

4.2 Sanitation and Sewerage

4.2.1 General

The national strategy for sanitation and sewerage is demand-oriented. It aims to stimulate sustainable improvements in sanitation service coverage, public health, and environmental pollution abatement. To achieve this goal, the Government has made investment choices based on demand and the extent to which choices contribute to efficiency and cost-effectiveness.

This sub-sector focuses on household toilets, school toilets and public toilets (public markets and bus/jeepney terminals). The latest data from the PHO on household and public toilets as well as from DECS on school toilets were gathered by municipality. In case of household toilets, data were consolidated by urban and rural area. These facilities were classified into sanitary and unsanitary in terms of structure rather than the surrounding conditions.

The Code on Sanitation of the Philippines provides the minimum standards for services dealing with public health. Specifically, Chapter XVII on Sewage Collection and Disposal, Excreta Disposal and Drainage defines alternatives for on-site sanitation and sewage collection and disposal. At present, the development of sewerage systems, even in the urban centers of the province is not given priority because of the huge investment cost it entails.

4.2.2 Types of Facilities and Definition of Service Level Standard

For this Master Plan, the types of household toilet facilities commonly used are categorized into: 1) sanitary toilets - approved types of toilet facilities include water-sealed pour flush or flush-type toilets either with receiving space/pit or septic tanks/vaults, and ventilated improved pit latrines and sanitary privy considering its low construction cost especially in rural areas; and 2) unsanitary facilities - these include the types of facilities used for receiving and disposing human waste which do not fall under the category of approved types of toilet facilities such as open pit privy and over-hung latrines (refer to Figure 4.2.1 DOH standard structure of a household toilet that meets the minimum requirements of a sanitary facility, Supporting Report).

In terms of service level, households are classified into: 1) served households - households with at least one (1) sanitary toilet; 2) underserved households - households with unsanitary toilets; and 3) unserved households - households without toilet. Coverage of adequately

served households (with sanitary toilets) was estimated by urban and rural area of municipalities. The remaining households were considered as underserved and/or unserved. The service coverage was determined using the estimated number of households in 1995.

Service level standard for both elementary and secondary school toilets is translated in terms of: 1) served students - students who are adequately covered by the DECS standard ratio of one (1) unit per 50 students with access to sanitary toilets (number of sanitary toilet units multiplied by 50); and (2) underserved and/or unserved students - those with unsanitary and without toilet facilities, and students unserved (based on the standard ratio) even though they have access to sanitary toilets. Service coverage of adequately served students was estimated both for public and private schools by municipality. Figure 4.2.2, Supporting Report shows a standard structure of a school toilet facility adopted by the DOH through the JICA-DPWH and DOH Rural Environmental Sanitation Project.

For public toilets, the service level is classified into: 1) served - utilities that have at least one (1) sanitary toilet, and 2) underserved and/or unserved - utilities that have unsanitary or without toilet facilities. Service coverage of public utilities was estimated as a percentage of sanitary facilities to the total number of utilities.

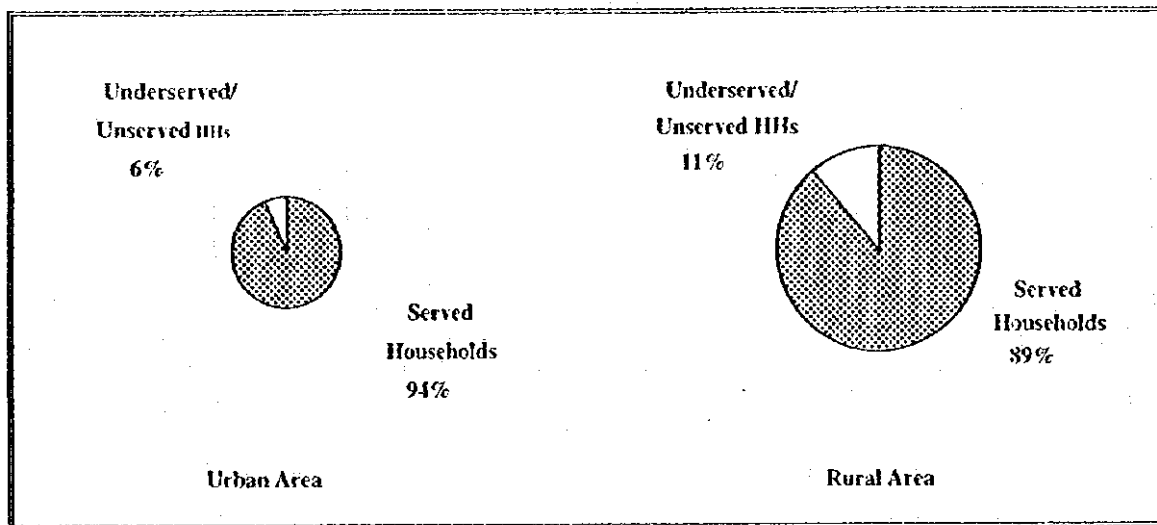
4.2.3 Sanitation Facilities and Service Coverage

(1) Household Toilets

The service coverage of sanitary toilets in the province is 90% of the total number of households. The rest is underserved and/or unserved, of which about 93% is without toilet facilities (refer to Table 4.2.1, Supporting Report and 4.2.3 Sanitation Facilities and Service Coverage, Data Report). The existence of households without toilets can be attributed to those households sharing the same facility with their relatives or neighbors. According to PHO, about 20% of the households without toilet is considered as "shared users".

In urban areas, approximately 94% of the total households is served. A lower served households of 89% exist in rural area comparing with urban area. Table 4.2.1 shows the municipal breakdown in the number of urban and rural household toilets by category, and service coverage. Figures 4.2.1 and 4.2.2 reflect the provincial service coverage of household toilet facilities for urban and rural areas.

Figure 4.2.1 Provincial Service Coverage of Household Toilet Facilities, 1995



(2) School and Public Toilets

Toilet facilities in elementary and secondary schools for both public and private schools were investigated. The province has a total of 2,887 toilet units found in 542 schools. Only 77% of the students is adequately served by sanitary toilets. The rest, 23% is underserved and/or unserved.

There are 39 public toilets located at public markets, bus/jeepney terminals and parks/playgrounds. About 92% is served, while the rest, 8% is underserved and/or unserved. Table 4.2.2 and Table 4.2.3 provide the number and service coverage of toilet facilities of schools and public utilities, respectively.

(3) Problem Areas

Compared to the national service coverage of sanitary household toilets of 77%, the province shows a much higher sanitation level.

The number of sanitary school toilets is below the service level standard of 50 students per sanitary facility. At present, the average ratio is 54 students per sanitary toilet.

Public toilets at markets and bus/jeepney terminals, although culturally acceptable, are improperly used and maintained resulting in unsanitary conditions. In most cases, no specific arrangements are made for the operation and maintenance and for the collection

Table 4.2.1 Sanitation Facilities and Service Coverage of Household Toilets, Urban and Rural, 1995

Municipality	Households		Household Toilet Facilities and Service Coverage															
	1995		Urban						Rural						Municipal Total			
	Urban	Rural	Households Served by Sanitary Toilets	% of HH	Number	% of HH	Households Served by Sanitary Toilets	% of HH	Number	% of HH	Households Served by Sanitary Toilets	% of HH	Number	% of HH	Households Served by Sanitary Toilets	% of HH	Number	% of HH
Anlem	265	773	211	80	54	20	610	79	163	21	821	79	217	21	821	79	217	21
Banavojo	163	991	163	100	0	0	944	95	47	5	1,107	96	47	4	1,107	96	47	4
Banay	1,927	3,340	1,902	99	25	3	2,775	83	565	17	4,677	89	590	11	4,677	89	590	11
Burgos	295	1,678	286	97	9	3	1,480	88	198	12	1,766	90	207	10	1,766	90	207	10
Cabugao	1,568	4,152	1,543	98	25	2	4,070	98	82	2	5,613	98	107	2	5,613	98	107	2
Candon	1,398	7,484	1,377	98	21	2	7,380	99	104	1	8,757	99	125	1	8,757	99	125	1
Caoyan	1,344	1,895	1,244	93	100	7	1,149	61	746	39	2,393	74	846	26	2,393	74	846	26
Cervantes	454	2,145	451	99	3	1	1,918	89	227	11	2,369	91	230	9	2,369	91	230	9
Calimuyod	81	1,528	81	100	0	0	1,526	100	2	0	1,607	100	2	0	1,607	100	2	0
C. del Pilar	119	541	119	100	0	0	487	90	54	10	606	92	54	8	606	92	54	8
Ladidada	245	519	235	96	10	4	502	97	17	3	737	96	27	4	737	96	27	4
Magsadda	1,082	3,539	1,082	100	0	0	3,536	100	3	0	4,618	100	3	0	4,618	100	3	0
Nagbulcol	143	624	135	94	8	6	350	56	274	44	485	63	282	37	485	63	282	37
Narvacan	542	6,801	530	98	12	2	5,884	87	917	13	6,414	87	929	13	6,414	87	929	13
Quirino	269	1,132	266	99	3	1	1,054	93	78	7	1,320	94	81	6	1,320	94	81	6
Salcedo	273	1,707	273	100	0	0	1,707	100	0	0	1,980	100	0	0	1,980	100	0	0
San Emilio	416	766	325	78	91	22	307	40	459	60	632	53	550	47	632	53	550	47
San Esteban	148	1,221	138	93	10	7	1,007	82	214	18	1,145	84	224	16	1,145	84	224	16
San Ildefonso	198	753	175	88	23	12	697	93	56	8	872	92	79	8	872	92	79	8
San Juan	707	3,612	694	98	13	2	2,885	80	727	20	3,579	83	740	17	3,579	83	740	17
San Vicente	219	1,913	219	100	0	0	1,424	74	489	26	1,643	77	489	23	1,643	77	489	23
Santa	363	2,194	355	98	8	2	1,953	89	241	11	2,308	90	249	10	2,308	90	249	10
Santa Catalina	233	2,031	224	96	9	4	1,928	95	103	5	2,152	95	112	5	2,152	95	112	5
Santa Cruz	368	5,101	368	100	0	0	4,785	94	316	6	5,597	94	372	6	5,597	94	372	6
Santa Lucia	431	3,651	316	73	115	27	3,276	90	375	10	3,592	88	490	12	3,592	88	490	12
Santa Maria	732	4,175	4,907	98	18	2	3,867	93	308	7	4,581	93	326	7	4,581	93	326	7
Santiago	442	2,485	436	99	6	1	2,142	86	343	14	2,578	88	349	12	2,578	88	349	12
Santo Domingo	577	3,705	564	98	13	2	3,349	90	356	10	3,913	91	369	9	3,913	91	369	9
Sigay	0	361	0	0	0	0	267	74	94	26	267	74	94	26	267	74	94	26
Sinait	561	4,250	561	100	0	0	3,692	87	558	13	4,253	88	558	12	4,253	88	558	12
Sugpon	192	323	170	89	22	11	280	87	43	13	450	87	65	13	450	87	65	13
Suyo	309	1,335	309	100	0	0	1,011	76	324	24	1,320	80	324	20	1,320	80	324	20
Tagudin	889	5,009	795	89	94	11	4,427	88	582	12	5,222	89	676	11	5,222	89	676	11
Vigan (Capital)	7,768	0	7,768	91	697	9	0	0	0	0	7,071	91	697	9	7,071	91	697	9
Provincial Total	25,221	81,734	23,776	94	1,445	6	72,669	89	9,065	11	96,445	90	10,510	10	96,445	90	10,510	10

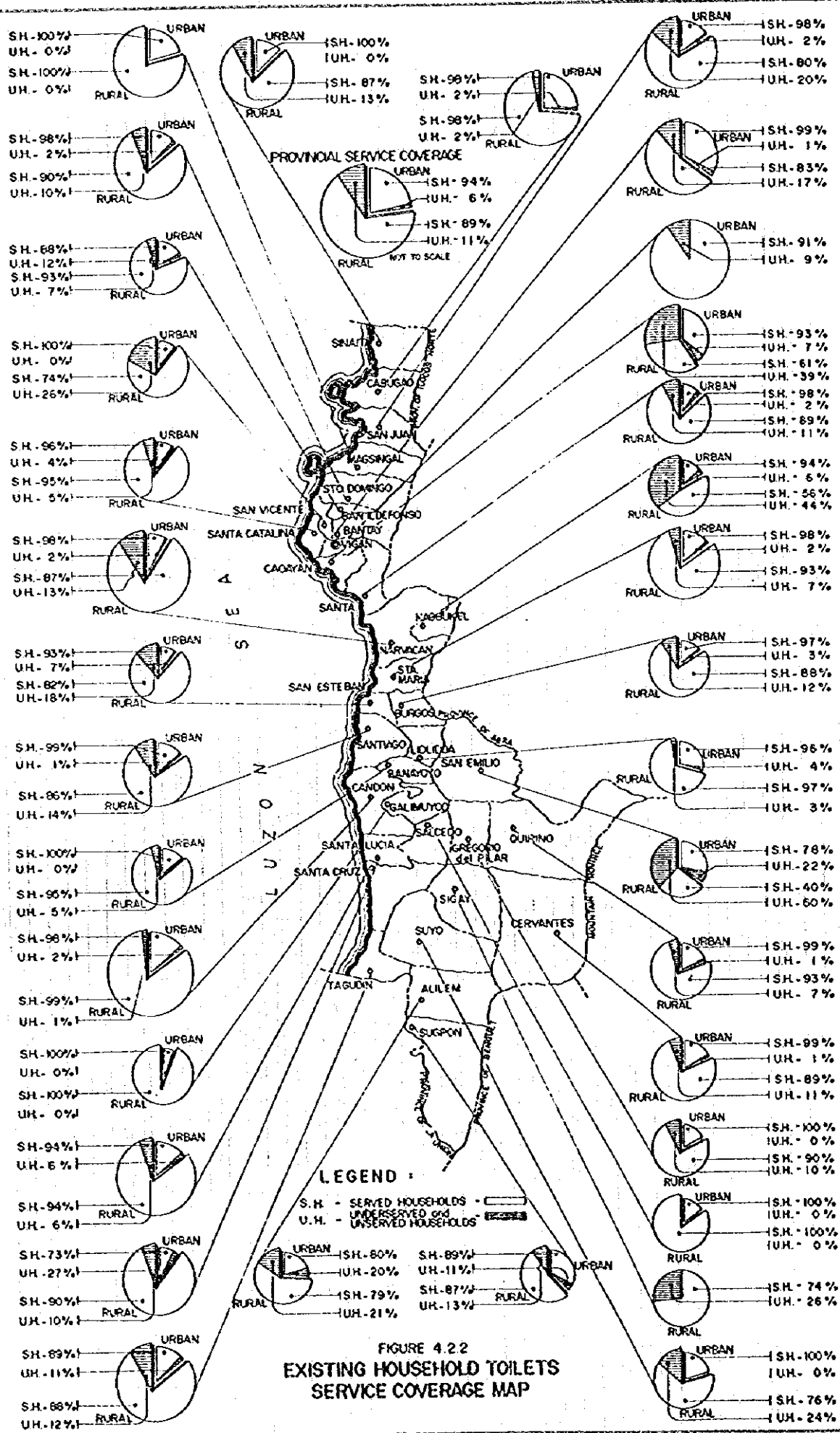


Table 4.2.2 School Toilet Facilities and Service Coverage in 1995

Municipality	Number of Schools						Number of Students						Number of Toilet Units						Service Coverage						
	Public			Private			Public			Private			Public			Private			Public			Private			
	Total	Number	%	Total	Number	%	Total	Number	%	Total	Number	%	Total	Number	%	Total	Number	%	Total	Number	%	Total	Number	%	
Alifan	14	0	0	1,333	0	0	32	6	0	6	38	1,333	100	0	0	0	0	0	0	0	0	0	0	0	
Banayoyo	7	0	7	1,340	0	0	35	5	0	5	40	1,340	100	0	0	0	0	0	0	0	0	0	0	0	
Bantay	18	1	19	3,552	2,523	6,075	88	14	0	14	110	3,552	58	400	7	3,952	65	0	0	2,123	35	2,123	35	2,123	
Burgos	10	1	11	1,942	161	2,103	42	2	44	11	13	57	1,942	92	100	5	2,042	97	0	61	3	61	3	61	
Cabugao	27	1	28	4,612	1,233	5,845	89	6	95	27	122	4,450	76	300	5	4,750	81	162	3	933	16	1,095	19	1,095	
Candon	28	3	31	9,147	1,741	10,888	106	6	112	64	66	178	5,300	49	300	3	5,600	51	3,847	35	1,441	13	5,288	49	
Caoyan	11	0	11	2,377	0	2,377	60	0	60	10	70	2,377	100	0	0	2,377	100	0	0	0	0	0	0	0	
Cervantes	18	2	20	2,509	210	2,719	32	2	34	6	7	41	1,600	59	100	4	1,700	63	909	33	110	4	1,019	37	
Galimuyod	9	1	10	1,451	80	1,531	17	2	19	7	1	8	850	56	80	5	930	61	601	39	0	0	601	39	
G. del Pilar	8	1	9	552	118	670	20	2	22	4	5	27	552	82	100	15	632	97	0	18	3	18	3	18	
Ladidida	6	0	6	694	0	694	16	0	16	6	6	22	694	100	0	0	694	100	0	0	0	0	0	0	
Magsingal	18	2	20	3,466	1,267	4,733	69	4	73	10	11	84	3,450	73	200	4	3,650	77	16	0	1,067	23	1,067	23	
Nagbukel	9	0	9	1,151	0	1,151	36	0	36	4	4	40	1,151	100	0	0	1,151	100	0	0	0	0	0	0	
Narvacan	37	3	40	8,453	871	9,324	236	4	240	36	2	38	278	8,453	91	200	2	8,653	93	0	671	7	671	7	
Quirino	13	2	15	1,412	392	1,804	22	6	28	6	8	36	1,100	61	300	17	1,400	78	312	17	92	5	404	22	
Salcedo	17	1	18	2,512	174	2,486	41	2	43	6	7	50	2,050	82	100	4	2,150	86	262	11	74	3	336	14	
San Emilio	11	1	12	1,138	114	1,252	8	2	10	2	4	14	400	32	100	8	500	40	738	59	14	1	752	60	
San Esteban	5	1	6	1,279	168	1,447	36	2	38	7	8	46	1,279	88	100	7	1,379	95	0	0	68	5	68	5	
San Ildefonso	5	0	5	749	0	749	52	0	52	4	4	56	749	100	0	0	749	100	0	0	0	0	0	0	
San Juan	23	1	24	5,086	306	5,392	152	2	154	17	18	172	5,086	94	100	2	5,186	96	0	0	206	4	206	4	
San Vicente	5	1	6	1,407	171	1,578	18	2	20	10	11	31	900	57	100	6	1,000	63	507	32	71	4	578	37	
Santa	12	1	13	2,339	239	2,578	84	4	88	3	3	91	2,339	91	200	8	2,539	98	0	0	39	2	39	2	
Santa Catalina	7	1	8	2,069	193	2,262	29	2	31	8	9	40	1,450	64	100	4	1,550	69	619	27	93	4	712	31	
Santa Cruz	24	4	28	5,201	1,638	6,839	73	10	83	43	46	129	3,650	53	500	7	4,150	61	1,551	23	1,138	17	2,689	39	
Santa Lucia	17	2	19	4,271	1,341	5,612	32	6	38	6	8	46	1,600	29	300	5	1,900	34	2,671	48	1,041	19	3,712	66	
Santa Maria	20	1	21	5,452	276	5,728	145	4	149	13	14	163	5,452	95	200	3	5,652	99	0	0	76	1	76	1	
Santiago	12	2	14	2,906	556	3,462	37	4	41	16	20	61	1,850	53	200	6	2,050	59	1,056	31	356	10	1,412	41	
Sanro Domingo	22	1	23	4,097	355	4,452	152	4	156	12	12	168	4,097	92	200	4	4,297	97	0	0	155	3	155	3	
Sigay	4	0	4	412	0	412	6	0	6	0	0	6	412	100	0	0	412	100	0	0	0	0	0	0	
Sinait	18	0	18	5,520	0	5,520	126	0	126	11	11	137	5,520	100	0	0	5,520	100	0	0	0	0	0	0	
Sugpon	9	0	9	640	0	640	12	0	12	8	8	20	600	94	0	0	600	94	40	6	0	0	40	6	
Suyo	19	0	19	1,987	0	1,987	30	0	30	16	16	46	1,500	75	0	0	1,500	75	487	25	0	0	487	25	
Tagudin	19	3	22	6,799	2,181	8,980	145	6	151	47	1	48	199	6,799	76	300	3	7,099	79	0	0	1,881	21	1,881	21
Vigan (Capital)	18	5	23	10,152	5,415	15,567	210	12	222	18	2	20	242	10,152	65	600	4	10,752	69	0	0	4,815	31	4,815	31
Provincial Total	500	42	542	107,807	21,723	129,530	2,298	104	2,392	463	32	495	93,917	73	5,180	4	99,097	77	13,890	11	16,543	13	30,433	23	

Table 4.2.3 Public Toilet Facilities and Service Coverage in 1995

Municipality	Public Markets			Jeepney/Bus Terminals			Parks/Playgrounds			Served		Underserved	
	No. of Sanitary Toilets	Number of Unsanitary Toilets	Sub-total	No. of Sanitary Toilets	Number of Unsanitary Toilets	Sub-total	No. of Sanitary Toilets	Number of Unsanitary Toilets	Total	No. of Sanitary Toilets	%	Number of Unsanitary Toilets	%
Ahlem	0	0	0	0	0	0	0	0	0	0	0	0	100
Banayovo	0	0	0	0	0	0	0	0	0	0	0	0	100
Bantay	0	0	0	3	0	3	1	0	1	4	100	0	0
Burgos	0	0	0	0	0	0	0	0	0	0	0	0	100
Cabugao	1	0	1	0	0	0	1	0	1	2	100	0	0
Candon	1	0	1	1	0	1	1	0	1	3	100	0	0
Caoyan	0	0	0	0	0	0	0	0	0	0	0	0	100
Cervantes	0	1	1	0	0	0	0	0	1	0	0	1	100
Galimuyod	0	0	0	0	0	0	0	0	0	0	0	0	100
G. del Pilar	0	0	0	0	0	0	0	0	0	0	0	0	100
Liditoda	0	0	0	0	0	0	0	0	0	0	0	0	100
Magsangal	1	0	1	0	0	0	0	0	1	1	100	0	0
Nagbukel	0	0	0	0	0	0	0	0	0	0	0	0	100
Narvacan	1	0	1	1	0	1	0	0	2	2	100	0	0
Quirino	1	0	1	0	0	0	1	0	1	2	100	0	0
Salcedo	1	0	1	0	0	0	0	0	1	1	100	0	0
San Emilio	0	0	0	0	0	0	0	0	0	0	0	0	100
San Esteban	0	0	0	0	0	0	0	0	0	0	0	0	100
San Idelfonso	1	0	1	0	0	0	0	0	1	1	100	0	0
San Juan	1	0	1	0	0	0	0	0	1	1	100	0	0
San Vicente	1	0	1	0	0	0	0	0	1	1	100	0	0
Santa	1	0	1	0	0	0	1	0	2	2	100	0	0
Santa Catalina	0	0	0	0	0	0	0	0	0	0	0	0	100
Santa Cruz	1	0	1	0	0	0	0	0	1	1	100	0	0
Santa Lucia	1	0	1	0	0	0	0	0	1	1	100	0	0
Santa Maria	1	0	1	0	0	0	1	0	2	2	100	0	0
Santiago	0	1	1	0	0	0	0	0	1	0	0	1	100
Santo Domingo	1	0	1	0	0	0	1	0	2	2	100	0	0
Sigay	0	0	0	0	0	0	0	0	0	0	0	0	100
Sinait	1	0	1	0	0	0	0	0	1	1	100	0	0
Sugpon	0	0	0	0	0	0	0	0	0	0	0	0	100
Suyo	0	0	0	0	0	0	0	0	0	0	0	0	100
Taeudin	1	0	1	0	0	0	0	0	1	1	100	0	0
Vigan (Capital)	1	0	1	6	0	6	1	0	7	8	100	0	0
Provincial Total	17	2	19	11	0	11	8	0	18	36	95	2	5

of fees to cover such costs. Although it is considered as sanitary because of its structure, majority of these facilities have unsanitary conditions.

Even if a high percentage of sanitary toilets is revealed, problems arise from the unsatisfactory disposal of the effluent from the septic tanks, or the direct discharge of wastewater to the local drains. Generally, there is little concern about the unsatisfactory disposal of wastes once it is outside their dwelling units. Practically, almost all the households dispose their wastes in the manner that poses risks to public health.

4.2.4 Sewerage Facilities

As earlier mentioned, Vigan has a sewerage system that has outlived its useful life (built 80 years ago). The system includes 2 septic tanks, 14,990 linear meter of sewer lines and manholes. Sewer lines consist of 150mm concrete sewer pipes in 90% of the streets in the Poblacion, and 200mm concrete sewer main traversing the main streets of de los Reyes and Florentino. Only the sewer pipes can be considered as functional, since the septic tanks no longer function as treatment facilities. Recently, the Vigan Water District had provided a sewage outfall to Meztizo river on the eastern side of the Poblacion to reduce flow to the septic tanks (7m in length, 7m in width and 5m in depth) which are already filled with sludge deposits. Presently, sewage effluent in these tanks just overflows to adjacent agricultural lands. The sewage directed to the septic tanks and those directly into the river does not undergo any form of treatment. This practice contributes extensively to contamination of both surface and groundwater resources.

In other urban areas of the province, most of the wastewater from the dwelling units with acceptable facilities finds its way to open drains and eventually to watercourses. These deficiencies are the major contributing factors to the poor condition of the water environment in some areas of the province.



Chapter 5

***EXISTING SECTOR ARRANGEMENTS
AND INSTITUTIONAL CAPACITY***



5. EXISTING SECTOR ARRANGEMENTS AND INSTITUTIONAL CAPACITY

5.1 General

Much has happened in the sector since 1987 when the national master plan was initially prepared. The water supply, sewerage and sanitation sector today is in a transition stage. The Local Government Code (LGC) has essentially re-defined the role, relationship and linkages of central, provincial, municipal and barangay institutions in the provision of basic services, including water and sanitation. The responsibility for water supply and sanitation functions were lodged with various national agencies. The new direction mandates the LGUs to play a larger role in planning and implementing water supply and sanitation projects. This raises serious institutional capacity and resource reallocation issues.

Chapter Five provides an overview of existing sector policies and arrangements as a basis for formulating modifications and improvements. It identifies current capacity building issues which need to be addressed in the early stages of master plan implementation. Most importantly, it assesses the impact of the present centralized delivery system at the local levels.

5.2 Sector Reforms

The GOP has set the future agenda for sector reform. These initiatives followed the completion of the Water Supply Sector Reform Study and the National Urban Sewerage and Sanitation Strategy Study. The GOP has endorsed the major recommendations of these studies through the following NEDA resolutions:

- (1) NEDA Resolution No. 4 (series of 1994): LGUs, in the context of the LGC and related decentralization efforts, now play a lead role in service delivery. The resolution allows LGUs to implement all levels of water supply projects and redefines the roles of other sector agencies. LWUA shall implement only financially viable Level III water supply projects in areas outside the MWSS jurisdiction. DILG's participation will consist of general administration and institution building, such as assistance to the LGUs in the formation of Rural and/or Barangay Waterworks and Sanitation Association and in the identification of water supply systems. *DPWH, together with DILG and DOH, will provide technical assistance (within a period of about 2 years) to LGUs in the planning, implementation and operation and maintenance of water supply facilities.*

- (2) NEDA Resolution No. 5 reaffirms the principle of provision of sewerage and sanitation services on the basis of willingness-to-pay. The resolution mandates the establishment of a Central Project Support Office (CPSO) at LWUA to assist LGUs in the formulation, preparation and implementation of sewerage and sanitation projects.

5.3 Sector Institutions

(1) Existing Institutional Arrangements

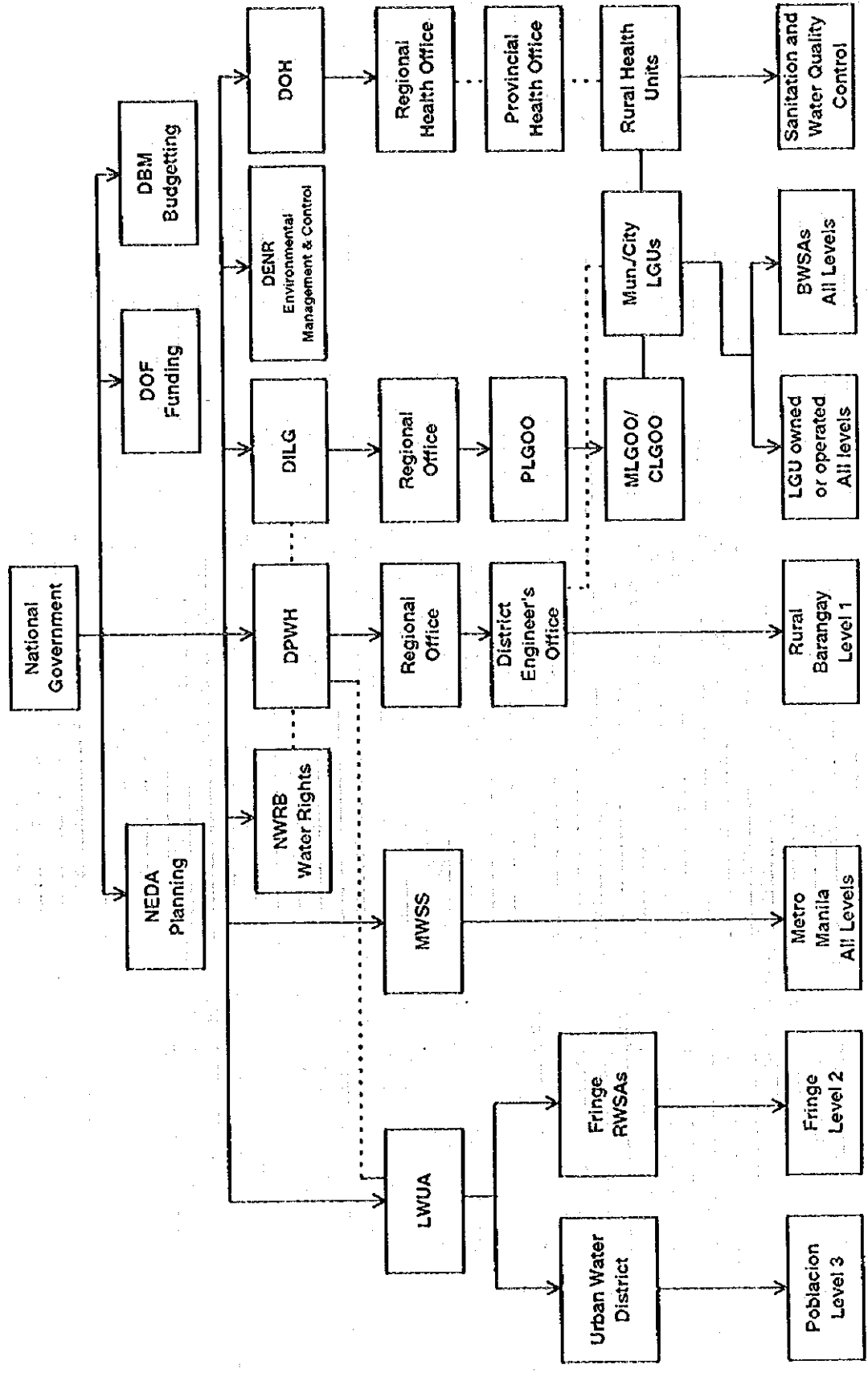
In the beginning of this chapter, it was noted that the sector is in transition. The LGC, however, mandates major changes on sector structure and performance in the future. New Implementing Rules and Regulations (IRR) reflecting the new sector role of the LGUs and national agencies are being prepared. Sector projects are still led generally by national agencies, in coordination with LGUs. The following discussion on institutional arrangements therefore presents the starting point of the transition (i.e., the existing set-up).

At the central level, there are three (3) line departments (DILG, DPWH and DOH) and two (2) government owned and controlled corporations (LWUA and MWSS) responsible for planning and implementation (refer to Figure 5.3.1, Functional Relationship). Other GOP departments are concerned with macro-planning, national resource allocation decisions, as well as exercise of regulatory powers for tariff setting, and environmental protection and management issues.

At the provincial and municipal levels, there are central agency field offices (of DPWH and DILG) and LGU offices working in the sector. DOH field offices have since been devolved and most of its resources are already under LGU supervision. Water districts, RWSAs and BWSAs have been organized to deal with the actual delivery of services. Some LGUs continue to operate municipal or provincial water and sanitation systems. As the LGC is gradually put into operation, many of the responsibilities and resources currently administered by central departments may be devolved to LGUs. Project management offices (PMOs, at the central level), *ad hoc* inter-agency committees and task forces have been organized to address coordination issues.

There are many water and sanitation activities outside the government realm. The private sector, NGOs and community-based organizations (CBOs), out of necessity, are rehabilitating publicly-installed, non-operating facilities or constructing new ones.

Figure 5.3.1 - Functional Relationships



The current major institutional issues are those of management of the transition process and of re-establishing leadership in the sector. Major resource realignments and capacity building initiatives are needed. The formulation of a new set of implementing rules and regulations will be started shortly.

(2) Sector finance

The water sector reform study reports that in order to increase nationwide water supply coverage to about 87% by 1998, new investments of about P39.3 B will be needed. Of this, only P12.8 B has been secured, i.e., carried over from existing projects. In addition, the level of public investment in water supply has declined in real terms in recent years. During the period 1988 through 1992, P17.268 B was allocated of which only P10.453 B was disbursed. Despite the declining trend in investments, the water sector fund utilization rate is only 60.5% - indicating serious institutional planning and implementation capacity issues. The delay in the institutional response to the policy shifts has invariably contributed to this decline in activity level.

If the new arrangements are to flourish, the issue of LGU access to external sources of capital development funds (backed by GOP guarantees) needs to be addressed.

5.4 Sector Agencies at the National Level

(1) Department of the Interior and Local Government (DILG)

Responsibility: The Department has the mandate of strengthening local capacity for delivery of basic services, including water and sanitation. It is responsible for providing general administration and institution-building support to LGUs including assistance in the formation and training of BWSAs; coordination of master plan preparation; sourcing of external funds; formulation and installation of sector management systems, including O&M and BWSA financial management systems. Ultimately, DILG is geared to provide a range of support activities to develop the capability of LGUs to provide, manage, operate and maintain water supply projects either directly or through community-based organizations, like BWSAs.

Current Activities: On a transitory basis, interagency provincial and municipal water task forces have been established in some provinces. These task forces (TFs) are the

current sector entry point of DILG. Through the TFs, barangays needing improved water supply and households needing sanitation improvements are identified and organizations are formed. Training activities are also done with the TFs. Conferences are held regularly to assess performance and review sector experiences. Training generally follows the cascade approach from the national up to the barangay level.

Resources: The PMO for Water Supply and Sanitation is established under the Assistant Secretary for Plans and Programs. About sixty (60) staff members comprise the PMO. It has four (4) operating divisions (Administration; Finance and Procurement; Project Planning; and Field Operations). Its Work Program is integrated with the DILG Annual Plan of Implementation. Like other line Departments, DILG's annual budget allocation goes through the general appropriations review and approval process in Congress which usually requires a one-year lead time. Action officers are assigned for every active province. Monitoring and evaluation of project implementation are done by the provincial (and municipal) local government operations officers (PLGOOs/ MLGOOs). Funds for sector training and BWSA formation are channeled through the regional and provincial DILG offices.

(2) Local Water Utilities Administration (LWUA)

Responsibility: LWUA is a specialized lending institution mandated to promote and oversee the development of provincial water utilities based on financial viability of projects. Most water utilities were under the LGUs until 1973, when some LGUs opted to waive their control over the utility and organize water districts (WDs) to qualify under the LWUA program. In 1987, LWUA responsibilities were expanded to include assistance to Level II Rural Waterworks and Sanitation Associations (RWSAs). The provision of Level II and III services and of wastewater disposal systems in communities outside Metropolitan Manila are largely coordinated through the LWUA. The WDs currently serve about 18.43 M consumers in about 703 cities and municipalities. NEDA Resolution No. 4 directs LWUA to focus on its development banking role and to finance only viable WDs. Since its establishment in 1972, LWUA has formed 544 WDs (486 of which have availed of loans totaling P 4.0 B). It has completed over 880 water supply projects.

Activities: LWUA has since developed a wide array of support services for WD development.

Institutional development services for WDs and RWSAs include: formation, management advisory services, training programs, management audits and operations reviews, installation of uniform commercial practices systems; information and marketing support.

Financial services include: economic and financial analysis, tariff analysis and fund sourcing. Various types of loans are available to finance the construction of water systems; reactivation of non-operating systems, rehabilitation and expansion of facilities; and training. Special loans finance watershed management projects; construction of administration buildings; purchase of service vehicles, communication and computer facilities; restoration of facilities damaged by calamities; initial or emergency operational needs. Commodity loans support generation of additional service connections.

Technical services: LWUA oversees the planning, design, construction, and control of quality standards to improve the water system facilities of WDs and RWSAs. LWUA formulates uniform standards for design, materials and construction to lower project costs and disseminates periodic water supply industry performance indicators.

LWUA consults with interested LGUs on the formation of WDs and RWSAs. Public hearings are held prior to the formation of WDs and tariff adjustments. Where tariff increases are not accepted, improvement projects are either reviewed or shelved altogether. LWUA collaborates with LGUs and consumers on all phases of WD improvement programs especially during the construction of water supply facilities.

Resources: LWUA maintains and fields a pool of management advisors, trainers, engineers and other professionals to give WDs and RWSAs proper guidance in their operation and administration. In addition, the Central Sewerage and Sanitation Program Support Office (CPSO) was recently established at LWUA to coordinate the implementation of sewerage and sanitation projects at the national level and to assist LGUs and WDs plan and manage sewerage and sanitation projects and programs at the local level.

LWUA training programs embrace efforts directed at the training and education needs of those who manage and operate water supply systems and those who provide assistance from the national level so that the water systems will succeed. Training for the water districts comprise about 20 technical and 20 management courses, while in-house courses cover cadetship training for fresh engineering graduates, management advisors, and

supervisors courses on construction project management, and computer education are also conducted.

(3) Department of Public Works and Highways (DPWH)

Responsibility: The Department is responsible for the construction and major repair/rehabilitation of rural water supply systems (Level I) and for the planning and execution of sewerage projects in some cities and larger poblaciones in the country with participation of LGUs.

Activities: The actual construction of the projects are done through contract or force account by the regional and district offices of the Department or other designated agencies under supervision of the PMO and in accordance with approved work programs.

The following describes the current project planning and programming process for water supply projects. The central office advises regional office that funding will be available and requests for proposals for a specified number of projects. The regional office allocates the total number of projects among the district offices and directs preparation of a Program of Work (PoW) with a listing of sites. A draft PoW is submitted to the PPDO for comments. In most instances, this is reviewed by the Provincial Board. PPDO endorses the PoW to the DPWH Regional Office. The PoW is sent to the PMO-RWS at the central office which authorizes the release of budget allotment. DEO is now cleared to start construction. Reporting is done based on accomplishments.

Resources: The PMO for Rural Water Supply was established in 1981 (Ministry Order 14) to "manage and direct the planning, design, construction, organization and maintenance of foreign-assisted rural water supply projects" of the Department. It consists of a 44 technical and 26 administrative staff (regular). In addition, as the loan project packages may require, project staff are recruited on contract. At the field level, the Department maintains about 92 District Engineering offices. Most of the DEOs are staffed with a water engineer, drilling crews and equipment. In some DEOs, staff have been assigned to oversee BWSA formation and training activities.

(4) Department of Health (DOH)

Responsibility: The Department is the principal health policy-making and implementing agency. Its main function is to develop and implement sanitation programs nationwide

and administer health education aimed at reducing morbidity due to, among others, waterborne and sanitation related illness specifically diarrhea diseases which ranked second leading cause of morbidity among the population in the past years. Its role in the water supply program is in the promotion of safe water supplies through water quality surveillance.

Activities: A major program of DOH (Environmental Health Service) is the improvement of the environmental sanitation conditions to make it more conducive to promotion and maintenance of the health of the people. The priority program components include water supply and sanitation (water treatment and disinfection, quality monitoring and surveillance), excreta and sewage disposal, wastewater collection and disposal. DOH also implements *Water for Life* project which calls for spring development for use in Level I systems and for organizing BWSAs. DOH is also responsible for the provision of sanitation facilities in rural areas.

Operating budgets come from general appropriations in the national budget. Capital expenditure funds to support construction of excreta and waste disposal systems come from project funds. Under the First Water Supply, Sewerage and Sanitation Sector Project, DOH administered a project subsidy of P105.00 (cost of the bowl) per toilet. Similar arrangements are ongoing with the IBRD-assisted FW4SP. In addition, it supervises the construction of public school toilets, sullage removal units and the distribution of household toilet bowls.

Resources: The health care system is delivered through five organizational levels: Central headquarters; Regional Health Offices and general and special hospitals; Provincial Health Offices, including provincial and district hospitals; Municipal Health Offices; and, Rural Health Units/Barangay Health Stations. Its unique structure enables the Department to reach up to the barangay level through its grassroots network of barangay health workers and volunteers. DOH manages regional and provincial laboratories with technicians who carry out water quality tests. It should be noted that substantial segments of its institutional structure (from the provincial level downwards) have been devolved and are now supervised by the respective LGU.

Through its far-reaching network, DOH conducts health education campaigns which focus on women and children health in rural communities. The program is supported by centrally-produced information, education and communication materials. Enrichment of

hygiene education lesson plans for the school curricula is undertaken by DECS and DOH. Together with UNICEF, CIDA and other bilateral agencies, DOH has produced and distributed IEC materials with key messages on water supply, sanitation and hygiene behavior.

DOH provides training focused on skills development of its health workers, volunteers and community artisans. Its training programs are either conducted by in-house staff or commissioned through non-government organizations (NGOs). Provincial and district sanitary engineers and inspectors are trained on skills development and planning. Chemists and laboratory technicians are trained on tools and techniques to support on-going drinking water quality programs. BWSAs are instructed, among others, on protection and disinfection of water supply sources, constructing and maintaining toilets.

(5) Other National Agencies

Other national agencies provide macro-planning, funding and support, and regulatory guidelines for the water supply and sanitation sector.

The National Economic and Development Authority (NEDA), as the central planning office, ensures that all agency plans and programs are consistent with national priorities in the Medium-Term Public Investment Program and the Priority Sub-Sector Activity Layout. External grants and loan proposals are reviewed and approved at NEDA. It also coordinates the establishment of a system for national sector master planning and the monitoring system (with DILG).

The Department of Finance (DOF) is responsible for the generation and management of the financial resources of the government. It reviews and approves all public sector debt; oversees the fiscal soundness of public investments based on equity, cost recovery and economic growth, and sets the fiscal deficit of major government corporations, as part of the public sector borrowing program.

The Department of Budget and Management (DBM) plans the budget allocations for the government agencies, including capital and operating expenditures, equity infusion to public corporations, grants and subsidies for Congressional approval. DBM also ensures that budget releases conform with approved plans and programs.

The Department of Environment and Natural Resources (DENR) formulates and enforces policies and guidelines for environmental protection and pollution control. It is responsible for watershed protection and water resources management. It checks compliance of major projects with environmental guidelines. DENR works with all environmental management agencies and special regulatory bodies.

The Department of Education, Culture and Sports (DECS) implements hygiene education programs through schools using the *Teacher-Child-Parent (TCP)* approach. Health and sanitation messages are integrated in the curricula and special activities are designed to make the parents and other family members learn and put them into practice. The program is supplemented by a wide range of learning materials (workbooks) while prototypes of safe water sources and water-sealed toilets are set up in schools. DECS assists in the GOP school toilet building project by identifying priority schools and by supporting DOH's integrated health information, education and communication campaign using the formal and non-formal educational system.

The National Water Resources Board (NWRB) coordinates the overall policy framework for water resources development and management. NWRB was created to guide an orderly and scientific development of all water resources in the Philippines consistent with the principles of optimum utilization, conservation and protection to meet present and future needs. NWRB also deals with water rights issues. NEDA Board Resolution No. 4 strengthens the NWRB by increasing its control over the private extraction of groundwater.

The Metropolitan Waterworks and Sewerage System (MWSS) provides for the potable water supply and sewerage needs of Metropolitan Manila and its contiguous areas.

5.5 Sector Agencies at the Local Level

(1) Provincial Level

Under Sec. 17 of the Local Government Code, The LGU is responsible for the sector functions including: delivery of health services and infrastructure facilities intended to service the needs of the province, such as inter-municipal waterworks, drainage and sewerage, among others.

- 1) The Provincial Planning and Development Office (PPDO) is primarily tasked to formulate economic, social, physical and other development plans and policies for consideration of the local government development council. It conducts continuing studies, researches, and training programs necessary to evolve plans and programs for implementation. It also integrates and coordinates all sector plans and studies undertaken by the different function groups or agencies and monitors and evaluates the implementation of the different development programs, projects and activities in the local government units.

Under its existing organizational set-up, PPDO is composed of 19 personnel distributed in five (5) divisions namely; Administrative, Research Evaluation and Statistic, Special Projects, Plans and Programs, and Local Economic Enterprise (refer to Figure 5.5.1, Supporting Report).

Under the 20% Development Fund a certain amount is allotted to the sector based on the priority lists of projects submitted by the PEO and PHO. The lists mostly include requests coming from different barangay and NGOs. As a matter of policy, each recipient barangay is requested to put up a counterpart, either in cash, material or labor. Project evaluation being implemented is done by the PPDO in coordination with PEO and PHO.

- 2) The Provincial Engineer's Office (PEO) is mandated to initiate, review and recommend changes in policies and objective, plan and programs, techniques, procedures and policies in infrastructure development of the province. It administers, supervises and controls the construction, maintenance, improvement and repair of roads and bridges and other public works projects. It provides engineering services to local government units concerned, including investigation and survey, engineering designs, feasibility studies and project management.

The Office has five (5) divisions consisting of 69 regular/permanent personnel (refer to Figure 5.5.2, Supporting Report). Distribution of personnel by division is as follows:

Administrative Division	8
Roads and Bridges Construction	26
Building and Structure, Construction & Maintenance Division	30
Waterworks/Drainage, Flood Control	1
Quality Control Division	4
TOTAL	69

- 3) The Provincial Health Office (PHO) is composed of 467 personnel mostly assigned to the provincial hospital, six (6) district hospitals and one (1) community hospital (refer to Figure 5.5.3, Supporting Report).

Charged with the task of securing an effective and optimum health care delivery services to the people of Ilocos Sur, the PHO continues to protect the health of the population especially against environmental hazards. Program thrusts are being implemented to its target beneficiaries on approved operational health plans. Some of its impact programs included expanded nutrition and immunization program, control of communicable diseases such as malaria and leprosy; and the improvement of health facilities, equipment and infrastructure support.

Since 1993, the PHO has been implementing an outreach program to help the constituents, especially the indigents, on health problems by extending free clinics, medical missions and other related activities.

(2) Municipal and Barangay Levels

The municipality serves primarily as a general purpose government for the coordination and delivery of basic, regular and direct services and effective governance of the inhabitants within its territorial jurisdiction. It shall endeavor to be self-reliant and shall continue discharging the functions and responsibilities which are necessary for efficient and effective provision of the following basic services: a) Agricultural Services; b) Health and Social Welfare Services; c) Information Services; d) Solid Waste Disposal System/Environmental Management System; e) Infrastructure Facilities; and d) Tourism Facilities.

Both municipal and barangay units are still adjusting to the present devolution government functions process. They still rely on the provincial and central government for funding and guidance in the implementation of sector projects.

1) Municipal Planning and Development Office (MPDO)

Mandate: The MPDO is mandated to formulate integrated economic, social, physical and other development plans and policies for consideration of the local development council. Like its provincial counterpart, MPDO conducts continuing studies,

researches and training programs necessary to evolve plans and programs for implementation. It is also tasked to prepare comprehensive plans and other development planning document.

Activities: The regular activities of the MPDOs include: preparation of the Municipal Comprehensive Plans and other planning documents; assessment, monitoring and evaluation of different projects of the municipal government; and assistance in the integration and coordination of all sector plans.

Resources: The Municipal Planning and Development Office typically consists of the following: MPDC as head of the office, Economist, Draftsman and Utility.

2) Municipal Engineer's Office (MEO)

Mandate: The office is responsible for the administration, coordination, supervision and control of all construction, maintenance, improvement and repair of roads, bridges and other engineering and public work projects in the municipality. It likewise initiates, reviews and recommends changes in policies and objective, plans and programs, techniques and practices in infrastructure development.

Activities: The MEO regularly performs investigation and survey, engineering designs, feasibility studies and project management.

Resources: The MEO is typically composed of the Municipal Engineer, General Labor Foreman, Labor Foreman, Clerk, Carpenter and Electrician.

3) Barangay Councils (BCs)

The Barangay Councils provide among others the maintenance of barangay facilities related to general hygiene and sanitation and solid waste collection. It also submits recommendations to higher legislative bodies for the improvement of the barangay health and social welfare services.

4) Rural Health Units / Barangay Health Stations (RHU/BHS)

RHUs are under the supervision of the Municipal Health Officer. In 1976, the province has registered some 157 Barangay Health Stations (BHS) and Rural Health

Units (RHUs) where a variety of medical services like consultations, treatments, maternal and child health (MCH) examinations, pre-natal and post natal and vaccinations are administered under the direction of the rural health officer.

(3) Field Offices of Central Sector Agencies

1) DPWH District Engineering Office (DEO)

Mandate: The DEO mandate includes the following:

- a) Undertake and evaluate the planning, design, construction and work supervision functions of the department for all highways, flood control and water resources development systems and other public works within the district;
- b) Undertake the maintenance of the above-mentioned infrastructures within the district and supervise the maintenance of such local roads and other infrastructures receiving national government financial assistance;
- c) Coordinate with other department, agencies, institutions, respective local government units within the district in the planning and implementation of the infrastructure projects; and,
- d) Conduct continuing consultations with the local communities to take appropriate measures to make the services of the DPWH responsive to the needs of the general public; compile and submit such information to the regional office and recommend such appropriate actions as may be necessary

Resources: The water and sanitation section of the DEO is a unit under the Construction Division. At present, existing personnel under this unit include a Well Driller Supervisor and a Well Driller.

2) Local Development Council / Provincial Development Council (LDC/PDC)

The main function of the Provincial Development Council is to formulate long term, medium term and annual socio- economic development plans and policies and to formulate local investment incentives to promote the inflow and direction of private investment capital. It is also the function of the PDC to coordinate, monitor and evaluate the implementation of the development programs and projects. The PDC is headed by Governor. It is composed of all mayors of component municipalities,

chairman of the committee on appropriation of the Sangguniang Panlalawigan, the Congressman and representatives of NGOs operating in the province.

(4) Water Districts (WDs)

A water district is a local government corporation formed pursuant to Presidential Decree No. 198, organized for the purpose of serving the water supply requirements of the residents within its franchise area. Technical and financial assistance (loans) are provided by LWUA to the water districts. LWUA also exercises regulatory functions vis a vis the districts.

A water district, to be self-sufficient, is operated in a business-like manner to generate enough revenues from its water sales. The income is used to meet operational expenses, debt service and reasonable reserves for contingencies.

There are five (5) water districts organized in the province. These are: Metro Vigan Water Districts, Santa Water Districts, Tagudin Water District, Santa Lucia Water District and Narvaican Water District.

(5) Rural Waterworks and Sanitation Association (RWSAs)

RWSAs are organized by the beneficiaries to facilitate participation in the planning, construction, operation, maintenance and management of water and sanitation projects.

The RWSAs are operated and maintains the community water supply system. The members contribute at least 10% of the project cost as local equity and pay a monthly service fee sufficient to operate, maintain and authorized the project. Most RWSAs provide Level II or III service. There are 10 registered RWSAs in the province, but at present there are only two associations that are operational. These are the Lingsat and Turod Bliss RWSAs, both in Bantay, Ilocos Sur.

(6) Barangay Waterworks and Sanitation Association (BWSAs)

Republic Act 6716 mandated the construction of at least one Level I (point source) water supply system in all barangays and the formation of a BWSA to operate and maintain the system/s. The association consists of at least 50 households whose goal is to improve the

health and economic well-being of its members, by improving access to safe and potable water for domestic use at a reasonable cost. It is a non-stock cooperative which manages and owns the water supply facility constructed through their own resources or with external capital development assistance.

The association is mandated 1) to operate, manage and own the water supply facility; 2) to mobilize the member's resources (financial contributions to cooperative fund) for the construction, operation and maintenance of the system.

The organizational structure of the BWSA consists of 1) General assembly of members; 2) Board of directors; 3) Election committee; 4) Education and training committee; 5) Audit and supervisory committee and 6) Management staff.

To organize a BWSA, a community meeting is convened and the Barangay leaders are informed that the barangay has been selected by the LGU for possible water supply assistance. This is usually preceded by a resolution from the barangay requesting for the assistance. The survey is conducted to determine whether the Barangay meets the criteria for assistance. The survey also forms the basis of feasibility study which is presented to the Barangay for approval. Upon acceptance by the people, the LGU submits the annual implementation plan (AIP), together with the FS for funding allocation. Upon approval, the application to organize a BWSA is filed with the PPDO who forwards the application to Director of the Cooperative Development Authority, and the BWSA is formed.

In the province, there are no operational BWSAs.

(7) Others (including the private sector and NGOs)

The Caritas Nueva Segovia (NGO) has been involved in water supply development in the form of investment, technical studies and construction of water supply systems. Non-government organizations (NGOs) have also demonstrated capability to undertake project development and implementation with the participation of the community.

5.6 Project Management Policies/Activities at the Local Level

(1) Project identification and priority setting

PPDO, PEO - Projects are identified through the following scheme: In the Five-Year Provincial Investment Plan and in the Roads and Bridges Plan, various infrastructure

projects are already identified and prioritized. Aside from these documents, various letters/resolutions/requests from different barangay, municipalities, organizations and NGOs are basis of project identification and prioritization. Oftentimes, it is the local chief executive who sets the priorities. Sometimes, it is the Sangguniang Panlalawigan with concurrence of the chief executive.

PHO - Projects are identified and prioritized through the various government hospitals. At times, projects are also identified through Provincial Health Board and letter requests from RHUs, barangays and NGOs. From all these sources of information, the Provincial Health Officer makes his recommendations to the local chief executive. If the request is channeled through the Sangguniang Panlalawigan, the Body then decides which projects are priority with the concurrence of the local chief executive.

(2) Project preparation and planning

For water supply projects, the feasibility study is done by the PPDO while the PEO undertakes the detailed design. For sanitation projects, feasibility study and planning are both done by the PHO. Only projects which have been identified and priority-listed undergo feasibility study and detailed design.

(3) Project implementation

Locally-funded sanitation projects are implemented by the PHO while water supply projects are constructed by the DEO following national standards. The implementation of all infrastructure projects is the responsibility of the provincial government and DPWH-DEO. Non-infrastructure projects are handled by the concerned agencies like the DOH and the DILG.

(4) Operation and maintenance

The LGU provides technical assistance to establish RWSAs to operate and maintain water supply projects. The Provincial Government receives technical assistance from the DOH and the DILG in establishing RWSAs and in providing skills and capability-building training to them.

(5) Monitoring and evaluation

Current monitoring and evaluation systems focus on measuring the physical output of the sector projects. It is however weak in impact evaluation. Physical accomplishment are noted, although measurement of socio-economic benefits is difficult.

(6) Financing

The present source of local financing for the sector projects is the 20% Development Fund from the IRA of the province. There are also donors for sector projects. General appropriations funding is generally channeled through central level agencies.

(7) Contract administration

The Government Accounting and Auditing Manual in the procurement of goods and services and in the awarding of civil works is followed in the province.

(8) Linkage with national government agencies

The province works closely with the Regional Development Council for endorsement of programs/projects requiring national or foreign funding.

5.7 External Support Agencies Active in the Sector

(1) Multilateral Agencies

The World Bank (IBRD) currently supports the First Water Supply, Sewerage and Sanitation Sector Project or FW4SP (Loan 3242PH). This project provides capital funds (US\$ 58.0 M) for rural water supply in Luzon provinces and sanitation nationwide based on completed provincial master plans. The project concept calls for a community-based approach through BWSAs. The project is due to close in 1995 and preparations for a successor project, with DILG as implementing agency, will be started shortly. In addition, the Bank is preparing two new loans for LWUA implementation - the Urban Water Supply Project and the Urban Sewerage and Sanitation Project. Through its various trust fund facilities, the Bank has arranged for various technical assistance grants and other support activities.

The Asian Development Bank (ADB) supports the Second Island Provinces Project (1052-PHI-SF). The project provides US\$24.0 M (loan) to a counterpart budget of Pesos 202.45 M. A small technical assistance component has been allocated for well drilling, training, water quality and installation of pumps. This DWPH-executed project was effective through 1994. Both of the island provinces projects focus on technology and the physical installation of facilities. A follow-on third "islands project" is under discussion. ADB is also supporting the LWUA Municipal Water Supply Project which includes a technical assistance grant for institution building activities at LWUA and the eight (8) participating WDs.

The United Nations Development Programme (UNDP), through its Danish Trust Fund facilities, has actively supported the preparation of provincial master plans. In addition, its Institution Building through Decentralized Implementation of Community-Managed Water and Sanitation Projects, is assisting DILG-PMO in developing models and approaches for community-based water and sanitation in selected pilot areas. The project bears a strong poverty alleviation focus. UNDP is also in the final stages of a country project to assist GOP in strengthening the groundwater databank in the country through a US\$ 682,500 grant.

The United Nations Children's Fund (UNICEF) supports the sector through the Philippines Plan of Action for Children. Apart from hardware support in priority project sites, UNICEF assists NBDA in updating of the national master plan. UNICEF works through the inter-agency committee on environmental health and through NGOs. With the World Health Organization (WHO), UNICEF is assisting in the preparation of information, education and communication (IEC) materials and in strengthening the sector monitoring system.

(2) Bilateral Agencies

The Japan International Cooperation Agency (JICA) extends technical cooperation in the basic design study for the Rural Environmental Sanitation Project (Phase III). This project, to be jointly implemented by DPWH and DOH, envisages the construction of Level I and II water systems and school toilet facilities in rural areas of ten (10) provinces through grants. With DPWH, rural water supply systems are being constructed at the evacuation centers for the Pinatubo refugees. JICA also supports the groundwater development study in Cavite province (with LWUA) and the institutional development

activities at MWSS. JICA is providing the services of the Study Team preparing provincial sector plans in nine (9) provinces.

The Overseas Economic Cooperation Fund (OECF) is financing the RWS IV Project through 1995. It provides a loan of up to Yen 5.08 B to counterpart funds of Pesos 400 M for the construction/rehabilitation of Level I systems, construction of workshop buildings and procurement of various equipment. OECF is supporting the Provincial Cities Water Supply Project of LWUA and the Angat Water Supply Optimization Project of MWSS.

The Australian International Development Assistance Bureau (AIDAB) is supporting the Central Visayas Water and Sanitation Project through a A\$ 14.65 M grant. The project is implemented by the LGUs and the regional development council. Project components include: planning and monitoring information systems; infrastructure planning and rehabilitation; and institution building with an emphasis on community management based on experiences from other AIDAB-funded projects. The Project has been extended through 1997.

5.8 Current Community Development and Training Approaches

5.8.1 Community Development

The principal experience of the province on community mobilization for water and sanitation was with the former Barangay Water Program. The establishment of community-based RWSAs was done by the PPDO following the guidelines set by the RWDC program. The PPDO had organized the RWSAs in the different towns of the province.

The Community Workers (CWs) assists the communities to identify their needs and problems, and consequently proposes suitable and viable projects to be implemented in the community. The CWs also coordinate with different financial institutions to seek financial assistance for the proposed projects.

5.8.2 Human Resources Development and Training

There are training activities being organized by the province. The programs which have been organized were on well drilling and system maintenance.

The Department of Health through the Provincial Health Office conducts rural sanitary inspector training and seminars on environmental health program; training of food handlers and food operators on food safety.

5.8.3 Sanitation/Hygiene Education

The health/hygiene education of the PHO focuses mainly on public information and dissemination through an inter-agency coordination and collaboration. Implementation of health and sanitation programs utilizes community volunteer health workers (CVHWs), rural sanitary inspectors, rural health midwives, public health nurses and rural health doctors who compose the RHU. Health oriented NGOs also assist in disseminating different public health services to the communities. IEC materials are aired over local radio programs, published in local papers and disseminated in "Purok Classes". Health educational materials from the central DOH consisting of posters, streamers, comics and stickers are used.

Under the initiative of DECS, selected public elementary schools in the province implement the 'Teacher-Child-Parent Approach' which involve the participation of other members of the family in teaching health and hygiene education to the students.

5.9 Existing Sector Monitoring

(1) National Level

The primary sources of sector data are the field office and staff of DPWH, DOH, LWUA, MWSS and NSO. Other agencies, including NEDA and LGUs, use data from these agencies. Each of these agencies runs its own project (or activity) monitoring systems largely based on required reports of its field offices. Current reporting requirements focus on physical accomplishments and capital expenditures. One serious shortcoming is the assumption that all constructed facilities are functioning and in use.

Apart from regular project monitoring, instructions are issued to conduct inventories of facilities (with actual status). The last completed inventory was done in 1990. These surveys are done in conjunction with sector or area planning studies. Only the NSO gathers and assesses information nationwide on a regular basis as part of its Census on Population and Housing (CPH). The CPH "long form" is administered on 10% of the

households once every ten years. NSO plans to increase the CPH "short form" frequency to every five years. Water and sanitation is not included in the short form.

There is wide dissatisfaction among implementors themselves over the existing monitoring system. Monitoring report preparation is seen as a nuisance to performing one's job, and is thus haphazardly done. This leads to the problem of reliability of information coming from the field. There is a need to establish a system which is perceived as having a direct link to performance, similar to project-based monitoring.

(2) Local Level

Sector Monitoring is done by PPDO personnel in charge of water supply. However, only those projects under the Level I system being implemented by the provincial government are being monitored by PPDO. The monitoring system is focused on the procurement and delivery of materials, and implementation of the project as per work schedule. Thus, the monitoring and evaluation report only shows, for example, the number of hand pumps delivered and installed in particular areas of the province.

The evaluation and monitoring mechanism being practiced in the province is design to generate information on the status of project implementation and to gather problem areas on the implementation of projects so that remedial actions can be readily undertaken at the earliest time possible. The monitoring and evaluation system also requires the institutionalization of reporting system relative to the progress and accomplishments of the projects. Feedback and comments on the proposed and implemented projects are also gathered.

Chapter 6

***PAST FINANCIAL PERFORMANCE
IN WATER SUPPLY AND SANITATION***



6. PAST FINANCIAL PERFORMANCE IN WATER SUPPLY AND SANITATION

6.1 General

Locally funded programs and projects for the water supply and sanitation sector have been devolved from central government agencies to LGUs since 1992 according to the Local Government Code of 1991 and NEDA Board Resolution No. 4 (1994).

In order to clarify the flow of funds to the sector in this transitional period and to apply for the planning of financial arrangements, this chapter sets forth (1) past public investment to the sector by central government agencies and LGUs; (2) roles of the Internal Revenue Allotment (IRA) to the sector financing; (3) cost recovery and financial performances in WDs or other associations; and (4) affordability of users at present.

6.2 Past Public Investment

6.2.1 Past Public Investment by the Central Agencies and LGUs

The recent development of the water supply and sanitation sector in the province was mainly achieved by line agencies such as DPWH, LWUA, DILG and DOH as well as the provincial government, which is shown in Table 6.2.1.

Table 6.2.1 Previous Sector Investment to the Province by Concerned Agency

Unit: 1,000 Pesos

Funding Category		1990-94				
Agency	Funds	Level I	Level II	Level III	Sewerage	Sanitation
DILG						
DPWH	Foreign Fund 1)	361				
	Local Fund 2)	24,272				
LWUA 3)				8,091		
DOH		16				69
Province	Provincial Government	2,183 4)				64 4)
Municipality	Municipal Government					
Others 5)		11,038	4,000			

Sources: Each central agency and the provincial government

Notes:

- 1) Investment in 1990 only.
- 2) Investment between 1990 and 1991; Locally funded projects were devolved to LGUs since 1992.
- 3) Investment from 1991 to 1994.
- 4) Investment in 1994 only.
- 5) Countryside Development Fund (CDF)

Investments for Level I facilities from the local fund of DPWH amounted to P 24,272 thousand during the years 1990 and 1991, covering 437 shallow wells, 181 deep wells, 31 spring development and 9 rehabilitation works. DPWH had not provided any local funds to the sector since 1992.

The LWUA had released a total of P 8,091 thousand during the period of 1991 to 1994 to formulate or to improve and expand the water supply facilities of 5 water districts; Narvacan, Sta. Lucia, Sta. Maria, Tagudin and Vigan Metro WDs.

DILG had no investment from 1990 to 1994. DOH released P 85 thousand in the same period. The provincial government also financed an amount of P 2,247 thousand for the relevant sector in 1994. Further, CDF had disbursed P 15,038 thousand for the water supply sector from 1990 to 1994.

According to "Philippines Water Supply Reform Study in 1993", P 311 per capita was invested on water projects in Metro Manila, P 200 per capita on projects in urban areas outside Metro Manila, and about P 30 benefiting the rural population during 1990-1991.

In the province, an estimated amount of P 47 per capita was invested by DPWH during the same period. From the fact that most of the investments were allocated to Level I water supply system in the rural areas, per capita investment of the province is larger than the national average of P 30 per capita, even if the investments by other agencies and LGUs were disregarded.

6.2.2 Sources of Local Funds

According to the Local Government Code of 1991, 40% of the national internal revenue taxes of the 3rd fiscal year preceding the current year (from 1994 onwards) is allocated to LGUs nationwide, specifically to the administrative units of (1) province (23%); (2) city (23%); (3) municipality (34%); and barangay (20%). Further, respective Internal Revenue Allotments (IRA) in different administrative levels are allotted to all administrative units concerned according to the manner of calculation in terms of population, land area and other factors.

As shown in Table 6.2.2, IRA allotted to the province ranged from 0.9 to 1.1 % of the national total IRA between 1990 and 1994. On the other hand, the total IRA to all

Table 6.2.2 Past Internal Revenue Allotment to the Province of Ilocos Sur in 1990-94

Unit: Pesos

	1990	1991	1992	1993	1994
National					
I National Total of IRA					
(a) IRA to all provinces	2,031,174,331	2,697,481,707	4,571,136,402	8,445,600,000	11,498,994,198
(b) IRA to all municipalities *	3,054,601,475	4,046,837,742	7,127,522,550	12,484,800,000	16,325,288,074
Province					
II IRA to Ilocos Sur Province					
(1) Total: (2) + (3)	56,403,768	76,855,325	150,778,356	254,232,161	351,407,226
(2) Provincial Government	19,130,950	29,372,888	50,067,324	88,876,358	131,148,285
Percentage against (a)	(0.94)	(1.09)	(1.10)	(1.05)	(1.14)
(3) Municipalities	37,272,818	47,477,437	100,711,042	165,355,793	220,258,946
Percentage against (b)	(1.22)	(1.17)	(1.41)	(1.32)	(1.35)
III Total Income of the Provincial Government	26,850,233	34,847,019	55,257,651	104,488,970	188,370,115
Percentage of IRA	(71.25)	(84.31)	(90.61)	(85.06)	(69.62)
IV Total Income of Municipalities**	35,525,971	81,170,015	122,489,643	207,713,731	n. a.
Percentage of IRA	(43.22)	(42.04)	(82.27)	(79.51)	
Municipality					
V IRA to Municipalities ***					
Total	37,272,818 (100.0)	47,477,437 (100.0)	100,711,042 (100.0)	165,355,793 (100.0)	220,258,946 (100.0)
1. Ablen	783,647 (2.1)	1,017,910 (2.1)	2,658,407 (2.6)	4,443,161 (2.7)	5,698,615 (2.6)
2. Banayoyo	552,540 (1.5)	706,506 (1.5)	2,425,706 (2.4)	3,136,131 (1.9)	4,280,145 (1.9)
3. Bantay	1,618,108 (4.3)	2,043,679 (4.3)	3,662,291 (3.6)	6,276,629 (3.8)	8,459,935 (3.8)
4. Burgos	767,172 (2.1)	967,692 (2.0)	2,285,244 (2.3)	3,769,955 (2.3)	5,035,465 (2.3)
5. Cabugao	1,711,161 (4.6)	2,126,682 (4.5)	3,705,463 (3.7)	6,359,547 (3.8)	8,529,532 (3.9)
6. Candon	2,430,959 (6.5)	3,082,585 (6.5)	4,925,405 (4.9)	8,564,606 (5.2)	11,282,205 (5.1)
7. Caoayan	1,041,290 (2.8)	1,275,711 (2.7)	2,625,124 (2.6)	4,358,380 (2.6)	5,944,314 (2.7)
8. Cervantes	1,258,970 (3.4)	1,681,860 (3.5)	3,607,664 (3.6)	6,202,819 (3.8)	7,949,820 (3.6)
9. Galinuyod	645,768 (1.7)	837,396 (1.8)	2,595,577 (2.6)	3,443,385 (2.1)	4,678,651 (2.1)
10. G. del Pilar	586,385 (1.6)	757,430 (1.6)	2,666,621 (2.6)	3,621,096 (2.2)	4,738,991 (2.2)
11. Lihida	412,612 (1.1)	552,158 (1.2)	1,765,206 (1.8)	2,812,018 (1.7)	3,714,171 (1.7)
12. Magsingal	1,455,225 (3.9)	1,837,369 (3.9)	3,452,455 (3.4)	5,877,906 (3.6)	7,900,951 (3.6)
13. Nagbukel	477,901 (1.3)	597,293 (1.3)	1,821,621 (1.8)	2,907,485 (1.8)	4,011,330 (1.8)
14. Narvacan	2,140,836 (5.7)	2,661,481 (5.6)	4,439,856 (4.4)	7,712,430 (4.7)	10,116,605 (4.6)
15. Quirino	983,422 (2.6)	1,314,656 (2.8)	3,228,874 (3.2)	5,540,167 (3.4)	6,983,250 (3.2)
16. Salcedo	748,581 (2.0)	926,715 (2.0)	2,166,803 (2.2)	3,512,668 (2.1)	4,828,873 (2.2)
17. San Emilio	732,658 (2.0)	978,356 (2.1)	2,524,617 (2.5)	4,228,866 (2.6)	5,519,073 (2.5)
18. San Esteban	557,677 (1.5)	708,269 (1.5)	1,954,009 (1.9)	3,110,701 (1.9)	4,258,387 (1.9)
19. San Ildefonso	449,589 (1.2)	582,416 (1.2)	1,773,985 (1.8)	2,806,750 (1.7)	3,909,193 (1.8)
20. San Juan	1,292,947 (3.5)	1,631,930 (3.4)	3,143,636 (3.1)	5,260,536 (3.2)	7,121,922 (3.2)
21. San Vicente	707,387 (1.9)	903,100 (1.9)	2,147,574 (2.1)	3,498,613 (2.1)	4,789,493 (2.2)
22. Santa	952,858 (2.6)	1,171,615 (2.5)	2,547,749 (2.5)	4,239,234 (2.6)	5,663,703 (2.6)
23. Santa Catalina	775,198 (2.1)	982,870 (2.1)	2,227,514 (2.2)	3,664,138 (2.2)	5,027,481 (2.3)
24. Santa Cruz	1,709,037 (4.6)	2,269,837 (4.8)	3,990,850 (4.0)	6,911,197 (4.2)	9,001,757 (4.1)
25. Santa Lucia	1,276,546 (3.4)	1,627,755 (3.4)	3,115,700 (3.1)	5,256,000 (3.2)	7,107,735 (3.2)
26. Santa Maria	1,503,242 (4.0)	1,839,971 (3.9)	3,362,694 (3.3)	5,693,617 (3.4)	7,727,957 (3.5)
27. Santiago	1,024,359 (2.7)	1,334,884 (2.8)	2,831,888 (2.8)	4,735,019 (2.9)	6,285,385 (2.9)
28. Santo Domingo	1,319,582 (3.5)	1,669,708 (3.5)	3,181,797 (3.2)	5,374,747 (3.3)	7,324,436 (3.3)
29. Sigay	537,155 (1.4)	703,058 (1.5)	2,635,798 (2.6)	3,545,586 (2.1)	4,502,866 (2.0)
30. Sinit	1,445,334 (3.9)	1,804,694 (3.8)	3,395,199 (3.4)	5,766,046 (3.5)	7,775,716 (3.5)
31. Sugpon	760,430 (2.0)	959,747 (2.0)	2,611,240 (2.6)	4,413,214 (2.7)	5,540,768 (2.5)
32. Suyo	844,859 (2.3)	1,107,031 (2.3)	3,128,362 (3.1)	4,433,661 (2.7)	5,781,883 (2.6)
33. Tagudin	1,639,125 (4.4)	2,169,373 (4.6)	3,784,369 (3.8)	6,503,022 (3.9)	8,618,830 (3.9)
34. Vigan	2,138,888 (5.7)	2,655,306 (5.6)	4,321,710 (4.3)	7,377,059 (4.5)	10,157,518 (4.6)

Sources:

(1) Department of Budget and Management, (2) Bureau of Local Government Finance (DOF) and (3) Provincial Annual Report

Notes:

*IRA to barangays is not included. **Data do not fully cover all the municipalities in 1990 and 1991. ***Figures in bracket are shares (%) in the total of all municipalities in the province.

municipalities of the province was arranged with 1.2 - 1.4% to the national total IRA for nationwide municipalities (refer to Table 6.2.1, Supporting Report).

For the provincial government, the IRA has been the most important financial source of the total revenue as experienced, with 70-90% of the total revenue of the provincial government between 1990 and 1994. The expenditures of the provincial government for the relevant sector in 1994 were reported at P 2,247 thousand, about 1.7% of the IRA.

As for municipality, distribution share to each municipality in the province was within a certain range between 1990 and 1994. Municipalities, which had the share of more than 4% of the provincial total in 1994, were Candon, Narvacan, Sta. Cruz and Vigan.

6.3 Cost Recovery

The capital cost for Level I systems is free to the community, while operation and maintenance is the responsibility of the associations. As for Level II systems, the capital cost is shouldered by the RWSA through a loan or grants. Water charges collected by each association cover cost of operation and maintenance, and loan amortization. According to the Loan Department of LWUA, the new loan disbursement to RWSAs has been stopped for the last couple of years.

For Level III system, WDs or RWSAs bear the entire capital cost financed by LWUA through loans with concessional terms of 8.5% - 12.5% interest rate and repayment period extending up to 30 years. Less capable WDs are granted soft loans that are interest free during the first 5 years' operation. In the occasion of the first assistance by the LWUA, the loan for the full investment required could be provided for the WDs. For the expansion/rehabilitation works of the WDs, 90 % of required investments may be granted by a loan and remaining 10% shall be arranged by the equity of WDs. The cost of amortizing the loan and operation and maintenance of the system is recovered through monthly water bills. Details of financial performance with cost recovery are discussed in section 6.5.

Regarding sanitation sector, construction of the superstructure and the depository of household toilet is through self-help.

6.4 Affordability

Table 6.4.1 indicates the affordability by level of sector service. At present the current water bills in the province seem to be within an affordable range based on the experiences, although actual income is different from municipality to municipality and barangay to barangay.

Table 6.4.1 Affordability in Water and Sanitation Services

Income/Level of Services	Amount (Pesos)	% to Monthly Income	Affordable Range (%) 5)
Median of Monthly Income 1)	4,331	100.0	-
Average Level III: Monthly Water Bill 2)	172	4.0	5.0 or less
Average Level II: Monthly Water Bill 3)	30 - 60	0.7 - 1.4	2.0 - 3.0
Mo. Level I Expenditures 3)	5 - 10	0.1 - 0.2	1.0 or less
Private Toilet Construction Cost - Flush Type Toilet 4)	34,900	-	-

Notes:

- 1) 1991 Family Income and Expenditures survey, NSO (Median of the provincial figure is inflated to 1994 prices)
- 2) Data from LWUA. It is assumed that 21 cum will be consumed per family
- 3) Common figures in the province
- 4) Current prices by JICA Study Team
- 5) Based on the experiences mainly from LWUA, DPWH and DILG

On the other hand, construction cost of private toilet seems to be expensive comparing with the family income. The estimated cost of flush type toilet facility is 8 times higher than the median monthly family income in the province. Therefore, subsidy from LGUs may be necessary.

6.5 Past Financial Performance of WDs and RWSAs/BWSAs

Five (5) WDs are currently managed in the province. Additional 4 WDs were institutionally established, but they are not operational. Table 6.5.1 and Table 6.5.2 show financial indicators and loan status of WDs in 1995, respectively. The Tagudin and Vigan Metro WDs seem to be financially sound under the status that the revenue exceeded the total cost of operation and maintenance and monthly amortization, although some arrears are reported. As of now, 5 WDs have received loans of P 31,492 thousand from LWUA.

Most of the facilities managed by RWSAs and BWSAs were constructed under grant conditions by central government agencies (DPWH and LWUA) and LGUs with the recipient providing some equity contribution in the form of materials or labor. The associations are responsible for the operation and maintenance of the systems, but financial performance of the associations tends to face difficulties partly because the beneficiaries do not recognize the cost requirements. The information from the LWUA on the registration of Level II systems revealed that there are 10 RWSAs in the province, to which a total of P 2,708 thousand was invested for the construction of facilities by different central government agencies.

Table 6.5.1 Financial Indicators of Water Districts

Water District	Descriptions						
	No. of Metered Connections	No. of Flat Rate Connections	Average Monthly Rate	Average Consump. per Conn.	Average O&M Costs	Average Revenue	Collection Efficiency
	Nos.	Nos.	Pesos/cu.m.	cu.m./mo.	cu.m./mo.	Pesos/mo.	Percent (%)
Sta. Lucia	320	-	9.17	15	n.a.	n.a.	65
Tagudin	989	-	10.86	17	89,576	214,745	95
Vigan Metro	2,354	-	7.15	24	386,812	532,571	79

Source: IDS, LWUA

Note: There are six (6) other water districts in the province. Among them, data of 2 WDs (Narvacan and Santa) are not available and 4 WDs are not operational.

Table 6.5.2 Loan Status of Water Districts

Water District	Descriptions			
	Total Loan Availed	Remaining Payment Period 1)	Average Monthly Amortization	Current Arrears
	1000 Pesos	Months	Pesos	1000 Pesos
Sta. Lucia	492	285	3,416	-
Tagudin	13,319	258	106,308	144
Vigan Metro	14,334	258	139,875	3,106
Narvacan	3,342	289	19,671	456
Santa	455	110	5,024	352

Source: Loans Operation Div., LWUA (As of May, 1995)

Note: 1) The longest remaining payment period among several loans is indicated.

Chapter 7

WATER SOURCE DEVELOPMENT



7. WATER SOURCE DEVELOPMENT

7.1 General

The study on water source development covers the entire province to come up with a "Groundwater Availability Map" which identifies the areas with available potable water sources. The study gives emphasis on groundwater sources rather than surface water considering the better quality and economy of utilizing groundwater for domestic water supply.

The study has two major components: (1) interpretation of existing geological and groundwater conditions, (2) preparation of Groundwater Availability Map to show groundwater potential areas under three categories. Standard well specifications by municipality were also established as reference for the future requirement of the water supply sub-sector.

The major data used in the study were obtained from concerned agencies (NAMRIA, BMGS, NWRB, LWUA, DPWH and PPDO) and supplemented by the information gathered through questionnaires. Among the information, the Geologic Map published by then BMGS, the Water Resource Investigation Report and the Well Inventory Database of NWRB were essential for the analysis of geological characteristics, projection of high yielding area and possible area with salt water intrusion, and classification of groundwater potential areas, respectively.

The Groundwater Availability Map may be used for provincial level master plan at present. However, updating the map is a requisite to gain more information on prevailing groundwater conditions using the questionnaires prepared for the study. An annual review and updating of the database will enable the LGUs to implement water source development on a project site basis.

The database on existing groundwater sources and their conditions is summarized in Table 7.1.1 (Well data from each municipality are presented in Table 7.1.1, Water Source Information, Data Report). It shows that there are 30,314 shallow wells, 739 deep wells and 218 developed springs existing in the province. About 16% of these water sources are public facilities. Of the total wells, 92% remains functional at present. In addition to the above sources, 36 undeveloped springs were accounted.

Table 7.1.1 Existing Groundwater Sources in the Province

Description	Shallow Well	Deep Well	Spring	Total
1. Number of water sources	30,314	739	218	31,271
2. Profile of different sources	97%	2%	1%	100%
3. Owned by Government Agency	4,378	543	217	5,138
4. Privately owned	25,936	196	1	26,133
5. Sources with quality problem	-	-	-	-
6. Non-functional wells	2,184	345	-	2,529
7. Undeveloped	-	-	36	36
8. Untapped springs	-	-	8	8

7.2 Geology

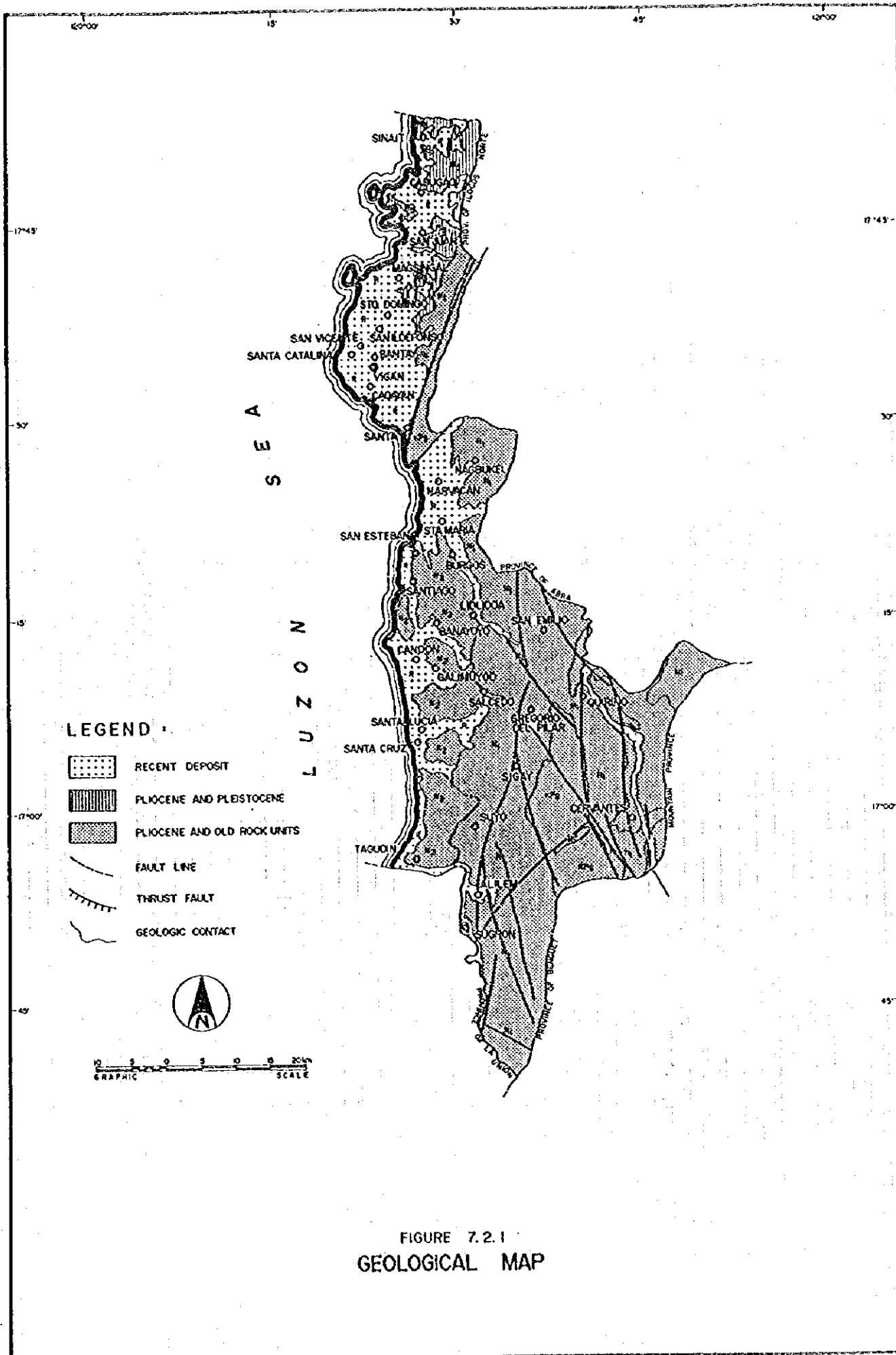
The rock units in the province are classified into three (3) main groups based on the ages of rock formations. These are, from the oldest to youngest, the Pliocene and Older Rocks, the Pliocene to Pleistocene Rocks and the Recent Deposits. The grouping of the rocks is related to their potential as groundwater sources. The younger rocks are considered the most important to groundwater because of their high porosity and permeability relative to the older rocks. The distribution of these rock groups is shown in Figure 7.2.1, Geological Map of the Province.

(1) Pliocene and Older rocks

These rocks, covering about 80% of the province, are mostly found in the mountainous southern half of Ilocos Sur. The Eocene andesite lava and pyroclastics and Miocene dacite intrusive are dominant in the southeastern portion. In the eastern and central part of the province from Magsingal to Sugpon; the Early to Late Miocene conglomerate, sandstone, shale, limestone with minor basalt flows and pyroclastics are widespread. The rocks are cut apart from the younger rocks by a north-northeast trending fault in the northwestern section.

(2) Pliocene to Pleistocene rocks

The rocks comprised approximately 5% of the total provincial land area. They sporadically occur in the northern hilly part from Sinait to Sto Domingo. These rocks are composed of alternating layers of semi-consolidated sandstone, shale and siltstone with occasional tuff, limestone, and conglomerate. These are reported to have thickness ranging from 1,600 to 3,300m and in parts underlie the Recent alluvium as revealed by some of the wells in the province.



(3) Recent deposits

These deposits are widely distributed in the western half of the province covering about 15% of the provincial land area. They are composed of loose clay, silt, sand and gravel, and are confined along the coastal plains and lower extensions of large river systems. The deposits have total thickness of more than 50m as indicated by the wells drilled into the formation.

7.3 Groundwater Sources

7.3.1 Classification of Groundwater Sources

For planning purposes, the province is divided into the following groundwater categories:

(1) Shallow well areas

These are areas having water bearing rock formations extending not more than 20m in depth from the ground surface. Shallow well areas are usually located in alluvial and coastal plains where Recent unconsolidated materials overlie impervious rocks at shallow depth. The extent of completely shallow well area is limited, because most of the Recent formations are thick or deposited on the Late Pliocene to Pleistocene rocks that usually have multiple aquifers located at greater depths.

(2) Deep well area

In deep well areas, the aquifers are located more than 20m from the ground level. These areas could be found in portions underlain by the Pliocene to Pleistocene and Recent formations. Most of these areas have more than one aquifer occurring at various depths. Areas where shallow and deep wells could be developed are categorized as deep well areas.

(3) Difficult area

These are areas not suitable for well. The areas under this category are largely consist of rock formations older than Pliocene in age. The groundwater availability in the aforesaid rocks is very low and usually confined in the opened rock fractures. Springs are the common sources of water supply in these areas.

In addition to the above classification, areas potential to have high yielding aquifers and with saline water intrusion problem are also presented based on NWRB's geo-resistivity survey and results of water quality examination of some wells.

7.3.2 Groundwater Availability in the Province

The Groundwater Availability Map presented in Figure 7.3.1 shows the distribution of the three groundwater categories in the province. It also depicts areas potential for high yielding wells and with saline water intrusion. The well information, such as depth, static water level, and specific capacity; given in the figure are averages of limited data available in each municipality that were taken as reference. The major databases used in the preparation of the map were obtained from BMGS and NWRB. The methodology and procedure with respective outputs are discussed in Section 7.3, Supporting Report. Technical well information in each municipality is also presented in Table 7.6.1 of the same report.

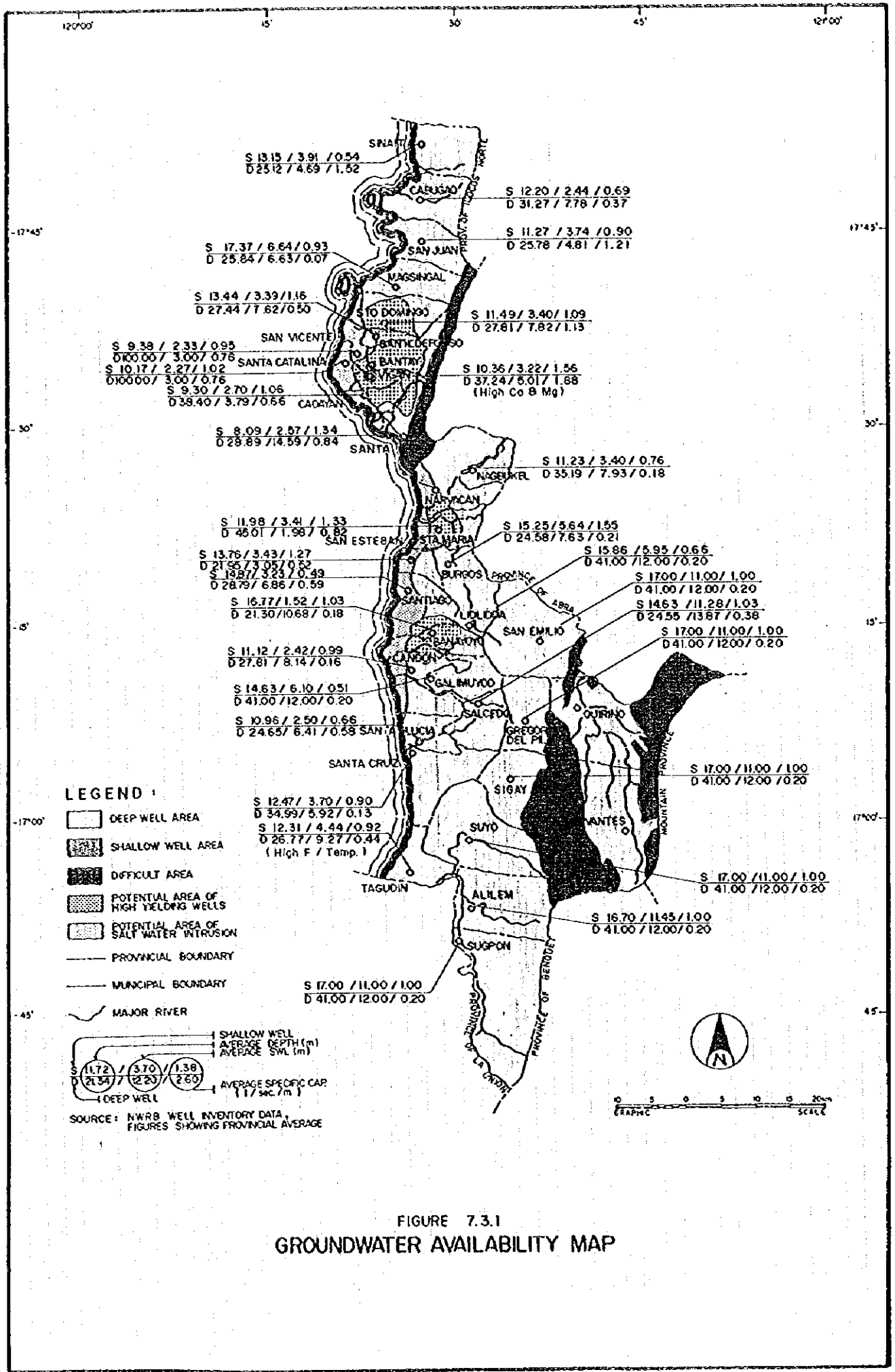
As mentioned above, the interpretation of existing groundwater condition is based on limited data. The well parameters (depth, static water level and specific capacity) indicated in the map are anticipated to vary within a specific municipality, since the ground characteristics change with depth and direction. Particularly, the specific capacities of wells are very variable, which depend on aquifer characteristics, well type and design, and method of construction. Most of the wells in the inventory of NWRB are driven wells, which have limited intake sections that are usually not properly set in the most permeable layers. Thus, majority of these wells have low specific capacities. Bored and gravel packed wells are expected to have higher specific capacities than wells constructed using conventional methods.

(1) Shallow well areas

No shallow well area is defined in Ilocos Sur. The Recent alluvium and beach deposits, where shallow aquifers usually occur, are thick or underlain by formations with deeper aquifers. The shallow wells in the province are driven to an average depth of 11.68 m (2.74 to 19.82m). These well have average static water level of 3.5 mbgl (0.61 to 14.60 mbgl) and average specific capacity of 1.03 l/sec/m of drawdown (0.03 to 7.57 l/sec/m).

(2) Deep well areas

These areas cover approximately 80% of the province. They are mostly located in the northern, western and central portions. The existing deep wells in Ilocos Sur have an average depth of 31.90m (20.10 to 132.93 m) with average static water level of 7.78 mbgl (1.22 to 24.10 mbgl) and average specific capacity of 0.82 l/sec/m of drawdown (0.01 to 12.60 l/sec/m).



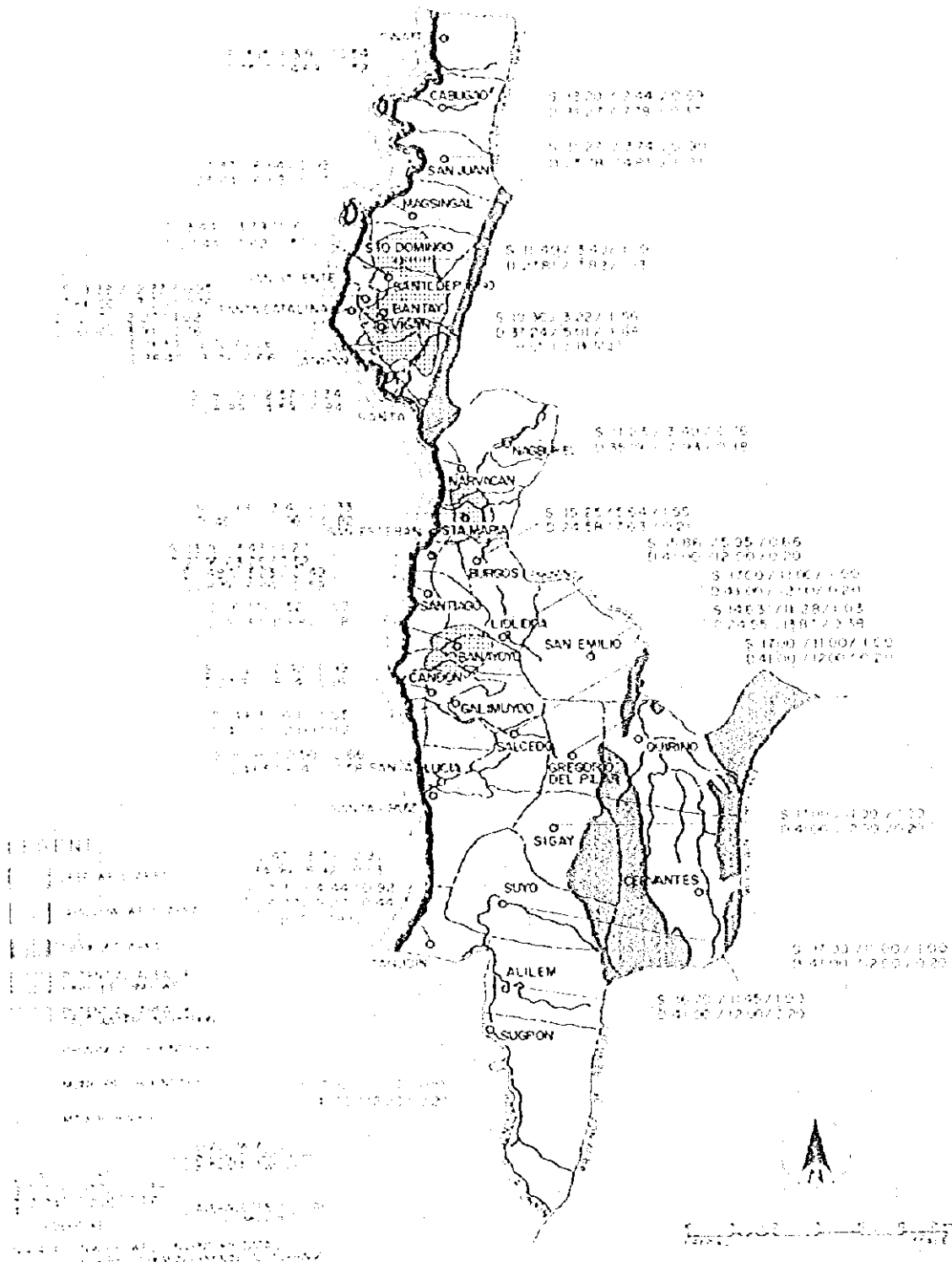


FIGURE 7.3.1
GROUNDWATER AVAILABILITY MAP

(3) **Difficult areas**

About 20% of the province is classified under difficult area category. These areas are mainly located in the eastern hilly and mountainous municipalities of Cervantes, Quirino, Sigay, San Emilio, Gregorio del Pilar, Burgos, Lidlidda, Suyo, Atilem and Sugpon.

(4) **Water quality of groundwater**

The groundwater in the province is generally potable except in some areas with high iron, manganese and salinity concentrations. Water resources investigation conducted by NWRB and the water supply improvement studies for various water districts in the province identified the areas with water quality problem as follows:

1) **Possible area with salt water intrusion**

The geo-resistivity survey of NWRB delineated the western coast of the province as possible area intruded by saline water. This conformed with the results of water quality analyses of some wells in the area.

2) **Area with high iron and manganese concentrations**

According to the water supply improvement studies of the water districts in Ilocos Sur, some portions of Tagudin and Vigan have high iron and manganese contents. The high concentrations of these chemicals are possibly caused by weathering of iron-rich rocks of the recharge area.

3) **Areas affected by other chemicals**

Hard water in some parts of the province is attributed to high concentration of calcium and magnesium derived from the limestone members of the different rock formations underlying Ilocos Sur. Furthermore, high fluoride content is reported in Tagudin, which probably comes from thermal water.

The areas mentioned above are indicated in the Groundwater Availability Map:

7.4 Spring Sources

Spring is a natural outlet of groundwater at the ground surface. It occurs when water table intersects the ground surface, usually along the contacts of pervious and impervious rock formations and through rock fractures. Because of the intense fracturing, particularly older

formations, and the presence of large solution openings in limestone, secondary permeability is induced to the rocks that favors spring development.

For this study, springs are categorized into developed, undeveloped and untapped springs. A developed spring is utilized and must have sanitary protection, otherwise it is classified as undeveloped spring, which is considered as unsafe water source. An untapped spring, as the name implies, is unutilized and flowing in its natural state.

The province is dissected by several faults and has undergone series of folding that resulted in intense fracturing, basically in older rock formations. Based on the inventory of water sources made through the study, there are 201 developed springs currently serving the province. These springs have discharges ranging from 0.25 to 2.00 l/sec. A total of 36 undeveloped springs is reported in the municipalities of Galimuyod, Gregorio del Pilar, Lidlidda, Nagbukel, Quirino, San Juan, Santiago, Sugpon and Suyo. These springs have yields varying from 0.01 to 8.00 l/sec. Eight (8) untapped springs have been identified in Burgos, Gregorio del Pilar, Magsingal, Nagbukel, Quirino and Santa with potential yield ranging from 0.50 to 20.33 l/sec. The technical information of springs in each municipality is presented in Table 7.4.1, Supporting Report.

7.5 Surface Water Source

The province has several major rivers, namely, Abra, Amburayan, Buaya, Santa Maria, Bucong, Oaig Daya, Narvacan, San Ildefonso and Cabugao rivers. These rivers are generally flowing westward and empty into the Luzon Sea. The drainage areas of these rivers range from 25 to more than 500sq.km. They are currently use for irrigation. Among these rivers, Abra and Santa Maria rivers are potential sources of domestic water supply considering their perennial flow and proximity to highly populated municipalities of the province.

Water quality analysis of the Abra and Sta. Maria rivers was conducted to determine the surface water quality in the province. The results of the analysis showed that both river waters were turbid with high iron content and Biochemical Oxygen Demand (BOD). These levels exceeded the maximum limit for Class "A" fresh surface water (refer to 7.5 Water Quality Analysis Results, Supporting Report). Both river waters will require complete treatment when utilize as source of domestic water supply.

7.6 Future Development Potential of Water Sources

Based on the study of existing water sources, groundwater is considered safe and more economical source for future water supply requirements of the province.

Shallow wells are the most practical source for Level I service. Considering the existing wells in the province, the potential aquifers for shallow wells occur between 4 to 20 mbgl. One disadvantage of shallow wells is the lowering of water level during dry spell that reduces the discharges of the wells. Another disadvantage is the usual high susceptibility of shallow aquifers to direct infiltration of surface pollutants.

In general, deep wells have better water quality and invariable yields when developed with appropriate technology. This is because of aquifers' relatively deeper location that makes them less susceptible to surface contaminants. The usual confinement of deep aquifers resulted in rise of water level above the aquifers. Lowering of water level does not affect the saturated thickness, therefore, deep well discharges remain constant. In the Recent deposits and Plio-Pleistocene rocks, good aquifers apparently occur from 21 to 60 mbgl and from 80 to 140 mbgl. In the Miocene sediments, potential aquifers are expected in the upper 60m.

Additional wells can still be developed to meet the future water supply demand of the province. Prior to any well development, a detailed groundwater resource study must be considered for its optimum utilization. For planning purpose, standard well specifications for each of the municipality were prepared as presented in Table 7.6.3, Supporting Report. The parameters such as well depth, static water level and specific capacity provided in the specifications were estimated from the available data gathered for the study.

The identified untapped springs can be developed as alternative sources for wells. These are the most reliable water sources in areas considered difficult for well development, particularly in Galimuyod, Gregorio del Pilar, Quirino, Suyo and Sugpon. Prior to spring development, supplementary study must also be conducted to determine the effect of seasonal fluctuation of discharge and water quality.



Chapter 8

**FUTURE REQUIREMENTS IN WATER
SUPPLY AND SANITATION IMPROVEMENT**



8. FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT

8.1 General

Phased investments for provincial sector development are planned in the same manner as adopted in the National Sector Master Plan (NSMP); Medium-Term Investment covering the years 1996 to 2000 and Long-Term Development covering the period 2001 to 2010.

Targets of provincial service coverage for the two phases are established as percentages of beneficiaries or utilities to be served by sub-sector. Service coverage in the base year (1995) and national sector targets indicated in the NSMP and the Medium-Term Philippine Development Plan (MTPDP) are the bases of the study. Sector targets which are not prescribed in the national plan; school and public toilets as well as sewerage are assumed based on the current conditions. In addition, preliminary discussions on solid waste management are included as a vital component of sanitation sector.

Projection of frame values by municipality is undertaken for respective sub-sectors; future population by urban and rural area, the number of student enrollment to public schools and the number of public utilities. Base figures for the study of framework are referred to the 1990 Census of Population and Housing and the statistical data of the province and information from relevant agencies. Population by target year is projected referring to the declining growth rates of regional population projected by NSO, while the base year population (1995) is estimated referring to the 1980-1990 growth rate by municipality (broken down to urban and rural areas). The population distribution to urban and rural areas prepared by NSO in 1990 is modified to meet actual conditions in the classification of the areas.

Types of required facilities and their implementation criteria according to service level standards are referred to the said Master Plan. Some planning conditions and assumptions not prescribed in the national plan are conferred to the relevant standards of sector agencies and provincial government. For sewerage requirements, the deficit in sanitation must first be addressed. Partial upgrading of on-site disposal to a sewerage system (off-site disposal) is envisaged in the final target year.

In estimating future requirements by municipality, additional population (or number of students/public utilities) to be served by sub-sector is first calculated as a shortfall at target years

in comparison between target and base year service coverage. In this regard, planned/on-going projects to be completed by 1995 are considered as part of base year service coverage. Required number of facilities by sector component is then estimated corresponding to the said additional population (or number of students/public utilities) to be served. Rehabilitation work for Level I facilities limited to new deep wells to be constructed under PW4SP is taken into account. Generally, rehabilitation of deep wells and shallow wells constructed by means of conventional method is difficult.

Logistic support is considered as a minimum requirement of LGUs for community development and training, and other relevant activities along with the implementation of PW4SP. The types and number of well drilling/rehabilitation equipment and supporting vehicle for Level I facilities are also suggested as reference information.

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

8.2 Targets of Provincial Sector Plan

Provincial sector targets for the year 2000 and 2010 are determined as the provincial average of the desirable minimum level for each sub-sector. Table 8.2.1 summarizes the target percentages to be served by sub-sector. Details by sub-sector are discussed in this sub-section.

(1) Water supply

The base year service coverage was calculated as a total of those in 1995 and expected by planned/on-going projects scheduled to be completed by the end of 1995 as shown in Table 8.2.2 (details are referred to Supporting Report).

The base year service coverage in urban area (76%) is slightly higher than the MTPDP sector target (71%) for the year 2000, while rural area (71%) is far behind the MTPDP sector target of 85%. As identified in Chapter 4, the lower service coverage in rural area is caused by the presence of a large number of unsafe sources/facilities and/or no provision of water supply facilities.

Considering the existing conditions, water supply sector targets were determined by urban and rural area. Provincial sector target for Phase I development is set forth at 85%

Table 8.2.1 Provincial Sector Targets

Sub-Sectors	Phase I (1996-2000)		Phase II (2001-2010)		
	Population Coverage (%)	Additional Population to be Served	Population Coverage (%)	Additional Population to be Served	
Water Supply					
Urban Water Supply	85	19,066	95	110,742	
Rural Water Supply	85	82,563	95	90,858	
Sanitation	Households Coverage (%)	Additional Households to be Served	Households Coverage (%)	Additional Households to be Served	
Urban	Household Toilets	14,643	95	57,162	
	Flush	1,804	50	13,578	
	Pour Flush	895	50	535	
	VIP	229	0	0	
	Rural	Flush	974	20	1,307
		Pour Flush	9,180	80	41,742
VIP		1,561	0	0	
School Toilet	Coverage (%)	Additional Public School Students to be Served	Coverage (%)	Additional Public School Students to be Served	
	90	19,562	95	23,157	
Public Toilet	Coverage (%)	Additional Public Utilities with Sanitary Toilets	Coverage (%)	Additional Public Utilities with Sanitary Toilets	
	100	5	100	29	
Sewerage	Not Applicable		Coverage (%)	Population to be Served	
			50	76,799	
Solid Waste	Coverage (%)	Additional Households to be Served	Not Applicable		
	50	9,684			

Table 8.2.2 Base Year Service Coverage of Water Supply

Municipalities	Type	Population 1995	Population Served by 1995 Facilities				% Coverage
			Level III	Level II	Level I	Total	
Alilem	Urban	1,411	0	0	905	905	64
	Rural	4,307	0	0	1,758	1,758	41
	Total	5,718	0	0	2,663	2,663	47
Banayoyo	Urban	818	0	0	685	685	84
	Rural	5,510	0	0	4,629	4,629	84
	Total	6,328	0	0	5,314	5,314	84
Bantay	Urban	10,098	1,150	0	6,020	7,170	71
	Rural	18,037	3,750	0	9,461	13,211	73
	Total	28,135	4,900	0	15,481	20,381	72
Burgos	Urban	1,494	0	0	899	899	60
	Rural	8,793	0	975	4,763	5,738	65
	Total	10,287	0	975	5,662	6,637	65
Cabugao	Urban	7,904	850	0	6,336	7,186	91
	Rural	22,091	1,710	0	17,454	19,164	87
	Total	29,995	2,560	0	23,790	26,350	88
Candon	Urban	7,229	0	0	4,560	4,560	63
	Rural	40,042	0	550	24,796	25,346	63
	Total	47,271	0	550	29,356	29,906	63
Caoayan	Urban	6,787	630	0	4,279	4,909	72
	Rural	9,700	1,700	0	4,167	5,867	60
	Total	16,487	2,330	0	8,446	10,776	65
Cervantes	Urban	2,608	0	0	1,863	1,863	71
	Rural	11,603	0	0	9,063	9,063	78
	Total	14,211	0	0	10,926	10,926	77
Galimuyod	Urban	430	0	0	375	375	87
	Rural	8,298	0	0	7,411	7,411	89
	Total	8,728	0	0	7,786	7,786	89
G. del Pilar	Urban	607	600	0	0	600	99
	Rural	2,992	800	550	1,407	2,757	92
	Total	3,599	1,400	550	1,407	3,357	93
Lidlidda	Urban	1,247	0	0	1,129	1,129	91
	Rural	2,739	0	0	2,454	2,454	90
	Total	3,986	0	0	3,583	3,583	90
Magsingal	Urban	5,278	0	0	4,208	4,208	80
	Rural	18,723	0	0	14,244	14,244	76
	Total	24,001	0	0	18,452	18,452	77
Nagbukel	Urban	732	0	0	469	469	64
	Rural	3,216	0	50	2,030	2,080	65
	Total	3,948	0	50	2,499	2,549	65
Narvacan	Urban	2,816	874	0	1,040	1,914	68
	Rural	34,821	0	450	18,344	18,794	54
	Total	37,637	874	450	19,384	20,708	55
Quirino	Urban	1,381	0	1,020	0	1,020	74
	Rural	6,034	0	2,226	0	2,226	37
	Total	7,415	0	3,246	0	3,246	44
Salcedo	Urban	1,344	0	0	1,036	1,036	77
	Rural	8,655	0	0	6,644	6,644	77
	Total	9,999	0	0	7,680	7,680	77
San Emilio	Urban	2,303	0	0	2,141	2,141	93
	Rural	4,104	0	0	3,563	3,563	87
	Total	6,407	0	0	5,704	5,704	89
San Esteban	Urban	752	0	255	318	573	76
	Rural	6,033	0	149	3,770	3,919	65
	Total	6,785	0	404	4,088	4,492	66

Table 8.2.2 Base Year Service Coverage of Water Supply (Cont'd.)

Municipalities	Type	Population 1995	Population Served by 1995 Facilities				% Coverage
			Level III	Level II	Level I	Total	
San Hdefonso	Urban	1,024	0	0	802	802	78
	Rural	4,046	0	0	3,110	3,110	77
	Total	5,070	0	0	3,912	3,912	77
San Juan	Urban	3,400	0	0	2,732	2,732	80
	Rural	18,565	0	325	14,462	14,787	80
	Total	21,965	0	325	17,194	17,519	80
San Vicente	Urban	1,193	0	0	1,063	1,063	89
	Rural	9,643	0	0	6,590	6,590	68
	Total	10,836	0	0	7,653	7,653	71
Santa	Urban	1,731	755	0	606	1,361	79
	Rural	11,497	95	494	6,942	7,531	66
	Total	13,228	850	494	7,548	8,892	67
Santa Catalina	Urban	1,242	0	0	941	941	76
	Rural	11,068	0	0	8,401	8,401	76
	Total	12,310	0	0	9,342	9,342	76
Santa Cruz	Urban	4,461	0	0	3,075	3,075	69
	Rural	27,697	0	1,075	18,448	19,523	70
	Total	32,158	0	1,075	21,523	22,598	70
Santa Lucia	Urban	2,256	920	0	896	1,816	80
	Rural	20,045	645	125	12,923	13,693	68
	Total	22,301	1,565	125	13,819	15,509	70
Santa Maria	Urban	3,644	0	0	1,947	1,947	53
	Rural	21,543	250	0	11,258	11,508	53
	Total	25,187	250	0	13,205	13,455	53
Santiago	Urban	2,385	335	75	1,361	1,771	74
	Rural	13,543	0	0	9,764	9,764	72
	Total	15,928	335	75	11,125	11,535	72
Santo Domingo	Urban	2,951	25	0	2,343	2,368	80
	Rural	19,450	10	475	15,779	16,264	84
	Total	22,401	35	475	18,122	18,632	83
Sigay	Urban	0	0	0	0	0	0
	Rural	2,086	0	1,625	455	2,080	100
	Total	2,086	0	1,625	455	2,080	100
Sinait	Urban	2,891	995	0	1,896	2,891	100
	Rural	20,401	0	0	16,014	16,014	78
	Total	23,292	995	0	17,910	18,905	81
Sugpon	Urban	976	0	225	690	915	94
	Rural	1,810	0	1,175	0	1,175	65
	Total	2,786	0	1,400	690	2,090	75
Suyo	Urban	1,790	0	1,275	0	1,275	71
	Rural	7,047	0	4,700	294	4,994	71
	Total	8,837	0	5,975	294	6,269	71
Tagudin	Urban	4,853	2,660	0	1,674	4,334	89
	Rural	27,951	2,555	675	18,679	21,909	78
	Total	32,804	5,215	675	20,353	26,243	80
Vigan (Capital)	Urban	41,403	6,300	0	24,425	30,725	74
	Rural	0	0	0	0	0	0
	Total	41,403	6,300	0	24,425	30,725	74
Provincial Total	Urban	131,439	16,094	2,850	80,714	99,658	76
	Rural	432,090	11,515	15,619	279,077	306,211	71
	Total	563,529	27,609	18,469	359,791	405,869	72

for both urban and rural areas focusing on the bottom up of rural water supply. Phase II targets are planned to increase both urban and rural water supply coverage to 95% as envisaged in the NSMP target level.

(2) Sanitation

1) Household toilets

As with water supply, the base year service coverage is calculated as shown in Table 8.2.3 reflecting any planned or on-going projects scheduled to be completed by 1995 (details are referred to Supporting Report).

The province has a base year service coverage of 90%, which is well above the current national average coverage of 77%. Urban area registers a high level of 94% that is beyond the national target of 93% set by the MTPDP. Rural area however, has an 89% considering some "shared users". By type of sanitary toilet facility, the existing percentage composition to total households is as follows:

Type	Urban (%)	Rural (%)
Flush	12	4
Pour-flush	80	88
VIP latrine	8	8

To lessen the gap of the service coverage between the urban and rural area and to attain an equitable distribution of this basic facility, the same target is applied to both areas. Provincial target of Phase I for household toilets is planned to be 94%, which is the current service coverage in urban area and just one (1) percent higher than the set target by the MTPDP. For Phase II, 95% that is again a little bit higher than the set target of 94% in the NSMP is adopted.

The existing composition of the 3 facility types serves as an indicator in the distribution for Phase I, while for Phase II, VIP latrine is phased-out and a 50-50 distribution for flush and pour-flush is considered in urban area.

2) School toilets

The base year service coverage of public school students is shown in Table 8.2.4 counting expected coverage of any planned or on-going projects scheduled to be completed by 1995 (details are referred to Supporting Report).

Table 8.2.3 Base Year Service Coverage of Household Toilets

Municipality	Area	Households and Population Using Sanitary Toilets										
		1995		No. of HHs	Number of Households			Served Population	Coverage (%)			
		Population	Flush		Pour Flush	VIP Latrine	Total		Flush	Pour Flush	VIP Latrine	Total
Alibem	Urban	1,411	265	7	145	59	211	1,129	3	55	22	80
	Rural	4,307	773	0	411	199	610	3,403	0	53	26	79
	Total	5,718	1,038	7	556	258	821	4,532	1	54	25	79
Sanavoyo	Urban	818	163	0	163	0	163	818	0	100	0	100
	Rural	5,510	991	0	916	28	944	5,235	0	92	3	95
	Total	6,328	1,154	0	1,079	28	1,107	6,053	0	94	2	96
Bantay	Urban	10,098	1,927	562	1,064	276	1,902	9,997	29	55	14	99
	Rural	18,037	3,340	170	2,468	137	2,775	14,971	5	74	4	83
	Total	28,135	5,267	732	3,532	413	4,677	24,968	14	67	8	89
Burgos	Urban	1,494	295	4	136	146	286	1,449	1	46	49	97
	Rural	8,793	1,678	49	1,358	73	1,480	7,738	3	81	4	88
	Total	10,287	1,973	53	1,494	219	1,766	9,187	3	76	11	90
Cabugao	Urban	7,904	1,568	205	1,299	39	1,543	7,746	13	83	2	98
	Rural	22,091	4,152	11	3,815	244	4,070	21,649	0	92	6	98
	Total	29,995	5,720	216	5,114	283	5,613	29,395	4	89	5	98
Candon	Urban	7,229	1,398	74	1,272	31	1,377	7,084	5	91	2	98
	Rural	40,042	7,484	147	6,983	250	7,380	39,642	2	93	3	99
	Total	47,271	8,882	221	8,255	281	8,757	46,726	2	93	3	99
Cacayan	Urban	6,787	1,344	172	883	189	1,244	6,312	13	66	14	93
	Rural	9,700	1,895	101	1,048	0	1,149	5,917	5	55	0	61
	Total	16,487	3,239	273	1,931	189	2,393	12,229	8	60	6	74
Cervantes	Urban	2,608	454	180	205	66	451	2,582	40	45	15	99
	Rural	11,603	2,145	404	741	773	1,918	10,327	19	35	36	89
	Total	14,211	2,599	584	946	839	2,369	12,909	22	36	32	91
Galimuyod	Urban	430	81	0	65	16	81	430	0	80	20	100
	Rural	8,298	1,528	4	1,499	23	1,526	8,298	0	98	2	100
	Total	8,728	1,609	4	1,564	39	1,607	8,728	0	97	2	100

Table 8.2.3 Base Year Service Coverage of Household Toilets (Cont'd.)

Municipality	Area	Households and Population Using Sanitary Toilets										
		1995		Number of Households				Served Population	Coverage (%)			
		Population	No. of HHs	Flush	Pour Flush	VIP Latrine	Total		Flush	Pour Flush	VIP Latrine	Total
O. del Pilar	Urban	607	119	30	76	13	119	607	25	64	11	100
	Rural	2,992	541	2	390	95	487	2,693	0	72	18	90
	Total	3,599	660	32	466	108	606	3,300	5	71	16	92
Lidhidda	Urban	1,247	245	0	224	11	235	1,197	0	91	4	96
	Rural	2,739	519	0	482	20	502	2,657	0	93	4	97
	Total	3,986	764	0	706	31	737	3,854	0	92	4	96
Magsingal	Urban	5,278	1,082	100	893	89	1,082	5,278	9	83	8	100
	Rural	18,723	3,539	110	2,680	746	3,536	18,723	3	76	21	100
	Total	24,001	4,621	210	3,573	835	4,618	24,001	5	77	18	100
Nagbukel	Urban	732	143	4	131	0	135	688	3	92	0	94
	Rural	3,216	624	0	327	23	350	1,801	0	52	4	56
	Total	3,948	767	4	458	23	485	2,489	1	60	3	63
Narvacan	Urban	2,816	542	90	440	0	530	2,760	17	81	0	98
	Rural	34,821	6,801	360	5,524	0	5,884	30,294	5	81	0	87
	Total	37,637	7,343	450	5,964	0	6,414	33,054	6	81	0	87
Quirino	Urban	1,381	269	1	225	40	266	1,367	0	84	15	99
	Rural	6,034	1,132	0	640	414	1,054	5,612	0	57	37	93
	Total	7,415	1,401	1	865	454	1,320	6,979	0	62	32	94
Salcedo	Urban	1,344	273	5	261	7	273	1,344	2	96	2	100
	Rural	8,655	1,707	19	1,584	104	1,707	8,655	1	93	6	100
	Total	9,999	1,980	24	1,845	111	1,980	9,999	1	93	6	100
San Emilio	Urban	2,303	416	0	296	29	325	1,796	0	71	7	78
	Rural	4,104	766	0	307	0	307	1,642	0	40	0	40
	Total	6,407	1,182	0	603	29	632	3,438	0	51	2	53
San Esteban	Urban	752	148	10	128	0	138	699	7	86	0	93
	Rural	6,033	1,221	24	983	0	1,007	4,947	2	81	0	82
	Total	6,785	1,369	34	1,111	0	1,145	5,646	2	81	0	84

Table 8.2.3 Base Year Service Coverage of Household Toilets (Cont'd.)

Municipality	Area	1995				Households and Population Using Sanitary Toilets						
		Population	No. of HHs	Number of Households			Served Population	Coverage (%)				
				Flush	Pour Flush	VIP Latrine		Flush	Pour Flush	VIP Latrine	Total	
San Ildelfonso	Urban	1,024	198	24	151	0	175	901	12	76	0	88
	Rural	4,046	753	17	680	0	697	3,763	2	90	0	93
	Total	5,070	951	41	831	0	872	4,664	4	87	0	92
San Juan	Urban	3,400	707	25	616	53	694	3,332	4	87	7	98
	Rural	18,565	3,612	174	2,711	0	2,885	14,852	5	75	0	80
	Total	21,965	4,319	199	3,327	53	3,579	18,184	5	77	1	83
San Vicente	Urban	1,193	219	21	188	10	219	1,193	10	86	4	100
	Rural	9,643	1,913	80	1,200	144	1,424	7,136	4	63	8	74
	Total	10,836	2,132	101	1,388	154	1,643	8,329	5	65	7	77
Santa	Urban	1,731	363	28	279	48	355	1,696	8	77	13	98
	Rural	11,497	2,194	5	1,948	0	1,953	10,232	0	89	0	89
	Total	13,228	2,557	33	2,227	48	2,308	11,928	1	87	2	90
Santa Catalina	Urban	1,242	233	20	204	0	224	1,192	9	88	0	96
	Rural	11,068	2,031	124	1,797	7	1,928	10,515	6	88	0	93
	Total	12,310	2,264	144	2,001	7	2,152	11,707	6	88	0	95
Santa Cruz	Urban	4,461	868	11	724	77	812	4,193	1	83	9	94
	Rural	27,697	5,101	43	4,420	322	4,785	26,035	1	87	6	94
	Total	32,158	5,969	54	5,144	399	5,597	30,228	1	86	7	94
Santa Lucia	Urban	2,256	431	40	252	24	316	1,647	9	58	6	73
	Rural	20,045	3,651	47	2,732	497	3,276	18,041	1	75	14	90
	Total	22,301	4,082	87	2,984	521	3,592	19,688	2	73	13	88
Santa Maria	Urban	3,644	732	36	653	25	714	3,571	5	89	3	98
	Rural	21,543	4,175	32	3,782	53	3,867	20,035	1	91	1	93
	Total	25,187	4,907	68	4,435	78	4,581	23,606	1	90	2	93
Santiago	Urban	2,385	442	5	419	12	436	2,361	1	95	3	99
	Rural	13,543	2,485	593	1,322	227	2,142	11,647	24	53	9	86
	Total	15,928	2,927	598	1,741	239	2,578	14,008	20	59	8	88

Table 8.2.3 Base Year Service Coverage of Household Toilets (Cont'd.)

Municipality	Area	Households and Population Using Sanitary Toilets										
		1995		No. of HHs	Number of Households			Served Population	Coverage (%)			
		Population	Flush		Pour Flush	VIP Latrine	Total		Flush	Pour Flush	VIP Latrine	Total
Santo Domingo	Urban	2,951	14	550	0	564	2,892	2	95	0	98	
	Rural	19,450	58	3,291	0	3,349	17,505	2	89	0	90	
	Total	22,401	72	3,841	0	3,913	20,397	2	90	0	91	
Sigay	Urban	0	0	0	0	0	0	0	0	0	0	
	Rural	2,086	0	267	0	267	1,544	0	74	0	74	
	Total	2,086	0	267	0	267	1,544	0	74	0	74	
Sinait	Urban	2,891	35	519	7	561	2,891	6	93	1	100	
	Rural	20,401	3	3,266	423	3,692	17,749	0	77	10	87	
	Total	23,292	38	3,785	430	4,253	20,640	1	79	9	88	
Sugpon	Urban	976	0	83	87	170	869	0	43	45	89	
	Rural	1,810	0	118	162	280	1,575	0	37	50	87	
	Total	2,786	0	201	249	450	2,444	0	39	48	87	
Suyo	Urban	1,790	5	198	106	309	1,790	2	64	34	100	
	Rural	7,047	11	697	303	1,011	5,356	1	52	23	76	
	Total	8,837	16	895	409	1,320	7,146	1	54	25	80	
Tagudin	Urban	4,853	146	583	66	795	4,319	16	66	7	89	
	Rural	27,951	195	3,814	418	4,427	24,597	4	76	8	88	
	Total	32,804	341	4,397	484	5,222	28,916	6	75	8	89	
Vigan (Capital)	Urban	41,403	1,005	5,618	448	7,071	37,677	13	72	6	91	
	Rural	0	0	0	0	0	0	0	0	0	0	
	Total	41,403	1,005	5,618	448	7,071	37,677	13	72	6	91	
Provincial Total	Urban	131,439	2,859	18,943	1,974	23,776	123,807	11	75	8	94	
	Rural	432,090	81,734	64,201	5,685	72,669	384,786	3	79	7	89	
	Total	563,529	106,955	83,144	7,659	96,445	508,593	5	78	7	90	

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

Municipality	Public Schools Toilets			Public Toilets		
	1995 Total No. of Public Schools Students	Std. No. of Public School Students that can be Served by Base Year (1995) Sanitary Toilets	Coverage (%)	Number of PU in 1995	Number of PU with Sanitary Toilets in Base Year (1995)	Coverage (%)
Alilem	1,333	1,333	100	0	0	0
Banayoyo	1,340	1,340	100	0	0	0
Bantay	3,552	3,552	100	3	3	100
Burgos	1,942	1,942	100	0	0	0
Cabugao	4,612	4,450	96	1	1	100
Candon	9,147	5,300	58	2	2	100
Caosyan	2,377	2,377	100	0	0	0
Cervantes	2,509	1,600	64	1	0	0
Galimuyod	1,451	850	59	0	0	0
G. del Pilar	552	552	100	0	0	0
Lidlidda	694	694	100	0	0	0
Magsingal	3,466	3,450	100	1	1	100
Nagbukel	1,151	1,151	100	0	0	0
Narvacan	8,453	8,453	100	2	2	100
Quirino	1,412	1,100	78	1	1	100
Salcedo	2,312	2,050	89	1	1	100
San Emilio	1,138	400	35	0	0	0
San Esteban	1,279	1,279	100	0	0	0
San Ildefonso	749	749	100	1	1	100
San Juan	5,086	5,086	100	1	1	100
San Vicente	1,407	900	64	1	1	100
Santa	2,339	2,339	100	1	1	100
Santa Catalina	2,069	1,450	70	0	0	0
Santa Cruz	5,201	3,650	70	1	1	100
Santa Lucia	4,271	1,600	37	1	1	100
Santa Maria	5,452	5,452	100	1	1	100
Santiago	2,906	1,850	64	1	0	0
Santo Domingo	4,097	4,097	100	1	1	100
Sigay	412	300	73	0	0	0
Sinait	5,520	5,520	100	1	1	100
Sugpon	640	600	94	0	0	0
Suyo	1,987	1,500	75	0	0	0
Tagudin	6,799	6,799	100	1	1	100
Vigan (Capital)	10,152	10,152	100	7	7	100
Provincial Total	107,807	93,917	87	30	28	93

Note: PU - Public Utilities

Present service coverage is 87% applying the standard number of public school students to be served by one (1) unit of toilet facility. The high level is due to a large number of newly constructed schoolbuildings with sanitary toilets and the fact that the province was a recipient of the recently concluded JICA- assisted Rural Environmental Sanitation Project II. A total of 16 school toilets (with an average of 5 units of toilet bowl per facility) was constructed.

In the absence of national targets for school toilets, the existing level of service coverage is the base in setting up the targets. It is expected that all new construction of schoolbuildings will entail sanitary toilet enabling the coverage to increase on a high level. For Phase I and II, 90% and 95% are set, respectively.

3) Public toilets

The base year service coverage considering expected additional coverage by 1995 is shown in Table 8.2.4 (details are referred to Supporting Report).

A high 93% of the existing public utilities is served with sanitary toilets. This is attributed by the fact that majority of the public utilities (mostly public markets) are provided with at least one sanitary toilet facility.

In setting up the targets without national targets as of now, the indicator would be the existing level of coverage. Accordingly, a 100% coverage for Phase I and Phase II is assumed.

(3) Sewerage

Although Vigan has a sewerage system, it is already considered as non-functional because it has already outlived its service life. Therefore, it can be considered that there is no sewerage system in any municipality at the present time. This plan however, does not consider the service during Phase I. For Phase II, a target of 50% coverage was applied to urban population of municipalities with more than 10,000 urban population provided by Level III water supply systems.

(4) Solid waste

The municipal level data in 1995 on the number of households served by the municipal refuse collection revealed that the current practice is concentrated to urban areas. The base year service coverage for urban area by municipality is reflected in Table 8.2.5.

Table 8.2.5 Base Year Service Coverage of Municipal Solid Waste System in 1995

Municipality	Total No. of Households	No. of Urban Households	No. of Household Served *	Coverage of Households (%)	Coverage of Urban HHs (%)
Alilem	1,038	265	0	0	0
Banayoyo	1,154	163	0	0	0
Bantay	5,267	1,927	0	0	0
Burgos	1,973	295	0	0	0
Cabugao	5,720	1,568	0	0	0
Candon	8,882	1,398	0	0	0
Caoyan	3,239	1,344	0	0	0
Cervantes	2,599	454	0	0	0
Galimuyod	1,609	81	0	0	0
G. del Pilar	660	119	0	0	0
Lidlidda	764	245	0	0	0
Magsingal	4,621	1,082	0	0	0
Nagbukel	767	143	0	0	0
Narvacan	7,343	542	0	0	0
Quirino	1,401	269	0	0	0
Salcedo	1,980	273	0	0	0
San Emilio	1,182	416	0	0	0
San Esteban	1,369	148	0	0	0
San Ildelfonso	951	198	0	0	0
San Juan	4,319	707	0	0	0
San Vicente	2,132	219	0	0	0
Santa	2,557	363	0	0	0
Santa Catalina	2,264	233	0	0	0
Santa Cruz	5,969	868	0	0	0
Santa Lucia	4,082	431	331	8	77
Santa Maria	4,907	732	696	14	95
Santiago	2,927	442	1407 **	48	318
Santo Domingo	4,282	577	0	0	0
Sigay	361	0	0	0	0
Sinait	4,811	561	0	0	0
Sugpon	515	192	0	0	0
Suyo	1,644	309	0	0	0
Tagudin	5,898	889	0	0	0
Vigan (Capital)	7,768	7,768	2,859	37	37
Provincial Total	106,955	25,221	5,293	5	21

* Equivalent to total number of urban households served

** Covers some rural barangays / households

A mere 5% of the total households in the province relies on municipal refuse collection using trucks or a 21% urban household coverage. These municipalities have a total of 9 units of collection truck.

No national targets have yet been set. However, considering the present level of coverage, a 50% urban household coverage is applied for the medium-term period (2000).

8.3 Projection of Frame Values

8.3.1 Population Projection

Future population for all municipalities by urban and rural area was projected for the target years of 2000 and 2010 together with the present population in 1995 as a planning base year.

The NSO projection at provincial and municipal levels was not available by the time of study. The future population was therefore projected in the following manner (details are included in Supporting Report). Reference information/data used for the study are:

- Population census data of 1980 and 1990 on different administrative levels,
- Annual population growth rates for future regional population projected by NSO, and
- The 1992 Philippine Yearbook.

The past population development at different administrative levels was first reviewed to come up with the demographic characteristics of the region and province. Through review of NSO regional population projection and the 1992 Philippine Yearbook, the behavior of population development through the future was analyzed. Referring to these demographic study, population projection of the province by target year was carried out in assumption of declining annual growth rates employing a simple compounded formula $(1+r)^n$. Present population in 1995 was also estimated in the same manner. Major study results are presented as follows:

(1) Review of past population development in the province and population distribution in 1990 to urban and rural areas

The past population development during the census period from 1980 to 1990 revealed that:

- The province recorded 1.6% of average annual growth rate, almost same as the regional rate at 1.9%, as a conservative growth, and

- Percentage of provincial population to the regional population slightly decreased from 15.0% in 1980 to 14.6% in 1990 and urban population percentage adversely decreased.

- (2) Review of the NSO regional population projection in view of annual growth rates (base year is 1990) and the demographic conditions presented in the 1992 Philippine Yearbook

Annual growth rates of regional population projected by NSO were analyzed using simplified formula. The conservative growth rates were calculated reflecting demographic characteristics of moderate decline of fertility and mortality described in the 1992 Philippine Yearbook. Future behaviors of provincial population are assumed to follow more or less same as those of regional ones, unless specific development takes place in the province.

- (3) Estimation of present provincial population (1995) applying 1980-1990 average annual growth rate of respective municipalities (further broken down to urban and rural areas) assuming that the behaviors of past population development prevailed up to the present.

- (4) Projection of provincial population by target year:

- The manner of discount in annual growth rates of regional population for the target years was applied for provincial population projection, however the minimum growth rate was assumed at 1.00 % for planning purpose.
- Population in 2000 was projected from the base year 1995 applying the annual growth rate of 1.13 % (29.1% discount of the growth rate of the province observed during last census decade, 1980-1990).
- Population in 2010 with the base year of 2000 was projected applying the annual growth rate of 1.00 %
- Present profile of population distribution both in urban and rural areas is assumed to prevail through the future.

Population by target year and the year 1995 is presented in Table 8.3.1 covering all municipalities broken down to urban and rural areas. Number of households by target year was also studied and included in Table 8.3.5, Supporting Report.

8.3.2 School Enrollment Projection

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

Table 8.3.1 Future Population by Urban and Rural Area by Municipality

Municipality	1990			1995			2000			2010		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
	Alilem	1,251	4,063	5,314	1,411	4,307	5,718	1,492	4,556	6,048	1,648	5,033
Banavoyo	778	5,086	5,864	818	5,510	6,328	865	5,829	6,694	955	6,439	7,394
Bantay	9,535	16,489	26,024	10,098	18,037	28,135	10,682	19,079	29,761	11,800	21,075	32,875
Bursos	1,411	8,190	9,601	1,494	8,793	10,287	1,580	9,302	10,882	1,745	10,275	12,020
Cabugao	7,635	20,362	27,997	7,904	22,091	29,995	8,361	23,367	31,728	9,236	25,811	35,047
Candon	6,922	36,551	43,473	7,229	40,042	47,271	7,647	42,356	50,003	8,447	46,788	55,235
Caoyan	6,507	9,130	15,637	6,787	9,700	16,487	7,179	10,261	17,440	7,930	11,335	19,265
Cervantes	2,319	10,157	12,476	2,608	11,603	14,211	2,759	12,273	15,032	3,048	13,557	16,605
Galimuyod	412	7,529	7,941	430	8,298	8,728	455	8,777	9,232	503	9,695	10,198
G. del Pilar	570	2,847	3,417	607	2,992	3,599	642	3,165	3,807	709	3,496	4,205
Lididda	1,127	2,388	3,515	1,247	2,739	3,986	1,319	2,897	4,216	1,457	3,200	4,657
Magsingal	4,949	17,322	22,271	5,278	18,723	24,001	5,583	19,805	25,388	6,167	21,877	28,044
Nagbukel	725	3,081	3,806	732	3,216	3,948	774	3,402	4,176	855	3,758	4,613
Narvacan	2,750	32,403	35,153	2,816	34,821	37,637	2,979	36,833	39,812	3,291	40,686	43,977
Quirino	1,234	5,389	6,623	1,381	6,034	7,415	1,461	6,383	7,844	1,614	7,051	8,665
Salcedo	1,287	8,110	9,397	1,344	8,655	9,999	1,422	9,155	10,577	1,571	10,113	11,684
San Emilio	1,970	3,679	5,649	2,303	4,104	6,407	2,436	4,341	6,777	2,691	4,795	7,486
San Esteban	718	5,609	6,327	752	6,033	6,785	795	6,382	7,177	878	7,050	7,928

Table 8.3.1 Future Population by Urban and Rural Area by Municipality (Cont'd.)

Municipality	1990			1995			2000			2010		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
	San Ildefonso	1,004	3,524	4,528	1,024	4,046	5,070	1,083	4,280	5,363	1,196	4,728
San Juan	3,329	16,999	20,328	3,400	18,565	21,965	3,596	19,638	23,234	3,972	21,693	25,665
San Vicente	1,106	8,883	9,989	1,193	9,643	10,836	1,262	10,200	11,462	1,394	11,267	12,661
Santa	1,713	10,857	12,570	1,731	11,497	13,228	1,831	12,161	13,992	2,023	13,433	15,456
Santa Catalina	1,224	10,164	11,388	1,242	11,068	12,310	1,314	11,707	13,021	1,451	12,932	14,383
Santa Cruz	4,129	24,635	28,764	4,461	27,697	32,158	4,719	29,297	34,016	5,213	32,362	37,575
Santa Lucia	2,163	18,341	20,504	2,256	20,045	22,301	2,386	21,204	23,590	2,636	23,422	26,058
Santa Maria	3,464	20,357	23,821	3,644	21,543	25,187	3,855	22,788	26,643	4,258	25,172	29,430
Santiago	2,238	12,189	14,427	2,385	13,543	15,928	2,523	14,326	16,849	2,787	15,825	18,612
Santo Domingo	2,702	18,018	20,720	2,951	19,450	22,401	3,122	20,574	23,696	3,449	22,726	26,175
Sigay	0	1,964	1,964	0	2,086	2,086	0	2,207	2,207	0	2,438	2,438
Sinait	2,795	18,984	21,779	2,891	20,401	23,292	3,058	21,580	24,638	3,378	23,838	27,216
Sugpon	889	1,955	2,844	976	1,810	2,786	1,032	1,915	2,947	1,140	2,115	3,255
Suyo	1,510	6,440	7,950	1,790	7,047	8,837	1,894	7,454	9,348	2,092	8,234	10,326
Tagudin	4,657	24,638	29,295	4,853	27,951	32,804	5,133	29,567	34,700	5,670	32,660	38,330
Vigan (Capital)	38,574	0	38,574	41,403	0	41,403	43,796	0	43,796	48,378	0	48,378
Provincial Total	123,597	396,333	519,930	131,439	432,090	563,529	139,035	457,061	596,096	153,582	504,879	658,461

School age population is extrapolated from the 1990 NSO age group classification of 5-9, 10-14 and 15-19 years old bracket by municipality. The age group for the elementary level is from 7 to 13 years, while that for the high school level is from 14 to 17 years. The percentage of school age population for the target years is based on the existing composition or structure of the 1990 population.

From the school age population, the number of children who would attend either private or public school, by target year is computed using the projected participation rate. The participation rate by target year varies depending on the socio-economic condition of the province. Generally, an improved economy will result to a higher participation rate. For the province, an increase of 4% in the participation rate in both private and public schools is foreseen by 2010.

The number of public school students by target year is then derived from the projected number of children who will attend school. A participation rate for public school enrollment is established based on the existing participation rate of public school students to the total school age population. A slight increase of 7% from the 1995 rate is foreseen in 2000 and another 7% from the 2000 rate in 2010 (details are referred to Table 8.3.6, Supporting Report).

Table 8.3.2 shows the projected number of public school students by municipality, by target year. A total of 125,334 and 143,110 public school students is estimated to enroll for years 2000 and 2010, respectively.

8.3.3 Projection of the Number of Public Utilities

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

Three (3) public markets/bus terminals are planned to be constructed by year 2000, and another 29 by 2010. Refer to Table 8.3.2 for the total number of public utilities by municipality by target year (details are referred to Table 8.3.7, Supporting Report).

Table 8.3.2 Projected Public School Enrollment and Number of Public Utilities by Municipality

Municipality	Number of Public School Students			No. of Public Utilities		
	1995	2000	2010	1995	2000	2010
Alilem	1,333	1,460	1,593	0	0	2
Banayoyo	1,340	1,525	1,721	0	0	1
Bantay	3,552	4,167	5,691	3	3	3
Burgos	1,942	2,192	2,500	0	0	0
Cabugao	4,612	5,228	6,134	1	1	3
Candon	9,147	10,620	12,482	2	2	4
Caoayan	2,377	2,640	2,925	0	0	1
Cervantes	2,509	3,019	3,422	1	2	2
Galimuyod	1,451	1,688	1,975	0	0	0
G. del Pilar	552	622	707	0	0	2
Lidlidda	694	797	910	0	0	2
Magsingal	3,466	4,761	5,611	1	1	1
Nagbukel	1,151	1,150	1,137	0	0	1
Narvacan	8,453	9,787	10,564	2	2	3
Quirino	1,412	1,550	1,997	1	1	2
Salcedo	2,312	2,604	2,783	1	1	2
San Emilio	1,138	1,375	1,616	0	0	1
San Esteban	1,279	1,435	1,667	0	0	1
San Idelfonso	749	892	1,350	1	1	1
San Juan	5,086	5,797	6,257	1	1	1
San Vicente	1,407	1,640	2,830	1	1	1
Santa	2,339	2,608	2,938	1	1	1
Santa Catalina	2,069	2,368	2,738	0	0	0
Santa Cruz	5,201	6,488	8,102	1	1	2
Santa Lucia	4,271	5,177	6,314	1	1	1
Santa Maria	5,452	6,089	6,870	1	1	2
Santiago	2,906	3,479	4,324	1	1	1
Santo Domingo	4,097	4,698	5,410	1	1	2
Sigay	412	464	526	0	0	1
Sinait	5,520	6,217	6,576	1	2	3
Sugpon	640	675	747	0	0	2
Suyo	1,987	2,338	2,524	0	0	2
Tagudin	6,799	9,107	9,440	1	1	3
Vigan (Capital)	10,152	10,677	10,729	7	8	8
Provincial Total	107,807	125,334	143,110	30	33	62

8.3.4 Planning Area and its Projected Population for Sewerage

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

Only two (2) municipalities, Vigan and Bantay with a total urban population of 60,178 are considered (refer to Table 8.5.5).

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

The number of urban households in 2000 is the potential households for the planning (refer to Table 8.3.5, Supporting Report).

8.4 Types of Facilities and Implementation Criteria

In principle, types of facilities and their implementation criteria as prescribed in the NSMP are adopted to this PW4SP.

8.4.1 Water Supply

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

(1) Urban water supply

1) Service level

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

2) Utilization of existing facilities

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

3) Water source

Majority of existing Level III systems are utilizing deep wells in view of economy and easy O&M. In this context, priority is given to deep wells wherever applicable.

The groundwater productivity was assumed based on the study results of water sources in Chapter 7 and presented in Table 8.4.1.

4) Number of systems

In principle, one Level III system is considered for urban area of every municipality. When any Level III system exists, the future requirements are considered as an expansion of the existing system, otherwise a new system was considered.

In addition to the above, any rural barangay/s being served by the existing urban Level III system are considered to be continued throughout the future. A merged Level III system covering more than two municipalities is also considered, if technical and economic conditions are being met.

5) Rehabilitation

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

(2) Rural water supply

1) Service level

The Level I systems are generally planned for rural areas where houses are scattered (deep and/or shallow wells). Spring development is excluded from the Level I planning in view of cost effectiveness. Level II systems are considered where houses are clustered and suitable untapped spring is available.

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

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

2) Utilization of existing facilities

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

Table 8.4.1 Groundwater Productivity

Municipality	Specific Capacity (liter/sec./m)	Well Depth (meter)	Groundwater Productivity per Deep Well (cu. m/16 hr)
Alilem	1.50	30	864
Banayoyo	2.50	30	1,440
Bantay	2.50	50	1,440
Burgos	1.50	30	864
Cabugao	2.50	50	1,440
Candon	2.50	30	1,440
Caoayan	2.50	50	1,440
Cervantes	1.00	30	576
Galimuyod	2.50	30	1,440
G. del Pilar	1.00	30	576
Lidlidda	1.50	30	864
Magsingal	2.50	50	1,440
Nagbukel	2.50	30	1,440
Narvacan	2.50	30	1,440
Quirino	1.00	30	576
Salcedo	2.50	30	1,440
San Emilio	1.00	30	576
San Esteban	2.50	30	1,440
San Hdefonso	2.50	50	1,440
San Juan	2.50	50	1,440
San Vicente	2.50	50	1,440
Santa	2.50	50	1,440
Santa Catalina	2.50	50	1,440
Santa Cruz	2.50	30	1,440
Santa Lucia	2.50	30	1,440
Santa Maria	2.50	30	1,440
Santiago	2.50	30	1,440
Santo Domingo	2.50	50	1,440
Sigay	1.00	30	576
Sinait	2.50	50	1,440
Sugpon	1.50	30	864
Suyo	1.00	30	576
Tagudin	2.50	30	1,440
Vigan (Capital)	2.50	50	1,440

3) Water source

For Level I facilities, deep well construction is given priority wherever applicable in view of safety against possible contamination and stable water supply. Standard specifications of shallow and deep wells are summarized in Table 8.4.2 based on the water source evaluation results presented in Chapter 7. Conventional construction method (driven well) may be employed under the favorable substrata or hydro-geological conditions. The standard structure of wells in application of "open-hole drilling and gravel pack" is presented in Figure 8.4.1, Supporting Report.

Table 8.4.2 Standard Specifications of Level I Wells

Specification	Shallow Well	Deep Well
Construction Method	Open-hole drilling and gravel pack	
Casing Diameter	50 mm	100 mm
Borehole Diameter	150 mm	200 mm
Ranges of Well Depth	Standard Depth	
0 - 20 m	20 m	N.A.
21 - 40 m	N.A.	30 m
41 - 60 m	N.A.	50 m
61 - 80 m	N.A.	70 m

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

4) Number of systems/facilities

Number of Level I wells is estimated based on the service level standard; while, the number of springs coincides with the number of Level II systems.

5) Rehabilitation

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

8.4.2 Sanitation

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

(1) Household toilets

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

The type of toilet facilities is dependent on the existing or planned service level of water supply in the community. In urban and rural areas with Level I or II water supply facilities, only pour-flush and/or VIP are considered, while in urban areas with Level III water supply systems, flush type toilets requiring a piped water connection are included.

(2) School toilets

Standard service level currently used by DECS (50 students per unit facility) is employed for both phases.

The standard toilet facility (1 building) with 5 units of toilet bowl to serve for 250 students is adopted for the planning purpose, which is modified from FW4SP design to provide a shallow well as a water source.

(3) Public toilets

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

The standard FW4SP design with 6-units of toilet bowl for the market is adopted. In this design, it is assumed that water supply will be tapped from the existing system, hence an elevated water tank is provided.

8.4.3 Urban Sewerage

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

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

Sewage treatment facilities may range from community scale septic tank or imhoff tank to aerated lagoon systems and to a more advanced treatment process such as oxidation ditch. For

this PW4SP, aerated lagoons are assumed as a representative treatment facility for planning purpose. Daily average wastewater quantity is assumed to be 100 liters per capita per day.

8.4.4 Solid Waste

In terms of facility requirements, this PW4SP only studied the number of refuse collection trucks required for the year 2000. A rated capacity of 5 cu.m truck/vehicle is considered for calculation of required units of truck. Disposal of solid waste shall be studied in detail through investigations, F/S and D/D. Unit solid waste generation for urban area is assumed to be 0.418 kg. per capita per day.

8.5 Service Coverage by Target Year

8.5.1 Water Supply

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

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

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

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

(1) Phase I requirements

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