Sector C

Agricultural and Fishery Water Management

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Sector C. Agricultural and Fishery Water Management

C.1 Present Conditions of Agricultural and Fishery

C.1.1 Characteristics of Agriculture and Fishery in the Study Area

C.1.1.1 Agriculture

Pampanga river basin is one of the major granaries in the country, especially in production of paddy. As shown in the Table C.1.1.1, Central Luzon (Region III) is the highest producer of paddy among all 16 regions in the country. In 2008, 2,675,000 ton of paddy (16 % of the country total) are harvested in around 583,000 ha in total of both wet and dry seasons. The province of Nueva Ecija is ranked at the highest among all 80 provinces in the country and the other provinces are also ranked at higher group in terms of harvested area and production of paddy. Most of products of paddy are marketed to the major consuming area such as Metro Manila particularly, because of the close location.

Table C. 1.1.1 Paddy Production by Province in 2008

	Area Harvested of Paddy (1,000 ha)				Production	
	Irrigated	Rain-fed	Total	National Ranking	Volume (1,000 ton)	National Ranking
Bulacan	59.8	21.3	81.1	17th	353	14th
Nueva Ecija	246.3	39.6	285.9	1st	1,372	1st
Pampanga	82.3	3.6	85.9	14th	399	13th
Tarlac	120.0	9.7	129.7	10th	551	7th
Total of 4 Provinces	508.4	74.2	582.6		2,675	
Total of Central Luzon	580.4	86.0	666.3	1st	3,014	1st
Country's Total	3,032.6	1,427.4	4,460.0		16,816	

Note : The data is provincial bases including out of the study area
Source :Bureau of Agricultural Statistics

In Central Luzon, the agriculture sector accounts for twenty four (24) percent of the region's output in 2003, which ranked second highest in terms of agricultural output among all the regions in the country (next to Region IVa). The Gross Regional Domestic Product (GRDP) in Region III for 2007 is estimated to be 501 billion pesos with the annual growth rate of 10%. Out of the GRDP, 18.6% is shared by agriculture sector which reveals that the regional economy still depends largely on agricultural production. Out of total workers of 3.396 million, 0.745 million or 21.9% of the total workers were engaged in agriculture sector as cultivators and agriculture laborers. The agriculture is majority of work force, and this trend is prominent especially in the rural areas. Thus, the agriculture sector especially irrigation to paddy production in the study area is the most important factor both at macro level in the country strategy of food security and at micro level of the farm economy in the rural area.

The agricultural lands lie at the central portion of the study area, mostly in the flat lands of the river basins of the Pampanga and the major tributaries in the provinces of Nueva Ecija, Tarlac, Pampanga and Bulacan. Around 468,000 ha or 45 % of the study area is agricultural land, in which around 397,000 ha or 38 % is paddy field. The region's major agricultural crop is paddy and corn is the next of cereal crop. Paddy is planted in both irrigated and rain fed field, while vegetables and fruits are planted mainly in upland. The production of major crops by province is summarized in the following Table C.1.1.2.

Table C. 1.1.2 Production of Major Crops other than Paddy in 2008

(unit : ton)

	Bulacan	Nueva Ecija	Pampanga	Tarlac	Total
White Corn	1,490	8,053	9,892	1,245	20,680
Yellow Corn	145	13,448	43,245	117,227	174,065
Corn (Total)	1,635	21,501	53,137	118,472	194,745
Calamansi	601	6,525	650	231	8,006
Camote	610	1,098	2,508	22,325	26,540
Eggplant	1,937	6,880	2,296	6,149	17,262
Garlic		325			325
Mango	10,621	15,092	5,048	18,266	49,027
Mongo	22	51	25	2,141	2,238
Onion		70,289	4		70,292
Peanut	37	31	190	616	874
Sugarcane	132	2,550	504,481	807,951	1,315,114
Tomato	3,561	10,194	2,482	3,776	20,013

Note : The data is provincial bases including out of the study area
Source :Bureau of Agricultural Statistics

In the study area, farmers plant paddy twice a year with limited vegetables in irrigated area. There are two cropping seasons, the wet and dry seasons. In general, wet season cropping is from June to September/November and the dry cropping is from October/November to April/ May, while some area are planted 3rd crops optionally, such as vegetable and mongo beans which are planted in between dry and wet seasons. To meet the requirement for the above double cropping, irrigation operation is carried out based on the pre-fixed irrigation schedule. For the upland areas without irrigation facilities, farmers plant string beans, eggplant, tomato, okra, and others in dry season.

C.1.1.2 Fishery

Fishery activities in the study area consist mainly of inland municipal and commercial fishing and aquaculture, while marine fishery is also prevailing in a part of Bulacan and Pampanga as well as Zambales and Bataan in Central Luzon. Aquaculture is the largest share (92 %) of the region's fish production as shown in Table C.1.1.3.

Table C. 1.1.3 Fish Production by Province in 2008

(unit: ton)

Provinces	Commercial Fisheries	Municipal Fisheries		Aquaculture	Total
		Inland	Marine		
Bulacan	978	1,261	2,722	46,808	51,769
Nueva Ecija	0	1,783	0	7,022	8,805
Pampanga	0	9,327	2,237	143,917	155,481
Tarlac	0	398	0	6,141	6,538
4 Province Total	978	12,768	4,959	203,889	222,593
(Share)	(0.4 %)	(5.8 %)	(2.2 %)	(91.6 %)	(100 %)
Region III Total	8,980	13,243	29,222	223,481	274,926
Country Total	1,226,205	181,678	1,151,309	2,407,698	4,966,889

Source: Bureau of Fisheries & Aquatic Resources

Fishes caught in Pampanga river basin especially in Pampanga delta are a mixture of fresh water species and those tolerant of salt water. Major species such as tilapia and tiger shrimp can tolerate varying concentration of salt water up to strength sea water. Major fish culture is aquaculture in fishponds, in which major fishes are Tilapia and Milkfish. Region III, mostly in Pampanga delta, is ranked at the highest producer in the country in terms of aquaculture of Tilapia and Milkfish both in brackish and fresh water in fishponds, as shown in Table C.1.1.4.

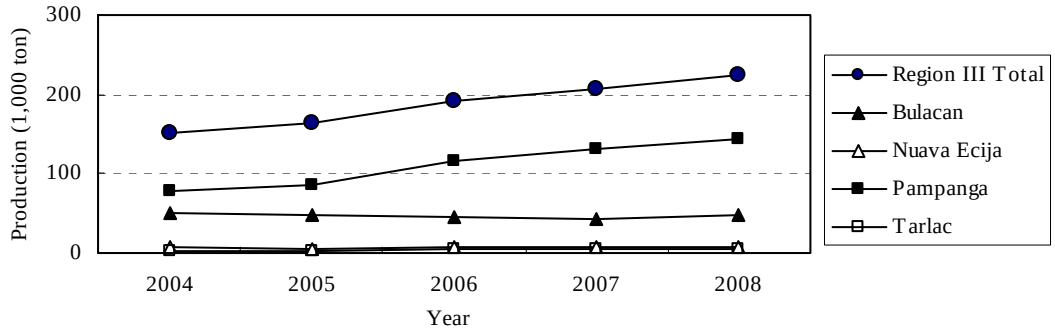
Table C. 1.1.4 Major Fish Production by Type in Region III in 2008

(unit : ton)

		Tilapia			Milkfish		
		Region III	Country Total	Share of Region III	Region III	Country Total	Share of Region III
Brackish water							
	Fishpond	4,385	12,156	(36%)	56,530	220,567	(26%)
	Fishcage	1	186		-	3,302	
	Fishpen	-	81		-	5,242	
Fresh water							
	Fishpond	110,472	130,456	(85%)	-	37	
	Fishcage	-	79,001		-	14,248	
	Fishpen	-	19,215		-	26,998	
	Others		76		-	-	
Marine		-	13		2,895	79,347	(4%)
Total		114,858	241,171	(48%)	59,425	349,741	(17%)

Source: Bureau of Fisheries & Aquatic Resources

In 1992 after the Mt. Pinatubo eruption, fishery production declined drastically especially in the province of Pampanga due to the loss and damage of the flow and the fishponds. However, in these years, production of aquaculture is remarkably increased especially in Pampanga delta, while fish harvest are stable in other provinces for the last five years as shown in the following Figure C.1.1.1.



Source: Bureau of Agricultural Statistics

Figure C. 1.1.1 Trend of Aquaculture Production in Region III

Fishpond area lies mostly in Pampanga delta as shown in land cover map on Annex-F C.1.1.1, taking fresh or brackish water directly from the rivers or creeks. In addition, certain numbers of fish ponds are also operated within the service area of the NIA irrigation systems. NIA doesn't give permit for fishery in the canals, while fishponds are allowed by NIA. Reportedly, fishpond owners pay an Irrigation service Fee (ISF) double or more amounts compared to paddy farming. This is through an agreement between NIA and the fishpond owners / farmers. Fishery operation is about 4-8 months and its water requirement is around five times of that for paddy.

C.1.1.3 Irrigation Development in the Study Area

Irrigation system including national, communal and private ones is most developed in vast plains and low land of Pampanga river basin. As of 2008, irrigation development covers around 240,000ha or 60 % of the total paddy field in the study area. Irrigation development is prompted mainly by National Irrigation Administration (NIA), which is a national government agency mandated to plan, construct and operate irrigation systems to support agriculture production in the country. Bureau of Soils and Water Management (BSWM) under the Department of Agriculture (DA) is also government agency to promote small scale irrigation or water harvesting system utilizing small local catchments. Other existing irrigation systems are either privately-owned or constructed by other government agencies through various programs. The irrigation systems are briefly categorized as the following Table C.1.1.5.

Table C. 1.1.5 Type of Irrigation System in the Study Area

	Administrative Agency	Service Area	(Share)
National Irrigation System (NIS)	Constructed and operated by NIA	177,616 ha*1	(72 %)
- River Irrigation System (RIS)			
- Pump Irrigation System (PIS)			
- Groundwater Irrigation System (GIS)			
- Small Reservoir Irrigation Project (SRIP)			
Communal Irrigation System (CIS)	Constructed by NIA and turned over to IA	53,884 ha*1	(22 %)
- Communal Irrigation System (CIS)			
- Pump Irrigation System (PIS)			
Small Scale Irrigation and Water Harvesting	BSWM	1,826 ha*2	(1%)
- Diversion Dam (DD)			
- Small Water Impounding Project (SWIP)			
- Small Farm Reservoir (SFR)			
- Shallow Tubewell (STW)			
Private Irrigation System		12,770 ha*3	(5 %)
Total		246,096 ha	(100 %)

Source : *1; NIA, *2; BSWM, *3; RPFP, 2005-2030 (including out of Study area)

Under NIA, irrigation systems are either national or communal. National Irrigation System (NIS), of which the service area is generally more than 1,000 ha, is constructed, operated and maintained by NIA. There are eight (8) NISs in the Study area with a total service area of 178,000 ha including groundwater systems as shown in Table C.1.1.6 of which locations and schematic flow diagram are shown in Annex-F C.1.1.2 and C.1.1.3, respectively. The Upper Pampanga River Integrated Irrigation System (UPRIIS) is the largest in the study area and also in the entire country. It has a total service area of 119,000 ha at present divided into five divisions, covering the province of Nueva Ecija and some areas in the Bulacan and Tarlac. Tarlac-San Miguel-O'donel River Irrigation System (RIS) located in the province of Tarlac is diverting water from Agno River, however its service area lies in the study area and drained water flows into Pampanga river basin.

Table C. 1.1.6 Summary of National Irrigation System (NIS) in the Study Area

Name of System	Type of NIS	Service Area	Sub-system	Water Source	Province
Angat-Maasim RIS (AMRIS)	Reservoir & Gravity	31,485 ha	Angat	Angat R.	Bulacan
			Maasim	Maasim R.	Bulacan
Porac-Gumain RIS	Gravity	4,004 ha	Porac	Porac R.	Pampanga
			Gumain	Gumain R.	Pampanga
Tarlac-San Miguel-O'donel RIS (TASMORIS)	Gravity	5,301 ha	Tarlac	Tarlac R.	Tarlac
			San Miguel - O'donel	San Miguel & O'donel R.	Tarlac
Pampanga Delta RIS (PDRIS)	Gravity	11,920 ha	-	Pampanga R.	Pampanga & Nueva Ecija
Upper Pampanga River Integrated Irrigation System (UPRIIS)	Reservoir and Gravity	24,962 ha	Division-I	Pampanga R. & Talavera R.	Nueva Ecija
		23,913 ha	Division-II	Pampanga R.	Nueva Ecija
		29,846 ha	Division-III	Pampanga R.	Nueva Ecija
		23,811 ha	Division-VI	Penaranda R.	Nueva Ecija & Bulacan
		16,879 ha	Division-V	Pampanga R.	Nueva Ecija & Tarlac
Aulo SRIP	Reservoir	810 ha		Aulo R.	Nueva Ecija
Nueva Ecija Pump IS	Pump	1,313 ha		Groundwater	Nueva Ecija
Tarlac Groundwater Irrigation System (TGIS)	Pump	3,372 ha		Groundwater	Tarlac & Nueva Ecija
Total		177,616 ha			

Source: NIA

Communal irrigation systems (CISs), most of which have service area of less than 1,000 ha, are constructed and turned over by NIA to an organized group of farmer-beneficiaries called "Irrigators' Association (IA)". The construction cost of CISs are borne by NIA and later amortized by the beneficiaries after turnover. Some CISs are privately owned and operated. There are one hundred eighty six (186) functional CISs with 37,100 ha of service area. Some ninety five (95) systems with total service area of 16,830 ha are non-functional as shown in Table C.1.1.7.

Table C. 1.1.7 Summary of Existing Communal Irrigation System (CIS) in the Study Area

Province	Functional				Non-Functional			
	CIS (Gravity)		PIS (Pump system)		CIS (Gravity)		PIS (Pump system)	
	Nos	Area (ha)	Nos	Area (ha)	Nos	Area (ha)	Nos	Area (ha)
Bulacan	23	2,259	6	317	13	1,197	6	637
N-Ecija	65	14,321	8	580	7	1,480	6	2,705
Pampanga	54	8,665	23	6,847	48	6,923	2	270
Tarlac	7	4,065	0	0	13	3,618	0	0
Total	149	29,310	37	7,744	81	13,218	14	3,612
	186 systems		37,054 ha		95 systems		16,830 ha	

Source : Prepared by the Study Team based on the NIA GIS data

As shown above, around one-third of the existing CISs are not operational at moment. One of the reasons is that some CISs firmed up area have been integrated into new large NIS such as UPRIIS, etc. so that the previous intake systems were abandoned and hence functional CIS's area was reduced. The other reasons of reducing CIS service area include the urbanization in the farm land and/or deterioration of the old systems. Especially, some existing pump irrigation systems are not operational due to the high operation and maintenance cost. The location map of existing CISs including both functional and non-functional systems is shown in Annex-F C.1.1.4

In addition to the above irrigation system of NISs and CISs, there are various small scale irrigations under the Bureau of Soils and Water Management (BSWM) of the Department of Agriculture (DA). These systems are developed to increase cropping intensity and production by providing small scale irrigation and rain water harvesting infrastructure utilizing small local catchments or shallow groundwater. These small scale irrigations are categorized into 1) diversion dams (DD), 2) small farm reservoir (SFR), 3) small water impounding project (SWIP) and 4) shallow tubewell (STW), which are summarized in Table C.1.1.8. Their location is shown in Annex-F C.1.1.5. In most of these systems, dry season crops are planted without or limited supplementary irrigation due to insufficient water source in their small catchment.

Table C. 1.1.8 Summary of Small Scale Irrigations under BSWM in the Study Area

Type of System	Nos	Area (ha)	
		Wet Season	Dry Season
Diversion Dam (DD)	32	1,108	735
Small Water Impounding Project (SWIP)	14	681	108
Small Farm Reservoir (SFR)	1	37	0
Total	47	1,826	843

Source : Prepared by the Study Team based on the BSWM GIS Data base

C.1.1.4 Projected Future Irrigation Projects

Concrete future plan is not available for the irrigation development in the study area covering the target year 2025 of this study. In the NIA COPLAN, 2009-2018[1)] and NIA: Indicative Irrigation Development Program, 2010-2019[2)], the on-going and proposed national irrigation projects to be implemented till 2018 are listed including nationwide program as shown in Tables C.1.1.9 and C.1.1.10, respectively.

Table C. 1.1.9 Summary of On-going National Irrigation Projects

Name of Project	Province Covered	Schedule	
		Start	End
Balog-Balog Multipurpose Project Phase I	Tarlac	1999	2011
Rehabilitation of AMRIS	Bulacan	2009	2010
Along-along Creek Irrigation Project (In UPRIIS Div-3)	Nueva Ecija	2010	2019
Comprehensive Agrarian Reform Program, Irrigation Component, Project-II	Nationwide	1993	-
Repair, rehabilitation of existing Groundwater Irrigation Systems, Establishment of Groundwater Pump Project	Nationwide	-	-
Repair, Rehabilitation, Restoration & Preventive Maintenance of existing National & Communal Irrigation Facilities	Nationwide	-	-
Balikatan Sagip Patubig Program (BSPP)	Nationwide	2010 -	2019
Repair, Rehabilitation, Restoration & Preventive Maintenance of Existing National & Communal Irrigation Facilities (RRENIS/CIS)	Nationwide	2010 -	2019
Restoration/Rehabilitation of Existing NIA Assisted Irrigation System (PRE-NIA-AIS)	Nationwide	2010 -	2019
Participatory Irrigation Development Project (PIDP)	Nationwide	2010 -	2019
Rehabilitation of Small Water Impounding Projects / Diversion Dam	Nationwide	2009-	2011
Upper Tabuating SRIP	Nueva Ecija	2010-	2010-

Source : NIA COPLAN, 2009-2018, NIA: Indicative Irrigation Development Program, 2010-2019 and BSWM

In addition to the proposed projects in NIA COPLAN, the updated Central Luzon Regional Physical Framework Plan (RPFP) covering 2005-2030[3)], envisioned the development of the Balintingon Multipurpose Project, of which feasibility study was made in 1983[4)] and reviewed and updated in 2008[5)]. This project was proposed to irrigate new area of 14,900 ha of its own service area and to divert water to AMRIS area.

The location map of the projected national irrigation project including the Balintingon project is shown in Annex-F C.1.1.6, and their schematic flow diagrams are shown in Annex-F C.1.1.7.

Table C. 1.1.10 Summary of Proposed National Irrigation Projects

Name of Projects	Province Covered	Service Area (ha)	Expected Funding
Participatory Irrigation Development Project	Nationwide	26,791	GAA / IBRD
Procurement of Pumps, Drilling Rigs & Related Equipment	Nationwide	3,900	GAA / Spanish Loan
Balog-balog Multipurpose Project Phase 2	Tarlac	34,410	GAA / ODA
Sector Loan on Rehabilitation of Irrigation Facilities	Nationwide		GAA / JICA
Casecnan Multipurpose Power & Irrigation Project Irrigation Component - Phase II	Nueva Ecija / Bulacan	61,000	GAA / ODA
Irrigation Water Resources Augmentation Pump Establishment Project	Nationwide	2,361	-
Appropriate Irrigation Technologies for Enhanced Agricultural Production	Include. Regions III	4,000	GAA / ODA
Central Luzon Groundwater Irrigation Systems Reactivation Project	Nueva Ecija	5,000	-
Gumain Reservoir Project	Pampanga	16,750	-

Note : GAA : General Appropriations Act, BRD : International Bank for Reconstruction and Development
Details are referred to Project Profile in Annex-T C.3.2.1.

Source : NIA COPLAN, 2009-2018 and Indicative Irrigation Development Program, 2010-2019

Concrete development plan for individual CISs is not available, while new construction or rehabilitation of existing CISs will be implemented under the nationwide programs. The proposed project to be implemented by BSWM is summarized in Table C.1.1.11.

Table C. 1.1.11 Summary of Proposed Small Scale Irrigations under BSWM

	Nos	Service Area (ha)
Diversion Dam (DD)	18	1959
Small Water Impounding Project (SWIP)	24	1,635
Small Farmers Reservoir (SFR)	4	112
Total	46	2,706

Source : Estimated by the Study Team based on the BSWM data base

C.1.2 Estimated Water Demand for Agriculture and Fishery

C.1.2.1 Irrigation Water Demand

The irrigation water demand has been preliminarily estimated for the water balance analysis of Pampanga river basin both for existing and future firm-up service area. For NISs whose water source is surface water, the data on the firm-up service area are taken from information given by NIA, and the water demands have been estimated at their intake points, while the estimated water demands for CISs whose water source is surface water are summed up in the water balance catchment shown in Annex-F C.1.2.1. The irrigation water demands are determined on the average at monthly basis. There is no concrete plan for future irrigation development projects covering the target year 2025, and the estimated water requirement for each irrigation system applying current cropping and rainfall pattern in these years is not available. Thus, some assumptions are considered for the current estimates in this stage of the study as below.

- In the NIA's existing and proposed irrigation system, only the Definite Development Plan for Casecnan Multipurpose Project[6)] estimated the detailed water requirement in all the divisions of the UPRIIS to conduct water balance study for their expansion and improvement of the system. Therefore, taking the assumption that the cropping pattern, cropping intensity, water consumption at filed and irrigation efficiency are similar in all the systems in the basin, water demands are preliminarily estimated applying the unit diversion water requirement per hectare in UPRIIS, except for the case that the planned water demand is available in the previous studies.
- The proposed projects including the data on their service area are determined based on the NIA COPLAN[1)] covering the years of 2009-2018. In addition, the Balintingon project is also included in the study, because it was envisioned in the Updated Central Luzon Regional Physical Framework Plan (RPFP) [3)], covering 2005-2030.
- The NIA COPLAN includes the development of the Upper Tabuating Small Reservoir Irrigation Project. However, the service area of this project is designed within the proposed area of the above-mentioned Balintingon project, and therefore it is excluded from the water balance study to avoid double counting of water demand.
- For the Balintingon project area, the water demand applied in the latest supplemental report for applying ICC in 2008 [5)] was employed.
- For the Balog-Balog project area, the water demand applied in updated F/S in 2009[7)] is employed.
- For the AMRIS area, the irrigated area for estimating water demand is set at 26,000ha in dry season and 20,358ha (78.3% of the firmed-up service area) in wet season, respectively, based on the actual condition.
- The program for future development of CISs is not available, therefore it is assumed that the existing non-functional CISs be mostly rehabilitated by the target year, which may be implemented under the NIA's nation-wide programs.
- CISs, which lie in the future potential large scale NISs, such as the UPRIIS Division-V, Balog-Balog project, Balintingon project etc, will be integrated into these systems. If they are not operational at present, these systems may not be rehabilitated. However, CISs, which are operational at present, will be utilized also in future by local supplementary sources and/or

re-use intakes. Therefore, the diversion water demands are included in the water balance study for the case of future irrigation system.

- For CISs, it is assumed that the actual irrigated area is 62.5% of the firmed-up service area in dry season, if the water source is local flow which would be limited in dry season.
- Pump irrigation systems (PISs) which are operational at present and located in the future large scale NISs as above, will be abandoned due to the high O&M cost, and hence water demands at such PIS are not included in the water balance study for the future case.
- The irrigation water demand whose water source is groundwater is also preliminary estimated based on the granted water use permit. It is assumed that the present and future peak water demand is equal to the currently granted water quantity. The monthly variation of the demand is estimated based on the crop water requirement determined in Tarlac Groundwater Irrigation System Reactivation Project (TGISRP)[8].

(1) Present Irrigation Water Demand

The existing NISs whose water source is surface water are summarized in Table C.1.2.1 and their schematic flow diagram is shown in Annex-F C.1.1.3.

Table C. 1.2.1 Summary of Existing NISs for Water Balance Study

Name of System	Service Area (ha)	Firmed-up Service Area (ha)	Sub-system	Water Source	Intake Point
Angat-Maasim RIS (AMRIS)	31,485	26,791	Angat	Angat R.	Bustos Dam
			Maasim	Maasim R.	3 diversion dams
Porac-Gumain RIS	4,004	3,087	Porac	Porac R.	Porac dam and Solib dam
			Gumain	Gumain R.	Gumain dam
Tarlac-San Miguel-O'donel RIS (TASMORIS)	5,301	4,200	TARIS	Tarlac R.	Tarlac dam
			SMORIS	San Miguel & O'donel R.	Smoris dam
Pampanga Delta RIS (PDRIS)	11,920	6,604		Pampanga R.	Cong Dadong dam
Upper Pampanga River Integrated Irrigation System (UPRIIS)	24,962	20,520	Division-I	Pampanga R. & Talavera R.	Talavera dam and Rizal dam
	23,913	22,591	Division-II	Pampanga R.	Rizal dam (through Main canal MC1)
	29,846	25,881	Division-III	Pampanga R.	Bongabon (Atate) dam
	23,811	19,924	Division-IV	Penaranda R.	Penaranda dam and Bongabon dam (through main canal and Lateral G2)
	16,879	16,879	Division-V	Pampanga R.	Rizal dam (through Super Diversion Canal)
Aulo SRIP	810	810		Aulo R.	Aulo dam

Source: NIA

The estimated diversion water demands at each intake point for the existing NISs are summarized in Table C.1.2.2. For the irrigation water demand in UPRIIS, the re-use rate, which is defined as the ratio of re-used water and diversion water requirement, is assumed referring the Casecnan project[6] , and the net diversion water requirement is computed by subtracting the re-use water volume from the demand. The re-use rate assumed is shown in Table C.1.2.3. The estimated net diversion water demands at each intake point are summarized in Table C.1.2.4.

Table C. 1.2.2 Estimated Diversion Water Demands for Existing NISs

Irrigation System	Intake Point	River	Diversion Water Requirement (m^3/s)											
			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug	Sep	Oct.	Nov.	Dec
UPRIIS, Div-I	Talavera Dam	Talavera	2.1	2.3	0.7	0.0	0.1	2.0	2.0	0.6	0.7	1.9	1.6	1.6
UPRIIS, Div-I,II, V	Rizal Dam	Pampanga	76.5	88.3	74.3	23.5	2.2	42.5	33.0	8.9	10.6	23.5	42.5	68.2
UPRIIS, Div-III, IV	Bongabon Dam	Pampanga	37.0	41.9	30.5	5.4	7.2	27.4	10.4	4.9	5.7	10.9	22.0	31.8
Aulo	Aulo SRIP	Aulo	1.1	1.2	0.6	0.0	0.2	0.7	0.3	0.1	0.2	0.4	0.7	0.9
UPRIIS, Div-IV	Penaranda Dam	Penaranda	26.1	28.3	15.9	0.0	4.4	17.1	6.4	3.6	4.0	10.4	17.7	21.1
PDRIS	Cong Dadong Dam	Pampanga	8.7	9.4	5.3	0.0	1.5	5.7	2.1	1.2	1.3	3.4	5.9	7.0
AMRIS	Bustos Dam	Angat	41.3	41.7	32.0	9.7	0.0	25.5	9.9	1.2	5.4	10.1	18.8	34.2
TASMORIS	Tarlac Dam	Tarlac	5.3	6.1	5.1	1.6	0.2	3.5	2.1	0.6	0.8	1.6	2.7	4.8
TASMORIS	Smoris Dam	O'Donnel	0.3	0.3	0.3	0.1	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.2
Porac-Gumain	Porac Dam	Porac	1.0	1.2	1.0	0.3	0.0	0.7	0.4	0.1	0.1	0.3	0.5	0.9
Porac-Gumain	Solib Dam	Porac	0.9	1.1	0.9	0.3	0.0	0.6	0.4	0.1	0.1	0.3	0.5	0.8
Porac-Gumain	Gumain Dam	Gumain	2.2	2.5	2.1	0.7	0.1	1.4	0.8	0.3	0.3	0.7	1.1	2.0

Note : Intake points are indicated on Annex-F C.1.2.2
Source : JICA Study Team

Table C. 1.2.3 Re-Use Rate for UPRIIS

Intake point	Irrigation System	Re-use rate
Rizal dam	UPRIIS Div-I, II, V	0.106
Bongabon dam	UPRIIS Div-III	0.180
Penaranda dam	UPRIIS Div-IV	0.041

Source: Estimated by JICA Study Team based on NIA, Casecnan Project[6)]

Table C. 1.2.4 Estimated Net Diversion Water Demands for Existing NISs

Irrigation System	Intake Point	River	Net Diversion Water Requirement (m^3/s)											
			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug	Sep	Oct.	Nov.	Dec
UPRIIS, Div-I	Talavera Dam	Talavera	2.1	2.3	0.7	0.0	0.1	2.0	2.0	0.6	0.7	1.9	1.6	1.6
UPRIIS, Div-I,II, V	Rizal Dam	Pampanga	68.4	78.9	66.4	21.0	2.0	38.0	29.5	8.0	9.5	21.0	38.0	60.9
UPRIIS, Div-III, IV	Bongabon Dam	Pampanga	30.3	34.4	25.0	4.5	5.9	22.5	8.5	4.0	4.7	8.9	18.0	26.1
Aulo	Aulo SRIP	Aulo	1.1	1.2	0.6	0.0	0.2	0.7	0.3	0.1	0.2	0.4	0.7	0.9
UPRIIS, Div-IV	Penaranda Dam	Penaranda	25.0	27.1	15.3	0.0	4.2	16.4	6.1	3.4	3.8	9.9	17.0	20.3
PDRIS	Cong Dadong Dam	Pampanga	8.7	9.4	5.3	0.0	1.5	5.7	2.1	1.2	1.3	3.4	5.9	7.0
AMRIS	Bustos Dam	Angat	41.3	41.7	32.0	9.7	0.0	25.5	9.9	1.2	5.4	10.1	18.8	34.2
TASMORIS	Tarlac Dam	Tarlac	5.3	6.1	5.1	1.6	0.2	3.5	2.1	0.6	0.8	1.6	2.7	4.8
TASMORIS	Smoris Dam	O'Donnel	0.3	0.3	0.3	0.1	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.2
Porac-Gumain	Porac Dam	Porac	1.0	1.2	1.0	0.3	0.0	0.7	0.4	0.1	0.1	0.3	0.5	0.9
Porac-Gumain	Solib Dam	Porac	0.9	1.1	0.9	0.3	0.0	0.6	0.4	0.1	0.1	0.3	0.5	0.8
Porac-Gumain	Gumain Dam	Gumain	2.2	2.5	2.1	0.7	0.1	1.4	0.8	0.3	0.3	0.7	1.1	2.0

Note : Intake points are indicated on Annex-F C.1.2.2
Source : JICA Study Team

The existing CISs and small scale irrigations under BSWM in each water balance catchment and their estimated water demands are shown in Annex-T C.1.2.1 and C.1.2.2, respectively. The water demand for existing CISs and small scale irrigations under BSWM in total in the study area is summarized in Table C.1.2.5.

Table C. 1.2.5 Estimated Total Water Demands for Existing CISs and Small Scale Irrigations

	Diversion Water Requirement (m^3/s)											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug	Sep	Oct.	Nov.	Dec
Total Water Demand	31.60	34.25	19.30	0.00	7.73	30.27	11.25	6.34	7.02	18.28	21.48	25.58

Source : JICA Study Team

(2) Projected Irrigation Water Demand

The projected future NISs, whose water source is surface water, in addition to the existing NISs as above are summarized in the following Table C.1.2.6 and their schematic flow diagram is shown in Annex-F C.1.1.7.

Table C. 1.2.6 Summary of Projected Future NISs for Water Balance Study

Name of Project	Service Area (ha)	Water Source	Remarks
Casecnan MIPP Phase-II	37,200*1	Pampanga River at Rizal dam through Super Diversion Canal	Phase Expansion of UPRIIS, Division-V
Balog-Balog MP Phase-II	39,150*1	Tarlac River	Weir and canal system were completed in Phase-I
Gumain MP	16,750*3	Gumain River	Feasibility Study was completed in 1985[9].
Balintingon MP	14,900*2	Penaranda River	Feasibility Study was completed in 1983[4].

Source: *1; NIA, *2; Balintingon Multipurpose Project, Supplemental Report [5],
*3; NIA/JICA: Feasibility Study Report on the Gumain River Irrigation Project, 1985. [9]

The estimated diversion water demands and net diversion water demand at each intake point for the future NISs are summarized in Table C.1.2.7 and C.1.2.8, respectively. To estimate the net diversion water demands, the re-use rate shown Table 7.3.9 is employed.

Table C. 1.2.7 Estimated Diversion Water Demands for Projected Future NISs

Irrigation System	Intake Point	River	Diversion Water Requirement (m^3/s)											
			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug	Sep	Oct.	Nov.	Dec
UPRIIS, Div-I	Talavera Dam	Talavera	2.1	2.3	0.7	0.0	0.1	2.0	2.0	0.6	0.7	1.9	1.6	1.6
UPRIIS, Div-I,II, V	Rizal Dam	Pampanga	104.4	120.4	101.3	32.0	3.0	57.9	45.0	12.2	14.5	32.0	57.9	93.0
UPRIIS, Div-III	Bongabon Dam	Pampanga	37.0	41.9	30.5	5.4	7.2	27.4	10.4	4.9	5.7	10.9	22.0	31.8
Aulo	Aulo SRIP	Aulo	1.1	1.2	0.6	0.0	0.2	0.7	0.3	0.1	0.2	0.4	0.7	0.9
Balintingon	Balintingon Dam	Penaranda	19.5	21.2	11.9	0.0	3.3	12.8	4.8	2.7	3.0	7.7	13.3	15.8
UPRIIS, Div-IV	Penaranda Dam	Penaranda	26.1	28.3	15.9	0.0	4.4	17.1	6.4	3.6	4.0	10.4	17.7	21.1
PDRIS	Cong Dadong Dam	Pampanga	8.7	9.4	5.3	0.0	1.5	5.7	2.1	1.2	1.3	3.4	5.9	7.0
AMRIS	Bustos Dam	Angat	41.3	41.7	32.0	9.7	0.0	25.5	9.9	1.2	5.4	10.1	18.8	34.2
BBMP	Balog-Balog Dam	Tarlac	52.5	50.9	21.2	6.5	14.2	24.8	16.5	12.6	7.6	14.2	45.6	45.9
Porac-Gumain	Gumain Dam	Gumain	12.9	12.9	7.6	6.3	6.7	6.2	4.3	6.0	5.3	2.8	8.8	12.5

Source: JICA Study Team

Table C. 1.2.8 Estimated Net Diversion Water Demands for Projected Future NISs

Irrigation System	Intake Point	River	Net Diversion Water Requirement (m^3/s)											
			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug	Sep	Oct.	Nov.	Dec
UPRIIS, Div-I	Talavera Dam	Talavera	2.1	2.3	0.7	0.0	0.1	2.0	2.0	0.6	0.7	1.9	1.6	1.6
UPRIIS, Div-I,II, V	Rizal Dam	Pampanga	93.3	107.6	90.6	28.6	2.7	51.8	40.2	10.9	12.9	28.6	51.8	83.1
UPRIIS, Div-III	Bongabon Dam	Pampanga	30.3	34.4	25.0	4.5	5.9	22.5	8.5	4.0	4.7	8.9	18.0	26.1
Aulo	Aulo SRIP	Aulo	1.1	1.2	0.6	0.0	0.2	0.7	0.3	0.1	0.2	0.4	0.7	0.9
Balintingon	Balintingon Dam	Penaranda	19.5	21.2	11.9	0.0	3.3	12.8	4.8	2.7	3.0	7.7	13.3	15.8
UPRIIS, Div-IV	Penaranda Dam	Penaranda	25.0	27.1	15.3	0.0	4.2	16.4	6.1	3.4	3.8	9.9	17.0	20.3
PDRIS	Cong Dadong Dam	Pampanga	8.7	9.4	5.3	0.0	1.5	5.7	2.1	1.2	1.3	3.4	5.9	7.0
AMRIS	Bustos Dam	Angat	41.3	41.7	32.0	9.7	0.0	25.5	9.9	1.2	5.4	10.1	18.8	34.2
BBMP	Balog-Balog Dam	Tarlac	52.5	50.9	21.2	6.5	14.2	24.8	16.5	12.6	7.6	14.2	45.6	45.9
Porac-Gumain	Gumain Dam	Gumain	12.9	12.9	7.6	6.3	6.7	6.2	4.3	6.0	5.3	2.8	8.8	12.5

Source: JICA Study Team

The projected future CISs and small scale irrigations under BSWM in each water balance catchment and their estimated water demands are shown in Annex-T C.1.2.3 and C.1.2.4, respectively. The water demand for projected future CISs and small scale irrigations under BSWM in total in the study area is summarized in Table C.1.2.9.

Table C. 1.2.9 Estimated Total Water Demands for Projected Future CISs and Small Scale Irrigations

	Diversion Water Requirement (m^3/s)											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug	Sep	Oct.	Nov.	Dec
Total Water Demand	41.75	45.24	25.48	0.00	10.45	40.87	15.22	8.56	9.50	24.73	28.32	33.76

Source : JICA Study Team

(3) Irrigation Water Demand for Groundwater Source

The following table summarizes the present and future irrigation water demand for groundwater source in total in the study area. The water demand by each municipality or city is listed in Annex-T C.1.2.5.

Table C. 1.2.10 Estimated Present and Future Irrigation Water Demand for Groundwater Source in the Study Area

	Average Water Requirement (m^3/s)
Present Total (2008)	0.578
Future Total (2025)	2.242

Source : JICA Study Team

C.1.2.2 Other Water Demands

(1) Fisheries Water Demand

The water demand for fisheries is estimated as follows.

- The unit water demand for fisheries which is used as standard criterion or procedure for water permit grant in NWRB is employed. Assuming that there is minimal prawn cultivation, the unit water demand of 0.9259 liter/s/ha is applied.
- The area of fish pond as well as the ratio of freshwater fish pond at present for each city/municipality is given by BFAR Region III.
- It is assumed that the area of fish pond will be kept in future.

The estimated water demand for fisheries in total in the study area is shown in the following table. The water demand by each water balance catchment is presented in Annex-T C.1.2.6. In the water balance study, water demand only for fresh water would be considered.

Table C. 1.2.11 Estimated Fisheries Water Demand in the Study Area

		Present condition (2008)	Future condition (2025)
Fish pond Area (km^2)	Brackish water	193.3	193.3
	Fresh water	68.7	68.7
Water demand (m^3/s)	Brackish water	17.9	17.9
	Fresh water	6.4	6.4
Total water demand (m^3/s)		24.3	24.3
Total water demand (MCM/year)		765	765

Source: JICA Study Team

(2) Livestock Water Demand

The water demand for livestock is estimated as follows.

- The unit water demand for livestock which is used as standard criterion or procedure for water permit grant in NWRB (0.00024 liter/s/head for cattle and swine, 0.00000146 liter/s/head for poultry) is employed.
- City/Municipality data for number of livestock are used for the present water demand.
- The increasing rate in number of livestock is assumed to be proportional to the increasing rate of the GRDP for agricultural sector in Region III. The proportional coefficient is assumed to be 0.282 for livestock and 0.151 for poultry, respectively, based on the relationship between the average increasing rate for the total number of livestock and poultry in Philippines and that for GDP of agricultural sector in Philippines in the last five years, according to the statistical data by NSCB. It is also observed that the annual increasing rate of the GRDP of agricultural sector in Region III in the last five years is 8.2%/year in average, according to the statistical data by

NSCB. The increasing rate in the number is therefore set at 2.3%/year for livestock and 1.2% for poultry, respectively.

The estimated water demand for livestock in total in the study area is shown in the following table. The water demand for each municipality and city is presented in Annex-T C.1.2.7.

Table C. 1.2.12 Estimated Livestock Water Demand in the Study Area

	Present condition (2008)	Future condition (2025)
Total number of livestock (head)	1,075,245	1,582,681
Total number of poultry (head)	22,166,976	27,150,334
Water demand (m^3/s)	0.290	0.419
Water demand (MCM/year)	9.2	13.2

Source: JICA Study Team

C.1.3 Water Charge related to Irrigation

C.1.3.1 Irrigation Service Fee (ISF)

The National Irrigation Authority (NIA) provides the irrigation water supply services as the WSP including construction, operation and management of the irrigation facilities for the farmers. NIA sets up the ISF based on a concept such that NIA delivers the right volume of water at the right time to every farm at least twice a year, and the farmers shall pay ISF for NIA's services in the delivery of water to the farms.

The rate of ISF is expressed in terms of production volume of the irrigated paddy but not in terms of monetary value. Accordingly, the rate varies year by year depending on the price of the rice. Due to this background, the rates of ISF for the principal national irrigation systems (NISs) in and around the study area are estimated in terms of the monetary value. As listed below, the rates of ISF for NISs except NEPIS and UPRIIS are estimated at 1,500 pesos/ha as of 2008, while those for NEPIS and UPRIIS are 1,000 pesos/ha and 1,750 pesos/ha, respectively.

Table C. 1.3.1 Historical Trend of Irrigation Water Charges of NISs in and around the Study Area

(unit: pesos/ha)

National Irrigation Systems	2002	2003	2004	2005	2006	2007	2008
AMRIS	1,222	1,240	1,276	1,286	1,294	1,300	1,500
Porac-Gumain RIS	1,274	1,294	1,288	1,282	1,307	1,236	1,500
NEPIS	900	900	900	1,000	1,000	1,000	1,000
TASMORIS	1,113	1,095	1,098	1,152	1,195	1,190	1,500
Pampanga RIS	-	1,500	1,349	1,400	1,381	1,377	1,500
TGIS	-	-	-	-	-	-	1,500
UPRIIS-District I	-	-	-	-	1,716	-	-
UPRIIS-District II	-	-	-	-	1,750	-	-
UPRIIS-District III	-	-	-	-	1,257	-	-
UPRIIS-District IV	-	-	-	-	1,750	-	-

Note -: Lack of data.
Source: NIA

C.1.3.2 Collection Ratio of ISF

Some of the water rates are subject to the low collection ratio, and a major concern is given to the ISF in particular. The past trend of collection ratios of ISFs for NIS is as listed below.

Table C. 1.3.2 Annual Collection Ratio of Irrigation Service Fees for National Irrigation System

National Irrigation Systems	2002	2003	2004	2005	2006	2007	2008
AMRIS	60.2%	51.7%	45.3%	45.4%	47.9%	49.2%	27.3%
Porac-Gumain RIS	38.3%	50.6%	49.3%	71.4%	63.2%	65.3%	71.8%
NEPIS	37.5%	38.1%	21.9%	30.4%	15.5%	19.5%	10.2%
TASMORIS	28.4%	38.1%	35.4%	40.6%	44.3%	37.9%	67.1%
Pampanga RIS	-	94.2%	65.4%	72.2%	85.4%	74.8%	59.1%
TGIS	-	-	-	-	-	-	-
UPRIIS-District I	-	-	-	-	58.5%	-	-
UPRIIS-District II	-	-	-	-	66.9%	-	-
UPRIIS-District III	-	-	-	-	52.1%	-	-
UPRIIS-District IV	-	-	-	-	44.6%	-	-

Note: - Lack of data.
Source: NIA.

As listed above, the collection ratio of ISFs varies depending on the irrigation system and the years. The present collection rates as of 2008 are in a range of 10.2 % to 67.1 %. According to officials of NIA, the current tariff regulation had been set in 1975 (34 years ago), and since then, it has never been revised. The tariff systems are generally set to recover operation and maintenance cost including salaries and wages of staffs and labors. However, even the salaries and wages are hardly recovered by the water rate at present.

C.2 Problems and Issues of Agriculture/Irrigation and Fishery Sector on IWRM Plan

C.2.1 General

The current problems and issues of agriculture and fishery are identified and evaluated through clarification of available data, filed reconnaissance and interview and discussions with the various stakeholders during the study period. Though the agriculture and the fishery sectors consist of various aspects including land resources, productivity, post harvesting, marketing, and so on, this Study focuses only those concerning the water resources development and management in the river basin.

The major problems and issues are categorized into 1) water shortage relating irrigation water development, 2) low irrigation efficiency as irrigation management and 3) others concerning water quality, groundwater depletion and flood damage. The issues on agriculture/irrigation and fishery sectors have two types, which are those to be solved within the sector and inter-sector issues to be solved among the other sectors. The sector issues are further categorized into 1) implementation of irrigation development projects, 2) maintenance, rehabilitation, restoration and upgrading of irrigation systems, 3) irrigation water management such as improvement of irrigation efficiency and water saving technology and 4) Small scale irrigation development including small water impounding and shallow tubewell. The Inter-sector issues include 1) water allocation among the other sectors, 2) development and management on multipurpose dam projects and 3) water quality management both of surface and groundwater among the other sectors.

C.2.2 Problems and Issues on Water Shortage

C.2.2.1 Water Shortage and in Existing Irrigation Systems

In many paddy fields including existing irrigation systems both of national and communal irrigation, water shortage are observed, which are considered to be due to 1) recent climate change causing unstable rainfall pattern, 2) limited water resource development, 3) deterioration of irrigation facilities due to the insufficient maintenance and 4) lack of small scale irrigation including water impounding facilities, etc. In addition, degradation of watershed due to illegal logging and slash and burn agriculture is also one of the reasons of unstable water resource for irrigated cultivation.

C.2.2.2 Delay of Large Scale Irrigation Development Projects

In the Pampanga river basin, there are various plans of irrigation development including large scale development of national irrigation systems, communal irrigation systems and small scale irrigation developments. Major large scale projects are 1) Casecnan Multipurpose Irrigation & Power Project - Irrigation Component (CMIPP-IC), Phase-2, 2) Balintingon Reservoir Multipurpose Project (BRMP), and 3) Balog-Balog Multipurpose Project (BBMP), Phase-II. However, their implementation has been suspended or delayed mainly due to the insufficient budgetary arrangement despite rapid escalation of the construction materials. For the BBMP, it was reported in the workshop in the stakeholder meeting that unstable security conditions due to the NPA activities had been also the cause of the delay of the project implementation.

C.2.2.3 Water Shortage in AMRIS

At present, most serious problems on irrigation water source in the existing irrigation system is the case of the AMRIS due to the water allocation of the Angat multipurpose dam. As discussed in *Sector Report H: Water Resources Development and Management* in detail of the inadequate reliability of water supply in Angat-Umiray, the priority of water distribution from the Angat dam is given to the municipal water supply, and hence the irrigation operation in the AMRIS has been facing chronic water shortage. In addition, as the effective storage capacity of 1.5 MCM of the existing Bustos dam is not enough to regulate the daily fluctuation of the water through the hydropower plants during peak power generation, the AMRIS can not effectively utilize the full water from the Angat dam.

C.2.3 Problems and Issues on Low irrigation Efficiency

C.2.3.1 Insufficient and Deterioration of Irrigation Facilities

Low irrigation efficiency as the issues of the irrigation water management is caused by various reasons. Physically, they are 1) deterioration of canals and related facilities due to the lack of maintenance, 2) insufficient water control facilities including discharge measuring devises, and 3) high water conveyance loss in the unlined canal. The low irrigation efficiency causes the low collection efficiency on irrigation service fees.

C.2.3.2 Insufficient Water Management

The low irrigation efficiency is also caused by lack of proper water management activities both by the farmers and the related agencies, which requires the capacity development and introduction and dissemination of new water saving technologies. In the workshop, it was pointed out that the role of LGUs is weak, especially in the implementation and operation of communal irrigation systems.

C.2.4 Other Problems and Issues

C.2.4.1 Water Quality

The Pampanga delta is the biggest aquaculture area in the nation, and hence aquaculture in the fishponds is one of the most important industries in this region. In the fishponds, major issue is the water quality, which consists of two aspects, one is the water pollution in the fishpond areas due to contamination by effluents and garbage from the other sectors such as factories, urbanization and livestock industry, etc, and the other is pollution load given by fishponds causing water pollution in the Manila bay. In addition, it was pointed out in the workshop that sulfate in the groundwater has been increased due to the Pinatubo eruption.

C.2.4.2 Depletion of Groundwater

Depletion of groundwater is reported in Bulacan, Pampanga and Nueva Ecija provinces due to the increasing pump installation of irrigation, fishpond and domestic water supply, which is also because of the insufficient implementation of groundwater use regulation, including lack of inventory of pump irrigation facilities. Depletion of groundwater has caused salt intrusion in pump irrigation systems in some areas in Pampanga and Bulacan provinces.

C.2.4.3 Flood Damage to Irrigation System and Fishpond

Frequent flood damages and poor drainage conditions due to the degradation of the drains and the related facilities in the existing agricultural land are the reasons of low and unstable production, especially in lower Pampanga and its tributaries. Flood damage in the fishpond area is also reported in the workshop. From the view point of conservation of agricultural and fishery land, the mitigation of flood damage is required, which is discussed in *Sector Report E: Flood and Sediment Disaster Management.*

C.3 Projects as Components of the Proposed IWRM Plan

C.3.1 National and Regional Development Strategy on Agriculture and Fishery

C.3.1.1 National Policy for Agriculture Sector

The major policies in the agriculture sector plan under the Medium-Term Philippine Development Plan (MTPDP), 2004-2010[10)] include the creation of job opportunities in rural areas and increase the benefits to agriculture and competitive marketing capacity through the expansion of agri-business land. In the irrigation sector, investment incentives for sustainable and early gestating projects, such as small scale irrigation projects and rehabilitation of national irrigation systems are being emphasized. The development strategies for the agriculture sector in MTPDP are anchored on two primary goals: (1) expanding the production base; and (2) increasing productivity. Self-sufficiency in rice production is considered a key component of the agriculture productivity goal. In response to the "rice crisis" in 2008, the Government committed resources to expand rice production in order to meet the projected demand. The resources are allocated for various programs such as the Rice Self-Sufficiency Plan for 2009-2010[11)]. These initiatives recognize the necessity of upgrading and increasing irrigation infrastructure to permit farmers to exploit the potentials of improved agricultural technologies promoted through these various programs.

Rice production grew at an average of 3.68% per year in the period 2000-2007. However, self-sufficiency in rice is not yet achieved due to the country's larger requirements brought about by its high population growth rate. The Rice Self-Sufficiency Plan for 2009-2010[11)] is geared towards (1) achievement of 100% rice self-sufficiency by 2010 through sustainable rice production, and (2) improvement of rice productivity and income of the farmers, enhancement on small farmer's self-reliance and control over the means of productions especially on seeds, capital and inputs; development and promotion of farmers' capacity to manage and improve their local agriculture resources. This Program aims to (1) increase paddy production from 16.24 million tons in 2007 to 17.3 million tons in 2008; 18.5 million tons in 2009; and 19.8 million tons in 2010, (2) augment rice income through increases in yield and crop diversification, and (3) reduce rice importation significantly in 2010.

C.3.1.2 Regional Policy for Agriculture Sector

In Updated Central Luzon Regional Physical Framework Plan (RPFP), 2005-2030[3)] adopted in 2006, one of the focal points is improvement of productivity, profit and resiliency of the region's agriculture, which include post harvest handling, processing marketing networks, and supporting crop production on sloping area. Concerning the land resources, conversion of prime agricultural land to non-agricultural uses should be subject to social benefit-cost analysis under intensity promotion of program supporting the development of areas identified as Strategic Agriculture and Fisheries Development Zones. Irrigated areas where significant public investment has taken place should not be for conversion.

In the RPFP, the government should continue allocating funds in support of the development of the agricultural sector, and construction of irrigation and drainage facilities, farm to market roads and farm mechanization are emphasized. The priority is given to the development of new irrigation systems and rehabilitation of existing systems in order to expand coverage to priority production area and increase their efficiency. For water resource and irrigation development, 1) Casecnan Multipurpose Project, 2) Balog-Balog Multipurpose Project, 3)Balintingon Multipurpose Project, 4) Rehabilitation of Angat Afterbay Regulator Dam, 5)Improvement of National Irrigation System, 6) Communal Irrigation Development Program and 7) Development of Pump Irrigation Systems are envisioned to support the development in Central Luzon.

C.3.1.3 Strategic Agriculture and Fishery Development Zone (SAFDZ)

In accordance with the Republic Act 8435 (Agriculture and Fisheries Modernization Act)[12)], the Department of Agriculture is defined the area for the acceleration and modernization of agriculture and fisheries sector in support to the country's food security and to realize and sustain rural development.

The Bureau of Soils and Water Management has completed the basic development resource information and map for the Strategic Agriculture and Fisheries Development Zone (SAFDZ), which represents the various categories for strategic agricultural and fishery development.

In section 9 of R.A 8435, it is noted that all irrigated lands, irrigable lands already covered by irrigation projects with firm funding commitments, and lands with existing or having the potential for growing high value crops so delineated and included within the SAFDZ shall not be converted for a period of five (5) years from the effectively of this Act: Provided however, that not more than five percent (5%) of the said lands located within the SAFDZ may be converted upon compliance with existing laws, rules, regulations, executive orders and issuances and administrative orders relating to land use conversion.

In section 20 of the Local Government Code[14)], the difference in the percentage lands that may be converted to other uses:

- Chartered Cities and 1st Class Municipalities - 15% of the local arable lands
- 2nd and 3rd Class Municipalities - 10% of the arable lands
- 4th and 5th Class Municipalities - 5% of the arable lands

In the SAFDZ of Region-III, areas of each category are summarized by province in Table C.3.1.1 and each strategic agriculture and fishery zone is shown in Annex-F C.3.1.1.

Table C. 3.1.1 Strategic Agriculture and Fishery Development Zone by Province

(unit: ha)

Category	Bulacan	Nueva Ecija	Pampanga	Tarlac	Total
1	85,304	241,450	68,053	120,288	515,095
2	14,034	28,835	9,071	26,183	78,123
3	23,319	8,555	32,961	1,227	66,062
4	624	4,805	0	0	5,429
5	1,641	7,715	13,965	3,465	26,786
6	0	0	0	0	0
7	0	0	122	0	122
Total	124,922	291,360	124,172	151,163	691,617

Note : The data is provincial bases including out of the Study area
Category : 1. Strategic Crop Sub-development Zone
2. Strategic Livestock Sub-development Zone
3. Strategic Fishery Sub-development Zone
4. Strategic Integrated Crop/Livestock Sub-development Zone
5. Strategic Integrated Crop/Fishery Sub-development Zone
6. Strategic Integrated Crop/Livestock /Fishery Sub-development Zone
7. Strategic Integrated Fishery/Livestock Sub-development Zone
Source : Handbook on Strategic Agriculture and Fishery Zone, Region III

C.3.2 Projects as the Countermeasures against the Problems and Issues on Agriculture/Irrigation and Fishery

Based on the problems and issues identified in Chapter C.2 and taking the national and regional strategy into consideration, the following goals are set up for agriculture/irrigation and fishery sectors. This sector goal is based on condition that the primary agricultural lands be preserved and the government continue to support in development of irrigation infrastructures both for new construction and rehabilitation/improvement of existing irrigation systems. Also, new technologies shall be developed, demonstrated and widely disseminated in order to improve the efficiencies and to increase agricultural productivity with the competitive cost for production.

For the fishery sector, the government agencies including LGUs are supporting to increase and improve the productivity in fishery, especially for aquaculture in this region, while no specific projects/programs are identified on water resource development and management relating to the fishery sector except for water quality. In this study, therefore sector goal are set up as below;

- Rehabilitate and develop the irrigation system
- Enhance the new agricultural technology on water management Sustainable
- Fishery under the integrated water resource management

Projects and programs are identified in order to achieve the above sector goals based on clarification of the current problems and issues described in the previous Chapter C.2 as well as the discussion in the stakeholder meetings in the study period. The on-going and proposed projects are referred to the NIA Indicative Irrigation Development Program (2010-2019)[2)], the NIA Regional Irrigation Development Program (2010-2019)[13)] and information obtained from the Bureau of Soil and Water Management and the Bureau of Fisheries & Aquatic Resources.

Major provincial and aerial development strategy in the Pampanga river basin is broadly categorized as below.

- Bulacan - Water allocation at Angat storage dam
  - Rehabilitation and improvement of AMRIS
  - Sustainable aquaculture production in Pampanga delta
- Nueva Ecija - Implementation of CMIIP-IC - II and BMRP
  - Rehabilitation of UPRIIS
  - Small water impounding in hilly area
- Pampanga - Rehabilitation of Pampanga Delta RIS, Polac Gumain RIS and CISs
- Tarlac - Implementation of BBMP-II
  - Rehabilitation of TASMORIS
  - Expansion and rehabilitation groundwater irrigation
- All Provinces - Development and restoration of CISs and Small scale irrigation
  - Improvement of irrigation efficiency

The projects related to the problems, issues and measures are shown in Table C.3.2.1. The list of the identified projects/programs on agriculture/irrigation and fishery is summarized in Table C.3.2.2. Their profiles for the on-going, planned and conceptual projects proposed in this study are prepared in Annex-T C.3.2.1. Annex-F C.3.2.1 shows the location of the projects.

Table C. 3.2.1 (1/2) On-going, Proposed and Conceptual Projects related to Problems and Issues on Agriculture/Irrigation and Fishery

Goals:
1) Rehabilitate and develop the irrigation system
2) Enhance the new agricultural technology on water management
3) Sustainable fishery under the integrated water resource management

Problems and Issues / Causes	Countermeasures	Projects and Plans	Sector
1. Waters Shortage Relating Irrigation Water Development **(1) Water shortage in existing NISs and CISs** • Recent climate change causing unstable rainfall pattren • Limited water resource development • Deterioration of irrigation facilities due to the insufficient maintenance • Lack of small scale irrigation including water impounding facilities **(2) Delay of Implementation of Casecnan-II, Balintingon, Balog Balog Project** • Insufficient budgetary arrangement despite rapid escalation of the construction material • Unstable security conditions due to the NPS activities **(3) Water Shortage in AMRIS** • Inadequate reliability of water supply due to insufficient water supply capacity • Increasing domestic water demand in Metro Manila • Lower priority of water allocation to irrigation • Peak hydropower generation and less regulation capacity in Bustos	1.1 Implementation of Regular Programs on Rehabilitation and Development on NIA Assisted Irrigation System	• AI-G-03: Repair, Rehabilitation of Existing Groundwater Irrigation Systems, Establishment of Groundwater Pump Project	AIF
		• AI-G-04: Balikatan Sagip Patubig Program	AIF
		• AI-G-05: Repair, Rehabilitation, Restoration & Preventive Maintenance of Existing National & Communal Irrigation Facilities	AIF
		• AI-G-06: Restoration/Rehabilitation of Existing NIA Assisted Irrigation System	AIF
		• AI-G-09:Comprehensive Agrarian Reform Program, Irrigation Component	AIF
	1.2 Rehabilitation of NIS	• AI-G-07: Participatory Irrigation Development Project (PIDP), APL1-Infrastructure Development (for Rehabilitation of AMRIS)	AIF
		• AI-P-03: Sector Loan on Rehabilitation of Irrigation Facilities (SLRIF; for Rehabilitation of Polac-Gumain NIS)	AIF
		• AI-P-10: Rehabilitation of AMRIS	AIF
	1.3 Development of National Irrigation System	• AI-G-01; Balog-Balog Multipurpose Project Phase1	AIF
		• AI-G-02: Along-along Creek Irrigation Project	AIF
		• AI-G-10: Upper Tabuating SRIP	AIF
		• AI-P-01:Balintingon Reservoir Multipurpose Project (BBMP)	AIF
		• AI-P-02:Balog-Balog Multipurpose Project, Phase2 (BBMP-II)	AIF
		• AI-P-04: Casecnan Multi-purpose Irrigation & Power Project (CMIPP-IC) , Phase 2	AIF
		• AI-P-09: Gumain Reservoir Project	AIF
	1.4 Development of Communal and Small Scale Irrigation Projects	• AI-P-05: Procurement of Pumps, Drilling Rigs & Related Equipment	AIF
		• AI-P-06: Irrigation Water Resources Augmentation Pump Establishment Project	AIF
		• AI-P-08: Central Luzon Groundwater Irrigation Systems Reactivation Project	AIF
		• AI-G-08: Rehabilitation of Small Water Impounding Projects / Diversion Dams	AIF
		• AI-P-11: Construction of priority small scale irrigation systems /Small Water Impounding Projects (SWIP), Small Diversion Dam Projects (SDD)	AIF
		• AI-C-01: New Construction of Small Scale Irrigation Projects	AIF
	1.5 Water resources Development and Capacity Building on Water Allocation	• IS-C-02: Project for Recovery of Reliability of Water Supply in Angat-Umiray System	IS
		• IS-C-04: Capacity Development of NWRB and Relevant Agencies on Water Allocation and Distribution	IS

Source: JICA Study Team
Note: AIF - Agriculture/Irrigation and Fishery, WQ – Water-related Environmental Management,
FL - Flood and Sediment Disaster Management, IS – Inter-sector for Water Resources Management

Table C. 3.2.1 (2/2) On-going, Proposed and Conceptual Projects related to Problems and Issues on Agriculture/Irrigation and Fishery

Problems and Issues / Causes	Countermeasures	Projects and Plans	Sector
2. Low Irrigation Efficiency **(1) Insufficient and Deterioration of Irrigation Facilities** • Degradation of canals and related facilities due to lack of maintenance • Insufficient water control facilities including discharge measuring devises • High water conveyance loss in the unlined canal **(2) Insufficient and Water Management** • Lack of proper water management activities both by the farmers and the related agencies • Weak role of LGU's in implementation and operation of CISs	2.1 Enhancement of Water Saving Technology	• AI-P-07: Appropriate Irrigation Technologies for Enhanced Agricultural Production • AI-C-02: Introduction of Water Saving Irrigation Technology	AIF AIF
	2.2 Improvement of Water Management	• AI-C-03: Improvement of Monitoring System and Capacity Development for Proper Water Management in NISs and CISs	AIF
3. Other Issues **(1) Water Quality** • Water pollution in the fishpond area due to contamination by effluents and garbage from the other sectors such as factories, urbanization and livestock industry, etc. • Pollution load given by fishponds • Increase of sulfate in groundwater due to Pinatubo eruption	3.1 Improvement of Fishery Activities toward Sustainable Fishery Development	• AF-G-01: Aquaculture Fisheries Development Programs • AF-G-02: Comprehensive Regulatory Services • AF-G-03: Support Projects and Activities • AF-G-04: Fisheries Resources Management for Improved and Sustainable Harvest • WQ-C-02: Capacity Development to Improve Water Quality and Aquaculture Fisheries Management	AIF AIF AIF AIF WQ
	3.2 Improvement of Water Quality Monitoring	• WQ-C-01: Capacity Development to Upgrade WQ Monitoring and Data Management Program	WQ
	3.3 Establishment of Groundwater Monitoring	• IS-C-01: Establishment of Comprehensive Groundwater Monitoring in Pampanga river basin	IS
(2) Depletion of Groundwater • Increasing pump installation of irrigation, fishpond and domestic water supply • Insufficient implementation of groundwater use regulation • Lack of inventory of pump facilities **(3) Flood Damage to Irrigation System and Fishpond** • Frequent flood damage and poor drainage condition	3.4 Mitigation Measures against Flood Damage	(Refer to Flood mitigation Projects)	FL

Source: JICA Study Team
Note: AIF - Agriculture/Irrigation and Fishery, WQ – Water-related Environmental Management,
FL - Flood and Sediment Disaster Management, IS – Inter-sector for Water Resources Management

Table C. 3.2.2 List of On-going, Proposed and Conceptual Programs and Projects for Agriculture/Irrigation and Fishery

No.	Code	Title of Project/Plan	Implementing Agency	Status
1	AI-G-01	Balog-Balog Multipurpose Project Phase 1	NIA	On-going
2	AI-G-02	Along-along Creek Irrigation Project (UPRIIS Div3)	NIA	On-going
3	AI-G-03	Repair, Rehabilitation of Existing Groundwater Irrigation Systems, Establishment of Groundwater Pump Project (REGIP)	NIA	On-going
4	AI-G-04	Balikatan Sagip Patubig Program (BSPP)	NIA	On-going
5	AI-G-05	Repair, Rehabilitation, Restoration & Preventive Maintenance of Existing National & Communal Irrigation Facilities (RRENIS/ RRECIS)	NIA	On-going
6	AI-G-06	Restoration/Rehabilitation of Existing NIA Assisted Irrigation System (RRE-NIAIS)	NIA	On-going
7	AI-G-07	Participatory Irrigation Development Project APL1-Infrastructure Development	NIA	On-going
8	AI-G-08	Rehabilitation of Small Water Impounding Projects / Diversion Dams	BSWM	On-going
9	AI-G-09	Comprehensive Agrarian Reform Program, Irrigation Component	DAR / NIA	On-going
10	AI-G-10	Upper Tabuating SRIP	NIA	On-going
11	AI-P-01	Balintingon Reservoir Multipurpose Project (BRMP)	NIA / Mun. General Tino	Proposed
12	AI-P-02	Balog-Balog Multipurpose Project Phase 2	NIA	Proposed
13	AI-P-03	Sector Loan on Rehabilitation of Irrigation Facilities	NIA	Proposed
14	AI-P-04	Casecnan Multi-purpose Irrigation & Power Project Irrigation Component Phase 2	NIA	Proposed
15	AI-P-05	Procurement of Pumps, Drilling Rigs & Related Equipment	NIA	Proposed
16	AI-P-06	Irrigation Water Resources Augmentation Pump Establishment Project	NIA	Proposed
17	AI-P-07	Appropriate Irrigation Technologies for Enhanced Agricultural Production	NIA	Proposed
18	AI-P-08	Central Luzon Groundwater Irrigation Systems Reactivation Project	NIA	Proposed
19	AI-P-09	Gumain Reservoir Project	NIA	Proposed
20	AI-P-10	Rehabilitation of AMRIS	NIA	Proposed
21	AI-P-11	Construction of Priority Small Scale Irrigation Systems/Small Water Impounding Projects (SWIP), Small Diversion Dam Projects (SDD)	DA-BSWM	Proposed
22	AI-C-01	New Construction of Small Scale Irrigation Project under BSWM	BSWM/LGUs	Conceptual
23	AI-C-02	Introduction of Water Saving Irrigation Technology	NIA	Conceptual
24	AI-C-03	Improvement of Monitoring System and Capacity Development for Proper Water Management in NISs and CISs	NIA	Conceptual
25	AF-G-01	Aquaculture Fisheries Development Programs	BFAR	On-going
26	AF-G-02	Comprehensive Regulatory Services	BFAR	On-going
27	AF-G-03	Support Projects and Activities	BFAR	On-going
28	AF-G-04	Fisheries Resources Management for Improved and Sustainable Harvest	Bulacan Gov.	On-going

Source: JICA Study Team

C.3.2.1 Projects/Programs to Deal with Water Shortage

There are various projects to improve water shortage situation in existing irrigation areas, which are categorized into (1) NIA regular programs, (2) Rehabilitation of NISs, (3) Development of large scale irrigation projects and (4) Development of small scale irrigation projects. The projects to address the water shortage in AMRIS are described in *Sector Report H: Water Resources Development and Distribution*.

(1) Regular Programs on Rehabilitation and Development on NIA Assisted Irrigation System

(a) AI-G-03: Repair, Rehabilitation of Existing Groundwater Irrigation Systems, Establishment of Groundwater Pump Project (REGIP)

AI-G-04: Balikatan Sagip Patubig Program (BSPP)

AI-G-05: Repair, Rehabilitation, Restoration & Preventive Maintenance of Existing National & Communal Irrigation Facilities (RRENIS/RRECIS)

AI-G-06: Restoration/Rehabilitation of Existing NIA Assisted Irrigation System (RRE-NAIS)

These programs are NIA's nation-wide regular programs allocating the budget for new development and rehabilitation of CISs and some rehabilitation works of NISs. Their financial source are generally national budget (GAA ; General Appropriations Act) except some cases under the foreign assisted. Rehabilitation of CISs are conducted in case that the required works be beyond the capacity of IAs, while normal maintenance should be managed by IAs. Rehabilitation/repair and improvement of groundwater pump irrigation system to sustain the operation of the existing wells. Construction and installation of new deep and shallow tube wells are also included. These programs are summarized in Table C.3.2.3 and details are tabulated in Annex-T C.3.2.2.

Table C. 3.2.3 Summary of NIA On-going Regular Program

	No of system:	Beneficiaries	Target area
REGIP	29 CISs	4,169 farmers	7,622 ha
BSPP	9 CISs	764 farmers	1,347 ha
RRENIS / RRECIS	3 NISs / 24 CISs	41,105 farmers	50,038 ha
RRE-NAIS (UPRIIS)	1 NIS / 33 CISs	2,907 farmers	5,029 ha
RRE-NAIS (Others)	5 NISs	67,733 farmers	167,125 ha

Source: NIA Regional Irrigation Development Program, 2010-2019

(b) AI-G-09: Comprehensive Agrarian Reform Program, Irrigation Component (CARP-IC)

The program is a nation-wide program to support the Comprehensive Agrarian Reform Program (CARP) under Department of Agrarian Reform (DAR) providing rural infrastructure necessary to enhance farm productivity and income of CARP beneficiaries. The CARP involves pre-engineering, construction / rehabilitation of irrigation and drainage facilities, farm roads, marketing facilities, and institutional development. The irrigation component covers development of CISs/CIPs and strengthening of the IAs through the irrigation development projects, which are conducted by NIA with same manner as the other NIA projects for construction of CISs except their financial source under DAR.

Though there is no definite long term plan of the projects under CARP-IC, the projects to be implemented in Region-III for the period from 2010 through 2025 are estimated based on the average annual accomplishment in previous years.

(2) Rehabilitation of NIS

(a) AI-G-07: Participatory Irrigation Development Project (PIDP), APL1-Infrastructure Development (for Rehabilitation of AMRIS)

The PIDP financed by the World Bank seeks to improve NIA's financial viability through institutional reform and capability building including better service delivery to farmers, enhance farmers participation and their capability to manage NIS transferred from NIA to IA. APL1 under PIDP involves the infrastructure improvement and sustenance of national irrigation systems, policy instruments and institutional development for improved IMT in O&M, capacity building for IAs, organization and financial corporate strengthening.

Under this PIDP-APL-1, rehabilitation of AMRIS is selected to cover whole existing area with the beneficiaries of 49,000 families. Proposed works includes 1) rehabilitation of North and South constant gates, 2) repair and improvement of control house, 3) construction of measuring device, 4) canal lining, 5) replacement of steel gates, and 6) manual and mechanized desisting in the canals.

(b) AI-P-03: Sector Loan on Rehabilitation of Irrigation Facilities (SLRIF; for Rehabilitation of Polac-Gumain NIS)

The objective of SLRIF is to strengthen the irrigation sector and to contribute to improve living standard in the rural area by restoring NISs and establishing sustainable management and O&M through reconstruction and systematic implementation of irrigation management transfer program.

Rehabilitation of the Porac-Gumain NIS of 3,126 ha was proposed in the JICA preparatory study for the SLRIF in 2009, because of its high and urgent necessity of the rehabilitation. In this existing NIS, the irrigable area was devastated during the eruption of Mt. Pinatubo, where lahar and volcanic ash covered the whole irrigable area by an average of depth of 30cm, and hence irrigation and drainage facilities were damaged. The project works include 1) rehabilitation of diversion works, canal system, drainage system, road, and O&M facilities, and 2) Institutional strengthening program.

(c) AI-P-10: Rehabilitation of AMRIS

The urgent necessity of rehabilitation work of the Bustos diversion dam in AMRIS has been recognized including the downstream apron and its foundation. Its project components and their implementation plan are under preparation by NIA supported by JICA as of March 2010.

(3) Development of National Irrigation Projects

(a) AI-G-01: Balog-Balog Multipurpose Project (BBMP) Phase, Phase-1

Phase-1 of the BBMP is going on to rehabilitate the existing NIS of TASMORIS, while its Phase-2 for construction of Balog-Balog dam is proposed as shown in Chapter C.3.2.1(3)(2) (Code: AI-P-02). The Phase-1 covers the rehabilitation area of 10,255 ha and extension of 2,220 ha with 7,340 beneficiaries. The project works includes raising Tarlac Diversion dam, construction of north main canal and irrigation and drainage facilities in extension area, rehabilitation of the existing facilities and resettlement works, improvement of drainage system.

(b) AI-G-02: Along-Along Creek Irrigation Project

This project located in San Antonio, Nueva Ecija includes construction of check gate, new and rehabilitation of irrigation and drainage facilities, raising of embankment and dredging, which are under implementation to generate additional service area of 2,500 ha for UPRIIS District III. The project works is on-going, which is scheduled to be completed in December 2010, according to NIA UPRIIS, Division III.

(c) AI-G-10: Upper Tabuating SRIP

The project located in General Tino, Nueva Ecija involves construction of a new zoned earth fill dam with a height of 25m and a reservoir area of 71.5 ha, targeting new irrigable area of 700 ha, flood control and aquaculture. After the feasibility study, topographic survey was completed in February 2010, and the project works of irrigation facilities were commenced in March 2010, while dam construction was awaited budget allocation from the central office as of March 2010, according to NIA UPRIIS, Div-3.

(d) AI-P-01: Balintingon Reservoir Multipurpose Project (BRMP)

The project envisions the construction of a rock fill center-core dam and its appurtenant structures across Sumacbao River in Neva Ecija. The project works include constriction of a diversion weir and new irrigation facilities in the commanded area of about 14,900ha and hydropower plant with an installed capacity of 30MW.

To overcome the financial affordability, BOT investors have been invited to implement the project. The MOA was signed on February 17, 2010 between NIA and the investor for undertaking a full blown study to determine its financial, socio-economic and technical viabilities.

According to Municipality of General Tinio, there is an idea to send a part of the regulated water by the reservoir to AMRIS area so that it would be utilized to supplement the water used in AMRIS and MWSS. However, if the water would be utilized for such purpose, the available water for the irrigation in the project area would be reduced. It should be noted that there is a potential conflict between these

(e) AI-P-02: Balog-Balog Multipurpose Project Phase 2 (BBMP-II)

The project is composed of the construction of a storage dam with hydropower plant on the upper Bulsa river and the extension of the irrigation service area in continuation to the BBMP-I (Code AI-G-01). According to the updated F/S prepared in December 2009, the proposed dam is designed of 113.5m high rock fill dam with a storage capacity of 575MCM (effective storage: 525MCM), in which the proposed capacity of hydropower plant is 43.5MW. The dam will have a flood control function and be utilized for the inland fishery in the reservoir. The proposed irrigation area commanded by the proposed dam is 34,410 ha in total with the beneficiaries of 15,660 families, which is including 6,080 ha of rehabilitation. The updated F/S is under scrutiny by the NIA central office and to be submitted to NEDA for evaluation. The project is envisioned to be implemented by BOT.

(f) AI-P-04: Casecnan Multi-purpose Irrigation & Power Project Irrigation Component (CMIPP-IC), Phase 2

The CMIPP-IC, Phase 2 is the sustained project of CMIPP-IC, Phase 1. The construction of the new intake at Rizal and the Super Diversion Canal (SDC) have already been completed taking into consideration the water requirements of the entire 37,200ha of new area, however the facilities in the new area constructed under the Phase 1 was only 16,879 ha, and remaining area is scheduled to be constructed in Phase 2. In order to maximize the utilization and economic benefits of the water delivered by the Casecnan BOT Project (Trans-basin diversion) and the irrigation facilities already constructed under Phase 1, the immediate implementation of the Phase 2 project is proposed to cover the remaining 20,321ha of new area and the rehabilitation of about 40,000ha in UPRIIS.

The updated F/S was completed in October 2009, in which the project components of the Phase-2 include 1) extension of SDC and construction of additional lateral and sub-lateral canals, drainage canals and related structures in 20,321ha, and 2) rehabilitation / improvement of UPRIIS area, such as rehabilitation of the PENRIS main and lateral canals, and related structures. The project will benefit 11,931 farmers

within the new area.

(g) AI-P-09: Gumain Reservoir Project

Feasibility study of the Gumain reservoir project was conducted in 1985, however updating of the study has not been made since then. In the F/S in 1985, construction of 108m high, zoned embankment dam was proposed to store irrigation water to serve 11,000ha of paddy and 5,200ha of sugercane area including the existing Porac-Gumain & Caulaman RIS. Due to the possible change caused by the eruption of Mt.Pinatuno, it is necessary to study again its feasibility including the technical and economic viability.

(4) Development of Communal and Small Scale Irrigation Projects

(a) AI-P-05: Procurement of Pumps, Drilling Rigs & Related Equipment

AI-P-06: Irrigation Water Resources Augmentation Pump Establishment Project

These are two new regular program of NIA covering the nation-wide. Program of the Procurement of Pumps, Drilling Rigs & Related Equipment (PPDRRE) is scheduled to start in 2011, while Irrigation Water Resources Augmentation Pump Establishment Project (IWRAPEP) will start in 2013 according to the NIA indicative irrigation Development Program, which are summarized in Table C.3.2.4.

Table C. 3.2.4 Summary of NIA Planned Regular Program

	No of pump unit	Beneficiaries	Target area
PPDRRE	1,000 units	3,900 families	3,900ha.
IWRAPEP	1,330 units	1,333 families	2,360ha
	1,029 units (surface water)		1,437ha (new)
	301 units (shallow tubewells)		924ha (rehab)

Source: NIA Indicative Irrigation Development Program, 2010-2019

(b) AI-P-08: Central Luzon Groundwater Irrigation Systems Reactivation Project

In the NIA Indicative Irrigation Development Program, this project is planned to start in 2015 in continuation to the previous groundwater irrigation development in Tarlac province, The project involves the construction of 100 deep well pump systems covering 5,000ha; provision of rural water supply in selected Barangays and procurement of equipment, however the definite plan and design of this project has not been available. According to NIA Region III, the project area in the CMIPP-IC, Phase 2 (Code: AI-P-04) should be excluded.

(c) AI-G-08: Rehabilitation of Small Water Impounding Projects / Diversion Dams

The small scale irrigation projects including small water impounding projects contribute not only increasing rice production in the region but also the strengthening livelihood especially in upland and hilly area where the development is not covered by the large scale development. Though there are many small water impounding systems, some of them are not functioning. Under the regular program of the Bureau of Soil and Water Management (BSWM) rehabilitation of seven small water impounding projects (SWIPs) in Nueva Ecija and Bulacan with the area of 235ha to be restored is on-going.

(d) AI-P-11: Construction of Priority Small Scale Irrigation Systems/Small Water Impounding Projects (SWIP), Small Diversion Dam Projects (SDD)

The priority projects are identified by DA Region III. The detail design has been completed, however the implementation has been delayed since around 2002, because of limited budget allocation. According to the DA Region III, the following projects are given higher priority.

- Bulacan (1SWIP and 2SDD, service area = 125ha)

- Nueva Ecija (1SWIP, service area = 95ha)
- Pampanga (1SWIP and 3SDD, service area = 195ha)
- Tarlac (1SWIP, service area =45ha)

In addition, the PPDO, Nueva Ecija has prepared his own list of priority small scale irrigation development projects as below. Though the list has been submitted to BSWM with estimated cost, the implementation has also been delayed due to the limited budget.

- Nueva Ecija (new construction of 1 DD and rehabilitation of 11 DD and 5 SWIP)

Details are shown in Annex-T C.3.2.3.

(e) AI-C-01: New Construction of Small Scale Irrigation Project under BSWM

There are various potentials of small scale irrigation identified by BSWM which are not covered by the on-going and planed priority projects (Code: AI-G-08 and AI-G-11). These potential is to be exploited re though various projects consisting of (1) diversion dams (DD), (2) small farm reservoir (SFR), (3) small water impounding project (SWIP) and (4) shallow tubewell (STW). The high and urgent necessity of such small scale irrigation development is recognized from the view points of well-balanced, equitable development of agricultural activity in the study area, which was also pointed out by several stakeholders through technical working group meetings and stakeholders meetings.

The potential small scale irrigation project was further estimated from the information given by BSWM as one of necessary conceptual projects and plans. The potential sites for small scale irrigation projects estimated are summarized in Table C.3.2.5.

Table C. 3.2.5 Summary of Estimated Potential Small Scale Irrigations under BSWM

	Nos	Service Area (ha)
Diversion Dam (DD)	18	959
Small Water Impounding Project (SWIP)	24	1,635
Small Farmers Reservoir (SFR)	4	112
Total	46	2,706

Source : Estimated by the Study Team based on the BSWM data base

C.3.2.2 Projects to Address Low Irrigation Efficiency

Improving irrigation efficiency is vital for the integrated water resources management to effective and optimum use of limited water sources in the basin as well as improving agricultural productivity with less water, which was also raised from the stakeholders. In the study area, aside from the on-going and planned structural projects, there have been several potential activities which are related to enhancement of the irrigation efficiency from the view points of water management and water saving technology for irrigation as described below.

(a) AI-P-07: Appropriate Irrigation Technologies for Enhanced Agricultural Production

This project is also nation-wide covering Region III, VI, IV, XI and XII according to NIA Indicative Development Program. The project involves the use of innovative and appropriate technology including photovoltaic energy in power generation and drip tape for water dispersion. Irrigation technology to be implemented includes drip sprinkler and flood irrigation facilitated by solar power. The target are in Central Luzon is estimated at 4,000 ha and beneficiaries are 2,000 families approximately. The project is scheduled to start in 2015, however the detailed project component to be executed in Region III has not been clearly available.

(b) AI-C-02: Introduction of Water Saving Irrigation Technology

Water saving irrigation is one of the key issues on effective water use in irrigation systems as well as improvement of related facilities. Also, new technology is highly required under the situation caused by possible climate change in future. Activities are on-going jointly by NIA-UPRIIS and PhilRice for Upscaled Technology Demonstration and Adoption of water saving irrigation since 2007 in order to improve equitable distribution in UPRIIS. These activities aim at trial, research, demonstration and dissemination of implementing the adoption of Controlled Irrigation/Alternate Wet and Dry (AWD) by means of intermittent irrigation and rotational water supply. PhilRice is also conducting trial on System of Rice Intensification (SRI), which is a set of new farming practices developed to increase the productivity of land, water, and other farm input.

These activities are however still limited in the selected area in UPRIIS, and potential of adoption of such new technology in wide area is quite high. The above-mentioned activities are proposed to be more enhanced, integrated and disseminated to entire study area. In this conceptual project, its components include; (1) Trial and research, (2) Demonstration farm operation, (3) Training to trainers and technical campaign to IAs, (4) Monitoring with close coordination among related agencies such as DA, NIA, PhilRice, IRRI, and JICA technical cooperation project, etc. The project also requires (5) Capacity development of IAs, because more sustainable and equitable water distribution within irrigation schemes can be achieved through farmers' participation.

(c) AI-C-03: Monitoring System and Capacity Development for Proper Water Management in NISs and CISs

In the most of existing major irrigation systems, water discharge at intake and in some control points in canals is monitored periodically. However, their reliability and quantity are not observed sufficient to properly control the system and also they are not well utilized to improve water delivery planning. The reasons are due to (1) Discharge measuring devices are insufficient at necessary points, (2) Measuring devices have been deteriorated or not well functioning as designed because of sediment in the canals, etc, (3) Conversion tables (H-Q curve) of water discharge against water level and gate opening height, etc. are not sufficiently calibrated and updated, (4) Communication system are insufficient among the sites and offices, and so on.

In addition, timely reactions such as gate adjustment corresponding to the unexpected rainfall are not fully controlled due to the insufficient monitoring and control system which is causing certain amount of water loss. To utilize the limited water sources more efficiently, it is necessary to monitor the water flow in the systems, which is also vital for further adoption of water saving technology. The conceptual project for Monitoring System and Capacity Development for Proper Water Management in NISs and CISs is proposed. This project will also contribute to the inter-sector surface water monitoring system below

- IS-C-03: Enhancement of Monitoring System for Surface Water in Pampanga River

C.3.2.3 Projects/Programs to Address Sustainable Development of Fishery

For the fishery sector, no specific projects/programs are identified on water resource development and management except for water quality, while regular programs are identified to support fisher folk to increase and improve the productivity, especially for aquaculture.

(a) AF-G-01: Aquaculture Fisheries Development Programs

According to Bureau of Fisheries & Aquatic Resources (BFAR) Region III, Aquaculture Fisheries Development Programs are on-going, of which components consist of (1) support private and provincial Tilapia hatcheries (2) Input assistance, (3)

Training/consultations, (4)Upgrading of bloodstocks, (5) Seeding of existing communal bodies, and (6) Extension support, education and training services, etc. The program also includes the activity on water quality monitoring as well as training for fisheries. The proper management of aquaculture would benefit to improvement of water quality at surrounding water bodies. .

(b) AF-G-02: Comprehensive Regulatory Services

This program is also one of the BFAR's on-going priority programs. The services include the components of (1) Fish health management & inspection, (2) Residue monitoring and surveillance of feed mills and, (3) Aquatic animal disease surveillance, monitoring and control, etc.

(c) AF-G-03: Support Projects and Activities

This projects and activities include post-harvesting, marketing and credit, such as (1) Market development services, (2) Market-matching and consumer information services, (3) Participation to Agri-Aqua trade fairs, (4) Assistance to fisher folk in accessing agricultural credit & loan under the BFAR's regular program.

(d) AF-G-04: Fisheries Resources Management for Improved and Sustainable Harvest

This on-going project by the Bulacan provincial government integrates the activities related to fisheries and coastal management to ensure the attainment of rationally and properly managed and sustained fisheries and aquatic resources in the coastal areas considering the livelihood of fisher folks. The on-going activities are (1) Resource inventory, (2) Advocacy to adoption of the municipal fisheries ordinance, (3) Mangrove planting, (4) Capacity building and public awareness, and (5) Organizing community river clean-up day, etc. This program also includes the activity on water quality monitoring with related agencies such as BFAR and DENR.

- WQ-C-02: Capacity Development to Improve Water Quality and Aquaculture Fisheries Management

C.3.2.4 Inter-Sector Projects/Programs to Address Other Issues

Bases on the identified problems and issues, which require the inter-sector measures, the following projects/programs are identified.

(1) Projects to Address Flood Damage to Agriculture and Fishery Area

- FL-G-01, 02, 03, 04, FL-P-01, 02 FL-C-01 and 02: Various flood mitigation projects (Refer to *Sector Report E: Flood and Sediment Disaster Management*)

(2) Projects to Address Groundwater Depletion

- IS-C-01; Establishment of Comprehensive Groundwater Monitoring in Pampanga River Basin (Refer to *Sector Report H: Water Resources Development and Distribution)*

(3) Projects to Address Water Quality

- WQ-C-01: Capacity Development to Upgrade WQ Monitoring and Data Management Program

C.3.3 Project Cost

The cost of the planned and conceptual projects under the proposed IWRM Plan are estimated based on the available reports and the existing estimate by the concerned government authorities whatever available. The costs of the projects/programs under the NIA Indicative Irrigation Development Program (2010-2019) was estimated with the price level in 2009, which include both of the direct and indirect cost, such as administration cost, etc. but excluding price escalation contingency. In case that available cost estimate was made before 2008, the estimated cost is converted to the price level of

2009 applying price escalation conversion factor. The estimated costs of the projects are shown in the Project Profile in Annex-T C.3.2.1.

References

1) NIA: COPLAN, 2009-2018.
2) NIA: Indicative Irrigation Development Program, 2010-2019
3) NEDA Region III: Updated Central Luzon Regional Physical Framework Plan (RPFP), 2005-2030, 2006.
4) NIA, Balintingon Reservoir Multipurpose Project, Feasibility Study, Vol. I, Main Report, 1983.
5) Supplemental Report, Balintingon RMP, Nueva Ecija, 2008 with revised ICC form as of February 2008
6) NIA: Definitive Development Plan, Irrigation Component of the Casecnan Multipurpose Irrigation and Power Project (CMIPP-IC) under the Central Luzon Irrigation Project (CLIP), Appendix-I, Meteorology and Hydrology, 2000.
7) NIA: Feasibility Updating Study for Balog-Balog Multipurpose Project, Stage II, 2009.
8) NIA: A Report of Final/Definitive Development Plan, Tarlac Groundwater Irrigation System Reactivation Project (TGISRP) under the Central Luzon Irrigation Project (CLIP), Main Report, 2000.
9) NIA/JICA: Feasibility Study Report on the Gumain River Irrigation Project, 1985.
10) NEDA: Medium-Term Philippine Development Plan, 2004-2010, 2004.
11) DA: Rice Self-Sufficiency Plan for 2009-2010.
12) GOP: Republic Act 8435, Agriculture and Fisheries Modernization Act, 1997.
13) NIA Region III: NIA Regional Irrigation Development Program (2010-2019).

Annex-Tables

Annex-T C.1.2.1 Summary of Existing CISs and Small Scale Irrigations in Water Balance Catchment

River	Water Balance Catchemnt	Existing CIS (Functioning)		Existing WRMP		Total Area (ha)
		Nos of Systems	Service Area (ha)	Nos of Systems	Service Area (ha)	
Angat	ANG01	3	77			77
	ANG0201	1	59			59
	ANG0202	3	83	1	20	103
	ANG0203					0
	ANG0204			1	42	42
	ANG03					0
Coronell	COR01	18	3,408			3,408
Pampanga	PAM01	6	888	1	40	928
	PAM0201	38	8,840	13	529	9,369
	PAM0202					0
	PAM0203		0			0
	PAM03					0
	PAM0401	6	337			337
	PAM0402	1	120			120
	PAM0501	11	1,485			1,485
	PAM0502			1	120	120
	PAM0503					0
	PAN01	5	740	2	165	905
Pasac	PAS0101			2	64	64
	PAS0102	5	600			600
	PAS0103	22	2,609	6	257	2,866
	PAS0104	9	1,488	5	65	1,553
	PAS0105					0
	PAS0106					0
	PAS0107					0
	PAS0108					0
Penaranda	PEN0101					0
	PEN0102	2	240			240
	PEN0103					0
Rio Chico	RCH0101	23	7,424	4	185	7,609
	RCH0102	16	3,200	7	339	3,539
	RCH0103	4	1,650			1,650
	RCH0104	2	110			110
Total		175	33,358	44	1,826	35,184

Source : NIA & BSWM

Annex-T C.1.2.2 Estimated Diversion Water Demands for Existing CISs and Small Scale Irrigations

Water Balance Catchment	River	Diversion Water Requirement (m^3/s)											
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug	Sep	Oct.	Nov.	Dec
ANG01		0.06	0.07	0.04	0.00	0.02	0.07	0.02	0.01	0.02	0.04	0.04	0.05
ANG0201		0.05	0.05	0.03	0.00	0.01	0.05	0.02	0.01	0.01	0.03	0.03	0.04
ANG0202	Angat R.	0.06	0.06	0.04	0.00	0.01	0.04	0.01	0.01	0.01	0.02	0.04	0.05
	Other River	0.05	0.05	0.03	0.00	0.01	0.05	0.02	0.01	0.01	0.03	0.03	0.04
ANG0203		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANG0204		0.03	0.04	0.02	0.00	0.01	0.04	0.01	0.01	0.01	0.02	0.02	0.03
ANG03		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COR01		2.79	3.02	1.70	0.00	0.75	2.93	1.09	0.61	0.68	1.77	1.90	2.26
PAM01	Pampanga R.	0.41	0.45	0.25	0.00	0.07	0.27	0.10	0.06	0.06	0.16	0.28	0.33
	Other River	0.50	0.54	0.31	0.00	0.14	0.53	0.20	0.11	0.12	0.32	0.34	0.41
PAM0201	Pampanga R.	4.65	5.04	2.84	0.00	0.78	3.05	1.14	0.64	0.71	1.84	3.16	3.76
	Other River	4.77	5.17	2.91	0.00	1.28	5.01	1.86	1.05	1.16	3.03	3.24	3.86
PAM0202		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAM0203		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAM03		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAM0401	Pampanga R.	0.14	0.15	0.09	0.00	0.02	0.09	0.03	0.02	0.02	0.06	0.10	0.12
	Other River	0.19	0.20	0.11	0.00	0.05	0.20	0.07	0.04	0.05	0.12	0.13	0.15
PAM0402	Pampanga R.	0.16	0.17	0.10	0.00	0.03	0.10	0.04	0.02	0.02	0.06	0.11	0.13
	Other River	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAM0501		1.22	1.32	0.74	0.00	0.33	1.28	0.48	0.27	0.30	0.77	0.83	0.98
PAM0502		0.10	0.11	0.06	0.00	0.03	0.10	0.04	0.02	0.02	0.06	0.07	0.08
PAM0503		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAN01		0.74	0.80	0.45	0.00	0.20	0.78	0.29	0.16	0.18	0.47	0.50	0.60
PAS0101		0.05	0.06	0.03	0.00	0.01	0.06	0.02	0.01	0.01	0.03	0.04	0.04
PAS0102	Pampanga R.	0.41	0.45	0.25	0.00	0.07	0.27	0.10	0.06	0.06	0.16	0.28	0.33
	Other River	0.23	0.25	0.14	0.00	0.06	0.25	0.09	0.05	0.06	0.15	0.16	0.19
PAS0103		2.35	2.54	1.43	0.00	0.63	2.46	0.92	0.52	0.57	1.49	1.59	1.90
PAS0104		1.27	1.38	0.78	0.00	0.34	1.34	0.50	0.28	0.31	0.81	0.86	1.03
PAS0105		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAS0106		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAS0107		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAS0108		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEN0101		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEN0102	Penaranda R.	0.18	0.20	0.11	0.00	0.03	0.12	0.04	0.02	0.03	0.07	0.12	0.15
	Other River	0.08	0.09	0.05	0.00	0.02	0.09	0.03	0.02	0.02	0.05	0.06	0.07
PEN0103		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RCH0101		6.23	6.75	3.80	0.00	1.67	6.54	2.43	1.37	1.52	3.96	4.23	5.04
RCH0102		2.90	3.14	1.77	0.00	0.78	3.04	1.13	0.64	0.71	1.84	1.97	2.34
RCH0103	Talavera R.	1.44	1.56	0.88	0.00	0.24	0.95	0.35	0.20	0.22	0.57	0.98	1.17
	Other River	0.45	0.49	0.28	0.00	0.12	0.47	0.18	0.10	0.11	0.29	0.31	0.36
RCH0104		0.09	0.10	0.06	0.00	0.02	0.09	0.04	0.02	0.02	0.06	0.06	0.07

Source :Estimated by the Study Team

Annex-T C.1.2.3 Summary of Projected Future CISs and Small Scale Irrigations in Water Balance Catchment

River	Water Balance Catchment	Projected CIS (Functioning)		Projected WRMP		Total Area (ha)
		Nos of Systems	Service Area (ha)	Nos of Systems	Service Area (ha)	
Angat	ANG01	4	202			202
	ANG0201	2	94			94
	ANG0202	6	212	1	20	232
	ANG0203	1	7			7
	ANG0204			1	42	42
	ANG03			2	55	55
Coronell	COR01	20	4,308	5	220	4,528
Pampanga	PAM01	18	3,087	1	40	3,127
	PAM0201	38	8,840	26	931	9,771
	PAM0202					0
	PAM0203	1	800			800
	PAM03					0
	PAM0401	4	259	2	50	309
	PAM0402	1	120			120
	PAM0501	12	1,650	2	30	1,680
	PAM0502			1	120	120
	PAM0503					0
	PAN01	6	740	1	220	960
Pasac	PAS0101			2	64	64
	PAS0102	5	600	1	30	630
	PAS0103	31	3,309	8	402	3,711
	PAS0104	9	1,488	5	65	1,553
	PAS0105					0
	PAS0106		0			0
	PAS0107					0
	PAS0108					0
Penaranda	PEN0101			1	40	40
	PEN0102			2	35	35
	PEN0103					0
Rio Chico	RCH0101	43	12,072	7	327	12,399
	RCH0102	15	3,180	27	2,069	5,249
	RCH0103	4	1,650	4	59	1,709
	RCH0104	2	110			110
Total		222	42,728	105	4,819	47,547

Source : NIA & BSWM

Annex-T C.1.2.4 Estimated Diversion Water Demand for Projected Future CISs and Small Scale Irrigations

Water Balance Catchment	River	Diversion Water Requirement (m^3/s)											
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug	Sep	Oct.	Nov.	Dec
ANG01		0.17	0.18	0.10	0.00	0.04	0.17	0.06	0.04	0.04	0.11	0.11	0.13
ANG0201		0.08	0.08	0.05	0.00	0.02	0.08	0.03	0.02	0.02	0.05	0.05	0.06
ANG0202	Angat R.	0.11	0.12	0.07	0.00	0.02	0.07	0.03	0.02	0.02	0.04	0.08	0.09
	Other River	0.12	0.13	0.07	0.00	0.03	0.13	0.05	0.03	0.03	0.08	0.08	0.10
ANG0203		0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
ANG0204		0.03	0.04	0.02	0.00	0.01	0.04	0.01	0.01	0.01	0.02	0.02	0.03
ANG03		0.05	0.05	0.03	0.00	0.01	0.05	0.02	0.01	0.01	0.03	0.03	0.04
COR01		3.71	4.02	2.26	0.00	1.00	3.89	1.45	0.82	0.91	2.35	2.52	3.00
PAM01	Pampanga R.	0.54	0.59	0.33	0.00	0.09	0.36	0.13	0.07	0.08	0.22	0.37	0.44
	Other River	2.22	2.41	1.36	0.00	0.60	2.33	0.87	0.49	0.54	1.41	1.51	1.80
PAM0201	Pampanga R.	4.81	5.21	2.93	0.00	0.81	3.15	1.17	0.66	0.73	1.91	3.26	3.89
	Other River	5.00	5.42	3.05	0.00	1.34	5.25	1.95	1.10	1.22	3.17	3.39	4.04
PAM0202		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAM0203		0.66	0.71	0.40	0.00	0.18	0.69	0.26	0.14	0.16	0.42	0.45	0.53
PAM03		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAM0401	Pampanga R.	0.32	0.35	0.20	0.00	0.05	0.21	0.08	0.04	0.05	0.13	0.22	0.26
	Other River	0.05	0.06	0.03	0.00	0.01	0.05	0.02	0.01	0.01	0.03	0.03	0.04
	Pampanga R.	0.16	0.17	0.10	0.00	0.03	0.10	0.04	0.02	0.02	0.06	0.11	0.13
PAM0402	Other River	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAM0501		1.38	1.49	0.84	0.00	0.37	1.44	0.54	0.30	0.34	0.87	0.93	1.11
PAM0502		0.10	0.11	0.06	0.00	0.03	0.10	0.04	0.02	0.02	0.06	0.07	0.08
PAM0503		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAN01A		0.79	0.85	0.48	0.00	0.21	0.83	0.31	0.17	0.19	0.50	0.53	0.64
PAS0101		0.05	0.06	0.03	0.00	0.01	0.06	0.02	0.01	0.01	0.03	0.04	0.04
PAS0102	Pampanga R.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Other River	0.52	0.56	0.32	0.00	0.14	0.54	0.20	0.11	0.13	0.33	0.35	0.42
PAS0103		3.04	3.29	1.86	0.00	0.82	3.19	1.19	0.67	0.74	1.93	2.06	2.46
PAS0104		1.27	1.38	0.78	0.00	0.34	1.34	0.50	0.28	0.31	0.81	0.86	1.03
PAS0105		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAS0106		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAS0107		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PAS0108		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEN0101		0.03	0.04	0.02	0.00	0.01	0.03	0.01	0.01	0.01	0.02	0.02	0.03
PEN0102	Penaranda R.	0.05	0.05	0.03	0.00	0.01	0.03	0.01	0.01	0.01	0.02	0.03	0.04
	Other River	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEN0103		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RCH0101		10.15	11.00	6.20	0.00	2.73	10.66	3.97	2.23	2.48	6.45	6.90	8.21
RCH0102		4.30	4.66	2.62	0.00	1.15	4.51	1.68	0.94	1.05	2.73	2.92	3.48
RCH0103	Talavera R.	1.44	1.56	0.88	0.00	0.24	0.95	0.35	0.20	0.22	0.57	0.98	1.17
	Other River	0.50	0.54	0.30	0.00	0.13	0.52	0.19	0.11	0.12	0.32	0.34	0.40
RCH0104		0.09	0.10	0.06	0.00	0.02	0.09	0.04	0.02	0.02	0.06	0.06	0.07

Source :Estimated by the Study Team

Annex-T C.1.2.5 Estimated Irrigation Water Demand for Groundwater Source by Municipality/City

CityMun	Province	Total Area (km^2)	Area inside the Study Area (km^2)	Ratio	Others Water Use Permit (m^3/s)	NIA Water Use Permit (m^3/s)	Demand Others (2008) (m^3/s)	Demand NIA (2008) (m3/s)	New Area (2025) (ha)	Demand_ New Area (2025) (m3/s)	Demand (2008)		Demand (2025)	
											(m^3/s)	(MCM/y)	(m^3/s)	(MCM/y)
Angat	Bulacan	58.56	52.59	0.898	0.002	0.000	0.000	0.000		0.000	0.000	0.014	0.000	0.014
Baliuag	Bulacan	43.63	43.63	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Bulacan	Bulacan	69.38	11.19	0.161	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Bustos	Bulacan	40.48	17.74	0.438	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Calumpit	Bulacan	46.52	46.52	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Dona Remedios Trinidad	Bulacan	878.91	854.25	0.972	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Guiguinto	Bulacan	24.80	1.64	0.066	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Hagonoy	Bulacan	94.58	94.55	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Malolos City	Bulacan	72.58	72.58	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Norzagaray	Bulacan	246.57	206.82	0.839	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Pandi	Bulacan	50.39	1.39	0.028	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Paombong	Bulacan	45.83	45.83	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Plaridel	Bulacan	35.44	20.04	0.565	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Pulilan	Bulacan	43.62	43.62	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
San Ildefonso	Bulacan	166.53	166.53	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
San Miguel	Bulacan	235.92	235.92	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
San Rafael	Bulacan	104.95	104.95	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Santa Maria	Bulacan	78.65	0.75	0.010	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Aliaga	Nueva Ecija	92.17	92.17	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Bongabon	Nueva Ecija	229.40	224.53	0.979	0.009	0.000	0.002	0.000		0.000	0.002	0.061	0.002	0.061
Cabanatuan City	Nueva Ecija	198.18	198.18	1.000	0.008	0.000	0.002	0.000		0.000	0.002	0.060	0.002	0.060
Cabiao	Nueva Ecija	113.48	113.48	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Carranglan	Nueva Ecija	739.39	692.95	0.937	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Gabaldon	Nueva Ecija	252.52	252.22	0.999	0.012	0.000	0.003	0.000		0.000	0.003	0.086	0.003	0.086
Gapan	Nueva Ecija	164.50	164.50	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Gen Mamerto Natividad	Nueva Ecija	98.01	98.01	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
General Tinio	Nueva Ecija	580.85	580.04	0.999	0.000	0.000	0.000	0.000	108	0.041	0.000	0.000	0.041	1.291
Guimba	Nueva Ecija	219.23	137.29	0.626	0.050	0.000	0.011	0.000		0.000	0.011	0.357	0.011	0.357
Jaen	Nueva Ecija	90.45	90.45	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Laur	Nueva Ecija	221.35	221.35	1.000	0.001	0.000	0.000	0.000		0.000	0.000	0.007	0.000	0.007
Licab	Nueva Ecija	60.42	60.42	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Llanera	Nueva Ecija	114.25	114.25	1.000	0.000	0.000	0.000	0.000	220	0.083	0.000	0.000	0.083	2.629
Lupao	Nueva Ecija	142.66	129.69	0.909	0.054	0.000	0.012	0.000	300	0.114	0.012	0.387	0.126	3.972
Science City Of Munoz	Nueva Ecija	142.44	142.44	1.000	0.034	0.000	0.008	0.000		0.000	0.008	0.240	0.008	0.240
Palayan City	Nueva Ecija	136.11	136.11	1.000	0.015	0.000	0.003	0.000		0.000	0.003	0.104	0.003	0.104
Pantabangan	Nueva Ecija	421.05	421.05	1.000	0.000	0.000	0.000	0.000	1,210	0.459	0.000	0.000	0.459	14.462
Penaranda	Nueva Ecija	78.53	78.53	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Quezon	Nueva Ecija	68.33	68.33	1.000	0.000	0.000	0.000	0.000	180	0.068	0.000	0.000	0.068	2.151
Rizal	Nueva Ecija	123.88	123.88	1.000	0.021	0.000	0.005	0.000		0.000	0.005	0.150	0.005	0.150
San Antonio	Nueva Ecija	156.90	156.90	1.000	0.014	0.000	0.003	0.000		0.000	0.003	0.100	0.003	0.100
San Isidro	Nueva Ecija	58.07	58.07	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
San Jose City	Nueva Ecija	161.75	161.75	1.000	0.022	0.000	0.005	0.000		0.000	0.005	0.159	0.005	0.159
San Leonardo	Nueva Ecija	51.69	51.69	1.000	0.007	0.000	0.002	0.000		0.000	0.002	0.050	0.002	0.050
Santa Rosa	Nueva Ecija	116.52	116.52	1.000	0.002	0.000	0.000	0.000		0.000	0.000	0.014	0.000	0.014
Santo Domingo	Nueva Ecija	82.69	82.69	1.000	0.003	0.000	0.001	0.000		0.000	0.001	0.018	0.001	0.018
Talavera	Nueva Ecija	135.06	135.06	1.000	0.007	0.000	0.002	0.000		0.000	0.002	0.050	0.002	0.050
Talugtug	Nueva Ecija	73.46	38.82	0.528	0.016	0.000	0.004	0.000	60	0.023	0.004	0.115	0.026	0.832
Zaragosa	Nueva Ecija	71.98	71.98	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Angeles City	Pampanga	62.80	62.80	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Apalit	Pampanga	60.10	60.10	1.000	0.005	0.000	0.001	0.000		0.000	0.001	0.033	0.001	0.033
Arayat	Pampanga	176.68	176.68	1.000	0.029	0.000	0.006	0.000		0.000	0.006	0.205	0.006	0.205
Bacolor	Pampanga	74.24	74.24	1.000	0.038	0.000	0.009	0.000		0.000	0.009	0.269	0.009	0.269
Candaba	Pampanga	208.20	208.20	1.000	0.038	0.000	0.009	0.000		0.000	0.009	0.274	0.009	0.274
Floridablanca	Pampanga	120.94	83.39	0.690	0.038	0.000	0.009	0.000		0.000	0.009	0.273	0.009	0.273
Guagua	Pampanga	48.93	48.93	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Lubao	Pampanga	155.02	148.79	0.960	0.038	0.000	0.009	0.000	251	0.095	0.009	0.269	0.104	3.269
Mabalacat	Pampanga	145.73	140.22	0.962	0.041	0.000	0.009	0.000	281	0.106	0.009	0.290	0.116	3.649
Macabebe	Pampanga	102.36	102.36	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Magalang	Pampanga	104.53	104.53	1.000	0.019	0.000	0.004	0.000	200	0.076	0.004	0.133	0.080	2.523
Masantol	Pampanga	45.94	45.94	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Mexico	Pampanga	122.01	122.01	1.000	0.026	0.000	0.006	0.000		0.000	0.006	0.188	0.006	0.188
Minalin	Pampanga	45.45	45.45	1.000	0.005	0.000	0.001	0.000		0.000	0.001	0.035	0.001	0.035
Porac	Pampanga	293.31	291.96	0.995	0.006	0.000	0.001	0.000	40	0.015	0.001	0.045	0.017	0.523
City Of San Fernando	Pampanga	68.57	68.57	1.000	0.050	0.000	0.011	0.000		0.000	0.011	0.355	0.011	0.355
San Luis	Pampanga	55.25	55.25	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
San Simon	Pampanga	59.93	59.93	1.000	0.003	0.000	0.001	0.000		0.000	0.001	0.018	0.001	0.018
Santa Ana	Pampanga	40.44	40.44	1.000	0.146	0.000	0.033	0.000	40	0.015	0.033	1.045	0.048	1.523
Santa Rita	Pampanga	23.19	23.19	1.000	0.012	0.000	0.003	0.000	160	0.061	0.003	0.087	0.063	1.999
Santo Tomas	Pampanga	14.46	14.46	1.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Sasmuan	Pampanga	44.80	44.76	0.999	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Bamban	Tarlac	250.57	146.51	0.585	0.000	0.000	0.000	0.000	150	0.057	0.000	0.000	0.057	1.793
Capas	Tarlac	422.30	133.94	0.317	0.011	0.299	0.002	0.068	470	0.178	0.070	2.216	0.248	7.834
Concepcion	Tarlac	221.46	221.46	1.000	0.170	0.187	0.039	0.042	630	0.239	0.081	2.556	0.320	10.085
La Paz	Tarlac	116.65	116.65	1.000	0.147	0.246	0.033	0.056	90	0.034	0.089	2.812	0.123	3.888
Tarlac City	Tarlac	261.08	132.07	0.506	0.016	0.594	0.004	0.135		0.000	0.138	4.367	0.138	4.367
Victoria	Tarlac	112.08	83.35	0.744	0.011	0.100	0.003	0.023		0.000	0.025	0.797	0.025	0.797
Total					1.122	1.426	0.255	0.324	4,390	1.664	**0.578**	18.238	**2.242**	70.708

Source: JICA Study Team

Annex-T C.1.2.6 Estimated Fisheries Water Demand by Water Balance Catchment

Water Balance Catchment	Present Net Fish Pond Area (km^2)	Future Net Fish Pond Area (km^2)	Percentage of Freshwater Fishpond (%)	Present Total Water Demand		Present Fresh Water Demand		Future Total Water Demand		Future Fresh Water Demand	
				(m^3/s)	(MCM/y)	(m^3/s)	(MCM/y)	(m^3/s)	(MCM/y)	(m^3/s)	(MCM/y)
ANG01	50.4	50.4	1.5	4.7	147.2	0.1	2.1	4.7	147.2	0.1	2.1
ANG0201	0.4	0.4	100.0	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.2
ANG0202	0.5	0.5	100.0	0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6
ANG0203	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ANG0204	0.0	0.0	100.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1
ANG03	0.0	0.0	100.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1
PAM01	40.0	40.0	4.9	3.7	116.8	0.2	5.7	3.7	116.8	0.2	5.7
PAM0201	18.3	18.3	99.8	1.7	53.3	1.7	53.2	1.7	53.3	1.7	53.2
PAM0202	0.0	0.0	100.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1
PAM0203	0.1	0.1	100.0	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2
PAM03	0.4	0.4	100.0	0.0	1.3	0.0	1.3	0.0	1.3	0.0	1.3
PAM0401	3.8	3.8	100.0	0.4	11.2	0.4	11.2	0.4	11.2	0.4	11.2
PAM0402	0.1	0.1	100.0	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2
PAM0501	0.3	0.3	100.0	0.0	0.8	0.0	0.8	0.0	0.8	0.0	0.8
PAM0502	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAM0503	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAN01	0.1	0.1	100.0	0.0	0.3	0.0	0.3	0.0	0.3	0.0	0.3
RCH0101	8.5	8.5	100.0	0.8	24.8	0.8	24.8	0.8	24.8	0.8	24.8
RCH0102	1.6	1.6	100.0	0.2	4.8	0.2	4.8	0.2	4.8	0.2	4.8
RCH0103	1.7	1.7	100.0	0.2	4.9	0.2	4.9	0.2	4.9	0.2	4.9
RCH0104	0.0	0.0	100.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1
PEN0101	0.2	0.2	100.0	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.5
PEN0102	0.3	0.3	100.0	0.0	0.8	0.0	0.8	0.0	0.8	0.0	0.8
PEN0103	0.0	0.0	100.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1
COR01	0.4	0.4	100.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0	1.0
PAS0101	33.1	33.1	5.6	3.1	96.6	0.2	5.4	3.1	96.6	0.2	5.4
PAS0102	36.6	36.6	21.3	3.4	106.9	0.7	22.7	3.4	106.9	0.7	22.7
PAS0103	8.6	8.6	100.0	0.8	25.0	0.8	25.0	0.8	25.0	0.8	25.0
PAS0104	54.4	54.4	17.6	5.0	158.8	0.9	28.0	5.0	158.8	0.9	28.0
PAS0105	0.8	0.8	66.9	0.1	2.5	0.1	1.7	0.1	2.5	0.1	1.7
PAS0106	0.9	0.9	54.4	0.1	2.7	0.0	1.5	0.1	2.7	0.0	1.5
PAS0107	0.2	0.2	100.0	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.5
PAS0108	0.3	0.3	100.0	0.0	0.7	0.0	0.7	0.0	0.7	0.0	0.7
Total	262.0	262.0		24.3	765.0	**6.4**	**200.6**	24.3	765.0	**6.4**	**200.6**

Source: JICA Study Team

Annex-T C.1.2.7 Estimated Livestock Water Demand by City/Municipality

CityMun	Province	Total Area (km^2)	Area inside the study area (km^2)	Ratio	Ratio of Commer. _Cattle / Carabao	Ratio of Commer. _Others	Ratio of Commer. _Poultry	Cattle / Carabao (2008) (head)	Others (2008) (head)	Poultry (2008) (head)	Cattle / Carabao (2025) (head)	Others (2025) (head)	Poultry (2025) (head)	Water Demand (2008) (m^3/s)	Water Demand (2008) (MCM/y)	Water Demand (2025) (m^3/s)	Water Demand (2025) (MCM/y)
Angat	Bulacan	58.56	52.59	0.898	0.000	0.909	0.948	3,280	64,339	165,141	4,828	94,703	202,267	0.016	0.519	0.024	0.763
Baliuag	Bulacan	43.63	43.63	1.000	0.000	0.949	0.000	1,105	37,112	26,350	1,627	54,626	32,274	0.009	0.290	0.014	0.427
Bulacan	Bulacan	69.38	11.19	0.161	0.000	0.787	0.053	34	594	1,510	50	875	1,849	0.000	0.005	0.000	0.007
Bustos	Bulacan	40.48	17.74	0.438	0.000	0.872	0.977	522	13,148	110,328	768	19,352	135,131	0.003	0.109	0.005	0.159
Calumpit	Bulacan	46.52	46.52	1.000	0.000	0.000	0.651	766	1,277	128,143	1,128	1,880	156,951	0.001	0.021	0.001	0.030
Dona Remedios Trinidad	Bulacan	878.91	854.25	0.972	0.000	0.000	0.000	1,286	2,481	28,276	1,892	3,652	34,632	0.001	0.030	0.001	0.044
Guiguinto	Bulacan	24.80	1.64	0.066	0.000	0.875	0.329	33	292	1,815	49	430	2,223	0.000	0.003	0.000	0.004
Hagonoy	Bulacan	94.58	94.55	1.000	0.000	0.000	0.789	429	3,174	33,473	631	4,672	40,998	0.001	0.029	0.001	0.042
Malolos City	Bulacan	72.58	72.58	1.000	0.000	0.604	0.690	791	828	130,993	1,165	1,219	160,442	0.001	0.018	0.001	0.025
Norzagaray	Bulacan	246.57	206.82	0.839	0.000	0.716	0.792	2,225	19,407	242,424	3,276	28,566	296,924	0.006	0.175	0.008	0.255
Pandi	Bulacan	50.39	1.39	0.028	0.000	0.909	0.960	82	2,830	18,406	121	4,165	22,543	0.001	0.023	0.001	0.033
Paombong	Bulacan	45.83	45.83	1.000	0.000	0.590	0.000	197	3,392	18,215	290	4,993	22,310	0.001	0.028	0.001	0.041
Plaridel	Bulacan	35.44	20.04	0.565	0.000	0.834	0.731	1,253	7,024	57,580	1,844	10,338	70,525	0.002	0.065	0.003	0.095
Pulilan	Bulacan	43.62	43.62	1.000	0.000	0.857	0.833	758	15,238	132,204	1,115	22,429	161,925	0.004	0.127	0.006	0.186
San Ildefonso	Bulacan	166.53	166.53	1.000	0.000	0.852	0.944	7,833	86,865	1,073,211	11,530	127,859	1,314,480	0.024	0.766	0.035	1.116
San Miguel	Bulacan	235.92	235.92	1.000	0.000	0.864	0.910	9,781	152,570	688,983	14,397	224,572	843,873	0.040	1.260	0.059	1.848
San Rafael	Bulacan	104.95	104.95	1.000	0.000	0.731	0.931	7,549	37,657	688,870	11,111	55,428	843,735	0.012	0.374	0.017	0.542
Santa Maria	Bulacan	78.65	0.75	0.010	0.000	0.941	0.982	62	1,702	14,657	91	2,505	17,952	0.000	0.014	0.001	0.020
Aliaga	Nueva Ecija	92.17	92.17	1.000	0.000	0.000	0.662	2,194	3,460	213,695	3,229	5,093	261,735	0.002	0.053	0.002	0.075
Bongabon	Nueva Ecija	229.40	224.53	0.979	0.000	0.506	0.000	1,634	8,328	38,397	2,405	12,258	47,030	0.002	0.077	0.004	0.113
Cabanatuan City	Nueva Ecija	198.18	198.18	1.000	0.299	0.267	0.883	3,846	13,430	832,451	5,660	19,768	1,019,594	0.005	0.169	0.008	0.239
Cabiao	Nueva Ecija	113.48	113.48	1.000	0.000	0.167	0.934	842	3,262	839,366	1,239	4,801	1,028,063	0.002	0.070	0.003	0.093
Carranglan	Nueva Ecija	739.39	692.95	0.937	0.000	0.041	0.218	4,206	4,207	94,247	6,191	6,192	115,434	0.002	0.068	0.003	0.099
Gabaldon	Nueva Ecija	252.52	252.22	0.999	0.000	0.015	0.041	2,492	5,183	48,813	3,667	7,630	59,787	0.002	0.060	0.003	0.088
Gapan	Nueva Ecija	164.50	164.50	1.000	0.181	0.421	0.903	2,368	11,996	652,026	3,485	17,657	798,608	0.004	0.139	0.006	0.197
Gen Mamerto Natividad	Nueva Ecija	98.01	98.01	1.000	0.067	0.790	0.130	1,143	9,449	64,011	1,682	13,908	78,401	0.003	0.083	0.004	0.122
General Tinio	Nueva Ecija	580.85	580.04	0.999	0.375	0.540	0.917	5,819	6,704	548,290	8,565	9,868	671,551	0.004	0.120	0.005	0.170
Guimba	Nueva Ecija	219.23	137.29	0.626	0.086	0.114	0.617	3,184	6,902	97,582	4,686	10,160	119,520	0.003	0.081	0.004	0.118
Jaen	Nueva Ecija	90.45	90.45	1.000	0.000	0.226	0.765	1,258	8,919	285,475	1,852	13,128	349,653	0.003	0.090	0.004	0.129
Laur	Nueva Ecija	221.35	221.35	1.000	0.118	0.104	0.112	1,633	2,143	51,949	2,404	3,154	63,627	0.001	0.031	0.001	0.045
Licab	Nueva Ecija	60.42	60.42	1.000	0.000	0.000	0.759	1,768	2,792	249,881	2,603	4,109	306,057	0.001	0.046	0.002	0.065
Llanera	Nueva Ecija	114.25	114.25	1.000	0.000	0.009	0.452	2,037	5,302	162,124	2,999	7,804	198,571	0.002	0.063	0.003	0.091
Lupao	Nueva Ecija	142.66	129.69	0.909	0.000	0.055	0.000	2,733	5,750	62,656	4,022	8,464	76,742	0.002	0.067	0.003	0.098
Science City Of Munoz	Nueva Ecija	142.44	142.44	1.000	0.023	0.150	0.675	2,465	7,943	176,216	3,629	11,692	215,832	0.003	0.087	0.004	0.126
Palayan City	Nueva Ecija	136.11	136.11	1.000	0.000	0.532	0.815	1,012	4,327	297,368	1,489	6,370	364,219	0.002	0.054	0.002	0.076
Pantabangan	Nueva Ecija	421.05	421.05	1.000	0.222	0.002	0.000	3,296	2,875	67,883	4,852	4,232	83,144	0.002	0.050	0.002	0.073
Penaranda	Nueva Ecija	78.53	78.53	1.000	0.325	0.325	0.857	2,120	5,524	331,726	3,121	8,131	406,302	0.002	0.073	0.003	0.104
Quezon	Nueva Ecija	68.33	68.33	1.000	0.114	0.193	0.782	1,600	4,253	227,729	2,355	6,260	278,925	0.002	0.055	0.002	0.078
Rizal	Nueva Ecija	123.88	123.88	1.000	0.183	0.191	0.582	2,726	5,532	163,330	4,013	8,142	200,048	0.002	0.070	0.003	0.101
San Antonio	Nueva Ecija	156.90	156.90	1.000	0.000	0.146	0.415	1,652	6,871	111,919	2,432	10,114	137,079	0.002	0.070	0.003	0.101
San Isidro	Nueva Ecija	58.07	58.07	1.000	0.000	0.219	0.803	1,081	2,947	207,472	1,591	4,338	254,114	0.001	0.040	0.002	0.057
San Jose City	Nueva Ecija	161.75	161.75	1.000	0.113	0.108	0.734	7,755	9,887	358,280	11,414	14,552	438,824	0.005	0.150	0.007	0.217
San Leonardo	Nueva Ecija	51.69	51.69	1.000	0.000	0.256	0.913	1,138	7,441	526,102	1,675	10,952	644,375	0.003	0.089	0.004	0.125
Santa Rosa	Nueva Ecija	116.52	116.52	1.000	0.733	0.216	0.875	4,377	6,804	353,486	6,443	10,016	432,953	0.003	0.101	0.005	0.145
Santo Domingo	Nueva Ecija	82.69	82.69	1.000	0.000	0.257	0.562	1,365	4,393	217,542	2,009	6,466	266,447	0.002	0.054	0.002	0.076
Talavera	Nueva Ecija	135.06	135.06	1.000	0.000	0.287	0.795	3,582	9,957	416,738	5,272	14,656	510,425	0.004	0.122	0.006	0.174
Talugtug	Nueva Ecija	73.46	38.82	0.528	0.223	0.005	0.656	1,332	2,276	85,920	1,961	3,350	105,235	0.001	0.031	0.001	0.045
Zaragosa	Nueva Ecija	71.98	71.98	1.000	0.216	0.011	0.000	1,877	5,839	72,894	2,763	8,594	89,282	0.002	0.062	0.003	0.090
Angeles City	Pampanga	62.80	62.80	1.000	0.000	0.000	0.000	0	0	0	0	0	0	0.000	0.000	0.000	0.000
Apalit	Pampanga	60.10	60.10	1.000	0.000	0.000	0.927	533	1,121	243,587	784	1,650	298,348	0.001	0.024	0.001	0.032
Arayat	Pampanga	176.68	176.68	1.000	0.000	0.325	0.734	1,447	3,786	268,013	2,129	5,573	328,265	0.002	0.052	0.002	0.073
Bacolor	Pampanga	74.24	74.24	1.000	0.000	0.000	0.801	489	1,458	232,118	719	2,147	284,300	0.001	0.025	0.001	0.035
Candaba	Pampanga	208.20	208.20	1.000	0.000	0.438	0.795	709	9,387	536,741	1,043	13,817	657,406	0.003	0.101	0.005	0.143
Floridablanca	Pampanga	120.94	83.39	0.690	0.000	0.681	0.903	1,508	5,295	138,197	2,219	7,794	169,265	0.002	0.058	0.003	0.084
Guagua	Pampanga	48.93	48.93	1.000	0.000	0.732	0.773	889	10,047	120,602	1,308	14,788	147,714	0.003	0.088	0.004	0.129
Lubao	Pampanga	155.02	148.79	0.960	0.000	0.625	0.929	1,710	8,509	906,408	2,518	12,524	1,110,177	0.004	0.119	0.005	0.165
Mabalacat	Pampanga	145.73	140.22	0.962	0.000	0.492	0.957	1,550	2,676	366,368	2,281	3,939	448,731	0.002	0.049	0.002	0.068
Macabebe	Pampanga	102.36	102.36	1.000	0.000	0.000	0.858	16	2,345	39,198	23	3,452	48,010	0.001	0.020	0.001	0.029
Magalang	Pampanga	104.53	104.53	1.000	0.000	0.843	0.975	1,452	12,319	1,452,004	2,137	18,132	1,778,429	0.005	0.171	0.007	0.235
Masantol	Pampanga	45.94	45.94	1.000	0.000	0.000	0.426	5	1,906	28,347	7	2,806	34,719	0.001	0.016	0.001	0.023
Mexico	Pampanga	122.01	122.01	1.000	0.000	0.079	0.940	1,899	7,426	793,203	2,796	10,931	971,522	0.003	0.107	0.005	0.149
Minalin	Pampanga	45.45	45.45	1.000	0.000	0.193	0.988	97	4,932	1,790,391	142	7,259	2,192,889	0.004	0.120	0.005	0.157
Porac	Pampanga	293.31	291.96	0.995	0.000	0.864	0.989	1,462	32,415	721,829	2,153	47,713	884,103	0.009	0.290	0.013	0.418
City Of San Fernando	Pampanga	68.57	68.57	1.000	0.000	0.944	0.922	598	38,881	968,485	881	57,230	1,186,210	0.011	0.343	0.016	0.494
San Luis	Pampanga	55.25	55.25	1.000	0.000	0.140	0.842	214	5,112	104,330	315	7,525	127,784	0.001	0.045	0.002	0.065
San Simon	Pampanga	59.93	59.93	1.000	0.000	0.031	0.868	442	3,843	117,492	650	5,656	143,905	0.001	0.038	0.002	0.054
Santa Ana	Pampanga	40.44	40.44	1.000	0.000	0.047	0.956	1,067	2,713	408,778	1,571	3,993	500,675	0.002	0.047	0.002	0.065
Santa Rita	Pampanga	23.19	23.19	1.000	0.000	0.472	0.921	504	4,397	208,679	742	6,472	255,592	0.001	0.047	0.002	0.066
Santo Tomas	Pampanga	14.46	14.46	1.000	0.000	0.000	0.970	24	3,839	297,021	36	5,650	363,794	0.001	0.043	0.002	0.060
Sasmuan	Pampanga	44.80	44.76	0.999	0.000	0.000	0.890	10	731	5,770	14	1,077	7,068	0.000	0.006	0.000	0.009
Bamban	Tarlac	250.57	146.51	0.585	0.000	0.837	0.870	0	0	0	0	0	0	0.000	0.000	0.000	0.000
Capas	Tarlac	422.30	133.94	0.317	0.000	0.627	0.870	2,368	19,776	71,743	3,486	29,109	87,872	0.005	0.171	0.008	0.251
Concepcion	Tarlac	221.46	221.46	1.000	0.000	0.449	0.870	4,629	21,750	457,380	6,813	32,014	560,204	0.007	0.221	0.010	0.320
La Paz	Tarlac	116.65	116.65	1.000	0.000	0.000	0.870	3,109	10,943	254,301	4,577	16,108	311,470	0.004	0.118	0.005	0.171
Tarlac City	Tarlac	261.08	132.07	0.506	0.000	0.803	0.870	2,076	55,713	106,554	3,056	82,005	130,508	0.014	0.442	0.021	0.650
Victoria	Tarlac	112.08	83.35	0.744	0.000	0.866	0.870	3,224	24,750	113,294	4,745	36,431	138,764	0.007	0.217	0.010	0.318
Total								144,549	930,696	22,166,976	212,765	1,369,915	27,150,334	0.290	9.159	0.419	13.229

Source: JICA Study Team

Annex-T C.3.2.1 (1/16) Project Profile for Agricultural Sector

Project Code	AI-G-01	
Project Title	Balog-Balog Multipurpose Project Phase 1	
Status of Project	On-going	
Objective Area	Tarlac Province	
Implementing Agency	NIA	
Objectives	Development of national irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 1999-2010	Estimated by Study Team for 2011-2025
	2,362 as of 2009	236 as of 2009
EIRR	(N/A)	
Expected Source of Fund	GAA*	
Expected Implementation Schedule	1999-2010*	

Project Description
- Construction of 113m high earth & rock fill dam across Bulsa River to generate electricity & provide year round irrigation water to service area of 39,150ha.(Phase-1 & 2)
- Phase 1 involves rehabilitation of existing systems (TARRIS & SMORIS), raising Tarlac Diversion dam ogee by 1.3m, construction of irrigation & drainage facilities for an expansion area of 2,200ha, resettlement works, construction of north main canal, improvement of drainage system.
- Beneficiaries: 7,340 farm-families
- Target area (new): 2,220ha
- Target area (rehabilitation): 10,255ha

Remarks
- *: Estimated and/or proposed by project proponent
- For 2011-2025, 10% of the project cost (236 Mil. Pesos) is considered.

Source of Information
- NIA: Project Briefer (As of September 30, 2009).
- NIA: Indicative Irrigation Development Program, 2010-2019.

Project Code	AI-G-02	
Project Title	Along-along Creek Irrigation Project (UPRIIS Div3)	
Status of Project	On-going	
Objective Area	San Antonio, Nueva Ecija Province	
Implementing Agency	NIA	
Objectives	Development of national irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2009-2010	Estimated by Study Team for 2011-2025
	250 as of 2009	25 as of 2009
EIRR	(N/A)	
Expected Source of Fund	GAA*	
Expected Implementation Schedule	2009-2010*	

Project Description
- Construction of check gate, irrigation and drainage facilities to generate additional service area of 2,500ha for UPRIIS District III, and address inundation problems in some barangays of San Antonio
- Water sources ; Cabungan Creek (New) & Along-Along Creek (Rehab)
- Project works ; (New) Irrigation Canal along Brgy. San Jose
  (Rehab) 1) Canal, 2) Raising of embankment, & 3) Dredging
- Beneficiaries: 300 farm-families
- Target area (new): 2,500ha

Remarks
- *: Estimated and/or proposed by project proponent
- For 2011-2025, 10% of the project cost (25 Mil. Pesos) is considered.

Source of Information
- NIA: Indicative Irrigation Development Program, 2010-2019.

Annex-T C.3.2.1 (2/16) Project Profile for Agricultural Sector

Project Code	AI-G-03	
Project Title	Repair, Rehabilitation of Existing Groundwater Irrigation Systems, Establishment of Groundwater Pump Project (REGIP)	
Status of Project	On-going	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	NIA	
Objectives	Rehabilitation and development on NIA assisted irrigation system as a regular program to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2010-2019	Estimated by Study Team for 2011-2025
	333 as of 2009	398 as of 2009
EIRR	(N/A)	
Expected Source of Fund	GAA*	
Expected Implementation Schedule	Annual Program, 2010 – 2019*	

Project Description
- Rehabilitation/repair and improvement of groundwater pump irrigation projects to sustain the operation of the existing wells.
- Construction & installation of new deep wells and shallow tube wells nationwide
- Proposed components for 2010-2019 in the study area
  - No of system: CIS-29
  - Beneficiaries: 4,169 farmer
  - Target area: 7,622ha

Remarks
- *: Estimated and/or proposed by project proponent
- The project cost estimated is only for inside the study area.
- It is assumed that the project continues till 2025 and the cost for 2020-2025 is equal to that for 2016-2019.

Source of Information
- NIA: Indicative Irrigation Development Program, 2010-2019.
- NIA: Regional Irrigation Development Program, 2010-2019, Region III.

Project Code	AI-G-04	
Project Title	Balikatan Sagip Patubig Program (BSPP)	
Status of Project	On-going	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	NIA	
Objectives	Rehabilitation and development on NIA assisted irrigation system as a regular program to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2010-2019	Estimated by Study Team for 2011-2025
	58 as of 2009	46 as of 2009
EIRR	(N/A)	
Expected Source of Fund	GAA*	
Expected Implementation Schedule	Annual Program, 2010 – 2019*	

Project Description
- Rehabilitation program designed to bring back idle and non-functioning CIS into operation & provide irrigation to new areas. Program promotes participation among national government - DA/NIA, LGU, IAs
- Proposed components for 2010-2019 in the study area
  - No of system: CIS-9
  - Beneficiaries: 764farmer
  - Target area: 1,347ha

Remarks
- *: Estimated and/or proposed by project proponent
- The project cost estimated is only for inside the study area.
- It is assumed that the project continues till 2025 and the cost for 2020-2025 is equal to that for 2016-2019.

Source of Information
- NIA: Indicative Irrigation Development Program, 2010-2019.
- NIA: Regional Irrigation Development Program, 2010-2019, Region III.

Annex-T C.3.2.1 (3/16) Project Profile for Agricultural Sector

Project Code	AI-G-05	
Project Title	Repair, Rehabilitation, Restoration & Preventive Maintenance of Existing National & Communal Irrigation Facilities (RRENIS/CIS)	
Status of Project	On-going	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	NIA	
Objectives	Rehabilitation and development on NIA assisted irrigation system as a regular program to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2010-2019	Estimated by Study Team for 2011-2025
	1,579 as of 2009	1,579 as of 2009
EIRR	(N/A)	
Expected Source of Fund	GAA*	
Expected Implementation Schedule	Annual Program, 2010 – 2019*	

Project Description
- A. Rehabilitation of irrigation facilities and structures of new & existing NIS/CIS
- B. Preventive maintenance of existing irrigation facilities & structures in NIS. Activities include minor repairs of lining, raising of embankment, grouted rip raping, construction of new canals, clearing & weeding modification of turn-outs, repair of diversion/irrigation structures, repair of steel gates/flash boards/staff gauges, installation of reinforcing concrete and repair of transmission lines.
- Proposed components for 2010-2019 in the study area
  - No of system: NIS-3, CIS-24
  - Beneficiaries: 41,105farmer
  - Target area: 50,038ha

Remarks
- *: Estimated and/or proposed by project proponent
- The project cost estimated is only for inside the study area.
- It is assumed that the project continues till 2025 and the cost for 2020-2025 is equal to that for 2016-2019.

Source of Information
- NIA: Indicative Irrigation Development Program, 2010-2019.
- NIA: Regional Irrigation Development Program, 2010-2019, Region III.

Project Code	AI-G-06	
Project Title	Restoration/Rehabilitation of Existing NIA Assisted Irrigation System (PRE-NAIS)	
Status of Project	On-going	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	NIA	
Objectives	Rehabilitation and development on NIA assisted irrigation system as a regular program to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2010-2019	Estimated by Study Team for 2011-2025
	7,353 as of 2009	8,767 as of 2009
EIRR	(N/A)	
Expected Source of Fund	GAA*	
Expected Implementation Schedule	Annual Program, 2010 – 2019*	

Project Description
- Proposed components for 2010-2019 in the study area
  (UPRIIS)
  - No of system: NIS-5
  - Beneficiaries: 67,733farmer
  - Target area: 167,125ha
  (Others in Study Area)
  - No of system: NIS-1, CIS-33
  - Beneficiaries: 2,907farmer
  - Target area:5,029ha

Remarks
- *: Estimated and/or proposed by project proponent
- The estimated project cost by the project proponent is as follows; UPRISS: 6,990Mil. Pesos, Others: 363Mil. Pesos.
- It is assumed that the project continues till 2025 and the cost for 2020-2025 is equal to that for 2016-2019.

Source of Information
- NIA: Indicative Irrigation Development Program, 2010-2019.
- NIA: Regional Irrigation Development Program, 2010-2019, Region III and UPRISS.

Annex-T C.3.2.1 (4/16) Project Profile for Agricultural Sector

Project Code	AI-G-07	
Project Title	Participatory Irrigation Development Project APL1-Infrastructure Development	
Status of Project	On-going	
Objective Area	Bulacan and Pampanga Provinces	
Implementing Agency	NIA	
Objectives	Rehabilitation of NIS to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2009-2013	Estimated by Study Team for 2011-2025
	68.5 as of 2009	41 as of 2009
EIRR	(N/A)	
Expected Source of Fund	GAA*	
Expected Implementation Schedule	2009 – 2013*	

Project Description
- Nationwide project
- The project seeks to improve NIA's financial viability through institutional reform & capability building including better service delivery to farmers; enhance farmers participation & their capability to manage NIS transferred from NIA to Ias & further narrow the gap between service areas & actual irrigated areas.
- APL1-Infrastructure development: Physical infrastructure improvement (14core A NIS) & sustenance (44core B NIS); policy instruments & institutional development for improved IMT in O&M (58 NIS under NIMF, 5 pilot CIS under CIDF); capacity building for IA; organization & financial corporate strengthening.
- APL1-Irrigation Sector Program (NIA-Rationalization Plan), incentives & terminal leaves,

- AMRIS is selected as a project site in the study area.
- Target area (rehabilitation): 26,791ha
- Beneficiaries: 49,000 farm-families
- Proposed civil works includes; 1) rehabilitation of North and South constant gates, 2) repair and improvement of control house, 3) construction of measuring device, 4) canal lining, 5) replacement of steel gates, and 6) manual and mechanized desisting in the canals.

Remarks
- *: Estimated and/or proposed by project proponent
- For 2011-2025, 60% of the project cost (41 Mil. Pesos) is considered.

Source of Information
- NIA: Indicative Irrigation Development Program, 2010-2019.
- NIA: Regional Irrigation Development Program, 2010-2019, Region III.
- WB: Project Appraisal Document, 2009.

Project Code	AI-G-08	
Project Title	Rehabilitation of Small Water Impounding Projects / Diversion Dams	
Status of Project	On-going	
Objective Area	Nueva Ecija, Bulacan Province	
Implementing Agency	BSWM	
Objectives	Development of communal and small scale irrigation system as a regular program to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2009-2011	Estimated by Study Team for 2011-2025
	25.4 as of 2009	128 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	2009 – 2011*	

Project Description
- Regular Rehabilitation of small water impounding project
- Proposed components for 2009-20111 in the study area
  - 7 SWIPs in Nueva Ecija and Bulacan
  - Restored area = 235ha

Remarks
- *: Estimated and/or proposed by project proponent
- It is assumed that the project continues till 2025 and the annual cost is equal to 25.4Mil Pesos/ 3years (8.5Mil Pesos/year).

Source of Information
- BSWM

Annex-T C.3.2.1 (5/16) Project Profile for Agricultural Sector

Project Code	AI-G-09	
Project Title	Comprehensive Agrarian Reform Program, Irrigation Component (CARP-IC)	
Status of Project	On-going	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces, covering Agrarian Reform Communities (ARCs)	
Implementing Agency	DAR/NIA	
Objectives	Rehabilitation and development on NIA assisted irrigation system as a regular program to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	1,020 as of 2009
EIRR	(N/A)	
Expected Source of Fund	GAA / World Bank / JICA*	
Expected Implementation Schedule	1993 -*	

Project Description
- The program provides facilities necessary to enhance farm productivity and income of CARP beneficiaries.
- The Program involves pre-engineering, construction / rehabilitation of irrigation and drainage facilities, farm roads, marketing facilities, and institutional development.
- Irrigation component covers development of CIS/CIP and strengthening of the IAs through the irrigation development projects

Remarks
- *: Estimated and/or proposed by project proponent
- According to the previous investment for CARP-IC, 356Mil.Pesos/year has been allocated for CARP-IC for the entire country. The ratio of the rice production for four provinces (Nueva Ecija, Pampanga, Tarlac and Bulacan) and that for the entire country in 2007 is about 0.19, based on the country STAT by Bureau of Agricultural Statistics, DA. Assuming that necessary budget is proportional to the rice production, it is estimated that 68Mil. Pesos/year would be necessary for the study area.

Source of Information
- DAR : Agrarian Reform Infrastructure Support Project, Phase-III.
- NIA : CARP-IC Project
- NIA: Indicative Irrigation Development Program, 2010-2019.

Project Code	AI-G-10	
Project Title	Upper Tabuating SRIP	
Status of Project	On-going	
Objective Area	General Tino, Nueva Ecija Province	
Implementing Agency	NIA	
Objectives	Development of national irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2009-2011	Estimated by Study Team for 2011-2025
	251.7 as of 2009	76 as of 2009
EIRR	(N/A)	
Expected Source of Fund	GAA*	
Expected Implementation Schedule	2009 – 2011*	

Project Description
- Construction of a zoned earth fill dam with a height of 25m and a reservoir area of 71.50ha for irrigation, flood control and aquaculture
- Target area (New): 700ha

Remarks
- *: Estimated and/or proposed by project proponent
- For 2011-2025, 30% of the project cost (76 Mil. Pesos) is considered.

Source of Information
- NIA: Indicative Irrigation Development Program, 2010-2019.
- NIA : UPRIIS Div-3.

Annex-T C.3.2.1 (6/16) Project Profile for Agricultural Sector

Project Code	AI-P-01	
Project Title	Balintingon Reservoir Multipurpose Project (BRMP)	
Status of Project	On-going	
Objective Area	Nuva Ecija Province	
Implementing Agency	Municipality of General Tinio	
Objectives	Development of national irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2010-2016	Estimated by Study Team for 2011-2025
	13,591 as of 2009	13,591 as of 2009
EIRR	15.14 %*	
Expected Source of Fund	Selected Investor*	
Expected Implementation Schedule	2010 – 2016*	

Project Description

- The project envisions the construction of a 140m high rock fill center-core dam and its appurtenant structures across Sumacbao River to regulate the discharge of the catchment's area of about 228km^2. A reservoir with a storage capacity of 572MCM would be created. At the toe of the dam on the right abutment, an open type powerhouse equipped with two Francis type turbines with a capacity of 15MW each would be constructed. These main features, would be supplemented by a diversion weir (140m long) and new irrigation facilities (109km of main canal, 168km of laterals and sub-laterals, main and supplementary farm ditches, 210km of drainage channels, and access roads). At full implementation, the project would serve an area of about 14,900 hectares in the Balintingon area.
- Beneficiaries: 9,152 farm-families
- Target area (new): 14,900ha
- Installed capacity of hydropower plant: 30MW
- Expected generated power: 119.6GWH

Remarks

- *: Estimated and/or proposed by project proponent
- Revised ICC form submitted to NEDA in February, 2008
- Resolution No.84-2008: LGU is in partnership with NIA
- Resolution No.85-2008: the BRMP is a public domain of Gen. Tinio
- Resolution No.86-2008: Gen. Tinio to secure financing
- Resolution No.87-2008: Governor of Nueva Ecija to allocate Php0.1billion for social fund for the people displaced in the project.
- Resolution No.21-2009: Mayer of Gen.Tinio to invite investors to undertake design and secure financing package for the construction of BRMP
- Invitation for bidding in April, 2009
- Eight investors from China, US showed interest to participate through BOT
- MOA was singed on February 17, 2010 between NIA and Investor (Concordo Pacific Investment Holding Ltd. Inc.) for “Full Blown Study” to be completed within 120 days
- EO from the president to be able to proceed with the project mobilization. It is expected to be released before the end of the year.
- The project cost is as follows; Peso: 4,206, Loan: 9,385.
- It is estimated that 800-1,000families would be affected by the project.

Source of Information

- Supplemental Report, Balintingon RMP, Nueva Ecija, 2008 with revised ICC form as of February 2008
- PPT presentation on Balintingon RMP by Municipality of General Tinio.
- Interview by JST.

Annex-T C.3.2.1 (7/16) Project Profile for Agricultural Sector

Project Code	AI-P-02	
Project Title	Balog-Balog Multipurpose Project Phase 2	
Status of Project	Planned	
Objective Area	Tarlac Province	
Implementing Agency	NIA	
Objectives	Development of national irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2011-2019	Estimated by Study Team for 2011-2025
	16,095 as of 2009	16,095 as of 2009
EIRR	19.09 %*	
Expected Source of Fund	ODA loan / GAA*	
Expected Implementation Schedule	2011- 2019*	

Project Description

- Construction of 113m high earth & rock fill dam with storage capacity of 575MCM (effective storage: 525MCM) across Bulsa River to generate electricity & provide year round irrigation water to service area of 39,150ha as well as flood control in low-lying areas. The project envisions to provide upland communities to enlarge in inland fish production on the reservoir.
- Beneficiaries: 15,660 farm-families
- Target area (new): 28,330ha
- Target area (rehabilitation): 6,080ha
- Installed capacity of hydropower plant: 43.5MW
- Expected generated power: 89GWH

Remarks

- *: Estimated and/or proposed by project proponent
- Updated FS was completed in December 2009
- Submitted to NEDA for evaluation, possible BOT
- The project cost estimated is for Phase 2.
- It is estimated that 548faimilies would be affected by the project.

Source of Information

- NIA: Indicative Irrigation Development Program, 2010-2019
- NIA: Project Briefer (As of September 30, 2009).
- Interview by JST

Annex-T C.3.2.1 (8/16) Project Profile for Agricultural Sector

Project Code	AI-P-03	
Project Title	Sector Loan on Rehabilitation of Irrigation Facilities	
Status of Project	Planned	
Objective Area	Pampanga Province	
Implementing Agency	NIA	
Objectives	Rehabilitation of NIS to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2011-2016	Estimated by Study Team for 2011-2025
	222 as of 2009	222 as of 2009
EIRR	28.4 % for all*	
Expected Source of Fund	JICA / GAA*	
Expected Implementation Schedule	2011 – 2016*	

Project Description

- Nationwide project
- Optimization of irrigation potentials of NIS & CIS not covered by PIDP & ISOEIP.
- Involves restoration, rehabilitation, construction of irrigation facilities.

(Study Area)

Rehabilitation of Porac-Gumain NIS of 3,126ha.

In this existing NIS, the irrigable area is devastated during the eruption of Mt. Pinatubo, where lahar and volcanic ash covered the whole irrigable area by an average of depth of 30cm, and hence drainage canals were totally blocked. As a result, excess water during rainy season has no place to way out at farm level, which submerge the area or underwater. This project is essential to resolved all problems prior to Irrigation Management Transfer (IMT) such as squatters, water usage control, environment awareness, conservation and protection of irrigation and drainage facilities.

- Outline of the Project includes, 1) Construction of civil works for rehabilitation of diversion works, canal system, drainage system, road, and O&M facilities, and 2) Institutional Strengthening Program

Remarks

- *: Estimated and/or proposed by project proponent
- F/S completed
- Total project cost is 10,155Mil. Pesos(Peso:1.523, Loan:8.632)
- The project cost estimated is for Porac-Gumain NIS.

Source of Information

- NIA: Indicative Irrigation Development Program, 2010-2019.
- JICA preparatory study in 2009.

Annex-T C.3.2.1 (9/16) Project Profile for Agricultural Sector

Project Code	AI-P-04	
Project Title	Casecnan Multi-purpose Irrigation & Power Project Irrigation Component Phase 2	
Status of Project	Planned	
Objective Area	Nueva Ecija Province	
Implementing Agency	NIA	
Objectives	Development of national irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2012-2018	Estimated by Study Team for 2011-2025
	7,000 as of 2009	7,000 as of 2009
EIRR	28.00%*	
Expected Source of Fund	ODA loan / GAA*	
Expected Implementation Schedule	2012 – 2018*	
Project Description - Construction of the remaining 33 km Super Diversion Canal (SDC), irrigation facilities to generate 21,000 new service area & rehabilitation of downstream portion of UPRIIS covering 40,000ha. - Beneficiaries: 81,000 farm-families - Target area (new): 21,000ha - Target area (Rehabilitation): 40,000ha - Project component of Phase 2 includes 1) new construction such as extension of SDC, construction of lateral and sub-lateral canals, drainage canals and related structures in 20,321ha, and 2) rehabilitation / improvement of UPRIIS area, such as rehabilitation of the PENRIS main and lateral canals, and related structures.		
Remarks - *: Estimated and/or proposed by project proponent - Updated F/S was completed in October 2009		
Source of Information - NIA: Indicative Irrigation Development Program, 2010-2019 - Updated Feasibility Study for the Casecnan Multi-purpose Irrigation & Power Project, Irrigation Component Phase 2.		

Project Code	AI-P-05	
Project Title	Procurement of Pumps, Drilling Rigs & Related Equipment	
Status of Project	Planned	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	NIA	
Objectives	Development of communal and small scale irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2011-2013	Estimated by Study Team for 2011-2025
	206 as of 2009	206 as of 2009
EIRR	(N/A)	
Expected Source of Fund	Spanish Loan / GAA*	
Expected Implementation Schedule	2011 – 2013*	
Project Description - Nationwide project - Central Luzon area includes the procurement of - 1,000 units of centrifugal pumps - 1 units of trailer mounted rotary/percussion type drilling rigs - 2 units of resistively machines & electric logger - back-up spare parts - 4 units of service vehicles to be used in the identification, resistively, testing, drilling, installation & monitoring activities of project - Beneficiaries: 3,900 farm-families - Target area (Rehabilitation): 3,900ha.		
Remarks - *: Estimated and/or proposed by project proponent - for DA, Need evaluation - Total project cost is 1,028Mil. Pesos (Peso: 321, Loan: 707). - The project cost estimated is for Region III.		
Source of Information - NIA: Indicative Irrigation Development Program, 2010-2019. - NIA: Comprehensive Infrastructure Integrated Program, 2007.		

Annex-T C.3.2.1 (10/16) Project Profile for Agricultural Sector

Project Code	AI-P-06	
Project Title	Irrigation Water Resources Augmentation Pump Establishment Project	
Status of Project	Planned	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	NIA	
Objectives	Development of communal and small scale irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2013-2016	Estimated by Study Team for 2011-2025
	130 as of 2009	130 as of 2009
EIRR	(N/A)	
Expected Source of Fund	ODA loan*	
Expected Implementation Schedule	2013 – 2016*	

Project Description
- Nationwide project
- Central Luzon area includes;
  - Procurement of 1,330 units of pumps including diesel engines
  - Total of 301 units of shallow tube wells
  - 1,029 units of surface water pump irrigation to cover an area of 2,360 hectares.
  - Beneficiaries: 1,333 farm -families
  - Target area (New): 1,437ha
  -Target area (Rehabilitation): 924ha

Remarks
- *: Estimated and/or proposed by project proponent
- F/S completed
- Total project cost is 973Mil. Pesos (Peso: 422, Loan: 551).
- The project cost estimated is for Region III.

Source of Information
- NIA: Indicative Irrigation Development Program, 2010-2019.
- NIA: Comprehensive Infrastructure Integrated Program, 2007.

Project Code	AI-P-07	
Project Title	Appropriate Irrigation Technologies for Enhanced Agricultural Production	
Status of Project	Planned	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	NIA	
Objectives	Improvement of irrigation efficiency in the basin as well as improving productivity with less water	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2015-2020	Estimated by Study Team for 2011-2025
	654 as of 2009	654 as of 2009
EIRR	(N/A)	
Expected Source of Fund	ODA loan / GAA*	
Expected Implementation Schedule	2015 – 2020*	

Project Description
- Nationwide project(Region III, IV, VI, XI&XII)
- The project involves the use of innovative and appropriate technology including photovoltaic energy in power generation and drip tape for water dispersion. Irrigation technology to be implemented includes drip sprinkler and flood irrigation facilitated by solar power.
- Central Luzon area includes the followings.
  - Beneficiaries: 2,000 farm-families
  -Target area (New): 4,000ha

Remarks
- *: Estimated and/or proposed by project proponent
- MOA signed with donor
- Total project cost is 3,250Mil. Pesos (Peso:0.650, Loan:2.600).
- The project cost estimated is for Region III.

Source of Information
- NIA: Indicative Irrigation Development Program, 2010-2019.
- NIA: Comprehensive Infrastructure Integrated Program, 2007.

Annex-T C.3.2.1 (11/16) Project Profile for Agricultural Sector

Project Code	AI-P-08	
Project Title	Central Luzon Groundwater Irrigation Systems Reactivation Project	
Status of Project	Planned	
Objective Area	Nueva Ecija and Pampanga Provinces	
Implementing Agency	NIA	
Objectives	Development of communal and small scale irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2015-2019	Estimated by Study Team for 2011-2025
	1,429 as of 2009	1,429 as of 2009
EIRR	(N/A)	
Expected Source of Fund	ODA loan / GAA*	
Expected Implementation Schedule	2015 – 2019*	

Project Description
- Construction of 100 deep well pump systems covering 5,000ha; provision of rural water supply in selected barangays; procurement of equipment
- Target area (New): 5,000ha

Remarks
- *: Estimated and/or proposed by project proponent
- F/S completed
- According to NIA RegionIII, the project area in the Casecnan Phase 2 project should be excluded.
- The project cost estimated is as follows; Peso: 626, Loan: 803.

Source of Information
- NIA: Indicative Irrigation Development Program, 2010-2019.

Project Code	AI-P-09	
Project Title	Gumain Reservoir Project t	
Status of Project	Planned	
Objective Area	Pampanga Province	
Implementing Agency	NIA	
Objectives	Development of national irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2020-2027	Estimated by Study Team for 2011-2025
	13,729 as of 2009 (2,768 as of 1984)	13,729 as of 2009
EIRR	(N/A)	
Expected Source of Fund	ODA loan / GAA	
Expected Implementation Schedule	2020 - 2027	

Project Description
- Construction of 108m high, zoned embankment dam to store irrigation water to serve irrigation water to serve 11,000ha of paddy & 5,200ha of sugercane area & augment water supply to 7,900ha in Porac-Gumain & Caulaman RIS.
- Target area : 16,200ha (11,000ha of paddy and 5,200ha of sugercane) including the existing Porac-Gumain & Caulaman RIS

Remarks
- *: Estimated and/or proposed by project proponent
- F/S completed in 1985
- Re-study would be necessary.

Source of Information
- NIA: Indicative Irrigation Development Program, 2010-2019.

Annex-T C.3.2.1 (12/16) Project Profile for Agricultural Sector

Project Code	AI-P-10	
Project Title	Rehabilitation of AMRIS	
Status of Project	Planned	
Objective Area	Bulacan Province	
Implementing Agency	NIA	
Objectives	Rehabilitation of NIS to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	983 as of 2009	983 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description
- The project, located in Bulacan, Region III, will rehabilitate Bustos, Lower & Upper Maasim Dam to recover the function of major irrigation facilities in Angat-Maasim RIS.
- Beneficiaries: 26,000 farm-families

Remarks
- Proposed project already forwarded by NEDA thru DFA to GOJ for Grant Aid Assistance.
- Implementation plan are under preparation by NIA supported by JICA as of March 2010.

Source of Information
- NIA: Comprehensive Infrastructure Integrated Program, 2007.
- Interview by JST.

Project Code	AI-P-11	
Project Title	Construction of Priority Small Scale Irrigation Systems/Small Water Impounding Projects (SWIP), Small Diversion Dam Projects (SDD)	
Status of Project	Planned	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	DA Region III/LGUs	
Objectives	Development of communal and small scale irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	168.6 as of 2009 (91.5 as of 2002)	168.6 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description
- Bulacan (1SWIP and 2SDD, service area = 125ha)
- Nueva Ecija (1SWIP, service area = 95ha)
- Pampanga (1SWIP and 3SDD, service area = 195ha)
- Tarlac (1SWIP, service area =45ha)
- Nueva Ecija (new construction of 1 DD and rehabilitation of 11 DD and 5 SWIP) proposed by PPDO, Nueva Ecija

Remarks
- D/D completed.

Source of Information
- DA Region III
- PPDO, Nueva Ecija
- Interview by JST

Annex-T C.3.2.1 (13/16) Project Profile for Agricultural Sector

Project Code	AF-G-01	
Project Title	Aquaculture Fisheries Development Programs	
Status of Project	On-going	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	BFAR	
Objectives	Improvement of fishery activities toward sustainable fishery development as a regular program	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	450 as of 2009 (total for AF-G-01 to 04)
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	Annual Program	

Project Description

The program includes the following components.

- Support to accredited/registered private and provincial Tilapia Hatcheries.
  a) Input assistance, b) Training/consultations, c)Upgrading of bloodstocks,
  d) Monitoring of production, e) Strengthening of linkages between hatchery operators
- Seeding of existing communal bodies of water including SFR and SWIP and continuous replenishment of fish stock in the area.
  a) Fingering stocking and dispersal,
  b) Water quality monitoring and assessment of inland waters including SWIPs & SFR
- Extension support, education and training services
  a) Conduct of training in fisheries, b) Technical assistance & advisory services, c) Establishment of techno-demo (Stocking of Large-size Tilapia, Culture of Pangasisu, Culture of Saline Tilapia), d) Input assistance on Tilapia-Ulang

Remarks

- Based on the budget allocation for fishery operation in BFAR region III in 2009, it is assumed that the total budget for the AF-G-01 to 04 is 30Mil. Pesos/year.

Source of Information

- BAFR Central Luzon: Pampanga Priority Plans & Programs, CY2009.

Project Code	AF-G-02	
Project Title	Comprehensive Regulatory Services	
Status of Project	On-going	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	BFAR	
Objectives	Improvement of fishery activities toward sustainable fishery development as a regular program	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	*Refer to AF-G-01*
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	Annual Program	

Project Description

The programs includes the following components.

- Fish Health Management & Inspection
  a) Residue monitoring and surveillance of feed mills and registered farms for EU accreditation,
  b) Aquatic animal disease surveillance, monitoring and control
- Monitoring, control & surveillance (MCS)
  a) Deputation of fish warden & fish examiners,
  b) Filing of illegal fishing cases & apprehensions,
  c) Coordination with law enforcement agencies
- Issuance of regulatory documents
  a) FLS,
  b) Import and export permits
- Quarantine services
- Diosdado Macapagal International Airport in Clark, Mabalacat, Pampanga

Remarks

Source of Information

- BAFR Central Luzon: Pampanga Priority Plans & Programs, CY2009.

Annex-T C.3.2.1 (14/16) Project Profile for Agricultural Sector

Project Code	AF-G-03	
Project Title	Support Projects and Activities	
Status of Project	On-going	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	BFAR	
Objectives	Improvement of fishery activities toward sustainable fishery development as a regular program	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	*Refer to AF-G-01*
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	Annual Program	

Project Description

The programs include the following components.

- Market development services
- Market-matching and consumer information services, b) Participation to Agri-Aqua trade fairs, c) Marketing assistance
- Project and activities on credit facilitation services
- Assistance to fisher folk in accessing agricultural credit & loan (ACEF, QUEDANCOR, Land Bank of Philippines)
- Fisheries post harvest services
- Distribution of post-harvest equipment & machineries such as live tilapia container box and smokehouse

Remarks

Source of Information

- BAFR Central Luzon: Pampanga Priority Plans & Programs, CY2009.

Project Code	AF-G-04	
Project Title	Fisheries Resources Management for Improved and Sustainable Harvest	
Status of Project	On-going	
Objective Area	Bulacan Province (Hagonoy, Paombongm, City of Malolos, Bulacan)	
Implementing Agency	Provincial Government of Bulacan	
Objectives	Improvement of fishery activities toward sustainable fishery development as a regular program	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	*Refer to AF-G-01*
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	Annual Program	

Project Description

Obectives

(1) General:

to ensure the attainment of rationally and properly managed and sustained fisheries and aquatic resources in the coastal areas

(2) Specific:

a) Design strategies and projects to address issues and problems in resource management

b) Create awareness and generate support from stakeholders towards

Program components

1) Resource inventory, 2) Policy/Regulatory, 3) Capability building, 4) Livelihood support,
5) Resource enhancement, and 6) Public awareness

On-going activities includes;

1) Advocacy to adoption of Municipal Fisheries Ordinance
2) Mangrove Planting
3) Lecture and Film showing
4) Community river clean-up day

Remarks

Source of Information

- BAFR Central Luzon: Pampanga Priority Plans & Programs, CY2009.

Annex-T C.3.2.1 (15/16) Project Profile for Agricultural Sector

Project Code	AI-C-01	
Project Title	New Construction of Small Scale Irrigation Project under BSWM	
Status of Project	Conceptual	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	BSWM	
Objectives	Development of communal and small scale irrigation system to address water shortage in existing NISs and CISs	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	514 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description

- Construction of small scale irrigation systems consisting of Small Water Impounding Projects (SWIP), Small Diversion Dam Projects (SDD), Small Farm Reservoir (SFR), Shallow Tube Well (STW) and other rainwater harvesting systems
- The project support the construction of small scale irrigation systems which are not covered by the on-going and planed projects under BSWM
- Proposed Projects
  - Diversion Dam (DD) 18 nos 959ha
  - Small Water Impounding Project (SWIP) 24 nos 1,635 ha
  - Small Farmers Reservoir (SFR) 4 nos 112 ha
  - (Total) (46 nos) (2,706 ha)

Remarks

- It is assumed that the project cost is 0.19Mil. Pesos/ha, referring the project cost of AI-P-11.

Required Action to Upgrade to a Proposed Project for Implementation

- F/S level study would be required.

Source of Information

- BSWM

Project Code	AI-C-02	
Project Title	Introduction of Water Saving Irrigation Technology	
Status of Project	Conceptual	
Objective Area	Bulacan, Nueva Ecija, Pampanga and Tarlac Provinces	
Implementing Agency	NIA / (DA / PhilRice)	
Objectives	Improvement of irrigation efficiency in the basin as well as improving productivity with less water	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	150 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule		

Project Description

- The program aims at;
  - raising water user's awareness on the importance of technology and promote compulsory adoption by farmers
  - minimize water delivery and distribution losses;
  - increasing water use efficiency for increased rice production towards water saving at the system level
  - saving water from the reservoir to increase cropping intensity thru the adoption of quick turn around or third cropping
- The program components include;
  - Trial and research
  - Demonstration farm operation
  - Training to trainers and technical campaign to IAs
  - Monitoring
  - Capacity development of IAs

Remarks

- For the project cost, input on technical assistance by foreign expert team (60mil/pesos/year) for 3yeras is considered.

Required Action to Upgrade to a Proposed Project for Implementation

- TOR for the T.A. should be determined.

Source of Information

- Interview by JST to NIA, NIA-JICA Irrigation Association Strengthening Support Project (TCP2) and Phil Rice

Annex-T C.3.2.1 (16/16) Project Profile for Agricultural Sector

Project Code	AI-C-03	
Project Title	Improvement of Monitoring System and Capacity Development for Proper Water Management in NISs and CISs	
Status of Project	Conceptual	
Objective Area	Bulacan and Pampanga Provinces	
Implementing Agency	NIA	
Objectives	Improvement of irrigation efficiency in the basin as well as improving productivity with less water	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	150 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule		

Project Description

The programs include the following components.

- Installation of additional discharge measurement device
- Improvement of discharge monitoring system
- Review of calibration of conversion tables
- Establishment of communication system
- Capacity development

Remarks

- The project cost is roughly estimated by referring the cost for the proposed central operation and monitoring system in the F/S for Casecnan Project Phase 2.

Required Action to Upgrade to a Proposed Project for Implementation

- Basic project components should be studied.

Source of Information

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Annex –T C.3.2.2 Regular Programs on Rehabilitation and Development on NIA Assisted Irrigation System

Program	System	Province	Nos. of System		No. Farmer Beneficiaries	Total Target Area				Total Cost (Peso 10^3)	2010				2011-2015				2016-2019			
			NIS	CIS		New (ha.)	Restored (ha.)	Rehab (ha.)	Total (ha)		New (ha.)	Restored (ha.)	Rehab (ha.)	Cost ($P10^3$)	New (ha.)	Restored (ha.)	Rehab (ha.)	Cost ($P10^3$)	New (ha.)	Restored (ha.)	Rehab (ha.)	Cost ($P10^3$)
RRENAIS		Bulacan			-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
	CIS	Nueva Ecija		2	243	0	0	250	250	22,000	0	0	250	22,000	0	0	0	0	0	0	0	0
	NIS	Polac-Gumain RIS	1		713	0	330	880	1,210	100,000	0	100	360	47,000	0	0	300	25,000	0	230	220	28,000
	CIS	Pampanga		31	1,951	433	267	2,869	3,569	241,000	50	40	358	38,000	183	197	1,537	130,500	200	30	974	72,500
		Tarlac			-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total			1	33	**2,907**	**433**	**597**	**3,999**	**5,029**	**363,000**	50	140	968	107,000	183	197	1,837	155,500	200	260	1,194	100,500
RRENIS	NIS	AMRIS (Bulacan/Pampanga)	1		22,325	0	1,030	26,791	27,821	262,000	0	225	2,679	33,300	0	625	13,396	136,500	0	180	10,717	92,200
		Nueva Ecija			-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-
	NIS	PDRIS (Pampanga)	1		8,995	4,000	4,468	3,000	11,468	688,059	1,200	814	1,500	210,864	2,800	3,366	1,500	459,978	0	287	0	17,217
	NIS	TASMORIS (Tarlac)	1		5,223	0	4,500	0	4,500	225,000	0	400	0	20,000	0	2,250	0	112,500	0	1,850	0	92,500
Sub-total			3		**36,543**	**4,000**	**9,998**	**29,791**	**43,789**	**1,175,059**	**1,200**	**1,439**	**4,179**	**264,164**	**2,800**	**6,241**	**14,896**	**708,978**	**0**	**2,317**	**10,717**	**201,917**
RRECIS	CIS	Bulacan			-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIS	Nueva Ecija		4	897	350	0	300	650	40,000	0	0	0	0	350	0	300	40,000	0	0	0	0
	CIS	Pampanga		4	203	0	0	389	389	17,500	0	0	0	0	0	0	389	17,500	0	0	0	0
	CIS	Tarlac		16	3,462	4,435	775	0	5,210	346,300	100	50	0	11,000	2,735	725	0	261,500	1,600	0	0	73,800
Sub-total				**24**	**4,562**	**4,785**	**775**	**689**	**6,249**	**403,800**	**100**	**50**	**0**	**11,000**	**3,085**	**725**	**689**	**319,000**	**1,600**	**0**	**0**	**73,800**
REGIP	CIS	Bulacan	5		2,500	3,000	0	0	3,000	100,000	300	0	0	10,000	1,500	0	0	50,000	1,200	0	0	40,000
	CIS	Nueva Ecija	2		No Data	1,100	0	0	1,100	66,000	0	0	0	0	1,100	0	0	66,000	0	0	0	0
	CIS	Pampanga	11		481	972	300	160	1,432	35,700	0	0	0	0	721	300	120	29,100	251	0	40	6,600
	CIS	Tarlac	11		1,188	1,340	210	540	2,090	131,400	180	20	50	16,000	760	100	250	70,800	400	90	240	44,600
Sub-total			**29**		**4,169**	**6,412**	**510**	**700**	**7,622**	**333,100**	**480**	**20**	**50**	**26,000**	**4,081**	**400**	**370**	**215,900**	**1,851**	**90**	**280**	**91,200**
BSPP		Bulacan	-		-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-
	CIS	Nueva Ecija	2		386	600	0	0	600	20,000	0	0	0	0	600	0	0	20,000	0	0	0	0
	CIS	Pampanga	2		134	0	0	237	237	7,000	0	0	35	2,000	0	0	202	5,000	0	0	0	0
	CIS	Tarlac	5		244	75	435	0	510	31,300	75	80	0	10,000	0	355	0	21,300	0	0	0	0
Sub-total			9		**764**	**675**	**435**	**237**	**1,347**	**58,300**	**75**	**80**	**35**	**12,000**	**600**	**355**	**202**	**46,300**	**0**	**0**	**0**	**0**
Grand Total			**42**	**57**	**48,945**	**16,305**	**12,315**	**35,416**	**64,036**	**2,333,259**	**1,905**	**1,729**	**5,232**	**420,164**	**10,749**	**7,918**	**17,994**	**1,445,678**	**3,651**	**2,667**	**12,191**	**467,417**

Note : RRENAIS ; Restoration/Rehabilitation of Existing NIA Assisted Irrigation System
RRENIS ; Repair, Rehabilitation, Restoration & Preventive Maintenance of Existing National Irrigation Facilities
RRECIS ; Repair, Rehabilitation, Restoration & Preventive Maintenance of Existing Communal Irrigation Facilities
REGIP ; Repair, Rehabilitation of Existing Groundwater Irrigation Systems, Establishment of Groundwater Pump Project
BSPP ; Balikatan Sagip Patubig Program

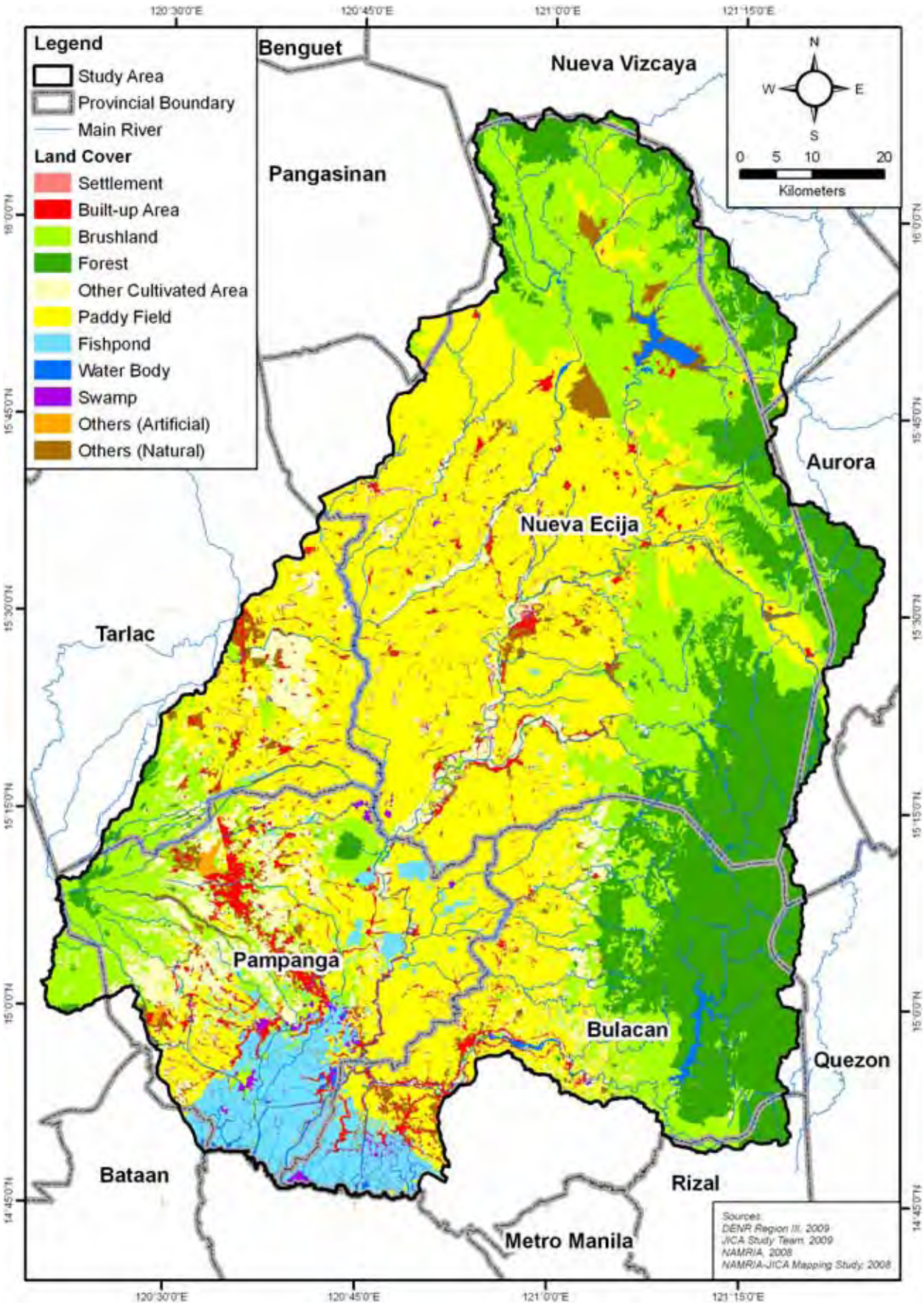
Source : NIA Regional Irrigation Development Plan, 2010-2019

Annex-T C.3.2.3 List of Small Water Impounding Projects, Diversion Dams

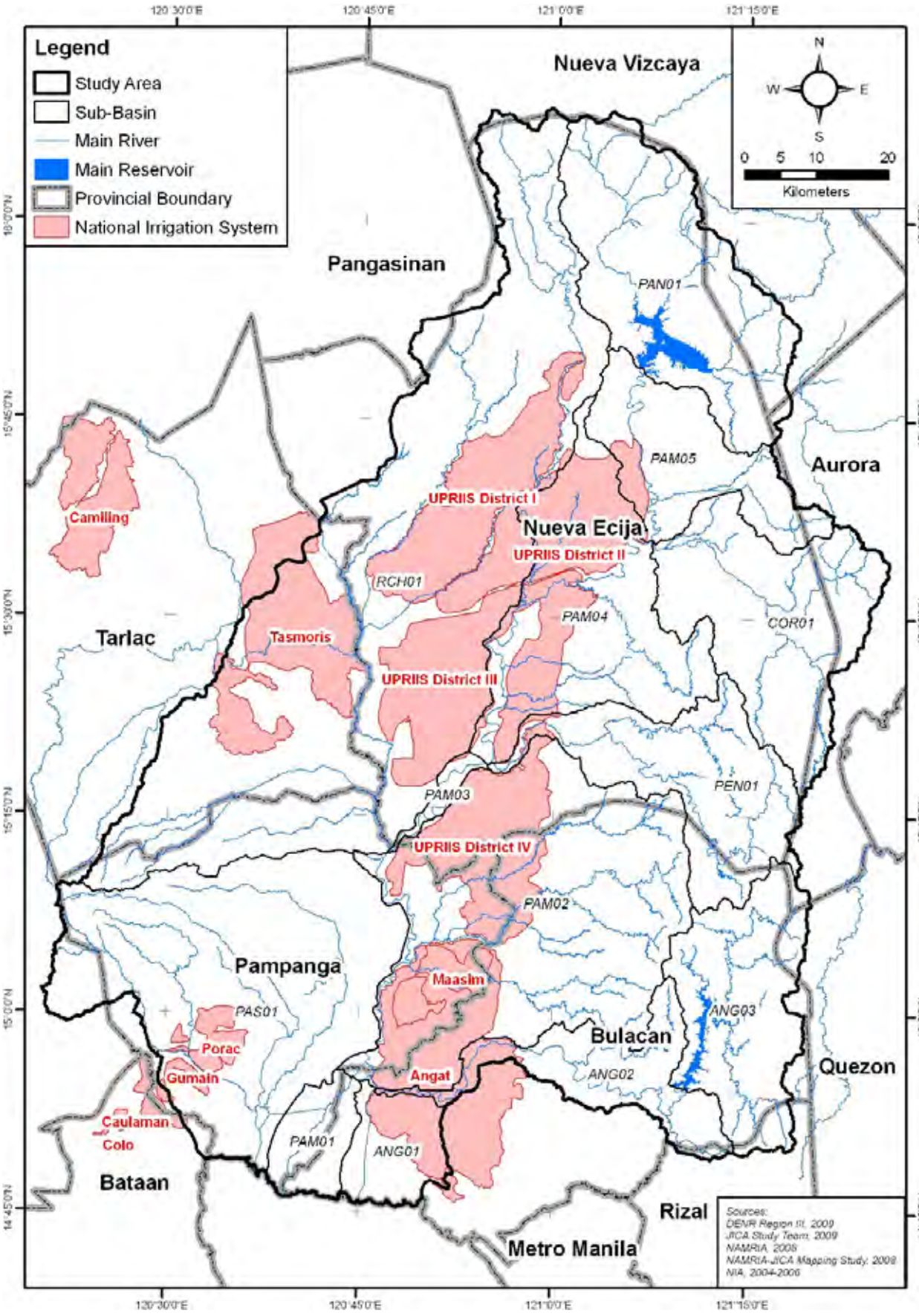
Proposed by DA Region III			
City/Municipality	Particular	Service Area (ha)	Estimated Project Cost (Mil. Pesos)
Bulacan			
1. San-Miguel	Banga-Banga Divesrion Dam Project, Banga-Bnaga	35	1.037
2. San Ildefonso	Pala-Pala Small Water Impounding Project, Pala-Pala	40	1.868
	Santiago Diversion Dam Project, Sumanding	50	1,920
Nueva Ecija			
1. Rizal	Kasilangan Small Water Impounding Project, Kasilangan	95	15.430
Pampanga			
1. Mabalacat	Atlu-Bola Diversion Dam Project, Atlu-Bola	50	1.350
2. Mexico	Mabalucuc Diversion Dam Project, San Vicente	45	1.824
3. Bacolor	Maliwalu Diversion Dam Project, Maliwalu	30	1.824
4. Florida Blanca	Binalaba Small Water Impounding Project, Dampe	70	11.018
Tarlac			
1. San Clemente	Muluto Small Water Impounding Project, Maluto	45	10.710
Sub Total (Price level in 2002)			46.981
Sub Total (Adjusted Price in 2009)			86.586
Proposed by Nueva Ecija Province			
City/Municipality	Particular	Service Area (ha)	Estimated Project Cost (Mil. Pesos)
1. Peñaranda	Construction of Diwalaan Diversion Dams, Brgy. Las Piñas		12.002
2. Sta. Rosa	Rehabilitation of Diversion Dams of Different Barangays of Sta. Rosa		7.094
3. Gen. Tinio	Rehabilitation of Tabuating & Magpantay Diversion Dams		1.999
4. Talugtug	Rehabilitation of Sampaloc SWIP		1.322
	Rehabilitation of Sto. Domingo SWIP		0.886
5. Zaragoza	Rehabilitation of check Gates and Canals of Different Diversion Dams of Zaragoza		14.462
6. Nampicuan	Dredging of Main Channel of SWIP-Alzate		5.227
	Dredging of Main Channel of SWIP-Estacion		2.985
7. San Jose City	Rehabilitation of Diversion Dams and SWIPs of Different Barangays of San Jose City		3.931
8. Cuyapo	Rehabilitation of Irrigation Facilities		14.000
9. Muñoz City	Rehabilitation of Diversion Dams and SWIPs of Different Barangays of Muñoz City		1.710
10. Guimba	Rehabilitation of Diversion Dams and SWIPs of Different Barangays of Guimba		7.494
11. Laur	Rehabilitation of Diversion Dams of Different Barangays of Laur		3.476
12. Rizal	Rehabilitation of San Esteban Diversion Dam		3.780
	Rehabilitation of Estrella Diversion Dam		1.665
Sub Total (Price level in 2009)			82.033
Total (Price level in 2009)			**168.619**

Source; DA-Region III, Nueve Ecijia Province

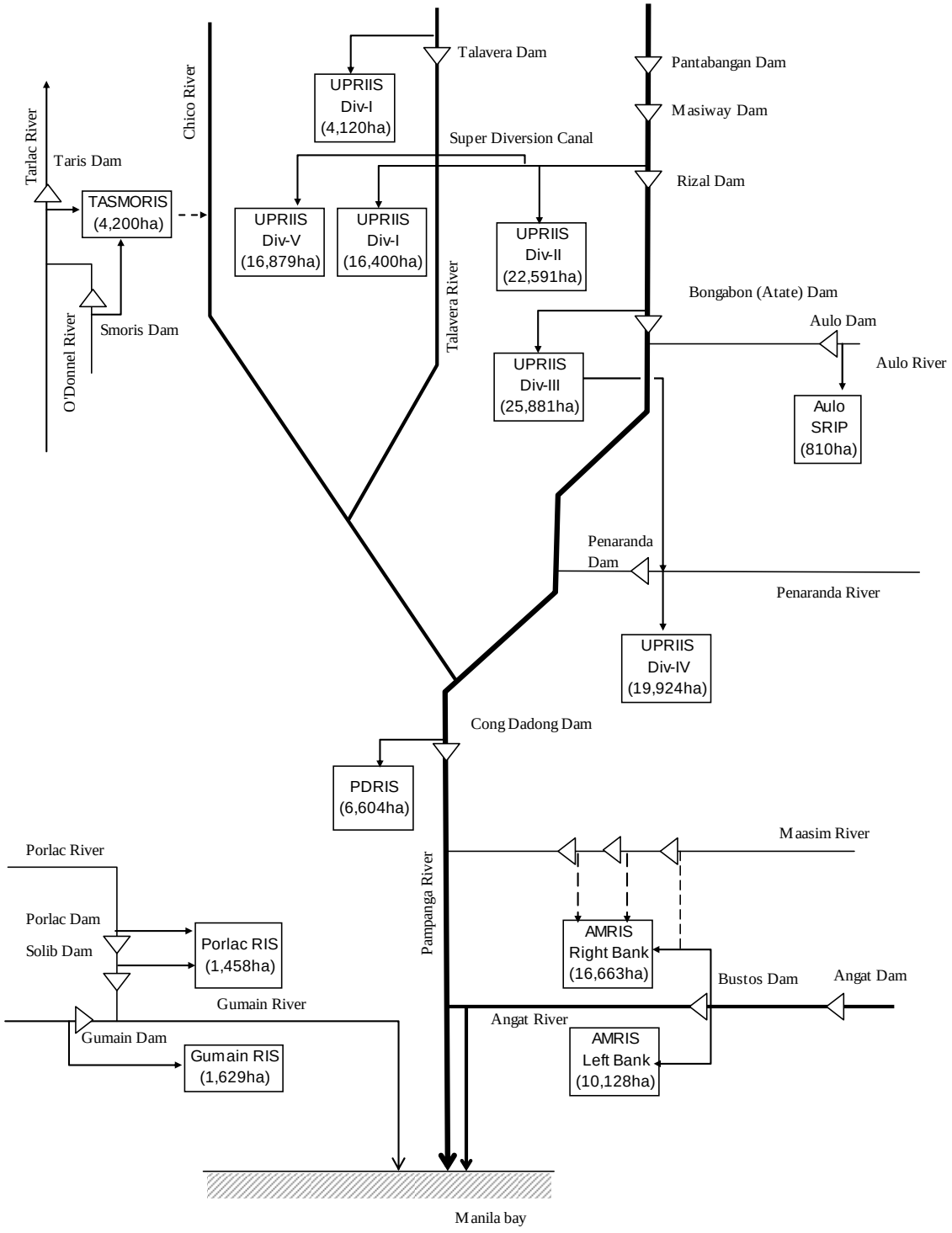
Annex-Figures



Annex-F C.1.1.1 Land Cover Map

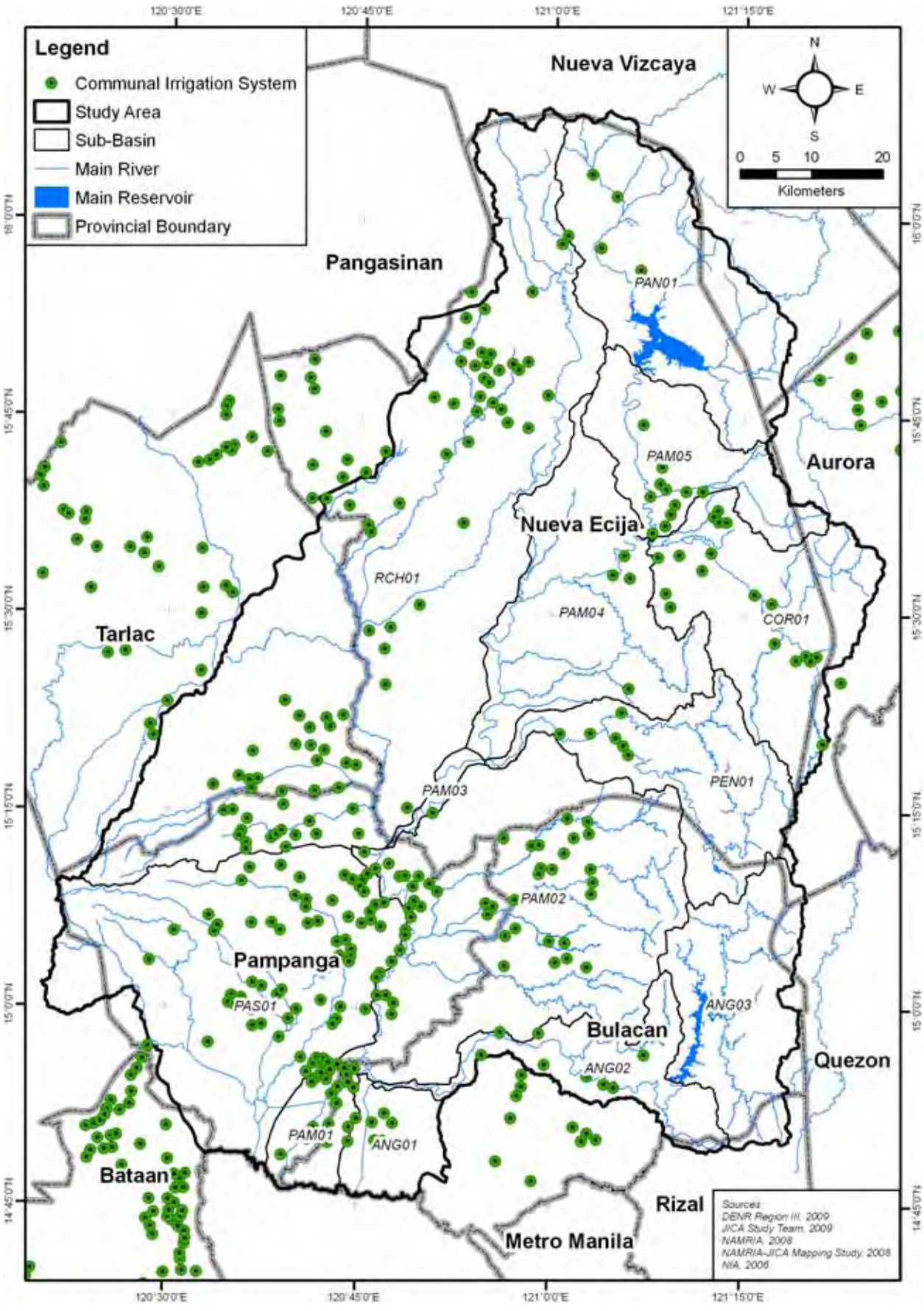


Annex-F C.1.1.2 Location Map of Existing NIS

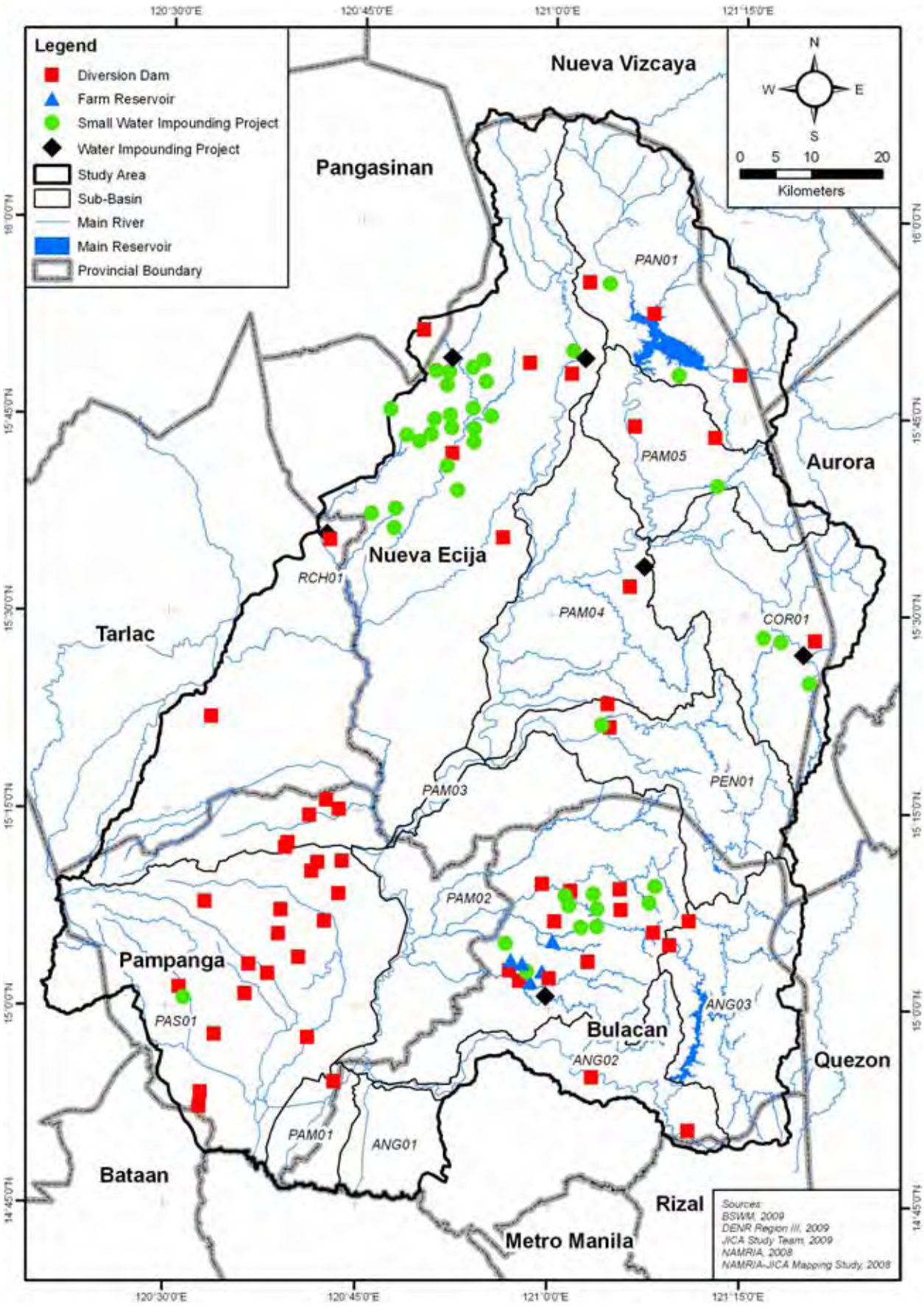


Source : JICA Study Team

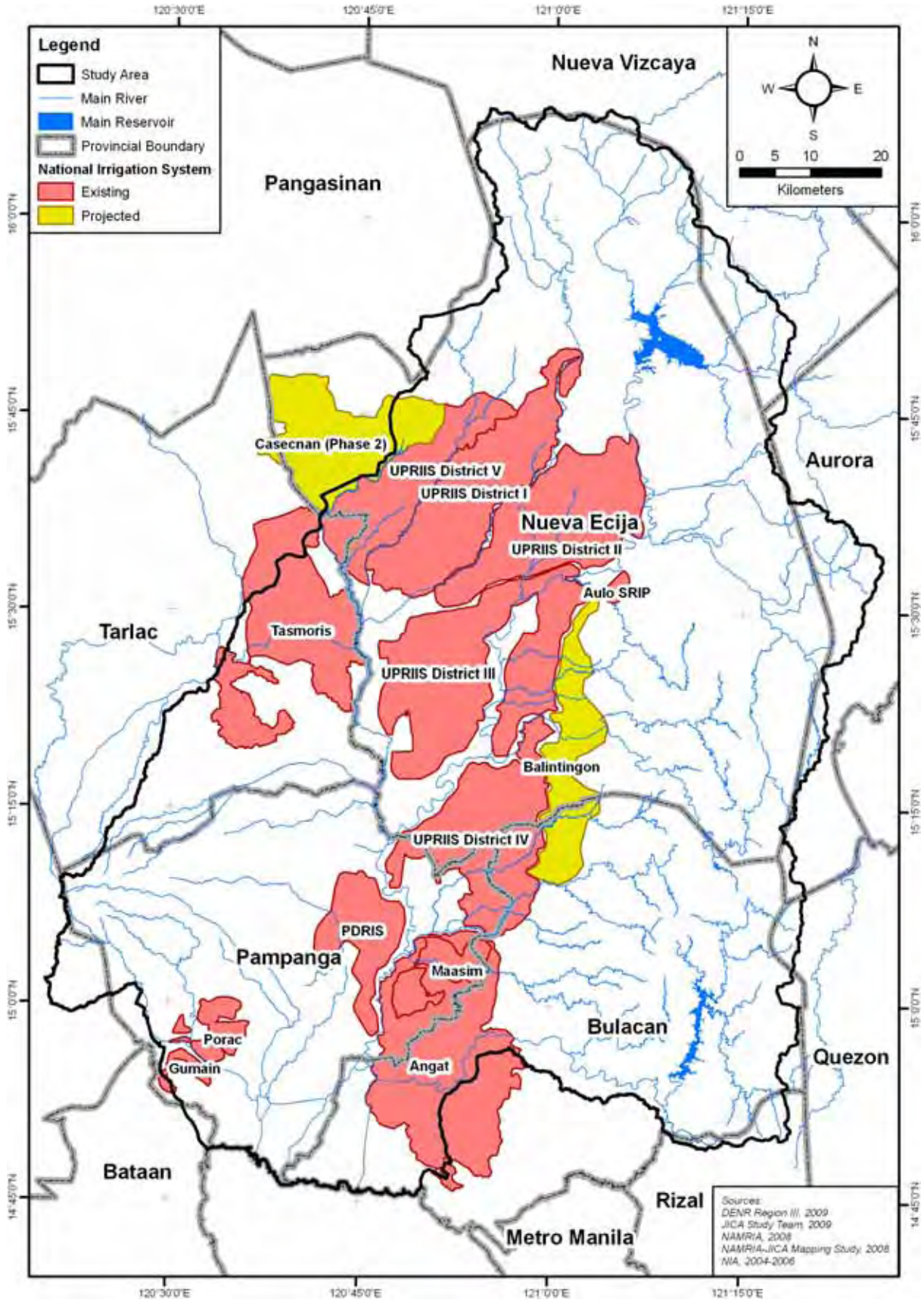
Annex-F C.1.1.3 Schematic Flow Diagram of Existing NIS



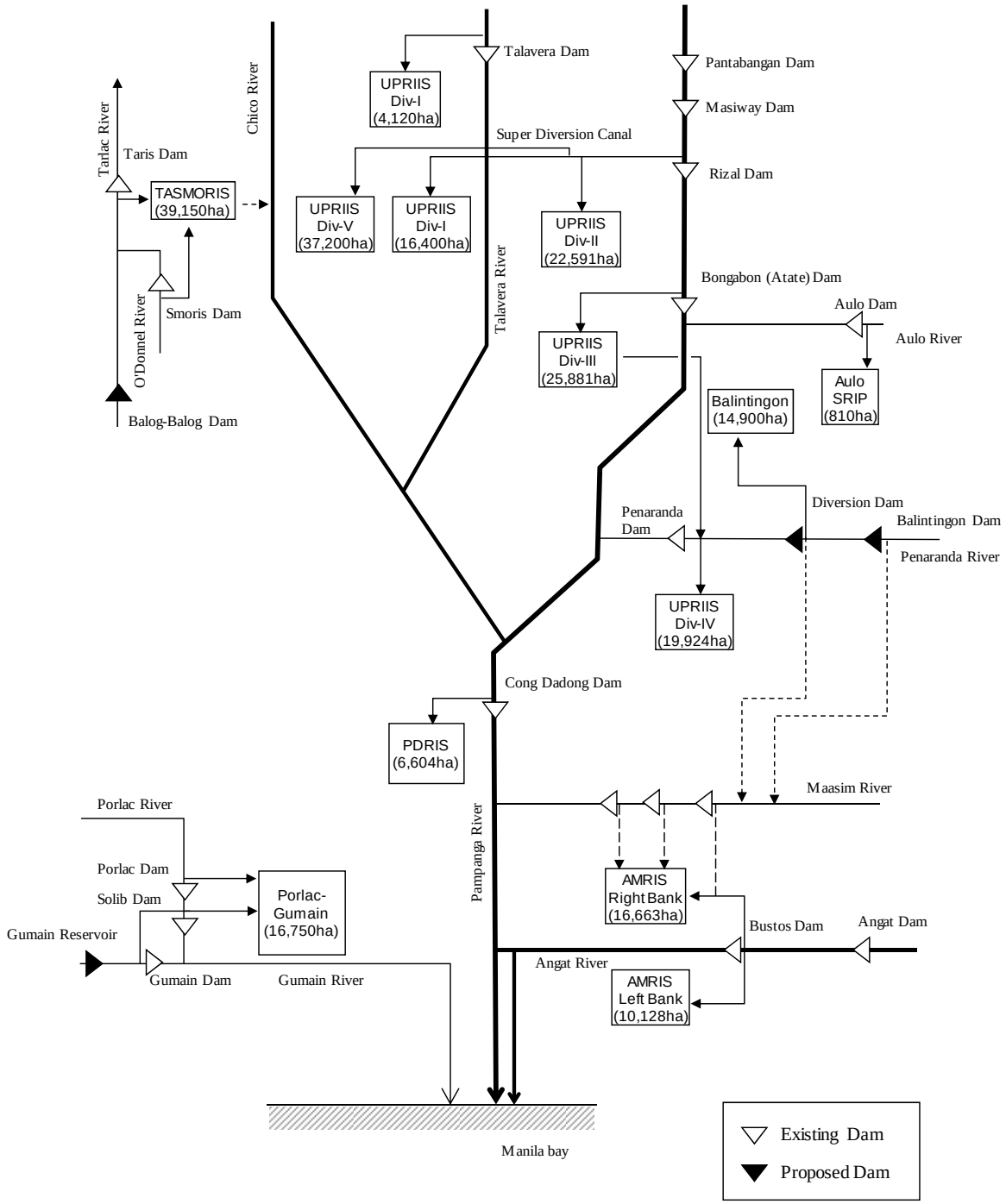
Annex-F C.1.1.4 Location Map of CIS



Annex-F C.1.1.5 Location Map of Small Scale Irrigations under BSWM

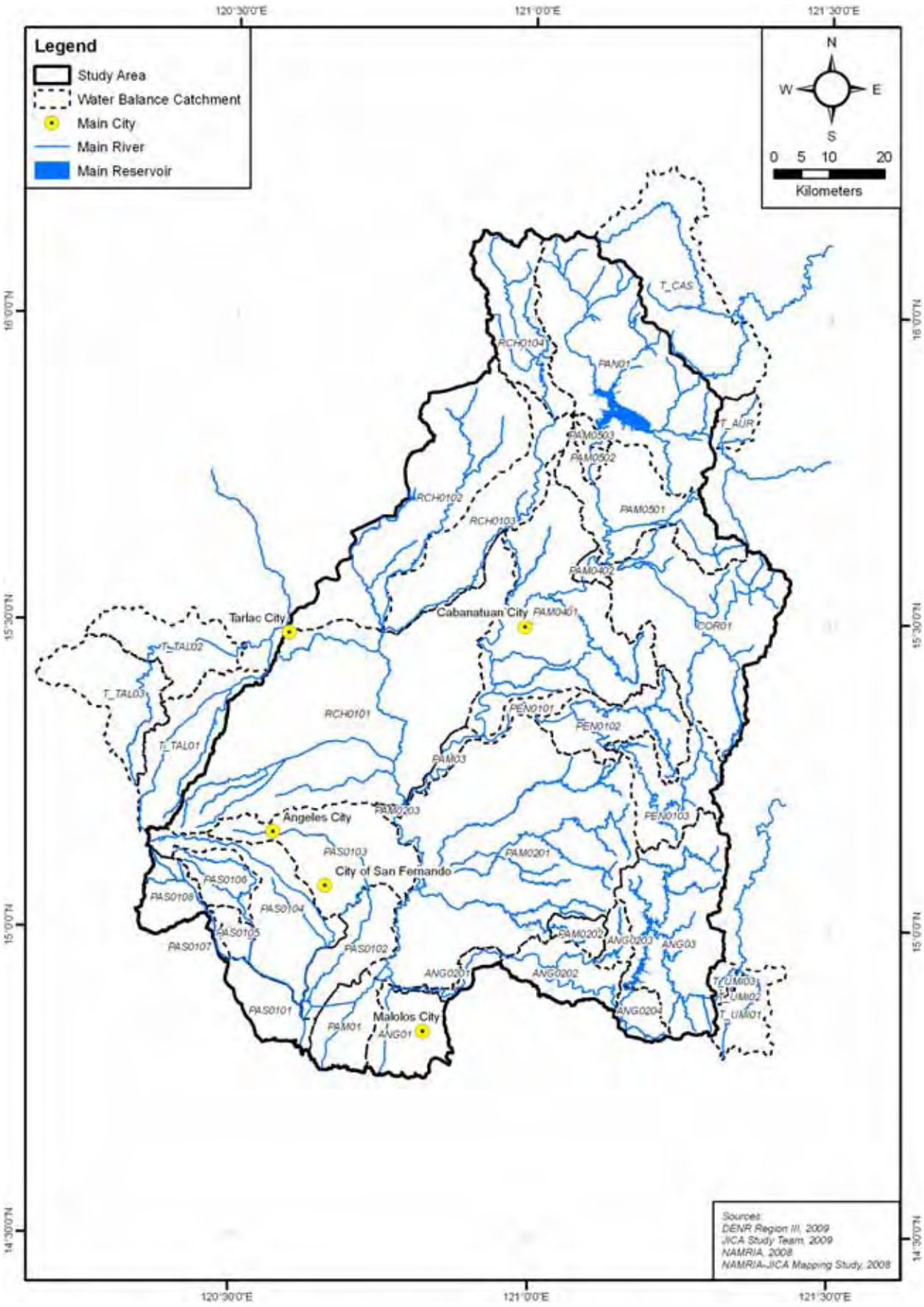


Annex-F C.1.1.6 Location Map of Projected NIS

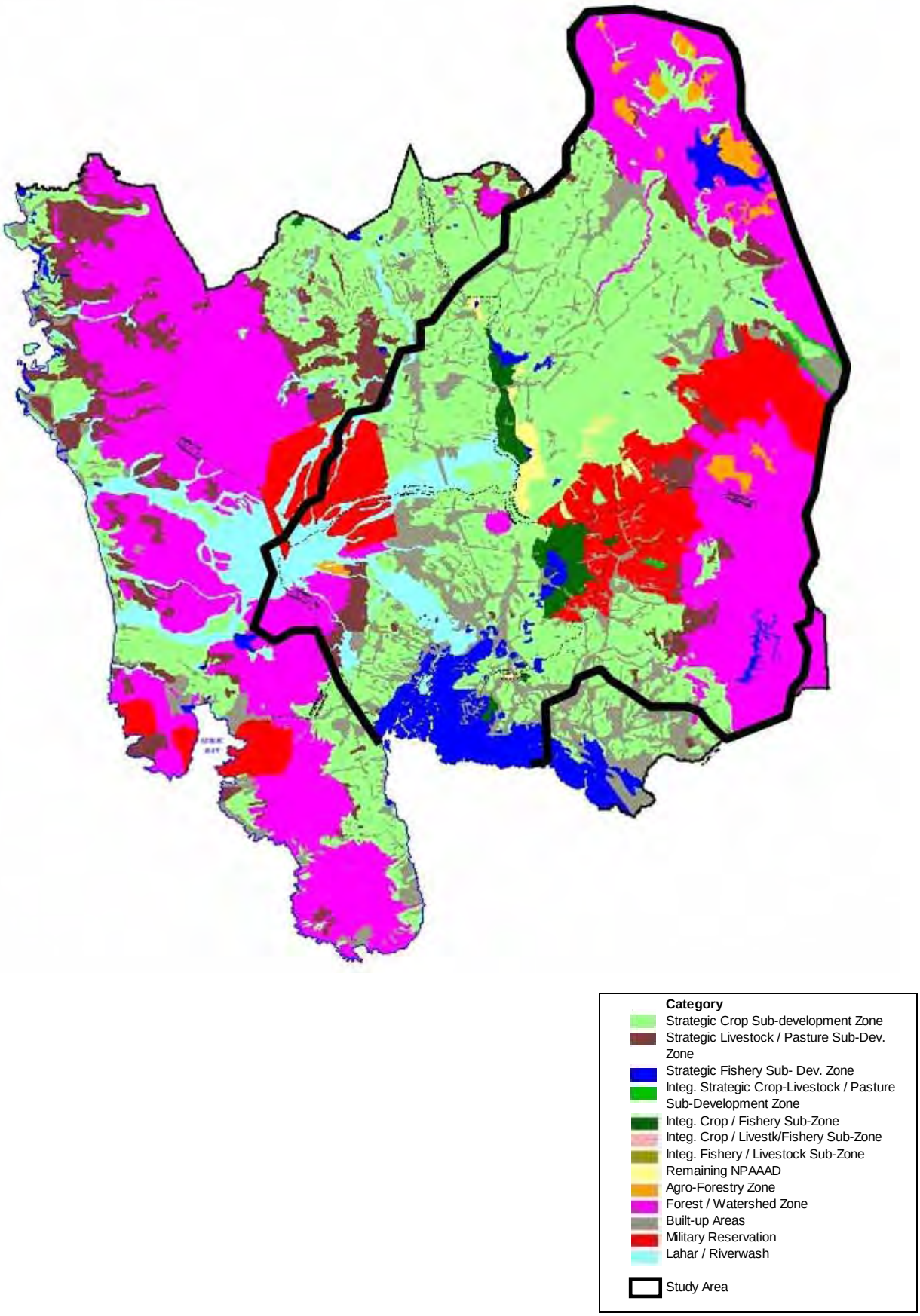


Source : JICA Study Team

Annex-F C.1.1.7 Schematic Flow Diagram of Projected NIS

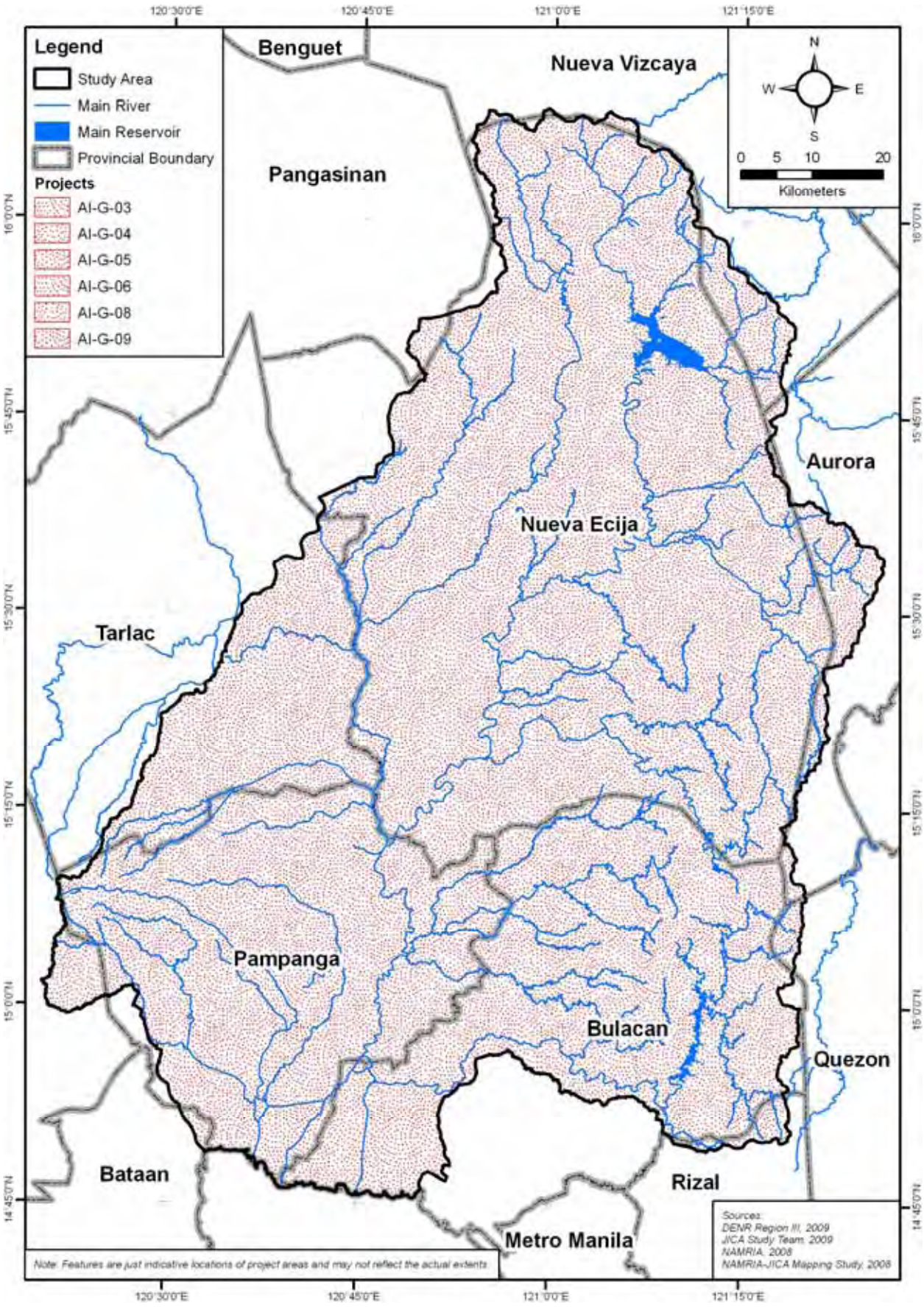


Annex-F C.1.2.1 Water Balance Catchments

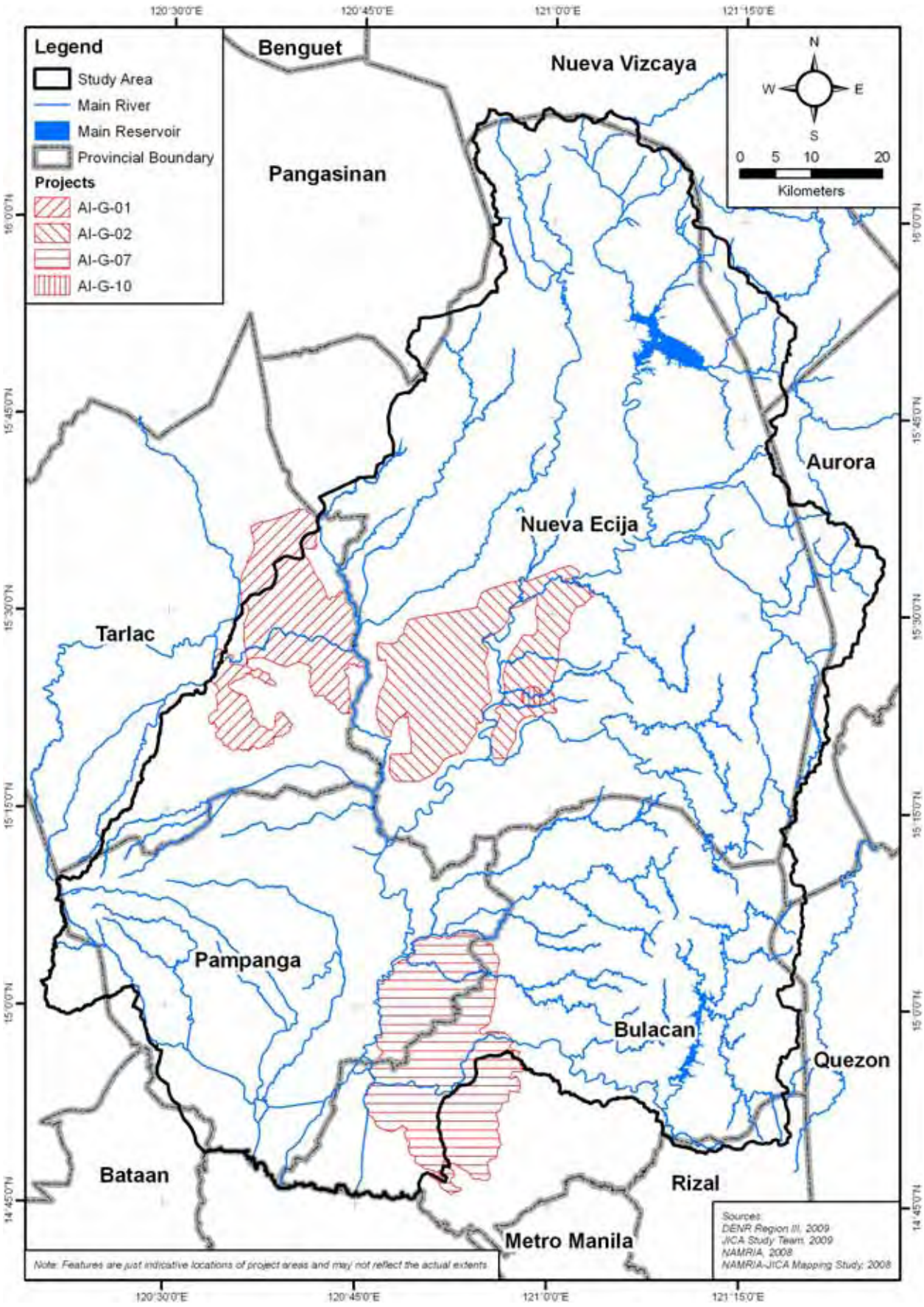


Source : Handbook on Strategic Agriculture and Fishery Zone, Region III

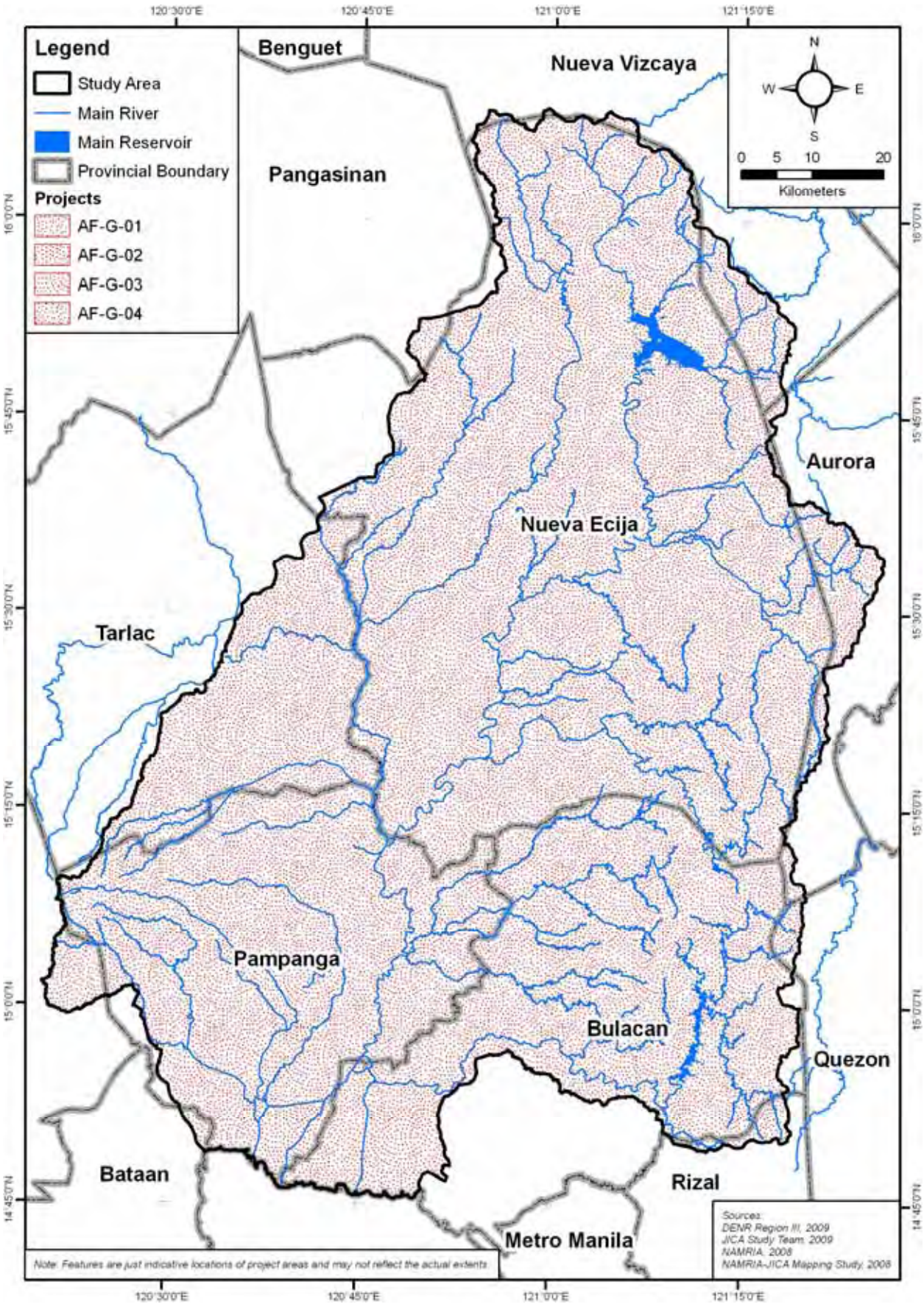
Annex-F C.3.1.1 Strategic Agriculture and Fishery Development Zone



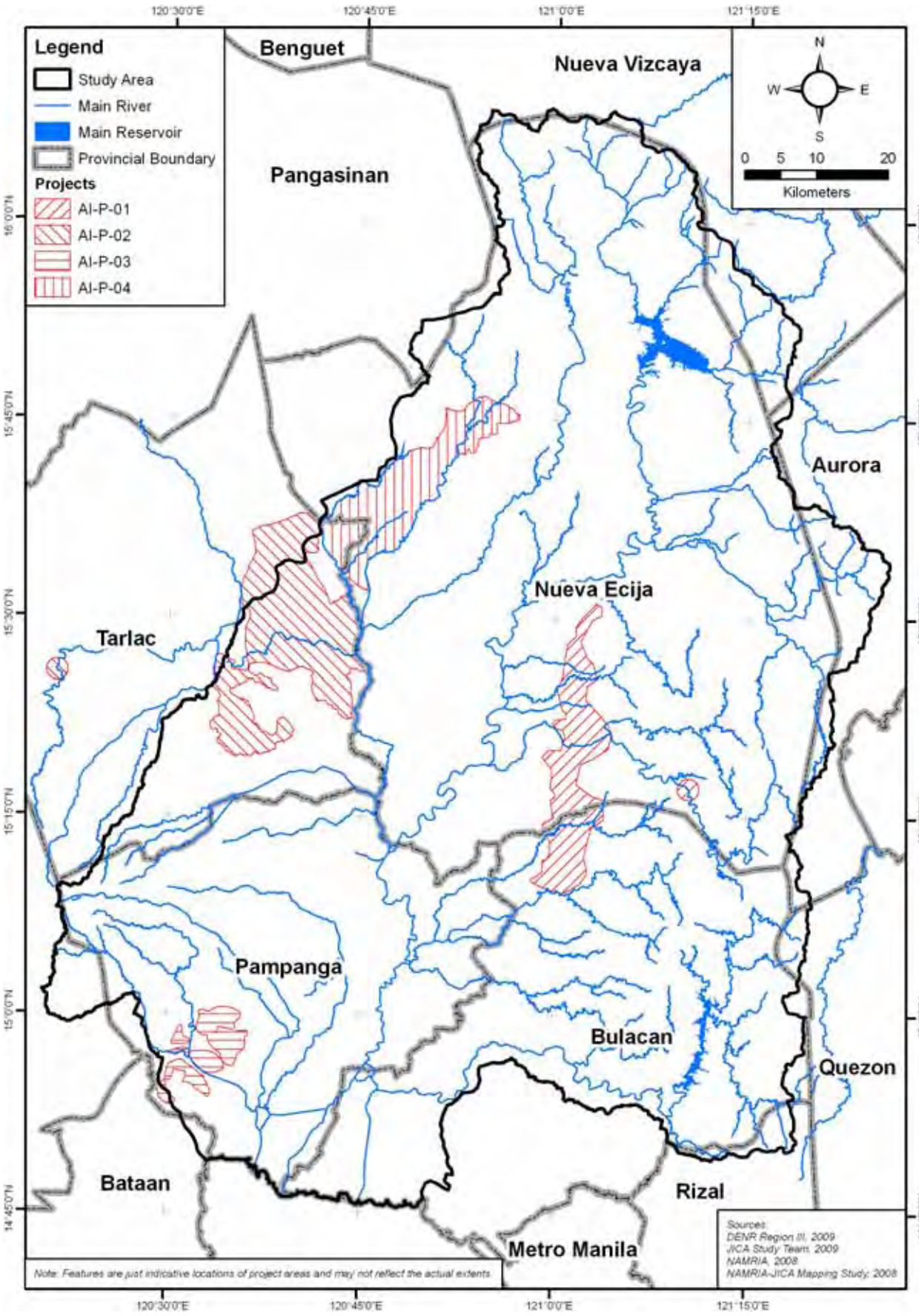
Annex-F C.3.2.1 (1/7) Location of Projects in Agriculture/Irrigation and Fishery



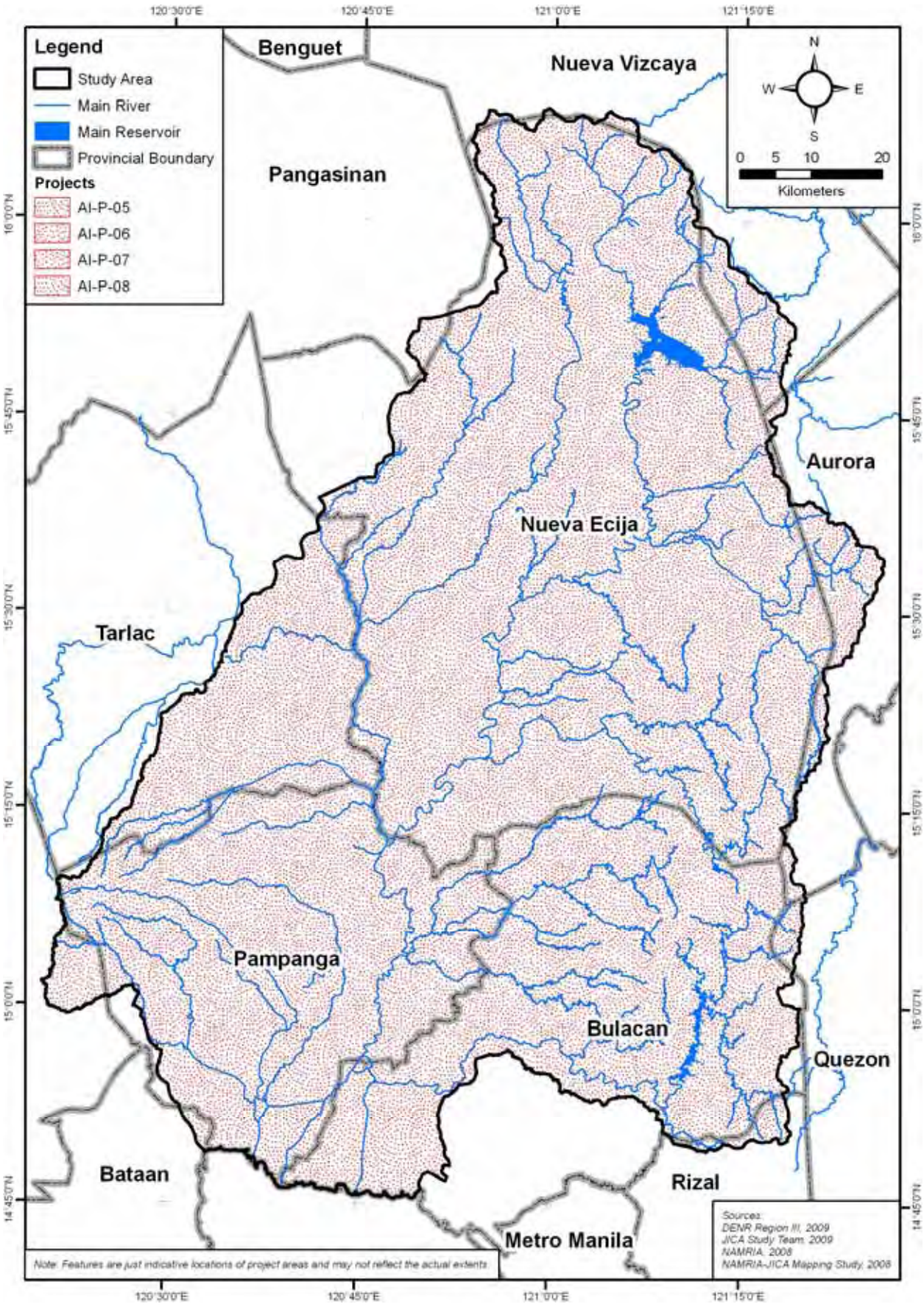
Annex-F C.3.2.1 (2/7) Location of Projects in Agriculture/Irrigation and Fishery



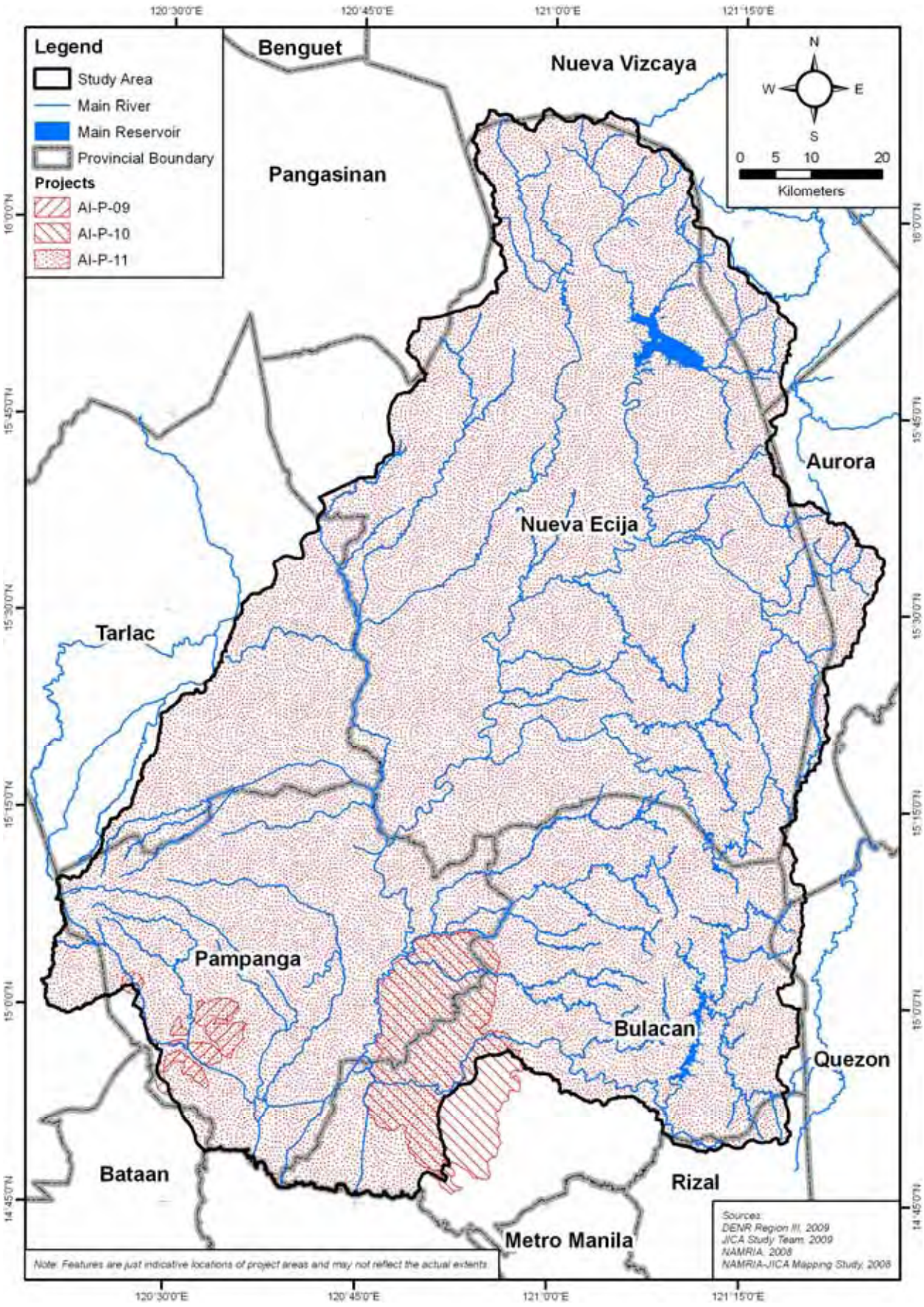
Annex-F C.3.2.1 (3/7) Location of Projects in Agriculture/Irrigation and Fishery



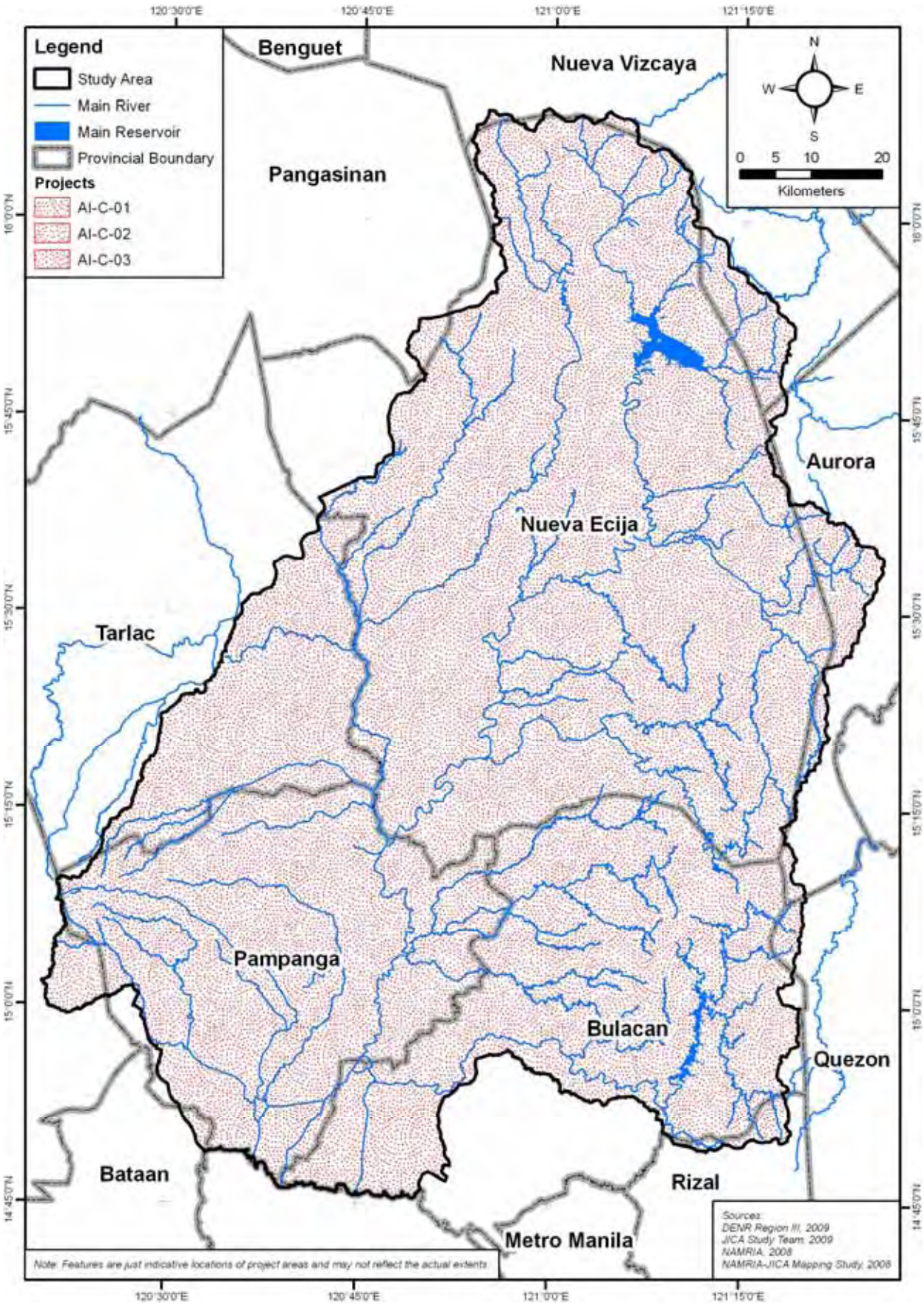
Annex-F C.3.2.1 (4/7) Location of Projects in Agriculture/Irrigation and Fishery



Annex-F C.3.2.1 (5/7) Location of Projects in Agriculture/Irrigation and Fishery



Annex-F C.3.2.1 (6/7) Location of Projects in Agriculture/Irrigation and Fishery



Annex-F C.3.2.1 (7/7) Location of Projects in Agriculture/Irrigation and Fishery

Sector D

Municipal Water Supply, Sanitation and Sewerage System Management

Sector D. Municipal Water Supply, Sanitation and Sewerage System Management

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Sector D. Municipal Water Supply, Sanitation and Sewerage System Management

D.1 Population in the Study Area

D.1.1 Study Area Coverage

The study area covers the entire catchment area of Pampanga river basin covering an area of 10,434km^2. The study area spreads over the administrative area of 11 provinces and 90 cities/municipalities. The substantial part of the study area is about 95% and this lies within the boundary of the four provinces, namely, Nueva Ecija, Tarlac, Pampanga and Bulacan. The remaining area is about 5%, which is part of the other seven provinces such as Aurora, Zambales, Rizal, Quezon, Pangasinan, Bataan and Nueva Viscaya. Table D.1.1.1 shows the study area coverage.

In the present study for municipal water supply, sanitation and sewerage system management, four provinces (Nueva Ecija, Tarlac, Pampanga and Bulaca) which cover 95% of the study area would be focused.

Table D. 1.1.1 Study Area Coverage

Province	Area Coverage		Number of Cities/Municipalities
	(km^2)	Ratio to the study area	
2.1 Nueva Ecija	5013	48.0%	30
2.2 Pampanga	2022	19.4%	22
2.3 Bulacan	2021	19.4%	18
2.4 Tarlac	834	8.0%	6
Sub-total		***95%***	***76***
2.5 Aurora	195	1.9%	3
2.6 Zambales	74	0.7%	2
2.7 Rizal	42	0.4%	1
2.8 Quezon	30	0.3%	1
2.9 Pangasinan	26	0.2%	1
2.10 Bataan	14	0.1%	2
2.11 Nueva Viscaya	163	1.6%	4
Sub-total		***5%***	
Total	**10,434**	**100.0%**	**90**

Source: JICA Study Team

D.1.2 Past and Present Population

The past and present population in the study area is estimated based on the censuses of NSCB at the city/municipal level in 1980, 1990, 1995, 2000 and 2007. The population within the study area is assumed as the population of each city/municipality multiplied with the percentage of the administrative area covered by the study area. On this assumption, the population in the study area in 2007 is estimated at about 5.8 million, which corresponds to about 59.2% of the total in Region III and/or 6.5% of the national total. Refer to Tables D.1.2.1 and Annex-T D.1.2.1, Pampanga Province takes the largest population of 2.2 million (about 38% of the total) in the study area. After Pampanga Province, Nueva Ecija has the second largest population of 1.7 million (30% of the total), Bulacan 1.3 million (23%) and Tarlac 0.5 million (8%).

Table D. 1.2.1 Population within the Study Area

Province	1980	1990	1995	2000	2007
Bulacan	594,920	769,921	908,081	1,072,923	1,299,400
Nueva Ecija	990,542	1,222,034	1,402,016	1,549,715	1,733,849
Pampanga	1,159,123	1,503,152	1,602,261	1,839,706	2,180,084
Tarlac	260,839	322,431	345,794	396,042	472,676
Others	28,922	40,365	43,744	51,150	70,148
Whole Study Area	3,034,346	3,857,903	4,301,897	4,909,536	5,756,156

Source: (1) Population Census in 1980, 1990, 1995, 2000, and 2007 by NSCB (for Basic Population Data)
(2) JICA Study Team (for Overlapping Ratio of study area with Cities/Municipalities)

The past population growth in the study area is estimated based on the above population censuses. The annual average growth from 1980 to 2007 in the study area is 2.40%, which is slightly higher than the nation average of 2.35% as listed in Table D.1.2.2 and Annex-T D.1.2.1. Among the major four provinces in the study area, Bulacan currently has the intensive urbanization in the south-eastern part of the province, which faces Metro Manila, in particular. Due to such intensive urbanization, the Province recorded the highest growth of 2.94% from 1980 to 2007 among those in the four provinces, while Nueva Ecija the lowest growth of 2.1%.

Table D. 1.2.2 Estimated Annual Ave. Population Growth in the Study Area

Province	1980-1990	1990-2000	2000-2007	1980-2007
Bulacan	2.61%	3.37%	2.77%	2.94%
Nueva Ecija	2.12%	2.40%	1.62%	2.10%
Pampanga	2.63%	2.04%	2.45%	2.37%
Tarlac	2.14%	2.08%	2.56%	2.23%
Whole Study Area	2.43%	2.44%	2.30%	2.40%

Source: (1) Population Census in 1980, 1990, 1995, 2000, and 2007 by NSCB (for Basic Population Data)
(2) JICA Study Team (for Overlapping Ratio of study area with Cities/Municipalities)

D.1.3 Population Projection

The population projection in the study area is based on the NSO 40 years population projection, five calendar year interval, medium series, by province from year 2000 up to 2040. The latest population census conducted by NSO per municipal level was on August 2007. The year 2007 population was projected by applying the growth rates used by NSO in the population projection, medium series for the year 2005 to 2025. Table D.1.3.1 shows the NSO provincial population projection medium series up to year 2025.

Table D. 1.3.1 NSO Past and Projected Population

NSO Provincial Medium Assumption				
Year	Bulacan	Nueva Ecija	Pampanga	Tarlac
POPULATION				
2000	2,253,700	1,669,900	1,893,200	1,074,800
2005	2,613,600	1,817,300	2,088,600	1,176,300
2010	2,986,200	1,969,100	2,285,000	1,279,700
2015	3,364,600	2,121,500	2,476,000	1,381,700
2020	3,746,900	2,264,400	2,656,800	1,477,300
2025	4,125,400	2,392,200	2,823,900	1,564,700
GROWTH RATES				
2000-2005	3.01%	1.71%	1.98%	1.82%
2005-2010	2.70%	1.62%	1.81%	1.70%
2010-2015	2.41%	1.50%	1.62%	1.55%
2015-2020	2.18%	1.31%	1.42%	1.35%
2020-2025	1.94%	1.10%	1.23%	1.16%

Source: NSO

Table D.1.3.2 summarizes the projected population within the study area and Annex-T D.1.3.1 shows the population projection by cities/municipalities in the study area. It should be noted that the ratio of urban and rural population is assumed to be unchanged in future.

Table D. 1.3.2 Projected Population within the Study Area

Province	Urban:Rural ratio	2008	2015	2020	2025
Bulacan	70:30	1,334,500	1,585,932	1,766,134	1,944,546
Nueva Ecija	50:50	1,761,894	1,960,159	2,092,188	2,210,272
Pampanga	68:32	2,219,624	2,493,194	2,675,248	2,843,509
Tarlac	44:56	480,708	536,813	573,956	607,911
Total		5,796,726	6,576,098	7,107,526	7,606,238

Source: JICA Study Team

D.2 Present Condition of Water Supply, Sanitation, and Sewerage System

D.2.1 General

The present water supply, sanitation, and sewerage system of the study area was assessed and evaluated to define the problems and issues in relation to the integrated water resources management in Pampanga river basin. The existing water supply, sanitation, and sewerage systems of the seventy six (76) cities and municipalities of the four provinces of Bulacan, Pampanga, Nueva Ecija, and Tarlac that are mainly sitting in Pampanga river basin were assessed based on the field investigation and data collected from the Provincial Planning and Development Office (PPDO), Local Water Utilities Administration (LWUA), City Health Office(CHO), Provincial Health Office (PHO), Regional Health Office (RHO), Local Government Units (LGU), National Statistics Office (NSO), and Water Districts (WD). The based year for all the collected data is year 2008. Each component of this sector is discussed in detail in the following sections.

D.2.2 National and Regional Policy for Development of Municipal Water Supply, Sanitation and Sewerage

Immediately after the Millennium Development Goals (MDGs)[1)] was released through the UNDP Millennium Summit held in September 2000, the Government of Philippines had resolved to adopt the MDGs and tightly integrated them into the Medium-Term Philippine Development Plan (MTPDP), 2004-2010[2)] thus allowing government strategies, policies and action plans to simultaneously address national and MDG targets.

The MDGs focused on the eight targets, namely: (1) eradicating extreme poverty and hunger; (2) achieving universal primary education; (3) promoting gender equality and empowering women; (4) reducing child mortality; (5) improving maternal health; (6) combating HIV/AIDS, malaria and other diseases; (7) ensuring environmental sustainability; and (8) developing global partnerships for development. Of these targets, the seventh item stresses on the access to safe drinking water in any water supply service level. In line with this policy, the MDGs for the Central Luzon[1)] set the target population, who could accesses to the safe drinking water and sanitary toilet facility by the year 2015, as listed below.

Table D. 2.2.1 Central Luzon MDG Water and Sanitation Target

Goals and Targets	Baseline (1990)	Target by 2015
Proportion of households with access to safe drinking water	78.92 %	89.46 %
Proportion of households with access to sanitary toilet facility	80.00 %	90.00 %

Source :UNDP Central Luzon MDG[1)]

In addition to the above MDGs, the Clean Water Act was enacted in 2004[3)], and its Section 8 entitled "Domestic Sewage Collection, Treatment and Disposal" prescribed the following requirements:

- Within five (5) years following the affectivity of this Act, the agencies, which vests in the entities to provide water supply and sewerage facilities and/or concessionaires in Metro Manila and other highly urbanized cities, shall connect the existing sewage lines in all subdivisions, condominiums, commercial centers, hotels, sports and recreational facilities, hospitals, market places, public buildings, industrial complexes and other similar establishments including households to available sewerage system. This connection works shall be made through coordination with the LGUs.
- The said connection shall be subject to sewerage services charge/fee in accordance with existing rules or regulations unless the sources had already utilized their own sewerage system.
- All sources of sewage and waste water shall comply with the requirements herein. In the areas not considered as the highly urbanized centers (HUCs), the DPWH in coordination with the

Department, DOH and other concerned agencies, shall employ septic tank or combined sewerage-septic management system.

Recently, Philippine Water Supply Sector Roadmap[4)] has been issued from NEDA. It describes the framework, vision, goals, strategies and program needed to achieve the desired outcomes for the development of the water supply sector. The vision in the Philippine Water Supply Sector Roadmap is "Access to safe, adequate and sustainable water supply for all", which targets the objectively verifiable indicators with 100% access coverage and sustaining utility operation by 2025. There are four outcomes; 1) Strengthened Institutions in 2025, 2) Developed Capacities in 2025, 3) Strategic Alliances Built in 2025, and 4) Adequate Infrastructure Provision.

D.2.3 Water Supply

D.2.3.1 Estimation of Present Water Supply Service Level

There are three water service levels in the study area as follows.

- Level 3: Piped household connections,
- Level 2: Piped communal faucets, and
- Level 1: Point source.

The level 3 water supply systems in the study area are being provided by the WD, LGU and other private water providers while Level 2 water systems are operated by the respective Barangay Waterworks.

The Provincial Health Offices and other relevant agencies have undertaken the sample survey on the population who could access to water supply service level. The existing water service level ratios for each city and municipality in the study area were estimated based on the information from the aforesaid relevant agencies. The followings are assumed for the estimation in the present study.

- Based on surveys by the Provincial Health Office, number of households with access to safe water supply system which are served by levels 1, 2 and 3 are estimated.
- The number of household with unsafe water source is calculated by the total number of household and the number of households with access to safe water supply which is served by levels 1, 2 and 3. Then, ratio of safe and unsafe water access is calculated.
- It is assumed that unsafe water access is distributed to level 1, 2 and 3 systems according to the ratio of level 1, 2 and 3 systems with safe water source.
- By applying the ratio of level 1, 2 and 3 to the total population, the population served by each water supply system is estimated.
- The populations served by level 1, 2 and 3 are distributed into urban and rural areas by the followings.
  - The estimated population served by level 3 is firstly assigned in the urban area. The excess population served by level 3 is then assigned in the rural area.
  - Population served by level 1 and 2 are assumed to be equally distributed in the remained population after assigning the population served by level 3.

The estimated ratio of water supply service level by province is summarized in the following table. The data for each municipality/city are shown in Annex-T D.2.3.1 as well as in Annex-F D.2.3.1 and D.2.3.2.

Table D. 2.3.1 Present Coverage Ratio of the Water Supply Service System in the Study Area

Province	Water Supply Service Level			Safe Water Access	
	Level 3	Level 2	Level 1	Safe	Unsafe
Bulacan	57%	0%	43%	89%	11%
Nueva Ecija	34%	6%	60%	85%	15%
Pampanga	45%	5%	50%	76%	24%
Tarlac	32%	0%	68%	80%	20%
Total	45%	3%	52%	83%	17%

Note: Inside the study area only
Source: PHO for Bulacan, Nueva Ecija, Pampanga and Tarlac (arranged by JICA Study Team)

About 45% of the population in the basin has level 3 water system, 3% have level 2 water system, and 52% have level 1 water system. The basin average ratio with access to safe water is 83%. This means that 17% have water supply of any water service level that are not within the permissible water quality under the Philippine National Standards for drinking water which is also patterned after the World Health Organization (WHO) standards. Generally, ground water is the major water source in the study area. Based on the NSO 2000 census of population and housing[5], about 98% are using ground water as their water source in the basin. About 2% in the study area have the access to the use of surface water such as small springs and rivers as a point source for domestic supply and also use for drinking by boiling the water and or by the aid of simple household sand filtration.

D.2.3.2 Previous Master Plan for Municipal Water Supply

The current development of the water supply systems in Bulacan, Nueva Ecija. Pampanga and Tarlac provinces are based on the master plans[6),7),8),9)], which targeted the year 2010 and were prepared in 1991 and 1992. The master plans have two phases; Phase 1 for 1992-1997 and Phase 2 for 1998-2010. The target percentage of the population with safe water supply system for each province has been set as follows.

Table D. 2.3.2 Target Percentage of Population with Safe Water Supply System in the On-Going Master Plans

		Actual Coverage in 1990	Target Coverage in 1997	Target Coverage in 2010
Bulacan	Urban	52%	77%	98%
	Rural	47%	80%	94%
Nueva Ecija	Urban	76%	77%	100%
	Rural	29%	92%	100%
Pampanga	Urban	69%	77%	98%
	Rural	44%	80%	94%
Talrac	Urban	88%	77%	100%
	Rural	63%	92%	100%

Note: Inside the study area only
Source: Study on Water Supply, Sewerage and Sanitation Sector/Development Plan (1992-2010) for the Province of Bulacan, Nueva Ecija, Pampanga and Tarlac, 1991-1992.

The target service levels for urban and rural areas have been set as follows.

Table D. 2.3.3 Target Service Level for Water Supply in Urban and Rural Areas in the On-Going Master Plans

	Urban in 2010	Rural in 2010
Existing Level 3	No change	No change
Existing Level 2	Level 3	No change
Existing Level 1	Level 3	No change
Existing unsafe	Level 3	Level 1
New development	Level 3	Level 1

Source: Study on Water Supply, Sewerage and Sanitation Sector/Development Plan (1992-2010) for the Province of Bulacan, Nueva Ecija, Pampanga and Tarlac, 1991-1992.

The additional services and their development costs for 2010 have been estimated as follows.

Table D. 2.3.4 Additional Services and Their Development Cost for Water Supply for 2010 in the On-Going Master Plans

	Additional urban population served by Level 3 (person)	Cost for developing additional Level 3 facilities (mil pesos)	Additional rural population served by Level 1 (person)	Cost for developing additional Level 1 facilities (mil pesos)
Bulacan	535,682	1,071	455,971	310
Nueva Ecija	381,567	763	802,440	552
Pampanga	965,966	1,932	861,895	259
Talrac	123,003	246	148,444	44
Total	2,006,219	4,012	2,268,750	1,165

Note: Inside the study area only. Cost is in price level of 1992.
Source: Study on Water Supply, Sewerage and Sanitation Sector/Development Plan (1992-2010) for the Province of Bulacan, Nueva Ecija, Pampanga and Tarlac, 1991-1992.

The estimated present water supply service level ratios for urban and rural areas are presented in Table D.2.3.5 (refer to Annex-T D.2.3.2 for the data for each municipality and city). Based on the estimation, achievement of the master plans is summarized in Table D.2.3.6. The achievement of the target is different for each city and municipality. For urban area, 8 cities/municipalities have achieved the target for safe water supply system, whereas 12 cities/municipalities have achieved the target for rural area.

Table D. 2.3.5 Present Coverage Ratio of the Water Supply Service System in the Study Area

Province		Water Supply Service Level		
		Level 3	Level 2	Level 1
Bulacan	Urban	65%	0%	35%
	Rural	39%	0%	61%
Neva Ecija	Urban	55%	3%	42%
	Rural	16%	10%	74%
Pampanga	Urban	58%	5%	37%
	Rural	13%	2%	85%
Tarlac	Urban	66%	0%	34%
	Rural	3%	0%	97%
Total	Urban	59%	3%	38%
	Rural	18%	4%	78%

Note: Inside the study area only
Source: JICA Study Team based on PHO for Bulacan, Nueva Ecija, Pampanga and Tarlac

Table D. 2.3.6 Achievement of Target for 2010 set by Previous Master Plans for Water Supply Facilities

		Actual Coverage in 2008		Number of Cities/Municipalities which achieved target for 2010 (Number of achieved Cities-Mun. / Number of Cities-Mun.)	
		Coverage of safe water supply system	Coverage of Level 3 facility	Coverage of safe water supply system	Coverage of Level 3 facility
Bulacan	Urban	89%	65%	1/17	8/17
	Rural		39%	4/9	-
Nueva Ecija	Urban	85%	55%	6/28	7/28
	Rural		16%	7/29	-
Pampanga	Urban	76%	58%	1/22	5/22
	Rural		13%	1/16	-
Talrac	Urban	80%	66%	0/6	2/6
	Rural		3%	0/6	-
Total	Urban	83%	59%	8/73	22/73
	Rural		18%	12/60	-

Note: Inside the study area only
Source:
1) JICA Study Team based on PHO for Bulacan, Nueva Ecija, Pampanga and Tarlac,
2) Study on Water Supply, Sewerage and Sanitation Sector/Development Plan (1992-2010) for the Province of Bulacan, Nueva Ecija, Pampanga and Tarlac, 1991-1992.

D.2.4 Sanitation

D.2.4.1 Present Condition of Sanitation Facilities

The existing sanitary conditions for each city and municipality in the study area were evaluated based on the environmental report from the PHO. There are two types of toilets, namely: (a) the sanitary toilets in the form of the flush toilet with septic tank, and (b) unsanitary toilet without septic tanks, which disposes human waste without passing through the septic tank and leachate percolates directly into the ground or water bodies.

The estimated ratio of population with sanitary toilet is presented in Table D.2.4.1 (refer to Annex-T D.2.4.1 and Annex-F D.2.4.1 for details). Unsanitary toilet has a significant impact on the water quality issue. Referring to the Table D.2.4.1, the part of the ratio component of unsafe water is complemented by the ratio of unsanitary toilet.

Table D. 2.4.1 Safe Water Ratio Relative to Sanitation Facilities

Province	2008 Safe Water Ratio		2008 Sanitation Facilities	
	Safe	Unsafe	Sanitary	Unsanitary
Bulacan	89%	11%	91%	9%
Nueva Ecija	85%	15%	86%	14%
Pampanga	76%	24%	88%	12%
Tarlac	80%	20%	85%	15%
Total	83%	17%	88%	12%

Note: Inside the study area only
Source: PHOs, JICA Study Team

The current development of the sanitary facilities in Bulacan, Nueva Ecija, Pampanga and Tarlac provinces are based on the master plans[6), 7), 8), 9)], which targeted the year 2010 and were prepared in 1991 and 1992. The master plans have two phases; Phase 1 for 1992-1997 and Phase 2 for 1998-2010. The target percentage of the population with sanitary toilet for each province has been set as follows.

Table D. 2.4.2 Target Percentage of Population with Sanitary Toilet in the On-Going Master Plans

	Actual Coverage in 1990	Target Coverage in 1997	Target Coverage in 2010
Bulacan	81%	77%	98%
Nueva Ecija	49%	77%	100%
Pampanga	53%	77%	98%
Talrac	74%	77%	100%

Note: Inside the study area only
Source: Study on Water Supply, Sewerage and Sanitation Sector/Development Plan (1992-2010) for the Province of Bulacan, Nueva Ecija, Pampanga and Tarlac, 1991-1992.

The additional services and their development costs for 2010 have been estimated as follows.

Table D. 2.4.3 Additional Services and Their Development Cost for Sanitary Facilities for 2010 in the On-Going Master Plans

	Additional number of sanitary toilet	Cost for developing additional sanitary facilities (1,000Php)
Bulacan	127,480	127,480
Nueva Ecija	225,163	225,163
Pampanga	353,324	353,324
Talrac	35,713	35,713
Total	741,680	741,680

Note: Inside the study area only
Source: Study on Water Supply, Sewerage and Sanitation Sector/Development Plan (1992-2010) for the Province of Bulacan, Nueva Ecija, Pampanga and Tarlac, 1991-1992.

Based on the estimation on the present condition of sanitary facility, achievement of the master plans is summarized in Table D.2.4.4. Only three cities/municipalities have achieved the target for sanitary toilet.

Table D. 2.4.4 Achievement of Target for 2010 set by On-Going Master Plans for Sanitary Facilities

Province	Actual Coverage in 2008	Number of Cities/Municipalities which achieved target for 2010 (Number of achieved Cities-Mun. / Number of Cities-Mun.)
Bulacan	91%	0/18
Nueva Ecija	86%	1/30
Pampanga	88%	1/22
Talrac	85%	0/6
Total	88%	2/76

Note: Inside the study area only
Source: JICA Study Team

D.2.5 Sewerage System

In the Pampanga river basin, there is only one identified area that has a complete sewerage system which is in Clark field in Mabalacat, Pampanga. This area is formerly a US military airfield and now serving the Clark Special Economic Zone (CSEZ). Clark has two separate sewerage systems, the storm drainage system and sewage system. The sewage effluent is being treated in the biological waste water treatment plant (WWTP) which has a present capacity 8,023 m^3/d. The plant is composed of two (2) anaerobic ponds, two (2) facultative ponds, and two (2) maturation ponds. The present sewerage system is designed to cater effluent of about 16,280 population and receiving the effluent from the number of industrial, commercial and institutional within the CSEZ. The Clark Water Corporation (CWC) is the main provider for both water supply and sewerage systems. CWC is charging sewerage tariff at 40% of the domestic water bill. The present WWTP is proposed to be expanded by year 2010 to cater effluent of 13,500 m^3/d and by 2012 to 33,000 m^3/d.

In the province of Nueva Ecija, Cabanatuan City has the complete feasibility study and engineering design for the construction of the urban sewerage, sanitation and drainage system to serve about 33,200 people. The designed combine sewerage system is composed of drainage/sewer lines, lift stations, and waste water treatment plant with a capacity of 6,630 m^3/d dry weather flow for STP1 and 1,541 m^3/d dry weather flow for STP 2. The proposed biological treatment plant includes anaerobic lagoon and chemical disinfection. At present, the combined drainage and sewer lines are already constructed but the WWTP has not been done yet due to lack of funds.

The rest of the municipalities and cities in the study area have no sewerage system and the effluent is discharge directly into the nearest stream.

As per information gathered during the JICA study team focus group discussion on water quality and environment, some of the operators of the septic tank desludgers, disposed the untreated septage in the river which causes the increasing pollution load in the water bodies. The private desludger operators are supposed to be mandated to have the septage treated prior to the final disposal but in spite of the mandate, there are still some operators who don't conform to the law.

The problem on the increase of pollution load in the water bodies was identified as the result of insufficient water pollution load reduction facilities in the study area. The present sewage from the household septic tanks flows directly to the water bodies for there is no existing municipal wastewater treatment plant in the study area except for the area of Clark, Mabalacat, Pampanga where 80% is covered by the sewerage system. The system served 100 % of the domestic users while the other industrial and commercial users are not yet fully served.

The present sludge disposal system was reportedly unmonitored and mostly of the desludgers are disposing the untreated sludge to anywhere such as open dumpsite and rivers. Considering the present system, water pollution load analysis was carried out in *Sector Report F: Water-related*

Environmental Management, and the first ten cities/municipalities that were identified with high pollution load are the cities of Angeles, San Fernando,Malolos, Tarlac, Cabanatuan and the municipalities of Hagonoy, Baliwag, Calumpit, Mabalacat, and Guagua.

D.3 Plan for Municipal Water Supply, Sanitation and Sewerage System Management

D.3.1 Problem and Issues on Municipal Water Supply, Sanitation and Sewerage

The existing condition of municipal water supply, sanitation, and sewerage system was evaluated to assess the problems and issues of the sector. Each component was evaluated considering the existing data collected from the respective areas in the basin and was further validated through interviews, during the stakeholders' meetings, technical working group meetings, as well as the focus group discussion. There are three major problems and issues identified in this sector which pertains to the water quantity and quality as well the issue on the increasing pollution load in the water bodies. Each of these is further discussed below.

D.3.1.1 Inadequate Water Supply Source

The present water supply in the study area is inadequate considering the water demand requirements of the growing population. Likewise, the diminishing water well discharge, and even some water sources turned to dry water wells are being experienced by some areas in the basin which is caused by unregulated groundwater extraction. Some water wells in the coastal areas of Bulacan and Pampanga are left unused because of salt intrusion which is caused by over pumping that result saltwater to draw into the freshwater aquifer. The high percentage of unaccounted water was also identified as one problem in the water shortage caused by the left unrepaired pipe leakages, excessive water use of unmetered and illegal connections.

D.3.1.2 Unsafe Water Supply

The problem and issue on unsafe water supply is the water contamination caused by the four identified major causes such as; a) The existence of the unsanitary toilets where the leachate of human waste discharges directly to the ground and contaminates the ground water sources; b) The operation and maintenance of the water sources and distribution system are not properly carried out such as the long stand unrepaired pipe leaks, uncared periodic flushing of the pipelines, elapsed schedule for water well disinfection specifically for level 1 system. All of these give the bacteria a breeding ground; c) Improper well development that yields water with sand and other solids due to improper placing of blank and screen casings during construction, and d) Salt intrusion on ground water due to over extraction. The study team identified that about 83% has the access to safe water and others have unsafe water supply due to the above causes.

D.3.1.3 Increasing Pollution Load in Water Bodies

The problem on the increase of pollution load in the water bodies has been identified as the result of insufficient water pollution load reduction facilities in the study area. The present sewage from the household septic tanks flows directly to the water bodies. There is no existing municipal wastewater treatment plant in the study area except for the area of Clark where 80% is covered by the sewerage system. The system served 100 % of the domestic users while the other industrial and commercial users are not yet fully served. The present septage disposal system was reportedly unmonitored and most of the disludgers are disposing the untreated sludge to anywhere such as open dumpsite and rivers. Considering the present system, water pollution load analysis has been carried out and there are ten cities/municipalities that have been identified as high pollution load contributors. The areas are the cities of Angeles, San Fernando, Malolos, Tarlac, Cabanatuan and the municipalities of Hagonoy, Baliuag, Calumpit, Mabalacat and Guagua.

D.3.2 Projects as Components of Proposed IWRM Plan

Based on the problems and issues identified, necessary measures were identified to address correspondingly. Likewise, projects were carefully identified to achieve the following sector goals.

- Improve water supply quality
- Ensure necessary water supply capacity

- Reduce pollution load

D.3.2.1 Basic Strategy

The basic strategy for achieving the goals is set as follows.

(1) Water Supply

To address the issue on the inadequate water supply, the development of new water supply system for all water service level for both urban and rural areas are proposed to meet the growing water demand requirement in the study area. The ground water sources in the areas of Bulacan and Pampanga where salt water intrusion into the aquifer is prevalent, the development of bulk water supply is proposed. The new water supply system for level 3 will also include the expansion and rehabilitation of the existing water system in the respective cities and municipalities and new technology equipment for water source development is recommended. In the present study, the strategy for physical targets on the water service level ratios is set as follows. This strategy was presented and was confirmed during the Focus Group Meeting for the sector for Municipal Water Supply, Sanitation and Sewerage in the course of the present study.

- Increasing with the past trend and additional consideration to level up the municipalities with low level 3 ratio

Capacity development for the project design, implementation, and operation and maintenance will be incorporated in the hard component to complement the project targets.

(2) Sanitation

The 100% provision of sanitary toilet in the entire service area by year 2025 is recommended to achieve the sector goal of 100% safe water to complement with the other water quality issues and countermeasures

(3) Sewerage

The increasing pollution load in the water bodies requires the highly urbanized cities/municipalities to have a pollution load reduction facilities. The ten cities and municipalities identified in Chapter D.2.5 should have had such facilities considering the water pollution load analysis.

D.3.2.2 Projects as the Countermeasures against the Problems and Issues on Municipal Water Supply, Sanitation and Sewerage

Table D.3.2.1 shows the identified projects related to the problems and issues on municipal water supply, sanitation and sewerage. The project profiles for the projects for municipal water supply, sanitation and sewerage are prepared in Annex-T D.3.2.1. The location of the projects is presented in Annex-F D.3.2.1.

The list of the project for the sector of municipal water supply, sanitation and sewerage is shown in Table D.3.2.2. The identified projects are largely categorized by three groups, corresponding to the problems and issues. The outline of the projects is described below.

Table D. 3.2.1 On-going, Proposed and Conceptual Projects related to Problems and Issues on Municipal Water Supply, Sanitation and Sewerage

Goals:
1) Improve water supply quality
2) Ensure necessary water supply capacity
3) Reduce pollution load

Problems and Issues / Causes	Countermeasures	Programs and Projects	Sector
1. Inadequate Water Supply Source • Rapid increase in water demand due to increase in population • Decrease or no yield at level 1 source • Limited high technology/modern equipment for source development • High water loss due to pipe leakage, excessive water usage specially for users with flat tariff rate and illegal taps	1.1 Development of new water systems and expansion/ upgrading of existing water systems in both urban and rural areas 1.2 Utilization of high technology equipment in development of water system 1.3 Carrying out immediate water repairs, provide water meters, and perform periodic maintenance 1.4 Strict implementation/ enforcement of laws and penalties on pilferages	• MW-C-01 - 04: Additional Level 3,2,1 Facilities toward 2025 in Bulacan, Pampanga , Nueva Ecija and Tarlac Provinces (These projects include the soft components addressing the countermeasures 1.2, 1.3 and 1.4)	MWS
	1.5 Development of bulk water supply for securing sustainable water source	• MW-G-01: Angat Water Utilization and Aquaduct Improvement Project (AWUAIP) Phase 2	MWS
		• MW-P-01: Rehabilitation of Umiray-Macua Facilities	MWS
		• MW-P-02: Sumag River Diversion Project	MWS
		• MW-P-04: Metro Clark Bulk Surface Water Project	MWS
		• MW-C-05: Extended Bulacan Bulk Water Supply Project	MWS
		• MW-C-06: Pampanga Bulk Water Supply Project	MWS
2. Unsafe Water Supply • Unsanitary toilet facilities • System O&M not regularly carried out • Improper well development • Salt intrusion on groundwater, over extraction of groundwater	2.1 Providing 100% sanitary toilet facilities 2.2 Social preparation for users	• MS-C-01 - 04: Additional Sanitation Facilities toward 2025 in Bulacan, Pampanga , Nueva Ecija and Tarlac Provinces (These projects include capacity development of implementing agency addressing the countermeasures 2.2)	MWS
	2.1 Efficient system operation and maintenance 2.2 Quality checked design and well supervised construction 2.3 Strict implementation of well design	• MW-C-01 - 04: Additional Level 3,2,1 Facilities toward 2025 in Bulacan, Pampanga , Nueva Ecija and Tarlac Provinces (These projects include the soft components addressing the countermeasures 2.3, 2.4 and 2.5)	MWS
	2.4 Development of bulk water supply for salt intrusion area	• MW-P-03: Bulacan Treated Bulk Water Supply Project	MWS
	2.5 Strict regulation of groundwater use and monitoring of groundwater extraction	• IS-C-01:Establishment of Comprehensive Groundwater Monitoring in Pampanga River Basin	IS
3. Increasing Pollution Load in Water Bodies • Absence of waste water and septage treatment plant	3.1 Complete the existing sewerage project and expansion of the existing sewerage system	• MP-G-01: Cabanatuan Sewerage System • MP-G-02: Expansion of Clark Sewerage System	MWS MWS
	3.2 Provide appropriate sustainable septage treatment and disposal facilities in highly urbanized cities	• MP-C-01: Septage Treatment and Disposal Facility	MWS

Source: JICA Study Team

Table D. 3.2.2 List of On-going, Proposed and Conceptual Projects for Municipal Water Supply, Sanitation and Sewerage

No.	Code	Title of Program/Project	Implementing Agency	Status
1	MW-G-01	Angat Water Utilization and Aquaduct Improvement Project (AWUAIP) Phase 2	MWSS	On-going
2	MW-P-01	Rehabilitation of Umiray-Macua Facilities	MWSS	Proposed
3	MW-P-02	Sumag River Diversion Project	MWSS	Proposed
4	MW-P-03	Bulacan Treated Bulk Water Supply Project	MWSS/ Bulacan Gov.	Proposed
5	MW-P-04	Metro Clark Bulk Surface Water Project	CDC	Proposed
6	MW-C-01	Additional Level 3,2, 1 Facilities towards 2025 in Bulacan	LWUA/WDs/LGUs /Private WSPs	Conceptual
7	MW-C-02	Additional Level 3,2, 1 Facilities towards 2025 in Pampanga	LWUA/WDs/LGUs /Private WSPs	Conceptual
8	MW-C-03	Additional Level 3,2, 1 Facilities towards 2025 in Nueva Ecija	LWUA/WDs/LGUs /Private WSPs	Conceptual
9	MW-C-04	Additional Level 3,2, 1 Facilities towards 2025 in Tarlac	LWUA/WDs/LGUs /Private WSPs	Conceptual
10	MW-C-05	Extended Bulacan Bulk Water Supply Project	Bulacan Gov.	Conceptual
11	MW-C-06	Pampanga Bulk Water Supply Project	Pampanga Gov	Conceptual
12	MS-C-01	Additional Sanitary Facilities towards 2025 in Bulacan	LGUs	Conceptual
13	MS-C-02	Additional Sanitary Facilities towards 2025 in Pampanga	LGUs	Conceptual
14	MS-C-03	Additional Sanitary Facilities towards 2025 in Nueva Ecija	LGUs	Conceptual
15	MS-C-04	Additional Sanitary Facilities towards 2025 in Tarlac	LGUs	Conceptual
16	MP-G-01	Cabanatuan Sewerage System	LGUs	On-going
17	MP-G-02	Expansion of Clark Sewerage System	Clark Water	On-going
18	MP-C-01	Septage Treatment and Disposal Facility	LWUA/WDs/LGUs /Private WSPs	Conceptual

Source: JICA Study Team

D.3.2.3 Projects to Improve Inadequate Water Supply Source

There are two types of projects to improve inadequate water supply source; and (1)Development of new water supply system, and (2) Development of bulk water supply.

(1) Development of New Water Supply System

(a) MW-C-01, 02, 03, 04: Additional Level 3, 2, 1 Facilities towards 2025 in Bulacan, Pampanga, Nueva Ecija and Tarlac

The on-going and proposed projects are judged to hardly promise to secure the access to the safe water quality for drinking, in the study area. From this point of view, the four (4) conceptual projects of MW-C-01, MW-C-02, MW-C-03 and MW-C-04 are proposed to attain the following development scenarios.

- The coverage of Level 3, 2, 1 water supply system with safe drinking water supply shall reach 100% by 2025.
- The coverage ratios of the Level 3 Water Supply System in the urban area shall increase 1% per annum by 2015, and their average ratio shall reach 80% by 2025. At the same time, the lowest coverage ratio in the urban area shall not be below

46.5% in 2025.

- The present average coverage ratio of Level 3 Water Supply System in the rural area shall be maintained until 2025, notwithstanding the future increment of population. The target coverage ratio to be maintained in the rural area is 18% in average for the whole study area.

These projects also include the soft components addressing the following countermeasures.

- Utilization of high technology equipment in development of water system
- Carrying out immediate water repairs, provide water meters, and perform periodic maintenance
- Strict implementation/enforcement of laws and penalties on pilferages

(2) Development of Bulk Water Supply for Securing Sustainable Water Source

Surface water source or residual groundwater source at adjacent municipalities is developed and conveyed to WDs as a bulk water supply, in order to secure the sustainable water source.

(a) MW-G-01: Angat Water Utilization and Aquaduct Improvement Project (AWUAIP) Phase 2

This project is considered with the aim of maintaining and optimizing the quantity of raw water delivered from Angat strorage dam via Ipo dam-Bicti-La Mesa conveyance system. The project can mitigate the leakage that occurs on some segments of the existing aquaduct No.5 (AQ-5).

(b) MW-P-01: Rehabilitation of Umiray-Macua Facilities

On November 29, 2004, typhoon "Winnie" has caused severe damages to Umiray-Angat trans-basin tunnel and its facilities resulting to the complete stoppage of operation particularly the conveyance of raw water from Umiray River to Angat storage dam. This damage was recovered by the immediate works. This project is to ensure the flow of raw water from Umiray River to Angat storage dam as this contributes 20-30% of the present water supply to Metro Manila.

(c) MW-P-02: Sumag River Diversion Project

This project is to tap of Sumag River, one of the remaining intakes in Umiray-Angat trans-basin project. It is expected to supply additional 2.2m^3/s in annual average in an average year. The developed source is expected to be utilized for Bulacan Treated Bulk Water Supply Project (MW-P-03).

(d) MW-P-04: Metro Clark Bulk Surface Water Project

Water supply project for development of new frontier area in Clark Special Economic Zone, which would provide 20,793m^3/day (7.6MCM/year or 0.26m^3/s) of municipal water, was proposed in the master plan to develop new area in Clark Special Economic Zone. The proposed project has been upgraded into "Metro Clark Bulk Surface Water Project", as of October 2010, according to CDC. The upgraded project involves the development of sustainable new surface water sources to supply treated bulk water to public and private water providers serving Metro Clark as an alternative/supplement to current groundwater sources and to address current supply gaps and future projected demand.

(e) MW-C-05: Extended Bulacan Bulk Water Supply Project

The Bulacan Treated Water Supply Project (MW-P-03) was proposed, in 2007, through MOA agreed between MWSS and Bulacan Province. This proposed project aims at strengthening the municipal water supply capacity for Bulacan Province. However, the

municipal water demand in 2025 is estimated to rise above the present supply capacity.

Taking the above conditions into account, this conceptual project is proposed to further develop the new bulk municipal water supply system to meet the future population growth in Bulacan Province by 2025. The new system would take the surface water source as its principal source and its supply capacity could make up the potential deficit of 3.8m^3/s for about 1.7 million people in 2025.

(f) MW-C-06: Pampanga Bulk Water Supply Project

This conceptual project is proposed to develop the new bulk municipal water supply system to meet the future population in Pampanga Province. This project aims at promising the full supply level for the demand in 2025. The new system would take the surface water source and/or the groundwater in the vicinities as its principal source and make up the potential deficit of about 2.1m^3/s in 2025. It is assumed that 0.8m^3/s be provided through Metro Clark Bulk Surface Water Project (Code: MW-P-04) and the remaining 1.3m^3/s for 0.6 million people be supplied through Pampanga Bulk Water Supply Project.

D.3.2.4 Projects to Address Unsafe Water Supply

There are four types of projects to address unsafe water supply; and (1) Provision of sanitary facilities, (2) Improvement of water supply facilities, (3) Development of bulk water supply for salt intrusion area, and (4) Strict regulation of groundwater use and monitoring of groundwater extraction.

(1) Provision of Sanitary Facilities

(a) MS-C-01, 02, 03, 04: Additional Sanitation Facilities towards 2025 in Bulacan, Pampanga, Nueva Ecija and Tarlac

The 100% provision of sanitary toilet in the entire service area by year 2025 is recommended to achieve the sector goal of 100% safe water. The MDGs had targeted that about 90% of the household in the Central Luzon should be able to access to the safe drinking water by the year 2015. The 2008 sanitary toilet ratio of each city and municipality in the service area is projected to increase by 10% by the year 2015 and to target the 100% sanitary toilet coverage in the service area by year 2025.

These projects also include the capacity development of implementing agency addressing the following countermeasures.

- Social preparation for users

(2) Improvement of Water Supply Facilities

(a) MW-C-01, 02, 03, 04: Additional Level 3, 2, 1 Facilities towards 2025 in Bulacan, Pampanga, Nueva Ecija and Tarlac

These projects are basically proposed to improve inadequate water supply source. During the implementation of these projects, it is necessary to include the following soft components to address safe water supply.

- Efficient system operation and maintenance
- Quality checked design and well supervised construction
- Strict implementation of well design

(3) Development of Bulk Water Supply for Salt Intrusion Area

In some WDs in Bulacan province, the deterioration of water quality has already exceeded the tolerable level for drinking purpose due to salt-water intrusion. In these WDs, it is necessary to covert groundwater source to either residual groundwater source at adjacent municipality/city or surface water source as soon as possible. The following bulk water supply project and necessary water source development have to be implemented immediately.

(a) MW-P-03: Bulacan Treated Bulk Water Supply Project

This project will address the existing water quality degradation due to salt-water intrusion in Bulacan province. Water supply requirements through its water district with a total volume of 2.7m^3/s of treated surface water will be provided to 1.2 million people in Bulacan.

(4) Strict Regulation of Groundwater Use and Monitoring of Groundwater Extraction

In order to grasps the actual condition of groundwater condition in Pampanga river basin, it is necessary to establish groundwater monitoring system. The monitored data would be utilized for regulation of groundwater use. The following project is proposed as an inter-sector project for water resources management.

- IS-C-01: Establishment of Comprehensive Groundwater Monitoring in Pampanga River Basin

The contents of the project are described in *Sector Report: Water Resources Development and Management*.

D.3.2.5 Projects to Address Increasing Pollution Load in Water Bodies

The increasing pollution load in the water bodies requires the high pollution load contributing cities and municipalities to have a pollution load reduction facilities. The ten cities and municipalities identified in Chapter D.2.5 should have had such facilities considering the water pollution load analysis.

(a) MP-G-01: Cabanatuan Sewerage System

In Cabanatuan City, the sewerage system is designed as combined storm and sewage system with biological STP. The system is designed to serve 33,085 populations by year 2015, about 12% of the projected urban population. Although the sewerage pipelines have been completed, the STP has not yet been completed in the Cabanatuan sewerage system. The STP should be completed as soon as possible.

(b) MP-G-02: Expansion of Clark Sewerage System

The sewerage system in Clark is presently serving 80% of the Clark area, about 16,280 population and the non domestic influent of commercial, industrial, government offices and resorts. The current capacity of the STP is 8,023m^3/day. Clark is working on the design for the upgrade of the present WWTP to serve 100% of the Clark Area. There are two stages to be implemented, the first stage with the capacity of 13,500m^3/day will be implemented by June 2010 and the second stage will be implemented on year2012. The plant is designed at 33,000m^3/day for the stage 2 to accommodate the increasing waste water generation in Clark covering the year 2020 design period.

(c) MP-C-01: Septage Treatment and Disposal Facility

In order to enhance diffusion of the treatment and disposal for septage from the aforesaid sanitary toilets, this conceptual project is proposed on the premises that the sanitary toilets shall be prevailed over about 80% of the households in the urban area in the following ten (10) urban centers by 2025: (a) Angeles, San Fernando, Guagua and Mabalacat in Pampanga Province, (b) Baliuag, Calumpit, Hagonoy and Malolos in Bulacan Province, (c) Cabanatuan in Nueva Ecija Province and (d) Tarlac in Tarlac Province.

D.3.3 Project Component for the Conceptual Projects

D.3.3.1 MW-C-01, 02, 03, 04: Additional Level 3, 2, 1 Facilities towards 2025 in Bulacan, Pampanga, Nueva Ecija and Tarlac

To address the issue on the inadequate water supply, the development of new water supply system for all water service level for both urban and rural areas are proposed to meet the growing water demand requirement in the study area.

There is no national or regional definite target for upgrade of the present water supply service levels. It is not clearly defined even in the Philippine Water Supply Sector Roadmap[4)], which has been just prepared in 2009. Only available policy for water supply service level is the one applied in the previous master plans, which is described as shown in the following table.

Table D. 3.3.1 Policy for Water Supply Service Level in the Previous Master Plans

General	Three levels of water service shall be provided to urban and rural communities depending upon technical and financial considerations, the needs of the WDs and RWSAs, and their willingness and ability to share in the costs and the responsibility of constructing and maintaining the water systems.
Level 1	A protected well or a developed spring with an outlet but without a distribution system, generally adaptable for rural areas where houses are thinly scattered. A level 1 facility normally serves around 15 to 25 households and its outreach must not be more than 250 meters from the farthest user. The yield or discharge is generally 40 to 150 liters per minute.
Level 2	A system composed of a source, a reservoir, a piped distribution network and communal faucets, located at not more than 25meters from the farthest house. The system is designed to deliver about 40-80 liters of water per capita per day to an average of 100 households, with one faucet per 4 to 6 households. Generally, suitable for rural and urban fringe areas where houses are clustered densely to justify a simple piped system.
Level 3	A system with a source, a reservoir, a piped distribution network and household taps. It is generally suited for densely populated urban areas.

Source: Study on Water Supply, Sewerage and Sanitation Sector/Development Plan (1992-2010) for the Province of Bulacan, Nueva Ecija, Pampanga and Tarlac, 1991-1992.

In general, the water providers hardly expand and/or upgrade their water supply service systems in spite of their wishes due to their budgetary constraint. In fact, the target set in the previous master plan, which is almost 100% coverage of level 3 system in urban area, has not yet been achieved at all in many municipalities and cities. Therefore, it would be necessary to set more realistic and achievable target for water supply service level for the year of 2025. Furthermore, the expansion of level 3 systems in rural area would be in general ambitious at least for the year of 2025, except for the case that there is special willingness by WDs as well as rural communities.

The water service level ratio will be projected to address the development plan for the short term (2011-2015), medium term (2016-2020), and long term (2021-2025). Different physical targets on the water service level ratios were considered for the short, medium, and long term development plan in the study area. There were four options considered in the analysis of the water service ratio projection which is shown below:

- Option 1

  The projected water service level ratios for both urban and rural areas will be the same ratio with 2008. There will be no change of water service level ratio up to year 2025.

- Option 2

  The urban water service level 3 coverage is projected using the basin urban past trend service coverage of the project implementation from 1990 to 2008 for each city and municipality. The increase in the level 3 ratio will firstly upgrade the level 2 to level 3 and then the level 1 will eventually be adjusted. The present water service level ratios in the rural area will remain the same up to year 2025.

- Option 3

  Option 3 is the same with option 2 with additional percentage coverage increase starting in year 2020 in urban level 3 system by adding the 50% of the difference between the 2008

average basin level 3 service coverage ratio and the respective city and municipality 2008 level 3 service coverage ratio plus the past trend of basin urban level 3 coverage increase from 1990 to 2008. However, if the city or municipality has more than the average basin level 3 ratio, then only the past trend will apply. The present water service level ratios in the rural area will remain the same up to year 2025.

- Option 4

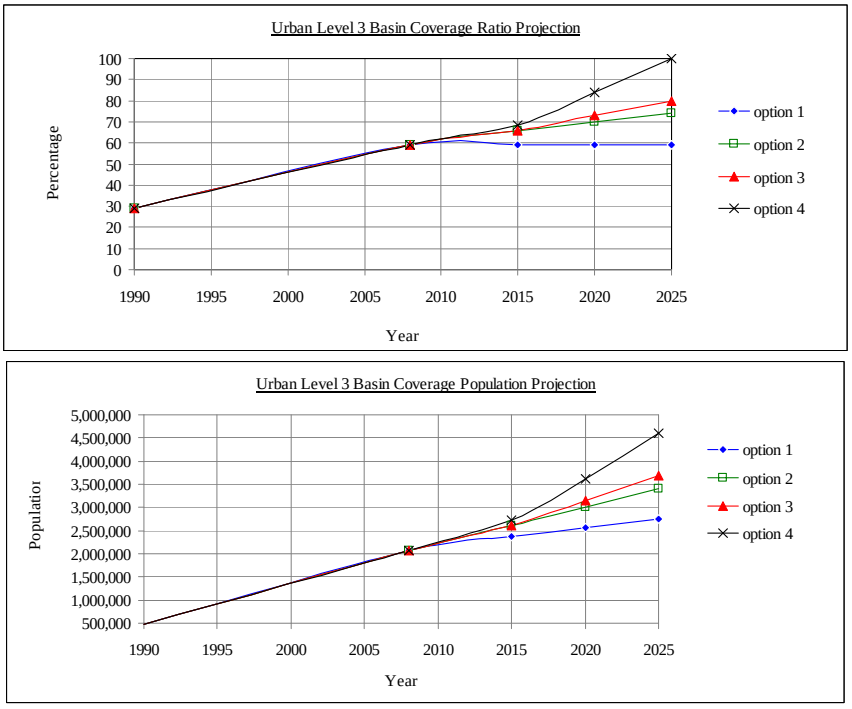
  The urban service level 3 coverage is projected using the 10% increment in the 2008 urban area level 3 service coverage of each city/municipality and progressively to saturate 100% level 3 coverage of all urban areas. Level 2 in the urban area is projected to have the same ratio with 2008 in 2015, and progressively upgrade all level 2 to level 3 by year 2025. Likewise, the level I in the urban areas will eventually be adjusted. All water service levels in the rural areas will have the same ratio in 2008 up to year 2025

The four options were calculated for the level 3 service coverage ratio projection and each option was plotted to see the ideal trend as shown in Tables D.3.3.2, Annex-T D.3.3.1 - D.3.3.4 and Figure D.3.3.1. Looking at the realistic trend, option 3 seems to be attainable and thus it is recommended in this study.

Table D. 3.3.2 Summary of Four Options of Level 3 Service Coverage Projection

Basin Urban Level 3 Projected Service Coverage								
	Projected Percentage Service Coverage				Projected Population Service Coverage			
year	Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4
1990	29%	29%	29%	29%	486,625	486,625	486,625	486,625
2008	59%	59%	59%	59%	2,081,267	2,081,267	2,081,267	2,081,267
2015	59%	66%	66%	68%	2,368,326	2,614,798	2,614,798	2,717,886
2020	59%	70%	73%	84%	2,564,775	3,014,841	3,140,957	3,622,540
2025	59%	74%	80%	100%	2,750,133	3,417,864	3,687,571	4,609,286

Note: Inside the study area only
Source: JICA Study Team



Source: JICA Study Team

Figure D. 3.3.1 Trend of Four Options of Level 3 Service Coverage Projection

The concept of the option 3 can be simply expressed as follows. This concept was presented and was confirmed during the Focus Group Meeting for the sector for Municipal Water Supply, Sanitation and Sewerage in the course of the present study.

- Increasing with the past trend and additional consideration to level up the municipalities with low level 3 ratio

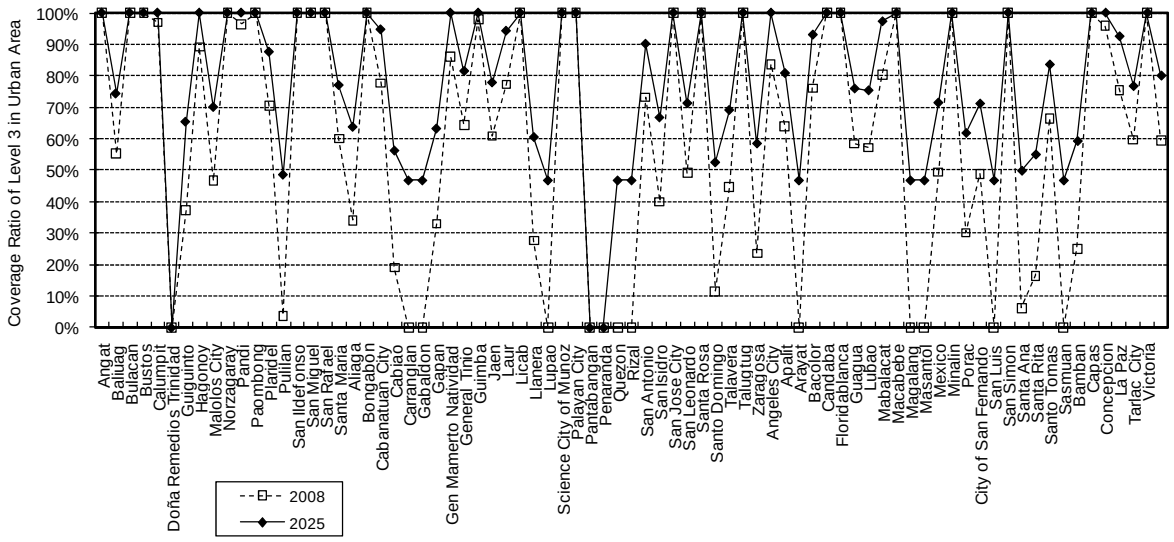
The target with the concept of the option 3 is elaborated as follows.

- Urban area
  - The increase in the level 3 ratio will firstly upgrade the level2 to level 3 and then the level 1 will eventually be adjusted.
  - It is assumed that the level 3 ratio will increase with the basin averaged past trend during 1992-2010, which is 1% increase per year, until 2015 (during short term).
  - For the municipalities and cities whose level 3 ratio at 2008 is more than the basin average, it is further assumed that the level 3 ratio will increase with 1% per year (same as short term), from 2016 to 2025 (mid- to long- term).
  - For the municipalities and cities whose level 3 ratio at 2008 is less than the basin average, it is assumed that the level 3 ratio will increase with 1% per year plus additional increase rate from 2016 to 2025 (mid- to long- term). The additional increase rate is to make the municipalities and cities to level up toward 2025 to achieve equitable water supply as much as possible. The additional increase is given as follows.

    (Additional increase rate (% per year)) = 0.5 x (Basin averaged level 3 ratio in 2008 - Level 3 ratio in 2008 at respective municipality and city)/10years

- Rural area
  - It is assumed that the present water service level ratios in the rural area will remain the same up to year 2025.

Figure D.3.3.2 shows that change of level 3 coverage ratio in urban area by municipality and city (refer to Annex-T D 3.3.5). The equity among municipalities and cities will be improved by increasing the level 3 ratio for the municipalities and cities whose level 3 ratio is currently lower than the basin average.



Source: JICA Study Team

Figure D. 3.3.2 Change of Level 3 Coverage Ratio in Urban Area by Municipality and City

The projects also include the soft components for the following countermeasures.

- For improving inadequate water supply source

- Utilization of high technology equipment in development of water system
- Carrying out immediate water repairs, provide water meters, and perform periodic maintenance
- Strict implementation/enforcement of laws and penalties on pilferages

- For addressing unsafe water supply
  - Efficient system operation and maintenance
  - Quality checked design and well supervised construction
  - Strict implementation of well design

The unit price for each water service level is estimated based from the 1992-2010 development plan of each four provinces of Bulacan, Pampanga, Nueva Ecija, and Tarlac. The 1992 unit price is escalated to the 2009 prices of the wholesale price index for construction materials. The total unit cost includes the soft component cost which is about 3% of the hard component cost for level 3 and 15% of the hard component cost for levels 2 and 1, following the estimates by the Philippine Water Supply Sector Roadmap. Table D.3.3.3 shows the average unit price per capita per water service level. The total cost for development of water supply system is presented in Table D.3.3.4.

Table D. 3.3.3 Unit Cost for Development of Water Supply System

Province	Adjusted 2009 Unit Cost (Pesos/cap)		
	Level 3	Level 2	Level 1
Bulacan	6,280	4,870	2,380
Pampanga	6,280	4,870	2,410
Nueva Ecija	6,280	4,870	1,050
Tarlac	6,280	4,870	1,030

Source: JICA Study Team

Table D. 3.3.4 Additional Population to be Served and Total Cost by Short-, Mid- and Long-Term Development

			Short-term -2015	Mid-term 2016-2020	Long-term 2021-2025	Total
Bulacan	Additional Served Population	Level 3	198,540	176,809	182,537	557,886
		Level 2	0	0	0	0
		Level 1	65,711	37,829	37,454	140,993
		Total	264,251	214,638	219,990	698,879
	Total Cost (mil pesos)		**1,403**	**1,200**	**1,235**	**3,839**
Pampanga	Additional Served Population	Level 3	233,704	229,733	238,061	701,499
		Level 2	1,328	884	817	3,028
		Level 1	99,441	58,480	46,864	204,785
		Total	334,473	289,097	285,742	909,312
	Total Cost (mil pesos)		**1,714**	**1,588**	**1,612**	**4,914**
Nueva Ecija	Additional Served Population	Level 3	133,187	139,089	143,205	415,482
		Level 2	9,719	6,472	5,789	21,979
		Level 1	86,102	49,053	42,980	178,135
		Total	229,008	194,614	191,974	615,596
	Total Cost (mil pesos)		**974**	**957**	**973**	**2,903**
Tarlac	Additional Served Population	Level 3	29,972	23,462	23,802	77,236
		Level 2	0	0	0	0
		Level 1	31,789	20,872	19,080	71,741
		Total	61,762	44,334	42,882	148,977
	Total Cost (mil pesos)		**221**	**169**	**169**	**559**
Total	Additional Served Population	Level 3	595,403	569,093	587,605	1,752,103
		Level 2	11,047	7,356	6,606	25,007
		Level 1	283,043	166,234	146,378	595,654
		Total	889,494	742,683	740,588	2,372,764
	Total Cost (mil pesos)		**4,312**	**3,914**	**3,989**	**12,215**

Note: Inside the study area only
Source: JICA Study Team

The unit O&M cost for level 3 system with groundwater source is roughly estimated at 10pesos/m^3 as shown in the following table. One could understand that salaries and wages are more than 50% of the O&M cost. Annex-T D.3.3.6 shows the further cost breakdown for the O&M cost.

Table D. 3.3.5 Unit O&M Cost for Level 3 System

	Cost	Unit
Basic Condition		
Population Served	10,000	person
Ave. Water Demand	1,500	m^3/day
Power	519,427	pesos/year
Chlorination	219,000	pesos/year
Salaries and Wages	3,003,000	pesos/year
Maintenance	628,000	pesos/year
Miscellaneous	1,051,050	pesos/year
Total Annual O&M Costs	5,420,477	pesos/year
Unit O&M Cost	10.04	pesos/ m^3

Source: JICA Study Team

D.3.3.2 MW-C-05: Extended Bulacan Bulk Water Supply Project

It is expected that the population of Bulacan would reach to 4 million in 2025 with urban population of 3miliion, although half of the population is counted outside the study area. It is roughly estimated that the entire Bulacan could require surface water source with about 6.5m^3/s in total in 2025, by assuming the followings;

- Estimated all deficit for level 2&3 municipal water use and industrial water use inside the study area would be supplied by surface water source.
- All water demand for level 2&3 municipal water use and industrial water use outside the study area require surface water source.
- Industrial water demand outside the study area is proportional to level 2&3 municipal water demand and the proportional coefficient is 12%, which is same as the estimated one for the entire study area.

It is expected that additional 3.8m^3/s (6.5-2.7m^3/s) of surface water source would be necessary to be prepared toward 2025. Considering this situation, in the present study, the conceptual project for Extended Bulacan Bulk Water Supply Project is proposed to emphasize more on preparing necessary surface water source in future.

The project includes the water resources development as well as the water supply system development with transmission pipeline and water treatment plant.

(1) Possible Water Source

The possible surface water sources for Bulacan in future would be almost same for Project for Recovery of Reliability of Water Supply in Angat-Umiray System (Code: IS-C-02) as follows;

- 1) Bayabas storage dam
- 2) Balintingon storage dam and conveyance to AMRIS
- 3) Upgrading and improvement of irrigation facilities and water management of AMRIS
- 4) Excess water for MWSS from Ipo dam

Among these, options 1) and 3) are conditionally recommended for Project for Recovery of Reliability of Water Supply in Angat-Umiray System (Code: IS-C-02) in the present study. Therefore, the remaining options of 2) and 4) would be possible options for the water source for this project.

(2) Project Cost

The estimated project cost assumed the same annualized unit cost for water supply system development used in Bulacan Treated Bulk Water Supply Project (Code: MW-P-03), i.e. 6.8pesos/m^3, and the annualized unit raw water development cost of 8pesos/m^3. The discount rate and project life time are assumed to be 10% and 50yeras, respectively. The roughly estimated initial investment cost is 16,754Mil. Pesos.

It is assumed that the base annual O&M cost is 0.5% of the initial investment cost. The water treatment cost of 0.7pseos/m^3 is also added. The estimated annual O&M cost is 167.7Mil Pesos/year.

(3) Recommendation

Bulk water supplier has not yet been identified. M/P or F/S level study to select the most appropriate water source for bulk water supply would be required. Although the current agreement between two concessioners and MWSS does not include the water supply service in Bulacan province, a revision of MWSS water supply master plan, which considers municipal & industrial water demand of Bulacan, is recommended, in order to optimize the water resources distribution in Metro Manila and Bulacan in future.

D.3.3.3 MW-C-06: Pampanga Bulk Water Supply Project

The present study evaluated that the many cities and municipalities in Pampanga province will be at high risk in terms of sustainable groundwater source, based on the water demand and potential balance of groundwater. In these cities and municipalities, the groundwater source would be necessary to be converted to either residual groundwater source at adjacent municipalities/cities or surface water source by 2025. The deficit of sustainable groundwater source is estimated at 2.1m^3/s. The part of the deficit would be supplied through Metro Clark Bulk Surface Water Project (Code: MW-P-04) covering Metro Clark (Angeles City, Mabalacat, Porac in Pampanga Province, Bamban, Concepcion, Capas in Tarlac Province). However, there exist no other plans for supplying surface water source to WDs in Pampanga at this moment. The conceptual project for Pampanga Bulk Water Supply Project is thereby proposed in the present study.

The project includes the water resources development as well as the water supply system development with transmission pipeline and water treatment plant.

(1) Possible Water Source

The possible surface water sources would be as follows;

- 1) Residual groundwater at surrounding cities/municipalities
- 2) Pampanga river at Cong Dadong dam
- 3) Gumain storage dam.

Among these, options 1) and 2) may require pump facilities to convey the water from the source to WDs. On the other hand, the water in the options 3) could be delivered basically by gravity, which would save the O&M cost for the water conveyance. However, the options 2) and 4) may require adjustment with other water users to share the limited water source.

(2) Project Cost

It is assumed that 0.8m^3/s be provided through Metro Clark Bulk Surface Water Project (Code: MW-P-04) and the remaining 1.3m^3/s be supplied through Pampanga Bulk Water Supply Project.

The estimated project cost assumed the same annualized unit cost for water supply system development used in Bulacan Treated Bulk Water Supply Project (Code: MW-P-03), i.e. 6.8pesos/m^3, and the annualized unit raw water development cost of 8pesos/m^3. The discount rate and project life time are assumed to be 10% and 50yeras, respectively. The roughly estimated initial investment cost is 5,732Mil. Pesos.

It is assumed that the base annual O&M cost is 0.5% of the initial investment cost. The water treatment cost of 0.7pseos/m^3 is also added. The estimated annual O&M cost is 57.4Mil Pesos/year.

(3) Recommendation

Bulk water supplier has not yet been identified. M/P or F/S level study should be conducted for the next step.

D.3.3.4 MS-C-01, 02, 03, 04: Additional Sanitation Facilities towards 2025 in Bulacan, Pampanga, Nueva Ecija and Tarlac

The 100% provision of sanitary toilet in the entire service area by year 2025 is recommended to achieve the sector goal of 100% safe water. The MDGs had targeted that about 90% of the household in the Central Luzon should be able to access to the safe drinking water by the year 2015. The 2008 sanitary toilet ratio of each city and municipality in the service area is projected to increase by 10% by the year 2015 and to target the 100% sanitary toilet coverage in the service area by year 2025.

There are two types of sanitary toilets recommended in the development plan for the households with unsanitary toilets. These are the conventional toilet and the EcoSan toilet[10)]. The conventional toilet is a type that disposes human waste by using water to flush it through a drainpipe to the septic tank. EcoSan toilet is defined as the Urine Diversion Dehydration Toilets (UDDT), an alternative to conventional sanitation. They are based on the holistic approach of Ecological Sanitation (EcoSan) which views human excreta not as waste but as a resource. EcoSan promotes ecologically and economically sustainable sanitation systems that are tailored to the needs of the users and to specific local conditions. The following figure shows the EcoSan toilet in the fishermen's village in San Fernando City in La Union province.

Fishermen's Village EcoSan Toilet

Figure D. 3.3.3 EcoSan toilet in the fishermen's village in San Fernando City in La Union Province

UDD toilets collect and treat feces and urine separately. A special bowl is used, for men a urinal can be added. The urine is stored in a plastic can and – diluted with water - can be applied as fertilizer. It is recommended to store the urine for 1 month to ensure pathogen die-off. The feces can be collected in separate plastic barrels which are placed in the chambers. To enhance the treatment process the feces should be covered with ash or lime. It can also be covered with dry sand or saw dust to prevent bad odor. The vault needs to be well ventilated.

The average storage time of feces is 12 months (depending on amount and climate). Within this time pathogens such as bacteria, viruses, certain helminthes, are eliminated. The treated material can be directly used as a fertilizer and soil conditioner. Another option is to compost the dried feces together with other biodegradable waste and use the compost for agriculture.

The UDD toilet does not need water to flush away excreta. Therefore the demand for clean water is significantly reduced. This recommends the system especially for areas with scarce water resources. Recovered material from human excreta is predominantly used in agriculture; urine as fertilizer and feces as organic matter for soil improvement. This can be done for example in allotment gardens. In this way additional income can be created through the selling either of fertilizer or cultivated vegetables. The following table shows the advantages and disadvantages of the two types of toilets.

Table D. 3.3.6 Advantages and Disadvantages of Two Types of Toilet

Toilet Type	Advantages	Disadvantages
EcoSan Toilet	Does not require a constant source of water	Requires education and acceptance to be used correctly
Conventional Toilet	Does not require acceptance	Requires a constant source of water

Source: JICA Study Team

Considering the social preparation and the acceptance of the people in the area, it is assumed that the two types of toilets can be implemented in the succeeding ratios for the areas with unsanitary toilets. The ratio of the toilet type for new installation for the areas with unsanitary toilets is as shown below.

Table D. 3.3.7 Ratio of Toilet Type for New Installation for Areas with Unsanitary Toilets

Year	EcoSan	Conventional
2015	20%	80%
2020	30%	70%
2025	50%	50%

Source: JICA Study Team

The projects also include the soft component for the capacity development of implementing agency addressing the social preparation for users.

The unit cost of hard component for each type of toilet may not differ for the only difference is the method of feces and urine disposal. All other components are most likely the same such as the bowls which the cost is almost the same with an average conventional bowl. The soft component cost for both types will differ since the training and social preparation of EcoSan is more intensive than conventional. In this study, the EcoSan toilet unit cost is about Php27,025, based on the 2005 price of watsansolid and was adjusted to 2009 price level of wholesale price index for construction materials, while the conventional toile is about Php24,205. The total unit cost includes the soft component cost which is about 3% of the hard component cost for conventional facility and 15% of the hard component cost for EcoSan facility. The following table summarizes the additional number of sanitary toilet to be installed and the total cost by short-, mid- and long-term development.

Table D. 3.3.8 Additional Number of Sanitary Toilet to be Installed and Total Cost by Short-, Mid- and Long-Term Development.

			Short-term -2015	Mid-term 2016-2020	Long-term 2021-2025	Total
Bulacan	Additional Number of Toilet	Conventional	67,438	36,626	35,665	139,729
		EcoSan	5,229	2,269	3,391	10,889
		Total	72,668	38,895	39,056	150,619
	Total Cost (mil pesos)		**1,774**	**948**	**955**	**3,676**
Pampanga	Additional Number of Toilet	Conventional	73,277	44,783	32,823	150,883
		EcoSan	7,216	10,061	22,431	39,708
		Total	80,493	54,844	55,254	190,591
	Total Cost (mil pesos)		**1,969**	**1,356**	**1,401**	**4,725**
Nueva Ecija	Additional Number of Toilet	Conventional	52,696	34,363	24,678	111,737
		EcoSan	4,399	7,593	16,583	28,575
		Total	57,095	41,956	41,261	140,312
	Total Cost (mil pesos)		**1,394**	**1,037**	**1,045**	**3,477**
Tarlac	Additional Number of Toilet	Conventional	13,959	9,515	6,734	30,208
		EcoSan	1,203	2,343	5,205	8,751
		Total	15,162	11,857	11,939	38,958
	Total Cost (mil pesos)		**370**	**294**	**304**	**968**
Total	Additional Number of Toilet	Conventional	207,370	125,286	99,900	432,556
		EcoSan	18,048	22,265	47,610	87,923
		Total	225,418	147,552	147,510	520,480
	Total Cost (mil pesos)		**5,507**	**3,634**	**3,705**	**12,846**

Note: Inside the study area only
Source: JICA Study Team

D.3.3.5 MP-C-01: Septage Treatment and Disposal Facility

The provision of septage treatment and disposal facilities to about 82% of the 2025 urban population of the cities of Angeles, San Fernando, Malolos, Cabanatuan, Tarlac, and the municipalities of Hagonoy, Baliuag, Calumpit, Mabalacat and Guagua have been proposed as a conceptual project.

On the septage treatment and disposal facilities, there is an existing sanitary landfill in Kalangitan, Capas, Tarlac which is being managed by the Clark Waste Management (CWM) and they have the plan to upgrade the facilities to receive treated and untreated septage for the whole Region III as well as the neighboring regions. The sanitary land is designed to cater for 25years projected waste generation of the said service area and the facility is about 100hectares in area. In the present study, it is assumed that this facility will be used for the septage treatment and disposal facilities.

The capital cost as well as O&M cost is considered in the project cost for this project. To estimate the cost, a model city which has 12,000 HH is considered. Necessary number of trucks is firstly estimated by assuming the followings;

- Average of 1.5 m^3 septic tank operational capacity per HH,
- Desludging to target six HH per day per truck and the transport of sludge will be the next day, a total of two days per trip,
- Collection efficiency is 75%, and
- Capacity of truck tanks is 10 m^3.

Table D. 3.3.9 Capital Cost and O&M Cost for 12,000 HH in 5years

			Remarks
1	Capital Cost of truck		
1.1	Base Condition		
	Number of HH	12,000	(a)
	Unit Sludge Volume (m^3)	1.5	(b)
	Volume of Sludge (m^3)	18,000	(c) =(a)x(b)
	Collection of HH per day per truck	6	(d)
	Operational volume of one truck (m^3)	9	(e) = (b)x(d)
	Necessary Number of truck trips	2,000	(f) = (c) / (e)
	Necessary Number of truck trips per year	400	(g) = (f) / 5ys
	Necessary days for 1 trip (days)	2	(h)
	Collection efficiency (%)	75	(i)
	Number of trips for 1 truck per year	137	(j) =365/(h)x(i)/100
	Necessary number of trucks	**2.92**	(k) = (g) / (j)
1.2	Cost of truck		
	Unit Cost (pesos)	**5,000,000**	(l)
Total Capital Cost of Truck (pesos)		**15,000,000**	(m) = (k)x(l)
2	O&M Cost		
2.1	Hauling Cost		
2.1.1	Fuel		
	Fuel rate (km/liter)	7	(n)
	Average distance (km) (back and forth)	98	(o)
	Total fuel/trip (liters)	14	(p) = (o)/(n)
	Unit Cost of fuel (pesos/liter)	44	(q)
	Total cost per trip (pesos)	616	(r) = (p)x(q)
	Total fuel cost (pesos)	**1,232,000**	(s) = (f)x(r)
2.1.2	Manpower		
	1- Diver @ 500/day/truck (pesos)	500	(t)
	3-Labor @ 350/day/truck (pesos)	1,050	(u)
	Total Labor Cost (pesos)	**6,200,000**	(v) = ((t)+(u))x(h)x(f)
2.2	Tipping Fee at Capas Sanitary Landfill (pesos/m^3)	2,500	(w)
	Total Tipping Fee (pesos)	**45,000,000**	(x) = (c)x(w)
2.3	Truck Maintenance (0.5%/year) (pesos)	**375,000**	(y) = (m)x 0.5%
Total O&M Cost for 12,000 HH in 5 years (pesos)		**52,807,000**	(z) = (s)+(v)+(x)+(y)

Source: JICA Study Team

The O&M cost is calculated considering the desludging, transporting and tipping fee. The transport is calculated based on the average distance of the 10 cities and municipalities from Capas, Tarlac. Table D.3.3.9 shows the estimated cost for purchasing the truck and O&M cost for the model city with 12,000 HH. Table D.3.3.10 shows the necessary number and capital cost of trucks for each city and municipality.

Table D. 3.3.10 Necessary Number and Capital Cost of Trucks for Each City and Municipality

	City/ Municipality	Province	Urban Population	Urban HHs w/ Average HH size /1	Ratio of covered by Project /2	Number of HHs covered by Project	Number of trucks required /3	Capital cost (mil pesos) /4
1	Baliuag	Bulacan	204,993	40,911	74%	30,410	8	40
2	Calumpit	Bulacan	146,682	29,274	98%	28,712	7	35
3	Hagonoy	Bulacan	189,004	37,720	97%	36,433	9	45
4	Malolos City	Bulacan	333,821	66,622	70%	46,683	12	60
5	Cabanatuan City	Nueva Ecija	310,962	62,060	89%	55,456	14	70
6	Angeles City	Pampanga	410,197	81,865	84%	69,007	17	85
7	Guagua	Pampanga	136,019	27,146	76%	20,608	6	30
8	Mabalacat	Pampanga	255,038	50,899	92%	47,068	12	60
9	San Fernando City	Pampanga	344,985	68,850	71%	48,983	12	60
10	Tarlac	Tarlac	132,470	26,438	77%	20,272	5	25
Total			2,464,172	491,787		403,632	102	510

/1: Average HH size in the study area : 5.01065 person / HH
/2: Project cover HHs with conventional tolets, without STP system, with Level 3 water supply system
/3: 2.92 trucks / 12,000HHs
/4: 5 million pesos / truck

The total annual cost which includes the annualized capital cost and O&M cost is calculated as shown in Table D.3.3.11. To calculate the annualized capital cost, economic life of truck at 7 years and discount rate at 10% is assumed. Considering that the average desludging period is every five years, it is expected that at least 5,684pesos/HH or about 3,790pesos/m^3 would be charged for a desludging if the cost would be fully recovered.

Table D. 3.3.11 Total Annual Cost for Desludging, Transporting and Tipping Fee of Septage

Septage Volume for 1year (m^3/HH)	Capital Cost for Trucks (pesos)			Annual O & M Cost (pesos)		Total Annual Cost (pesos)		Total Desluding Cost/HH (pesos)
	Cost/HH	Annualized Cost per HH	Annual Cost/m^3	Annual Cost/HH	Annual Cost /m^3	Total Annual Cost/HH	Total Annual Cost/m^3	
0.3	1,250	257	856	880	2,934	1,137	3,790	5,684

D.4 Water Demand Projection

D.4.1 Municipal Water Demand

The municipal water demand to the groundwater in the study area would increase due to population growth, rise in living standard, increment of economic products and other various socio-economic factors. Accordingly the municipal use within the study area is the major concern on the water demand projection and, its demand projection was made based on the present and future population, service ratio, unit water demand and unaccounted water demand. The main assumptions and parameters used are as follows.

- Population

  Population growth projection by NSCB is applied. The projected population is presented in Annex-T D.1.3.1

- Service Ratio and Served Population

  Based on the target set until 2025, which is shown in Chapter D.3.3.1, service ratio and served population for Level 1, 2, 3 water supply system is estimated.

- Unit Water Demand

  The unit water demand is set as shown in the following table. The domestic unit water demand used was based on the average water usage for each level in the basin which are 120 liter/day/person and 100liter/day/person for level 3 in urban and rural areas respectively, and 60liter/day/person and 50liter/day/person for both levels 2 and 1 in urban and rural areas respectively. The present unit water demand was projected to increase by 1% per annum to compensate the economic growth in the community, referring the 1980 LWUA Handbook for Feasibility Studies[11]. In the LWUA handbook, the recommended rate of increase in unit water demand to compensate the economic growth is 2%. Deviation was made on the projected increase in unit water demand from 2% to 1%, considering the assessment of the sector during field investigation and evaluation of socio economic data gathered.

Table D. 4.1.1 Present and Projected Unit Water Demand

(unit: liter/day/person)

	Present as of 2008			Projected in 2015			Projected in 2025		
	Level 3	Level 2	Level 1	Level 3	Level 2	Level 1	Level 3	Level 2	Level 1
Urban	120	60	60	129	64	64	142	71	71
Rural	100	50	50	107	54	54	118	60	60

Source: JICA Study Team

- Unaccounted Water and Others

  The unaccounted water is assumed as shown in the following table. The unaccounted water generated from periodic system flushing, system testing, pipe leaks, unmetered connections, unregistered users and other forms of water loss was accounted in the water demand requirement. The unaccounted water in the basin was not simple to determine because of the few available records from the water service providers. The unaccounted water percentage used in the basin was just based on the available average figure of the few water districts within the basin. The present unaccounted of 30% is projected to decrease to 25% by year 2015 and 20% by year 2025 considering the improved operation and maintenance in the system. This is also based on the 1980 LWUA Handbook for Feasibility Studies[11].

Table D. 4.1.2 Unaccounted Water

	Present as of 2008			Projected in 2015			Projected in 2025		
	Level 3	Level 2	Level 1	Level 3	Level 2	Level 1	Level 3	Level 2	Level 1
Urban & Rural	30 %	30 %	0 %	25 %	25 %	0 %	20 %	20 %	0 %

Source: JICA Study Team

The non-domestic water use such as commercial, light industrial, recreational and other purposes water demand was, further, assumed at 10% of the municipal demand for Level 3 water supply systems. Then, the total is expressed as the municipal water demand in the present study. The non-domestic demand appropriation in the basin was set to 10 % of the domestic demand and the percentage was also patterned from the similar areas of 1998 LWUA Nine Packages Water Supply Feasibility Studies

The estimated municipal water demand is shown in Annex-T D.4.1.1 and summarized as below:

Table D. 4.1.3 Summary of Present and Projected Municipal Water Demand in the Study Area

Province		Present as of 2008	Projected in 2015	Projected in 2025
Bulacan (m^3/day)	Urban	124,909	157,582	219,368
	Rural	42,594	51,905	67,501
Neva Ecija (m^3/day)	Urban	119,317	142,124	190,175
	Rural	59,097	68,605	83,373
Pampanga (m^3/day)	Urban	206,806	248,968	332,190
	Rural	45,004	53,209	65,928
Tarlac (m^3/day)	Urban	29,123	34,588	43,806
	Rural	15,041	18,001	22,500
Total (m^3/day)	Urban	480,155	583,262	719,998
	Rural	161,736	191,720	239,301
Total (m^3/day)		641,891	774,982	1,024,841
Total (m^3/s)		7.429	8.970	11.862
Total (MCM/year)		234	283	374

Note: Inside the study area only
Source: JICA Study Team

D.4.2 Industrial Water Demand

The industrial water demand is preliminary estimated based on the granted water permit as follows.

- The present water demand is assumed to be equal to the currently granted water quantity.
- The future water demand is projected by assuming that the increasing rate of the demand is proportional to the increasing rate of GRDP of industrial sector in Region III. The proportional coefficient is assumed to be 0.132, based on the relationship between the average increasing rate for the total water right for industrial water use in Philippines and that for GDP of industrial sector in Philippines in the last five years, according to the statistical data by NSCB[12)]. It is also observed that the annual increasing rate of the GRDP of industrial sector in Region III in the last five years is 9.0%/year in average, according to the statistical data by NSCB. The increasing rate of industrial water demand is therefore set at 1.2%/year.

The estimated industrial water demand in the study area is summarized in the following table. The water demand by spatially separated units for surface water and groundwater are presented in Annex-T D.4.2.1 and D.4.2.2, respectively. For the water demand with surface water, the water balance catchment shown in Annex-F D.4.1.1 is selected as the unit, considering the surface water movement with current and future possible major abstraction points as well as natural drainage system.

Table D. 4.2.1 Summary of Estimated Industrial Water Demand

Water Sources	Present Water Demand (2008)		Future Water Demand (2025)	
	(m^3/s)	(MCM/year)	(m^3/s)	(MCM/year)
Surface water	0.116	3.7	0.142	4.5
Groundwater	1.149	36.2	1.407	44.4
Total	1.265	39.9	1.549	48.9

Source: JICA Study Team

D.5 Water Tariff and Funding System by LWUA

D.5.1 Water Tariff System

D.5.1.1 Water Tariff for Municipal Water Supply Services

There are a variety of the public and private WSPs for the municipal water services as enumerated below:

- Water Districts,
- Local Government Units,
- Rural Water Supply Associations,
- Barangay Water Service Association,
- Subdivision,
- Cooperatives, and
- Private Water Service Providers

Of the above WSPs, the Water Districts currently set their water tariff based on the guideline by means of "**Full-Cost Pricing Method**" prepared by Local Water Utilities Administration (LWUA).

The "Full-Cost Pricing Method" for water is a pricing method to be covered for all the costs consisting of **variable cost** including production cost, delivery and distribution costs and costs for operating and maintenance, and **fixed cost** as initial investment. Accordingly, current prices of water distributed to end users by WDs under the control of LWUA should be included the whole costs needed.

LWUA lists up the following reasons for applying the said method as (1) it is a fairest manner for water pricing, and it makes people to recognize that the water has a cost for distributing to the end users, (2) by recognition that the water has a cost, people will have awareness to save the water, so that Full-Cost Pricing Method will contribute a countermeasure to save natural resources limited. And, (3) all the costs will be recovered by this method, and all the costs for ordinary and/or temporary (emergently) operating and maintenance of water distribution facilities as well as replacement cost of the facilities.

The Water Districts under the jurisdiction of LWUA are the majority of WSPs in the study area, and their water tariff is as listed below (refer to Annex-T D.5.1.1). The LWUA undertakes the Governmental financing to the Water Districts by loan, and the Water Districts is obligated to pay back the loan with some interests with using the source of their water tariff collected from the end users.

Table D. 5.1.1 Water Tariff for Municipal Water Service for Water Districts under Jurisdiction of LWUA

Province	Number of Samples	Service Conn'n Fee (pesos)	Basic Water Charge* (pesos)	Specific Charge (pesos/m^3)				
				11~ 20m^3	21~ 30m^3	31~ 40m^3	41~ 50m^3	>51m^3
I. Tariff in and around Study Area								
Bulacan	22	10,090	173	19	21	24	26	29
N. Ecija	18	3,207	192	20	22	23	25	27
Pampanga	12	9,526	148	16	18	19	21	23
Tarlac	2	11,208	174	19	21	23	25	27
Total	54	7,729	174	19	20	22	25	27
II The National Average Tariff as of 2008								
	-	-	167	19	21	23	25	26

Note: *: The minimum rate for the water use of less than 10m^3.
- : Data are not available

Source: "Philippine Water Districts Directory", LWUA

LWUA has reported semi-annual average unit price of water distributed as shown in Table D.5.1.2 (refer to Annex-T D.5.1.2). Each WD has been approved by LWUA to decide their own prices to the end users with their margins of 10% at maximum in addition to each unit cost. Therefore, the portion of these margins has already been included in the price.

Table D. 5.1.2 Average Unit Water Tariff for Municipal Water Supply in Last 10 Years

(Unit: Pesos/m^3)

Province		Number of Sample	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Bulacan	Others	20	12.2	11.7	12.5	13.2	13.4	14.1	15.2	15.9	16.8	16.8
	Meycauayan and Obando	2	n/a	n/a	24.7	24.7	24.7	36.9	42.2	42.2	42.2	42.2
Nueva Ecija		19	13.9	13.9	13.9	15.5	16.4	17.4	18.2	19.4	20.2	20.3
Pampanga		13	11.2	11.2	12.0	12.0	12.4	13.4	15.6	16.2	16.2	16.7
Tarlac		9	16.3	14.2	13.5	14.5	15.1	16.1	18.0	18.3	18.8	20.7

Remarks: 1) Unit water tariff in the table is for first half of the year.
2) Treated bulk water is provided by MWSI to Meycauayan and Obando WDs.
Source: LWUA Official Web Site Home Page.

Others except LGUs and MWSS are under jurisdiction of NWRB and apply the water tariff system prepared by NWRB. LGUs have their own tariff setting guidelines for water supply service called "Voluntary Regulation", while MWSS as one of cooperatives undertakes the municipal water supply services for the whole of Metro Manila setting its own water tariff based on its particular regulation.

There currently exist 38 private WSPs, which are under jurisdiction of NWRB, in and around the study area. Each of these WSPs is given a certification called "Certificate of Public Convenience" (CPC) by NWRB as authorized qualification for making their businesses of water supply services. The WSPs supply water to several different areas, and their water tariff is to be lower than those of the above Water Districts as listed below (refer to Annex-T D.5.1.3).

Table D. 5.1.3 Water Tariff for Municipal Water Service for Private WSPs under Jurisdiction of NWRB

Province	Number of Samples	Service Conn'n Fee (pesos)	Basic Water Charge (pesos)	Specific Charge (pesos/m^3)				
				11~ 20m^3	21~ 30m^3	31~ 40m^3	41~ 50m^3	>51m^3
N. Ecija	4	1,279	183	12	18	19	20	21
Pampanga	7	10,041	120	15	13	14	14	15
Tarlac	1	-	85	-	11	12	13	14
Total	12	5,660	144	13	15	16	16	17

Note: *: The minimum rate for the water use of less than 10m^3.
- : Data are not available
Source: "Annual Report of WSPs submitted to NWRB

D.5.1.2 Collection Ratio of Water Tariff

Table D.5.1.4 shows a summary of collection efficiency of WDs. WDs have been submitting monthly reports on their operations including results of tests for water quality, groundwater level of wells, volume of pumping-up water, status of pump operation, charge collection and financial status in every month. The charge collection has been reported the following 3 kinds as;

- Rate of On-Time Paid

  Not included because of no delay of payment.

- Actual Collection Rate

  In a case of delayed payment, WDs issue a bill for penalty to their customers. Accordingly, this collection rate is the rate of collection against the total amount of bills for water consumed

itself and the penalty. They call it as "Collection Efficiency", so that this is the real collection rate in the year in the year.

- Total Collection Rate

This is a rate of collection against grand total of the amount of bills for water consumed and penalty in the year and the remaining cumulative amount until the end of previous year (= account receivables). They call it as "Collection Ratio", and it may be said as the total collection rate because that it includes the entire remained amount billed of water consumed and penalty.

Table D. 5.1.4 Summary of Charge Collection Efficiencies WDs on Domestic/ Commercial/Industrial Water

Province/ WD	Duration: From the Beginning of the Year to:	Ratio of On-Time Paid	Collection Efficiency	Collection Ratio	Remarks
Bulacan					
Plaridel	The End of Dec. 2007	60.30%	97.27%	95.44%	
	The End of Aug. 2008	60.99%	95.46%	92.76%	
San Rafael	The End of Sep. 2007	47.41%	93.80%	91.00%	
	The End of Oct. 2007	47.34%	94.83%	93.00%	
	The End of Nov. 2007	47.40%	94.94%	93.00%	
	The End of Dec. 2007	47.22%	95.56%	94.00%	
	The End of Jan. 2008	50.54%	65.62%	61.00%	
	The End of Feb. 2008	47.30%	85.96%	78.00%	Lack of data on Account Receivables at the beginning of the year. So that, the **Collection Ratio** may not be trusted.
	The End of Mar. 2008	47.15%	89.32%	83.00%	
	The End of Apr. 2008	46.85%	91.12%	86.00%	
	The End of May 2008	47.08%	92.46%	89.00%	
	The End of June 2008	46.27%	92.70%	89.00%	
	The End of July 2008	49.63%	94.06%	91.00%	
	The End of Aug. 2008	51.76%	93.89%	91.00%	
Pampanga					
Candaba	The End of Jan. 2008	71.46%	112.46%	70.72%	
	The End of Feb. 2008	68.03%	98.58%	82.19%	
	The End of Mar. 2008	66.68%	98.44%	87.32%	
	The End of Apr. 2008	65.52%	99.15%	91.14%	
	The End of May 2008	64.96%	92.46%	95.44%	
	The End of June 2008	63.30%	98.75%	93.61%	
	The End of July 2008	62.40%	97.43%	93.26%	
Nueva Ecija					
Palayan	The End of July 2008	78.45%	96.30%	87.87%	
Tarlac					
Mayantoc	The End of Dec. 2007	53.29%	88.89%	95.62%	
Paniqui	The End of Aug. 2007	56.15%	65.01%	100.18%	
	The End of Sep. 2007	56.10%	100.40%	100.40%	
	The End of Oct. 2007	55.70%	100.43%	100.43%	
	The End of Nov. 2007	55.43%	100.43%	100.43%	
	The End of Dec. 2007	55.45%	99.99%	99.99%	
	The End of Jan. 2008	59.98%	107.71%	107.71%	Lack of data on Account Receivables at the beginning of the year. So that, the **Collection Ratio** may not be trusted.
	The End of Feb. 2008	57.53%	101.37%	101.37%	
	The End of Mar. 2008	57.89%	99.96%	99.96%	
	The End of Apr. 2008	58.15%	100.94%	100.94%	
	The End of May 2008	58.05%	100.25%	100.25%	
	The End of June, 2008	57.95%	99.52%	99.52%	
	The End of July, 2008	58.05%	99.68%	99.68%	
Santa Ignacia	The End of July, 2008	51.56%	86.58%	84.28%	

Source: LWUA through NWRB.

The collection ratios by the WSPs for municipal/industrial water supply service under jurisdiction of NWRB are in a range of 50 to 90%, and several WSPs could achieve the highest ratio of 90% as listed in Table D.5.1.5.

According to information from NWRB, the "Collection Efficiency" in CPC-WSPs is the collection rate on "On-Time Payment". So that, the Collection Efficiency in Table D.5.1.5 is to be read as the "Ratio of On-Time Paid" as indicated in Table D.5.1.4.

The customers for the municipal water supply services are required to pay their water charges at the beginning of the month for their consumption in the last month, and disconnection of the water supply service is executed to the customers, whose payments are delayed more than two months. This penalty is likely to boost the collection ratio of the water tariff.

Table D. 5.1.5 Annual Collection Ratio of the Water Tariff for Municipal Water Supply Service

As of December 2007

Province	CPS WSP	City/Municipality	Collection Efficiencies
Bulacan	San Gabriel	Santa Maria	60%
	Brgy 1, Bulihan	Malolos	-
	Brgy Tabe	Guiguinto	90%
	Zigzag Hills, Malhacan	Meycauayan	-
	-	Marilao	61%
Pampanga	Balibago	Angeles City	90%
	-	Mexico	70%
	Santo Domingo	Angeles City	90%
	Clarkview/Plaridel	Angeles City	90%
	Woofland Drive Camenville	Angeles City	-
	Timog Park	Angeles City	52%
	Santa Lucia Resettlement	Magalang	50%
Tarlac	Teresa Homes, Brgy Tibag	Tarlac City	65%

Note: - Lack of data.
Source: NWRB

D.5.2 Funding System by LWUA

D.5.2.1 LWUA and Water Districts (WDs)

LWUA is established based on PD198 issued on September 21, 1972 and Local Water Utilities Administration Law issued on Sep. 20, 1973 as amendment of the said PD as a financial supporting institution (lending institution) for Water Districts (WDs) together with giving technical and engineering guidance to WDs to be needed for WDs' water supply services. In this connection, the said law above also includes "Local Water District Law" stipulating purposes and rolls of WDs.

In organization, WDs are substructure of LWUA. Figure D.5.2.1 shows an existing organization chart of LWUA. The organization of LWUA is that authorized by EO286 issued on Dec. 6, 1995. WDs are directly managed and controlled under "Area Manager" shown in the figure. The whole Philippines are divided into 9 areas, so the said Area Managers are consisting of 9 managers. The target area is managed and controlled by the Central Luzon Area Manager.
LWUA itself is an organization under DOH since July 14, 2008, the day of EO738 issued. The national budget is not allotted, however. As it were, LWUA is an independent administrative institution. Main income sources are proceeds from interests collected for loans to WDs granted by LWUA, and some other engineering fees for their guidance services given to WDs.

WDs are also positioning as Governmental or national management institutions for performing water supply services as sub-structures of LWUA even they are commercial organization making profits by themselves. Because of financially independent commercial organization even positioning as Governmental or national management institutions, WDs also are not allotted any national budget for their activities. They set up base cost of water to distribute discussing with and guided by LWUA, and they can get margins by means of adding up to 10% on such base cost. This is a main source of their profit collecting from the end users of water as well as penalties. The amounts of penalties are also decided as 10 % of water tariff by a regulation of LWUA. There are some other sources of income as install fees of water meter, but those are negligible small to their whole amount of income.

According to LWUA, WDs are classified into 6 categories as "Small", "Average", "Medium", "Big", "Large", and "Very Large", depending upon (1) Net Income before Depreciation and Interest (Equivalent Point Rating: 20%), (2) Nature of Operation (10%), (3) Number of Service Connection

(10%), (4) Number of Employees (5%), (5) Gross Receipts (Income) (30%), and (6) Total Fixed Assets (25%). "Big" or higher WDs are considered as "WDs being able to financial stand alone". LWUA considers that no any loans should be needed for those WDs in general.

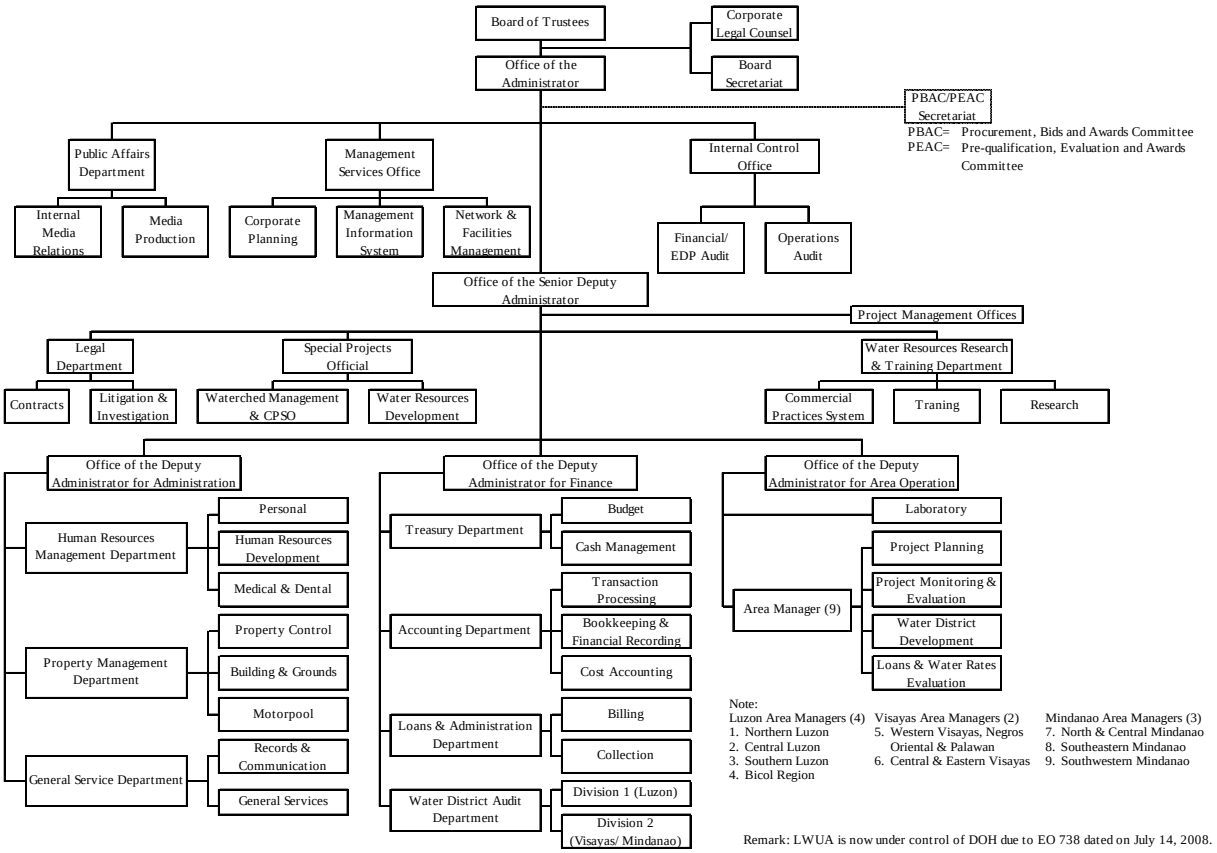


Figure D. 5.2.1 Organization of Local Water Utilities Administration (LWUA)

LWUA also has power to establish new WDs. In this case, LWUA makes financial scale and staffing considering the socio-economic conditions of planned districts to be covered, and makes detail business plans as a financial plan consisting of balance sheet, statement of profit and loss, and statement of cash flow (so called as "principal 3 financial statements") for the new WDs discussing with newly assigned staffs for at least 8 years for the future, and based on these documents, and water tariff system based on the said financial plan as well as affordability of people to pay and so forth. Because WDs are newly established, amount of fund needed financed by LWUA and its repayment schedule are also included. Of course, the amount of initial investment is to be considered for developing the water tariff system. Furthermore, LWUA gives various technical consulting services as technical support so that newly established WDs are to be able to stand alone as independent WSPs.

LWUA can lend funds to WDs 50% to 100% of the project cost for new development and expansion or improvement for Level 2 and 3 water supply systems. The loan terms of the loan portion are shown in Table D.5.2.1. The said loan terms have been newly effective since 2009, so those are still effective at present. Comparing with old ones, people's burden has greatly been reduced.

Table D. 5.2.1 Loan Terms of LWUA for New Development and Expansion or Improvement for Level 2 and 3 Water Supply Systems

Old Loan Terms (before 2009)	New Loan Terms (since March 10, 2009)
✓ 8.5% per annum of interest for first 2.0M	✓ 9.2% per annum of interest within 10 years of repayment period
✓ 10.5% per annum of interest for next 5.0M	
✓ 12.5% per annum of interest for next 13.0M	✓ 9.5%, from 11 to 20 years
✓ 14.0% per annum of interest for next 30.0M	✓ 9.8%, from 21 to 30 years
✓ 15.0% per annum of interest for next 50.0M	✓ 10.2% from 31 to 40 years

Source: LWUA

D.5.2.2 Funding Source

LWUA, lending funds to WDs as a main business, had been as an organization under direct Governmental control of the Office of the President. After several changes, it has become an institution under manages and controls of DOH as mentioned above since 2008. Accordingly, LWUA submits the budget to DOH with an amount of 1.5 billion pesos every year, and they get the national budgetary allocation through DOH. This budgetary allocation should not be utilized as a cost for administration of LWUA itself according to the Law. Furthermore, the execution of "NLIF (= Non LWUA Initiated Fund)" should be conducted by LWUA. According to a resolution of the Board of Trustees of LWUA issued on February 17, 2009, sources of this Fund consists of specified budget allocation for the water supply services from (1) DOH, (2) DPWH, (3) Office of President, (4) Congress, and (5) LGUs and other national institutions. In 2008, 2.0 billion pesos from DOH and DPWH to fund for the development of water supply system of 101 non-operational WDs and 130 waterless communities has been secured[13)].

LWUA can request financial support to international financing institutions through the National Government, and can be a received institution of loan guaranteed by the national Government, but limited by the amount of 500 million US$ of loan amount as a handling amount of LWUA. However, procedures needed for taking loans from the international financing institutions should be conducted by the President or duly authorized person assigned by the President as the Department of Finance (DOF).

Accordingly, in case that some necessity for executing a large scale project that cannot be financed by LWUA's own fund allotted by DOH, LWUA will request to take loans through DOH (namely, the national Government) to the international financing institutions. In this case, LWUA will become direct received institution as a party to treaty of the loan. The agreed amount of loan will be transferred to the account of LWUA in the National Bank of the Philippines directly. Disbursement of it can be decided by LWUA. Of course, to take such loans, it is needed to make a feasibility study in advance, and should be passed necessary criteria as FIRR or EIRR for execution of the project. Such criteria should be based on the guideline of NEDA. After such loan has been committed by both the parties (donor institution/country and the National Government of the Philippines), LWUA will make re-loan to WD(s) according to the LWUA's own loan terms as mentioned above. Contractors for the projects claim their contract amount due on the basis of piece-work system. Marginal profit from the interest is not the national revenue, but is income for LWUA due to the Law. That is a typical case of "2-Step Loan". Depending upon cases, the fund stream may be slightly different, but the fund reaches to WDs by the said manner in almost all the cases. WDs and LWUA are always contacting during the execution of the works on progress and fund's delivery and transfer. In certain cases, LWUA conduct a management of execution of the works directly, even in such a case, final borrower(s) is/are to be WD(s).

Publicized information of LWUA is saying that funds are secured by LWUA from the said National Government equity subscriptions, and from domestic agencies as well as following international financing institutions as:

- World Bank (WB)
- Danish International Development Agency (DANIDA, Denmark)
- Japan International Cooperation Agency (JICA, Japan)

- Asian Development Bank (ADB)
- Japan Bank for International Cooperation (JBIC, re-OECF, Japan)
- Australian Agency for International Development (AUSAID, Australia)
- French Protocol (France)
- KFW or Kreditanstalt fur Wiederaufbau (Germany)

D.6 Financing and Investment for Conceptual and Related Proposed Projects on Municipal Water Supply, Sanitation and Sewerage

D.6.1 General

Almost all of the projects in the sector for municipal water supply, sanitation and sewerage except for the projects for sewerage are categorized in Group-A project in the proposed IWRM plan, which are for basic human needs and are indispensible to secure the life of the people. The projects categorized as Group-A should be implemented according to those needs depending on population growth in the study area.

In the proposed IWRM plan, a lot of conceptual projects are proposed to be included, so that the sector goal for municipal water supply, sanitation and sewerage can be achieved. The project cost for the conceptual project has been preliminary estimated in order for the project proponents to secure necessary future budget for implementing the projects. The cost recovery for the project implementation is a basic strategy for the sustainability of the projects in the sector. In the present chapter, the financing and investment for implementation of the conceptual projects including the related proposed projects is preliminary discussed with considering the cost recovery.

D.6.2 Project Cost and Cost Recovery

D.6.2.1 Basic Strategy on Cost Recovery for Conceptual and Related Proposed Projects on Municipal Water Supply, Sanitation and Sewerage

The basic concept for cost recovery is different for the type of project. The basic strategy applied in the preset study as well as the expected project implementing body is summarized in Table D.6.2.1.

Table D. 6.2.1 Basic Strategy on Cost Recovery

Project Type	Project Code	Expected Project Implementing Body	Cost Recovery
Level2,3 water supply system development	MW-C-01 MW-C-02 MW-C-03 MW-C-04	LWUA,WDs, Private WSPs	Full recovery
Level1 water supply system development	MW-C-01 MW-C-02 MW-C-03 MW-C-04	LGUs	No recovery
Bulk water supply	MW-P-03 MW-P-04 MW-C-05 MW-C-06	MWSS/LGU CDC LGU/(Bulk Water Supplier) LGU/(Bulk Water Supplier)	Full recovery
Septage treatment and disposal	MP-C-01	LWUA, WDs, Private WSPs	Full recovery
Installation of sanitary toilet (only for soft component)	MS-C-01 MS-C-02 MS-C-03 MS-C-04	LGUs	No recovery

Source: JICA Study Team

According to LWUA guideline, the water tariff in the service area by WDs is determined based on the "Full-Cost Pricing Method", which considers full cost recovery for initial investment and O&M cost for the project for municipal water supply. In the present study, the full cost recovery for Level 2, 3 system developments is assumed as a basic strategy. Similarly, the cost for bulk water supply project is also assumed to be fully recovered by means of increase of water tariff.

On the other hand, the current practice for Level 1 water supply project does not collect water tariff from water uses, which means no cost recovery. In the present study, it is assumed that the cost for Level 1 water supply project is not recovered. The cost should be burdened by annual budget of LGUs.

The project for proper septage treatment and disposal is proposed for covering the urban Level 3 water supply service area in the selected 10 cities/municipalities, which produces higher pollution load.

Based on the proposed business model for septage treatment and disposal by USAID[14)], the cost for septage treatment and disposal should be also fully recovered as much as possible. In the present study, it is assumed that the cost for septage treatment and disposal be fully recovered by surcharge on water tariff.

The sanitary toilets should be installed basically by each family as a personal property. The project cost should thereby be shouldered by each family. For the area where there is no sanitary toilet at present, it is recommended that Ecosan toilet, which is rather new technology and may require intensive soft component for its social preparation, be expanded gradually toward 2025. The cost for the soft component is included in the project cost. However, the cost for the soft component should be burdened by annual budget of LGUs.

D.6.2.2 Annualized Cost for Conceptual and Related Proposed Projects on Municipal Water Supply, Sanitation and Sewerage

In order to discuss financial affordability of the projects, the preliminary estimated project cost has been converted to the annualized cost which includes initial investment cost, replacement cost and O&M cost. The assumed parameters to calculate the annualized cost are shown in Table D.6.2.2.

Table D. 6.2.2 Assumed Parameters to Calculate Annualized Cost

Project Type	Project Life Time (year)	Replacement Time Interval for Wells or Facilities (year)	Replacement Cost (% of initial investment)	Discount rate (%)
Level 2,3 water supply system development	50	25	15	10
Level 1 water supply system development	25	25	-	10
Bulk water supply	50	25	15	10
Septage treatment and disposal	7	7	-	10
Installation of sanitary toilet	25	25	-	10

Source: JICA Study Team

The annualized cost for the projects is presented in Table D.6.2.3.

Table D. 6.2.3 Annualized Cost

Project Type	Project Code	Initial Investment Cost (Mil. Pesos)	Annual Volume for Consumption (Mil. m^3/year)	Annualized Capital Cost (Mil. Pesos/year)	Annual O&M Cost (Mil. Pesos/year)	Total Annual Cost (Mil. Pesos/ year)	Unit Total Cost (Pesos/m^3)
Level 2,3 water supply system development	MW-C-01	3,509	32.3	358.2	322.5	680.7	21.1
	MW-C-02	4,420	41.4	452.0	414.2	866.2	20.9
	MW-C-03	2,716	24.8	277.7	248.3	526.1	21.2
	MW-C-04	485	4.6	49.6	45.8	95.4	20.8
Level 1 water supply system development	MW-C-01	336	4.3	37.0	1.7	38.6	9.0
	MW-C-02	494	6.4	54.4	2.5	56.8	8.9
	MW-C-03	187	5.5	20.6	0.9	21.5	3.9
	MW-C-04	74	2.2	8.1	0.4	8.5	3.9
Bulk water supply	MW-P-03	11,935	70.9	1,220.4	119.3	1,339.7	18.9
	MW-P-04	3,527	21.0	360.7	35.3	396.0	18.9
	MW-C-05	16,754	99.8	1,713.2	167.7	1,880.9	18.9
	MW-C-06	5,732	34.2	586.1	57.4	643.5	18.9
Septage treatment and disposal	MP-C-01	510	(110.5)*1	104.8	355.0	459.8	(4.2)*2
Installation of sanitary toilet*3	MS-C-01	137	(N/A)	15.1	0.7	15.8	(N/A)
	MS-C-02	246	(N/A)	27.1	1.2	28.3	(N/A)
	MS-C-03	180	(N/A)	19.8	0.9	20.7	(N/A)
	MS-C-04	52	(N/A)	5.7	0.3	6.0	(N/A)

*1: Equivalent water volume consumed by Level 3 water supply system in urban area of the target municipalities/cities
*2: Calculated based upon the equivalent water volume consumed by Level 3 water supply system
*3: The cost is only for the soft components.
Source: JICA Study Team

It is assumed that the cost for bulk water supply be allocated to relevant municipalities/cities according to necessary volume of bulk water to each municipality/city. It is also assumed that the cost for bulk

water supply and septage treatment and disposal be shared equally by all water users for Level 3 system in respective municipality/city. Table D.6.2.4 summarizes the estimated unit cost for water supply with bulk water supply and septage treatment and disposal. Annex-T D.6.2.1 shows the allocated cost for each municipality/city.

The unit cost for Level 2, 3 water supply system development is estimated at about 21 pesos/m^3. The additional cost of about 19 pesos/m^3 at maximum for bulk water supply and about 4 pesos/m^3 for septage treatment and disposal would be required.

Table D. 6.2.4 Unit Cost for Water Supply with Bulk Water Supply and Septage Treatment and Disposal

Province	City / Municipality	Unit Cost for Level 2, 3 Systems (Pesos/m^3)	Unit Cost for Bulk Water (Pesos/m^3)	Unit Cost for Septage (Pesos/m^3)	Unit Cost for Level 2, 3 Systems + Bulk Water Supply (Pesos/m^3)	Unit Cost for Level 2, 3 Systems + Bulk Water Supply + Septage (Pesos/m^3)	Increasing Ratio with Cost for Septage (%)
		(a)	(b)	(c)	(d) = (a)+(b)	(e) = (d)+(c)	(f) = (e-d)/(d)
Bulacan	Baliuag	21.1	6.9	4.2	28.0	32.2	15%
	Bulacan		18.9		40.0	40.0	
	Calumpit		17.8	4.1	38.9	43.0	11%
	Guiguinto		18.9		40.0	40.0	
	Hagonoy		18.8	4.2	39.9	44.1	10%
	Malolos City		17.2	4.2	38.3	42.5	11%
	Santa Maria		1.9		23.0	23.0	
Pampanga	Angeles City	20.9	10.3	4.1	31.2	35.3	13%
	Apalit		2.9		23.8	23.8	
	Guagua			4.2	20.9	25.1	20%
	Mabalacat		6.2	4.3	27.1	31.4	16%
	Macabebe		18.8		39.8	39.8	
	Masantol		18.8		39.8	39.8	
	City of San Fernando		14.0	4.1	34.9	39.0	12%
	Santo Tomas		6.5		27.4	27.4	
	Sasmuan		12.6		33.5	33.5	
Nueva Ecija	Cabanatuan City	21.2		4.1	21.2	25.3	20%
Tarlac	Tarlac City	20.8		4.2	20.8	25.0	20%
	Bamban		18.8		39.7	39.7	

Source: JICA Study Team

D.6.3 Discussion on Financing and Investment

D.6.3.1 Level 2, 3 Water Supply System Development without Bulk Water Supply

As shown in the previous section, the unit cost for Level 2, 3 water supply system development is estimated at about 21 pesos/m^3. When the margin of 10% is added, the unit water price would be about 23 pesos/m^3 in average. This is the almost same order or slightly higher than the present water tariff set by WDs in the study area, which is 16 to 21 Pesos/m^3 in case that there is no bulk water supply (refer to Table D.5.1.2 and Annex-T D.5.1.2). The setting of water tariff would be conducted by each WD with considering the actual local situation such as income level of residents and/or willingness to pay for municipal water supply. In order to recover the cost fully, it may be necessary to improve the WDs distinctive tariff systems by income class (namely, by consumed volume of water), and/or by categories of users as domestic users, commercial users, and industrial users. However, it can be at least expected that the water tariff when new Level 2, 3 water supply systems are developed would not jump up from the present water tariff.

The loan terms by LWUA for new development and expansion or improvement for Level 2, 3 water supply systems have been newly effective since 2009, in which people's burden has greatly been

reduced, as have shown in Section D.5.3. This change would be able to accelerate further expansion of Level 2, 3 systems, especially for the municipalities/cities which have recorded relatively low coverage ratio of Level 2, 3 systems. In fact, a total of 106 WDs were granted special loan facilities at reduced discount rates (7.5% - 9%) to make loans affordable and or to fast track project implementation in small WS areas in 2008[13)]. This increases the granted new loan from 0.539 billion pesos in 2007 to 1.418 billion pesos in 2008[13)].

In the present study, it is estimated that Level 2, 3 water supply system developments for the study area requires about 11.1 billion pesos for the initial investment cost in total of 15 years, i.e. about 0.74 billion pesos/year. The WDs categorized into "Big" or higher are considered as "WDs being able to financial stand alone". LWUA considers that no any loans should be needed for those WDs in general. If one assumes that those WDs can expand the Level 2, 3 water supply system in their service area without the loan by LWUA, the necessary loan amount for the initial investment cost for the study area would be estimated at about 6.1 billion pesos in 15 years, i.e. about 0.41 billion pesos/year (refer to Annex-T D.6.3.1).

According to the statement of cash flow of LWUA for 2007 and 2008[13)], the disbursement for projects is about 0.6 billion pesos/year, whereas the cash and cash equivalent at the end of year ranges 0.7 to 1.7 billion pesos. This means that total of about 1.3 to 2.3 billion pesos/year could be disbursed for projects in nationwide.

From 1973 to 2008, total loan granted by LWUA to WDs was 25 billion pesos[13)]. Considering the price escalation during 1973 to 2008, the total loan granted at current price level is estimated at about 100 billion pesos, assuming that the price escalation is represented by Wholesale Price Index (WPI) for Construction Material and the disbursement is constant. The estimated past loan granted per year at current price level is thereby about 2.8 billion pesos/year, which is slightly higher than the possible disbursement for the projects during 2007- 2008.

Recently, LWUA is strengthening its financial resources. After several changes, LWUA has become an institution under manages and controls of DOH since 2008. Accordingly, LWUA submits the budget to DOH with an amount of 1.5 billion pesos every year, and they get the national budgetary allocation through DOH. In addition to it, sources of NLIF (= Non LWUA Initiated Fund) that consists of specified budget allocation for the water supply services from (1) DOH, (2) DPWH, (3) Office of President, (4) Congress, and (5) LGUs and other national institutions, is also available. According to LWUA, in 2008, 2.0 billion pesos from DOH and DPWH to fund for the development of water supply system has been secured[13)].

When the total fund for projects in nationwide is 4.8 billion pesos/year (the estimated past loan granted per year plus the newly secured fund), the share of the required loan amount for the initial investment cost for Level 2, 3 water supply system developments for the study area becomes about 8.5%. This could be reasonably acceptable range, considering the population ratio between the population in the study area (about 6 million) and that for national total minus NCR (about 76 million), i.e. about 8%.

To secure the necessary fund for Level 2, 3 water supply system developments for the study area, it is recommended to increase the fund from NLIF (= Non LWUA Initiated Fund) further.

D.6.3.2 Level 2, 3 Water Supply System Development with Bulk Water Supply

The bulk water supply system would be developed and operated by the bulk water supplier such as MWSS or private companies. The bulk water supplier has to fully recover the cost. When the bulk water supply system is introduced, the total unit cost for water supply would be thereby increased. The estimated total unit cost for water supply with bulk water supply would be about 40 pesos/m^3 at maximum. When the margin of 10% is added for both Level 2, 3 water supply system development and bulk water supply system, the unit water price would be about 44 pesos/m^3 in average.

Some WDs such as Meycauayan WD, Obando WD in Bulacan Province have already introduced the bulk water supply system through the service provided by MWSI. The water tariff in these WDs is higher than 40 pesos/m^3 as shown in Table D.5.1.2 and Annex-T D.5.1.2, whereas the average water tariff is around 16-21 pesos/m^3 in the case of water supply system without bulk water supply.

Considering this fact, the expected maximum total unit cost of about 40 pesos/m^3 could be within the acceptable range in general.

LWUA regulates that the water tariff should not be increased higher than 60% in one time. This means that the water tariff when introducing the bulk water supply system should be increased gradually. Furthermore, LWUA also regulates that increasing rate is limited by the 5% of the average income level of low-income society of households. From this viewpoint, it may be said that LWUA's regulation to set the water tariff follows a standing point of "Demand Side Management Demand Side Management".

Improving the WDs distinctive tariff systems by income class (namely, by consumed volume of water), and/or by categories of users as domestic users, commercial users, and industrial users, could lessen the impact of increase of the unit cost for the water supply. In this connection, LWUA has already introduced to compute the water tariff in case of bulk water supply system.

The development cost for the bulk water supply system would be basically shouldered by the bulk water supplier. However, to mitigate the impact by the increase of the cost for water supply, some development cost could be shared by government side, using Public-Private-Partnership (PPP) scheme.

D.6.3.3 Septage Treatment and Disposal

The additional unit cost of about 4 Pesos/m^3 would be required for septage treatment and disposal. When the project for septage treatment and disposal is implemented and its cost is fully recovered by collecting additional fee from water users, the total unit cost would increase about 10-20%.

USAID[14)] has proposed an "Environmental Fees" to be added to the water bill as for recovering the full cost of septage treatment and disposal services, ranging from 7% to 10%, but it should not be named as "Surcharge of Water Tariff".

Table D.6.3.1 shows current practice for surcharge to water tariff for the septage treatment and disposal services in the Philippines. As the other examples, the city of Bandung in Indonesia has applied a rate of 30% as surcharge to the water bill, and the other city of Cirebon also in Indonesia has applied the other rate of 15% also as surcharge to water tariff.

Table D. 6.3.1 Current Practice for Surcharge to Water Tariff for Septage Treatment and Disposal Services in the Philippines.

Case	Description
MWSS in Metro Manila	Since 2008, MWSS has applied the 12% surcharge so called as "Environmental Fee" to water bills for sanitation charge (septage treatment services) together with sewerage charge in the sewerage facilities completed area. However, it is said that the cost for the sepatge treatment services is not fully recovered and the rate of recovery may be by 60% to 70%. MWSS has a plan to revise the "Environmental Fee" in every 5 years from the viewpoint of rationalization.
Baguio City	In 1995, a LGU of Baguio City exchange a "Memorandum of Agreement (MoA) with WD of that district, and in that MOA, Baguio City has offered to a surcharge with a rate of 60% to the water tariff, and Baguio City WD has been given a contract to collect such surcharge with withholding 10% administration fee for WD. Remaining 90% of collected amount of surcharges has been to be revenue of Baguio City. However, in 2001, the Baguio City could recover only by 25% of the cost for the whole septage treatment services.
Municipality of Dumaguete	Dumaguete has estimated the amount of whole cost including amount of a Bank Loan together with the amount of its interest at the sum of 3.26 mil. pesos (in case of including of initial investment cost, it should be at amount of 4.4 mil. pesos). The amount of surcharge of a rate of 2 pesos/m^3 as the septage treatment and disposal services until 2007. By this manner, Dumaguete can recover all the cost including annualized initial investment cost, operating and maintenance cost, a reserve fund for environmental fees. The basis was the volume of water consumed by the end users

Source: USAID

From the viewpoint of above mentioned circumstances, there may be a way to recover the whole costs for the septage treatment and disposal services. Namely, a surcharge of up to around 20% is set up as

called as “the fees for septage treatment and disposal services” or “the Environmental Fees” as suggested by USAID to the water tariff. Then, by this surcharge, all the annualized investment costs including annual O/M costs may be collected fully as well as some amount of margins.

The discussion above is on the premise that the services would be provided by WDs themselves, so that necessary department and post are to be additionally established by WDs together with number of staffs needed. If the said services are provided by outsourcing, it is enough to establish only an administration department with staffs needed. In that case, of course, almost of O/M cost is to be paid for such outsourcing.

D.6.3.4 Level 1 Water Supply System Development and Installation of Sanitary Toilet

No cost recovery is expected for the Level 1 water supply system development and installation of sanitary toilet (only for soft components). The project cost should be burdened by LGUs, the project implementing body. Therefore, the past financial status of each LGU and funds needed for the projects is compared as shown in Table D.6.3.2 (refer to Annex-T D.6.3.2 for each municipality and city).

Table D. 6.3.2 Past Financial Status of LGUs and Funds Needed for Projects for Level 1 Water Supply System Development and Installation of Sanitary Toilet (Only for Soft Components)

Province	Economic Status (Balance of Income and Expenditures) during Last 5 Years						Annual Cost for Level 1 System (Mil.Pesos /year)	Annual Cost for Sanitary Toilet (Mil.Pesos/ year)	Total Annual Cost (Mil.Pesos/ year)
	2004	2005	2006	2007	2008	Average			
Bulacan	92.038	222.105	90.902	163.515	228.285	**159.369**	38.646	15.766	**54.412**
Pampanga	42.402	63.599	311.141	196.903	436.262	**210.061**	56.839	28.371	**85.210**
Nueva Ecija	-75.792	317.110	77.818	23.139	116.912	**91.837**	21.541	20.673	**42.214**
Tarlac	140.408	129.126	137.108	181.786	191.105	**155.907**	8.510	6.005	**14.515**
Total	199.056	731.939	616.969	565.343	972.565	**617.174**	125.537	70.815	**196.351**

Remarks: Data shown in the table are summation of the data for the municipalities and cities in the study area.
Source: JICA Study Team

It can be understood that the total annual cost is in general small compared to the balance of income and expenditures. This means that the required fund for the implementation of Level 1 water supply system development and installation of sanitary toilet (only for soft components) is acceptable level for LGUs in the study area in general.

However, some municipalities/cities have reckoned up deficits during last all 5 years, and the balance in some municipalities/cities is smaller than the required fund. In that case, they may need more careful fiscal management. According to the financial documents, there is a financing item so called as “Inter-Local Transfer”. This is for financing each other LGUs by means to support financially with each other. However, the preceding using this system can be seen in only limited case in the past. This system should be promoted in the future.

References

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Annex-Tables

Annex-T D.1.2.1 Population and Population Growth within the Study Area

Province	City/Minicipality	Population within the Basin Boundary					Annual Ave. Population Growth Ratio			
		1980	1990	1995	2000	2007	1980-1990	1990-2000	2000-2007	1980-2007
Bulacan	Angat	22,311	30,977	35,057	41,340	47,701	3.34%	2.93%	2.07%	2.85%
	Baliuag	70,555	89,719	103,054	119,675	136,982	2.43%	2.92%	1.95%	2.49%
	Bulacan	5,632	7,866	8,747	10,145	11,659	3.40%	2.58%	2.01%	2.73%
	Bustos	11,283	15,328	18,136	20,643	26,601	3.11%	3.02%	3.69%	3.23%
	Calumpit	45,454	59,042	70,839	81,113	98,017	2.65%	3.23%	2.74%	2.89%
	Dona Remedios Trinidad	4,625	8,372	10,880	13,253	18,551	6.11%	4.70%	4.92%	5.28%
	Guiguinto	1,838	2,950	3,483	4,476	5,911	4.84%	4.26%	4.05%	4.42%
	Hagonoy	73,158	90,190	99,398	111,397	126,298	2.12%	2.13%	1.81%	2.04%
	Malolos City	95,699	125,178	147,414	175,291	223,069	2.72%	3.42%	3.50%	3.18%
	Norzagaray	21,836	28,088	42,792	64,571	88,470	2.55%	8.68%	4.60%	5.32%
	Pandi	624	899	1,115	1,324	1,669	3.71%	3.95%	3.37%	3.71%
	Paombong	26,267	32,052	33,149	41,077	53,510	2.01%	2.51%	3.85%	2.67%
	Plaridel	22,120	29,942	37,519	45,506	56,440	3.07%	4.27%	3.12%	3.53%
	Pulilan	38,110	48,199	59,682	68,188	85,008	2.38%	3.53%	3.20%	3.02%
	San Ildefonso	44,931	59,598	69,319	79,956	93,438	2.87%	2.98%	2.25%	2.75%
	San Miguel	73,113	91,124	108,147	123,824	138,839	2.23%	3.11%	1.65%	2.40%
	San Rafael	36,803	49,528	58,387	69,770	85,284	3.01%	3.49%	2.91%	3.16%
	Santa Maria	559	871	962	1,373	1,954	4.53%	4.66%	5.16%	4.74%
	Total	**594,920**	**769,921**	**908,081**	**1,072,923**	**1,299,400**	**2.61%**	**3.37%**	**2.77%**	**2.94%**
Nueva Ecija	Aliaga	32,349	40,425	45,815	50,004	61,270	2.25%	2.15%	2.95%	2.39%
	Bongabon	31,762	38,775	43,904	48,209	72,076	2.02%	2.20%	5.91%	3.08%
	Cabanatuan City	138,298	173,065	201,033	222,859	259,267	2.27%	2.56%	2.19%	2.35%
	Cabiao	37,922	48,850	55,902	62,624	68,382	2.56%	2.52%	1.26%	2.21%
	Carranglan	18,642	24,427	28,069	29,728	31,146	2.74%	1.98%	0.67%	1.92%
	Gabaldon	17,148	21,718	25,719	28,290	29,583	2.39%	2.68%	0.64%	2.04%
	Gapan City	60,014	70,489	77,735	89,199	98,795	1.62%	2.38%	1.47%	1.86%
	Gen. Mamerto Natividad	17,388	21,984	26,140	29,195	33,354	2.37%	2.88%	1.92%	2.44%
	Gen. Tinio	23,373	29,450	32,867	35,302	38,586	2.34%	1.83%	1.28%	1.87%
	Guimba	36,853	45,944	48,807	54,669	60,193	2.23%	1.75%	1.38%	1.83%
	Jaen	39,064	47,346	53,541	58,274	63,474	1.94%	2.10%	1.23%	1.81%
	Laur	17,729	21,464	25,143	26,902	30,997	1.93%	2.28%	2.04%	2.09%
	Licab	14,543	17,202	21,555	21,593	23,675	1.69%	2.30%	1.32%	1.82%
	Llanera	18,652	23,285	28,127	30,361	33,493	2.24%	2.69%	1.41%	2.19%
	Lupao	20,954	24,982	27,268	31,081	33,483	1.77%	2.21%	1.07%	1.75%
	Munoz	43,211	50,356	60,162	65,586	71,669	1.54%	2.68%	1.28%	1.89%
	Palayan City	14,959	20,393	26,851	31,253	33,506	3.15%	4.36%	1.00%	3.03%
	Pantabangan	13,916	18,341	22,183	23,868	25,520	2.80%	2.67%	0.96%	2.27%
	Penaranda	16,753	20,500	22,661	24,749	26,725	2.04%	1.90%	1.10%	1.74%
	Quezon	20,846	25,574	29,172	31,720	33,988	2.07%	2.18%	0.99%	1.83%
	Rizal	31,407	38,970	45,834	48,166	52,465	2.18%	2.14%	1.23%	1.92%
	San Antonio	42,969	51,815	56,130	63,672	67,446	1.89%	2.08%	0.83%	1.68%
	San Isidro	28,550	34,349	36,283	40,984	44,687	1.87%	1.78%	1.24%	1.67%
	San Jose City	64,254	82,836	96,860	108,254	122,353	2.57%	2.71%	1.76%	2.41%
	San Leonardo	34,706	39,740	46,545	50,478	54,596	1.36%	2.42%	1.13%	1.69%
	Santa Rosa	32,424	40,439	47,522	51,804	58,762	2.23%	2.51%	1.82%	2.23%
	Santo Domingo	29,013	35,864	40,992	45,934	47,960	2.14%	2.51%	0.62%	1.88%
	Talavera	62,225	77,256	85,797	97,329	105,122	2.19%	2.34%	1.11%	1.96%
	Talugtug	6,200	7,453	9,573	9,983	10,922	1.86%	2.97%	1.29%	2.12%
	Zaragosa	24,418	28,743	33,826	37,645	40,355	1.64%	2.73%	1.00%	1.88%
	Total	**990,542**	**1,222,034**	**1,402,016**	**1,549,715**	**1,733,849**	**2.12%**	**2.40%**	**1.62%**	**2.10%**
Pampanga	Angeles	188,834	236,686	234,011	263,971	314,493	2.28%	1.10%	2.53%	1.91%
	Apalit	48,253	62,373	65,720	78,295	97,296	2.60%	2.30%	3.15%	2.63%
	Arayat	56,742	73,189	85,940	101,792	118,312	2.58%	3.35%	2.17%	2.76%
	Bacolor	50,942	67,259	13,097	16,147	25,238	2.82%	-13.30%	6.59%	-2.57%
	Candaba	52,945	68,145	77,546	86,066	96,589	2.56%	2.36%	1.66%	2.25%
	Floridablanca	35,612	45,608	52,874	58,880	71,287	2.50%	2.59%	2.77%	2.60%
	Guagua	72,609	88,290	95,363	96,858	104,284	1.97%	0.93%	1.06%	1.35%
	Lubao	74,387	95,698	105,260	120,648	137,309	2.55%	2.34%	1.87%	2.30%
	Mabalacat	77,903	116,533	125,073	164,575	195,616	4.11%	3.51%	2.50%	3.47%
	Macabebe	45,830	55,505	59,469	65,346	70,332	1.93%	1.65%	1.06%	1.60%
	Magalang	34,840	43,940	52,607	77,530	98,595	2.35%	5.84%	3.49%	3.93%
	Masantol	35,350	41,964	45,326	48,120	50,984	1.73%	1.38%	0.83%	1.37%
	Mexico	53,491	69,546	91,696	109,481	141,298	2.66%	4.64%	3.71%	3.66%
	Minalin	27,414	34,795	35,670	35,150	40,084	2.41%	0.10%	1.89%	1.42%
	Porac	50,672	67,901	75,061	80,386	102,489	2.97%	1.70%	3.53%	2.64%
	San Fernando	110,891	157,851	193,025	221,857	269,365	3.59%	3.46%	2.81%	3.34%
	San Luis	25,701	31,920	36,005	41,554	47,517	2.19%	2.67%	1.93%	2.30%
	San Simon	23,518	30,678	35,474	41,253	48,050	2.69%	3.01%	2.20%	2.68%
	Santa Ana	25,361	32,540	37,975	42,990	49,756	2.52%	2.82%	2.11%	2.53%
	Santa Rita	24,995	28,296	32,321	32,780	36,723	1.25%	1.48%	1.64%	1.44%
	Santo Tomas	24,951	33,309	29,628	32,695	37,866	2.93%	-0.19%	2.12%	1.56%
	Sasmuan	17,881	21,125	23,121	23,333	26,601	1.68%	1.00%	1.89%	1.48%
	Total	**1,159,123**	**1,503,152**	**1,602,261**	**1,839,706**	**2,180,084**	**2.63%**	**2.04%**	**2.45%**	**2.37%**
Tarlac	Bamban	15,244	20,838	21,701	27,106	36,043	3.18%	2.66%	4.15%	3.24%
	Capas	14,755	19,412	25,701	30,200	38,720	2.78%	4.52%	3.61%	3.64%
	Concepcion	80,647	103,146	101,243	115,171	135,213	2.49%	1.11%	2.32%	1.93%
	La Paz	35,330	41,946	45,207	52,907	61,324	1.73%	2.35%	2.13%	2.06%
	Tarlac City	88,879	105,589	116,586	132,785	158,926	1.74%	2.32%	2.60%	2.18%
	Victoria	25,984	31,500	35,356	37,873	42,450	1.94%	1.86%	1.64%	1.83%
	Total	**260,839**	**322,431**	**345,794**	**396,042**	**472,676**	**2.14%**	**2.08%**	**2.56%**	**2.23%**
Bataan	Hermosa	1,023	1,380	1,544	1,843	2,091	3.04%	2.94%	1.82%	2.68%
	Orani	6,291	8,270	9,259	9,983	11,320	2.77%	1.90%	1.81%	2.20%
Aurora	Dingalan	1,643	2,733	3,649	3,806	4,152	5.22%	3.37%	1.25%	3.49%
	Maria Aurora	576	610	662	721	758	0.57%	1.69%	0.72%	1.02%
	San Luis	2,570	3,637	4,551	4,618	5,164	3.53%	2.42%	1.61%	2.62%
Quezon	General Nakar	255	385	444	498	523	4.21%	2.60%	0.72%	2.70%
Nueva Vizcaya	Alfonso Castaneda	705	945	1,121	1,212	1,677	2.98%	2.51%	4.75%	3.26%
	Aritao	582	686	771	838	905	1.66%	2.03%	1.09%	1.65%
	Dupax del Sur	125	159	180	212	225	2.47%	2.90%	0.84%	2.20%
	Santa Fe	136	214	254	278	288	4.62%	2.66%	0.51%	2.82%
Pangasinan	Umingan	4,681	5,433	5,850	6,632	7,073	1.50%	2.02%	0.92%	1.54%
Rizal	Rodriguez	5,709	9,149	10,867	15,709	30,498	4.83%	5.55%	9.94%	6.40%
Zambales	Botolan	123	161	186	211	234	2.76%	2.73%	1.49%	2.42%
	San Marcelino	4,504	6,603	4,407	4,590	5,241	3.90%	-3.57%	1.91%	0.56%
	Total	**28,922**	**40,365**	**43,744**	**51,150**	**70,148**	**3.39%**	**2.40%**	**4.62%**	**3.34%**
Grand Total		**3,034,346**	**3,857,903**	**4,301,897**	**4,909,536**	**5,756,156**	**2.43%**	**2.44%**	**2.30%**	**2.40%**

Source: (1) Population Census in 1980, 1990, 1995, 2000, and 2007 by NSCB (for Basic Population Data)
(2) JICA Study Team (for Overlapping Ratio of Study Area with Cities/Municipalities)

Annex-T D.1.3.1(1/2) Service Area Population Projection 2007-2025

Province	City / Municipality	Ratio of C/M to SA	Urban Ratio	Rural Ratio	2007						2008		
					Population (Whole City/Municipality)			Population (Study Area)			Population (Study Area)		
					Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Bulacan	Angat	0.898	28%	72%	14,888	38,229	53,117	13,370	34,331	47,701	13,731	35,259	48,990
	Baliuag	1.000	100%	0%	136,982	0	136,982	136,982	0	136,982	140,682	0	140,682
	Bulacan	0.161	8%	92%	6,047	66,242	72,289	975	10,684	11,659	1,002	10,972	11,974
	Bustos	0.438	26%	74%	16,002	44,679	60,681	7,015	19,586	26,601	7,204	20,115	27,319
	Calumpit	1.000	100%	0%	98,017	0	98,017	98,017	0	98,017	100,665	0	100,665
	Doña Remedios Trinidad	0.972	0%	100%	0	19,086	19,086	0	18,551	18,551	0	19,052	19,052
	Guiguinto	0.066	100%	0%	89,225	0	89,225	5,911	0	5,911	6,071	0	6,071
	Hagonoy	1.000	100%	0%	126,329	0	126,329	126,298	0	126,298	129,709	0	129,709
	Malolos City	1.000	100%	0%	223,069	0	223,069	223,069	0	223,069	229,095	0	229,095
	Norzagaray	0.839	34%	66%	36,319	69,151	105,470	30,465	58,005	88,470	31,288	59,572	90,860
	Pandi	0.028	100%	0%	60,637	0	60,637	1,669	0	1,669	1,714	0	1,714
	Paombong	1.000	19%	81%	10,078	43,432	53,510	10,078	43,432	53,510	10,350	44,605	54,955
	Plaridel	0.565	100%	0%	99,817	0	99,817	56,440	0	56,440	57,964	0	57,964
	Pulilan	1.000	100%	0%	85,008	0	85,008	85,008	0	85,008	87,304	0	87,304
	San Ildefonso	1.000	16%	84%	14,680	78,758	93,438	14,680	78,758	93,438	15,077	80,885	95,962
	San Miguel	1.000	21%	79%	28,613	110,226	138,839	28,613	110,226	138,839	29,386	113,203	142,589
	San Rafael	1.000	10%	90%	8,950	76,334	85,284	8,950	76,334	85,284	9,192	78,396	87,588
	Santa Maria	0.010	100%	0%	205,258	0	205,258	1,954	0	1,954	2,007	0	2,007
Nueva Ecija	Aliaga	1.000	69%	31%	42,282	18,988	61,270	42,282	18,988	61,270	42,966	19,295	62,261
	Bongabon	0.979	4%	96%	3,212	70,427	73,639	3,144	68,932	72,076	3,195	70,047	73,242
	Cabanatuan City	1.000	94%	6%	243,934	15,333	259,267	243,934	15,333	259,267	247,879	15,581	263,460
	Cabiao	1.000	96%	4%	65,383	2,999	68,382	65,383	2,999	68,382	66,440	3,048	69,488
	Carranglan	0.937	46%	54%	15,448	17,785	33,233	14,478	16,668	31,146	14,712	16,937	31,649
	Gabaldon	0.999	42%	58%	12,321	17,298	29,619	12,306	17,277	29,583	12,505	17,557	30,062
	Gapan	1.000	68%	32%	67,323	31,472	98,795	67,323	31,472	98,795	68,412	31,981	100,393
	Gen Mamerto Natividad	1.000	22%	78%	7,427	25,927	33,354	7,427	25,927	33,354	7,547	26,346	33,893
	General Tinio	0.999	52%	48%	20,012	18,628	38,640	19,984	18,602	38,586	20,307	18,903	39,210
	Guimba	0.626	20%	80%	18,803	77,313	96,116	11,775	48,418	60,193	11,966	49,201	61,167
	Jaen	1.000	33%	67%	21,214	42,260	63,474	21,214	42,260	63,474	21,557	42,944	64,501
	Laur	1.000	28%	72%	8,822	22,175	30,997	8,822	22,175	30,997	8,965	22,533	31,498
	Licab	1.000	22%	78%	5,154	18,521	23,675	5,154	18,521	23,675	5,237	18,821	24,058
	Llanera	1.000	16%	84%	5,431	28,062	33,493	5,431	28,062	33,493	5,519	28,516	34,035
	Lupao	0.909	6%	94%	2,273	34,559	36,832	2,066	31,417	33,483	2,100	31,924	34,024
	Science City of Munoz	1.000	41%	59%	29,689	41,980	71,669	29,689	41,980	71,669	30,169	42,659	72,828
	Palayan City	1.000	32%	68%	10,809	22,697	33,506	10,809	22,697	33,506	10,984	23,064	34,048
	Pantabangan	1.000	0%	100%	0	25,520	25,520	0	25,520	25,520	0	25,933	25,933
	Penaranda	1.000	0%	100%	0	26,725	26,725	0	26,725	26,725	0	27,157	27,157
	Quezon	1.000	27%	73%	9,015	24,973	33,988	9,015	24,973	33,988	9,161	25,377	34,538
	Rizal	1.000	13%	87%	6,781	45,684	52,465	6,781	45,684	52,465	6,891	46,423	53,314
	San Antonio	1.000	28%	72%	18,836	48,610	67,446	18,836	48,610	67,446	19,141	49,396	68,537
	San Isidro	1.000	100%	0%	44,687	0	44,687	44,687	0	44,687	45,410	0	45,410
	San Jose City	1.000	41%	59%	49,572	72,781	122,353	49,572	72,781	122,353	50,374	73,958	124,332
	San Leonardo	1.000	68%	32%	36,954	17,642	54,596	36,954	17,642	54,596	37,552	17,927	55,479
	Santa Rosa	1.000	3%	97%	1,611	57,151	58,762	1,611	57,151	58,762	1,637	58,075	59,712
	Santo Domingo	1.000	77%	23%	37,064	10,896	47,960	37,064	10,896	47,960	37,664	11,072	48,736
	Talavera	1.000	91%	9%	95,319	9,803	105,122	95,319	9,803	105,122	96,860	9,962	106,822
	Talugtug	0.528	12%	88%	2,378	18,293	20,671	1,256	9,666	10,922	1,277	9,822	11,099
	Zaragosa	1.000	44%	56%	17,760	22,595	40,355	17,760	22,595	40,355	18,047	22,961	41,008
Pampanga	Angeles City	1.000	100%	0%	314,493	0	314,493	314,493	0	314,493	320,197	0	320,197
	Apalit	1.000	100%	0%	97,296	0	97,296	97,296	0	97,296	99,061	0	99,061
	Arayat	1.000	17%	83%	20,570	97,742	118,312	20,570	97,742	118,312	20,943	99,515	120,458
	Bacolor	1.000	35%	65%	8,786	16,452	25,238	8,786	16,452	25,238	8,945	16,751	25,696
	Candaba	1.000	12%	88%	11,445	85,144	96,589	11,445	85,144	96,589	11,653	86,688	98,341
	Floridablanca	0.690	38%	62%	39,318	64,070	103,388	27,110	44,177	71,287	27,602	44,978	72,580
	Guagua	1.000	100%	0%	104,284	0	104,284	104,284	0	104,284	106,175	0	106,175
	Lubao	0.960	38%	62%	54,876	88,182	143,058	52,671	84,638	137,309	53,626	86,173	139,799
	Mabalacat	0.962	100%	0%	203,222	85	203,307	195,534	82	195,616	199,081	83	199,164
	Macabebe	1.000	12%	88%	8,117	62,215	70,332	8,117	62,215	70,332	8,264	63,344	71,608
	Magalang	1.000	69%	31%	68,358	30,237	98,595	68,358	30,237	98,595	69,598	30,785	100,383
	Masantol	1.000	31%	69%	15,558	35,426	50,984	15,558	35,426	50,984	15,840	36,069	51,909
	Mexico	1.000	42%	58%	59,818	81,480	141,298	59,818	81,480	141,298	60,903	82,958	143,861
	Minalin	1.000	37%	63%	14,631	25,453	40,084	14,631	25,453	40,084	14,896	25,915	40,811
	Porac	0.995	57%	43%	58,394	44,568	102,962	58,126	44,363	102,489	59,180	45,168	104,348
	City of San Fernando	1.000	98%	2%	264,496	4,869	269,365	264,496	4,869	269,365	269,293	4,957	274,250
	San Luis	1.000	55%	45%	26,084	21,433	47,517	26,084	21,433	47,517	26,557	21,822	48,379
	San Simon	1.000	34%	66%	16,289	31,761	48,050	16,289	31,761	48,050	16,584	32,337	48,921
	Santa Ana	1.000	100%	0%	49,756	0	49,756	49,756	0	49,756	50,658	0	50,658
	Santa Rita	1.000	100%	0%	36,723	0	36,723	36,723	0	36,723	37,389	0	37,389
	Santo Tomas	1.000	100%	0%	37,866	0	37,866	37,866	0	37,866	38,553	0	38,553
	Sasmuan	0.999	25%	75%	6,589	20,041	26,630	6,582	20,019	26,601	6,701	20,382	27,083
Tarlac	Bamban	0.585	77%	23%	47,367	14,277	61,644	27,695	8,348	36,043	28,166	8,489	36,655
	Capas	0.317	15%	85%	18,195	103,889	122,084	5,771	32,949	38,720	5,869	33,509	39,378
	Concepcion	1.000	33%	67%	44,237	90,976	135,213	44,237	90,976	135,213	44,989	92,522	137,511
	La Paz	1.000	19%	81%	11,445	49,879	61,324	11,445	49,879	61,324	11,639	50,727	62,366
	Tarlac City	0.506	65%	35%	203,606	110,549	314,155	103,001	55,925	158,926	104,751	56,875	161,627
	Victoria	0.744	13%	87%	7,146	49,939	57,085	5,314	37,136	42,450	5,404	37,767	43,171
Total			61%	39%	4,008,398	2,561,901	6,570,299	3,431,627	2,254,384	5,686,011	3,499,431	2,297,295	5,796,726

Source: JICA Study Team

Annex-T D.1.3.1(2/2) Service Area Population Projection 2007-2025

Province	City / Municipality	Ratio of C/M to SA	Urban Ratio	Rural Ratio	2015 Population (Study Area)			2020 Population (Study Area)			2025 Population (Study Area)		
					Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Bulacan	Angat	0.898	28%	72%	16,318	41,902	58,220	18,172	46,663	64,835	20,008	51,377	71,385
	Baliuag	1.000	100%	0%	167,188	0	167,188	186,185	0	186,185	204,993	0	204,993
	Bulacan	0.161	8%	92%	1,190	13,040	14,230	1,326	14,521	15,847	1,460	15,988	17,448
	Bustos	0.438	26%	74%	8,562	23,904	32,466	9,534	26,621	36,155	10,498	29,310	39,808
	Calumpit	1.000	100%	0%	119,631	0	119,631	133,224	0	133,224	146,682	0	146,682
	Doña Remedios Trinidad	0.972	0%	100%	0	22,641	22,641	0	25,214	25,214	0	27,761	27,761
	Guiguinto	0.066	100%	0%	7,214	0	7,214	8,034	0	8,034	8,846	0	8,846
	Hagonoy	1.000	100%	0%	154,148	0	154,148	171,663	0	171,663	189,004	0	189,004
	Malolos City	1.000	100%	0%	272,259	0	272,259	303,194	0	303,194	333,821	0	333,821
	Norzagaray	0.839	34%	66%	37,183	70,796	107,979	41,408	78,840	120,248	45,591	86,805	132,396
	Pandi	0.028	100%	0%	2,037	0	2,037	2,269	0	2,269	2,498	0	2,498
	Paombong	1.000	19%	81%	12,300	53,009	65,309	13,698	59,032	72,730	15,082	64,995	80,077
	Plaridel	0.565	100%	0%	68,885	0	68,885	76,712	0	76,712	84,461	0	84,461
	Pulilan	1.000	100%	0%	103,753	0	103,753	115,542	0	115,542	127,214	0	127,214
	San Ildefonso	1.000	16%	84%	17,917	96,125	114,042	19,953	107,047	127,000	21,968	117,861	139,829
	San Miguel	1.000	21%	79%	34,923	134,532	169,455	38,891	149,818	188,709	42,819	164,953	207,772
	San Rafael	1.000	10%	90%	10,924	93,166	104,090	12,165	103,752	115,917	13,394	114,233	127,627
	Santa Maria	0.010	100%	0%	2,385	0	2,385	2,656	0	2,656	2,924	0	2,924
Nueva Ecija	Aliaga	1.000	69%	31%	47,801	21,466	69,267	51,021	22,912	73,933	53,900	24,206	78,106
	Bongabon	0.979	4%	96%	3,554	77,929	81,483	3,794	83,178	86,972	4,008	87,873	91,881
	Cabanatuan City	1.000	94%	6%	275,774	17,334	293,108	294,349	18,502	312,851	310,962	19,546	330,508
	Cabiao	1.000	96%	4%	73,918	3,390	77,308	78,896	3,619	82,515	83,349	3,823	87,172
	Carranglan	0.937	46%	54%	16,367	18,844	35,211	17,470	20,113	37,583	18,456	21,248	39,704
	Gabaldon	0.999	42%	58%	13,913	19,532	33,445	14,849	20,848	35,697	15,688	22,024	37,712
	Gapan	1.000	68%	32%	76,110	35,580	111,690	81,237	37,976	119,213	85,822	40,120	125,942
	Gen Mamerto Natividad	1.000	22%	78%	8,397	29,311	37,708	8,962	31,285	40,247	9,468	33,051	42,519
	General Tinio	0.999	52%	48%	22,592	21,030	43,622	24,114	22,446	46,560	25,475	23,713	49,188
	Guimba	0.626	20%	80%	13,312	54,738	68,050	14,209	58,424	72,633	15,011	61,722	76,733
	Jaen	1.000	33%	67%	23,983	47,776	71,759	25,598	50,994	76,592	27,043	53,872	80,915
	Laur	1.000	28%	72%	9,974	25,069	35,043	10,645	26,758	37,403	11,246	28,268	39,514
	Licab	1.000	22%	78%	5,827	20,938	26,765	6,219	22,349	28,568	6,570	23,610	30,180
	Llanera	1.000	16%	84%	6,140	31,725	37,865	6,553	33,862	40,415	6,923	35,773	42,696
	Lupao	0.909	6%	94%	2,336	35,517	37,853	2,493	37,910	40,403	2,634	40,049	42,683
	Science City of Munoz	1.000	41%	59%	33,564	47,460	81,024	35,825	50,656	86,481	37,847	53,515	91,362
	Palayan City	1.000	32%	68%	12,220	25,659	37,879	13,043	27,388	40,431	13,779	28,934	42,713
	Pantabangan	1.000	0%	100%	0	28,851	28,851	0	30,794	30,794	0	32,532	32,532
	Penaranda	1.000	0%	100%	0	30,213	30,213	0	32,248	32,248	0	34,068	34,068
	Quezon	1.000	27%	73%	10,192	28,232	38,424	10,878	30,134	41,012	11,492	31,835	43,327
	Rizal	1.000	13%	87%	7,666	51,647	59,313	8,182	55,126	63,308	8,644	58,237	66,881
	San Antonio	1.000	28%	72%	21,294	54,955	76,249	22,729	58,656	81,385	24,012	61,967	85,979
	San Isidro	1.000	100%	0%	50,520	0	50,520	53,923	0	53,923	56,966	0	56,966
	San Jose City	1.000	41%	59%	56,042	82,281	138,323	59,817	87,823	147,640	63,193	92,780	155,973
	San Leonardo	1.000	68%	32%	41,777	19,945	61,722	44,592	21,288	65,880	47,108	22,490	69,598
	Santa Rosa	1.000	3%	97%	1,821	64,611	66,432	1,944	68,963	70,907	2,054	72,854	74,908
	Santo Domingo	1.000	77%	23%	41,902	12,318	54,220	44,724	13,148	57,872	47,248	13,890	61,138
	Talavera	1.000	91%	9%	107,760	11,083	118,843	115,019	11,829	126,848	121,510	12,497	134,007
	Talugtug	0.528	12%	88%	1,420	10,927	12,347	1,516	11,663	13,179	1,602	12,321	13,923
	Zaragosa	1.000	44%	56%	20,078	25,544	45,622	21,430	27,265	48,695	22,640	28,804	51,444
Pampanga	Angeles City	1.000	100%	0%	359,662	0	359,662	385,924	0	385,924	410,197	0	410,197
	Apalit	1.000	100%	0%	111,270	0	111,270	119,395	0	119,395	126,904	0	126,904
	Arayat	1.000	17%	83%	23,524	111,780	135,304	25,242	119,942	145,184	26,830	127,486	154,316
	Bacolor	1.000	35%	65%	10,048	18,815	28,863	10,781	20,189	30,970	11,460	21,458	32,918
	Candaba	1.000	12%	88%	13,089	97,372	110,461	14,044	104,483	118,527	14,928	111,054	125,982
	Floridablanca	0.690	38%	62%	31,004	50,521	81,525	33,267	54,211	87,478	35,360	57,620	92,980
	Guagua	1.000	100%	0%	119,262	0	119,262	127,970	0	127,970	136,019	0	136,019
	Lubao	0.960	38%	62%	60,236	96,794	157,030	64,634	103,862	168,496	68,699	110,395	179,094
	Mabalacat	0.962	100%	0%	223,617	94	223,711	239,947	100	240,047	255,038	107	255,145
	Macabebe	1.000	12%	88%	9,283	71,150	80,433	9,961	76,346	86,307	10,587	81,148	91,735
	Magalang	1.000	69%	31%	78,176	34,580	112,756	83,884	37,105	120,989	89,160	39,439	128,599
	Masantol	1.000	31%	69%	17,792	40,514	58,306	19,092	43,472	62,564	20,292	46,207	66,499
	Mexico	1.000	42%	58%	68,409	93,183	161,592	73,404	99,987	173,391	78,021	106,276	184,297
	Minalin	1.000	37%	63%	16,732	29,109	45,841	17,954	31,234	49,188	19,083	33,199	52,282
	Porac	0.995	57%	43%	66,474	50,735	117,209	71,328	54,439	125,767	75,814	57,863	133,677
	City of San Fernando	1.000	98%	2%	302,484	5,568	308,052	324,571	5,975	330,546	344,985	6,351	351,336
	San Luis	1.000	55%	45%	29,831	24,511	54,342	32,009	26,301	58,310	34,022	27,955	61,977
	San Simon	1.000	34%	66%	18,628	36,323	54,951	19,989	38,975	58,964	21,246	41,426	62,672
	Santa Ana	1.000	100%	0%	56,902	0	56,902	61,057	0	61,057	64,897	0	64,897
	Santa Rita	1.000	100%	0%	41,997	0	41,997	45,064	0	45,064	47,898	0	47,898
	Santo Tomas	1.000	100%	0%	43,304	0	43,304	46,467	0	46,467	49,389	0	49,389
	Sasmuan	0.999	25%	75%	7,527	22,894	30,421	8,077	24,566	32,643	8,585	26,111	34,696
Tarlac	Bamban	0.585	77%	23%	31,453	9,480	40,933	33,630	10,136	43,766	35,619	10,736	46,355
	Capas	0.317	15%	85%	6,554	37,420	43,974	7,007	40,009	47,016	7,422	42,376	49,798
	Concepcion	1.000	33%	67%	50,240	103,320	153,560	53,716	110,469	164,185	56,893	117,005	173,898
	La Paz	1.000	19%	81%	12,998	56,647	69,645	13,897	60,567	74,464	14,719	64,150	78,869
	Tarlac City	0.506	65%	35%	116,977	63,514	180,491	125,071	67,908	192,979	132,470	71,926	204,396
	Victoria	0.744	13%	87%	6,035	42,175	48,210	6,453	45,093	51,546	6,834	47,761	54,595
Total			61%	39%	3,976,579	2,599,519	6,576,098	4,302,492	2,805,034	7,107,526	4,609,286	2,996,952	7,606,238
	Bulacan		70%	30%	1,036,817	549,115	1,585,932	1,154,625	611,509	1,766,134	1,271,262	673,284	1,944,546
	Nueva Ecija		50%	50%	1,006,254	953,905	1,960,159	1,074,032	1,018,156	2,092,188	1,134,651	1,075,621	2,210,272
	Pampanga		68%	32%	1,709,251	783,943	2,493,194	1,834,061	841,187	2,675,248	1,949,415	894,094	2,843,509
	Tarlac		44%	56%	224,256	312,557	536,813	239,773	334,183	573,956	253,958	353,953	607,911
	Total		61%	39%	3,976,579	2,599,519	6,576,098	4,302,492	2,805,034	7,107,526	4,609,286	2,996,952	7,606,238

Source: JICA Study Team

Annex-T D.2.3.1 Present Coverage Ratio of the Water Supply Service System in the Study Area

Province	City / Municipality	HHs 2008	ACCESS TO SAFE WATER HHs					Service Level Ratio / Unsafe Ratio				
			Safe				Unsafe	Service Level				Unsafe
			Level 3	Level 2	Level 1	Total		Level 3	Level 2	Level 1	Total	
Bulacan	Angat	12,044	5,138	0	4,861	9,999	2,045	51%	0%	49%	100%	17%
	Baliuag	34,430	17,623	0	14,309	31,932	2,498	55%	0%	45%	100%	7%
	Bulacan	18,069	12,281	0	5,136	17,417	652	71%	0%	29%	100%	4%
	Bustos	11,762	7,270	0	4,003	11,273	489	64%	0%	36%	100%	4%
	Calumpit	20,454	19,380	0	593	19,973	481	97%	0%	3%	100%	2%
	Doña Remedios Trinidad	4,119	2,817	0	171	2,988	1,131	94%	0%	6%	100%	27%
	Guiguinto	23,322	8,469	0	14,256	22,725	597	37%	0%	63%	100%	3%
	Hagonoy	27,155	23,410	0	2,843	26,253	902	89%	0%	11%	100%	3%
	Malolos City	49,388	18,832	0	21,520	40,352	9,036	47%	0%	53%	100%	18%
	Norzagaray	19,380	12,743	0	5,798	18,541	839	69%	0%	31%	100%	4%
	Pandi	13,928	4,676	0	172	4,848	9,080	96%	0%	4%	100%	65%
	Paombong	10,651	7,785	0	942	8,727	1,924	89%	0%	11%	100%	18%
	Plaridel	24,774	16,589	0	6,912	23,501	1,273	71%	0%	29%	100%	5%
	Pulilan	17,132	610	0	15,956	16,566	566	4%	0%	96%	100%	3%
	San Ildefonso	17,866	3,356	0	7,539	10,895	6,971	31%	0%	69%	100%	39%
	San Miguel	28,907	13,451	0	15,456	28,907	0	47%	0%	53%	100%	0%
	San Rafael	21,898	5,038	0	14,515	19,553	2,345	26%	0%	74%	100%	11%
	Santa Maria	41,006	23,373	0	15,582	38,955	2,051	60%	0%	40%	100%	5%
Nueva Ecija	Aliaga	9,693	898	0	2,928	3,826	5,867	23%	0%	77%	100%	61%
	Bongabon	9,020	1,317	1,742	5,961	9,020	0	15%	19%	66%	100%	0%
	Cabanatuan City	42,151	31,265	9	11,507	42,781	0	73%	0%	27%	100%	0%
	Cabiao	12,204	2,171	466	9,325	11,962	242	18%	4%	78%	100%	2%
	Carranglan	6,225	0	0	2,787	2,787	3,438	0%	0%	100%	100%	55%
	Gabaldon	5,532	0	2,176	1,182	3,358	2,174	0%	65%	35%	100%	39%
	Gapan	14,798	3,318	1,450	10,029	14,797	1	22%	10%	68%	100%	0%
	Gen Mamerto Natividad	5,473	1,036	125	4,250	5,411	62	19%	2%	79%	100%	1%
	General Tinio	6,506	1,968	435	3,490	5,893	613	33%	7%	59%	100%	9%
	Guimba	14,496	2,793	66	11,720	14,579	0	19%	0%	80%	100%	0%
	Jaen	10,678	2,049	176	7,851	10,076	602	20%	2%	78%	100%	6%
	Laur	5,180	1,121	890	3,088	5,099	81	22%	17%	61%	100%	2%
	Licab	4,136	395	0	891	1,286	2,850	31%	0%	69%	100%	69%
	Llanera	6,170	229	195	4,698	5,122	1,048	4%	4%	92%	100%	17%
	Lupao	5,679	0	0	4,053	4,053	1,626	0%	0%	100%	100%	29%
	Science City of Munoz	11,629	4,761	940	4,135	9,836	1,793	48%	10%	42%	100%	15%
	Palayan City	7,082	2,318	457	3,856	6,631	451	35%	7%	58%	100%	6%
	Pantabangan	5,007	0	2,275	427	2,702	2,305	0%	84%	16%	100%	46%
	Penaranda	4,487	3,168	171	1,150	4,489	0	71%	4%	26%	100%	0%
	Quezon	5,931	0	0	2,440	2,440	3,491	0%	0%	100%	100%	59%
	Rizal	9,603	0	50	9,551	9,601	2	0%	1%	99%	100%	0%
	San Antonio	10,859	2,050	458	7,532	10,040	819	20%	5%	75%	100%	8%
	San Isidro	6,919	2,754	173	3,960	6,887	32	40%	3%	57%	100%	0%
	San Jose City	20,777	5,312	0	0	5,312	15,465	100%	0%	0%	100%	74%
	San Leonardo	9,717	3,026	1,847	4,237	9,110	607	33%	20%	47%	100%	6%
	Santa Rosa	10,244	4,533	499	5,212	10,244	0	44%	5%	51%	100%	0%
	Santo Domingo	8,451	671	50	6,826	7,547	904	9%	1%	90%	100%	11%
	Talavera	18,250	7,858	0	11,527	19,385	0	41%	0%	59%	100%	0%
	Talugtug	3,465	500	0	2,442	2,942	523	17%	0%	83%	100%	15%
	Zaragosa	6,746	715	736	5,462	6,913	0	10%	11%	79%	100%	0%
Pampanga	Angeles City	67,838	51,590	0	10,065	61,655	6,183	84%	0%	16%	100%	9%
	Apalit	35,509	7,747	0	4,391	12,138	23,371	64%	0%	36%	100%	66%
	Arayat	21,999	0	0	15,295	15,295	6,704	0%	0%	100%	100%	30%
	Bacolor	6,673	1,679	590	4,075	6,344	329	26%	9%	64%	100%	5%
	Candaba	22,465	2,206	100	10,063	12,369	10,096	18%	1%	81%	100%	45%
	Floridablanca	17,834	12,067	0	3,515	15,582	2,252	77%	0%	23%	100%	13%
	Guagua	22,782	10,720	95	7,555	18,370	4,412	58%	1%	41%	100%	19%
	Lubao	29,485	5,040	72	17,861	22,973	6,512	22%	0%	78%	100%	22%
	Mabalacat	35,435	25,218	0	6,219	31,437	3,998	80%	0%	20%	100%	11%
	Macabebe	14,108	4,190	0	1,491	5,681	8,427	74%	0%	26%	100%	60%
	Magalang	14,228	0	0	11,250	11,250	2,978	0%	0%	100%	100%	21%
	Masantol	8,434	0	0	7,710	7,710	724	0%	0%	100%	100%	9%
	Mexico	23,743	4,580	0	17,335	21,915	1,828	21%	0%	79%	100%	8%
	Minalin	8,011	3,033	0	3,684	6,717	1,294	45%	0%	55%	100%	16%
	Porac	23,180	3,084	1,976	12,985	18,045	5,135	17%	11%	72%	100%	22%
	City of San Fernando	49,690	20,249	6,869	15,128	42,246	7,444	48%	16%	36%	100%	15%
	San Luis	10,109	0	0	4,431	4,431	5,678	0%	0%	100%	100%	56%
	San Simon	8,302	3,372	0	2,926	6,298	2,004	54%	0%	46%	100%	24%
	Santa Ana	8,316	1,024	7,966	7,614	16,604	0	6%	48%	46%	100%	0%
	Santa Rita	9,646	1,229	0	6,240	7,469	2,177	16%	0%	84%	100%	23%
	Santo Tomas	8,111	3,438	0	1,729	5,167	2,944	67%	0%	33%	100%	36%
	Sasmuan	6,791	0	0	3,649	3,649	3,142	0%	0%	100%	100%	46%
Tarlac	Bamban	10,169	1,669	0	7,004	8,673	1,496	19%	0%	81%	100%	15%
	Capas	23,000	6,062	0	9,757	15,819	7,181	38%	0%	62%	100%	31%
	Concepcion	23,051	5,267	0	11,511	16,778	6,273	31%	0%	69%	100%	27%
	La Paz	10,653	1,243	0	7,580	8,823	1,830	14%	0%	86%	100%	17%
	Tarlac City	56,291	19,604	0	31,081	50,685	5,606	39%	0%	61%	100%	10%
	Victoria	12,417	1,076	0	6,731	7,807	4,610	14%	0%	86%	100%	37%
Total		1,281,663	484,454	33,054	551,956	1,069,464	222,504	45%	3%	52%	100%	17%

	Bulacan	396,285	202,841	0	150,564	353,405	42,880	57%	0%	43%	100%	11%
	Nueva Ecija	297,108	86,226	15,386	152,517	254,129	44,996	34%	6%	60%	100%	15%
	Pampanga	452,689	160,466	17,668	175,211	353,345	107,632	45%	5%	50%	100%	24%
	Tarlac	135,581	34,921	0	73,664	108,585	26,996	32%	0%	68%	100%	20%
	Total	1,281,663	484,454	33,054	551,956	1,069,464	222,504	45%	3%	52%	100%	17%

Note: Inside the study area only
Source: PHO for Bulacan, Nueva Ecija, Pampanga and Tarlac (arranged by JICA Study Team)

Annex-T D.2.3.2 Estimated Present Water Supply Service Level Ratios for Urban and Rural Areas and Accomplishment of Target in the Previous Master Plan

		1990								2008									Target in 2010			Achivement of Target		
		Urban				Rural				Urban				Rural					Urban		Rural	Urban		Rural
Province	City / Municipality	Level 3	Level 2&1	Unsafe	Sub Total	Level 3&2	Level 1	Unsafe	Sub Total	Level 3	Level 2&1	Unsafe	Safe	Level 3	Level 2	Level 1	Unsafe	Safe	Safe water access	Level 3	Safe water access	Safe water Access	Level 3	Safe water access
Bulacan	Angat	25%	23%	52%	100%	14%	56%	30%	100%	100%	0%	17%	83%	32%	0%	68%	17%	83%	98%	98%	94%		Yes	
	Baliuag	9%	35%	56%	100%	0%	0%	0%	0%	55%	45%	7%	93%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Bulacan	100%	0%	0%	100%	17%	50%	33%	100%	100%	0%	4%	96%	68%	0%	32%	4%	96%	98%	98%	94%		Yes	Yes
	Bustos	50%	34%	16%	100%	0%	47%	53%	100%	100%	0%	4%	96%	52%	0%	48%	4%	96%	98%	98%	94%		Yes	Yes
	Calumpit	26%	29%	46%	100%	0%	0%	0%	0%	97%	3%	2%	98%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Doña Remedios Trinidad	0%	0%	0%	0%	0%	25%	75%	100%	0%	0%	0%	0%	94%	0%	6%	27%	73%	98%	98%	94%	No pop.	No pop.	
	Guiguinto	2%	32%	66%	100%	0%	0%	0%	0%	37%	63%	3%	97%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Hagonoy	100%	0%	0%	100%	39%	30%	31%	100%	89%	11%	3%	97%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Malolos City	16%	32%	52%	100%	0%	0%	0%	0%	47%	53%	18%	82%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Norzagaray	48%	0%	52%	100%	2%	22%	76%	100%	100%	0%	4%	96%	52%	0%	48%	4%	96%	98%	98%	94%		Yes	Yes
	Pandi	36%	15%	48%	100%	6%	23%	71%	100%	96%	4%	65%	35%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Paombong	0%	92%	8%	100%	8%	36%	56%	100%	100%	0%	18%	82%	87%	0%	13%	18%	82%	98%	98%	94%		Yes	
	Plaridel	30%	12%	58%	100%	6%	18%	76%	100%	71%	29%	5%	95%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Pulilan	0%	81%	19%	100%	0%	0%	0%	0%	4%	96%	3%	97%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	San Ildefonso	0%	67%	33%	100%	7%	73%	20%	100%	100%	0%	39%	61%	18%	0%	82%	39%	61%	98%	98%	94%		Yes	
	San Miguel	44%	10%	47%	100%	1%	26%	73%	100%	100%	0%	0%	100%	33%	0%	67%	0%	100%	98%	98%	94%	Yes	Yes	Yes
	San Rafael	0%	54%	46%	100%	0%	22%	78%	100%	100%	0%	11%	89%	17%	0%	83%	11%	89%	98%	98%	94%		Yes	
	Santa Maria	36%	21%	43%	100%	2%	45%	53%	100%	60%	40%	5%	95%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
Nueva Ecija	Aliaga	0%	58%	42%	100%	2%	36%	62%	100%	34%	66%	61%	39%	0%	0%	100%	61%	39%	100%	100%	100%			
	Bongabon	0%	53%	47%	100%	0%	43%	57%	100%	100%	0%	0%	100%	11%	20%	69%	0%	100%	100%	100%	100%	Yes	Yes	Yes
	Cabanatuan City	100%	0%	0%	100%	19%	22%	59%	100%	78%	22%	0%	100%	0%	0%	100%	0%	100%	100%	100%	100%	Yes		Yes
	Cabiao	0%	63%	37%	100%	2%	45%	53%	100%	19%	81%	2%	98%	0%	5%	95%	2%	98%	100%	100%	100%			
	Carranglan	0%	72%	28%	100%	0%	50%	50%	100%	0%	100%	55%	45%	0%	0%	100%	55%	45%	100%	100%	100%			
	Gabaldon	0%	66%	34%	100%	36%	47%	16%	100%	0%	100%	39%	61%	0%	65%	35%	39%	61%	100%	100%	100%			
	Gapan	36%	29%	35%	100%	0%	50%	50%	100%	33%	67%	0%	100%	0%	13%	87%	0%	100%	100%	100%	100%			
	Gen Mamerto Natividad	0%	72%	28%	100%	2%	49%	49%	100%	86%	14%	1%	99%	0%	3%	97%	1%	99%	100%	100%	100%			
	General Tinio	53%	41%	6%	100%	7%	55%	38%	100%	64%	36%	9%	91%	0%	11%	89%	9%	91%	100%	100%	100%			
	Guimba	32%	39%	29%	100%	0%	34%	66%	100%	98%	2%	0%	100%	0%	1%	99%	0%	100%	100%	100%	100%	Yes		Yes
	Jaen	0%	45%	55%	100%	1%	34%	65%	100%	61%	39%	6%	94%	0%	2%	98%	6%	94%	100%	100%	100%			
	Laur	0%	42%	58%	100%	0%	71%	29%	100%	77%	23%	2%	98%	0%	22%	78%	2%	98%	100%	100%	100%			
	Licab	0%	59%	41%	100%	0%	58%	42%	100%	100%	0%	69%	31%	11%	0%	89%	69%	31%	100%	100%	100%		Yes	
	Llanera	0%	63%	37%	100%	0%	56%	44%	100%	28%	72%	17%	83%	0%	4%	96%	17%	83%	100%	100%	100%			
	Lupao	0%	63%	37%	100%	0%	48%	52%	100%	0%	100%	29%	71%	0%	0%	100%	29%	71%	100%	100%	100%			
	Science City of Munoz	0%	43%	57%	100%	0%	48%	52%	100%	100%	0%	15%	85%	12%	16%	72%	15%	85%	100%	100%	100%		Yes	
	Palayan City	31%	27%	41%	100%	0%	100%	0%	100%	100%	0%	6%	94%	4%	10%	86%	6%	94%	100%	100%	100%		Yes	
	Pantabangan	89%	11%	0%	100%	3%	59%	38%	100%	0%	0%	0%	0%	0%	84%	16%	46%	54%	100%	100%	100%	No pop.	No pop.	
	Penaranda	0%	53%	47%	100%	0%	52%	48%	100%	0%	0%	0%	0%	71%	4%	26%	0%	100%	100%	100%	100%	No pop.	No pop.	Yes
	Quezon	0%	100%	0%	100%	0%	52%	48%	100%	0%	100%	59%	41%	0%	0%	100%	59%	41%	100%	100%	100%			
	Rizal	0%	40%	60%	100%	0%	68%	32%	100%	0%	100%	0%	100%	0%	1%	99%	0%	100%	100%	100%	100%			
	San Antonio	100%	0%	0%	100%	2%	43%	55%	100%	73%	27%	8%	92%	0%	6%	94%	8%	92%	100%	100%	100%			
	San Isidro	0%	73%	27%	100%	0%	68%	32%	100%	40%	60%	0%	100%	0%	0%	0%	0%	0%	100%	100%	100%			No pop.
	San Jose City	83%	17%	0%	100%	2%	47%	51%	100%	100%	0%	74%	26%	100%	0%	0%	74%	26%	100%	100%	100%		Yes	
	San Leonardo	0%	76%	24%	100%	0%	68%	32%	100%	49%	51%	6%	94%	0%	30%	70%	6%	94%	100%	100%	100%			
	Santa Rosa	0%	77%	23%	100%	0%	63%	37%	100%	100%	0%	0%	100%	43%	5%	52%	0%	100%	100%	100%	100%	Yes	Yes	Yes
	Santo Domingo	0%	100%	0%	100%	6%	66%	28%	100%	12%	88%	11%	89%	0%	1%	99%	11%	89%	100%	100%	100%			
	Talavera	27%	73%	0%	100%	0%	58%	42%	100%	45%	55%	0%	100%	0%	0%	100%	0%	100%	100%	100%	100%	Yes		Yes
	Talugtug	0%	73%	27%	100%	18%	82%	0%	100%	100%	0%	15%	85%	6%	0%	94%	15%	85%	100%	100%	100%		Yes	
	Zaragosa	0%	66%	34%	100%	0%	60%	40%	100%	24%	76%	0%	100%	0%	12%	88%	0%	100%	100%	100%	100%	Yes		Yes
Pampanga	Angeles City	20%	37%	43%	100%	0%	0%	0%	0%	84%	16%	9%	91%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Apalit	0%	50%	50%	100%	10%	10%	79%	100%	64%	36%	66%	34%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Arayat	76%	21%	4%	100%	0%	18%	82%	100%	0%	100%	30%	70%	0%	0%	100%	30%	70%	98%	98%	94%			
	Bacolor	100%	0%	0%	100%	4%	22%	74%	100%	76%	24%	5%	95%	0%	13%	87%	5%	95%	98%	98%	94%			Yes
	Candaba	0%	53%	47%	100%	7%	19%	74%	100%	100%	0%	45%	55%	7%	1%	92%	45%	55%	98%	98%	94%		Yes	
	Floridablanca	59%	40%	1%	100%	6%	64%	30%	100%	100%	0%	13%	87%	64%	0%	36%	13%	87%	98%	98%	94%		Yes	
	Guagua	22%	68%	9%	100%	0%	0%	0%	0%	58%	42%	19%	81%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Lubao	13%	44%	42%	100%	0%	52%	48%	100%	57%	43%	22%	78%	0%	0%	100%	22%	78%	98%	98%	94%			
	Mabalacat	55%	44%	1%	100%	9%	52%	39%	100%	80%	20%	11%	89%	0%	0%	100%	11%	89%	98%	98%	94%			
	Macabebe	15%	13%	72%	100%	0%	0%	0%	0%	100%	0%	60%	40%	70%	0%	30%	60%	40%	98%	98%	94%		Yes	
	Magalang	0%	65%	35%	100%	12%	69%	19%	100%	0%	100%	21%	79%	0%	0%	100%	21%	79%	98%	98%	94%			
	Masantol	18%	15%	68%	100%	15%	16%	68%	100%	0%	100%	9%	91%	0%	0%	100%	9%	91%	98%	98%	94%			
	Mexico	0%	39%	61%	100%	2%	29%	69%	100%	49%	51%	8%	92%	0%	0%	100%	8%	92%	98%	98%	94%			
	Minalin	0%	17%	83%	100%	0%	22%	78%	100%	100%	0%	16%	84%	14%	0%	86%	16%	84%	98%	98%	94%		Yes	
	Porac	40%	54%	7%	100%	10%	69%	21%	100%	30%	70%	22%	78%	0%	13%	87%	22%	78%	98%	98%	94%			
	City of San Fernando	57%	33%	11%	100%	0%	0%	0%	0%	49%	51%	15%	85%	0%	31%	69%	15%	85%	98%	98%	94%			
	San Luis	0%	40%	60%	100%	7%	19%	74%	100%	0%	100%	56%	44%	0%	0%	100%	56%	44%	98%	98%	94%			
	San Simon	0%	71%	29%	100%	8%	13%	78%	100%	100%	0%	24%	76%	30%	0%	70%	24%	76%	98%	98%	94%		Yes	
	Santa Ana	0%	40%	60%	100%	24%	19%	57%	100%	6%	94%	0%	100%	0%	0%	0%	0%	0%	98%	98%	94%	Yes		No pop.
	Santa Rita	0%	0%	100%	100%	8%	52%	40%	100%	16%	84%	23%	77%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Santo Tomas	1%	47%	52%	100%	0%	0%	0%	0%	67%	33%	36%	64%	0%	0%	0%	0%	0%	98%	98%	94%			No pop.
	Sasmuan	0%	39%	61%	100%	3%	22%	75%	100%	0%	100%	46%	54%	0%	0%	100%	46%	54%	98%	98%	94%			
Tarlac	Bamban	0%	85%	15%	100%	9%	40%	51%	100%	25%	75%	15%	85%	0%	0%	100%	15%	85%	100%	100%	100%			
	Capas	0%	67%	33%	100%	0%	66%	34%	100%	100%	0%	31%	69%	28%	0%	72%	31%	69%	100%	100%	100%		Yes	
	Concepcion	54%	38%	8%	100%	1%	75%	23%	100%	96%	4%	27%	73%	0%	0%	100%	27%	73%	100%	100%	100%			
	La Paz	0%	62%	38%	100%	9%	41%	51%	100%	75%	25%	17%	83%	0%	0%	100%	17%	83%	100%	100%	100%			
	Tarlac City	55%	39%	6%	100%	2%	52%	46%	100%	60%	40%	10%	90%	0%	0%	100%	10%	90%	100%	100%	100%			
	Victoria	12%	71%	17%	100%	0%	71%	29%	100%	100%	0%	37%	63%	1%	0%	99%	37%	63%	100%	100%	100%		Yes	
Total		29%	39%	32%	100%	10%	32%	58%	100%	59%	41%	17%	83%	18%	4%	78%	17%	83%						

Bulacan	17%	35%	48%	100%	10%	37%	53%	100%	65%	35%	11%	89%	39%		61%	11%	89%							
Nueva Ecija	38%	38%	24%	100%	15%	15%	71%	100%	55%	45%	15%	85%	26%		74%	15%	85%							
Pampanga	29%	39%	31%	100%	6%	38%	56%	100%	58%	42%	24%	76%	15%		85%	24%	76%							
Tarlac	37%	50%	12%	100%	2%	60%	37%	100%	66%	34%	20%	80%	3%		97%	20%	80%							
Total	29%	39%	32%	100%	10%	32%	58%	100%	59%	41%	17%	83%	22%		78%	17%	83%							

Note: Inside the study area only

Source:

1) JICA Study Team based on PHO for Bulacan, Nueva Ecija, Pampanga and Tarlac,
2) Study on Water Supply, Sewerage and Sanitation Sector/Development Plan (1992-2010) for the Province of Bulacan, Nueva Ecija, Pampanga and Tarlac, 1991-1992.

Annex-T D.2.4.1 Present Sanitation Facilities

Province	City / Municipality	HHs 2008	HH with Sanitary Toilet	HH with Insanitary Toilet	HH without Toilet	Ratio	
						with	without
Bulacan	Angat	12,044	10,716	1,328		89%	11%
	Baliuag	34,430	31,788	2,642		92%	8%
	Bulacan	18,069	16,726	1,343		93%	7%
	Bustos	11,762	11,301	461		96%	4%
	Calumpit	20,454	18,490	1,964		90%	10%
	Doña Remedios Trinidad	4,119	2,156	1,963		52%	48%
	Guiguinto	23,322	21,941	1,381		94%	6%
	Hagonoy	27,155	24,056	3,099		89%	11%
	Malolos City	49,388	44,661	4,727		90%	10%
	Norzagaray	19,380	17,942	1,438		93%	7%
	Pandi	13,928	11,848	2,080		85%	15%
	Paombong	10,651	10,165	486		95%	5%
	Plaridel	24,774	23,877	897		96%	4%
	Pulilan	17,132	15,685	1,447		92%	8%
	San Ildefonso	17,866	15,760	2,106		88%	12%
	San Miguel	28,907	25,727	3,180		89%	11%
	San Rafael	21,898	20,155	1,743		92%	8%
	Santa Maria	41,006	39,378	1,628		96%	4%
Nueva Ecija	Aliaga	9,693	8,239	969	485	85%	15%
	Bongabon	9,020	6,834	1,674	512	76%	24%
	Cabanatuan City	42,151	42,781	0	0	100%	0%
	Cabiao	12,204	10,124	914	1,166	83%	17%
	Carranglan	6,225	3,563	2,162	500	57%	43%
	Gabaldon	5,532	4,148	1,003	381	75%	25%
	Gapan	14,798	13,944	0	854	94%	6%
	Gen Mamerto Natividad	5,473	4,979	391	736	82%	18%
	General Tinio	6,506	5,452	211	843	84%	16%
	Guimba	14,496	12,648	0	1,932	87%	13%
	Jaen	10,678	8,500	1,172	1,005	80%	20%
	Laur	5,180	4,115	1,135	0	78%	22%
	Licab	4,136	3,849	320	0	92%	8%
	Llanera	6,170	5,424	745	0	88%	12%
	Lupao	5,679	4,606	681	392	81%	19%
	Science City of Munoz	11,629	10,595	1,035	0	91%	9%
	Palayan City	7,082	5,984	582	516	84%	16%
	Pantabangan	5,007	3,566	705	736	71%	29%
	Penaranda	4,487	3,910	205	374	87%	13%
	Quezon	5,931	4,627	938	366	78%	22%
	Rizal	9,603	8,180	1,123	300	85%	15%
	San Antonio	10,859	9,275	0	1,584	85%	15%
	San Isidro	6,919	6,170	749	0	89%	11%
	San Jose City	20,777	18,462	0	2,315	89%	11%
	San Leonardo	9,717	7,841	0	1,876	81%	19%
	Santa Rosa	10,244	8,490	774	980	83%	17%
	Santo Domingo	8,451	6,432	2,019	0	76%	24%
	Talavera	18,250	16,327	1,381	542	89%	11%
	Talugtug	3,465	3,294	0	171	95%	5%
	Zaragosa	6,746	5,466	560	726	81%	19%
Pampanga	Angeles City	67,838	46,528			69%	31%
	Apalit	35,509	20,424	959	2,590	85%	15%
	Arayat	21,999	17,384	760	4,824	76%	24%
	Bacolor	6,673	6,318	0	37	99%	1%
	Candaba	22,465	13,454	204	4,312	75%	25%
	Floridablanca	17,834	15,560	140	1,108	93%	7%
	Guagua	22,782	17,948	660	305	95%	5%
	Lubao	29,485	19,244	1,031	5,096	76%	24%
	Mabalacat	35,435	28,591	502	1,246	94%	6%
	Macabebe	14,108	16,037	1,407	2,101	82%	18%
	Magalang	14,228	10,171	287	953	89%	11%
	Masantol	8,434	7,674	760	0	91%	9%
	Mexico	23,743	21,720	0	2,023	91%	9%
	Minalin	8,011	5,707	0	2,159	73%	27%
	Porac	23,180	17,907	15	1,051	94%	6%
	City of San Fernando	49,690	39,563	403	4,664	89%	11%
	San Luis	10,109	5,893	581	1,832	71%	29%
	San Simon	8,302	6,437	0	1,319	83%	17%
	Santa Ana	8,316	7,229	0	1,064	87%	13%
	Santa Rita	9,646	6,886	373	227	92%	8%
	Santo Tomas	8,111	5,588	0	1,150	83%	17%
	Sasmuan	6,791	4,487	187	917	80%	20%
Tarlac	Bamban	10,169	9,158	587	424	90%	10%
	Capas	23,000	17,486	345	5,169	76%	24%
	Concepcion	23,051	16,561	582	5,908	72%	28%
	La Paz	10,653	9,474	0	1,179	89%	11%
	Tarlac City	56,291	52,905	870	2,516	94%	6%
	Victoria	12,417	10,214	0	2,203	82%	18%
Total		1,281,663	1,076,745	66,014	75,669	88%	12%
	Bulacan	396,285	362,372	33,913	0	91%	9%
	Nueva Ecija	297,108	257,825	21,448	19,292	86%	14%
	Pampanga	452,689	340,750	8,269	38,978	88%	12%
	Tarlac	135,581	115,798	2,384	17,399	85%	15%
	Total	1,281,663	1,076,745	66,014	75,669	88%	12%

Note: Inside the study area only
Source: JICA Study Team based on PHO for Bulacan, Nueva Ecija, Pampanga and Tarlac,

Annex-T D.3.2.1(1/12) Project Profiles for Municipal Water Supply, Sanitation and Sewerage

Project Code	MW-G-01	
Project Title	Angat Water Utilization and Aquaduct Improvement Project (AWUAIP) Phase 2	
Status of Project	On-going	
Objective Area	Bulacan Province and Metro Manila	
Implementing Agency	MWSS	
Objectives	Rehabilitation of water conveyance facilities for municipal water supply to address inadequate water supply source	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2010-2013	Estimated by Study Team for 2011-2025
	6,090 of 2009	4,568 as of 2009
EIRR	(N/A)	
Expected Source of Fund	China Loan*	
Expected Implementation Schedule	2010-2013*	

Project Description

- This Project is being considered with the aim of maintaining and optimizing the quantity of raw water delivered daily from Angat Dam via the Ipo Dam-Bicti-La Mesa Portal System to the water treatment plants. The project can mitigate the leakage that occurs on some segments of the existing aquaduct No.5 (AQ-5), which was constructed in 1990 and conveys 2,000MLD of raw water to Metro Manila. The leakage is estimated to be equivalent to about 150MLD.
- This project involves the construction of new aquaduct No.6 and the rehabilitation of existing aquaduct No.5 to secure the raw water supply from Ipo dam to Metro Manila.
- The Phase 2 project includes the followings; 1) L=9.9km aquaduct extension including the rehabilitation of existing AQ-5, and 2) Interconnection works for the six (6) aqueducts and resettlement.

Remarks

- *: Estimated and/or proposed by project proponent
- Bidding among the three (3) nominated Chinese contractors was held on July 7, 2009 and the project was awarded to China International Water & Electric Corp (CWE) having submitted the lowest bid. Contract documentation works is in progress.
- MWSS has just submitted to DOF its loan application for the project proposed to be funded under the preferential buyer's credit facility of the Export-Import Bank of China (China Eximbank), hence activities pertaining to loan application and negotiation is in progress. Once the loan is approved and the loan agreement is signed, then MWSS can now issue the Notice To Proceed to CWE and the construction works is expected to commence by the 1st quarter of this year 2010.
- NEDA, in its letter of August 11, 2009 informed MWSS that the Investment Coordination Committee-Cabinet Committee (ICC=CC) has approved the subject project on August 10, 2009.
- For 2011-2025, 75% of the project cost (4,568Mil. Pesos) is considered.

Source of Information

- MWSS: Summary of Projects & Updates as of 30 September, 2009.
- MWSS: Briefing on the project, available through MWSS web-site.
- Interview by JICA Study Team

Annex-T D.3.2.1(2/12) Project Profiles for Municipal Water Supply, Sanitation and Sewerage

Project Code	MW-P-01	
Project Title	Rehabilitation of Umiray-Macua Facilities	
Status of Project	Proposed	
Objective Area	General Nakar and Bulacan Province	
Implementing Agency	MWSS	
Objectives	Rehabilitation of water intake and conveyance facilities for municipal water supply to address inadequate water supply source	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2010-2011	Estimated by Study Team for 2011-2025
	454 as of 2009	454 as of 2009
EIRR	(N/A)	
Expected Source of Fund	Concessionaries*	
Expected Implementation Schedule	2010 – 2011*	

Project Description
- This project is to ensure the flow of raw water from Umiray River to Angat Reservoir as this contributes 20-30% of the present water supply. On November 29, 2004, typhoon "Winnie" has caused severe damages to our Umiray-Angat Transbasin Tunnel and its facilities resulting to the complete stoppage of operation particularly the conveyance of raw water from the Umiray River to the Angat Reservoir. This damage was recovered by the immediate works.
- This project is for the permanent rehabilitation works which includes the following components;1) Complete restoration of the access road to tunnel outlet, 2) Construction of permanent RCDG Bridge for the tunnel outlet, 3) Widening of oxbow channel at the tunnel outlet, 4) Intake structures such as the various mechanical gates; trash rack, waterway protection works, retaining wall, ogee dam, etc, 5) Rehabilitation of mini-hydro plant, 6) Construction of log arresters, 7) Installation of power/communication cables inside the tunnel, 8) Village/Housing relocation

Remarks
- *: Estimated and/or proposed by project proponent
- Updating of cost estimate for bidding was recently completed.
- Processing of the MOA with the municipality of General Nakar, Quezon, is in progress.
- Implementation including bidding process will be done by MWSS but to be funded by the Concessionaries.

Source of Information
- MWSS: Summary of Projects & Updates as of 30 September, 2009.
- MWSS: Briefing on the project, available through MWSS web-site.
- Interview by JICA Study Team

Project Code	MW-P-02	
Project Title	Sumag River Diversion Project	
Status of Project	Proposed	
Objective Area	General Nakar Province	
Implementing Agency	MWSS	
Objectives	New water resources development for municipal water supply to address inadequate water supply source	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2010-2011	Estimated by Study Team for 2011-2025
	540 as of 2009	540 as of 2009
EIRR	(N/A)	
Expected Source of Fund	Common Purpose Facility (CPF) by Concessionaries*	
Expected Implementation Schedule	2010 – 2011*	

Project Description
- This project is to tap of the Sumag River in General Nakar, Quezon, originally part of the Umiray-Angat transbasin project with a supply volume of 188MLD.
- To maximize the potential water transfer from the Umiray-Angat transbasin project, this project is necessary to be implemented.

Remarks
- *: Estimated and/or proposed by project proponent
- Updating of cost estimate already completed.
- This will be funded by the concessionaires through the Common Purpose Facility (CPF) Framework of the Concession Agreement.

Source of Information
- MWSS: Summary of Projects & Updates as of 30 September, 2009.
- Interview by JICA Study Team

Annex-T D.3.2.1(3/12) Project Profiles for Municipal Water Supply, Sanitation and Sewerage

Project Code	MW-P-03	
Project Title	Bulacan Treated Bulk Water Supply Project	
Status of Project	Proposed	
Objective Area	Bulacan Province	
Implementing Agency	MWSS / Bulacan Government	
Objectives	Development of bulk water supply system to address inadequate water supply source as well as to secure safe drinking water	
Project Cost (Million Pesos)	Estimated by Project Proponent for 2010-2012	Estimated by Study Team for 2011-2025
	5,500 as of 2009	11,935 as of 2009
EIRR	(N/A)	
Expected Source of Fund	Common Purpose Facility (CPF) by Concessionaries*	
Expected Implementation Schedule	2010 – 2012*	

Project Description

- This project will address the water supply requirements of the Province of Bulacan through its water district with a total volume of 230MLD.
- In 2007, MOA between MWSS and provincial government of Bulacan on Bulacan water supply plan was signed. According to this, MWSS would implement the Bulacan bulk water supply project in three phases.
- The project is the first phase of the entire plan, which involves the construction of water supply facilities, including a raw aqueduct, a treatment plant, reservoirs, pumping station and primary lines, to cater to the demand of 10 municipalities/cities in Bulacan.
- The concessionaries will convey the raw water to the proposed water-treatment plant. Bulk water after treatment will then be stored in a reservoir, where it is delivered to the delivery point of each water district of the different municipalities and cities of Bulacan. The water districts, in turn, will distribute the water to Bulacan residents.
-

Remarks

- *: Estimated and/or proposed by project proponent
- MWSS decided to have this project be implemented by Concessionaries under the Common Purpose Facility (CPF) Framework of the Concession Agreement.
- The annualized unit raw water development cost of 8pesos/ m^3 (with discount rate of 10% and lifetime of 50years) is additionally considered for the estimation of the total project cost.
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Source of Information

- MWSS: Summary of Projects & Updates as of 30 September, 2009.
- MWSS: Summary of Projects & Updates as of 15 February, 2009.
- Interview by JICA Study Team
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Annex-T D.3.2.1(4/12) Project Profiles for Municipal Water Supply, Sanitation and Sewerage

Project Code	MW-P-04	
Project Title	Metro Clark Bulk Surface Water Project	
Status of Project	Proposed	
Objective Area	Metro Clark (Angeles City, Mabalacat, Porac in Pampanga Province, Bamban, Concepcion, Capas in Tarlac Province)	
Implementing Agency	Clark Development Corporation (CDC)	
Objectives	Development of bulk water supply system to address inadequate water supply source	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	3,527 as of 2009
EIRR	(N/A)	
Expected Source of Fund	CDC with private sector participation*	
Expected Implementation Schedule	(N/A)	

Project Description

- Water supply project for development of new frontier area in Clark Special Economic Zone, which would provide 20,793m^3/day (7.6MCM/year or 0.26m^3/s) of municipal water, was proposed in the master plan to develop new area in Clark Special Economic Zone. The target year is set at 2035 in the master plan. The estimated project cost is 640Mil. Pesos. The potential sites for water resources development are Marimula, Sacobia and Bangut.
- The proposed project has been upgraded into "Metro Clark Bulk Surface Water Project", as of October 2010, according to CDC. The upgraded project involves the development of sustainable new surface water sources to supply treated bulk water to public and private water providers serving Metro Clark as an alternative/supplement to current groundwater sources and to address current supply gaps and future projected demand. Implementation of the project (design, financing, construction, operation and maintenance) is proposed for private sector participation.

Remarks

- *: Estimated and/or proposed by project proponent
- Feasibility study is on-going under support from International Finance Corporation (IFC), which investigates three potential sites for water resources development; Marimula, Sacobia and Bangut.
- Because the result of the F/S is not available as of October 2010, it is assumed that the projected deficit of sustainable groundwater source in Metro Clark (Angeles City, Mabalacat, Porac in Pampanga Province, Bamban, Concepcion, Capas in Tarlac Province) at 2025 by the present study, which is 0.8m^3/s, be supplied through MetroClark Bulk Surface Water Project.
- It should be noted that it would be necessary to construct storage dams at some of the potential sites for water sources (Marimula, Sacobia and Bangut) in order to provide municipal water of 0.8m^3/s, according to the result of the preliminary water balance by the study team.
- The estimated project cost assumed the same annualized unit cost for water supply system development used in Bulacan Treated Bulk Water Supply Project (Code: MW-P-03), i.e. 6.8pesos/m^3 (with discount rate of 10% and lifetime of 50years) , and the annualized unit raw water development cost of 8pesos/m^3 (with discount rate of 10% and lifetime of 50years).

Source of Information

- CDC: Master Development Plan for 10,684Hectares in the Clark Special Economic Zone, Utilities Requirement Projections, 2008.
- CDC: Metro Clark Bulk Surface Water Project, 2010.

Annex-T D.3.2.1(5/12) Project Profiles for Municipal Water Supply, Sanitation and Sewerage

Project Code	MW-C-01	
Project Title	Additional Level 3,2, 1 Facilities towards 2025 in Bulacan	
Status of Project	Conceptual	
Objective Area	Bulacan Province	
Implementing Agency	LWUA/WDs/ LGUs/Private WSPs	
Objectives	Municipal water supply system development	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	3,839 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description

- To address the issue on the inadequate water supply, the development of new water supply system for all water service level for both urban and rural areas are proposed to meet the growing water demand requirement in Bulacan Province. The new water supply system for level 3 will also include the expansion and rehabilitation of the existing water system in the respective cities and municipalities. In the present study, the strategy for physical targets on the water service level ratios is set as follows; increasing with the past trend and additional consideration to level up the municipalities with low level 3 ratio.
- The estimated additional population to be served toward 2025 is as follows (inside the study area only).
  1)Level 1: 140thousand, 2)Level 2: 0, 3)Level 3: 558thoudand.
- These projects also include the soft components addressing the following countermeasures; 1) Utilization of high technology equipment in development of water system, 2) Carrying out immediate water repairs, provide water meters, and perform periodic maintenance, 3) Strict implementation/enforcement of laws and penalties on pilferage, 4) Efficient system operation and maintenance, 5) Quality checked design and well supervised construction, 6) Strict implementation of well design.

Remarks

- The project cost estimated is only for inside the study area.
- Annual O&M cost for level3 system is estimated at about 10pesos/m^3.

Required Action to Upgrade to a Proposed Project for Implementation

- Updated provincial water supply, sanitation and sewerage sector plan should be prepared.

Source of Information

Project Code	MW-C-02	
Project Title	Additional Level 3,2, 1 Facilities towards 2025 in Pampanga	
Status of Project	Conceptual	
Objective Area	Pampanga Province	
Implementing Agency	LWUA/WDs/ LGUs/Private WSPs	
Objectives	Municipal water supply system development	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	4,914 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description

- To address the issue on the inadequate water supply, the development of new water supply system for all water service level for both urban and rural areas are proposed to meet the growing water demand requirement in Pampanga Province. The new water supply system for level 3 will also include the expansion and rehabilitation of the existing water system in the respective cities and municipalities. In the present study, the strategy for physical targets on the water service level ratios is set as follows; increasing with the past trend and additional consideration to level up the municipalities with low level 3 ratio.
- The estimated additional population to be served toward 2025 is as follows (inside the study area only).
  1)Level 1: 205thousand, 2)Level 2: 3thousand, 3)Level 3: 701thoudand.
- These projects also include the soft components addressing the following countermeasures; 1) Utilization of high technology equipment in development of water system, 2) Carrying out immediate water repairs, provide water meters, and perform periodic maintenance, 3) Strict implementation/enforcement of laws and penalties on pilferage, 4) Efficient system operation and maintenance, 5) Quality checked design and well supervised construction, 6) Strict implementation of well design.

Remarks

- The project cost estimated is only for inside the study area.
- Annual O&M cost for level3 system is estimated at about 10pesos/m^3.

Required Action to Upgrade to a Proposed Project for Implementation

- Updated provincial water supply, sanitation and sewerage sector plan should be prepared.

Source of Information

Annex-T D.3.2.1(6/12) Project Profiles for Municipal Water Supply, Sanitation and Sewerage

Project Code	MW-C-03	
Project Title	Additional Level 3,2, 1 Facilities towards 2025 in Nueva Ecija	
Status of Project	Conceptual	
Objective Area	Nueva Ecija Province	
Implementing Agency	LWUA/WDs/ LGUs/Private WSPs	
Objectives	Municipal water supply system development	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	2,903 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description

- To address the issue on the inadequate water supply, the development of new water supply system for all water service level for both urban and rural areas are proposed to meet the growing water demand requirement in Nueva Ecija Province. The new water supply system for level 3 will also include the expansion and rehabilitation of the existing water system in the respective cities and municipalities. In the present study, the strategy for physical targets on the water service level ratios is set as follows; increasing with the past trend and additional consideration to level up the municipalities with low level 3 ratio.
- The estimated additional population to be served toward 2025 is as follows (inside the study area only).
  1)Level 1: 178thousand, 2)Level 2: 22thousand, 3)Level 3: 415thoudand.
- These projects also include the soft components addressing the following countermeasures; 1) Utilization of high technology equipment in development of water system, 2) Carrying out immediate water repairs, provide water meters, and perform periodic maintenance, 3) Strict implementation/enforcement of laws and penalties on pilferage, 4) Efficient system operation and maintenance, 5) Quality checked design and well supervised construction, 6) Strict implementation of well design.

Remarks

- The project cost estimated is only for inside the study area.
- Annual O&M cost for level3 system is estimated at about 10pesos/m^3.

Required Action to Upgrade to a Proposed Project for Implementation

- Updated provincial water supply, sanitation and sewerage sector plan should be prepared.

Source of Information

Project Code	MW-C-04	
Project Title	Additional Level 3,2, 1 Facilities towards 2025 in Tarlac	
Status of Project	Conceptual	
Objective Area	Tarlac Province	
Implementing Agency	LWUA/WDs/ LGUs/Private WSPs	
Objectives	Municipal water supply system development	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	559 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description

- To address the issue on the inadequate water supply, the development of new water supply system for all water service level for both urban and rural areas are proposed to meet the growing water demand requirement in Tarlac Province. The new water supply system for level 3 will also include the expansion and rehabilitation of the existing water system in the respective cities and municipalities. In the present study, the strategy for physical targets on the water service level ratios is set as follows; increasing with the past trend and additional consideration to level up the municipalities with low level 3 ratio.
- The estimated additional population to be served toward 2025 is as follows (inside the study area only).
  1)Level 1: 72thousand, 2)Level 2: 0, 3)Level 3: 77thoudand.
- These projects also include the soft components addressing the following countermeasures; 1) Utilization of high technology equipment in development of water system, 2) Carrying out immediate water repairs, provide water meters, and perform periodic maintenance, 3) Strict implementation/enforcement of laws and penalties on pilferage, 4) Efficient system operation and maintenance, 5) Quality checked design and well supervised construction, 6) Strict implementation of well design.

Remarks

- The project cost estimated is only for inside the study area.
- Annual O&M cost for level3 system is estimated at about 10pesos/m^3.

Required Action to Upgrade to a Proposed Project for Implementation

- Updated provincial water supply, sanitation and sewerage sector plan should be prepared.

Source of Information

Project Code	MW-C-05	
Project Title	Extended Bulacan Bulk Water Supply Project	
Status of Project	Conceptual	
Objective Area	Bulacan Province	
Implementing Agency	Bulacan Government / (Bulk water supplier has not yet been identified)	
Objectives	Development of bulk water supply system to address inadequate water supply source as well as to secure safe drinking water	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	16,754 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description

- It is expected that the population of Bulacan would reach to 4 million in 2025 with urban population of 3miliion, although half of the population is counted outside the study area. It is roughly estimated that the entire Bulacan could require surface water source with about 6.5m^3/s in total in 2025, by assuming the followings; 1) Estimated all deficit for level 2&3 municipal water use and industrial water use inside the study area would be supplied by surface water source, 2) All water demand for level 2&3 municipal water use and industrial water use outside the study area require surface water source, and 3) Industrial water demand outside the study area is proportional to level 2&3 municipal water demand and the proportional coefficient is 12%, which is same as the estimated one for the entire study area. It is expected that additional 3.8m^3/s (6.5-2.7m^3/s) of surface water source would be necessary to be prepared toward 2025. Considering this situation, in the present study, the conceptual project for Extended Bulacan Bulk Water Supply Project is proposed to emphasize more on preparing necessary surface water source in future.
- The possible surface water sources for Bulacan in future would be almost same for Project for Recovery of Reliability of Water Supply in Angat-Umiray System (Code: IS-C-02) as follows; 1) Bayabas storage dam, 2) Balintingon storage dam and conveyance to AMRIS, 3) Upgrading and improvement of irrigation facilities and water management of AMRIS, 4) Excess water for MWSS from Ipo dam. Among these, option 1) and 3) are conditionally recommended for Project for Recovery of Reliability of Water Supply in Angat-Umiray System (Code: IS-C-02) in the present study. Therefore, the remaining options of 2) and 4) would be possible options for the water source for this project.
- The project includes the water resources development as well as the water supply system development with transmission pipeline and water treatment plant.

Remarks

- The estimated project cost assumed the same annualized unit cost for water supply system development used in Bulacan Treated Bulk Water Supply Project (Code: MW-P-03), i.e. 6.8pesos/m^3 (with discount rate of 10% and lifetime of 50years) , and the annualized unit raw water development cost of 8pesos/ m^3 (with discount rate of 10% and lifetime of 50years).

Required Action to Upgrade to a Proposed Project for Implementation

- Bulk water supplier has not yet been identified. M/P or F/S level study to select the most appropriate water source for bulk water supply would be required. Although the current agreement between two concessioners and MWSS does not include the water supply service in Bulacan province, a revision of MWSS water supply master plan, which considers municipal & industrial water demand of Bulacan, is recommended, in order to optimize the water resources distribution in Metro Manila and Bulacan in future.

Source of Information

Annex-T D.3.2.1(8/12) Project Profiles for Municipal Water Supply, Sanitation and Sewerage

Project Code	MW-C-06	
Project Title	Pampanga Bulk Water Supply Project	
Status of Project	Conceptual	
Objective Area	Pampanga Province	
Implementing Agency	Pampanga Government / (Bulk water supplier has not yet been identified)	
Objectives	Development of bulk water supply system to address inadequate water supply source as well as to secure safe drinking water	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	5,732 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description

- The present study evaluated that the many cities and municipalities in Pampanga province will be at high risk in terms of sustainable groundwater source, based on the water demand and potential balance of groundwater. In these cities and municipalities, the groundwater source would be necessary to be converted to either residual groundwater source at adjacent municipalities/cities or surface water source by 2025. The deficit of sustainable groundwater source is estimated at 2.1m^3/s. The part of the deficit would be supplied through Metro Clark Bulk Surface Water Project (Code: MW-P-04) covering Metro Clark (Angeles City, Mabalacat, Porac in Pampanga Province, Bamban, Concepcion, Capas in Tarlac Province). However, there exist no other plans for supplying surface water source to WDs in Pampanga at this moment. The conceptual project for Pampanga Bulk Water Supply Project is thereby proposed in the present study.
- The possible surface water sources would be as follows; 1) Residual groundwater at surrounding cities/municipalities, 2) Pampanga river at Cong Dadong dam, 3) Gumain storage dam.
- The project includes the water resources development as well as the water supply system development with transmission pipeline and water treatment plant.

Remarks

- It is assumed that 0.8m^3/s be provided through Metro Clark Bulk Surface Water Project (Code: MW-P-04) and the remaining 1.3m^3/s be supplied through Pampanga Bulk Water Supply Project.
- The estimated project cost assumed the same annualized unit cost for water supply system development used in Bulacan Treated Bulk Water Supply Project (Code: MW-P-03), i.e. 6.8pesos/m^3 (with discount rate of 10% and lifetime of 50years) , and the annualized unit raw water development cost of 8pesos/ m^3 (with discount rate of 10% and lifetime of 50years).

Required Action to Upgrade to a Proposed Project for Implementation

- Bulk water supplier has not yet been identified. M/P or F/S level study to select the most appropriate water source for bulk water supply would be required.

Source of Information

Annex-T D.3.2.1(9/12) Project Profiles for Municipal Water Supply, Sanitation and Sewerage

Project Code	MS-C-01	
Project Title	Additional Sanitary Facilities towards 2025 in Bulacan	
Status of Project	Conceptual	
Objective Area	Bulacan Province	
Implementing Agency	LGUs	
Objectives	Development of sanitation facilities to address unsafe water supply	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	3,676 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description
- The 100% provision of sanitary toilet in the entire service area by year 2025 is recommended to achieve the sector goal of 100% safe water. The MDGs had targeted that about 90% of the household in the Central Luzon should be able to access to the safe drinking water by the year 2015. The 2008 sanitary toilet ratio of each city and municipality in the service area is projected to increase by 10% by the year 2015 and to target the 100% sanitary toilet coverage in the service area by year 2025.
- The following two types of sanitary toilet are considered; 1) Conventional toilet, 2) EcoSan toilet.
- The estimated additional number of toilet to be installed toward 2025 is as follows (inside the study area only); 1)Conventional: 140thousand, 2) EcoSan: 11thousand
- The project also include the capacity development of implementing agency addressing the following countermeasures; Social preparation for users.

Remarks
- The project cost estimated is only for inside the study area.

Required Action to Upgrade to a Proposed Project for Implementation
- Updated provincial water supply, sanitation and sewerage sector plan should be prepared.

Source of Information
-

Project Code	MS-C-02	
Project Title	Additional Sanitary Facilities towards 2025 in Pampanga	
Status of Project	Conceptual	
Objective Area	Pampanga Province	
Implementing Agency	LGUs	
Objectives	Development of sanitation facilities to address unsafe water supply	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	4,725 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description
- The 100% provision of sanitary toilet in the entire service area by year 2025 is recommended to achieve the sector goal of 100% safe water. The MDGs had targeted that about 90% of the household in the Central Luzon should be able to access to the safe drinking water by the year 2015. The 2008 sanitary toilet ratio of each city and municipality in the service area is projected to increase by 10% by the year 2015 and to target the 100% sanitary toilet coverage in the service area by year 2025.
- The following two types of sanitary toilet are considered; 1) Conventional toilet, 2) EcoSan toilet.
- The estimated additional number of toilet to be installed toward 2025 is as follows (inside the study area only); 1) Conventional: 151thousand, 2) EcoSan: 40thousand
- The project also include the capacity development of implementing agency addressing the following countermeasures; Social preparation for users.

Remarks
- The project cost estimated is only for inside the study area.

Required Action to Upgrade to a Proposed Project for Implementation
- Updated provincial water supply, sanitation and sewerage sector plan should be prepared.

Source of Information
-

Project Code	MS-C-03	
Project Title	Additional Sanitary Facilities towards 2025 in Nueva Ecija	
Status of Project	Conceptual	
Objective Area	Nueva Ecija Province	
Implementing Agency	LGUs	
Objectives	Development of sanitation facilities to address unsafe water supply	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	3,477 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description
- The 100% provision of sanitary toilet in the entire service area by year 2025 is recommended to achieve the sector goal of 100% safe water. The MDGs had targeted that about 90% of the household in the Central Luzon should be able to access to the safe drinking water by the year 2015. The 2008 sanitary toilet ratio of each city and municipality in the service area is projected to increase by 10% by the year 2015 and to target the 100% sanitary toilet coverage in the service area by year 2025.
- The following two types of sanitary toilet are considered; 1) Conventional toilet, 2) EcoSan toilet.
- The estimated additional number of toilet to be installed toward 2025 is as follows (inside the study area only); 1) Conventional: 112thousand, 2) EcoSan: 29thousand
- The project also include the capacity development of implementing agency addressing the following countermeasures; Social preparation for users.

Remarks
- The project cost estimated is only for inside the study area.

Required Action to Upgrade to a Proposed Project for Implementation
- Updated provincial water supply, sanitation and sewerage sector plan should be prepared.

Source of Information
-

Project Code	MS-C-04	
Project Title	Additional Sanitary Facilities towards 2025 in Tarlac	
Status of Project	Conceptual	
Objective Area	Tarlac Province	
Implementing Agency	LGUs	
Objectives	Development of sanitation facilities to address unsafe water supply	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	968 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description
- The 100% provision of sanitary toilet in the entire service area by year 2025 is recommended to achieve the sector goal of 100% safe water. The MDGs had targeted that about 90% of the household in the Central Luzon should be able to access to the safe drinking water by the year 2015. The 2008 sanitary toilet ratio of each city and municipality in the service area is projected to increase by 10% by the year 2015 and to target the 100% sanitary toilet coverage in the service area by year 2025.
- The following two types of sanitary toilet are considered; 1) Conventional toilet, 2) EcoSan toilet.
- The estimated additional number of toilet to be installed toward 2025 is as follows (inside the study area only); 1) Conventional: 30thousand, 2) EcoSan: 9thousand
- The project also include the capacity development of implementing agency addressing the following countermeasures; Social preparation for users.

Remarks
- The project cost estimated is only for inside the study area.

Required Action to Upgrade to a Proposed Project for Implementation
- Updated provincial water supply, sanitation and sewerage sector plan should be prepared.

Source of Information
-

Project Code	MP-G-01	
Project Title	Cabanatuan Sewerage System	
Status of Project	On-going	
Objective Area	Cabanatuan City	
Implementing Agency	Cabanatuan City	
Objectives	Sewerage system development to reduce pollution load to water body	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	189 as of 2009 (96 as of 2000)	189 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description
- In Cabanatuan City, the sewerage system is designed as combined storm and sewage system with biological STP. The system is designed to serve 33,085 populations by year 2015, about 12% of the projected urban population. Although the sewerage pipelines have been completed, the STP has not yet been completed in the Cabanatuan sewerage system. The STP should be completed as soon as possible.
- The proposed combined sewerage system composed of the followings; 1) drainage / sewer lines, 2) lift stations, 3) waste water treatment plant with capacity of 8,171m^3/day for dry weather flow.
- The proposed biological treatment plant includes anaerobic lagoon and chemical disinfection.

Remarks
- Combined drainage and sewer lines have been started operation.
- Treatment plant has not yet been constructed due to budgetary constraints.

Source of Information
- Cabanatuan City: Water District Development Project, WDDP-USSD, Sewage Treatment Plant (STP) for Cabanatuan City, Design Report, Vol.I, Main Report, 2003.

Project Code	MP-G-02	
Project Title	Expansion of Clark Sewerage System	
Status of Project	Proposed	
Objective Area	Clark Special Economic Zone	
Implementing Agency	Clark Water	
Objectives	Sewerage system development to reduce pollution load to water body	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	456 as of 2009	456 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description
- The sewerage system in Clark is presently serving 80% of the Clark area, about 16,280 population and the non domestic influent of commercial, industrial, government offices and resorts. The current capacity of the STP is 8,023m^3/day. Clark is working on the design for the upgrade of the present WWTP to serve 100% of the Clark Area. There are two stages to be implemented, the first stage with the capacity of 13,500m^3/day will be implemented by June 2010 and the second stage will be implemented on year2012. The plant is designed at 33,000m^3/day for the stage 2 to accommodate the increasing waste water generation in Clark covering the year 2020 design period.

Remarks
- There is no information on the project cost for the phase 2. The total cost is roughly estimated by assuming the unit cost of 0.018mil pesos/m^3, which is derived from the project cost for the phase 1 and the incremental capacity.

Source of Information
-

Annex-T D.3.2.1(12/12) Project Profiles for Municipal Water Supply, Sanitation and Sewerage

Project Code	MP-C-01	
Project Title	Septage Treatment and Disposal Facility	
Status of Project	Conceptual	
Objective Area	Tarlac Province and 10 selected municipalities and cities (Angeles, San Fernando, Malolos, Cabanatuan, Tarlac, Hagonoy, Baliuag, Calumpit, Mabalacat and Guagua)	
Implementing Agency	LWUA/WDs/LGUs/Private WSPs	
Objectives	Improvement of septage treatment and disposal to reduce pollution load to water body	
Project Cost (Million Pesos)	Estimated by Project Proponent	Estimated by Study Team for 2011-2025
	(N/A)	510 as of 2009
EIRR	(N/A)	
Expected Source of Fund	(N/A)	
Expected Implementation Schedule	(N/A)	

Project Description

- The provision of septage treatment and disposal facilities to about 40% of the 2025 urban population of the cities of Angeles, San Fernando, Malolos, Cabanatua , Tarlac, and the municipalities of Hagonoy, Baliuag, Calumpit, Mabalacat and Guagua have been proposed as a conceptual project.
- On the septage treatment and disposal facilities, there is an existing sanitary landfill in Kalangitan, Capas, Tarlac which is being managed by the Clark Waste Management (CWM) and they have the plan to upgrade the facilities to receive treated and untreated septage for the whole Region III as well as the neighboring regions. The sanitary land is designed to cater for 25years projected waste generation of the said service area and the facility is about 100hectares in area. In the present study, it is assumed that this facility will be used for the septage treatment and disposal facilities.
- The capital cost for purchasing truck is considered as the project cost. The O&M cost for collection and tipping fee as well as the transportation cost for the collected septage is also considered for the possible tariff.

Remarks

- The estimated project cost is for initial purchase of trucks for transportation. The lifetime of the trucks would be 7years.
- The estimated annual O&M cost is 2,934pesos/m^3 for septage.

Required Action to Upgrade to a Proposed Project for Implementation

- F/S level study would be required.

Source of Information

-

Annex-T D.3.3.1(1/2) Water Service Level Projection 2008-2025 - Option 1

Province	City / Municipality	2008									2015								
		Urban				Rural				Total	Urban				Rural				Total
		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal	
Bulacan	Angat	13,731	0	0	13,731	11,442	0	23,816	35,259	48,990	16,318	0	0	16,318	13,598	0	28,304	41,902	58,220
	Baliuag	77,641	0	63,041	140,682	0	0	0	0	140,682	92,270	0	74,918	167,188	0	0	0	0	167,188
	Bulacan	1,002	0	0	1,002	7,441	0	3,531	10,972	11,974	1,190	0	0	1,190	8,843	0	4,196	13,040	14,230
	Bustos	7,204	0	0	7,204	10,414	0	9,701	20,115	27,319	8,562	0	0	8,562	12,376	0	11,529	23,904	32,466
	Calumpit	97,676	0	2,989	100,665	0	0	0	0	100,665	116,079	0	3,552	119,631	0	0	0	0	119,631
	Doña Remedios Trinidad	0	0	0	0	17,962	0	1,090	19,052	19,052	0	0	0	0	21,345	0	1,296	22,641	22,641
	Guiguinto	2,262	0	3,809	6,071	0	0	0	0	6,071	2,688	0	4,526	7,214	0	0	0	0	7,214
	Hagonoy	115,663	0	14,046	129,709	0	0	0	0	129,709	137,455	0	16,693	154,148	0	0	0	0	154,148
	Malolos City	106,917	0	122,178	229,095	0	0	0	0	229,095	127,061	0	145,198	272,259	0	0	0	0	272,259
	Norzagaray	31,288	0	0	31,288	31,159	0	28,413	59,572	90,860	37,183	0	0	37,183	37,030	0	33,766	70,796	107,979
	Pandi	1,653	0	61	1,714	0	0	0	0	1,714	1,965	0	72	2,037	0	0	0	0	2,037
	Paombong	10,350	0	0	10,350	38,673	0	5,932	44,605	54,955	12,300	0	0	12,300	45,959	0	7,050	53,009	65,309
	Plaridel	40,916	0	17,048	57,964	0	0	0	0	57,964	48,625	0	20,260	68,885	0	0	0	0	68,885
	Pulilan	3,215	0	84,089	87,304	0	0	0	0	87,304	3,820	0	99,933	103,753	0	0	0	0	103,753
	San Ildefonso	15,077	0	0	15,077	14,483	0	66,403	80,885	95,962	17,917	0	0	17,917	17,211	0	78,914	96,125	114,042
	San Miguel	29,386	0	0	29,386	36,964	0	76,240	113,203	142,589	34,923	0	0	34,923	43,928	0	90,604	134,532	169,455
	San Rafael	9,192	0	0	9,192	13,376	0	65,020	78,396	87,588	10,924	0	0	10,924	15,896	0	77,270	93,166	104,090
	Santa Maria	1,204	0	803	2,007	0	0	0	0	2,007	1,431	0	954	2,385	0	0	0	0	2,385
Nueva Ecija	Aliaga	14,613	0	28,353	42,966	0	0	19,295	19,295	62,261	16,258	0	31,543	47,801	0	0	21,466	21,466	69,267
	Bongabon	3,195	0	0	3,195	7,499	14,145	48,403	70,047	73,242	3,554	0	0	3,554	8,343	15,737	53,849	77,929	81,483
	Cabanatuan City	192,541	43	55,295	247,879	0	12	15,569	15,581	263,460	214,208	48	61,518	275,774	0	14	17,321	17,334	293,108
	Cabiao	12,611	2,562	51,267	66,440	0	145	2,902	3,048	69,488	14,031	2,850	57,037	73,918	0	161	3,229	3,390	77,308
	Carranglan	0	0	14,712	14,712	0	0	16,937	16,937	31,649	0	0	16,367	16,367	0	0	18,844	18,844	35,211
	Gabaldon	0	8,103	4,402	12,505	0	11,377	6,180	17,557	30,062	0	9,015	4,897	13,913	0	12,657	6,875	19,532	33,445
	Gapan	22,512	5,798	40,102	68,412	0	4,040	27,941	31,981	100,393	25,045	6,450	44,615	76,110	0	4,494	31,085	35,580	111,690
	Gen Mamerto Natividad	6,489	30	1,028	7,547	0	753	25,593	26,346	33,893	7,220	34	1,143	8,397	0	837	28,474	29,311	37,708
	General Tinio	13,094	799	6,413	20,307	0	2,095	16,808	18,903	39,210	14,568	889	7,135	22,592	0	2,331	18,699	21,030	43,622
	Guimba	11,718	1	246	11,966	0	276	48,925	49,201	61,167	13,037	2	274	13,312	0	307	54,431	54,738	68,050
	Jaen	13,117	185	8,256	21,557	0	942	42,002	42,944	64,501	14,593	206	9,185	23,983	0	1,048	46,728	47,776	71,759
	Laur	6,925	456	1,583	8,965	0	5,041	17,492	22,533	31,498	7,704	508	1,762	9,974	0	5,609	19,461	25,069	35,043
	Licab	5,237	0	0	5,237	2,152	0	16,668	18,821	24,058	5,827	0	0	5,827	2,394	0	18,544	20,938	26,765
	Llanera	1,522	159	3,838	5,519	0	1,136	27,380	28,516	34,035	1,693	177	4,270	6,140	0	1,264	30,461	31,725	37,865
	Lupao	0	0	2,100	2,100	0	0	31,924	31,924	34,024	0	0	2,336	2,336	0	0	35,517	35,517	37,853
	Science City of Munoz	30,169	0	0	30,169	5,082	6,960	30,616	42,659	72,828	33,564	0	0	33,564	5,654	7,743	34,062	47,460	81,024
	Palayan City	10,984	0	0	10,984	918	2,347	19,799	23,064	34,048	12,220	0	0	12,220	1,022	2,611	22,027	25,659	37,879
	Pantabangan	0	0	0	0	0	21,835	4,098	25,933	25,933	0	0	0	0	0	24,292	4,559	28,851	28,851
	Penaranda	0	0	0	0	19,165	1,034	6,957	27,157	27,157	0	0	0	0	21,322	1,151	7,740	30,213	30,213
	Quezon	0	0	9,161	9,161	0	0	25,377	25,377	34,538	0	0	10,192	10,192	0	0	28,232	28,232	38,424
	Rizal	0	36	6,855	6,891	0	242	46,182	46,423	53,314	0	40	7,626	7,666	0	269	51,378	51,647	59,313
	San Antonio	13,994	295	4,852	19,141	0	2,831	46,565	49,396	68,537	15,569	328	5,397	21,294	0	3,150	51,804	54,955	76,249
	San Isidro	18,159	1,141	26,111	45,410	0	0	0	0	45,410	20,202	1,269	29,049	50,520	0	0	0	0	50,520
	San Jose City	50,374	0	0	50,374	73,958	0	0	73,958	124,332	56,042	0	0	56,042	82,281	0	0	82,281	138,323
	San Leonardo	18,428	5,806	13,318	37,552	0	5,442	12,485	17,927	55,479	20,502	6,459	14,817	41,777	0	6,055	13,890	19,945	61,722
	Santa Rosa	1,637	0	0	1,637	24,786	2,909	30,381	58,075	59,712	1,821	0	0	1,821	27,575	3,236	33,800	64,611	66,432
	Santo Domingo	4,333	242	33,088	37,664	0	81	10,992	11,072	48,736	4,821	270	36,811	41,902	0	90	12,229	12,318	54,220
	Talavera	43,302	0	53,559	96,860	0	0	9,962	9,962	106,822	48,175	0	59,586	107,760	0	0	11,083	11,083	118,843
	Talugtug	1,277	0	0	1,277	609	0	9,213	9,822	11,099	1,420	0	0	1,420	678	0	10,249	10,927	12,347
	Zaragosa	4,241	1,639	12,167	18,047	0	2,727	20,234	22,961	41,008	4,719	1,824	13,535	20,078	0	3,033	22,511	25,544	45,622
Pampanga	Angeles City	267,925	0	52,272	320,197	0	0	0	0	320,197	300,947	0	58,715	359,662	0	0	0	0	359,662
	Apalit	63,225	0	35,836	99,061	0	0	0	0	99,061	71,017	0	40,253	111,270	0	0	0	0	111,270
	Arayat	0	0	20,943	20,943	0	0	99,515	99,515	120,458	0	0	23,524	23,524	0	0	111,780	111,780	135,304
	Bacolor	6,801	271	1,873	8,945	0	2,119	14,632	16,751	25,696	7,639	305	2,104	10,048	0	2,380	16,435	18,815	28,863
	Candaba	11,653	0	0	11,653	5,886	795	80,007	86,688	98,341	13,089	0	0	13,089	6,612	893	89,867	97,372	110,461
	Floridablanca	27,602	0	0	27,602	28,605	0	16,373	44,978	72,580	31,004	0	0	31,004	32,131	0	18,390	50,521	81,525
	Guagua	61,959	549	43,666	106,175	0	0	0	0	106,175	69,597	617	49,049	119,262	0	0	0	0	119,262
	Lubao	30,670	92	22,863	53,626	0	346	85,827	86,173	139,799	34,450	104	25,682	60,236	0	389	96,406	96,794	157,030
	Mabalacat	159,765	0	39,316	199,081	0	0	83	83	199,164	179,456	0	44,162	223,617	0	0	94	94	223,711
	Macabebe	8,264	0	0	8,264	44,550	0	18,794	63,344	71,608	9,283	0	0	9,283	50,040	0	21,110	71,150	80,433
	Magalang	0	0	69,598	69,598	0	0	30,785	30,785	100,383	0	0	78,176	78,176	0	0	34,580	34,580	112,756
	Masantol	0	0	15,840	15,840	0	0	36,069	36,069	51,909	0	0	17,792	17,792	0	0	40,514	40,514	58,306
	Mexico	30,065	0	30,838	60,903	0	0	82,958	82,958	143,861	33,771	0	34,638	68,409	0	0	93,183	93,183	161,592
	Minalin	14,896	0	0	14,896	3,531	0	22,383	25,915	40,811	16,732	0	0	16,732	3,967	0	25,142	29,109	45,841
	Porac	17,834	5,461	35,885	59,180	0	5,966	39,202	45,168	104,348	20,032	6,134	40,308	66,474	0	6,701	44,034	50,735	117,209
	City of San Fernando	131,451	43,044	94,798	269,293	0	1,548	3,409	4,957	274,250	147,653	48,349	106,482	302,484	0	1,739	3,829	5,568	308,052
	San Luis	0	0	26,557	26,557	0	0	21,822	21,822	48,379	0	0	29,831	29,831	0	0	24,511	24,511	54,342
	San Simon	16,584	0	0	16,584	9,608	0	22,728	32,337	48,921	18,628	0	0	18,628	10,793	0	25,530	36,323	54,951
	Santa Ana	3,124	24,304	23,230	50,658	0	0	0	0	50,658	3,509	27,300	26,093	56,902	0	0	0	0	56,902
	Santa Rita	6,152	0	31,237	37,389	0	0	0	0	37,389	6,910	0	35,087	41,997	0	0	0	0	41,997
	Santo Tomas	25,652	0	12,901	38,553	0	0	0	0	38,553	28,813	0	14,491	43,304	0	0	0	0	43,304
	Sasmuan	0	0	6,701	6,701	0	0	20,382	20,382	27,083	0	0	7,527	7,527	0	0	22,894	22,894	30,421
Tarlac	Bamban	7,054	0	21,112	28,166	0	0	8,489	8,489	36,655	7,877	0	23,576	31,453	0	0	9,480	9,480	40,933
	Capas	5,869	0	0	5,869	9,221	0	24,288	33,509	39,378	6,554	0	0	6,554	10,298	0	27,123	37,420	43,974
	Concepcion	43,168	0	1,821	44,989	0	0	92,522	92,522	137,511	48,206	0	2,033	50,240	0	0	103,320	103,320	153,560
	La Paz	8,786	0	2,853	11,639	0	0	50,727	50,727	62,366	9,812	0	3,186	12,998	0	0	56,647	56,647	69,645
	Tarlac City	62,514	0	42,237	104,751	0	0	56,875	56,875	161,627	69,810	0	47,167	116,977	0	0	63,514	63,514	180,491
	Victoria	5,404	0	0	5,404	546	0	37,221	37,767	43,171	6,035	0	0	6,035	610	0	41,565	42,175	48,210
Total		2,081,267	101,018	1,317,146	3,499,431	418,033	97,142	1,782,119	2,297,295	5,796,726	2,368,326	113,177	1,495,076	3,976,579	479,906	108,188	2,011,425	2,599,519	6,576,098
	Bulacan	564,377	0	308,063	872,440	181,914	0	280,146	462,060	1,334,500	670,711	0	366,105	1,036,817	216,187	0	332,928	549,115	1,585,932
	Nueva Ecija	500,472	27,297	376,704	904,473	134,171	86,369	636,881	857,421	1,761,894	556,790	30,369	419,095	1,006,254	149,269	96,087	708,548	953,905	1,960,159
	Pampanga	883,623	73,721	564,355	1,521,699	92,182	10,773	594,970	697,925	2,219,624	992,530	82,807	633,913	1,709,251	103,543	12,101	668,299	783,943	2,493,194
	Tarlac	132,795	0	68,023	200,818	9,767	0	270,122	279,890	480,708	148,294	0	75,962	224,256	10,907	0	301,650	312,557	536,813
	Total	2,081,267	101,018	1,317,146	3,499,431	418,033	97,142	1,782,119	2,297,295	5,796,726	2,368,326	113,177	1,495,076	3,976,579	479,906	108,188	2,011,425	2,599,519	6,576,098

Source: JICA Study Team

Annex-T D.3.3.1(2/2) Water Service Level Projection 2008-2025 - Option 1

Province	City / Municipality	2020									2025								
		Urban				Rural				Total	Urban				Rural				Total
		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal	
Bulacan	Angat	18,172	0	0	18,172	15,143	0	31,519	46,663	64,835	20,008	0	0	20,008	16,673	0	34,704	51,377	71,385
	Baliuag	102,754	0	83,431	186,185	0	0	0	0	186,185	113,134	0	91,859	204,993	0	0	0	0	204,993
	Bulacan	1,326	0	0	1,326	9,848	0	4,673	14,521	15,847	1,460	0	0	1,460	10,843	0	5,145	15,988	17,448
	Bustos	9,534	0	0	9,534	13,782	0	12,839	26,621	36,155	10,498	0	0	10,498	15,175	0	14,136	29,310	39,808
	Calumpit	129,269	0	3,955	133,224	0	0	0	0	133,224	142,327	0	4,355	146,682	0	0	0	0	146,682
	Doña Remedios Trinidad	0	0	0	0	23,771	0	1,443	25,214	25,214	0	0	0	0	26,172	0	1,589	27,761	27,761
	Guiguinto	2,994	0	5,040	8,034	0	0	0	0	8,034	3,297	0	5,549	8,846	0	0	0	0	8,846
	Hagonoy	153,073	0	18,590	171,663	0	0	0	0	171,663	168,536	0	20,468	189,004	0	0	0	0	189,004
	Malolos City	141,499	0	161,695	303,194	0	0	0	0	303,194	155,792	0	178,029	333,821	0	0	0	0	333,821
	Norzagaray	41,408	0	0	41,408	41,237	0	37,603	78,840	120,248	45,591	0	0	45,591	45,403	0	41,402	86,805	132,396
	Pandi	2,188	0	81	2,269	0	0	0	0	2,269	2,409	0	89	2,498	0	0	0	0	2,498
	Paombong	13,698	0	0	13,698	51,182	0	7,851	59,032	72,730	15,082	0	0	15,082	56,352	0	8,644	64,995	80,077
	Plaridel	54,150	0	22,562	76,712	0	0	0	0	76,712	59,620	0	24,841	84,461	0	0	0	0	84,461
	Pulilan	4,255	0	111,287	115,542	0	0	0	0	115,542	4,684	0	122,530	127,214	0	0	0	0	127,214
	San Ildefonso	19,953	0	0	19,953	19,167	0	87,880	107,047	127,000	21,968	0	0	21,968	21,103	0	96,757	117,861	139,829
	San Miguel	38,891	0	0	38,891	48,919	0	100,899	149,818	188,709	42,819	0	0	42,819	53,861	0	111,092	164,953	207,772
	San Rafael	12,165	0	0	12,165	17,702	0	86,050	103,752	115,917	13,394	0	0	13,394	19,491	0	94,743	114,233	127,627
	Santa Maria	1,594	0	1,062	2,656	0	0	0	0	2,656	1,754	0	1,170	2,924	0	0	0	0	2,924
Nueva Ecija	Aliaga	17,353	0	33,668	51,021	0	0	22,912	22,912	73,933	18,332	0	35,568	53,900	0	0	24,206	24,206	78,106
	Bongabon	3,794	0	0	3,794	8,905	16,797	57,477	83,178	86,972	4,008	0	0	4,008	9,408	17,745	60,721	87,873	91,881
	Cabanatuan City	228,636	51	65,661	294,349	0	14	18,487	18,502	312,851	241,540	54	69,367	310,962	0	15	19,531	19,546	330,508
	Cabiao	14,976	3,042	60,878	78,896	0	172	3,447	3,619	82,515	15,821	3,214	64,314	83,349	0	182	3,641	3,823	87,172
	Carranglan	0	0	17,470	17,470	0	0	20,113	20,113	37,583	0	0	18,456	18,456	0	0	21,248	21,248	39,704
	Gabaldon	0	9,622	5,227	14,849	0	13,509	7,338	20,848	35,697	0	10,166	5,522	15,688	0	14,272	7,753	22,024	37,712
	Gapan	26,732	6,885	47,620	81,237	0	4,797	33,179	37,976	119,213	28,241	7,274	50,308	85,822	0	5,068	35,052	40,120	125,942
	Gen Mamerto Natividad	7,706	36	1,220	8,962	0	894	30,391	31,285	40,247	8,141	38	1,289	9,468	0	944	32,107	33,051	42,519
	General Tinio	15,549	949	7,616	24,114	0	2,488	19,958	22,446	46,560	16,427	1,003	8,045	25,475	0	2,628	21,085	23,713	49,188
	Guimba	13,915	2	293	14,209	0	327	58,097	58,424	72,633	14,700	2	309	15,011	0	346	61,376	61,722	76,733
	Jaen	15,575	220	9,803	25,598	0	1,118	49,876	50,994	76,592	16,454	232	10,356	27,043	0	1,181	52,691	53,872	80,915
	Laur	8,223	542	1,880	10,645	0	5,987	20,771	26,758	37,403	8,687	573	1,986	11,246	0	6,324	21,944	28,268	39,514
	Licab	6,219	0	0	6,219	2,556	0	19,793	22,349	28,568	6,570	0	0	6,570	2,700	0	20,910	23,610	30,180
	Llanera	1,807	189	4,557	6,553	0	1,349	32,512	33,862	40,415	1,909	200	4,815	6,923	0	1,426	34,347	35,773	42,696
	Lupao	0	0	2,493	2,493	0	0	37,910	37,910	40,403	0	0	2,634	2,634	0	0	40,049	40,049	42,683
	Science City of Munoz	35,825	0	0	35,825	6,035	8,265	36,356	50,656	86,481	37,847	0	0	37,847	6,376	8,731	38,408	53,515	91,362
	Palayan City	13,043	0	0	13,043	1,090	2,786	23,511	27,388	40,431	13,779	0	0	13,779	1,152	2,944	24,838	28,934	42,713
	Pantabangan	0	0	0	0	0	25,928	4,866	30,794	30,794	0	0	0	0	0	27,391	5,141	32,532	32,532
	Penaranda	0	0	0	0	22,758	1,228	8,261	32,248	32,248	0	0	0	0	24,043	1,298	8,728	34,068	34,068
	Quezon	0	0	10,878	10,878	0	0	30,134	30,134	41,012	0	0	11,492	11,492	0	0	31,835	31,835	43,327
	Rizal	0	43	8,140	8,182	0	287	54,838	55,126	63,308	0	45	8,599	8,644	0	303	57,933	58,237	66,881
	San Antonio	16,617	350	5,761	22,729	0	3,362	55,294	58,656	81,385	17,555	370	6,086	24,012	0	3,552	58,415	61,967	85,979
	San Isidro	21,563	1,355	31,006	53,923	0	0	0	0	53,923	22,780	1,431	32,755	56,966	0	0	0	0	56,966
	San Jose City	59,817	0	0	59,817	87,823	0	0	87,823	147,640	63,193	0	0	63,193	92,780	0	0	92,780	155,973
	San Leonardo	21,883	6,894	15,815	44,592	0	6,463	14,826	21,288	65,880	23,118	7,283	16,707	47,108	0	6,827	15,662	22,490	69,598
	Santa Rosa	1,944	0	0	1,944	29,433	3,454	36,076	68,963	70,907	2,054	0	0	2,054	31,093	3,649	38,112	72,854	74,908
	Santo Domingo	5,145	288	39,291	44,724	0	96	13,052	13,148	57,872	5,436	304	41,508	47,248	0	101	13,789	13,890	61,138
	Talavera	51,420	0	63,599	115,019	0	0	11,829	11,829	126,848	54,322	0	67,189	121,510	0	0	12,497	12,497	134,007
	Talugtug	1,516	0	0	1,516	724	0	10,939	11,663	13,179	1,602	0	0	1,602	765	0	11,557	12,321	13,923
	Zaragosa	5,036	1,947	14,447	21,430	0	3,238	24,027	27,265	48,695	5,321	2,057	15,263	22,640	0	3,420	25,383	28,804	51,444
Pampanga	Angeles City	322,922	0	63,002	385,924	0	0	0	0	385,924	343,232	0	66,965	410,197	0	0	0	0	410,197
	Apalit	76,203	0	43,192	119,395	0	0	0	0	119,395	80,996	0	45,908	126,904	0	0	0	0	126,904
	Arayat	0	0	25,242	25,242	0	0	119,942	119,942	145,184	0	0	26,830	26,830	0	0	127,486	127,486	154,316
	Bacolor	8,197	327	2,258	10,781	0	2,553	17,635	20,189	30,970	8,712	347	2,400	11,460	0	2,714	18,744	21,458	32,918
	Candaba	14,044	0	0	14,044	7,095	958	96,430	104,483	118,527	14,928	0	0	14,928	7,541	1,019	102,495	111,054	125,982
	Floridablanca	33,267	0	0	33,267	34,477	0	19,733	54,211	87,478	35,360	0	0	35,360	36,646	0	20,975	57,620	92,980
	Guagua	74,678	662	52,630	127,970	0	0	0	0	127,970	79,375	703	55,940	136,019	0	0	0	0	136,019
	Lubao	36,966	111	27,557	64,634	0	417	103,445	103,862	168,496	39,291	118	29,290	68,699	0	443	109,952	110,395	179,094
	Mabalacat	192,560	0	47,387	239,947	0	0	100	100	240,047	204,671	0	50,367	255,038	0	0	107	107	255,145
	Macabebe	9,961	0	0	9,961	53,695	0	22,652	76,346	86,307	10,587	0	0	10,587	57,072	0	24,076	81,148	91,735
	Magalang	0	0	83,884	83,884	0	0	37,105	37,105	120,989	0	0	89,160	89,160	0	0	39,439	39,439	128,599
	Masantol	0	0	19,092	19,092	0	0	43,472	43,472	62,564	0	0	20,292	20,292	0	0	46,207	46,207	66,499
	Mexico	36,237	0	37,168	73,404	0	0	99,987	99,987	173,391	38,516	0	39,505	78,021	0	0	106,276	106,276	184,297
	Minalin	17,954	0	0	17,954	4,256	0	26,978	31,234	49,188	19,083	0	0	19,083	4,524	0	28,675	33,199	52,282
	Porac	21,494	6,582	43,251	71,328	0	7,190	47,249	54,439	125,767	22,846	6,996	45,972	75,814	0	7,642	50,221	57,863	133,677
	City of San Fernando	158,435	51,879	114,257	324,571	0	1,866	4,109	5,975	330,546	168,399	55,142	121,443	344,985	0	1,983	4,368	6,351	351,336
	San Luis	0	0	32,009	32,009	0	0	26,301	26,301	58,310	0	0	34,022	34,022	0	0	27,955	27,955	61,977
	San Simon	19,989	0	0	19,989	11,581	0	27,394	38,975	58,964	21,246	0	0	21,246	12,309	0	29,117	41,426	62,672
	Santa Ana	3,766	29,293	27,999	61,057	0	0	0	0	61,057	4,002	31,135	29,759	64,897	0	0	0	0	64,897
	Santa Rita	7,415	0	37,649	45,064	0	0	0	0	45,064	7,881	0	40,017	47,898	0	0	0	0	47,898
	Santo Tomas	30,918	0	15,549	46,467	0	0	0	0	46,467	32,862	0	16,527	49,389	0	0	0	0	49,389
	Sasmuan	0	0	8,077	8,077	0	0	24,566	24,566	32,643	0	0	8,585	8,585	0	0	26,111	26,111	34,696
Tarlac	Bamban	8,422	0	25,207	33,630	0	0	10,136	10,136	43,766	8,920	0	26,699	35,619	0	0	10,736	10,736	46,355
	Capas	7,007	0	0	7,007	11,010	0	28,999	40,009	47,016	7,422	0	0	7,422	11,661	0	30,715	42,376	49,798
	Concepcion	51,541	0	2,174	53,716	0	0	110,469	110,469	164,185	54,591	0	2,303	56,893	0	0	117,005	117,005	173,898
	La Paz	10,491	0	3,407	13,897	0	0	60,567	60,567	74,464	11,111	0	3,608	14,719	0	0	64,150	64,150	78,869
	Tarlac City	74,641	0	50,430	125,071	0	0	67,908	67,908	192,979	79,056	0	53,414	132,470	0	0	71,926	71,926	204,396
	Victoria	6,453	0	0	6,453	652	0	44,442	45,093	51,546	6,834	0	0	6,834	690	0	47,070	47,761	54,595
Total		2,564,775	121,269	1,616,449	4,302,492	522,841	115,544	2,166,649	2,805,034	7,107,526	2,750,133	128,687	1,730,467	4,609,286	563,832	122,149	2,310,971	2,996,952	7,606,238
	Bulacan	746,921	0	407,704	1,154,625	240,752	0	370,757	611,509	1,766,134	822,373	0	448,889	1,271,262	265,073	0	408,210	673,284	1,944,546
	Nueva Ecija	594,294	32,415	447,324	1,074,032	159,324	102,559	756,273	1,018,156	2,092,188	627,836	34,244	472,571	1,134,651	168,316	108,348	798,958	1,075,621	2,210,272
	Pampanga	1,065,005	88,854	680,202	1,834,061	111,104	12,985	717,098	841,187	2,675,248	1,131,989	94,442	722,983	1,949,415	118,092	13,801	762,202	894,094	2,843,509
	Tarlac	158,555	0	81,219	239,773	11,662	0	322,521	334,183	573,956	167,935	0	86,024	253,958	12,352	0	341,601	353,953	607,911
	Total	2,564,775	121,269	1,616,449	4,302,492	522,841	115,544	2,166,649	2,805,034	7,107,526	2,750,133	128,687	1,730,467	4,609,286	563,832	122,149	2,310,971	2,996,952	7,606,238

Source: JICA Study Team

Annex-T D.3.3.2(1/2) Water Service Level Projection 2008-2025 - Option 2

Province	City / Municipality	2008									2015								
		Urban				Rural				Total	Urban				Rural				Total
		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal	
Bulacan	Angat	13,731	0	0	13,731	11,442	0	23,816	35,259	48,990	16,318	0	0	16,318	13,598	0	28,304	41,902	58,220
	Baliuag	77,641	0	63,041	140,682	0	0	0	0	140,682	103,973	0	63,215	167,188	0	0	0	0	167,188
	Bulacan	1,002	0	0	1,002	7,441	0	3,531	10,972	11,974	1,190	0	0	1,190	8,843	0	4,196	13,040	14,230
	Bustos	7,204	0	0	7,204	10,414	0	9,701	20,115	27,319	8,562	0	0	8,562	12,376	0	11,529	23,904	32,466
	Calumpit	97,676	0	2,989	100,665	0	0	0	0	100,665	119,631	0	0	119,631	0	0	0	0	119,631
	Doña Remedios Trinidad	0	0	0	0	17,962	0	1,090	19,052	19,052	0	0	0	0	21,345	0	1,296	22,641	22,641
	Guiguinto	2,262	0	3,809	6,071	0	0	0	0	6,071	3,193	0	4,021	7,214	0	0	0	0	7,214
	Hagonoy	115,663	0	14,046	129,709	0	0	0	0	129,709	148,245	0	5,903	154,148	0	0	0	0	154,148
	Malolos City	106,917	0	122,178	229,095	0	0	0	0	229,095	146,120	0	126,139	272,259	0	0	0	0	272,259
	Norzagaray	31,288	0	0	31,288	31,159	0	28,413	59,572	90,860	37,183	0	0	37,183	37,030	0	33,766	70,796	107,979
	Pandi	1,653	0	61	1,714	0	0	0	0	1,714	2,037	0	0	2,037	0	0	0	0	2,037
	Paombong	10,350	0	0	10,350	38,673	0	5,932	44,605	54,955	12,300	0	0	12,300	45,959	0	7,050	53,009	65,309
	Plaridel	40,916	0	17,048	57,964	0	0	0	0	57,964	53,447	0	15,438	68,885	0	0	0	0	68,885
	Pulilan	3,215	0	84,089	87,304	0	0	0	0	87,304	11,083	0	92,670	103,753	0	0	0	0	103,753
	San Ildefonso	15,077	0	0	15,077	14,483	0	66,403	80,885	95,962	17,917	0	0	17,917	17,211	0	78,914	96,125	114,042
	San Miguel	29,386	0	0	29,386	36,964	0	76,240	113,203	142,589	34,923	0	0	34,923	43,928	0	90,604	134,532	169,455
	San Rafael	9,192	0	0	9,192	13,376	0	65,020	78,396	87,588	10,924	0	0	10,924	15,896	0	77,270	93,166	104,090
	Santa Maria	1,204	0	803	2,007	0	0	0	0	2,007	1,598	0	787	2,385	0	0	0	0	2,385
Nueva Ecija	Aliaga	14,613	0	28,353	42,966	0	0	19,295	19,295	62,261	19,604	0	28,197	47,801	0	0	21,466	21,466	69,267
	Bongabon	3,195	0	0	3,195	7,499	14,145	48,403	70,047	73,242	3,554	0	0	3,554	8,343	15,737	53,849	77,929	81,483
	Cabanatuan City	192,541	43	55,295	247,879	0	12	15,569	15,581	263,460	233,512	0	42,262	275,774	0	14	17,321	17,334	293,108
	Cabiao	12,611	2,562	51,267	66,440	0	145	2,902	3,048	69,488	19,205	0	54,713	73,918	0	161	3,229	3,390	77,308
	Carranglan	0	0	14,712	14,712	0	0	16,937	16,937	31,649	1,146	0	15,222	16,367	0	0	18,844	18,844	35,211
	Gabaldon	0	8,103	4,402	12,505	0	11,377	6,180	17,557	30,062	974	8,042	4,897	13,913	0	12,657	6,875	19,532	33,445
	Gapan	22,512	5,798	40,102	68,412	0	4,040	27,941	31,981	100,393	30,372	1,123	44,615	76,110	0	4,494	31,085	35,580	111,690
	Gen Mamerto Natividad	6,489	30	1,028	7,547	0	753	25,593	26,346	33,893	7,807	0	589	8,397	0	837	28,474	29,311	37,708
	General Tinio	13,094	799	6,413	20,307	0	2,095	16,808	18,903	39,210	16,149	0	6,443	22,592	0	2,331	18,699	21,030	43,622
	Guimba	11,718	1	246	11,966	0	276	48,925	49,201	61,167	13,312	0	0	13,312	0	307	54,431	54,738	68,050
	Jaen	13,117	185	8,256	21,557	0	942	42,002	42,944	64,501	16,271	0	7,712	23,983	0	1,048	46,728	47,776	71,759
	Laur	6,925	456	1,583	8,965	0	5,041	17,492	22,533	31,498	8,402	0	1,571	9,974	0	5,609	19,461	25,069	35,043
	Licab	5,237	0	0	5,237	2,152	0	16,668	18,821	24,058	5,827	0	0	5,827	2,394	0	18,544	20,938	26,765
	Llanera	1,522	159	3,838	5,519	0	1,136	27,380	28,516	34,035	2,123	0	4,017	6,140	0	1,264	30,461	31,725	37,865
	Lupao	0	0	2,100	2,100	0	0	31,924	31,924	34,024	164	0	2,172	2,336	0	0	35,517	35,517	37,853
	Science City of Munoz	30,169	0	0	30,169	5,082	6,960	30,616	42,659	72,828	33,564	0	0	33,564	5,654	7,743	34,062	47,460	81,024
	Palayan City	10,984	0	0	10,984	918	2,347	19,799	23,064	34,048	12,220	0	0	12,220	1,022	2,611	22,027	25,659	37,879
	Pantabangan	0	0	0	0	0	21,835	4,098	25,933	25,933	0	0	0	0	0	24,292	4,559	28,851	28,851
	Penaranda	0	0	0	0	19,165	1,034	6,957	27,157	27,157	0	0	0	0	21,322	1,151	7,740	30,213	30,213
	Quezon	0	0	9,161	9,161	0	0	25,377	25,377	34,538	713	0	9,478	10,192	0	0	28,232	28,232	38,424
	Rizal	0	36	6,855	6,891	0	242	46,182	46,423	53,314	537	0	7,129	7,666	0	269	51,378	51,647	59,313
	San Antonio	13,994	295	4,852	19,141	0	2,831	46,565	49,396	68,537	17,059	0	4,235	21,294	0	3,150	51,804	54,955	76,249
	San Isidro	18,159	1,141	26,111	45,410	0	0	0	0	45,410	23,739	0	26,781	50,520	0	0	0	0	50,520
	San Jose City	50,374	0	0	50,374	73,958	0	0	73,958	124,332	56,042	0	0	56,042	82,281	0	0	82,281	138,323
	San Leonardo	18,428	5,806	13,318	37,552	0	5,442	12,485	17,927	55,479	23,426	3,534	14,817	41,777	0	6,055	13,890	19,945	61,722
	Santa Rosa	1,637	0	0	1,637	24,786	2,909	30,381	58,075	59,712	1,821	0	0	1,821	27,575	3,236	33,800	64,611	66,432
	Santo Domingo	4,333	242	33,088	37,664	0	81	10,992	11,072	48,736	7,754	0	34,148	41,902	0	90	12,229	12,318	54,220
	Talavera	43,302	0	53,559	96,860	0	0	9,962	9,962	106,822	55,718	0	52,042	107,760	0	0	11,083	11,083	118,843
	Talugtug	1,277	0	0	1,277	609	0	9,213	9,822	11,099	1,420	0	0	1,420	678	0	10,249	10,927	12,347
	Zaragosa	4,241	1,639	12,167	18,047	0	2,727	20,234	22,961	41,008	6,124	418	13,535	20,078	0	3,033	22,511	25,544	45,622
Pampanga	Angeles City	267,925	0	52,272	320,197	0	0	0	0	320,197	326,123	0	33,539	359,662	0	0	0	0	359,662
	Apalit	63,225	0	35,836	99,061	0	0	0	0	99,061	78,806	0	32,464	111,270	0	0	0	0	111,270
	Arayat	0	0	20,943	20,943	0	0	99,515	99,515	120,458	1,647	0	21,878	23,524	0	0	111,780	111,780	135,304
	Bacolor	6,801	271	1,873	8,945	0	2,119	14,632	16,751	25,696	8,342	0	1,706	10,048	0	2,380	16,435	18,815	28,863
	Candaba	11,653	0	0	11,653	5,886	795	80,007	86,688	98,341	13,089	0	0	13,089	6,612	893	89,867	97,372	110,461
	Floridablanca	27,602	0	0	27,602	28,605	0	16,373	44,978	72,580	31,004	0	0	31,004	32,131	0	18,390	50,521	81,525
	Guagua	61,959	549	43,666	106,175	0	0	0	0	106,175	77,945	0	41,317	119,262	0	0	0	0	119,262
	Lubao	30,670	92	22,863	53,626	0	346	85,827	86,173	139,799	38,667	0	21,569	60,236	0	389	96,406	96,794	157,030
	Mabalacat	159,765	0	39,316	199,081	0	0	83	83	199,164	195,109	0	28,509	223,617	0	0	94	94	223,711
	Macabebe	8,264	0	0	8,264	44,550	0	18,794	63,344	71,608	9,283	0	0	9,283	50,040	0	21,110	71,150	80,433
	Magalang	0	0	69,598	69,598	0	0	30,785	30,785	100,383	5,472	0	72,704	78,176	0	0	34,580	34,580	112,756
	Masantol	0	0	15,840	15,840	0	0	36,069	36,069	51,909	1,245	0	16,547	17,792	0	0	40,514	40,514	58,306
	Mexico	30,065	0	30,838	60,903	0	0	82,958	82,958	143,861	38,560	0	29,850	68,409	0	0	93,183	93,183	161,592
	Minalin	14,896	0	0	14,896	3,531	0	22,383	25,915	40,811	16,732	0	0	16,732	3,967	0	25,142	29,109	45,841
	Porac	17,834	5,461	35,885	59,180	0	5,966	39,202	45,168	104,348	24,685	1,481	40,308	66,474	0	6,701	44,034	50,735	117,209
	City of San Fernando	131,451	43,044	94,798	269,293	0	1,548	3,409	4,957	274,250	168,827	27,175	106,482	302,484	0	1,739	3,829	5,568	308,052
	San Luis	0	0	26,557	26,557	0	0	21,822	21,822	48,379	2,088	0	27,742	29,831	0	0	24,511	24,511	54,342
	San Simon	16,584	0	0	16,584	9,608	0	22,728	32,337	48,921	18,628	0	0	18,628	10,793	0	25,530	36,323	54,951
	Santa Ana	3,124	24,304	23,230	50,658	0	0	0	0	50,658	7,492	23,316	26,093	56,902	0	0	0	0	56,902
	Santa Rita	6,152	0	31,237	37,389	0	0	0	0	37,389	9,850	0	32,147	41,997	0	0	0	0	41,997
	Santo Tomas	25,652	0	12,901	38,553	0	0	0	0	38,553	31,845	0	11,459	43,304	0	0	0	0	43,304
	Sasmuan	0	0	6,701	6,701	0	0	20,382	20,382	27,083	527	0	7,000	7,527	0	0	22,894	22,894	30,421
Tarlac	Bamban	7,054	0	21,112	28,166	0	0	8,489	8,489	36,655	10,079	0	21,374	31,453	0	0	9,480	9,480	40,933
	Capas	5,869	0	0	5,869	9,221	0	24,288	33,509	39,378	6,554	0	0	6,554	10,298	0	27,123	37,420	43,974
	Concepcion	43,168	0	1,821	44,989	0	0	92,522	92,522	137,511	50,240	0	0	50,240	0	0	103,320	103,320	153,560
	La Paz	8,786	0	2,853	11,639	0	0	50,727	50,727	62,366	10,722	0	2,276	12,998	0	0	56,647	56,647	69,645
	Tarlac City	62,514	0	42,237	104,751	0	0	56,875	56,875	161,627	77,999	0	38,979	116,977	0	0	63,514	63,514	180,491
	Victoria	5,404	0	0	5,404	546	0	37,221	37,767	43,171	6,035	0	0	6,035	610	0	41,565	42,175	48,210
Total		2,081,267	101,018	1,317,146	3,499,431	418,033	97,142	1,782,119	2,297,295	5,796,726	2,614,798	65,089	1,296,691	3,976,579	479,906	108,188	2,011,425	2,599,519	6,576,098
	Bulacan	564,377	0	308,063	872,440	181,914	0	280,146	462,060	1,334,500	728,644	0	308,173	1,036,817	216,187	0	332,928	549,115	1,585,932
	Nueva Ecija	500,472	27,297	376,704	904,473	134,171	86,369	636,881	857,421	1,761,894	618,560	13,117	374,577	1,006,254	149,269	96,087	708,548	953,905	1,960,159
	Pampanga	883,623	73,721	564,355	1,521,699	92,182	10,773	594,970	697,925	2,219,624	1,105,967	51,972	551,312	1,709,251	103,543	12,101	668,299	783,943	2,493,194
	Tarlac	132,795	0	68,023	200,818	9,767	0	270,122	279,890	480,708	161,627	0	62,629	224,256	10,907	0	301,650	312,557	536,813
	Total	2,081,267	101,018	1,317,146	3,499,431	418,033	97,142	1,782,119	2,297,295	5,796,726	2,614,798	65,089	1,296,691	3,976,579	479,906	108,188	2,011,425	2,599,519	6,576,098

Source: JICA Study Team

Annex-T D.3.3.2(2/2) Water Service Level Projection 2008-2025 - Option 2

Province	City / Municipality	2020									2025								
		Urban				Rural				Total	Urban				Rural				Total
		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal	
Bulacan	Angat	18,172	0	0	18,172	15,143	0	31,519	46,663	64,835	20,008	0	0	20,008	16,673	0	34,704	51,377	71,385
	Baliuag	125,096	0	61,089	186,185	0	0	0	0	186,185	147,983	0	57,010	204,993	0	0	0	0	204,993
	Bulacan	1,326	0	0	1,326	9,848	0	4,673	14,521	15,847	1,460	0	0	1,460	10,843	0	5,145	15,988	17,448
	Bustos	9,534	0	0	9,534	13,782	0	12,839	26,621	36,155	10,498	0	0	10,498	15,175	0	14,136	29,310	39,808
	Calumpit	133,224	0	0	133,224	0	0	0	0	133,224	146,682	0	0	146,682	0	0	0	0	146,682
	Doña Remedios Trinidad	0	0	0	0	23,771	0	1,443	25,214	25,214	0	0	0	0	26,172	0	1,589	27,761	27,761
	Guiguinto	3,958	0	4,076	8,034	0	0	0	0	8,034	4,800	0	4,046	8,846	0	0	0	0	8,846
	Hagonoy	171,663	0	0	171,663	0	0	0	0	171,663	189,004	0	0	189,004	0	0	0	0	189,004
	Malolos City	177,882	0	125,312	303,194	0	0	0	0	303,194	212,542	0	121,279	333,821	0	0	0	0	333,821
	Norzagaray	41,408	0	0	41,408	41,237	0	37,603	78,840	120,248	45,591	0	0	45,591	45,403	0	41,402	86,805	132,396
	Pandi	2,269	0	0	2,269	0	0	0	0	2,269	2,498	0	0	2,498	0	0	0	0	2,498
	Paombong	13,698	0	0	13,698	51,182	0	7,851	59,032	72,730	15,082	0	0	15,082	56,352	0	8,644	64,995	80,077
	Plaridel	63,355	0	13,357	76,712	0	0	0	0	76,712	73,978	0	10,483	84,461	0	0	0	0	84,461
	Pulilan	18,120	0	97,422	115,542	0	0	0	0	115,542	26,311	0	100,903	127,214	0	0	0	0	127,214
	San Ildefonso	19,953	0	0	19,953	19,167	0	87,880	107,047	127,000	21,968	0	0	21,968	21,103	0	96,757	117,861	139,829
	San Miguel	38,891	0	0	38,891	48,919	0	100,899	149,818	188,709	42,819	0	0	42,819	53,861	0	111,092	164,953	207,772
	San Rafael	12,165	0	0	12,165	17,702	0	86,050	103,752	115,917	13,394	0	0	13,394	19,491	0	94,743	114,233	127,627
	Santa Maria	1,912	0	744	2,656	0	0	0	0	2,656	2,251	0	673	2,924	0	0	0	0	2,924
Nueva Ecija	Aliaga	23,475	0	27,545	51,021	0	0	22,912	22,912	73,933	27,495	0	26,405	53,900	0	0	24,206	24,206	78,106
	Bongabon	3,794	0	0	3,794	8,905	16,797	57,477	83,178	86,972	4,008	0	0	4,008	9,408	17,745	60,721	87,873	91,881
	Cabanatuan City	263,958	0	30,391	294,349	0	14	18,487	18,502	312,851	294,404	0	16,558	310,962	0	15	19,531	19,546	330,508
	Cabiao	24,443	0	54,453	78,896	0	172	3,447	3,619	82,515	29,990	0	53,359	83,349	0	182	3,641	3,823	87,172
	Carranglan	2,096	0	15,374	17,470	0	0	20,113	20,113	37,583	3,138	0	15,318	18,456	0	0	21,248	21,248	39,704
	Gabaldon	1,782	7,841	5,227	14,849	0	13,509	7,338	20,848	35,697	2,667	7,499	5,522	15,688	0	14,272	7,753	22,024	37,712
	Gapan	36,480	0	44,757	81,237	0	4,797	33,179	37,976	119,213	42,830	0	42,992	85,822	0	5,068	35,052	40,120	125,942
	Gen Mamerto Natividad	8,781	0	181	8,962	0	894	30,391	31,285	40,247	9,468	0	0	9,468	0	944	32,107	33,051	42,519
	General Tinio	18,443	0	5,671	24,114	0	2,488	19,958	22,446	46,560	20,757	0	4,718	25,475	0	2,628	21,085	23,713	49,188
	Guimba	14,209	0	0	14,209	0	327	58,097	58,424	72,633	15,011	0	0	15,011	0	346	61,376	61,722	76,733
	Jaen	18,647	0	6,951	25,598	0	1,118	49,876	50,994	76,592	21,052	0	5,991	27,043	0	1,181	52,691	53,872	80,915
	Laur	9,500	0	1,145	10,645	0	5,987	20,771	26,758	37,403	10,599	0	647	11,246	0	6,324	21,944	28,268	39,514
	Licab	6,219	0	0	6,219	2,556	0	19,793	22,349	28,568	6,570	0	0	6,570	2,700	0	20,910	23,610	30,180
	Llanera	2,593	0	3,960	6,553	0	1,349	32,512	33,862	40,415	3,086	0	3,837	6,923	0	1,426	34,347	35,773	42,696
	Lupao	299	0	2,194	2,493	0	0	37,910	37,910	40,403	448	0	2,186	2,634	0	0	40,049	40,049	42,683
	Science City of Munoz	35,825	0	0	35,825	6,035	8,265	36,356	50,656	86,481	37,847	0	0	37,847	6,376	8,731	38,408	53,515	91,362
	Palayan City	13,043	0	0	13,043	1,090	2,786	23,511	27,388	40,431	13,779	0	0	13,779	1,152	2,944	24,838	28,934	42,713
	Pantabangan	0	0	0	0	0	25,928	4,866	30,794	30,794	0	0	0	0	0	27,391	5,141	32,532	32,532
	Penaranda	0	0	0	0	22,758	1,228	8,261	32,248	32,248	0	0	0	0	24,043	1,298	8,728	34,068	34,068
	Quezon	1,305	0	9,573	10,878	0	0	30,134	30,134	41,012	1,954	0	9,538	11,492	0	0	31,835	31,835	43,327
	Rizal	982	0	7,201	8,182	0	287	54,838	55,126	63,308	1,470	0	7,175	8,644	0	303	57,933	58,237	66,881
	San Antonio	19,345	0	3,384	22,729	0	3,362	55,294	58,656	81,385	21,637	0	2,374	24,012	0	3,552	58,415	61,967	85,979
	San Isidro	28,034	0	25,889	53,923	0	0	0	0	53,923	32,464	0	24,502	56,966	0	0	0	0	56,966
	San Jose City	59,817	0	0	59,817	87,823	0	0	87,823	147,640	63,193	0	0	63,193	92,780	0	0	92,780	155,973
	San Leonardo	27,234	1,543	15,815	44,592	0	6,463	14,826	21,288	65,880	31,126	0	15,982	47,108	0	6,827	15,662	22,490	69,598
	Santa Rosa	1,944	0	0	1,944	29,433	3,454	36,076	68,963	70,907	2,054	0	0	2,054	31,093	3,649	38,112	72,854	74,908
	Santo Domingo	10,512	0	34,212	44,724	0	96	13,052	13,148	57,872	13,468	0	33,780	47,248	0	101	13,789	13,890	61,138
	Talavera	65,222	0	49,797	115,019	0	0	11,829	11,829	126,848	74,979	0	46,532	121,510	0	0	12,497	12,497	134,007
	Talugtug	1,516	0	0	1,516	724	0	10,939	11,663	13,179	1,602	0	0	1,602	765	0	11,557	12,321	13,923
	Zaragosa	7,608	0	13,822	21,430	0	3,238	24,027	27,265	48,695	9,170	0	13,471	22,640	0	3,420	25,383	28,804	51,444
Pampanga	Angeles City	369,233	0	16,691	385,924	0	0	0	0	385,924	410,197	0	0	410,197	0	0	0	0	410,197
	Apalit	90,530	0	28,865	119,395	0	0	0	0	119,395	102,569	0	24,335	126,904	0	0	0	0	126,904
	Arayat	3,029	0	22,213	25,242	0	0	119,942	119,942	145,184	4,561	0	22,269	26,830	0	0	127,486	127,486	154,316
	Bacolor	9,490	0	1,291	10,781	0	2,553	17,635	20,189	30,970	10,660	0	799	11,460	0	2,714	18,744	21,458	32,918
	Candaba	14,044	0	0	14,044	7,095	958	96,430	104,483	118,527	14,928	0	0	14,928	7,541	1,019	102,495	111,054	125,982
	Floridablanca	33,267	0	0	33,267	34,477	0	19,733	54,211	87,478	35,360	0	0	35,360	36,646	0	20,975	57,620	92,980
	Guagua	90,035	0	37,935	127,970	0	0	0	0	127,970	102,498	0	33,521	136,019	0	0	0	0	136,019
	Lubao	44,722	0	19,912	64,634	0	417	103,445	103,862	168,496	50,970	0	17,729	68,699	0	443	109,952	110,395	179,094
	Mabalacat	221,353	0	18,593	239,947	0	0	100	100	240,047	248,028	0	7,011	255,038	0	0	107	107	255,145
	Macabebe	9,961	0	0	9,961	53,695	0	22,652	76,346	86,307	10,587	0	0	10,587	57,072	0	24,076	81,148	91,735
	Magalang	10,066	0	73,818	83,884	0	0	37,105	37,105	120,989	15,157	0	74,003	89,160	0	0	39,439	39,439	128,599
	Masantol	2,291	0	16,801	19,092	0	0	43,472	43,472	62,564	3,450	0	16,843	20,292	0	0	46,207	46,207	66,499
	Mexico	45,045	0	28,359	73,404	0	0	99,987	99,987	173,391	51,780	0	26,242	78,021	0	0	106,276	106,276	184,297
	Minalin	17,954	0	0	17,954	4,256	0	26,978	31,234	49,188	19,083	0	0	19,083	4,524	0	28,675	33,199	52,282
	Porac	30,054	0	41,274	71,328	0	7,190	47,249	54,439	125,767	35,735	0	40,079	75,814	0	7,642	50,221	57,863	133,677
	City of San Fernando	197,383	12,931	114,257	324,571	0	1,866	4,109	5,975	330,546	227,047	0	117,938	344,985	0	1,983	4,368	6,351	351,336
	San Luis	3,841	0	28,168	32,009	0	0	26,301	26,301	58,310	5,784	0	28,238	34,022	0	0	27,955	27,955	61,977
	San Simon	19,989	0	0	19,989	11,581	0	27,394	38,975	58,964	21,246	0	0	21,246	12,309	0	29,117	41,426	62,672
	Santa Ana	11,092	21,966	27,999	61,057	0	0	0	0	61,057	15,035	20,103	29,759	64,897	0	0	0	0	64,897
	Santa Rita	12,823	0	32,241	45,064	0	0	0	0	45,064	16,024	0	31,874	47,898	0	0	0	0	47,898
	Santo Tomas	36,494	0	9,973	46,467	0	0	0	0	46,467	41,258	0	8,131	49,389	0	0	0	0	49,389
	Sasmuan	969	0	7,108	8,077	0	0	24,566	24,566	32,643	1,459	0	7,125	8,585	0	0	26,111	26,111	34,696
Tarlac	Bamban	12,458	0	21,172	33,630	0	0	10,136	10,136	43,766	14,976	0	20,643	35,619	0	0	10,736	10,736	46,355
	Capas	7,007	0	0	7,007	11,010	0	28,999	40,009	47,016	7,422	0	0	7,422	11,661	0	30,715	42,376	49,798
	Concepcion	53,716	0	0	53,716	0	0	110,469	110,469	164,185	56,893	0	0	56,893	0	0	117,005	117,005	173,898
	La Paz	12,158	0	1,739	13,897	0	0	60,567	60,567	74,464	13,614	0	1,106	14,719	0	0	64,150	64,150	78,869
	Tarlac City	89,649	0	35,422	125,071	0	0	67,908	67,908	192,979	101,576	0	30,894	132,470	0	0	71,926	71,926	204,396
	Victoria	6,453	0	0	6,453	652	0	44,442	45,093	51,546	6,834	0	0	6,834	690	0	47,070	47,761	54,595
Total		3,014,841	44,281	1,243,371	4,302,492	522,841	115,544	2,166,649	2,805,034	7,107,526	3,417,864	27,601	1,163,821	4,609,286	563,832	122,149	2,310,971	2,996,952	7,606,238
	Bulacan	852,626	0	302,000	1,154,625	240,752	0	370,757	611,509	1,766,134	976,868	0	294,394	1,271,262	265,073	0	408,210	673,284	1,944,546
	Nueva Ecija	707,108	9,384	357,541	1,074,032	159,324	102,559	756,273	1,018,156	2,092,188	796,264	7,499	330,888	1,134,651	168,316	108,348	798,958	1,075,621	2,210,272
	Pampanga	1,273,667	34,897	525,497	1,834,061	111,104	12,985	717,098	841,187	2,675,248	1,443,416	20,103	485,896	1,949,415	118,092	13,801	762,202	894,094	2,843,509
	Tarlac	181,441	0	58,333	239,773	11,662	0	322,521	334,183	573,956	201,315	0	52,643	253,958	12,352	0	341,601	353,953	607,911
	Total	3,014,841	44,281	1,243,371	4,302,492	522,841	115,544	2,166,649	2,805,034	7,107,526	3,417,864	27,601	1,163,821	4,609,286	563,832	122,149	2,310,971	2,996,952	7,606,238

Source: JICA Study Team

Annex-T D.3.3.3(1/2) Water Service Level Projection 2008-2025 - Option 3

Province	City / Municipality	2008									2015							
		Urban				Rural				Total	Urban				Rural			
		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal
Bulacan	Angat	13,731	0	0	13,731	11,442	0	23,816	35,259	48,990	16,318	0	0	16,318	13,598	0	28,304	41,902
	Baliuag	77,641	0	63,041	140,682	0	0	0	0	140,682	103,973	0	63,215	167,188	0	0	0	0
	Bulacan	1,002	0	0	1,002	7,441	0	3,531	10,972	11,974	1,190	0	0	1,190	8,843	0	4,196	13,040
	Bustos	7,204	0	0	7,204	10,414	0	9,701	20,115	27,319	8,562	0	0	8,562	12,376	0	11,529	23,904
	Calumpit	97,676	0	2,989	100,665	0	0	0	0	100,665	119,631	0	0	119,631	0	0	0	0
	Doña Remedios Trinidad	0	0	0	0	17,962	0	1,090	19,052	19,052	0	0	0	0	21,345	0	1,296	22,641
	Guiguinto	2,262	0	3,809	6,071	0	0	0	0	6,071	3,193	0	4,021	7,214	0	0	0	0
	Hagonoy	115,663	0	14,046	129,709	0	0	0	0	129,709	148,245	0	5,903	154,148	0	0	0	0
	Malolos City	106,917	0	122,178	229,095	0	0	0	0	229,095	146,120	0	126,139	272,259	0	0	0	0
	Norzagaray	31,288	0	0	31,288	31,159	0	28,413	59,572	90,860	37,183	0	0	37,183	37,030	0	33,766	70,796
	Pandi	1,653	0	61	1,714	0	0	0	0	1,714	2,037	0	0	2,037	0	0	0	0
	Paombong	10,350	0	0	10,350	38,673	0	5,932	44,605	54,955	12,300	0	0	12,300	45,959	0	7,050	53,009
	Plaridel	40,916	0	17,048	57,964	0	0	0	0	57,964	53,447	0	15,438	68,885	0	0	0	0
	Pulilan	3,215	0	84,089	87,304	0	0	0	0	87,304	11,083	0	92,670	103,753	0	0	0	0
	San Ildefonso	15,077	0	0	15,077	14,483	0	66,403	80,885	95,962	17,917	0	0	17,917	17,211	0	78,914	96,125
	San Miguel	29,386	0	0	29,386	36,964	0	76,240	113,203	142,589	34,923	0	0	34,923	43,928	0	90,604	134,532
	San Rafael	9,192	0	0	9,192	13,376	0	65,020	78,396	87,588	10,924	0	0	10,924	15,896	0	77,270	93,166
	Santa Maria	1,204	0	803	2,007	0	0	0	0	2,007	1,598	0	787	2,385	0	0	0	0
Nueva Ecija	Aliaga	14,613	0	28,353	42,966	0	0	19,295	19,295	62,261	19,604	0	28,197	47,801	0	0	21,466	21,466
	Bongabon	3,195	0	0	3,195	7,499	14,145	48,403	70,047	73,242	3,554	0	0	3,554	8,343	15,737	53,849	77,929
	Cabanatuan City	192,541	43	55,295	247,879	0	12	15,569	15,581	263,460	233,512	0	42,262	275,774	0	14	17,321	17,334
	Cabiao	12,611	2,562	51,267	66,440	0	145	2,902	3,048	69,488	19,205	0	54,713	73,918	0	161	3,229	3,390
	Carranglan	0	0	14,712	14,712	0	0	16,937	16,937	31,649	1,146	0	15,222	16,367	0	0	18,844	18,844
	Gabaldon	0	8,103	4,402	12,505	0	11,377	6,180	17,557	30,062	974	8,042	4,897	13,913	0	12,657	6,875	19,532
	Gapan	22,512	5,798	40,102	68,412	0	4,040	27,941	31,981	100,393	30,372	1,123	44,615	76,110	0	4,494	31,085	35,580
	Gen Mamerto Natividad	6,489	30	1,028	7,547	0	753	25,593	26,346	33,893	7,807	0	589	8,397	0	837	28,474	29,311
	General Tinio	13,094	799	6,413	20,307	0	2,095	16,808	18,903	39,210	16,149	0	6,443	22,592	0	2,331	18,699	21,030
	Guimba	11,718	1	246	11,966	0	276	48,925	49,201	61,167	13,312	0	0	13,312	0	307	54,431	54,738
	Jaen	13,117	185	8,256	21,557	0	942	42,002	42,944	64,501	16,271	0	7,712	23,983	0	1,048	46,728	47,776
	Laur	6,925	456	1,583	8,965	0	5,041	17,492	22,533	31,498	8,402	0	1,571	9,974	0	5,609	19,461	25,069
	Licab	5,237	0	0	5,237	2,152	0	16,668	18,821	24,058	5,827	0	0	5,827	2,394	0	18,544	20,938
	Llanera	1,522	159	3,838	5,519	0	1,136	27,380	28,516	34,035	2,123	0	4,017	6,140	0	1,264	30,461	31,725
	Lupao	0	0	2,100	2,100	0	0	31,924	31,924	34,024	164	0	2,172	2,336	0	0	35,517	35,517
	Science City of Munoz	30,169	0	0	30,169	5,082	6,960	30,616	42,659	72,828	33,564	0	0	33,564	5,654	7,743	34,062	47,460
	Palayan City	10,984	0	0	10,984	918	2,347	19,799	23,064	34,048	12,220	0	0	12,220	1,022	2,611	22,027	25,659
	Pantabangan	0	0	0	0	0	21,835	4,098	25,933	25,933	0	0	0	0	0	24,292	4,559	28,851
	Penaranda	0	0	0	0	19,165	1,034	6,957	27,157	27,157	0	0	0	0	21,322	1,151	7,740	30,213
	Quezon	0	0	9,161	9,161	0	0	25,377	25,377	34,538	713	0	9,478	10,192	0	0	28,232	28,232
	Rizal	0	36	6,855	6,891	0	242	46,182	46,423	53,314	537	0	7,129	7,666	0	269	51,378	51,647
	San Antonio	13,994	295	4,852	19,141	0	2,831	46,565	49,396	68,537	17,059	0	4,235	21,294	0	3,150	51,804	54,955
	San Isidro	18,159	1,141	26,111	45,410	0	0	0	0	45,410	23,739	0	26,781	50,520	0	0	0	0
	San Jose City	50,374	0	0	50,374	73,958	0	0	73,958	124,332	56,042	0	0	56,042	82,281	0	0	82,281
	San Leonardo	18,428	5,806	13,318	37,552	0	5,442	12,485	17,927	55,479	23,426	3,534	14,817	41,777	0	6,055	13,890	19,945
	Santa Rosa	1,637	0	0	1,637	24,786	2,909	30,381	58,075	59,712	1,821	0	0	1,821	27,575	3,236	33,800	64,611
	Santo Domingo	4,333	242	33,088	37,664	0	81	10,992	11,072	48,736	7,754	0	34,148	41,902	0	90	12,229	12,318
	Talavera	43,302	0	53,559	96,860	0	0	9,962	9,962	106,822	55,718	0	52,042	107,760	0	0	11,083	11,083
	Talugtug	1,277	0	0	1,277	609	0	9,213	9,822	11,099	1,420	0	0	1,420	678	0	10,249	10,927
	Zaragosa	4,241	1,639	12,167	18,047	0	2,727	20,234	22,961	41,008	6,124	418	13,535	20,078	0	3,033	22,511	25,544
Pampanga	Angeles City	267,925	0	52,272	320,197	0	0	0	0	320,197	326,123	0	33,539	359,662	0	0	0	0
	Apalit	63,225	0	35,836	99,061	0	0	0	0	99,061	78,806	0	32,464	111,270	0	0	0	0
	Arayat	0	0	20,943	20,943	0	0	99,515	99,515	120,458	1,647	0	21,878	23,524	0	0	111,780	111,780
	Bacolor	6,801	271	1,873	8,945	0	2,119	14,632	16,751	25,696	8,342	0	1,706	10,048	0	2,380	16,435	18,815
	Candaba	11,653	0	0	11,653	5,886	795	80,007	86,688	98,341	13,089	0	0	13,089	6,612	893	89,867	97,372
	Floridablanca	27,602	0	0	27,602	28,605	0	16,373	44,978	72,580	31,004	0	0	31,004	32,131	0	18,390	50,521
	Guagua	61,959	549	43,666	106,175	0	0	0	0	106,175	77,945	0	41,317	119,262	0	0	0	0
	Lubao	30,670	92	22,863	53,626	0	346	85,827	86,173	139,799	38,667	0	21,569	60,236	0	389	96,406	96,794
	Mabalacat	159,765	0	39,316	199,081	0	0	83	83	199,164	195,109	0	28,509	223,617	0	0	94	94
	Macabebe	8,264	0	0	8,264	44,550	0	18,794	63,344	71,608	9,283	0	0	9,283	50,040	0	21,110	71,150
	Magalang	0	0	69,598	69,598	0	0	30,785	30,785	100,383	5,472	0	72,704	78,176	0	0	34,580	34,580
	Masantol	0	0	15,840	15,840	0	0	36,069	36,069	51,909	1,245	0	16,547	17,792	0	0	40,514	40,514
	Mexico	30,065	0	30,838	60,903	0	0	82,958	82,958	143,861	38,560	0	29,850	68,409	0	0	93,183	93,183
	Minalin	14,896	0	0	14,896	3,531	0	22,383	25,915	40,811	16,732	0	0	16,732	3,967	0	25,142	29,109
	Porac	17,834	5,461	35,885	59,180	0	5,966	39,202	45,168	104,348	24,685	1,481	40,308	66,474	0	6,701	44,034	50,735
	City of San Fernando	131,451	43,044	94,798	269,293	0	1,548	3,409	4,957	274,250	168,827	27,175	106,482	302,484	0	1,739	3,829	5,568
	San Luis	0	0	26,557	26,557	0	0	21,822	21,822	48,379	2,088	0	27,742	29,831	0	0	24,511	24,511
	San Simon	16,584	0	0	16,584	9,608	0	22,728	32,337	48,921	18,628	0	0	18,628	10,793	0	25,530	36,323
	Santa Ana	3,124	24,304	23,230	50,658	0	0	0	0	50,658	7,492	23,316	26,093	56,902	0	0	0	0
	Santa Rita	6,152	0	31,237	37,389	0	0	0	0	37,389	9,850	0	32,147	41,997	0	0	0	0
	Santo Tomas	25,652	0	12,901	38,553	0	0	0	0	38,553	31,845	0	11,459	43,304	0	0	0	0
	Sasmuan	0	0	6,701	6,701	0	0	20,382	20,382	27,083	527	0	7,000	7,527	0	0	22,894	22,894
Tarlac	Bamban	7,054	0	21,112	28,166	0	0	8,489	8,489	36,655	10,079	0	21,374	31,453	0	0	9,480	9,480
	Capas	5,869	0	0	5,869	9,221	0	24,288	33,509	39,378	6,554	0	0	6,554	10,298	0	27,123	37,420
	Concepcion	43,168	0	1,821	44,989	0	0	92,522	92,522	137,511	50,240	0	0	50,240	0	0	103,320	103,320
	La Paz	8,786	0	2,853	11,639	0	0	50,727	50,727	62,366	10,722	0	2,276	12,998	0	0	56,647	56,647
	Tarlac City	62,514	0	42,237	104,751	0	0	56,875	56,875	161,627	77,999	0	38,979	116,977	0	0	63,514	63,514
	Victoria	5,404	0	0	5,404	546	0	37,221	37,767	43,171	6,035	0	0	6,035	610	0	41,565	42,175
Total		2,081,267	101,018	1,317,146	3,499,431	418,033	97,142	1,782,119	2,297,295	5,796,726	2,614,798	65,089	1,296,691	3,976,579	479,906	108,188	2,011,425	2,599,519
	Bulacan	564,377	0	308,063	872,440	181,914	0	280,146	462,060	1,334,500	728,644	0	308,173	1,036,817	216,187	0	332,928	549,115
	Nueva Ecija	500,472	27,297	376,704	904,473	134,171	86,369	636,881	857,421	1,761,894	618,560	13,117	374,577	1,006,254	149,269	96,087	708,548	953,905
	Pampanga	883,623	73,721	564,355	1,521,699	92,182	10,773	594,970	697,925	2,219,624	1,105,967	51,972	551,312	1,709,251	103,543	12,101	668,299	783,943
	Tarlac	132,795	0	68,023	200,818	9,767	0	270,122	279,890	480,708	161,627	0	62,629	224,256	10,907	0	301,650	312,557
	Total	2,081,267	101,018	1,317,146	3,499,431	418,033	97,142	1,782,119	2,297,295	5,796,726	2,614,798	65,089	1,296,691	3,976,579	479,906	108,188	2,011,425	2,599,519

Source: JICA Study Team

Annex-T D.3.3.3(2/2) Water Service Level Projection 2008-2025 - Option 3

Province	City / Municipality	2020									2025								
		Urban				Rural				Total	Urban				Rural				Total
		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal	
Bulacan	Angat	18,172	0	0	18,172	15,143	0	31,519	1	18,173	20,008	0	0	20,008	16,673	0	34,704	51,377	71,385
	Baliuag	127,091	0	59,094	186,185	0	0	0	1	186,186	152,375	0	52,618	204,993	0	0	0	0	204,993
	Bulacan	1,326	0	0	1,326	9,848	0	4,673	1	1,327	1,460	0	0	1,460	10,843	0	5,145	15,988	17,448
	Bustos	9,534	0	0	9,534	13,782	0	12,839	1	9,535	10,498	0	0	10,498	15,175	0	14,136	29,310	39,808
	Calumpit	133,224	0	0	133,224	0	0	0	1	133,225	146,682	0	0	146,682	0	0	0	0	146,682
	Doña Remedios Trinidad	0	0	0	0	23,771	0	1,443	0	0	0	0	0	0	26,172	0	1,589	27,761	27,761
	Guiguinto	4,404	0	3,630	8,034	0	0	0	1	8,035	5,783	0	3,063	8,846	0	0	0	0	8,846
	Hagonoy	171,663	0	0	171,663	0	0	0	1	171,664	189,004	0	0	189,004	0	0	0	0	189,004
	Malolos City	187,588	0	115,606	303,194	0	0	0	1	303,195	233,915	0	99,906	333,821	0	0	0	0	333,821
	Norzagaray	41,408	0	0	41,408	41,237	0	37,603	1	41,409	45,591	0	0	45,591	45,403	0	41,402	86,805	132,396
	Pandi	2,269	0	0	2,269	0	0	0	1	2,270	2,498	0	0	2,498	0	0	0	0	2,498
	Paombong	13,698	0	0	13,698	51,182	0	7,851	1	13,699	15,082	0	0	15,082	56,352	0	8,644	64,995	80,077
	Plaridel	63,355	0	13,357	76,712	0	0	0	1	76,713	73,978	0	10,483	84,461	0	0	0	0	84,461
	Pulilan	34,235	0	81,307	115,542	0	0	0	0	115,542	61,798	0	65,416	127,214	0	0	0	0	127,214
	San Ildefonso	19,953	0	0	19,953	19,167	0	87,880	1	19,954	21,968	0	0	21,968	21,103	0	96,757	117,861	139,829
	San Miguel	38,891	0	0	38,891	48,919	0	100,899	1	38,892	42,819	0	0	42,819	53,861	0	111,092	164,953	207,772
	San Rafael	12,165	0	0	12,165	17,702	0	86,050	1	12,166	13,394	0	0	13,394	19,491	0	94,743	114,233	127,627
	Santa Maria	1,912	0	744	2,656	0	0	0	1	2,657	2,251	0	673	2,924	0	0	0	0	2,924
Nueva Ecija	Aliaga	26,723	0	24,298	51,021	0	0	22,912	1	51,021	34,358	0	19,543	53,900	0	0	24,206	24,206	78,106
	Bongabon	3,794	0	0	3,794	8,905	16,797	57,477	1	3,795	4,008	0	0	4,008	9,408	17,745	60,721	87,873	91,881
	Cabanatuan City	263,958	0	30,391	294,349	0	14	18,487	1	294,350	294,404	0	16,558	310,962	0	15	19,531	19,546	330,508
	Cabiao	32,430	0	46,466	78,896	0	172	3,447	0	78,897	46,865	0	36,483	83,349	0	182	3,641	3,823	87,172
	Carranglan	4,694	0	12,776	17,470	0	0	20,113	0	17,470	8,626	0	9,830	18,456	0	0	21,248	21,248	39,704
	Gabaldon	3,990	5,633	5,227	14,849	0	13,509	7,338	0	14,850	7,332	2,834	5,522	15,688	0	14,272	7,753	22,024	37,712
	Gapan	41,876	0	39,361	81,237	0	4,797	33,179	0	81,237	54,231	0	31,591	85,822	0	5,068	35,052	40,120	125,942
	Gen Mamerto Natividad	8,781	0	181	8,962	0	894	30,391	1	8,963	9,468	0	0	9,468	0	944	32,107	33,051	42,519
	General Tinio	18,443	0	5,671	24,114	0	2,488	19,958	1	24,115	20,757	0	4,718	25,475	0	2,628	21,085	23,713	49,188
	Guimba	14,209	0	0	14,209	0	327	58,097	1	14,210	15,011	0	0	15,011	0	346	61,376	61,722	76,733
	Jaen	18,647	0	6,951	25,598	0	1,118	49,876	1	25,599	21,052	0	5,991	27,043	0	1,181	52,691	53,872	80,915
	Laur	9,500	0	1,145	10,645	0	5,987	20,771	1	10,646	10,599	0	647	11,246	0	6,324	21,944	28,268	39,514
	Licab	6,219	0	0	6,219	2,556	0	19,793	1	6,220	6,570	0	0	6,570	2,700	0	20,910	23,610	30,180
	Llanera	3,116	0	3,437	6,553	0	1,349	32,512	0	6,554	4,190	0	2,733	6,923	0	1,426	34,347	35,773	42,696
	Lupao	670	0	1,823	2,493	0	0	37,910	0	2,494	1,231	0	1,403	2,634	0	0	40,049	40,049	42,683
	Science City of Munoz	35,825	0	0	35,825	6,035	8,265	36,356	1	35,826	37,847	0	0	37,847	6,376	8,731	38,408	53,515	91,362
	Palayan City	13,043	0	0	13,043	1,090	2,786	23,511	1	13,044	13,779	0	0	13,779	1,152	2,944	24,838	28,934	42,713
	Pantabangan	0	0	0	0	0	25,928	4,866	0	0	0	0	0	0	0	27,391	5,141	32,532	32,532
	Penaranda	0	0	0	0	22,758	1,228	8,261	0	0	0	0	0	0	24,043	1,298	8,728	34,068	34,068
	Quezon	2,923	0	7,955	10,878	0	0	30,134	0	10,878	5,371	0	6,121	11,492	0	0	31,835	31,835	43,327
	Rizal	2,199	0	5,984	8,182	0	287	54,838	0	8,183	4,040	0	4,604	8,644	0	303	57,933	58,237	66,881
	San Antonio	19,345	0	3,384	22,729	0	3,362	55,294	1	22,730	21,637	0	2,374	24,012	0	3,552	58,415	61,967	85,979
	San Isidro	30,661	0	23,262	53,923	0	0	0	1	53,924	38,014	0	18,952	56,966	0	0	0	0	56,966
	San Jose City	59,817	0	0	59,817	87,823	0	0	1	59,818	63,193	0	0	63,193	92,780	0	0	92,780	155,973
	San Leonardo	28,393	384	15,815	44,592	0	6,463	14,826	1	44,592	33,576	0	13,532	47,108	0	6,827	15,662	22,490	69,598
	Santa Rosa	1,944	0	0	1,944	29,433	3,454	36,076	1	1,945	2,054	0	0	2,054	31,093	3,649	38,112	72,854	74,908
	Santo Domingo	15,876	0	28,848	44,724	0	96	13,052	0	44,724	24,800	0	22,448	47,248	0	101	13,789	13,890	61,138
	Talavera	69,469	0	45,550	115,019	0	0	11,829	1	115,020	83,951	0	37,559	121,510	0	0	12,497	12,497	134,007
	Talugtug	1,516	0	0	1,516	724	0	10,939	1	1,517	1,602	0	0	1,602	765	0	11,557	12,321	13,923
	Zaragosa	9,535	0	11,895	21,430	0	3,238	24,027	0	21,431	13,242	0	9,398	22,640	0	3,420	25,383	28,804	51,444
Pampanga	Angeles City	369,233	0	16,691	385,924	0	0	0	1	385,925	410,197	0	0	410,197	0	0	0	0	410,197
	Apalit	90,530	0	28,865	119,395	0	0	0	1	119,396	102,569	0	24,335	126,904	0	0	0	0	126,904
	Arayat	6,782	0	18,460	25,242	0	0	119,942	0	25,242	12,539	0	14,290	26,830	0	0	127,486	127,486	154,316
	Bacolor	9,490	0	1,291	10,781	0	2,553	17,635	1	10,782	10,660	0	799	11,460	0	2,714	18,744	21,458	32,918
	Candaba	14,044	0	0	14,044	7,095	958	96,430	1	14,045	14,928	0	0	14,928	7,541	1,019	102,495	111,054	125,982
	Floridablanca	33,267	0	0	33,267	34,477	0	19,733	1	33,268	35,360	0	0	35,360	36,646	0	20,975	57,620	92,980
	Guagua	90,392	0	37,578	127,970	0	0	0	1	127,971	103,259	0	32,760	136,019	0	0	0	0	136,019
	Lubao	45,091	0	19,543	64,634	0	417	103,445	1	64,635	51,754	0	16,946	68,699	0	443	109,952	110,395	179,094
	Mabalacat	221,353	0	18,593	239,947	0	0	100	1	239,948	248,028	0	7,011	255,038	0	0	107	107	255,145
	Macabebe	9,961	0	0	9,961	53,695	0	22,652	1	9,962	10,587	0	0	10,587	57,072	0	24,076	81,148	91,735
	Magalang	22,539	0	61,346	83,884	0	0	37,105	0	83,884	41,671	0	47,489	89,160	0	0	39,439	39,439	128,599
	Masantol	5,130	0	13,962	19,092	0	0	43,472	0	19,092	9,484	0	10,808	20,292	0	0	46,207	46,207	66,499
	Mexico	46,900	0	26,504	73,404	0	0	99,987	1	73,405	55,723	0	22,298	78,021	0	0	106,276	106,276	184,297
	Minalin	17,954	0	0	17,954	4,256	0	26,978	1	17,955	19,083	0	0	19,083	4,524	0	28,675	33,199	52,282
	Porac	35,286	0	36,042	71,328	0	7,190	47,249	0	71,328	46,856	0	28,957	75,814	0	7,642	50,221	57,863	133,677
	City of San Fernando	206,034	4,280	114,257	324,571	0	1,866	4,109	1	324,572	245,436	0	99,549	344,985	0	1,983	4,368	6,351	351,336
	San Luis	8,600	0	23,408	32,009	0	0	26,301	0	32,009	15,901	0	18,121	34,022	0	0	27,955	27,955	61,977
	San Simon	19,989	0	0	19,989	11,581	0	27,394	1	19,990	21,246	0	0	21,246	12,309	0	29,117	41,426	62,672
	Santa Ana	19,229	13,829	27,999	61,057	0	0	0	0	61,057	32,332	2,805	29,759	64,897	0	0	0	0	64,897
	Santa Rita	17,669	0	27,395	45,064	0	0	0	0	45,064	26,327	0	21,571	47,898	0	0	0	0	47,898
	Santo Tomas	36,494	0	9,973	46,467	0	0	0	1	46,468	41,258	0	8,131	49,389	0	0	0	0	49,389
	Sasmuan	2,170	0	5,907	8,077	0	0	24,566	0	8,077	4,012	0	4,572	8,585	0	0	26,111	26,111	34,696
Tarlac	Bamban	15,352	0	18,277	33,630	0	0	10,136	0	33,630	21,108	0	14,511	35,619	0	0	10,736	10,736	46,355
	Capas	7,007	0	0	7,007	11,010	0	28,999	1	7,008	7,422	0	0	7,422	11,661	0	30,715	42,376	49,798
	Concepcion	53,716	0	0	53,716	0	0	110,469	1	53,717	56,893	0	0	56,893	0	0	117,005	117,005	173,898
	La Paz	12,158	0	1,739	13,897	0	0	60,567	1	13,898	13,614	0	1,106	14,719	0	0	64,150	64,150	78,869
	Tarlac City	89,649	0	35,422	125,071	0	0	67,908	1	125,072	101,576	0	30,894	132,470	0	0	71,926	71,926	204,396
	Victoria	6,453	0	0	6,453	652	0	44,442	1	6,454	6,834	0	0	6,834	690	0	47,070	47,761	54,595
Total		3,140,957	24,126	1,137,409	4,302,492	522,841	115,544	2,166,649	1	4,302,545	3,687,571	5,639	916,076	4,609,286	563,832	122,149	2,310,971	2,996,952	7,606,238

	Bulacan	880,888	0	273,737	1,154,625	240,752	0	370,757	1	1,154,626	1,039,104	0	232,159	1,271,262	265,073	0	408,210	673,284	1,944,546
	Nueva Ecija	747,595	6,016	320,421	1,074,032	159,324	102,559	756,273	1	1,074,033	881,809	2,834	250,008	1,134,651	168,316	108,348	798,958	1,075,621	2,210,272
	Pampanga	1,328,139	18,110	487,813	1,834,061	111,104	12,985	717,098	1	1,834,062	1,559,212	2,805	387,397	1,949,415	118,092	13,801	762,202	894,094	2,843,509
	Tarlac	184,335	0	55,438	239,773	11,662	0	322,521	1	239,774	207,447	0	46,511	253,958	12,352	0	341,601	353,953	607,911
	Total	3,140,957	24,126	1,137,409	4,302,492	522,841	115,544	2,166,649	1	4,302,495	3,687,571	5,639	916,076	4,609,286	563,832	122,149	2,310,971	2,996,952	7,606,238

Source: JICA Study Team

Annex-T D.3.3.4(1/2) Water Service Level Projection 2008-2025 - Option 4

Province	City / Municipality	2008									2015								
		Urban				Rural				Total	Urban				Rural				Total
		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal	
Bulacan	Angat	13,731	0	0	13,731	11,442	0	23,816	35,259	48,990	16,318	0	0	16,318	13,598	0	28,304	41,902	58,220
	Baliuag	77,641	0	63,041	140,682	0	0	0	0	140,682	108,988	0	58,200	167,188	0	0	0	0	167,188
	Bulacan	1,002	0	0	1,002	7,441	0	3,531	10,972	11,974	1,190	0	0	1,190	8,843	0	4,196	13,040	14,230
	Bustos	7,204	0	0	7,204	10,414	0	9,701	20,115	27,319	8,562	0	0	8,562	12,376	0	11,529	23,904	32,466
	Calumpit	97,676	0	2,989	100,665	0	0	0	0	100,665	119,631	0	0	119,631	0	0	0	0	119,631
	Doña Remedios Trinidad	0	0	0	0	17,962	0	1,090	19,052	19,052	0	0	0	0	21,345	0	1,296	22,641	22,641
	Guiguinto	2,262	0	3,809	6,071	0	0	0	0	6,071	3,410	0	3,804	7,214	0	0	0	0	7,214
	Hagonoy	115,663	0	14,046	129,709	0	0	0	0	129,709	152,870	0	1,278	154,148	0	0	0	0	154,148
	Malolos City	106,917	0	122,178	229,095	0	0	0	0	229,095	154,287	0	117,972	272,259	0	0	0	0	272,259
	Norzagaray	31,288	0	0	31,288	31,159	0	28,413	59,572	90,860	37,183	0	0	37,183	37,030	0	33,766	70,796	107,979
	Pandi	1,653	0	61	1,714	0	0	0	0	1,714	2,037	0	0	2,037	0	0	0	0	2,037
	Paombong	10,350	0	0	10,350	38,673	0	5,932	44,605	54,955	12,300	0	0	12,300	45,959	0	7,050	53,009	65,309
	Plaridel	40,916	0	17,048	57,964	0	0	0	0	57,964	55,513	0	13,372	68,885	0	0	0	0	68,885
	Pulilan	3,215	0	84,089	87,304	0	0	0	0	87,304	14,196	0	89,557	103,753	0	0	0	0	103,753
	San Ildefonso	15,077	0	0	15,077	14,483	0	66,403	80,885	95,962	17,917	0	0	17,917	17,211	0	78,914	96,125	114,042
	San Miguel	29,386	0	0	29,386	36,964	0	76,240	113,203	142,589	34,923	0	0	34,923	43,928	0	90,604	134,532	169,455
	San Rafael	9,192	0	0	9,192	13,376	0	65,020	78,396	87,588	10,924	0	0	10,924	15,896	0	77,270	93,166	104,090
	Santa Maria	1,204	0	803	2,007	0	0	0	0	2,007	1,670	0	716	2,385	0	0	0	0	2,385
Nueva Ecija	Aliaga	14,613	0	28,353	42,966	0	0	19,295	19,295	62,261	21,038	0	26,763	47,801	0	0	21,466	21,466	69,267
	Bongabon	3,195	0	0	3,195	7,499	14,145	48,403	70,047	73,242	3,554	0	0	3,554	8,343	15,737	53,849	77,929	81,483
	Cabanatuan City	192,541	43	55,295	247,879	0	12	15,569	15,581	263,460	241,785	0	33,989	275,774	0	14	17,321	17,334	293,108
	Cabiao	12,611	2,562	51,267	66,440	0	145	2,902	3,048	69,488	21,422	0	52,495	73,918	0	161	3,229	3,390	77,308
	Carranglan	0	0	14,712	14,712	0	0	16,937	16,937	31,649	1,637	0	14,731	16,367	0	0	18,844	18,844	35,211
	Gabaldon	0	8,103	4,402	12,505	0	11,377	6,180	17,557	30,062	1,391	7,624	4,897	13,913	0	12,657	6,875	19,532	33,445
	Gapan	22,512	5,798	40,102	68,412	0	4,040	27,941	31,981	100,393	32,656	0	43,454	76,110	0	4,494	31,085	35,580	111,690
	Gen Mamerto Natividad	6,489	30	1,028	7,547	0	753	25,593	26,346	33,893	8,059	0	337	8,397	0	837	28,474	29,311	37,708
	General Tinio	13,094	799	6,413	20,307	0	2,095	16,808	18,903	39,210	16,827	0	5,765	22,592	0	2,331	18,699	21,030	43,622
	Guimba	11,718	1	246	11,966	0	276	48,925	49,201	61,167	13,312	0	0	13,312	0	307	54,431	54,738	68,050
	Jaen	13,117	185	8,256	21,557	0	942	42,002	42,944	64,501	16,991	0	6,992	23,983	0	1,048	46,728	47,776	71,759
	Laur	6,925	456	1,583	8,965	0	5,041	17,492	22,533	31,498	8,701	0	1,272	9,974	0	5,609	19,461	25,069	35,043
	Licab	5,237	0	0	5,237	2,152	0	16,668	18,821	24,058	5,827	0	0	5,827	2,394	0	18,544	20,938	26,765
	Llanera	1,522	159	3,838	5,519	0	1,136	27,380	28,516	34,035	2,307	0	3,833	6,140	0	1,264	30,461	31,725	37,865
	Lupao	0	0	2,100	2,100	0	0	31,924	31,924	34,024	234	0	2,102	2,336	0	0	35,517	35,517	37,853
	Science City of Munoz	30,169	0	0	30,169	5,082	6,960	30,616	42,659	72,828	33,564	0	0	33,564	5,654	7,743	34,062	47,460	81,024
	Palayan City	10,984	0	0	10,984	918	2,347	19,799	23,064	34,048	12,220	0	0	12,220	1,022	2,611	22,027	25,659	37,879
	Pantabangan	0	0	0	0	0	21,835	4,098	25,933	25,933	0	0	0	0	0	24,292	4,559	28,851	28,851
	Penaranda	0	0	0	0	19,165	1,034	6,957	27,157	27,157	0	0	0	0	21,322	1,151	7,740	30,213	30,213
	Quezon	0	0	9,161	9,161	0	0	25,377	25,377	34,538	1,019	0	9,172	10,192	0	0	28,232	28,232	38,424
	Rizal	0	36	6,855	6,891	0	242	46,182	46,423	53,314	767	0	6,899	7,666	0	269	51,378	51,647	59,313
	San Antonio	13,994	295	4,852	19,141	0	2,831	46,565	49,396	68,537	17,698	0	3,596	21,294	0	3,150	51,804	54,955	76,249
	San Isidro	18,159	1,141	26,111	45,410	0	0	0	0	45,410	25,254	0	25,266	50,520	0	0	0	0	50,520
	San Jose City	50,374	0	0	50,374	73,958	0	0	73,958	124,332	56,042	0	0	56,042	82,281	0	0	82,281	138,323
	San Leonardo	18,428	5,806	13,318	37,552	0	5,442	12,485	17,927	55,479	24,679	2,281	14,817	41,777	0	6,055	13,890	19,945	61,722
	Santa Rosa	1,637	0	0	1,637	24,786	2,909	30,381	58,075	59,712	1,821	0	0	1,821	27,575	3,236	33,800	64,611	66,432
	Santo Domingo	4,333	242	33,088	37,664	0	81	10,992	11,072	48,736	9,011	0	32,891	41,902	0	90	12,229	12,318	54,220
	Talavera	43,302	0	53,559	96,860	0	0	9,962	9,962	106,822	58,951	0	48,810	107,760	0	0	11,083	11,083	118,843
	Talugtug	1,277	0	0	1,277	609	0	9,213	9,822	11,099	1,420	0	0	1,420	678	0	10,249	10,927	12,347
	Zaragosa	4,241	1,639	12,167	18,047	0	2,727	20,234	22,961	41,008	6,726	0	13,352	20,078	0	3,033	22,511	25,544	45,622
Pampanga	Angeles City	267,925	0	52,272	320,197	0	0	0	0	320,197	336,913	0	22,749	359,662	0	0	0	0	359,662
	Apalit	63,225	0	35,836	99,061	0	0	0	0	99,061	82,144	0	29,126	111,270	0	0	0	0	111,270
	Arayat	0	0	20,943	20,943	0	0	99,515	99,515	120,458	2,352	0	21,172	23,524	0	0	111,780	111,780	135,304
	Bacolor	6,801	271	1,873	8,945	0	2,119	14,632	16,751	25,696	8,644	0	1,404	10,048	0	2,380	16,435	18,815	28,863
	Candaba	11,653	0	0	11,653	5,886	795	80,007	86,688	98,341	13,089	0	0	13,089	6,612	893	89,867	97,372	110,461
	Floridablanca	27,602	0	0	27,602	28,605	0	16,373	44,978	72,580	31,004	0	0	31,004	32,131	0	18,390	50,521	81,525
	Guagua	61,959	549	43,666	106,175	0	0	0	0	106,175	81,523	0	37,739	119,262	0	0	0	0	119,262
	Lubao	30,670	92	22,863	53,626	0	346	85,827	86,173	139,799	40,474	0	19,762	60,236	0	389	96,406	96,794	157,030
	Mabalacat	159,765	0	39,316	199,081	0	0	83	83	199,164	201,817	0	21,800	223,617	0	0	94	94	223,711
	Macabebe	8,264	0	0	8,264	44,550	0	18,794	63,344	71,608	9,283	0	0	9,283	50,040	0	21,110	71,150	80,433
	Magalang	0	0	69,598	69,598	0	0	30,785	30,785	100,383	7,818	0	70,359	78,176	0	0	34,580	34,580	112,756
	Masantol	0	0	15,840	15,840	0	0	36,069	36,069	51,909	1,779	0	16,013	17,792	0	0	40,514	40,514	58,306
	Mexico	30,065	0	30,838	60,903	0	0	82,958	82,958	143,861	40,612	0	27,797	68,409	0	0	93,183	93,183	161,592
	Minalin	14,896	0	0	14,896	3,531	0	22,383	25,915	40,811	16,732	0	0	16,732	3,967	0	25,142	29,109	45,841
	Porac	17,834	5,461	35,885	59,180	0	5,966	39,202	45,168	104,348	26,679	0	39,795	66,474	0	6,701	44,034	50,735	117,209
	City of San Fernando	131,451	43,044	94,798	269,293	0	1,548	3,409	4,957	274,250	177,901	18,101	106,482	302,484	0	1,739	3,829	5,568	308,052
	San Luis	0	0	26,557	26,557	0	0	21,822	21,822	48,379	2,983	0	26,847	29,831	0	0	24,511	24,511	54,342
	San Simon	16,584	0	0	16,584	9,608	0	22,728	32,337	48,921	18,628	0	0	18,628	10,793	0	25,530	36,323	54,951
	Santa Ana	3,124	24,304	23,230	50,658	0	0	0	0	50,658	9,199	21,609	26,093	56,902	0	0	0	0	56,902
	Santa Rita	6,152	0	31,237	37,389	0	0	0	0	37,389	11,110	0	30,887	41,997	0	0	0	0	41,997
	Santo Tomas	25,652	0	12,901	38,553	0	0	0	0	38,553	33,144	0	10,160	43,304	0	0	0	0	43,304
	Sasmuan	0	0	6,701	6,701	0	0	20,382	20,382	27,083	753	0	6,774	7,527	0	0	22,894	22,894	30,421
Tarlac	Bamban	7,054	0	21,112	28,166	0	0	8,489	8,489	36,655	11,022	0	20,430	31,453	0	0	9,480	9,480	40,933
	Capas	5,869	0	0	5,869	9,221	0	24,288	33,509	39,378	6,554	0	0	6,554	10,298	0	27,123	37,420	43,974
	Concepcion	43,168	0	1,821	44,989	0	0	92,522	92,522	137,511	50,240	0	0	50,240	0	0	103,320	103,320	153,560
	La Paz	8,786	0	2,853	11,639	0	0	50,727	50,727	62,366	11,112	0	1,886	12,998	0	0	56,647	56,647	69,645
	Tarlac City	62,514	0	42,237	104,751	0	0	56,875	56,875	161,627	81,508	0	35,469	116,977	0	0	63,514	63,514	180,491
	Victoria	5,404	0	0	5,404	546	0	37,221	37,767	43,171	6,035	0	0	6,035	610	0	41,565	42,175	48,210
Total		2,081,267	101,018	1,317,146	3,499,431	418,033	97,142	1,782,119	2,297,295	5,796,726	2,717,886	49,615	1,209,077	3,976,579	479,906	108,188	2,011,425	2,599,519	6,576,098
	Bulacan	564,377	0	308,063	872,440	181,914	0	280,146	462,060	1,334,500	751,919	0	284,898	1,036,817	216,187	0	332,928	549,115	1,585,932
	Nueva Ecija	500,472	27,297	376,704	904,473	134,171	86,369	636,881	857,421	1,761,894	644,915	9,905	351,434	1,006,254	149,269	96,087	708,548	953,905	1,960,159
	Pampanga	883,623	73,721	564,355	1,521,699	92,182	10,773	594,970	697,925	2,219,624	1,154,582	39,710	514,959	1,709,251	103,543	12,101	668,299	783,943	2,493,194
	Tarlac	132,795	0	68,023	200,818	9,767	0	270,122	279,890	480,708	166,470	0	57,786	224,256	10,907	0	301,650	312,557	536,813
	Total	2,081,267	101,018	1,317,146	3,499,431	418,033	97,142	1,782,119	2,297,295	5,796,726	2,717,886	49,615	1,209,077	3,976,579	479,906	108,188	2,011,425	2,599,519	6,576,098

Source: JICA Study Team

Annex-T D.3.3.4(2/2) Water Service Level Projection 2008-2025 - Option 4

Province	City / Municipality	2020									2025								
		Urban				Rural				Total	Urban				Rural				Total
		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal		Level 3	Level 2	Level 1	SubTotal	Level 3	Level 2	Level 1	SubTotal	
Bulacan	Angat	18,172	0	0	18,172	15,143	0	31,519	46,663	64,835	20,008	0	0	20,008	16,673	0	34,704	51,377	71,385
	Baliuag	153,779	0	32,406	186,185	0	0	0	0	186,185	204,993	0	0	204,993	0	0	0	0	204,993
	Bulacan	1,326	0	0	1,326	9,848	0	4,673	14,521	15,847	1,460	0	0	1,460	10,843	0	5,145	15,988	17,448
	Bustos	9,534	0	0	9,534	13,782	0	12,839	26,621	36,155	10,498	0	0	10,498	15,175	0	14,136	29,310	39,808
	Calumpit	133,224	0	0	133,224	0	0	0	0	133,224	146,682	0	0	146,682	0	0	0	0	146,682
	Doña Remedios Trinidad	0	0	0	0	23,771	0	1,443	25,214	25,214	0	0	0	0	26,172	0	1,589	27,761	27,761
	Guiguinto	5,916	0	2,118	8,034	0	0	0	0	8,034	8,846	0	0	8,846	0	0	0	0	8,846
	Hagonoy	170,951	0	712	171,663	0	0	0	0	171,663	189,004	0	0	189,004	0	0	0	0	189,004
	Malolos City	237,506	0	65,688	303,194	0	0	0	0	303,194	333,821	0	0	333,821	0	0	0	0	333,821
	Norzagaray	41,408	0	0	41,408	41,237	0	37,603	78,840	120,248	45,591	0	0	45,591	45,403	0	41,402	86,805	132,396
	Pandi	2,269	0	0	2,269	0	0	0	0	2,269	2,498	0	0	2,498	0	0	0	0	2,498
	Paombong	13,698	0	0	13,698	51,182	0	7,851	59,032	72,730	15,082	0	0	15,082	56,352	0	8,644	64,995	80,077
	Plaridel	69,267	0	7,445	76,712	0	0	0	0	76,712	84,461	0	0	84,461	0	0	0	0	84,461
	Pulilan	65,675	0	49,867	115,542	0	0	0	0	115,542	127,214	0	0	127,214	0	0	0	0	127,214
	San Ildefonso	19,953	0	0	19,953	19,167	0	87,880	107,047	127,000	21,968	0	0	21,968	21,103	0	96,757	117,861	139,829
	San Miguel	38,891	0	0	38,891	48,919	0	100,899	149,818	188,709	42,819	0	0	42,819	53,861	0	111,092	164,953	207,772
	San Rafael	12,165	0	0	12,165	17,702	0	86,050	103,752	115,917	13,394	0	0	13,394	19,491	0	94,743	114,233	127,627
	Santa Maria	2,258	0	398	2,656	0	0	0	0	2,656	2,924	0	0	2,924	0	0	0	0	2,924
Nueva Ecija	Aliaga	36,738	0	14,283	51,021	0	0	22,912	22,912	73,933	53,900	0	0	53,900	0	0	24,206	24,206	78,106
	Bongabon	3,794	0	0	3,794	8,905	16,797	57,477	83,178	86,972	4,008	0	0	4,008	9,408	17,745	60,721	87,873	91,881
	Cabanatuan City	276,210	0	18,139	294,349	0	14	18,487	18,502	312,851	310,962	0	0	310,962	0	15	19,531	19,546	330,508
	Cabiao	50,881	0	28,015	78,896	0	172	3,447	3,619	82,515	83,349	0	0	83,349	0	182	3,641	3,823	87,172
	Carranglan	9,609	0	7,862	17,470	0	0	20,113	20,113	37,583	18,456	0	0	18,456	0	0	21,248	21,248	39,704
	Gabaldon	8,167	1,455	5,227	14,849	0	13,509	7,338	20,848	35,697	15,688	0	0	15,688	0	14,272	7,753	22,024	37,712
	Gapan	58,046	0	23,191	81,237	0	4,797	33,179	37,976	119,213	85,822	0	0	85,822	0	5,068	35,052	40,120	125,942
	Gen Mamerto Natividad	8,782	0	180	8,962	0	894	30,391	31,285	40,247	9,468	0	0	9,468	0	944	32,107	33,051	42,519
	General Tinio	21,037	0	3,077	24,114	0	2,488	19,958	22,446	46,560	25,475	0	0	25,475	0	2,628	21,085	23,713	49,188
	Guimba	14,209	0	0	14,209	0	327	58,097	58,424	72,633	15,011	0	0	15,011	0	346	61,376	61,722	76,733
	Jaen	21,867	0	3,732	25,598	0	1,118	49,876	50,994	76,592	27,043	0	0	27,043	0	1,181	52,691	53,872	80,915
	Laur	9,966	0	679	10,645	0	5,987	20,771	26,758	37,403	11,246	0	0	11,246	0	6,324	21,944	28,268	39,514
	Licab	6,219	0	0	6,219	2,556	0	19,793	22,349	28,568	6,570	0	0	6,570	2,700	0	20,910	23,610	30,180
	Llanera	4,508	0	2,046	6,553	0	1,349	32,512	33,862	40,415	6,923	0	0	6,923	0	1,426	34,347	35,773	42,696
	Lupao	1,371	0	1,122	2,493	0	0	37,910	37,910	40,403	2,634	0	0	2,634	0	0	40,049	40,049	42,683
	Science City of Munoz	35,825	0	0	35,825	6,035	8,265	36,356	50,656	86,481	37,847	0	0	37,847	6,376	8,731	38,408	53,515	91,362
	Palayan City	13,043	0	0	13,043	1,090	2,786	23,511	27,388	40,431	13,779	0	0	13,779	1,152	2,944	24,838	28,934	42,713
	Pantabangan	0	0	0	0	0	25,928	4,866	30,794	30,794	0	0	0	0	0	27,391	5,141	32,532	32,532
	Penaranda	0	0	0	0	22,758	1,228	8,261	32,248	32,248	0	0	0	0	24,043	1,298	8,728	34,068	34,068
	Quezon	5,983	0	4,895	10,878	0	0	30,134	30,134	41,012	11,492	0	0	11,492	0	0	31,835	31,835	43,327
	Rizal	4,500	0	3,682	8,182	0	287	54,838	55,126	63,308	8,644	0	0	8,644	0	303	57,933	58,237	66,881
	San Antonio	20,810	0	1,919	22,729	0	3,362	55,294	58,656	81,385	24,012	0	0	24,012	0	3,552	58,415	61,967	85,979
	San Isidro	40,439	0	13,484	53,923	0	0	0	0	53,923	56,966	0	0	56,966	0	0	0	0	56,966
	San Jose City	59,817	0	0	59,817	87,823	0	0	87,823	147,640	63,193	0	0	63,193	92,780	0	0	92,780	155,973
	San Leonardo	35,467	0	9,125	44,592	0	6,463	14,826	21,288	65,880	47,108	0	0	47,108	0	6,827	15,662	22,490	69,598
	Santa Rosa	1,944	0	0	1,944	29,433	3,454	36,076	68,963	70,907	2,054	0	0	2,054	31,093	3,649	38,112	72,854	74,908
	Santo Domingo	27,171	0	17,553	44,724	0	96	13,052	13,148	57,872	47,248	0	0	47,248	0	101	13,789	13,890	61,138
	Talavera	88,970	0	26,049	115,019	0	0	11,829	11,829	126,848	121,510	0	0	121,510	0	0	12,497	12,497	134,007
	Talugtug	1,516	0	0	1,516	724	0	10,939	11,663	13,179	1,602	0	0	1,602	765	0	11,557	12,321	13,923
	Zaragosa	14,305	0	7,125	21,430	0	3,238	24,027	27,265	48,695	22,640	0	0	22,640	0	3,420	25,383	28,804	51,444
Pampanga	Angeles City	373,719	0	12,205	385,924	0	0	0	0	385,924	410,197	0	0	410,197	0	0	0	0	410,197
	Apalit	103,769	0	15,626	119,395	0	0	0	0	119,395	126,904	0	0	126,904	0	0	0	0	126,904
	Arayat	13,883	0	11,359	25,242	0	0	119,942	119,942	145,184	26,830	0	0	26,830	0	0	127,486	127,486	154,316
	Bacolor	10,028	0	753	10,781	0	2,553	17,635	20,189	30,970	11,460	0	0	11,460	0	2,714	18,744	21,458	32,918
	Candaba	14,044	0	0	14,044	7,095	958	96,430	104,483	118,527	14,928	0	0	14,928	7,541	1,019	102,495	111,054	125,982
	Floridablanca	33,267	0	0	33,267	34,477	0	19,733	54,211	87,478	35,360	0	0	35,360	36,646	0	20,975	57,620	92,980
	Guagua	107,723	0	20,247	127,970	0	0	0	0	127,970	136,019	0	0	136,019	0	0	0	0	136,019
	Lubao	54,032	0	10,602	64,634	0	417	103,445	103,862	168,496	68,699	0	0	68,699	0	443	109,952	110,395	179,094
	Mabalacat	228,251	0	11,696	239,947	0	0	100	100	240,047	255,038	0	0	255,038	0	0	107	107	255,145
	Macabebe	9,961	0	0	9,961	53,695	0	22,652	76,346	86,307	10,587	0	0	10,587	57,072	0	24,076	81,148	91,735
	Magalang	46,136	0	37,748	83,884	0	0	37,105	37,105	120,989	89,160	0	0	89,160	0	0	39,439	39,439	128,599
	Masantol	10,500	0	8,591	19,092	0	0	43,472	43,472	62,564	20,292	0	0	20,292	0	0	46,207	46,207	66,499
	Mexico	58,491	0	14,914	73,404	0	0	99,987	99,987	173,391	78,021	0	0	78,021	0	0	106,276	106,276	184,297
	Minalin	17,954	0	0	17,954	4,256	0	26,978	31,234	49,188	19,083	0	0	19,083	4,524	0	28,675	33,199	52,282
	Porac	49,977	0	21,350	71,328	0	7,190	47,249	54,439	125,767	75,814	0	0	75,814	0	7,642	50,221	57,863	133,677
	City of San Fernando	257,731	0	66,840	324,571	0	1,866	4,109	5,975	330,546	344,985	0	0	344,985	0	1,983	4,368	6,351	351,336
	San Luis	17,605	0	14,404	32,009	0	0	26,301	26,301	58,310	34,022	0	0	34,022	0	0	27,955	27,955	61,977
	San Simon	19,989	0	0	19,989	11,581	0	27,394	38,975	58,964	21,246	0	0	21,246	12,309	0	29,117	41,426	62,672
	Santa Ana	35,464	0	25,593	61,057	0	0	0	0	61,057	64,897	0	0	64,897	0	0	0	0	64,897
	Santa Rita	28,493	0	16,571	45,064	0	0	0	0	45,064	47,898	0	0	47,898	0	0	0	0	47,898
	Santo Tomas	41,016	0	5,451	46,467	0	0	0	0	46,467	49,389	0	0	49,389	0	0	0	0	49,389
	Sasmuan	4,442	0	3,635	8,077	0	0	24,566	24,566	32,643	8,585	0	0	8,585	0	0	26,111	26,111	34,696
Tarlac	Bamban	22,707	0	10,922	33,630	0	0	10,136	10,136	43,766	35,619	0	0	35,619	0	0	10,736	10,736	46,355
	Capas	7,007	0	0	7,007	11,010	0	28,999	40,009	47,016	7,422	0	0	7,422	11,661	0	30,715	42,376	49,798
	Concepcion	53,716	0	0	53,716	0	0	110,469	110,469	164,185	56,893	0	0	56,893	0	0	117,005	117,005	173,898
	La Paz	12,889	0	1,008	13,897	0	0	60,567	60,567	74,464	14,719	0	0	14,719	0	0	64,150	64,150	78,869
	Tarlac City	106,109	0	18,962	125,071	0	0	67,908	67,908	192,979	132,470	0	0	132,470	0	0	71,926	71,926	204,396
	Victoria	6,453	0	0	6,453	652	0	44,442	45,093	51,546	6,834	0	0	6,834	690	0	47,070	47,761	54,595
Total		3,622,540	1,455	678,496	4,302,492	522,841	115,544	2,166,649	2,805,034	7,107,526	4,609,286	0	0	4,609,286	563,832	122,149	2,310,971	2,996,952	7,606,238
	Bulacan	995,990	0	158,635	1,154,625	240,752	0	370,757	611,509	1,766,134	1,271,262	0	0	1,271,262	265,073	0	408,210	673,284	1,944,546
	Nueva Ecija	881,194	1,455	191,384	1,074,032	159,324	102,559	756,273	1,018,156	2,092,188	1,134,651	0	0	1,134,651	168,316	108,348	798,958	1,075,621	2,210,272
	Pampanga	1,536,476	0	297,586	1,834,061	111,104	12,985	717,098	841,187	2,675,248	1,949,415	0	0	1,949,415	118,092	13,801	762,202	894,094	2,843,509
	Tarlac	208,881	0	30,892	239,773	11,662	0	322,521	334,183	573,956	253,958	0	0	253,958	12,352	0	341,601	353,953	607,911
	Total	3,622,540	1,455	678,496	4,302,492	522,841	115,544	2,166,649	2,805,034	7,107,526	4,609,286	0	0	4,609,286	563,832	122,149	2,310,971	2,996,952	7,606,238

Source: JICA Study Team

Annex-T D.3.3.5 (1/2) Water Service Coverage Ratio 2008 – 2025

Province	City / Municipality	Study Area Water Servie Ratio											
		2008						2015					
		Urban			Rural			Urban			Rural		
		Level 3	Level 2	Level 1	Level 3	Level 2	Level 1	Level 3	Level 2	Level 1	Level 3	Level 2	Level 1
Bulacan	Angat	100%	0%	0%	32%	0%	68%	100%	0%	0%	32%	0%	68%
	Baliuag	55%	0%	45%	0%	0%	0%	62%	0%	38%	0%	0%	0%
	Bulacan	100%	0%	0%	68%	0%	32%	100%	0%	0%	68%	0%	32%
	Bustos	100%	0%	0%	52%	0%	48%	100%	0%	0%	52%	0%	48%
	Calumpit	97%	0%	3%	0%	0%	0%	100%	0%	0%	0%	0%	0%
	Doña Remedios Trinidad	0%	0%	0%	94%	0%	6%	0%	0%	0%	94%	0%	6%
	Guiguinto	37%	0%	63%	0%	0%	0%	44%	0%	56%	0%	0%	0%
	Hagonoy	89%	0%	11%	0%	0%	0%	96%	0%	4%	0%	0%	0%
	Malolos City	47%	0%	53%	0%	0%	0%	54%	0%	46%	0%	0%	0%
	Norzagaray	100%	0%	0%	52%	0%	48%	100%	0%	0%	52%	0%	48%
	Pandi	96%	0%	4%	0%	0%	0%	100%	0%	0%	0%	0%	0%
	Paombong	100%	0%	0%	87%	0%	13%	100%	0%	0%	87%	0%	13%
	Plaridel	71%	0%	29%	0%	0%	0%	78%	0%	22%	0%	0%	0%
	Pulilan	4%	0%	96%	0%	0%	0%	11%	0%	89%	0%	0%	0%
	San Ildefonso	100%	0%	0%	18%	0%	82%	100%	0%	0%	18%	0%	82%
	San Miguel	100%	0%	0%	33%	0%	67%	100%	0%	0%	33%	0%	67%
	San Rafael	100%	0%	0%	17%	0%	83%	100%	0%	0%	17%	0%	83%
	Santa Maria	60%	0%	40%	0%	0%	0%	67%	0%	33%	0%	0%	0%
Nueva Ecija	Aliaga	34%	0%	66%	0%	0%	100%	41%	0%	59%	0%	0%	100%
	Bongabon	100%	0%	0%	11%	20%	69%	100%	0%	0%	11%	20%	69%
	Cabanatuan City	78%	0%	22%	0%	0%	100%	85%	0%	15%	0%	0%	100%
	Cabiao	19%	4%	77%	0%	5%	95%	26%	0%	74%	0%	5%	95%
	Carranglan	0%	0%	100%	0%	0%	100%	7%	0%	93%	0%	0%	100%
	Gabaldon	0%	65%	35%	0%	65%	35%	7%	58%	35%	0%	65%	35%
	Gapan	33%	8%	59%	0%	13%	87%	40%	1%	59%	0%	13%	87%
	Gen Mamerto Natividad	86%	0%	14%	0%	3%	97%	93%	0%	7%	0%	3%	97%
	General Tinio	64%	4%	32%	0%	11%	89%	71%	0%	29%	0%	11%	89%
	Guimba	98%	0%	2%	0%	1%	99%	100%	0%	0%	0%	1%	99%
	Jaen	61%	1%	38%	0%	2%	98%	68%	0%	32%	0%	2%	98%
	Laur	77%	5%	18%	0%	22%	78%	84%	0%	16%	0%	22%	78%
	Licab	100%	0%	0%	11%	0%	89%	100%	0%	0%	11%	0%	89%
	Llanera	28%	3%	70%	0%	4%	96%	35%	0%	65%	0%	4%	96%
	Lupao	0%	0%	100%	0%	0%	100%	7%	0%	93%	0%	0%	100%
	Science City of Munoz	100%	0%	0%	12%	16%	72%	100%	0%	0%	12%	16%	72%
	Palayan City	100%	0%	0%	4%	10%	86%	100%	0%	0%	4%	10%	86%
	Pantabangan	0%	0%	0%	0%	84%	16%	0%	0%	0%	0%	84%	16%
	Penaranda	0%	0%	0%	71%	4%	26%	0%	0%	0%	71%	4%	26%
	Quezon	0%	0%	100%	0%	0%	100%	7%	0%	93%	0%	0%	100%
	Rizal	0%	1%	99%	0%	1%	99%	7%	0%	93%	0%	1%	99%
	San Antonio	73%	2%	25%	0%	6%	94%	80%	0%	20%	0%	6%	94%
	San Isidro	40%	3%	57%	0%	0%	0%	47%	0%	53%	0%	0%	0%
	San Jose City	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%
	San Leonardo	49%	15%	35%	0%	30%	70%	56%	8%	35%	0%	30%	70%
	Santa Rosa	100%	0%	0%	43%	5%	52%	100%	0%	0%	43%	5%	52%
	Santo Domingo	12%	1%	88%	0%	1%	99%	19%	0%	81%	0%	1%	99%
	Talavera	45%	0%	55%	0%	0%	100%	52%	0%	48%	0%	0%	100%
	Talugtug	100%	0%	0%	6%	0%	94%	100%	0%	0%	6%	0%	94%
	Zaragosa	24%	9%	67%	0%	12%	88%	31%	2%	67%	0%	12%	88%
Pampanga	Angeles City	84%	0%	16%	0%	0%	0%	91%	0%	9%	0%	0%	0%
	Apalit	64%	0%	36%	0%	0%	0%	71%	0%	29%	0%	0%	0%
	Arayat	0%	0%	100%	0%	0%	100%	7%	0%	93%	0%	0%	100%
	Bacolor	76%	3%	21%	0%	13%	87%	83%	0%	17%	0%	13%	87%
	Candaba	100%	0%	0%	7%	1%	92%	100%	0%	0%	7%	1%	92%
	Floridablanca	100%	0%	0%	64%	0%	36%	100%	0%	0%	64%	0%	36%
	Guagua	58%	1%	41%	0%	0%	0%	65%	0%	35%	0%	0%	0%
	Lubao	57%	0%	43%	0%	0%	100%	64%	0%	36%	0%	0%	100%
	Mabalacat	80%	0%	20%	0%	0%	100%	87%	0%	13%	0%	0%	100%
	Macabebe	100%	0%	0%	70%	0%	30%	100%	0%	0%	70%	0%	30%
	Magalang	0%	0%	100%	0%	0%	100%	7%	0%	93%	0%	0%	100%
	Masantol	0%	0%	100%	0%	0%	100%	7%	0%	93%	0%	0%	100%
	Mexico	49%	0%	51%	0%	0%	100%	56%	0%	44%	0%	0%	100%
	Minalin	100%	0%	0%	14%	0%	86%	100%	0%	0%	14%	0%	86%
	Porac	30%	9%	61%	0%	13%	87%	37%	2%	61%	0%	13%	87%
	City of San Fernando	49%	16%	35%	0%	31%	69%	56%	9%	35%	0%	31%	69%
	San Luis	0%	0%	100%	0%	0%	100%	7%	0%	93%	0%	0%	100%
	San Simon	100%	0%	0%	30%	0%	70%	100%	0%	0%	30%	0%	70%
	Santa Ana	6%	48%	46%	0%	0%	0%	13%	41%	46%	0%	0%	0%
	Santa Rita	16%	0%	84%	0%	0%	0%	23%	0%	77%	0%	0%	0%
	Santo Tomas	67%	0%	33%	0%	0%	0%	74%	0%	26%	0%	0%	0%
	Sasmuan	0%	0%	100%	0%	0%	100%	7%	0%	93%	0%	0%	100%
Tarlac	Bamban	25%	0%	75%	0%	0%	100%	32%	0%	68%	0%	0%	100%
	Capas	100%	0%	0%	28%	0%	72%	100%	0%	0%	28%	0%	72%
	Concepcion	96%	0%	4%	0%	0%	100%	100%	0%	0%	0%	0%	100%
	La Paz	75%	0%	25%	0%	0%	100%	82%	0%	18%	0%	0%	100%
	Tarlac City	60%	0%	40%	0%	0%	100%	67%	0%	33%	0%	0%	100%
	Victoria	100%	0%	0%	1%	0%	99%	100%	0%	0%	1%	0%	99%
Total		59%	3%	38%	18%	4%	78%	66%	2%	33%	18%	4%	78%

	Bulacan	65%	0%	35%	39%	0%	61%	70%	0%	30%	39%	0%	61%
	Nueva Ecija	55%	3%	42%	16%	10%	74%	61%	1%	37%	16%	10%	74%
	Pampanga	58%	5%	37%	13%	2%	85%	65%	3%	32%	13%	2%	85%
	Tarlac	66%	0%	34%	3%	0%	97%	72%	0%	28%	3%	0%	97%
	Total	59%	3%	38%	18%	4%	78%	66%	2%	33%	18%	4%	78%

Annex-T D.3.3.5 (2/2) Water Service Coverage Ratio 2008 – 2025

Province	City / Municipality	Study Area Water Servie Ratio											
		2020						2025					
		Urban			Rural			Urban			Rural		
		Level 3	Level 2	Level 1	Level 3	Level 2	Level 1	Level 3	Level 2	Level 1	Level 3	Level 2	Level 1
Bulacan	Angat	100%	0%	0%	32%	0%	68%	100%	0%	0%	32%	0%	68%
	Baliuag	68%	0%	32%	0%	0%	0%	74%	0%	26%	0%	0%	0%
	Bulacan	100%	0%	0%	68%	0%	32%	100%	0%	0%	68%	0%	32%
	Bustos	100%	0%	0%	52%	0%	48%	100%	0%	0%	52%	0%	48%
	Calumpit	100%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%
	Doña Remedios Trinidad	0%	0%	0%	94%	0%	6%	0%	0%	0%	94%	0%	6%
	Guiguinto	55%	0%	45%	0%	0%	0%	65%	0%	35%	0%	0%	0%
	Hagonoy	100%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%
	Malolos City	62%	0%	38%	0%	0%	0%	70%	0%	30%	0%	0%	0%
	Norzagaray	100%	0%	0%	52%	0%	48%	100%	0%	0%	52%	0%	48%
	Pandi	100%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%
	Paombong	100%	0%	0%	87%	0%	13%	100%	0%	0%	87%	0%	13%
	Plaridel	83%	0%	17%	0%	0%	0%	88%	0%	12%	0%	0%	0%
	Pulilan	30%	0%	70%	0%	0%	0%	49%	0%	51%	0%	0%	0%
	San Ildefonso	100%	0%	0%	18%	0%	82%	100%	0%	0%	18%	0%	82%
	San Miguel	100%	0%	0%	33%	0%	67%	100%	0%	0%	33%	0%	67%
	San Rafael	100%	0%	0%	17%	0%	83%	100%	0%	0%	17%	0%	83%
	Santa Maria	72%	0%	28%	0%	0%	0%	77%	0%	23%	0%	0%	0%
Nueva Ecija	Aliaga	52%	0%	48%	0%	0%	100%	64%	0%	36%	0%	0%	100%
	Bongabon	100%	0%	0%	11%	20%	69%	100%	0%	0%	11%	20%	69%
	Cabanatuan City	90%	0%	10%	0%	0%	100%	95%	0%	5%	0%	0%	100%
	Cabiao	41%	0%	59%	0%	5%	95%	56%	0%	44%	0%	5%	95%
	Carranglan	27%	0%	73%	0%	0%	100%	47%	0%	53%	0%	0%	100%
	Gabaldon	27%	38%	35%	0%	65%	35%	47%	18%	35%	0%	65%	35%
	Gapan	52%	0%	48%	0%	13%	87%	63%	0%	37%	0%	13%	87%
	Gen Mamerto Natividad	98%	0%	2%	0%	3%	97%	100%	0%	0%	0%	3%	97%
	General Tinio	76%	0%	24%	0%	11%	89%	81%	0%	19%	0%	11%	89%
	Guimba	100%	0%	0%	0%	1%	99%	100%	0%	0%	0%	1%	99%
	Jaen	73%	0%	27%	0%	2%	98%	78%	0%	22%	0%	2%	98%
	Laur	89%	0%	11%	0%	22%	78%	94%	0%	6%	0%	22%	78%
	Licab	100%	0%	0%	11%	0%	89%	100%	0%	0%	11%	0%	89%
	Llanera	48%	0%	52%	0%	4%	96%	61%	0%	39%	0%	4%	96%
	Lupao	27%	0%	73%	0%	0%	100%	47%	0%	53%	0%	0%	100%
	Science City of Munoz	100%	0%	0%	12%	16%	72%	100%	0%	0%	12%	16%	72%
	Palayan City	100%	0%	0%	4%	10%	86%	100%	0%	0%	4%	10%	86%
	Pantabangan	0%	0%	0%	0%	84%	16%	0%	0%	0%	0%	84%	16%
	Penaranda	0%	0%	0%	71%	4%	26%	0%	0%	0%	71%	4%	26%
	Quezon	27%	0%	73%	0%	0%	100%	47%	0%	53%	0%	0%	100%
	Rizal	27%	0%	73%	0%	1%	99%	47%	0%	53%	0%	1%	99%
	San Antonio	85%	0%	15%	0%	6%	94%	90%	0%	10%	0%	6%	94%
	San Isidro	57%	0%	43%	0%	0%	0%	67%	0%	33%	0%	0%	0%
	San Jose City	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%
	San Leonardo	64%	1%	35%	0%	30%	70%	71%	0%	29%	0%	30%	70%
	Santa Rosa	100%	0%	0%	43%	5%	52%	100%	0%	0%	43%	5%	52%
	Santo Domingo	35%	0%	65%	0%	1%	99%	52%	0%	48%	0%	1%	99%
	Talavera	60%	0%	40%	0%	0%	100%	69%	0%	31%	0%	0%	100%
	Talugtug	100%	0%	0%	6%	0%	94%	100%	0%	0%	6%	0%	94%
	Zaragosa	44%	0%	56%	0%	12%	88%	58%	0%	42%	0%	12%	88%
Pampanga	Angeles City	96%	0%	4%	0%	0%	0%	100%	0%	0%	0%	0%	0%
	Apalit	76%	0%	24%	0%	0%	0%	81%	0%	19%	0%	0%	0%
	Arayat	27%	0%	73%	0%	0%	100%	47%	0%	53%	0%	0%	100%
	Bacolor	88%	0%	12%	0%	13%	87%	93%	0%	7%	0%	13%	87%
	Candaba	100%	0%	0%	7%	1%	92%	100%	0%	0%	7%	1%	92%
	Floridablanca	100%	0%	0%	64%	0%	36%	100%	0%	0%	64%	0%	36%
	Guagua	71%	0%	29%	0%	0%	0%	76%	0%	24%	0%	0%	0%
	Lubao	70%	0%	30%	0%	0%	100%	75%	0%	25%	0%	0%	100%
	Mabalacat	92%	0%	8%	0%	0%	100%	97%	0%	3%	0%	0%	100%
	Macabebe	100%	0%	0%	70%	0%	30%	100%	0%	0%	70%	0%	30%
	Magalang	27%	0%	73%	0%	0%	100%	47%	0%	53%	0%	0%	100%
	Masantol	27%	0%	73%	0%	0%	100%	47%	0%	53%	0%	0%	100%
	Mexico	64%	0%	36%	0%	0%	100%	71%	0%	29%	0%	0%	100%
	Minalin	100%	0%	0%	14%	0%	86%	100%	0%	0%	14%	0%	86%
	Porac	49%	0%	51%	0%	13%	87%	62%	0%	38%	0%	13%	87%
	City of San Fernando	63%	1%	35%	0%	31%	69%	71%	0%	29%	0%	31%	69%
	San Luis	27%	0%	73%	0%	0%	100%	47%	0%	53%	0%	0%	100%
	San Simon	100%	0%	0%	30%	0%	70%	100%	0%	0%	30%	0%	70%
	Santa Ana	31%	23%	46%	0%	0%	0%	50%	4%	46%	0%	0%	0%
	Santa Rita	39%	0%	61%	0%	0%	0%	55%	0%	45%	0%	0%	0%
	Santo Tomas	79%	0%	21%	0%	0%	0%	84%	0%	16%	0%	0%	0%
	Sasmuan	27%	0%	73%	0%	0%	100%	47%	0%	53%	0%	0%	100%
Tarlac	Bamban	46%	0%	54%	0%	0%	100%	59%	0%	41%	0%	0%	100%
	Capas	100%	0%	0%	28%	0%	72%	100%	0%	0%	28%	0%	72%
	Concepcion	100%	0%	0%	0%	0%	100%	100%	0%	0%	0%	0%	100%
	La Paz	87%	0%	13%	0%	0%	100%	92%	0%	8%	0%	0%	100%
	Tarlac City	72%	0%	28%	0%	0%	100%	77%	0%	23%	0%	0%	100%
	Victoria	100%	0%	0%	1%	0%	99%	100%	0%	0%	1%	0%	99%
Total		73%	1%	26%	18%	4%	78%	80%	0%	20%	18%	4%	78%
	Bulacan	76%	0%	24%	39%	0%	61%	82%	0%	18%	39%	0%	61%
	Nueva Ecija	70%	1%	30%	16%	10%	74%	78%	0%	22%	16%	10%	74%
	Pampanga	72%	1%	27%	13%	2%	85%	80%	0%	20%	13%	2%	85%
	Tarlac	77%	0%	23%	3%	0%	97%	82%	0%	18%	3%	0%	97%
	Total	73%	1%	26%	18%	4%	78%	80%	0%	20%	18%	4%	78%

Annex-T D.3.3.6 Cost Breakdown for O&M Cost for Level 3 System with Groundwater Source

		Price	Unit
POWER			
Population Served		10,000	person
Ave. Water Demand		1500	m^3/day
Peak Hour		26.04	lps
Well pump capacity		21	lps
Well Pump HP		17.23	HP
Chlorine pump HP		0.25	HP
TotalPump HP		13.04	KW
Ave. Pumping Time		19.84	hr
Power cost/kwh		5.5	peso/kwh
Daily pumping cost		1,423	pesos/day
Annual Cost		519,427	pesos/year
CHLORINATION			
Concentration		2	ppm
Calcium Hypochlorite 70% Chlorine		3	kg/day
Hypochlorite cost of per kg		200	pesos/kg
Total per day		600	pesos/day
Annual Cost		219,000	pesos/year
SALARIES AND WAGES			
1 Manpower per 100 connections		20	pesron
	Monthly rate		
1 Manager	18,000	18,000	pesos
5 Technical	13,500	67,500	pesos
1 Fin	13,500	13,500	pesos
3 Admin/Fin	10,500	42,000	pesos
10 plumbers	9,000	90,000	pesos
Average salary/person/month		11,550	pesos
Annual Cost		3,003,000	pesos/year
MAINTENANCE			
Project cost per capita (*new system)*		6,280	peso/person
Total project cost		62,800,000	pesos
Annual Maintenance Cost *(1% of Construction Cost)*		628,000	pesos/year
MISCELLANEOUS			
Annual Miscellaneos cost, 35% of salaries &		1,051,050	pesos/year
TOTAL ANNUAL O&M COSTS		**5,420,477**	pesos/year
Unit O&M Cost		**10.04**	pesos/m^3

Source: JICA Study Team

Annex-T D.4.1.1 Present and Projected Municipal Water Demand by City/Municipality in the Study Area

Water Demand (m^3/day)

Province	City / Municipality	2008 Urban Level 3	2008 Urban Level 2	2008 Urban Level 1	2008 Urban SubTotal	2008 Rural Level 3	2008 Rural Level 2	2008 Rural Level 1	2008 Rural SubTotal	2008 Total	2015 Urban Level 3	2015 Urban Level 2	2015 Urban Level 1	2015 Urban SubTotal	2015 Rural Level 3	2015 Rural Level 2	2015 Rural Level 1	2015 Rural SubTotal	2015 Total	2025 Urban Level 3	2025 Urban Level 2	2025 Urban Level 1	2025 Urban SubTotal	2025 Rural Level 3	2025 Rural Level 2	2025 Rural Level 1	2025 Rural SubTotal	2025 Total
Bulacan	Angat	2,589	0	0	2,589	1,798	0	1,191	2,989	5,578	3,087	0	0	3,087	2,134	0	1,528	3,662	6,750	3,907	0	0	3,907	2,705	0	2,082	4,787	8,694
	Baliuag	14,641	0	3,782	18,423	0	0	0	0	18,423	19,672	0	4,046	23,717	0	0	0	0	23,717	29,751	0	3,736	33,487	0	0	0	0	33,487
	Bulacan	189	0	0	189	1,169	0	177	1,346	1,535	225	0	0	225	1,388	0	227	1,614	1,840	285	0	0	285	1,759	0	309	2,068	2,353
	Bustos	1,359	0	0	1,359	1,636	0	485	2,122	3,480	1,620	0	0	1,620	1,942	0	623	2,565	4,185	2,050	0	0	2,050	2,462	0	848	3,310	5,360
	Calumpit	18,419	0	179	18,598	0	0	0	0	18,598	22,634	0	0	22,634	0	0	0	0	22,634	28,640	0	0	28,640	0	0	0	0	28,640
	Doña Remedios Trinidad	0	0	0	0	2,823	0	55	2,877	2,877	0	0	0	0	3,350	0	70	3,420	3,420	0	0	0	0	4,246	0	95	4,342	4,342
	Guiguinto	427	0	229	655	0	0	0	0	655	604	0	257	862	0	0	0	0	862	1,129	0	217	1,347	0	0	0	0	1,347
	Hagonoy	21,811	0	843	22,653	0	0	0	0	22,653	28,048	0	378	28,426	0	0	0	0	28,426	36,903	0	0	36,903	0	0	0	0	36,903
	Malolos City	20,162	0	7,331	27,492	0	0	0	0	27,492	27,646	0	8,073	35,719	0	0	0	0	35,719	45,672	0	7,093	52,765	0	0	0	0	52,765
	Norzagaray	5,900	0	0	5,900	4,896	0	1,421	6,317	12,217	7,035	0	0	7,035	5,811	0	1,823	7,635	14,670	8,902	0	0	8,902	7,367	0	2,484	9,851	18,752
	Pandi	312	0	4	315	0	0	0	0	315	385	0	0	385	0	0	0	0	385	488	0	0	488	0	0	0	0	488
	Paombong	1,952	0	0	1,952	6,077	0	297	6,374	8,326	2,327	0	0	2,327	7,213	0	381	7,593	9,920	2,945	0	0	2,945	9,143	0	519	9,662	12,606
	Plaridel	7,716	0	1,023	8,738	0	0	0	0	8,738	10,112	0	988	11,100	0	0	0	0	11,100	14,444	0	744	15,189	0	0	0	0	15,189
	Pulilan	606	0	5,045	5,652	0	0	0	0	5,652	2,097	0	5,931	8,028	0	0	0	0	8,028	12,066	0	4,645	16,711	0	0	0	0	16,711
	San Ildefonso	2,843	0	0	2,843	2,276	0	3,320	5,596	8,439	3,390	0	0	3,390	2,701	0	4,261	6,962	10,352	4,289	0	0	4,289	3,424	0	5,805	9,229	13,519
	San Miguel	5,541	0	0	5,541	5,809	0	3,812	9,621	15,162	6,607	0	0	6,607	6,894	0	4,893	11,786	18,394	8,360	0	0	8,360	8,739	0	6,665	15,404	23,765
	San Rafael	1,733	0	0	1,733	2,102	0	3,251	5,353	7,086	2,067	0	0	2,067	2,495	0	4,173	6,667	8,734	2,615	0	0	2,615	3,162	0	5,685	8,847	11,462
	Santa Maria	227	0	48	275	0	0	0	0	275	302	0	50	353	0	0	0	0	353	440	0	48	487	0	0	0	0	487
Nueva Ecija	Aliaga	2,756	0	1,701	4,457	0	0	965	965	5,422	3,709	0	1,805	5,514	0	0	1,159	1,159	6,673	6,708	0	1,388	8,096	0	0	1,452	1,452	9,548
	Bongabon	602	0	0	602	1,178	1,010	2,420	4,609	5,211	672	0	0	672	1,309	1,133	2,908	5,350	6,023	783	0	0	783	1,526	1,331	3,643	6,501	7,283
	Cabanatuan City	36,308	4	3,318	39,629	0	1	778	779	40,408	44,180	0	2,705	46,885	0	1	935	936	47,822	57,482	0	1,176	58,658	0	1	1,172	1,173	59,831
	Cabiao	2,378	220	3,076	5,674	0	10	145	155	5,829	3,634	0	3,502	7,135	0	12	174	186	7,321	9,150	0	2,590	11,741	0	14	218	232	11,973
	Carranglan	0	0	883	883	0	0	847	847	1,730	217	0	974	1,191	0	0	1,018	1,018	2,209	1,684	0	698	2,382	0	0	1,275	1,275	3,657
	Gabaldon	0	695	264	959	0	813	309	1,122	2,080	184	686	313	1,184	0	911	371	1,283	2,466	1,432	251	392	2,075	0	1,070	465	1,536	3,611
	Gapan	4,245	497	2,406	7,148	0	289	1,397	1,686	8,834	5,746	96	2,855	8,698	0	324	1,679	2,002	10,700	10,589	0	2,243	12,832	0	380	2,103	2,483	15,315
	Gen Mamerto Natividad	1,224	3	62	1,288	0	54	1,280	1,333	2,621	1,477	0	38	1,515	0	60	1,538	1,598	3,113	1,849	0	0	1,849	0	71	1,926	1,997	3,846
	General Tinio	2,469	69	385	2,923	0	150	840	990	3,913	3,055	0	412	3,468	0	168	1,010	1,178	4,645	4,053	0	335	4,388	0	197	1,265	1,462	5,850
	Guimba	2,210	0	15	2,225	0	20	2,446	2,466	4,691	2,519	0	0	2,519	0	22	2,939	2,961	5,480	2,931	0	0	2,931	0	26	3,683	3,708	6,639
	Jaen	2,473	16	495	2,985	0	67	2,100	2,167	5,152	3,079	0	494	3,572	0	75	2,523	2,599	6,171	4,110	0	425	4,536	0	89	3,161	3,250	7,786
	Laur	1,306	39	95	1,440	0	360	875	1,235	2,675	1,590	0	101	1,690	0	404	1,051	1,455	3,145	2,069	0	46	2,115	0	474	1,317	1,791	3,906
	Licab	988	0	0	988	338	0	833	1,172	2,159	1,102	0	0	1,102	376	0	1,001	1,377	2,480	1,283	0	0	1,283	438	0	1,255	1,693	2,975
	Llanera	287	14	230	531	0	81	1,369	1,450	1,981	402	0	257	659	0	91	1,645	1,736	2,395	818	0	194	1,012	0	107	2,061	2,168	3,180
	Lupao	0	0	126	126	0	0	1,596	1,596	1,722	31	0	139	170	0	0	1,918	1,918	2,088	240	0	100	340	0	0	2,403	2,403	2,743
	Science City of Munoz	5,689	0	0	5,689	799	497	1,531	2,827	8,516	6,350	0	0	6,350	887	558	1,839	3,284	9,635	7,390	0	0	7,390	1,034	655	2,304	3,994	11,383
	Palayan City	2,071	0	0	2,071	144	168	990	1,302	3,373	2,312	0	0	2,312	160	188	1,189	1,538	3,850	2,690	0	0	2,690	187	221	1,490	1,898	4,588
	Pantabangan	0	0	0	0	0	1,560	205	1,765	1,765	0	0	0	0	0	1,749	246	1,995	1,995	0	0	0	0	0	2,054	308	2,363	2,363
	Penaranda	0	0	0	0	3,012	74	348	3,433	3,433	0	0	0	0	3,346	83	418	3,847	3,847	0	0	0	0	3,901	97	524	4,522	4,522
	Quezon	0	0	550	550	0	0	1,269	1,269	1,819	135	0	607	742	0	0	1,525	1,525	2,266	1,049	0	435	1,483	0	0	1,910	1,910	3,393
	Rizal	0	3	411	414	0	17	2,309	2,326	2,741	102	0	456	558	0	19	2,774	2,794	3,352	789	0	327	1,116	0	23	3,476	3,499	4,614
	San Antonio	2,639	25	291	2,955	0	202	2,328	2,530	5,486	3,228	0	271	3,499	0	227	2,797	3,024	6,523	4,225	0	169	4,393	0	266	3,505	3,771	8,165
	San Isidro	3,424	98	1,567	5,089	0	0	0	0	5,089	4,491	0	1,714	6,205	0	0	0	0	6,205	7,422	0	1,346	8,768	0	0	0	0	8,768
	San Jose City	9,499	0	0	9,499	11,622	0	0	11,622	21,121	10,603	0	0	10,603	12,913	0	0	12,913	23,516	12,338	0	0	12,338	15,054	0	0	15,054	27,392
	San Leonardo	3,475	498	799	4,772	0	389	624	1,013	5,785	4,432	302	948	5,682	0	436	750	1,186	6,868	6,556	0	961	7,517	0	512	940	1,452	8,968
	Santa Rosa	309	0	0	309	3,895	208	1,519	5,622	5,930	345	0	0	345	4,327	233	1,825	6,386	6,730	401	0	0	401	5,045	274	2,287	7,605	8,006
	Santo Domingo	817	21	1,985	2,823	0	6	550	555	3,379	1,467	0	2,185	3,652	0	6	660	667	4,319	4,842	0	1,594	6,436	0	8	827	835	7,271
	Talavera	8,166	0	3,214	11,379	0	0	498	498	11,877	10,542	0	3,331	13,873	0	0	598	598	14,471	16,392	0	2,667	19,058	0	0	750	750	19,808
	Talugtug	241	0	0	241	96	0	461	556	797	269	0	0	269	106	0	553	660	929	313	0	0	313	124	0	693	817	1,130
	Zaragosa	800	141	730	1,670	0	195	1,012	1,206	2,877	1,159	36	866	2,061	0	218	1,216	1,434	3,495	2,585	0	667	3,253	0	257	1,523	1,780	5,032
Pampanga	Angeles City	50,523	0	3,136	53,659	0	0	0	0	53,659	61,703	0	2,146	63,849	0	0	0	0	63,849	80,091	0	0	80,091	0	0	0	0	80,091
	Apalit	11,922	0	2,150	14,073	0	0	0	0	14,073	14,910	0	2,078	16,988	0	0	0	0	16,988	20,027	0	1,728	21,754	0	0	0	0	21,754
	Arayat	0	0	1,257	1,257	0	0	4,976	4,976	6,232	312	0	1,400	1,712	0	0	6,036	6,036	7,748	2,448	0	1,015	3,463	0	0	7,649	7,649	11,112
	Bacolor	1,282	23	112	1,418	0	151	732	883	2,301	1,578	0	109	1,688	0	171	888	1,059	2,746	2,081	0	57	2,138	0	204	1,125	1,328	3,466
	Candaba	2,197	0	0	2,197	925	57	4,000	4,982	7,179	2,476	0	0	2,476	1,038	64	4,853	5,955	8,431	2,915	0	0	2,915	1,224	76	6,150	7,450	10,364
	Floridablanca	5,205	0	0	5,205	4,495	0	819	5,314	10,519	5,866	0	0	5,866	5,042	0	993	6,035	11,901	6,904	0	0	6,904	5,946	0	1,258	7,204	14,108
	Guagua	11,684	47	2,620	14,351	0	0	0	0	14,351	14,747	0	2,644	17,391	0	0	0	0	17,391	20,161	0	2,326	22,487	0	0	0	0	22,487
	Lubao	5,784	8	1,372	7,163	0	25	4,291	4,316	11,479	7,316	0	1,380	8,696	0	28	5,206	5,234	13,930	10,105	0	1,203	11,308	0	33	6,597	6,630	17,938
	Mabalacat	30,127	0	2,359	32,486	0	0	4	4	32,490	36,915	0	1,825	38,739	0	0	5	5	38,744	48,427	0	498	48,925	0	0	6	6	48,932
	Macabebe	1,558	0	0	1,558	7,001	0	940	7,940	9,499	1,756	0	0	1,756	7,853	0	1,140	8,993	10,749	2,067	0	0	2,067	9,260	0	1,445	10,704	12,772
	Magalang	0	0	4,176	4,176	0	0	1,539	1,539	5,715	1,035	0	4,653	5,688	0	0	1,867	1,867	7,556	9,136	0	3,372	11,508	0	0	2,366	2,366	13,874
	Masantol	0	0	950	950	0	0	1,803	1,803	2,754	236	0	1,059	1,295	0	0	2,188	2,188	3,482	1,852	0	767	2,619	0	0	2,772	2,772	5,392
	Mexico	5,669	0	1,850	7,520	0	0	4,148	4,148	11,668	7,295	0	1,910	9,206	0	0	5,032	5,032	14,238	10,880	0	1,583	12,463	0	0	6,377	6,377	18,840
	Minalin	2,809	0	0	2,809	555	0	1,119	1,674	4,483	3,166	0	0	3,166	623	0	1,358	1,980	5,146	3,726	0	0	3,726	734	0	1,720	2,455	6,181
	Porac	3,363	468	2,153	5,984	0	426	1,960	2,386	8,370	4,670	126	2,580	7,376	0	482	2,378	2,860	10,237	9,149	0	2,056	11,205	0	573	3,013	3,586	14,791
	City of San Fernando	24,788	3,689	5,688	34,165	0	111	170	281	34,446	31,942	2,319	6,815	41,076	0	125	207	332	41,408	47,921	0	7,068	54,989	0	149	262	411	55,400
	San Luis	0	0	1,593	1,593	0	0	1,091	1,091	2,685	395	0	1,776	2,171	0	0	1,324	1,324	3,494	3,105	0	1,287	4,391	0	0	1,677	1,677	6,069
	San Simon	3,127	0	0	3,127	1,510	0	1,136	2,646	5,774	3,525	0	0	3,525	1,694	0	1,379	3,072	6,597	4,148	0	0	4,148	1,997	0	1,747	3,744	7,892
	Santa Ana	589	2,083	1,394	4,066	0	0	0	0	4,066	1,418	1,990	1,670	5,077	0	0	0	0	5,077	6,313	249	2,113	8,675	0	0	0	0	8,675
	Santa Rita	1,160	0	1,874	3,034	0	0	0	0	3,034	1,864	0	2,057	3,921	0	0	0	0	3,921	5,140	0	1,532	6,672	0	0	0	0	6,672
	Santo Tomas	4,837	0	774	5,611	0	0	0	0	5,611	6,025	0	733	6,758	0	0	0	0	6,758	8,056	0	577	8,633	0	0	0	0	8,633
	Sasmuan	0	0	402	402	0	0	1,019	1,019	1,421	100	0	448	548	0	0	1,236	1,236	1,784	783	0	325	1,108	0	0	1,567	1,567	2,675
Tarlac	Bamban	1,330	0	1,267	2,597	0	0	424	424	3,021	1,907	0	1,368	3,275	0	0	512	512	3,787	4,121	0	1,030	5,152	0	0	644	644	5,796
	Capas	1,107	0	0	1,107	1,449	0	1,214	2,663	3,770	1,240	0	0	1,240	1,616	0	1,465	3,081	4,321	1,449	0	0	1,449	1,892	0	1,843	3,735	5,184
	Concepcion	8,140	0	109	8,249	0	0	4,626	4,626	12,876	9,505	0	0	9,505	0	0	5,579	5,579	15,085	11,108	0	0	11,108	0	0	7,020	7,020	18,129
	La Paz	1,657	0	171	1,828	0	0	2,536	2,536	4,364	2,029	0	146	2,174	0	0	3,059	3,059	5,233	2,658	0	79	2,737	0	0	3,849	3,849	6,586
	Tarlac City	11,788	0	2,534	14,323	0	0	2,844	2,844	17,166	14,757	0	2,495	17,252	0	0	3,430	3,430	20,682	19,833	0	2,193	22,026	0	0	4,316	4,316	26,342
	Victoria	1,019	0	0	1,019	86	0	1,861	1,947	2,966	1,142	0	0	1,142	96	0	2,245	2,340	3,482	1,334	0	0	1,334	112	0	2,824	2,936	4,271
Total		392,467	8,659	79,029	480,155	65,691	6,939	89,106	161,736	641,891	494,720	5,554	82,988	583,262	75,313	7,790	108,617	191,720	774,982	719,998	500	65,041	785,540	91,482	9,161	138,658	239,301	1,024,841

	Bulacan	106,425	0	18,484	124,909	28,586	0	14,007	42,594	167,503	137,859	0	19,723	157,582	33,927	0	17,978	51,905	209,488	202,885	0	16,483	219,368	43,008	0	24,493	67,501	286,869
	Nueva Ecija	94,375	2,340	22,602	119,317	21,084	6,169	31,844	59,097	178,414	117,032	1,119	23,973	142,124	23,425	6,918	38,262	68,605	210,729	172,173	251	17,751	190,175	27,309	8,126	47,937	83,373	273,548
	Pampanga	166,626	6,319	33,861	206,806	14,486	770	29,748	45,004	251,810	209,249	4,435	35,284	248,968	16,249	871	36,088	53,209	302,177	304,436	249	27,505	332,190	19,160	1,035	45,732	65,928	398,118
	Tarlac	25,041	0	4,081	29,123	1,535	0	13,506	15,041	44,164	30,580	0	4,008	34,588	1,712	0	16,289	18,001	52,589	40,504	0	3,302	43,806	2,004	0	20,496	22,500	66,306
	Total	392,467	8,659	79,029	480,155	65,691	6,939	89,106	161,736	641,891	494,720	5,554	82,988	583,262	75,313	7,790	108,617	191,720	774,982	719,998	500	65,041	785,540	91,482	9,161	138,658	239,301	1,024,841

Source: JICA Study Team

Annex-T D.4.2.1 Present and Projected Industrial Water Demand for Surface Water Source

Water Balance Catchment	Industrial Water Demand (2008)		Industrial Water Demand (2025)	
	(m^3/s)	(MCM/y)	(m^3/s)	(MCM/y)
ANG01	0.000	0.000	0.000	0.000
ANG0201	0.000	0.000	0.000	0.000
ANG0202	0.021	0.662	0.026	0.811
ANG0203	0.000	0.000	0.000	0.000
ANG0204	0.000	0.000	0.000	0.000
ANG03	0.000	0.000	0.000	0.000
COR01	0.000	0.000	0.000	0.000
PAM01	0.000	0.000	0.000	0.000
PAM0201	0.095	2.996	0.116	3.669
PAM0202	0.000	0.000	0.000	0.000
PAM0203	0.000	0.000	0.000	0.000
PAM03	0.000	0.000	0.000	0.000
PAM0401	0.000	0.000	0.000	0.000
PAM0402	0.000	0.000	0.000	0.000
PAM0501	0.000	0.000	0.000	0.000
PAM0502	0.000	0.000	0.000	0.000
PAM0503	0.000	0.000	0.000	0.000
PAN01	0.000	0.000	0.000	0.000
PAS0101	0.000	0.000	0.000	0.000
PAS0102	0.000	0.000	0.000	0.000
PAS0103	0.000	0.000	0.000	0.000
PAS0104	0.000	0.000	0.000	0.000
PAS0105	0.000	0.000	0.000	0.000
PAS0106	0.000	0.000	0.000	0.000
PAS0107	0.000	0.000	0.000	0.000
PAS0108	0.000	0.000	0.000	0.000
PEN0101	0.000	0.000	0.000	0.000
PEN0102	0.000	0.000	0.000	0.000
PEN0103	0.000	0.000	0.000	0.000
RCH0101	0.000	0.000	0.000	0.000
RCH0102	0.000	0.000	0.000	0.000
RCH0103	0.000	0.000	0.000	0.000
RCH0104	0.000	0.000	0.000	0.000
Total	0.116	3.658	0.142	4.481

Source: JICA Study Team

Annex-T D.4.2.2 Present and Projected Industrial Water Demand for Groundwater Source

CityMun	Province	Total Area (km^2)	Area inside the study area (km^2)	Ratio	Industrial Water Demand (2008)		Industrial Water Demand (2025)	
					(m^3/s)	(MCM/y)	(m^3/s)	(MCM/y)
Angat	Bulacan	58.56	52.59	0.898	0.000	0.000	0.000	0.000
Baliuag	Bulacan	43.63	43.63	1.000	0.002	0.060	0.002	0.073
Bulacan	Bulacan	69.38	11.19	0.161	0.000	0.000	0.000	0.000
Bustos	Bulacan	40.48	17.74	0.438	0.000	0.000	0.000	0.000
Calumpit	Bulacan	46.52	46.52	1.000	0.000	0.007	0.000	0.009
Dona Remedios Trinidad	Bulacan	878.91	854.25	0.972	0.000	0.000	0.000	0.000
Guiguinto	Bulacan	24.80	1.64	0.066	0.000	0.000	0.000	0.000
Hagonoy	Bulacan	94.58	94.55	1.000	0.000	0.000	0.000	0.000
Malolos City	Bulacan	72.58	72.58	1.000	0.011	0.360	0.014	0.440
Norzagaray	Bulacan	246.57	206.82	0.839	0.000	0.000	0.000	0.000
Pandi	Bulacan	50.39	1.39	0.028	0.000	0.000	0.000	0.000
Paombong	Bulacan	45.83	45.83	1.000	0.000	0.000	0.000	0.000
Plaridel	Bulacan	35.44	20.04	0.565	0.000	0.000	0.000	0.000
Pulilan	Bulacan	43.62	43.62	1.000	0.014	0.433	0.017	0.530
San Ildefonso	Bulacan	166.53	166.53	1.000	0.000	0.000	0.000	0.000
San Miguel	Bulacan	235.92	235.92	1.000	0.000	0.000	0.000	0.000
San Rafael	Bulacan	104.95	104.95	1.000	0.001	0.036	0.001	0.044
Santa Maria	Bulacan	78.65	0.75	0.010	0.000	0.000	0.000	0.000
Aliaga	Nueva Ecija	92.17	92.17	1.000	0.000	0.000	0.000	0.000
Bongabon	Nueva Ecija	229.40	224.53	0.979	0.000	0.000	0.000	0.000
Cabanatuan City	Nueva Ecija	198.18	198.18	1.000	0.001	0.032	0.001	0.039
Cabiao	Nueva Ecija	113.48	113.48	1.000	0.000	0.000	0.000	0.000
Carranglan	Nueva Ecija	739.39	692.95	0.937	0.000	0.000	0.000	0.000
Gabaldon	Nueva Ecija	252.52	252.22	0.999	0.000	0.000	0.000	0.000
Gapan	Nueva Ecija	164.50	164.50	1.000	0.000	0.000	0.000	0.000
Gen Mamerto Natividad	Nueva Ecija	98.01	98.01	1.000	0.000	0.000	0.000	0.000
General Tinio	Nueva Ecija	580.85	580.04	0.999	0.000	0.000	0.000	0.000
Guimba	Nueva Ecija	219.23	137.29	0.626	0.000	0.000	0.000	0.000
Jaen	Nueva Ecija	90.45	90.45	1.000	0.000	0.000	0.000	0.000
Laur	Nueva Ecija	221.35	221.35	1.000	0.000	0.000	0.000	0.000
Licab	Nueva Ecija	60.42	60.42	1.000	0.000	0.000	0.000	0.000
Llanera	Nueva Ecija	114.25	114.25	1.000	0.000	0.000	0.000	0.000
Lupao	Nueva Ecija	142.66	129.69	0.909	0.000	0.000	0.000	0.000
Science City Of Munoz	Nueva Ecija	142.44	142.44	1.000	0.000	0.000	0.000	0.000
Palayan City	Nueva Ecija	136.11	136.11	1.000	0.000	0.000	0.000	0.000
Pantabangan	Nueva Ecija	421.05	421.05	1.000	0.000	0.000	0.000	0.000
Penaranda	Nueva Ecija	78.53	78.53	1.000	0.000	0.000	0.000	0.000
Quezon	Nueva Ecija	68.33	68.33	1.000	0.000	0.000	0.000	0.000
Rizal	Nueva Ecija	123.88	123.88	1.000	0.000	0.000	0.000	0.000
San Antonio	Nueva Ecija	156.90	156.90	1.000	0.000	0.000	0.000	0.000
San Isidro	Nueva Ecija	58.07	58.07	1.000	0.000	0.000	0.000	0.000
San Jose City	Nueva Ecija	161.75	161.75	1.000	0.000	0.000	0.000	0.000
San Leonardo	Nueva Ecija	51.69	51.69	1.000	0.002	0.063	0.002	0.077
Santa Rosa	Nueva Ecija	116.52	116.52	1.000	0.000	0.000	0.000	0.000
Santo Domingo	Nueva Ecija	82.69	82.69	1.000	0.000	0.000	0.000	0.000
Talavera	Nueva Ecija	135.06	135.06	1.000	0.000	0.000	0.000	0.000
Talugtug	Nueva Ecija	73.46	38.82	0.528	0.000	0.000	0.000	0.000
Zaragosa	Nueva Ecija	71.98	71.98	1.000	0.000	0.000	0.000	0.000
Angeles City	Pampanga	62.80	62.80	1.000	0.000	0.000	0.000	0.000
Apalit	Pampanga	60.10	60.10	1.000	0.047	1.466	0.057	1.796
Arayat	Pampanga	176.68	176.68	1.000	0.000	0.000	0.000	0.000
Bacolor	Pampanga	74.24	74.24	1.000	0.000	0.000	0.000	0.000
Candaba	Pampanga	208.20	208.20	1.000	0.000	0.000	0.000	0.000
Floridablanca	Pampanga	120.94	83.39	0.690	0.000	0.000	0.000	0.000
Guagua	Pampanga	48.93	48.93	1.000	0.000	0.000	0.000	0.000
Lubao	Pampanga	155.02	148.79	0.960	0.000	0.000	0.000	0.000
Mabalacat	Pampanga	145.73	140.22	0.962	0.213	6.711	0.261	8.220
Macabebe	Pampanga	102.36	102.36	1.000	0.000	0.000	0.000	0.000
Magalang	Pampanga	104.53	104.53	1.000	0.000	0.000	0.000	0.000
Masantol	Pampanga	45.94	45.94	1.000	0.000	0.000	0.000	0.000
Mexico	Pampanga	122.01	122.01	1.000	0.000	0.000	0.000	0.000
Minalin	Pampanga	45.45	45.45	1.000	0.000	0.000	0.000	0.000
Porac	Pampanga	293.31	291.96	0.995	0.010	0.315	0.012	0.386
City Of San Fernando	Pampanga	68.57	68.57	1.000	0.777	24.494	0.951	30.001
San Luis	Pampanga	55.25	55.25	1.000	0.000	0.000	0.000	0.000
San Simon	Pampanga	59.93	59.93	1.000	0.000	0.000	0.000	0.000
Santa Ana	Pampanga	40.44	40.44	1.000	0.000	0.000	0.000	0.000
Santa Rita	Pampanga	23.19	23.19	1.000	0.000	0.000	0.000	0.000
Santo Tomas	Pampanga	14.46	14.46	1.000	0.000	0.000	0.000	0.000
Sasmuan	Pampanga	44.80	44.76	0.999	0.000	0.000	0.000	0.000
Bamban	Tarlac	250.57	146.51	0.585	0.000	0.000	0.000	0.000
Capas	Tarlac	422.30	133.94	0.317	0.000	0.000	0.000	0.000
Concepcion	Tarlac	221.46	221.46	1.000	0.000	0.000	0.000	0.000
La Paz	Tarlac	116.65	116.65	1.000	0.000	0.000	0.000	0.000
Tarlac City	Tarlac	261.08	132.07	0.506	0.072	2.259	0.088	2.767
Victoria	Tarlac	112.08	83.35	0.744	0.000	0.000	0.000	0.000
Total					1.149	36.236	1.407	44.382

Source: JICA Study Team

Annex-T D.5.1.1(1/2) Rate Systems by Water Districts for Municipal Water

Bulacan Province

Municipality	Rate Systems of Municipal Water (Pesos)							Effective Date of the Rate System: After;
	Service Conn'n Fee	Basic Water Charge (Minimum Charge) (< 10 m^3)	Specific Charges (Pesos/m^3)					
			(11-20m^3)	(21-30m^3)	(31-40m^3)	(41-50m^3)	(51 m^3 <)	
Angat	4,758	160.00	17.50	19.25	21.25	23.50	26.00	8/1/06
Balagtas	2,116	130.00	13.15	13.45	13.90	14.45	15.10	7/1/01
Baliuag	13,635	120.00	13.50	15.25	17.25	19.50	22.00	3/1/06
Bocaue	6,824	173.00	18.75	21.00	24.00	27.75	32.00	12/1/06
Bulacan	7,780	145.00	15.25	16.25	17.50	19.00	19.00	11/1/07
Bustos	7,370	110.00	11.00	12.10	14.30	14.30	14.30	5/1/00
Calumpit	13,176	125.00	13.50	15.00	17.00	19.50	22.50	10/1/05
Dona R. Trinidad	-	-	-	-	-	-	-	-
Guiguinto	300	140.00	15.00	16.25	17.75	19.50	21.50	9/1/01
Hagonoy	20,836	90.00	10.00	11.00	12.00	12.00	12.00	7/1/02
Malolos City	27,926	125.00	13.50	14.75	16.25	18.00	20.00	1/1/07
Marilao	9,068	186.00	22.00	26.15	30.45	34.90	39.50	4/1/06
Meycauayan City	12,464	384.00	41.25	47.00	54.20	54.20	62.80	3/1/05
Norzagaray	4,888	219.00	22.75	24.35	26.50	29.15	32.10	10/1/07
Obando	7,780	367.00	40.95	49.15	61.65	78.40	99.25	1/1/06
Pandi	787	170.00	19.50	21.75	24.25	27.00	30.00	1/1/06
Paombong	-	-	-	-	-	-	-	-
Plaridel	8,214	80.00	8.50	9.50	10.60	11.80	13.10	9/1/01
Pulilan	3,600	150.00	16.00	17.25	18.75	20.50	22.50	1/1/02
San Ildefonso	4,771	160.00	17.00	18.25	19.75	21.50	23.50	4/15/08
San Jose Del Monte	51,114	280.00	30.95	34.00	37.25	40.55	40.55	5/20/08
San Miguel	4,517	143.00	15.50	16.75	18.25	20.00	22.00	6/1/06
San Rafael	4,200	175.00	19.00	20.50	22.25	24.25	26.50	1/1/05
Santa Maria	5,854	175.00	18.65	20.20	22.45	25.40	28.70	3/1/08

Source: "*Philippine Water Districts Directory*" Local Water Utilities Administration (LWUA) in the Philippines.

Pampanga Province

Municipality	Rate Systems of Municipal Water (Pesos)							Effective Date of the Rate System: After;
	Service Conn'n Fee	Basic Water Charge (Minimum Charge) (< 10 m^3)	Specific Charges (Pesos/m^3)					
			(11-20m^3)	(11-20m^3)	(11-20m^3)	(11-20m^3)	(11-20m^3)	
Angeles City	28,830	140.00	15.25	16.75	18.50	20.50	22.75	3/1/06
Apalit	-	-	-	-	-	-	-	-
Arayat	-	-	-	-	-	-	-	-
Bacolor	-	150.00	16.50	17.75	19.25	21.00	23.00	2/1/07
Candaba	-	195.00	22.00	24.25	26.75	29.50	32.50	8/1/05
Floridablanca	10,023	132.00	14.25	15.25	16.50	18.00	19.75	2/1/06
Guagua	7,724	120.00	13.20	15.00	17.40	20.40	24.00	1/1/05
Lubao	4,073	112.00	12.30	13.20	14.40	14.40	14.40	4/1/05
Mabalacat	20,179	144.00	15.35	16.70	18.70	18.70	18.70	2/1/06
Macabebe	3,228	135.00	14.50	15.75	17.25	19.00	21.00	2/1/06
Magalang	-	-	-	-	-	-	-	-
Masantol	1,142	180.00	18.75	19.55	20.40	21.30	22.25	1/1/07
Mexico	-	-	-	-	-	-	-	-
Minalin	-	-	-	-	-	-	-	-
Porac	1,457	145.00	16.25	17.75	19.50	21.50	23.75	2/1/05
San Fernando City	17,199	175.00	19.65	22.25	25.15	28.50	32.20	1/1/06
San Luis	-	-	-	-	-	-	-	-
San Simon	-	-	-	-	-	-	-	-
Santa Ana	-	-	-	-	-	-	-	-
Santa Rita	-	-	-	-	-	-	-	-
Santo Tomas	-	-	-	-	-	-	-	-
Sasmuan	1,400	150.00	16.00	16.65	17.00	17.00	17.00	12/1/05

Source: "*Philippine Water Districts Directory*" Local Water Utilities Administration (LWUA) in the Philippines.

Annex-T D.5.1.1(2/2) Rate Systems by Water Districts for Municipal Water

Nueva Ecija Province

Municipality	Rate Systems of Municipal Water (Pesos)							Effective Date of the Rate System: After;
	Service Conn'n Fee	Basic Water Charge (Minimum Charge) (< 10 m^3)	Specific Charges (Pesos/m^3)					
			(11-20m^3)	(11-20m^3)	(11-20m^3)	(11-20m^3)	(11-20m^3)	
Aliaga	-	-	-	-	-	-	-	-
Bongabon	1,097	265.00	27.50	29.25	31.65	34.70	38.05	1/1/06
Cabanatuan City	22,425	115.00	12.50	13.75	15.25	17.15	19.50	2/1/05
Cabiao	1,700	125.00	12.60	12.75	13.00	13.00	13.00	4/4/00
Carranglan	-	-	-	-	-	-	-	-
Cuyapo	602	240.00	25.35	27.85	29.95	29.95	31.95	3/4/08
Gabaldon	-	-	-	-	-	-	-	-
Gapan City	2,992	193.00	20.50	22.00	24.00	26.60	30.35	12/1/06
Gen. M. Natividad	420	240.00	24.70	25.50	26.35	27.25	28.20	1/1/04
Gen. Tinio	1,767	170.00	17.50	18.50	20.00	22.00	24.50	1/1/00
Guimba	2,246	235.00	26.15	28.75	31.70	35.10	38.85	1/1/07
Jaen	1,354	245.00	26.20	27.55	29.05	31.00	33.20	7/8/07
Laur	-	-	-	-	-	-	-	-
Licab	-	184.00	19.50	20.75	22.25	24.00	26.00	7/1/07
Llanera	-	-	-	-	-	-	-	-
Lupao	-	-	-	-	-	-	-	-
Munoz	2,559	178.00	18.70	19.60	20.85	22.35	24.00	1/1/08
Nampicuan	-	-	-	-	-	-	-	-
Palayan City	895	205.00	21.65	23.10	24.85	26.90	29.25	1/1/06
Pantabangan	-	-	-	-	-	-	-	-
Penaranda	2,560	180.00	18.80	19.95	21.35	22.85	24.75	7/1/05
Quezon	-	-	-	-	-	-	-	-
Rizal	-	-	-	-	-	-	-	-
San Antonio	1,931	180.00	19.50	21.20	23.20	25.40	25.40	1/29/08
San Isidro	-	-	-	-	-	-	-	-
San Jose City	4,994	189.00	20.00	21.50	23.50	25.90	28.80	1/1/07
San Leonardo	-	-	-	-	-	-	-	-
Santa Rosa	2,598	150.00	16.00	17.25	18.75	20.50	22.50	10/1/05
Santo Domingo	-	-	-	-	-	-	-	-
Talavera	4,378	180.00	18.30	18.70	19.30	20.10	21.00	1/1/03
Talugtug	0	174.00	18.75	20.25	22.00	24.00	26.25	9/1/07

Source: "*Philippine Water Districts Directory*" Local Water Utilities Administration (LWUA) in the Philippines.

Tarac Province

Municipality	Rate Systems of Municipal Water (Pesos)							Effective Date of the Rate System: After;
	Service Conn'n Fee	Basic Water Charge (Minimum Charge) (< 10 m^3)	Specific Charges (Pesos/m^3)					
			(11-20m^3)	(11-20m^3)	(11-20m^3)	(11-20m^3)	(11-20m^3)	
Bamban	-	-	-	-	-	-	-	-
Capas	-	-	-	-	-	-	-	-
Concepcion	6,093	163.00	17.80	19.45	21.45	23.75	26.40	10/1/05
La Paz	-	-	-	-	-	-	-	-
Tarlac City	16,323	185.00	20.00	21.75	23.75	26.00	28.50	6/1/07
Victoria	-	-	-	-	-	-	-	-

Source: "*Philippine Water Districts Directory*" Local Water Utilities Administration (LWUA) in the Philippines.

Annex-T D.5.1.2 Fluctuation of Average Unit Price of Water Distributed by Water District in Last 10 Years

(Peso/m^3)

Water District	First half of 2000	Latter half of 2000	First half of 2001	Latter half of 2001	First half of 2002	Latter half of 2002	First half of 2003	Latter half of 2003	First half of 2004	Latter half of 2004	First half of 2005	Latter half of 2005	First half of 2006	Latter half of 2006	First half of 2007	Latter half of 2007	First half of 2008	Latter half of 2008	First half of 2009	Latter half of 2009
Bulacan	**12.23**	**11.56**	**11.71**	**12.12**	**13.64**	**13.83**	**14.24**	**14.24**	**14.39**	**14.80**	**16.20**	**17.03**	**17.62**	**18.19**	**18.34**	**18.71**	**19.13**	**19.13**	**19.13**	**19.13**
Angat	11.08	11.08	11.08	11.08	11.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	17.58	17.58	17.58	17.58	17.58	17.58	17.58
Balagtas			13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	16.35	16.35	16.35	16.35	16.35	16.35
Baliwag		10.92	10.92	10.92	10.92	10.92	10.92	10.92	10.92	10.92	10.92	10.92	13.58	13.58	13.58	13.58	13.58	13.58	13.58	13.58
Bocaue					16.75	16.75	16.75	16.75	16.75	16.75	17.58	17.58	17.58	19.02	19.02	19.02	19.02	19.02	19.02	19.02
Bulacan				11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	15.33	15.33	15.33	15.33	15.33
Bustos	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37
Calumpit	12.02	12.02	12.02	12.02	12.02	12.02	12.02	12.02	12.02	12.02	12.02	13.67	13.67	13.67	13.67	13.67	13.67	13.67	13.67	13.67
Guiguinto				15.08	15.08	15.08	15.08	15.08	15.08	15.08	15.08	15.08	15.08	15.08	15.08	15.08	15.08	15.08	15.08	15.08
Hagonoy					10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Malolos	11.15	11.15	11.15	11.15	11.15	11.15	11.15	11.15	11.15	11.15	11.15	11.15	11.15	13.58	13.58	13.58	13.58	13.58	13.58	13.58
Marilao					16.55	18.05	18.05	18.05	18.05	18.05	18.05	18.05	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25
Meycauayan					26.40	26.40	26.40	26.40	26.40	26.40	42.22	42.22	42.22	42.22	42.22	42.22	42.22	42.22	42.22	42.22
Norzagaray		6.87	6.87	6.87	6.87	6.87	15.73	15.73	15.73	15.73	15.73	18.35	18.35	18.35	18.35	23.00	23.00	23.00	23.00	23.00
Obando					22.92	22.92	22.92	22.92	22.92	22.92	31.50	42.27	42.27	42.27	42.27	42.27	42.27	42.27	42.27	42.27
Pandi	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	16.17	19.42	19.42	19.42	19.42	19.42	19.42	19.42	19.42	19.42
Plaridel				8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67
Pulilan				16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08
San Ildefonso	12.08	12.08	12.08	12.08	12.08	12.08	12.08	12.08	12.08	12.08	12.08	12.08	15.08	15.08	15.08	15.08	17.08	17.08	17.08	17.08
San Jose del Monte City	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	21.55	21.55	21.55	21.55	25.85	25.85	25.85	30.98	30.98	30.98	30.98
San Miguel	12.42	12.42	12.42	12.42	12.42	12.42	12.42	12.42	12.42	12.42	12.42	12.42	15.52	15.52	15.52	15.52	15.52	15.52	15.52	15.52
San Rafael						12.75	12.75	12.75	16.17	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00
Sta Maria				13.47	13.47	15.08	15.08	15.08	15.08	16.72	16.72	16.72	16.72	16.72	16.72	16.72	18.78	18.78	18.78	18.78
Nueva Ecija	**13.85**	**14.67**	**13.92**	**13.98**	**13.93**	**15.31**	**15.48**	**16.12**	**16.44**	**17.35**	**17.41**	**18.19**	**18.19**	**19.38**	**19.39**	**19.60**	**20.23**	**20.32**	**20.32**	**20.69**
Bongabon			11.58	11.58	11.58	16.25	16.25	16.25	21.45	21.45	21.45	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75
Cabanatuan City				11.67	11.67	11.67	11.67	11.67	11.67	11.67	12.58	12.58	12.58	12.58	12.58	12.58	12.58	12.58	12.58	12.58
Cabiao	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62	12.62
Cuyapo	9.70	9.70	9.70	9.70	9.70	9.70	12.38	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	25.73	25.73	25.73	25.73
Gapan		18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	20.60	20.60	20.60	20.60	20.60	20.60	20.60
Gen. M. Natividad			15.50	15.50	15.50	20.62	20.62	24.73	24.73	24.73	24.73	24.73	24.73	24.73	24.73	24.73	24.73	24.73	24.73	24.73
Gen. Tinio	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	23.33
Guimba						17.53	17.53	17.53	17.53	20.88	20.88	20.88	20.88	26.13	26.13	26.13	26.13	26.13	26.13	26.13
Jaen	16.28	16.28	16.28	16.28	16.28	19.53	19.53	19.53	19.53	19.53	19.53	19.53	19.53	24.55	24.55	24.55	24.55	26.08	26.08	26.08
Licab															19.55	19.55	19.55	19.55	19.55	19.55
Lupao																				19.53
Muñoz				12.32	12.32	12.32	12.32	14.18	14.18	14.18	14.18	14.18	14.18	14.18	14.18	18.70	18.70	18.70	18.70	20.83
Palayan City			11.83	11.83	11.83	14.33	14.33	14.33	14.33	18.58	18.58	21.75	21.75	21.75	21.75	21.75	21.75	21.75	21.75	21.75
Peñaranda				16.83	16.83	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92	18.92
San Antonio				15.70	15.70	16.53	16.53	16.53	16.53	17.33	17.33	17.33	17.33	17.33	17.33	17.33	19.57	19.57	19.57	19.57
San Jose City					13.30	13.30	13.30	13.30	13.30	13.30	13.30	13.30	13.30	20.13	20.13	20.13	20.13	20.13	20.13	20.13
Sta Rosa	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08	16.08
Taravera			12.23	12.23	12.23	12.23	12.23	12.23	12.23	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.33
Talugtug																18.80	18.80	18.80	18.80	18.80
Pampanga	**11.15**	**11.16**	**11.16**	**11.87**	**12.01**	**12.01**	**12.01**	**12.01**	**12.42**	**12.95**	**13.38**	**14.60**	**15.64**	**16.16**	**16.18**	**16.18**	**16.18**	**16.56**	**16.69**	**17.36**
Angeres City	11.80	11.80	11.80	11.80	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	15.33	15.33	15.33	15.33	15.33	15.33	15.33	18.08
Bacolor															16.42	16.42	16.42	16.42	16.42	16.42
Candaba												21.92	21.92	21.92	21.92	21.92	21.92	21.92	21.92	21.92
Florida b lanca	8.60	8.60	8.60	8.60	8.60	8.60	8.60	8.60	12.25	12.25	12.25	12.25	14.23	14.23	14.23	14.23	14.23	14.23	14.23	14.23
Guagua		8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	17.87	17.87	17.87
Lubao		11.13	11.13	11.13	11.13	11.13	11.13	11.13	11.13	11.13	12.23	12.23	12.23	12.23	12.23	12.23	12.23	12.23	12.23	12.23
Mabalacat		11.63	11.63	11.63	11.63	11.63	11.63	11.63	11.63	11.63	11.63	11.63	15.48	15.48	15.48	15.48	15.48	15.48	15.48	19.57
Macabebe	11.18	11.18	11.18	11.18	11.18	11.18	11.18	11.18	11.18	11.18	11.18	11.18	14.58	14.58	14.58	14.58	14.58	14.58	16.18	18.87
Masantol	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	18.77	18.77	18.77	18.77	18.77	18.77	18.77
Porac											16.17	16.17	16.17	16.17	16.17	16.17	16.17	16.17	16.17	16.17
San Fernando City				17.53	17.53	17.53	17.53	17.53	17.53	17.53	17.53	19.80	19.80	19.80	19.80	19.80	19.80	19.80	19.80	19.80
Sasmuan		13.30	13.30	13.30	13.30	13.30	13.30	13.30	13.30	13.30	13.30	15.88	15.88	15.88	15.88	15.88	15.88	15.88	15.88	15.88
Sta Rita																				15.83
Tarlac	**16.25**	**13.86**	**14.22**	**14.03**	**13.47**	**14.05**	**14.50**	**14.93**	**15.11**	**15.11**	**16.09**	**17.45**	**18.00**	**18.00**	**18.30**	**18.30**	**18.76**	**20.66**	**20.66**	**21.14**
Camiling			17.33	17.33	17.33	17.33	17.33	17.33	19.00	19.00	21.17	21.17	21.17	21.17	21.17	21.17	21.17	24.00	24.00	24.00
Concepcion			11.83	11.83	11.83	11.83	13.58	13.58	13.58	13.58	13.58	17.85	17.85	17.85	17.85	17.85	17.85	17.85	17.85	17.85
Gerona				13.28	13.28	13.28	13.28	13.28	13.28	13.28	13.28	13.28	18.25	18.25	18.25	18.25	18.25	21.57	21.57	21.57
Mayantoc	16.25	16.25	16.25	16.25	16.25	16.25	16.25	16.25	16.25	16.25	18.37	20.85	20.85	20.85	20.85	20.85	20.85	20.85	20.85	20.85
Moncada					12.08	13.08	13.08	13.08	13.08	13.08	13.08	16.08	16.08	16.08	16.08	16.08	20.15	20.15	20.15	20.15
Paniqui						17.70	17.70	17.70	17.70	17.70	17.70	17.70	17.70	17.70	17.70	17.70	17.70	17.70	17.70	17.70
Ramos					13.70	13.70	13.70	13.70	13.70	13.70	16.20	16.20	16.20	16.20	16.20	16.20	16.20	20.77	20.77	20.77
Sta Ignacia					11.80	11.80	14.10	14.10	14.10	14.10	14.10	16.55	16.55	16.55	16.55	16.55	16.55	22.98	22.98	27.25
Tarlac City		11.47	11.47	11.47	11.47	11.47	11.47	15.33	15.33	15.33	17.33	17.33	17.33	17.33	20.08	20.08	20.08	20.08	20.08	20.08

Source: LWUA Official Web Site Home Page.

Annex-T D.5.1.3 Rate Systems of CPC Grantees for Municipal/Commercial/Industrial Water

Bulacan Province

Service Location/	City/ Municipality	Rate Systems of Municipal Water (Pesos)											Rate Systems of Commercial and Industrial Water		
		Service Conn'n Fee in Average[1]	Basic Water Charge (Minimum Charge) (< 10 m^3)	Specific Charges (Pesos/m^3)									Variable Charges (Pesos/m^3)		
				(0 - 10 m^3)	(11 - 20 m^3)	(21 - 30 m^3)	(31 - 40 m^3)	(41 - 50 m^3)	(51 - 60 m^3)	(61 - 70 m^3)	(71 - 100 m^3)	(100 m^3 <)	(0 - 25 m^3)	(26 - 1,000 m^3)	(1,000 m^3 <)
San Gabriel Rural Waterworks & Development Cooperative	Santa Maria	288.53	130.00	-	13.50	14.25	15.50	17.50	20.00	23.00	26.00	29.00	-	-	-
Bulihan Rural Waterworks Cooperative and Allied Services	Malolos	-	-	12.00	13.00	14.00	15.00	16.00	16.00	(Over 51m^3)			-	-	-
Tabe Rural Waterworks and Sanitation Assoziation Inc.	Guiguinto	2,269.83	-	12.00	13-14	15-16	17-18	19-20	20.00	(Over 51m^3)			-	-	-
Malhakan Rural Waterworks Multipurpose Cooperative	Meycauayan	-	210.00	-	22.50	24.00	25.50	27.00	28.50	(Over 51m^3)			-	-	-
Confed Properties, Inc., CPI-HH2 Waterworks	Marilao[6]	-	210.00	-	22.00	23.00	24.00	25.00	26.00	(Over 51m^3)			-	-	-

Pampanga Province

Service Location/	City/ Municipalit	Rate Systems of Municipal Water (Pesos)											Rate Systems of Commercial and Industrial Water		
		Service Conn'n Fee in Average[1]	Basic Water Charge (Minimum Charge) (< 10 m^3)	Specific Charges (Pesos/m^3)									Variable Charges (Pesos/m^3)		
				(0 - 10 m^3)	(11 - 20 m^3)	(21 - 30 m^3)	(31 - 40 m^3)	(41 - 50 m^3)	(51 - 60 m^3)	(61 - 70 m^3)	(71 - 100 m^3)	(100 m^3 <)	(0 - 25 m^3)	(26 - 1,000 m^3)	(1,000 m^3 <)
Lago Waterworks, Inc.	Angeles City	7,245.00	-	16.50	17.00	17.50	18.00	18.50	19.00	(Over 51m^3)			-	-	-
-	Mexico[4]	12,836.75	160.00	-	16.00	16.25	16.50	17.00	21.00	(Over 51m^3)			220.00	27[ii]	
"Sinukuan Water System, Inc"	Angeles City	-	97.00	-	8.00	8.20	8.40	8.60	9.00	(Over 51m^3)			130.00	-	-
Calsons Development Corporations	Angeles City	-	147.00	-	15.00	15.50	16.00	16.50	17.00	(Over 51m^3)			735.00	32.00	34.00
Taguete Waterworks In	Angeles City	-	130.00	-	14.50	16.00	17.75	19.90	21.50	(Over 51m^3)			-	-	-
Trilan Waterworks Inc.	Angeles City	-	-	13.00	13.50	14.00	14.50	15.00	15.50	(Over 51m^3)			18.00	19.00	23.00
"Santa Lucia Water Incorporated	Magalang	-	68.00	-	7.15	8.00	9.00	10.00	11.00	(Over 51m^3)			140.00	-	-

Tarlac Province

Service Location/	City/ Municipalit	Rate Systems of Municipal Water (Pesos)											Rate Systems of Commercial and Industrial Water		
		Service Conn'n Fee in Average[1]	Basic Water Charge (Minimum Charge) (< 10 m^3)	Specific Charges (Pesos/m^3)									Variable Charges (Pesos/m^3)		
				(0 - 10 m^3)	(11 - 20 m^3)	(21 - 30 m^3)	(31 - 40 m^3)	(41 - 50 m^3)	(51 - 60 m^3)	(61 - 70 m^3)	(71 - 100 m^3)	(100 m^3 <)	(0 - 25 m^3)	(26 - 1,000 m^3)	(1,000 m^3 <)
"JQG Homes Development Corporation".	Tarlac City	-	85.00		11.00	12.00	13.00	14.00	15.00	(Over 51m^3)			-	-	-

Source : "Annual Report" of CPS-WSP.

Annex-T D.6.2.1 Allocated Cost for Each Municipality/City

Province	City / Municipality	Additional Annual Cost for Level 1 System (Mil.Pesos/ year)	Additional Annual Cost for Sanitary Toilet (Mil.Pesos/ year)	Additional Annual Cost for Level 2,3 System (Mil.Pesos/ year)	Aditional Annual Cost for Bulk Water Supply (Mil.Pesos/ year)	Additional Annual Cost for Septage (Mil.Pesos/ year)	Additional Total Annual Cost for Level 2, 3 System + Bulk Water Supply + Septage (Mil.Pesos/ year)	Unit Cost for Level 2, 3 System (Pesos/m3)	Unit Cost for Bulk Water (Pesos/m3)	Unit Cost for Septage (Pesos/m3)	Unit Cost for Level 2, 3 System + Bulk Water Supply (Pesos/m3)	Unit Cost for Level 2, 3 System + Bulk Water Supply + Septage (Pesos/m3)
Bulacan	Angat	2.984	0.688	13.690			13.690	21.1			21.1	21.1
	Baliuag	0.048	1.493	88.908	62.800	34.991	186.699	21.1	6.9	4.2	28.0	32.2
	Bulacan	0.442	0.130	4.592	11.020		15.612	21.1	18.9		40.0	40.0
	Bustos	1.216	0.250	9.582			9.582	21.1			21.1	21.1
	Calumpit		1.085	58.300	155.855	32.455	246.610	21.1	17.8	4.1	38.9	43.0
	Doña Remedios Trinidad	0.137	0.744	9.768			9.768	21.1			21.1	21.1
	Guiguinto	0.058	0.062	4.188	6.297		10.485	21.1	18.9		40.0	40.0
	Hagonoy		1.616	87.252	211.950	41.307	340.508	21.1	18.8	4.1	39.9	44.1
	Malolos City	1.086	2.602	151.084	245.589	53.420	450.093	21.1	17.2	4.2	38.3	42.5
	Norzagaray	3.560	1.003	33.962			33.962	21.1			21.1	21.1
	Pandi		0.028	1.005			1.005	21.1			21.1	21.1
	Paombong	0.743	0.499	26.661	69.080		95.741	21.1			21.1	21.1
	Plaridel		0.520	39.333	18.840		58.173	21.1			21.1	21.1
	Pulilan	2.352	0.930	69.695			69.695	21.1			21.1	21.1
	San Ildefonso	8.320	1.303	16.075			16.075	21.1			21.1	21.1
	San Miguel	9.553	1.855	36.084			36.084	21.1			21.1	21.1
	San Rafael	8.147	0.941	12.273			12.273	21.1			21.1	21.1
	Santa Maria		0.018	1.246	0.315		1.561	21.1	1.9		23.0	23.0
Pampanga	Angeles City		7.712	169.256	249.665	63.190	482.111	20.9	10.3	4.2	31.2	35.3
	Apalit		1.151	46.807	21.983		68.790	20.9	2.9		23.8	23.8
	Arayat	8.023	2.047	14.918			14.918	20.9			20.9	20.9
	Bacolor	1.141	0.115	5.214			5.214	20.9			20.9	20.9
	Candaba	6.242	1.695	6.098			6.098	20.9			20.9	20.9
	Floridablanca	1.277	0.552	18.795			18.795	20.9			20.9	20.9
	Guagua		0.632	49.133		78.188	127.320	20.9		4.1	20.9	25.1
	Lubao	6.696	2.417	25.184			25.184	20.9			20.9	20.9
	Mabalacat	0.006	1.323	105.004	133.468	24.321	262.793	20.9	6.2	4.3	27.1	31.4
	Macabebe	1.466	0.972	17.660	64.379		82.039	20.9	18.8		39.8	39.8
	Magalang	3.264	1.074	49.575			49.575	20.9			20.9	20.9
	Masantol	3.010	0.426	11.283	10.992		22.274	20.9	18.8		39.8	39.8
	Mexico	6.472	1.189	30.524			30.524	20.9			20.9	20.9
	Minalin	1.746	0.763	6.162			6.162	20.9			20.9	20.9
	Porac	4.286	0.735	36.280			36.280	20.9			20.9	20.9
	City of San Fernando	5.667	2.366	136.059	552.716	53.755	742.531	20.9	14.0	4.2	34.9	39.0
	San Luis	2.031	0.910	18.917			18.917	20.9			20.9	20.9
	San Simon	1.773	0.656	8.759			8.759	20.9			20.9	20.9
	Santa Ana	1.812	0.466	34.748			34.748	20.9			20.9	20.9
	Santa Rita	0.253	0.251	24.001			24.001	20.9			20.9	20.9
	Santo Tomas		0.514	18.566	15.702		34.268	20.9	6.5		27.4	27.4
	Sasmuan	1.673	0.404	4.773	3.140		7.914	20.9	12.6		33.5	33.5
NuevaEcija	Aliaga	0.594	0.777	23.489			23.489	21.2			21.2	21.2
	Bongabon	1.490	1.360	7.001			7.001	21.2			21.2	21.2
	Cabanatuan City	0.479	1.116	121.186		55.429	176.615	21.2		4.1	21.2	25.3
	Cabiao	0.506	0.819	40.789			40.789	21.2			21.2	21.2
	Carranglan	0.583	0.940	10.262			10.262	21.2			21.2	21.2
	Gabaldon	0.326	0.589	11.749			11.749	21.2			21.2	21.2
	Gapan	1.406	0.741	38.810			38.810	21.2			21.2	21.2
	Gen Mamerto Natividad	0.788	0.481	3.744			3.744	21.2			21.2	21.2
	General Tinio	0.521	0.512	9.674			9.674	21.2			21.2	21.2
	Guimba	1.506	0.742	3.991			3.991	21.2			21.2	21.2
	Jaen	1.293	1.000	9.691			9.691	21.2			21.2	21.2
	Laur	0.538	0.530	5.712			5.712	21.2			21.2	21.2
	Licab	0.513	0.160	2.237			2.237	21.2			21.2	21.2
	Llanera	0.864	0.360	3.477			3.477	21.2			21.2	21.2
	Lupao	0.991	0.535	1.465			1.465	21.2			21.2	21.2
	Science City of Munoz	0.942	0.668	12.524			12.524	21.2			21.2	21.2
	Palayan City	0.609	0.446	4.228			4.228	21.2			21.2	21.2
	Pantabangan	0.126	0.544	5.809			5.809	21.2			21.2	21.2
	Penaranda	0.214	0.277	6.078			6.078	21.2			21.2	21.2
	Quezon	0.819	0.580	6.390			6.390	21.2			21.2	21.2
	Rizal	1.454	0.658	4.871			4.871	21.2			21.2	21.2
	San Antonio	1.433	0.836	9.846			9.846	21.2			21.2	21.2
	San Isidro	0.081	0.379	23.621			23.621	21.2			21.2	21.2
	San Jose City		1.357	37.642			37.642	21.2			21.2	21.2
	San Leonardo	0.686	0.838	19.469			19.469	21.2			21.2	21.2
	Santa Rosa	0.935	0.782	8.774			8.774	21.2			21.2	21.2
	Santo Domingo	0.466	0.883	24.371			24.371	21.2			21.2	21.2
	Talavera	0.307	1.073	48.359			48.359	21.2			21.2	21.2
	Talugtug	0.283	0.070	0.571			0.571	21.2			21.2	21.2
	Zaragosa	0.788	0.621	11.433			11.433	21.2			21.2	21.2
Tarlac	Bamban	0.298	0.361	16.719	23.553		40.272	20.8	18.8		39.7	39.7
	Capas	0.762	0.686	4.750			4.750	20.8			20.8	20.8
	Concepcion	2.904	2.545	16.329			16.329	20.8			20.8	20.8
	La Paz	1.592	0.590	5.743			5.743	20.8			20.8	20.8
	Tarlac City	1.785	1.191	46.471		22.975	69.446	20.8		4.1	20.8	25.0
	Victoria	1.168	0.633	1.873			1.873	20.8			20.8	20.8
Total		125.537	70.815	2,110.560	1,857.344	460.031	4,427.935					

Source: JICA Study Team

Annex-T D.6.3.1 Estimated Necessary Loan Amount for Level 3,2 Water Supply System Development

Province	City / Municipality	Category of WD in 2006	Initial Investment Cost (Million Pesos)	Annual O&M Cost (Million Pesos/year)	Neceaary Loan Amount (Million Pesos)
Bulacan	Angat	Medium	72.3	6.3	72.3
	Baliuag	Big	469.3	40.9	0.0
	Bulacan	Big	24.2	2.1	0.0
	Bustos		50.6	4.4	50.6
	Calumpit	Big	307.8	26.8	0.0
	Doña Remedios Trinidad		51.6	4.5	51.6
	Guiguinto		22.1	1.9	22.1
	Hagonoy	Big	460.6	40.2	0.0
	Malolos City	Medium	797.5	69.5	797.5
	Norzagaray	Medium	179.3	15.6	179.3
	Pandi	Small	5.3	0.5	5.3
	Paombong		140.7	12.3	140.7
	Plaridel	Big	207.6	18.1	0.0
	Pulilan	Small	367.9	32.1	367.9
	San Ildefonso		84.9	7.4	84.9
	San Miguel	Medium	190.5	16.6	190.5
	San Rafael	Medium	64.8	5.6	64.8
	Santa Maria	Medium	6.6	0.6	6.6
Pampanga	Angeles City	Large	893.5	77.9	0.0
	Apalit	N/A	247.1	21.5	247.1
	Arayat	N/A	78.7	6.9	78.7
	Bacolor	Small	27.1	2.4	27.1
	Candaba	N/A	32.0	2.8	32.0
	Floridablanca	Big	99.2	8.6	0.0
	Guagua	Medium	259.4	22.6	259.4
	Lubao	Medium	132.9	11.6	132.9
	Mabalacat	Large	554.3	48.3	0.0
	Macabebe	Small	93.2	8.1	93.2
	Magalang		261.7	22.8	261.7
	Masantol	Small	59.6	5.2	59.6
	Mexico		161.1	14.0	161.1
	Minalin		32.5	2.8	32.5
	Porac	Small	190.4	16.8	190.4
	City of San Fernando	Big	717.9	62.6	0.0
	San Luis		99.9	8.7	99.9
	San Simon		46.2	4.0	46.2
	Santa Ana	N/A	183.4	16.0	183.4
	Santa Rita		126.7	11.0	126.7
	Santo Tomas		98.0	8.5	98.0
	Sasmuan	Small	25.2	2.2	25.2
NuevaEcija	Aliaga		124.0	10.8	124.0
	Bongabon	Small	34.6	3.5	34.6
	Cabanatuan City	Big	639.7	55.8	0.0
	Cabiao	Average	215.3	18.8	215.3
	Carranglan		54.2	4.7	54.2
	Gabaldon	N/A	60.1	5.6	60.1
	Gapan	Average	204.2	17.9	204.2
	Gen Mamerto Natividad	Small	19.6	1.7	19.6
	General Tinio	Average	50.7	4.5	50.7
	Guimba	Average	21.0	1.8	21.0
	Jaen	Small	51.0	4.5	51.0
	Laur		29.3	2.7	29.3
	Licab	N/A	11.8	1.0	11.8
	Llanera	N/A	18.2	1.6	18.2
	Lupao	N/A	7.7	0.7	7.7
	Science City of Munoz	Medium	65.0	5.9	65.0
	Palayan City	Small	21.9	2.0	21.9
	Pantabangan	N/A	27.1	3.0	27.1
	Penaranda	Medium	31.9	2.8	31.9
	Quezon		33.7	2.9	33.7
	Rizal	N/A	25.7	2.2	25.7
	San Antonio	Small	51.5	4.6	51.5
	San Isidro	Small	124.7	10.9	124.7
	San Jose City	Medium	198.7	17.3	198.7
	San Leonardo	N/A	101.9	9.1	101.9
	Santa Rosa	Average	45.8	4.1	45.8
	Santo Domingo	N/A	128.6	11.2	128.6
	Talavera	Big	255.3	22.3	0.0
	Talugtug	N/A	3.0	0.3	3.0
	Zaragosa	N/A	59.9	5.3	59.9
Tarlac	Bamban	N/A	88.3	7.7	88.3
	Capas	N/A	25.1	2.2	25.1
	Concepcion	Big	86.2	7.5	0.0
	La Paz		30.3	2.6	30.3
	Tarlac City	Large	245.3	21.4	0.0
	Victoria		9.9	0.9	9.9
Total			**11,125.0**	**973.0**	**6,164.0**

Source: JICA Study Team

Annex-T D.6.3.2 Past Financial Status of Each LGU and Funds Needed for Projects for Level 1 Water Supply System Development and Installation of Sanitary Toilet (Only for Soft Components)

Province	City / Municipality	Economic Status (Balance of Income and Expenditures) during Last 5 Years						Additional Annual Cost for Level 1 System (Mil.Pesos/year)	Additional Annual Cost for Sanitary Toilet (Mil.Pesos/year)	Total (Mil.Pesos/year)
		2004	2005	2006	2007	2008	Average			
Bulacan	Angat	-0.770	-1.078	6.789	3.361	11.057	**3.872**	2.984	0.688	**3.672**
	Baliuag	2.232	2.842	-3.581	0.111	17.456	**3.812**	0.048	1.493	**1.540**
	Bulacan	1.638	7.544	10.756	8.031	-10.871	**3.420**	0.442	0.130	**0.572**
	Bustos	1.784	1.784	3.175	-0.223	8.999	**3.104**	1.216	0.250	**1.466**
	Calumpit	-12.498	-4.273	10.603	4.248	0.203	**-0.343**		1.085	**1.085**
	Doña Remedios Trinidad	14.633	5.863	3.237	25.921	26.391	**15.209**	0.137	0.744	**0.880**
	Guiguinto	3.487	8.409	7.168	-2.684	13.916	**6.059**	0.058	0.062	**0.120**
	Hagonoy	3.294	0.815	6.690	12.237	1.284	**4.864**		1.616	**1.616**
	Malolos City	50.427	45.089	-8.201	34.642	-4.310	**23.529**	1.086	2.602	**3.688**
	Norzagaray	10.667	35.662	-6.112	-6.112	-7.412	**5.339**	3.560	1.003	**4.563**
	Pandi	4.911	-3.052	15.119	7.582	15.344	**7.981**		0.028	**0.028**
	Paombong	3.936	-6.227	-0.950	2.044	1.643	**0.089**	0.743	0.499	**1.242**
	Plaridel	23.501	36.499	19.275	31.793	21.765	**26.567**		0.520	**0.520**
	Pulilan	-6.235	7.135	25.526	7.161	22.922	**11.302**	2.352	0.930	**3.282**
	San Ildefonso	-6.231	5.244	1.468	10.131	4.866	**3.096**	8.320	1.303	**9.623**
	San Miguel	-7.816	24.239	20.107	26.931	35.896	**19.871**	9.553	1.855	**11.408**
	San Rafael	4.768	14.853	9.631	11.451	16.269	**11.394**	8.147	0.941	**9.087**
	Santa Maria	0.309	40.756	-29.797	-13.108	52.866	**10.205**		0.018	**0.018**
Pampanga	Angeles City	-49.548	-55.769	78.067	-10.084	88.289	**10.191**		7.712	**7.712**
	Apalit	-3.619	3.563	0.948	3.143	2.066	**1.220**		1.151	**1.151**
	Arayat	-3.438	1.096	2.333	0.016	5.498	**1.101**	8.023	2.047	**10.070**
	Bacolor	1.296	0.408	0.103	-2.124	1.871	**0.311**	1.141	0.115	**1.256**
	Candaba	3.413	1.946	21.711	16.959	7.185	**10.243**	6.242	1.695	**7.937**
	Floridablanca	27.621	35.729	41.791	55.671	55.671	**43.296**	1.277	0.552	**1.830**
	Guagua	3.906	5.741	0.229	1.582	0.788	**2.449**		0.632	**0.632**
	Lubao	7.085	3.407	1.174	-2.520	3.781	**2.586**	6.696	2.417	**9.113**
	Mabalacat	23.600	22.737	21.387	5.644	135.221	**41.718**	0.006	1.323	**1.329**
	Macabebe	0.382	0.166	0.863	1.578	0.781	**0.754**	1.466	0.972	**2.438**
	Magalang	2.680	2.699	2.027	1.468	5.413	**2.858**	3.264	1.074	**4.338**
	Masantol	2.622	1.112	3.657	2.639	0.063	**2.019**	3.010	0.426	**3.436**
	Mexico	1.431	11.084	5.862	6.342	5.754	**6.095**	6.472	1.189	**7.661**
	Minalin	-1.872	0.114	0.114	6.913	0.987	**1.251**	1.746	0.763	**2.509**
	Porac	-0.094	5.931	0.890	10.316	26.421	**8.693**	4.286	0.735	**5.021**
	City of San Fernando	20.052	3.975	111.397	100.055	68.882	**60.872**	5.667	2.366	**8.033**
	San Luis	-1.248	7.802	4.164	-7.958	7.762	**2.105**	2.031	0.910	**2.941**
	San Simon	5.328	2.740	2.132	1.072	1.072	**2.469**	1.773	0.656	**2.429**
	Santa Ana	-0.693	2.903	2.483	6.903	14.985	**5.316**	1.812	0.466	**2.278**
	Santa Rita	2.995	5.169	8.417	-1.463	1.657	**3.355**	0.253	0.251	**0.504**
	Santo Tomas	0.267	-0.203	0.675	0.032	1.356	**0.425**		0.514	**0.514**
	Sasmuan	0.237	1.245	0.718	0.718	0.763	**0.736**	1.673	0.404	**2.077**
NuevaEcija	Aliaga	6.105	5.911	18.720	6.176	31.395	**13.661**	0.594	0.777	**1.371**
	Bongabon	8.922	-4.670	4.226	2.878	13.796	**5.030**	1.490	1.360	**2.850**
	Cabanatuan City	-111.270	69.290	17.279	-30.295	-98.813	**-30.762**	0.479	1.116	**1.595**
	Cabiao	-3.338	4.075	3.120	-0.446	1.671	**1.017**	0.506	0.819	**1.325**
	Carranglan	10.262	15.126	7.940	12.019	12.019	**11.473**	0.583	0.940	**1.523**
	Gabaldon	3.725	0.311	-0.646	0.864	3.564	**1.564**	0.326	0.589	**0.915**
	Gapan	-53.584	25.004	33.297	32.548	25.707	**12.594**	1.406	0.741	**2.146**
	Gen Mamerto Natividad	7.135	1.334	-4.705	6.175	-1.941	**1.600**	0.788	0.481	**1.269**
	General Tinio	11.133	5.848	3.983	4.766	-0.827	**4.980**	0.521	0.512	**1.032**
	Guimba	1.836	3.800	12.463	1.238	5.532	**4.974**	1.506	0.742	**2.247**
	Jaen	-0.015	0.631	0.631	6.496	0.860	**1.721**	1.293	1.000	**2.292**
	Laur	-25.817	7.966	21.036	21.036	0.309	**4.906**	0.538	0.530	**1.068**
	Licab	5.808	-1.061	-1.895	4.538	-8.196	**-0.161**	0.513	0.160	**0.673**
	Llanera	6.277	1.300	9.674	0.478	2.668	**4.079**	0.864	0.360	**1.225**
	Lupao	-5.337	-2.690	1.742	2.994	3.421	**0.026**	0.991	0.535	**1.526**
	Science City of Munoz	14.710	-32.408	-6.782	2.085	30.580	**1.637**	0.942	0.668	**1.610**
	Palayan City	2.994	0.088	2.389	18.605	26.190	**10.053**	0.609	0.446	**1.055**
	Pantabangan	-0.971	135.354	-97.315	-97.315	-0.829	**-12.215**	0.126	0.544	**0.671**
	Penaranda	-2.943	-1.096	-1.096	-0.810	1.481	**-0.893**	0.214	0.277	**0.491**
	Quezon	12.273	13.161	7.128	30.109	-0.270	**12.480**	0.819	0.580	**1.399**
	Rizal	-1.700	-0.543	-0.046	1.136	2.795	**0.328**	1.454	0.658	**2.113**
	San Antonio	4.780	12.582	4.951	4.986	18.254	**9.111**	1.433	0.836	**2.269**
	San Isidro	2.302	1.537	-3.494	2.767	0.898	**0.802**	0.081	0.379	**0.460**
	San Jose City	27.786	15.372	18.126	4.965	27.206	**18.691**		1.357	**1.357**
	San Leonardo	4.064	2.668	12.207	3.931	7.885	**6.151**	0.686	0.838	**1.524**
	Santa Rosa	-3.485	2.260	1.690	1.690	4.864	**1.404**	0.935	0.782	**1.717**
	Santo Domingo	2.185	3.361	4.040	1.330	-0.911	**2.001**	0.466	0.883	**1.349**
	Talavera	-1.230	28.272	6.389	-23.399	7.777	**3.562**	0.307	1.073	**1.379**
	Talugtug	0.181	0.381	0.053	-0.795	-2.432	**-0.522**	0.283	0.070	**0.354**
	Zaragosa	1.420	3.946	2.713	2.388	2.259	**2.546**	0.788	0.621	**1.409**
Tarlac	Bamban	5.137	1.081	3.998	4.211	7.966	**4.479**	0.298	0.361	**0.658**
	Capas	10.520	6.931	3.150	9.878	6.606	**7.417**	0.762	0.686	**1.448**
	Concepcion	43.698	53.639	67.267	71.947	98.508	**67.012**	2.904	2.545	**5.449**
	La Paz	8.858	3.654	26.941	0.804	1.221	**8.296**	1.592	0.590	**2.182**
	Tarlac City	61.300	56.410	17.843	74.715	60.602	**54.174**	1.785	1.191	**2.977**
	Victoria	10.895	7.412	17.909	20.231	16.203	**14.530**	1.168	0.633	**1.801**
Total		199.056	731.939	616.969	565.343	972.565	**617.174**	125.537	70.815	**196.351**

Source: JICA Study Team