

7. WATER SOURCE DEVELOPMENT

7.3 Groundwater Sources

7.3.2 Groundwater Availability in the Province

(1) Major Information and References

The Groundwater Availability Map was prepared using the following information and reference (detailed list of reference is presented in Table 7.1.2, Data Report):

- Administrative and Topographical Maps of the Province published by NAMRIA with scales of 1:250,000 and 1:50,000, respectively.
- Geological Map of the Philippines published by BMGS with a scale of 1:1,000,000.
- Water Resource Investigation conducted by NWRB, 1986.
- Well Inventory Database prepared by NWRB, LWUA and DPWH.
- Well Inventory Database in the province.
- General information on groundwater condition by DPWH-DEO and PPDO.
- Well Log Data by DPWH-DEO and PEO.
- Water source information by Water Districts.

(2) Approach and Methodology

The procedure in preparing the Groundwater Availability Map is explained below with workflow depicted in Figure 7.3.1.

- 1) Prepare a base map with an approximate scale of 1:800,000 (fit to the A4 map size). The topographical map of NAMRIA (1:250,000) was used as a reference map. Basic information including rivers and provincial and municipal boundaries are indicated in the prepared base map.
- 2) The groundwater potential areas, based on the geology of the province, are delineated on the base map. The Recent alluvial and/or beach deposits, Pliocene-Quaternary sedimentary formation (clay, silt, sand and gravel) and Pliocene-Quaternary volcanic rock units (pyroclastics, debris flow and tuff) are regarded as possible aquifers considering their high porosity and permeability.

Boundaries between groundwater development potential area and difficult area were defined and delineated as presented in Figure 7.3.1, Main Report.

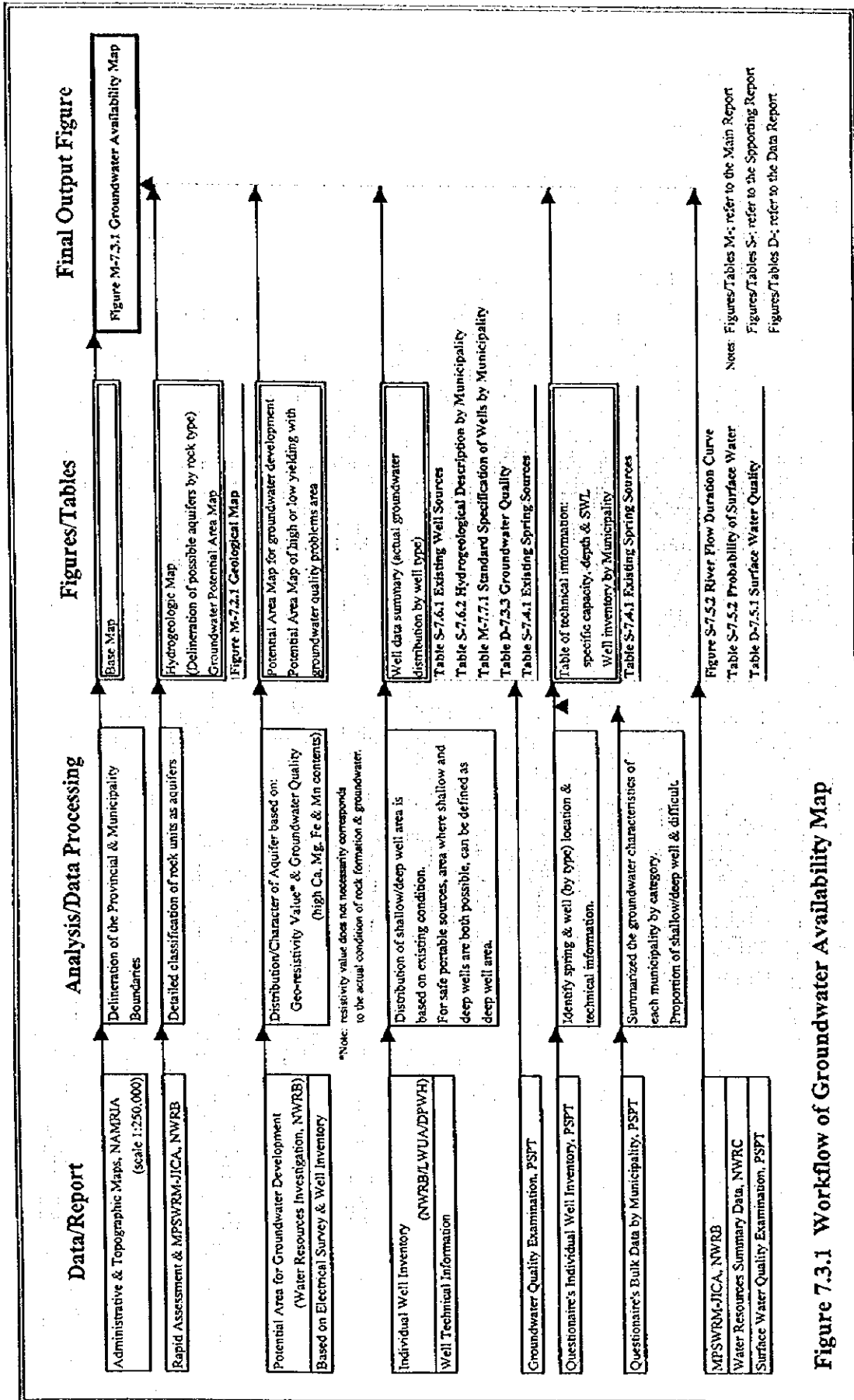


Figure 7.3.1 Workflow of Groundwater Availability Map

- 3) Areas with potential high yielding aquifer in the Water Resources Investigation of NWRB, are reflected in the defined groundwater potential areas.

Based on the results of electric resistivity survey of the above investigation, resistivity values from 20 to 210 ohm-meter indicate a potential high yielding formation. Values less than 10 ohm-meter suggest clayey layer. Figure 7.3.1, Main Report, shows the boundaries of areas with high and low yielding aquifers.

- 4) Delineate shallow and deep well areas based on well database of NWRB and DPWH central office, well inventory of DPWH-DEO and rock distribution. Figure 7.3.2 presents the categorization in terms of groundwater utilization.

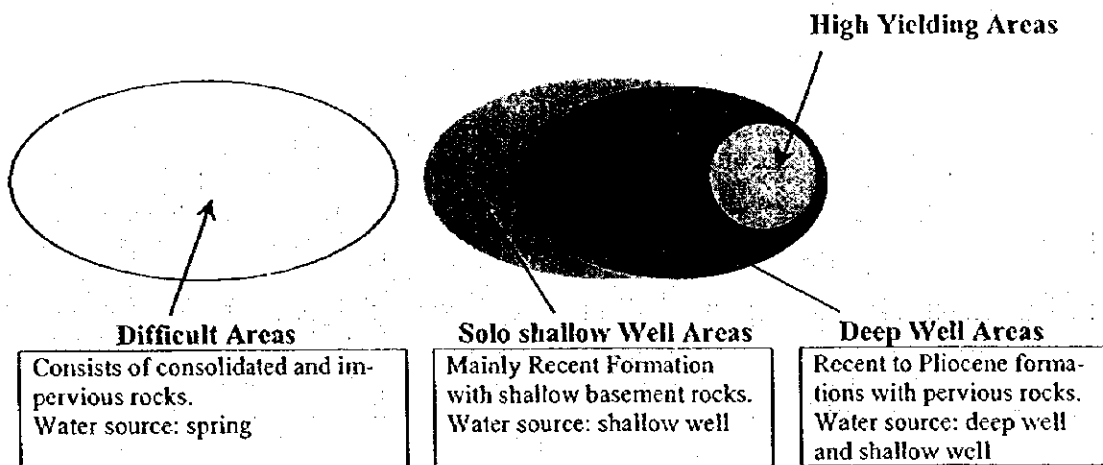


Figure 7.3.2 Area Category by Groundwater Utilization

Solo shallow well areas are defined on the following basis:

- (a) Predominance of serviceable shallow wells and presence of deep wells with water quality problem and/or low yielding aquifers.
- (b) Occurrence of impervious rocks beneath the Recent formation at shallow depth.

- 5) Based on the information provided by NWRB's well inventory and the data obtained through the questionnaires, well specification for each municipality is established as shown in the map. These specifications are used as references in evaluating the groundwater availability in each locality. Individual well locations with technical information are presented in Figure 7.6.1, Data Report.

(3) Future Updating and Utilization of the Map

For future updating of the map, the following procedure shall be employed.

- 1) Referring to the results of any supplementary water sources investigation by various agencies, re-define the potential area for groundwater development by applying the aforementioned procedures.
- 2) Update the provincial database using the questionnaire made for the study to make necessary revision of the delineated boundaries of groundwater categories.

7.4 Spring Sources

The numbers and discharge of developed and untapped springs by municipality are shown in Table 7.4.1. The dividing discharge of 2.0 lps for existing developed spring sources means that this capacity is enough for Level II water supply and can be applied to upgrade small-size Level III water supply. The data are derived from the questionnaires and Table 7.1.1 Water Source Information, Data Report.

Table 7.4.1 Existing Spring Sources

Municipality/City	No. of Developed Spring		Untapped Spring		
	Q<2.0 lps	Q>2.0 lps	No.	Ave. lps	Range lps
Almagro	-	-	-		~
Basey	8	1	6	0.2	0.1 ~ 0.6
Calbayog City	-	-	-		~
Calbiga	-	-	-		~
Catbalogan	-	-	-		~
Daram	38	0	-		~
Gandara	-	-	-		~
Hinabangan	-	-	-		~
Jiabong	-	-	-		~
Marabut	-	-	-		~
Mataguina	-	-	-		~
Motiong	-	-	-		~
Pagsanghan	-	-	-		~
Paranas	0	10	-		~
Pinabacdao	-	-	-		~
San Jorge	-	-	-		~
San Jose de Buan	0	4	-		~
San Sebastian	-	-	-		~
Santa Margarita	-	-	-		~
Santa Rita	-	-	6	0.3	0.3 ~ 0.3

Table 7.4.1 Existing Spring Sources

(cont'd)

Municipality/City	No. of Developed Spring		Untapped Spring		
	Q<2.0 lps	Q>2.0 lps	No.	Ave. lps	Range lps
Santo Nino	-	-	-		~
Tagapulan	5	0	3	0.5	0.5 ~ 0.6
Talalora	6	0	-		~
Tarangan	-	-	-		~
Villareal	7	0	-		~
Zumarraga	-	-	-		~

Note: Ave. lps & Range lps mean the average discharge and the range of discharges in lps (liter/second), respectively.

7.5 Surface Water Sources

The major rivers in the province were selected to evaluate their potential as water supply sources to meet the future water needs of the province. The following criteria were adopted for the selection:

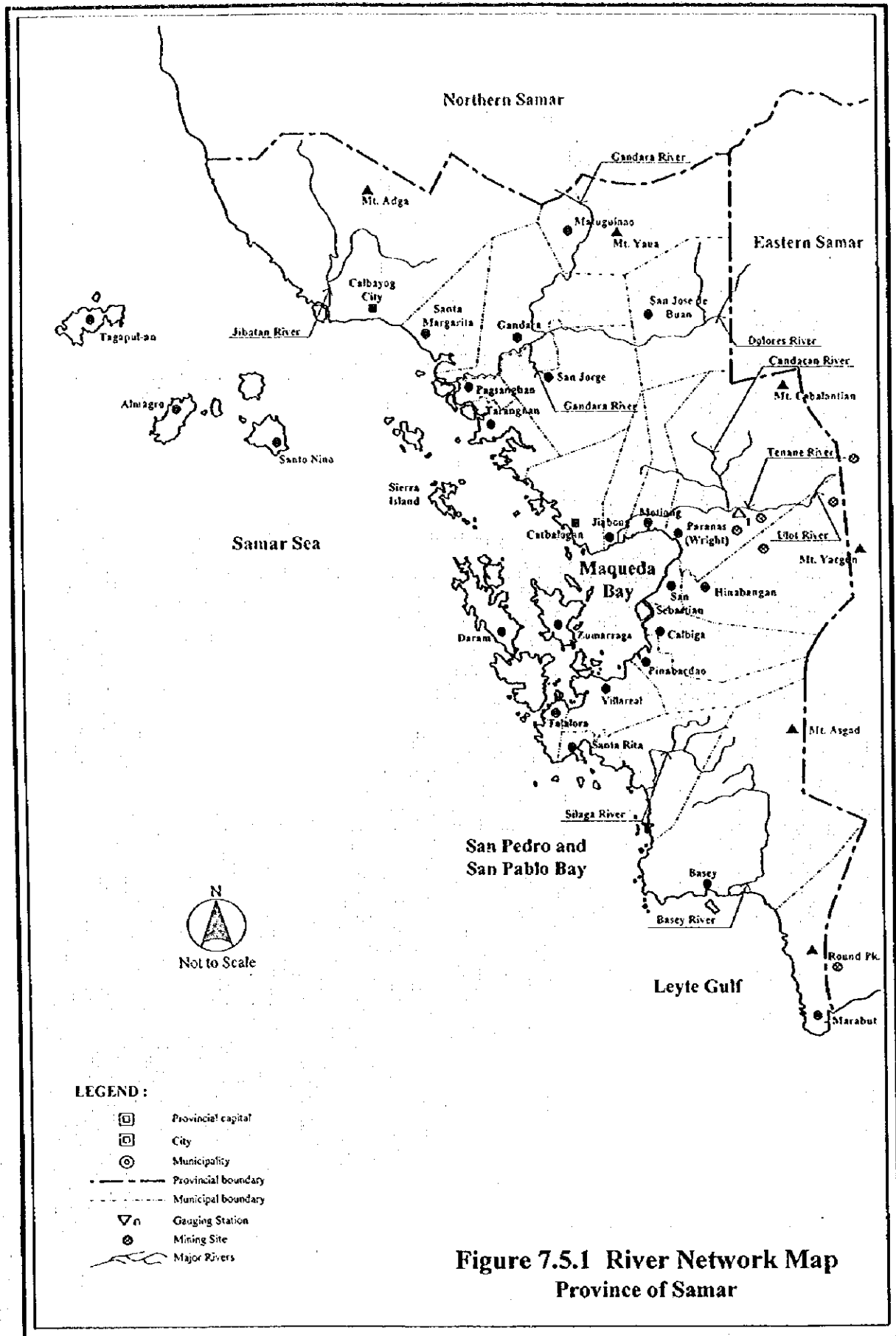
- rivers which have been utilized for domestic use,
- rivers which have gauging stations, and
- rivers with watershed of 100 km² or more.

Based on the above criteria, the selected major rivers are Jibatan, Gandara, Tanane, Silaga and Basey Rivers. The Dolores, Ulot and Candacan rivers are tributaries of major rivers as shown in Figure 7.5.1 River Network Map.

The gauging station in the province is at Tanane River shown in Figure 7.5.1. The other 2 stations in the provinces of Leyte are added in the analysis process considering the same climate pattern. Runoff records are obtained from the "Philippine Water Resources Summary Data" prepared by the NWRC in 1980. Information on the gauging stations and the present uses (water rights) of the major rivers in the province is summarized in Table 7.5.1.

(1) Surface Water Utilization/Water Rights

As seen in Table 7.5.1, the present water uses in the watershed of major rivers and their tributaries total to 2.78 m³/sec. The diversions for major flume, operated by NIA and private associations, are in Calbayog City at Jibatan River and in Motiong at Tanane River. Mining sites are in mountainous area and are in the upstream area of Marabut, and in Tanane River watershed of Paranas and Hinabangan as shown in the Figure 7.5.1.



**Figure 7.5.1 River Network Map
Province of Samar**

Table 7.5.1 Gauging Station & River Water Use by Major River Basins

Major River	River Basin		Information from Gauging Station				Surface Water Use (Water Rights) in Watershed				
	Stream & Main Systems	Drainage-1 sq. km	Location No. in Figure 7.5.1	Peak Q _p	Max. Q _{pk}	River Flow Rate (Q, cum/sec) Min. Q _m Q _{pk} Q _{dn}	Municipality in watershed	Domestic cum/sec	Industrial cum/sec	Irrigation cum/sec	Others-3 cum/sec
Jibatan		No gauging station exists.					(Northern Samar)-5 Calaog City	NR-4	NR-4	1.14	NR-4
Gandara	Dolores-E	No gauging station exists.					(Eastern Samar)-5 San Juan de Buan	NR-4	NR-4	NR-4	NR-4
	Dolores-W	No gauging station exists.					Matuguino San Juan de Buan San Jorge	NR-4 NR-4 NR-4	NR-4 NR-4 NR-4	NR-4 NR-4 NR-4	NR-4 NR-4 NR-4
	Gandara	No gauging station exists.					Gandara (Northern Samar)-5 Matuguino	NR-4 NR-4 NR-4	NR-4 NR-4 NR-4	NR-4 NR-4 NR-4	NR-4 NR-4 NR-4
Tenane	Candacan	No gauging station exists.					Gandara Cabalongan	- NR-4	- NR-4	0.57 NR-4	- NR-4
		No gauging station exists.					Jiabong Motong Paranas	- - -	- - -	- - -	- - -
	Tanane		392.0 (1): Tenane	595.80	461.99	5.36	(Eastern Samar)-5 Hinabangan	NR-4 NR-4	NR-4 NR-4	NR-4 NR-4	NR-4 NR-4
Silaga		No gauging station exists.					Paranas Motong Jiabong	- - -	- - -	0.18 0.37 0.16	- - -
Basey		No gauging station exists.					Basey Santa Rita	NR-4 -	NR-4 -	NR-4 0.30	NR-4 -
		No gauging station exists.					Basey	-	-	0.07	-

Source: Philippine Water Resources Summary Data, established January 1980 by NWRRC

Notes: Drainage-1 : Watershed Area at Gauging Station Q_p : Peak Discharge of Daily Maximum Discharge
 NA-2 : Recorded River Gauge Height only Q_{pk} : Maximum Daily Discharge of Weighted Daily Discharge
 Others-3 : Including Livestock, Recreation & Fisheries Q_m : Minimum Daily Discharge of Weighted Daily Discharge
 NR-4 : Surface water utilization was not registered in NWRB Database, as of March 1997.
 (Province)-5 : Out of Applicable Area

(2) River Flow Analysis

The flow duration curves, derived from the available runoff records, are shown in Figure 7.5.2. Also, for the preparation of duration curve, the specific discharges at the Sangpultan-Dapdap and Binahaan-Lingayon Gauging Stations in the province of Leyte are added for comparison.

The stream flow, maintenance flow, diversion flow and return flow are usually used to estimate the exploitable surface water potential. In this study, the stream flow was considered as the flow potential for domestic use and the diversion flow value was treated as the equivalent to the discharge of water rights registration in surface water use. No detailed study on the return flow has been performed yet due to the difficulties in investigating the irrigation, evapotranspiration and recharge value to groundwater, etc. within the entire watersheds in the province. Therefore, the return flow was not considered for the estimation of exploitable potential.

It is generally accepted that to secure the required volume for water supply, each water use sector adopts the different return periods. Usually, the dependability of domestic water supply is taken to be 90% or higher (10-year or longer return-period) of the whole hydrological period.

In determining the river maintenance flow, such factors as runoff characteristics, navigation, fishing, picturesque scenery, salt water intrusion, clogging of river mouth, riparian structures, groundwater table, flora and fauna, and river water quality shall be considered to maintain the normal function of the river. In the Philippines, 10% of the dependable flow of the river is required as minimum maintenance flow. Therefore, the maintenance flow was calculated as the dependable flow for irrigation, which equals to 80% (5-year return-period) of the whole hydrological period.

Finally, the exploitable potential of surface water in the province was studied in the case of inflow to and outflow from the respective municipalities. The results are summarized in Table 7.5.2.

(3) Surface Water Quality

Mining sites exist upstream of the Ulot stream that is connected to the Tanane River. The locations of the mining sites are shown in Figure 7.5.1.

Percent of Time (%) (No. in Figure 7.5.1)	Specific Discharge (cum/sec/100sq km)		
	Tenane River	Sangpultan-Dapdap River	Binahaan-Lingayon River
	I	Leyte	Leyte
10%	9.73	16.04	21.88
20%	7.05	9.43	16.98
30%	5.66	7.15	12.68
40%	4.67	4.80	10.64
50%	3.86	4.00	9.19
60%	3.25	3.02	8.40
70%	2.74	2.44	7.70
80%	2.30	2.06	6.70
90%	1.86	1.63	5.54
100%	1.01	0.70	1.20
Data Period	1959-'70	1952-'70	1948-'70

Source; Philippine Water Resources Summary Data, as of Jan. 1980 by NWRC
Interim Report, Master Plan Study on Water Resources Management, as of Oct. 1997 by NWRB

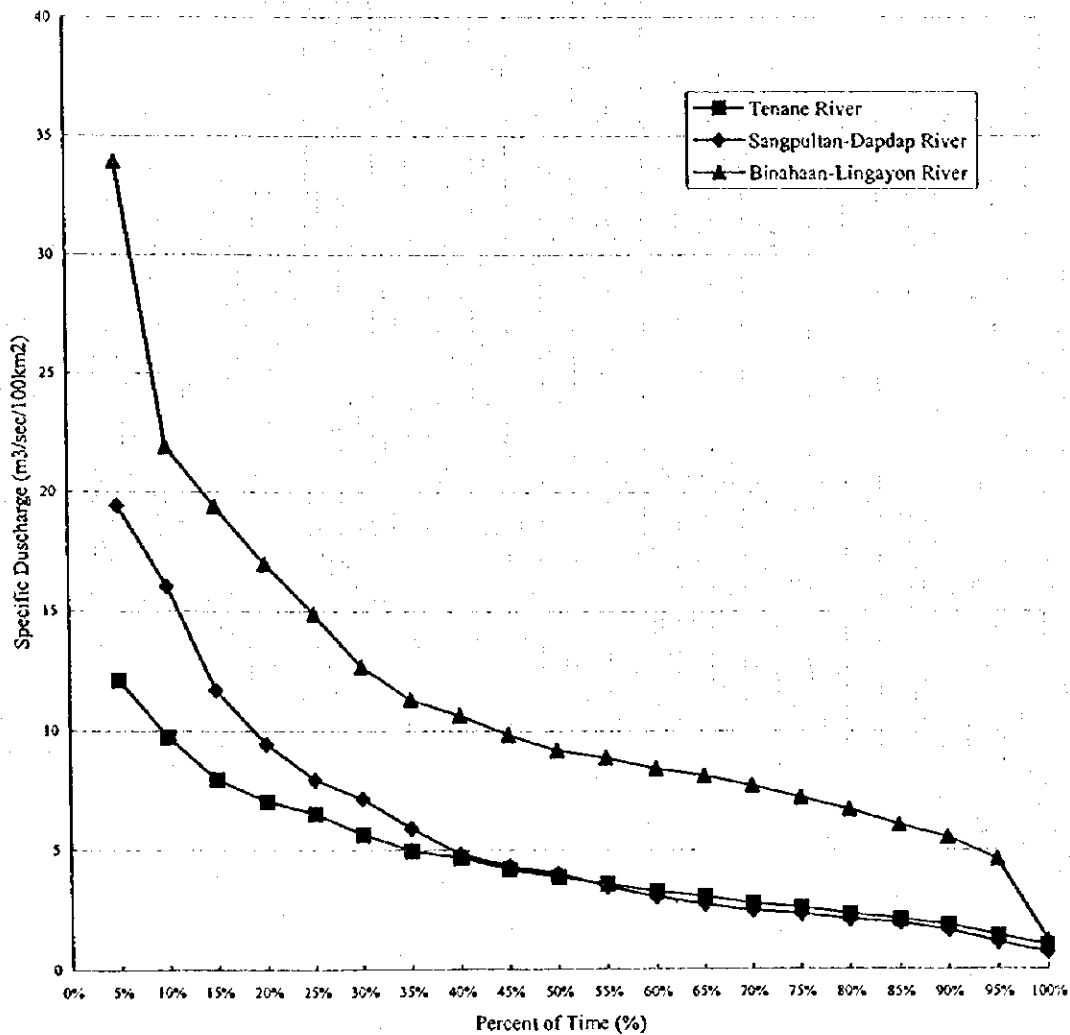


Figure 7.5.2 River Flow Duration Curve

Table 7.5.2 Probability of Surface Water

Surface Water Sources		Related Data										Probability of Surface Water (10-year return-period)					
		Location		Watershed Area in		Sp. D (return-period)		Inlet Flow to Municipality		Potential (P)		Outlet Flow from Municipality					
		Municipality & other Province	River Connection	Location (1)	Upstream (2)	10-year (3)	5-year (4)	S/Flow (5)	M/Flow (6)	Use (7)	Potential (P)	S/Flow (9)	M/Flow (10)	Use (11)	Potential (12)		
Major River Water & Main	upstream to down, outlet or inlet	sq. km	sq. km	Q	Q	cu.m/sec	cu.m/sec	cu.m/sec	cu.m/sec	cu.m/sec	cu.m/sec	cu.m/sec	cu.m/sec	cu.m/sec			
Jibaton	Calbayog City		504.48	36.41	1.63	2.06	0.59	0.08	0.00	0.52	8.83	1.12	1.14	6.58			
Candara	San Juan de Buan to Dolores		93.87	187.73	1.63	2.06	3.07	0.39	0.00	2.68	4.60	0.58	0.00	4.02			
	Dolores-W		82.13	0.00	1.63	2.06	0.00	0.00	0.00	0.00	1.34	0.17	0.00	1.17			
	San Juan de Buan from Dolores		434.13	363.73	1.63	2.06	5.94	0.75	0.00	5.19	13.03	1.64	0.00	11.39			
	San Jorge		176.00	797.87	1.63	2.06	13.03	1.64	0.00	11.39	15.91	2.01	0.00	13.90			
	Gandara to Gandara		82.18	973.87	1.63	2.06	15.91	2.01	0.00	13.90	17.25	2.18	0.00	15.07			
	Gandara		246.40	46.93	1.63	2.06	0.77	0.10	0.00	0.67	4.79	0.60	0.00	4.19			
	Gandara from Dolores		381.86	1,349.38	1.63	2.06	22.04	2.78	0.00	19.26	28.23	3.57	0.57	24.14			
Tanane	Candacan		20.83	0.00	1.63	2.06	0.00	0.00	0.00	0.00	0.34	0.04	0.00	0.30			
	Jiabong		31.25	20.83	1.63	2.06	0.34	0.04	0.00	0.30	0.85	0.11	0.00	0.74			
	Motlong		36.45	52.08	1.63	2.06	0.85	0.11	0.00	0.74	1.45	0.18	0.00	1.26			
	Paranas to Tanane		192.27	88.53	1.63	2.06	1.45	0.18	0.00	1.26	4.59	0.58	0.00	4.01			
	Hinabangan		144.57	20.83	1.63	2.06	0.34	0.04	0.00	0.30	2.70	0.34	0.00	2.36			
	Paranas from Candacan		104.15	446.20	1.63	2.06	7.29	0.92	0.00	6.37	8.99	1.13	0.18	7.68			
	Motlong		23.44	550.35	1.63	2.06	8.99	1.13	0.18	7.68	9.37	1.18	0.54	7.64			
	Jiabong		18.23	573.79	1.63	2.06	9.37	1.18	0.54	7.64	9.67	1.22	0.70	7.75			
	Basey		76.72	0.00	1.86	2.30	0.00	0.00	0.00	0.00	1.43	0.18	0.00	1.25			
Silaga	Santa Rita		184.14	76.72	1.86	2.30	1.43	0.18	0.00	1.25	4.86	0.60	0.30	3.96			
	Basey		322.24	0.00	1.86	2.30	0.00	0.00	0.00	0.00	6.00	0.74	0.07	5.19			

Notes:
 Sp. D (Specific Discharge) was analyzed by montly mean flow records from gauging station.
 S/Flow (Stream Flow) was estimated specific discharge (10-year return-period) multiplied by upstream area.
 M/Flow (Maintenance Flow) was estimated 10% of river flow in case of 5-year return-period.
 Sp.D (10-year or 5-year return-period) without gauging station was adopted by the other analysis result from near gauging station.
 Inlet & outlet "Use" (Water Rights) are summed up by NWRB Database, as of March 1997.
 Unit Q for Specific Discharge is cu.m/sec/100 sq. km.
 S/Flow, M/Flow & Use in final outlet flow of each stream system was added to respective inlet flows of main system.

The results of water quality analysis are summarized in Table 7.5.1, Data Report. The sampling locations were selected upstream of the respective municipalities. In the table, Class AA and Class A of the DENR "Water Quality Criteria for Fresh Water" are shown as reference for raw water evaluation. The PNSDW-1994 is also used to evaluate water quality with reference to turbidity and trace elements. The water quality of the selected rivers falls within the class "A" standard, although the parameters tested are limited.

7.6 Future Development Potential of Water Sources

(1) Groundwater

A well inventory covering all the municipalities shows that there are 1,557 existing wells in the province, while 295 wells are recorded in the inventory prepared by PSPT (See Table 7.1.1 and 7.3.1, Data Report). Despite the smaller number of wells included in the PSPT data, these were used in the analysis, since these provided technical information. Of the total 295 wells, only 18 wells have complete information: depth, static water level and specific capacity. Data are summarized in Table 7.6.1 Existing Well Sources.

Considering the well information, the most productive wells are those with the depth ranging from 15m to 18m and from 30m to 66m. The good yielding wells have static water level varying from about 3m to 6mbgs and specific capacity of about 12 lpsm to 75 lpsm.

Based on the hydraulic characteristics and location of wells in Samar, aquifers are widely distributed in northwestern and southwestern parts of the province. Shallow well area is distributed but limited to islands and coastal areas in the province. The Miocene and older rock units are widely distributed in the eastern and the northwestern parts of the province that are classified as difficult area for groundwater development.

As indicated in Figure 7.3.1 Main Report, the fluvial area along Jibatan and Gandara Rivers, and coastal plains of the Maqueda Bay are high yielding potential areas covering the northwestern to central western parts of the province. However, more than half of the numbers of shallow and deep wells in the municipalities of Matuguinao, Santa Margarita, Gandara, and Calbayog City contain low pH value, as acid groundwater.

Table 7.6.1 Existing Well Sources

Municipality/ City	Type	No.	Depth (m)		SWL (mbgs)		Sp. Cap. (lpsm)	
			Ave.	Range	Ave.	Range	Ave.	Range
Almagro	DW	2	38.3	30.0 - 40.0	-	-	4.0	4.0 - 4.0
	SW			-	-	-	-	-
Basey	DW	28	28.0	20.0 - 35.0	3.6	3.0 - 6.0	-	-
	SW	33	15.6	10.0 - 18.0	5.9	3.0 - 6.0	-	-
Calbayog City	DW			-	-	-	-	-
	SW			-	-	-	-	-
Calbiga	DW			-	-	-	-	-
	SW			-	-	-	-	-
Catbalogan	DW	2	50.1	40.0 - 51.0	1.8	ff - 2.0	21.1	16.5 - 75.5
	SW	1	3.0	3.0 - 3.0	1.0	1.0 - 1.0	12.0	12.0 - 12.0
Faram	DW	20	24.4	20.0 - 55.0	3.0	3.0 - 3.0	-	-
	SW	36	7.2	5.0 - 10.0	3.0	3.0 - 3.0	-	-
Gandara	DW	1	27.0	27.0 - 27.0	3.0	3.0 - 3.0	-	-
	SW			-	-	-	-	-
Hinabangan	DW			-	-	-	-	-
	SW			-	-	-	-	-
Jiabong	DW	4	25.5	24.0 - 30.0	4.5	3.0 - 6.0	-	-
	SW	2	14.9	12.0 - 18.0	4.5	3.0 - 6.0	-	-
Marabut	DW			-	-	-	-	-
	SW			-	-	-	-	-
Matuguinao	DW			-	-	-	-	-
	SW			-	-	-	-	-
Motiong	DW	12	26.4	20.0 - 30.0	5.5	3.0 - 6.0	-	-
	SW	3	13.7	12.0 - 18.0	3.6	3.0 - 6.0	-	-
Pagsanghan	DW			-	-	-	-	-
	SW			-	-	-	-	-
Paraas	DW	29	53.6	20.0 - 80.0	2.4	ff - 6.0	-	-
	SW			-	-	-	-	-
Pinabacdao	DW			-	-	-	-	-
	SW			-	-	-	-	-
San Jorge	DW			-	-	-	-	-
	SW			-	-	-	-	-
San Jose de Buan	DW			-	-	-	-	-
	SW			-	-	-	-	-

Table 7.6.1 Existing Well Sources

(Cont'd)

Municipality/ City	Type	No.	Depth (m)			SWL (mbgs)			Sp. Cap. (lpsm)		
			Ave.	Range		Ave.	Range		Ave.	Range	
San Sebastian	DW			-			-			-	
	SW			-			-			-	
Santa Margarita	DW			-			-			-	
	SW			-			-			-	
Santa Rita	DW	13	34.3	24.0	48.0	1.7	ff	3.0		-	
	SW	13	10.3	3.0	18.0	3.0	3.0	3.0		-	
Santo Nino	DW	3	42.5	40.0	48.0	4.6	3.0	6.0		-	
	SW	13	15.0	15.0	15.0	1.8	ff	6.0	0.7	0.6	0.9
Tagapulan	DW			-			-			-	
	SW			-			-			-	
Taalora	DW	8	30.0	30.0	30.0	2.1	ff	6.0	0.3	0.2	0.3
	SW	6	17.5	12.0	18.0	2.4	ff	6.0	0.2	0.2	0.2
Tarangan	DW			-			-			-	
	SW	38	10.1	12.0	18.0	4.5	ff	6.0		-	
Villareal	DW	9	27.7	20.0	66.0	5.8	3.0	6.0	0.7	0.1	4.4
	SW	19	11.6	9.0	19.0	4.8	3.0	6.0		-	
Zumarraga	DW			-			-			-	
	SW			-			-			-	

Notes: The values of "Ave. depth, SWL and Sp.Cap." by municipality are estimated using the weighted average based on 1995 census population in respective barangays at well location.

Legend: SWL=static water level, Sp.Cap.=specific capacity, Ave.=average, SW=shallow well, DW=deep well and "ff" in the column of SWL means free flowing well

As alternative water sources, the untapped springs can be developed for future use. These are the most reliable sources for water supply in the province because groundwater quality has a serious problem of iron water. Existing spring sources of 312 are utilized for water supply and they originate from the Samar Central Highlands in the eastern and the northwestern mountainous parts of the provincial area. The untapped springs of 15 are proposed as future water sources in the areas of Basey, Santa Rita and Tagapulan.

Iron removal facilities shall be considered for Level-I deep well facilities in case there are no alternative spring sources in deep well areas with water quality problem of iron groundwater. The proportion of the iron removal facilities to be constructed for Level-I deep well facilities covering the entire province is estimated at 10%.

The detailed hydrogeological characteristics of each municipality are summarized in Table 7.6.2, while the individual well locations with technical information are shown in Figure 7.6.1 individual Well Location and Specification Map, Data Report.

Additional wells shall be designed employing "gravel packed well" with a gravel thickness of about 50mm or more depending on the grain sizes of aquifers and pumping capacity. While, natural gravel packed well may be adopted within the areas where well-sorted natural gravel formation is distributed at the expected aquifer. Such areas are usually the upstream areas of alluvial fans or plains in the province. The application of such method for Level-I well is also justifiable, since inflow velocity of groundwater through the screen is very low because of minimal pumping rate by means of hand-pump operation.

Generally, shallower well has a higher possibility to be constructed by the natural gravel packed method than the deeper one in areas formed by recent deposits. This is because the layers at different depths of alluvial plain or fan deposits had been formed by different situations of transportation and sedimentation between varied grain sizes. The adaptability of the natural gravel packed well is experimentally assumed referring to the limited information such as topography, geology, static water levels, etc., as shown in Table 7.6.3.

Table 7.6.2 Hydrogeological Descriptions by Municipality

Municipality	Ground Information										Well Information					Groundwater Information				
	Topography			Lithofacies (Major Aquifers)			Geology		Depth		SWL		Sp.Cap. (pm)	L-III well	Availability			Potential		Quality Area Feature
	Area Proportion (%)			Q			Stratigraphy of Geological Age*		m		m				Area Proportion (%)		Comparative			
	High Plateau	Hilly	Piedmont	Mountain	Neogene	Paleogene	Quaternary	Tertiary	min.	max.	min.	max.	min.	max.	SV	DW	Diff.	Wells	Springs	Problem
Almagro	5%	65%	30%	30%	X	X	X	30	40	-	-	4.0	0	100%	0%	0%	fair	nch	nch	none
Basey	23%	39%	38%	recent deposits & limestone	X	X	X	10	35	3.0	6.0	-	0	0%	52%	43%	fair	nch	nch	saline
Calbayog City	34%	32%	34%	recent deposits & limestone	X	X	X	-	-	-	-	-	0	0%	68%	32%	fair	few	few	acidic & none
Calbiga	19%	3%	78%	recent deposits & limestone	X	X	X	-	-	-	-	-	0	0%	33%	67%	fair	nch	nch	saline
Catbalogan	54%	22%	24%	limestone	X	X	X	3	51	ff	2.0	12.0	0	0%	86%	14%	fair	nch	nch	none
Daram	5%	65%	30%	weathered sedimentary rocks	X	X	X	5	55	3.0	3.0	-	0	20%	0%	30%	fair	nch	nch	none
Gandara	70%	17%	13%	recent deposits & limestone	X	X	X	27	27	3.0	3.0	-	0	0%	31%	19%	good	few	few	mining
Hinabagan	4%	2%	94%	recent deposits & limestone	X	X	X	-	-	-	-	-	0	0%	6%	94%	good	nch	nch	mining
Jabong	10%	7%	83%	limestone	X	X	X	12	30	3.0	6.0	-	0	0%	23%	77%	good	few	few	saline
Marabut	7%	2%	91%	recent deposits	X	X	X	-	-	-	-	-	0	8%	0%	92%	poor	nch	nch	mining
Mataguinao	26%	31%	43%	limestone	X	X	X	-	-	-	-	-	0	0%	58%	42%	fair	few	few	saline
Motong	51%	42%	7%	recent deposits & limestone	X	X	X	12	30	3.0	6.0	-	0	0%	48%	52%	good	few	few	saline
Pagranghan	80%	20%	0%	recent deposits & limestone	X	X	X	-	-	-	-	-	0	0%	100%	0%	good	poor	poor	saline
Paranas	19%	28%	53%	recent deposits & limestone	X	X	X	20	80	ff	6.0	-	0	0%	12%	88%	good	nch	nch	mining
Pinabacdao	58%	14%	28%	recent deposits & limestone	X	X	X	-	-	-	-	-	0	0%	63%	37%	good	few	few	saline
San Jorge	14%	29%	57%	recent deposits & limestone	X	X	X	-	-	-	-	-	0	0%	49%	51%	good	few	few	mining
San Jose de Buen	0%	13%	87%	weathered sedimentary rocks	X	X	X	-	-	-	-	-	0	0%	0%	100%	risky	nch	nch	mining
San Sebastian	65%	35%	0%	recent deposits & limestone	X	X	X	-	-	-	-	-	0	0%	100%	0%	good	few	few	saline
Santa Margarita	55%	45%	0%	recent deposits & limestone	X	X	X	-	-	-	-	-	0	0%	100%	0%	good	few	few	saline
Santa Rita	86%	11%	3%	recent deposits & limestone	X	X	X	3	48	ff	3.0	-	0	0%	97%	3%	good	nch	nch	saline
Santo Nino	5%	65%	30%	weathered volcanic	X	X	X	15	48	ff	6.0	0.7	0	100%	0%	0%	fair	few	few	mining
Tagapuluan	5%	65%	30%	weathered volcanic	X	X	X	-	-	-	-	-	0	100%	0%	0%	good	few	few	mining
Talibora	15%	5%	80%	weathered sedimentary rocks	X	X	X	12	30	ff	6.0	0.3	0	0%	0%	100%	risky	nch	nch	mining
Tarangnan	80%	20%	0%	recent deposits & limestone	X	X	X	12	18	ff	6.0	-	0	0%	100%	0%	good	few	few	saline
Villares	97%	3%	0%	recent deposits & limestone	X	X	X	9	66	3.0	6.0	0.7	0	0%	100%	0%	good	few	few	saline
Zumarraga	5%	65%	30%	weathered sedimentary rocks	X	X	X	-	-	-	-	-	0	20%	0%	80%	poor	nch	nch	mining

Legend: Geol. Age: Q=Quaternary, Neo=Neogene, Paleo=Paleogene, C=Cretaceous
 Well Information: SWL=static water level, Sp.Cap.=specific capacity, L-III=well operated for L-III service
 Groundwater Information: SW=shallow well area, DW=deep well area, Diff=difficult area, FF=free flowing well

Table 7.6.3 Proportion of Gravel Packed and Natural Gravel Packed Wells

Municipality/City (only potential area)	Proposed Well Depth	Proportion (%) of Level-I Deep Wells	
		Gravel Packed	Natural Gravel Packed
Basey	80 m	90%	10%
Calbayog City	80 m	90%	10%
Gandara	80 m	80%	20%
San Jorge	80 m	80%	20%
San Sebastian	80 m	90%	10%

Examination on the effective grain sizes and uniformity coefficient by sieve analysis at the influential aquifers (composed of coarse sand and/or fine gravel) should be conducted during the implementation period. Such analysis and actual well construction results are very helpful to apply natural gravel packed method in future planning.

In the Samar Central Highlands area, it is reported by DPWH/DEO that numerous deep wells present high Fe contents (PNSDW; $Fe \leq 1.0$ ppm). Groundwater with high Fe and acid pH values seems to be present in this Samar Central Highlands based on examination results in this province and Eastern Samar. Ionic water pumped from deep wells is caused by groundwater itself, well materials eluded in acid water or combination of groundwater and well materials. There are four cases on water quality problem in terms of Fe and pH values as shown below.

- (1) Iron concentration is less than the PNSDW (1 ppm) and the pH value of groundwater indicates neutral or alkaline. There is a low possibility of iron contamination through the future.
- (2) Although iron concentration is within the PNSDW, groundwater quality shows an acid pH value. There is a possibility of iron contamination from steel materials.
- (3) Iron concentration exceeds the PNSDW and groundwater shows neutral or alkaline. There is iron contamination caused by groundwater itself.
- (4) Iron concentration exceeds the PNSDW and groundwater shows acid pH side. There is a possibility of iron contamination caused by groundwater and/or well materials.

Where groundwater has high Fe content, the Iron Removal Facility shall be additionally installed. Where the parameter of groundwater indicates an acid pH side, the well materials shall be designed to use anti-corrosive materials, such as anti-metallic (polyvinyl chloride; PVC) or anti-corrosive metal (stainless steel; SUS) materials.

Generally, shallower well presents water quality with alkalinity parameter. This is because the shallow wells are usually constructed in alluvial plain or fan deposits. The well casing materials of the said anti-corrosive shall be used for deep wells. The development of deep wells using anti-corrosive materials in the province is experimentally assumed referring to the limited information such as results of water quality examination, geology, etc., as shown in Table 7.6.4.

Table 7.6.4 Proportion of Wells to be Constructed by Different Materials

Municipality/City (only potential area)	Proposed Well Depth	Proportion (%) of Level-I Deep Wells	
		GI Casing Pipes	PVC Casing Pipes
Calbayog City	80 m	80%	20%
Catbalogan	80 m	80%	20%
Gandara	80 m	70%	30%
Pagsanghan	80 m	80%	20%
Matunguinao	120 m	50%	50%
Santa Margarita	80 m	80%	20%
San Jorge	80 m	70%	30%
Tarangnan	80 m	80%	20%

Water quality examination on Fe and pH parameters should be conducted during the implementation period. Such groundwater quality analysis is very helpful to design well materials in future planning.

(2) Spring

Untapped spring sources identified are shown in Table 7.6.5. These data were collected and tabulated using the questionnaire sheet-untapped spring information format, Data Report. Data also include barangay name, owner, discharge, transmission pipeline length and relative elevation.

Table 7.6.5 Untapped Spring Sources Identified

Location		Untapped Spring			
Municipality	Barangay	Owner	Discharge (lps)	T.L.L.* (km)	Relative Elevation (m)
Basey	Balante	Public	0.2	0.8	NA
	Baloog	Public	0.1	0.9	NA
	Basiao	Public	0.1	1.8	NA
	Bulao	Public	0.2	2.2	NA
	Guirang	Public	0.1	2.1	NA
	Salvacion	Public	0.6	1.8	NA
Santa Rita	Caticugan	Public	0.3	0.1	NA
	Pagsulhogon	Public	0.3	1.7	NA
	San Eduardo	Public	0.3	0.3	NA
	San Juan	Public	0.3	0.8	NA
	Tagacay	Public	0.3	14.0	NA
	Union	Public	0.3	0.5	NA
Tagapulan	Baguiw	Public	0.6	0.4	NA
	Balocawe	Public	0.6	0.4	NA
	Luna	Public	0.5	0.1	NA

Note: T.L.L. - Transmission line length

NA - Data not available

7.7 Water Source Development for Medium-Term Development Plan

7.7.1 Detailed Groundwater Investigation Required

(1) Water Quality Examination

Water quality problem areas are distributed in most of the northern part of the province. Such water quality problem depends on the type of water source (e.g., water from well, spring or river).

For deep well source, high Fe content is the most serious problem. The causes of high Fe content are that: (a) the raw groundwater is ironic; or (b) Fe is released from well materials made of steel due to low pH value (acid water). The countermeasures are considered in this report, such as construction of the iron removal facility for high Fe content groundwater and well construction using anti-corrosive materials for acid groundwater.

Generally, spring source is potable. However, there are mining sites in the mountain area where spring eyes exist. The wastewater discharged during mining operation might have affected in the watershed/recharge areas of spring sources.

River water quality on acid pH values was studied in Calbayog City in 1991. The groundwater in this area shows acidity. Regarding surface water, there are few water quality examination reports or records. Three (3) Water Districts, out of the four in this province utilize surface water for their water supply. Water quality examination was only conducted during the feasibility study by the LWUA.

Water quality examination was conducted by the PSPT through PW4SP preparation. Supplementing the results, the following additional examination shall be conducted.

Level-I Deep Well

- Sampling Site; Samar Central Lowlands Area
- Examination Parameters; to include Fe, Mn, pH, Color and Turbidity, etc.

Developed and Undeveloped Spring

- Sampling Site; Samar Central Highlands Area
- Examination Parameters; to include Fe, Mn, pH, SO₄, Hg, Cu, etc.

River Water

- Sampling Site; Northern Lowlands Area
- Examination Parameters; to include Fe, Mn, pH, Color and Turbidity, etc.

7.7.2 Spacing Allocation for Level II and III Wells

The pumping rates required for Level I facilities are fairly lower than that for Level II and III systems. The well interference in Level I facilities need not to be studied in terms of spacing of wells and production rate, since most formations in shallow and deep well areas generally have enough groundwater development potential. As Level II and III wells are usually expected to produce larger discharge to meet the water demand, the spacing of wells to avoid well interference has to be considered. Spacing allocation for Level II and III wells was examined considering specific capacity, pumping rate, and assumed drawdown of 1cm at the interference radius for a pumping duration of 16 hours.

(1) Specific Capacity

According to the existing well source information, specific capacity was considered with ranges from 0.5 lpsm to 6.5 lpsm. To simplify the calculation, an average value in each range is adopted in the calculation of interference radius.

(2) Pumping Rate

The pumping rate was estimated by assuming a drawdown of 10m with the average value of specific capacity and pump operation of 16 hours/day. The formula used to determine proper well spacing is the Jacob modified equation. Drawdown at the interference boundary is assumed at 1cm after a pumping duration of 16 hours.

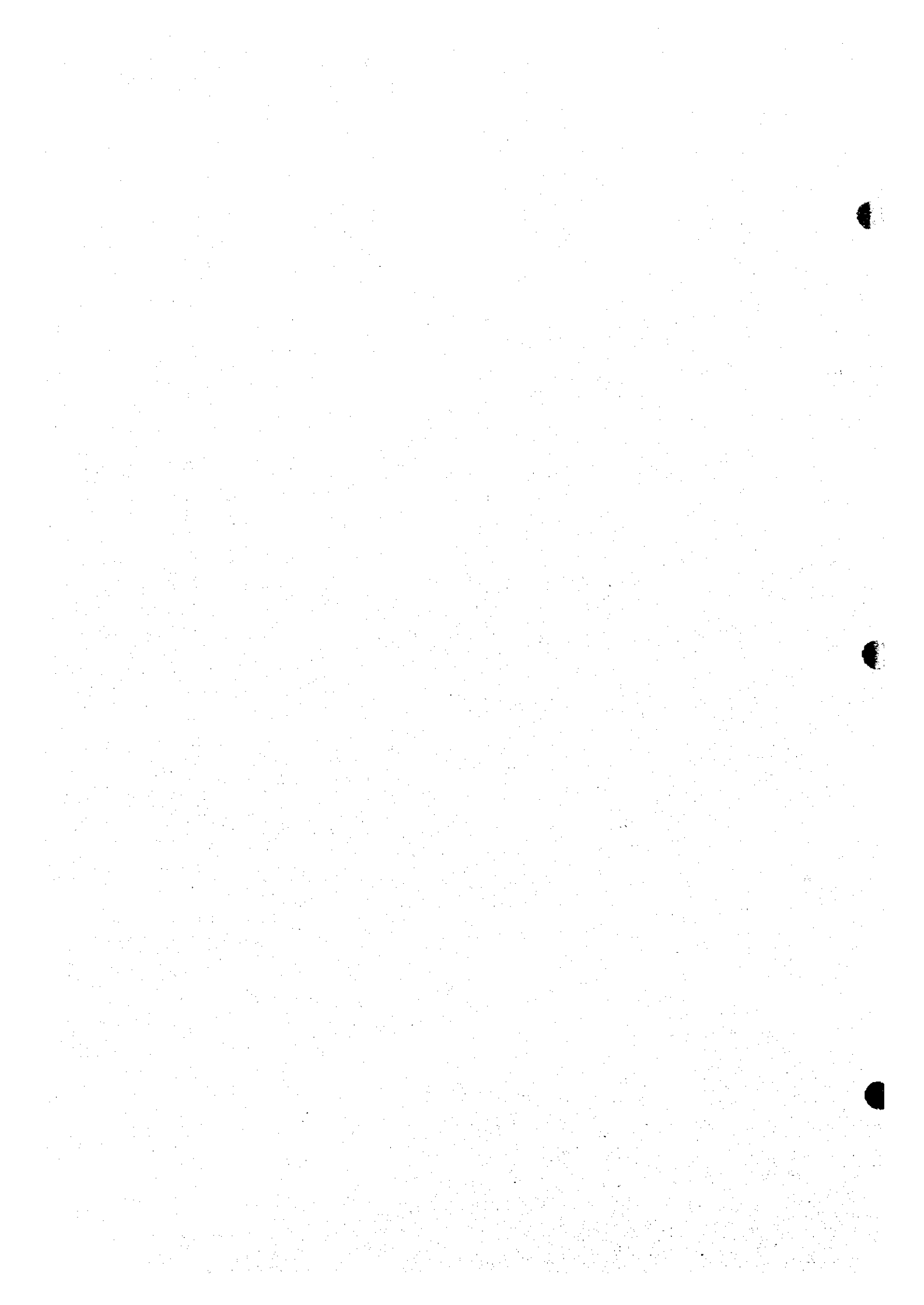
Table 7.7.1 presents the estimated spacing requirements and number of wells to be constructed within a well field of one km². The spacing interval between adjacent wells to avoid well interference is planned to be more than twice the distances of the calculated interference radius.

Table 7.7.1 Spacing Arrangements for Planned Wells

Range of Specific Capacity (lpsm)	Estimated Pumping Rate (m ³ /day)	Estimated Interference Radius (m)	Estimated Number of Wells/km ²
0.5 - 1.5	500	80	45
1.5 - 3.0	1,000	120	20
3.0 - 4.5	2,000	160	11
4.5 - 6.0	2,500	200	7
> 6.0	>2,500	>200	>7

**FUTURE REQUIREMENTS
AND DEVELOPMENT PLAN**

B



8. FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT

8.2 Targets of Provincial Sector Plan

Table B.2.1 Estimation of Base Year Service Coverage of Water Supply

Name of Municipality/City	Area	Population (1998)	Population Served by 1998 Facilities				Population Served by Planned On-going Projects				Population Served In the Base Year (1998)				
			Level III	Level II	Level I	Total	Level III	Level II	Level I	Total	Level III	Level II	Level I	Total	Percentage Coverage
Ahnagro	Urban	321		222		222							222		69
	Rural	10,503		1,908	6,366	8,274							1,908	6,366	79
	Total	10,824		2,130	6,366	8,496							2,130	6,366	78
Bacay	Urban	11,078	3,937	589	3,350	7,896							3,937	589	71
	Rural	29,356	6,267	1,083	8,337	16,187							6,267	1,083	55
	Total	40,434	10,204	1,672	11,687	24,083							10,204	1,672	60
Calbayog City	Urban	73,851	39,338	1,729	18,417	59,504							39,338	1,729	81
	Rural	59,891	12,588	7,944	22,047	42,579							12,588	7,944	71
	Total	133,742	51,946	9,673	40,464	102,083							51,946	9,673	76
Calbiga	Urban	3,930	3,567			3,567							3,567		91
	Rural	14,452	5,384		4,799	10,183							5,384	4,799	70
	Total	18,382	8,951		4,799	13,750							8,951	4,799	75
Carbalogan (Capital)	Urban	55,487	32,979	365	14,834	48,178							32,979	365	87
	Rural	22,753	2,588	1,033	7,442	11,063							2,588	1,033	49
	Total	78,240	35,567	1,398	22,276	59,241							35,567	1,398	76
Daram	Urban	11,066		1,434	5,359	6,793							1,434	5,359	61
	Rural	23,469		2,443	14,394	16,839							2,443	14,394	72
	Total	34,535		3,879	19,753	23,632							3,879	19,753	68
Gandara	Urban	5,303		210	3,076	3,286								210	62
	Rural	23,133			13,371	13,371								13,371	58
	Total	28,436		210	16,447	16,657								16,447	59
Hinabangan	Urban	5,216		4,799		4,799							4,799		92
	Rural	7,013			4,408	4,408								4,408	63
	Total	12,231		4,799	4,408	9,207							4,799	4,408	75
Ibong	Urban	3,944	3,634			3,634							3,634		92
	Rural	12,435		1,526	4,829	6,355								1,526	51
	Total	16,379	3,634	1,526	4,829	9,989						3,634	1,526	4,829	61
Marabut	Urban	1,309		171	585	756								171	58
	Rural	8,984		1,482	2,991	4,473								1,482	50
	Total	10,293		1,653	3,576	5,229								1,653	51
Matuguiniao	Urban	2,431		610	1,411	2,021								610	83
	Rural	3,228			955	955								955	30
	Total	5,659		610	2,366	2,976								610	53
Moriong	Urban	4,766		1,404	2,329	3,733								1,404	78
	Rural	8,759			4,981	4,981								4,981	57
	Total	13,525		1,404	7,310	8,714								1,404	64
Pagsanghan	Urban	1,124			648	648								648	58
	Rural	6,652			3,981	3,981								3,981	60
	Total	7,776			4,629	4,629								4,629	60
Paranas (Wright)	Urban	8,887	2,540	1,282	2,001	5,823							2,540	1,282	66
	Rural	15,850	370	2,116	5,702	8,188							370	2,116	52
	Total	24,737	2,910	3,398	7,703	14,011							2,910	3,398	57
Pinabacdao	Urban	1,154			742	742								742	64
	Rural	10,838			7,503	7,503								7,503	69
	Total	11,992			8,245	8,245								8,245	69
San Jorge	Urban	2,271		422		422								422	19
	Rural	10,264		1,145	6,106	7,251								1,145	71
	Total	12,532		1,567	6,106	7,673								1,567	61
San Jose De Buan	Urban	2,130		479	1,133	1,614								479	76
	Rural	3,731			509	509								509	14
	Total	5,861		479	1,644	2,123								479	36
San Sebastian	Urban	1,947			419	419								419	22
	Rural	4,646			2,589	2,589								2,589	56
	Total	6,593			3,008	3,008								3,008	46
Santa Margarita	Urban	13,467			11,019	11,019								11,019	82
	Rural	6,413			1,374	1,374								1,374	21
	Total	19,880			12,393	12,393								12,393	62
Santa Rita	Urban	11,417		920	6,899	7,819								920	68
	Rural	18,733		667	10,646	11,313								667	60
	Total	30,150		1,587	17,545	19,132								1,587	63
Santo Niño	Urban	2,728		332	477	809								332	30
	Rural	10,366		917	4,411	5,328								917	51
	Total	13,094		1,249	4,888	6,137								1,249	47
Tagapul-an	Urban	1,493			789	789								789	53
	Rural	6,845		587	4,119	4,706								587	69
	Total	8,338		587	4,908	5,495								587	66
Tatalora	Urban	2,165		75	1,226	1,301								75	60
	Rural	4,548		351	3,474	3,825								351	84
	Total	6,713		426	4,700	5,126								426	76
Tarangnan	Urban	3,258			1,621	1,621								1,621	50
	Rural	16,481		458	10,043	10,501								458	64
	Total	19,739		458	11,664	12,122								458	61
Willareal	Urban	3,436		160	1,076	1,236								160	35
	Rural	19,141		238	3,167	3,405								238	18
	Total	22,577		398	4,243	4,641								398	21
Zumarraga	Urban	1,265			953	953								953	75
	Rural	13,627			10,736	10,736								10,736	79
	Total	14,892			11,709	11,709								11,709	79
Provincial Total	Urban	235,444	90,834	10,404	78,366	179,604							90,834	10,404	76
	Rural	372,149	27,697	23,999	169,300	229,897							27,697	23,999	59
	Total	607,594	118,531	34,404	247,666	409,501							118,531	34,404	66

Table 8.2.2 Population Coverage in Phase I Provided by Served Population in the Base Year (Water Supply)

Name of Municipality/City	Area	Population Served by 1993 Facilities				1998		2004	
		Level III	Level II	Level I	Total	Total Population	Coverage (%)	Total Population	Coverage (%)
Abnagro	Urban		222		222	321	69	321	69
	Rural		1,908	6,366	8,274	10,503	79	11,661	71
	Total		2,130	6,366	8,496	10,824	78	11,982	71
Basey	Urban	3,952	589	3,350	7,891	11,078	71	11,961	66
	Rural	6,767	1,083	8,337	16,187	29,356	55	29,142	56
	Total	10,724	1,672	11,687	24,083	40,434	60	41,103	59
Calbayog City	Urban	39,358	1,729	18,417	59,504	73,851	81	119,709	50
	Rural	12,588	7,944	22,047	42,579	59,891	71	23,500	100
	Total	51,946	9,673	40,464	102,083	133,742	76	143,209	71
Calbiga	Urban	3,567			3,567	3,930	91	4,722	75
	Rural	5,384		4,799	10,183	14,452	70	14,263	71
	Total	8,951		4,799	13,750	18,382	75	19,035	72
Cathalogan (Capital)	Urban	31,979	365	14,834	48,178	55,487	87	59,495	81
	Rural	2,588	1,033	7,442	11,063	22,753	49	22,753	49
	Total	35,567	1,398	22,276	59,241	78,240	76	82,248	72
Daram	Urban		1,434	5,359	6,793	11,066	61	12,718	53
	Rural		2,445	14,394	16,839	23,469	72	23,469	72
	Total		3,879	19,753	23,632	34,535	68	36,187	65
Gandara	Urban		210	3,076	3,286	5,303	62	7,121	46
	Rural			13,371	13,371	23,135	58	23,773	56
	Total		210	16,447	16,657	28,438	59	30,896	54
Hinabangan	Urban	4,799			4,799	5,216	92	6,100	79
	Rural			4,408	4,408	7,015	63	6,299	70
	Total	4,799		4,408	9,207	12,231	75	12,399	74
Jiabong	Urban	3,634			3,634	3,944	92	4,647	78
	Rural		1,526	4,829	6,355	12,435	51	13,603	47
	Total	3,634	1,526	4,829	9,989	16,379	61	18,250	55
Marabut	Urban		171	585	756	1,309	58	1,309	58
	Rural		1,492	2,991	4,473	8,984	50	8,855	51
	Total		1,663	3,576	5,229	10,293	51	10,164	51
Matuguiniao	Urban		610	1,411	2,021	2,431	83	3,380	60
	Rural			955	955	3,228	30	3,228	30
	Total		610	2,366	2,976	5,659	53	6,608	45
Motiong	Urban		1,404	2,329	3,733	4,766	78	5,493	68
	Rural			4,981	4,981	8,759	57	8,759	57
	Total		1,404	7,310	8,714	13,525	64	14,252	61
Pagsaghan	Urban			648	648	1,124	58	1,715	38
	Rural			3,981	3,981	6,652	60	6,953	57
	Total			4,629	4,629	7,776	60	8,668	53
Paranas (Wright)	Urban	2,540	1,282	2,001	5,823	8,887	66	12,728	46
	Rural	370	2,116	5,702	8,188	15,850	52	13,059	63
	Total	2,910	3,398	7,703	14,011	24,737	57	25,787	54
Pinabacdao	Urban			742	742	1,154	64	1,210	61
	Rural			7,503	7,503	10,838	69	11,623	65
	Total			8,245	8,245	11,992	69	12,833	64
San Jorge	Urban		422		422	2,271	19	3,520	12
	Rural	1,145	6,106	7,251	10,261	10,261	71	10,261	71
	Total	1,567	6,106	7,673	12,532	12,532	61	13,781	56
San Jose De Buan	Urban		479	1,135	1,614	2,130	76	2,741	59
	Rural		509	509	509	3,751	14	3,999	13
	Total		479	1,644	2,123	5,881	36	6,740	31
San Sebastian	Urban		419	419	419	1,947	22	2,410	17
	Rural		2,589	2,589	2,589	4,646	56	4,627	56
	Total		3,008	3,008	3,008	6,593	46	7,037	43
Santa Margarita	Urban			11,019	11,019	13,467	82	16,868	65
	Rural			1,374	1,374	6,421	21	4,573	30
	Total			12,393	12,393	19,888	62	21,441	58
Santa Rita	Urban		920	6,899	7,819	11,417	68	17,200	45
	Rural		667	10,646	11,313	18,733	60	15,502	73
	Total		1,587	17,545	19,132	30,150	63	32,702	59
Santo Niño	Urban		332	477	809	2,728	30	3,087	26
	Rural		917	4,411	5,328	10,366	51	10,704	50
	Total		1,249	4,888	6,137	13,094	47	13,791	45
Tagapul-An	Urban		789		789	1,493	53	2,307	34
	Rural		587	4,119	4,706	6,845	69	6,845	69
	Total		587	4,908	5,495	8,338	66	9,152	60
Talafora	Urban		75	1,226	1,301	2,165	60	2,230	58
	Rural		351	3,474	3,825	4,548	84	4,793	80
	Total		426	4,700	5,126	6,713	76	7,023	73
Tarangnan	Urban			1,621	1,621	3,258	50	3,702	44
	Rural		458	10,043	10,501	16,481	64	18,020	58
	Total		458	11,664	12,122	19,739	61	21,722	56
Villareal	Urban		160	1,076	1,236	3,436	36	3,543	35
	Rural		238	3,167	3,405	19,141	18	19,424	18
	Total		398	4,243	4,641	22,577	21	22,967	20
Zumanaga	Urban			953	953	1,265	75	1,296	74
	Rural			10,756	10,756	13,627	79	14,405	75
	Total			11,709	11,709	14,892	79	15,701	75
Provincial Total	Urban	90,834	10,404	78,366	179,604	235,444	76	311,583	58
	Rural	27,697	23,900	169,300	220,897	372,140	59	334,095	59
	Total	118,531	34,304	247,666	400,501	607,584	66	645,678	62

Table 8.2.3 Number of Households Served by Sanitary Toilets in the Base Year (1998)

Name of Municipality/City	Area	Population (1998)	Number of Households (1998)	Households Using Sanitary Toilets in 1998				Recipient HHs of Planned/Ongoing Projects				Households Using Sanitary Toilets in the Base Year (1998)									
				Flush Toilets	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total	Coverage (%)					
																Pour	VIP/Dry	Total	Flush	VIP/Dry	Total
Almagro	Urban	321	65	25	2	27								2	27	38	3	42			
	Rural	10,503	2,092	439	209	648								439	209	648	21	31			
	Total	10,824	2,157	464	211	675								464	211	675	22	10	31		
Basy	Urban	11,078	2,261	90	791	68	949							90	791	68	949	4	42		
	Rural	29,356	6,233	1,309	623	1,932								1,309	623	1,932	21	10	31		
	Total	40,434	8,494	2,100	691	2,881								2,100	691	2,881	1	25	8	34	
Caltbayog City	Urban	71,831	14,313	572	5,009	429	6,010							572	5,009	429	6,010	4	35	42	
	Rural	59,891	12,173	2,556	1,217	3,773								2,556	1,217	3,773	21	10	31		
	Total	133,742	26,485	7,565	1,646	9,783								7,565	1,646	9,783	2	29	6	37	
Calbiga	Urban	3,910	763	31	267	23	321							31	267	23	321	4	35	42	
	Rural	14,452	2,961	622	296	918								622	296	918	21	10	31		
	Total	18,382	3,724	889	319	1,239								889	319	1,239	1	24	9	33	
Catalagan (Capital)	Urban	55,487	10,609	424	3,713	318	4,455							424	3,713	318	4,455	4	35	42	
	Rural	22,753	4,609	926	441	1,367								926	441	1,367	21	10	31		
	Total	78,240	15,018	424	4,639	759	5,822							424	4,639	759	5,822	3	31	5	39
Duram	Urban	11,066	1,969	768	11	59	827							768	11	59	827	39	3	42	
	Rural	23,469	5,462	937	446	1,383								937	446	1,383	21	10	31		
	Total	34,535	6,431	1,705	505	2,210								1,705	505	2,210	27	8	34		
Gandara	Urban	5,303	1,012	395	30	425								395	30	425	39	3	42		
	Rural	23,153	4,674	982	467	1,449								982	467	1,449	21	10	31		
	Total	28,456	5,686	1,377	497	1,874								1,377	497	1,874	24	9	33		
Hinabangan	Urban	5,216	931	37	326	28	391							37	326	28	391	4	35	42	
	Rural	7,015	1,257	264	126	390								264	126	390	21	10	31		
	Total	12,231	2,188	590	154	781								590	154	781	2	27	7	36	
Jibong	Urban	12,435	2,320	487	232	719								487	232	719	4	35	42		
	Rural	16,379	3,019	87	732	253	1,013							87	732	253	1,013	1	24	8	34
	Total	28,814	5,339	574	964	972	1,732							574	964	972	21	10	31		
Marabut	Urban	1,309	268	105	8	113								105	8	113	39	3	42		
	Rural	2,431	1,762	370	176	546								370	176	546	21	10	31		
	Total	3,740	2,030	475	184	659								475	184	659	23	9	32		
Mataguinao	Urban	10,293	2,030	171	13	184								171	13	184	21	10	31		
	Rural	3,228	594	125	59	184								125	59	184	29	7	36		
	Total	13,521	2,624	296	72	368								296	72	368	29	7	36		
Motienq	Urban	4,766	885	344	26	370								344	26	370	39	3	42		
	Rural	8,759	1,681	353	168	521								353	168	521	21	10	31		
	Total	13,525	2,566	697	194	891								697	194	891	27	8	35		
Pausanghan	Urban	6,652	1,396	38	7	95								38	7	95	39	3	42		
	Rural	7,776	1,421	251	120	371								251	120	371	21	10	31		
	Total	14,428	2,817	359	127	466								359	127	466	24	9	33		
Paranaq (Wright)	Urban	8,887	1,726	69	604	52	725							69	604	52	725	4	35	42	
	Rural	15,850	3,090	643	306	949								643	306	949	21	10	31		
	Total	24,737	4,786	1,243	358	1,674								1,243	358	1,674	1	26	7	35	

Table 8.2.3 Number of Households Served by Sanitary Toilets in the Base Year (1998)

Name of Municipality/City	Area	Population (1998)	Number of Households (1998)	Households Using Sanitary Toilets in 1998				Recipient HHs of Planned/On-going Projects				Households Using Sanitary Toilets in the Base Year (1998)							
				Flush Toilets	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total	Coverage (%)			
																Pour Flush	VIP/Dry	Total	
Pinabacdao	Urban	1,154	215	84	6	90								84	6	90	39	3	47
	Rural	10,838	2,121	445	212	657								445	212	657	21	10	31
	Total	11,992	2,336	529	218	747								529	218	747	23	9	32
San Jorge	Urban	2,271	404	158	12	170								158	12	170	39	3	42
	Rural	10,261	2,060	433	206	639								433	206	639	21	10	31
	Total	12,532	2,464	591	218	809								591	218	809	24	9	33
San Jose De Buan	Urban	2,130	445	174	13	187								174	13	187	39	3	42
	Rural	3,751	800	168	80	248								168	80	248	21	10	31
	Total	5,881	1,245	342	93	435								342	93	435	27	7	35
San Sebastian	Urban	1,947	362	141	11	152								141	11	152	39	3	42
	Rural	4,646	927	195	93	288								195	93	288	21	10	31
	Total	6,593	1,289	336	104	440								336	104	440	26	8	34
Santa Margarita	Urban	13,467	2,777	1,083	83	1,166								1,083	83	1,166	39	3	42
	Rural	6,421	1,269	266	127	393								266	127	393	21	10	31
	Total	19,888	4,046	1,349	210	1,559								1,349	210	1,559	33	5	39
Santa Rita	Urban	11,417	2,297	806	69	865								806	69	865	39	3	42
	Rural	18,733	3,645	765	365	1,130								765	365	1,130	21	10	31
	Total	30,150	5,942	1,661	434	2,095								1,661	434	2,095	28	7	35
Santo Nito	Urban	2,728	576	225	17	242								225	17	242	39	3	42
	Rural	10,366	2,094	440	209	649								440	209	649	21	10	31
	Total	13,094	2,670	665	226	891								665	226	891	25	8	33
Tagapul-An	Urban	1,493	345	135	10	145								135	10	145	39	3	42
	Rural	6,845	1,342	282	134	416								282	134	416	21	10	31
	Total	8,338	1,687	417	144	561								417	144	561	25	9	33
Talaora	Urban	2,165	433	169	13	182								169	13	182	39	3	42
	Rural	4,548	844	177	84	261								177	84	261	21	10	31
	Total	6,713	1,277	346	97	443								346	97	443	27	8	35
Tarangnan	Urban	3,238	643	251	19	270								251	19	270	39	3	42
	Rural	16,481	3,236	680	324	1,004								680	324	1,004	21	10	31
	Total	19,719	3,881	931	543	1,274								931	543	1,274	24	9	33
Villareal	Urban	3,436	643	251	19	270								251	19	270	39	3	42
	Rural	19,141	3,625	761	363	1,124								761	363	1,124	21	10	31
	Total	22,577	4,268	1,012	382	1,394								1,012	382	1,394	24	9	33
Zumarraga	Urban	1,265	235	92	7	99								92	7	99	39	3	42
	Rural	13,627	2,532	536	255	791								536	255	791	21	10	31
	Total	14,892	2,767	628	262	890								628	262	890	23	9	32
Provincial Total	Urban	235,444	45,536	12,511	1,363	19,124								12,511	1,363	19,124	36	3	42
	Rural	372,140	73,391	15,412	7,338	22,750								15,412	7,338	22,750	21	10	31
	Total	607,584	118,927	27,923	8,701	41,874								27,923	8,701	41,874	27	7	35

Table 8.2.4 Number of Public School Student Served by School Toilets in Base Year (1998)

Name of Municipality/City	1998 Total Number of Public School Student	Standard No. of Student that can be Served by 1998	No. of Student to be Served by Planned/On-going Projects	Standard No. of Students that can be Served by Toilets in Base Year (1998)	Coverage (%)
Almagro	2,110	1,360		1,360	64
Basey	9,582	3,600		3,600	38
Calbayog City	29,438	1,640		1,640	6
Calbiga	4,459	3,280		3,280	74
Catbalogan (Capital)	19,431	7,880		7,880	41
Daram	7,081	4,560		4,560	64
Gandara	5,698	3,840		3,840	67
Hinabangan	3,080	1,520		1,520	49
Jiabong	3,005	2,240		2,240	75
Marabut	2,710	1,040		1,040	38
Mataguinao	736	560		560	76
Motiong	3,211	2,560		2,560	80
Pagsanghan	1,670	960		960	57
Paranas (Wright)	6,812	3,600		3,600	53
Pinabacdao	2,896	1,840		1,840	64
San Jorge	2,183	1,200		1,200	55
San Jose De Buan	918	918		918	100
San Sebastian	1,496	720		720	48
Santa Margarita	3,738	2,760		2,760	74
Santa Rita	5,670	3,600		3,600	63
Santo Niño	2,850	1,200		1,200	42
Tagapul-An	1,806	1,120		1,120	62
Talalora	1,684	800		800	48
Tarangnan	4,137	3,040		3,040	73
Villareal	5,954	2,640		2,640	44
Zumarraga	2,792	1,760		1,760	63
Provincial Total	135,147	60,238		60,238	45

Table 8.2.5 Number of Public Utilities with Sanitary Toilets in the Base Year (1998)

Name of Municipality/City	Type	No. of PU with Toilets in 1998	No. of PU with Sanitary Toilets in 1998	No. of PU with Sanitary Toilets in Planned/Ongoing Projects	No. of PU with Toilets in Base Year 1998	No. of PU with Sanitary Toilets in Base year 1998	Coverage (%)
Almagro	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Bacay	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Calbayog City	Public Market	1	1		1	1	100
	Bus/Jeepney Terminal	8	8		8	8	100
	Parks/Playground	3	3		3	3	100
	Total	12	12		12	12	100
Calbiga	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Catbalogan (Capital)	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground	1	1		1	1	100
	Total	1	1		1	1	100
Daram	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Gandara	Public Market	1	1		1	1	100
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total	1	1		1	1	100
Hinabangan	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Jiabong	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Marabut	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Mataguinao	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Motiong	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Pagsanghan	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Paranas (Wright)	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						

Table 8.2.5 Number of Public Utilities with Sanitary Toilets in the Base Year (1998) (Cont'd.)

Name of Municipality/City	Type	No. of PU with Toilets in 1998	No. of PU with Sanitary Toilets in 1998	No. of PU with Sanitary Toilets in Planned/Ongoing Projects	No. of PU with Toilets in Base Year 1998	No. of PU with Sanitary Toilets in Base year 1998	Coverage (%)
Pinabacdao	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
San Jorge	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
San Jose De Buan	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
San Sebastian	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Santa Margarita	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Santa Rita	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Santo Nido	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Tagaput-An	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Tatalora	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Tarangnan	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Villareal	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Zumarraga	Public Market						
	Bus/Jeepney Terminal						
	Parks/Playground						
	Total						
Provincial Total	Public Market	2	2		2	2	100
	Bus/Jeepney Terminal	8	8		8	8	100
	Parks/Playground	4	4		4	4	100
	Total	14	14		14	14	100

Table 8.2.6 Households Coverage in Phase I Provided by Existing Facilities in the Base Year (Household Toilets)

Name of Municipality/City	Area	No. of Household Served by Existing Facilities						Coverage in 1998						Coverage in 2004					
		Flush		VIP/Dry		Total	No. of HHs	Percentage of Served Households		Served Population		No. of HHs	Percentage of Served Households		Served Population				
		Pour Flush	VIP/Dry	Total	Flush	VIP/Dry		Total	Number	%	Flush		VIP/Dry	Total	Number	%			
Almagro	Urban		25	2	27	65	38	3	42	135	42	65	38	3	42	147	42		
	Rural		439	209	648	2,092	21	10	31	100	31	2,323	19	9	28	3,574	28		
	Total		464	211	675	2,157	22	10	31	235	31	2,388	19	9	28	3,721	28		
Basse	Urban	90	791	68	949	2,261	4	35	42	4,653	42	2,441	4	32	39	4,759	39		
	Rural		1,309	623	1,932	6,233	21	10	31	3,434	31	6,187	21	10	31	9,178	31		
	Total	90	2,100	691	2,881	8,494	1	25	8	8,087	34	8,628	1	24	8	13,917	33		
Calbayog City	Urban	572	5,009	429	6,010	14,312	4	35	42	31,017	42	23,199	2	22	26	33,141	26		
	Rural		2,556	1,217	3,773	12,173	21	10	31	22,894	31	4,776	2	22	26	19,767	26		
	Total	572	7,565	1,646	9,783	26,485	2	29	37	53,911	37	27,975	2	27	35	52,908	35		
Calbiga	Urban	31	267	23	321	763	4	35	42	1,651	42	927	3	29	35	1,726	35		
	Rural		622	296	918	2,961	21	10	31	1,218	31	2,923	21	10	31	4,570	31		
	Total	31	889	319	1,239	3,724	1	24	9	2,869	33	3,850	1	23	8	6,296	32		
Catbalogan (Capital)	Urban	424	3,713	318	4,455	10,609	4	35	42	23,305	42	11,376	4	33	39	24,311	39		
	Rural		926	441	1,367	4,409	21	10	31	17,201	31	4,409	21	10	31	7,590	31		
	Total	424	4,639	759	5,822	15,018	3	31	39	40,506	39	15,785	3	29	37	31,701	37		
Daram	Urban		768	59	827	1,969	39	3	42	4,648	42	2,263	34	3	37	4,916	37		
	Rural		937	446	1,383	4,462	21	10	31	3,430	31	4,462	21	10	31	7,601	31		
	Total		1,705	505	2,210	6,431	27	8	34	8,078	34	6,725	25	8	33	12,517	33		
Gandara	Urban		395	30	425	1,012	39	3	42	2,227	42	1,359	29	2	31	2,380	31		
	Rural		982	467	1,449	4,674	21	10	31	1,644	31	4,803	20	10	30	7,689	30		
	Total		1,377	497	1,874	5,686	24	9	33	3,871	33	6,162	22	8	30	10,069	30		
Hinabangan	Urban	37	326	28	391	931	4	35	42	2,191	42	1,089	3	30	36	2,225	36		
	Rural		264	126	390	1,257	21	10	31	1,617	31	1,129	23	11	35	2,234	35		
	Total	37	590	154	781	2,188	2	27	7	3,808	36	2,218	2	27	7	4,459	35		
Jiabong	Urban	28	245	21	294	699	4	35	42	1,656	42	824	3	30	36	1,841	36		
	Rural		487	232	719	2,320	21	10	31	1,223	31	2,538	19	9	28	4,192	28		
	Total	28	732	253	1,013	3,019	1	24	8	2,879	34	3,362	1	22	8	6,033	30		

Table 8.2.6 Households Coverage in Phase I Provided by Existing Facilities in the Base Year (Household Toilets) (Cont'd.)

Name of Municipality/City	Area	No. of Household Served by Existing Facilities						Coverage in 1998										Coverage in 2004														
		Flush			VIP/Dry			Total	No. of HHs	Percentage of Served Households			Served Population			No. of HHs	Percentage of Served Households			Served Population												
		Flush	VIP/Dry	Total	Flush	VIP/Dry	Total			Flush	VIP/Dry	Total	Number	%	Number		%	Flush	VIP/Dry	Total	Number	%										
Marabut	Urban	105	8	113	268	3	42	550	42	268	39	3	42	550	42	268	39	3	42	550	42	268	39	3	42	550	42	268				
	Rural	370	176	546	1,762	21	10	31	406	31	1,736	21	10	31	406	31	1,736	21	10	31	406	31	1,736	21	10	31	406	31	1,736			
	Total	475	184	659	2,030	23	9	32	956	32	2,004	24	9	33	956	32	2,004	24	9	33	956	32	2,004	24	9	33	956	32	2,004			
Matuguinao	Urban	171	13	184	438	39	3	42	1,021	42	609	28	2	30	1,157	30	609	28	2	30	1,157	30	609	28	2	30	1,157	30	609			
	Rural	125	59	184	594	21	10	31	754	31	594	21	10	31	754	31	594	21	10	31	754	31	594	21	10	31	754	31	594			
	Total	296	72	368	1,032	29	7	36	1,775	36	1,203	25	6	31	2,298	31	1,203	25	6	31	2,298	31	1,203	25	6	31	2,298	31	1,203			
Motiong	Urban	344	26	370	883	39	3	42	2,002	42	1,017	34	3	36	2,076	36	1,017	34	3	36	2,076	36	1,017	34	3	36	2,076	36	1,017			
	Rural	353	168	521	1,681	21	10	31	1,477	31	1,681	21	10	31	1,477	31	1,681	21	10	31	1,477	31	1,681	21	10	31	1,477	31	1,681			
	Total	697	194	891	2,564	27	8	35	3,479	35	2,698	26	7	33	4,927	33	2,698	26	7	33	4,927	33	2,698	26	7	33	4,927	33	2,698			
Pagsanghan	Urban	88	7	95	225	39	3	42	472	42	343	26	2	28	529	28	343	26	2	28	529	28	343	26	2	28	529	28	343			
	Rural	251	120	371	1,196	21	10	31	348	31	1,251	20	10	30	2,296	30	1,251	20	10	30	2,296	30	1,251	20	10	30	2,296	30	1,251			
	Total	339	127	466	1,421	24	9	33	820	33	1,594	21	8	29	2,825	29	1,594	21	8	29	2,825	29	1,594	21	8	29	2,825	29	1,594			
Paranas (Wright)	Urban	69	604	673	1,726	4	35	3	3,733	42	2,471	3	24	2	29	3,838	29	2,471	3	24	2	29	3,838	29	2,471	3	24	2	29	3,838	29	2,471
	Rural	643	306	949	3,060	21	10	31	2,755	31	2,521	26	12	38	5,160	38	2,521	26	12	38	5,160	38	2,521	26	12	38	5,160	38	2,521			
	Total	69	1,247	1,316	4,786	26	7	33	6,488	35	4,992	1	25	7	34	8,998	34	4,992	1	25	7	34	8,998	34	4,992	1	25	7	34	8,998	34	4,992
Pinabacdao	Urban	84	6	90	215	39	3	42	485	42	225	37	3	40	515	40	225	37	3	40	515	40	225	37	3	40	515	40	225			
	Rural	445	212	657	2,121	21	10	31	358	31	2,275	20	9	29	3,587	29	2,275	20	9	29	3,587	29	2,275	20	9	29	3,587	29	2,275			
	Total	529	218	747	2,336	23	9	32	843	32	2,500	21	9	30	4,102	30	2,500	21	9	30	4,102	30	2,500	21	9	30	4,102	30	2,500			
San Jorge	Urban	158	12	170	404	39	3	42	954	42	626	25	2	27	1,035	27	626	25	2	27	1,035	27	626	25	2	27	1,035	27	626			
	Rural	433	206	639	2,060	21	10	31	704	31	2,060	21	10	31	3,463	31	2,060	21	10	31	3,463	31	2,060	21	10	31	3,463	31	2,060			
	Total	591	218	809	2,464	24	9	33	1,658	33	2,686	22	8	30	4,498	30	2,686	22	8	30	4,498	30	2,686	22	8	30	4,498	30	2,686			
San Jose De Buan	Urban	174	13	187	445	39	3	42	895	42	572	30	2	33	1,017	33	572	30	2	33	1,017	33	572	30	2	33	1,017	33	572			
	Rural	168	80	248	800	21	10	31	660	31	853	20	9	29	1,304	29	853	20	9	29	1,304	29	853	20	9	29	1,304	29	853			
	Total	342	93	435	1,245	27	7	35	1,555	35	1,425	24	7	31	2,321	31	1,425	24	7	31	2,321	31	1,425	24	7	31	2,321	31	1,425			
San Sebastian	Urban	141	11	152	362	39	3	42	818	42	448	31	2	34	870	34	448	31	2	34	870	34	448	31	2	34	870	34	448			
	Rural	195	93	288	927	21	10	31	604	31	924	21	10	31	1,523	31	924	21	10	31	1,523	31	924	21	10	31	1,523	31	924			
	Total	336	104	440	1,289	26	8	34	1,422	34	1,372	24	8	32	2,393	32	1,372	24	8	32	2,393	32	1,372	24	8	32	2,393	32	1,372			

Table 8.2.6 Households Coverage in Phase I Provided by Existing Facilities in the Base Year (Household Toilets) (Cont'd.)

Name of Municipality/City	No. of Household Served by Existing Facilities					Coverage in 1998										Coverage in 2004									
	Area	Flush	VIP/Dry	Total	No. of HHs	Percentage of Served Households			Served Population			No. of HHs	Percentage of Served Households			Served Population									
						Flush	VIP/Dry	Total	Flush	VIP/Dry	Total		Number	%	Flush	VIP/Dry	Total	Number	%						
Santa Margarita	Urban	1,083	83	1,166	2,777	39	3	42	5,656	42	3,478	31	2	34	6,142	34									
	Rural	266	127	393	1,269	21	10	31	4,175	31	904	29	14	43	2,106	43									
	Total	1,349	210	1,559	4,046	33	5	39	9,831	39	4,382	31	5	36	8,248	36									
Santa Rita	Urban	896	69	965	2,297	39	3	42	4,795	42	3,461	26	2	28	5,184	28									
	Rural	765	365	1,130	3,645	21	10	31	3,539	31	3,016	25	12	37	6,175	37									
	Total	1,661	434	2,095	5,942	28	7	35	8,334	35	6,477	26	7	32	11,359	32									
Santo Niño	Urban	225	17	242	576	39	3	42	1,146	42	651	35	3	37	1,199	37									
	Rural	440	209	649	2,094	21	10	31	846	31	2,162	20	10	30	3,270	30									
	Total	665	226	891	2,670	25	8	33	1,992	33	2,813	24	8	32	4,569	32									
Tagapul-An	Urban	135	10	145	345	39	3	42	627	42	533	25	2	27	677	27									
	Rural	282	134	416	1,342	21	10	31	463	31	1,342	21	10	31	2,307	31									
	Total	417	144	561	1,687	25	9	33	1,090	33	1,875	22	8	30	2,984	30									
Talaora	Urban	169	13	182	433	39	3	42	909	42	446	38	3	41	954	41									
	Rural	177	84	261	844	21	10	31	671	31	889	20	9	29	1,450	29									
	Total	346	97	443	1,277	27	8	35	1,580	35	1,335	26	7	33	2,404	33									
Tarangnan	Urban	251	19	270	643	39	3	42	1,368	42	730	34	3	37	1,492	37									
	Rural	680	324	1,004	3,238	21	10	31	1,010	31	3,540	19	9	28	5,497	28									
	Total	931	343	1,274	3,881	24	9	33	2,378	33	4,270	22	8	30	6,989	30									
Villareal	Urban	251	19	270	643	39	3	42	1,443	42	663	38	3	41	1,477	41									
	Rural	761	363	1,124	3,625	21	10	31	1,065	31	3,679	21	10	31	6,122	31									
	Total	1,012	382	1,394	4,268	24	9	33	2,508	33	4,342	23	9	32	7,599	32									
Zamarraga	Urban	92	7	99	235	39	3	42	531	42	240	38	3	41	558	41									
	Rural	536	255	791	2,552	21	10	31	392	31	2,698	20	9	29	4,388	29									
	Total	628	262	890	2,787	23	9	32	923	32	2,938	21	9	30	4,946	30									
Provincial Total	Urban	1,251	16,510	1,363	19,124	45,536	3	36	3	42	98,888	42	2	27	104,696	32									
	Rural	15,412	7,338	22,750	73,391	21	10	31	72,988	31	65,675	23	11	35	121,641	35									
	Total	1,251	31,922	41,874	118,927	1	27	7	171,876	35	125,999	1	25	33	226,337	33									

Table 8.2.7 Public School Students and Public Utilities Coverage in Phase I by Existing Facilities in the Base Year

Name of Municipality/City	Public School Toilets						Public Toilets					
	Coverage in 1998			Coverage in 2004			Coverage in 1998			Coverage in 2004		
	Std. No. of Student that can be Served by Base Year	Total No. of Public School Students	%	Total No. of Public School Student	%	No. of PU with Toilets in Base Year	No. of PU with Sanitary Toilets in Base Year	%	No. of PU with Toilets	No. of PU with Sanitary Toilets in Base Year	%	
Almagro	1,360	2,110	64	2,552	53				2			
Basey	3,600	9,582	38	10,377	35				5	12	240	
Calbayog City	1,640	29,438	6	33,415	5	12		100	3			
Calbiga	3,280	4,459	74	4,993	66				6	1	17	
Catbalogan (Capital)	7,880	19,431	41	20,620	38	1		100	1	1	100	
Daram	4,560	7,081	64	7,883	58	1		100	2			
Gandara	3,840	5,698	67	6,830	56				2			
Hinabangan	1,520	3,080	49	3,370	45				2			
Jiabong	2,240	3,005	75	3,762	60				1			
Marabut	1,040	2,710	38	2,742	38				1			
Matuguinao	560	736	76	944	59				1			
Motiong	2,560	3,211	80	3,672	70				1			
Pagsanghan	960	1,670	57	2,028	47				2			
Paranas (Wright)	3,600	6,812	53	7,054	51				1			
Pinabacdao	1,840	2,896	64	3,266	56				2			
San Jorge	1,200	2,183	55	2,531	47				1			
San Jose De Buan	918	918	100	1,291	71				2			
San Sebastian	720	1,496	48	1,683	43				2			
Santa Margarita	2,760	3,738	74	4,333	64				1			
Santa Rita	3,600	5,670	63	6,921	52							
Santo Niño	1,200	2,850	42	3,213	37							
Tagapul-An	1,120	1,806	62	2,196	51				1			
Talalora	800	1,684	48	1,842	43				1			
Tarangnan	3,040	4,137	73	5,109	60				1			
Villareal	2,640	5,954	44	6,138	43							
Zumarraga	1,760	2,792	63	3,266	54							
Provincial Total	60,238	135,147	45	152,031	40	14	14	100	39	14	36	

8.3 Projection of Frame Values

8.3.1 Review of Past Population Development and Population Projection

Since the NSO has not yet prepared/issued future population of the provinces, the provincial population for the years 1998 (planning base year), 2004 (medium-term target year) and 2010 (long-term target year) were projected. Available information for the study at present is as follows:

- NSO population census results from 1903 to 1995 (conducted 10 times)
- 1995 Census-based National and Regional Population Projection prepared by the NSO
- 1995 Census-based Regional and Provincial Population Projection prepared by the NEDA Regional Office-VIII
- Provincial Physical Framework Plan/Comprehensive Provincial Land Use Plan (1993-2002) prepared by the Provincial Office (hereafter referred to as "the Land Use Plan")

(1) Comparison of regional population projected by NSO and NEDA

The NSO conducted the national population projections for the period 1995-2040 and the regional 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.

In the regional population projection of Region VIII (Eastern Visayas), the subject region composed of the 3rd batch provinces of this study is classified as medium-sized region (projected population of at least 5 million but less than 10 million by year 2020).

On the other hand, the NEDA Regional Office-VIII projected the regional population together with the provincial population for year 2006 based on the 1995 census result.

Table 8.3.1 shows the comparison between the two agencies' projection on the regional population for the years 2000, 2005 and 2010. In the past development, the annual growth rate between 1990 and 1995 drastically increased compared with that of the previous census period. The NSO considered the latest development for its projection. Thus, the growth rates with 5-year interval, 1995, 2005 and 2010 are assumed at 2.21%, 2.00% and 1.82%, respectively.

The NEDA Regional Office also projected the population for year 2006 based on 1995 census result. In this study, the annual growth rate between the two years was calculated at 1.00% using the compounded formula for the purpose of comparison with NSO

projection. Thus, the population in a 5-year interval from year 1995 was estimated as shown below applying 1.00% as annual growth rate. Comparing with the projected population by NSO, the NBDA projection is rather conservative in consideration of the past trend between 1948 and 1995 as shown in Table 8.3.1 and Figure 8.3.1.

Year	Population	Source/Growth Rate
1995	3,366,917	Census result
2000	3,538,664	Estimated/ 1.00% (1995 - 2006)
2005	3,719,171	Estimated/ 1.00% (1995 - 2006)
2006	3,756,193	NEDA projection/ 1.00% (1995 - 2006)

Table 8.3.1 Comparison of Regional Population Projection by the NSO and NEDA

Year		1980	1990	1995	2000	2005	2010
Census	Population	2,799,534	3,054,490	3,366,917			
	Growth Rate		0.88%	1.97%			
NSO Projection	Population			3,356,854	3,743,895	4,132,242	4,523,762
	Growth Rate				2.21%	2.00%	1.82%
NEDA Projection	Population			3,366,917	3,538,664	3,719,171	
	Growth Rate				1.00%	1.00%	

Notes: The 1995 population as of July 1995 was used as a basis for NSO population projection.
The NEDA population in 2000 and 2005 were estimated in the study.

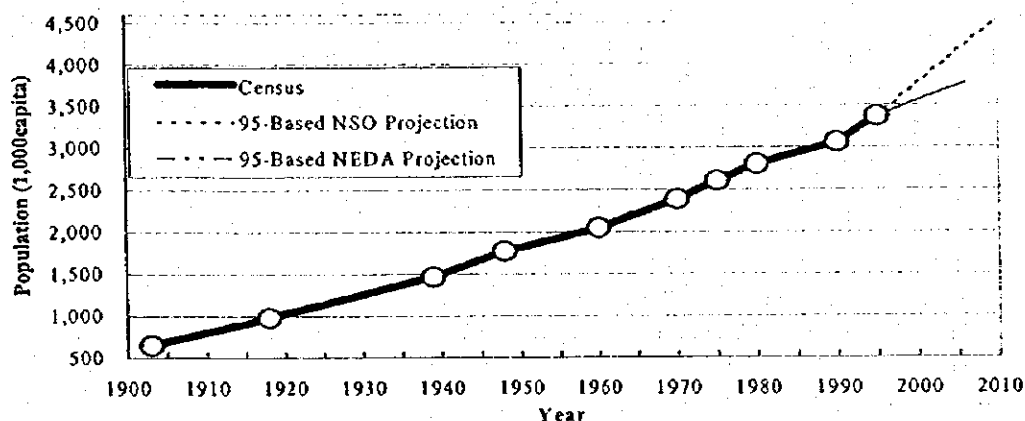


Figure 8.3.1 Past (Census) and Projected Population (prepared by NSO and NEDA) of Region-VIII

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

The provincial and municipal population for the year 2002 was projected with 1990 as base year. The population growth rates by municipality experienced between 1980 and 1990 were basically adopted for the projection. The provincial growth rate was 0.63%

between 1980 and 1990. While, the experienced and projected growth rates of Region VIII are 0.88 % between 1980 and 1990 and 0.95 % between 1990 and 2002.

The population projection on the provincial total and component municipalities was made with 1990 as base year. 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).

Table 8.3.2 shows the past population developments in census years (1980-1995) and the projections for the years 1995 and 2002 with 1990 as base year applying assumed growth rates for the period 1990 to 2002 in the said comprehensive Provincial Land Use Plan.

Table 8.3.2 Census Population and Projected Population in Land Use Plan

Municipality/ City	Census Population					Land Use Plan		
	1980	1990	GrowthRate (1980-1990)	1995	Growth Rate (1990-1995)	1995*	2002	Growth Rate (1990-2002)
Almagro	10,097	8,578	-1.62%	10,270	3.67%	7,905	7,051	-1.62%
Basey	36,760	39,137	0.63%	40,114	0.49%	40,385	42,200	0.63%
Calbayog City	106,71	115,39	0.78%	129,21	2.29%	119,961	126,666	0.78%
Calbiga	14,201	17,116	1.88%	18,070	1.09%	18,796	21,428	1.89%
Catbalogan	58,737	70,470	1.84%	76,324	1.61%	77,196	87,705	1.84%
Daram	30,821	31,332	0.16%	33,745	1.49%	31,584	31,939	0.16%
Gandara	24,764	23,673	-0.45%	27,263	2.86%	23,145	22,426	-0.45%
Hinabangan	10,786	11,906	0.99%	12,151	0.41%	12,507	13,400	0.99%
Jiabong	11,055	12,751	1.44%	15,484	3.96%	13,696	15,138	1.44%
Marabut	13,288	10,543	-2.29%	10,355	-0.36%	9,390	7,984	-2.29%
Matuguinao	5,020	3,819	-2.70%	5,205	6.39%	3,331	2,750	-2.70%
Motiong	10,035	12,115	1.90%	13,177	1.69%	13,311	15,185	1.90%
Pagsanghan	6,512	6,047	-0.74%	7,350	3.98%	5,826	5,531	-0.74%
Paranas (Wright)	21,556	22,702	0.52%	24,235	1.32%	23,298	24,160	0.52%
Pinabacdao	9,389	10,361	0.99%	11,590	2.27%	10,884	11,661	0.99%
San Jorge	9,123	10,111	1.03%	11,935	3.37%	10,643	11,434	1.03%
San Jose De Buan	5,455	4,217	-2.54%	5,471	5.34%	3,708	3,097	-2.54%
San Sebastian	4,606	5,732	2.21%	6,381	2.17%	6,394	7,451	2.21%
Santa Margarita	16,922	16,878	-0.03%	19,146	2.55%	16,853	16,817	-0.03%
Santa Rita	21,640	25,202	1.54%	28,930	2.80%	27,203	30,275	1.54%
Santo Niño	11,132	11,743	0.54%	12,761	1.68%	12,064	12,527	0.54%
Tagapul-An	7,605	6,760	-1.17%	7,949	3.29%	6,374	5,870	-1.17%
Talalora	6,332	6,112	-0.35%	6,565	1.44%	6,006	5,860	-0.35%
Tarangnan	15,558	15,894	0.21%	18,791	3.41%	16,062	16,299	0.21%
Villareal	20,505	21,820	0.62%	22,390	0.52%	22,505	23,500	0.62%
Zumaraga	12,821	13,324	0.39%	14,505	1.71%	13,586	13,961	0.39%
Province	501439	533,73	0.63%	589,37	2.00%	552,611	582,315	0.73%
Region	2,799,5	3,055,1	0.88%	3,366,9	1.97%	3,203,85	3,424,22	0.95%

Note: * Population in 1995 was estimated using growth rate employed in Land Use Plan

Comparing the census and the projected population in 1995, the provincial population of the census is about 7% higher than projected. Regarding the municipal census population in 1995, nineteen (19) out of 26 municipalities were higher with a range of 4

to 56% comparing with the projected ones, while the remaining seven (7) municipalities were lower within a range of -4%.

In addition to this, the province is presently updating its Land Use Plan using the NEDA projection based on 1995 census population. Thus, the future projection shall be made using the 1995 census results as the base year.

(3) Population Projection of the Province

The following conditions are considered in the population projection.

Regional Population

For the regional population in the study, the projection conducted by NEDA Regional Office may be adopted assuming that a rather conservative population growth will be realized comparing with that of the NSO projection.

- 1) The regional population projected by the NEDA for the year 2006 is referred to for the short and medium-term periods. The annual growth rate of 1.00% between 1995 and 2006 will be adopted for the projection in 1998 and 2004 using compounded formula with 1995 as the base year.
- 2) For the long-term projection, it is assumed that the annual growth rates will decrease gradually as adopted in the NSO projection. The annual growth rates adopted in the NSO projection decline from 2.00% (2000 - 2005) to 1.82% (2005 - 2010), which indicate that the relative reduction rate is 0.09%. In this study, the same reduction rate may be used to the NEDA projected growth rate of 1.00% (2000 - 2005). Thus, the population in year 2010 is estimated at 3,891,501 applying the growth rate of 0.91% from year 2005. The growth rates adopted in the study correspond to half of those figures employed by NSO.

<u>Year</u>	<u>Population</u>	<u>Growth Rate</u>
1995	3,366,917	Census result
1998	3,468,938	1.00% (1995 - 1998)
2004	3,682,348	1.00% (1995 - 2004)
2005	3,719,171	1.00% (1995 - 2005)
2010	3,891,501	0.91% (2005 - 2010)

Provincial Population

In the NEDA projection, the regional population to be increased from 1995 to 2006 was distributed to each province in proportion to the share of the provincial population increase to the regional population experienced between 1990 and 1995. In this study, it is assumed that the tendency of the population growth by province will not drastically change. Thus, the same manner as adopted by the NEDA projection was employed both for short/medium-term and long-term periods in the population distribution from the regional population to those for concerned provinces. The distribution of the regional population to be increased to the provincial population was made between the respective base/target years. Table 8.3.3 shows the projected population in years 1998, 2004 and 2010 together with NEDA the projection.

Table 8.3.3 Projected Population of the Province

Province	NEDA Projection				Projected Population		
	Population		Population Increase		1998	2004	2010
	1995	2006	Number	Share			
Biliran	132,209	149,921	17,712	4.55%	136,851	146,561	156,977
Eastern Samar	362,324	403,509	41,185	10.58%	373,118	395,697	417,825
Leyte	1,511,251	1,689,501	178,250	45.79%	1,557,966	1,655,686	1,751,458
Northern Samar	454,195	542,288	88,093	22.63%	477,282	525,577	572,908
Samar	589,373	658,859	69,486	17.85%	607,584	645,678	683,012
Southern Leyte	317,565	312,115	-5,450	-1.40%	316,137	313,149	310,221
Region	3,366,917	3,756,193	389,276	100.00%	3,468,938	3,682,348	3,891,501

Municipal Population

- 1) The total population of the province in 1998, 2004 and 2010 was fixed.
- 2) For the population projection by municipality, the same method employed in NEDA projection for the distribution of regional population to provincial population was applied. The provincial population to be increased in respective planning years was distributed to each municipality in proportion to the share of the population increase of each municipality to the provincial total experienced between 1990 and 1995. Table 8.3.4 presents the census results (1990 and 1995) and the projected population of the municipalities.

Table 8.3.4 Census Results and Projected Population of Municipalities

Municipality/ City	Census Result				Projected Population					
	1990	1995	Pop. Growth	Share to Provincial Pop. Growth	1998		2004		2010	
					Population	GR	Population	GR	Population	GR
Almagro	8,578	10,270	1,692	3.0%	10,824	1.77%	11,982	1.71%	13,117	1.52%
Basey	39,137	40,114	977	1.8%	40,434	0.27%	41,103	0.27%	41,759	0.26%
Calbayog City	115,39	129,21	13,826	24.8%	133,742	1.15%	143,209	1.15%	152,487	1.05%
Calbiga	17,116	18,070	954	1.7%	18,382	0.57%	19,035	0.58%	19,675	0.55%
Catbalogan	70,470	76,324	5,854	10.5%	78,240	0.83%	82,248	0.84%	86,176	0.78%
Daram	31,332	33,745	2,413	4.3%	34,535	0.77%	36,187	0.78%	37,806	0.73%
Gandara	23,673	27,263	3,590	6.5%	28,438	1.42%	30,896	1.39%	33,305	1.26%
Hinabangan	11,906	12,151	245	0.4%	12,231	0.22%	12,399	0.23%	12,563	0.22%
Jabong	12,751	15,484	2,733	4.9%	16,379	1.89%	18,250	1.82%	20,084	1.61%
Marabut	10,543	10,355	-188	-0.3%	10,293	-	10,164	-0.21%	10,038	-
Matuguinao	3,819	5,205	1,386	2.5%	5,595	2.83%	6,608	2.62%	7,538	2.22%
Motiong	12,115	13,177	1,062	1.9%	13,525	0.87%	14,252	0.88%	14,965	0.82%
Pagsanghan	6,047	7,350	1,303	2.3%	7,776	1.90%	8,668	1.83%	9,542	1.61%
Paranas	22,702	24,235	1,533	2.8%	24,737	0.69%	25,787	0.70%	26,816	0.65%
Pinabacdao	10,361	11,590	1,229	2.2%	11,992	1.14%	12,833	1.14%	13,658	1.04%
San Jorge	10,111	11,935	1,824	3.3%	12,532	1.64%	13,781	1.60%	15,005	1.43%
San Jose De Buan	4,217	5,471	1,254	2.3%	5,881	2.44%	6,740	2.30%	7,581	1.98%
San Sebastian	5,732	6,381	649	1.2%	6,593	1.10%	7,037	1.09%	7,472	1.00%
Santa Margarita	16,878	19,146	2,268	4.1%	19,888	1.28%	21,441	1.26%	22,963	1.15%
Santa Rita	25,202	28,930	3,728	6.7%	30,150	1.39%	32,702	1.36%	35,203	1.24%
Santo Niño	11,743	12,761	1,018	1.8%	13,094	0.86%	13,791	0.87%	14,474	0.81%
Tagapul-An	6,760	7,949	1,189	2.1%	8,338	1.61%	9,152	1.56%	9,950	1.40%
Talalora	6,112	6,565	453	0.8%	6,713	0.75%	7,023	0.76%	7,327	0.71%
Tarangnan	15,894	18,791	2,897	5.2%	19,739	1.65%	21,722	1.61%	23,666	1.44%
Villareal	21,820	22,390	570	1.0%	22,577	0.28%	22,967	0.29%	23,349	0.28%
Zumarraga	13,324	14,505	1,181	2.1%	14,892	0.88%	15,701	0.89%	16,493	0.82%
Province	533,73	589,37	55,640	100.0%	607,584	1.02%	645,678	1.02%	683,012	0.94

Note: Growth rates in 1998, 2004 and 2010 were calculated using compounded formula.

Population by Urban and Rural Area

1) Past population development

Table 8.3.5 shows the urban and rural population with growth rates in census years (1980-1995) by municipality. With regard to the ratio of the urban population of the province to the total population, the provincial averages in 1980 and 1990 were 14.6% and 25.5%, likewise it increased to 35.1% in 1995. The provincial growth rate of 6.43% between 1980 and 1990 increased to 8.73% in 1995. While, the growth rates of the rural population by municipality have kept on the same level: -0.74% (1980 - 1990) and -0.77% (1990 - 1995) as the provincial average.

2) Projection of urban and rural population for the years 1998, 2004 and 2010

The urban population by municipality for the target years was first projected and rural population was calculated to meet the aforementioned total population by fixing the urban population. In the projection of municipal urban population, the following are assumed by short/medium-term and long-term period.

Table 8.3.5 Past Population Development by Urban and Rural Area

Municipality/City	1980			1990				1995				
	Total	Urban/Rural	Share (%)	Total	Urban/Rural	G.R. (%)	Share (%)	Total	Urban/Rural	G.R. (%)	Share (%)	
Urban Area												
Almagro	10,097	0	0.0%	8,578	387	-	4.5%	10,270	321	-3.67%	3.1%	
Bacay	36,760	7,005	19.1%	39,137	10,001	3.62%	25.6%	40,114	10,661	1.29%	26.6%	
Calbayog City	106,71	14,081	13.2%	115,39	38,785	10.66%	33.6%	129,21	58,006	8.38%	44.9%	
Calbiga	14,201	2,196	15.5%	17,116	2,363	0.74%	13.8%	18,070	3,567	8.58%	19.7%	
Carbalogan	58,737	23,739	40.4%	70,470	31,104	2.74%	44.1%	76,324	53,571	11.49%	70.2%	
Daram	30,821	2,065	6.7%	31,332	5,126	9.52%	16.4%	33,745	10,276	14.92%	30.5%	
Gandara	24,764	2,190	8.8%	23,673	2,108	-0.38%	8.9%	27,263	4,576	16.77%	16.8%	
Hinabangan	10,786	0	0.0%	11,906	4,233	-	35.6%	12,151	4,823	2.64%	39.7%	
Jiabong	11,055	0	0.0%	12,751	3,170	-	24.9%	15,484	3,634	2.77%	23.5%	
Marabut	13,288	1,342	10.1%	10,543	1,551	1.46%	14.7%	10,355	1,309	-3.34%	12.6%	
Matuguinao	5,020	0	0.0%	3,819	576	-	15.1%	5,205	1,977	27.97%	38.0%	
Motiong	10,035	0	0.0%	12,115	2,449	-	20.2%	13,177	4,418	12.52%	33.5%	
Pagsanghan	6,512	0	0.0%	6,047	640	-	10.6%	7,350	910	7.29%	12.4%	
Paranas	21,556	3,025	14.0%	22,702	4,042	2.94%	17.8%	24,235	7,426	12.94%	30.6%	
Pinabacdao	9,389	0	0.0%	10,361	1,083	-	10.5%	11,590	1,127	0.80%	9.7%	
San Jorge	9,123	0	0.0%	10,111	465	-	4.6%	11,935	1,674	29.20%	14.0%	
San Jose De Buan	5,455	0	0.0%	4,217	1,522	-	36.1%	5,471	1,878	4.29%	34.3%	
San Sebastian	4,606	1,502	32.6%	5,732	1,465	-0.25%	25.6%	6,381	1,750	3.62%	27.4%	
Santa Margarita	16,922	3,775	22.3%	16,878	9,974	10.20%	59.1%	19,146	12,033	3.82%	62.8%	
Santa Rita	21,640	3,339	15.4%	25,202	3,536	0.57%	14.0%	28,930	9,302	21.34%	32.2%	
Santo Niño	11,132	0	0.0%	11,743	2,314	-	19.7%	12,761	2,565	2.08%	20.1%	
Tagapul-An	7,605	0	0.0%	6,760	496	-	7.3%	7,949	1,104	17.35%	13.9%	
Talalora	6,332	2,212	34.9%	6,112	2,081	-0.61%	34.0%	6,565	2,133	0.49%	32.5%	
Tarangnan	15,558	2,220	14.3%	15,894	2,050	-0.79%	12.9%	18,791	3,056	8.31%	16.3%	
Villareal	20,505	2,820	13.8%	21,820	3,299	1.58%	15.1%	22,390	3,384	0.51%	15.1%	
Zumarraga	12,821	1,451	11.3%	13,324	1,225	-1.68%	9.2%	14,505	1,250	0.40%	8.6%	
Province	501,43	72,962	14.6%	533,73	136,045	6.43%	25.5%	589,37	206,731	8.73%	35.1%	
Rural Area												
Almagro	10,097	10,097	100.0%	8,578	8,191	-2.07%	95.5%	10,270	9,949	3.97%	96.9%	
Bacay	36,760	29,755	80.9%	39,137	29,136	-0.21%	74.4%	40,114	29,453	0.22%	73.4%	
Calbayog City	106,71	92,638	86.8%	115,39	76,605	-1.88%	66.4%	129,21	71,210	-1.45%	55.1%	
Calbiga	14,201	12,005	84.5%	17,116	14,753	2.08%	86.2%	18,070	14,503	-0.34%	80.3%	
Carbalogan	58,737	34,998	59.6%	70,470	39,366	1.18%	55.9%	76,324	22,753	-10.38%	29.8%	
Daram	30,821	28,756	93.3%	31,332	26,206	-0.92%	83.6%	33,745	23,469	-2.18%	69.5%	
Gandara	24,764	22,574	91.2%	23,673	21,565	-0.46%	91.1%	27,263	22,687	1.02%	83.2%	
Hinabangan	10,786	10,786	100.0%	11,906	7,673	-3.35%	64.4%	12,151	7,328	-0.92%	60.3%	
Jiabong	11,055	11,055	100.0%	12,751	9,581	-1.42%	75.1%	15,484	11,850	4.34%	76.5%	
Marabut	13,288	11,946	89.9%	10,543	8,992	-2.80%	85.3%	10,355	9,046	0.12%	87.4%	
Matuguinao	5,020	5,020	100.0%	3,819	3,243	-4.28%	84.9%	5,205	3,228	-0.09%	62.0%	
Motiong	10,035	10,035	100.0%	12,115	9,666	-0.37%	79.8%	13,177	8,759	-1.95%	66.5%	
Pagsanghan	6,512	6,512	100.0%	6,047	5,407	-1.84%	89.4%	7,350	6,440	3.56%	87.6%	
Paranas	21,556	18,531	86.0%	22,702	18,660	0.07%	82.2%	24,235	16,809	-2.07%	69.4%	
Pinabacdao	9,389	9,389	100.0%	10,361	9,278	-0.12%	89.5%	11,590	10,463	2.43%	90.3%	
San Jorge	9,123	9,123	100.0%	10,111	9,646	0.56%	95.4%	11,935	10,261	1.24%	86.0%	
San Jose De Buan	5,455	5,455	100.0%	4,217	2,695	-6.81%	63.9%	5,471	3,593	5.92%	65.7%	
San Sebastian	4,606	3,104	67.4%	5,732	4,267	3.23%	74.4%	6,381	4,631	1.65%	72.6%	
Santa Margarita	16,922	13,147	77.7%	16,878	6,904	-6.24%	40.9%	19,146	7,113	0.60%	37.2%	
Santa Rita	21,640	18,301	84.6%	25,202	21,666	1.70%	86.0%	28,930	19,628	-1.96%	67.8%	
Santo Niño	11,132	11,132	100.0%	11,743	9,429	-1.65%	80.3%	12,761	10,196	1.58%	79.9%	
Tagapul-An	7,605	7,605	100.0%	6,760	6,264	-1.92%	92.7%	7,949	6,845	1.79%	86.1%	
Talalora	6,332	4,120	65.1%	6,112	4,031	-0.22%	66.0%	6,565	4,432	1.91%	67.5%	
Tarangnan	15,558	13,338	85.7%	15,894	13,844	0.37%	87.1%	18,791	15,735	2.59%	83.7%	
Villareal	20,505	17,685	86.2%	21,820	18,521	0.46%	84.9%	22,390	19,006	0.52%	84.9%	
Zumarraga	12,821	11,370	88.7%	13,324	12,099	0.62%	90.8%	14,505	13,255	1.84%	91.4%	
Province	501,43	428,477	85.4%	533,73	397,688	-0.74%	74.5%	589,37	382,642	-0.77%	64.9%	

Note: G.R. - Growth Rate

- Short/Medium-term target: 1998 and 2004

Growth rates between 1990 and 1995 in terms of the profile of urban population to total population by municipality were basically adopted. Rural population was calculated to meet the total population by fixing the urban population. However, for the municipalities having drastic changes of growth rates between the two census periods (1990 - 1995 and 1980 - 1990), the average growth rates of urban the population between 1980 and 1995 were employed. These municipalities are Calbiga, Gandara, Paranas, Sta. Rita and Tarangnan.

In addition, some modifications were made as follows:

- Municipalities of Matuguinao, Motiong, San Jorge and Tagapul-an; There are no data available on 1980 urban population of these municipalities. Thus, the rural population in 1995 was fixed and the urban population was calculated to meet the total population.
- Catbalogan and Daram municipalities; Applying high growth rates (more than 10%) between 1990 and 1995, the rural population will become negative figures. Thus, the 1995 rural population was fixed and the urban population was calculated to meet the total population
- Municipalities of Almagro and Marabut; Urban population in 1995 was fixed for short/medium-term to avoid a negative growth of the urban population.

- Long-term target: 2010

For the long-term projection, the share of urban/rural population in 2004 may be applied for the municipal population in 2010, assuming that adopted share of urban/rural population in the medium-term period will not drastically change.

Under the above assumptions, the provincial average share of the urban population for the year 2010 was arrived at 48.3%, higher than the figures in 1995 (35.1%) and in 1990 (25.5%). Table 8.3.6 presents the projected urban and rural population. The growth rates and shares on rural population were calculated using the estimated urban population.

Table 8.3.6 Population Projection by Urban and Rural Area:1998, 2004 and 2010

Municipality/ City	1998				2004				2010			
	Total	Urban / Rural	G.R. (%)	Share (%)	Total	Urban / Rural	G.R. (%)	Share (%)	Total	Urban / Rural	G.R. (%)	Share (%)
Urban Area												
Almagro	10,824	321	0.00%	3.0%	11,982	321	0.00%	2.7%	13,117	351	1.50%	2.7%
Basey	40,434	11,078	1.29%	27.4%	41,103	11,961	1.29%	29.1%	41,759	12,152	0.26%	29.1%
Calbayog City	133,742	73,851	8.38%	55.2%	143,209	119,709	8.38%	83.6%	152,487	127,465	1.05%	83.6%
Calbiga	18,382	3,930	3.28%	21.4%	19,035	4,772	3.29%	25.1%	19,675	4,932	0.55%	25.1%
Catbalogan	78,240	55,487	1.18%	70.9%	82,248	59,495	1.17%	72.3%	86,176	62,336	0.78%	72.3%
Daram	34,335	11,066	2.50%	32.0%	36,187	12,718	2.35%	35.1%	37,806	13,287	0.73%	35.1%
Gandara	28,438	5,303	5.04%	18.6%	30,896	7,121	5.04%	23.0%	33,305	7,676	1.26%	23.0%
Hinabangan	12,231	5,216	2.65%	42.6%	12,399	6,100	2.64%	49.2%	12,563	6,181	0.22%	49.2%
Jiabong	16,379	3,944	2.77%	24.1%	18,250	4,647	2.77%	25.5%	20,084	5,114	1.61%	25.5%
Marabut	10,293	1,309	0.00%	12.7%	10,164	1,309	0.00%	12.9%	10,038	1,309	0.00%	13.0%
Matuguinao	5,659	2,431	7.13%	43.0%	6,608	3,380	5.65%	51.2%	7,538	3,856	2.22%	51.2%
Motiong	13,525	4,766	2.56%	35.2%	14,252	5,493	2.39%	38.5%	14,965	5,768	0.82%	38.5%
Pagsanghan	7,776	1,124	7.29%	14.5%	8,668	1,715	7.30%	19.8%	9,542	1,888	1.61%	19.8%
Paranas	24,737	8,887	6.17%	35.9%	25,787	12,728	6.17%	49.4%	26,816	13,236	0.65%	49.4%
Pinabacdao	11,992	1,154	0.79%	9.6%	12,833	1,210	0.79%	9.4%	13,658	1,288	1.05%	9.4%
San Jorge	12,532	2,271	10.70%	18.1%	13,781	3,520	7.58%	25.5%	15,005	3,833	1.43%	25.5%
San Jose de Buan	5,881	2,130	4.29%	36.2%	6,740	2,741	4.29%	40.7%	7,581	3,083	1.98%	40.7%
San Sebastian	6,593	1,947	3.62%	29.5%	7,037	2,410	3.62%	34.2%	7,472	2,559	1.00%	34.2%
Santa Margarita	19,888	13,467	3.82%	67.7%	21,441	16,868	3.82%	78.7%	22,963	18,065	1.15%	78.7%
Santa Rita	30,150	11,417	7.07%	37.9%	32,702	17,200	7.07%	52.6%	35,203	18,515	1.24%	52.6%
Santo Niño	13,094	2,728	2.07%	20.8%	13,791	3,087	2.08%	22.4%	14,474	3,240	0.81%	22.4%
Tagapul-an	8,338	1,493	10.59%	17.9%	9,152	2,307	7.52%	25.2%	9,950	2,508	1.40%	25.2%
Talalora	6,713	2,165	0.50%	32.3%	7,023	2,230	0.49%	31.8%	7,327	2,327	0.71%	31.8%
Tarangnan	19,739	3,258	2.16%	16.5%	21,722	3,702	2.15%	17.0%	23,666	4,033	1.44%	17.0%
Villareal	22,577	3,436	0.51%	15.2%	22,967	3,543	0.51%	15.4%	23,349	3,602	0.28%	15.4%
Zumarraga	14,892	1,265	0.40%	8.5%	15,701	1,296	0.40%	8.3%	16,493	1,361	0.82%	8.3%
Province	607,584	235,444	4.43%	38.8%	645,678	311,583	4.78%	48.3%	683,012	329,965	0.96%	48.3%
Rural Area												
Almagro	10,824	10,503	1.82%	97.0%	11,982	11,661	1.76%	97.3%	13,117	12,766	1.52%	97.3%
Basey	40,434	29,356	-0.11%	72.6%	41,103	29,142	-0.12%	70.9%	41,759	29,607	0.26%	70.9%
Calbayog City	133,742	59,891	-5.61%	44.8%	143,209	23,500	-14.44%	16.4%	152,487	25,022	1.05%	16.4%
Calbiga	18,382	14,452	-0.12%	78.6%	19,035	14,263	-0.22%	74.9%	19,675	14,743	0.55%	74.9%
Catbalogan	78,240	22,753	0.00%	29.1%	82,248	22,353	0.00%	27.7%	86,176	23,840	0.78%	27.7%
Daram	34,335	23,469	0.00%	68.0%	36,187	23,469	0.00%	64.9%	37,806	24,519	0.73%	64.9%
Gandara	28,438	23,135	0.65%	81.4%	30,896	23,775	0.46%	77.0%	33,305	25,629	1.26%	77.0%
Hinabangan	12,231	7,015	-1.44%	57.4%	12,399	6,299	-1.78%	50.8%	12,563	6,382	0.22%	50.8%
Jiabong	16,379	12,435	1.62%	75.9%	18,250	13,603	1.51%	74.5%	20,084	14,970	1.61%	74.5%
Marabut	10,293	8,984	-0.23%	87.3%	10,164	8,855	-0.24%	87.1%	10,038	8,729	-0.24%	87.0%
Matuguinao	5,659	3,228	0.00%	57.0%	6,608	3,228	0.00%	48.8%	7,538	3,682	2.22%	48.8%
Motiong	13,525	8,759	0.00%	64.8%	14,252	8,759	0.00%	61.5%	14,965	9,197	0.82%	61.5%
Pagsanghan	7,776	6,652	1.09%	85.5%	8,668	6,953	0.74%	80.2%	9,542	7,654	1.61%	80.2%
Paranas	24,737	15,850	-1.94%	64.1%	25,787	13,059	-3.18%	50.6%	26,816	13,580	0.65%	50.6%
Pinabacdao	11,992	10,833	1.18%	90.4%	12,833	11,623	1.17%	90.6%	13,658	12,370	1.04%	90.6%
San Jorge	12,532	10,261	0.00%	81.9%	13,781	10,261	0.00%	74.5%	15,005	11,172	1.43%	74.5%
San Jose de Buan	5,881	3,751	1.44%	63.8%	6,740	3,999	1.07%	59.3%	7,581	4,498	1.98%	59.3%
San Sebastian	6,593	4,646	0.11%	70.5%	7,037	4,627	-0.07%	65.8%	7,472	4,913	1.00%	65.8%
Santa Margarita	19,888	6,421	-3.35%	32.3%	21,441	4,573	-5.50%	21.3%	22,963	4,898	1.15%	21.3%
Santa Rita	30,150	18,733	-1.54%	62.1%	32,702	15,502	-3.11%	47.4%	35,203	16,688	1.24%	47.4%
Santo Niño	13,094	10,366	0.55%	79.2%	13,791	10,704	0.54%	77.6%	14,474	11,234	0.81%	77.6%
Tagapul-an	8,338	6,845	0.00%	82.1%	9,152	6,845	0.00%	74.8%	9,950	7,442	1.40%	74.8%
Talalora	6,713	4,548	0.86%	67.7%	7,023	4,793	0.88%	68.2%	7,327	5,000	0.71%	68.2%
Tarangnan	19,739	16,481	1.56%	83.5%	21,722	18,020	1.50%	83.0%	23,666	19,633	1.44%	83.0%
Villareal	22,577	19,141	0.24%	84.8%	22,967	19,424	0.24%	84.6%	23,349	19,747	0.28%	84.6%
Zumarraga	14,892	13,627	0.93%	91.5%	15,701	14,405	0.93%	91.7%	16,493	15,132	0.82%	91.7%
Province	607,584	372,140	-0.91%	61.2%	645,678	334,095	-1.78%	51.7%	683,012	353,047	0.92%	51.7%

Note: G.R. - Growth Rate

Table 8.3.7 Projected Number of Households by Urban and Rural Area by Municipality by Target Year

Name of Municipality/City	Household Size						Number of Households						
	1995			1998			2004			2010			
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	
Almagro	4.94	5.02	5.02	65	1,982	2,047	65	2,092	2,157	2,323	88	3,192	3,280
Basey	4.90	4.71	4.76	2,174	6,254	8,428	2,261	6,233	8,494	6,187	3,038	7,402	10,440
Calbayog City	5.16	4.92	5.03	11,238	14,475	25,713	14,312	12,173	26,485	29,199	31,866	62,556	38,122
Calbiga	5.15	4.88	4.93	692	2,972	3,664	763	2,961	3,724	2,923	1,233	3,686	4,919
Catbalogan (Capital)	5.23	5.16	5.21	10,243	4,411	14,654	10,609	4,409	15,018	11,376	4,409	15,584	21,544
Daram	5.62	5.26	5.36	1,829	4,465	6,294	1,969	4,462	6,431	2,263	4,462	6,725	9,452
Gandara	5.24	4.95	5.00	874	4,580	5,454	1,012	4,674	5,686	1,359	4,803	6,162	8,326
Hinabangan	5.60	5.58	5.59	861	1,313	2,174	931	1,257	2,188	1,089	1,129	2,218	3,141
Jiabong	5.64	5.36	5.43	644	2,209	2,853	699	2,320	3,019	824	2,538	3,362	5,022
Mambur	4.88	5.10	5.08	268	1,772	2,040	268	1,762	2,030	268	1,736	2,004	2,509
Matuguinao	5.55	5.43	5.47	356	595	951	438	594	1,032	609	594	964	1,885
Motong	5.40	5.21	5.27	818	1,681	2,499	883	1,681	2,564	1,017	1,681	2,698	3,741
Pagsanghan	5.00	5.56	5.49	182	1,158	1,340	225	1,196	1,421	343	1,251	1,594	2,386
Paranas (Wright)	5.15	5.18	5.17	1,442	3,247	4,689	1,726	3,060	4,786	2,471	2,521	4,992	6,704
Pinabacdao	5.37	5.11	5.14	210	2,046	2,256	215	2,121	2,336	225	2,275	2,500	3,415
San Jorge	5.62	4.98	5.06	298	2,062	2,360	404	2,060	2,464	626	2,060	2,686	3,751
San Jose De Buan	4.79	4.69	4.72	392	766	1,158	445	800	1,245	572	853	1,425	1,896
San Sebastian	5.38	5.01	5.10	325	925	1,250	362	927	1,289	448	924	1,372	1,868
Santa Margarita	4.85	5.06	4.92	2,482	1,407	3,889	2,777	1,269	4,046	3,478	904	4,382	5,741
Santa Rita	4.97	5.14	5.08	1,871	3,819	5,690	2,297	3,645	5,942	3,461	3,016	6,477	8,801
Santo Niño	4.74	4.95	4.91	541	2,060	2,601	576	2,094	2,670	651	2,162	2,813	3,619
Tagapul-An	4.33	5.10	4.97	255	1,343	1,598	345	1,342	1,687	533	1,342	1,875	2,488
Talalora	5.00	5.39	5.25	427	823	1,250	433	844	1,277	446	889	1,335	1,832
Tarigan	5.07	5.09	5.09	603	3,091	3,694	643	3,238	3,881	730	3,540	4,270	5,916
Villareal	5.34	5.28	5.29	634	3,598	4,232	643	3,625	4,268	663	3,679	4,342	5,838
Zumarraga	5.39	5.34	5.34	232	2,483	2,715	235	2,552	2,787	240	2,698	2,938	4,123
Provincial Total	5.17	5.07	5.10	39,956	75,537	115,493	45,536	73,391	118,927	60,324	65,675	125,999	170,759

8.3.2 School Enrollment Projection

Table 8.3.8 Projected School Enrollment by Municipality by Target Year

Name of Municipality/City	1998			2004			2010		
	Total Enrollment		Public Sch. Enrollment	Total Enrollment		Public Sch. Enrollment	Total Enrollment		Public Sch. Enrollment
	School Age Population	Number	Participation Rate	School Age Population	Number	Participation Rate	School Age Population	Number	Participation Rate
Almagro	2,712	2,110	78	3,002	2,552	85	3,286	2,957	90
Bacay	10,745	9,582	89	10,923	10,377	95	11,097	10,542	95
Calbayog City	34,674	32,285	93	37,128	35,272	95	39,533	37,556	95
Calbiga	5,076	4,459	88	5,256	4,993	95	5,433	5,161	95
Catbalogan (Capital)	21,092	19,713	93	22,172	21,063	95	23,231	22,069	95
Daram	10,031	7,081	71	10,511	7,883	75	10,981	8,785	80
Gandara	7,574	5,913	78	8,229	6,995	85	8,871	7,984	90
Hinabang	3,499	3,080	88	3,547	3,370	95	3,594	3,414	95
Jiabong	4,502	3,005	67	5,016	3,762	75	5,520	4,416	80
Marabut	2,923	2,710	93	2,886	2,742	95	2,850	2,708	95
Matuguinao	1,470	736	50	1,717	944	55	1,959	1,175	60
Monong	3,872	3,211	83	4,080	3,672	90	4,284	4,070	95
Pagsanghan	2,021	1,670	83	2,253	2,028	90	2,480	2,356	95
Paranas (Wright)	7,123	6,812	96	7,425	7,054	95	7,721	7,335	95
Pinabacdao	3,391	2,896	85	3,629	3,266	90	3,862	3,669	95
San Jorge	3,287	2,183	66	3,615	2,531	70	3,936	2,952	75
San Jose De Buan	1,733	918	53	1,986	1,291	65	2,234	1,452	65
San Sebastian	1,752	1,496	85	1,870	1,683	90	1,986	1,787	90
Santa Margarita	5,359	3,738	70	5,777	4,333	75	6,187	4,950	80
Santa Rita	8,508	5,670	67	9,228	6,921	75	9,934	7,947	80
Santo Niño	3,390	2,850	84	3,570	3,213	90	3,747	3,560	95
Tagapul-An	2,223	1,806	81	2,440	2,196	90	2,653	2,520	95
Talalora	1,853	1,684	91	1,939	1,842	95	2,023	1,922	95
Tamangan	5,462	4,137	76	6,011	5,109	85	6,549	5,894	90
Villareal	6,559	6,183	94	6,672	6,338	95	6,783	6,444	95
Zumarraga	4,077	3,102	76	4,298	3,438	80	4,515	3,838	85
Provincial Total	164,908	139,030	84	175,180	154,868	88	185,249	167,463	89

8.3.3 Projection of the Number of Public Utilities

Table 8.3.9 Projected Number of Public Utilities by Municipality by Target Year

Name of Municipality/City	Type	1998	2004		2010	
		No. of Public Utilities	Proposed Construction	Total	Proposed Construction	Total
Almagro	Public Market					
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total					
Basey	Public Market	1		1		1
	Bus/Jeepney Terminal	1		1		1
	Parks/Playground					
	Total	2		2		2
Calbayog City	Public Market	1		1		1
	Bus/Jeepney Terminal	1		1		1
	Parks/Playground	3		3		3
	Total	5		5		5
Calbiga	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground	2		2		2
	Total	3		3		3
Catbalogan (Capital)	Public Market	1		1		1
	Bus/Jeepney Terminal		1	1		1
	Parks/Playground	4		4		4
	Total	5	1	6		6
Daram	Public Market					
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total					
Gandara	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total	1		1		1
Hinabangan	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground	1		1		1
	Total	2		2		2
Jiabong	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground	1		1		1
	Total	2		2		2
Marabut	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total	1		1		1
Matuguinao	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total	1		1		1
Motiong	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total	1		1		1
Pagsanghan	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total	1		1		1

Table 8.3.9 Projected Number of Public Utilities by Municipality by Target Year

Name of Municipality/City	Type	1998	2004		2010	
		No. of Public Utilities	Proposed Construction	Total	Proposed Construction	Total
Paranas (Wright)	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground	1		1		1
	Total	2		2		2
Pinabacdao	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total	1		1		1
San Jorge	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground	1		1		1
	Total	2		2		2
San Jose De Buan	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total	1		1		1
San Sebastian	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground	1		1		1
	Total	2		2		2
Santa Margarita	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground	1		1		1
	Total	2		2		2
Santa Rita	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total	1		1		1
Santo Niño	Public Market					
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total					
Tagapul-An	Public Market					
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total					
Taalora	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total	1		1		1
Tarangnan	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total	1		1		1
Villareal	Public Market	1		1		1
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total	1		1		1
Zumarraga	Public Market					
	Bus/Jeepney Terminal					
	Parks/Playground					
	Total					
Provincial Total	Public Market	21		21		21
	Bus/Jeepney Terminal	2	1	3		3
	Parks/Playground	15		15		15
	Total	38	1	39		39

8.4 Types of Facilities and Implementation Criteria

8.4.1 Water Supply

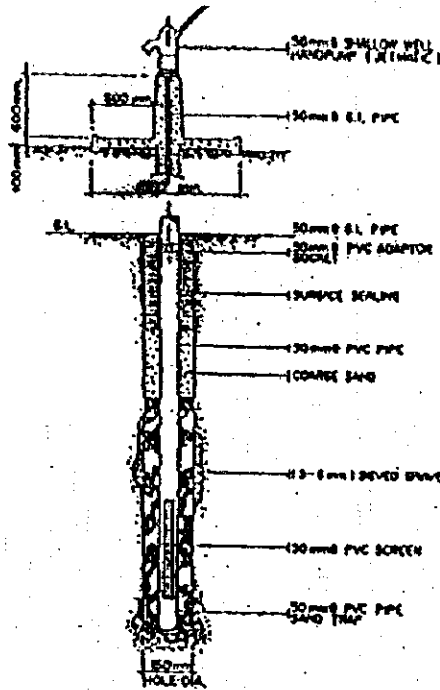
(1) Urban water supply

With regard to development/expansion of urban water supply by municipality, existing conditions, future requirements and planned/on-going projects were reviewed in the preparation of this PW4SP. Potential water source for future development was also evaluated in Chapter 7, taking into account the possibility to utilize untapped spring sources. Location of urban area of respective municipalities/city was referred to Figure 3.4.1 in Chapter 3. Table 8.4.1 presents the basic figures on the existing service coverage, water sources and future requirements.

Table 8.4.1 Existing Condition and Future Requirements of Urban Water Supply by Municipality

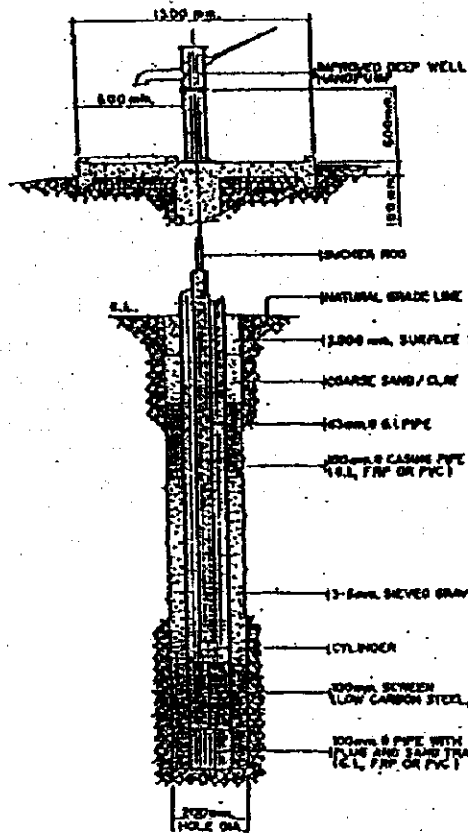
Name of Municipality/City	Existing Condition (1998)										Phase I (2004)										Phase II (2010)									
	Urban Population (1998)	No. of Levels III and Overlapping Bldgs.	Existing Level III System and Others			Level III Water Source		Urban Population (2004)	Pop. Served by Level III and Others			Newly Developed/Additional Water Source	Total Water Source Required (m3/d)	Urban Population (2010)	Additional Pop. Served		Newly developed/Additional Water source	Total	%											
			Pop. Served by Levels-III	%	Total Pop. Served	Type	Production (m3/d)		Additional Pop. Served by Level-III	%	Total Pop. Served				Pop. Served	%														
Almigo	321	None	222	69%	15,199	48,178	87%	860	SP	860	32,999	55%	48,178	81%	2,240	50,219	95%	1,400	7,700											
Babay	11,078	(WD)	3,937	36%	3,939	7,668	71%	40	Surf	40	2,833	25%	10,730	96%	400	11,544	95%	600	1,500											
Calbayog City	73,851	(WD)	39,358	53%	20,146	59,504	81%	3,200	Surf	3,200	47,730	65%	87,876	73%	3,700	127,605	95%	6,000	15,800											
Calbiga	3,930	(WD)	3,567	91%	3,567	3,567	91%	1,500	SP	1,500	4,698	98%	4,698	98%	200	4,932	95%	0	700											
Catibogan (Capital)	55,487	(WD)	32,979	59%	15,199	48,178	87%	860	SP	860	32,999	55%	48,178	81%	2,240	50,219	95%	1,400	7,700											
Daram	11,066	None	6,793	61%	6,793	6,793	61%	12,718	None	12,718	3,014	24%	9,807	77%	400	13,287	95%	200	1,600											
Gandara	5,303	None	3,286	62%	3,286	3,286	62%	7,121	None	7,121	1,688	24%	4,970	70%	360	5,676	95%	300	1,100											
Hinabangan	5,216	(Mun)	4,799	92%	4,799	4,799	92%	6,100	N.A.	6,100	4,799	79%	4,799	79%	700	6,181	95%	200	600											
Hilbong	3,944	(Mun)	3,634	92%	3,634	3,634	92%	4,330	SP	4,330	3,634	84%	3,634	84%	500	5,114	95%	200	700											
Mababul	1,309	None	756	58%	756	756	58%	1,309	SP	1,309	310	24%	1,066	81%	100	1,309	95%	200	600											
Matugono	2,431	None	2,021	83%	2,021	2,021	83%	3,380	None	3,380	801	24%	2,822	84%	200	3,826	95%	400	600											
Motonga	4,766	None	3,733	78%	3,733	3,733	78%	5,493	None	5,493	1,302	24%	5,035	92%	300	5,768	95%	500	700											
Orasaban	1,124	None	648	58%	648	648	58%	1,715	None	1,715	406	24%	1,055	62%	100	1,885	95%	200	300											
Puranas (Wright)	8,887	(Mun)	2,540	29%	3,293	5,823	66%	12,728	SP	12,728	3,017	5,557	44%	8,840	69%	400	13,236	95%	900	1,700										
Pinabacdao	1,154	None	742	64%	742	742	64%	1,210	None	1,210	287	24%	1,029	85%	100	1,288	95%	200	300											
San Jorge	2,271	None	422	19%	422	422	19%	3,520	None	3,520	834	24%	1,256	36%	200	3,853	95%	200	200											
San Jose De Buan	2,130	None	1,614	76%	1,614	1,614	76%	2,741	None	2,741	650	24%	2,623	83%	100	3,083	95%	300	400											
San Sebastian	1,947	None	419	22%	419	419	22%	2,410	None	2,410	571	24%	990	41%	100	2,559	95%	300	400											
Santa Manganta	13,467	None	11,019	82%	11,019	11,019	82%	16,808	None	16,808	3,998	24%	3,998	24%	600	18,065	95%	1,600	2,400											
Santa Rita	11,417	None	7,819	68%	7,819	7,819	68%	17,200	None	17,200	4,077	24%	4,077	24%	600	18,515	95%	1,600	2,400											
Santo Nino	2,728	None	809	30%	809	809	30%	3,087	None	3,087	752	24%	752	24%	100	3,240	95%	300	400											
Talibulan	1,493	None	789	53%	789	789	53%	2,307	None	2,307	547	24%	547	24%	100	2,508	95%	300	400											
Talalora	2,163	None	1,301	60%	1,301	1,301	60%	2,230	None	2,230	529	24%	529	24%	200	2,327	95%	300	400											
Taraganan	3,238	None	1,621	50%	1,621	1,621	50%	3,702	None	3,702	877	24%	2,809	67%	200	4,033	95%	400	600											
Villareal	3,436	None	1,216	36%	1,216	1,216	36%	3,543	None	3,543	840	24%	2,076	59%	200	3,692	95%	400	600											
Zumarraga	1,263	None	933	74%	933	933	74%	1,296	None	1,296	307	24%	1,261	97%	100	1,361	95%	200	300											
Provincial Total	253,444		90,834	36%	67,032	179,602	76%	8,380		8,380	57,201	48%	215,067	69%	8,600	329,965	95%	21,900	42,600											

(Note) WD: Water District; Prov: Province; Mun: Municipality; Asc: Association
 Unit consumption: 100 lpd
 Additional population served in 2010 includes the served population that will be absorbed by Level III system.

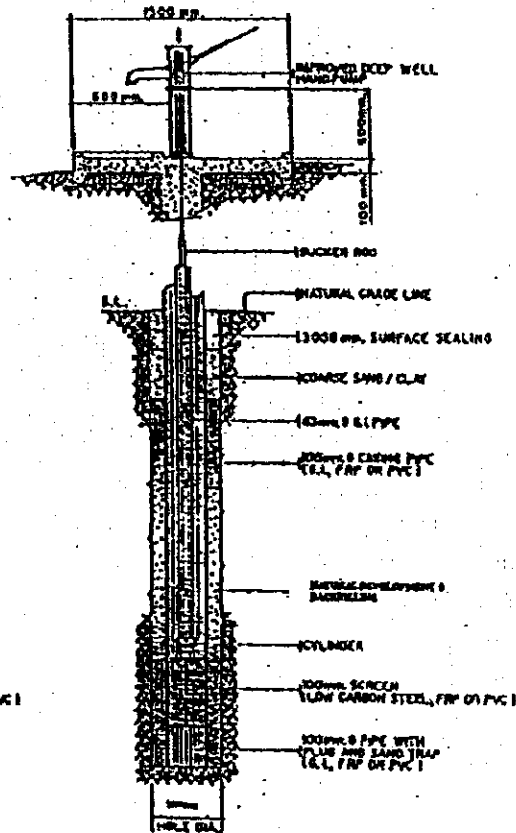


OPEN HOLE DRILLING & GRAVEL PACK METHOD

SHALLOW WELLS



OPEN HOLE DRILLING & GRAVEL PACK METHOD

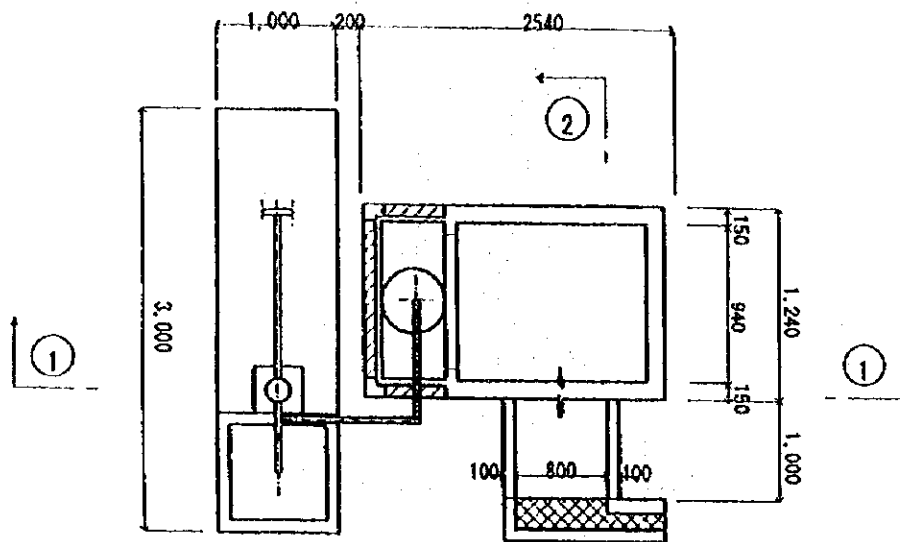


OPEN HOLE DRILLING & NATURAL GRAVEL PACK METHOD

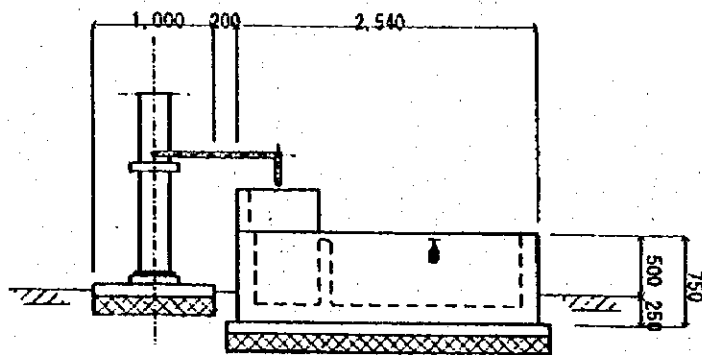
DEEP WELLS

FIGURE 8.4.1

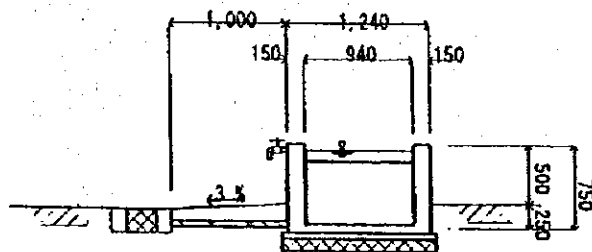
TYPICAL STRUCTURE OF LEVEL I WELL FACILITY



PLAN $S = 1/30$



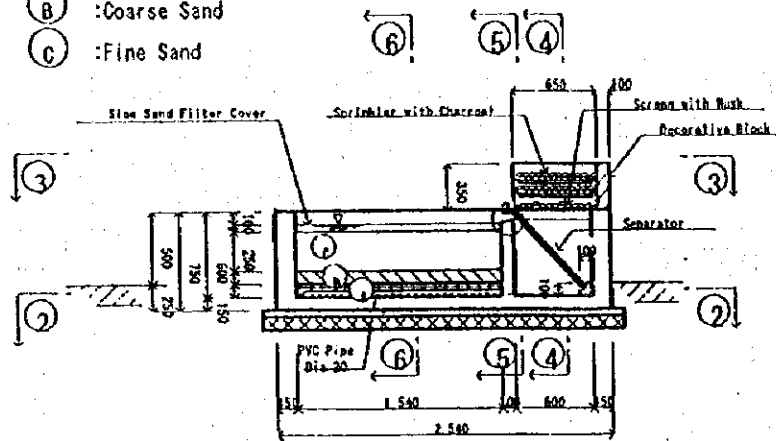
Section ① — ① $S = 1/30$



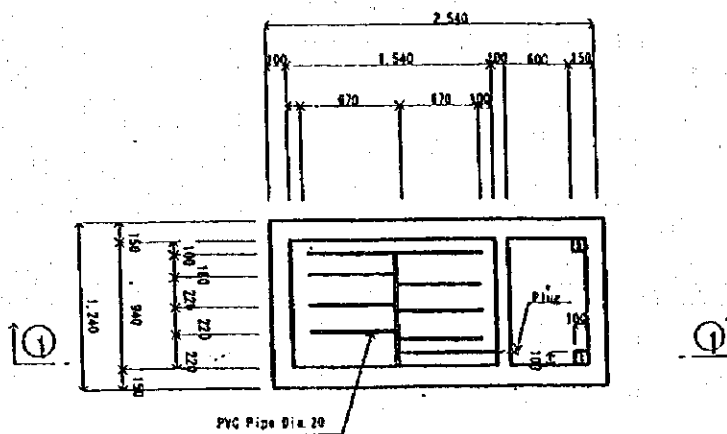
Section ② — ② $S = 1/30$

Figure 8.4.2(a) Iron Removal Facility

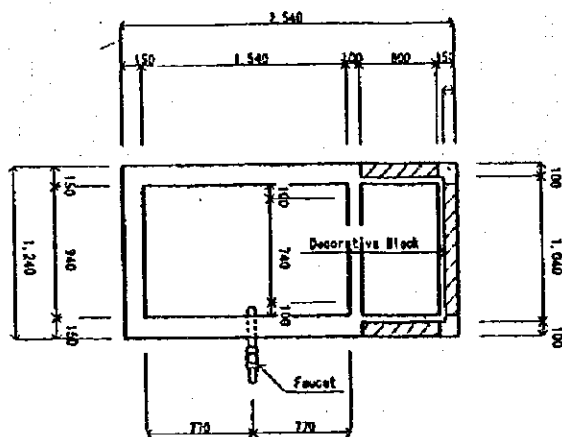
- (A) :Pebble
- (B) :Coarse Sand
- (C) :Fine Sand



Section ① - ① $S = 1/20$



Section ② - ② $S = 1/20$



Section ③ - ③ $S = 1/20$

Figure 8.4.2(b) Iron Removal Facility

Figure 8.4.3 STAGED IMPROVEMENT IN SEWAGE COLLECTION METHOD

