CHAPTER 13

FUTURE POPULATION

AND

WATER DEMAND PROJECTION

Chapter 13 FUTURE POPULATION AND WATER DEMAND PROJECTION

13.1 Future Population Projection

13.1.1 Procedures of Future Population Projection

Procedures of future population projection are summarized as shown on Figure 13.1.1. The projection starts from collection of past population records and evaluation of them. Based on obtained data, future population is calculated applying typical statistic equations. The calculations is conducted for each Kelurahan/Desa. Population density is also checked and results of the population projection are evaluated by comparing with the other available future population forecasts.

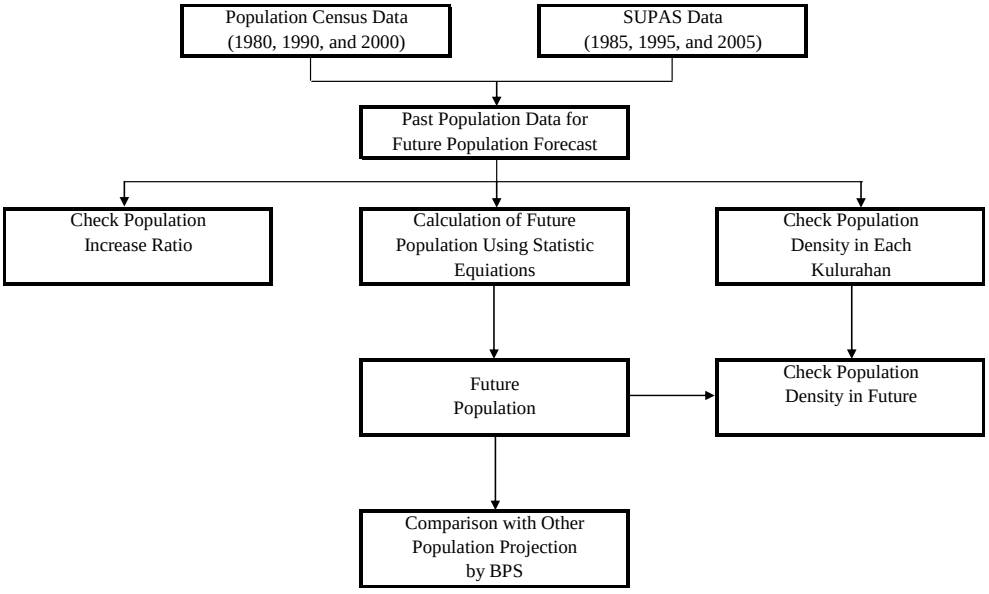


Figure 13.1.1 Procedures or Future Population Projection

13.1.2 Past Population Record for Future Population Projection

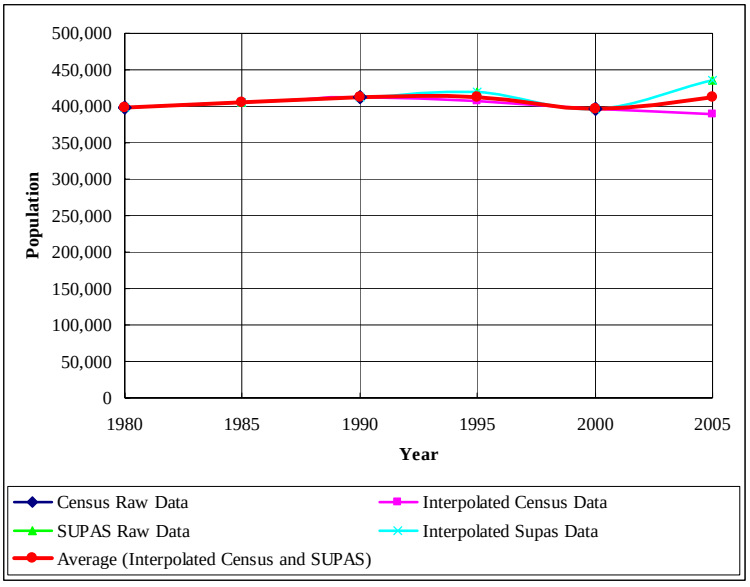
GOI conducts population census every decades and the last census was conducted in year 2000. The census survey is conducted by door to door and the census data is the most reliable population data according to BPS (BADAN PUSAT STATISTIK, Board of Statistic Center), DIY.

In between the census year, after five years from the previous census, BPS conducts SUPAS to estimate population. SUPAS is a kind of sample survey conducted in the selected sampled area, therefore, accuracy of the results of SUPAS is lower than the census data. As past population data, past census data of 1980, 1990, and 2000 are provided by the BPS together with past SUPAS data of 1985, 1995, and 2005. Past population data in the Study Area is as shown below.

Table 13.1.1 Past Population Data, Yogyakarta Municipality

Past Population Data / Year	1980	1985	1990	1995	2000	2005
Census Raw Data	398,192	na.	412,059	na.	396,711	na.
Interpolated Census Data	398,192	405,126	412,059	407,564	396,711	389,037
SUPAS Raw Data	na.	405,126	na.	418,944	na.	435,236
Interpolated Supas Data	398,192	405,126	412,059	418,944	396,711	435,236
Average (Interpolated Census and SUPAS)	398,192	405,126	412,059	413,254	396,711	412,137

Source: BPS



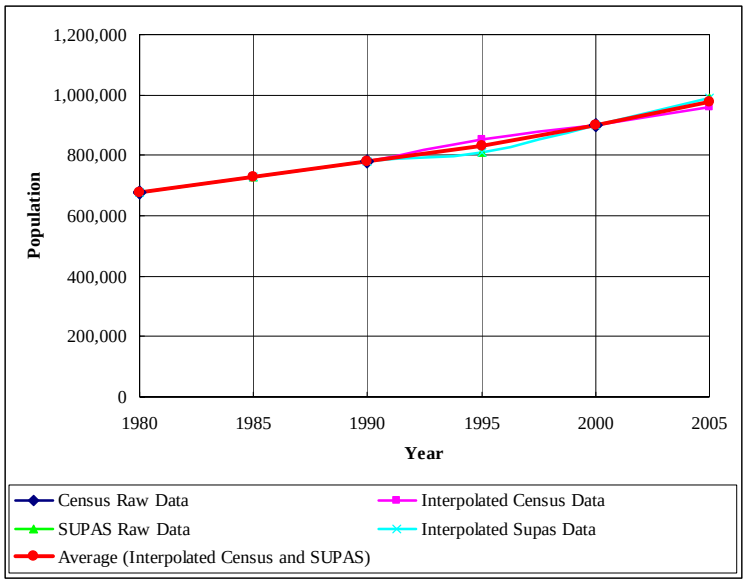
Source: BPS

Figure 13.1.2 Past Population Data, Yogyakarta Municipality

Table 13.1.2 Past Population Data, Sleman Regency

Past Population Data / Year	1980	1985	1990	1995	2000	2005
Census Raw Data	677,323	na.	780,334	na.	901,377	na.
Interpolated Census Data	677,323	728,829	780,334	852,615	901,377	961,899
SUPAS Raw Data	na.	728,829	na.	809,677	na.	990,130
Interpolated Supas Data	677,323	728,829	780,334	809,677	901,377	990,130
Average (Interpolated Census and SUPAS)	677,323	728,829	780,334	831,146	901,377	976,014

Source: BPS



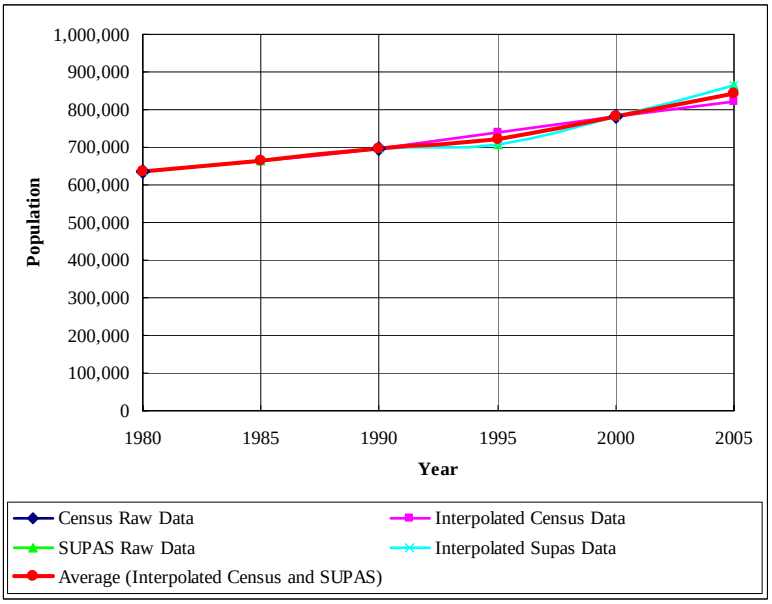
Source: BPS

Figure 13.1.3 Past Population Data, Sleman Regency

Table 13.1.3 Past Population Data, Bantul Regency

Past Population Data / Year	1980	1985	1990	1995	2000	2005
Census Raw Data	634,442		696,905		781,013	
Interpolated Census Data	634,442	665,674	696,905	738,959	781,013	823,067
SUPAS Raw Data		665,674		707,028		862,961
Interpolated Supas Data	634,442	665,674	696,905	707,028	781,013	862,961
Average (Interpolated Census and SUPAS)	634,442	665,674	696,905	722,994	781,013	843,014

Source: BPS



Source: BPS

Figure 13.1.4 Past Population Data, Bantul Regency

Since there is difference between interpolated Census data and SUPAS data, average population

data of these two data was employed as past population data for projection.

Census data and SUPAS data are available every 10 years, population in each year is calculated by interpolating.

For Yogyakarta Municipality, Sleman and Bantul Regencies, past population data for future population projection are as follows.

Table 13.1.4 Yogyakarta Municipality, Past Population Data for Future Population Projection

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Pop.	398,192	399,579	400,965	402,352	403,739	405,126	406,512	407,899	409,286	410,672
Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Pop.	412,059	412,298	412,537	412,776	413,015	413,254	409,945	406,637	403,328	400,020
Year	2000	2001	2002	2003	2004	2005				
Pop.	396,711	399,796	402,881	405,966	409,051	412,137				

Note: Pop. = Population

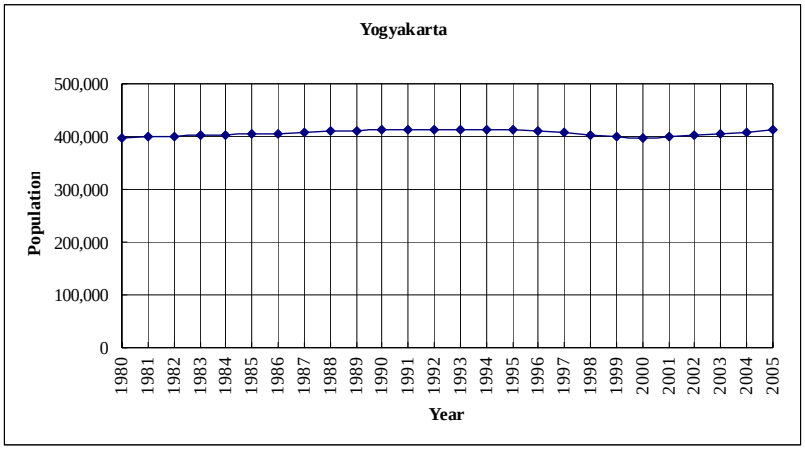


Figure 13.1.5 Yogyakarta Municipality, Past Population Data for Future Population Projection

Table 13.1.5 Sleman Regency, Past Population Data for Future Population Projection

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Pop.	677,323	687,624	697,925	708,226	718,527	728,829	739,130	749,431	759,732	770,033
Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Pop.	780,334	790,496	800,659	810,821	820,983	831,146	845,192	859,238	873,285	887,331
Year	2000	2001	2002	2003	2004	2005				
Pop.	901,377	916,304	931,232	946,159	961,087	976,014				

Note: Pop. = Population

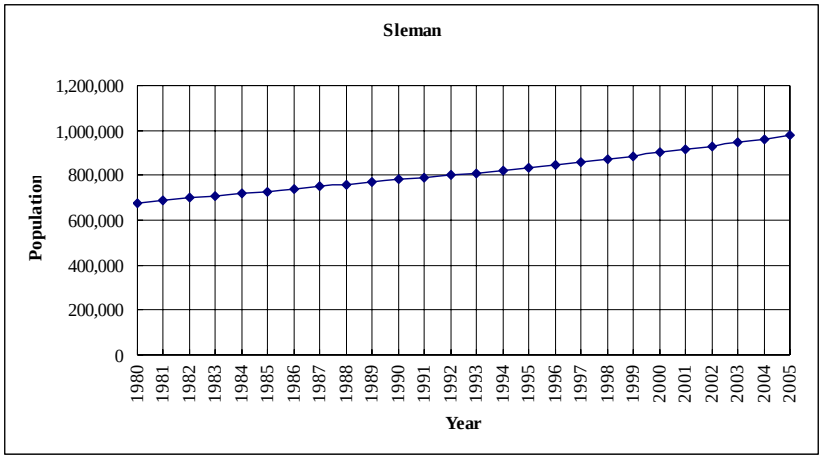


Figure 13.1.6 Sleman Regency, Past Population Data for Future Population Projection

Table 13.1.6 Bantul Regency, Past Population Data for Future Population Projection

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Pop.	634,442	640,688	646,935	653,181	659,427	665,674	671,920	678,166	684,412	690,659
Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Pop.	696,905	702,123	707,340	712,558	717,776	722,994	734,597	746,201	757,805	769,409
Year	2000	2001	2002	2003	2004	2005				
Pop.	781,013	793,413	805,813	818,214	830,614	843,014				

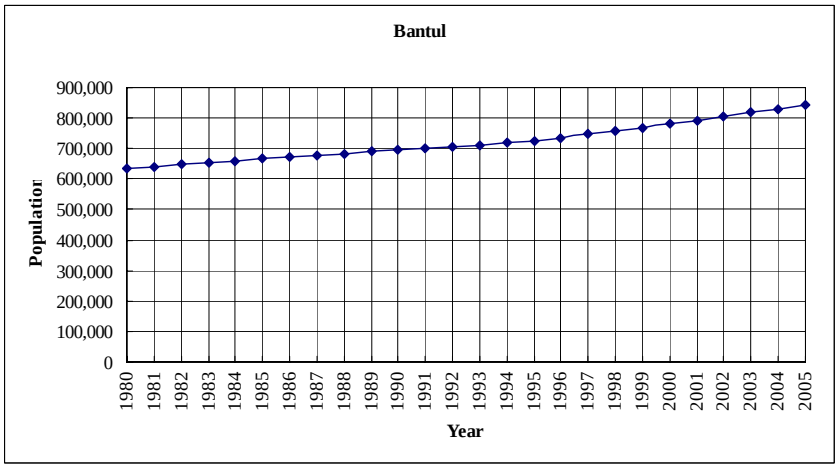


Figure 13.1.7 Bantul Regency, Past Population Data for Future Population Projection

Based on calculated past population data for future population projection for Yogyakarta Municipality, Sleman and Bantul Regencies, total Population of these three municipality and regencies are summarized as follows.

Table 13.1.7 Total Past Population Data for Future Population Projection

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988
Yogyakarta	398,192	399,579	400,965	402,352	403,739	405,126	406,512	407,899	409,286
Sleman	677,323	687,624	697,925	708,226	718,527	728,829	739,130	749,431	759,732
Bantul	634,442	640,688	646,935	653,181	659,427	665,674	671,920	678,166	684,412
Total Population	1,709,957	1,727,891	1,745,825	1,763,759	1,781,693	1,799,628	1,817,562	1,835,496	1,853,430
Year	1989	1990	1991	1992	1993	1994	1995	1996	1997
Yogyakarta	410,672	412,059	412,298	412,537	412,776	413,015	413,254	409,945	406,637
Sleman	770,033	780,334	790,496	800,659	810,821	820,983	831,146	845,192	859,238
Bantul	690,659	696,905	702,123	707,340	712,558	717,776	722,994	734,597	746,201
Total Population	1,871,364	1,889,298	1,904,917	1,920,536	1,936,155	1,951,774	1,967,393	1,989,735	2,012,076
Year	1998	1999	2000	2001	2002	2003	2004	2005	
Yogyakarta	403,328	400,020	396,711	399,796	402,881	405,966	409,051	412,137	
Sleman	873,285	887,331	901,377	916,304	931,232	946,159	961,087	976,014	
Bantul	757,805	769,409	781,013	793,413	805,813	818,214	830,614	843,014	
Total Population	2,034,418	2,056,759	2,079,101	2,109,514	2,139,927	2,170,339	2,200,752	2,231,165	

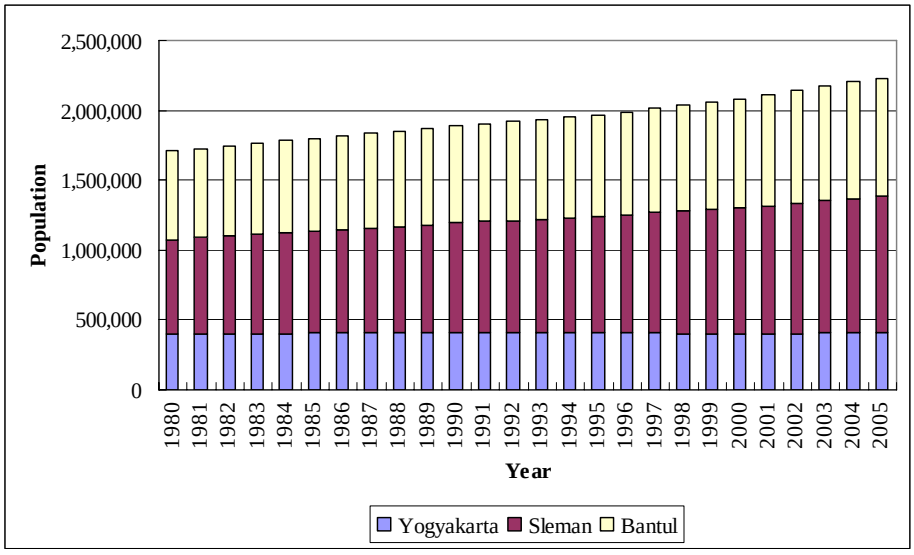


Figure 13.1.8 Total Past Population Data for Future Population Projection

Past population data for future population projection in each Kelurahan/Desa is shown in Appendix 13.

13.1.3 Past Population Increase Ratio

Based on the past population record, past population increase ratio was calculated. As shown on below, population increase ratio in Yogyakarta Municipality in past 25 years has been very low comparing to ratios of Sleman and Bantul. In last decade, population increase ratio in Yogyakarta has been minus and on the other hand, population in Sleman and Banturl Regencies are increasing by rather high increase ratio.

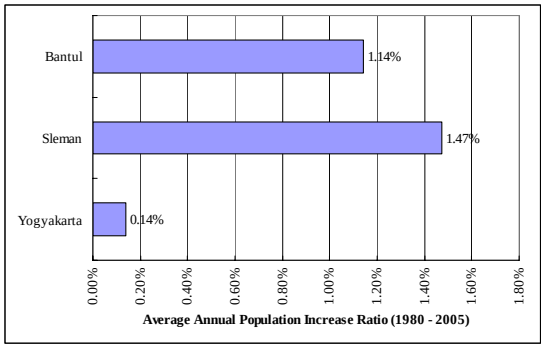


Figure 13.1.9 Average Annual Population Increase Ratio in Past 25 Years (1980 – 2005)

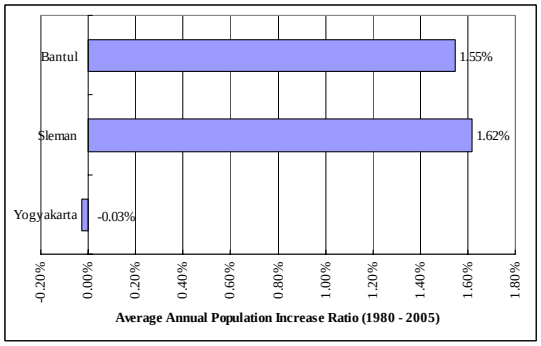


Figure 13.1.10 Average Annual Population Increase Ratio in Past 10 Years (1995 – 2005)

(1) Population Increase Ratio in Yogyakarta Municipality, Kecamatan Level

Past trend of population increase in Yogyakarta Municipality by each Kecamatan is as shown below.

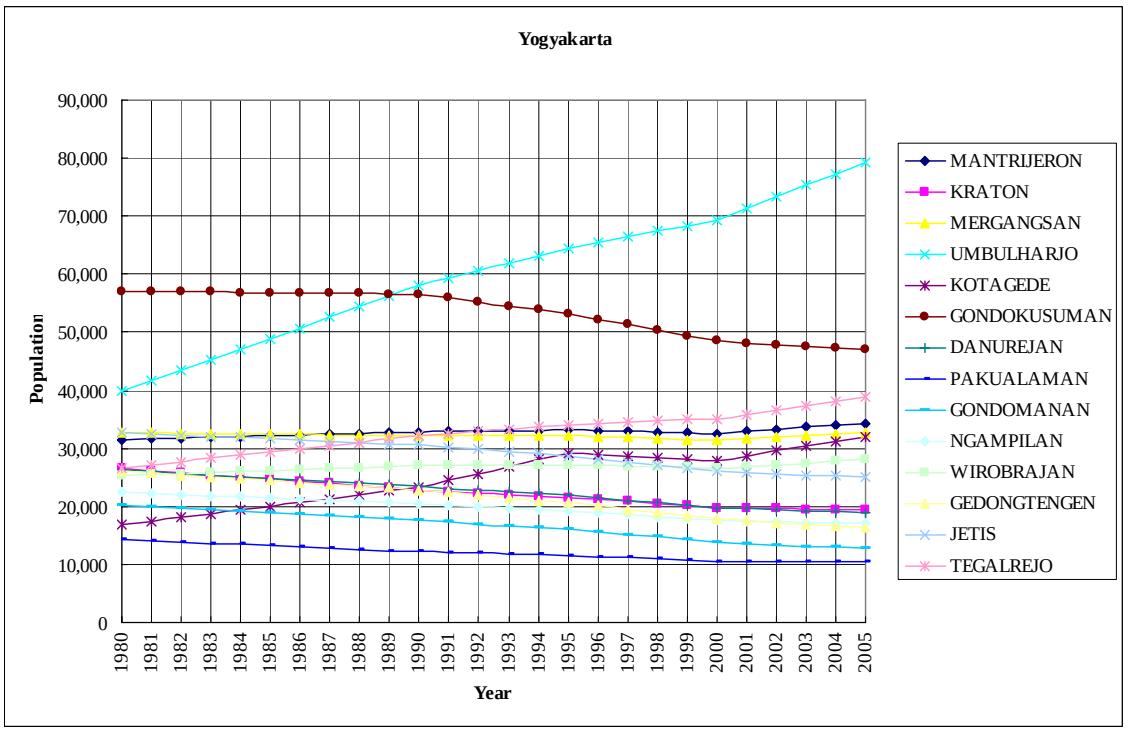


Figure 13.1.11 Past Population Trend of Yogyakarta Municipality by Kecamatan Level

From the past population trend, population increase ratio in last 25 years and in last 10 years were obtained as shown below.

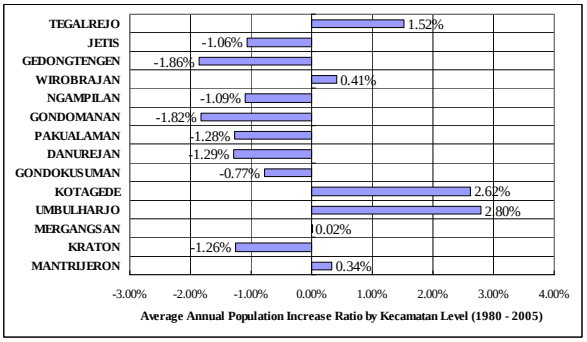


Figure 13.1.12 Average Annual Population Increase Ratio in Last 25 Years (1980 – 2005)

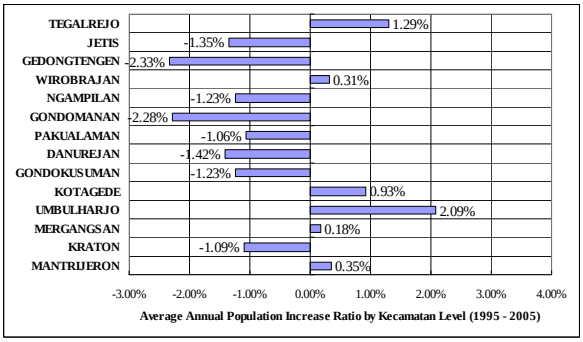


Figure 13.1.13 Average Annual Population Increase Ratio in Last 10 Years (1995 – 2005)

As shown on figures above, population is decreasing in many Kecamatans in Yogyakarta Municipality.

(2) Population Increase Ratio in Sleman Regency, Kecamatan Level

Past trend of population increase in Sleman Regency by each Kecamatan is as shown below.

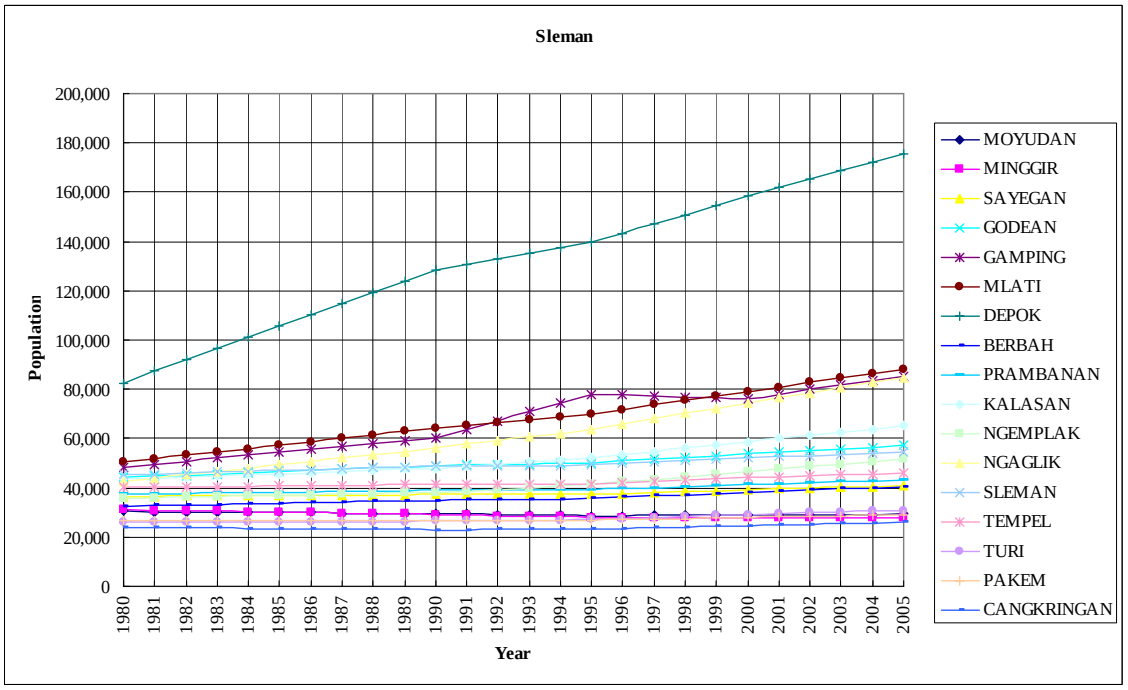


Figure 13.1.14 Past Population Trend of Sleman Regency by Kecamatan Level

From the past population trend, population increase ratio in last 25 years and in last 10 years were obtained as shown below.

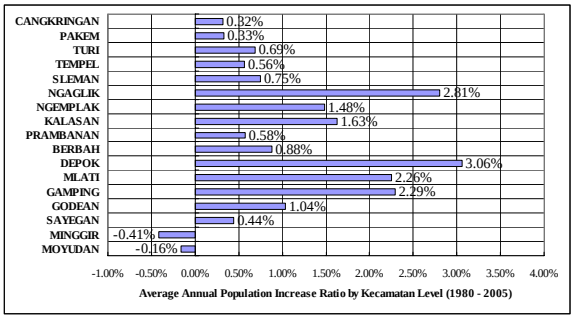


Figure 13.1.15 Average Annual Population Increase Ratio in Last 25 Years (1980 – 2005)

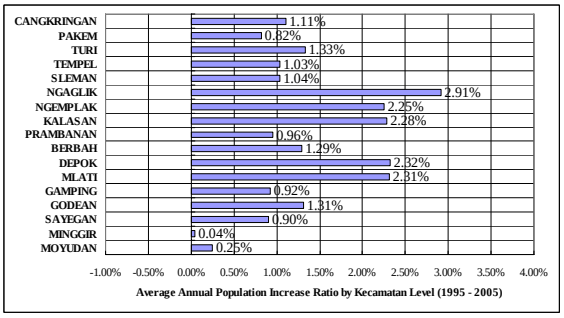


Figure 13.1.16 Average Annual Population Increase Ratio in Last 10 Years (1995 – 2005)

As shown on figures above, population in all Kecamatans are increasing in last 10 years.

(3) Population Increase Ratio in Bantul Regency, Kecamatan Level

Past trend of population increase in Bantul Regency by each Kecamatan is as shown below.

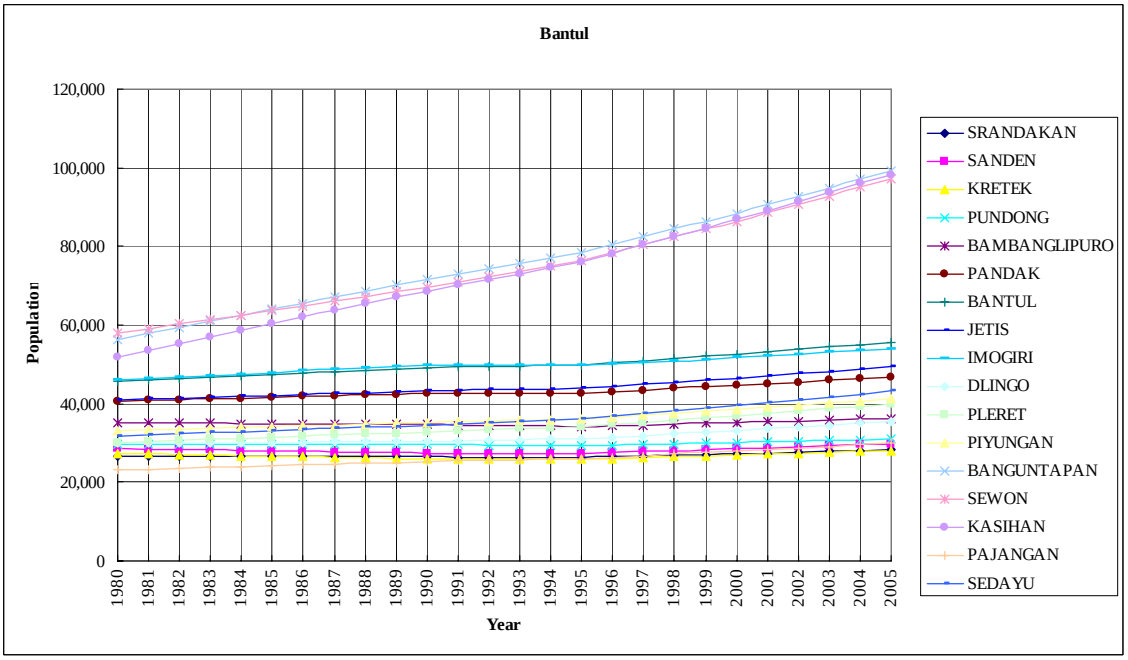


Figure 13.1.17 Past Population Trend of Sleman by Kecamatan Level

From the past population trend, population increase ratio in last 25 years and in last 10 years were obtained as shown below.

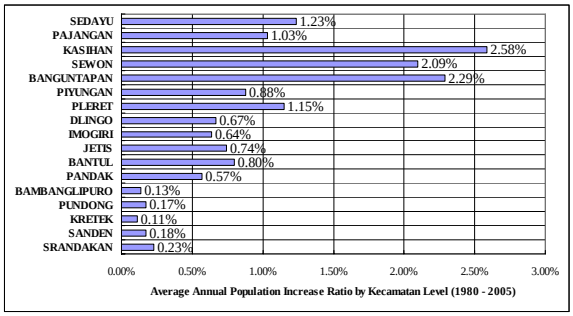


Figure 13.1.18 Average Annual Population Increase Ratio in Last 25 Years (1980 – 2005)

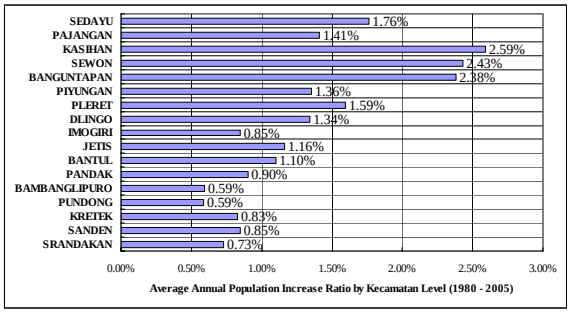


Figure 13.1.19 Average Annual Population Increase Ratio in Last 10 Years (1995 – 2005)

As shown on figures above, population in all Kecamatans are increasing in last 10 years.

(4) Area-wise Population Increase Ratio

Area-wise population increase ratio by Kelurahan was also shown on figure below. This figure shows population increase ratio in last 10 years (1995 – 2005) in each Kelurahan. As shown on this figure, central part of Yogyakarta Municipality shows minus increase ratio (population is decreasing) and surrounding area of the central part shows very high population increase ratio.

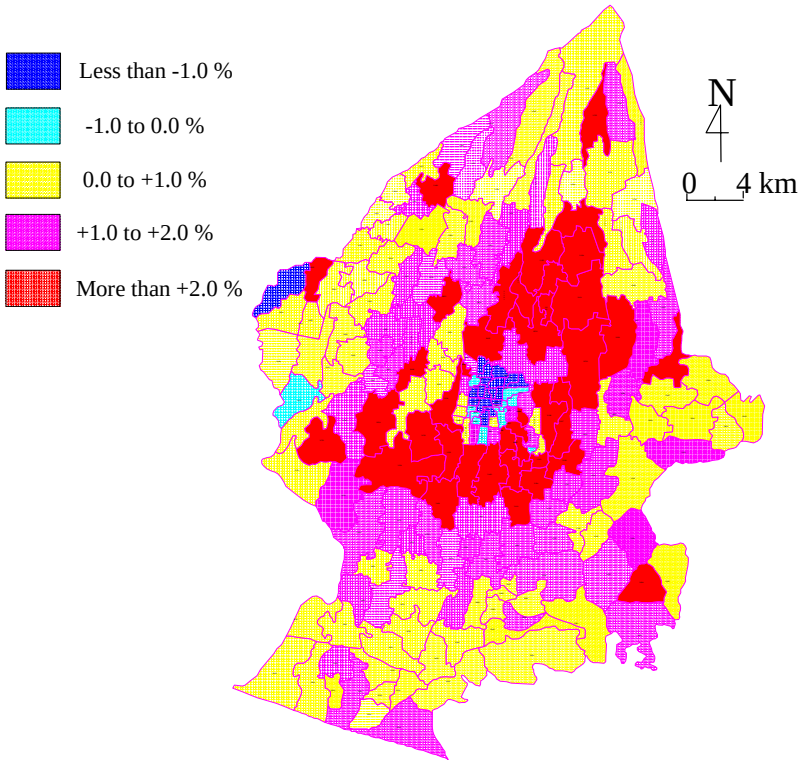


Figure 13.1.20 Population Increase Ratio in Last 10 Years in Each Kelurahan (1995 – 2005)

13.1.4 Population Density

Based on population data and land area of each area, population density is calculated. Population density in three area such as Yogyakarta Municipality, Sleman and Bantul Regencies in Year 2005 is as shown below.

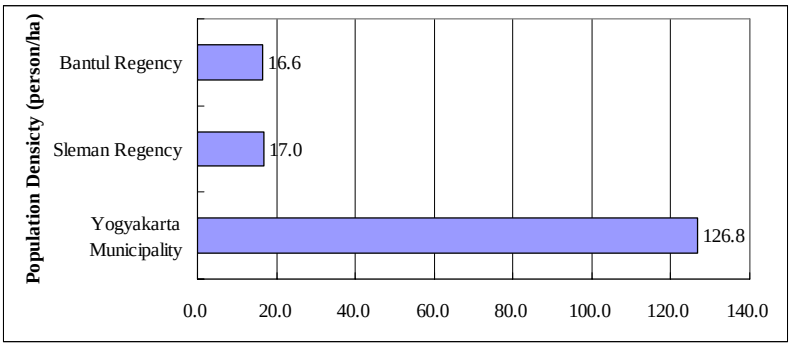


Figure 13.1.21 Population Density in Year 2005 in Each Area (2005)

Population density in Yogyakarta Municipality is much higher than ones in Sleman and Bantul Regencies.

Population densities in each Kecamatan in Yogyakarta Municipality, Sleman and Bantul Regencies ares calculated as shown below. Area-wise population density is also shown on Figure 13.1.25.

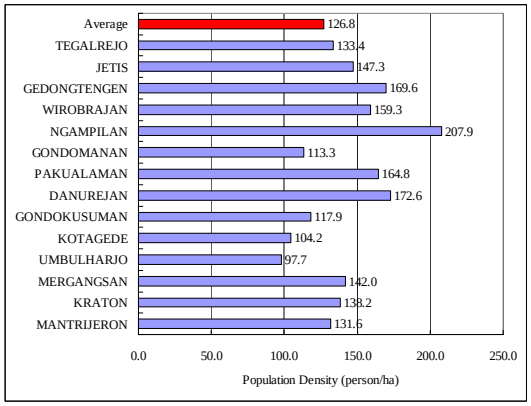


Figure 13.1.22 Population Density in Each Kecamatan in Yogyakarta Municipality in 2005

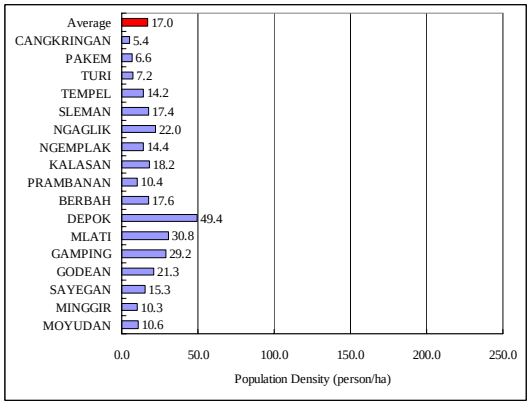


Figure 13.1.23 Population Density in Each Kecamatan in Sleman Regency in 2005

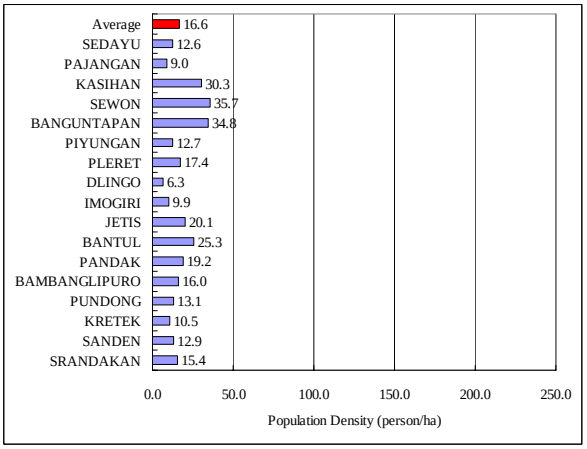


Figure 13.1.24 Population Density in Each Kecamatan in Bantul Regency in 2005

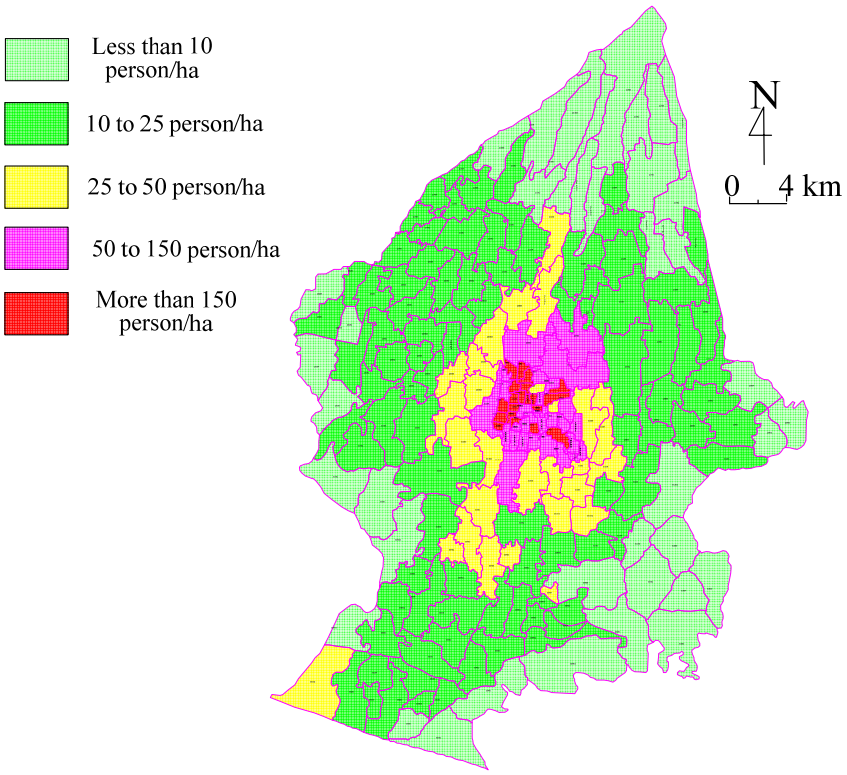


Figure 13.1.25 Population Density in Each Kelurahan in Year 2005

As shown on figure above, population density in Yogyakarta Municipality is higher than the other area and population density in surrounding area of the municipality, specially southern part of Sleman Regency, shows also high. It is because that many residential and housing development activities took place surrounding Yogyakarta Municipality.

13.1.5 Future Population Projection

(1) Method of Predicting Future Population

Each Kabubaten (Municipality and Regencies) is divided into spatial units called Kecamatan and Kulurahan/Desa. The list of each unit type for each Kabubaten is shown in Table 13.1.8.

Table 13.1.8 List of Kecamatan and Kelurahan of Each Kabubaten

10000	**YOGYAKARTA**	**20000**	**SLEMAN**	**30000**	**BANTUL**
10100	**MANTRIJERON**	**20100**	**MOYUDAN**	**30100**	**SRANDAKAN**
10101	Gedongkiwo	20101	Sumberahayu	30101	Poncosari
10102	Suryodiningratan	20102	Sumbersari	30102	Trimurti
10103	Mantrijeron	20103	Sumberagung	**30200**	**SANDEN**
10200	**KRATON**	20104	Sumberarum	30201	Gadingsari
10201	Patehan	**20200**	**MINGGIR**	30202	Gadingharjo
10202	Panembahan	20201	Sendangmulyo	30203	Srigading
10203	Kadipaten	20202	Sendangarum	30204	Murtigading
10300	**MERGANGSAN**	20203	Sendangrejo	**30300**	**KRETEK**
10301	Brontokusuman	20204	Sendangagung	30301	Tirtohargo
10302	Keparakan	20205	Sendangsari	30302	Parangtritis
10303	Wirogunan	**20300**	**SAYEGAN**	30303	Donotirto
10400	**UMBULHARJO**	20301	Margodadi	30304	Tirtosari
10401	Semaki	20302	Margoluwih	30305	Tirtomulyo
10402	Muja-muju	20303	Margomulyo	**30400**	**PUNDONG**
10403	Tahunan	20304	Margoagung	30401	Seloharjo
10404	Warungboto	20305	Margokaton	30402	Panjangrejo
10405	Pandeyan	**20400**	**GODEAN**	30403	Srihandono
10406	Sorosutan	20401	Sidorejo	**30500**	**BAMBANGLIPURO**
10407	Giwangan	20402	Sidoluhur	30501	Sidomulyo
10500	**KOTAGEDE**	20403	Sidomulyo	30502	Mulyodadi
10501	Rejowinangun	20404	Sidoagung	30503	Sumbermulyo
10502	Prenggan	20405	Sidokarto	**30600**	**PANDAK**
10503	Purbayan	20406	Sidoarum	30601	Caturharjo
10600	**GONDOKUSUMAN**	20407	Sidomoyo	30602	Triharjo
10601	Demangan	**20500**	**GAMPING**	30603	Gilangharjo
10602	Kotabaru	20501	Balecatur	30604	Wijirejo
10603	Klitren	20502	Ambarketawang	**30700**	**BANTUL**
10604	Baciro	20503	Banyuraden	30701	Palbapang
10605	Terban	20504	Nogotirto	30702	Ringinharjo
10700	**DANUREJAN**	20505	Trihanggo	30703	Bantul
10701	Suryatmajan	**20600**	**MLATI**	30704	Trirenggo
10702	Tegalpanggung	20601	Tirtoadi	30705	Sapdodadi
10703	Bausasran	20602	Sumberadi	**30800**	**JETIS**
10800	**PAKUALAMAN**	20603	Tlogoadi	30801	Patalan
10801	Gunungketur	20604	Sendangadi	30802	Canden
10802	Purwokinanti	20605	Sinduadi	30803	Sumberagung

10900	**GONDOMANAN**
11404	Bener
11403	Tegalrejo
11402	Karangwaru
11401	Kricak
11400	**TEGALREJO**
11303	Cokrodiningratan
11302	Gowongan
11301	Bumijo
11300	**JETIS**
11202	Sosromenduran
11201	Pringgokusuman
11200	**GEDONGTENGEN**
11103	Pakuncen
11102	Wirobrajan
11101	Patangpuluhan
11100	**WIROBRAJAN**
11002	Ngampilan
11001	Notoprajan
11000	**NGAMPILAN**
10902	Prawirodirjan
10901	Ngupasan

20700	**DEPOK**
21100	**NGEMPLAK**
21004	Selomartani
21003	Tamanmartani
21002	Tirtomartani
21001	Purwomartani
21000	**KALASAN**
20906	Bokoharjo
20905	Madurojo
20904	Sambirojo
20903	Gayamharjo
20902	Wukirharjo
20901	Sumberharjo
20900	**PRAMBANAN**
20804	Kalitirto
20803	Jogotirto
20802	Tegaltirto
20801	Sendangtirto
20800	**BERBAH**
20703	Condongcatur
20702	Maguwoharjo
20701	Caturtunggal
21101	Wedomartani
21102	Widodomartani
21103	Bimomartani
21104	Sindumartani
21105	Umbulmartani
21200	**NGAGLIK**
21201	Sariharjo
21202	Donoharjo
21203	Sardonoharjo
21204	Sukoharjo
21205	Sinduharjo
21206	Minomartani
21300	**SLEMAN**
21301	Caturharjo
21302	Triharjo
21303	Tridadi
21304	Pandowoharjo
21305	Trimulyo
21400	**TEMPEL**
21401	Banyurejo
21402	Tambakrejo
21403	Sumberejo
21404	Pondokrejo
21405	Mororejo
21406	Margorejo
21407	Lumbungrejo
21408	Merdikorejo
21500	**TURI**

30804	Trimulyo
31104	Bawuran
31103	Segoroyoso
31102	Pleret
31101	Wonokromo
31100	**PLERET**
31006	Terong
31005	Jatimulyo
31004	Temuwuh
31003	Dlingo
31002	Muntuk
31001	Mangunan
31000	**DLINGO**
30908	Wukirsari
30907	Imogiri
30906	Karangtalun
30905	Girirejo
30904	Karangtengah
30903	Kebonagung
30902	Sriharjo
30901	Selopamioro
30900	**IMOGIRI**
31105	Wonolelo
31200	**PIYUNGAN**
31201	Sitimulyo
31202	Srimulyo
31203	Srimartani
31300	**BANGUNTAPAN**
31301	Tamanan
31302	Jagalan
31303	Singosaren
31304	Wirokerten
31305	Jambidan
31306	Potorono
31307	Baturetno
31308	Banguntapan
31400	**SEWON**
31401	Pendowoharjo
31402	Timbulharjo
31403	Bangunharjo
31404	Panggungharjo
31500	**KASIHAN**
31501	Bangunjiwo
31502	Tirtonimolo
31503	Tamantirto
31504	Ngestiharjo
31600	**PAJANGAN**
31601	Triwidadi
31602	Sendangsari
31603	Guwosari

21501	Bangunkerto	**31700**	**SEDAYU**
21502	Donokerto	31701	Argodadi
21503	Girikerto	31702	Argorejo
21504	Wonokerto	31703	Argosari
21600	**PAKEM**	31704	Argomulyo
21601	Purwobinangun		
21602	Candibinangun		
21603	Harjobinangun		
21604	Pakembinangun		
21605	Hargobinangun		
21700	**CANGKRINGAN**		
21701	Wukirsari		
21702	Argomulyo		
21703	Glagaharjo		
21704	Kepuharjo		
21705	Umbulharjo		

The future population is projected for each Kelurahan using the five equations listed below. The past population record discussed in the previous section is applied to estimate the population size for all years up until 2020 which is the master plan target year.

Equations used to estimate future population size are;

1. Arithmetic Line,
2. Geometric Curve,
3. Exponential Curve,
4. Power Curve, and
5. Logistic Curve.

Future population is calculated by these five equations and results derived from these equations are compared by conformity coefficient to the past population record. Future population which shows the highest coefficient is selected as future population for respective unit.

Figures as shown below are the examples of future population projection using above five equations.

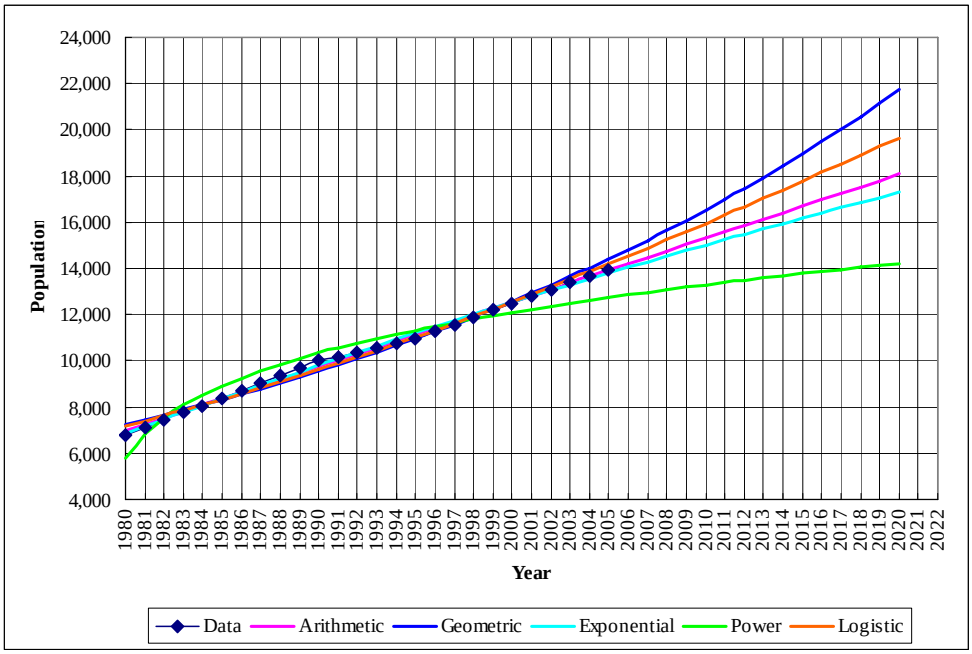


Figure 13.1.26 Example of Future Population Projection (Sleman, Sidoarum Kuluraha, Exponential Curve was selected)

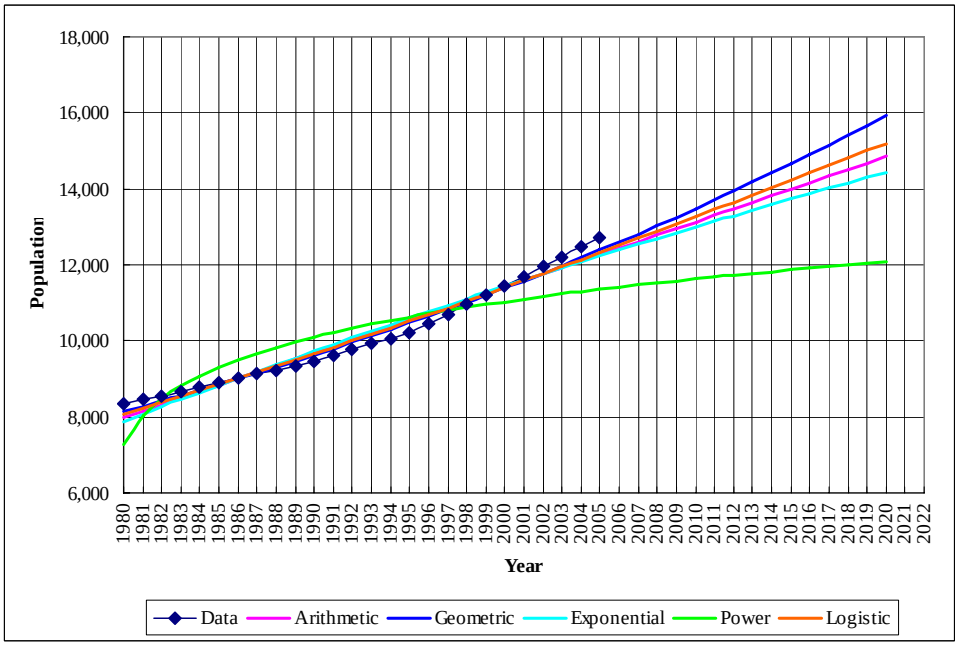


Figure 13.1.27 Example of Future Population Projection (Bantul, Wonokromo Kuluraha, Geometric Curve was selected)

The total estimated future population for each Kecamatan and Kabubaten was determined by summing the estimated population for each of its units.

(2) Results of Future Population Projections

The results of future population projections for each Kabubaten to year 2020 are shown on table below. Future populations for each Kelurahan are shown in Appendix 13.

Total population in Yogyakarta Municipality, Sleman and Bantul Regencies are as shown on figure below.

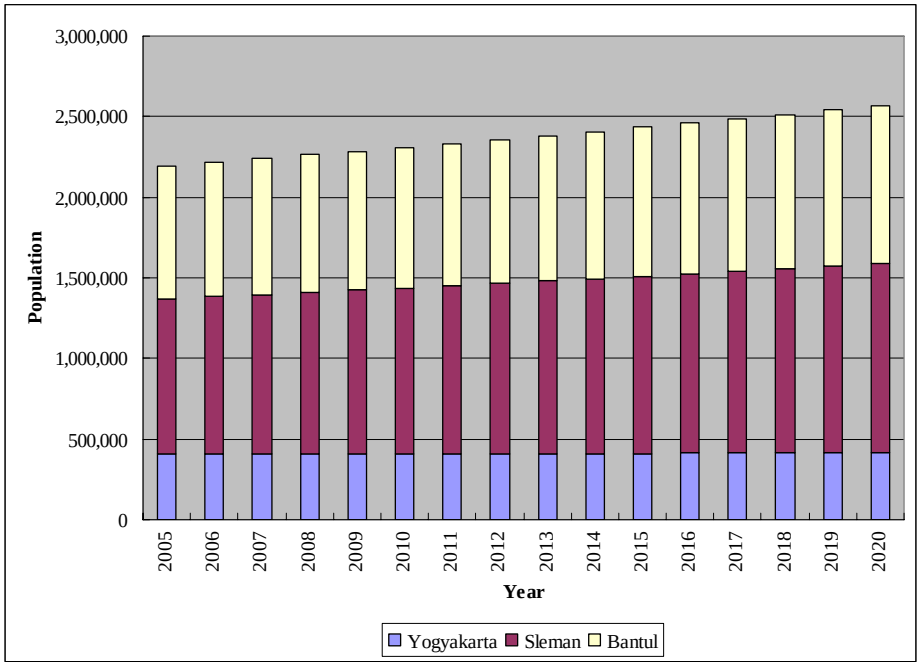


Figure 13.1.28 Results of Future Population Projection

Table 13.1.9 Future Population Projection for Each Kabubaten

	2005	2006	2007	2008	2009	2010	2011	2012
Yogyakarta	408,332	408,577	408,835	409,110	409,393	409,690	410,000	410,322
Sleman	960,803	973,644	986,670	999,892	1,013,316	1,026,937	1,040,770	1,054,835
Bantul	825,285	834,594	844,041	853,616	863,334	873,184	883,183	893,332
Total	2,194,420	2,216,815	2,239,546	2,262,618	2,286,043	2,309,811	2,333,953	2,358,489

	2013	2014	2015	2016	2017	2018	2019	2020
Yogyakarta	410,650	410,997	411,343	411,697	412,063	412,438	412,818	413,205
Sleman	1,069,111	1,083,617	1,098,354	1,113,338	1,128,576	1,144,055	1,159,802	1,175,815
Bantul	903,634	914,083	924,691	935,458	946,392	957,498	968,769	980,225
Total	2,383,395	2,408,697	2,434,388	2,460,493	2,487,031	2,513,991	2,541,389	2,569,245

(3) Comparison with Other Population Projections

The BPS also projected future population until year 2009 by Kabubaten level. Following figures show comparison of results of population projection.

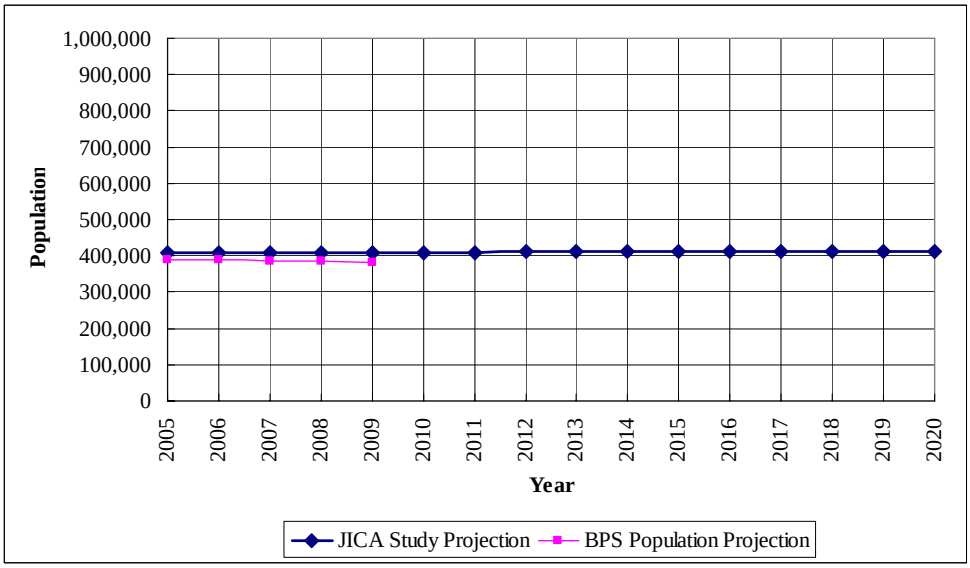


Figure 13.1.29 Yogyakarta Municipality
Comparison of Population Projection (by JICA Study and BPS)

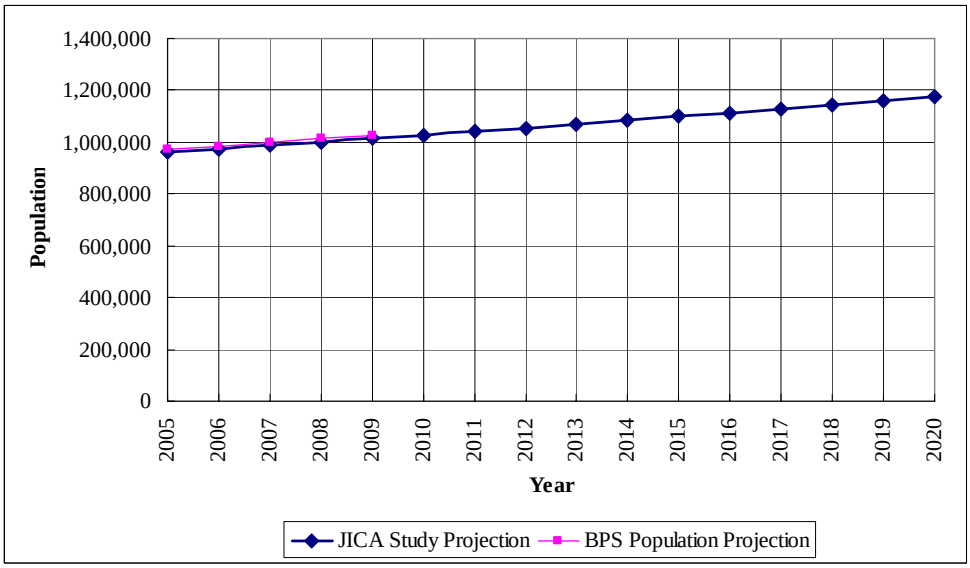


Figure 13.1.30 Sleman Regency
Comparison of Population Projection (by JICA Study and BPS)

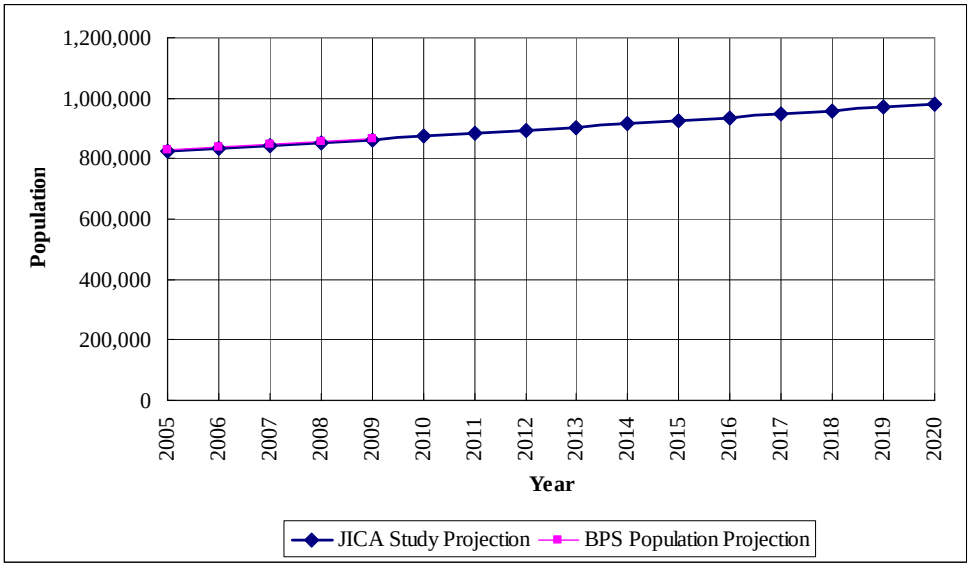


Figure 13.1.31 Bantul Regency
Comparison of Population Projection (by JICA Study and BPS)

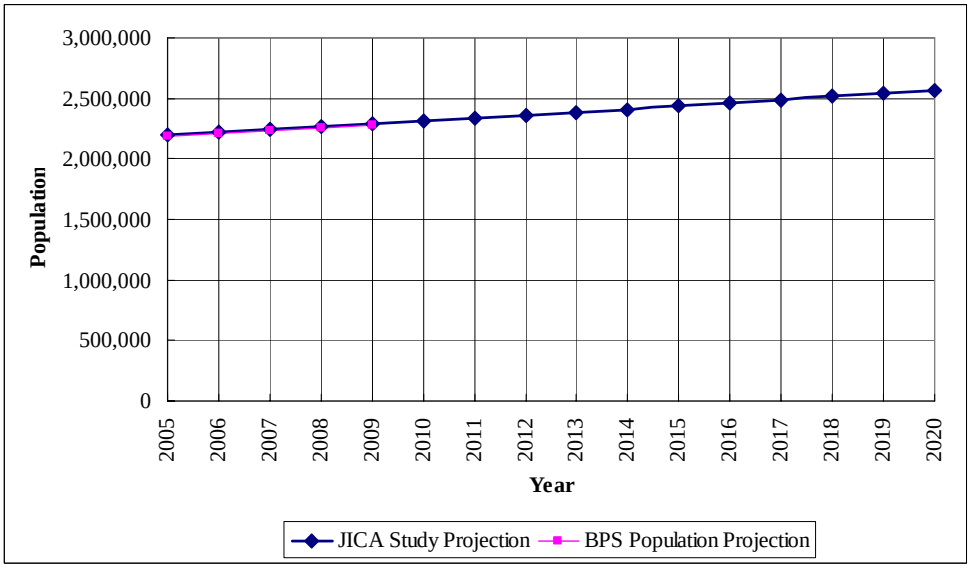


Figure 13.1.32 Total Population Projection (Yogyakarta, Sleman, and Bantul)
Comparison of Population Projection (by JICA Study and BPS)

As shown on above comparison, results of future population projection by JICA Study Team are very similar to the projection made by the BPS.

(4) Future Population Density

Population density in the Study Area in Year 2020 is calculated as shown below.

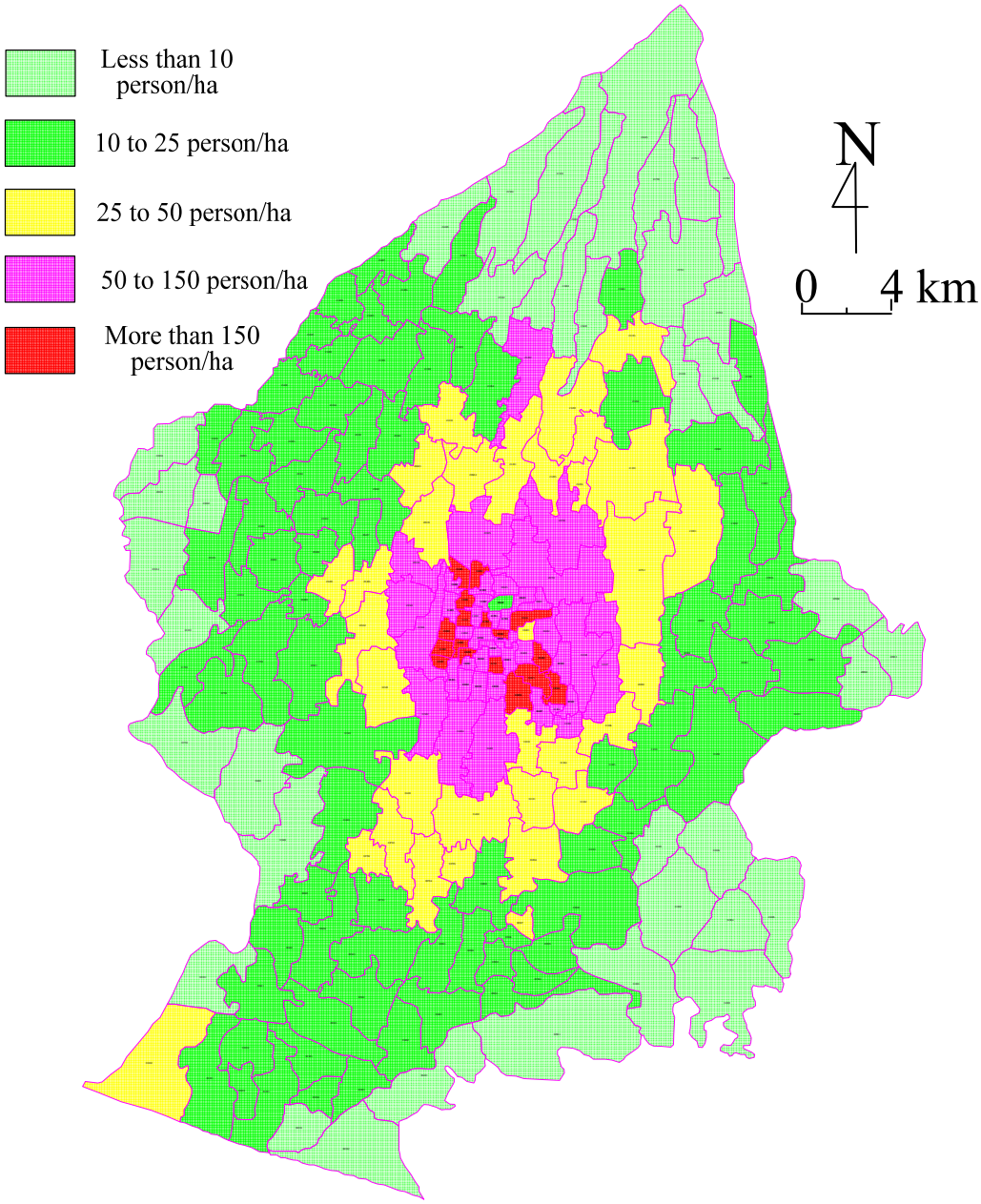


Figure 13.1.33 Population Density in the Study Area in Year 2020

13.2 Future Water Demand Projection

13.2.1 Review of Current Situation of Water Supply by Three PDAMs

Tables 13.2.1 to 13.2.3 show performance records of three PDAMs, Yogyakarta Municipality, Sleman and Bantul Regencies.

These records of respective PDAM performance is a basic information for future water demand projections.

13.2.2 Domestic per Capita Water Consumption

(1) Current Domestic Per Capita Water Demand

As summarized tables below, current level of the domestic per capita water consumption for study area is as follows.

Table 13.2.4 Current Level of Domestic Per Capita Water Consumption (2005) (lpcd)

PDAM Yogyakarta	163
PDAM Sleman	80
PDAM Bantul	99

Source: Respective PDAM

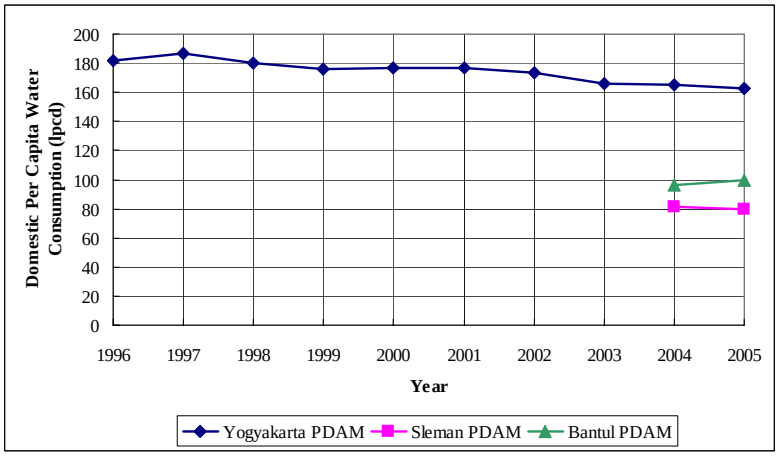


Figure 13.2.1 Domestic per Capita Water Consumption (l/sec)

Table 13.2.1 Summary of PDAM Yogyakarta Performance

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total Population	person	406,735	406,856	406,995	407,142	407,306	407,484	407,673	407,881	408,096	408,332
Total Water Production	l/sec	509.4	559.6	578.8	570.6	546.6	584.7	533.9	543.9	548.8	580.0
Total Water Consumption	l/sec	343.4	357.6	354.0	356.3	373.4	375.9	370.1	351.6	347.3	341.0
Public Services	l/sec	14.1	15.3	16.3	16.3	16.2	16.5	15.3	14.1	14.5	14.3
Domestic	l/sec	294.4	310.7	309.2	309.4	319.0	326.4	323.1	309.6	310.0	305.7
Commercial	l/sec	26.0	27.1	25.2	27.0	28.4	28.3	27.8	24.9	19.5	17.7
Industrial	l/sec	0.7	0.4	0.2	0.2	0.5	0.5	0.5	0.4	0.3	0.2
Public Standpipe	l/sec	4.7	1.8	0.4	0.6	6.3	0.5	0.5	0.4	0.6	0.7
Palace	l/sec	3.3	2.3	2.7	2.8	3.0	3.7	3.0	2.2	2.4	2.3
Non Revenue Water (NRW)	l/sec	166.0	202.0	224.7	214.3	173.3	208.8	163.7	192.4	201.4	239.0
UFW Ratio	%	32.6%	36.1%	38.8%	37.6%	31.7%	35.7%	30.7%	35.4%	36.7%	41.2%
Number of Domestic Connection	Nos	27,996	28,769	29,730	30,437	31,212	31,855	32,214	32,276	32,387	32,398
Served Population	person	139,980	143,845	148,650	152,185	156,060	159,275	161,070	161,380	161,935	161,990
(1 connection for 5 family members)		5	5	5	5	5	5	5	5	5	5
Service Ratio	%	34.4%	35.4%	36.5%	37.4%	38.3%	39.1%	39.5%	39.6%	39.7%	39.7%
Domestic Per Capita Water Consumption	lpcd	182	187	180	176	177	177	173	166	165	163

Table 13.2.2 Summary of PDAM Sleman Performance

		2004	2005
Total Population	person	948,146	960,803
Total Water Production	l/sec	159.3	178.0
Total Water Consumption	l/sec	96.1	95.4
Public Services	l/sec	3.3	4.0
Domestic	l/sec	88.9	87.7
Commercial	l/sec	2.1	1.8
Industrial	l/sec		
Public Standpipe	l/sec	1.8	1.8
Palace	l/sec		
Non Revenue Water (NRW)	l/sec	63.2	82.6
UFW Ratio	%	39.6%	46.4%
Number of Domestic Connection	Nos	18,788	18,994
Served Population	person	93,940	94,970
(1 connection for 5 family members)		5	5
Service Ratio	%	9.9%	9.9%
Domestic Per Capita Water Consumption	lpcd	82	80

Table 13.2.3 Summary of PDAM Bantul Performance

		2004	2005
Total Population	person	816,100	825,285
Total Water Production	l/sec	102.7	107.4
Total Water Consumption	l/sec	61.6	62.8
Public Services	l/sec	1.4	2.7
Domestic	l/sec	57.8	59.4
Commercial	l/sec	0.3	0.5
Industrial	l/sec	0.1	0.1
Public Standpipe	l/sec	2.1	2.1
Palace	l/sec		
Non Revenue Water (NRW)	l/sec	41.0	44.6
NRW Ratio	%	40.0%	41.5%
Number of Domestic Connection	Nos	10,333	10,333
Served Population	person	51,665	51,665
(1 connection for 5 family members)		5	5
Service Ratio	%	6.3%	6.3%
Domestic Per Capita Water Consumption	lpcd	97	99

(2) Domestic per Capita Water Consumption in Urban and Rural Area

The domestic per capita water consumption for respective PDAMs described in the previous section are obtained by dividing total domestic water consumption by total number of served population. Therefore, these domestic per capita water consumption represent average per capita water consumption for whole service area of respective PDAM.

Because of difference of living standard in urban and rural area, per capita water consumption in urban and rural area must be different. From this view point, domestic per capita water consumption in urban area and rural area are studied and compared.

Since there is no clear cut definition or boundary of the urban area in the Study area, the Study referred UAY (Urban Agglomeration of Yogyakarta) as urban area. The UAY is planned in Yogyakarta Urban Development Project (YUDP) and as shown on figure below.

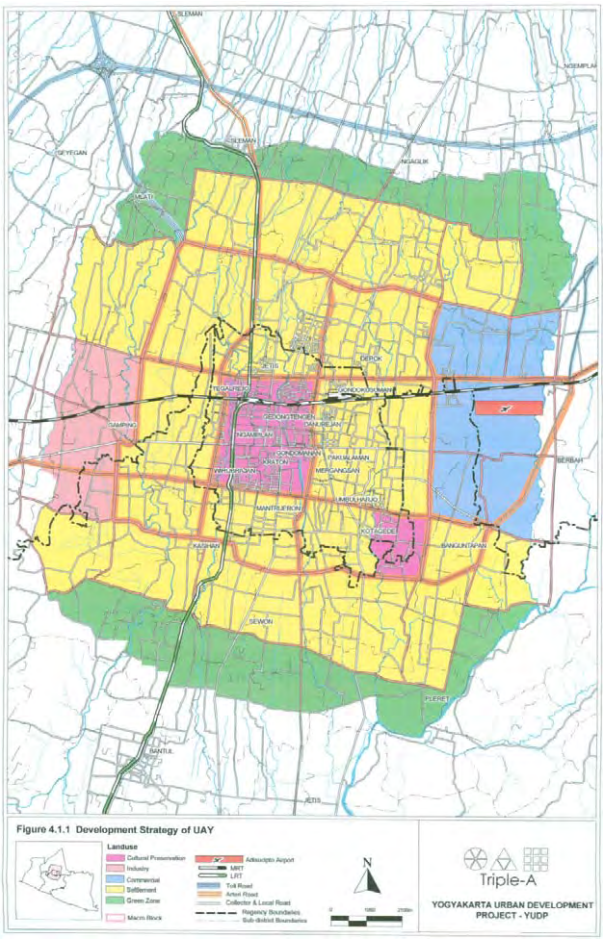


Figure 13.2.2 Boundary of Urban Agglomeration of Yogyakarta (UAY) by YUDP

As shown on the figure above, whole area of Yogyakarta is included in the UAY. Southern part of Sleman Regency and northern part of Bantul Regency are also included in the UAY.

Based on the UAY boundary, the domestic per capita water consumptions which locate inside and outside of the UAY for PDAMs Sleman and Bantul are compared as shown on tables below.

Table 13.2.5 Comparison of Domestic per Capita Water Consumption by Outside/Inside of UAY for Sleman Regency

Data Year	Name of Unit	Domestic Consumption	Number of Connection	Family Size	Served Population	Domestic Per Capita	UAY	
		l/sec	nos	person	person	lpcd	Outside	Inside
2005	A Turi	2.0	571	5	2,855	59.3	59.3	
2005	B Ngemplak	8.0	1,339	5	6,695	103.9	103.9	
2005	C Tambakrejo	1.8	394	5	1,970	77.9	77.9	
2005	D Sleman BNA	17.1	3,664	5	18,320	80.9		80.9
2005	E Mlati	4.0	844	5	4,220	81.1		81.1
2005	F Camping	11.6	2,166	5	10,830	92.2		92.2
2005	G Nogotirto	7.0	1,727	5	8,635	69.8		69.8
2005	H Godean	3.5	715	5	3,575	84.4	84.4	
2005	I Ngaglic	9.0	2,043	5	10,215	76.2	76.2	
2005	J Depok	14.6	3,187	5	15,935	79.2		79.2
2005	K Kalasan	7.5	1,848	5	9,240	70.2	70.2	
2005	L Prambanan	1.7	496	5	2,480	59.2	59.2	
2004	A Turi	1.5	568	5	2,840	45.9	45.9	
2004	B Ngemplak	8.0	1,294	5	6,470	106.4	106.4	
2004	C Tambakrejo	1.6	354	5	1,770	80.1	80.1	
2004	D Sleman BNA	16.0	3,469	5	17,345	79.8		79.8
2004	E Mlati	3.9	902	5	4,510	73.9		73.9
2004	F Camping	10.0	2,153	5	10,765	80.2		80.2
2004	G Nogotirto	7.4	1,736	5	8,680	73.2		73.2
2004	H Godean	3.4	732	5	3,660	79.5	79.5	
2004	I Ngaglic	10.9	2,266	5	11,330	83.5	83.5	
2004	J Depok	16.8	3,026	5	15,130	96.1		96.1
2004	K Kalasan	7.7	1,793	5	8,965	74.0	74.0	
2004	L Prambanan	1.7	495	5	2,475	60.0	60.0	
					Data Count		14.0	10.0
					Average		**75.7**	**80.6**

Table 13.2.6 Comparison of Domestic per Capita Water Consumption by Outside/Inside of UAY for Bantul Regency

Data Year	Name of Unit	Domestic Consumption	Number of Connection	Family Size	Served Population	Domestic Per Capita	UAY	
		l/sec	nos	person	person	lpcd	Outside	Inside
2005	1.Sedayu	7.036	1,512	5	7,561	80.4	80.4	
2005	2.Kasihan	7.611	1,229	5	6,147	107.0		107.0
2005	3.Bangunjiwo	8.165	1,552	5	7,760	90.9		90.9
2005	4.Sewon	6.683	1,162	5	5,812	99.3		99.3
2005	5.Banguntapan	2.557	470	5	2,352	93.9		93.9
2005	6.Guosari	6.820	1,449	5	7,245	81.3	81.3	
2005	7.Bantul	8.204	975	5	4,874	145.4	145.4	
2005	8.Imogiri	1.479	297	5	1,487	85.9	85.9	
2005	9.Trimulyo	1.856	538	5	2,692	59.6	59.6	
2005	10.Srandakan	1.897	390	5	1,949	84.1	84.1	
2005	11.Bambanglipuro	1.181	217	5	1,084	94.1	94.1	
2005	12.Dlingo	5.952	540	5	2,702	190.3	190.3	
2004	1.Sedayu	6.507	1,374	5	6,869	81.8	81.8	
2004	2.Kasihan	7.155	1,113	5	5,567	111.0		111.0
2004	3.Bangunjiwo	8.319	1,470	5	7,349	97.8		97.8
2004	4.Sewon	6.109	1,046	5	5,229	100.9		100.9
2004	5.Banguntapan	2.305	410	5	2,049	97.2		97.2
2004	6.Guosari	5.995	1,334	5	6,670	77.7	77.7	
2004	7.Bantul	7.735	922	5	4,611	144.9	144.9	
2004	8.Imogiri	1.484	299	5	1,493	85.9	85.9	
2004	9.Trimulyo	1.439	477	5	2,386	52.1	52.1	
2004	10.Srandakan	2.040	394	5	1,968	89.6	89.6	
2004	11.Bambanglipuro	1.042	203	5	1,013	88.9	88.9	
2004	12.Dlingo	7.628	1,292	5	6,461	102.0	102.0	
					Data Count		16.0	8.0
					Average		**96.5**	**99.8**

The domestic per capita water consumptions are summarized as shown below.

Table 13.2.7 Summary of Domestic Per Capita Water Consumption in Each Area

	Domestic Per Capita Water Consumption (lpcd)
PDAM Yogyakarta Urban	163.1
PDAM Sleman Urban (inside of UAY)	80.6
PDAM Sleman Rural (outside of UAY)	75.7
PDAM Bantul Urban (inside of UAY)	99.8
PDAM Bantul Rural (outside of UAY)	96.5

(3) Consideration on Selection of Urban Area for Master Planning

Basis of selection of the urban area is Urban Agglomeration of Yogyakarta (UAY). In addition to the UAY, future population density in year 2020 is also taken into account. Since population density in fringe area of UAY will reach more than 25 person/ha according to the results of future population projection discussed above, other Kelurahan/Desa of which population density will be more than 25 person/ha even though outside of UAY, they are considered as urban area.

Based on consideration above, urban Kelurahan/Desa in Sleman and Bantul Regencies are selected as shown table below. Whole area of Yogyakarta Municipality is treated as urban area.

Table 13.2.8 Selection of Urban Area

Name of Kelurahan/Desa		Population in 2020	Area ha	Population Density in 2020	Urban or Rural	Remarks
20000	**Sleman Regency**					
20703	Condongcatur	82,802	950.0	87.2	**Urban**	
20701	Caturtunggal	94,906	1,104.0	86.0	**Urban**	
20605	Sinduadi	57,027	737.0	77.4	**Urban**	
20504	Nogotirto	20,024	349.0	57.4	**Urban**	
21202	Donoharjo	7,779	153.0	50.8	**Urban**	
20503	Banyuraden	20,211	400.0	50.5	**Urban**	
21201	Sariharjo	32,256	689.0	46.8	**Urban**	
20406	Sidoarum	17,294	373.0	46.4	**Urban**	
20702	Maguwoharjo	59,976	1,501.0	40.0	**Urban**	
21001	Purwomartani	46,839	1,205.0	38.9	**Urban**	
20502	Ambarketawang	23,290	628.0	37.1	**Urban**	
21203	Sardonoharjo	20,970	660.0	31.8	**Urban**	
20505	Trihanggo	17,373	562.0	30.9	**Urban**	
20604	Sendangadi	16,341	536.0	30.5	**Urban**	
20801	Sendangtirto	15,868	522.0	30.4	**Urban**	
21303	Tridadi	14,606	504.0	29.0	**Urban**	
21101	Wedomartani	35,788	1,244.0	28.8	**Urban**	
21206	Minomartani	17,373	609.0	28.5	**Urban**	
21105	Umbulmartani	12,065	444.0	27.2	Rural	too far from UAY
20603	Tlogoadi	12,827	482.0	26.6	**Urban**	
20405	Sidokarto	9,673	364.0	26.6	**Urban**	
21205	Sinduharjo	24,643	938.0	26.3	**Urban**	
20501	Balecatur	24,296	986.0	24.6	**Urban**	part of Desa included in UAY
20404	Sidoagung	8,159	332.0	24.6	Rural	
20602	Sumberadi	14,645	600.0	24.4	**Urban**	part of Desa included in UAY
20407	Sidomoyo	7,303	302.0	24.2	**Urban**	part of Desa included in UAY
21302	Triharjo	13,962	578.0	24.2	Rural	
20403	Sidomulyo	5,960	250.0	23.8	Rural	
20906	Bokoharjo	12,633	540.0	23.4	Rural	
21407	Lumbungrejo	7,437	333.0	22.3	Rural	
20303	Margomulyo	11,402	519.0	22.0	Rural	
21406	Margorejo	11,538	539.0	21.4	Rural	
21204	Sukoharjo	17,041	803.0	21.2	Rural	
20804	Kalitirto	12,516	621.0	20.2	Rural	
21003	Tamanmartani	14,378	730.0	19.7	Rural	
21002	Tirtomartani	14,726	753.0	19.6	Rural	
20402	Sidoluhur	9,407	519.0	18.1	Rural	
20601	Tirtoadi	8,899	497.0	17.9	**Urban**	part of Desa included in UAY
21404	Pondokrejo	5,501	327.0	16.8	Rural	
20304	Margoagung	8,614	518.0	16.6	Rural	
20802	Tegaltirto	9,315	572.0	16.3	**Urban**	part of Desa included in UAY
21301	Caturharjo	12,017	744.0	16.2	Rural	
20205	Sendangsari	9,976	656.0	15.2	Rural	

Name of Kelurahan/Desa		Population in 2020	Area ha	Population Density in 2020	Urban or Rural	Remarks
20302	**Margoluwih**	9006	611.0	14.7	Rural	
20301	Margodadi	7,165	500.0	14.3	Rural	
20905	Madurojo	10,034	709.0	14.2	Rural	
21401	Banyurejo	6,723	482.0	13.9	Rural	
21305	Trimulyo	8,062	579.0	13.9	Rural	
21405	Mororejo	4,677	337.0	13.9	Rural	
20901	Sumberharjo	12,437	917.0	13.6	Rural	
21604	Pakembinangun	5,647	418.0	13.5	Rural	
20803	Jogotirto	7,793	584.0	13.3	Rural	
21304	Pandowoharjo	9,643	727.0	13.3	Rural	
20102	Sumbersari	6,844	546.0	12.5	Rural	
21403	Sumberejo	3,657	292.0	12.5	Rural	
20103	Sumberagung	10,121	820.0	12.3	Rural	
20305	Margokaton	6,329	515.0	12.3	Rural	
21501	Bangunkerto	8,504	703.0	12.1	Rural	
21402	Tambakrejo	3,931	326.0	12.1	Rural	
20203	Sendangrejo	6,786	598.0	11.3	Rural	
21104	Sindumartani	6,625	602.0	11.0	Rural	
21004	Selomartani	9,786	896.0	10.9	Rural	
20401	Sidorejo	5,599	544.0	10.3	Rural	
21408	Merdikorejo	6,073	613.0	9.9	Rural	
21102	Widodomartani	6,431	666.0	9.7	Rural	
20201	Sendangmulyo	6,450	670.0	9.6	Rural	
21502	Donokerto	7,103	741.0	9.6	Rural	
20202	Sendangarum	3,184	345.0	9.2	Rural	
21103	Bimomartani	5,304	615.0	8.6	Rural	
20101	Sumberahayu	5,401	631.0	8.6	Rural	
21602	Candibinangun	5,349	636.0	8.4	Rural	
20104	Sumberarum	5,925	765.0	7.7	Rural	
21702	Argomulyo	6,366	847.0	7.5	Rural	
21603	Harjobinangun	3,945	552.0	7.1	Rural	
21504	Wonokerto	10,524	1,558.0	6.8	Rural	
20903	Gayamharjo	3,990	655.0	6.1	Rural	
21705	Umbulharjo	5,012	826.0	6.1	Rural	
21701	Wukirsari	8,376	1,456.0	5.8	Rural	
20904	Sambirojo	4,668	839.0	5.6	Rural	
21503	Girikerto	7,261	1,307.0	5.6	Rural	
21605	Hargobinangun	7,755	1,430.0	5.4	Rural	
21601	Purwobinangun	6,889	1,348.0	5.1	Rural	
20902	Wukirharjo	2,289	475.0	4.8	Rural	
20204	Sendangagung	1,970	458.0	4.3	Rural	
21703	Glagaharjo	3,383	795.0	4.3	Rural	
21704	Kepuharjo	3,142	875.0	3.6	Rural	

Name of Kelurahan/Desa		Population in 2020	Area ha	Population Density in 2020	Urban or Rural	Remarks
30000	**Bantul Regency**					
31302	Jagalan	3,070	27.0	113.7	**Urban**	
31504	Ngestiharjo	45,966	510.0	90.1	**Urban**	
31404	Panggungharjo	45,543	561.0	81.2	**Urban**	
31303	Singosaren	4,360	67.0	65.1	**Urban**	
31308	Banguntapan	49,432	833.0	59.3	**Urban**	
31403	Bangunharjo	37,754	679.0	55.6	**Urban**	
31307	Baturetno	21,786	394.0	55.3	**Urban**	
31502	Tirtonimolo	27,409	513.0	53.4	**Urban**	
30907	Imogiri	3,671	83.0	44.2	**Urban**	
31503	Tamantirto	28,971	672.0	43.1	**Urban**	
31301	Tamanan	14,248	375.0	38.0	**Urban**	
31304	Wirokerten	14,533	386.0	37.7	**Urban**	
31401	Pendowoharjo	26,082	698.0	37.4	**Urban**	
31101	Wonokromo	15,934	434.0	36.7	**Urban**	
30703	Bantul	16,132	524.0	30.8	**Urban**	
31306	Potorono	11,841	390.0	30.4	**Urban**	
31102	Pleret	12,393	425.0	29.2	**Urban**	
30705	Sapdodadi	6,624	232.0	28.6	**Urban**	
30704	Trirenggo	17,317	610.0	28.4	**Urban**	
31402	Timbulharjo	22,041	778.0	28.3	**Urban**	
30702	Ringinharjo	7,607	277.0	27.5	**Urban**	
30102	Trimurti	17,403	646.0	26.9	Rural	shall be considered separately
30804	Trimulyo	18,008	711.0	25.3	**Urban**	
30701	Palbapang	13,323	552.0	24.1	Rural	
30604	Wijirejo	10,754	468.0	23.0	Rural	
31305	Jambidan	8,439	376.0	22.4	**Urban**	part of Desa included in UAY
31702	Argorejo	16,179	723.0	22.4	Rural	
30906	Karangtalun	2,663	121.0	22.0	Rural	
30803	Sumberagung	13,866	635.0	21.8	**Urban**	continuation to Imogiri
30602	Triharjo	13,460	643.0	20.9	Rural	
30801	Patalan	11,636	565.0	20.6	Rural	
30603	Gilangharjo	14,723	726.0	20.3	Rural	
31501	Bangunjiwo	30,156	1,543.0	19.5	**Urban**	part of Desa included in UAY
30802	Canden	10,123	536.0	18.9	Rural	
30904	Karangtengah	5,274	288.0	18.3	Rural	
30601	Caturharjo	10,567	593.0	17.8	Rural	
30503	Sumbermulyo	14,448	820.0	17.6	Rural	
30403	Srihandono	12,020	687.0	17.5	Rural	
31704	Argomulyo	16,696	955.0	17.5	Rural	
31201	Sitimulyo	16,418	940.0	17.5	**Urban**	part of Desa included in UAY
30204	Murtigading	7,653	439.0	17.4	Rural	
30903	Kebonagung	3,249	187.0	17.4	Rural	
31203	Srimartani	14,726	858.0	17.2	Rural	
31103	Segoroyoso	8,287	487.0	17.0	**Urban**	part of Desa included in UAY
30502	Mulyodadi	10,145	645.0	15.7	Rural	
30402	Panjangrejo	8,770	571.0	15.4	Rural	
30303	Donotirto	7,184	470.0	15.3	Rural	

Name of Kelurahan/Desa		Population in 2020	Area ha	Population Density in 2020	Urban or Rural	Remarks
30305	Tirtomulyo	6,398	419.0	15.3	Rural	
30304	Tirtosari	3,611	239.0	15.1	Rural	
31603	Guwosari	12,256	878.0	14.0	Rural	
30501	Sidomulyo	11,116	805.0	13.8	Rural	
30203	Srigading	9,816	757.0	13.0	Rural	
30905	Girirejo	4,160	324.0	12.8	Rural	
31703	Argosari	7,864	637.0	12.3	Rural	
30902	Sriharjo	7,695	632.0	12.2	Rural	
30908	Wukirsari	17,450	1,539.0	11.3	Rural	
30202	Gadingharjo	3,430	308.0	11.1	Rural	
30201	Gadingsari	8,762	812.0	10.8	Rural	
31104	Bawuran	5,095	497.0	10.3	Rural	
31202	Srimulyo	14,587	1,456.0	10.0	Rural	
31602	Sendangsari	11,476	1,176.0	9.8	Rural	
31004	Temuwuh	7,409	767.0	9.7	Rural	
31701	Argodadi	10,452	1,121.0	9.3	Rural	
30101	Poncosari	11,038	1,186.0	9.3	Rural	
31105	Wonolelo	4,203	454.0	9.3	Rural	
30401	Seloharjo	10,012	1,110.0	9.0	Rural	
31601	Triwidadi	10,317	1,271.0	8.1	Rural	
31006	Terong	6,100	776.0	7.9	Rural	
30302	Parangtritis	8,422	1,187.0	7.1	Rural	
30301	Tirtohargo	2,506	362.0	6.9	Rural	
31005	Jatimulyo	6,043	891.0	6.8	Rural	
31002	Muntuk	8,496	1,285.0	6.6	Rural	
31003	Dlingo	5,485	916.0	6.0	Rural	
30901	Selopamioro	12,887	2,275.0	5.7	Rural	
31001	Mangunan	4,255	952.0	4.5	Rural	

Selected Kelurahan/Desa as urban area is as shown figure below.

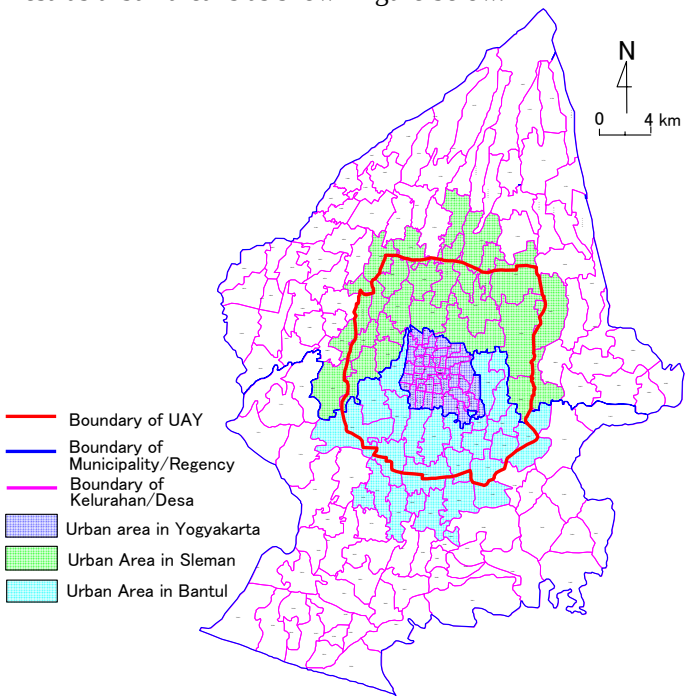


Figure 13.2.3 Urban Area of Water Supply Planning

Table 13.2.9 Urban Kelurahan/Desa in the Study Area

Yogyakarta Municipality: Whole Area is categorized as urban area

Urban Area in Sleman Regency

20400	**GODEAN**
20405	Sidokarto
20406	Sidoarum
20407	Sidomoyo
20500	**GAMPING**
20501	Balecatur
20502	Ambarketawang
20503	Banyuraden
20504	Nogotirto
20505	Trihanggo
20600	**MLATI**
20601	Tirtoadi
20602	Sumberadi
20603	Tlogoadi
20604	Sendangadi
20605	Sinduadi
20700	**DEPOK**
20701	Caturtunggal
20702	Maguwoharjo
20703	Condongcatur
20800	**BERBAH**
20801	Sendangtirto
20802	Tegaltirto
21000	**KALASAN**
21001	Purwomartani
21100	**NGEMPLAK**
21101	Wedomartani
21200	**NGAGLIK**
21201	Sariharjo
21202	Donoharjo
21203	Sardonoharjo
21205	Sinduharjo
21206	Minomartani
21300	**SLEMAN**
21303	Tridadi

Urban Area in Bantul Regency

30700	**BANTUL**
30703	Bantul
30704	Trirenggo
30705	Sapdodadi
30800	**JETIS**
30803	Sumberagung
30804	Trimulyo
30900	**IMOGIRI**
30907	Imogiri
31100	**PLERET**
31101	Wonokromo
31102	Pleret
31103	Segoroyoso
31200	**PIYUNGAN**
31201	Sitimulyo
31300	**BANGUNTAPAN**
31301	Tamanan
31302	Jagalan
31303	Singosaren
31304	Wirokerten
31305	Jambidan
31306	Potorono
31307	Baturetno
31308	Banguntapan
31400	**SEWON**
31401	Pendowoharjo
31402	Timbulharjo
31403	Bangunharjo
31404	Panggungharjo
31500	**KASIHAN**
31501	Bangunjiwo
31502	Tirtonimolo
31503	Tamantirto
31504	Ngestiharjo

(4) Future Domestic Per Capita Water Demand

Future domestic per capita water demands are estimated for respective PDAMs and community water supply system as follows.

1) For PDAM Yogyakarta

Per capita domestic water demand will increase from existing level (165 lpcd) to 180 lpcd in year 2020. 180 lpcd is applied to future target per capita domestic water demand because when supply capacity was sufficient against water demand before year 2001, the per capita domestic water demand was reached around 180 lpcd.

For PDAM Sleman Urban and For PDAM Bantul Urban

These two areas are just adjacent to Yogyakarta Municipality and there will be no difference with municipal conditions in future. Therefore, same target level in 2020 is applied as 180 lpcd. Future per capita domestic water demand will increase gradually from existing level (Sleman Urban, 80 lpcd, Bantul Urban 100 lpcd).

For PDAM Bantul Rural

Future target per capita domestic water demand is set as 150 lpcd and this level is lower than exiting municipal per capita (163.1 lpcd). Future per capita will increase gradually from existing level of per capita (95 lpcd).

For PDAM Sleman Rural

Same increase ratio of the "PDAM Bantul Rural" is applied for the PDAM Sleman Rural. Future per capita will increase gradually from existing level of per capita (75 lpcd).

For Community Water Supply System

Per capita domestic water demand is set as 60 lpcd which conforms to national target level.

Table 13.2.10 Future Per Capita Domestic Water Demand (lpcd)

	Latest Data	**2005**	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	**2020**
PDAM Yogyakarta	163.1	**165.0**	166.0	167.0	168.0	169.0	170.0	171.0	172.0	173.0	174.0	175.0	176.0	177.0	178.0	179.0	**180.0**
PDAM Sleman, Urban	80.6	**80.0**	86.7	93.3	100.0	106.7	113.3	120.0	126.7	133.3	140.0	146.7	153.3	160.0	166.7	173.3	**180.0**
PDAM Sleman, Rural	75.7	**75.0**	78.0	81.0	84.0	87.0	90.0	93.0	96.0	99.0	102.0	105.0	108.0	111.0	114.0	117.0	**120.0**
PDAM Bantul, Urban	99.8	**100.0**	105.3	110.7	116.0	121.3	126.7	132.0	137.3	142.7	148.0	153.3	158.7	164.0	169.3	174.7	**180.0**
PDAM Bantul, Rural	96.5	**95.0**	98.7	102.3	106.0	109.7	113.3	117.0	120.7	124.3	128.0	131.7	135.3	139.0	142.7	146.3	**150.0**
Community Water Supply		**60.0**	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	**60.0**

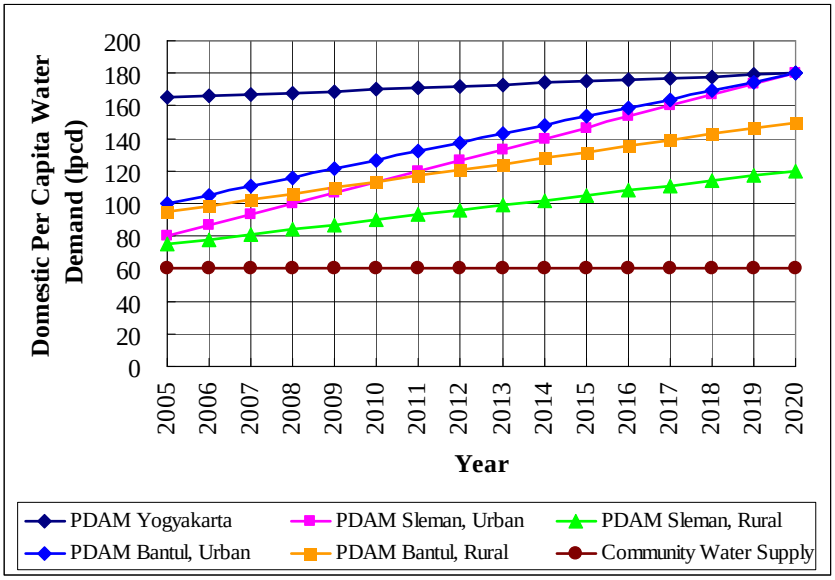


Figure 13.2.4 Domestic Per Capita Water Demand (lpcd)

Current per capita water consumption was also obtained from the results of the socio-economic survey (refer to Chapter 10) in this Study. According to the results of the survey, frequency ratio of answers concerning per capita water consumption is the highest in the range of 100 to 199 l/sec. From this results, future domestic per capita water demand shown above is evaluated as reasonable.

13.2.3 Future Domestic Service Ratio

(1) Existing Service Ratio

Existing service ratio is calculated dividing served population by total population. The served population is derived by multiplying number of house connection and average family size. Based on the results of socio economic survey (refer to Chapter 10) and census data, average family size is set as 5 people per family.

1) Yogyakarta Municipality

Most area of Yogyakarta Municipality is supplied by PDAM Yogyakarta. There is only one community water supply system but its scale is very small. Existing service ratio is as shown on Table 13.2.11.

Table 13.2.11 Existing Service Ratio in Yogyakarta Municipality (2005)

	Total Population	Number of House Connections	Served Population	Service Ratio
	person	nos.	person	%
	408,332	-	-	-
PDAM Yogyakarta		32,398	161,990	39.7%
Community Water Supply System		115	575	0.1%
Total		32,513	162,565	39.8%

2) Sleman Regency

Water in Sleman Regency is supplied by PDAM Sleman, PDAM Yogyakarta, and community water supply system. These three providers are supplying water without clear cut demarcation. Therefore, evaluation of existing service ratio is rather complicated.

There are 12 water supply units under jurisdiction of PDAM Sleman. Table 13.2.12 shows service area and served population of each unit of PDAM Sleman.

In addition to served population by PDAM Sleman, served population by PDAM Yogyakarta and community water supply system should also be considered. Service ratio which includes all served populations such as by PDAM Sleman, PDAM Yogyakarta, and Community water supply system is shown on Table 13.2.13.

3) Bantul Regency

Water in Bantul Regency is supplied by PDAM Bantul, PDAM Yogyakarta, and community water supply system. These three providers are supplying water without clear cut demarcation.

There are 12 water supply units under jurisdiction of PDAM Bantul. Table 13.2.14 shows service area and served population of each unit of PDAM Bantul.

In addition to served population by PDAM Bantul, served population by PDAM Yogyakarta and community water supply system should also be considered. Service ratio which includes all served populations such as by PDAM Bantul, PDAM Yogyakarta, and Community water supply system is shown on Table 13.2.15.

Table 13.2.12 Served Population of Each Water Supply Unit of PDAM Sleman

		Group A	Group B	Group C	Group D	Group E	Group F	Group G	Group H	Group I	Group J	Group K	Group L	Total
		Turi	Ngemplak	Tambakrejo	Sleman	Mlati	Gamping	Nogotirto	Godean	Ngaglik	Depok	Kalasan	Prambanan	
20101	Sumberahayu													0
20102	Sumbersari													0
20103	Sumberagung								1,073					1,073
20104	Sumberarum													0
20201	Sendangmulyo													0
20202	Sendangarum													0
20203	Sendangrejo			99										99
20204	Sendangagung			788										788
20205	Sendangsari													0
20301	Margodadi													0
20302	Margoluwih													0
20303	Margomulyo													0
20304	Margoagung													0
20305	Margokaton													0
20401	Sidorejo													0
20402	Sidoluhur								1,430					1,430
20403	Sidomulyo													0
20404	Sidoagung								1,073					1,073
20405	Sidokarto							2,591						2,591
20406	Sidoarum							2,591						2,591
20407	Sidomoyo							2,591						2,591
20501	Balecatur						2,166							2,166
20502	Ambarketawang						2,166	864						3,030
20503	Banyuraden						2,166							2,166
20504	Nogotirto						2,166							2,166
20505	Trihanggo						1,625							1,625
20601	Tirtoadi					211								211
20602	Sumberadi				550	2,532								3,082
20603	Tlogoadi					1,266								1,266
20604	Sendangadi				4,580		325							4,905
20605	Sinduadi				4,580									4,580
20701	Caturtunggal										5,577			5,577
20702	Maguwoharjo										3,187	129		3,316
20703	Condongcatur									1,532	5,577			7,110
20801	Sendangtirto											554		554
20802	Tegaltirto											961		961
20803	Jogotirto													0
20804	Kalitirto											1,515		1,515
20901	Sumberharjo													0
20902	Wukirharjo													0
20903	Gayamharjo													0
20904	Sambirojo													0
20905	Madurojo													0
20906	Bokoharjo												1,736	1,736
21001	Purwomartani											5,821		5,821
21002	Tirtomartani												744	744
21003	Tamanmartani													0
21004	Selomartani											259		259
21101	Wedomartani									2,043	1,594			3,637
21102	Widodomartani		1,339											1,339
21103	Bimomartani		2,009											2,009
21104	Sindumartani		2,678											2,678
21105	Umbulmartani		134							1,022				1,155
21201	Sariharjo				550					1,532				2,082
21202	Donoharjo				916					1,022				1,938
21203	Sardonoharjo									1,022				1,022
21204	Sukoharjo		201							1,022				1,222
21205	Sinduharjo									1,022				1,022
21206	Minomartani													0
21301	Caturharjo				733									733
21302	Triharjo				916									916
21303	Tridadi				4,580	211	217							5,008
21304	Pandowoharjo				916									916
21305	Trimulyo													0
21401	Banyurejo			788										788
21402	Tambakrejo			197										197
21403	Sumberejo			99										99
21404	Pondokrejo													0
21405	Mororejo													0
21406	Margorejo													0
21407	Lumbungrejo													0
21408	Merdikorejo													0
21501	Bangunkerto													0
21502	Donokerto	1,142												1,142
21503	Girikerto													0
21504	Wonokerto	286												286
21601	Purwobinangun													0
21602	Candibinangun													0
21603	Harjobinangun	286												286
21604	Pakembinangun	1,142												1,142
21605	Hargobinangun													0
21701	Wukirsari													0
21702	Argomulyo		335											335
21703	Glagaharjo													0
21704	Kepuharjo													0
21705	Umbulharjo													0
		2,855	6,695	1,970	18,320	4,220	10,830	8,635	3,575	10,215	15,935	9,240	2,480	94,970

Note: Hatched/Colored lines mean urban Kelurahan/Desa which are discussed in previous section.
Source: PDAM Sleman

Table 13.2.13 Service Ratio in Sleman Regency

			Total Population	PDAM Yogyakarta			PDAM Sleman			Community System			Total		
				No. Conc.	Served Pop.	Service Ratio	No. Conc.	Served Pop.	Service Ratio	No. Conc.	Served Pop.	Service Ratio	**No. Conc.**	**Served Pop.**	**Service Ratio**
			person	nos.	person	%	nos.	person	%	nos.	person	%	nos.	person	%
	20000	**Sleman Regency**	**960,803**	**4,865**	**24,325**	**2.5%**	**18,994**	**94,970**	**9.9%**	**5,564**	**19,532**	**2.0%**	**29,423**	**138,827**	**14.4%**
	20101	Sumberahayu	5,722		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	20102	Sumbersari	6,873		0	0.0%	0	0	0.0%	140	700	10.2%	140	700	10.2%
	20103	Sumberagung	10,139		0	0.0%	215	1,073	10.6%	0	0	0.0%	215	1,073	10.6%
	20104	Sumberarum	6,053		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	20201	Sendangmulyo	6,537		0	0.0%	0	0	0.0%	50	250	3.8%	50	250	3.8%
	20202	Sendangarum	3,237		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	20203	Sendangrejo	7,100		0	0.0%	20	99	1.4%	0	0	0.0%	20	99	1.4%
	20204	Sendangagung	3,506		0	0.0%	158	788	22.5%	0	0	0.0%	158	788	22.5%
	20205	Sendangsari	7,228		0	0.0%	0	0	0.0%	40	200	2.8%	40	200	2.8%
	20301	Margodadi	7,133		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	20302	Margoluwih	8,173		0	0.0%	0	0	0.0%	80	400	4.9%	80	400	4.9%
	20303	Margomulyo	10,076		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	20304	Margoagung	8,248		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	20305	Margokaton	6,238		0	0.0%	0	0	0.0%	50	250	4.0%	50	250	4.0%
	20401	Sidorejo	5,668		0	0.0%	0	0	0.0%	75	375	6.6%	75	375	6.6%
	20402	Sidoluhur	8,774		0	0.0%	286	1,430	16.3%	0	0	0.0%	286	1,430	16.3%
	20403	Sidomulyo	5,474		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	20404	Sidoagung	7,398		0	0.0%	215	1,073	14.5%	0	0	0.0%	215	1,073	14.5%
U	20405	Sidokarto	8,664		0	0.0%	518	2,591	29.9%	0	0	0.0%	518	2,591	29.9%
U	20406	Sidoarum	13,799		0	0.0%	518	2,591	18.8%	0	0	0.0%	518	2,591	18.8%
U	20407	Sidomoyo	6,433		0	0.0%	518	2,591	40.3%	0	0	0.0%	518	2,591	40.3%
U	20501	Balecatur	17,225		0	0.0%	433	2,166	12.6%	150	750	4.4%	583	2,916	16.9%
U	20502	Ambarketawang	19,424		0	0.0%	606	3,030	15.6%	0	0	0.0%	606	3,030	15.6%
U	20503	Banyuraden	16,247		0	0.0%	433	2,166	13.3%	0	0	0.0%	433	2,166	13.3%
U	20504	Nogotirto	17,576		0	0.0%	433	2,166	12.3%	0	0	0.0%	433	2,166	12.3%
U	20505	Trihanggo	14,657	7	35	0.2%	325	1,625	11.1%	0	0	0.0%	332	1,660	11.3%
U	20601	Tirtoadi	7,948		0	0.0%	42	211	2.7%	0	0	0.0%	42	211	2.7%
U	20602	Sumberadi	12,302		0	0.0%	616	3,082	25.0%	0	0	0.0%	616	3,082	25.0%
U	20603	Tlogoadi	10,262		0	0.0%	253	1,266	12.3%	60	300	2.9%	313	1,566	15.3%
U	20604	Sendangadi	13,443		0	0.0%	981	4,905	36.5%	0	0	0.0%	981	4,905	36.5%
U	20605	Sinduadi	42,561	1,019	5,095	12.0%	916	4,580	10.8%	0	0	0.0%	1,935	9,675	22.7%
U	20701	Caturtunggal	86,177	1,092	5,460	6.3%	1,115	5,577	6.5%	0	0	0.0%	2,207	11,037	12.8%
U	20702	Maguwoharjo	35,982		0	0.0%	663	3,316	9.2%	50	250	0.7%	713	3,566	9.9%
U	20703	Condongcatur	53,294	1,148	5,740	10.8%	1,422	7,110	13.3%	0	0	0.0%	2,570	12,850	24.1%
U	20801	Sendangtirto	12,705		0	0.0%	111	554	4.4%	0	0	0.0%	111	554	4.4%
U	20802	Tegaltirto	8,695		0	0.0%	192	961	11.1%	0	0	0.0%	192	961	11.1%
	20803	Jogotirto	7,752		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	20804	Kalitirto	10,612		0	0.0%	303	1,515	14.3%	0	0	0.0%	303	1,515	14.3%
	20901	Sumberharjo	11,516		0	0.0%	0	0	0.0%	200	1,000	8.7%	200	1,000	8.7%
	20902	Wukirharjo	2,204		0	0.0%	0	0	0.0%	300	1,500	68.1%	300	1,500	68.1%
	20903	Gayamharjo	3,939		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	20904	Sambirojo	4,596		0	0.0%	0	0	0.0%	577	2,885	62.8%	577	2,885	62.8%
	20905	Madurojo	9,921		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	20906	Bokoharjo	10,124		0	0.0%	347	1,736	17.1%	0	0	0.0%	347	1,736	17.1%
U	21001	Purwomartani	28,531		0	0.0%	1,164	5,821	20.4%	0	0	0.0%	1,164	5,821	20.4%
	21002	Tirtomartani	12,906		0	0.0%	149	744	5.8%	0	0	0.0%	149	744	5.8%
	21003	Tamanmartani	12,708		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	21004	Selomartani	9,517		0	0.0%	52	259	2.7%	0	0	0.0%	52	259	2.7%
U	21101	Wedomartani	22,900		0	0.0%	727	3,637	15.9%	0	0	0.0%	727	3,637	15.9%
	21102	Widodomartani	6,317		0	0.0%	268	1,339	21.2%	0	0	0.0%	268	1,339	21.2%
	21103	Bimomartani	5,351		0	0.0%	402	2,009	37.5%	0	0	0.0%	402	2,009	37.5%
	21104	Sindumartani	6,319		0	0.0%	536	2,678	42.4%	0	0	0.0%	536	2,678	42.4%
	21105	Umbulmartani	9,251	298	1,490	16.1%	231	1,155	12.5%	0	0	0.0%	529	2,645	28.6%
U	21201	Sariharjo	18,998		0	0.0%	416	2,082	11.0%	0	0	0.0%	416	2,082	11.0%
U	21202	Donoharjo	7,013		0	0.0%	388	1,938	27.6%	60	300	4.3%	448	2,238	31.9%
U	21203	Sardonoharjo	15,673	336	1,680	10.7%	204	1,022	6.5%	0	0	0.0%	540	2,702	17.2%
	21204	Sukoharjo	12,190	280	1,400	11.5%	244	1,222	10.0%	50	250	2.1%	574	2,872	23.6%
U	21205	Sinduharjo	16,165	685	3,425	21.2%	204	1,022	6.3%	0	0	0.0%	889	4,447	27.5%
U	21206	Minomartani	13,567		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	21301	Caturharjo	11,427		0	0.0%	147	733	6.4%	0	0	0.0%	147	733	6.4%
	21302	Triharjo	13,664		0	0.0%	183	916	6.7%	0	0	0.0%	183	916	6.7%
U	21303	Tridadi	12,261		0	0.0%	1,002	5,008	40.8%	0	0	0.0%	1,002	5,008	40.8%
	21304	Pandowoharjo	8,746		0	0.0%	183	916	10.5%	0	0	0.0%	183	916	10.5%
	21305	Trimulyo	7,466		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	21401	Banyurejo	6,675		0	0.0%	158	788	11.8%	0	0	0.0%	158	788	11.8%
	21402	Tambakrejo	3,987		0	0.0%	39	197	4.9%	0	0	0.0%	39	197	4.9%
	21403	Sumberejo	3,682		0	0.0%	20	99	2.7%	0	0	0.0%	20	99	2.7%
	21404	Pondokrejo	5,153		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	21405	Mororejo	4,358		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	21406	Margorejo	9,173		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	21407	Lumbungrejo	6,651		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	21408	Merdikorejo	5,480		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	21501	Bangunkerto	7,664		0	0.0%	0	0	0.0%	240	1,200	15.7%	240	1,200	15.7%
	21502	Donokerto	7,017		0	0.0%	228	1,142	16.3%	0	0	0.0%	228	1,142	16.3%
	21503	Girikerto	6,669		0	0.0%	0	0	0.0%	420	2,100	31.5%	420	2,100	31.5%
	21504	Wonokerto	8,600		0	0.0%	57	286	3.3%	90	450	5.2%	147	736	8.6%
	21601	Purwobinangun	6,790		0	0.0%	0	0	0.0%	80	400	5.9%	80	400	5.9%
	21602	Candibinangun	4,862		0	0.0%	0	0	0.0%	450	2,250	46.3%	450	2,250	46.3%
	21603	Harjobinangun	3,971		0	0.0%	57	286	7.2%	0	0	0.0%	57	286	7.2%
	21604	Pakembinangun	5,449		0	0.0%	228	1,142	21.0%	260	1,300	23.9%	488	2,442	44.8%
	21605	Hargobinangun	7,236		0	0.0%	0	0	0.0%	70	350	4.8%	70	350	4.8%
	21701	Wukirsari	8,398		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	21702	Argomulyo	6,423		0	0.0%	67	335	5.2%	0	0	0.0%	67	335	5.2%
	21703	Glagaharjo	3,213		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	21704	Kepuharjo	2,725		0	0.0%	0	0	0.0%	902	902	33.1%	902	902	33.1%
	21705	Umbulharjo	4,022		0	0.0%	0	0	0.0%	1,170	1,170	29.1%	1,170	1,170	29.1%

Note: Hatched/Colored lines mean urban Kelurahan/Desa which are discussed in previous section.
Source: PDAM Yogyakarta, PDAM Sleman, PU Sleman

Table 13.2.14 Served Population of Each Water Supply Unit of PDAM Bantul

	Unit	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	
Kelurahan		Sedayu	Kasihan	Bangunji	Sewon	Bangunta	Guosari	Bantul	Imogiri	Trimulyo	Srandaka	Bambang	Dlingo	Total
30101	Poncosari										585			585
30102	Trimurti										585			585
30201	Gadingsari										58			58
30202	Gadingharjo										117			117
30203	Srigading										19			19
30204	Murtigading										585			585
30301	Tirtohargo													0
30302	Parangtritis											195		195
30303	Donotirto											87		87
30304	Tirtosari											22		22
30305	Tirtomulyo											22		22
30401	Seloharjo													0
30402	Panjangrejo											141		141
30403	Srihandono											54		54
30501	Sidomulyo											76		76
30502	Mulyodadi											141		141
30503	Sumbermulyo											217		217
30601	Caturharjo													0
30602	Triharjo													0
30603	Gilangharjo											33		33
30604	Wijirejo						362					22		384
30701	Palbapang											54		54
30702	Ringinharjo							1,706						1,706
30703	Bantul						725	2,924						3,649
30704	Trirenggo													0
30705	Sapdodadi								74					74
30801	Patalan											22		22
30802	Canden													0
30803	Sumberagung								297					297
30804	Trimulyo								297	2,692				2,989
30901	Selopamioro													0
30902	Sriharjo													0
30903	Kebonagung													0
30904	Karangtengah								30					30
30905	Girirejo								45					45
30906	Karangtalun								223					223
30907	Imogiri								223					223
30908	Wukirsari								223					223
31001	Mangunan													0
31002	Muntuk													0
31003	Dlingo												486	486
31004	Temuwuh												1,081	1,081
31005	Jatimulyo												1,081	1,081
31006	Terong												54	54
31101	Wonokromo													0
31102	Pleret													0
31103	Segoroyoso													0
31104	Bawuran													0
31105	Wonolelo													0
31201	Sitimulyo													0
31202	Srimulyo					588								588
31203	Srimartani					588								588
31301	Tamanan													0
31302	Jagalan													0
31303	Singosaren													0
31304	Wirokerten													0
31305	Jambidan													0
31306	Potorono					118								118
31307	Baturetno					529								529
31308	Banguntapan					529								529
31401	Pendowoharjo			233			2,536	244						3,012
31402	Timbulharjo								74					74
31403	Bangunharjo				3,487									3,487
31404	Panggungharjo				2,325		362							2,687
31501	Bangunjiwo			5,199										5,199
31502	Tirtonimolo		492											492
31503	Tamantirto		123	2,328										2,451
31504	Ngestiharjo		5,532											5,532
31601	Triwidadi													0
31602	Sendangsari						725							725
31603	Guwosari						2,536							2,536
31701	Argodadi													0
31702	Argorejo	3,024												3,024
31703	Argosari	756												756
31704	Argomulyo	3,781												3,781
		7,561	6,147	7,760	5,812	2,352	7,245	4,874	1,487	2,692	1,949	1,084	2,702	51,665

Note: Hatched/Colored lines mean urban Kelurahan/Desa which are discussed in previous section.
Source: PDAM Bantul

Table 13.2.15 Service Ratio in Bantul Regency

			Total Population	PDAM Yogyakarta			PDAM Bantul			Community System			Total		
				No. Conc.	Served Pop.	Service Ratio	No. Conc.	Served Pop.	Service Ratio	No. Conc.	Served Pop.	Service Ratio	**No. Conc.**	**Served Pop.**	**Service Ratio**
			person	nos.	person	%	nos.	person	%	nos.	person	%	nos.	person	%
	30000	**Bantul Regency**	**825,285**	**325**	**1,625**	**0.2%**	**10,333**	**51,665**	**6.3%**	**3,598**	**17,990**	**2.2%**	**14,256**	**71,280**	**8.6%**
	30101	Poncosari	11,136		0	0.0%	117	585	5.2%	70	350	3.1%	187	935	8.4%
	30102	Trimurti	16,307		0	0.0%	117	585	3.6%	0	0	0.0%	117	585	3.6%
	30201	Gadingsari	8,861		0	0.0%	12	58	0.7%	0	0	0.0%	12	58	0.7%
	30202	Gadingharjo	3,310		0	0.0%	23	117	3.5%	0	0	0.0%	23	117	3.5%
	30203	Srigading	9,135		0	0.0%	4	19	0.2%	0	0	0.0%	4	19	0.2%
	30204	Murtigading	7,430		0	0.0%	117	585	7.9%	0	0	0.0%	117	585	7.9%
	30301	Tirtohargo	2,538		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	30302	Parangtritis	7,265		0	0.0%	39	195	2.7%	140	700	9.6%	179	895	12.3%
	30303	Donotirto	7,298		0	0.0%	17	87	1.2%	0	0	0.0%	17	87	1.2%
	30304	Tirtosari	3,679		0	0.0%	4	22	0.6%	0	0	0.0%	4	22	0.6%
	30305	Tirtomulyo	6,284		0	0.0%	4	22	0.3%	0	0	0.0%	4	22	0.3%
	30401	Seloharjo	9,756		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	30402	Panjangrejo	8,545		0	0.0%	28	141	1.6%	0	0	0.0%	28	141	1.6%
	30403	Srihandono	11,942		0	0.0%	11	54	0.5%	0	0	0.0%	11	54	0.5%
	30501	Sidomulyo	11,136	325	1,625	14.6%	15	76	0.7%	0	0	0.0%	340	1,701	15.3%
	30502	Mulyodadi	10,163		0	0.0%	28	141	1.4%	0	0	0.0%	28	141	1.4%
	30503	Sumbermulyo	13,961		0	0.0%	43	217	1.6%	0	0	0.0%	43	217	1.6%
	30601	Caturharjo	10,087		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	30602	Triharjo	11,917		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	30603	Gilangharjo	13,970		0	0.0%	7	33	0.2%	0	0	0.0%	7	33	0.2%
	30604	Wijirejo	9,854		0	0.0%	77	384	3.9%	0	0	0.0%	77	384	3.9%
	30701	Palbapang	11,987		0	0.0%	11	54	0.5%	0	0	0.0%	11	54	0.5%
U	30702	Ringinharjo	6,840		0	0.0%	341	1,706	24.9%	0	0	0.0%	341	1,706	24.9%
U	30703	Bantul	14,522		0	0.0%	730	3,649	25.1%	0	0	0.0%	730	3,649	25.1%
U	30704	Trirenggo	15,586		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
U	30705	Sapdodadi	5,719		0	0.0%	15	74	1.3%	0	0	0.0%	15	74	1.3%
	30801	Patalan	10,588		0	0.0%	4	22	0.2%	0	0	0.0%	4	22	0.2%
	30802	Canden	9,884		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
U	30803	Sumberagung	12,629		0	0.0%	59	297	2.4%	0	0	0.0%	59	297	2.4%
U	30804	Trimulyo	15,043		0	0.0%	598	2,989	19.9%	70	350	2.3%	668	3,339	22.2%
	30901	Selopamioro	12,608		0	0.0%	0	0	0.0%	495	2,475	19.6%	495	2,475	19.6%
	30902	Sriharjo	7,634		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	30903	Kebonagung	3,122		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	30904	Karangtengah	4,479		0	0.0%	6	30	0.7%	70	350	7.8%	76	380	8.5%
	30905	Girirejo	4,108		0	0.0%	9	45	1.1%	0	0	0.0%	9	45	1.1%
	30906	Karangtalun	2,632		0	0.0%	45	223	8.5%	0	0	0.0%	45	223	8.5%
U	30907	Imogiri	3,471		0	0.0%	45	223	6.4%	0	0	0.0%	45	223	6.4%
	30908	Wukirsari	15,035		0	0.0%	45	223	1.5%	0	0	0.0%	45	223	1.5%
	31001	Mangunan	4,093		0	0.0%	0	0	0.0%	599	2,995	73.2%	599	2,995	73.2%
	31002	Muntuk	7,439		0	0.0%	0	0	0.0%	225	1,125	15.1%	225	1,125	15.1%
	31003	Dlingo	5,294		0	0.0%	97	486	9.2%	0	0	0.0%	97	486	9.2%
	31004	Temuwuh	6,347		0	0.0%	216	1,081	17.0%	50	250	3.9%	266	1,331	21.0%
	31005	Jatimulyo	5,844		0	0.0%	216	1,081	18.5%	277	1,385	23.7%	493	2,466	42.2%
	31006	Terong	5,115		0	0.0%	11	54	1.1%	175	875	17.1%	186	929	18.2%
U	31101	Wonokromo	12,386		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
U	31102	Pleret	10,476		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
U	31103	Segoroyoso	7,132		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
	31104	Bawuran	4,979		0	0.0%	0	0	0.0%	170	850	17.1%	170	850	17.1%
	31105	Wonolelo	3,953		0	0.0%	0	0	0.0%	120	600	15.2%	120	600	15.2%
U	31201	Sitimulyo	13,643		0	0.0%	0	0	0.0%	130	650	4.8%	130	650	4.8%
	31202	Srimulyo	13,799		0	0.0%	118	588	4.3%	120	600	4.3%	238	1,188	8.6%
	31203	Srimartani	12,752		0	0.0%	118	588	4.6%	100	500	3.9%	218	1,088	8.5%
U	31301	Tamanan	10,341		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
U	31302	Jagalan	3,061		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
U	31303	Singosaren	3,151		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
U	31304	Wirokerten	10,813		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
U	31305	Jambidan	7,356		0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
U	31306	Potorono	9,518		0	0.0%	24	118	1.2%	0	0	0.0%	24	118	1.2%
U	31307	Baturetno	13,705		0	0.0%	106	529	3.9%	0	0	0.0%	106	529	3.9%
U	31308	Banguntapan	39,484		0	0.0%	106	529	1.3%	0	0	0.0%	106	529	1.3%
U	31401	Pendowoharjo	19,938		0	0.0%	602	3,012	15.1%	0	0	0.0%	602	3,012	15.1%
U	31402	Timbulharjo	18,686		0	0.0%	15	74	0.4%	0	0	0.0%	15	74	0.4%
U	31403	Bangunharjo	25,988		0	0.0%	697	3,487	13.4%	0	0	0.0%	697	3,487	13.4%
U	31404	Panggungharjo	31,083		0	0.0%	537	2,687	8.6%	0	0	0.0%	537	2,687	8.6%
U	31501	Bangunjiwo	22,290		0	0.0%	1,040	5,199	23.3%	340	1,700	7.6%	1,380	6,899	31.0%
U	31502	Tirtonimolo	20,761		0	0.0%	98	492	2.4%	0	0	0.0%	98	492	2.4%
U	31503	Tamantirto	19,640		0	0.0%	490	2,451	12.5%	0	0	0.0%	490	2,451	12.5%
U	31504	Ngestiharjo	34,436		0	0.0%	1,106	5,532	16.1%	0	0	0.0%	1,106	5,532	16.1%
	31601	Triwidadi	9,287		0	0.0%	0	0	0.0%	77	385	4.1%	77	385	4.1%
	31602	Sendangsari	10,109		0	0.0%	145	725	7.2%	70	350	3.5%	215	1,075	10.6%
	31603	Guwosari	9,918		0	0.0%	507	2,536	25.6%	40	200	2.0%	547	2,736	27.6%
	31701	Argodadi	9,634		0	0.0%	0	0	0.0%	150	750	7.8%	150	750	7.8%
	31702	Argorejo	11,401		0	0.0%	605	3,024	26.5%	30	150	1.3%	635	3,174	27.8%
	31703	Argosari	7,522		0	0.0%	151	756	10.1%	40	200	2.7%	191	956	12.7%
	31704	Argomulyo	13,450		0	0.0%	756	3,781	28.1%	40	200	1.5%	796	3,981	29.6%

Note: Hatched/Colored lines mean urban Kelurahan/Desa which are discussed in previous section.
Source: PDAM Yogyakarta, PDAM Bantul PU Bantul

(2) Basis of Future Water Demand Projection

Since several water supply providers exist in the Study Area such as three PDAMs and Community Water Supply Systems, future water supply service type as a basis of future water demand projection is presumed depending on existing supply conditions.

Figure 13.2.5 shows the basis of future water demand projection for respective areas which have currently different type of water supply. It should be noted that classification of the basis of future water demand projection shown on Figure 13.2.5 is criteria for future service ratio and per capita water demand in respective area. Therefore, these classifications do not mean future demarcation of water supply system among PDAMs or Community Water Supply Systems.

Conforming to the basis of future water demand projection, domestic water demand for each Kelurahan/Desa is projected.

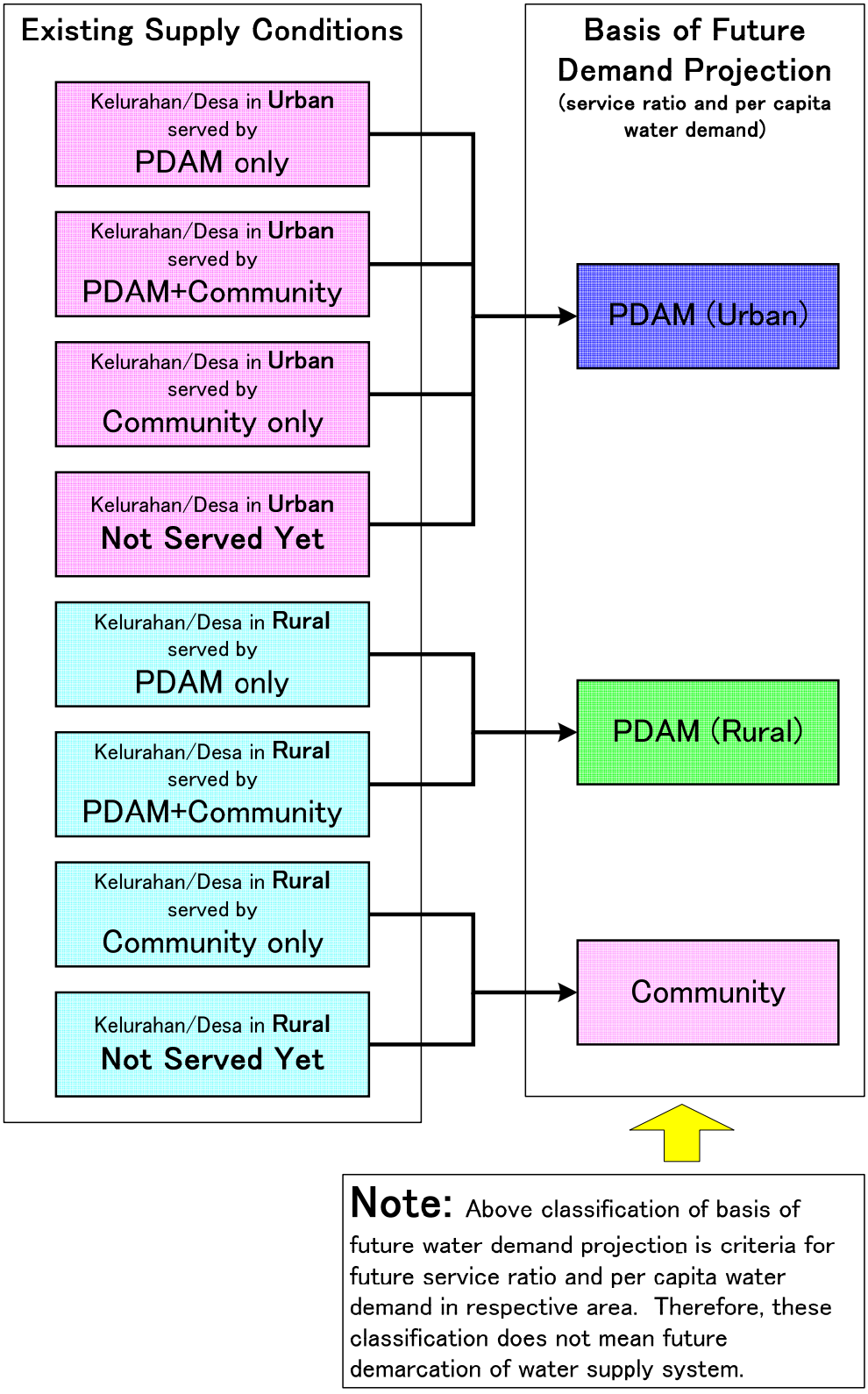


Figure 13.2.5 Existing Supply Conditions and Basis of Future Water Demand Projection

Table 13.2.16 Basis of Future Water Demand Projection

		Existing Water Supply Source					
		PDAM Yogyakarta	**PDAM Sleman**	**PDAM Bantul**	**Community**	**Remarks**	**Basis of Future Water Demand Projection**
10000	**Yogyakarta Municipali**	**X**			**X**		**Urban PDAM**
20000	**Sleman Regency**	X	X		X		
20101	Sumberahayu					**No Supply**	Community
20102	Sumbersari				X		Community
20103	Sumberagung		X				Rural PDAM
20104	Sumberarum					**No Supply**	Community
20201	Sendangmulyo				X		Community
20202	Sendangarum					**No Supply**	Community
20203	Sendangrejo		X				Rural PDAM
20204	Sendangagung		X				Rural PDAM
20205	Sendangsari				X		Community
20301	Margodadi					**No Supply**	Community
20302	Margoluwih				X		Community
20303	Margomulyo					**No Supply**	Community
20304	Margoagung					**No Supply**	Community
20305	Margokaton				X		Community
20401	Sidorejo				X		Community
20402	Sidoluhur		X				Rural PDAM
20403	Sidomulyo					**No Supply**	Community
20404	Sidoagung		X				Rural PDAM
20405	Sidokarto		X				Urban PDAM
20406	Sidoarum		X				Urban PDAM
20407	Sidomoyo		X				Urban PDAM
20501	Balecatur		X		X		Urban PDAM
20502	Ambarketawang		X				Urban PDAM
20503	Banyuraden		X				Urban PDAM
20504	Nogotirto		X				Urban PDAM
20505	Trihanggo	X	X				Urban PDAM
20601	Tirtoadi		X				Urban PDAM
20602	Sumberadi		X				Urban PDAM
20603	Tlogoadi		X		X		Urban PDAM
20604	Sendangadi		X				Urban PDAM
20605	Sinduadi	X	X				Urban PDAM
20701	Caturtunggal	X	X				Urban PDAM
20702	Maguwoharjo		X		X		Urban PDAM
20703	Condongcatur	X	X				Urban PDAM
20801	Sendangtirto		X				Urban PDAM
20802	Tegaltirto		X				Urban PDAM
20803	Jogotirto					**No Supply**	Community
20804	Kalitirto		X				Rural PDAM
20901	Sumberharjo				X		Community
20902	Wukirharjo				X		Community
20903	Gayamharjo					**No Supply**	Community
20904	Sambirojo				X		Community
20905	Madurojo					**No Supply**	Community
20906	Bokoharjo		X				Rural PDAM
21001	Purwomartani		X				Urban PDAM
21002	Tirtomartani		X				Rural PDAM
21003	Tamanmartani					**No Supply**	Community
21004	Selomartani		X				Rural PDAM
21101	Wedomartani		X				Urban PDAM
21102	Widodomartani		X				Rural PDAM
21103	Bimomartani		X				Rural PDAM
21104	Sindumartani		X				Rural PDAM
21105	Umbulmartani	X	X				Rural PDAM

		Existing Water Supply Source					
		PDAM Yogyakarta	**PDAM Sleman**	**PDAM Bantul**	**Community**	**Remarks**	**Basis of Future Water Demand Projection**
21201	Sariharjo		X				Urban PDAM
21202	Donoharjo		X		X		Urban PDAM
21203	Sardonoharjo	X	X				Urban PDAM
21204	Sukoharjo	X	X		X		Rural PDAM
21205	Sinduharjo	X	X				Urban PDAM
21206	Minomartani					**No Supply**	Urban PDAM
21301	Caturharjo		X				Rural PDAM
21302	Triharjo		X				Rural PDAM
21303	Tridadi		X				Urban PDAM
21304	Pandowoharjo		X				Rural PDAM
21305	Trimulyo					**No Supply**	Community
21401	Banyurejo		X				Rural PDAM
21402	Tambakrejo		X				Rural PDAM
21403	Sumberejo		X				Rural PDAM
21404	Pondokrejo					**No Supply**	Community
21405	Mororejo					**No Supply**	Community
21406	Margorejo					**No Supply**	Community
21407	Lumbungrejo					**No Supply**	Community
21408	Merdikorejo					**No Supply**	Community
21501	Bangunkerto				X		Community
21502	Donokerto		X				Rural PDAM
21503	Girikerto				X		Community
21504	Wonokerto		X		X		Rural PDAM
21601	Purwobinangun				X		Community
21602	Candibinangun				X		Community
21603	Harjobinangun		X				Rural PDAM
21604	Pakembinangun		X		X		Rural PDAM
21605	Hargobinangun				X		Community
21701	Wukirsari					**No Supply**	Community
21702	Argomulyo		X				Rural PDAM
21703	Glagaharjo					**No Supply**	Community
21704	Kepuharjo				X		Community
21705	Umbulharjo				X		Community

		Existing Water Supply Source					
		PDAM Yogyakarta	**PDAM Sleman**	**PDAM Bantul**	**Community**	**Remarks**	**Basis of Future Water Demand Projection**
30000	**Bantul Regency**	X		X	X		
30101	Poncosari			X	X		Rural PDAM
30102	Trimurti			X			Rural PDAM
30201	Gadingsari			X			Rural PDAM
30202	Gadingharjo			X			Rural PDAM
30203	Srigading			X			Rural PDAM
30204	Murtigading			X			Rural PDAM
30301	Tirtohargo					**No Supply**	Community
30302	Parangtritis			X	X		Rural PDAM
30303	Donotirto			X			Rural PDAM
30304	Tirtosari			X			Rural PDAM
30305	Tirtomulyo			X			Rural PDAM
30401	Seloharjo					**No Supply**	Community
30402	Panjangrejo			X			Rural PDAM
30403	Srihandono			X			Rural PDAM
30501	Sidomulyo	X		X			Rural PDAM
30502	Mulyodadi			X			Rural PDAM
30503	Sumbermulyo			X			Rural PDAM
30601	Caturharjo					**No Supply**	Community
30602	Triharjo					**No Supply**	Community
30603	Gilangharjo			X			Rural PDAM
30604	Wijirejo			X			Rural PDAM
30701	Palbapang			X			Rural PDAM
30702	Ringinharjo			X			Urban PDAM
30703	Bantul			X			Urban PDAM
30704	Trirenggo					**No Supply**	Urban PDAM
30705	Sapdodadi			X			Urban PDAM
30801	Patalan			X			Rural PDAM
30802	Canden					**No Supply**	Community
30803	Sumberagung			X			Urban PDAM
30804	Trimulyo			X	X		Urban PDAM
30901	Selopamioro				X		Community
30902	Sriharjo					**No Supply**	Community
30903	Kebonagung					**No Supply**	Community
30904	Karangtengah			X	X		Rural PDAM
30905	Girirejo			X			Rural PDAM
30906	Karangtalun			X			Rural PDAM
30907	Imogiri			X			Urban PDAM
30908	Wukirsari			X			Rural PDAM
31001	Mangunan				X		Community
31002	Muntuk				X		Community
31003	Dlingo			X			Rural PDAM
31004	Temuwuh			X	X		Rural PDAM
31005	Jatimulyo			X	X		Rural PDAM
31006	Terong			X	X		Rural PDAM
31101	Wonokromo					**No Supply**	Urban PDAM
31102	Pleret					**No Supply**	Urban PDAM
31103	Segoroyoso					**No Supply**	Urban PDAM
31104	Bawuran				X		Community
31105	Wonolelo				X		Community
31201	Sitimulyo				X		Urban PDAM
31202	Srimulyo			X	X		Rural PDAM
31203	Srimartani			X	X		Rural PDAM

		Existing Water Supply Source					
		PDAM Yogyakarta	PDAM Sleman	PDAM Bantul	Community	Remarks	Basis of Future Water Demand Projection
31301	Tamanan					**No Supply**	Urban PDAM
31302	Jagalan					**No Supply**	Urban PDAM
31303	Singosaren					**No Supply**	Urban PDAM
31304	Wirokerten					**No Supply**	Urban PDAM
31305	Jambidan					**No Supply**	Urban PDAM
31306	Potorono			X			Urban PDAM
31307	Baturetno			X			Urban PDAM
31308	Banguntapan			X			Urban PDAM
31401	Pendowoharjo			X			Urban PDAM
31402	Timbulharjo			X			Urban PDAM
31403	Bangunharjo			X			Urban PDAM
31404	Panggungharjo			X			Urban PDAM
31501	Bangunjiwo			X	X		Urban PDAM
31502	Tirtonimolo			X			Urban PDAM
31503	Tamantirto			X			Urban PDAM
31504	Ngestiharjo			X			Urban PDAM
31601	Triwidadi				X		Community
31602	Sendangsari			X	X		Rural PDAM
31603	Guwosari			X	X		Rural PDAM
31701	Argodadi				X		Community
31702	Argorejo			X	X		Rural PDAM
31703	Argosari			X	X		Rural PDAM
31704	Argomulyo			X	X		Rural PDAM

(3) Future Service Ratio

Based on the above basis of future water demand projection, future service ratio is assumed as follows.

PDAM Yogyakarta:	Current Service Ratio -> 80% in Year 2015
PDAM Sleman (Urban area)	Current Service Ratio -> 80% in Year 2015
PDAM Sleman (Rural area)	Current Service Ratio -> 60% in Year 2015
PDAM Bantul (Urban area)	Current Service Ratio -> 80% in Year 2015
PDAM Bantul (Rural area)	Current Service Ratio -> 60% in Year 2015
Community Water Supply System	Current Service Ratio -> 60% in Year 2020

These target service ratio and target years are assumed complying with Indonesian national targets defied as Millennium Development Goals.

According to the results of the socio-economic survey conducted as part of this Study, 65 % of unserved (not connected to public water supply system) people are willing to connect to the water supply services if the requirements were met (refer to Chapter 10). Therefore, target service ratio shown above is conforming to peoples willingness.

It should be noted that 80 % of PDAM customers have also own private well (PW) according to the results of Socio Economic Survey (refer to Chapter 10). This ratio is estimated as decrease to 20% in Year 2015 according to improvement of PDAM water supply service quality.

1) Yogyakarta Municipality, Future Service Ratio

Future service ratio is estimated based on conditions mentioned above as shown on Table 13.2.17 and Figure 13.2.6.

Table 13.2.17 Future Domestic Service Ratio in Yogyakarta Municipality

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Service Ratio	**39.7%**	**43.7%**	**47.7%**	**51.8%**	**55.8%**	**59.8%**	**63.9%**	**67.9%**	**71.9%**	**76.0%**	**80.0%**	**80.0%**	**80.0%**	**80.0%**	**80.0%**	**80.0%**
PDAM only	7.9%	11.4%	15.3%	19.7%	24.6%	29.9%	35.8%	42.1%	48.9%	56.2%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%
PDAM + PW	31.7%	32.3%	32.5%	32.1%	31.2%	29.9%	28.1%	25.8%	23.0%	19.8%	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%
PW only	60.3%	56.3%	52.3%	48.2%	44.2%	40.2%	36.1%	32.1%	28.1%	24.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Ratio of PW dependency	80.0%	74.0%	68.0%	62.0%	56.0%	50.0%	44.0%	38.0%	32.0%	26.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%

Note: "PW" is private well
"PW only" means ratio of people who use private well only and do not connect to public water supply system.

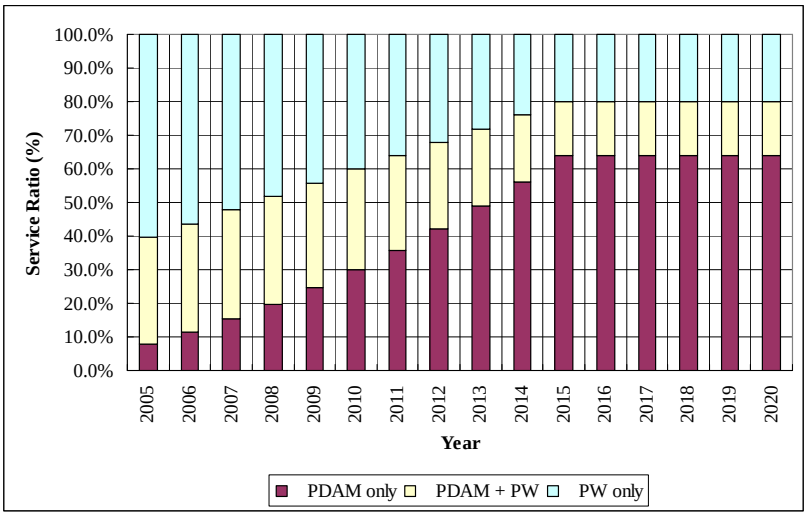


Figure 13.2.6 Future Domestic Service Ratio in Yogyakarta Municipality

2) Sleman and Bantul Regencies, Future Service Ratio

Future service ratio is estimated based on conditions mentioned above as shown on tables below.

Table 13.2.18 Service Ratio of PDAM (Urban)

Table 13.2.19 Service Ratio of PDAM (Rutal)

Table 13.2.18 Service Ratio of PDAM (Urban)

20000	**Sleman Regency**	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
20405	Sidokarto	29.9%	34.9%	39.9%	44.9%	49.9%	54.9%	60.0%	65.0%	70.0%	75.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20406	Sidoarum	18.8%	24.9%	31.0%	37.1%	43.3%	49.4%	55.5%	61.6%	67.8%	73.9%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20407	Sidomoyo	40.3%	44.2%	48.2%	52.2%	56.2%	60.1%	64.1%	68.1%	72.1%	76.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20501	Balecatur	12.6%	19.3%	26.1%	32.8%	39.5%	46.3%	53.0%	59.8%	66.5%	73.3%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20502	Ambarketawang	15.6%	22.0%	28.5%	34.9%	41.4%	47.8%	54.2%	60.7%	67.1%	73.6%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20503	Banyuraden	13.3%	20.0%	26.7%	33.3%	40.0%	46.7%	53.3%	60.0%	66.7%	73.3%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20504	Nogotirto	12.3%	19.1%	25.9%	32.6%	39.4%	46.2%	52.9%	59.7%	66.5%	73.2%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20505	Trihanggo	11.3%	18.2%	25.1%	31.9%	38.8%	45.7%	52.5%	59.4%	66.3%	73.1%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20601	Tirtoadi	2.7%	10.4%	18.1%	25.9%	33.6%	41.3%	49.1%	56.8%	64.5%	72.3%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20602	Sumberadi	25.0%	30.5%	36.0%	41.5%	47.0%	52.5%	58.0%	63.5%	69.0%	74.5%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20603	Tlogoadi	12.3%	19.1%	25.9%	32.6%	39.4%	46.2%	52.9%	59.7%	66.5%	73.2%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20604	Sendangadi	36.5%	40.8%	45.2%	49.5%	53.9%	58.2%	62.6%	66.9%	71.3%	75.6%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20605	Sinduadi	22.7%	28.5%	34.2%	39.9%	45.6%	51.4%	57.1%	62.8%	68.5%	74.3%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20701	Caturtunggal	12.8%	19.5%	26.2%	33.0%	39.7%	46.4%	53.1%	59.8%	66.6%	73.3%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20702	Maguwoharjo	9.2%	16.3%	23.4%	30.5%	37.5%	44.6%	51.7%	58.8%	65.8%	72.9%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20703	Condongcatur	24.1%	29.7%	35.3%	40.9%	46.5%	52.1%	57.6%	63.2%	68.8%	74.4%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20801	Sendangtirto	4.4%	11.9%	19.5%	27.1%	34.6%	42.2%	49.7%	57.3%	64.9%	72.4%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
20802	Tegaltirto	11.1%	17.9%	24.8%	31.7%	38.6%	45.5%	52.4%	59.3%	66.2%	73.1%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
21001	Purwomartani	20.4%	26.4%	32.3%	38.3%	44.2%	50.2%	56.2%	62.1%	68.1%	74.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
21101	Wedomartani	15.9%	22.3%	28.7%	35.1%	41.5%	47.9%	54.4%	60.8%	67.2%	73.6%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
21201	Sariharjo	11.0%	17.9%	24.8%	31.7%	38.6%	45.5%	52.4%	59.3%	66.2%	73.1%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
21202	Donoharjo	27.6%	32.9%	38.1%	43.3%	48.6%	53.8%	59.1%	64.3%	69.5%	74.8%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
21203	Sardonoharjo	17.2%	23.5%	29.8%	36.1%	42.3%	48.6%	54.9%	61.2%	67.4%	73.7%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
21205	Sinduharjo	27.5%	32.8%	38.0%	43.3%	48.5%	53.8%	59.0%	64.3%	69.5%	74.8%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
21206	Minomartani	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	48.0%	56.0%	64.0%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
21303	Tridadi	40.8%	44.8%	48.7%	52.6%	56.5%	60.4%	64.3%	68.3%	72.2%	76.1%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
30000	**Bantul Regency**																
30702	Ringinharjo	24.9%	30.4%	36.0%	41.5%	47.0%	52.5%	58.0%	63.5%	69.0%	74.5%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
30703	Bantul	25.1%	30.6%	36.1%	41.6%	47.1%	52.6%	58.1%	63.5%	69.0%	74.5%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
30704	Trirenggo	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	48.0%	56.0%	64.0%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
30705	Sapdodadi	1.3%	9.2%	17.0%	24.9%	32.8%	40.7%	48.5%	56.4%	64.3%	72.1%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
30803	Sumberagung	2.4%	10.1%	17.9%	25.6%	33.4%	41.2%	48.9%	56.7%	64.5%	72.2%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
30804	Trimulyo	19.9%	25.9%	31.9%	37.9%	43.9%	49.9%	55.9%	62.0%	68.0%	74.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
30907	Imogiri	6.4%	13.8%	21.1%	28.5%	35.9%	43.2%	50.6%	57.9%	65.3%	72.6%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31101	Wonokromo	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	48.0%	56.0%	64.0%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31102	Pleret	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	48.0%	56.0%	64.0%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31103	Segoroyoso	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	48.0%	56.0%	64.0%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31201	Sitimulyo	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	48.0%	56.0%	64.0%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31301	Tamanan	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	48.0%	56.0%	64.0%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31302	Jagalan	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	48.0%	56.0%	64.0%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31303	Singosaren	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	48.0%	56.0%	64.0%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31304	Wirokerten	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	48.0%	56.0%	64.0%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31305	Jambidan	0.0%	8.0%	16.0%	24.0%	32.0%	40.0%	48.0%	56.0%	64.0%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31306	Potorono	1.2%	9.1%	17.0%	24.9%	32.7%	40.6%	48.5%	56.4%	64.2%	72.1%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31307	Baturetno	3.9%	11.5%	19.1%	26.7%	34.3%	41.9%	49.5%	57.2%	64.8%	72.4%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31308	Banguntapan	1.3%	9.2%	17.1%	24.9%	32.8%	40.7%	48.5%	56.4%	64.3%	72.1%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31401	Pendowoharjo	15.1%	21.6%	28.1%	34.6%	41.1%	47.6%	54.0%	60.5%	67.0%	73.5%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31402	Timbulharjo	0.4%	8.4%	16.3%	24.3%	32.2%	40.2%	48.2%	56.1%	64.1%	72.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31403	Bangunharjo	13.4%	20.1%	26.7%	33.4%	40.1%	46.7%	53.4%	60.0%	66.7%	73.3%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31404	Panggungharjo	8.6%	15.8%	22.9%	30.1%	37.2%	44.3%	51.5%	58.6%	65.7%	72.9%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31501	Bangunjiwo	23.3%	29.0%	34.7%	40.3%	46.0%	51.7%	57.3%	63.0%	68.7%	74.3%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31502	Tirtonimolo	2.4%	10.1%	17.9%	25.7%	33.4%	41.2%	48.9%	56.7%	64.5%	72.2%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31503	Tamantirto	12.5%	19.2%	26.0%	32.7%	39.5%	46.2%	53.0%	59.7%	66.5%	73.2%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
31504	Ngestiharjo	16.1%	22.5%	28.9%	35.2%	41.6%	48.0%	54.4%	60.8%	67.2%	73.6%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%

Table 13.2.19 Service Ratio of PDAM (Rural)

20000	Sleman Regency	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
20103	Sumberagung	10.6%	15.5%	20.5%	25.4%	30.3%	35.3%	40.2%	45.2%	50.1%	55.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
20203	Sendangrejo	1.4%	7.2%	13.1%	19.0%	24.8%	30.7%	36.6%	42.4%	48.3%	54.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
20204	Sendangagung	22.5%	26.2%	30.0%	33.7%	37.5%	41.2%	45.0%	48.7%	52.5%	56.2%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
20402	Sidoluhur	16.3%	20.7%	25.0%	29.4%	33.8%	38.1%	42.5%	46.9%	51.3%	55.6%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
20404	Sidoagung	14.5%	19.0%	23.6%	28.1%	32.7%	37.2%	41.8%	46.3%	50.9%	55.4%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
20804	Kalitirto	14.3%	18.9%	23.4%	28.0%	32.6%	37.1%	41.7%	46.3%	50.9%	55.4%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
20906	Bokoharjo	17.1%	21.4%	25.7%	30.0%	34.3%	38.6%	42.9%	47.1%	51.4%	55.7%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21002	Tirtomartani	5.8%	11.2%	16.6%	22.0%	27.5%	32.9%	38.3%	43.7%	49.2%	54.6%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21004	Selomartani	2.7%	8.4%	14.2%	19.9%	25.6%	31.4%	37.1%	42.8%	48.5%	54.3%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21102	Widodomartani	21.2%	25.1%	29.0%	32.8%	36.7%	40.6%	44.5%	48.4%	52.2%	56.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21103	Bimomartani	37.5%	39.8%	42.0%	44.3%	46.5%	48.8%	51.0%	53.3%	55.5%	57.8%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21104	Sindumartani	42.4%	44.1%	45.9%	47.7%	49.4%	51.2%	53.0%	54.7%	56.5%	58.2%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21105	Umbulmartani	28.6%	31.7%	34.9%	38.0%	41.2%	44.3%	47.4%	50.6%	53.7%	56.9%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21204	Sukoharjo	21.5%	25.4%	29.2%	33.1%	36.9%	40.8%	44.6%	48.5%	52.3%	56.2%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21301	Caturharjo	6.4%	11.8%	17.1%	22.5%	27.8%	33.2%	38.6%	43.9%	49.3%	54.6%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21302	Triharjo	6.7%	12.0%	17.4%	22.7%	28.0%	33.4%	38.7%	44.0%	49.3%	54.7%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21304	Pandowoharjo	10.5%	15.4%	20.4%	25.3%	30.3%	35.2%	40.2%	45.1%	50.1%	55.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21401	Banyurejo	11.8%	16.6%	21.4%	26.3%	31.1%	35.9%	40.7%	45.5%	50.4%	55.2%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21402	Tambakrejo	4.9%	10.4%	16.0%	21.5%	27.0%	32.5%	38.0%	43.5%	49.0%	54.5%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21403	Sumberejo	2.7%	8.4%	14.1%	19.9%	25.6%	31.3%	37.1%	42.8%	48.5%	54.3%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21502	Donokerto	16.3%	20.6%	25.0%	29.4%	33.8%	38.1%	42.5%	46.9%	51.3%	55.6%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21504	Wonokerto	3.3%	9.0%	14.7%	20.3%	26.0%	31.7%	37.3%	43.0%	48.7%	54.3%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21603	Harjobinangun	7.2%	12.5%	17.8%	23.0%	28.3%	33.6%	38.9%	44.2%	49.4%	54.7%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21604	Pakembinangun	21.0%	24.9%	28.8%	32.7%	36.6%	40.5%	44.4%	48.3%	52.2%	56.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
21702	Argomulyo	5.2%	10.7%	16.2%	21.6%	27.1%	32.6%	38.1%	43.6%	49.0%	54.5%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30000	**Bantul Regency**																
30101	Poncosari	5.2%	10.7%	16.2%	21.7%	27.1%	32.6%	38.1%	43.6%	49.0%	54.5%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30102	Trimurti	3.6%	9.2%	14.9%	20.5%	26.2%	31.8%	37.4%	43.1%	48.7%	54.4%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30201	Gadingsari	0.7%	6.6%	12.5%	18.5%	24.4%	30.3%	36.3%	42.2%	48.1%	54.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30202	Gadingharjo	3.5%	9.2%	14.8%	20.5%	26.1%	31.8%	37.4%	43.1%	48.7%	54.4%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30203	Srigading	0.2%	6.2%	12.2%	18.1%	24.1%	30.1%	36.1%	42.1%	48.0%	54.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30204	Murtigading	7.9%	13.1%	18.3%	23.5%	28.7%	33.9%	39.1%	44.4%	49.6%	54.8%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30302	Parangtritis	2.7%	8.4%	14.1%	19.9%	25.6%	31.3%	37.1%	42.8%	48.5%	54.3%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30303	Donotirto	1.2%	7.1%	13.0%	18.8%	24.7%	30.6%	36.5%	42.4%	48.2%	54.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30304	Tirtosari	0.6%	6.5%	12.5%	18.4%	24.4%	30.3%	36.2%	42.2%	48.1%	54.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30305	Tirtomulyo	0.3%	6.3%	12.3%	18.2%	24.2%	30.2%	36.1%	42.1%	48.1%	54.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30402	Panjangrejo	1.6%	7.5%	13.3%	19.2%	25.0%	30.8%	36.7%	42.5%	48.3%	54.2%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30403	Srihandono	0.5%	6.4%	12.4%	18.3%	24.3%	30.2%	36.2%	42.1%	48.1%	54.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30501	Sidomulyo	15.3%	19.7%	24.2%	28.7%	33.2%	37.6%	42.1%	46.6%	51.1%	55.5%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30502	Mulyodadi	1.4%	7.2%	13.1%	19.0%	24.8%	30.7%	36.6%	42.4%	48.3%	54.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30503	Sumbermulyo	1.6%	7.4%	13.2%	19.1%	24.9%	30.8%	36.6%	42.5%	48.3%	54.2%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30603	Gilangharjo	0.2%	6.2%	12.2%	18.2%	24.1%	30.1%	36.1%	42.1%	48.0%	54.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30604	Wijirejo	3.9%	9.5%	15.1%	20.7%	26.3%	31.9%	37.6%	43.2%	48.8%	54.4%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30701	Palbapang	0.5%	6.4%	12.4%	18.3%	24.3%	30.2%	36.2%	42.1%	48.1%	54.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30801	Patalan	0.2%	6.2%	12.2%	18.1%	24.1%	30.1%	36.1%	42.1%	48.0%	54.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30904	Karangtengah	0.7%	6.6%	12.5%	18.5%	24.4%	30.3%	36.3%	42.2%	48.1%	54.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30905	Girirejo	1.1%	7.0%	12.9%	18.8%	24.7%	30.5%	36.4%	42.3%	48.2%	54.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30906	Karangtalun	8.5%	13.6%	18.8%	23.9%	29.1%	34.2%	39.4%	44.5%	49.7%	54.8%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
30908	Wukirsari	1.5%	7.3%	13.2%	19.0%	24.9%	30.7%	36.6%	42.4%	48.3%	54.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
31003	Dlingo	9.2%	14.3%	19.3%	24.4%	29.5%	34.6%	39.7%	44.8%	49.8%	54.9%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
31004	Temuwuh	17.0%	21.3%	25.6%	29.9%	34.2%	38.5%	42.8%	47.1%	51.4%	55.7%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
31005	Jatimulyo	18.5%	22.6%	26.8%	30.9%	35.1%	39.2%	43.4%	47.5%	51.7%	55.8%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
31006	Terong	1.1%	7.0%	12.8%	18.7%	24.6%	30.5%	36.4%	42.3%	48.2%	54.1%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
31202	Srimulyo	4.3%	9.8%	15.4%	21.0%	26.6%	32.1%	37.7%	43.3%	48.9%	54.4%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
31203	Srimartani	4.6%	10.1%	15.7%	21.2%	26.8%	32.3%	37.8%	43.4%	48.9%	54.5%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
31602	Sendangsari	7.2%	12.5%	17.7%	23.0%	28.3%	33.6%	38.9%	44.2%	49.4%	54.7%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
31603	Guwosari	25.6%	29.0%	32.5%	35.9%	39.3%	42.8%	46.2%	49.7%	53.1%	56.6%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
31702	Argorejo	26.5%	29.9%	33.2%	36.6%	39.9%	43.3%	46.6%	50.0%	53.3%	56.7%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
31703	Argosari	10.1%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	45.0%	50.0%	55.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
31704	Argomulyo	28.1%	31.3%	34.5%	37.7%	40.9%	44.1%	47.2%	50.4%	53.6%	56.8%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%

13.2.4 Future Domestic Water Demand

From domestic service ratio in respective Kelurahan/Desa, future served population is calculated. From the calculated served population and per capita domestic water demand which are discussed in previous sections, future domestic water demand is calculated as explained below.

(1) Yogyakarta Municipality

Future domestic water demand for Yogyakarta Municipality by respective Kelurahan is shown in Appendix 13. Figure 13.2.7 shows the future domestic water demand and groundwater requirement which will be used through private well.

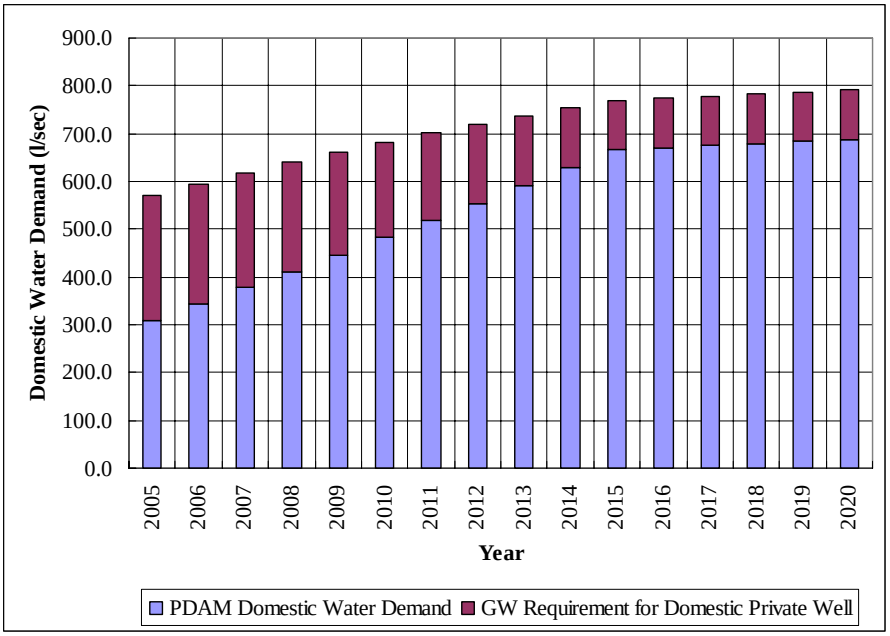


Figure 13.2.7 Yogyakarta Municipality, Future Domestic Water Demand and Groundwater Requirement for Private Well

Since dependency rate on private well will be decrease from current 80% to 20 % in 2020, volume of groundwater usage will decrease gradually.

(2) Sleman and Bantul Regencies, Future Domestic Water Demand

Future domestic water demands for Sleman and Bantul Regencies are shown in Appendix 13 in form of tables as shown below.

- Sleman and Bantul Regencies, Future Domestic Water Demand for PDAM (Urban)

(l/sec)

- Sleman and Bantul Regencies, Future Domestic Water Demand for PDAM (Rural) (l/sec)
- Sleman and Bantul Regencies, Future Domestic Water Demand for Community Water Supply System (l/sec)
- Sleman and Bantul Regencies, Future Domestic Groundwater Requirement (l/sec)

For Yogyakarta Municipality, future domestic water demands are described by only two categories such as "PDAM (urban)" and "groundwater requirement through private wells". On the other hand for Sleman and Bantul Regencies, there are four categories of domestic water demand. They are;

- PDAM (urban): water demand which will occur in urban area and which will be met by PDAM,
- PDAM (rural): water demand which will occur in rural area and which will be met by PDAM,
- Community System: water demand will occur in rural area and which will be met by community water supply system, and
- GW requirement for domestic private well: this is a total groundwater requirement of private well usage of PDAM customers and water usage of unserved population either by PDAM or community water supply system.

Figures 13.2.8 and 13.2.9 show summary of domestic water demands for Sleman and Bantul Regencies, respectively.

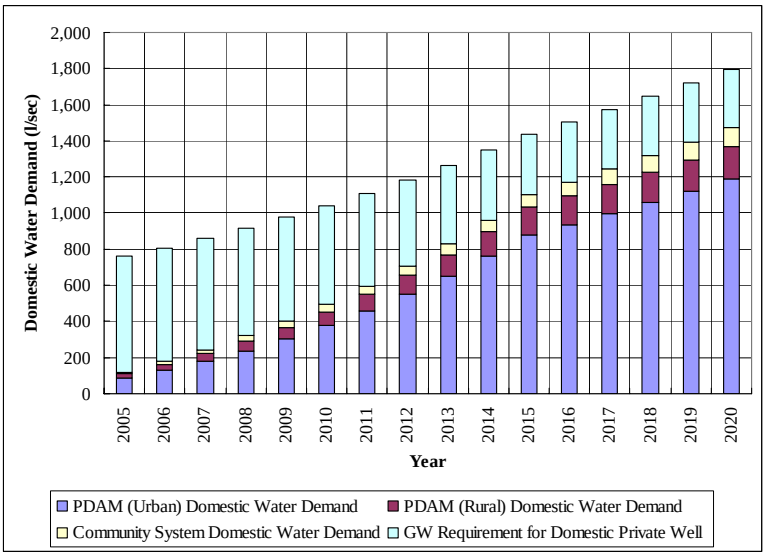


Figure 13.2.8 Summary of Domestic Water Demand in Sleman Regency

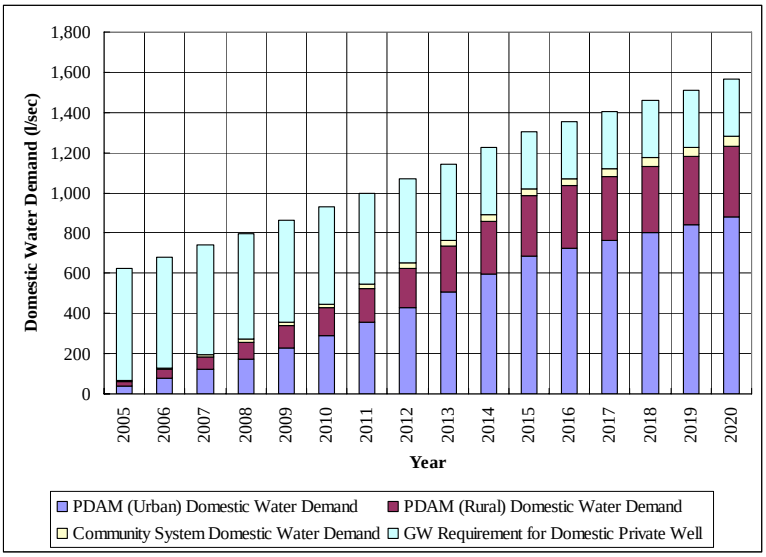


Figure 13.2.9 Summary of Domestic Water Demand in Bantul Regency

(3) Summary of Domestic Water Demand

Summary of the domestic water demands for Yogyakarta Municipality, Sleman and Bantul Regencies are shown on Figures 13.2 10 to 13.2.13.

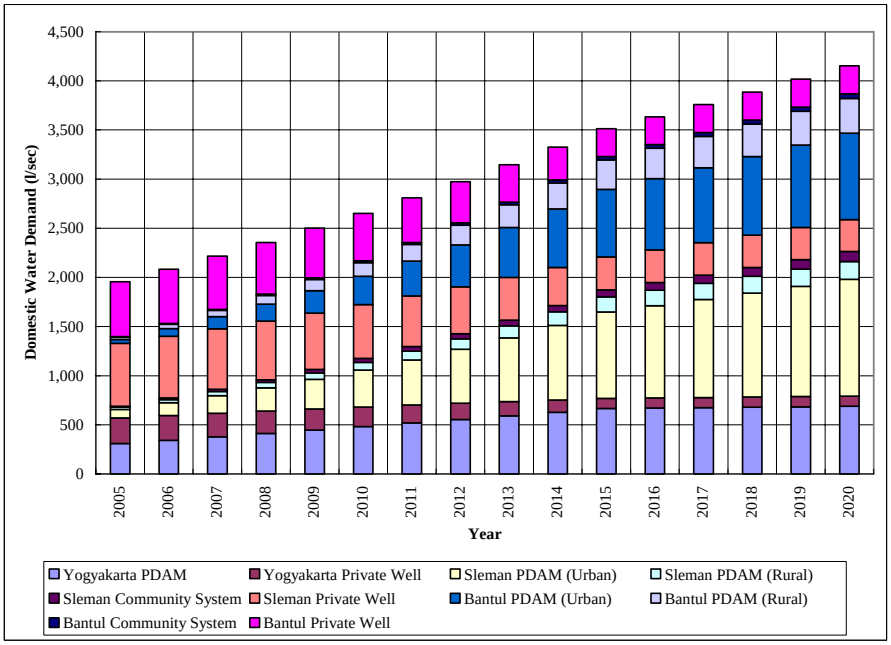


Figure 13.2.10 Summary of Domestic Water Demand

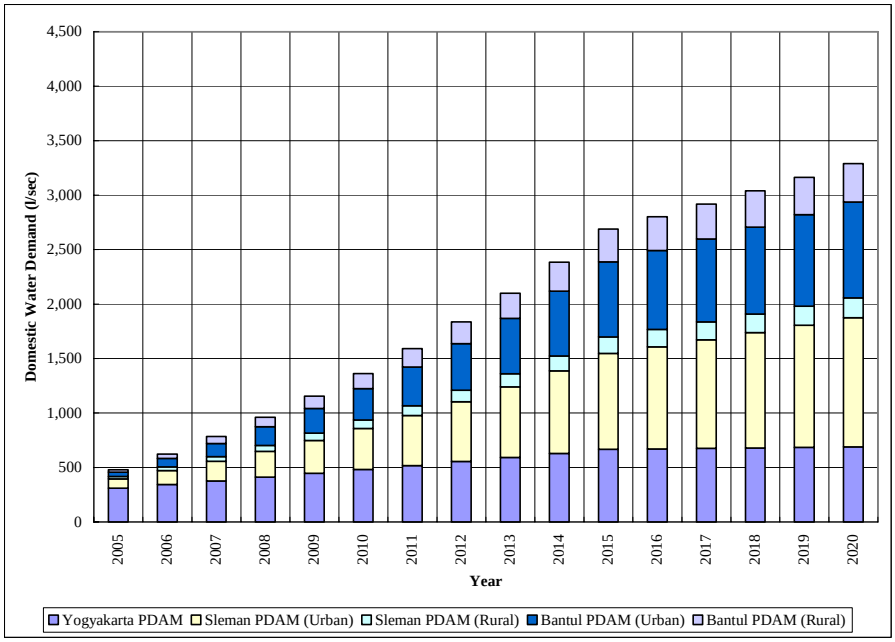


Figure 13.2.11 Summary of Domestic Water Demand which will be Supplied by PDAMs

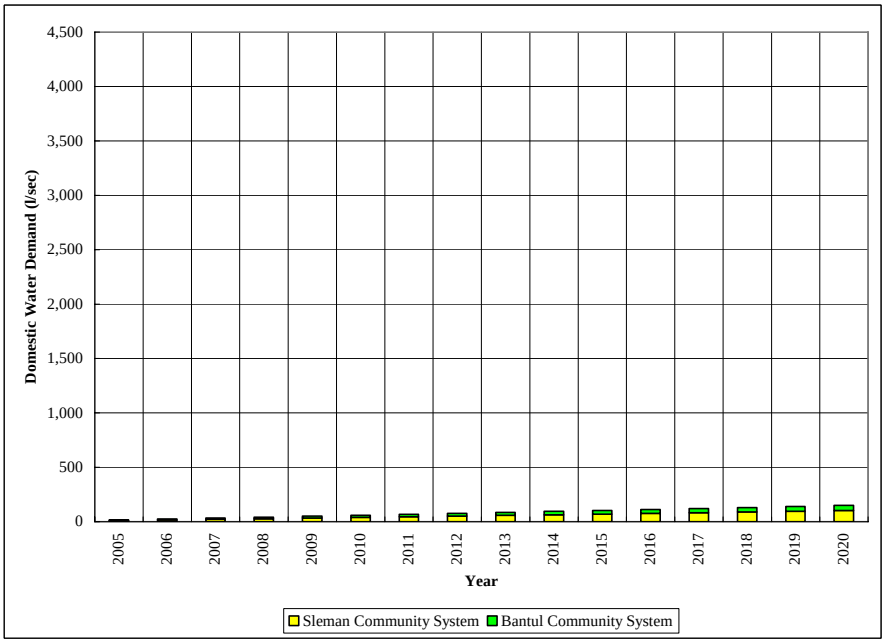


Figure 13.2.12 Summary of Domestic Water Demand which will be Supplied by Community Water Supply System

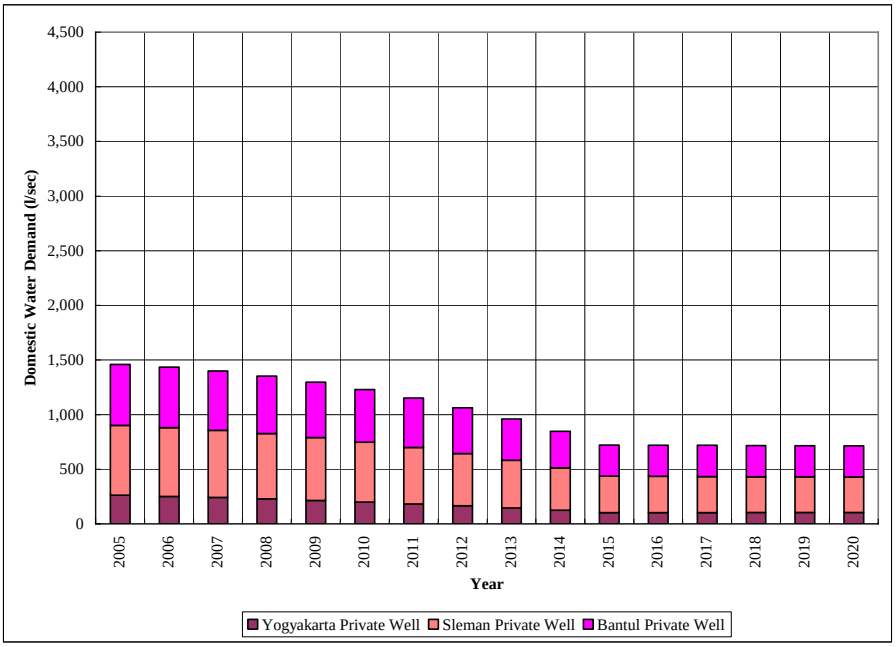


Figure 13.2.13 Groundwater Requirement through Private Wells

13.2.5 Non-Domestic Water Demand

(1) Future Public Service Water Demand

Future public service water demand is projected to increase from current water consumption as public service applying increase ratio as same as total population increase ratio.

(2) Future Commercial Water Demand

1) General Commercial Water Demand

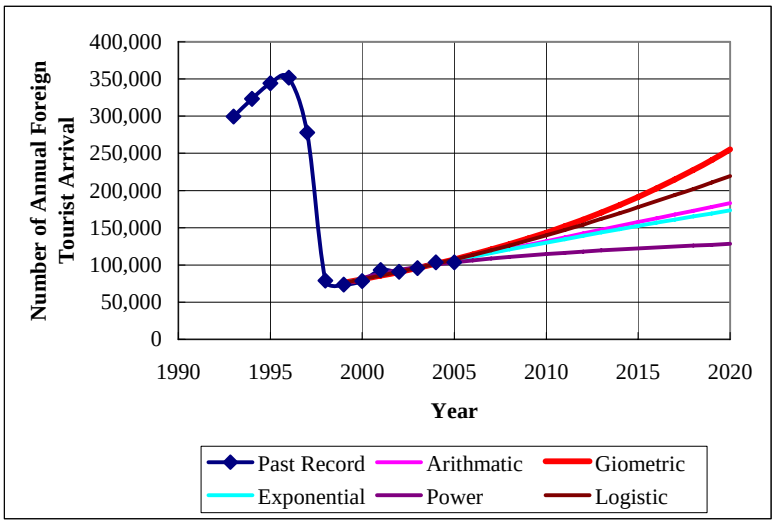
Future general commercial water demand is projected by assuming the increase ratio shall be 4.7 %, with a contant ratio up to the year of 2020. This ratio is regarded as same as the past 5 year average increase ratio of GDRP (Gross Domestic Regional Products).

2) Tourism Related Commercial Water Demand

Future tourism related commercial water demand is projected based on number of tourist arrival to DIY.

Future Number of Tourist Arrival

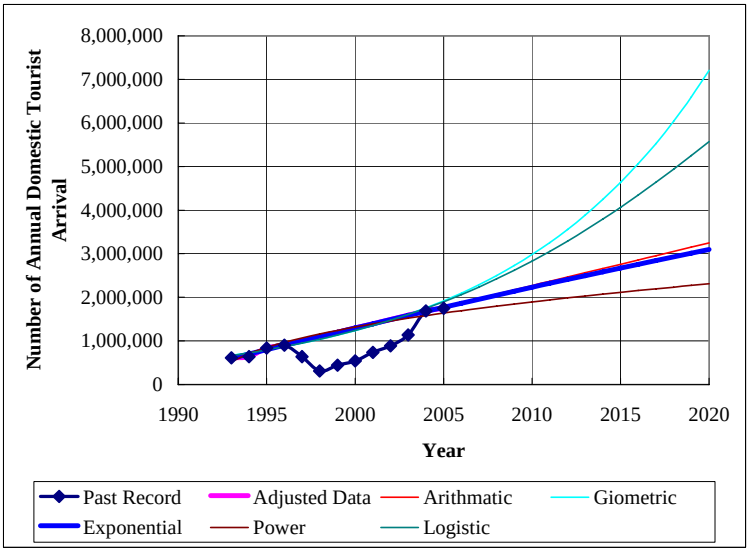
Future number of tourist arrival is projected as shown on Figures 13.2.14 and 13.2.15 for foreign and domestic tourists, respectively. To project future number of tourists, five statistical equations which were applied to population forecasts were also applied.



Source：Badan Parwisata Daerah Propinsi DIY

Figure 13.2.14 Projection of Annual Foreign Tourist Arrival

As shown on figure above, number of foreign tourists was drastically decreased from 1997 when financial crisis occurred in Asia. Therefore, data after year 1999 were utilized for the projection, data before 1998 were neglected. In above figure, Geometric Curve is applied for future tourist population since it has the highest conformity to the past record.



Source：Badan Parwisata Daerah Propinsi DIY

Figure 13.2.15 Projection of Annual Domestic Tourist Arrival

Regarding domestic tourists, number of tourist arrivals also decreased from 1997, however, number of tourists was recovered from year 2004 as shown on figure above. Future number of domestic tourists are calculated applying Exponential Curve since it has the highest conformity to the past record of tourist numbers.

From future number of foreign and domestic tourist population, total tourist population in future is projected as shown on Figure 13.2.16.

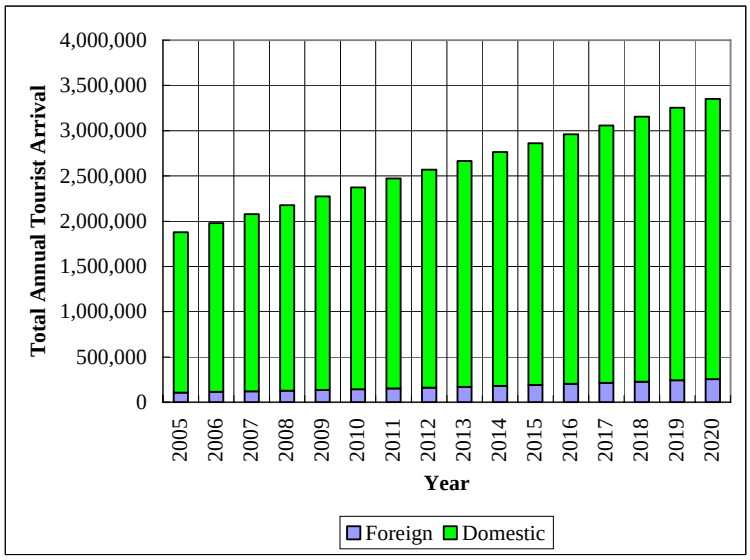


Figure 13.2.16 Total Annual Tourist Arrival to DIY

According to the data obtained from tourism department, average length of stay of tourists is summarized as shown on Table 13.2.20.

Table 13.2.20 Average Length of Stay

	Foreign Tourists		Domestic Tourists	
Year	Star Hotels	Economy Hotels	Star Hotels	Economy Hotels
2001	2.03	2.05	1.65	1.10
2002	1.83	1.91	1.84	1.25
2003	1.95	1.80	1.78	1.20
2004	1.84	2.20	1.65	1.46
2005	2.41	2.22	2.30	1.65
Average	**2.01**	**2.04**	**1.84**	**1.33**

Source：Badan Parwisata Daerah Propinsi DIY

From total number of tourists and average length of stay, daily number of tourists is calculated as follows.

Table 13.2.21 Daily Number of Tourist Stay in DIY

Year	Foreign Tourists			Domestic Tourists			Total Tourists		
	Star Hotels	Economy Hotels	Total	Star Hotels	Economy Hotels	Total	Star Hotels	Economy Hotels	Total
2005	454	140	595	3,244	4,120	7,363	3,698	4,260	7,958
2006	481	148	630	3,414	4,336	7,751	3,896	4,485	8,380
2007	510	157	667	3,583	4,551	8,135	4,093	4,709	8,802
2008	540	167	707	3,751	4,765	8,516	4,292	4,931	9,223
2009	572	177	749	3,918	4,977	8,895	4,490	5,153	9,643
2010	606	187	793	4,084	5,187	9,270	4,690	5,374	10,063
2011	642	198	840	4,248	5,395	9,643	4,890	5,593	10,483
2012	680	210	890	4,411	5,602	10,013	5,091	5,812	10,903
2013	721	222	943	4,572	5,807	10,380	5,293	6,030	11,323
2014	763	235	999	4,733	6,011	10,744	5,496	6,247	11,743
2015	809	249	1,058	4,892	6,214	11,106	5,701	6,463	12,164
2016	857	264	1,121	5,050	6,414	11,464	5,907	6,678	12,585
2017	908	280	1,187	5,207	6,613	11,820	6,114	6,893	13,008
2018	961	297	1,258	5,362	6,811	12,174	6,324	7,108	13,431
2019	1,018	314	1,333	5,517	7,007	12,524	6,535	7,321	13,857
2020	1,079	333	1,412	5,670	7,202	12,872	6,749	7,535	14,284

Per Capita Water Demand of Tourist

Per capita water demand of tourist per day is estimated as follows considering other resort's water consumption.

Table 13.2.22 Per Tourist Water Demand per Day

Stay at	Per Capita Water Demand per Day (lpcd)
Star Hotels	420
Economy Hotels	260

From daily number of tourists and per tourist water demand, future tourism water demand is calculated as shown on Table 13.2.23. Proportion of water demand for Yogyakarta, Sleman and Bantul is calculated based on number of hotel rooms in each municipality/regency.

Table 13.2.23 Future Tourism Water Demand (l/sec)

	Yogyakarta			Sleman			Bantul		
	Star Hotel	Econ. Hotel	Total	Star Hotel	Econ. Hotel	Total	Star Hotel	Econ. Hotel	Total
2005	8.3	5.1	13.5	9.5	5.1	14.6	4.4	2.1	6.4
2006	8.8	5.4	14.2	10.0	5.4	15.4	4.6	2.2	6.8
2007	9.2	5.7	14.9	10.5	5.7	16.1	4.9	2.3	7.1
2008	9.7	5.9	15.6	11.0	5.9	16.9	5.1	2.4	7.5
2009	10.1	6.2	16.3	11.5	6.2	17.7	5.3	2.5	7.8
2010	10.6	6.5	17.0	12.0	6.5	18.5	5.6	2.6	8.2
2011	11.0	6.7	17.8	12.5	6.7	19.2	5.8	2.7	8.5
2012	11.5	7.0	18.5	13.0	7.0	20.0	6.0	2.8	8.8
2013	11.9	7.3	19.2	13.5	7.3	20.8	6.3	2.9	9.2
2014	12.4	7.5	19.9	14.1	7.5	21.6	6.5	3.0	9.5
2015	12.9	7.8	20.6	14.6	7.8	22.4	6.8	3.1	9.9
2016	13.3	8.0	21.4	15.1	8.0	23.1	7.0	3.2	10.2
2017	13.8	8.3	22.1	15.6	8.3	23.9	7.3	3.3	10.6
2018	14.3	8.6	22.8	16.2	8.6	24.7	7.5	3.4	10.9
2019	14.7	8.8	23.5	16.7	8.8	25.5	7.8	3.5	11.3
2020	15.2	9.1	24.3	17.3	9.1	26.3	8.0	3.6	11.6

(3) Future Industrial Water Demand

Future industrial water demand is projected by increase ratio of 4.7 % of which past 5 year average increase ratio of GDRP (Gross Domestic Regional Products). For Sleman Regency, since there is no data of industrial water demand, same figure of Yogyakarta Municipality is applied.

13.2.6 Total Future Water Demand

From discussions made in previous sections, total future water demand is calculated as described in proceeding sections. To calculate total future water demand, following conditions are applied.

Net Water Demand: This demand is summation of domestic and non-domestic water demands and is net water demand which does not include any peak factors and UFW.

UFW Ratio: Target UFW ratio is set as 25 % in year 2020. The UFW ratio will be reduced from current level to the target UFW ratio.

Day Average Water Demand:	Summation of the Net Water Demand and UFW which will be calculated from UFW ratio (Day Average Water Demand) = (Net Water Demand) + (UFW) (UFW) = (Net Water Demand) x (UFW ratio)
Peak Factor:	Ratio of yearly average water demand and the maximum water demand in the year. Yearly average water demand and the maximum water demand in the year are obtained from past record of water supply quantity. (Peak Factor) = (Maximum demand in year) / (Average demand in year)
Day Maximum Water Demand:	This demand is the maximum water demand in the year and is the water demand to plan/design the water treatment plant. (Day Maximum Water Demand) = (Day Average Water Demand) x (Peak Factor)

Total future water demand and groundwater requirements through private wells are calculated as shown on tables and figures below.

Table 13.2.24 Yogyakarta Municipality, Total Future Water Demand

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total Population	person	408,332	408,577	408,835	409,110	409,393	409,690	410,000	410,322	410,650	410,997	411,343	411,697	412,063	412,438	412,818	413,205
Served Population	person	161,990	178,565	195,165	211,795	228,452	245,140	261,861	278,614	295,398	312,223	329,074	329,358	329,650	329,950	330,254	330,564
Service Ratio	%	39.7%	43.7%	47.7%	51.8%	55.8%	59.8%	63.9%	67.9%	71.9%	76.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Domestic Per Capita Water Demand	lpcd	165.0	166.0	167.0	168.0	169.0	170.0	171.0	172.0	173.0	174.0	175.0	176.0	177.0	178.0	179.0	180.0
Net Water Demand	l/sec	344.5	381.4	419.0	457.3	496.3	536.0	576.5	617.8	659.8	702.6	746.3	756.9	768.0	779.5	791.5	803.9
Public Services	l/sec	14.3	14.4	14.6	14.7	14.9	15.1	15.2	15.4	15.5	15.7	15.9	16.0	16.2	16.4	16.6	16.7
Domestic	l/sec	309.4	343.1	377.2	411.8	446.9	482.3	518.3	554.6	591.5	628.8	666.5	670.9	675.3	679.8	684.2	688.7
Commercial	l/sec	17.7	20.7	24.0	27.5	31.3	35.4	39.8	44.5	49.5	54.9	60.6	66.7	73.2	80.0	87.4	95.1
Industrial	l/sec	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4
Public Standpipe	l/sec	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Palace	l/sec	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
UFW Ratio	%	41.2%	40.1%	39.1%	38.0%	36.9%	35.8%	34.7%	33.6%	32.6%	31.5%	30.4%	29.3%	28.2%	27.2%	26.1%	25%
UFW	l/sec	142.0	153.1	163.6	173.6	183.1	192.0	200.2	207.9	214.9	221.2	226.9	222.0	216.9	211.7	206.4	201.0
Day Average Water Demand	l/sec	486.5	534.5	582.6	630.9	679.4	728.0	776.7	825.6	874.7	923.9	973.2	978.9	984.9	991.3	997.9	1,004.9
Peak Factor	-	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Day Maximum Water Demand	**l/sec**	**583.8**	**641.4**	**699.2**	**757.1**	**815.3**	**873.6**	**932.1**	**990.8**	**1,049.6**	**1,108.6**	**1,167.8**	**1,174.7**	**1,181.9**	**1,189.5**	**1,197.5**	**1,205.9**

Table 13.2.25 Yogyakarta Municipality, Future Groundwater Requirement through Private Wells

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Domestic	l/sec	261.1	251.5	240.5	228.2	214.5	199.4	182.9	165.0	145.7	125.0	102.8	102.9	103.0	103.1	103.2	103.3
GW for Commercial	l/sec	31.2	30.5	29.7	28.8	27.6	26.2	24.7	22.9	20.9	18.7	16.2	13.5	10.6	7.3	3.8	0.0
Total GW Requirement	**l/sec**	**292.2**	**282.0**	**270.3**	**257.0**	**242.1**	**225.6**	**207.6**	**187.9**	**166.6**	**143.7**	**119.1**	**116.5**	**113.6**	**110.5**	**107.0**	**103.3**

Yogyakarta Municipality

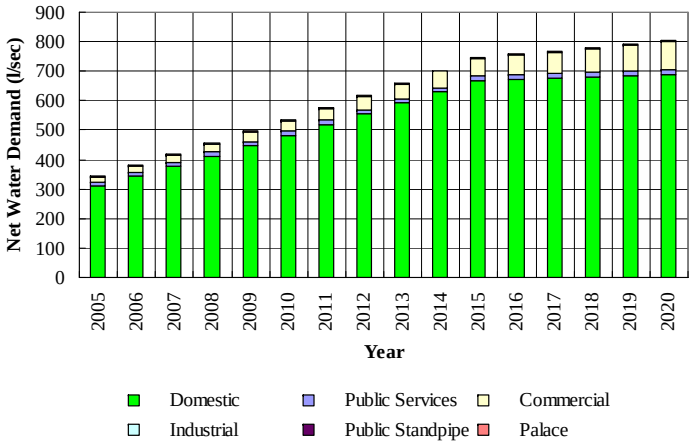


Figure 13.2.17 Net Water Demand for PDAM

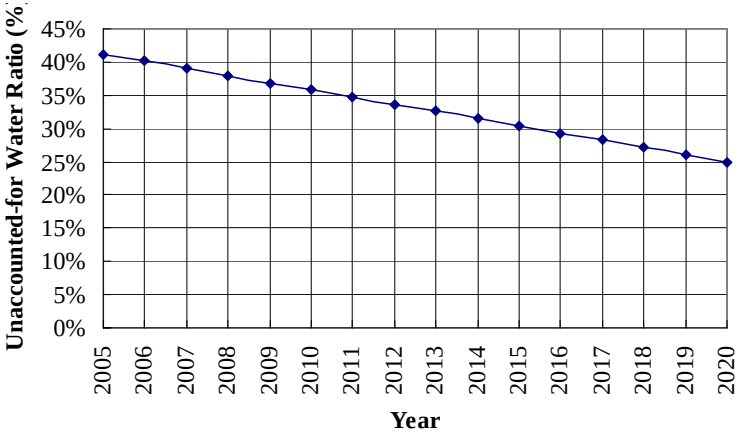


Figure 13.2.18 Future UFW Ratio

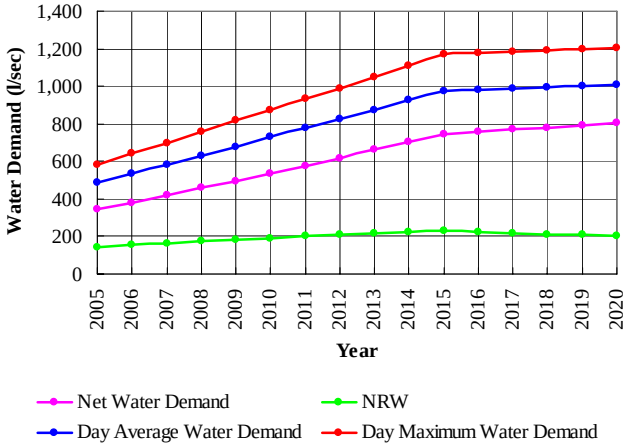


Figure 13.2.19 Total Future Water Demand

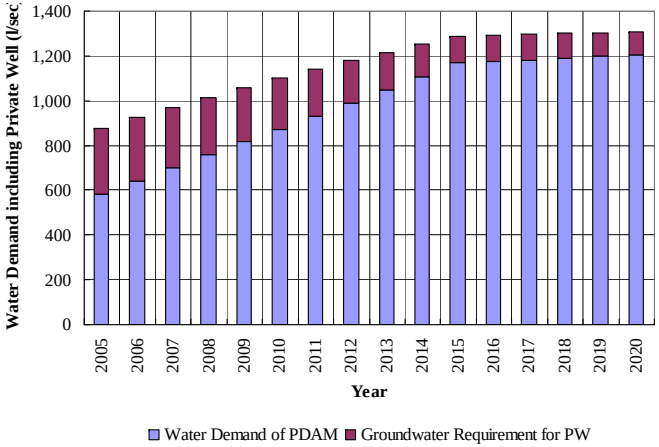


Figure 13.2.20 Total Future Water Demand and Groundwater Requirement for Private Wells

Table 13.2.26 Sleman Regency, Total Future Water Demand

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total Population	person	960,803	973,644	986,670	999,892	1,013,316	1,026,937	1,040,770	1,054,835	1,069,111	1,083,617	1,098,354	1,113,338	1,128,576	1,144,055	1,159,802	1,175,815
Served Population	person	135,227	188,837	244,008	300,774	359,171	419,235	481,008	544,535	609,849	677,000	746,029	765,855	785,958	806,332	826,997	847,954
Served Population by PDAM (Urban)	person	92,448	128,360	165,657	204,372	244,537	286,185	329,349	374,073	420,389	468,341	517,965	527,994	538,194	548,567	559,119	569,859
Served Population by PDAM (Rural)	person	26,847	36,323	45,897	55,572	65,351	75,234	85,228	95,334	105,551	115,885	126,337	127,093	127,865	128,646	129,443	130,253
Served Population by Community Wa	person	15,932	24,155	32,454	40,829	49,283	57,816	66,430	75,128	83,908	92,774	101,727	110,768	119,898	129,119	138,434	147,842
Service Ratio	%	14.1%	19.4%	24.7%	30.1%	35.4%	40.8%	46.2%	51.6%	57.0%	62.5%	67.9%	68.8%	69.6%	70.5%	71.3%	72.1%
Service Ratio by PDAM (Urban)	%	9.6%	13.2%	16.8%	20.4%	24.1%	27.9%	31.6%	35.5%	39.3%	43.2%	47.2%	47.4%	47.7%	47.9%	48.2%	48.5%
Service Ratio by PDAM (Rural)	%	2.8%	3.7%	4.7%	5.6%	6.4%	7.3%	8.2%	9.0%	9.9%	10.7%	11.5%	11.4%	11.3%	11.2%	11.2%	11.1%
Service Ratio by Community Wate	%	1.7%	2.5%	3.3%	4.1%	4.9%	5.6%	6.4%	7.1%	7.8%	8.6%	9.3%	9.9%	10.6%	11.3%	11.9%	12.6%
Domestic Per Capita Water Demand																	
by PDAM (Urban)	lpcd	80.0	86.7	93.3	100.0	106.7	113.3	120.0	126.7	133.3	140.0	146.7	153.3	160.0	166.7	173.3	180.0
by PDAM (Rural)	lpcd	75.0	78.0	81.0	84.0	87.0	90.0	93.0	96.0	99.0	102.0	105.0	108.0	111.0	114.0	117.0	120.0
by Community Water Supply Syste	lpcd	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Net Water Demand	l/sec	127.8	187.4	255.1	331.0	415.7	509.5	612.7	726.0	849.6	984.1	1,129.8	1,201.8	1,275.9	1,352.1	1,430.6	1,511.4
Public Services	l/sec	4.0	4.1	4.1	4.2	4.2	4.3	4.3	4.4	4.5	4.5	4.6	4.6	4.7	4.8	4.8	4.9
Domestic	l/sec	120.0	178.3	244.5	318.9	401.9	493.9	595.3	706.5	828.0	960.1	1,103.4	1,172.8	1,244.2	1,317.6	1,393.1	1,470.8
PDAM (Urban)	l/sec	85.6	128.8	179.0	236.5	301.9	375.4	457.4	548.4	648.7	758.9	879.3	937.0	996.7	1,058.2	1,121.7	1,187.2
PDAM (Rural)	l/sec	23.3	32.8	43.0	54.0	65.8	78.4	91.7	105.9	120.9	136.8	153.5	158.9	164.3	169.7	175.3	180.9
Community	l/sec	11.1	16.8	22.5	28.4	34.2	40.2	46.1	52.2	58.3	64.4	70.6	76.9	83.3	89.7	96.1	102.7
Commercial	l/sec	1.8	3.0	4.4	5.9	7.5	9.2	11.0	13.0	15.1	17.3	19.7	22.2	24.8	27.6	30.5	33.5
Industrial	l/sec	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4
Public Standpipe	l/sec	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
UFW Ratio	%	46.4%	45.0%	43.5%	42.1%	40.7%	39.3%	37.8%	36.4%	35.0%	33.6%	32.1%	30.7%	29.3%	27.9%	26.4%	25%
UFW	l/sec	59.3	84.3	111.1	139.4	169.2	200.1	231.9	264.4	297.3	330.3	363.1	369.0	373.6	376.6	378.1	377.9
Day Average Water Demand	l/sec	187.1	271.8	366.1	470.4	584.8	709.5	844.6	990.4	1,146.9	1,314.3	1,492.9	1,570.8	1,649.4	1,728.7	1,808.7	1,889.3
Peak Factor	-	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Day Maximum Water Demand	**l/sec**	**224.5**	**326.1**	**439.4**	**564.5**	**701.8**	**851.4**	**1,013.5**	**1,188.4**	**1,376.3**	**1,577.2**	**1,791.5**	**1,885.0**	**1,979.3**	**2,074.5**	**2,170.4**	**2,267.2**

Table 13.2.27 Sleman Regency, Future Groundwater Requirement through Private Wells

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Domestic	l/sec	639.6	629.6	615.6	597.4	574.8	547.5	515.4	478.2	435.8	387.9	334.2	332.3	330.4	328.6	326.7	324.9
GW for Commercial	l/sec	16.4	16.1	15.7	15.2	14.6	13.8	13.0	12.0	10.9	9.7	8.4	7.0	5.4	3.7	1.9	0.0
Total GW Requirement	**l/sec**	**656.0**	**645.7**	**631.3**	**612.6**	**589.3**	**561.3**	**528.4**	**490.3**	**446.7**	**397.6**	**342.6**	**339.3**	**335.9**	**332.3**	**328.7**	**324.9**

Sleman Regency

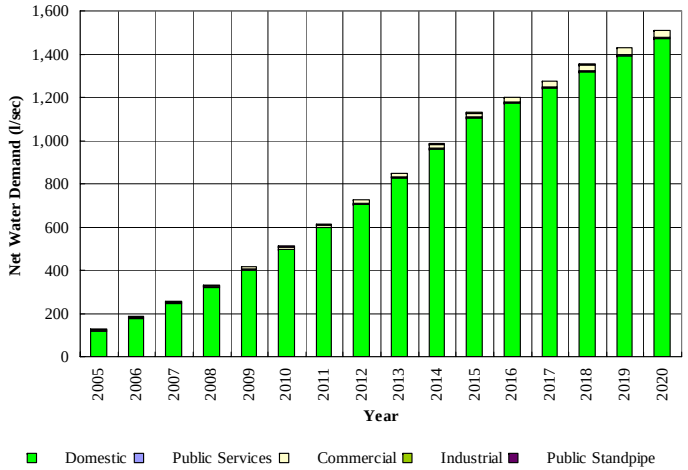


Figure 13.2.21 Net Water Demand for PDAM and Community Water Supply System

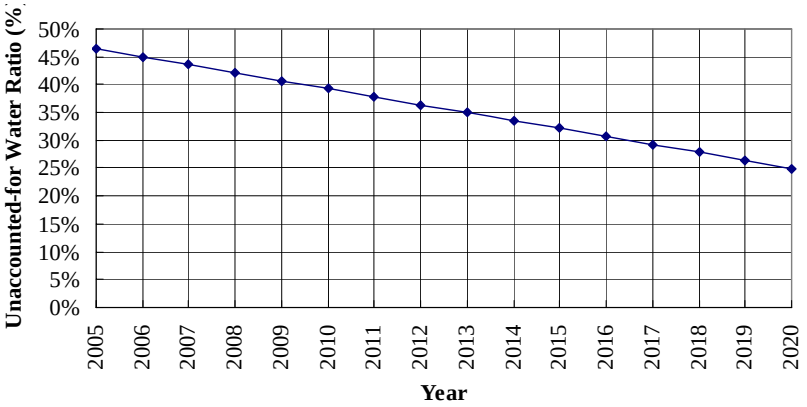


Figure 13.2.22 Future UFW Ratio

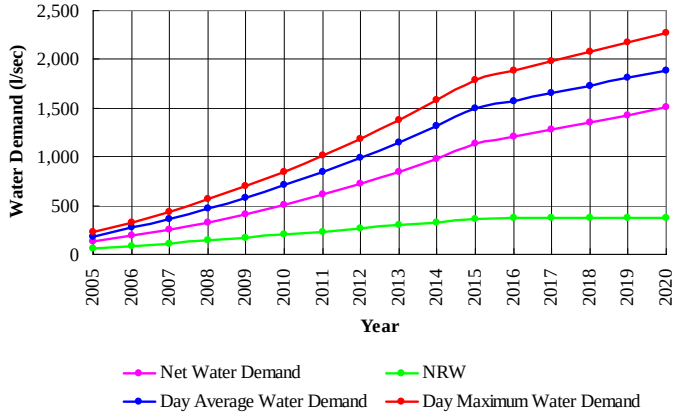


Figure 13.2.23 Total Future Water Demand

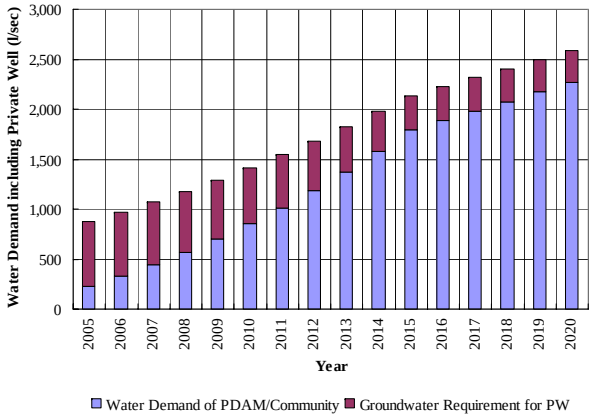


Figure 13.2.24 Total Future Water Demand and Groundwater Requirement for Private Wells

Table 13.2.28 Bantul Regency, Total Future Water Demand

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total Population	person	825,285	834,594	844,041	853,616	863,334	873,184	883,183	893,332	903,634	914,083	924,691	935,458	946,392	957,498	968,769	980,225
Served Population	person	62,470	113,529	165,837	219,421	274,308	330,525	388,105	447,079	507,476	569,327	632,667	644,556	656,602	668,810	681,174	693,713
Served Population by PDAM (Urban)	person	33,051	63,493	94,982	127,542	161,199	195,977	231,901	269,005	307,309	346,845	387,643	394,350	401,166	408,098	415,141	422,310
Served Population by PDAM (Rural)	person	20,239	37,144	54,222	71,474	88,905	106,516	124,313	142,294	160,469	178,836	197,398	198,569	199,759	200,961	202,180	203,412
Served Population by Community Wa	person	9,180	12,892	16,634	20,404	24,204	28,033	31,891	35,780	39,699	43,647	47,627	51,637	55,677	59,750	63,854	67,990
Service Ratio	%	7.6%	13.6%	19.6%	25.7%	31.8%	37.9%	43.9%	50.0%	56.2%	62.3%	68.4%	68.9%	69.4%	69.8%	70.3%	70.8%
Service Ratio by PDAM (Urban)	%	4.0%	7.6%	11.3%	14.9%	18.7%	22.4%	26.3%	30.1%	34.0%	37.9%	41.9%	42.2%	42.4%	42.6%	42.9%	43.1%
Service Ratio by PDAM (Rural)	%	2.5%	4.5%	6.4%	8.4%	10.3%	12.2%	14.1%	15.9%	17.8%	19.6%	21.3%	21.2%	21.1%	21.0%	20.9%	20.8%
Service Ratio by Community Wate	%	1.1%	1.5%	2.0%	2.4%	2.8%	3.2%	3.6%	4.0%	4.4%	4.8%	5.2%	5.5%	5.9%	6.2%	6.6%	6.9%
Domestic Per Capita Water Demand																	
by PDAM (Urban)	lpcd	100.0	105.3	110.7	116.0	121.3	126.7	132.0	137.3	142.7	148.0	153.3	158.7	164.0	169.3	174.7	180.0
by PDAM (Rural)	lpcd	95.0	98.7	102.3	106.0	109.7	113.3	117.0	120.7	124.3	128.0	131.7	135.3	139.0	142.7	146.3	150.0
by Community Water Supply Syste	lpcd	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Net Water Demand	l/sec	72.3	134.7	204.0	280.3	363.9	455.1	554.2	661.4	777.1	901.5	1,035.0	1,085.3	1,136.9	1,189.7	1,243.8	1,299.3
Public Services	l/sec	2.7	2.7	2.8	2.8	2.8	2.9	2.9	2.9	3.0	3.0	3.0	3.1	3.1	3.1	3.2	3.2
Domestic	l/sec	66.9	128.8	197.4	273.1	356.0	446.5	544.8	651.2	765.9	889.4	1,021.8	1,071.1	1,121.5	1,173.1	1,226.0	1,280.2
PDAM (Urban)	l/sec	38.3	77.4	121.7	171.2	226.4	287.3	354.3	427.6	507.4	594.1	687.9	724.2	761.5	799.8	839.3	879.8
PDAM (Rural)	l/sec	22.3	42.4	64.2	87.7	112.8	139.7	168.3	198.7	230.9	264.9	300.8	311.0	321.4	331.8	342.4	353.1
Community	l/sec	6.4	9.0	11.6	14.2	16.8	19.5	22.1	24.8	27.6	30.3	33.1	35.9	38.7	41.5	44.3	47.2
Commercial	l/sec	0.5	1.0	1.6	2.2	2.8	3.6	4.3	5.1	6.0	6.9	7.9	8.9	10.0	11.2	12.4	13.6
Industrial	l/sec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Public Standpipe	l/sec	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
UFW Ratio	%	41.5%	40.4%	39.3%	38.2%	37.1%	36.0%	34.9%	33.8%	32.7%	31.6%	30.5%	29.4%	28.3%	27.2%	26.1%	25%
UFW	l/sec	30.0	54.4	80.2	107.1	135.0	163.9	193.4	223.6	254.1	284.9	315.7	319.1	321.7	323.6	324.6	324.8
Day Average Water Demand	l/sec	102.3	189.1	284.1	387.3	498.9	619.0	747.6	885.0	1,031.2	1,186.4	1,350.7	1,404.4	1,458.6	1,513.3	1,568.5	1,624.1
Peak Factor	-	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Day Maximum Water Demand	**l/sec**	**122.7**	**227.0**	**340.9**	**464.8**	**598.7**	**742.8**	**897.2**	**1,062.0**	**1,237.5**	**1,423.7**	**1,620.8**	**1,685.3**	**1,750.4**	**1,816.0**	**1,882.2**	**1,948.9**

Table 13.2.29 Bantul Regency, Future Groundwater Requirement through Private Wells

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Domestic	l/sec	559.3	552.5	541.4	526.1	506.3	481.9	452.6	418.4	379.1	334.3	284.0	284.4	284.7	285.1	285.5	285.9
GW for Commercial	l/sec	6.9	6.8	6.6	6.4	6.2	5.9	5.5	5.1	4.6	4.1	3.6	2.9	2.3	1.6	0.8	0.0
Total GW Requirement	**l/sec**	**566.3**	**559.3**	**548.1**	**532.5**	**512.5**	**487.7**	**458.1**	**423.5**	**383.7**	**338.4**	**287.6**	**287.3**	**287.0**	**286.6**	**286.3**	**285.9**

Bantul Regency

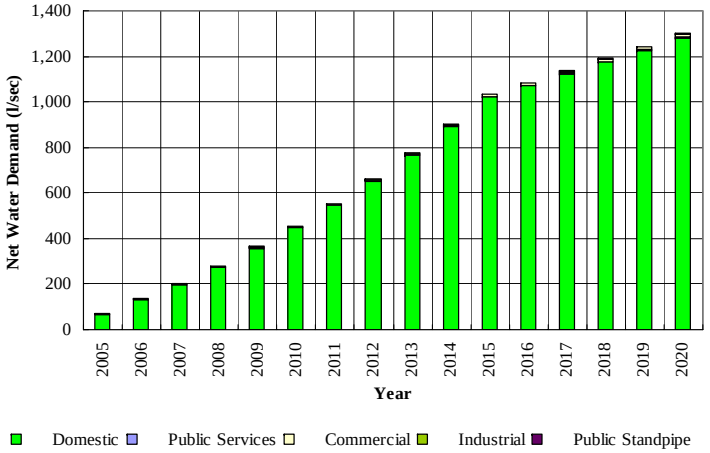


Figure 13.2.25 Net Water Demand for PDAM and Community Water Supply System

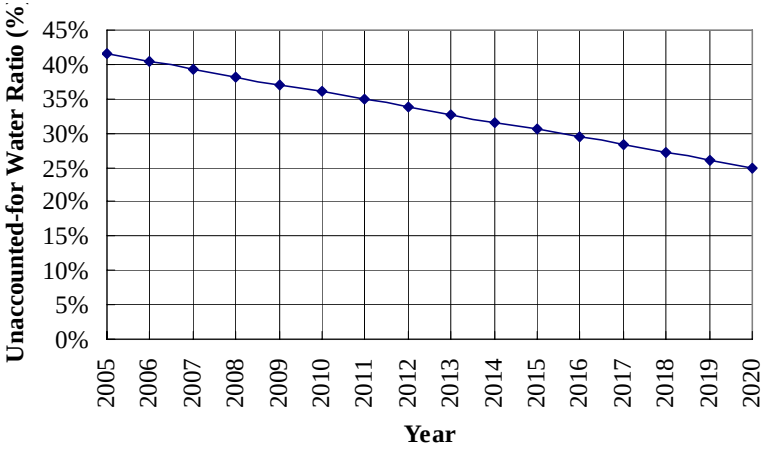


Figure 13.2.26 Future UFW Ratio

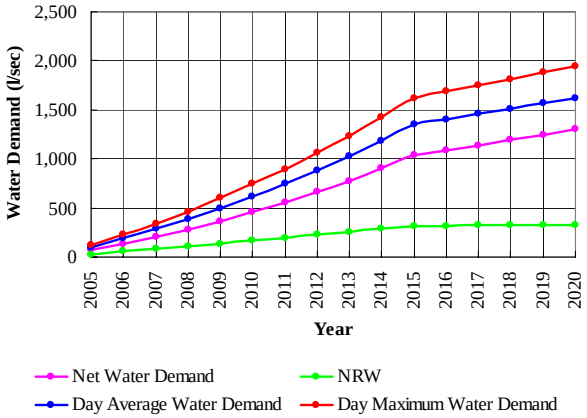


Figure 13.2.27 Total Future Water Demand

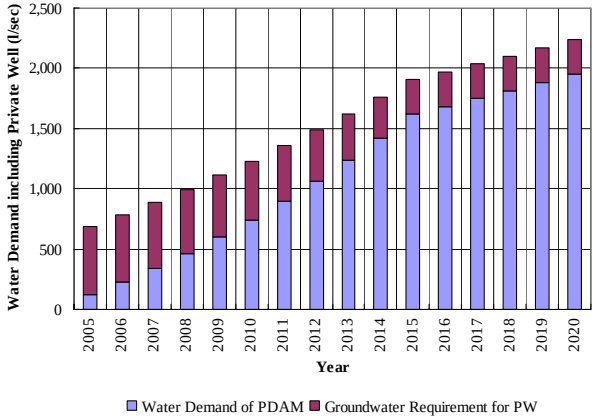
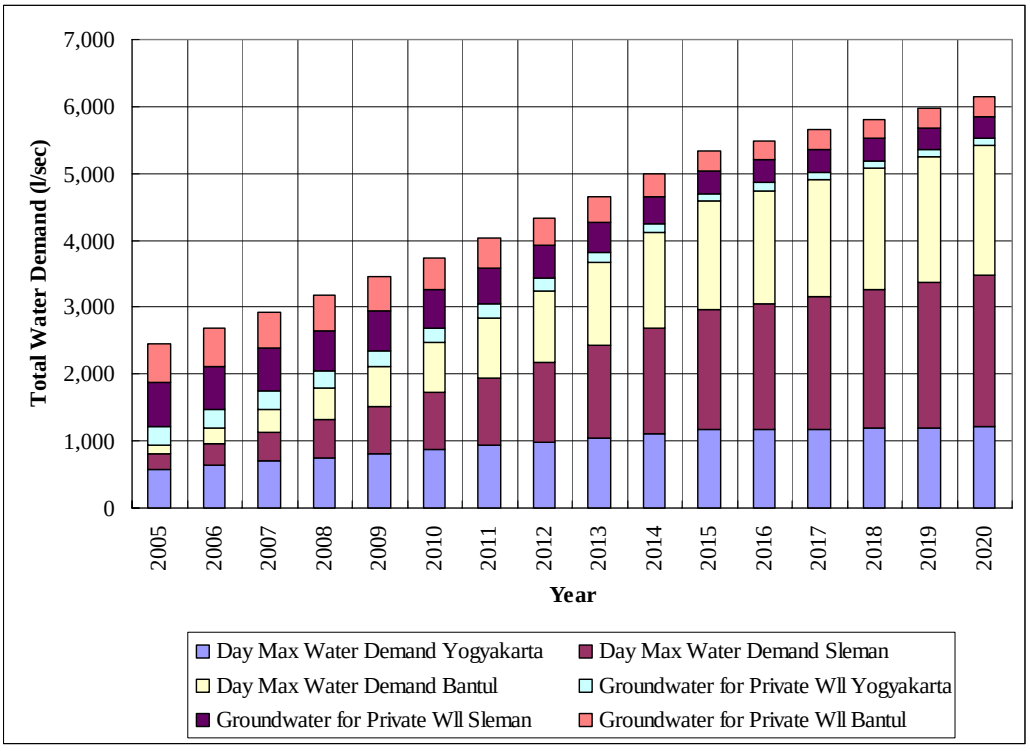


Figure 13.2.28 Total Future Water Demand and Groundwater Requirement for Private Wells

Table 13.2.30 Summary of Future Water Demand (l/sec)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Day Max Water Demand, Yogyakarta	584	641	699	757	815	874	932	991	1,050	1,109	1,168	1,175	1,182	1,190	1,197	1,206
Day Max Water Demand, Sleman	225	326	439	565	702	851	1,014	1,188	1,376	1,577	1,791	1,885	1,979	2,074	2,170	2,267
Day Max Water Demand, Bantul	123	227	341	465	599	743	897	1,062	1,237	1,424	1,621	1,685	1,750	1,816	1,882	1,949
Groundwater for Private Well, Yogyakarta	292	282	270	257	242	226	208	188	167	144	119	116	114	110	107	103
Groundwater for Private Well, Sleman	656	646	631	613	589	561	528	490	447	398	343	339	336	332	329	325
Groundwater for Private Well, Bantul	566	559	548	533	512	488	458	424	384	338	288	287	287	287	286	286
Total	**2,446**	**2,681**	**2,929**	**3,189**	**3,460**	**3,742**	**4,037**	**4,343**	**4,660**	**4,989**	**5,329**	**5,488**	**5,648**	**5,809**	**5,972**	**6,136**

Note:
"Day Max Water Demand" includes day max water demand of PDAM system and community water supply system. "Groundwater for Private Well" includes groundwater demand through private wells by PDAM customers, by commercial, and by unserved population.



Note:
"Day Max Water Demand" includes day max water demand of PDAM system and community water supply system. "Groundwater for Private Well" includes groundwater demand through private wells by PDAM customers, by commercial, and by unserved population.

Figure 13.2.29 Summary of Future Water Demand (l/sec)

13.2.7 Case Study on Future Water Demand Projection

(1) Cases of Future Water Demand Projection

Basic data, methodologies, and results of future water demand projection are described in previous sections. According to the results of water demand projection, water demand which will be supplied by PDAM is 932 l/sec in 2005 (daily maximum basis, total of Yogyakarta, Sleman, and Bantul) and the demand will increase to 5,422 l/sec in 2020. This result means that the total capacity of three PDAMs should be expanded as 5.8 times from current capacity during next fifteen years.

Feasibility, adequacy, or practicability of this drastic expansion of water supply system within rather short period, 15 years, should be examined by forthcoming study from various aspects such as technical, financial, and capability of respective PDAMs. Although it will be examined in future, considering significant magnitude or rate of expansion, several cases of future water demand which represents lower future water demand are studied. In the case study, four cases are considered and compared as follows.

Case 1: Future water demand projection which is discussed in previous sections. Future domestic per capita water demand is gradually increased from current level. Concerning service ratio, national target ratio is adopted.

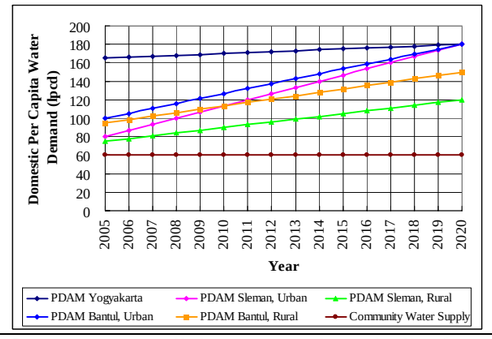
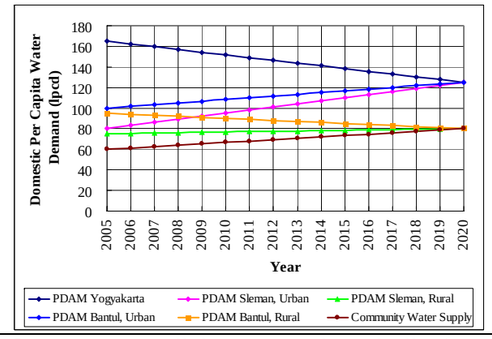
Case 2: Modified from Case 1 projection. Future domestic per capita water demand is set 125 lpcd for urban area and 80 lpcd for rural area. Service ratio in rural area is decreased from Case 1 to 40 %.

Case 3: Modified from Case 2 projection. Service ratio in urban area is decreased from Case 2 to 55 % and target year is postponed to 2020 except Yogyakarta Municipality.

Case 4: Modified from Case 3 projection. Service ratio is further decreased for all area. Service ratio is 50 % in urban area and 35 % in rural area.

These conditions/parameters of future water demand projection for each case are summarized in Table 13.2.31.

Table 13.2.31 Conditions and Parameters of Case Study (Cases 1 to 4)

Conditions/ Parameters	Case 1	Case 2	Case 3	Case 4
Domestic Per Capita Water Demand (lpcd)	Domestic Per Capita Water Consumption (lpcd) in the target year 2020. The per capita water demand will be increased gradually from current level to the target level in year 2020. Yogyakarta PDAM: 180 lpcd Sleman PDAM, Urban Area: 180 lpcd Sleman PDAM, Rural Area: 120 lpcd Bantul PDAM, Urban Area: 180 lpcd Bantul PDAM, Rural Area: 150 lpcd Community Water Supply: 60 lpcd 	Domestic Per Capita Water Consumption (lpcd) in the target year 2020. The per capita water demand will be increased or decreased gradually from current level to the target level in year 2020. Yogyakarta PDAM: 125 lpcd Sleman PDAM, Urban Area: 125 lpcd Sleman PDAM, Rural Area: 80 lpcd Bantul PDAM, Urban Area: 125 lpcd Bantul PDAM, Rural Area: 80 lpcd Community Water Supply: 80 lpcd 	Same as “Case 2”	Same as “Case 2”
Target Service Ratio (%)	Service ratio will be increased gradually from current service ratio to target level in year mentioned below. PDAM Yogyakarta: Current Service Ratio -> 80% in Year 2015 PDAM Sleman, Urban area: Current Service Ratio -> 80% in Year 2015 PDAM Sleman, Rural area: Current Service Ratio -> 60% in Year 2015 PDAM Bantul, Urban area: Current Service Ratio -> 80% in Year 2015 PDAM Bantul, Rural area Current Service Ratio -> 60% in Year 2015 Community Water Supply System: Current Service Ratio -> 60% in Year 2020	Service ratio will be increased gradually from current service ratio to target level in year mentioned below. PDAM Yogyakarta: Current Service Ratio -> 80% in Year 2015 PDAM Sleman, Urban area: Current Service Ratio -> 80% in Year 2015 PDAM Sleman, Rural area: Current Service Ratio -> 40% in Year 2015 PDAM Bantul, Urban area: Current Service Ratio -> 80% in Year 2015 PDAM Bantul, Rural area Current Service Ratio -> 40% in Year 2015 Community Water Supply System: Current Service Ratio -> 40% in Year 2020	Service ratio will be increased gradually from current service ratio to target level in year mentioned below. PDAM Yogyakarta: Current Service Ratio -> 80% in Year 2015 PDAM Sleman, Urban area: Current Service Ratio -> 55% in Year 2020 PDAM Sleman, Rural area: Current Service Ratio -> 40% in Year 2020 PDAM Bantul, Urban area: Current Service Ratio -> 55% in Year 2020 PDAM Bantul, Rural area Current Service Ratio -> 40% in Year 2020 Community Water Supply System: Current Service Ratio -> 40% in Year 2020	Service ratio will be increased gradually from current service ratio to target level in year mentioned below. PDAM Yogyakarta: Current Service Ratio -> 50% in Year 2020 PDAM Sleman, Urban area: Current Service Ratio -> 50% in Year 2020 PDAM Sleman, Rural area: Current Service Ratio -> 35% in Year 2020 PDAM Bantul, Urban area: Current Service Ratio -> 50% in Year 2020 PDAM Bantul, Rural area Current Service Ratio -> 35% in Year 2020 Community Water Supply System: Current Service Ratio -> 35% in Year 2020
Peak Factor (Day Max Water Demand/Day Average Water Demand)	1.2	1.1	Same as “Case 2”	Same as “Case 2”

(2) Results of Case Study and Comparison of Cases

Based on conditions/parameters of case study, future water demand is calculated for each case. Tables 13.2.32 to 34 show the results of case study and comparison of respective cases of Yogyakarta Municipality and Sleman and Bantul Regencies. Table 13.2.35 shows future total water demand of each case.

(3) Shortage of PDAM Water Supply Capacities against Future Water Demand

Figure 13.2.30 shows difference (gap) between existing capacity of three PDAMs and future water demand which will be supplied by these PDAMs of each case.

In other words, the figure shows required PDAM capacity expansion to meet future water demand by 2020. Required total capacity expansion of PDAM for each case is as shown below.

Cases	Required PDAM capacity expansion to meet future water demand by 2020
Case 1	4,330 l/sec
Case 2	2,300 l/sec
Case 3	1,690 l/sec
Case 4	1,280 l/sec

Table 13.2.32 Results of Case Study and Comparison of Cases for Yogyakarta Municipality

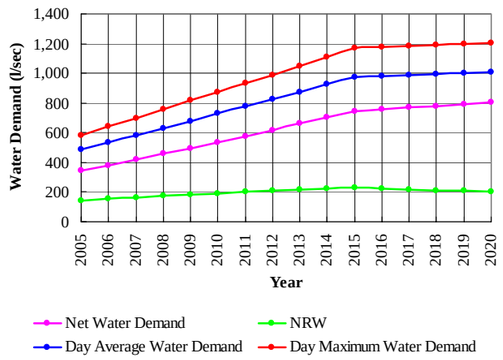
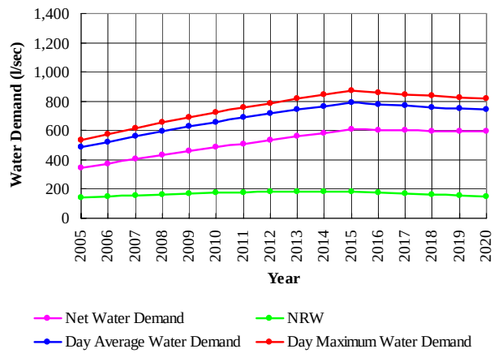
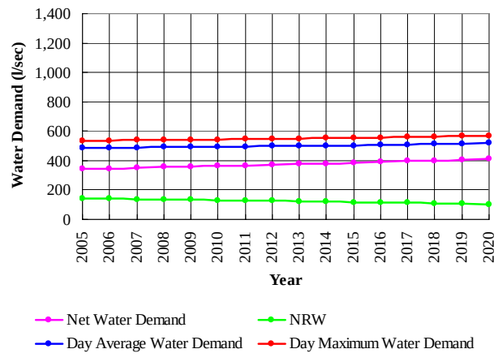
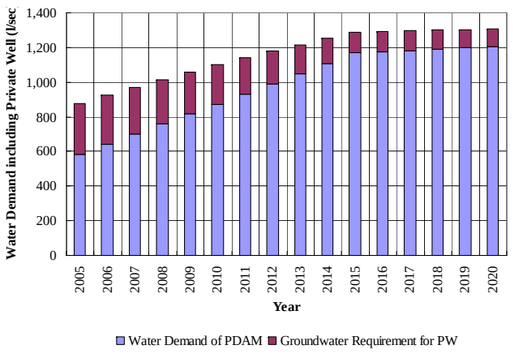
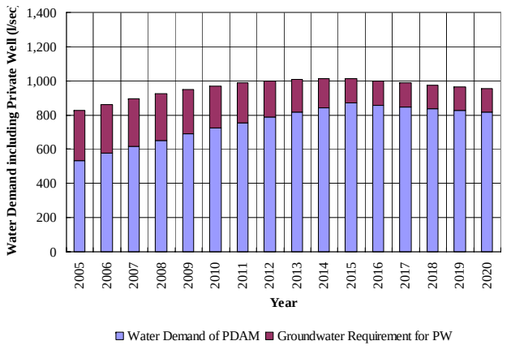
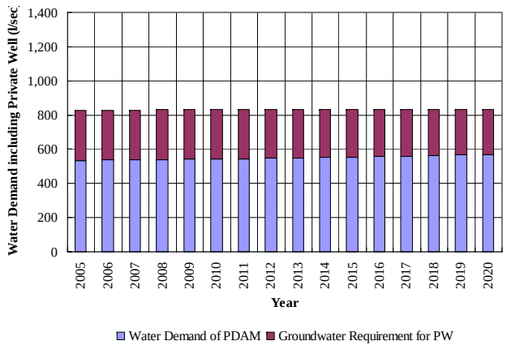
Case 1	Case 2	Case 3	Case 4
Total Future Water Demand for PDAM Yogyakarta			
		Same as “Case 2”	
Total Future Water Demand for PDAM Yogyakarta and Groundwater Requirements for Private Wells			
		Same as “Case 2”	

Table 13.2.33 Results of Case Study and Comparison of Cases for Sleman Regency

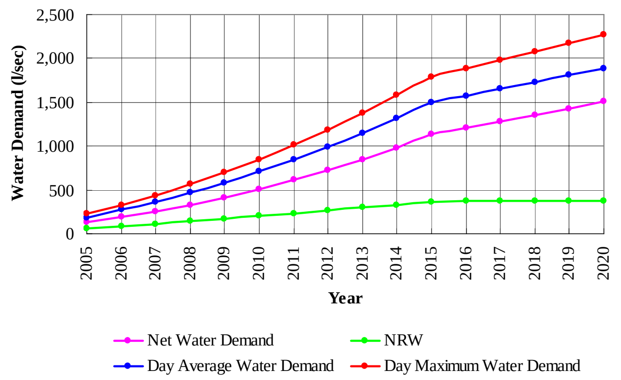
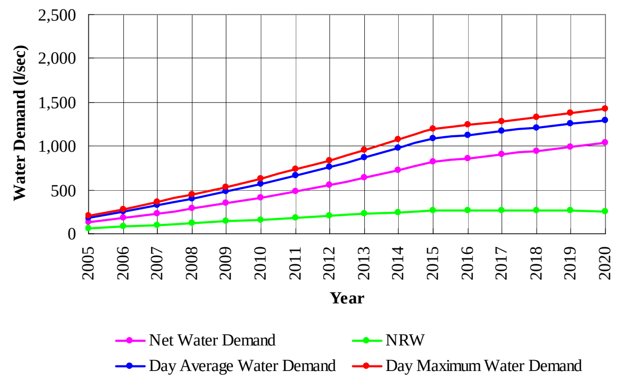
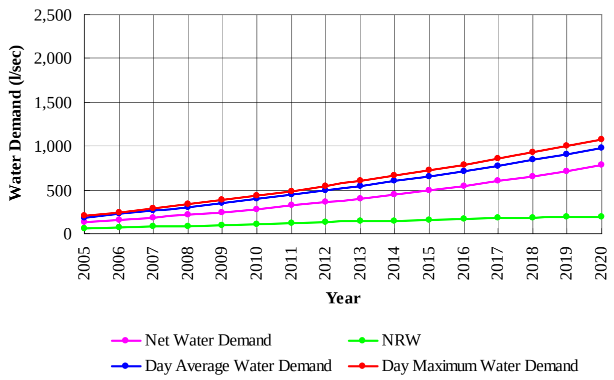
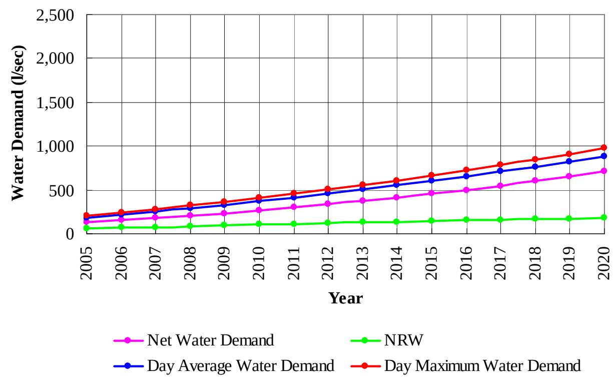
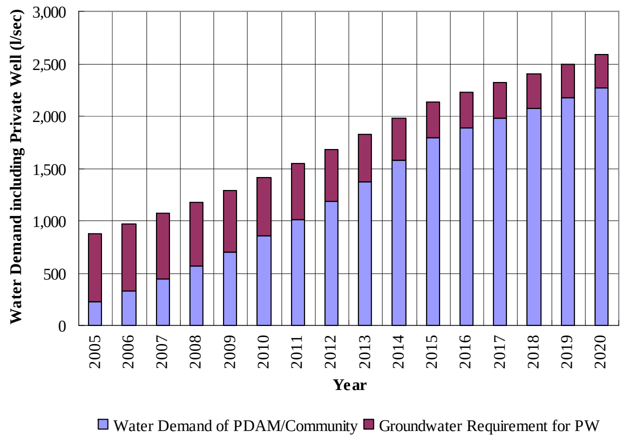
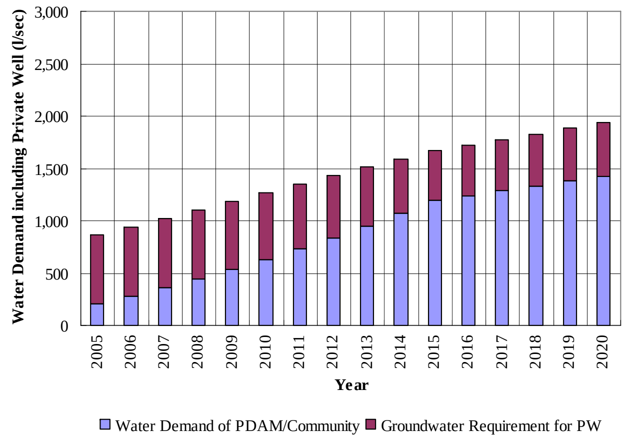
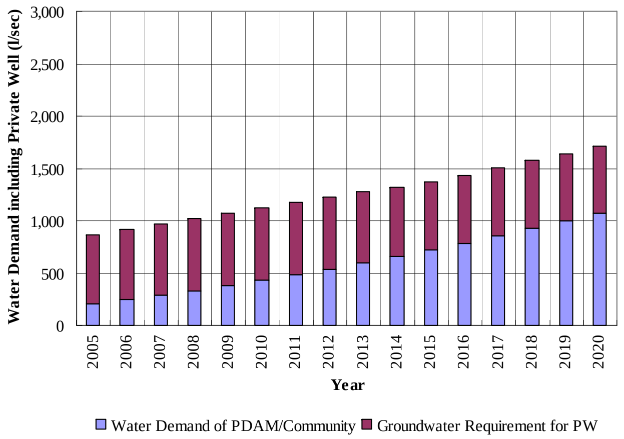
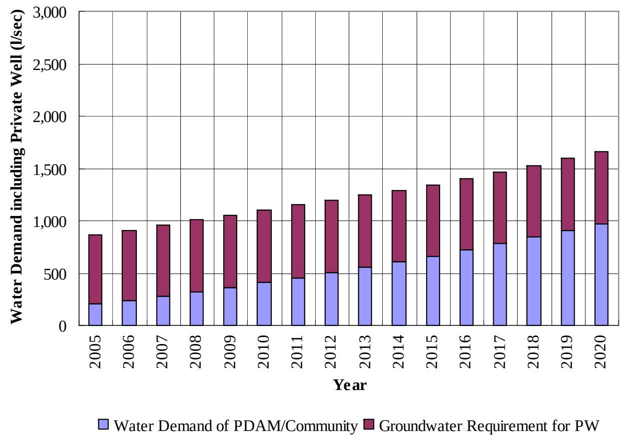
<table>
<tr><th>Case 1</th><th>Case 2</th><th>Case 3</th><th>Case 4</th></tr>
<tr><td colspan="4">Total Future Water Demand for PDAM Sleman (Urban + Rural) and Community Water Supply System</td></tr>
<tr>
<td> 
</td>
<td> 
</td>
<td> 
</td>
<td> 
</td>
</tr>
<tr><td colspan="4">Total Future Water Demand for PDAM Sleman (Urban + Rural) and Community Water Supply System
and Groundwater Requirements for Private Wells</td></tr>
<tr>
<td> 
</td>
<td> 
</td>
<td> 
</td>
<td> 
</td>
</tr>
</table>

Table 13.2.34 Results of Case Study and Comparison of Cases for Bantul Regency

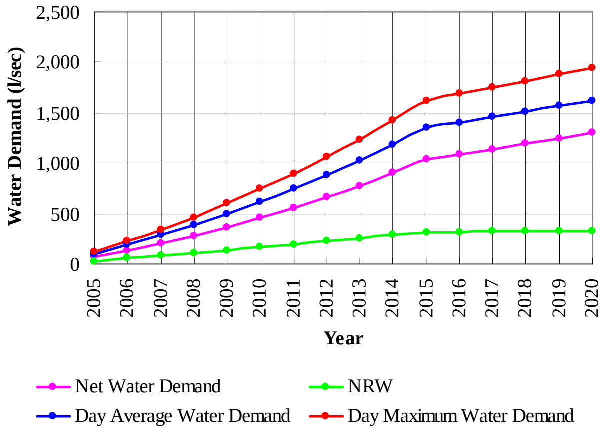
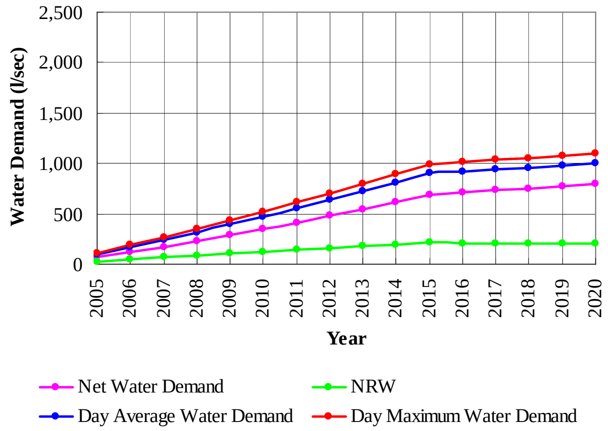
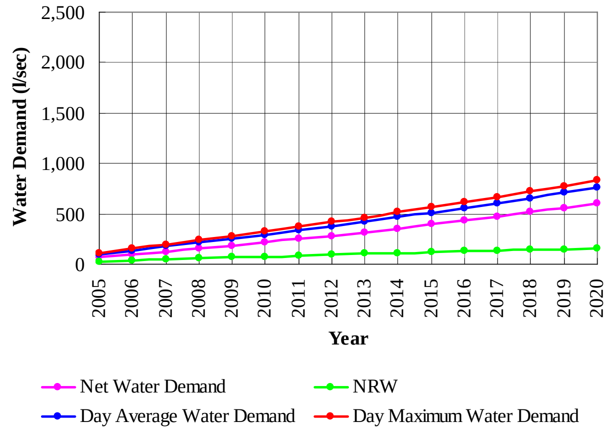
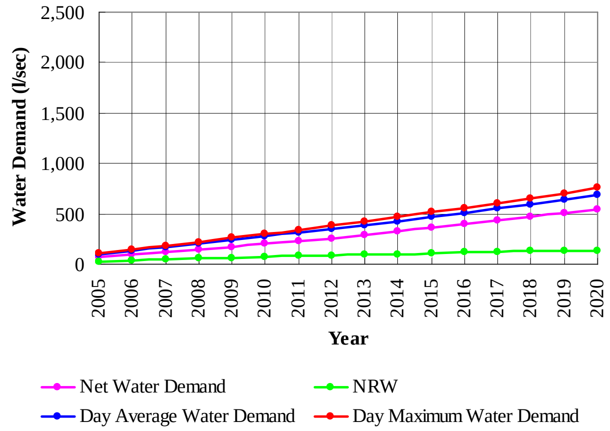
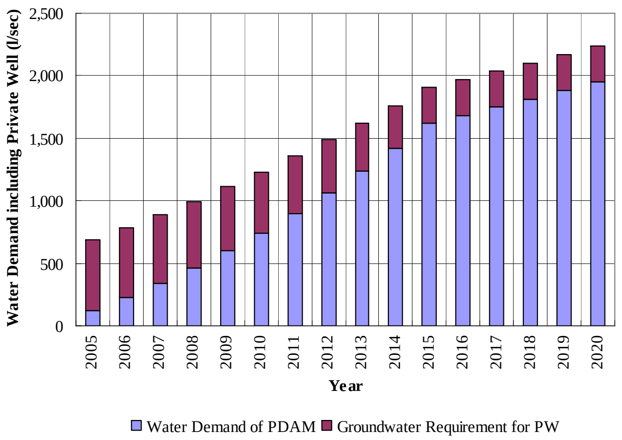
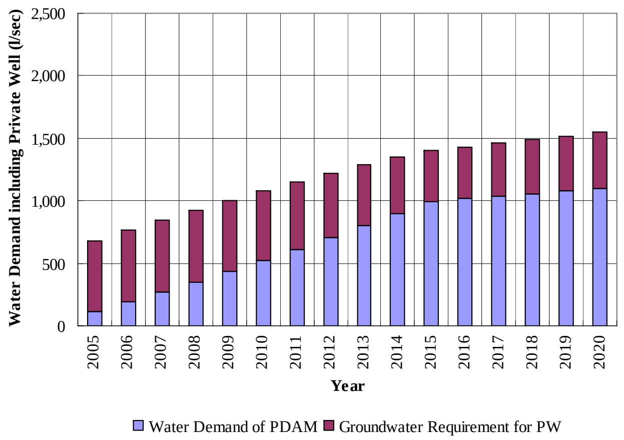
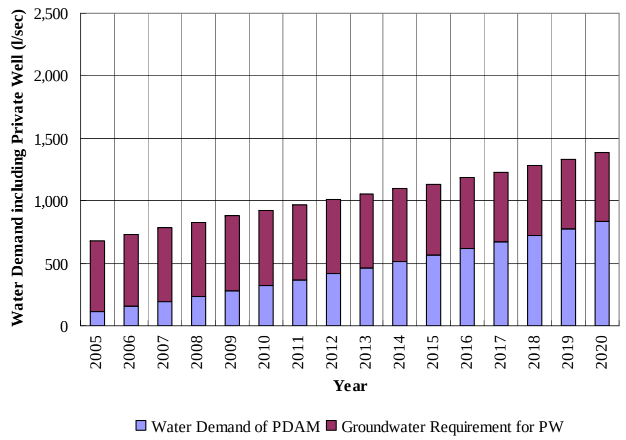
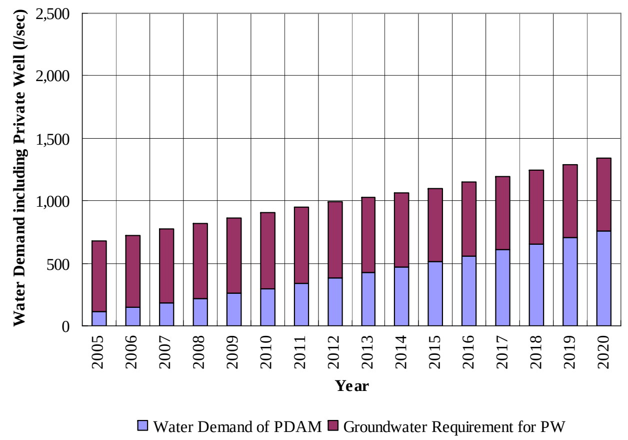
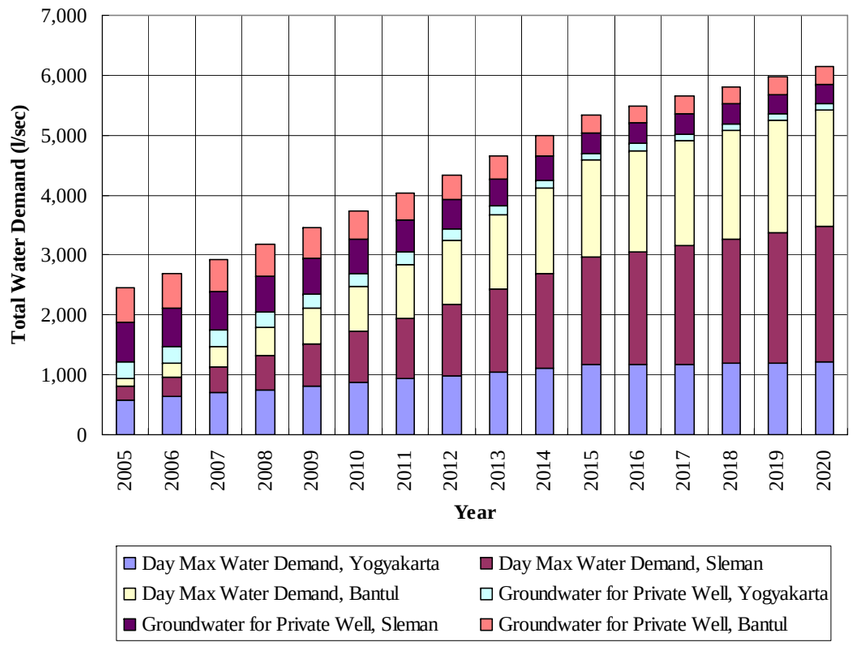
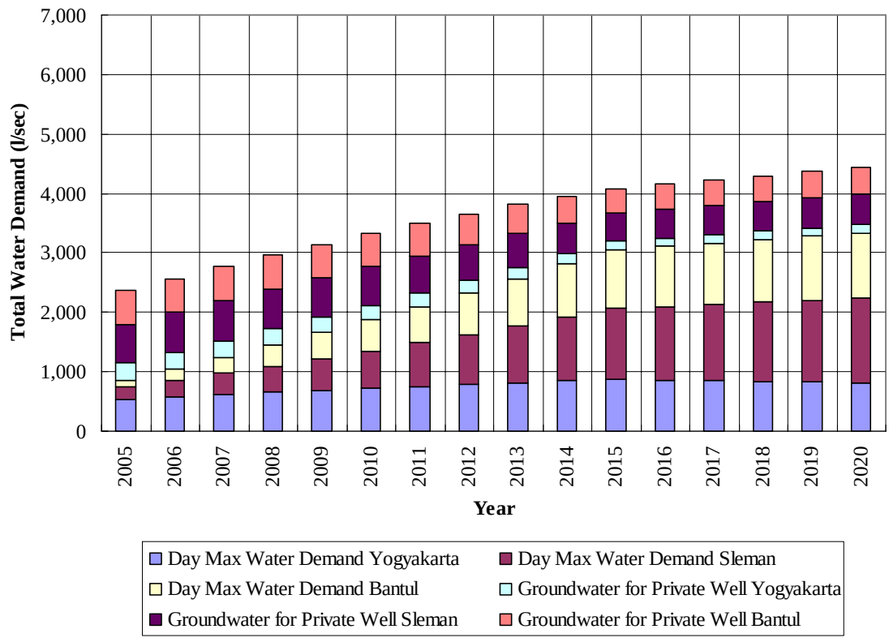
<table>
<tr><th>Case 1</th><th>Case 2</th><th>Case 3</th><th>Case 4</th></tr>
<tr><td colspan="4">Total Future Water Demand for PDAM Bantul (Urban + Rural) and Community Water Supply System</td></tr>
<tr>
<td> 
</td>
<td> 
</td>
<td> 
</td>
<td> 
</td>
</tr>
<tr><td colspan="4">Total Future Water Demand for PDAM Bantul (Urban + Rural) and Community Water Supply System
and Groundwater Requirements for Private Wells</td></tr>
<tr>
<td> 
</td>
<td> 
</td>
<td> 
</td>
<td> 
</td>
</tr>
</table>

Table 13.2.35 Summary of Future Total Water Demand of Each Case

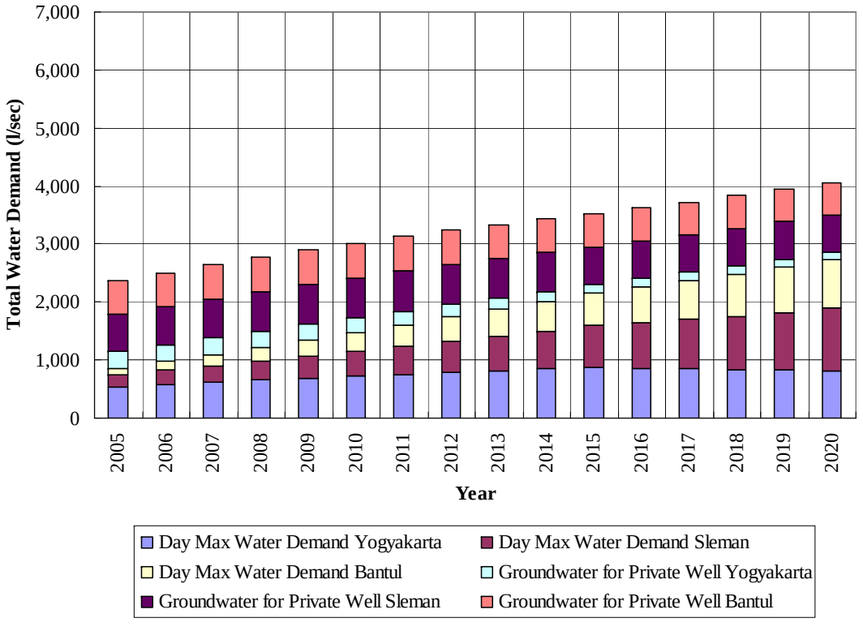
Case 1



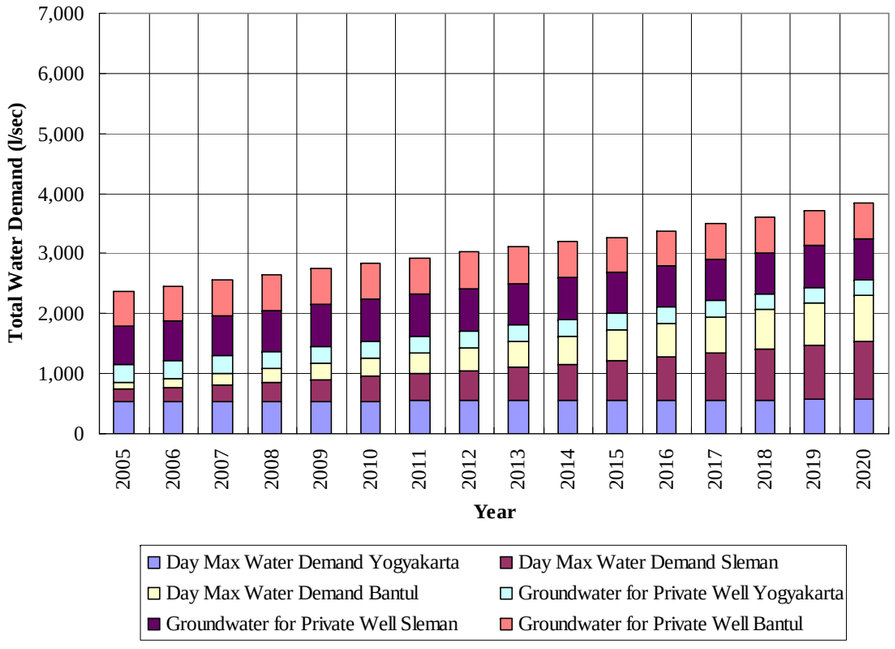
Case 2



Case 3



Case 4



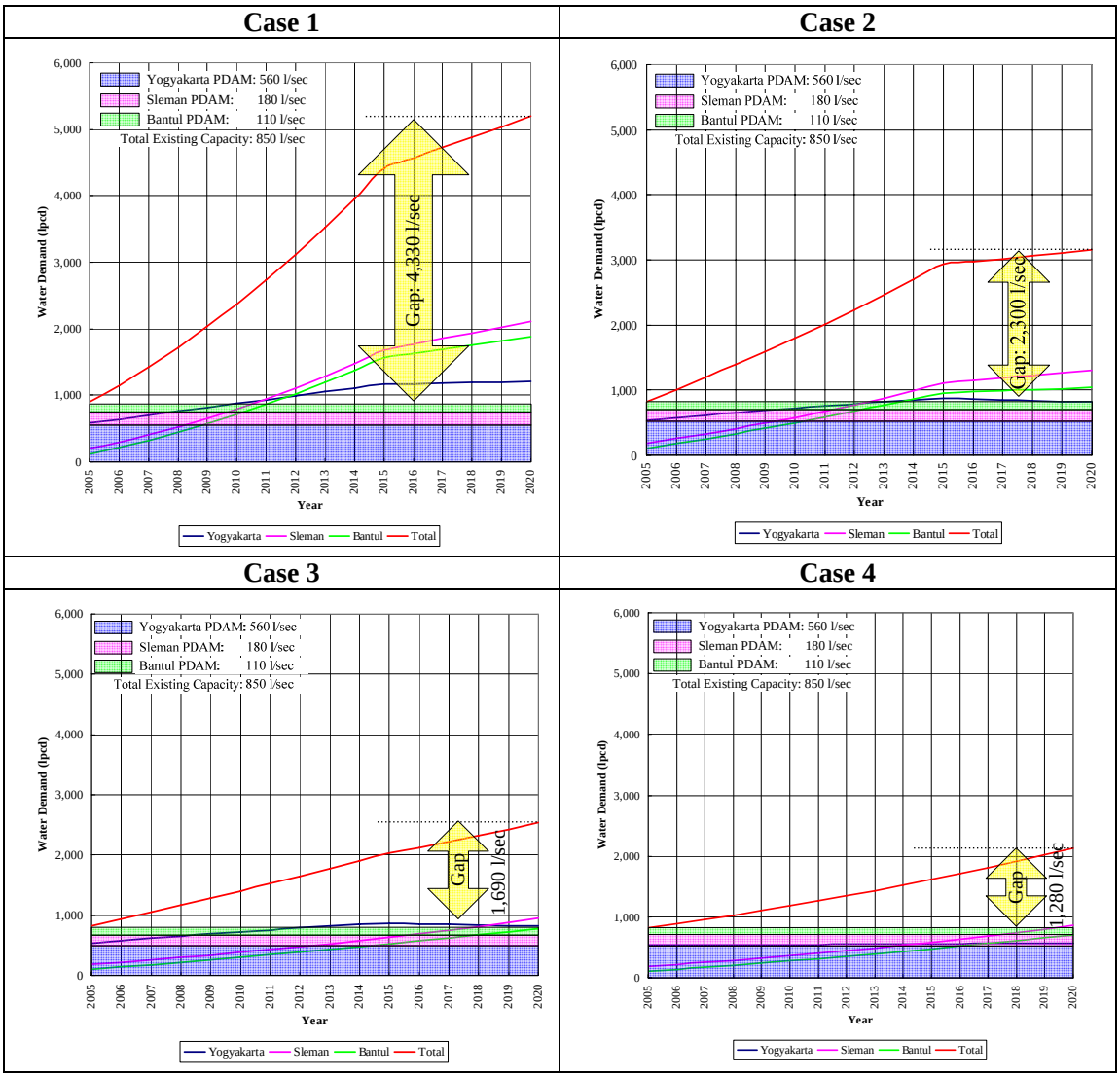


Figure 13.2.30 Shortage of PDAM Water Supply Capacity against Future Water Demand

13.2.8 Area Wise Future Water Demand

(1) Study Area Zoning

For forthcoming water supply system planning, future water demand is distributed/allocated for each area, zone. Zoning of the Study Area is as shown on Figure 13.2.31 and each zone is defined based on respective aerial topographic and administrative characteristics. Contour line of EL. 125 m is also considered as key factor of the zoning. Mataram canal which will be the route of future clear water transmission line runs along with contour line of EL. 150 m toward Yogyakarta Municipality. From the elevation of the future clear water transmission pipeline (around EL. 150 m), area lower than EL. 125 m may be supplied by the new system taking account of piping head loss and residual pressure at customer taps.

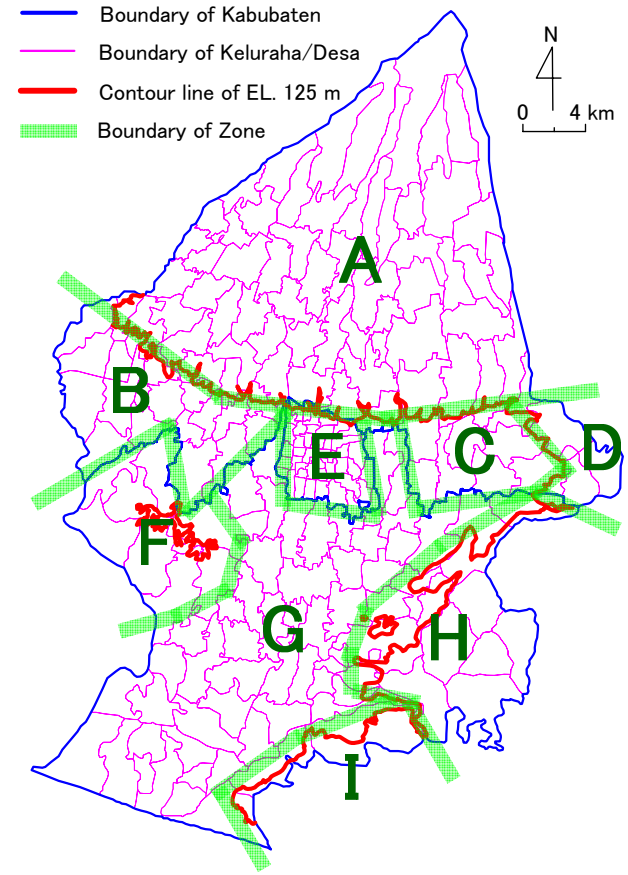


Figure 13.2.31 Study Area Zoning

Explanation of each zone is as follows.

Zone A: (Sleman Regency) This area is higher than EL. 125 m and this boundary is just corresponding to northern edge of Yogyakarta Municipality (southern edge of Sleman Regency).

Zone B: (Sleman Regency) Western part of Sleman Regency and ground level is lower than EL. 125 m.

Zone C: (Sleman Regency) Eastern part of Sleman Regency and ground level is lower than EL. 125 m.

Zone D: (Sleman Regency) Eastern end of Sleman Regency and ground level is higher than EL. 125 m.

Zone E: (Yogyakarta Municipality) Whole area of Yogyakarta Municipality is included in this zone. The ground level is lower than EL. 125 m.

Zone F: (Bantul Regency) Western part of Bantul Regency and ground level is higher than central part of Bantul Regency and hilly area, some part is higher than EL. 125 m.

Zone G: (Bantul Regency) Central part of Bantul Regency. The ground level is lower than EL. 125 m and gently slope down to the sea.

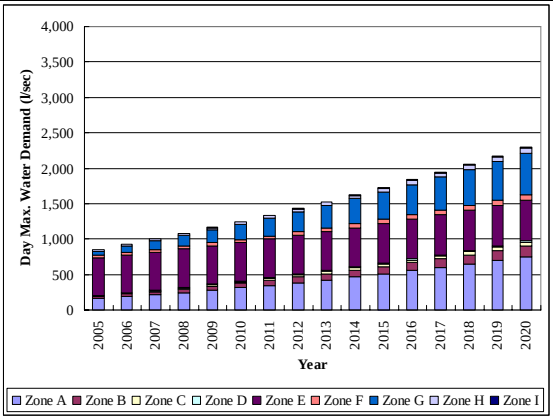
Zone H: (Bantul Regency) Mountainous area of western Bantul Regency and located north of Oyo river.

Zone I: (Bantul Regency) Mountainous area of western Bantul Regency and located south of Oyo river.

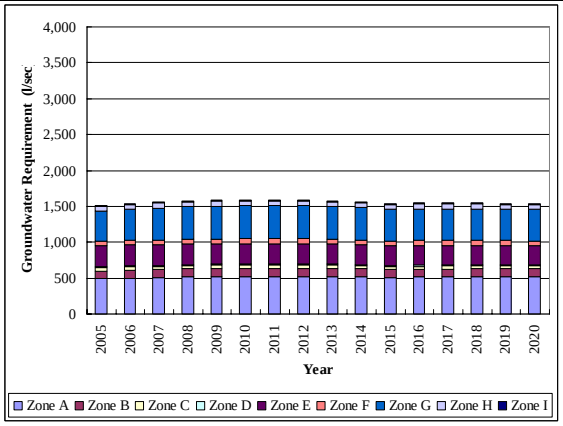
(2) Zonal Future Water Demand

Kelurahan and Desa in respective zone are identified and future water demand of Case 4 which is discussed in previous section is allocated to each zone based on Kulurahan/Desa future water demand.

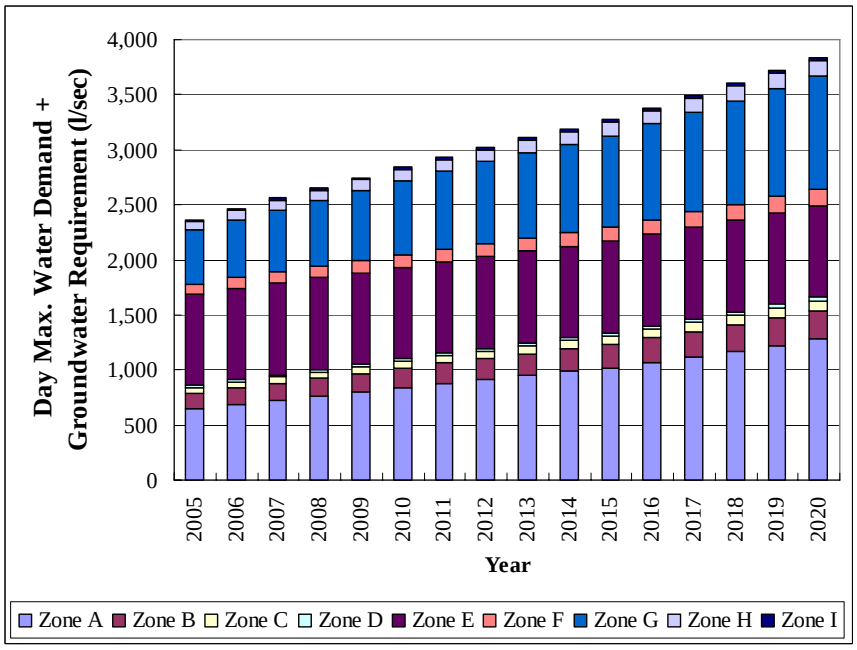
Zonal future water demand is shown on Figures 13.2.32 to 13.2.33.



Zonal Future Day Max. Water Demand (for PDAM and Community Water Supply System)



Zonal Future Groundwater Requirement (for private wells)



Zonal Future Day Max. Water Demand and Groundwater Requirement

Figure 13.2.32 Zonal Future Water Demand (Case 4)

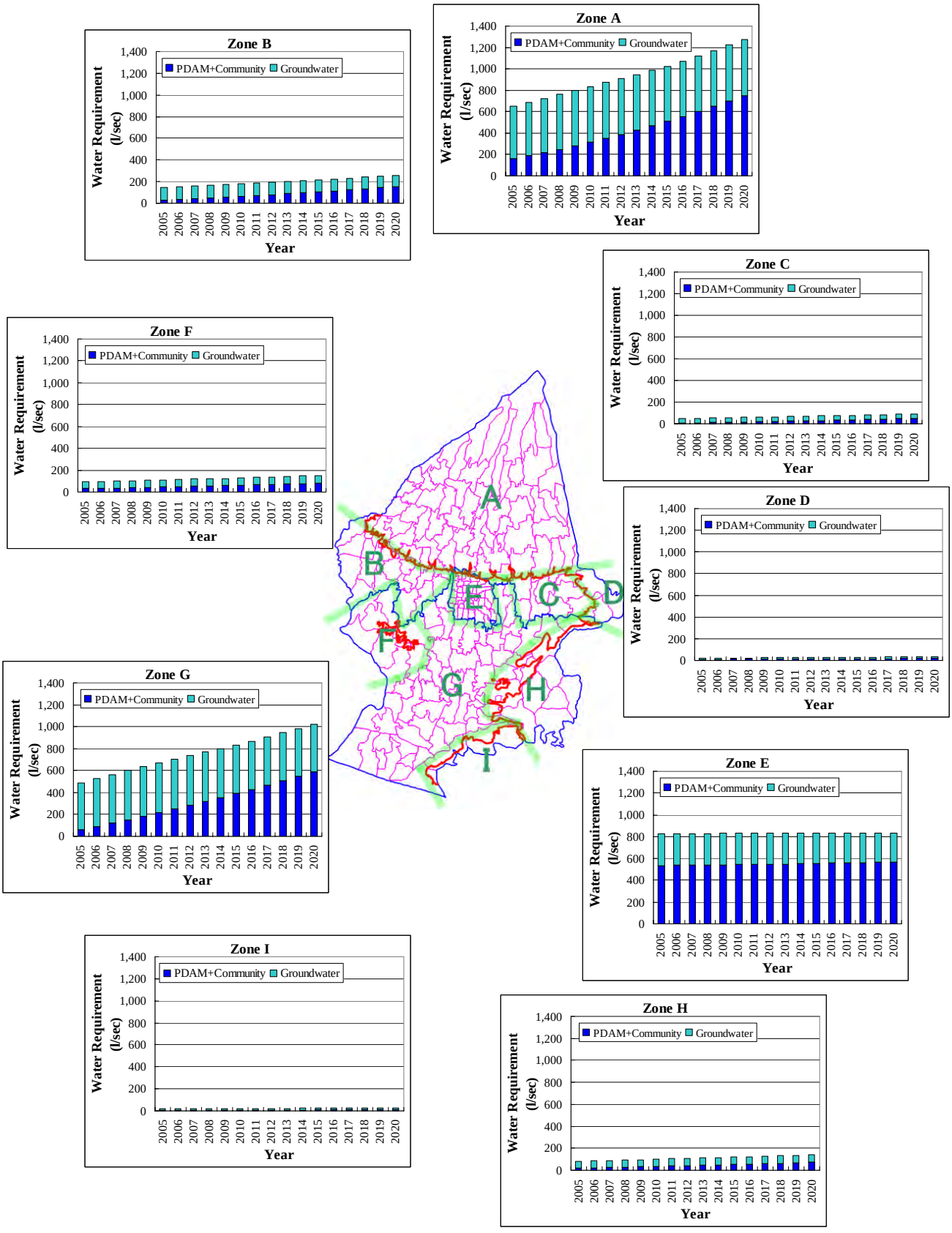


Figure 13.2.33 Zonal Future Water Demand