Chapter 8

FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT

8. FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT

8.1 General

Phased investments for provincial sector development, Medium-Term Investment (2001-2005) and Long-Term Development (2006-2010), are planned in almost the same manner as adopted in the 1998 Philippine National Development Plan (PNDP), the National Sector Master Plan (NSMP) and Updated Medium-Term Philippine Development Plan.

Targets of provincial service coverage for the two phases are established as percentages of beneficiaries or utilities to be served by sub-sector. Service coverage in the base year (1998) and national sector targets indicated in the National Sector Master Plan (NSMP) and the updated Medium-Term Philippine Development Plan, 1996 - 1998 (MTPDP) are the bases of the study. Sector targets which are not prescribed in the national plan; school and public toilets as well as sewerage are assumed based on the current conditions. In addition, preliminary discussions on solid waste management are included as a vital component of sanitation sector.

Projection of frame values by municipality is undertaken for respective sub-sectors; future population by urban and rural area, the number of student enrollment to public schools and the number of public utilities. Reference base figures for the study of framework are the 1995 Census of Population and Housing, the statistical data of the province and the information from relevant agencies. Municipal population by target year and the base year (1998) is estimated referring to the NSO population census results (past 3 census periods: 1980 - 1995), the 1995 Census-based Regional and Provincial Population projection prepared by NSO and the Provincial Physical Framework Plan/Comprehensive Provincial Land Use Plan. While, the population distribution to urban and rural areas prepared by NSO in 1995 is modified to meet actual conditions in the classification of the areas.

Types of required facilities and their implementation criteria according to service level standards are referred to the NSMP and the NEDA Board Resolution No. 12 (s. 1995). Some planning conditions and assumptions not prescribed in the national plan are conferred to the relevant standards of sector agencies and provincial government. For sewerage requirements, the deficit in sanitation must first be addressed. Partial upgrading of on-site disposal to a sewerage system (off-site disposal) is envisaged in the final target year.
In estimating future requirements by municipality, additional population (or number of stu-

dents/public utilities) to be served by sub-sector is first calculated as a shortfall at target years in comparison between each target and its base year service coverage. In this regard, planned/on-going projects to be completed by respective base years are considered as part of existing services for each target year. Required number of facilities by sector component is then estimated corresponding to the said additional population (or number of students/public utilities) to be served. Rehabilitation work for Level I facilities limited to new deep wells to be constructed under PW4SP is taken into account. Generally, rehabilitation of deep wells and shallow wells constructed by means of conventional method is difficult.

Logistic support is considered as a minimum requirement of LGUs for community development and training, and other relevant activities along with the implementation of PW4SP. The types and number of well drilling/rehabilitation equipment and supporting vehicle for Level I facilities are also suggested as reference information. Also, minimum requirements for setting up a provincial laboratory to support drinking water quality surveillance and monitoring are described. This will include building, instrument/equipment and reagent/chemical requirements. The 1993 Philippine National Standards for Drinking Water (PNSDW) requires that initial examinations of water from newly constructed sources should first be undertaken before operation for public use and henceforth periodic examinations of these water supply sources/facilities.

Project priority for medium-term development is discussed entailing general criteria to identify specific projects. However, at the provincial level master plan, it is suggested that municipal priority ranking be used for allocation of provincial fund.

8.2 Targets of Provincial Sector Plan

Provincial sector targets for the years 2005 and 2010 are determined as the provincial average of the desirable minimum level for each sub-sector. Table 8.2.1 summarizes the target percentages to be served by sub-sector. Details by sub-sector are discussed in this subsection.

(1) Water supply

The base year (1998) service coverage was calculated as a total of 1998 figures and expected by planned/on-going projects scheduled to be completed by 1999. Table 8.2.2 shows service coverage for the planning purpose (details are referred to Supporting Report).

Table 8.2.1 Provincial Sector Targets

Sub-sector	Base Year Service Coverage	Phase I (2001-2005)		Phase II (2006-2010)	
Water Supply	Population Coverage (%)	Population Coverage (%)	Additional Population to be Served	Population Coverage (%)	Additional Population to be Served
Urban Water Supply	75	75	15,151	95	117,307
Rural Water Supply	54	54	35,312	93	249,538
Sanitation	Household Coverage (%)	Household Coverage (%)	Additional Households to be Served	Household Coverage (%)	Additional Households to be Served
Household Toilet					
Urban Area	93	93	3,728	93	18,606
Flush	21	30	888	50	15,663
Pour Flush	71	65	2,158	50	2,943
VIP/Dry	8	5	682	0	0
Rural Area	74	80	16,355	93	51,960
Flush	4	5	2,286	10	3,199
Pour Flush	53	60	9,251	90	48,761
VIP/Dry	43	35	4,818	0	0
School Toilet	Public School Student Coverage (%)	Public School Student Coverage (%)	Additional Public School Students to be Served	Public School Student Coverage (%)	Additional Public School Students to be Served
	23	40	35,531	90	110,266
Public Toilet	Public Utilities Coverage (%)	Public Utilities Coverage (%)	Additional Public Utilities with Sanitary Toilets	Public Utilities Coverage (%)	Additional Public Utilities with Sanitary Toilets
	92	100	42	100	19
Sewerage	Urban Population Coverage (%)	Not Applicable		Urban Population Coverage (%)	Urban Population to be Served
	0			50	51,444
Solid Waste	Urban Household Coverage (%)	Urban Household Coverage (%)	Additional Urban House-holds to be Served	Not Applicable	
	100	100	4,342		

Table 8.2.2 Estimation of Base Year Service Coverage of Water Supply

Name of Municipality	Area	Population (1998)	Population Served by 1998 Facilities				
			Level III	Level II	Level I	Total	Percentage Coverage
Cuartero	Urban	3,894			1,774	1,774	46
	Rural	25,529		402	13,981	14,383	56
	Total	29,423		402	15,755	16,157	55
Dao	Urban	5,646			3,864	3,864	68
	Rural	24,000			17,548	17,548	73
	Total	29,646			21,412	21,412	72
Dumalag	Urban	3,193			2,841	2,841	89
	Rural	27,352	2,465	775	18,464	21,704	79
	Total	30,545	2,465	775	21,305	24,545	80
Dumarao	Urban	5,447	1,890	75	2,309	4,274	78
	Rural	33,767	340	350	28,215	28,905	86
	Total	39,214	2,230	425	30,524	33,179	85
Ivisan	Urban	4,632	1,285		1,687	2,972	64
	Rural	19,098	655	675	10,117	11,447	60
	Total	23,730	1,940	675	11,804	14,419	61
Jamindan	Urban	2,516			722	722	29
	Rural	36,235		300	1,232	1,532	4
	Total	38,751		300	1,954	2,254	6
Ma-ayon	Urban	4,578			2,422	2,422	53
	Rural	26,410		500	11,636	12,136	46
	Total	30,988		500	14,058	14,558	47
Mambusao	Urban	6,492	2,175		1,944	4,119	63
	Rural	31,068	10	660	14,196	14,866	48
	Total	37,560	2,185	660	16,140	18,985	51
Panay	Urban	2,969	1,685		25	1,710	58
	Rural	38,031	4,960		1,166	6,126	16
	Total	41,000	6,645		1,191	7,836	19
Panitan	Urban	2,638	995		825	1,820	69
	Rural	31,224	840	625	19,394	20,859	67
	Total	33,862	1,835	625	20,219	22,679	67
Pilar	Urban	5,117	860		3,026	3,886	76
	Rural	32,055	195	665	24,365	25,225	79
	Total	37,172	1,055	665	27,391	29,111	78
Pontevedra	Urban	6,427	3,680		380	4,060	63
	Rural	33,126	3,400	2,628	8,585	14,613	44
	Total	39,553	7,080	2,628	8,965	18,673	47
President Roxas	Urban	6,615			2,769	2,769	42
	Rural	18,736		125	4,997	5,122	27
	Total	25,351		125	7,766	7,891	31
Roxas City (Capital)	Urban	59,024	33,945		20,946	54,891	93
	Rural	71,743	16,315	948	36,751	54,014	75
	Total	130,767	50,260	948	57,697	108,905	83
Sapi-an	Urban	4,038			1,376	1,376	34
	Rural	19,055		660	12,017	12,677	67
	Total	23,093		660	13,393	14,053	61
Sigma	Urban	2,248			674	674	30
	Rural	24,264		1,100	6,232	7,332	30
	Total	26,512		1,100	6,906	8,006	30
Tapaz	Urban	2,135			1,747	1,747	82
	Rural	38,674		500	16,576	17,076	44
	Total	40,809		500	18,323	18,823	46
Provincial Total	Urban	127,609	46,515	75	49,331	95,921	75
	Rural	530,367	29,180	10,913	245,472	285,565	54
	Total	657,976	75,695	10,988	294,803	381,486	58

The base year service coverage in urban area (75%) is higher than the updated MTPDP sector target (69%) for the year 1998, while rural area (54%) is far behind the sector

target of 79%. As identified in Chapter 4, lower service coverage in rural area is considered to arise from existence of high percentage of underserved population.

For Phase I development, targets of service coverage for water supply by urban and rural area were set up considering the following conditions:

i) at least the existing service coverage shall be secured to meet population increase; and

ii) viable investment using available IRA to be allocated to water supply sector shall be considered.

Thus, the existing service coverage of 75% for urban and 54% for rural area are assumed for the medium-term targets. The target for the rural water supply was determined in view of limited IRA available, though the increase of the service coverage is an urgent subject.

Phase II targets are planned to increase urban and rural water supply coverage to 95% and 93%, respectively, as envisaged in the NSMP.

(2) Sanitation

1) Household toilets

The base year service coverage is calculated as shown in Table 8.2.3 reflecting any planned or on-going projects scheduled to be completed by 1999 (refer to SR).

The province has base year service coverage of 78%, which is above the current national average coverage of 60%. Urban and rural area registers a level of 93% and 74%, respectively. Both of them are well above the national average coverage. By type of sanitary toilet facility, the existing composition to total households is as follows:

Type	Urban (%)	Rural (%)
Flush	21	4
Pour-flush	71	53
VIP latrine	8	43

To attain sufficiency and equitable access to basic services, provincial target of Phase I for urban household toilets is planned at 93%, while, for rural household toilets, 80% is assumed. The target for the urban service coverage will be kept the existing high percentage (93%). While that for the rural service is pursued to lessen the gap.

Table 8.2.3 Base Year Service Coverage of HH Toilets

Name of Municipality/ City	Area	1998		Households and Population Using Sanitary Toilets								
				Number of Households					Service Coverage (%)			
		Population	HHs	Flush	Pour Flush	VIP/Dry	Total	Population	Flush	Pour Flush	VIP/Dry	Total
Cuartero	Urban	3,894	712	152	512	12	676	3,700	21	72	2	95
	Rural	25,529	4,510		250	21	271	1,532		6		6
	Total	29,423	5,222	152	762	33	947	5,232	3	15	1	18
Dao	Urban	5,646	1,084	38	971		1,009	5,251	4	90		93
	Rural	24,000	4,715		1,571	2,635	4,206	21,360		33	56	89
	Total	29,646	5,799	38	2,542	2,635	5,215	26,611	1	44	45	90
Dumalag	Urban	3,193	576	13	370		383	2,108	2	64		66
	Rural	27,352	5,028		2,585	1,779	4,364	23,797		51	35	87
	Total	30,545	5,604	13	2,955	1,779	4,747	25,905		53	32	85
Dumarao	Urban	5,447	1,123	40	801	206	1,047	5,066	4	71	18	93
	Rural	33,767	6,726	12	241	4,813	5,066	25,326		4	72	75
	Total	39,214	7,849	52	1,042	5,019	6,113	30,392	1	13	64	78
Ivisan	Urban	4,632	864		804		804	4,308		93		93
	Rural	19,098	3,752		2,540		2,540	12,987		68		68
	Total	23,730	4,616		3,344		3,344	17,295		72		72
Jamindan	Urban	2,516	508		450	40	490	2,416		89	8	96
	Rural	36,235	6,928		1,290	4,856	6,146	32,250		19	70	89
	Total	38,751	7,436		1,740	4,896	6,636	34,666		23	66	89
Ma-ayon	Urban	4,578	899		682	163	845	4,304		76	18	94
	Rural	26,410	5,079		2,459	1,125	3,584	18,752		48	22	71
	Total	30,988	5,978		3,141	1,288	4,429	23,056		53	22	74
Mambusao	Urban	6,492	1,174		439	642	1,081	5,973		37	55	92
	Rural	31,068	6,140		2	5,390	5,392	27,340			88	88
	Total	37,560	7,314		441	6,032	6,473	33,313		6	82	89
Panay	Urban	2,969	588		568		568	2,880		97		97
	Rural	38,031	6,940		5,699		5,699	31,186		82		82
	Total	41,000	7,528		6,267		6,267	34,066		83		83
Panitan	Urban	2,638	502	19	366		385	2,032	4	73		77
	Rural	31,224	5,947		1,742		1,742	9,055		29		29
	Total	33,862	6,449	19	2,108		2,127	11,087		33		33
Pilar	Urban	5,117	1,036		918		918	4,555		89		89
	Rural	32,055	6,200		1,092	4,406	5,498	28,529		18	71	89
	Total	37,172	7,236		2,010	4,406	6,416	33,084		28	61	89
Pontevedra	Urban	6,427	1,128	379	488	93	960	5,463	34	43	8	85
	Rural	33,126	6,192	388	4,104	1,036	5,528	29,483	6	66	17	89
	Total	39,553	7,320	767	4,592	1,129	6,488	34,946	10	63	15	89
President	Urban	6,615	1,277		635	339	974	5,028		50	27	76
	Rural	18,736	3,562		2,217	774	2,991	15,739		62	22	84
	Total	25,351	4,839		2,852	1,113	3,965	20,767		59	23	82
Roxas City	Urban	59,024	11,551	4,148	6,954	179	11,281	57,844	36	60	2	98
	Rural	71,743	13,588	2,802	9,391	521	12,714	67,439	21	69	4	94
	Total	130,767	25,139	6,950	16,345	700	23,995	125,283	28	65	3	95
Sapi-an	Urban	4,038	806		742		742	3,715		92		92
	Rural	19,055	3,657		2,895		2,895	15,054		79		79
	Total	23,093	4,463		3,637		3,637	18,769		81		81
Sigma	Urban	2,248	447		261	122	383	1,934		58	27	86
	Rural	24,264	4,739		173	3,290	3,463	17,713		4	69	73
	Total	26,512	5,186		434	3,412	3,846	19,647		8	66	74
Tapaz	Urban	2,135	403		371		371	1,965		92		92
	Rural	38,674	7,893		1,856	1,536	3,392	16,630		24	19	43
	Total	40,809	8,296		2,227	1,536	3,763	18,595		27	19	45
Provincial Total	Urban	127,609	24,678	4,789	16,332	1,796	22,917	118,542	19	66	7	93
	Rural	530,367	101,596	3,202	40,107	32,182	75,491	394,172	3	39	32	74
	Total	657,976	126,274	7,991	56,439	33,978	98,408	512,714	6	45	27	78

of the coverage between the urban and rural areas and to achieve a balanced distribution of this basic facility as embodied in the PNDP. For Phase II, 93% as set by

the NSMP is adopted for urban household toilets, while, 90% is arranged for rural household toilets.

The existing composition of the 3 facility types serves as an indicator in the distribution for Phase I, while for Phase II, VIP and sanitary pit privy/latrine (dry-type) is phased-out.

2) School toilets

The base year service coverage of public school students is shown in Table 8.2.4 counting expected coverage of any planned or on-going projects scheduled to be completed by 1999 (details are referred to Supporting Report).

Base year service coverage is 23% applying the standard number of public school students to be served by one (1) unit of toilet facility. The low level is due to a large number of unsanitary or absence of facilities.

Table 8.2.4 Base Year Service Coverage of Public School Toilets and Public Toilets

Name of Municipality/City	Public School Toilets			Public Toilets		
	Total Number of Public School Students (1998)	Std. No. of Public School Student that can be Served by Base Year (1998) Sanitary Toilets	Service Coverage (%)	Number of Public Utilities with Toilets in 1998	Number of Public Utility with Sanitary Toilets in Base Year (1998)	Service Coverage (%)
Cuartero	6,699	640	10	2	2	100
Dao	6,146	960	16	4	4	100
Dumalag	5,510	1,600	29	4	4	100
Dumarao	10,120	3,920	39	3	1	33
Ivisan	6,269	1,440	23	2	2	100
Jamindan	9,196	2,480	27	4	4	100
Ma-ayon	9,600	3,200	33	4	4	100
Mambusao	7,311	1,640	22	4	1	25
Panay	8,778	1,200	14	2	2	100
Panitan	8,282	2,160	26	4	4	100
Pilar	10,277	2,080	20	2	2	100
Pontevedra	10,201	1,840	18	2	2	100
President Roxas	6,224	1,280	21	2	2	100
Roxas City (Capital)	27,754	6,360	23	13	13	100
Sapi-an	6,237	1,920	31	2	2	100
Sigma	4,873	1,280	26	2	2	100
Tapaz	10,472	2,120	20	5	5	100
Provincial Total	153,949	36,120	23	61	56	92

In the absence of national targets for school toilets, the existing level of service coverage is the base in setting up the targets. It is expected that all new construction of

school-buildings will entail sanitary toilets enabling the coverage to increase on a high level. For Phase I and II, 40% and 90% are set, respectively.

3) Public toilets

The base year service coverage considering expected additional coverage by 1999 is shown in Table 8.2.4 (details are referred to Supporting Report).

Almost all-existing public utilities are served with at least one sanitary toilet giving 92% coverage. This can be attributed by the fact that almost all public utilities (mostly public markets) are provided with sanitary toilet facilities.

Without national targets as of now, the indicator in setting up provincial targets would be the existing level of coverage. Accordingly, 100% coverage both for Phase I and Phase II are assumed.

(3) Sewerage

Given the non-existence of sewerage systems in any municipality at the present time, this plan does not consider the service during Phase I. For Phase II, a target of 50% coverage was applied to urban population of municipalities with more than 10,000 urban population provided by Level III water supply systems.

(4) Solid waste

The municipal level data in 1998 on the number of households served by the municipal refuse collection revealed that the current practice is concentrated to urban areas. The base year service coverage for urban area by municipality is reflected in Table 8.2.5.

About 30% of the total households in the province relied on municipal refuse collection using trucks or 100% urban household coverage. These municipalities have a total of 65 units of collection truck.

No national targets have yet been set. However, considering the present level of coverage, a 100% urban household coverage is applied for the medium-term period (2001-2005).

Table 8.2.5 Base Year Service Coverage of Municipal Solid Waste System in 1998

Name of Municipality/City	Total No. of Households	No. of Urban Households	No. of Households Served	Coverage of Households (%)	Coverage of Urban Households (%)
Cuartero	5,222	712	280	5	39
Dao	5,799	1,084	103	2	10
Dumalag	5,604	576	700	12	100
Dumarao	7,849	1,123	616	8	55
Ivisan	4,616	864	839	18	97
Jamindan	7,436	508			
Ma-ayon	5,978	899	590	10	66
Mambusao	7,314	1,174	1,166	16	99
Panay	7,528	588			
Panitan	6,449	502	420	7	84
Pilar	7,236	1,036	1,175	16	100
Pontevedra	7,320	1,128	1,114	15	99
President Roxas	4,839	1,277	1,852	38	100
Roxas City (Capital)	25,139	11,551	25,139	100	100
Sapi-an	4,463	806	1,100	25	100
Sigma	5,186	447	562	11	100
Tapaz	8,296	403	441	5	100
Provincial Total	126,274	24,678	36,097	29	100

8.3 Projection of Frame Values

8.3.1 Population Projection

Future population for all municipalities by urban and rural areas was projected for the target years of 2005 and 2010 together with the present population in 1998 as a planning base year.

The future regional and provincial population has been projected by the NSO, while the projections at municipal levels were not available during the study. The future population of LGUs was therefore projected (details are included in the Supporting Report). Available information for the study at present is as follows:

NSO population census results from 1980 to 1995

1995 Census-based Regional and Provincial Population Projection prepared by the NSO

Provincial Physical Framework Plan/Comprehensive Provincial Land Use Plan (1993-2002) prepared by the Provincial Office

(1) 1995 Census-Based Regional and Provincial Population Projections: NSO

The NSO conducted regional and provincial projections for the period 1995-2020. The assumptions take into account future trends in the demographic processes of fertility, mortality and migration required by the cohort-component method for projecting population. The 1995 Population Census was used as the basis for the projection.

In the regional population projection, the subject region for this study; Region VI is classified as the medium-sized region (at least 5 million but less than 10 million by year 2000). The following are the result of projection for the region and the province of Capiz in 2000, 2005 and 2010.

Table 8.3.1 Regional and Provincial Population Projection by NSO

Year		1980	1990	1995	2000	2005	2010
Region VI	Population	4,525,615	5,393,333	5,756,623	6,328,671	6,890,447	7,428,329
	Growth Rate	-	1.77%	1.31%	1.91%	1.72%	1.51%
Capiz	Population	492,231	584,091	*622,034	681,949	742,312	801,742
	Growth Rate	-	1.73%	1.27%	1.86%	1.71%	1.55%

Note: Average annual growth rates: geometric growth rate
* Population of the province as of Sep. 1 was 624,469 (1995 Census) and 622,034 (as of May, 1995)

In the past development, annual growth rates of the region and province between 1990 and 1995 decreased compared with those of previous census period. The growth rates of Region VI and the province from 1980 to 1995 were almost same. Although the both growth rates of the region and province between 1990 and 1995 decreased more than 70% compared with those of previous census period, the NSO considered the previous development for its projection. Thus, the growth rates of the region with 5-year interval between 1995 and 2010 are assumed at 1.91%, 1.72% and 1.51%, respectively. Likewise, those of the province are 1.86%, 1.71% and 1.55%, respectively.

(2) The Land Use Plan: Province of Capiz (Planning period 1993-2002)

The population projection on the provincial total and component municipalities together with the regional population was made with a base year 1990. The population for the year 2002 was projected using a uniform growth rate between 1990 and 2002 referring to the experience from 1980 to 1990 (census years).

In comparison between Land Use Plan and NSO's projection for year 2002, there is no significant difference both in regional and provincial population.

On the other hand, regarding the projected municipal population in 1995, that of twelve (12) out of 17 municipalities is higher than that of NSO with a range of 1% to 10%, while that of remaining five (5) municipalities is lower with a range of -2% to -15%.

Thus, municipal population projection shall be made using 1995 census results as a base year. While, the regional and provincial population projected by the NSO may be adopted in this PW4SP, since there is not so much difference from that of Land Use Plan.

(3) Population Projection of the Province

The following conditions are considered in the population projection.

Regional and Provincial Population

For the regional and provincial population in the study, the projection conducted by NSO shall be adopted. Table 8.3.2 shows the projected population of the region VI and component provinces.

Table 8.3.2 Projected Population by the NSO

Province	Census Population	Projected Population/Growth Rate					
		Population			Average Annual Growth Rate		
	1995	1998	2005	2010	1995-2000	2000-2005	2005-2010
Aklan	408,949	432,359	487,839	528,072	1.84%	1.72%	1.60%
Antique	430,363	455,051	512,755	554,797	1.84%	1.69%	1.59%
Capiz	**622,034***	**657,975**	**742,312**	**801,742**	**1.86%**	**1.71%**	**1.55%**
Guimaras	126,034	133,422	150,680	162,774	1.88%	1.72%	1.56%
Iloilo	1,743,302	1,847,328	2,086,833	2,249,494	1.91%	1.72%	1.51%
Negros Occidental	2,425,941	2,573,658	2,910,028	3,131,450	1.95%	1.72%	1.48%
Region VI	5,756,623	6,099,793	6,890,447	7,428,329	1.91%	1.72%	1.51%

Source: NSO

Note: Population of the province as of Sep. 1,1995 was 624,469 (1995 Census) and 622,034 (as of May, 1995)

Municipal Population

1) The total population of the province in 1998, 2005 and 2010 was fixed.

2) Municipal population for short/medium-term target years (1998 and 2005) is estimated using the recorded growth rates between 1990 and 1995. The municipal population estimated initially is adjusted in proportion to the population size of each municipality to the total provincial population, to meet the above mentioned provincial population fixed for the years 1998 and 2005. In this adjustment, the population of Tapaz in 1998 was fixed to avoid negative growth rate.

For the year 2010 in the long-term, it is assumed that the tendency of population growth of respective municipalities will be stable reflecting the experiences in the past long term between 1980 and 1995. Thus, experienced growth rate between 1980 and 1995 by municipality is firstly applied to project 2010 population from the year 2005. Then, the municipal population initially estimated is adjusted in the same manner mentioned above. Table 8.3.3 presents census results (1980, 1990 and 1995) and projected population of the municipalities.

Table 8.3.3 Census results and Projected Population of Municipalities

Municipality	Census Result					Projected Population/Growth Rate								
				GR		1998			2005			2010		
	1980	1990	1995	1990-1995	1980-1995	Population		GR	Population		GR	Population		GR
						Initial	Adjust.		Initial	Adjust.		Initial	Adjust.	
Cuartero	18,513	22,592	26,477	3.22%	2.41%	29,122	29,423	3.58%	36,366	37,313	3.49%	42,040	41,757	2.28%
Dao	23,921	29,139	29,266	0.09%	1.35%	29,342	29,646	0.43%	29,522	30,290	0.34%	32,397	32,179	1.22%
Dumalag	22,198	25,465	28,348	2.17%	1.64%	30,232	30,545	2.52%	35,130	36,045	2.43%	39,106	38,844	1.51%
Dumarao	29,934	36,779	38,037	0.67%	1.61%	38,812	39,214	1.02%	40,684	41,743	0.93%	45,213	44,969	1.47%
Ivisan	17,414	21,497	22,720	1.11%	1.79%	23,487	23,730	1.46%	25,379	26,040	1.37%	28,454	28,262	1.65%
Jamindan	25,652	27,862	34,022	4.08%	1.90%	38,354	38,751	4.43%	50,729	52,050	4.34%	57,187	56,803	1.76%
Maayon	25,715	29,779	30,333	0.37%	1.11%	30,670	30,988	0.71%	31,472	32,292	0.63%	34,119	33,890	0.97%
Mambusao	32,097	33,200	35,632	1.42%	0.70%	37,176	37,560	1.77%	41,044	42,112	1.68%	43,605	43,312	0.56%
Panay	31,650	36,812	39,124	1.23%	1.42%	40,580	41,000	1.57%	44,193	45,344	1.49%	48,664	48,337	1.29%
Panitan	27,631	32,863	33,269	0.25%	1.25%	33,515	33,862	0.59%	34,096	34,984	0.50%	37,218	36,968	1.11%
Pilar	30,104	35,924	36,464	0.30%	1.29%	36,792	37,172	0.64%	37,568	38,547	0.56%	41,090	40,814	1.15%
Pontevedra	30,489	36,730	38,223	0.80%	1.52%	39,148	39,553	1.15%	41,394	42,471	1.06%	45,796	45,488	1.38%
Pre. Roxas	21,805	24,048	24,695	0.53%	0.83%	25,092	25,351	0.88%	26,042	26,720	0.79%	27,852	27,665	0.70%
Roxas City	81,183	102,794	118,715	2.92%	2.57%	129,428	130,767	3.28%	158,337	162,460	3.19%	184,399	183,160	2.43%
Sapian	18,753	22,007	22,534	0.47%	1.23%	22,856	23,093	0.82%	23,626	24,241	0.73%	25,772	25,599	1.10%
Sigma	20,043	25,084	25,801	0.57%	1.70%	26,241	26,512	0.91%	27,297	28,008	0.82%	30,468	30,263	1.56%
Tapaz	35,129	40,916	40,809	-0.05%	1.00%	40,809	40,809	0.00%	40,596	41,653	0.20%	43,787	43,493	0.87%
Province	492,231	583,491	624,469	1.37%	1.60%	651,657	657,975	1.76%	723,473	742,312	1.74%	807,164	801,742	1.55%

Note: Growth rates in 1998, 2005 and 2010 were calculated using geometric formula.

Population by Urban and Rural Area

1) Past population development

With regards to the ratio of the urban population of the province to the total population, the provincial averages in 1980 and 1990 were 13.5% and 28.2%, respectively. While it decreased to 19.1% in 1995. Likewise, the provincial growth rate of 9.48% between 1980 and 1990 also decreased to -6.16% in 1995.

With regard to rural population, the growth rates as the provincial average were -0.16% (1980 - 1990) and 3.79% (1990 - 1995). The reason of the drastic change of share/growth rate of urban area is explained that urban/rural classification of barangays in Roxas City (all barangays were classified as urban in 1990 Census) was rearranged in 1995 Census.

2) Projection of urban and rural population for the years 1998, 2005 and 2010

Urban population by municipality for the target years was at first projected and rural population was calculated to meet aforementioned total population fixing the urban population.

In the projection of municipal urban population, the following are assumed by short/medium-term and long-term.

Short/Medium-term target: 1998 and 2005

The share of urban population in 1995 in terms of the profile of urban population to

total population by municipality were basically adopted, assuming that the latest profile will not change drastically in short/medium-term period.

Long-term target: 2010

For the long-term projection, the recorded growth rates of urban population between 1980 and 1995 may be applied for the municipal population in 2010, assuming that the tendency of urban population in the long-term period will be stable reflecting the experiences in the past long term.

Under the above assumptions, provincial average share of urban population for the year 2010 arrived at 23.5%, higher than the figures in 1995 (19.1%). Table 8.3.4 presents projected urban and rural population. The growth rates and shares on rural population are calculated using estimated rural population.

Table 8.3.4 Population Projection by Urban and Rural Area:1998, 2005 and 2010

	Municipality	1998		2005			2010			
		Total	Urban/ Rural	Total	Urban/ Rural	Share (%)	Total	Urban/ Rural	G.R. (%)	Share (%)
Urban Area	Cuartero	29,423	3,894	37,313	4,938	13.2%	41,757	5,515	2.24%	13.2%
	Dao	29,646	5,646	30,290	5,769	19.0%	32,179	8,052	6.90%	25.0%
	Dumalag	30,545	3,193	36,045	3,768	10.5%	38,844	4,102	1.72%	10.6%
	Dumarao	39,214	5,447	41,743	5,799	13.9%	44,909	7,876	6.31%	17.5%
	Ivisan	23,730	4,632	26,040	5,083	19.5%	28,262	5,622	2.04%	19.9%
	Jamindan	38,751	2,516	52,050	3,380	6.5%	56,803	4,053	3.70%	7.1%
	Maayon	30,988	4,578	32,292	4,770	14.8%	33,890	5,216	1.80%	15.4%
	Mambusao	37,560	6,492	42,112	7,279	17.3%	43,312	7,904	1.66%	18.2%
	Panay	41,000	2,969	45,344	3,283	7.2%	48,337	3,385	0.61%	7.0%
	Panitan	33,862	2,638	34,984	2,726	7.8%	36,968	2,851	0.90%	7.7%
	Pilar	37,172	5,117	38,547	5,306	13.8%	40,814	7,176	6.22%	17.6%
	Pontevedra	39,553	6,427	42,471	6,901	16.2%	45,488	7,458	1.56%	16.4%
	Pre. Roxas	25,351	6,615	26,720	6,972	26.1%	27,665	6,936	-0.11%	25.1%
	Roxas City	130,767	59,024	162,460	73,329	45.1%	183,160	102,887	7.01%	56.2%
	Sapian	23,093	4,038	24,241	4,239	17.5%	25,599	4,669	1.95%	18.2%
	Sigma	26,512	2,248	28,008	2,375	8.5%	30,263	2,375	0.00%	7.8%
	Tapaz	40,809	2,135	41,653	2,179	5.2%	43,493	2,317	1.23%	5.3%
	Province	657,975	127,609	742,312	148,096	20.0%	801,742	188,393	4.93%	23.5%
Rural Area	Cuartero	29,423	25,529	37,313	32,375	86.8%	41,757	36,242	2.28%	86.8%
	Dao	29,646	24,000	30,290	24,521	81.0%	32,179	24,127	-0.32%	75.0%
	Dumalag	30,545	27,352	36,045	32,277	89.5%	38,844	34,741	1.48%	89.4%
	Dumarao	39,214	33,766	41,743	35,944	86.1%	44,909	37,033	0.60%	82.5%
	Ivisan	23,730	19,098	26,040	20,957	80.5%	28,262	22,640	1.56%	80.1%
	Jamindan	38,751	36,235	52,050	48,670	93.5%	56,803	52,750	1.62%	92.9%
	Maayon	30,988	26,410	32,292	27,521	85.2%	33,890	28,674	0.82%	84.6%
	Mambusao	37,560	31,068	42,112	34,833	82.7%	43,312	35,407	0.33%	81.8%
	Panay	41,000	38,031	45,344	42,060	92.8%	48,337	44,952	1.34%	93.0%
	Panitan	33,862	31,224	34,984	32,258	92.2%	36,968	34,117	1.13%	92.3%
	Pilar	37,172	32,056	38,547	33,241	86.2%	40,814	33,638	0.24%	82.4%
	Pontevedra	39,553	33,126	42,471	35,570	83.8%	45,488	38,030	1.35%	83.6%
	Pre. Roxas	25,351	18,736	26,720	19,747	73.9%	27,665	20,729	0.97%	74.9%
	Roxas City	130,767	71,743	162,460	89,131	54.9%	183,160	80,273	-2.07%	43.8%
	Sapian	23,093	19,055	24,241	20,003	82.5%	25,599	20,929	0.91%	81.8%
	Sigma	26,512	24,264	28,008	25,633	91.5%	30,263	27,888	1.70%	92.2%
	Tapaz	40,809	38,674	41,653	39,474	94.8%	43,493	41,176	0.85%	94.7%
	Province	**657,975**	**530,366**	**742,312**	**594,216**	**80.0%**	**801,742**	**613,349**	**0.64%**	**76.5%**

8.3.2 School Enrollment Projection

From the 1995 total population of the province, the number of children who would be enrolling in elementary and high school levels for all municipalities is derived.

School age population is extrapolated from the NSO age group classification of 5-9, 10-14 and 15-19 years old bracket by municipality. The age group for the elementary level is from 6 to 13 years, while that for the high school level is from 14 to 17 years. The percentages of school age population for the target years are based on the existing composition or structure of the 1995 population.

From the school age population, the number of children who would attend either private or public school, by target year is computed using the projected participation rate. The participation rate by target year varies depending on the socio-economic condition of the province. Generally, an improved economy will result to a higher participation rate. For the province, an increase in the participation rate in both private and public schools is foreseen by year 2010.

The number of public school students by target year is then derived from the projected number of children who will attend school. A participation rate for public school enrollment is established based on the existing participation rate of public school students to the total school age population. Based on the projection, an increase of 3% from the 1998 rate is foreseen in 2005 and another increase of 4% from the 2005 rate in 2010 (details are referred to Table 8.3.6, Supporting Report).

Table 8.3.5 shows the projected number of public school students by municipality, by target year. About 179,100 and 202,100 public school students are estimated to enroll for years 2005 and 2010, respectively.

8.3.3 Projection of the Number of Public Utilities

The number of public utilities (limited to public markets and bus/jeepney terminals) by target year is projected in urban areas for all municipalities. The provincial physical framework plan and the provincial comprehensive development plan serve as references in the projection. Bus or jeepney terminals are considered in major transport routes of the province.

Table 8.3.5 Projected Public School Enrollment and Number of Public Utilities by Municipality

Name of Municipality/City	Number of Public School Student			Number of Public Utilities		
	1998	2005	2010	1998	2005	2010
Cuartero	6,699	8,719	10,332	3	5	6
Dao	6,146	6,883	7,770	2	4	5
Dumalag	5,510	6,670	7,702	2	4	5
Dumarao	10,120	10,547	11,978	2	4	5
Ivisan	6,269	7,146	8,001	2	4	5
Jamindan	9,196	12,842	14,839	2	4	5
Ma-ayon	9,600	9,524	9,495	2	4	5
Mambusao	7,311	9,011	9,886	2	4	5
Panay	8,778	10,287	11,652	2	4	5
Panitan	8,282	9,148	10,203	2	4	5
Pilar	10,277	10,808	11,805	3	5	6
Pontevedra	10,201	11,138	12,592	2	4	5
President Roxas	6,224	7,076	6,940	2	4	5
Roxas City (Capital)	27,754	36,215	43,232	7	12	15
Sapi-an	6,237	6,684	7,281	2	4	5
Sigma	4,873	5,562	6,440	2	4	5
Tapaz	10,472	10,869	11,980	3	5	6
Provincial Total	153,949	179,129	202,128	42	79	98

A total of 42 public utilities are planned for construction by year 2005 and another 19 by year 2010. Refer to Table 8.3.5 for the number of public utilities by municipality by target year (details are referred to Supporting Report).

8.3.4 Planning Area and its Projected Population for Sewerage

Urban areas with more than 10,000 population provided by Level III water supply systems in 2010 serve as the planning area. Population in the area is considered as the potential population to be served.

Only Roxas City with urban population of about 51,000 is considered (refer to Table 8.5.4).

8.3.5 Number of Households to be Served by Municipal Solid Waste Collection System

The number of urban households in 2005 is the potential households for the planning (refer to Table 8.3.5, Supporting Report).

8.4 Types of Facilities and Implementation Criteria

In principle, types of facilities and their implementation criteria as prescribed in the NSMP and the NEDA Board Resolution No. 12 (s. 1995) are adopted to this PW4SP.

8.4.1 Water Supply

The following are the major conditions and assumptions applied to urban and rural water supply, which are intended as a guide for the implementation of sector projects.

(1) Urban water supply

Prevailing situation of urban water supply in each municipality was firstly reviewed mainly focusing on existing water sources and magnitude of service coverage. Planned/on-going projects for concerned municipalities were also studied and reflected in the planning, with due attention to merging of municipalities into an integrated water supply system. Potential water source for future development was then evaluated based on the study results in Chapter 7, taking into account the possibility to utilize untapped spring sources. Recommendations arising from these studies were also incorporated as overall development strategy.

Aforementioned studies were carried out by the following sequence:

Review of existing water supply systems and water sources;
Review of planned/on-going projects;
Establishment of planning conditions covering service level, utilization of existing facilities, water sources, and number of systems; and
Recommendations for overall development strategy.

Table 8.4.1 presents summary of the study results by municipality.

1) Review of existing water supply systems and water sources

The municipalities/city of Dumarao, Ivisan, Manbusao, Panay, Panitan, Pilar, Pontevedra and Roxas City are served by WDs.

Among them, Ivisan, Panay and Roxas City are covered by the Metro Roxas Water District (MRWD).

Population served by existing Level III systems range from about 1,100 persons at Pilar WD to 58,800 persons at MRWD, however, majority of served population is more or less 2,000 persons. Those systems are utilizing various kinds of water sources such as deep well, spring and surface water.

The remaining 7 municipalities, out of the total 17 municipalities have no Level III system in their urban areas and are presently served by Level II systems and/or Level I facilities.

Table 8.4.1 Summary of Urban Water Supply Development by Municipality/City (Capiz)

Municipality	Existing Condition	On-going/Planned Project	Water Source Availability	Future Requirements
Cuartero	There is no Level III system. Majority of the people served by shallow wells and rain water collector.	CIMWSS was prepared for BOT scheme; Rehabilitation plan of water source	DW; low yield (ironic) SP; scattered, limited yield & far from populated area (potable) Future development; CIMWSS using surface water development	Capiz Inter-Municipal Water Supply System was studied. Implementation of the projecte is expected through BOT. Merging into MRWD may also be considered.
Dao	There is no Level III at present. Majority of the people is served by shallow wells and rain water collector.	Panay River source deve. Plan	-ditto-	-ditto-
Dumalag	There exists one WWs, water source of which is the spring.	Plan of additional spring dev't.	-ditto-	-ditto-
Dumarao	There is one WD, water source of which is the spring.	Expansion plan of the system under CIMWSS	DW; low yield (ironic) SP; scattered, limited yield, but near from populated area (potable) Future development; CIMWSS using surface water development	-ditto-
Ivisan	MRWD provides services to the area.	JBIC assisted PCWSP III is on-going	DW; medium yield in coastal alluvium (salinity) and in basalt formation SP; a few springs in the hilly area Future development; MRWD	Expansion of the system is under way by MRWD.
Jamindan	There is non functional Level III system. People rely on shallow wells and rain water collector.	Plan of CIMWSS; Rehabilitation of old water source (non functioning system) is under way	DW; low yield (ironic) SP; scattered, limited yield & far from populated area (potable) Future development; CIMWSS using surface water development (BOT or merge to MRWD)	Rehabilitation of existing system; Merging into CIMWSS plan
Ma-ayon	There is no Level III at present. They use shallow wells and/or rain water collector.	Connection plan with Pontevedra WD	-ditto-	Expansion of the system under Pontevedra WD
Mambusao	There is a small WD. The water source is deep well. Majority of the people use shallow wells and/or rain water collector because of high water charges.	Expansion plan to other barangays	-ditto-	Expansion of the system to other barangays; Merging into CIMWSS be studied.
Panay	The area is served by MRWD which serves for 31barangays. Eleven coastal barangays are not yet served.	Expansion plan to other barangays	DW; low yield (salinity) SP; none Future development; MRWD	Expansion of the system by MRWD to cove 11 coastal barangays.

Table 8.4.1 Summary of Urban Water Supply Development by Municipality/City (Capiz)

Municipality	Existing Condition	On-going/Planned Project	Water Source Availability	Future Requirements
Panitan	There exists one WD which utilizes surface water.	Merging with MRWD is under way	DW; insufficient capacity in basalt formation (slightly ironic) SP; very few & limited yield (potable) Future development; surface water	Expansion of the existing system using surface water. Merging into MRWD.
Pilar	There is one WD, water source of which is the spring. The system serves for only poblacion and part of barangay Natividad.	Rehabilitation plan of existing dam; Tapping plan of Yating Falls	DW; insufficient yield (salinity & ironic) SP; scattered & limited yield Future development; spring	Expansion of the existing system using spring sources (Yating Falls).
Pontevedra	There exists one WD which utilizes two deep wells. The WD serves for 16 barangays.	Plan of new souce dev't. at bry Binantucan	DW; sufficient yield (salinity & ironic) SP; scattered & limited yield Future development; DW	Expansion of the existing system; Merging into MRWD may be studied.
President Roxas	There is no Level III system. People use shallow wells and/or rain water collector.	Plan for test well const. And geo-registivity survey; Plan to connect to Pontevedra WD	DW; insufficient yield (salinity & acidic) SP; scattered & limited yield Future development; spring/well	Merging with Pontevedra WD may be studied. Cabug-cabug and other sources are under study for a new system creasion.
Roxas City (Capital)	MRWD provides services to the area.	Expansion plan to other municipalities	DW; normal yield (salinity) SP; very few (potable) Future development; surface water with due consideration of CIMWSS	Expansion of the system in franchise area (Ivisan, Panitan, Panay etc.).
Sapi-an	There is no Level III system. People use shallow wells and/or rain water collector.	Plan of CIMWSS	DW; normal yield coastal area (salinity) and in basalt formation SP; scattered & limited yield (potable) Future development; grouped springs	A new system creation using spring source or joining to CIMWSS
Sigma	There is no Level III system. People use shallow wells and/or rain water collector.	Merging plan with CIMWSS	DW; low yield (ironic) SP; scattered, limited yield & far from populated area (potable) Future development; CIMWSS using surface water development	A new system creation using spring/well source or joining to CIMWSS
Tapaz	There is no Level III system. People use shallow wells and/or rain water collector.	Spring source deve. Plan; Merging plan into CIMWSS	-ditto-	-ditto-

2) Review of planned/on-going projects

At present, MRWD is preparing an expansion plan using surface water in assistance of LWUA under JBIC-assisted Provincial Cities Water Supply Project III. In addition, the Province conducted project study on Capiz Inter-municipal Water Supply System (CIMWSS) for the nine (9) municipalities of 2nd district.

3) Establishment of planning conditions

a. Service level

It shall be noted that a national policy for urban water supply is a Level III system, as the most suitable measure. Therefore, for the investment needs of the sector development, it is assumed in this PW4SP that underserved or unserved urban population at present and in the future will be provided with individual house connections. However, it does not intend in the future to exclude, as individual cases, Level I and II facilities from being implemented in urban area.

b. Utilization of existing facilities

The existing Level I and II facilities are considered to be utilized during the Phase I period. However, the population served by these facilities is to be absorbed by Level III service in Phase II.

c. Water sources

Possibility/availability to utilize surface water and groundwater (spring and deep well) is evaluated as potential water sources for water supply development.

From the viewpoints of cost effectiveness and easy O&M of water supply system, utilization of spring sources is given due priority in the course of urban water supply planning. Application of deep wells for water source is regarded as the second priority in principle. Utilization of surface water was studied, on the other hand, in project study on CIMWSS, although a large capital investment and complexity of surface water treatment are required.

d. Number of systems

In principle, one (1) Level III system is considered for urban area of every municipality. In the municipalities with an existing Level III system/s, the expansion of the system was first considered. In case of no existence of Level III system/s, a new system was recommended. Existing plan/s on the development of Level III/WD are also taken into account to determine the respective systems of the municipalities.

Possibility and necessity to merge service area of some neighboring municipalities to an urban water supply system were also studied from the viewpoint of:

water source constraints, and

economical development/scale merit of water supply system by cost reduction of water source development and other common facilities as well as O&M cost/minimized number of technical staff.

Any rural barangay/s being served by an existing urban Level III system are considered to continue throughout the future.

e. Rehabilitation

Rehabilitation of existing and future facilities is assumed to be undertaken by the operating bodies.

4) Overall development strategy

Expansion of the existing system/s was planned for those with WD/Level III, while creation of the system is considered for those without systems at present.

Merging of municipal systems (physical arrangement) in the long-term is considered. Integrated management systems shall also be sought. Conditions to be studied include; water source availability, willingness by concerned municipalities and technical study on cost recovery/economic construction.

The following municipalities were studied by LWUA/province for the integration both in physical and management systems.

- Metro Roxas WD (Ivisan, Panay and Roxas City) and Panitan
- Cuartero, Dao, Dumalag, Dumarao, Jamidan, Mambusao, Sapi-an, Sigma and Tapaz

Integration of small Level III systems for operation and management shall be sought, although these systems are currently managed individually.

Some municipalities have high potential for spring development due to the presence of a number of untapped spring sources favorable for urban water supply that were identified during the course of PW4SP preparation. However, a detailed survey to ensure appropriate development of spring sources shall be conducted in the implementation of the projects.

(2) Rural water supply

1) Service level

Level I systems (deep well/shallow well/developed spring) are generally planned for rural areas where houses are scattered. In the PW4SP, public investment for Level I facilities covers 30% of the total number of required facilities, considering the existing share between public (13%) and private facilities (87%).

Level II systems are considered where houses are clustered and suitable untapped spring is available.

Service level standards are set forth as 15 households per source for Level I and 5 households per communal faucet for Level II, as defined in the national plan.

Application of Level III systems in rural areas may be considered in a case to case basis during actual implementation.

2) Utilization of existing facilities

The existing facilities/systems in all service levels are considered to be utilized throughout the future.

3) Water source

For Level I facilities, deep well construction is given priority wherever applicable considering safety against possible contamination and stable water supply. Standard specifications of shallow and deep wells are summarized in Table 8.4.2 based on the water source evaluation results presented in Chapter 7. Conventional construction method (driven well) may be employed under favorable substrata or hydrogeological conditions. The standard structure of wells in application of "open-hole drilling and gravel pack" is presented in Figure 8.4.1, Supporting Report. In addition to this, for deep well with high iron content, application of iron removal facility is recommended. The standard structure of iron removal facility is presented in Figures 8.4.2 (a) and 8.4.2 (b), Supporting Report.

Spring development is not considered in Level I planning referring to the study results of water source development presented in Chapter 7.

For Level II systems, only untapped springs suitable for water supply purpose are considered. Identified untapped springs are presented in Table 7.4.1, Supporting Report.

Table 8.4.2 Standard Specifications of Level I Wells

Specification	Shallow Well	Deep Well
Construction Method	Open-hole drilling and gravel pack	
Casing Diameter	50mm	100mm
Borehole Diameter	150mm	200mm
Ranges of Well Depth	Standard Depth	
0 - 20m	20m	Not Applicable
21 - 50m	Not Applicable	40m
51 - 100m	Not Applicable	80m
101 - 150m	Not Applicable	120m

Profile between gravel packed well and natural gravel packed well for Level I water supply:

The open-hole drilling method is employed for the well construction to ensure yield of ground water from adequate aquifer in provision of proper screen location and specifications. The conventional "cased-hole driven well" shall be used only in cases where well specifications are established in the specified area with sufficient information on the hydrogeological condition including existence of natural gravel at the expected aquifer.

It is important to study the potential areas to adopt natural gravel method, which can perform the same level of function as gravel-packed wells. Such areas are usually limited to the upper stream of larger rivers in alluvial fans and alluvial plains. The l proportion will be worked out between those areas where the application of gravel-packed and natural gravel pack wells referring to the condition of the province.

Modification needs of riser pipe diameter according to the water level of deep wells:

The standard specification of deep well hand pump is set with a diameter of 2-1/2 inch in the plan. However, water level of the deep wells may range between 20m and around 40m, depending on the aquifer conditions.

Although the Malawi type deep well pump with a cylinder that is currently used in the Philippines has operation experience up to 40 m in pumping water level, the diameter of riser pipe must be adjusted between 1" to 2-1/2" in order to lower required power at the pump handle (calculating required power under the specific pumping water level).

4) Number of systems/facilities

The number of Level I wells and spring development is estimated based on the service level standard; while the number of Level II systems coincides with the number of untapped springs having an estimated discharge of 2.0 lps. or more.

5) Rehabilitation

Rehabilitation of existing Level I wells is not considered, since most of the wells constructed by driving method is not suitable for rehabilitation to recover their functions. However, minor repair work for hand-pump and concrete apron is a requisite.

8.4.2 Sanitation

The conditions and assumptions are established for the different sanitation components to serve as guides in the implementation of projects.

(1) Household toilets

Three types of sanitary toilet facilities for individual houses are considered for Phase I; flush, pour-flush and VIP/sanitary pit privy (dry-type). While for Phase II, flush and pour-flush are planned considering the improvement of living standard.

The type of toilet facilities is dependent on the existing or planned service level of water supply in the community. In urban and rural areas with Level I or II water supply facilities, only pour-flush and/or VIP are considered, while in urban areas with Level III water supply systems, flush type toilets requiring a piped water connection are included. Isolated rural areas where there is dearth of water supply, sanitary pit privy (dry type) is taken into account.

(2) School toilets

Standard service level currently used by DECS (40 students per unit facility) is employed for both phases.

The standard toilet facility (1 building) with 5 units of toilet bowl to serve for 200 students is adopted for the planning purpose, which is modified from FW4SP design to provide a shallow well as a water source. Since DECS is currently promoting the "one classroom-one toilet" concept, the PW4SP also adopts this concept on a 50-50 basis, that

is 50% of the school toilet requirements will be allocated using the JICA-RESP design and the other 50% will be adopting the new concept.

(3) Public toilets

As a minimum requirement, at least 1 sanitary toilet facility is assumed to be provided for respective utilities: public market bus/jeepney terminal and parks/playground.

The DOH standard design with 6-units of toilet bowl for the market is adopted. In this design, it is assumed that water supply will be tapped from the existing system, hence an elevated water tank is provided.

8.4.3 Urban Sewerage

The commencement of staged implementation of the sewerage program is planned in Phase II for the limited urban area (50% of urban population served by Level III system for the municipalities with urban population of more than 10,000). It is practical to start the program fully using the existing facilities to allow for lower initial investment cost than starting at once a conventional sewerage system (refer to Figure 8.4.2 Staged Improvement in Sewage Collection Method, Supporting Report).

Low cost off-site technologies such as small-bore sewer for collection of effluent from septic tank are to be adopted. Improvement of sewage collection method may be gradually achieved from combined sewer to separate sewerage system.

Sewage treatment facilities may range from community scale septic tank or Imhoff tank to aerated lagoon systems and to a more advanced treatment process such as oxidation ditch. For this PW4SP, aerated lagoons are assumed as a representative treatment facility for planning purpose. Daily average wastewater quantity is assumed at 100 liters per capita per day.

8.4.4 Solid Waste

In terms of facility requirements, this PW4SP only studied the number of refuse collection trucks required for the year 2005. A rated capacity of 5 cu.m truck/vehicle is considered for calculation of required units of truck. Disposal of solid waste shall be studied in detail through investigations, F/S and D/D. Unit solid waste generation for urban area is assumed to be 0.418 kg. per capita per day.

8.5 Service Coverage by Target Year

8.5.1 Water Supply

The service coverage in terms of population to be served by target year was estimated by urban and rural area by municipality. The service coverage in rural area was further subdivided by service level (Level I & Level II) to finally come up with physical requirements.

Base figures applied to estimate the future service coverage and the additional population to be served are:

provincial sector targets;
population projection by target year; and
base year service coverage (served population) by existing facilities.

Future requirements in terms of additional population to be served were then estimated by urban (Level III) and rural (Level I & II) area by municipality as a shortfall to meet the population to be served in each target year. The population served in base year is adopted as the population served in target year, when the former population exceeds the population to be served in the target year/s. Manner of calculation is specifically presented by phase.

(1) Phase I requirements

Additional service coverage was estimated as a shortfall of the population to be served in Phase I comparing with the population served in base year. In this connection, existing facilities both in urban and rural areas are assumed to be utilized during the Phase I period.

The utilization of untapped springs for Level II systems was given priority during Phase I period for rural water supply. At the time of this plan preparation, 19 untapped springs in 5 municipalities were identified.

(2) Phase II requirements

Additional service coverage was estimated as a shortfall of the population to be served in Phase II comparing with the population served in Phase I. In this regard, existing facilities in rural area were assumed to be utilized through the two Phases, while urban population served by Level I and II facilities in base year was assumed to be absorbed by Level III service during Phase II period.

Table 8.5.1 presents the service coverage by target year and by level of service as well as the additional population to be served (details are referred to Supporting Report).

Table 8.5.1 Population to be Served by Target Year (Water Supply)

Name of Municipality/ City	Area	Phase I Coverage (2005)							Phase II Coverage (2010)						
		Total Population	Service Coverage			Additional Population to be Served			Total Population	Service Coverage			Additional Population to be Served		
			Level III	Level II	Level I	Level III	Level II	Level I		Level III	Level II	Level I	Level III	Level II	Level I
Cuntero	Urban	4,938	1,087		1,774	1,087			5,515	5,239		5,239	4,152		
	Rural	32,375		2,100	16,020		1,698	2,039	36,242		2,100	31,605			15,585
	Total	37,313	1,087	2,100	17,794	1,087	1,698	2,039	41,757	5,239	2,100	31,605	4,152		15,585
Dao	Urban	5,769	1,270		3,864	1,270			8,052	7,649			6,379		
	Rural	24,521			17,548				24,127			22,438			4,890
	Total	30,290	1,270		21,412	1,270			32,179	7,649		22,438	6,379		4,890
Dumalag	Urban	3,768			2,841				4,102	3,897			3,897		
	Rural	32,277	2,465	775	18,464				34,742	2,465	775	29,070			10,606
	Total	36,045	2,465	775	21,305				38,844	6,362	775	29,070	3,897		10,606
Dumaras	Urban	5,799	3,167	75	2,309	1,277			7,876	7,482			4,315		
	Rural	35,944	340	350	28,215				37,033	340	350	33,751			5,536
	Total	41,743	3,507	425	30,524	1,277			44,909	7,822	350	33,751	4,315		5,536
Ivisan	Urban	5,083	2,404		1,687	1,119			5,622	5,341			2,937		
	Rural	20,957	655	675	10,117				22,640	655	675	19,725			9,608
	Total	26,040	3,059	675	11,804	1,119			28,262	5,996	675	19,725	2,937		9,608
Jamindan	Urban	3,380	744		722	744			4,053	3,850			3,106		
	Rural	48,670		3,961	3,190		3,661	1,958	52,750		3,961	45,097			41,907
	Total	52,050	744	3,961	3,912	744	3,661	1,958	56,803	3,850	3,961	45,097	3,106		41,907
Ma-ayon	Urban	4,770	1,050		2,422	1,050			5,216	4,955			3,905		
	Rural	27,522		3,677	11,636		3,177		28,674		3,677	22,990			11,354
	Total	32,292	1,050	3,677	14,058	1,050	3,177		33,890	4,955	3,677	22,990	3,905		11,354
Mambusao	Urban	7,279	3,778		1,944	1,603			7,904	7,509			3,731		
	Rural	34,833	10	660	18,217		4,021		35,408	10	660	32,259			14,042
	Total	42,112	3,788	660	20,161	1,603	4,021		43,312	7,519	660	32,259	3,731		14,042
Panay	Urban	3,283	2,408		25	2,433	723		3,385	3,216			808		
	Rural	42,061	4,960		6,022	10,982			44,952	4,960					
	Total	45,344	7,368		6,047	13,415	723		48,337	8,176			808		
Panitan	Urban	2,726	1,595		825	2,420	600		2,851	2,708			1,113		
	Rural	32,258	840	625	19,394	20,859			34,117	840	625	30,264			10,870
	Total	34,984	2,435	625	20,219	23,279	600		36,968	3,548	625	30,264	1,113		10,870
Pilar	Urban	5,306	2,028		3,026	5,054	1,168		7,176	6,817			4,789		
	Rural	33,241	195	665	24,365	25,225			33,638	195	665	30,423			6,058
	Total	38,547	2,223	665	27,391	30,279	1,168		40,814	7,012	665	30,423	4,789		6,058
Pontevedra	Urban	6,901	5,199		380	5,579	1,519		7,458	7,085			1,886		
	Rural	35,570	3,400	2,628	12,691	18,719		4,106	38,050	3,400	2,628	29,340			16,649
	Total	42,471	8,599	2,628	13,071	24,298	1,519	4,106	45,488	10,485	2,628	29,340	1,886		16,649
President Roxas	Urban	6,972	1,535		2,769	4,304	1,535		6,936	6,589			5,054		
	Rural	19,748		651	6,751	7,402		526	20,729		651	18,627			11,876
	Total	26,720	1,535	651	9,520	11,706	1,535	526	27,665	6,589	651	18,627	5,054		11,876
Roxas City (Capital)	Urban	73,329	33,945		20,946	54,891			102,887	97,743			63,798		
	Rural	89,131	16,315	948	36,751	54,014			80,273	16,315	948	57,391			20,640
	Total	162,460	50,260	948	57,697	108,905			183,160	114,058	948	57,391	63,798		20,640
Sapian	Urban	4,239	933		1,376	2,309	933		4,669	4,436			3,503		
	Rural	20,002		660	12,017	12,677		933	20,930		660	18,805			6,788
	Total	24,241	933	660	13,393	14,986	933	933	25,599	4,436	660	18,805	3,503		6,788
Sigma	Urban	2,375	523		674	1,197	523	523	2,375	2,256			1,733		
	Rural	25,633		1,612	8,679	10,291		512	27,888		1,612	24,324			15,645
	Total	28,008	523	1,612	9,353	11,488	523	512	30,263	2,256	1,612	24,324	1,733		15,645
Tapaz	Urban	2,179			1,747	1,747			2,317	2,201			2,201		
	Rural	39,474		500	21,133	21,633		4,557	41,176		500	37,794			16,661
	Total	41,653		500	22,880	23,380		4,557	43,493	2,201	500	37,794	2,201		16,661
Provincial Total	Urban	148,096	61,666	75	49,331	111,072	15,151		188,394	178,973			117,307		
	Rural	594,217	29,180	20,487	271,210	320,877		9,574	613,349	29,180	20,487	520,748			249,538
	Total	742,313	90,846	20,562	320,541	431,949	15,151	9,574	801,743	208,153	20,487	520,748	117,307		249,538

Through Phase I development, approximately 50,500 persons in the province will be served by additional water supply services, of which 15,200 persons or 30% of the total will be urban population and 35,300 persons or 70% will be rural population.

For Phase II period, a total of 366,800 persons, of which 117,300 persons or 32% in urban area and 249,500 persons or 68% in rural area, will be further benefited by water supply services. This additional service coverage in urban area includes the upgrade of service level for 49,400 persons served by Level I and II facilities in 1998.

8.5.2 Sanitation

(1) Household toilets

The service coverage (number of households to be served) by different types of sanitary facility is estimated by urban and rural area by municipality for the years 2005 and 2010. The future service coverage and additional households to be served are estimated to meet the provincial targets using the number of household served in the base year and the number of households in target years.

Additional number of households to be served by different type of facility by urban and rural area by municipality is the shortfall of the number of households to be served in target years comparing with either that in base year or in Phase I (details are referred to Supporting Report). However, when the number of households to be served in target year/s is less than or equal to that in base year, no additional number of households to be served is counted.

In the determination of the number of households to be served by flush type toilet, when the number of households to be served in the target year is higher than in base year, the target coverage is applied with conditions. When the target coverage is higher than Level III water supply coverage, the latter coverage is adopted, while in the other case, the target coverage is applied. In cases where the target coverage is less than that in base year, the base year coverage is adopted.

For Phase I, any type of existing sanitary facilities both in urban and rural areas is to be utilized during Phase I period. For Phase II, water-sealed toilet facilities in Phase I both in urban and rural areas are to be utilized.

The projected number of served households at the end of the Phase I period is 118,498. Additional households to be served totaled to 20,083, of which 19% is urban households and 81% is rural households. While at the end of Phase II period, the number of served households are 186,406 with additional households to be served at 70,566. Table 8.5.2 provides the number of households to be served by target year for urban and rural areas by municipality.

(2) School toilets

The service coverage or the number of public school students to be served is estimated by municipality for the years 2005 and 2010.

The projected number of served households at the end of the Phase I period is 118,498. Additional households to be served totaled to 20,083, of which 19% is urban households and 81% is rural households. While at the end of Phase II period, the number of served households are 186,406 with an additional households to be served at 70,566. Table 8.5.2 provides the number of households to be served by target year for urban and rural areas by municipality.

(2) School toilets

The service coverage or the number of public school students to be served is estimated by municipality for the years 2005 and 2010.

The future service coverage and additional number of students to be served are estimated using the number of students served in the base year, the number of students in target years and the provincial sector targets.

Additional number of students to be served by municipality is the shortfall of the number of students to be served in targets comparing with either that in base year or in Phase I (details are referred to Supporting Report). However, when the number of students to be served in target/s is less than or equal to the base year, no additional number of households to be served is considered.

The existing facilities are to be utilized during Phase I period, while the facilities in Phase I are to be utilized during Phase II period.

The projected number of served students at the end of Phase I period is 71,651. The additional students to be served are 35,531. While at the end of Phase II period, the projected

Table 8.5.2 Additional Number of Households to be Served by Target Year (Household Toilets)

Name of Municipality/ City	Area	Phase I Coverage (2005)									Phase II Coverage (2010)								
		Total Households	No. of Served Households				Add'l. No. of Households to be Served				Total Households	No. of Served Households				Add'l. No. of Households to be Served			
			Flush	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total		Flush	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total
Cuartero	Urban	903	152	546	142	840		34	130	164	1,379	641	499	142	1,282	489			489
	Rural	5,720	229	2,746	1,601	4,576	229	2,496	1,580	4,305	9,061	229	6,597	1,601	8,427		3,851		3,851
	Total	6,623	381	3,292	1,743	5,416	229	2,530	1,710	4,469	10,440	870	7,096	1,743	9,709	489	3,851		4,340
Dao	Urban	1,107	155	875		1,030	21			21	2,013	936	936		1,872	781	61		842
	Rural	4,817		1,571	2,635	4,206					6,032		2,975	2,635	5,610		1,404		1,404
	Total	5,924	155	2,446	2,635	5,236	21			21	8,045	936	3,911	2,635	7,482	781	1,465		2,246
Dumalag	Urban	680	13	411	208	632		41	208	249	1,026	477	269	208	954	464			464
	Rural	5,933		2,848	1,898	4,746		263	119	382	8,686	808	5,372	1,898	8,078	808	2,524		3,332
	Total	6,613	13	3,259	2,106	5,378		304	327	631	9,712	1,285	5,641	2,106	9,032	1,272	2,524		3,796
Dumaran	Urban	1,196	167	945		1,112	65			65	1,969	916	915		1,831	749			749
	Rural	7,160	286	3,437	2,005	5,728	274	388		662	9,258	340	6,265	2,005	8,610	54	2,828		2,882
	Total	8,356	453	4,382	2,005	6,840	339	388		727	11,227	1,256	7,180	2,005	10,441	803	2,828		3,631
Ivisan	Urban	948	132	750		882	78			78	1,406	654	654		1,308	522			522
	Rural	4,117	165	3,129		3,294	165	589		754	5,660	526	4,738		5,264	361	1,609		1,970
	Total	5,065	297	3,879		4,176	243	589		832	7,066	1,180	5,392		6,572	883	1,609		2,492
Jamindan	Urban	683	95	540		635	95	50		145	1,013	471	471		942	376			376
	Rural	9,306	372	4,467	2,606	7,445	372	927		1,299	13,188	372	9,287	2,606	12,265		4,820		4,820
	Total	9,989	467	5,007	2,606	8,080	467	977		1,444	14,201	843	9,758	2,606	13,207	376	4,820		5,196
Ma-ayon	Urban	937	131	740		871	26			26	1,304	607	606		1,213	476			476
	Rural	5,293	212	2,540	1,482	4,234	212	81	357	650	7,169	212	4,973	1,482	6,667		2,433		2,433
	Total	6,230	343	3,280	1,482	5,105	238	81	357	676	8,473	819	5,579	1,482	7,880	476	2,433		2,909
Mambusao	Urban	1,316	184	796	244	1,224	143			143	1,976	919	675	244	1,838	735			735
	Rural	6,884	275	3,304	1,928	5,507	115			115	8,852	10	6,294	1,928	8,232		2,990		2,990
	Total	8,200	459	4,100	2,172	6,731	258			258	10,828	929	6,969	2,172	10,070	735	2,990		3,725
Panay	Urban	650	91	514		605	37			37	846	394	393		787	303			303
	Rural	7,675	307	5,833		6,140	307	134		441	11,238	1,045	9,406		10,451	738	3,573		4,311
	Total	8,325	398	6,347		6,745	344	134		478	12,084	1,439	9,799		11,238	1,041	3,573		4,614
Panitan	Urban	519	72	411		483	53	45		98	713	332	331		663	260			260
	Rural	6,144	246	2,949	1,720	4,915	246	1,207	1,720	3,173	8,529	793	5,419	1,720	7,932	547	2,470		3,017
	Total	6,663	318	3,360	1,720	5,398	299	1,252	1,720	3,271	9,242	1,125	5,750	1,720	8,595	807	2,470		3,277
Pilar	Urban	1,074	150	849		999	81			81	1,794	834	834		1,668	684			684
	Rural	6,430		1,092	4,406	5,498					8,410	195	3,220	4,406	7,821	195	2,128		2,323
	Total	7,504	150	1,941	4,406	6,497	81			81	10,204	1,029	4,054	4,406	9,489	879	2,128		3,007
Pontevedra	Urban	1,211	379	732	15	1,126		166		166	1,865	867	852	15	1,734	488	120		608
	Rural	6,649	388	4,104	1,036	5,528					9,508	884	6,922	1,036	8,842	496	2,818		3,314
	Total	7,860	767	4,836	1,051	6,654		166		166	11,373	1,751	7,774	1,051	10,576	984	2,938		3,922
President Roxas	Urban	1,346	188	814	250	1,252	188	90		278	1,734	807	556	250	1,613	619			619
	Rural	3,754	150	2,853		3,003	12			12	5,182	150	4,669		4,819		1,816		1,816
	Total	5,100	338	3,667	250	4,255	200	90		290	6,916	957	5,225	250	6,432	619	1,816		2,435
Roxas City (Capital)	Urban	14,350	4,148	8,675	523	13,346		1,721	344	2,065	25,722	11,961	11,437	523	23,921	7,813	2,762		10,575
	Rural	16,881	2,802	10,703		13,505		791		791	20,068	1,866	16,797		18,663		6,094		6,094
	Total	31,231	6,950	19,378	523	26,851		2,512	344	2,856	45,790	13,827	28,234	523	42,584	7,813	8,856		16,669
Sapi-an	Urban	846	118	669		787	45			45	1,167	543	542		1,085	425			425
	Rural	3,839	154	2,917		3,071	154	22		176	5,233	154	4,713		4,867		1,796		1,796
	Total	4,685	272	3,586		3,858	199	22		221	6,400	697	5,255		5,952	425	1,796		2,221
Sigma	Urban	472	66	285	88	439	56			56	594	276	188	88	552	210			210
	Rural	5,006	200	2,403	1,402	4,005	200	342		542	6,972	200	4,882	1,402	6,484		2,479		2,479
	Total	5,478	266	2,688	1,490	4,444	256	342		598	7,566	476	5,070	1,490	7,036	210	2,479		2,689
Tapaz	Urban	411		382		382		11		11	579	269	269		538	269			269
	Rural	8,056		3,867	2,578	6,445		2,011	1,042	3,053	10,294		6,995	2,578	9,573		3,128		3,128
	Total	8,467		4,249	2,578	6,827		2,022	1,042	3,064	10,873	269	7,264	2,578	10,111	269	3,128		3,397
Provincial Total	Urban	28,649	6,241	18,954	1,470	26,645	888	2,158	682	3,728	47,100	21,904	20,427	1,470	43,801	15,663	2,943		18,606
	Rural	113,664	5,786	60,763	25,297	91,846	2,286	9,251	4,818	16,355	153,340	7,784	109,524	25,297	142,605	3,199	48,761		51,960
	Total	142,313	12,027	79,697	26,767	118,491	3,174	11,409	5,500	20,083	200,440	29,688	129,951	26,767	186,406	18,862	51,704		70,566

number of served students are 181,917 with additional students to be served at 110,266. Table 8.5.3 summarizes the number of public school students to be served by target year.

(3) Public toilets

The service coverage of public utilities with sanitary toilet facility by municipality is estimated for the years 2005 and 2010.

The future service coverage and additional coverage are estimated using the existing number of public utilities with sanitary toilets in the base year, the number of public utilities in target years, and provincial sector targets.

The additional number of public utilities with sanitary toilets needed by municipality is the shortfall of the number of public utilities in target year comparing with either the existing coverage or Phase I coverage (details are referred to Supporting Report).

The existing sanitary facilities are to be utilized during Phase I period. The facilities in Phase I are to be utilized during Phase II period.

The number of served public utilities at the end of Phase I period is 98. The additional public utilities to be served are 42. While at the end of Phase II period, the number of served public utilities are 117 with additional public utilities to be served at 19. Table 8.5.4 summarizes the additional number of public utilities to be served by municipality by target year.

Table 8.5.3 Additional Number of Public School Student to be Served by Target Year (School Toilets)

Name of Municipality/City	Phase I Coverage (2005)			Phase II Coverage (2010)		
	Total No. of Public School Student	Std. No. of Public School Students to be Served	Add'l. No. of Public School Student to be Served	Total No. of Public School Student	Std. No. of Public School Students to be Served	Add'l. No. of Public School Student to be Served
Cuartero	8,719	2,369	1,729	10,332	9,299	6,930
Dao	6,883	2,325	1,365	7,770	6,993	4,668
Dumalag	6,670	2,923	1,323	7,702	6,932	4,009
Dumarao	10,547	6,012	2,092	11,978	10,780	4,768
Ivisan	7,146	2,857	1,417	8,001	7,201	4,344
Jamindan	12,842	5,027	2,547	14,839	13,355	8,328
Ma-ayon	9,524	5,089	1,889	9,495	8,546	3,457
Mambusao	9,011	3,427	1,787	9,886	8,897	5,470
Panay	10,287	3,241	2,041	11,652	10,487	7,246
Panitan	9,148	3,975	1,815	10,203	9,183	5,208
Pilar	10,808	4,224	2,144	11,805	10,625	6,401
Pontevedra	11,138	4,049	2,209	12,592	11,333	7,284
President Roxas	7,076	2,684	1,404	6,940	6,246	3,562
Roxas City (Capital)	36,215	13,544	7,184	43,232	38,909	25,365
Sapi-an	6,684	3,246	1,326	7,281	6,553	3,307
Sigma	5,562	2,383	1,103	6,440	5,796	3,413
Tapaz	10,869	4,276	2,156	11,980	10,782	6,506
Provincial Total	179,129	71,651	35,531	202,128	181,917	110,266

Table 8.5.4 Additional Number of Public Utilities with Sanitary Toilets by Target Year

Name of Municipality/City	Type	Phase I Coverage (2005)		Phase II Coverage (2010)	
		Add'l. No. of Public Utility with Sanitary Toilets	No. of Public Utility with Sanitary Toilets	Add'l. No. of Public Utility with Sanitary Toilets	No. of Public Utilities with Sanitary Toilets
Cuartero	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	1		1
	Total	2	4	1	5
Dao	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	3		3
	Total	2	6	1	7
Dumalag	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	3		3
	Total	2	6	1	7
Dumarao	Public Market	1	2		2
	Bus/Jeepney Terminal			1	1
	Parks/Playground	3	3		3
	Total	4	5	1	6
Ivisan	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	1		1
	Total	2	4	1	5
Jamindan	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	3		3
	Total	2	6	1	7

Table 8.5.4 Additional Number of Public Utilities with Sanitary Toilets by Target Year

(Cont'd)

Name of Municipality/City	Type	Phase I Coverage (2005)		Phase II Coverage (2010)	
		Add'l. No. of Public Utility with Sanitary Toilets	No. of Public Utility with Sanitary Toilets	Add'l. No. of Public Utility with Sanitary Toilets	No. of Public Utilities with Sanitary Toilets
Ma-avon	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	3		3
	Total	2	6	1	7
Mambusao	Public Market	2	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	3	3		3
	Total	5	6	1	7
Panay	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	1		1
	Total	2	4	1	5
Panitan	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	3		3
	Total	2	6	1	7
Pilar	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	1		1
	Total	2	4	1	5
Pontevedra	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	1		1
	Total	2	4	1	5
President Roxas	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	1		1
	Total	2	4	1	5
Roxas City (Capital)	Public Market	2	12	1	13
	Bus/Jeepney Terminal	1	4	2	6
	Parks/Playground	2	2		2
	Total	5	18	3	21
Sapi-an	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	1		1
	Total	2	4	1	5
Sigma	Public Market	1	3		3
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	1		1
	Total	2	4	1	5
Tapaz	Public Market	1	4		4
	Bus/Jeepney Terminal			1	1
	Parks/Playground	1	3		3
	Total	2	7	1	8
Provincial Total	Public Market	19	60	1	61
	Bus/Jeepney Terminal	1	4	18	22
	Parks/Playground	22	34		34
	Total	42	98	19	117

8.5.3 Urban Sewerage

The service coverage in 2010 (Phase II) is estimated for the municipalities with population of more than 10,000 in urban area provided by Level III water supply. It is assumed that half of the population in the area/s is to be served by the sewerage systems. Table 8.5.5 shows the population to be served in Phase II.

Table 8.5.5 Population to be Served by Urban Sewerage in Phase II

Name of Municipality	Urban Population in 2010	Level III Water Supply Coverage	Population to be Served
Roxas City (Capital)	102,887	97,743	51,444
Provincial Total	188,394	178,973	51,444

8.5.4 Solid Waste

Future requirements in the sub-sector are studied giving priority to urban area for the Phase I. Staged improvement for the rural area shall be studied in the future.

Service coverage in Phase I was assumed at 100% with reference to the present service coverage of 100% in urban area. Additional service coverage in Phase I is calculated as a shortfall of target coverage in Phase I to meet urban population growth. Table 8.5.6 presents additional service coverage for Phase I in the urban area.

Table 8.5.6 Additional Number of Urban Households to be Served by Municipal Solid Waste System in Phase I

Name of Municipality	No. of Urban Households Served in the Base Year	Phase I Coverage (2005)		
		No. of Urban Households	Urban Households Coverage	Add'l. No. of Urban Households to be Served
Cuartero	280	903	903	623
Dao	103	1,107	1,107	1,004
Dumalag	700	680	700	
Dumarao	616	1,196	1,196	580
Ivisan	839	948	948	109
Jamindan		683	683	683
Ma-ayon	590	937	937	347
Mambusao	1,166	1,316	1,316	150
Panay		650	650	650
Panitan	420	519	519	99
Pilar	1,175	1,074	1,175	
Pontevedra	1,114	1,211	1,211	97
President Roxas	1,852	1,346	1,852	
Roxas City (Capital)	25,139	14,350	25,139	
Sapi-an	1,100	846	1,100	
Sigma	562	472	562	
Tapaz	441	411	441	
Provincial Total	36,097	28,649	40,439	4,342

8.6 Facilities, Equipment and Rehabilitation to Meet the Target Services

8.6.1 Water Supply

(1) Required facilities

Water supply facilities required by service level were estimated by urban and rural area by municipality based on the additional service coverage by target year and summarized in Table 8.6.1 (details are referred to Supporting Report).

Urban water supply:

Physical requirements of Level III systems were estimated as the number of required house connections. Mode of project indicates whether future urban water supply will be implemented as expansion of existing system or construction of a new system. The number of water sources was also estimated based on the water source evaluation results in Chapter 7.

Rural water supply:

Physical requirements of Level II systems were estimated as the number of systems and number of communal faucets, while that of Level I facilities were first estimated as the number of wells with classification of deep and shallow wells. Deep wells were further subdivided in terms of three different standard depths based on the water source evaluation results.

Furthermore, as for Level I facilities, in this PW4SP, 30% of the total required facilities will be implemented by public (LGUs).

(2) Rehabilitation

Rehabilitation requirements were estimated as 10% of the total number of deep wells to be constructed under PW4SP. Rehabilitation work will be mainly redevelopment of wells by means of air surging, while minor repair of concrete apron and hand-pump will be undertaken by respective beneficiary organizations.

(3) Equipment

Logistic support:

For rural water supply development, 1 unit each or set of the following equipment was considered necessary for the provincial government to conduct various activities of PW4SP implementation;

Transportation- service vehicle

Office equipment- computer with printer, typewriter, mimeo machine, scanning machine and copier

Field equipment- sound system, tape recorder and tools for maintenance

For urban water supply, no hardware was considered.

Well drilling and rehabilitation equipment:

As a reference information, necessary types and number of well drilling and rehabilitation equipment were studied considering the existing equipment of sector agencies in the province.

During Phase I, a total of 81 Level I deep wells shall be newly constructed by public (LGUs) and 10% of these deep wells shall be rehabilitated annually (details are referred to Supporting Report). Presently, the DEO-DPWH (in Roxas City) has one unit of rotary type drilling rig applicable for more than 8" bore hole diameter.

Therefore, at least 1 unit/set each of drilling rig (medium size percussion type), well rehabilitation equipment, support vehicle for well rehabilitation and service truck for deep well construction shall be mobilized/procured either by the private sector or LGUs (details are referred to Supporting Report).

Selection of well drilling machine

An appropriate type of well drilling machine with its specifications shall be selected after comprehensive study on the technical requirements, local capability in O&M of the machine and cost effectiveness.

From the technical viewpoint, geological conditions in the province allow for the use of either rotary or percussion type drilling machine (no rock drilling is expected). While, in view of economical and O&M experience on the machine in the local area, a percussion type is recommendable. Although, the rotary type machine is quite effective to reduce construction period under soft soil condition, special training on mud-circulation, handling manner, etc. are required together with additional equipment and materials as compared with percussion type. The drilling speed of the percussion type is rather slow, but has advantages in drilling boulder and cobble formations.

One unit of truck mounted percussion drilling machine was considered to be procured in the long-term development period.

Table 8.6.1 Water Supply Facilities Required by Target Year

Name of Municipality/City	Phase I (2005) Requirements											Phase I (2010) Requirements							
	Urban Water Supply (Level III)			Rural Water Supply								Urban WS (Level III)		Rural Water Supply					
				Level II		Level I								Level I					
	Mode of Project	No. of Add'l. Water Source	No. of HHs Connection	No. of System	No. of Communal Faucets	Number of Deep Wells				No. of Shallow Wells	Total No. of Wells	No. of Add'l. Water Source	No. of HHs Connection	Number of Deep Wells				No. of Shallow Wells	Total No. of Wells
						40 m	80 m	120 m	Sub-total					40 m	80 m	120 m	Sub-total		
Cuartero	New	1	199	3	60		15		15	9	24	1	1,038		156		156	104	260
Dao	New	1	244	2								1	1,595	82			82		82
Dumalag	N/A			3								1	974	177			177		177
Dumarao	Expansion	1	263	20								1	1,079		66		66	27	93
Ivisan	Expansion	1	209	3								1	734		161		161		161
Jamindan	New	1	150	7	140	8			8	17	25	1	777	210			210	489	699
Ma-ayon	New	1	206	7	123							1	976		114		114	76	190
Mambusao	Expansion	1	290			53			53		53	1	933	235			235		235
Panay	Expansion	1	143			59			59		59	1	202	514			514		514
Panitan	Expansion	1	114									1	278		182		182		182
Pilar	Expansion	1	236									1	1,197	11			11	90	101
Pontevedra	Expansion	1	266			51			51		51	1	472	278			278		278
President Roxas	New	1	296	1	20	5			5	17	22	1	1,264	40			40	158	198
Roxas City (Capital)	N/A											9	15,950		344		344		344
Sapi-an	New	1	186									1	876		114		114		114
Sigma	New	1	104	1	20	32			32		32	1	433	261			261		261
Tapaz	N/A					38			38	24	62	1	550	167			167	111	278
Provincial Total	Exp.- 7 New- 7	14	2,906	47	363	246	15		261	67	328	25	29,328	1,975	1,137		3,112	1,055	4,167

(4) Laboratory

Instrument/Equipment and Other Laboratory Accessory:

The provincial government will need at least one set of instruments/equipment in order to ensure regular water quality monitoring and surveillance activities for the entire province. Water samples have to be examined on time to avoid unpredictable changes of the quality due to long storage.

The laboratory equipment requirement for the provincial hospital in Roxas City is designed to upgrade the existing facility. The following are the requirements:

	Item	Unit	Upgrading of Provincial Laboratory
1.	Instrument/Equipment		
	Turbidity meter	set	1
	Color meter	set	1
	pH/Residual chlorine checker	set	1
	Incubator	set	1
	Refrigerator	set	1
	Sterilizer	set	1
	Portable water quality testing kit	set	1
	Electric stove	set	1
	Range hood	set	1
2.	Glassware/Chemical	set	1
3.	Accessory		
	Sink	set	1
	Working table	set	1
	Shelf	set	1
	Office desk	set	1
	Chair	set	1

8.6.2 Sanitation

This sub-section refers to physical requirements by target year covering household, school and public toilet facilities. Table 8.6.2 presents the required sanitation facilities by target year. Rehabilitation for the sanitation facilities is considered as part of recurrent cost.

(1) Household toilets

Future requirements in the number of household toilets by different type for urban and rural areas were estimated based on the additional households to be served by type of facility both for urban and rural areas by target year (details are referred to Supporting Report).

Table 8.6.2 Sanitation Facilities Required by Target Year

Name of Municipality/City	Phase I (2005) Requirements													Phase II (2010) Requirements										
	Urban Sanitation								Rural Sanitation					Urban Sanitation							Rural Sanitation			
	No. of Households				No. of Public Sch. Toilets	No. of Public Toilets			No. of Households				No. of Public Sch. Toilets	No. of Households				No. of Public Sch. Toilets	No. of Public Toilets			No. of Households				No. of Public Sch. Toilets
	Flush	Pour Flush	VIP/ Dry	Total		Public Market	Bus/ Jeepney Terminal	Parks/ Playground	Flush	Pour Flush	VIP/ Dry	Total		Flush	Pour Flush	VIP/ Dry	Total		Public Market	Bus/ Jeepney Terminal	Parks/ Playground	Flush	Pour Flush	VIP/ Dry	Total	
Cuartero	-	34	130	164		1		1	229	2,496	1,580	4,305	8	489			489	5		1			3,851		3,851	40
Dao	21			21	1	1		1					6	781	61		842	6		1			1,404		1,404	26
Dumalag	-	41	208	249		1		1		263	119	382	6	464			464	2		1		808	2,524		3,332	31
Dumarao	65			65	1	1		3	274	388		662	9	749			749	4		1		54	2,828		2,882	44
Ivisan	78			78	1	1		1	165	589		754	6	522			522	4		1		361	1,609		1,970	29
Jamindan	95	50		145	-	1		1	372	927		1,299	12	376			376	3		1			4,820		4,820	62
Ma-ayon	26			26	1	1		1	212	81	357	650	8	476			476	3		1			2,433		2,433	36
Mambusao	143	-		143	2	2		3	115			115	7	735			735	5		1			2,990		2,990	36
Panay	37			37	-	1		1	307	134		441	9	303			303	3		1		738	3,573		4,311	49
Panitan	53	45		98		1		1	246	1,207	1,720	3,173	8	260			260	2		1		547	2,470		3,017	42
Pilar	81			81	1	1		1					9	684			684	6		1		195	2,128		2,323	44
Pontevedra	-	166		166	2	1		1					9	488	120		608	6		1		496	2,818		3,314	47
President Roxas	188	90		278	2	1		1	12			12	5	619			619	4		1			1,816		1,816	23
Roxas City (Capital)	-	1,721	344	2,065	16	2	1	2		791		791	20	7,813	2,762		10,575	71	1	2			6,094		6,094	85
Sapi-an	45			45		1		1	154	22		176	5	425			425	3		1			1,796		1,796	27
Sigma	56			56		1		1	200	342		542	5	210			210	1		1			2,479		2,479	27
Tapaz	-	11		11		1		1		2,011	1,042	3,053	10	269			269	2		1			3,128		3,128	51
Provincial Total	888	2,158	682	3,728	27	19	1	22	2,286	9,251	4,818	16,355	142	15,663	2,943		18,606	130	1	18		3,199	48,761		51,960	699

(2) School toilets

The future requirements in the number of toilet facilities were estimated based on the standard number of students to be served by a 5-unit standard facility or a toilet in every classroom (50-50 sharing) and the additional students to be served by target (details are referred to Supporting Report).

Total required facilities were further broken down into urban and rural areas by applying the percentage share of urban and rural population.

8.6.3 Urban Sewerage and Solid Waste

Physical requirements for the sewerage facilities are not discussed in this sub-section. Further study shall be conducted in the future.

As reference information, the number of refuse collection trucks is estimated for the urban area in Phase I. Ten (10) additional units of truck are required to meet assumed service coverage as reflected in Table 8.6.3.

Table 8.6.3 Number of Refuse Collection Trucks Required in Phase I

Name of Municipality/ City	Additional Urban Households to be Served	Estimated Daily Amount of Refuse to beGenerated, (Kg)	Number of Collection Truck Required
Cuartero	623	261	1
Dao	1,004	420	1
Dumalag			
Dumarao	580	243	1
Ivisan	109	46	1
Jamindan	683	286	1
Ma-ayon	347	146	1
Mambusao	150	63	1
Panay	650	272	1
Panitan	99	42	1
Pilar			
Pontevedra	97	41	1
President Roxas			
Roxas City (Capital)			
Sapi-an			
Sigma			
Tapaz			
Provincial Total	4,342	1,820	10

8.7 Identification of Priority Projects for Medium-Term Development Plan

In general, the present service coverage by municipality with reference to the target coverage indicates the direction of development effort for implementing PW4SP with municipal priorities.

Specific projects shall be selected subject to detailed studies and will not be discussed in the provincial master plan. In addition, pertinent information to identify priority projects is not available both at provincial and municipal level during this PW4SP preparation, except some future expansion work for WDs.

The general criteria for identifying priority projects as guide for implementing the PW4SP are summarized below.

The first level of priority should be given to projects with positive feasibility studies and identified funding. Next level of priority should be given to projects with positive feasibility studies, although no funding source has been identified. The third level should be for which feasibility study has been conducted. Within each level, if funds were insufficient, a ranking could be carried out applying some factors, such as willingness to pay, water-related diseases status and per capita cost. Under the above-mentioned conditions, the implementers should prepare a list of projects.

Due attention shall be paid on the importance of integrated development of relevant sub-sectors to maximize the effects and benefits through simultaneous implementation of water supply and sanitation projects. On a municipal level priority, synthetic evaluation of sector components for concerned municipalities (which is studied in the financial arrangements, Chapter 11) may be used for implementation arrangements.