used to finance routine needs (such as civil employees' salaries). The local government may also borrow funds by raising bonds through regional development banks called *Bank Pembangunan Daerah* (BPDs) to finance development, capacity building needs and salaries. Lending for salaries is not sustainable and is resulting in increasing levels of debt servicing at the regional level.

Since 2001 there has been an increase in the base salaries of civil employees; however, although the provincial and district governments have had the power to raise additional revenues from land and property, they have been reluctant to do so. Many poorer districts are happy to operate on their DAU allocation, and not inclined to make an effort to improve revenue flow from other sources. Many chief executives have a low understanding of public and municipal sector finance laws and lending requirements, which is a reason for the generally weak financial management performance of many regional government agencies. The DIY is no exception in this respect.

There are also significant problems with asset management and valuation which is highly relevant to public asset administration. Many regional governments have not grasped the value of public sector assets under their jurisdiction accompanying decentralization. Under decentralization over 20 million assets items have been transferred from central to regional (province and district). The inventory and valuation records kept for these assets are insufficient. Subsequently, most regions own a large pool of public assets, or dead capital, which are generating limited or no returns. These are assets which cannot be taxed or utilized for public and private sector investment and revenue generation. Many regional governments find themselves in the position of being asset rich and cash poor. They need to develop capacity building to manage their assets better. The DIY is also facing this asset management problem.

3.2.2 Population

According to the results of the National Socio-Economic Survey in 2005, the population in DIY was recorded as 3,281,800 people, consisting of 50.78% females and 49.22 % males. The percentage of urban population is 58.11% and of rural population is 41.89%.

The growth rate of the population is 1.88%, which is greater than that of 2004 and before as shown in Table 3.2.1. The growth rate of Yogyakarta Municipality is higher than the total average of Yogyakarta Province at 5.5%[2].

The provincial average size of household was 3.04 and that of Bantul, Sleman and Yogyakarta Municipality were 3.42, 3.00 and 2.78 respectively. According to the socio-economists, the definition of household in Indonesia is not clear enough. After marriage, husbands are recorded as the head of family even if they live with their parents or other family members. Consequently, 'size of household' isn't always the same as the number of family members living in the same house.

Table 3.2.1 Number of Households and Population by Sex in DIY (by Regency/Municipality)

Regency/City	Household	Population			Ratio Sex	Growth	Size of household
		Male	Female	Total			
1. Kulonprogo	106,896	192,988	193,689	386,686	0.99	2.83	3.62
2. Bantul	240,522	401,172	422,562	823,734	0.95	0.91	3.42
3. Gunung Kidul	200,800	340,862	354,886	695,748	0.96	1.3	3.46
4. Sleman	318,423	482,810	472,314	955,124	1.02	1.18	3.00
5. Yogyakarta	151,420	197,505	223,003	420,508	0.89	5.5	2.78
DIY	1,081,061	1,615,337	1,666,463	3,281,800	0.97	1.88	3.04
2004	959,552	1,584,421	1,636,387	3,220,808	0.97	0.42	3.36
2003	922,636	1,595,183	1,612,202	3,207,385	0.99	1.61	3.48

Source : National Labor Force SurveyBPS-Statistics of DIY

With the total area of DIY at 3,185,80 km2, population density in 2005 was 1,030 persons per km2. Yogyakarta City recorded the highest population density, 12,939 persons per km2, while Gunungkidul Regency had the lowest at 468 persons per km2.

Based on the National Labor-Force Survey, the population aged 15 years and over by activity is 1,851,209 people including 93,507 unemployed workers. Non-economically active people who are attending school, involved in housekeeping and others number 721,810 people.

Table 3.2.2 shows the population aged 15 years and over by main industries. 36.1% are involved in the agriculture sector. The service industry, whose ratio reaches 29.3%, comprises the second largest population. 20.0% are in the manufacturing and construction industries. 14.1% of the population works for public services.

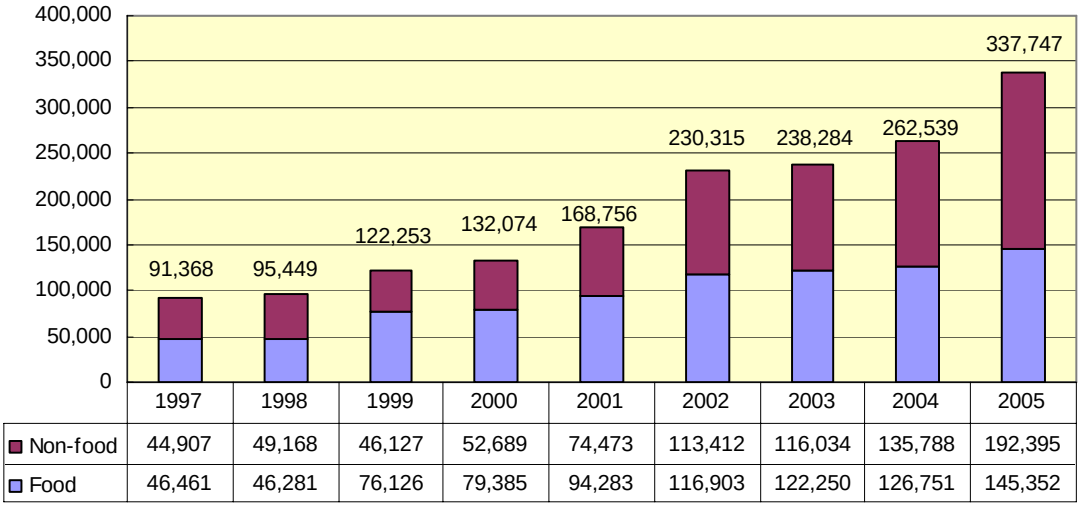
[2] The population projection was adjusted according to the real census data that was conducted in 2005. The growth ratio, 5.5, is the result of the adjustment, and not real population growth.

Table 3.2.2 Population 15 Years of Age and Over Who Worked During the Previous Week by Main Industry in DIY

Main Industry	Population			
	Male	Female	Total	%
1. Agriculture	331,043	303,378	634,421	36.09%
2. Manufacturing Industry	124,484	115,789	240,273	13.67%
3. Construction	108,305	2,381	110,686	6.30%
4. Wholesale, Retail Trade and Restaurant	196,374	230,004	426,378	24.26%
5. Transportation, Storage, and Communication	50,061	8,806	58,867	3.35%
6. Finance, Insurance, Real Estate and Business Services	19,988	9,735	29,723	1.69%
7. Public Services	129,875	116,993	246,868	14.04%
8. Others	10,096	390	10,486	0.60%
Total	970,226	787,476	1,757,702	100.00%

Source : National Labor Force Survey BPS-Statistics of DIY

The monthly expenditure per capita[3] recorded as Rp.337,717 in 2005 consists of food consumption in the amount of Rp.145,352 and non-food consumption of Rp.192,365 as shown in Figure 2.3.6. The ratio of expenditure increased 28.6% from 2004 to 2005. However, due to volcano eruption and earthquake, the expenditure is expected to be decreased in 2006[4].



	1997	1998	1999	2000	2001	2002	2003	2004	2005
Non-food	44,907	49,168	46,127	52,689	74,473	113,412	116,034	135,788	192,395
Food	46,461	46,281	76,126	79,385	94,283	116,903	122,250	126,751	145,352

Figure 3.2.6 Monthly Expenditure per Capita from 1997 to 2005 (Rp.)

3.2.3 Industry

The major industries in the Study Area are; tourismand its relative services, small-scale manufacturing and agriculture. These categories share more than 70% of the total GDRP of the Study Area.

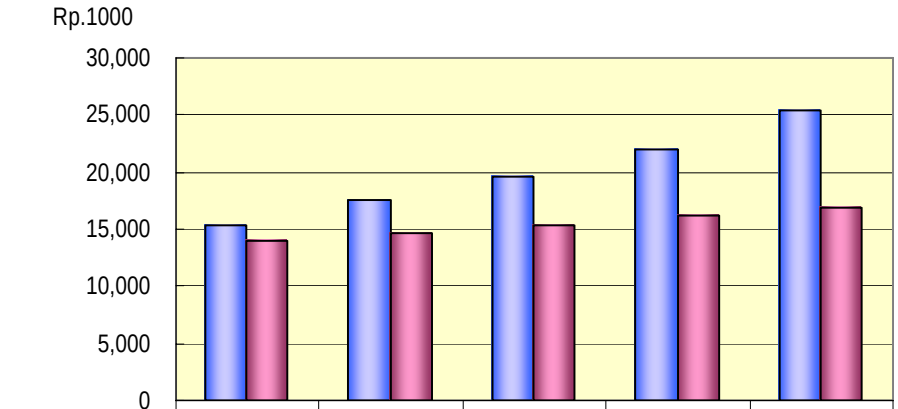
[3] BPS statistics of DIY has taken expenditure approach instead of income approach to grasp the living standard.

[4] Refer to Socio-Economic Survey conducted by JICA Study Team shown in Chapter 10

The economic growth of DIY in 2005 based on 2000 constant prices was recorded at about 4.74% in accordance with the statistical data of BPS DIY. There is positive growth in all sectors.

The construction sector had a high growth rate at 6.61% in 2005. The financial, ownership and business services sector, the electricity, gas, water supply sector and the transport and communication sector also all have positive growth rates at 8.17%, 5.83% and 5.76% respectively. Positive growth is also seen in the agriculture sector, at 4.35%.

Figure 3.2.7 illustrates the GDRP at current and constant price per capita in DIY. GDRP has grown constantly since the economic crisis in 1998.



year	2001	2002	2003	2004	2005
Current Price	15,289	17,522	19,613	22,024	25,419
Constant Price	14,055	14,687	15,360	16,146	16,911

Figure 3.2.7 GDRP in DIY at Current and Constant Price (2000)

The Gross Regional Domestic Product by Industrial Origin at Current Price in DIY is shown in Table 3.2.3. The obvious characteristics of the industrial structure can be observed. The trade, hotels and restaurants sector has the highest production in DIY, producing Rp.4,866,927 million in 2005. Borobodur and Prambanan are famous world heritages approved by UNESCO, thus, around 103,401 international visitors stayed in Yogjakarta to see the world heritages in 2004.

Table 3.2.3 GRDP at Current & Constant Price in DIY

Industrial Origin	At Current Price		Constant	
	Million Rp.	%	Million Rp.	%
1. Agriculture	3,991,035	15.7%	3185771	18.8%
2. Mining and Quarrying	198,337	0.8%	122,332	0.7%
3. Manufacturing Industry	3,588,201	14.1%	2,463,230	14.6%
4. Electricity, Gas, and Water Supply	321,872	1.3%	153,291	0.9%
5. Construction	2,320,422	9.1%	1,395,079	8.2%
6. Trade, Hotels, and Restaurant	4,866,927	19.1%	3,444,828	20.4%
7. Transportation and Communication	2,589,587	10.2%	1,673,352	9.9%
8. Financial, Ownership and Business Services	2,522,222	9.9%	1,623,210	9.6%
9. Services	5,020,474	19.8%	2,849,959	16.9%
Gross Regional Domestic Product (GRDP)	25,419,079	100.0%	16,911,053	100.0%
GRDP per capita (Rupiah)	7,602,192		5,057,661	

Source : BPS - Statistics of DIY

The local tourists also enjoy visiting those heritages for vacation and a recorded 1,688,599 of them visited in 2004. Although 351,542 international visitors were recorded in 1996, tourism declined during the economic crisis. Since then foreign visitors have gradually come back to Yogyakarta. Table 3.2.4 shows the tendency of tourism promotion. The number of tourists in 2006, which was a year of disasters, has not yet been announced.

Table 3.2.4 Tourists to DIY

Year	Foreign tourists	Growth (%)	Domestic tourists	Growth (%)	TOTAL tourists	Growth (%)
1997	277,847	-21.0%	638,552	-29.17%	916,399	-27.0%
1998	78,811	-71.6%	309,135	-51.6%	387,946	-57.7%
1999	73,361	-6.9%	440,986	42.7%	514,347	32.6%
2000	78,414	6.9%	540,996	22.7%	619,410	20.4%
2001	92,945	18.5%	739,274	36.7%	832,219	34.4%
2002	90,777	-2.3%	888,360	20.2%	979,137	17.7%
2003	95,626	5.3%	1,234,690	39.0%	1,330,316	35.9%
2004	103,401	8.1%	1,688,599	36.8%	1,792,000	34.7%

Source: Baparda Prop DIY 2005

The production of the manufacturing sector is influenced by tourism-related economic activities as well. The tourism market is one of the potential markets in Yogyakarta Province and the traditional goods, ethnic batik and various souvenirs are favorably purchased by tourists. Those small scale manufacturing businesses related to the tourism sector are good for rural development.

However, as mentioned before, the earthquake and volcano's eruption in May 2006 might influence a lot of their economic activities. The damage by the earthquake was very serious especially in Bantul Rerigion. The World Heritage Prambanan was damaged by the

earthquake and it is still under repair.

It is projected that the tourism sectors have declined by such natural disasters. The statistical data has not been compiled yet, but the socio-economic indicators would show some impacts of natural disasters.

Lastly, the importance of the agriculture sector in DIY should be emphasized here as well. It is not only significant for production but also for labors' market and land usage including water resources. Table 3.2.5 illustrates the harvest areas of major food crops. Bantul and Sleman, which are target regencies of the Master Plan, have huge paddy fields. Other than that, vegetables and fruits are produced in this area. The production of animal husbandry has been increasing in recent years as living conditions have improved. The management of the water resources for irrigation and livestock are sometimes critical in the agriculture sector.

Table 3.2.5 Harvested Area of Food Crops by Kind and Regency/City in DIY

Crops	Regency/City					Province
	Kulon-Progo	Bantul	Gunung-kidul	Sleman	Yogyakarta	
1. Wetland Paddy	17,732	24,870	10,511	41,971	164	95,248
2. Dryland Paddy	16	211	35,063	435	-	35,725
3. Maize	3,889	5,155	59,046	4,604	20	72,714
4. Cassava	3,148	2,840	53,453	1,252	2	60,695
5. Sweet Potatoes	32	32	144	409	-	617
6. Peanuts	1,679	5,709	56,897	6,049	28	70,362
7. Soybeans	3,066	4,177	25,540	512	2	33,297
8. Green Peanuts	171	69	702	25	-	967
9. Sorgum	-	-	522	-	-	522

Source : Agriculture Survey-IA/IB, Regency/City of Agriculture Offices, DIY

3.3 Legislative System

3.3.1 Water Law

(1) Law System in Indonesia

The spectrum of Indonesian laws includes three levels (Constitution, Statues, and Regulations) and three branches of government (central, province, and district). When we speak of laws (acts), we usually refer to statutes in narrow sense, and sometimes include regulations or bylaws (rules and regulations) in broad term. Here we define the law (act) refer to the statutes and regulations refer to bylaws of particular laws.

The laws and regulations are categorized into six types in descending order of authoritative status:

(i) Undang Undang Dasar (UUD): Basic State Law
(ii) Undang Undang (UU): State Law
(iii) Peraturan Pemerintah (PP): Government Regulations
(iv) Peraturan Presiden (PP): President Regulations
(v) Peraturan Menteri (PM): Ministerial Regulations
(vi) Peraturan Daerah (PD): Regional Government Regulations (Province/District)

As discussed below, there are two important legal documents governing the water supply sector: Water Resources Law and Drinking Water Supply System Regulation. The former is UU (No. 7/2004) and the latter, PP (No. 16/2005). PP 16/2005 is a bylaw of UU 7/2004 in that the former regulation is further stipulation of Article 40 of the latter law.

(2) Water Resources Law

The law governing water sector and water resources development is Law No. 7/2004 which was enacted in March 2004. The Law 7/2004 specifies basic principle of the following regulatory matters:

(i) Water usage rights
(ii) Authority and responsibility of government institutions (central, province and districts)
(iii) Water resource conservation
(iv) Water resource utilization (development)
(v) Control of destructive water power
(vi) Water resources planning and management system
(vii) Construction, operation and maintenance of water resources infrastructures
(viii) Water resources information system
(ix) Empowerment of water resources stakeholders and institutions
(x) Financing for water resources management
(xi) Rights, obligations and roles of communities
(xii) Coordination of water resource management (cross-sectoral and cross-regional)
(xiii) Treatment of complaints by communities and organizations

Important things stipulated by the Law relevant to our study are:

(a) Water includes surface water, ground water, rainwater and seawater found on land. (Art.1)

(b) The State guarantees the right of every person to get water for basic daily needs. (Art.5)

(c) The water resources shall be controlled by the State. (Art.6)

(d) The water usage right is divided into two forms: water use right and water utilization right. (Art.7)

(e) The water use right to fulfill basic daily needs of individuals and small-scale farming does not need a permit (license) from the government. (Art.8)

(f) Water exploitation right may be given to individuals or enterprises (PDAMs, etc) based

on a permit by the government. (Art.9)

(g) Surface water management and ground water management shall be based on water basin and groundwater basin, respectively based on the recommendation by the National Water Resource Council. (Art.13)

(h) The division of roles and functions of the three governments (central, province and district) is as follows: (Art. 14, 15 and 16)
- The Central Government determines the norms, standards, guidelines and manuals (NSGM) on water resources management.
- The Central Government deals with matters for river basins across provinces.
- The Provincial Government deals with matters for river basins across districts.
- The District Government deals with matters for river basins in one district area.
- The District Government specifies daily minimum supply water requirement.

(i) Development of water resources shall be planned in a manner vertically (scheme-plan-program) and horizontally (central-province-district) coordinated as shown in Figure 3.3.1. (Art. 20, 26, 27, 34, 59, 62)

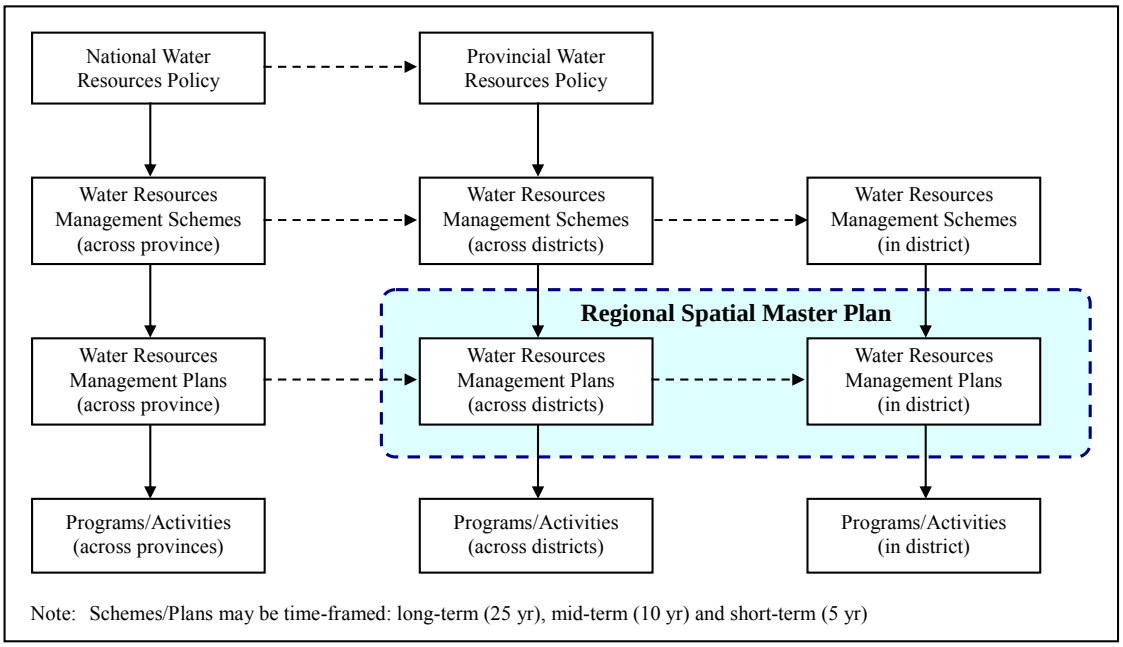
(j) The priority order of water use shall be (i) basic daily needs, (ii) small-scale farming, and others (agriculture, industry, energy, industry, mining, environment sanitation, etc). Priority order for the others shall be decided according to local needs. (Art.29)

(k) The fulfillment of domestic water needs shall be done by developing Drinking Water Supply System (SPAM). The detailed rules, roles and functions of institutions concerned, coordination and supporting bodies, etc shall be stipulated by separate government regulations. (Art. 40)

(l) The users of water resource shall be charged for the water resources management fees by the government responsible, except for users of water resources for basic daily needs and for small-scale farming. The latter users shall not be charged by the fees. (Art. 80)

UU7/2004 specifies basic principles and requirements in the abstract form. Detailed regulations (rules and guidelines) are needed to implement the Law. In this respect a number of government regulations (PP/PM) have been put in place to support implementation of the Law. PP 16/2005 stipulating the drinking water supply system (SPAM) as specified in Article 40 of UU7/2004 is one of such regulations. However, all the regulations specified in the Law have not been issued yet (as of December 2006).

In the local context of DIY management and control of surface water as well as groundwater is one of most important legal matters in order to plan and implement sustainable water resource management plans for the Province. However, the rules and regulations on management and development of those waters have not been issued by the Central Government though these are clearly specified in Articles 12, 36 and 37 of the Law 7/2004. Issue of this regulation is highly awaited.



(Source) JICA Study Team

Figure 3.3.1 Water Resources Planning Framework Based on UU 7/2004

(3) Regulations on Drinking Water Supply System

The Government Regulation on drinking water supply system (SPAM) was established in March 2005 to support implementation SPAM pursuant to Article 40 of UU 7/2004 as explained above.

The Regulation 16/2005 consists of the chapters specifying the following matters:

(i) Definition and scope of SPAM
(ii) Water supply system
(iii) Raw water protection
(iv) Planning, Construction, Management, Operation & Rehabilitation, Monitoring & Evaluation
(v) Authority and responsibility of central, provincial and district governments
(vi) Supporting Board of Water Supply System Development (BPPSPAM)
(vii) Financing and Tariff
(viii) Duty and responsibility of service providers and customers
(ix) Guidance and supervision
(x) Public and organization claims
(xi) Administrative punishment
(xii) Transitional rules

Things stipulated by the Regulation we must be aware of for our study are summarized as follows:

(a) Raw water for SPAM is water which comes from surface water, groundwater and/or rainwater which meet quality standards as potable water. (Clause 1)

(b) SPAM is a unity of physical (technical) functions and non-technical (institution, management, finance, public relation, and legal matters) functions of water supply facilities and infrastructure. (Clause 1)

(c) SPAM can be classified into pipe system and non-pipe system. The pipe system consists of raw water unit, production unit, distribution unit, service unit and management unit. The non-pipe system is independent systems supplies by shallow well, pump well, rainwater basin, water terminal, water tank vehicle, etc. (Clause 5)

(d) The implementation of SPAM development must be performed integrally with sanitation facility and infrastructure development to guarantee sustainability of water supply function. (Clauses 2 and 23)

(e) The executor (service provider) of SPAM development and management will take company forms of state enterprise (*Perusahaan Negara*: PN), local enterprises (*Perusahaan Daerah*: PD), local corporation (*Perseroan Daerah*, Perseroda), limited corporation (*Perseroan Terbatas*, PT) or cooperative/community-based organizations. (Clause 1)

(f) The division of roles and functions of the three governments (central, province and district) is as follows: (Clauses 38, 39 and 40)

- The Central Government determines the norms, standards, guidelines and manuals (NSGM) for development and management of SPAM.
- The Central Government deals with matters for cross-province SPAM development.
- The Provincial Government deals with matters for cross-district SPAM development.
- The District Government deals with matters for SPAM development in its own district area
- Concerned departments (PU) of district governments deal with SPAM development for the areas which PDAM does not provide services.

(g) The policy/strategy and master plans for PDAM shall be formulated in a manner vertically and horizontally integrated as shown in Figure 3.3.2. (Clauses 24 and 25)

(h) The service provider (PDAM, etc) has to prepare the master plan of PDAM for its own service area. The master plan must reflect suggestions and responses from customers through public consultation. (Clause 26)

(i) Technical guidelines and procedures for PDAM management, maintenance & rehabilitation, and monitoring & evaluation will be regulated by separate Ministerial Regulations (under drafting by PU). (Clauses 34, 35 and 36)

(j) If public service providers (PDAM, etc) cannot improve coverage and quality of service, the supervising local government can invite private companies to participate in implementation of improvement work needed. (Clause 37)

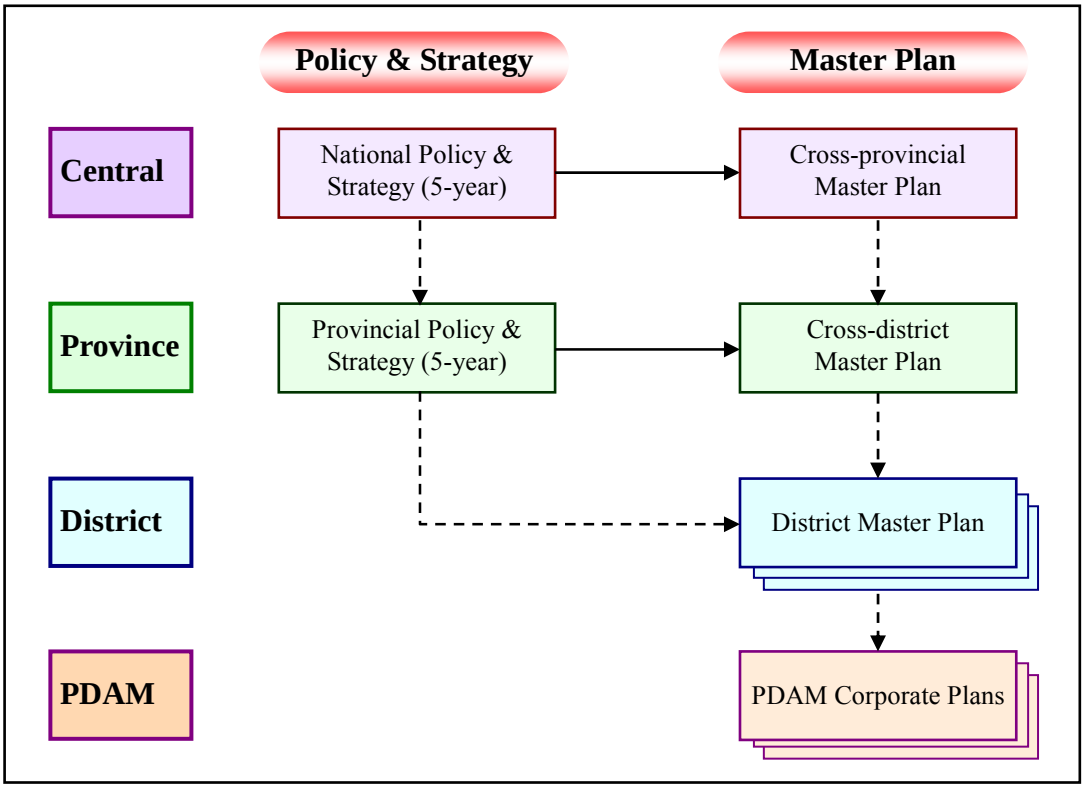
(k) The Supporting Board of Water Supply System Development (BPPSPAM) will be established in Jakarta pursuant to Ministerial Regulation No. 294/PRT/M/2005, to provide support and assistance for governments and service providers. (Clauses 42 to 56)

(l) The supervising governments can provide financial and capital contribution to improve

service performance of public service providers (PN, PD, Perseroda) based on other relevant laws/regulations (Law No.35/2004, Regulation No.107/PMK.06/2005, etc). (Clause 59)

(m) Rules and regulations for tariff setting will be set out by a separate Ministerial Regulation (PMDN No.23/2006). (Clause 60)

The progress of planning work (as of January 2007) for SPAM according to PP16/2005 is as follows. The National Policy and Strategy has been prepared by the Central Government (PU) (see Chapter 4 for details). DIY Government issued Governor Decision No.2/TIM/2007 regarding establishment of the Team for formulation of Regional Policy and Strategy for SPAM on the day of January 5, 2007. The DIY Government and the three District Governments are about to prepare the regional policy and strategy for SPAM.



(Source) JICA Study Team

Figure 3.3.2 SPAM Planning Framework Based on PP 16/2005

It should be mentioned that PP16/2005 calls for PDAMs to comply with the following two obligations as transitional rules (see Clause 78).

1) PDAMs must complete the master plan of SPAM in their service areas not later than 1 January 2010.

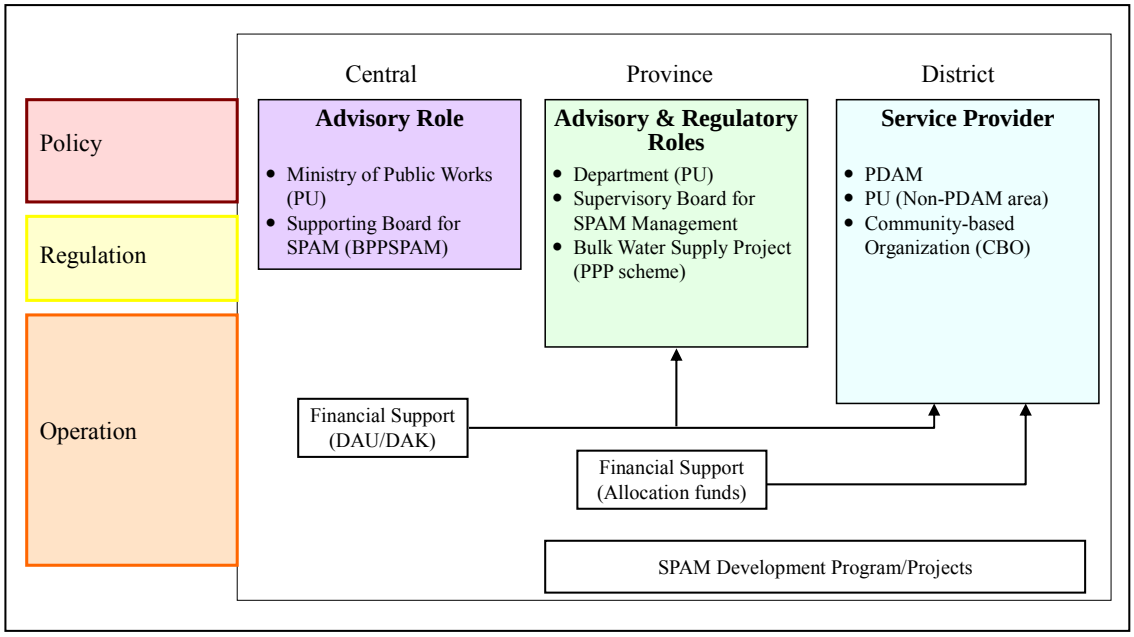
2) PDAMs must adjust with requirements specified by this Regulation not later than 1

January 2008. These requirements include duties and responsibilities of service providers as specified in Clause 63:

a. Implement water supply system development that is integrated with determined development of sanitation facility and infrastructure;
b. Implement plans and programs of procurement activities, including construction work, operation, maintenance and rehabilitation;
c. Perform management activities, including collective service payments based on the determined tariff;
d. Provide water supply service with suitable quantity and quality based on the determined standards;
e. Make an implementation report transparently, accountably, and legally according to principles of good company management;
f. Present the report to the central government/concerned local government; and
g. Publish audited financial report to the public

The Government should closely watch if PDAMs concerned have complied or are willing to comply with above requirements.

Finally water sector institutional framework which UU 7/2004 and PP 16/2005 is likely to envisage is shown in Figure 3.3.3. It should be mentioned regulatory functions are not clearly set out in the Law and the Regulation. This is one of areas to be improved in legal aspects, especially relevant when PSP (Private Sector Participation) policy is implemented.



(Source) JICA Study Team

Figure 3.3.3 Water Supply Sector Institutional Framework Based on Law 7/2004 and Regulation 16/2005

(4) Regulations on Private Sector Participation

Since domestic water has been considered a basic need that the State must supply to every citizen (as Law 7/2004 implies), water supply and sanitation services in Indonesia have been traditionally provided by the public sector (PDAMs, etc). On the other hand, in several large industrialized European countries, such as France, UK and Spain, the water service has been extensively provided by private companies or mixed public-private companies.

As a result of the failure of many PDAMs in Indonesia to provide adequate service to the population, a trend started in the early 2000s to introduce in the water sector various forms of Private Sector Participation (PSP) or Public-Private Partnerships (PPP). This followed the large-scale introduction of private companies in other public sectors, such as energy, telecommunications and transportation. The introduction of various forms of PSP or PPP has been promoted to a greater extent by the World Bank and others international agencies.

The Indonesian Government has recently accelerated promotion of PSP/PPP in infrastructure development by enacting two important regulations. These are Presidential Regulation 67/2005 and Finance Ministry Regulation No. 38/PMK.01/2006.

According to Presidential Regulation 67/2005 on cooperation between the government and private sector in infrastructure provision, the central as well as local government's support for infrastructure provision by means of cooperation agreement with private sectors has been enabled, as long as it gives heed to the principle of financial risk management and control in the National Budget (APBN) or Regional Budget (APBD).

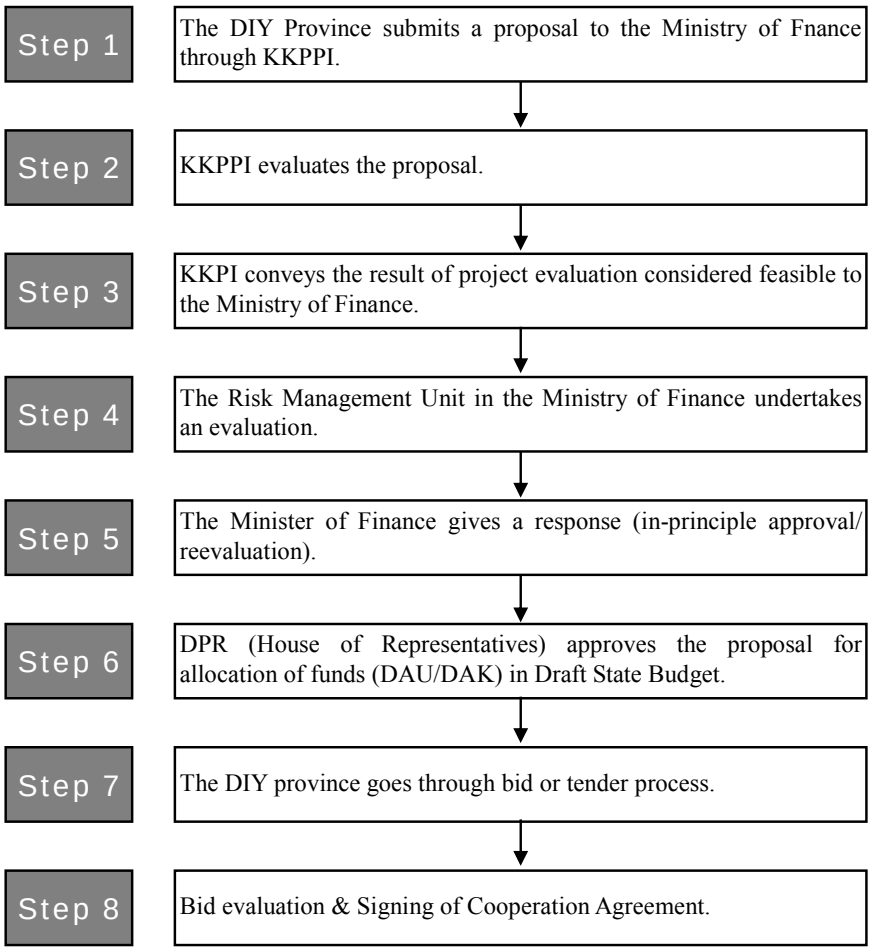
Regulation 67/2005 has mandated the Ministry of Finance to be the executing agency for the risk control and management. Therefore, in May 2006, the Minister of Finance put into effect the Minister of Finance's Regulation No.38/PMK.01/2006 as implementation guidelines for giving government's support by the central government. The Committee on Infrastructure Provision Acceleration Policy (KKPPI) was established in the Ministry to evaluate proposals and analyze risks to support decision making by the Minister.

The Ministry of Finance has limited the types of risk that can be guaranteed and supported within the framework of Ministry's Regulation 38/2006 to political risk, project performance risk, and request risk. Political risk can be allocated to the government by stipulating the amount of compensation in the infrastructure cooperation agreement.

On the other hand, support for project performance risk will be given by the government to location risk due to delay of land acquisition and increase in land price. There

is indication that this risk distribution is very attractive to investors in infrastructure sector that need land in a large amount such as for toll roads, large-scale water treatment plants, etc.

The cooperation agreement (BOT agreement) for development of bulk water supply for the *Kartamatul* area of DIY has been signed in 2005, but there has been no progress since then. Assuming the existing BOT agreement is cancelled or nullified and a renewed PPP project launches, the Government support will be provided through the steps as shown in Figure 3.3.4.



(Source) Infrastructure Vol. 02 (September 2006)

Figure 3.3.4 Procedure for Obtaining Central Government Support Based on Permenken No. 38/2006

(5) Questionnaire Survey on Law, Policy and Administration

The JICA Study Team conducted a questionnaire survey to see if government officials concerned have a clear understanding and interpretation of related regulations. The questions divided into four main subjects: (i) water law, (ii) water policy, (iii) water administration, and (iv) sector performance. Ten (10) entities have responded to the questionnaire. These include: two from DIY Province (Secretary and PU); two from Yogyakata City (BAPPEDA and PDAM); three from Sleman Regency (BAPPEDA, PU and PDAM); and three from Bantul

Regency (BAPPEDA, PU and PDAM).

Table 3.3.1 summarizes responses to questionnaire for the ten responders. The results of the questionnaire survey revealed that:

- The levels of governments (central, province and district) having prime responsibility for management of surface water, groundwater and water quality are different among entities. This suggests lack of clarity of institutional responsibility on this issue.
- The cost recovery policy varies among PDAMs. Yogyakarta (urban area only) adopts full cost recovery while Sleman and Bantul (urban-rural mixed area) does partial cost recovery policy. Full subsidy policy for capital cost is adopted for the rural area not covered by PDAM.
- Regarding PSP policy, the government agencies (Secretary, BAPPEDA and PU) prefer PSP/PPP while the operators (PDAM) are reluctant to take it. However, all respondents (even PDAMs) favor user participation and decentralization in water sector.
- Perception of relative role and influence of government branches on domestic water supply varies among respondent. The PDAMs tend to perceive more decentralized institutional responsibility than regional governments.
- Regarding of operators overstaffing and the effect of PSP/PPP there is a sharp division of opinion among respondents. All three PDAMs do not consider PSP can lead to redundancy in operation staffs. They seem to seek improvement of operational efficiency by not resorting to PSP options.
- All entities do no think there is an independent body (regulator) for determining water price. This implies regulatory framework (including tariff regulation) is not established yet, and suggests area of policy improvement in this area.

Some respondents raised particular issues to be addressed.

- From the Secretary of DIY Province: areas needing technical assistance include: (i) development of stable water sources, (ii) equitable water use, (iii) prioritization of water use, (iv) management of water facilities by communities, and (v) watershed management and conservation
- From PU of DIY Province: needs support for areas such as (i) water resources management and (ii) improvement of SPAM management by PDAMs.
- From PDAM Sleman: areas to be improved include (i) how to motivate employees for making a profitable company, (ii) how to use cost-reducing technologies, (iii) how to reduce water losses, (iv) how to locate cheaper water sources, (v) how to replace water meters, (vi) how to make procedures simple, and (vii) how to upgrade team work capacity.

3.3.2 Legislation on Sanitation

The Regulation No. 16/2005 has the stipulations of the following related to sewer/sanitary facilities. The stipulations are summarized as follows.

1) The development of sanitation facility is based on the following considerations;

- Consideration into the poor and people in water-troubled areas
- Improvement of people's health
- Fulfillment of service standards
- No involvement in negative social impact

2) If the sewage facility has already been available, every person and group is prohibited to be disposed to sewage directly, without undergoing any process, to raw water resources for drinking water.

3) If the sewage facility has not been available yet, every person and group is prohibited to dispose sewage directly, without undergoing any process, to raw water resources determined by the central government/concerned local government.

4) Centralized sewage disposal system is intended for populous areas with nothing the supporting capacity of an area and its water supply system and also considering people's socio-economic condition.

Supplementation

Density of a settlement means population density per area unit (example: 200 people/ha). A settlement can be so dense that it is impossible to apply localized wastewater system.

Example: it is inappropriate to use septic tank in a settlement with 300 people/ha or more, because it will possibly cause pollution of local water resources (shallow well).

Table 3.3.1 Summary of Responses to Questionnaire on Water Institution

No.	Question \ Respondent	DIY		Yogyakarta City		Sleman Regency			Bantul Regency		
		Secretary	PU	BAPPEDA	PDAM	BAPPEDA	PU	PDAM	BAPPEDA	PU	PDAM
1	**Water Law**										
1.2.1	Private water rights allowed?	Yes	Yes	Yes	No	Yes	No	No	No	No	Yes
1.3.3.1 & 2.2.2	Priority order of water use (listing top 3)	1.domestic 2.irrigation 3.environment	1.domestic 2.irrigation 3.power	1.environment 2.irrigation 3.domestic	1.domestic 2.irrigation 3.environment	1.domestic 2.irrigation 3.commercial	1.domestic 2.irrigation 3.environment	1.domestic 2.irrigation 3.environment	1.domestic 2.irrigation 3.commercial	1.domestic 2.irrigation 3.environment	1.domestic 2.irrigation 3.power
1.4.1	Are conflict-resolution mechanisms specified in law?	Yes	Yes	Yes	Yes	Yes	Yes	No clear	Yes	Yes	Yes
1.4.2	If yes, which organization responsible for conflict-resolution?	1.Local gov't 2.River Boards	1.Local gov't 2.River Boards	River Boards	1.Local gov't 2.River Boards	P3A, PTGA	1.Local gov't 2.River Boards		WUAs	Local gov't	Local gov't
1.6.1	Level of government having primary responsibility for:										
	(a) Surface water	Central gov't	Central gov't	Central gov't	Provincial gov't	Central gov't	Central gov't	Central gov't	Central gov't	Central gov't	Central gov't
	(b) Ground water	Central gov't	Central gov't	District gov't	District gov't	Provincial gov't	Provincial gov't	Provincial gov't	Provincial gov't	Provincial gov't	Provincial gov't
	© Water quality	Central gov't	Central gov't	Provincial gov't	Provincial gov't	District gov't	Central gov't	Provincial gov't	Central gov't	District gov't	Central gov't
1.6.2	Existing intragovernmental responsibility favor an integrated water planning and development?	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	No
1.6.6	Extent to which legal provisions effective in protecting water quality (on 1 to 10 scale9	8	8	7	not effective	6	6	5	7	8	8
1.7.1	Does present law contribute to centralization?	Yes	No	No	No	Yes	Yes	No	No	No	Yes
1.7.3	Extent to which legal provisions favor for the following (on 1 to 10 scale) in water development										
	(a) Private sector	4	4	4	7	7	7	not effective	7	7	4
	(b) NGO	3	3	3	2	7	3	not effective	7	6	3
	© Community	3	3	7	4	6	1	not effective	7	8	3
2	**Water Policy**										
2.4.2	Cost recovery policy for domestic use	1.Partial cost recovery for urban water 2.Full subsidy for rural water	1.Partial cost recovery for urban water 2.Full subsidy for rural water	Partial cost recovery	Full cost recovery	Partial cost recovery	Partial cost recovery	Partial cost recovery	Partial cost recovery	Full cost recovery	1.Partial cost recovery for urban water 2.Full subsidy for rural water
2.5.1	Are there well-established policies for interregional and intersectoral water transfers?	No	No	Yes	No	No	Yes for interregional, no for intersectoral	No	Yes	No	Yes

No.	Question / Respondent	DIY		Yogyakarta City		Sleman Regency			Bantul Regency		
		Secretary	PU	BAPPEDA	PDAM	BAPPEDA	PU	PDAM	BAPPEDA	PU	PDAM
2.5.4	What is the organizational basis for wter transfer?	River boards	River boards	Stakeholders	River boards, stakeholders	River boards, basin-level organizations	River boards, basin-level organizations	River boards, basin-level organizations	River boards	River boards	Stakeholder, WUAs, etc
2.7.1	Government policies favour water sector privatization?	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
2.7.2	If yes, how favourable are those policies (on 1 to 10 scale)	Urban use: 8 Rural use: 8 Commercial: 8	Urban use: 8 Rural use: 6 Commercial: 8	Urban use: 6 Rural use: 5 Commercial: 4		Urban use: 6 Rural use: 4 Commercial: 8	Urban use: 9 Rural use: 8 Commercial: 8		Urban use: 8 Rural use: 8 Commercial: 8	Urban use: 9 Rural use: 8 Commercial: 8	
2.7.4	How well are users disposed toward private sector involvement in water sector?	Favorable in particular sector	Favorable in particular sector	Favorable in particular sector	Indifferent	Favorable in particular sector	Favorable in particular sector	Not favorable	Indiferrent	Favorable in particular sector	Favorable in particular sector
2.7.5	Government policies fabour users participation and decentralization?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.7.8	How well are government officials disposed toward user participation an decentralization?	Favorable in selective contexts for both development and management	Favorable overall for both development and management	Favorable overall for management	Favorable in selective contexts for both development and management	Favorable overall for development and favorable in selective contexts for management	Favorable in selective contexts for both development and management	Favorable in selective contexts for development but not favorable for management	Indifferent	Favorable overall for both development and management	Favorable in selective contexts for both development and management
2.9.1	How well does water policy reflect water law (on 1 to 10 scale)	8	8	7	6	6	8	7	7	5	7
2.10.1	How effective is the overall water policy in addressing sectoral challenges (on 1 to 10 scale)	6	8	7	5	7	7	7	6	8	7
3.	**Water Administration**										
3.1.1	Judgment on relative role and influence of government branches on domestic water supply sector (on 1 to 10 scale)										
	(a) Central government	8	8	6	3	2	7	1	5	8	6
	(b) Provincial government	8	8	6	5	6	7	7	5	8	6
	© District government	8	8	6	8	7	7	10	7	5	6
	(d) Water company (PDAM)	8	10	7	7	8	8	8	7	9	7
3.1.4	To what extent is administrative coordination achieved (on 1 to 10 scale)	6	6	7	5	8	7	7	7	8	6
3.2.3	Is functional specialization within water administration balanced?	No	No	Yes	No	Yes	Yes	No	Yes	No	No

No.	Question / Respondent	DIY		Yogyakarta City		Sleman Regency			Bantul Regency		
		Secretary	PU	BAPPEDA	PDAM	BAPPEDA	PU	PDAM	BAPPEDA	PU	PDAM
3.2.4	If no, what are the gaps in the existing administrative setup?	Coordination and cooperation of parties concerned at the program levels	Low coordination between local governments and PDAM		Low coordination between local governments and PDAM			Low coordination between local governments and PDAM		Gap between infrastructure management needs and human resource capacities	Conflicts between domestic and irrigation water uses
3.3.1	Do you feel water administration budget is adequate to meet policy objectives?	No	No	No	Yes	No	No	No	Yes	No	No
3.3.2	If no, how serious is the budget constraint (on 1 to 10 scale)	8	8	6		2	6	8		6	7
3.3.3	Is the water administration overstaffed?	Yes	Yes	No	No	Yes	No	Yes	No	No	No
3.3.4	If yes, how wide is the scope for staff reduction (on 1 to 10 scale)	8	8			2		3			
3.3.5	Can privatization and community participation lead to redundancy in water administration?	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No
3.3.6	If yes, how strong in the staff-reduction effect (on 1 to 10 scale)? (a) Privatization (b) User participation	 10 8	 8 8	 7 6		 6 5	 7 10				
3.4.1	Is there an independent body for determining water price?	No	No	No	No	No	No	No	No	Yes	No
3.4.2	If yes, state the name of the body									PDAM	
3.4.3	If no, which agencies are involved in price determination?	Provincial gov't (?)	Regency gov't PDAM, customers	DPRD, Community water users	City gov't, PDAM	PDAM	WUAs	Regency gov't PDAM, customers	PDAM		Head of District gov't
4	**Overall Performance of Water Supply Sector and Institution**										
4.1	Physical Performance (on 1 to 10 scale)										
	(a) Ability to bridge overall demand-supply gap	6	6	7	8	7	6	7	5	8	7
	(b) Physical health of water development projects	7	6	7	8	7	6	7	6	6	7
	© Conflict-resolution efficiency (low cost and less time)	8	8	7	7	6	7	8	7	5	7
	(d) Smoothness of water transfer across sectors and	8	8	6	9	7	6	3	7	7	6

No.	Question / Respondent	DIY		Yogyakarta City		Sleman Regency			Bantul Regency		
		Secretary	PU	BAPPEDA	PDAM	BAPPEDA	PU	PDAM	BAPPEDA	PU	PDAM
	(e) Smoothness of water transfer between users	8	8	7	9	8	8	9	7	6	7
4.2	Financial Performance (on 1 to 10 scale)										
	(a) Actual investment vs. investment requirements	6	6	7	8	6	8	2	5	8	7
	(b) Cost recovery vs.	6	6	6	8	6	6	2	5	7	6
4.3	Economic Efficiency (on 1 to 10 scale)	4	4	7	8	5	8	3	5	8	7
	(a) Extent to which water prices cover supply cost	4	4	7	8	5	8	3	5	8	7
	(b) Extent to which water prices cover scarcity value	4	4	7	5	5	3	1	5	6	7
4.4	Equity Performance (on 1 to 10 scale)										
	(a) Equity between regions	8	7	7	8	7	8	8	7	8	7
	(b) Equity between sectors	8	8	7	8	7	3	10	6	7	7
	© Equity among social groups	8	8	6	8	6	9	10	6	6	6
4.5	Overall rating (on 1 to 10 scale)	7	7	7	8	7	7	6	6	7	7
	Key issues and challenges in water supply sector for the JICA Study Area	Technical assistance in water sector is needed for: 1. development of permanent water sources 2. fair water use 3. Prioritization of water use 4. sustainable management of water facilities by communities 5. catchment area environment conservation	Needs support for water resources management and management for PDAM					1. to change employees mind towards how to make the company bigger 2. to identify technologies to decrease costs 3. to reduce water losses 4. to find cheapest water sources 5. to replace water meters 6. to make various procedures simple 7. to upgrade team workmanship and capacity			

(Source) JICA Study Team's questionnaire survey

3.3.3 Environmental Laws

(1) Legal System and Environment Management Act

Basic State Law (UUD) on Environment was enacted in 1982, and systematization on environmental law was thus attempted in accordance with the legal forms such as Governmental Ordinance, Presidential Decree, Environment Minister's Decree, and *BAPEDAL* (former Environmental Impact Management Agency) Head's Decree etc.

Table 3.3.2 shows the improvement status of environmental related laws. It can be understood that the legal system and administrative organization on Indonesia's social environmental management system was improved from the 1980s up to the beginning of the 1990s. On January 2001, environmental management administration was transferred to the District Government in accordance with the enactment of Decentralized Law. Simultaneously, the State Ministry of Environment and the *BAPEDAL* were newly integrated as the Ministry of Environment in 2002.

Table 3.3.2 Improvement Status on Environmental Related Laws

Issuance Year	History on Act, Law, Rule/Regulation, and Decree etc.
1945, 1973	Constitutional Provision: Article 33(3)
1967	Forestry Basic Law & Mining Law
1972	Creation of National Environmental Commission
1973	- Water Quality Pollution Prevention/Restraint on Mining & Energy Business - Rules/Regulations on Insecticide
1974	Irrigation Law
1978	- Articulation of a national Environmental Policy, as part of the State Policy (*GBHN*) - Presidential Decree No. 28/1978 & No. 35/1978 - Creation of Ministry of Development Supervision & Environment - Prevention on Environmental Contamination caused by Factories
1982	Act No.4/1982 on the Basic Provision for Environmental Management
1983	- Presidential Decree No. 25/1978 - Creation of the State Ministry of Population & Environment (*KLH*) - Environmental Management Basic Law
1984	Minister's Decree on National Parks
1985	Rules/regulations on Forestry Protection (Governmental Ordinance No.28)
1986	- Act No.4 on Basic Provisions for Management of Living Environment (Article 16) - Rules/regulations on Environmental Impact Assessment (EIA)
1987	Governmental Ordinance No.29: Required Implementation as of 5 June 1987, of an EIA System
1988	Minister's Decree on Standards of Environment & Effluence to the Air/Rivers/Sea areas
1990	- Presidential Decree No. 23, creating new agency *BAPEDAL* - Creation of Environmental Impact Management Agency (*BAPEDAL*) - Rules/regulations on EIA (Governmental Ordinance No.50) - Ministerial Decrees Nos.49-53: General EIA Guidelines promulgated by *KLH* - Act No.5/1990 on Natural Resources Conservation and Ecosystem - Rules/regulations on Control of Water Pollution (Governmental Ordinance No.20)
1991	- Rules/regulations on Rivers - Rules/regulations on Swamps
1992	Act No.24 on Spatial Use Management
1993	- Assignment on the State Minister for Environment - Establishment of Environmental Management Center (EMC) by JICA's aids - Rules/regulations on EIA (Revised): Governmental Ordinance No.51, repealing Nos.29 & 49-53, only address applicability parameters

Issuance Year	History on Act, Law, Rule/Regulation, and Decree etc.
1994	- Establishment of the State Ministry of Environment (*LH*) - Rules/regulations No.19 on Hazardous & Toxic Waste Management
1996	- Decree No.07/1996 by the State Minister for the Environment - Establishment of National Coordination Team Office on Forest Fire Management
1997	Act No.23/1997 on the Environmental Management
1999	Act No.22/1999 on Regional Autonomy (Decentralization) and took effect in 2001
2000	Presidential Decree No.2/2000, Article 56a
2002	Integration of *BAPEDAL* and *KLH* as a new Ministry of Environment

Source: Website, Smith & van der Wansem, 1995

(2) Environment Management Act and Guidelines

New environmental management act was signed by President on September 19, 1997 and was served as a law (Act No.23, 1997). Consequently, the old environmental management basic law (Act No.4 of 1982) was off the books. This newly 1997 Environmental Management Act was characterized in that i) environmental regulation enhancement on businesses' activities; ii) penalty enhancement; iii) enrichment of official regulations for dealing with environmental disputes and/or complaints; and iv) introduction of right specifications on environmental information for the public.

It is remarkable that the specifications by arbitration/intercession of voluntary neutrality third-party were set up in addition to the solution method in court based upon the justice concerning the enrichment of official regulations for dealing with environmental disputes and/or complaints. On the other hand, even if there exist a limit by regulative approach, *BAPEDAL* performed the business so-called *JIGUNUSA* under the cooperation among local public bodies, police, and prosecutors to solve the environmental offense and already tied up the numerous dispute matters not to be involved into the court, taking the regulative technique with advantages into consideration toward the regulatory compliance.

Furthermore, the public has the recognized right to interface with the environment information on the basis of "Any person have the right to know the information on the role of environmental management" stipulated by Provision No.2 of Article No.5 of new Environmental Management Act.

Environmental standards are stipulated by the Minister of Environment based upon the 1999 Environmental Management Law. Water quality and air environment standards were promulgated, however, the respective act such as Air Pollution Control Act or Water Pollution Prevention Act are not established yet. Table 3.3.3 summarized the major related rules and regulations in the Republic of Indonesia.

Table 3.3.3 Major Environmental Related Rules and Regulations

Item	Classification	Description	Law Code No.
Act	Basic	Act on Environmental Management	No.23, 1997
		Act on Conservation of Living Resources and their Ecosystems	No.5, 1990
		Act on Spatial Use Management	No.24, 1992
Governmental Ordinance (G.O.)	Water Pollution, EIA, Wastes	G.O. on the Control of Water Pollution	No. 20, 1990
		G.O. on Environmental Impact Assessment EIA	No.51, 1990
		G.O. on Hazardous & Toxic Waste management	No.19, 1994
Presidential Decree	System	Presidential Decree on Environmental Impact Management Agency	No.77, 1994
Environment Minister's Decree	Water Quality	Minister's Decree on Quality Standards of Liquid Waste by Industry Activities	No.KEP-51/MENLH/10/1995
		Minister's Decree. on Quality Standards of Liquid Waste by Hotel Activities	No.KEP-52/MENLH/10/1995
	Air	Minister's Decree. on Standards concerning Automobile Exhaust Gases	No.KEP-35/MENLH/10/1993
		Minister's Decree. on Emission Standards for Stationary Sources	No.KEP-13/MENLH/3/1995
		Minister's Decree. on Blue Sky Program Implementation	No.KEP-15/MENLH/4/1996
		Minister's Decree. on Priority Stipulation to Primary Autonomy for Blue Sky Program Implementation	No.KEP-16/MENLH/4/1996
	Noise, Vibration & Offensive Odor	Minister's Decree. on Noise Level Standards	No.KEP-48/MENLH/11/1996
		Minister's Decree. on Vibration Level Standards	No.KEP-49/MENLH/11/1996
		Minister's Decree. on Offensive Odor Level Standards	No.KEP-50/MENLH/11/1996
	EIA	Minister's Decree. on Types of Businesses or Activities Required to Prepare an Environmental Impact	No.KEP-11/MENLH/3/1994
		Minister's Decree. on General Guidelines for Environmental Management & Environmental Monitoring Procedures	No.KEP-12/MENLH/3/1994
		Minister's Decree. on Guidelines for Membership & Working Procedures for EIA Commissions	No.KEP-13/MENLH/3/1994
		Minister's Decree. on General Guidelines for Preparation of EIA	No.KEP-4/MENLH/3/1994
		Minister's Decree. on Establishment of an EIA Commission for Integrated/Multi-sectional Activities	No.KEP-15/MENLH/3/1994
		Minister's Decree. on Determination of Significant Impact	No.KEP-56/1994
	Others	Minister's Decree. on Guidelines for Establishment of Environmental Quality Standards	No.KEP-02/MENLH/1/1998
		Minister's Decree. on General Guidelines for Environmental Monitoring Implementation	No.KEP-42/MENLH/11/1994
BAPEDAL Head's Decree	Hazardous Wastes	Head's Decree on Procedures & Requirements for Storage & Collection of Hazardous & Toxic Wastes	No.KEP-01/BAPEDAL/09/1995
		Head's Decree on Procedures & Requirements for Hazardous & Toxic Waste Manifests	No.KEP-02/BAPEDAL/09/1995
		Head's Decree on Technical Requirements for Hazardous & Toxic Waste Treatment	No.KEP-03/BAPEDAL/09/1995
		Head's Decree on Procedures & Requirements for Disposal of Treated Hazardous & Toxic Wastes and Landfill Sites	No.KEP-04/BAPEDAL/09/1995
		Head's Decree on Symbols & Labels for Hazardous & Toxic Wastes	No.KEP-05/BAPEDAL/09/1995

Source: APCEL Report: Indonesia, Preliminary Assessment of Indonesia's Environment Law, Alan K.J. Tan, Faculty of Law, National University of Singapore

(3) International Conventions on Environmental Conservation

The international conventions on environmental conservation were ratified and/or signed up by the Government of Indonesia was summarized on Table 3.3.4.

Table 3.3.4 Accession Status to the International Conventions

Name of Convention	Accession Status	Remark
Convention on Biological Diversity (CBD)	Ratified Treaty	AD 1994
Convention for Protection of the World Cultural and Natural Heritage	Ratified Treaty	AD 1990
International Environmental Information System （INFOTERRA）		
Environment Profile by Country		
Vienna Convention for the Protection of the Ozone Layer [Vienna Treaties]		
Montreal Protocol on Substances that Deplete the Ozone Layer		
Convention on Wetlands of International Importance Especially as Waterfowl Habitat [Ramsar Convention]	-	under Review
Natural Environmental Conservation Strategy by Country		
Convention on International Sea Laws	Ratified Treaty	-
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) [Washington Convention]	Ratified Treaty	AD 1978
Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal [Basel Convention]		
International Council for Bird Preservation (ICBP) [Migratory Bird Treaty Act]		
Test-ban Treaty		
Biological or Chemical Weapon Treaty		

Source: World Resources, 1993-1995

(4) Water Supply Improvement Regulation on Environmental Protection

Water supply improvement regulation on environmental protection can be as summarized in Table 3.3.5 from the viewpoints of legislation, EIA guidelines, pollution and social issues

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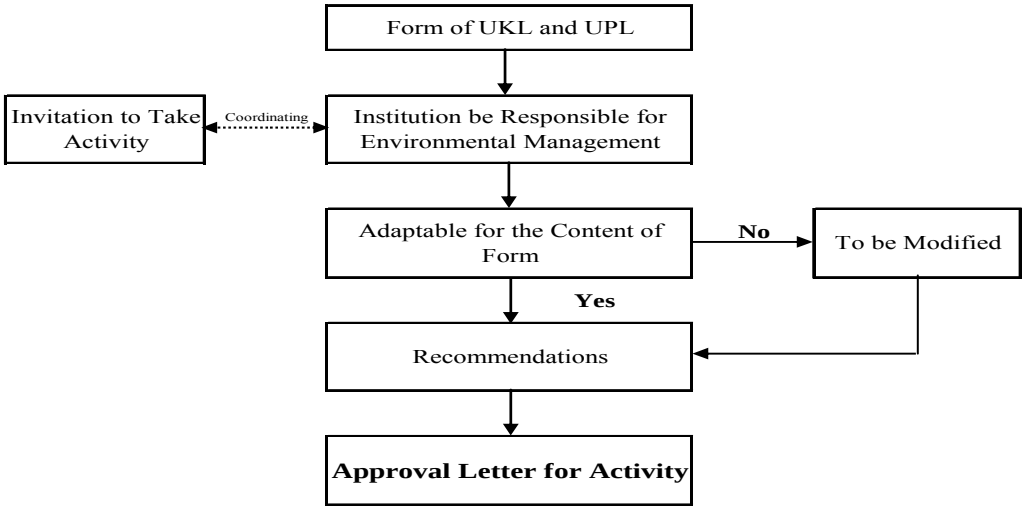
Table 3.3.5 Water Supply Improvement Regulation on Environmental Protection

Classification	Description
Legislation	- Bylaw on Water Use (Governmental rules and regulations No.22, 1988) - Health-related Water Use Standard (Health Minister's Decree No.173/MenKes/PerVIII/1977) - Health-related Groundwater Use Standard (Health Minister's Decree No.258/MenKes/PerVII/1982) - Drinking Water Quality Standard (Health Minister's Decree No.01/Burhukmass/I/1985)
EIA Guidelines	- Technical Guidelines on EIA of Water Supply
Pollution	- Environmental Standard on Noise & Vibration (Ministry of Environment) A-Weighted Sound Pressure Level for the residential zones is as designed 55 – 60 dB. - Sludge disposal of water treatment plant
Social Issues	- Historic Ruins Law (Holland Colonial Government, 1931) - Guidelines on Cultural Properties Protection (Ministry of Culture & Education, 1970) - Impact to other water use

Source: Regulation on Indonesian Environmental Protection by Sector, March 1992, OECF (JBIC)

(5) Necessity and Procedures of IEE and EIA Approval

Initial Environmental Examination (IEE), i.e. *UKL* (Environmental Management Plan) and *UPL* (Environmental Monitoring Plan) are obligated during the full-scale study stage performing the Feasibility Study (F/S) in Indonesia. Figure 3.3.5 shows the flowchart on *UKL* and *UPL* procedures.



Source: The Regulation of State Ministry of Environment, No. 68, 2002 on Guidelines of Environmental Management Plan (UPL) & Environmental Monitoring Plan (UKL)

Figure 3.3.5 Procedures for UKL and UPL

With regard to *AMDAL* (EIA: Environmental Impact Assessment), there are five (5) guidelines concerning the environmental assessment and/or environmental studies based on the 1986 governmental ordinance to stipulate the object or appraisal procedure and the 1987 Decree by the Environment Minister. Article No.16 of Environmental Management Law was established by Governmental Ordinance No.51 in 1993, and revised again in 1999.

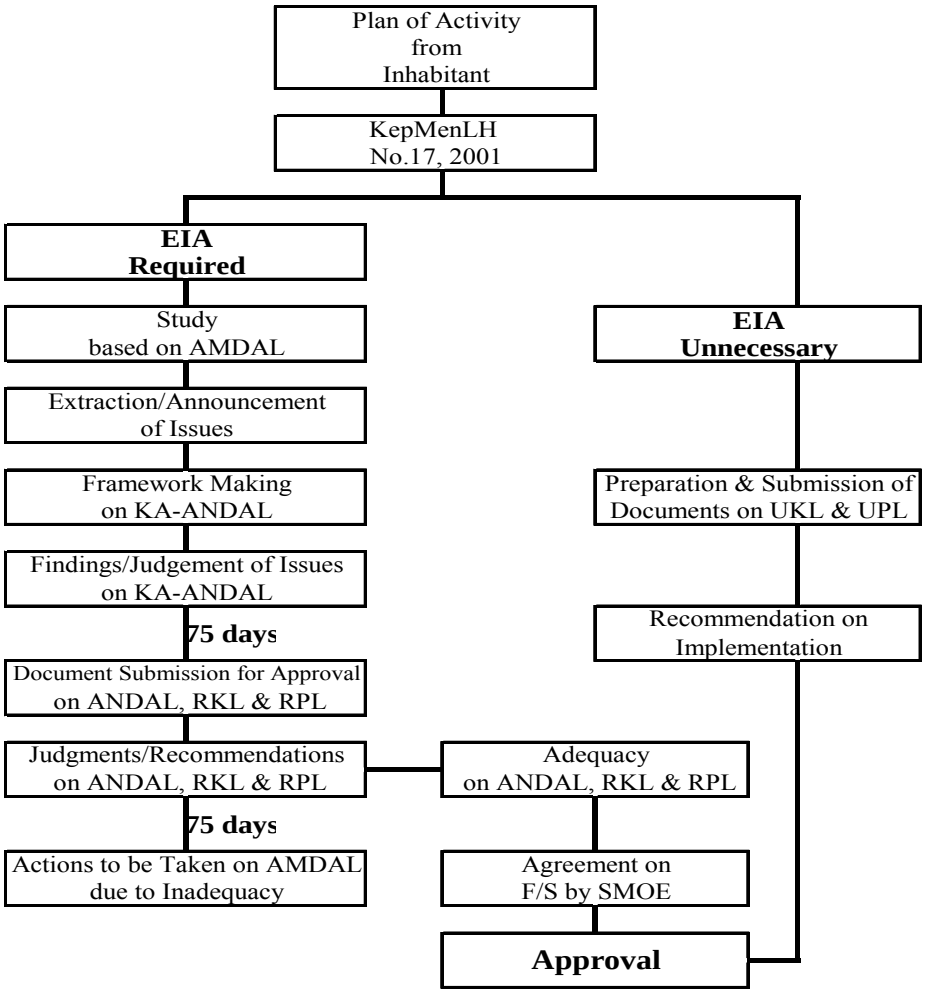
However, the related ministries/agencies formulated the individual implementation guideline respectively. Furthermore, the agency governing the target project will give the final conclusive determination on *AMDAL*'s appraisal by obtaining the advices from the Central and/or Provincial Committee on Environment. Table 3.3.6 shows that any projects/activities related to the fourteen (14) sectors must be performed with the implementation of EIA. Figure 3.3.6 shows the flowchart on EIA procedures.

In addition, the demarcation line on judgment of necessity between IEE and EIA are summarized as Table 3.3.7 according to the information from *BAPEDALDA* of Sleman Regency, Yogyakarta City, and Bantul Regency respectively. Moreover, only submission of *SPPL* (Environmental Management Recommendation Letter) to *BAPEDALDA* is required while the very slight impact is anticipated.

Table 3.3.6 Target Projects and/or Activities Required EIA

	Sector	Type of Projects and/or Activities	Scale
I.	Mining & Energy	1. Following Mining Area (Active Coal Mine)	
		- Coal	≥ 200 ha or
		- Primary Mineral	≥ 200,00 tons/yr
		- Secondary Mineral	≥ 60,00 tons/yr
		- Nonmetal Mineral, Sand & Gravel	≥ 100,00 tons/yr
		- Radioactive Substances (including Mining, Process, and refinement)	≥ 300,00 tons/yr
		2. Power-transmission Line	150 kV
		3. Power Facilities (Diesel, Natural Gas, Steam and Combined-Cycle)	100 MW
		4. Hydropower Facilities (except Small-scale and Direct Flow Types)	
		5. Geothermal Power Generation Facilities	55 MW
		6. Other Power Facilities	5 MW
		7. Digging of Oil & Natural Gas	
		8. Process (Refining) of Oil & Natural Gas	
		9. Oil & Natural Gas Pipelines	≥ 25 km
II.	Health Care	1. Hospital (Class A)	
		2. Hospital (Class A or Class I equality)	
		3. Other Hospitals	≥ 400 Rooms
		4. Fully Nursing Hospital	
		5. Production Facilities of Experimental Medicals	
III.	Public Works	1. Construction of Dam and Dyke/Levee	Height ≥15 m or Reservoir Area ≥100 ha
		2. Development of Irrigable Area	Irrigated Area ≥2,000 ha
		3. Development of Tidal Flat	Area ≥5,000 ha
		4. Coast Preservation in Great City	Population ≥500,000
		5. River Improvement Project in Great City	Population ≥500,000
		6. Canal or Flood-control Facilities in Great City	Length ≥5 km or Width ≥20 m
		7. Other Canal (Shore Frontage and Swamp etc.)	Length ≥5 km or Width ≥20 m
		8. Construction of Expressway and Road with Flyover	
		9. Construction of Arterial Road	Length ≥25 km
		10. Construction and Improvement of Arterial Road except Great City or Capital Region	Length ≥5 km or Area ≥5 ha
		11. Waste Incinerator	≥800 tons/ha
		12. Waste Disposal Site (Reclamation)	≥800 tons/ha
		13. Waste Disposal Site (Open Dumping)	≥80 tons/ha
		14. Drainage Facilities in Great City or Capital Region	Major
		15. Drainage:	
		- Drainage Facilities within Urban Area	Area ≥50 ha
		- Sewerage	Treated Area ≥2,500 ha
		16. Intake Facilities from Lake, River, and Spring etc.	
		17. Public Housing	Area ≥50 ha
		18. Urban Renewal Project	Area ≥5 ha
		19. High-rise Building and High-rise Condominium	Height ≥60 m
IV.	Agriculture	1. Aquaculture of Shrimp/Prawn and Fish	Area ≥50 ha
		2. Paddy Development in Forest Area	Area ≥1,000 ha
		3. Plantation	Area ≥10,000 ha
		4. Cash Crop Farm	Area ≥5,000 ha
V.	Sightseeing	1. Hotel	Room ≥200 or Area ≥5 ha
		2. Golf Course	
		3. Recreation Park	Area ≥100 ha
		4. Tourist Resort Area	
VI.	Relocation/Resettlement & Forest Residence	Construction of Inhabited Area for Immigrant	Area ≥3,000 ha
VII.	Industry	1. Cement	
		2. Paper & Pulp	
		3. Chemical Fertilizer (Synthesis)	
		4. Oil Chemistry	
		5. Steelmaking	
		6. Lead Refinement	
		7. Copper Refinement	
		8. Production of Alumina	
		9. Production of Special Steel	
		10. Production of Aluminum	
		11. Production of Metal Pellet	
		12. Production of Pig Iron	
		13. Production of Ferro-alloy	
		14. Industrial Park/Complex	
		15. Shipbuilding	Ship ≥3,000 dwt
		16. Aircraft Manufacturing	
		17. Production of Plywood (including Related Facilities)	
		18. Production of Weapon, Munitions and Explosive	
		19. Waste Batteries	
VIII.	Transportation	1. Construction of Railway	Total Length ≥25 km
		2. Construction of Subway	
		3. Construction of Harbor (1st - 3rd class) and Related Facilities	
		4. Construction of Special Seaport	
		5. Coast Reclamation Project	Area ≥25 ha
		6. Harbor Dredging	Capacity ≥100,000 m^3
		7. Harbor Loading & Unloading Area	
		8. Airport and Related Facilities	
IX.	Trade & Commercial/Business	Trade Center or Shopping Mall/Center	Area ≥5 ha or Building Area ≥10,000 m^2
X.	Safeguard & Security	1. Construction of Munitions Safekeeping Facilities	Class A - Class C
		2. Construction of Naval Base	Class A - Class C
		3. Construction of Air Force Base	Class A - Class C
		4. Combat Exercise Site or Shooting Range/Target Practice Range	Area ≥10,000 ha
XI.	Nuclear Power	1. Construction and Operation of Nuclear Reactor	
		- Energy Production Reactor	
		- Experimental Reactor	≥100 kW
		2. Construction and Operation of Nuclear Energy Facilities except Nuclear Reactor	
		- Production of Nuclear Substances	≥Fuel Seed 50/yr
		- Radioactive Waste Treatment Facilities	
		- Radioisotope	≥1,850 TBq
		- Manufacture of Radioisotope	
XII.	Forest	1. Construction of Safari Park	Area ≥250 ha
		2. Construction of Zoo	Area ≥100 ha
		3. Logging of Forest (Right of Forest Extension)	
		4. Logging of Sago Palm Woods	
		5. Logging of Industrial Tree-planting	
		6. Construction of Park (National Park, Natural Conservation Area, Game Area, Beach Park, Wildlife Sanctuary, Biosphere Sanctuary etc.)	
XIII.	Hazardous Waste	Construction of Hazardous Waste Treatment Facilities	
XIV.	Integration/Multiple Ministries & Agencies	Related activities (EIA required respectively), on ecosystem with identity species, belong to the project or activities were held jurisdiction by multiple ministries/agencies.	

Source: Environmental Conservation Measures in Indonesia, IWATA Genichi, 1995



Source: Interpretation from Government Regulation No.27, 1999 about AMDAL

Figure 3.3.6 Procedures for EIA

Table 3.3.7 Demarcation Line on Judgment of Necessity between IEE and EIA

Classification	UKL & UPL (IEE)	AMDAL (EIA)	Remarks
1) Water Treatment Plant[*1]	Water treatment capcity with 50 - 100ℓ/s	Water treatment capacity over 100ℓ/s	
2) Withdrawal from River, Lake, and Spring[*2]	- Draw water below 250ℓ/s - Service area below 500ha - Length of transmission main below 10km (Length of transmission main with 2 - 10 km[*1])	- Draw water over 250ℓ/s - Service area over 500ha - Length of transmission main over 10km - Pipeline cross over 2 or more regencies[*2]	- Urban Area - Equivalent of supplied population of 200 thousands or medium-scale city
3) Pumping-up of Groundwater[*1*2]	Pump up water with 5 - 50ℓ/s	Pump up water over 50ℓ/s	- Per well - Pump up water from 5 wells within 10ha
4) Withdrawal from Spring[*1]	Draw water with 5 - 50ℓ/s	Draw water over 50ℓ/s	

*Note: *1 Source for Groundwater and Springs refers "Type of Documents for Environmental management in Business, Attachment III, Yogyakarta Regulation No.41, 2006.*

**2 "Business and/or Activities need Execution of EIA", Appendix, No.117/2001, Decree by State Minister for the Environment.*

CHAPTER 4

RELATED DEVELOPMENT PLANS AND ASSISTANCE OF OTHER DONOR AGENCIES

CHAPTER 4 RELATED DEVELOPMENT PLANS AND ASSISTANCE OF OTHER DONOR AGENCIES

4.1 Development Plan of National Level

4.1.1 National Development Plan and National Water Supply Sector Development Plan

The existing Nation Development plan is PROPENAS 2004 – 2009. In the National Development Plan, improvement of safe water supply system considering the poor is stated conforming to the last 5 year National Development Plan.

Referring to the National Development Plan and also Millennium Development Goals, mid-term water supply sector development plan (RPJMN 2004 – 2009) was prepared.

Millennium Development Goals (MDGs -2015) are as follows.

8 GOALS (Target) :

- Reduce poverty and hunger
- Universal Basic Education
- Improve the gender and women empowerment
- Reduce the mortality of infant and child
- Improve the heals of pregnancy
- Reduce HIV AIDS, Malaria, and other diseases
- Sustainability of environment
- Global relation ship to development

Based on above MDGs, GOI established “National Action Plan, Drinking Water Supply in Indonesia” as follows.

- GENERAL GOALS (Target):
  - Improve the people welfare through improve health rate with drinking water supply and clean environment
- NATIONAL LEVEL TARGET to 2015
  - Urban Area: Service ratio 80 %, with 100 l/d per capita consumption
  - Rural Area: Service ratio 60 %, with 60 l/d per capita consumption
- PROVINCIAL/REGIONAL LEVEL TARGET
  - To establish policy support on regional development
  - To prepare regional land use plan
  - To secure potential water resources
  - To prepare Master plan of drinking water supply in urban and rural area
  - To achieve MDGs with adequate regional capacity

According to the RPJMN 2004-2009, National development target by year 2009 is as follows.

Table 4.1.1 Future Served Population/Service Ratio, Target of RPJMN 2004-2009

No	Category	Present Served Population (million) (2004) (Service Ratio%)	Target Served Population (million) (2009) (Service Ratio%)	Increasing scope Million people
1	Urban	31.2 (33%)	77.0 (66%)	45.8
2	Rural	8.7 (7%)	36.0 (30%)	27.3
3	Total	39.5 (18%)	113.0 (40%)	73.5

Source: Ministry of Public Works

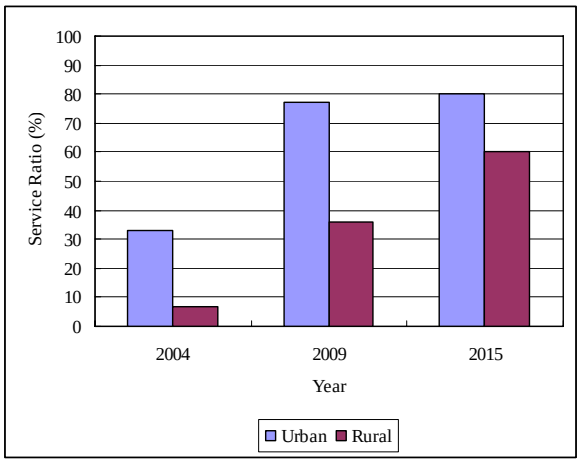


Figure 4.1.1 Future Service Ratio, Target of RPJMN 2004-2009

In the RPJMN 2004-2009, problems and strategic issues are identified as follows;

Service Levels

- The growth of services of drinking water supply with pipe system in last 10 years is not comply with population growth, 19 % in 1997 to 17 % in 2003
- Non-pipe SPAM on last 30 years is developed faster than piped SPAM, but the development of non-pipe SPAM still requires assistance.
- Water loss of pipe system is 10%-50%, with average 37% in 2004 and water pressure in distribution network is usually low
- Drinking water services though pipe system in urban area is limited for middle to high class people, but for poor people access to the piped water supply system is rather difficult
- Accurate data concerning water supply services are not sufficiently available
- Water production of PDAM may fulfill the requirement of clean water, but there is a contamination in distribution network
- High number of diseases because of low access of drinking water

Financial Source, Budgetary Arrangements

- SPAM funding problems for development, operation and maintenance, because of low tariff and high loan
- Investment for SPAM development is depend on foreign loan, and own fund is not enough

- Low priority on regional government funding for SPAM development

Institution and Laws

- Low function of boards/services on SPAM management, so the development function of SPAM is very weak
- Business principle is not fully implemented yet on SPAM (PDAM), such as employee recruitment is not connect enough with human resources development program in SPAM management
- SPAM should have cooperative attitude for agglomeration
- Groundwater capacity in several location is limited because of the management of catchments area is not good enough
- Groundwater quality is deteriorated, because of the increasing of human and industry activities are not balances with environmental protection

Stakeholders

- Less community empowerment

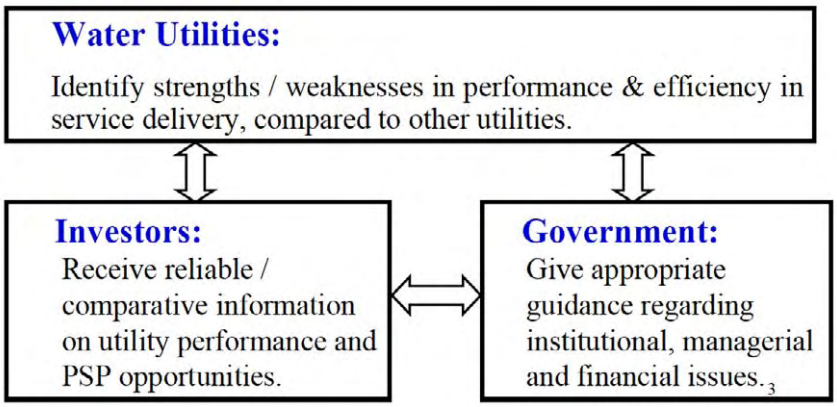
Based on understanding these issues listed above, policy and strategy of SPAM development are described in the RPJMN 2004-2009. Contents of RPJMN 2004-2009 are:

- Service Level and Quality
  - To increase the service level and quality consistently, step by step
  - To decrease water loss through adequate maintenance and rehabilitation
  - To put higher priority to supply water to low income people
- Funding
  - To increase the funding allocation of SPAM development through alternative source of fund
  - To improve management of PDAM financial situation
- Institution, Regulation, and Laws
  - To strength the regulator and operator function on SPAM management
  - To implemente business principle on the management of institution
  - To make a regulation

4.1.2 PERPAMSI Benchmarking

PERPAMSI implemented a World Bank supported program (PPIAF) in 2002/2003 where 80 water utilities participated and increase number of utilities gradually.

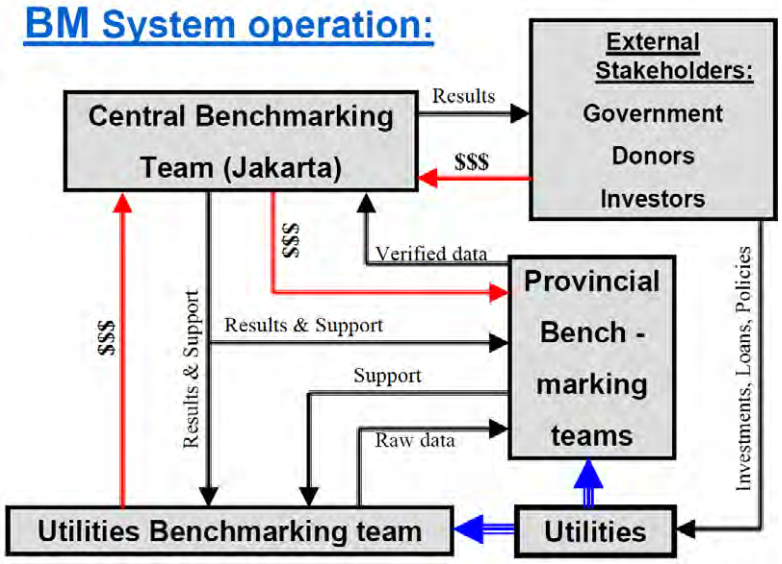
Purpose and system operation of the benchmarking are as shown below.



Source:http://www.worldbank.org/html/fpd/water/waterweek/presentations/24/WBI%20-%20PERPAMSI%20Twinning%20Program%20and%20Benchmarking.pdf

Figure 4.1.2 Purpose of PERPAMSI Benchmarking

The results of PERPAMSI Benchmarking (10 Best PDAM Kota) is shown in Appendix 7.



Source:http://www.worldbank.org/html/fpd/water/waterweek/presentations/24/WBI%20-%20PERPAMSI%20Twinning%20Program%20and%20Benchmarking.pdf

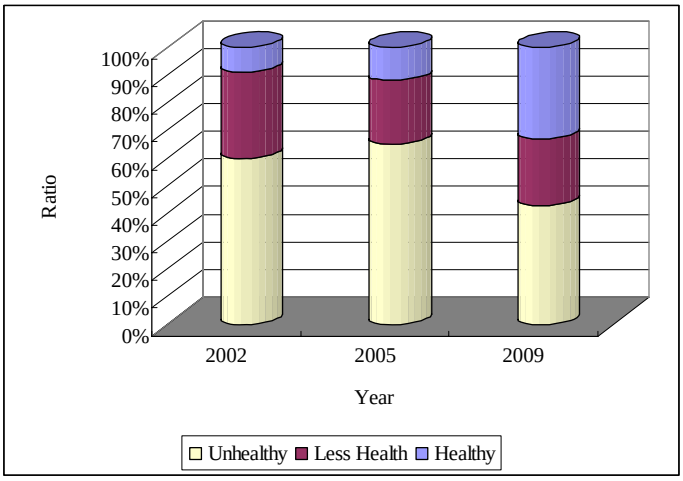
Figure 4.1.3 System of PERPAMSI Benchmarking

As a result of Cipta Karya and BPPSPAM's evaluation, PDAMs were categorized as "healthy", "less healthy" and "unhealthy" as shown on table below. Under the situation in 2002, 60 % of PDAMs were categolized in "unhealthy". Improvements of PDAM situation are planed also shown on table below.

Table 4.1.2 Classification of PDAMs and Improvement Plan

PDAM Category	2002	2005	2009
Healthy (PDAM has ability to develop, profitable company, loan management, change the assets, efficient operational)	9%	12%	33%
Less healthy (PDAM is not developed enough, low profit)	31%	23%	24%
Unhealthy (PDAM does not have ability to develop, no benefit, operational on limited resources)	60%	65%	43%

Source: Policy and National Strategy of Drinking Water Supply System



Source: Policy and National Strategy of Drinking Water Supply System

Figure 4.1.4 Improvement Plan of PDAM

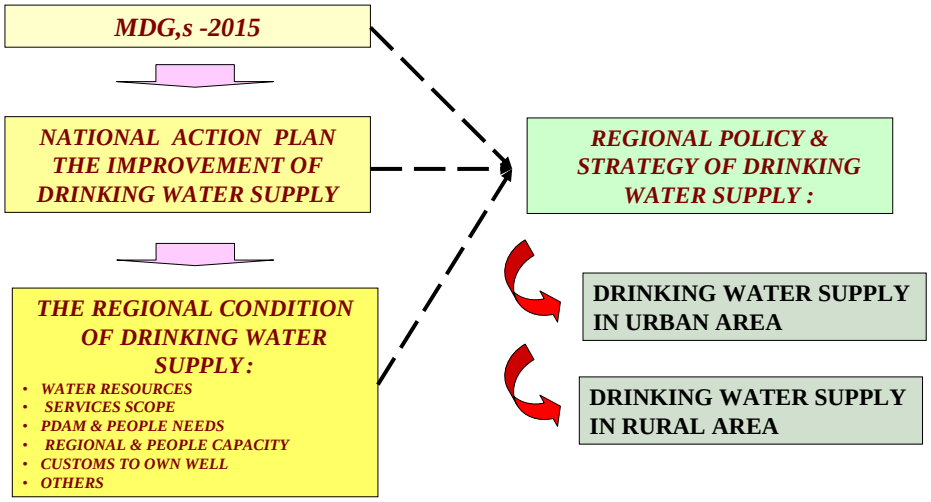
Meanwhile, PDAM Health Program has been formed by Inter-department Central Government Team, which is consists of: BAPPENAS, Kimpraswil Department, Home Affair Department, and Financial Department based on Decision Letter of Minister of Coordinator in Economic, No. KEP 28/EKON/06/2002, with the main duties are

- Formulating the policy and strategy of accelerating in Healthy PDAM,
- Coordinating the plan and development of water supply program with other infrastructure and accelerating the increasing of water supply quality, and
- Doing others duty that given by Minister of Economic Sector Coordinator.

4.2 Development Plan of Provincial Level

4.2.1 Provincial Level Water Sector Development Plan

Provincial development plan for water sector is planned by BAPEDA together with KIMPRASWIL (Cipta Karya) and the future plan and policy/strategy are set up conforming to the national development policy. Relation between national policy and provincial policy is shown on figure below.



Source: Bappeda DIY

Figure 4.2.1 National and Regional Policies

To achieve MDGs, "Grand Strategy of Water Supply in DIY" is prepared as follows.

- Expansion of Water Supply Service
- By using water supply system optimally, using the PDAM idle production capacity, creating a new system, increasing the community role to achieve healthier life in Yogyakarta by Year 2010
- Maintain Sustainable Water Resources
- By increasing the efficiency of water usage, protecting and increasing the quality of water resources, and increasing the environment quality through cooperation with other region to secure sustainable water resources
- Technical assistance
- By facilitating and giving physical assistance, especially for poor community
- Mobilize Alternative Funding
- By funding of government and cooperation funding network of private parties both domestic and foreign
- Institutional Reformation
- By increasing stakeholder role in decision-making and water supply management
- Service Obligation
- By determining and facilitating the minimal service to all community layer

Based on these grand strategies and considering "Health PDAM Program", in DIY Province, action plan of water supply sector are supporting and facilitating followings:

- Compilation of City/Regency Grand Strategy in Water Supply in DIY Province Area
- Compilation of Water Supply Program in DIY Province to support the acceleration of achiving the MDGs-2015 target
- Supporting and facilitating the arrangement of master plan in city/regency water supply in DIY Provincial area
- Completion of the water supply in Gunungkidul Regency, specially in south area
- Completion of the development of water supply system in Kulonprogo regency which using Sermo Dam

- Supporting and facilitating the water supply in Kartamantul agglomeration area
- Completion of the development of water supply system in Prambanan Gunung
- Fulfilling the water supply need in: Piyungan Bantul Industrial Area, Estate Campus Area, etc

KIMPRASWIL of DIY Province as an institution that has responsibility of water supply, as technical assistance of water supply in City/Regency in DIY Province will help Regional Government in:

- Implementation of the technical assistance in compiling Master Plan
- Identification of Water Supply Program in DIY Province in order to support the accelerating target fulfillment MDGs-2015
- Supporting the cooperation of City/Regency Government in supplying the safe water
- Assistance to find funding resources of water supply infrastructure development that come from government or private cooperation funding both inside and outside the country
- Supporting Central Government in PDAM Health Program
- Improvement of water supply system, in order to accelerating the water supply service coverage and water supply fulfillment in the dry area
- Securing sustainable water resources

4.2.2 Inter Municipal Cooperation on Urban Infrastructure Management between Yogyakarta City, Sleman Regency, and Bantul Regency

In 2001, Kartamantul Joint Secretariat was established based on agreement among Yogyakarta City, Sleman Regency and Bantul Regency to support cross boundary cooperation among these three regions. The Joint Secretariat published "Inter Municipal Cooperation Kartamantul" in 2006 reviewing situation of seven sectors. The seven sectors are

- Roads Management,
- Transportation Management,
- Water Resource Management,
- Wastewater Management,
- Drainage Management,
- Solid Waste Disposal Management, and
- Organization Structure.

Vision of the Joint Secretariat is "*Take responsibility as a bridge for the realization of an equal, fair, participative, transparent, and democratic cooperation, in order to develop the comfort, beautiful, & health urban agglomeration area with the support of adequate infrastructure and a high community participation*".

To materialize the vision, the Joint Secretariat announced its challenges as follows

- Continued delivery of functions and role in public service improvement
- Long-term institutional capacity development
- Legal and political support such as central government policy, support of local provincial

government, optimal support from legislative assemble, and strong stakeholder network.

For water resource sector, the Joint Secretariat targets cooperation which will be built with objective to fulfill of permanent amount of water demands/clean water in the urban agglomeration area in DIY. The Secretariat focus on issues such as management and services including water treatment plants, piping, reservoir, organization and mechanism, financing, tariff, and environment.

4.2.3 Triple-A

The Triple-A is "Atlas", "Agenda" and "Aturan-main (Rules-of-the game) of the DIY and translates the formal planning documents such as national development plan into concrete investment priorities of the development stakeholders based on their shared visions, joint strategies, synchronized investments and combined funding. The functions of these three instruments complement each other:

- Atlas presents relevant information on the existing conditions and trends, and of the development potential of DIY Province.
- Agenda, based on the information provided in the Atlas, translates strategic development plans into concrete investment priorities of the stakeholders.
- Aturan-main(Rules-of-the-game) present guidelines for the effective use of the Atlas and Agenda in mobilizing and coordinating stakeholder investment.

The Triple-A was conducted through multi-stakeholder task forces, and was supported by funding from the Swiss Agency for Development and Cooperation (SDC), the Cities Alliance and the World Bank. The preparation of the Triple-A of DIY Province was coordinated with the simultaneous preparation of the similar instruments by the five regencies of the province. Besides, a regional Triple-A has been prepared which focuses o regional economic growth and poverty reduction through urban-rural linkages, inter-municipal relationships, and inter provincial synergies.

The Triple-A concept has been formally adopted in a joint commitment dated 24 August 2002, that was signed by the Governor of DIY and by the heads of its five regencies. The present updated Agenda was formally accepted on 20 December 2004 and finalized on 31 March 2005.

4.3 Assistance of Other Donor Agencies

Various donor agencies are actively implement many kinds of projects specially for restoration of damages caused by the last severe earthquake in May 2006.

Continuous assistance is made for water supply sector by USAID as a part of “Environmental Service Program (ESP)”. Under the scope of the ESP, the USAID is focusing on capacity development of PDAM. The USAID conducted a questionnaire survey (sample number is about 5,000 households) and the purpose of this survey is to improve customer management and customer relations of PDAM. The USAID will present guideline of improvement of customer management.

The USAID is also implementing assistance for reduction of NRW in Yogyakarta. As the first step, the USAID assists to prepare distribution pipe network drawings.

CHAPTER 5

WATER RESOURCES

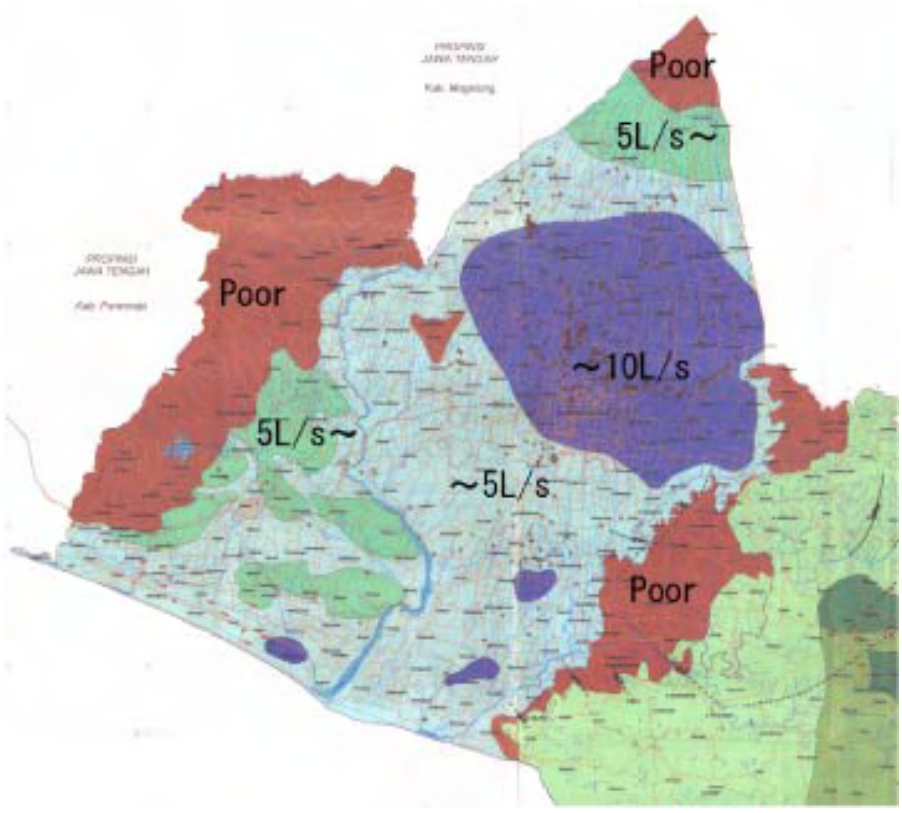
CHAPTER 5 WATER RESOURCES

5.1 General

In the study area, there are abundant water resources such as groundwater, spring water and river water. Large part of the study area is covered by alluvial deposits or volcanic sediments mainly originated from Merapi volcano. Alluvial deposits derived mainly from the redeposited volcaniclastic materials. These formations have high permeability so act as good aquifer. There are many springs and well for various kinds of usage. The Progo River is the biggest river in the Study Area and provides irrigation water through the Mataram canal that reaches the Opak River at all times of the year even in dry season.

Domestic water supplies (piped scheme) in the area consist of PDAM water supply system for urban areas and Community water supply system for rural areas. A number of shallow dug wells are also using for household use and small-scale irrigation.

Figure 5.1.1 shows a groundwater potential of the study area. The value on the figure means estimated yield of a well of each color-coded zone.



Source: "Peta Hidrogeologi Propinsi D.I.Y" Dinas Perindustrian Peerdagangan dan Koperasi D.I.Y 2004.

Figure 5.1.1 Groundwater Potential of the Study Area

5.2 Water Resources for PDAM

There are three PDAMs in the study area, each for Yogyakarta Municipality, Sleman Regency and Bantul Regency. PDAM water supply systems are mainly covered urban areas in each region.

Figure 5.2.1 - 5.2.3 show the location of water sources for each PDAM, and Table 5.2.1 - 5.2.3 indicate the specification of each water source. These data were based on each PDAM by collecting records or interviewing with staff of PDAM.

PDAM Sleman and PDAM Bantul have water sources in its own area but large number of the water sources for PDAM Yogyakarta located in Sleman Regency (see Figure 5.2.1).

5.2.1 Type of Water Sources

Water sources for PDAMs are classified into river, spring, shallow well and deep well. Table 5.2.4 shows the number of water sources for each PDAM and Table 5.2.5 shows the total quantity of water production capacity in each PDAM. According to these tables, deep well has 62% share of water source by number and has 63% by quantity in total 3 regions. River has 5%, spring has 15% and shallow well has 17% share of water source by water production capacity in all 3 regions.

PDAM Yogyakarta depends largely on deep wells and the 67% of total production capacity is from its deep wells. For PDAM Sleman, spring has 26% of total production capacity and its share is higher than it of other 2 regions. Shallow well for PDAM Bantul has higher percentage (24%) of total production capacity than other 2 regions.

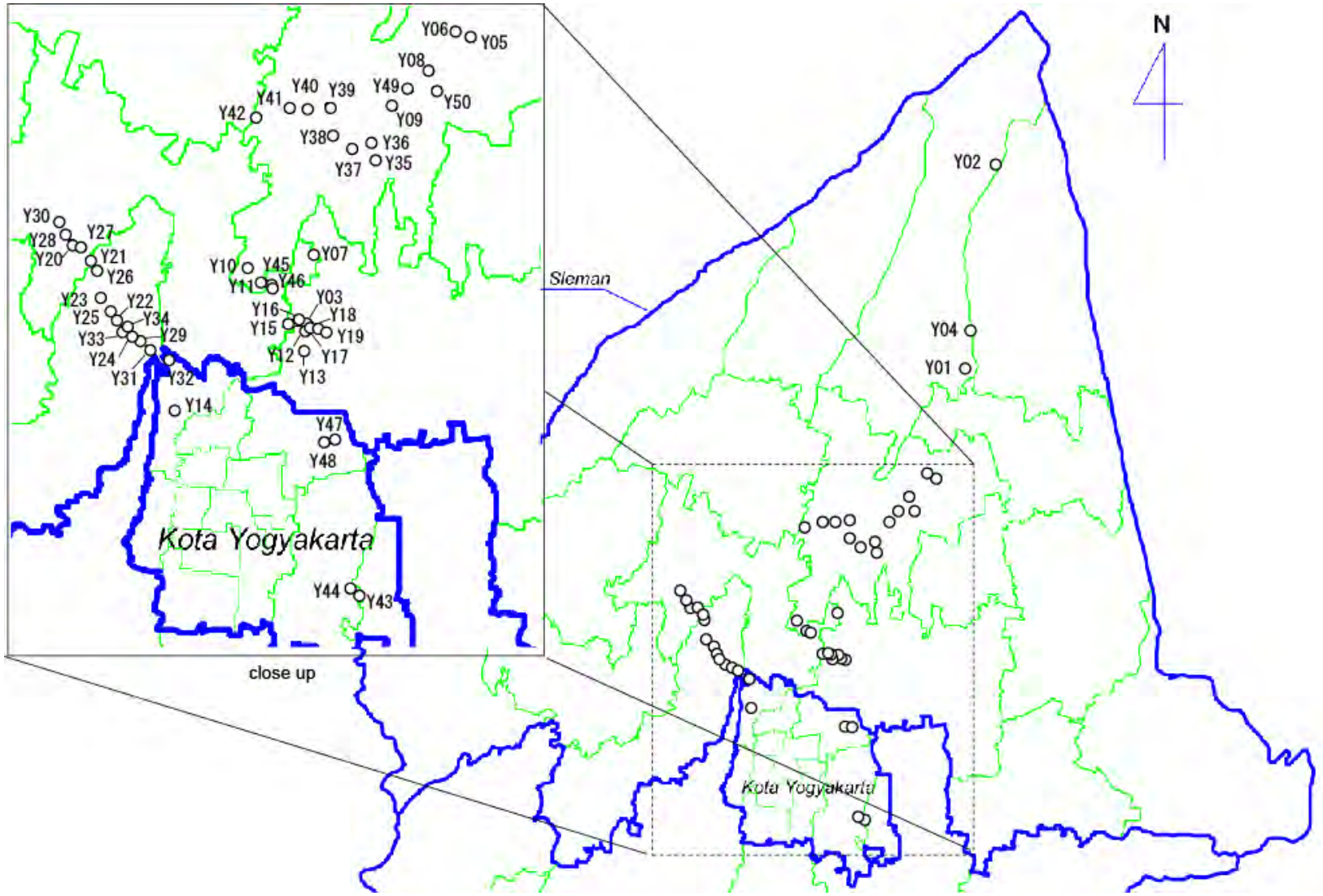


Figure 5.2.1 Location of Water Sources for PDAM Yogyakarta

Table 5.2.1 List of Water Sources for PDAM Yogyakarta

No.	Type	Code or Name	Coordinates (or Location)		Elev. (m)	Depth (m)	Diameter (m)	Water Level (G.L.-m)	Production Capacity (L/s)	memo
			Latitude (dd'mm'ss's)	Longitude (dd'mm'ss's)						
Y01	River	Padasan	Padasan, Sleman		-	-	-	-	80	
Y02	Spring	Umbul Wadon	S07'35'34'3	E110'26'24'3	916	-	-	-	90	
Y03		Karangayam I	S07'45'39'6	E110'23'02'6	166	-	-	-	38	
Y04	Shallow Well	Bedoyo	S07'39'00'2	E110'25'52'9	502	11	1.5	-	15	
Y05		Besi-1	Besi, Sleman		-	-	-	-	34	
Y06		Besi-2	S07'41'57'0	E110'24'56'8	305	9.75	1.5	9.00	27	
Y07		Kentungan	Kentungan, Sleman		-	-	-	-	12	
Y08		Candi	Candi. Sleman		-	-	-	-	7	
Y09		Bulusan	Bulusan, Sleman		-	-	-	-	6	
Y10		Jongkang	S07'44'56'7	E110'22'18'3	163	6.73	2.0	3.10	(43)	Pump is repairing
Y11		Nandan	Nandan, Sleman		-	-	-	-	6	
Y12		Karang Gayam II	Karang Gayam, Sleman		-	-	-	-	15	
Y13		Karang Wuni	Karang Wuni, Sleman		-	-	-	-	15	
Y14		Winogo	Winogo		-	-	-	-	12	at Kota Yogyakarta
Y15	Deep Well	K1	S07'45'39'4	E110'22'53'0	171	70	8inch	21.08 (DWL)	20	
Y16		K.3	Depok, Sleman		-	70	10inch	-	20	
Y17		K.4	Depok, Sleman		-	-	-	-	20	
Y18		K.5	Depok, Sleman		-	70	10inch	-	30	
Y19		K6	S07'45'46'3	E110'23'19'3	152	63	8inch	-	30	
Y20		B.1	S07'44'38'1	E110'20'04'7	155	68	8inch	-	30	
Y21		B.2	S07'44'51'8		147	66	8inch	-	25	
Y22		B.3	S07'45'37'0	E110'20'39'2	144	70	8inch	-	30	
Y23		B4	S07'45'20'2	E110'20'26'3	150	70	10inch	18.07 (DWL)	30	
Y24		B.5	S07'45'49'9	E110'20'50'0	137	70	8inch	-	30	
Y25		B.6	S07'45'31'2	E110'20'34'6	142	70	10inch	-	30	
Y26		B.7	S07'44'59'2	E110'20'24'7	154	70	10inch	-	30	
Y27		B.8	S07'44'41'1	E110'20'12'3	157	65	8inch	-	20	
Y28		B.9	S07'44'30'8	E110'20'00'6	157	68	8inch	-	40	
Y29		B.10	S07'45'53'2	E110'20'57'0	137	-	-	-	17	
Y30		B11	S07'44'22'0	E110'19'55'2	163	70	8inch	14.6 (DWL)	30	
Y31		B.L	S07'45'58'4	E110'21'04'0	135	68	8inch	-	30	
Y32		B.13	S07'46'06'9	E110'21'20'4	135	70	8inch	-	30	
Y33		BR1	S07'45'45'7	E110'20'42'8	137	70	10inch	9.4 (DWL)	25	
Y34		B.R2	S07'45'44'4	E110'20'43'8	138	70	10inch	-	(20)	Not operated
Y35		N3	S07'43'34'4	E110'23'57'2	236	65	10inch	-	25	
Y36		N.4	Ngaglik, Sleman		-	70	8inch	-	25	
Y37		N.5	Ngaglik, Sleman		-	-	-	-	25	
Y38		N6	S07'43'15'5	E110'23'24'7	237	70	10inch	-	25	
Y39		N.7	Ngaglik, Sleman		-	60	10inch	-	25	
Y40		N.8	Ngaglik, Sleman		-	70	10inch	-	25	
Y41		N.9	Ngaglik, Sleman		-	67	10inch	-	25	
Y42		N10	S07'43'01'9	E110'22'26'1	232	67	10inch	-	25	
Y43		KG1	S07'49'05'6	E110'23'44'6	117	70	8inch	25 (DWL)	10	SWL GL -9m at Kota Yogyakarta
Y44		KG2	Kotagede		-	67	10inch	-	20	at Kota Yogyakarta
Y45		Gemawang.1	Sinduadi, Mlati, Sleman		-	74	10inch	-	-	
Y46		Gemawang.2	Sinduadi, Mlati, Sleman		-	80	10inch	-	15	
Y47		Pengok.1	Demangan,Gondokusuman		-	78	10inch	-	-	at Kota Yogyakarta
Y48		Pengok.2	Demangan,Gondokusuman		-	78	10inch	-	-	at Kota Yogyakarta
Y49		A	Sinduharjo,Ngalik, Sleman		-	78	10inch	-	11	
Y50		G	Ngaglik, Sleman		-	72	10inch	-	11	

Note:All sources except Y14,Y43,Y44,Y47 and Y48 are in Sleman

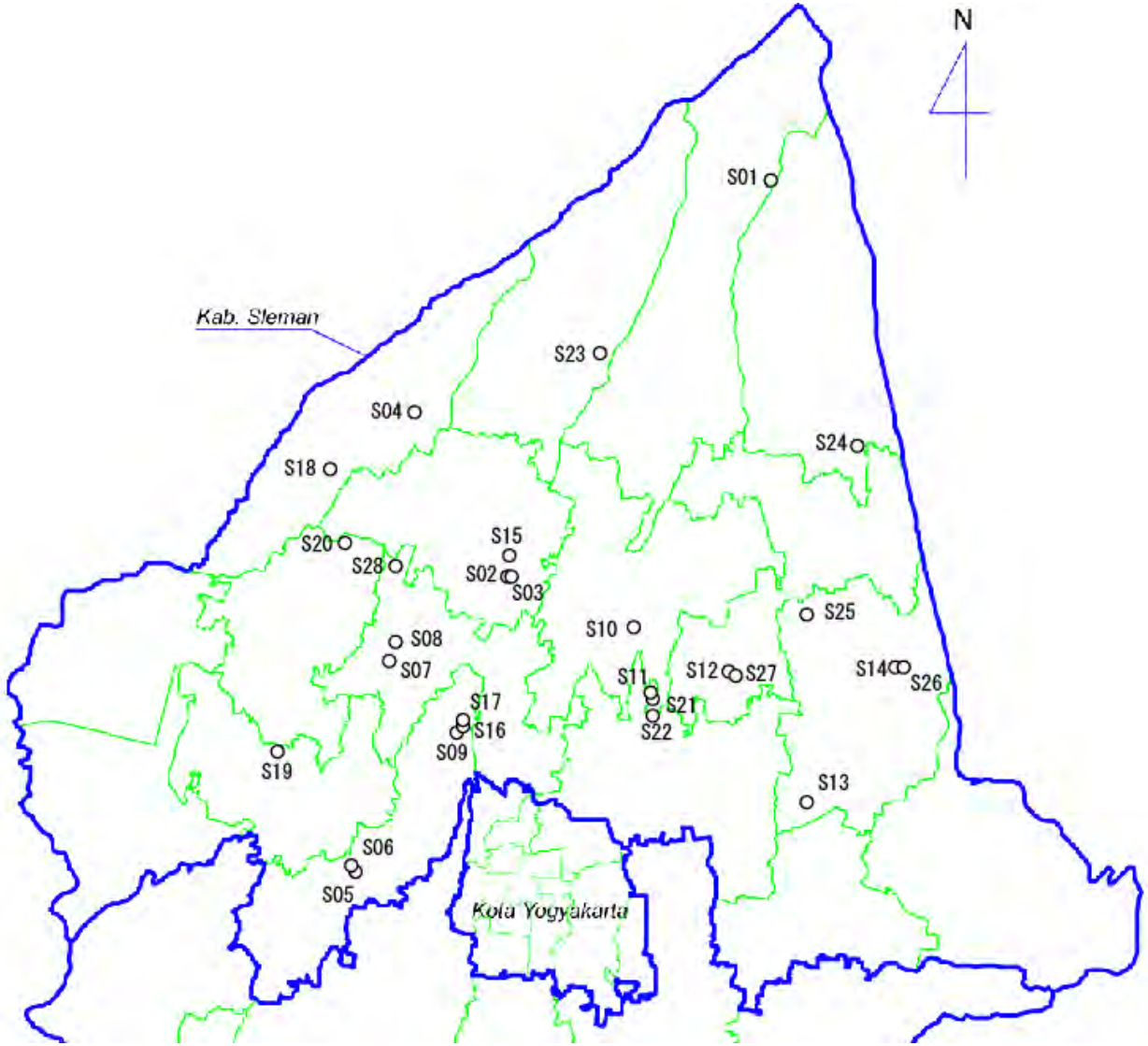


Figure 5.2.2 Location of Water Sources for PDAM Sleman

Table 5.2.2 List of Water Sources for PDAM Sleman

No.	Type	Code or Name	Coordinates (or Location)		Elev. (m)	Depth (m)	Diameter (m)	Water Level (G.L.-m)	Production Capacity (L/s)	memo
			Latitude (dd'mm'ss's)	Longitude (dd'mm'ss's)						
S01	Spring	Umbul Wadon	S07'35'34'3	E110'26'24'3	916	-	-	-	90	
S02		Tuk Dandang	S07'42'30'3	E110'21'47'9	221	-	-	-	25	
S03	Shallow Well	Sungai Denggung	S07'42'30'2	E110'21'49'2	223	3	0.8	-	15	at the River bed
S04		Kadisono	S07'39'35'3	E110'20'10'2	338	7.1	0.8	1.7	-	constructed at Sept.'06 Operation will be started in this year
S05		SDK01	S07'47'44'0	E110'19'07'2	99	8	0.8	3.47	10	
S06		SDK02	S07'47'43'7	E110'19'07'0	99	8	0.8	-	10	
S07		Sidomoyo	S07'44'00'2	E110'19'43'6	168	8	0.8	4.9 (DWL)	8	8L/s rainy season, 4L/s dry season
S08		Danen	S07'43'39'6	E110'19'50'8	175	8	0.8	-	15	
S09		Nogotiro Shallow Well	S07'45'14'6	E110'20'58'5	148	8	0.8	-	6	same location as SB04
S10		Ngaglic Shallow Well	S07'43'24'1	E110'24'02'4	225	8	0.8	3.62 (DWL)	7	
S11		JL.Kakap	S07'44'40'6	E110'24'23'4	183	8	0.8	8.14	2	same location as SB19
S12		Kregan Shallow Well	S07'44'10'5	E110'25'40'6	195	8	0.8	6.01	7	same location as SB31
S13		Cupuwatu Shallow Well	S07'46'28'8	E110'27'06'4	134	8	0.8	4.6	6	same location as SB26 SB26 is not operated
S14		Prambanan, Shallow Well	S07'44'04'9	E110'28'37'1	182	12	0.8	-	4	same location as SB28
S15	Deep Well	SB01	Mancasan, Pendowoharjo		-	62	8inch	-	15	
S16		SB04	S07'45'14'6	E110'20'58'5	148	72	6inch	-	20	
S17		SB05	DonokitriII, Nogotiro		-	65	8inch	-	20	
S18		SB09	S07'40'37'0	E110'18'40'9	241	76	6inch	-	20	
S19		SB10	S07'45'35'6	E110'17'44'9	128	77	6inch	-	25	
S20		SB12	Tegal 10, Seyegen		-	69	12inch	-	20	
S21		SB19	S07'44'41'0	E110'24'24'2	183	80	0.3	-	35	Redrilled in 2005
S22		SB20	Jl.Mujair, Minomartani		-	82	8inch	-	15	
S23		SB22	S07'38'37'8	E110'23'25'9	477	62	-	4 (DWL)	15	WL data from PDAM
S24		SB24	S07'40'13'4	E110'27'56'1	389	80	8inch	-	25	
S25		SB27	Kemasan, Selomartani		-	80	8inch	-	15	
S26		SB28	S07'44'04'9	E110'28'37'4	182	80	10inch	-	20	
S27		SB31	S07'44'11'2	E110'25'43'2	196	84	6inch	-	30	
S28		SB33	S07'42'20'8	E110'19'48'1	213	85	10inch	-	20	

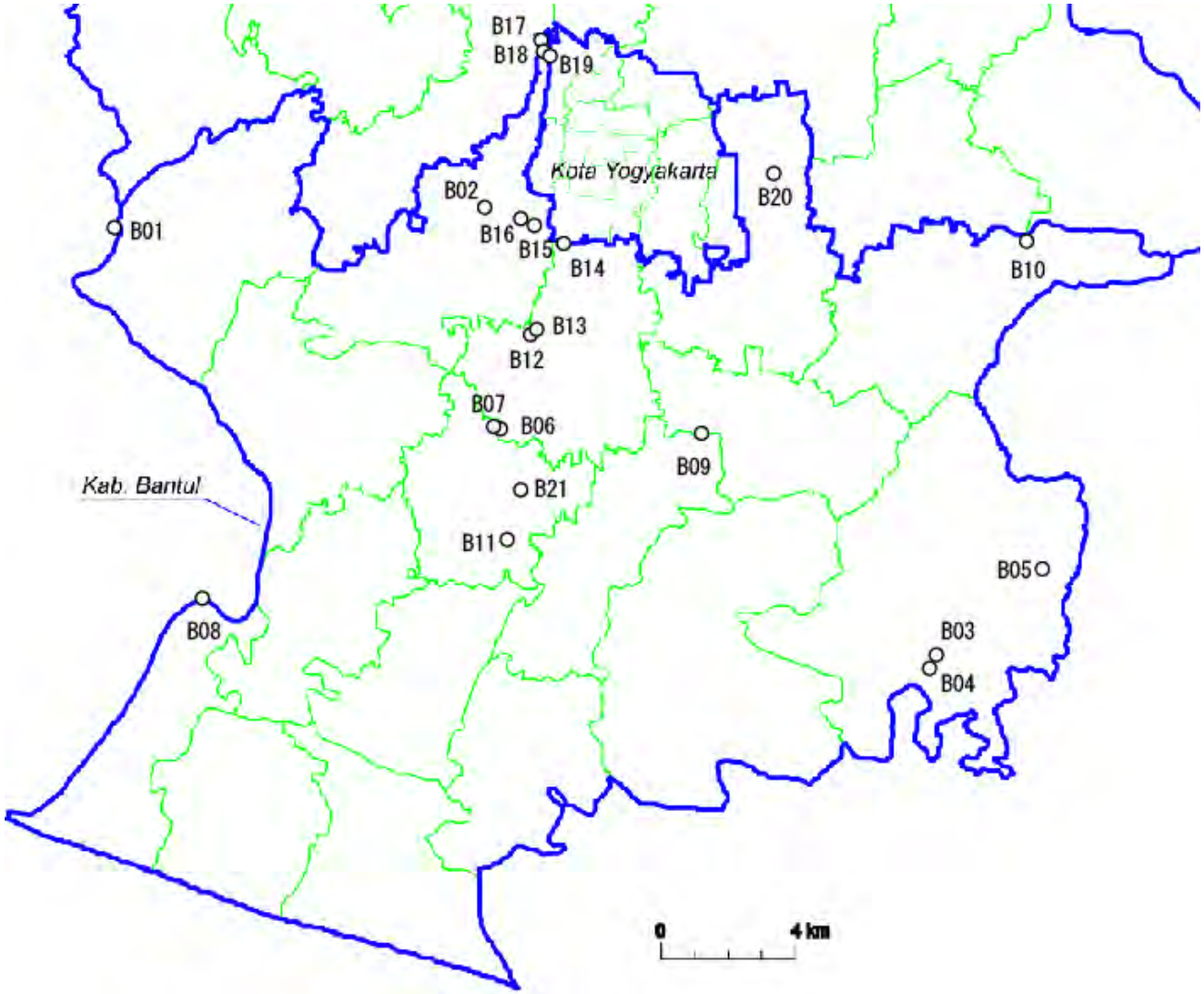


Figure 5.2.3 Location of Water Sources for PDAM Bantul

Table 5.2.3 List of Water Sources for PDAM Bantul

No.	Type	Code or Name	Coordinates (or Location)		Elev. (m)	Depth (m)	Diameter (m)	Water Level (G.L.-m)	Production Capacity (L/s)	memo
			Latitude (dd'mm'ss's)	Longitude (dd'mm'ss's)						
B01	River	Kalijoho,Argosari, Sedayu	S07'49'24'4	E110'14'03'0	52	-	-	-	15	
B02	Spring	Kalipakis, Kasihan	S07'49'02'1	E110'20'07'7	86	-	-	-	5	near River Bedog
B03		Grajagan,Dlingo, Dlingo	S07'56'22'4	E110'27'28'3	107	-	-	-	5	
B04		Tuk Gede' DlingoII, Dlingo,Dlingo	S07'56'34'9	E110'27'23'9	91	-	-	-	10	
B05		Rejosari,Jatimulyo, Dlingo	S07'54'58'3	E110'29'15'8	169	-	-	-	2	after earthquake Q=17l/s → 2l/s
B06	Shallow Well	Krandohan-1	S07'52'39'3	E110'20'23'3	52	7	1(up4m), 12inch	4.57 (DWL)	14	
B07		Krandohan-2	S07'52'39'2	E110'20'22'6	52	7	1(up4m), 12inch	3.34	14	
B08		Celan,Trimurti, Srandakan	S07'55'30'3	E110'15'26'9	39	11.95	2	11	6	near River Progo
B09		Sindet,Trimulyo, Jetis	S07'52'44'2	E110'23'37'2	57	-	1	-	7.5	near River Opak
B10		Wanunjoyo Lor, Srmartani, Piyungan	S07'49'33'2	E110'29'00'5	101	6.22	0.8	5.72	3	
B11	Deep Well	Sumberbatikan	S07'54'27'0	E110'20'27'1	36	120	8inch	-	5	
B12		Kaliputih-1, Sewon	S07'51'02'3	E110'20'52'8	66	120	-	36 (DWL)	13	
B13		Kaliputih-2, Sewon	S07'51'01'3	E110'20'56'6	65	120	-	-	12	
B14		Dongelan, Sewon	S07'49'36'9	E110'21'18'8	82	120	10inch	3.15 (DWL)	15	
B15		Tegal Senggotan, Bangunjiwo	S07'49'20'3	E110'20'55'8	87	100	10inch	-	-	
B16		Keloran, Bangunjiwo	S07'49'11'3	E110'20'44'0	87	100	10inch	-	14	
B17		Kasihan-1, Kasihan	S07'46'11'9	E110'20'56'4	127	120	12inch	-	7	
B18		Kasihan-2, Kasihan	S07'46'13'3	E110'20'58'3	129	120	10inch	-	12	
B19		Kasihan-3, Kasihan	S07'46'13'4	E110'20'58'9	130	120	12inch	-	5	
B20		J Banguntapan, Banguntapan	S07'48'27'2	E110'24'50'5	116	100	8inch	-	7	
B21		Bantul-Timur, Triharjo, Bantul	S07'53'40'6	E110'20'43'9	57	100	8inch	-	15	

Table 5.2.4 Number of Water Sources for Each PDAM

unit:number

Type of Water Source	PDAM Yogyakarta		PDAM Sleman		PDAM Bantul		Total	
River	1	*2%*	0	*0%*	1	*5%*	2	*2%*
Spring	2	*4%*	2	*7%*	4	*19%*	8	*8%*
Shallow Well	11	*22%*	12	*43%*	5	*24%*	28	*28%*
Deep Well	36	*72%*	14	*50%*	11	*52%*	61	*62%*
Total	50	*100%*	28	*100%*	21	*100%*	99	*100%*

Source:Noted above information is collecting from staff of each PDAM

Table 5.2.5 Quantity of Water Production Capacity in Each PDAM

unit:L/s

Type of Water Source	PDAM Yogyakarta		PDAM Sleman		PDAM Bantul		Total	
River	80	*7%*	0	*0%*	15	*8%*	95	*5%*
Spring	128	*11%*	115	*23%*	22	*12%*	265	*14%*
Shallow Well	192	*16%*	90	*18%*	44.5	*24%*	326.5	*17%*
Deep Well	804	*67%*	295	*59%*	105	*56%*	1,204	*64%*
Total	1,204	*100%*	500	*100%*	186.5	*100%*	1,891	*100%*

Source:Noted above information is collecting from staff of each PDAM

Table 5.2.6 Number of Water Sources in Each Region (for PDAM)

unit:number

Type of Water Source	Yogyakarta Municipality		Sleman Regency		Bantul Regency		Total	
River	0	*0%*	1	*1%*	1	*5%*	2	*2%*
Spring	0	*0%*	4	*5%*	4	*19%*	8	*8%*
Shallow Well	1	*20%*	22	*30%*	5	*24%*	28	*28%*
Deep Well	4	*80%*	46	*63%*	11	*52%*	61	*62%*
Total	5	*100%*	73	*100%*	21	*100%*	99	*100%*

Source:Noted above information is collecting from staff of each PDAM

Table 5.2.7 Water Production Capacity in Each PDAM (by water source)

unit:L/s

Type of Water Source	PDAM Yogyakarta		PDAM Sleman		PDAM Bantul		Total	
River	0	*0%*	80	*5%*	15	*8%*	95	*5%*
Spring	0	*0%*	243	*15%*	22	*12%*	265	*14%*
Shallow Well	12	*29%*	270	*16%*	44.5	*24%*	326.5	*17%*
Deep Well	30	*71%*	1,069	*64%*	105	*56%*	1,204	*64%*
Total	42	*100%*	1,662	*100%*	186.5	*100%*	1,891	*100%*

Source:Noted above information is collecting from staff of each PDAM

By interviewing with official from PDAM Sleman, PDAM Sleman dug some new shallow wells as alternative to deep wells. The reasons are following.

- water quality (deep well has high concentration of iron)
- operation cost (deep well needs high cost for pumping and treatment)

5.2.2 Water Sources in Each Region

PDAM Sleman and PDAM Bantul have water sources in its own area but large number of the water sources for PDAM Yogyakarta located in Sleman Regency Water sources for PDAMs were categorized by their location. Table 5.2.6 shows the number of water sources in each region and Table 5.2.7 shows the quantity of water production capacity in each region.

According to these tables, 73 water sources of total 99 are on Sleman Regency and 1,662 L/s of total 1,891 L/s is from the water sources of Sleman Regency. For water supply of PDAMs in the study area, 74% by number of water sources and 88% by quantity of production capacity are depend on water sources in Sleman Regency.

Deep well is main source and shallow well is the second in all 3 regions.

5.2.3 On-Site Measurement

Figure 5.2.4 shows the location of water sources for PDAMs and Community Water Supply Systems, which were carried out the on-site measurement in this study. The measurement was conducted by using water level indicator for groundwater level, portable pH meter and EC meter for pH and EC (electric conductivity) of water taking from the sources. Concentration of iron (Fe) and manganese (Mn) are also checked by PAC test (on-site simple measurement kit). Exact location of each water source was identified by using GPS receiver.

The measurement results and other information collecting from PDAMs are listed on Table 5.2.1, 5.2.2 and 5.2.3 by each PDAM.

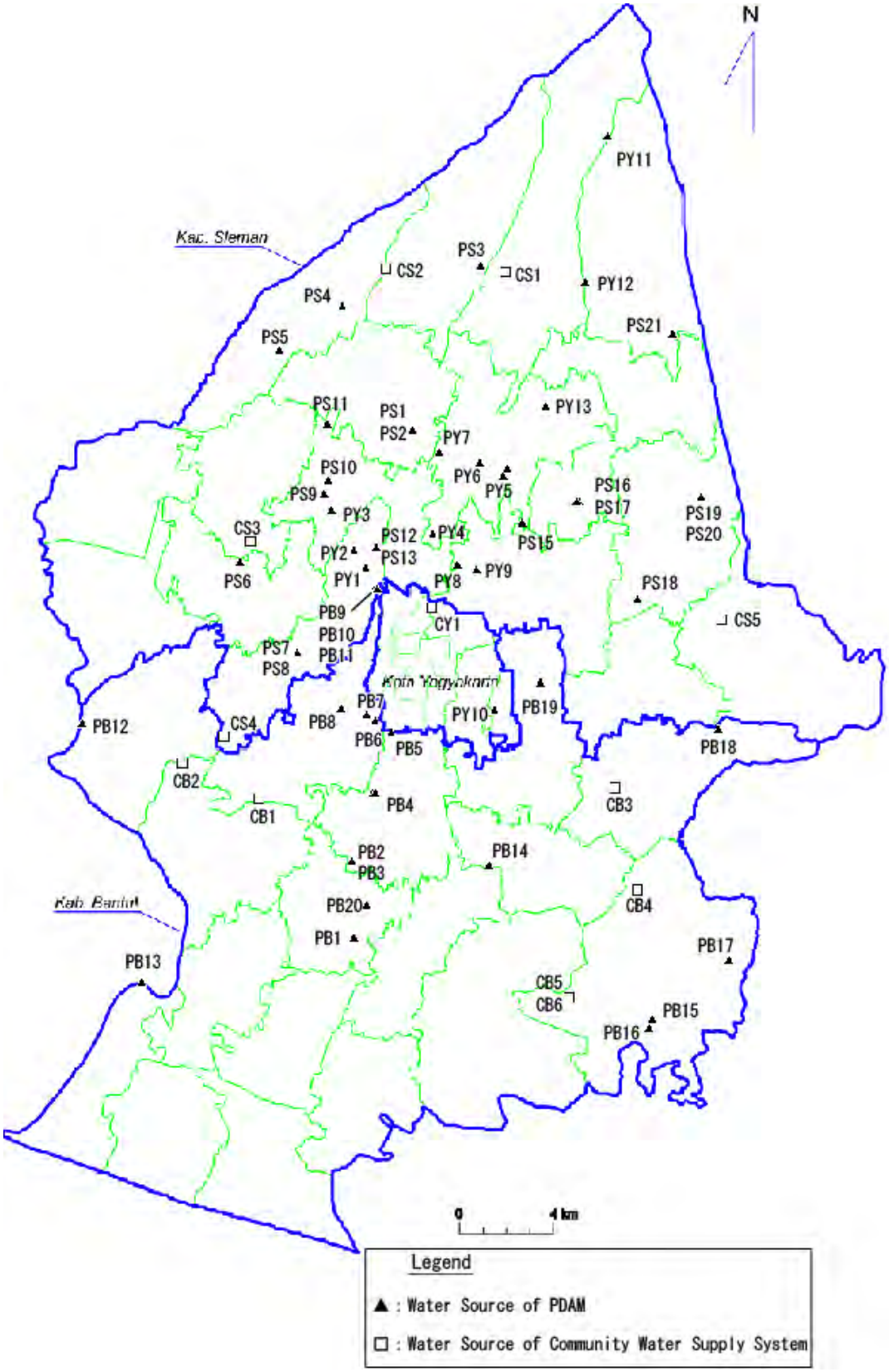


Figure 5.2.4 Location of Measurement Points for Water Sources

Table 5.2.8 Measurement Result of Water Sources of PDAM Yogyakarta

No.	Name	Type	Latitude	Longitude	Elev.	Depth (m)	Diameter (m)	Water Level (G.L.-m)	EC (mS/m)	pH	Temp. (℃)	Fe(mg/l)	Mn(mg/l)	memo
			(dd'mm'ss's)	(dd'mm'ss's)	(m)									
PY1	BR1	DW	S07'45'45'7	E110'20'42'8	137			9.4 (operating)	29.5	7.18	28.0	5	Not detected	
PY2	B4	DW	S07'45'20'2	E110'20'26'3	150	70	10inch	18.07 (operating)	30.7	6.80	29.2	2	0.5	
PY3	B11	DW	S07'44'22'0	E110'19'55'2	163	70	8inch	14.6 (operating)	32.7	6.93	28.0	2～5	-	
PY4	Jongkang	SW	S07'44'56'7	E110'22'18'3	163	6.73	2.0	3.10	46.2	6.65	27.9	Not detected	Not detected	Pump is repairing
PY5	N3	DW	S07'43'34'4	E110'23'57'2	236	65	17.5inch	-	43.5	7.30	27.0	0.5	-	
PY6	N6	DW	S07'43'15'5	E110'23'24'7	237	70	18inch	-	24.9	7.08	27.1	2～5	0.5	
PY7	N10	DW	S07'43'01'9	E110'22'26'1	232	67	17inch	-	53.4	7.24	27.0	0.5	-	
PY8	K1	DW	S07'45'39'4	E110'22'53'0	171	70	8inch	21.08 (operating)	31.4	7.10	27.6	0.5	0.5	
PY9	K6	DW	S07'45'46'3	E110'23'19'3	152	63	8inch	-	34.2	6.86	27.7	0.5	-	
PY10	KG1	DW	S07'49'05'6	E110'23'44'6	117	70	8inch	25 (operating)	66.5	7.11	28.6	2	0.5	SWL GL -9m
	After Treatment		-	-	-	-	-	-	51.7	7.35	29.4	-	-	
PY11	Umbul Wadon	Spring	S07'35'34'3	E110'26'24'3	916	-	-	-	23.0	6.68	21.0	Not detected	-	
PY12	Bedoyo	SW	S07'39'00'2	E110'25'52'9	502	11	1.5	-	23.1	7.30	25.9	0.2	-	
PY13	Besi-2	SW	S07'41'57'0	E110'24'56'8	305	9.75	1.5	9.00	30.6	6.70	26.8	Not detected	-	

Table 5.2.9 Measurement Result of Water Sources of PDAM Sleman

No.	Name	Type	Latitude	Longitude	Elev.	Depth (m)	Diameter (m)	Water Level (G.L.-m)	EC (mS/m)	pH	Temp. (℃)	Fe(mg/l)	Mn(mg/l)	memo
			(dd'mm'ss's)	(dd'mm'ss's)	(m)									
PS1	Tuk Dandang	Spring	S07'42'30'3	E110'21'47'9	221	-	-	-	22.4	6.74	27.1	Not detected	Not detected	
PS2	Sungai Denggung	SW	S07'42'30'2	E110'21'49'2	223	3	0.8	-	27.0	7.18	27.1	0.05	Not detected	River bed
PS3	SB22 Surondadi, Turi	DW	S07'38'37'8	E110'23'25'9	477	62	-	4(operating)	20.9	7.00	26.8	0.5	Not detected	WL data from PDAM
PS4	Kadisono	SW	S07'39'35'3	E110'20'10'2	338	7.1	0.8	1.7	21.6	6.64	26.2	Not detected	Not detected	constructed at 29.9.'06 Operation will be started in next year
PS5	SB09 Blimbingan	DW	S07'40'37'0	E110'18'40'9	241	76	6inch	-	90.0	7.30	30.0	0.5～1	Not detected	
PS6	SB10 Kramen-I	DW	S07'45'35'6	E110'17'44'9	128	77	6inch	-	70.5	7.04	28.8	2～5	<0.5	
PS7	SDK01	SW	S07'47'44'0	E110'19'07'2	99	8	0.8	3.47	36.7	7.00	28.8	1～2	1	
PS8	SDK02	SW	S07'47'43'7	E110'19'07'0	99	8	0.8	-	-	-	-	-	-	
PS9	Sidomoyo	SW	S07'44'00'2	E110'19'43'6	168	8	0.8	4.9(operating)	31.2	7.08	27.7	<0.05	Not detected	8L/s rainy season, 4L/s dry season
PS10	Danen	SW	S07'43'39'6	E110'19'50'8	175	8	0.8	-	28.8	6.66	27.4	Not detected	Not detected	Sampling at Sidomoyo
PS11	SB33	DW	S07'42'20'8	E110'19'48'1	213	85	10inch	-	37.3	6.90	28.0	2	<0.5	same location as SB07 SB07 is not operated
PS12	SB04 Nogotiro	DW	S07'45'14'6	E110'20'58'5	148	72	6inch	-	47.6	7.10	29.2	1～2	<0.5	
PS13	Nogotiro Shallow Well	SW	S07'45'14'6	E110'20'58'5	148	8	0.8	-	-	-	-	-	-	same location as SB04
PS14	Ngaglic Shallow Well	SW	S07'43'24'1	E110'24'02'4	225	8	0.8	3.62(operating)	32.1	6.76	28.0	1	Not detected	
PS15	JL.Kakap	DW	S07'44'41'0	E110'24'24'2	183	80	0.3	-	32.1	7.07	28.8	5	0.5	same location as SB19
PS16	Kregan Shallow Well	SW	S07'44'10'5	E110'25'40'6	195	8	0.8	6.01	27.4	6.60	27.7	Not detected	Not detected	same location as SB31
PS17	SB31 Kregan	DW	S07'44'11'2	E110'25'43'2	196	84	6inch	-	32.9	7.12	27.9	1～2	<0.5	
PS18	Cupuwatu Shallow Well	SW	S07'46'28'8	E110'27'06'4	134	8	0.8	4.6	30.0	6.68	(32.0)	Not detected	Not detected	same location as SB26 SB26 is not operated
PS19	SB28	DW	S07'44'04'9	E110'28'37'4	182	80	10inch	-	36.1	6.98	27.9	1	<0.5	
PS20	Prambanan, Shallow Well	SW	S07'44'04'9	E110'28'37'1	182	12	0.8	-	32.0	6.76	27.9	Not detected	Not detected	same location as SB28
PS21	SB24	DW	S07'40'13'4	E110'27'56'1	389	80	8inch	-	18.85	6.96	24.5	2	Not detected	

Table 5.2.10 Measurement Result of Water Sources of PDAM Bantul

No.	Name	Type	Latitude	Longitude	Elev.	Depth (m)	Diameter (m)	Water Level (G.L.-m)	EC (mS/m)	pH	Temp. (℃)	Fe (mg/l)	Mn (mg/l)	memo
			(dd'mm'ss's)	(dd'mm'ss's)	(m)									
PB1	Sumberbatikan	DW	S07'54'27'0	E110'20'27'1	36	120	8inch	-	86.7	7.59	30.0	0.05	Not detected	
PB2	Krandohan-1	SW	S07'52'39'3	E110'20'23'3	52	7	1m (upper4m), 12inch	4.57 (operating)	51.9	6.50	28.8	0.1	1	
PB3	Krandohan-2	SW	S07'52'39'2	E110'20'22'6		7	1m (upper4m), 12inch	3.34	-	-	-	-	-	
PB4	Kaliputih-1, Sewon	DW	S07'51'02'3	E110'20'52'8	66	120	-	36 (operating)	52.7	6.50	29.0	5	1	
	After Treatment	-	-	-	-	-	-	-	51.3	6.69	-	-	-	
PB5	Dongelan, Sewon	DW	S07'49'36'9	E110'21'18'8	82	120		3.15 (operating)	52.3	6.72	28.1	<0.05	2	
PB6	Tegal Senggotan, Bangunjiwo	DW	S07'49'20'3	E110'20'55'8	87	100		-	62.5	6.93	28.6	2	1～2	Screen 32-42m, 45-60m
PB7	Keloran, Bangunjiwo	DW	S07'49'11'3	E110'20'44'0	87	100		-	41.4	6.72	28.8	5	1～2	sampling at Tegal Senggotan
PB8	Kalipakis, Kasihan	Spring	S07'49'02'1	E110'20'07'7	86	-	-	-	36.7	6.55	27.9	Not detected	Not detected	near River Bedog
PB9	Kasihan-1, Kasihan	DW	S07'46'11'9	E110'20'56'4	127	120	12inch		33.6	6.85	28.5	-	-	
PB10	Kasihan-2, Kasihan	DW	S07'46'13'3	E110'20'58'3	129	120	10inch		34.4	6.80	28.5	2	0.5	
PB11	Kasihan-3, Kasihan	DW	S07'46'13'4	E110'20'58'9	130	120	12inch		36.1	6.80	28.9	-	-	
PB12	Kalijoho,Argosari, Sedayu	River	S07'49'24'4	E110'14'03'0	52	-	-	-	25.5	7.64	29.6	0.05	Not detected	
PB13	Celan,Trimurti,Srandakan	SW	S07'55'30'3	E110'15'26'9	39	11.95	2	11	41.4	6.96	28.8	2	0.5	near River Progo
PB14	Sindet,Trimulyo,Jetis	SW	S07'52'44'2	E110'23'37'2	57	-	1	-	38.4	6.94	28.4	0.2	Not detected	near River Opak
PB15	Grajagan,Dlingo,Dlingo	Spring	S07'56'22'4	E110'27'28'3	107	-	-	-	60.1	6.94	28.1	Not detected	Not detected	
PB16	Tuk Gede' DlingoII,Dlingo, Dlingo	Spring	S07'56'34'9	E110'27'23'9	91	-	-	-	52.3	6.90	28.5	Not detected	Not detected	
PB17	Rejosari,Jatimulyo,Dlingo	Spring	S07'54'58'3	E110'29'15'8	169	-	-	-	60.9	7.09	28.2	Not detected	Not detected	after earthquake Q=17l/s→2l/s
PB18	Wanunjoyo Lor,Srmartani,Piyungan	SW	S07'49'33'2	E110'29'00'5	101	6.22	0.8	5.72	34.5	6.71	28.6	Not detected	Not detected	
PB19	J Banguntapan,Banguntapan	DW	S07'48'27'2	E110'24'50'5	116	100	8inch	-	58.0	7.23	29.3	2	0.5	
PB20	Bantul-Timur,Triharjo,Bantul	DW	S07'53'40'6	E110'20'43'9	57	100	8inch	-	86.8	7.50	29.3	0.2	Not detected	

5.3 Water Resources for Community Water Supply System

Community water supply systems covered rural areas where PDAM services cannot be provided. There are 104 community water supply systems in the study area (see 6.5 for details). 12 water sources for community water supply systems are selected in consideration of regional distribution and are measured in same way as PDAM water sources.

Measurement results are listed on Table 5.3.1, 5.3.2 and 5.3.3 by region. Spring water and shallow well are main water sources for community water supply systems.

Table 5.3.1 Measurement Result of Water Sources of Community Water Supply Systems in Yogyakarta Municipality

No.	Name	Type	Latitude	Longitude	Elev.	Depth (m)	Diameter (m)	Water Level (G.L.-m)	EC (mS/m)	pH	Temp. (℃)	Fe (mg/l)	Mn (mg/l)	memo
			(dd'mm'ss's)	(dd'mm'ss's)	(m)									
CY1	Jetisharjo	Spring	S07'46'38'0	E110'22'16'7	125	-	-	-	39.1	6.53	28.1	Not detected	Not detected	Q=100m^3/day

Table 5.3.2 Measurement Result of Water Sources of Community Water Supply Systems in Sleman Regency

No.	Name	Type	Latitude	Longitude	Elev.	Depth (m)	Diameter (m)	Water Level (G.L.-m)	EC (mS/m)	pH	Temp. (℃)	Fe(mg/l)	Mn(mg/l)	memo
			(dd'mm'ss's)	(dd'mm'ss's)	(m)									
CS1	Nepen, Pakem	Spring	S07'38'43'1	E110'24'00'8	485	-	-	-	19.04	6.56	25.3	Not detected	Not detected	Q=3l/s(dry season), 7l/s(rainy season)
CS2	Bangunsari, Turi	Spring	S07'38'39'4	E110'21'11'8	407	-	-	-	30.7	6.7	24.5	Not detected	Not detected	Q=1.5～2l/s
CS3	Krangkapan, Seyegen	Spring	S07'45'04'1	E110'18'00'4	133	-	-	-	28.8	6.47	28.2	Not detected	Not detected	Q=1.5～2l/s
CS4	Sembung, Gamping	DW	S07'49'40'5	E110'17'23'5	134	135	8inch	(14)	91.3	7.08	(30.5) res.tank	Not detected	Not detected	
CS5	Sumberwatu, Prambanan	DW	S07'46'54'9	E110'29'06'0	122	82	8inch	-	38.7	6.82	(29.7)res.tank	<0.05	Not detected	Drilled by PPAB

Table 5.3.3 Measurement Result of Water Sources of Community Water Supply Systems in Bantul Regency

No.	Name	Type	Latitude	Longitude	Elev.	Depth (m)	Diameter (m)	Water Level (G.L.-m)	EC (mS/m)	pH	Temp. (℃)	Fe(mg/l)	Mn(mg/l)	memo
			(dd'mm'ss's)	(dd'mm'ss's)	(m)									
CB1	Bibis	SW	S07'51'07'3	E110'18'12'6	119	9	2×2	2.63	68.3	6.72	29.4			WL reach the suface in rainy season
CB2	Metes	SW	S07'50'17'6	E110'16'24'2	131	3.74	1	2.75	92.8	6.69	27.4	<0.05	<0.5	
CB3	Paengunung	SW	S07'50'52'4	E110'26'35'6	71	6.17	0.82	4.12	60.4	6.82	28.8	0.05	0.5	4.5m^3/day
CB4	Teron	SW	S07'53'17'6	E110'27'07'0	363	6.55	1	5.62	18.54	6.07	27	Not detected	Not detected	
CB5	Mangunam, Dlingo	SW	S07'55'49'5	E110'25'30'4	366	4.4	1	4.36	31.7	6.68	25.9	0.05	0.5	
CB6	Mangunam2, Dlingo	SW	S07'55'51'4	E110'25'31'3	365	6.07	1.73×2.58	6.02	25.9	6.7	25.8	-	-	

5.4 Reviw of Existing Groundwater Surveys in the Study Area

Some surveys for evaluating groundwater resources were conducted in the study area.

5.4.1 Groundwater Recharge from Previous Surveys

Table 5.4.1 shows summary of the results of those studies.

Table 5.4.1 Summary of Results of Previous Surveys in the Study Area

Study	Organization	Year	Groundwater Recharge (billion m^3/y)	Groundwater Storage (billion m^3)	Memo
Greater Yogyakarta Groundwater Resources Study	Overseas Development Administration (UK) / Sir M MacDonald & Partners	1984	1.0 (=32,000L/s)	–	
Evaluasi Potensi Air Bawah Tanah di Zona Akuifer Merapi (Evaluation of Potential of MerapiAquifer)	Fakultas Teknik, Universitas Gadjah Mada	2001	(1.0) quoted value from the above study	5.0	
Good Governance in Water Resource Management	European Union / PPSDA Propinsi,DIY / Dinas PSDA Propinsi, Jawa Tengah	2005	2.1*1 (=67,000L/s)	–	
Penyelidikan Potensi Airtanah (Study of Groundwater Potential in Banlul)	Dinas PERINDAGKOP, DIY	2006	0.34 (=11,000L/s) (Bantul only)	10.2 (Bantul only)	Bantul only
Kajian Potensi dan Pemanfaatan Sumber Daya Air (Study of Water Resources Potential and Water Uses in Sleman)	PU Sleman	2006	–	8.0*2 (Sleman only)	Sleman only

*1) value estimated from the survey result

*2) revised value (the report shows 11.6Bm^3, but the calculation process has a error)

According to these results, the total amount of groundwater recharge in the study area range from **1.0 billion m^3/year (=32,000L/s)** to **2.1 billion m^3/year (=67,000L/s)**.

5.4.2 Groundwater Consumption in the Study Area from Previous Surveys

Following table shows water consumption in the study area.

Table 5.4.2 Water Consumption by Use

(m^3/year)

Use	Sleman	Bantul	Yogyakarta	Total
Tap Water (PDAM)*1	5,612,405	3,385,821	18,290,918	27,289,144
Industrial Water*2	2,506,652	5,393,670	2,535,502	10,435,824

*1) actual value in 2005 *Source;PDAM*

*2) estimated value in 2002 *Source;Good Governance in Water Resource Management*

In addition to above uses, much water has been used for irrigation but the irrigation water has been taking from surface water, river mainly.