

Chapter

6

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

6. PAST FINANCIAL PERFORMANCE IN WATER SUPPLY AND SANITATION

6.1 General

Based on the Local Government Code of 1991 and NEDA Board Resolution No. 4 (1994), the locally funded programs and projects for the water supply and sanitation sector have been devolved from the central government agencies to the LGUs since 1992. However, the central government still retains its role of providing support to LGUs in the form of technical, institution-building and limited financial assistance.

The financial arrangements conducted, since the sector's devolution to the LGUs, by the province with a special attention to the subject sector are reviewed and discussed in this chapter. The past experience is the basis to seek for appropriate financial arrangements for the medium term development. The essential study components are: (1) LGUs' past financial performance; (2) past public investment and present plans; (3) LGUs' present financing sources and management participation in the sector, (4) Existing practices by the LGUs on cost recovery and (5) affordability by users.

6.2 LGU's Past Financial Performance

The provincial government's past financial performance during the period 1994 to 1998 was investigated. Actual financial data were obtained for the years 1994 to 1997, while the financial figures in 1998 are only budgetary estimates. Likewise, the municipalities' past financial performance in the same period (1994 to 1998) is included in the Supporting Report.

6.2.1 Sources and Uses of Funds

(1) Sources of Funds in the Province

The sources of income of the LGU are Internal Revenue Allotments (IRA), local tax revenues, non-tax revenues such as grants, aids and subsidies, as shown below. At the present time, IRA is a major financial source of the province.

- (a) IRA -- the amount allotted by the National Government to different provinces, municipalities and barangays. A standard formula is used, which consider parameters such as population, land area, number of barangays, cost of devolved national functions, and other factors.

(b) Tax Revenues -- mainly consist of real property tax with 5% of the total income of the province.

(c) Grants, Aids and Subsidies -- assisted by JICA, UNDP, UNICEF, etc. and the NDCC (Calamity Fund from the Central Government during floods or whenever the province is declared as calamity area)

Based on 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 the LGUs nationwide, specifically to the administrative units of (1) province (23%); (2) city (23%); (3) municipality (34%), and barangay (20%). Further, respective IRAs in different administrative levels are allotted to all administrative units concerned.

Table 6.2.1 presents the income and expenditures of Davao Oriental during the period of 1994-1998. Local tax revenues, which were 5% of the total income of the province, consist of real property tax, business taxes and licenses, and miscellaneous taxes. IRA's share to the total income in annual average was 95%, which indicates that the province has historically been dependent on the IRA with its low tax and non-tax revenue collections.

Table 6.2.1 Income and Expenditures between 1994 and 1998

Province	1994	1995	1996	1997	1998
Receipts					
Tax Revenue	5,619,923.00	6,473,842.00	3,523,259.40	6,448,112.00	5,123,300.00
IRA	129,920,183.00	145,057,000.00	155,122,000.00	194,468,000.00	214,000,000.00
MOOR	3,115,859.54	6,459,371.90	6,539,406.54	5,443,824.47	6,043,500.00
Sub-Total	138,655,965.54	157,990,213.90	165,184,665.94	206,359,936.47	225,166,800.00
Expenditures					
Personal Services	-	91,647,548.00	101,595,817.45	119,766,792.17	132,974,441.00
MOOE	-	24,326,599.11	67,136,420.62	70,738,648.25	82,379,844.00
Sub-Total	-	115,974,147.11	168,732,238.07	190,505,440.42	215,354,285.00
Net Operating Income	138,655,965.54	42,016,066.79	(3,547,572.13)	15,854,496.05	9,812,515.00
Add: Borrowings	-	572,647.00	-	-	-
Less: Capital Outlays	-	2,265,970.80	4,606,252.86	18,079,182.00	9,817,515.00
Net Income	-	40,322,743.00	(8,153,824.96)	(2,224,685.90)	(4,940.00)

Source: Provincial Treasurer's Office

(2) Uses of Funds in the Province

Actual expenditures of the provincial government during the period of 1994 to 1997 show that personnel expenses were major parts with an average of 59% to the total revenue.

Maintenance and operating expenses of the province were 38% of the total revenue. In 1998, capital outlay is projected to be 4.4% of the annual revenue.

In 1997, the province had a net loss of ₱2.22 million from its receipts of ₱206.36 million after deducting the expenditures of ₱190.5 million and capital outlays ((₱18.079 million). Likewise, in 1998, a net loss of about ₱5,000 is projected after deducting the projected capital outlay of ₱9.8 million.

6.2.2 Availability of Funds

As previously noted, the IRA comprises 95% of the total income of the province, which is tapped to finance most of its expenditures including capital outlays and even non-office expenses (incidental). According to the Provincial Treasurer's Office, the amount of IRA that will be received by the province is known in advance before the end of the preceding year. Thus, for budgeting purposes, the province just uses the actual amount of IRA it received in the preceding year as its estimate of IRA for the budget year. In the case that the IRA received is larger than that of the preceding year, the province prepares a supplemental budget.

Table 6.2.2 presents the historical IRA of the provincial government and its municipalities between 1994 and budget year 1998. As shown, the IRA of the province is 1.07% of the provincial IRA nationwide in the period 1994-1997 and budget year 1998. While, the total amount of IRA allotted to all its municipalities in the years 1994-1997 is 1.4% in annual average, but in 1998, this share decreased to only 1.2% to the municipal IRA nationwide which is ₱28.24 billion. The IRA percentage of each municipality to total municipal IRA nationwide is presented in Table 6.2.2, Supporting Report.

Based on the past financial performance of the province, IRA has been a major source of funds. At first, 20% Development Fund (DF) and 5% Calamity Fund are deducted from the total amount of provincial IRA. Then, the remaining portion of the IRA is combined with other income sources. Contractual and statutory items, which are covered by R.A. 324 (b) are first deducted from the pooled income (75% IRA + all other income) before other appropriations are made.

According to the income statement of the province, available funds of the province are mainly spent to cover personnel salaries, benefits, the MOOE and capital expenditures. The provincial government's combined income from IRA and its tax, and non-tax revenues is just suffi-

cient for its operating, capital and non-office expenses. Thus, there is little surplus income that can be tapped for additional capital expenditures.

Table 6.2.2 Past Internal Revenue Allotment to the Province, 1994-1998

Item		1994	1995	1996	1997	1998
National	I. National Total of IRA	46,753,000,000.00	55,202,800,000.00	58,022,990,000.00	71,049,000,000.00	90,990,763,000.00
	(a) IRA to all Provinces	11,498,994,198.00	12,696,604,000.00	13,755,011,803.00	17,813,547,246.00	20,054,018,925.00
	(b) IRA to all Municipalities	16,325,288,074.00	18,768,952,000.00	19,607,715,553.00	24,848,688,251.00	28,245,875,434.00
Province	II. IRA to Davao Oriental Province					
	(1) Total: (2) + (3)					
	(2) Provincial Government	129,920,183.00	145,057,000.00	155,122,000.00	194,468,000.00	214,000,000.00
	Percentage against (a)	1.13%	1.14%	1.13%	1.09%	1.07%
	(3) Municipalities	164,684,923.00	189,742,399.00	214,320,047.00	243,665,688.00	264,335,093.00
	Percentage against (b)	1.00%	1.00%	1.09%	98%	0.93%
	III. Total Income of the Provincial Government	138,655,965.54	157,990,213.90	105,184,665.94	206,359,936.47	225,166,800.00
	Percentage of IRA	93.7%	91.8%	93.90%	94.2%	95%
Municipality	IV. Total Income of Municipalities	361,583,587.79	432,765,325.00	473,248,776.24	486,336,465.60	569,178,425.95
	Percentage of IRA	45.50%	43.80%	45.30%	50%	46.40%
Municipality	V. IRA to Municipalities**					
	Total	164,684,923.00	189,742,399.00	214,320,047.00	243,665,688.00	264,332,093.00
	Banganga	22,368,042.00	24,485,000.00	26,101,000.00	28,101,000.00	33,715,000.00
	Banaybanay	12,785,356.00	13,803,420.00	15,144,000.00	19,266,000.00	20,229,000.00
	Boston	1,900,931.00	8,665,000.00	9,272,482.00	11,636,483.00	11,635,093.00
	Caraga	16,132,192.00	17,712,000.00	18,933,521.00	23,395,619.00	23,396,000.00
	Cateel	10,336,192.00	14,828,000.00	25,748,095.00	19,653,251.00	18,857,000.00
	Gov. Generoso	13,754,735.00	13,753,245.00	15,249,611.00	16,436,335.00	20,243,000.00
	Lupon	22,534,022.00	24,772,000.00	26,496,000.00	32,571,000.00	35,828,000.00
	Manay	13,981,939.00	15,445,000.00	16,595,000.00	20,402,000.00	20,402,000.00
	Mati	29,522,253.00	32,699,000.00	35,445,882.00	42,471,000.00	44,595,000.00
	San Isidro	11,398,626.00	12,606,000.00	13,567,000.00	15,009,000.00	17,763,000.00
	Tarragona	9,970,635.00	10,973,734.00	11,767,456.00	14,724,000.00	17,669,000.00
	Province	129,920,183.00	145,057,000.00	155,122,000.00	194,468,000.00	214,000,000.00

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

For capital expenditures of the province, 20% Development Fund (DF) of the IRA is appropriated. The percentage allotted as the DF is the minimum requirement that should be arranged for capital projects as stated in the memorandum circulars of the DILG. Table 6.2.3 presents allotted funds for capital expenditures (20% DF) between 1995 and 1998.

Referring to the amount of actual capital expenditures from 1995 to 1997, the allotted DF was sufficient to cover the capital expenditures. In 1998, it is projected that the DF may be adequate to cover the capital outlays.

Table 6.2.3. Available Funds for Capital Expenditures (20% DF), 1995-1998

Unit: Pesos

Year	IRA of the Province (a)	20% Dev't. Fund (b)	Actual/projected Capital Expenditures (c)	Surplus/(Deficit) (d)
1995	145,056,570.00	29,011,314.00	29,011,314.00	-
1996	155,122,263.00	31,024,453.00	31,024,453.00	-
1997	187,451,121.80	38,523,027.00	37,490,224.00	1,032,803.00
1998	214,000,000.00	42,800,000.00	42,800,000.00	-

Note: Data Source: Table 6.2.2; Capital expenditures in 1998 are projected figure.

6.2.3 Financial Indicators

In order to determine the debt servicing capability of the province, the formula used by the Bureau of Local Government Finance (BLGF) under the Department of Finance was employed. It takes into account the regular income of the LGU referring to revenues (real property and business taxes) and receipts from economic enterprises, and fees and charges that are collected regularly. Receipts from borrowings, grants and inter-fund transfers are not considered as regular income.

Following is the formula adopted by BLGF in computing the debt servicing capacity, where the average annual growth rate to be used should not exceed 15%, according to the MDF Policy Governing Board Resolution 4-95.

$$DSC = \{ [RINC 1 (1 + AGR) + RINC 1] + IRA 2 \} \times 20\% - AMORT$$

Where:

DSC = debt servicing capacity of the LGU

RINC = regular income

AGR = average growth rate

IRA = internal revenue allotment

20% = debt servicing ceiling percentage imposed by the Local Government Code of 1991 under Section 324 (b).

AMORT = amortization of the LGU's outstanding loan

1 = current year

2 = preceding year

Based on the above formula, the amount of the debt servicing capacity of the provincial government was computed to be P43.82 million for the year 1998. This figure implies the maximum loanable amount through the MDF to the province. Data on the loan amortization payments on existing loans are not available.

6.3 Past Public Investment and Present Plans

6.3.1 Past and Current Annual Investment Plans

The past and recent development of the water supply and sanitation sector in the province was mainly undertaken by the line agencies such as DPWH, LWUA, DILG and DOH as well as the provincial government. The sector investments by these agencies between 1995 and 1998 are shown in Table 6.3.1.

Table 6.3.1 Previous Sector Investment to the Province by Concerned Agencies

Unit: Pesos

Funding Category		1995-1998				
Agency	Funds	Level I	Level II	Level III	Sub-Total	Sanitation
DILG		180,600.00	1,173,100.00		1,353,700.00	50,000.00
DPWH	Foreign Fund 1)	1,281,000.00			1,281,000.00	57,000.00
	Local Fund 2)	5,601,620.00	11,065,000.00		16,666,620.00	
LWUA				12,900,000.00	12,900,000.00	
DOH	UNICEF					1,739,600.00
Province	Provincial Government	5,549,278.00	599,840.00	660,000.00	6,809,118.00	490,882.00
	UNICEF	240,000.00			240,000.00	
Municipality	Municipal Government	27,251,564.00	7,320,580.00	3,657,000.00	38,229,144.00	1,360,000.00
Total		40,104,062.00	20,158,520.00	17,217,000.00	77,479,582.00	3,697,482.00

The largest investments registered so far are those for Level I water supply with P40.1 million followed by those for Level II water supply with P20.16 million. While, for Level III water supply an aggregated amount of P17.2 million were spent during the said period, 74.9% of which was financed by LWUA. The DOH has financed 47% of the investments in sanitation sector with P1.74 million, while the municipal government financed 37% of the total investments.

(1) Budgetary Allocation to the Sector

The Budget Office of the province consolidates the budget proposal submitted by all offices of the Provincial Government. While, the DBM issues a Local Budget Memorandum every October of the preceding budget year to guide the provinces in their budget

preparation. The sector obtains allotment from the 20% DF allocation by the Provincial Development Council (PDC).

Once, the budgetary arrangement is completed, the local chief executive (Governor) endorses it to the SP for approval and appropriation. The SP usually approves the budget, ideally before January of the budget year. In case the budget is not approved, the province operates on a re-enacted budget, which is based on the last year's budget, until the budget for the current year is approved.

(2) Capital Expenditures in the Sector

The projects programmed for implementation in the province by sector, by funding source, and by implementing agency are consolidated and presented by the PPDO in the Provincial Annual Investment Plan (AIP). The AIP is based on the planned investment of the province, as well as on the submission to the PPDO from the municipalities on their planned investments for the coming year. The AIPs of Davao Oriental for the WATSAN sector from 1995 to 1998 are summarized in Tables 6.3.2 and 6.3.3.

Table 6.3.2 shows annual activities in the water supply sector; the corresponding funding source and the amount of investment from 1995 to 1998, while Table 6.3.3 summarizes annual sector investment plan by service level. Levels II and III water supply had the largest fund allocation with the amount of ₱43.55 million. In 1998, a total amount of ₱13.2 million will be invested for the construction of Levels I, II and III facilities as well as sanitation facilities. The major financial source is LGUs' counterpart fund. The rest will be sourced from loans amounting to ₱3.2 million.

The required investment for water supply and sanitation sector was planned at ₱72.80 million as a cumulative cost from 1995 to 1998, of which only ₱2 million were allotted to the sanitation sector. Out of the total investment planned for WATSAN sector, the province financed only ₱7.3million (10%; refer to Table 6.3.1). The allocation to the sanitation sector was only ₱490,000 during the period.

There is a further need to clarify which of the planned investments were implemented and funded from any of the available sources such as local funds (provincial and municipal government) and foreign funds.

Table 6.3.2 Annual Activities in the Water Supply Sector

I t e m	1995			1996			1997			1998		
	IA	Fund Source	Amount (P '000)	IA	Fund Source	Amount (P '000)	IA	Fund Source	Amount (P '000)	LA	Fund Source	Amount (P '000)
Construction (DW, SW, Spring Box, Reservoir, Tank)												
Various Foreign Assisted												
National		OECE	1,281								UNICEF	240
Various Local Funding		DPWH	2,406								DPWH/DILG	150
		PROV'L/MUN.	4,167								PROV'L/MUN.	4,777
Construction of Rain Collectors/Water Tanks												
Develop Spring Sources												
Various Foreign Assisted												
National												
Various Local Funding												
Spring Development with L2												
Various Foreign Assisted												
National		DPWH	5,370								DPWH	1,163
National/Local Funding												
Various Local Funding		PROV'L/MUN.	1,391								PROV'L/MUN.	1,550
Spring Development with L3												
Spring Development with pipes, water tank												
Construction Levels 2/3												
Various Foreign Assisted												
National												
Various Local Funding		PROV'L/MUN.	240								PROV'L/MUN.	1,507
Loan		LWUA	3,225								LWUA	3,225
Maintains/Rehab/Improve L1/L2/L3 & SD												
Expansion L2/L3												
Construction of Health Center/Stations-Barangay		MUN.	80								MUN.	200
Water Disinfection/Chlorination of Water Sources		PROV'L	50								PROV'L	153
Barangay Sanitation												
Construction of School/Public Toilet		MUN.	120								MUN.	246

Source: Davao Oriental PPDO.

Table 6.3.3 Sector Allocation in the Annual Investment Plan

Unit: 000 Pesos

Item	1995	1996	1997	1998	Total
Level 1					
Foreign Assisted	1,281.00	-	-	240.00	2,239,705.00
National	2,406.00	2,163.12	1,063.10	150.00	930.00
Local	4,166.74	4,607.83	6,396.47	4,777.30	19,948.34
Level 2/3					
Foreign Assisted	-	-	200.00	-	200.00
National	5,370.00	4,200.00	6,875.60	1,162.50	17,608.10
Local	1,730.00	3,080.00	4,969.84	3,057.00	12,836.84
Loan - DBP/LBP	3,225.00	3,225.00	3,225.00	3,225.00	12,900.00
Expansion					
Repair/Maintenance					
Health Centers	80.00	300.00	60.00	200.00	640.00
Water Quality	50.00	165.00	147.65	153.23	515.88
Total-Water Supply	18,179.32	17,275.95	22,730.01	12,611.80	70,797.08
Total-Sanitation (Health)	250.00	890.00	257.65	608.83	2,006.48
Grand Total	18,429.32	18,165.95	22,987.66	13,220.63	72,803.56

Source: Provincial Planning and Development Office

6.3.2 Past and Current Breakdown of 20% Development Fund

The allocation of the 20% DF is guided by DILG Memorandum Circular No.95-215 as amended by Memorandum Circular No. 96-263 issuing 'the Policies and Guidelines on the Utilization of the DF and other related matters'. Based on these guidelines, the LGUs appropriate the DF for human and ecological security concerns.

As presented in Table 6.3.4, the infrastructure sector obtained 17.2% of the 20% DF in 1998 (i.e. P33.85 million out of P 56.49 million). Water supply and sanitation sector's share is very minimal with 5.8% of the DF.

Table 6.3.4 Allocation of the 20% Development Fund, 1994-1998

Unit: Pesos

Year	20% DF	Social Development	Economic Development	Infrastructure	Water Supply/ Sanitation	Others
1995	29,011,314.00	10,094,767.00	6,666,156.00	8,368,213.00	1,700,000.00	2,182,178.00
1996	31,024,453.00	8,941,850.00	6,702,603.00	6,900,000.00	2,000,000.00	6,480,000.00
1997	38,523,027.00	8,917,009.00	10,292,936.00	11,037,559.00	2,000,000.00	5,242,720.00
1998	42,800,000.00	10,606,200.00	8,623,000.00	7,345,000.00	2,500,000.00	13,725,800.00

Note: 1/ Investment in sanitation sector is only P300,000.00 in 1998.

6.3.3 Existing Plans of the LGUs for the Sector

The Provincial Government has been undertaking various programs for the water supply and sanitation sector. However, there are no specific projects to be implemented at present. The following are the items to be budgetary arranged.

(1) Logistic supports with required funding

The LGUs, through the course of project implementation, shall ensure provision of adequate logistic supports with financial arrangements. The LGUs have not given priority to the requirements under the budgetary constraints. The AIP needs to include the plan for the logistic supports entailing manpower and vehicle allocation.

(2) O&M Assistance

The AIP of the province in the last 4 years included the repair and maintenance items for water supply facilities. The province also provided some form of assistance in the O&M of existing facilities. The PPDO was recipients of a drilling rig from the RWDC and it maintains a drilling crew consisting of four drillers, one driver and casual employees.

6.4 LGUs' Present Financing Sources and Management Participation in the Sector

6.4.1 Cost Sharing Arrangements / Counterpart Funding

The implementation of water supply projects was previously undertaken by DPWH (construction through OECF loan assistance up to 1995) and DILG (BWP-institutional building, UNDP-WATSAN, and CIDA-capability building). The DPWH, through its DEOs, still receive requests for assistance from barangay people. This is due to lack of awareness on the part of people regarding the new institutional arrangement and proved the DEOs' technical ability. The requests, however, are granted on a case-to-case basis, usually if the manpower and budget are available.

The new cost-sharing scheme was authorized in 1998 in accordance with the policy of national government grants. It is stated that "this scheme shall be applied to all new ODA-assisted projects that are currently being packaged in support of LGUs".

Programs of central government agencies that involve devolved functions, particularly those that have social and/or environmental objectives are implemented through a cost-sharing arrangement between the central government agency and LGUs. For any central government grants that are provided for the development of Level I water supply systems and sanitation facilities to the limited municipalities, the LGUs and beneficiaries concerned shall share the capital cost required. No subsidies from the central government will be provided for the construction of Level II and III water supply systems.

6.4.2 ODA Assisted Projects and Grant Aid

In the past, the province received assistance through the Barangay Water Supply projects funded under UNICEF and CDF (part of General Appropriations Act-national budget). Level I water supply facilities was also provided through OECF loan.

(1) Arrangement Through Conduits

1) Municipal Development Fund (MDF)

The MDF is a revolving fund created under Presidential Decree No. 1914 to provide LGUs access to foreign loans, assistance or grants. Operations of the MDF, as well as the evaluation and control of local government transactions of the fund, are guided by the financial policies defined in the Joint Circular No. 6-87 of the DOF, COA and DBM. The policies include, among others, the following:

- On-lending terms for local governments or government corporations to be in accordance with the terms and conditions of the international agreements with foreign financial institutions;
- Loan repayments to conform with the terms and conditions of the corresponding Loan and Project Agreements;
- Annual debt service liabilities to all creditors to be at least 120 per cent of total net annual revenues from all sources after operating costs, unless otherwise provided in a mutual agreement among all parties concerned;
- Repayment to MDF to take precedence over all subsequent borrowings incurred;
- Payment of additional interest, charges and fees on amounts to be relented to local governments may be required by the Secretary of Finance in consultation or agreement with foreign lending institutions and LGUs/Project Cities to cover foreign exchange risks, commitment charges and front-end fees applied on foreign borrowings by lending institutions; and

- Internal revenue/specific tax allotments to be withheld by the DOF in case of default or arrearages for more than three (3) months.

The Policy on accessing loans through the MDF is currently under review by the central government to make the terms and conditions more concessional towards the LGUs.

2) Governmental Financing Institutions (GFI)

In the past, the LGUs could not access financing institutions for direct assistance. But with the devolution of the sector to the LGUs, the LGUs could now access direct financing from banks and other financing institutions.

Among the GFIs through which LGUs can access ODA loans are the Land Bank of the Philippines (LBP) and the Development Bank of the Philippines (DBP). For the LGU to enter into a loan, the respective legislative council (PA for the Province, Sangguniang Panlungsod; SP for the City and Sangguniang Bayan; SB for the Municipality) will authorize the Chief Executive Officer (Governor or Mayor, as the case may be). The collateral that the LGU may use in order to avail of loans from the bank could be any of the following: deposit hold out, public land and assignment of IRA.

In a deposit hold out loan, loanable amount is based on the amount in the time deposit account of the LGU in the bank. The LGU is allowed a maximum loanable amount of up to 90 per cent of the total amount of its time deposit account in the bank. One of the terms for this kind of loan includes deduction of amount due from the LGU's IRA deposited in that bank.

Another condition that the bank usually imposes on the loan is the signing of a MOA between the LGU and the bank, where the LGU guarantees that the loan will be honored despite a change in administration in the next election. Interest rate is not fixed. If payment is to be made from IRA, the bank imposes penalty charges.

Other collaterals accepted by the bank are: public land and assignment of IRA. Interest rate is not fixed but fluctuating depending on the current interest rates prevailing during repayment. Penalty charges are imposed, whenever the IRA of the province is delayed.

3) Foreign Lending Agencies

Other external assistance to the sector in the province comes from foreign assisted projects. In the past, participation of the province in foreign funded project was minimal. But with the devolution of the Sector to the LGUs, the participation of the LGUs has been given importance. After the devolution, the province became the direct recipient of foreign grants.

6.4.3 LGU-Financed and Managed Waterworks/Water District.

(1) Past Financial Performance of WDs and RWSAs/BWSAs

Four (4) WDs are currently managed in the province. In addition, there are sixteen (16) municipal waterworks (refer to Table 6.4.1 and Table 6.4.2). Some of these WDs/Waterworks have very low collection efficiency of water charges (50 to 70%). While, San Isidro WD has the highest collection efficiency of 95%. All WDs received loans from LWUA.

Table 6.4.1 Financial Indicators of WD/Waterworks

Waterworks	Description						
	No. of Metered Connections	No. of Flat Rate Connections	Average Monthly Rate	Average Consumption per Connection	Average O&M Cost	Average Revenue	Collection Efficiency
	Nos.	Nos.	Pesos/cu.m.	cu.m./mo.	Pesos/mo.	Pesos/mo.	Percent (%)
1. Banganga WD	406	45	P 60.00/mo.	11.44	P 20,000.00	P	60.00%
2. Lupon WD	500		85.00/mo.	14.34	72,719.86	117,745.55	62.83%
3. Mati WD	1,305		8.96/cu.m.	28.39	114,897.15	265,357.80	80.00%
4. San Isidro WD	429		80.00/mo.	24.16	44,197.67	56,055.50	95.00%
5. Pintalagan, Banaybanay		246	11.00/mo.	5.37	1,440.00		80.00%
6. Poblacion, Caraga	370	22	20.00/mo.	15.77	16,683.00		65.00%
7. San Luis, Caraga		215	10.00/mo.	25.81	1,450.00		60.00%
8. Santiago, Caraga		158	32.50/mo.	38.35	2,500.00		50.00%
9. Macangao, Lupon		26	110.00/mo.	15.00	2,000.00		90.00%
10. Central, Manay		260	20.00/mo.	24.00	2,159.00		75.00%
11. Macambol, Mati		36	12.00/mo.	26.67	400.00		55.00%
12. Matiao, Mati	369		80.00/mo.	19.11	15,000.00		85.00%
13. NHA Homeowners Assoc.		284	50.00/mo.	12.04	8,000.00		70.00%
14. Capitol Water System		110	50.00/mo.	13.64	5,000.00		60.00%
15. Sainz, Mati	607		60.00/mo.	12.90	5,500.00		70.00%
16. Sanghay, Mati		21	12.00/mo.	88.57	400.00		50.00%
17. Taguibo, Mati		32	12.00/mo.	95.63	400.00		60.00%
18. LGU, Pob. Gov. Generoso	155		65.00/mo.	13.16	6,000.00		75.00%
19. Tinuwasai, Gov. Generoso	117		60.00/mo.	15.90	5,500.00		82.00%
20. Bitagan, San Isidro		30	70.00/mo.	10.00	2,000.00		80.00%

* P30.00/month minimum + 10.00/cu.m.

Table 6.4.2 Loan Status of WD (as of June 1998)

Water District	Description			
	Total Loan Aailed (in '000 Pesos)	Remaining Payment Period (Months)	Average Monthly Am- ortization	Current Arrears (in '000 Pesos)
Banganga	703.00	75	P-377,500.00	419.52
Lupon	570.13	179	5,614.00	565.37
Mati	7,144.16	320	15,918.60	7,461.17
San Isidro	539.69	90	2,008.00	126.76

Source: Local Water District Administration

6.5 Existing Practices by the LGU on Cost Recovery

6.5.1 Capital Cost

In the previous arrangements, the capital cost for Level I systems was 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 the 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 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 thirty (30) years. Less capable WDs are granted soft loans that are interest free during the first five (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 investment 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. In case of LGU's operating Level III systems, the capital cost is managed by the LGU using the part of DF and other financial sources (borrowings and grants/aid).

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

6.5.2 Operation and Maintenance Cost

Cost recovery for operation and maintenance of Level I and II water supply systems is envisioned to be the responsibility of the users. As such, the users shall form an organization (or association) to handle the collection of water charges.

When the DPWH had been undertaking the construction of Level I water supply facilities, the DPWH through DEOs assisted to form many BWSAs. However, most of these BWSAs are no longer functioning, which resulted to non-collection of water fees. As a consequence, the users had to go to the LGUs (usually barangay or municipal) to address the problem. In some cases, the users also requested the DEOs for assistance.

Although the DPWH has no budget for operations and maintenance, it extends assistance in the form of materials (such as gaskets or joint pipes) from their supplies, if these items are available. Because of this situation, the emphasis was placed on the need of monthly contributions from the users for the O&M of the facilities. While, some of the active BWSAs for Level I collect monthly fees ranging from ₱5.00 to ₱15.00 per household.

Cost recovery for Level III systems, particularly for those covered by Water Districts is managed through different systems. The households covered by the Water District can be disconnected in case of no-payment by the users.

In the LGU's operating Level III systems, O&M cost is also collected as the water charge, although the LGU may extend financial support to a certain extent of requirements in the initial stage of operation.

6.6 Affordability of Users

This sub-section presents the affordability of users by sector service level. However, base information for the analysis is limited to that gathered from field survey at selected barangays and from the water districts in the province.

6.6.1 Capital Cost Contribution

Referring to the group interview results for Level and II water supply conducted in this study, 72% of respondents are willing to participate in the water supply projects in the future. Of those respondents, majorities (94 of 107 respondents or 88%) indicated that they are willing to contribute free labor during construction. While, only 31 out of 107 respondents (29%) are willing to contribute cash with minimal amount of ₱10.00 to ₱30.00 per household. The rest or 13.6 % of 146 respondents are still undecided on whether to pay or not for the construction of the system. Hence, LGUs may need to provide subsidy for Levels I and II water supply, due to insufficient household income.

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 around 6.1 times higher than the median monthly family income in the province and thus, may require subsidy from LGUs.

6.6.2 Operation and Maintenance Cost

Referring to the aforementioned survey for Level I and II water supply, majorities of respondents are willing to participate in O&M of the water supply facilities in the future. The interview results revealed that majorities would pay monthly as much as ₱50.00, while 15 respondents ₱21-30.000 per month. They also indicated that the water fees being collected are not enough to operate and maintain the facilities. Although, survey sample size is limited, the highest monthly amount affordable is about ₱50 that is 1.43% of the median family income. Thus, it can be assumed that the users can well afford to pay the amounts being currently charged by the BWSAs.

For the water districts or Level III waterworks, O&M expenses are covered mainly by the user fees which are charged on a per cum. basis by water user category. The water charge system was established by LWUA to compel water districts to be self-sufficient, financially viable and be able to repay any loans obtained to improve water supply services.

Table 6.6.1 presents the affordability by service level. At present, the current water bills in the province seem to be within an affordable range based on experience, although the actual income vary from municipality to municipality and barangay to barangay.

Table 6.6.1 Affordability in Water and Sanitation Services

Income/ Level of Service	Amount (Pesos)	% to Monthly Income	Affordable Range (%) 5/
Median of Monthly Income 1/	₱ 3,483.00	100	-
Average Level III: Monthly Water Bill 2/	80.00 – 100.00	2.3 – 2.9	5.0 or less
Average Level II: Monthly Water Bill 3/	80.00	2.3	2.0-3.0
Mo. Level I Expenditures	20.00 – 30.00	0.5-0.9	1.0-less
Private Toilet Construction Cost – Flush Type Toilet 4/	21,300.00	6.16	-

Notes:

1/ 1994 Family Income and Expenditures Survey, NSO

2/ Data from PSPT. It is assumed that 21 cum. will be consumed per family.

3/ Common figures in the province.

4/ Current prices estimated in this study

5/ Based on the experiences mainly from LWUA, DPWH and DILG. 5/ Based on the experiences mainly from LWUA, DPWH and DILG.

Chapter
WATER SOURCE DEVELOPMENT

7

7. WATER SOURCE DEVELOPMENT

7.1 General

The study on water source development covers the entire province to come up with water source potential exploitable for mainly domestic water supply. An emphasis is placed on the groundwater availability due to its prevalent use and comparatively conservative development through the future in the jurisdiction of the provincial government. It is also advantageous to utilize groundwater for domestic water supply because of better quality and economical use. Nevertheless, surface water potential of major rivers was studied in terms of quantity (return period flow rate) and quality to provide information for LGU's future use, if necessary.

A "Groundwater Availability Map" was prepared, which identifies the areas with available potable water sources. The study has two major components: (1) interpretation of existing geological and groundwater conditions and (2) preparation of Groundwater Availability Map to show groundwater potential areas under three kinds of categorized areas. Furthermore, standard well specifications by municipality were also established to reflect in the medium-term sector development plan. A groundwater quality map was also prepared to supplement the information on the groundwater development for drinking purpose.

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 from relevant local offices in the field (including spring inventories with verifications). The field information directly collected by the Study Team was also effectively used to increase the accuracy of the Map. Among the information, the Geologic Map published by BMGS, the Water Resource Investigation Report and the Well Inventory Database of NWRB are 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 and feasibility study at present. However, the recommendations on the required investigations were presented for the specific areas with scope of survey, as a reference for LGUs, to conduct them prior to D/D and construction work. Aside from the requirements, 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 overview on current groundwater use with the conditions is summarized in Table 7.1.1 (Well data collected from each municipality are presented in Table 7.1.1 Water Source Information, Data Report). There are 4,502 shallow wells, 896 deep wells and 399 developed springs in the province (functional services). Majorities of the wells are shallow wells. About 30% of these water sources are public facilities. Of the total existing wells, 88% remains functional at present. In addition to the above sources, 49 untapped springs are accounted.

Table 7.1.1 Existing Groundwater Sources in the Province

Category and Classification	Shallow Well	Deep Well	Spring	Total
1. Water source being availed				
a. Public sources	820	409	395	1,624
b. Privately owned sources	3,682	487	4	4,160
c. Number of water sources	4,502	896	399	5,797
d. Profile of different sources	78%	15%	7%	100%
2. Water sources with problems and non-functional wells				
a. Water quality problems*	1,430	0	0	1,430
b. Non-functional	448	296		744
3. Spring source information				
a. Undeveloped			N.A.	N.A.
b. Untapped			49	49

Note. 1: Number of water sources being availed at present including those with water quality problems.

2: Number of existing water sources with problems: being used, but with water quality problem/ abandoned wells.

3: Number of springs availed, but not adequately protected; and those as candidate sources to be developed.

*: Assumed number of sources (unsafe category) based on the study on existing water supply facilities in Chapter 4.

7.2 Geology

The rock units in the province are classified into three (3) main groups based on the ages of the rock formation. These are, from the oldest to youngest, the Miocene 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 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 and their geological features are described below.

(1) Miocene and Older rocks

These rocks cover a major part of the mountainous area extending from north to south in the entire province. The oldest formation is of volcanic origin consisting of andesite and basalt lava of Cretaceous to Paleogene age. The formation is largely distributed in the mountainous area on the southwest side of the province and in the largest peninsula extending to the south. Other older rock units are formed by volcanic, igneous, and sedimentary rocks of Eocene-Miocene age, consisting of andesite lava, diorite, gabbro, siltstone, sandstone, tuffaceous conglomerate, sandstone and shale.

The older rock units are mostly in consolidated condition. The possibility of groundwater development is very low and the area is categorized to be difficult area for groundwater development.

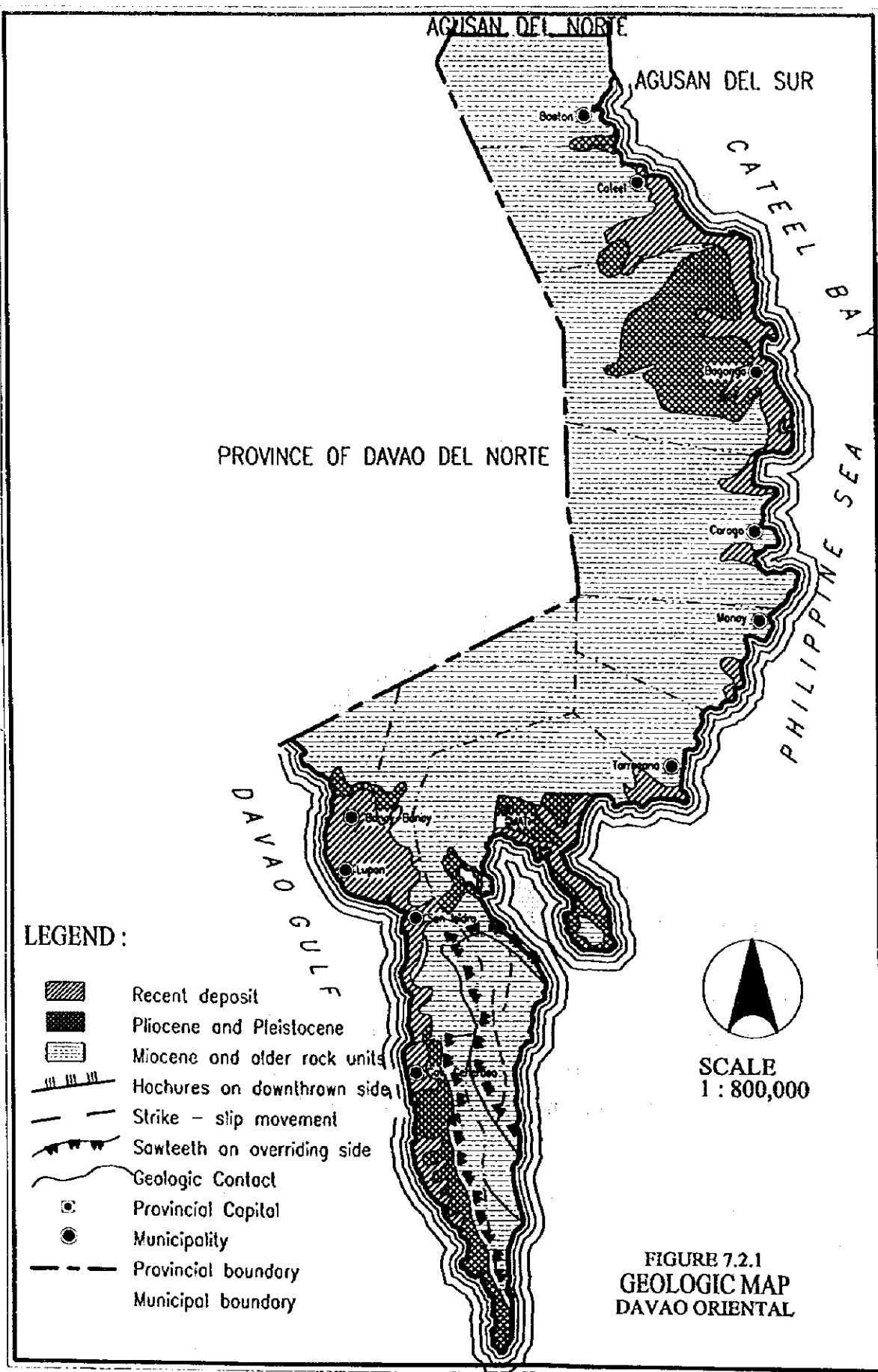
(2) Pliocene to Pleistocene rocks

The sediments are partly distributed in the marginal areas between the older rock units and recent deposits within a small and narrow area. The sediments cover the western rim of the largest peninsula extending to the south of Lupon municipality, the east of Mati municipality, and the west of Baganga municipality. The sediments consist of conglomerate, sandstone, porous limestone, shale and tuff and are semi-consolidated or unconsolidated. The sediments form a slightly high land with a smooth slope and an elevation of about 20 m on the eastern side of Mati municipality. The groundwater potential is generally substantial with sufficient aquifer thickness and can be recommended for groundwater development by means of deep wells.

(3) Recent deposits

Recent deposits are distributed in a limited area along the seashore on the western, central, and eastern portions of the province. These deposits consist of clay, silt, sand and gravel deposits. The recent deposits form groundwater basins consisting of several

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7.3 Groundwater Sources

7.3.1 Classification of Groundwater Availability

For planning purpose, the provincial area is divided into the following sub-areas in terms of groundwater availability.

(1) Shallow well area

These are areas having water-bearing rock formations extending not more than 20 m 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 20 m 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

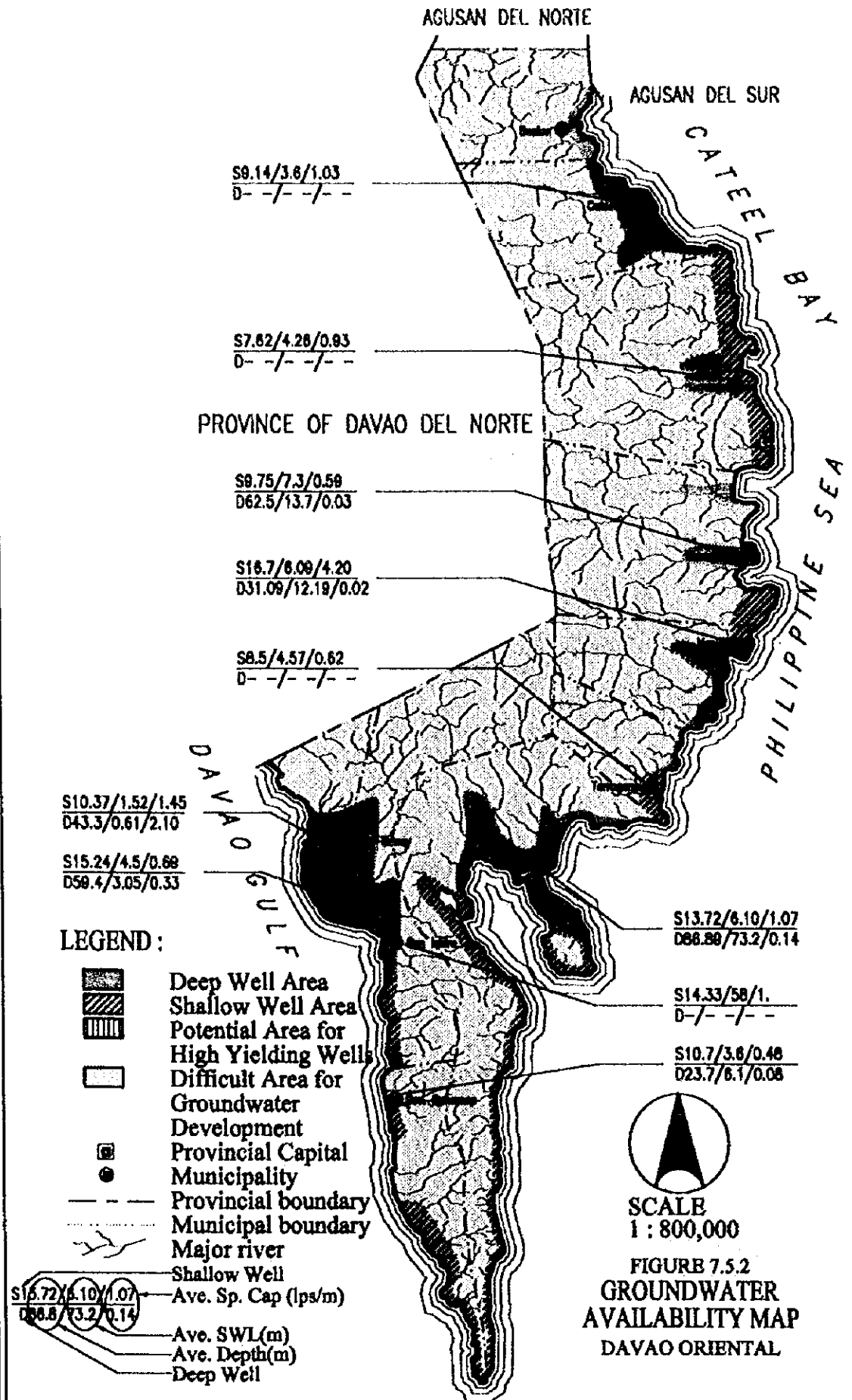
These are areas not suitable for well development. The areas under this category largely consist of rock formations older than Miocene in age. The groundwater availability in the aforesaid rocks is very low and usually released in the opened rock fractures. Springs are the common sources of water supply in these areas. However, difficult areas generally have alluvial sediments with small scale in the narrow areas along the streams issuing from mountains. In such areas, groundwater development by means of shallow and deep wells is often possible though the development potential is very limited.

In addition to the above classification, potential areas to have high yielding deep aquifers are also presented based on NWRB's geo-resistivity survey.

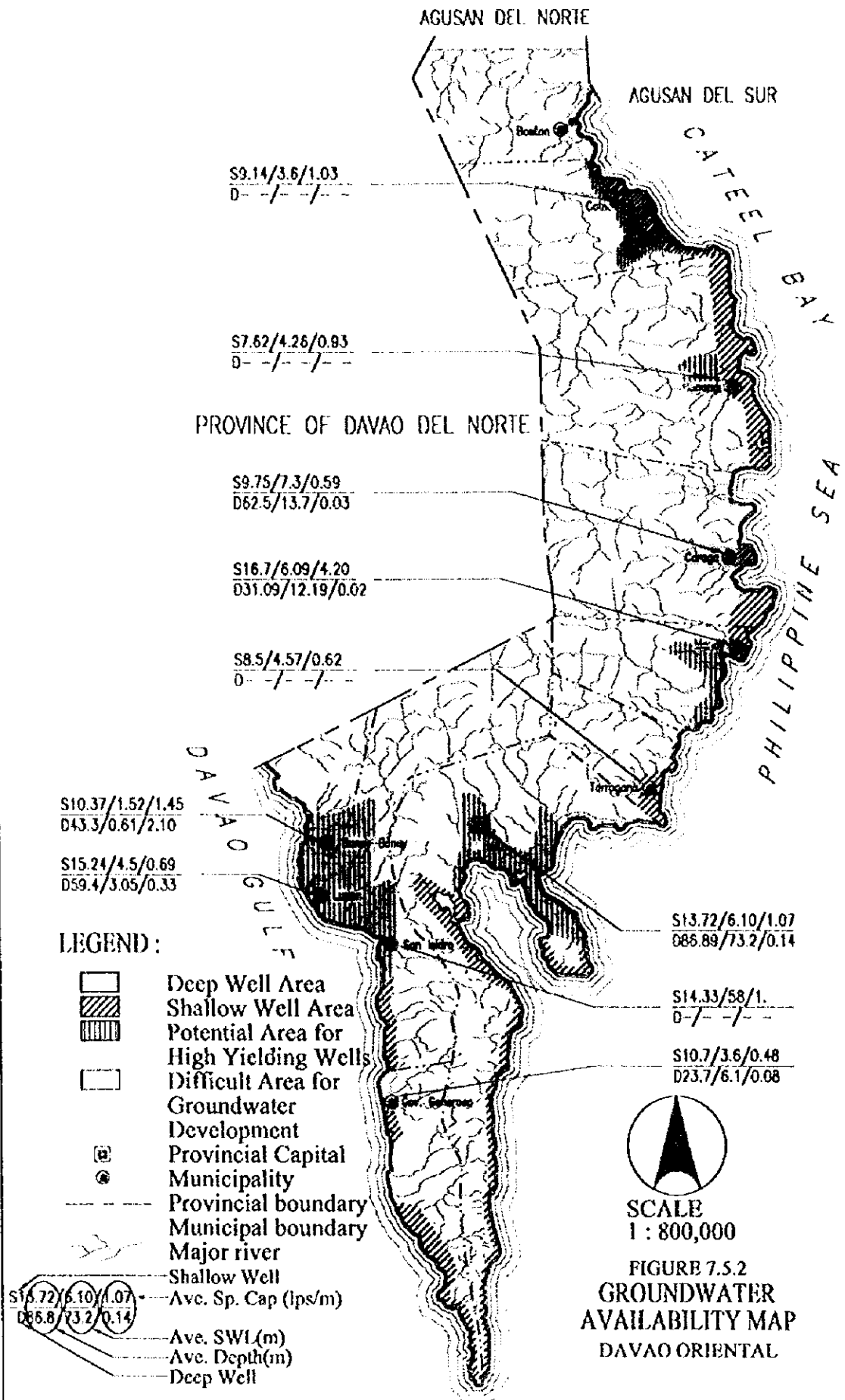
7.3.2 Groundwater Availability in the Province

The Groundwater Availability Map is presented in Figure 7.3.1. The major databases used in the preparation of the map were obtained from BMGS and NWRB. The methodology and study procedure with respective outputs are discussed in 7.3, Supporting Report. Technical information on the wells by municipality is also shown in the same report. The groundwater development potential in the province through the future are summarized below.

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(1) Shallow well area

Shallow well area covers about 4 % of the province. It is located in the southern part of Lupon Municipality and the southern rim of the peninsula in the town of Mati. Only shallow wells can be developed in these areas. Shallow wells are generally driven/drilled with an average depth of 6.0 m to 18.6 mbgl and water table is more than 4.2 mbgl.

(2) Deep well area

Deep well area covers approximately 13% of the province. The small alluvial plains are distributed along the coastal line where Lupon, San Ishidro, Mati, Baganga, Cateel Municipalities are located. In addition, Pliocene and Pleistocene sediments areas are also included to the deep well area. The areas distributed in the inland of Mati Municipality and as the hinterland of alluvial plains. These areas are categorized as high potential areas for deep well development. Average well depth of existing deep wells is 38.5 mbgl with average water level of 9.6 mbgl, and the average specific capacity is 2.3 cu. m/hr/m.

(3) Difficult Area

About 83 % of the provincial area are classified as the difficult area to exploit groundwater. The formations, which form high mountainous areas, cover the most areas of the province. The formations are made up of consolidated volcanic rocks, sediments, and metamorphic rocks of Cretaceous to Miocene age. The formations are impervious and not appropriate for groundwater development. The water sources for water supply are mostly springs.

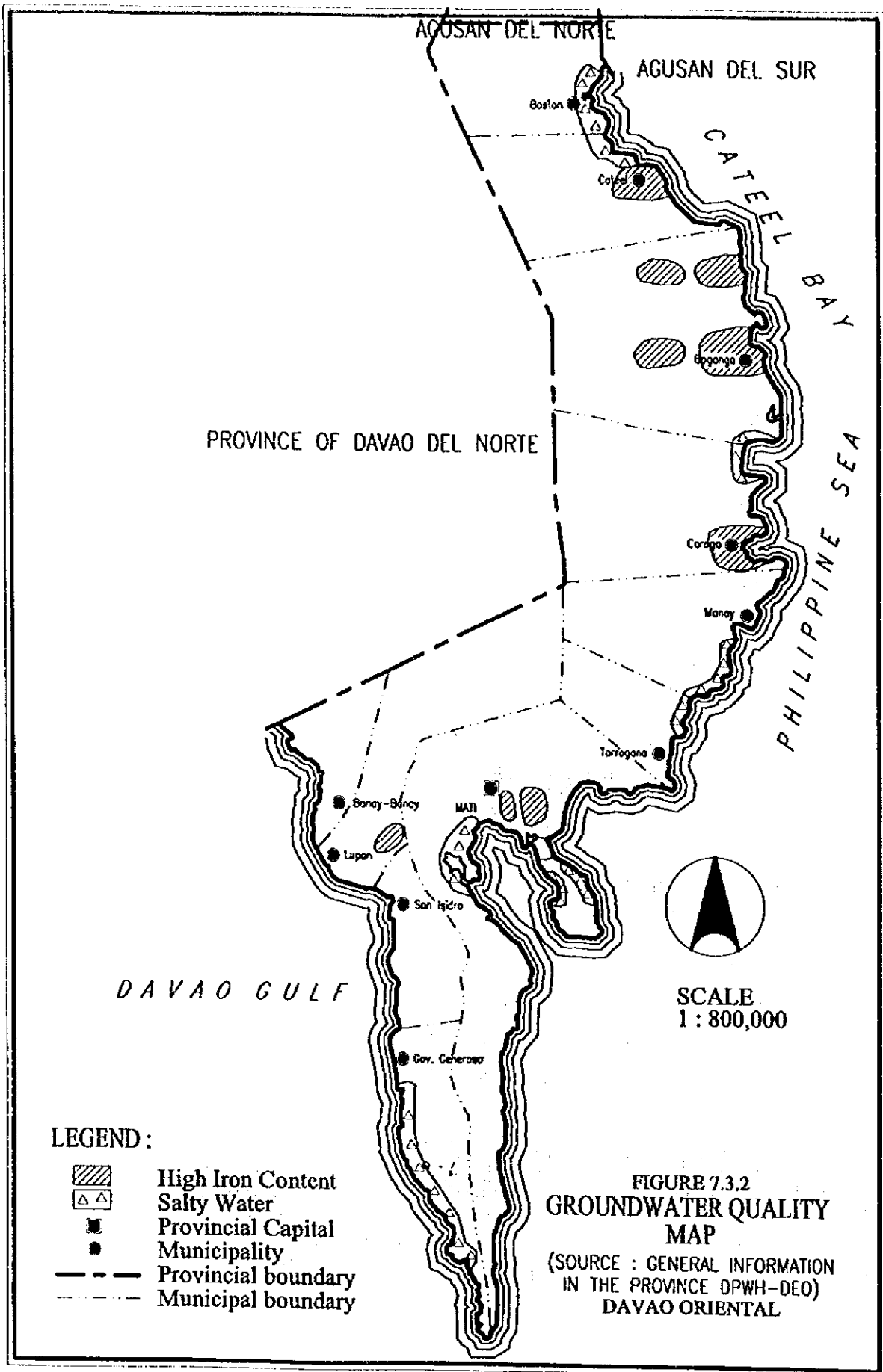
7.3.3 Groundwater Quality

Groundwater is generally potable except in some areas with high iron content and salt water intrusion. A water resources investigation for the province conducted by NWRB and general information from DPWH-DEO revealed the problem areas as shown in the Groundwater Quality Map in Figure 7.3.2. The following are summary of the findings.

(1) High iron content problem area

Groundwater with high iron content occurs in the inland areas of Lupon and Mati municipalities. It is also found in the coastal areas on the eastern side of the province such as Baganga, Dapunan, and Cateel municipalities. The depth of groundwater with high iron content is shallow and ranges from 18 m to 24 m in most areas.

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(2) Salt water intrusion

The province experiences salt-water intrusion in many areas along the seashore such as: 1) the eastern side of a large peninsula located south of Lupon municipality; 2) the western area along the coastal line of Mati municipality; 3) the neck portion area of a peninsula extending south of Mati municipality; 4) the eastern coastal areas from Boston to Baculin, of San Luis area, and from San Antonio to Jovellary. The salt water intrusion in most areas occurs in shallow wells with depths of 12 m to 20 m, except the neck portion of the peninsula located south of Mati municipality. This peninsula has the intrusion in shallow and deep groundwater.

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 formation and through rock features. Because of the intense fracturing, particularly older formation, and the presence of large solution openings in limestone, secondary permeability is induced to the rocks that favors spring development.

For the 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.

Based on the inventory of water sources prepared through the study, the province has 480 developed springs currently serving the province, which issue from high mountain areas. Most areas in the province are mountainous with slopes directly rising from the seashore. The alluvial areas are small in scale. Of these springs, 379 have discharges of less than 2.8 l/sec, while 20 have a yield of 2.8 l/sec or more. A total of 49 untapped springs are reported in the municipalities of Lupon, San Isidro, Gov. Generoso, Mati, Cateel, and Boston. These springs have yields varying from 0.11 to 31.0 l/sec. The technical information of springs in each municipality is presented in Table 7.4.1 Existing Spring Sources, Supporting Report.

7.5 Surface Water Sources

The major surface water sources in the province are the Cateel River, the Manurigao River,

the Caraga River, the Casauman River, the Bitanagan River and the Sunlog River. There are only two stream gauging stations in the province. However, the runoff records of these gauging stations are lacking.

Surface water use in the province totaled 7.53 cu.m/sec according to the NWRB's water rights registration database, as of March 1997. Of this usage, 99.9% of the water rights were registered for irrigation. Other surface water uses were for industrial and fisheries by a few private companies.

Data on river flow, maintenance flow, water use of the major rivers and stream systems, obtained from available runoff records from the gauging stations in Surigao del Sur and Davao del Norte, are presented in Table 7.5.2, Supporting Report. The inflow to and the outflow from the respective municipalities are estimated as the exploitable potential of the major rivers in the province.

Water quality analyses were conducted through this study. The results of water quality analysis at selected streams meet the Class A limitation of "DENR Fresh Water Quality Criteria" within tested parameters, excluding for high Fe and Mn contents at the Catcel and the Sunlog Rivers.

7.6 Future Development Potential of Water Sources

(1) Groundwater

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

Shallow wells are the possible source for Level I service. Considering the existing wells in the province, the potential aquifers for shallow wells occur between 6 to 19 mbgl. One disadvantage of shallow wells is the lowering of water level during dry season that reduces the discharge 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 depends that the wells tap to comparatively deeper aquifer. It reduces the hazards of groundwater pollution. In addition, lowering of

groundwater level does not affect the discharge, since usual confinement of deep aquifer rises water level above the aquifers. In Recent deposits and Pliocene to Pleistocene sediments, good aquifers apparently occur from 23 to 100 mbgl.

Additional wells can still be developed to meet the future water supply demand of the province. For future planning purpose, the Groundwater Availability Map includes basic information for municipal groundwater development with the following data: well depth, static water level, and specific capacity, and aquifer formation as shown in Table 7.6.2, Supporting Report. The groundwater development potential in the province is shown in Table 7.6.1.

(2) Spring

A total of 65 untapped spring sources for future development are listed in Table 7.6.3 Untapped Spring Source Identification, Supporting Report. The list includes detailed data on barangay name, owner, discharge rate in dry season, transmission line length and elevation differences between spring sources and served areas.

Such springs are almost uniformly distributed in the entire province. Municipalities of Lupon, Cateel, and Boston have comparatively large discharge ranging from 10 l/sec to 600 l/sec in most springs. On the other hand, springs in San Isidro and Gen. Generoso municipalities have small discharge. Distances between spring sources and proposed served areas are almost within 3 km. Elevation differences between water sources and served areas are less than 300 m, most of which are under 20 m to 90 m. The spring development potential in the province is shown in Table 7.6.2.

(3) Surface Water

The potential surface water volume exploitable from major rivers for the use of domestic water supply was estimated by municipality. It was arranged in this calculation to ensure maintenance flow of the rivers under the draught flow in 10-year return period in consideration of the present water rights.

The calculation results are shown in Table 7.5.2, Supporting Report. In particular, Cateel, Caraga, Lupon and Manay municipalities situated in the major river basins are privileged to use larger amount of river water. While, the municipalities of Boston,

Table 7.6.1 Groundwater Development Potential in the Province

Area	Groundwater Development Potential	Groundwater Quality	Area Feature
1. Lupon Area	Deep well area is distributed in the Lupon and Banyabany areas. Well depth: 7.6 to 16 mbgl and 24 to 77 mbgl. Water table: 0.61 to 26 mbgl. Specific capacity: 0.27 to 1.5 l/s/m.	High iron content area: the inland area of Lupon. Well depth: 18 to 24 m.	Alluvial plain is distributed in the Lupon and Banyabany areas. The mountainous areas with elevations of about 600 m.
2. Western Area of Large Peninsula Located South of Lupon	Deep well area is distributed in very limited area such as Gov. Generoso. Most areas of the peninsula are occupied by shallow well area. Well depth: 9 to 20 mbgl. Water table: 2.5 mbgl or less. Specific capacity: 0.07 to 2.07 l/s/m. Well depth: 8 to 16 mbgl and 23 m to 26 mbgl. Water table: 0.5 to 6.1 mbgl. Specific capacity: 0.10 to 1.66 mbgl.	Salt water intrusion: the western side of the large Peninsula. Well depth: 12 m to 20 m.	Alluvial plains are distributed in places along the seashore. In its hinterland, there are mountainous areas consisting of sedimentary rocks of Pliocene and Pliocene age. In the central areas of the peninsula, the older volcanic rocks are distributed.
3. Eastern Area of Large Peninsula	Along seashore, there are shallow wells in narrow and limited alluvial sediments. No. available data.	No water quality problem.	Along seashore, there is mostly no alluvial plain because mountainous areas directly face to the sea.
4. Mati Area	Alluvial plain and the formation areas of Pliocene to Pleistocene age belong to deep well area. Well depth: 7 to 14 mbgl and 25 to 100 mbgl. Water table: 27.3 mbgl. Specific capacity: 0.14 to 1.86 l/s/m.	High iron content: the inland area of Mati. Well depth: 18 m to 24 m. Salt water intrusion: the western area along coastal line of Mati; the neck portion area of a peninsula extended south of Mati. Well depth: 12 m to 20 m.	Alluvial plains along seashore are distributed. In eastern area of Mati, limestone is distributed, and in its northern area and a small peninsula south of Mati, volcanic rocks are distributed.
5. Eastern Coastal Area	Alluvial plains belongs to deep well area. Well depth: 6 to 19 mbgl and 26 to 63 mbgl. Water table: 1.8 to 17 mbgl. Specific capacity: 0.02 to 4.2 l/s/m.	High iron content: the coastal areas in the east side of the province such as Baganga, Dapunan, and Cateel. Well depth: 18 m to 24 m. Salt water intrusion: the eastern coastal areas from Boston to Baculin, of San Luis area, and from San Antonio to Jovellary.	Alluvial plains are partly found in the eastern coastal areas such as Caraga, Baganga, and Cateel. In other places, the mountains extend up to the seashore.

Table 7.6.2 Spring Development Potential in the Province

Area	Spring Water Development Potential	Water Quality	Aerial Feature
1. Lupon Area	Existing spring sources: 51 developed and 6 untapped. Discharge of untapped springs: 7.56 to 11.36 l/sec.	Potable	Alluvial plain is found in very limited areas. Its hinterland is mountainous areas, consisting of old volcanic rocks.
2. Western Area of Large Peninsula Located South of Lupon	Existing spring sources: 80 developed and 23 untapped. Discharge of untapped springs: 0.14 to 3.33 l/sec.	Potable	Alluvial sediments are distributed with very limited belt areas along seashore. Mountains formed by older sedimentary and volcanic rocks directly face with steep cliffs to the seashore.
3. Eastern Area of Large Peninsula	No available information	No available information	The same condition as that of western area
4. Mati Area	Existing spring sources: 200 developed and 9 untapped. Discharge of untapped springs: 0.17 to 2.6.1 l/sec.	Potable	In northern and western and eastern parts of Mati, high mountains with steep slopes consisting of sediments and volcanic rocks are distributed.
5. Eastern Coastal Area	Existing spring sources: 200 developed and 11 untapped. Discharge of untapped springs: 0.11 to 1.67 l/sec.	Potable	Mountains with steep slope extend up to the seashore.

Gov. Generoso, San Isidoro and Tarragona have no major and sustainable surface water source in the province.

7.7 Water Source Development for Medium-Term Development Plan

For preparation of the medium-term development plan in terms of water source development, standard specifications of wells by municipality were prepared. The parameters such as well depth, static water level and specific capacity are shown in Table 7.7.1, which were established using well information from NWRB and province (detailed data base is included in Table 7.1.1, Data Report) and hydrogeological assessment presented in Table 7.6.2, Supporting Report.

Shallow wells are currently used in some municipalities. The municipal areas are categorized into deep well and shallow well areas considering the practices. The proportion (%) of shallow and deep wells are determined with reference to groundwater development potential in the Groundwater Availability Map. Furthermore, the well locations are assumed in terms of rural and urban areas by municipality referring to the classification of rural and urban barangays. For the municipalities without any well data, the well parameters are appropriated using those in adjoining towns, provided they have similar hydrogeologic features.

For the furtherance in collecting accurate information to design the concrete specification of the planned wells, the following recommendations are made. Prior to the detailed design or pre-construction stages, additional detailed groundwater investigation entailing electric resistivity survey and the construction of test wells in the municipalities of Banaybanay, Lupon, San Isidro, Tarragona, and Boston shall be conducted. Of these municipalities, the Boston area has not well information enough to design the water source facilities in the whole area. Therefore, the electric resistivity survey shall be conducted in the urban and rural areas, with the construction of a test well in the urban area. Table 7.7.2 summarizes the requirements.

The groundwater development for water supply in urban areas (Level II and III systems) will require the construction of deep wells with larger casing diameters of 6" or more, which expect larger production rates. In these cases, short spacing intervals between the adjacent

Table 7.7.1 Standard Specification of Wells by Municipality

Municipality	Type	Proportion (%)	Standard Specification			Remarks
			Depth Range (m)	SWL (m)	Specific Capacity (l/sec/m)	
Banaybanay	Rural	SW	0	5<D<15	2	0.5
		DW	25	35<D<60	2	0.5
	Urban	SW	0	5<D<15	2	1.0
		DW	100	35<D<60	2	1.0
Lupon	Rural	SW	0	10<D<20	2	1.0
		DW	10	25<D<80	10	1.0
	Urban	SW	0	10<D<20	2	2.0
		DW	100	25<D<80	10	2.0
San Isidro	Rural	SW	0	10<D<15	5	1.0
		DW	10	25<D<45	2	1.0
	Urban	SW	0	10<D<15	5	1.0
		DW	90	25<D<45	2	1.0
Gov. Generoso	Rural	SW	0	10<D<15	2	1.0
		DW	10	25<D<30	5	1.0
	Urban	SW	0	10<D<15	2	1.0
		DW	100	25<D<30	5	1.0
Mali	Rural	SW	0	10<D<15	3	1.0
		DW	15	25<D<100	30	1.0
	Urban	SW	0	10<D<15	3	1.0
		DW	100	25<D<100	30	1.0
Tarragona	Rural	SW	0	10<D<20	5	0.5
		DW	10	20<D<25	5	0.5
	Urban	SW	0	10<D<20	5	1.0
		DW	100	20<D<25	5	1.0
Manay	Rural	SW	0	15<D<20	2	0.5
		DW	15	30<D<35	0.1	0.5
	Urban	SW	0	15<D<20	2	2.0
		DW	100	30<D<35	0.1	2.0
Carraga	Rural	SW	0	5<D<10	5	1.0
		DW	10	30<D<65	10	1.0
	Urban	SW	0	5<D<10	5	1.0
		DW	100	30<D<65	10	1.0
Baganga	Rural	SW	15	10<D<20	5	1.0
		DW				
	Urban	SW	100	10<D<20	5	1.0
		DW				
Cateel	Rural	SW	10	10<D<15	3	1.0
		DW				
	Urban	SW	100	10<D<15	3	1.5
		DW				
Boston	Rural	SW	10	15<D<20	3	1.0
		DW				
	Urban	SW	100	15<D<20	3	1.0
		DW				
	Rural	SW				
		DW				
	Urban	SW				
		DW				

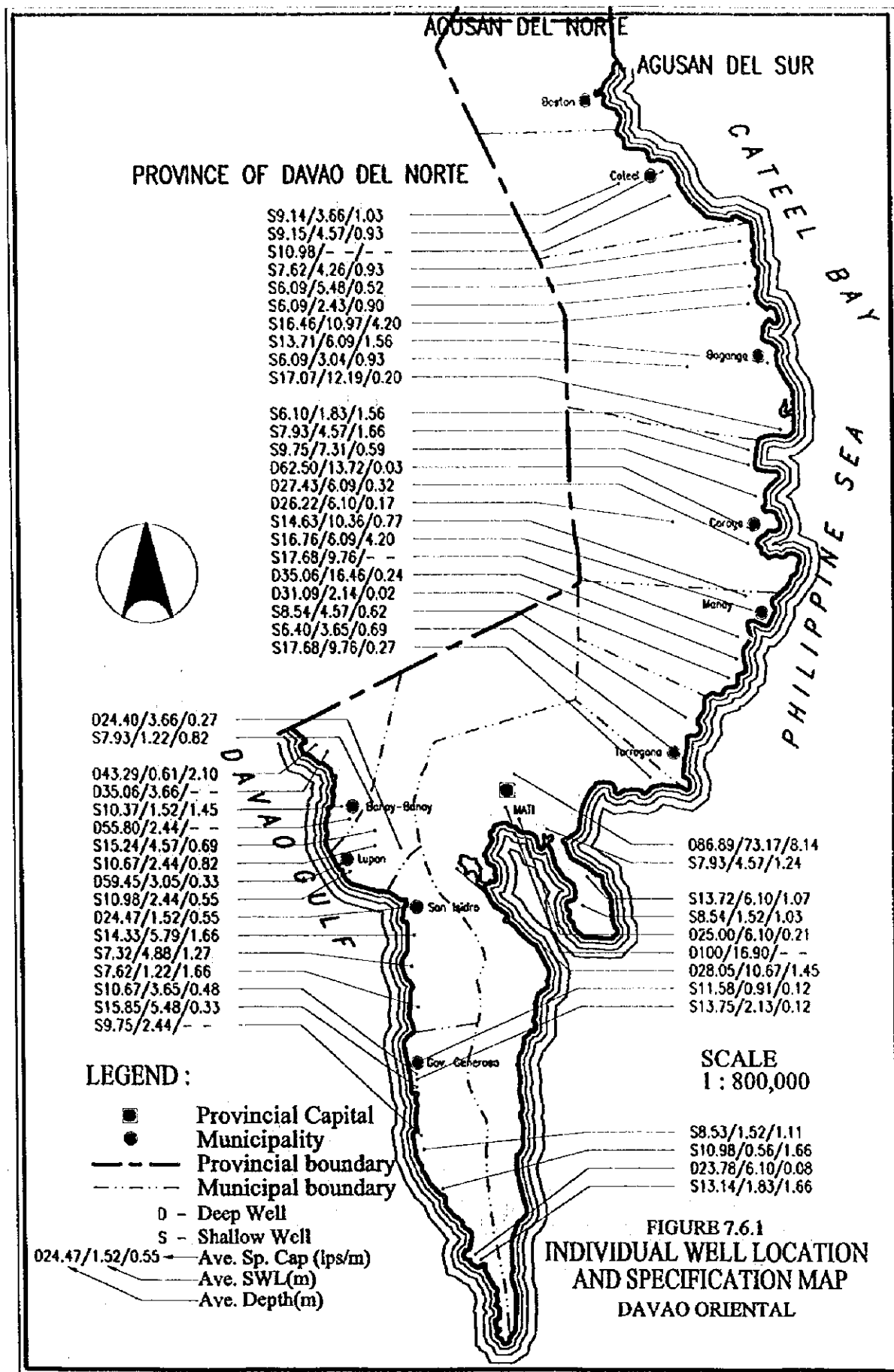
wells often cause the well interference due to the large lowering of pumping water level when the adjacent wells simultaneously pump up during long period. This results in the intermittent pump operation with excess electric consumption. Thus, appropriate spacing interval and number of wells to be constructed per sq. Km were estimated as shown in Table 7.7.1 Spacing Arrangements for Planned Wells, Supporting Report.

Spring sources, proposed by barangay level, for future development are shown in Table 7.6.3, Supporting Report. They shall also be investigated to confirm the development possibility in the following items: (1) locations and types of spring sources. (2) fluctuation of discharge rates through the year, (3) distances from spring sources and proposed served areas and (4) elevation differences between the two points.

Table 7.7.2 Additional Groundwater Investigation

Municipality	Survey Area	Survey Activities and Specification	
		Electric Resistivity Survey	Test Well Construction
Banaybanay & Lupon	Urban area	Measuring lines: 4/each municipality Prospecting interval: 200 m Length of a measuring line: 1 km Prospecting depth: 150 m	Number of test well-one/each Municipality Casing diameter: 200 m Well depth: 100 m Including pumping test, electric logging, and water quality analysis
San Isidro & Tarragona	Urban area	Measuring lines: 4/each municipality Prospecting interval: 200 m Length of a measuring line: 1 km Prospecting depth: 100 m	Number of test well-one/each Municipality Casing diameter: 200 m Well depth: 100 m Including pumping test, electric logging, and water quality analysis
Boston	Urban area	Survey area: 1 site Measuring lines: 4/each municipality Prospecting interval: 200 m Length of a measuring line: 1 km Prospecting depth: 100 m	Number of test well-one/each Municipality Casing diameter: 200 m Well depth: 100 m Including pumping test, electric logging, and water quality analysis
	Rural area	Survey area: 2 sites Measuring lines: 2/each site, 4 in total Prospecting interval: 200 m Length of a measuring line: 1 km Prospecting depth: 100 m	N.A.

Note: N.A. Not applicable



DISK NAME : DAVAO-ORIENTAL(DISK2)
FILENAME : DAVAO-ORIENTAL(WLSM)

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 almost the same manner as adopted in the 1998 Philippine National Development Plan (PNDP) and the National Sector Master Plan (NSMP), Medium-Term Investment covering the years 1999 to 2003 and Long-Term Development covering the period 2004 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 (1997) and national sector targets indicated in the National Sector Master Plan (NSMP) and the updated Medium-Term Philippine Development Plan, 1996 - 1998 (MTPDP) are the bases of the study. Sector targets that are not prescribed in the national plan; school and public toilets as well as sewerage are assumed based on the current conditions. In addition, preliminary discussions on solid waste management are included as a vital component of sanitation sector.

Projection of frame values by municipality is undertaken for respective sub-sectors; future population by urban and rural area, the number of student enrollment to public schools and the number of public utilities. Reference base figures for the study of framework are the 1995 Census of Population and Housing, the statistical data of the province and the information from relevant agencies. Provincial population by target year and the base year (1997) is estimated by adopting the projection method being used by NSO. While, the population distribution to urban and rural areas prepared by NSO in 1995 is modified to meet actual conditions in the classification of the areas.

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

In estimating future requirements by municipality, additional population (or number of students/public utilities) to be served by sub-sector is first calculated as a shortfall at target years in comparison between each target and its base year service coverage. In this regard,

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

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

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

8.2 Targets of Provincial Sector Plan

Provincial sector targets for the 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 1997 and expected by planned/on-going projects scheduled to be completed by the end of 1998. Table 8.2.2 shows service coverage for the planning purpose (details are referred to Supporting Report).

The base year service coverage in urban area (63%) is behind the Updated MTPDP sector target (68.8%) for the year 1998 and rural area (47%) is far behind the sector target of 79%. As identified in Chapter 4, the lower service coverage in rural area is

Table 8.2.1 Provincial Sector Targets

Sub-sectors	Existing Service Coverage	Phase I (1999-2003)		Phase II (2004-2010)	
Water Supply	Population Coverage (%)	Population Coverage (%)	Additional Population to be Served	Population Coverage (%)	Additional Population to be Served
<i>Urban Water Supply</i>	63	70	20,236	95	105,985
<i>Rural Water Supply</i>	47	60	69,870	93	133,564
Sanitation	Households Coverage (%)	Households Coverage (%)	Additional Households to be Served	Households Coverage (%)	Additional Households to be Served
<i>Household Toilet</i>					
<i>Urban Household</i>	60	70	5,303	93	17,918
Flush	17	40	2,772	50	11,581
Pour Flush	43	60	2,531	50	6,337
VIP	0	0	0	0	0
<i>Rural Household</i>	75	85	12,542	93	31,236
Flush	0	0	0	0	0
Pour Flush	100	85	4,699	100	31,236
VIP	0	15	7,843	0	0
<i>School Toilet</i>	Public School Student Coverage (%)	Public School Student Coverage (%)	Additional Public School Students to be Served	Public School Student Coverage (%)	Additional Public School Students to be Served
	53	75	33,013	95	39,710
<i>Public Toilet</i>	Public Utilities Coverage (%)	Public Utilities Coverage (%)	Additional Public Utilities with Sanitary Toilets	Public Utilities Coverage (%)	Additional Public Utilities with Sanitary Toilets
	55	70	26	100	75
<i>Sewerage</i>	Urban Population Coverage (%)	Not Applicable		Urban Population Coverage (%)	Urban Population to be Served
	0			50	64,282
<i>Solid Waste</i>	Urban Household Coverage (%)	Urban Household Coverage (%)	Additional Households to be Served	Not Applicable	
	64	75	4,832		

Table 8.2.2 Estimation of Base Year Service Coverage of Water Supply

Name of Municipality	Area	Population (1997)	Population Served by 1997 Facilities				
			Level III	Level II	Level I	Total	Percentage Coverage
Baganga	Urban	13,781	2,280	446	3,540	6,266	45
	Rural	27,365		3,882	5,514	9,396	34
	Total	41,146	2,280	4,328	9,054	15,662	38
Banaybanay	Urban	11,045			9,456	9,456	86
	Rural	23,388	1,324	4,144	11,909	17,377	74
	Total	34,433	1,324	4,144	21,365	26,833	78
Boston	Urban	2,450			782	782	32
	Rural	8,335		2,650	322	2,972	36
	Total	10,785		2,650	1,104	3,754	35
Caraga	Urban	5,410	2,021	652		2,673	49
	Rural	27,296	1,849	1,540	6,395	9,784	36
	Total	32,706	3,870	2,192	6,395	12,457	38
Cateel	Urban	5,730			2,330	2,330	41
	Rural	22,373		2,509	7,243	9,752	44
	Total	28,103		2,509	9,573	12,082	43
Governor Generoso	Urban	9,846	1,477		4,647	6,124	62
	Rural	32,876		8,115	9,293	17,408	53
	Total	42,722	1,477	8,115	13,940	23,532	55
Lupon	Urban	18,285	2,825	821	11,025	14,671	80
	Rural	34,158	129	2,488	21,662	24,279	71
	Total	52,443	2,954	3,309	32,687	38,950	74
Manay	Urban	8,082	1,500	800		2,300	28
	Rural	28,603		351	1,358	1,709	6
	Total	36,685	1,500	1,151	1,358	4,009	11
Mati (Capital)	Urban	43,698	14,528	162	16,627	31,317	72
	Rural	52,620	3,049	19,495	5,322	27,866	53
	Total	96,318	17,577	19,657	21,949	59,183	61
San Isidro	Urban	9,458	2,160	800	2,805	5,765	61
	Rural	21,838	160	3,991	7,414	11,565	53
	Total	31,296	2,320	4,791	10,219	17,330	55
Tarragona	Urban	4,608		1,500	38	1,538	33
	Rural	15,997		3,005	1,996	5,001	31
	Total	20,605		4,505	2,034	6,539	32
Provincial Total	Urban	132,393	26,791	5,181	51,250	83,222	63
	Rural	294,849	6,511	52,170	78,428	137,109	47
	Total	427,242	33,302	57,351	129,678	220,331	52

caused by the presence of a large number of unsafe sources/facilities or no provision of water supply facilities.

Considering the existing conditions, water supply sector targets were determined by urban and rural area. Phase I development shall be focused on the bottom up of rural water supply to 60% while in urban area, 70% is adopted for furtherance of service coverage. Phase II targets are planned to increase both urban and rural water supply coverage to 95% and 93%, respectively as envisaged in the NSMP.

(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 71%, which is above the current national average coverage of 60%. Urban area registers a level of 60% that is the same as national average coverage. Rural area is further high at 75% considering the numerous unsanitary facilities. By type of sanitary toilet facility, the existing percentage composition to total served households is as follows:

Type	Urban (%)	Rural (%)
Flush	34	0
Pour-flush	66	100
VIP latrine	0	0

To attain sufficiency and equitable access to basic services, the provincial target of Phase I for urban household is planned at 70%, while for rural household toilets, 75 is projected. This is pursued to lessen the gap of the coverage between the urban and rural area and to achieve a balanced distribution of this basic facility as embodied in the PNDP. For Phase II, 93% as set by the NSMP is adopted for both urban and rural areas.

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

Table 8.2.3 Base Year Service Coverage of Household Toilets

Name of Municipality	Area	1997		Households and Population Using Sanitary Toilets						Service Coverage (%)		
		Population	HRs	Number of Households			Total	Population	Flush	Pour Flush	VIP/Dry	Total
				Flush	Pour Flush	VIP/Dry						
Baganga	Urban	13,781	2,533	158	1,510		1,668	9,096	6	60		66
	Rural	27,365	5,242		4,296	5	4,301	22,440		82		82
	Total	41,146	7,775	158	5,806	5	5,969	31,536	2	75		77
Banaybanay	Urban	11,045	2,061	350	1,190		1,540	8,284	17	58		75
	Rural	23,388	4,291		3,107	5	3,112	17,074		72		73
	Total	34,433	6,352	350	4,297	5	4,652	25,358	6	68		73
Boston	Urban	2,450	457	34	387		421	2,254	7	85		92
	Rural	8,335	1,440		871	5	876	5,085		60		61
	Total	10,785	1,897	34	1,258	5	1,297	7,339	2	66		68
Caraga	Urban	5,410	1,044	127	535		662	3,409	12	51		63
	Rural	27,296	5,170		4,679	5	4,684	24,840		91		91
	Total	32,706	6,214	127	5,214	5	5,346	28,249	2	84		86
Cateel	Urban	5,730	1,071	95	756		851	4,527	9	71		79
	Rural	22,373	4,198		3,016	5	3,021	16,109		72		72
	Total	28,103	5,269	95	3,772	5	3,872	20,636	2	72		73
Governor Generoso	Urban	9,846	1,868	107	1,212		1,319	6,991	6	65		71
	Rural	32,876	6,250		4,567	5	4,572	24,000		73		73
	Total	42,722	8,118	107	5,779	5	5,891	30,991	1	71		73
Lupon	Urban	18,285	3,424	371	1,110		1,481	7,863	11	32		43
	Rural	34,158	6,556		6,194	5	6,199	32,451		94		95
	Total	52,443	9,980	371	7,304	5	7,680	40,314	4	75		77
Manay	Urban	8,082	1,513	238	703		941	5,011	16	46		62
	Rural	28,603	5,532		3,925	5	3,930	20,309		71		71
	Total	36,685	7,045	238	4,628	5	4,871	25,320	3	66		69
Mati (Capital)	Urban	43,698	8,551	2,606	2,002		4,608	23,597	30	23		54
	Rural	52,620	10,158		5,317	7	5,324	27,363		52		52
	Total	96,318	18,709	2,606	7,319	7	9,932	50,960	14	39		53
San Isidro	Urban	9,458	1,805	227	971		1,198	6,243	13	54		66
	Rural	21,838	4,067		3,751	5	3,756	20,091		92		92
	Total	31,296	5,872	227	4,722	5	4,954	26,334	4	80		84
Tarragona	Urban	4,608	893	65	372		437	2,258	7	42		49
	Rural	15,997	3,059		2,382	5	2,387	12,478		78		78
	Total	20,605	3,952	65	2,754	5	2,824	14,736	2	70		71
Provincial Total	Urban	132,393	25,220	4,378	10,748		15,126	79,533	17	43		60
	Rural	294,849	55,963		42,105	57	42,162	222,240		75		75
	Total	427,242	81,183	4,378	52,853	57	57,288	301,773	5	65		71

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

Name of Municipality	Public School Toilets			Public Toilets		
	Total Number of Public School Students (1997)	Std. No. of Public School Students that can be Served by Base Year (1997) Sanitary Toilets	Service Coverage (%)	Number of Public Utilities with Toilets in 1997	Number of Public Utility with Sanitary Toilets in Base Year (1997)	Service Coverage (%)
Baganga	10,256	3,280	32	6	3	50
Banaybanay	7,766	7,766	100	4	3	75
Boston	3,407	480	14	4	1	25
Caraga	8,990	3,040	34	4	1	25
Cateel	7,517	3,560	47	4	1	25
Governor Generoso	11,213	3,640	32	3	1	33
Lupon	12,856	7,120	55	3	2	67
Manay	8,416	4,040	48	3	2	67
Mati (Capital)	25,123	16,320	65	6	5	83
San Isidro	7,696	5,840	76	4	3	75
Tanagona	4,293	2,120	49	1	1	100
Provincial Total	107,533	57,206	53	42	23	55

Base year service coverage is 53% applying the standard number of public school students to be served by one (1) unit of toilet facility. The low level is due to a large number of unsanitary or absence of facilities.

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 toilets enabling the coverage to increase on a high level. For Phase I and II, 75% 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).

Only 55% of the existing public utilities is served with at least one sanitary toilets. This can be attributed by the fact that majority of the public utilities (mostly public markets) are not provided with sanitary toilet facilities.

In setting up the targets without national targets as of now, the indicator would be the existing level of coverage. Accordingly, an 70% coverage for Phase I and a 100% coverage for Phase II are assumed.

(3) Sewerage

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

(4) Solid waste

The municipal level data in 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.

About 20% of the total households in the province relied on municipal refuse collection using trucks or a 64% urban household coverage. These municipalities have a total of 15 units of collection truck.

No national targets have yet been set. However, considering the present level of coverage, a 75% urban household coverage is applied for the medium-term period (2000).

Table 8.2.5 Base Year Service Coverage of Municipal Solid Waste System in 1997

Name of Municipality	Total No. of Households	No. of Urban Households	No. of Households Served	Coverage of Households (%)	Coverage of Urban Households (%)
Baganga	7,775	2,533	1,851	24	73
Banaybanay	6,352	2,061	832	13	40
Boston	1,897	457	244	13	53
Caraga	6,214	1,044	809	13	77
Cateel	5,269	1,071	791	15	74
Governor Generoso	8,118	1,868	1,107	14	59
Lupon	9,980	3,424	2,521	25	74
Manay	7,045	1,513	996	14	66
Mati (Capital)	18,709	8,551	5,376	29	63
San Isidro	5,872	1,805	897	15	50
Tarragona	3,952	893	618	16	69
Provincial Total	81,183	25,220	16,042	20	64

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 2003 and 2010 together with the present population in 1997 as a planning base year.

Regional population in the future is published by the NSO, while projection at provincial and municipal levels was not available during the time of study. As a local based projection, the Study on the Davao Integrated Development Program (DIDP) Master Planning is currently implemented under the technical cooperation of JICA, however, the population projection has not been completed yet. The future population of LGUs was therefore projected in the following manner (details are included in the Supporting Report). Reference information/data used for the study are:

- Population census data of 1980, 1990 and 1995 on different administrative levels,
- National and Regional population projection by the NSO based on 1995 census results,
- "Ratio method" generally used by the NSO for population projection (details are shown in 8.3.1, Supporting Report),
- Classification of urban and rural barangays by NSO statistic information, and
- The 1995 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. Then, through review of NSO regional population projection and the 1995 Philippine Yearbook, the behavior of population development through the future was analyzed. Referring to these demographic studies, population projection of the region by target year was confirmed to be reasonable.

Population projection of the province was carried out in application of "ratio method". The projected figures were studied by means of declining annual growth rates employing a simple compounded formula $(1+r)^n$. Present population of the province in 1997 was also estimated in the same manner. Likewise, municipal population was projected. Major study procedures and their results are presented below.

(1) Review of past population development in the province and population distribution in 1995 to urban and rural areas

The past population development during the census periods from 1980 to 1990 and from 1990 to 1995 revealed that:

- The province recorded an average annual growth rate of 1.50% (1980-1990) and 0.93% (1990-1995) which were almost half as that of the region at 2.91% and 2.29% respectively.
- Percentage of provincial population to the regional population decreased from 10.2% in 1980 to 8.3% in 1995 which was affected by lower growth compared with the regional growth rates.

The classification of urban and rural areas compiled in 1995 population census was reviewed and updated by the PPDO. As a result of some revisions in the barangay classification, the population by municipality was adjusted as shown in Table 8.3.2, Section 8.3.1, Supporting Report.

(2) Manner of population projection

The regional population projected by the NSO based on 1995 census results was employed. The following are the projection procedures.

1) Adoption of regional population projected by the NSO for the years 1995 to 2020

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 rates described in the 1995 Philippine Yearbook.

2) Application of ratio method for population projection of the province and municipalities

Adopted formula is:
$$R(k) = R(0) \prod_{i=1}^k (1 + r - kr / 50)$$

where: $R(k)$ = ratio in "k"th year from 1995 of the population to that of the region or of the population of the municipality to that of the province

$R(0)$ = ratio in 1995 of the population of the province to that of the region or of the population of the municipality to that of the province

r = initial rate of change of the ratio

k = "k"th year from 1995

The initial rate of change is derived based on the levels and trends of the ratio observed in the 1970, 1980, 1990 and 1995 censuses.

3) Categorization of the province and municipalities to set initial rate (r)

Four standard types are prepared based on the trends of the rate (r) as observed in the censuses of 1970, 1980, 1990 and 1995. Initial rate to be used for each type of province or municipality is determined using a set criteria (refer to Section 8.3.1, Supporting Report).

The province was classified as Type I and an initial rate of change (r) was estimated at -0.0104.

(3) Present provincial population (1975) including its municipalities (further broken down to urban and rural areas) was estimated applying the initial rates of change as mentioned above, assuming that the behaviors of past population development prevailed up to the present.

(4) Household size in 1997 was also assumed to be the same as that in 1995.

Population by target year and the year 1997 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.

Table 8.3.1 Future Population by Urban and Rural Area by Municipality

Name of Municipality	1997			2003			2010		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Baganga	13,781	27,365	41,146	15,310	30,404	45,714	16,990	33,740	50,730
Banaybanay	11,045	23,388	34,433	12,459	26,382	38,841	14,037	29,722	43,759
Boston	2,450	8,335	10,785	2,719	9,248	11,967	3,013	10,250	13,263
Caraga	5,410	27,296	32,706	6,000	30,274	36,274	6,647	33,536	40,183
Cateel	5,730	22,373	28,103	6,326	24,703	31,029	6,977	27,244	34,221
Governor Generoso	9,846	32,876	42,722	10,823	36,137	46,960	11,883	39,678	51,561
Lupon	18,285	34,158	52,443	20,310	37,941	58,251	22,533	42,094	64,627
Manay	8,082	28,603	36,685	8,988	31,809	40,797	9,983	35,333	45,316
Mati (Capital)	43,698	52,620	96,318	47,488	57,185	104,673	51,551	62,077	113,628
San Isidro	9,458	21,838	31,296	10,465	24,163	34,628	11,566	26,705	38,271
Tarragona	4,608	15,997	20,605	5,210	18,090	23,300	5,885	20,430	26,315
Provincial Total	132,393	294,849	427,242	146,098	326,336	472,434	161,065	360,809	521,874

8.3.2 School Enrollment Projection

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

School age population is extrapolated from the NSO age group classification of 5-9, 10-14 and 15-19 years old bracket by municipality. The age group for the elementary level is from 7 to 13 years, while that for the high school level is from 14 to 17 years. The percentages of school age population for the target years are based on the existing composition or structure of the 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 in the participation rate in both private and public schools is foreseen by year 2010.

The number of public school students by target year is then derived from the projected number of children who will attend school. A participation rate for public school enrollment is established based on the existing participation rate of public school students to the total school age population. The existing participation rate is applied in 2000 and an increase of 3% 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 119,000 and 135,000 public school students is estimated to enroll for years 2000 and 2010, respectively.

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

Name of Municipality	Number of Public School Student			Number of Public Utilities		
	1997	2003	2010	1997	2003	2010
Baganga	10,256	11,331	13,008	6	9	17
Banaybanay	7,766	8,746	9,853	4	4	10
Boston	3,407	3,787	3,557	4	6	11
Caraga	8,990	10,005	11,445	4	5	10
Cateel	7,517	8,282	9,231	4	5	11
Governor Generoso	11,213	12,306	14,271	3	3	9
Lupon	12,856	14,262	16,902	3	6	12
Manay	8,416	9,314	10,477	3	3	7
Mati (Capital)	25,123	27,247	29,578	6	10	21
San Isidro	7,696	8,543	9,862	4	4	10
Tarragona	4,293	4,858	7,315	1	4	6
Provincial Total	107,533	118,681	135,499	42	59	124

8.3.3 Projection of the Number of Public Utilities

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

Seventeen (17) bus terminal are planned to be constructed by year 2000, and another 65 by the year 2010. Refer to Table 8.3.2 for the number of public utilities by municipality by target year (details are referred to Supporting Report).

8.3.4 Planning Area and its Projected Population for Sewerage

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

Only 6 municipalities with a total urban population of 161,000 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

Prevailing situation of urban water supply in each municipality was first reviewed mainly focusing on existing water sources and magnitude of service coverage. Planned/on-going projects for concerned municipalities were also studied and reflected on PW4SP planning, with due attention to merging of municipalities into an integrated water supply system. Potential water source for future development was then evaluated based on the study results in Chapter 7, taking into account the possibility to utilize untapped spring sources. Recommendations arising from these studies were also incorporated for furtherance of water supply development.

Aforementioned studies were carried out by following sequence:

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

1) Review of existing water supply systems and water sources

Majority of the existing Level III and II systems in urban area is utilizing spring sources. The municipalities of Baganga, Lupon, Mati and San Isidro are served by WD with spring and deep well sources, while the municipalities of Caraga, Governor Generoso and Manay have Level III systems operated by either municipality or local community.

The remaining 4 municipalities, namely Banaybanay, Boston, Cateel and Tarragona, do not have Level III system and are served by Level II system and/or Level I facilities.

Population served by Level III systems range from about 1,500 persons in Governor Generoso and Manay to 2,800 persons in Lupon, while Mati has served population of about 14,500 persons.

Preference is made to utilize spring sources owing to less O&M activities and cost compared to deep well with electric motor pump.

2) Review of planned/on-going projects

There is no plan or on-going project in the province.

3) Establishment of planning conditions

a. Service level

It shall be noted that a national policy for urban water supply is a Level III system, 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 from being implemented Level I and II facilities in urban areas as individual cases in the future

b. Utilization of existing facilities

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

c. Water sources

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

From the viewpoints of cost effectiveness and easy O&M of water supply system, utilization of spring sources is given due priority in the course of urban water supply planning. Application of deep wells for water source is regarded as the second priority in principle. Surface water is, on the other hand, not adopted at this moment, because of large capital investment requirements and complexity of surface water treatment.

Water source development study revealed that most of the municipalities in the planning area have high potential of spring development. Among the various identified untapped springs in 5 municipalities: Boston, Cateel, Governor Generoso, Lupon and Mati, have so far favorable spring sources suitable for Level III system (details are referred to in Supporting Report).

Table 8.4.1 presents a summary of potential water source together with water supply conditions of the existing systems. The magnitude of water supply coverage varies from about 1,500 persons to 14,500 persons by municipality.

Table 8.4.1 Potential Water Source for Urban Water Supply

Name of Municipality	Served Population in Base Year			Existing Source in Municipality		Potential Water Source		Remarks
	Level III	Others	Total	Spring	Deep Well	Spring	Deep Well	
Baganga	2,280	3,986	6,266	□	□	□	x	Existing WD
Banaybanay	0	9,456	9,456	□	□	□	□	
Boston	0	782	782	□	□	□	x	
Caraga	2,021	652	2,673	□	□	□	x	Existing Level III
Cateel	0	2,330	2,330	□	□	□	x	
Governor Generoso	1,477	4,647	6,124	□	□	□	x	Existing Level III
Lupon	2,825	11,846	14,671	□	□	x	□	Existing WD
Manay	1,500	800	2,300	□	□	□	x	Existing Level III
Mati (Capital)	14,528	16,789	31,317	□	□	□	x	Existing WD
San Isidro	2,160	3,605	5,765	□	□	□	x	Existing WD
Tarragona	0	1,538	1,538	□	□	□	x	

Note: □ - Available; x - Not available.

With regard to deep well development, groundwater productivity was assumed based on the study results of water sources in Chapter 7 and presented in Table 8.4.2. This planning parameter is applied where deep well source is applied for urban area.

Table 8.4.2 Groundwater Productivity

Name of Municipality	Specific Capacity (liter/sec/m)	Well Depth (meter)	Groundwater Productivity per Deep Well (cu.m/16 Hr)
Baganga	1.19	30	685
Banaybanay	1.94	50	1,117
Boston	0.95	30	547
Caraga	0.66	50	380
Cateel	0.95	30	547
Governor Generoso	0.67	30	386
Lupon	0.81	70	467
Manay	1.11	30	639
Mati (Capital)	0.85	70	490
San Isidro	1.08	30	622
Tarragona	0.53	30	305

d. Number of systems

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

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

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

Since the municipalities taken up in this PW4SP are generally scattered throughout the province, an individual system by municipality was recommended. However, Cateel and Lupon have very large scale untapped spring sources and therefore have high potential to share their water to neighboring municipalities, provided that technical and financial feasibility shall be confirmed during the feasibility study.

In addition to the above, any rural barangay/s being served by the existing urban Level III system are considered to continue throughout the future.

e. Rehabilitation

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

4) Recommendations for future water supply development

The province has high potential for spring development and various untapped spring sources favorable for urban water supply were identified during the course of PW4SP preparation. However, further survey to evaluate appropriate development of spring sources is prerequisite in the course of feasibility study and detailed design. Among others, confirmation of possible/dependable yield throughout the year, elevation and distance from the potential service area as well as topographic conditions to allow gravity flow of supply is indispensable.

Further study on system merging shall be made for some coastal municipalities with reference to water source arrangements.

(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 plan-

ning 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.

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 8.4.3 based on the water source evaluation results presented in Chapter 7. Conventional construction method (driven well) may be employed under favorable substrata or hydrogeological conditions. The standard structure of wells in application of "open-hole drilling and gravel pack" is presented in Figure 8.4.1, Supporting Report.

Table 8.4.3 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	150mm	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

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

The open-hole drilling method is employed for the well construction to ensure ground water yield from adequate aquifer in provision of proper screen location and specifications. The conventional "cased-hole driven well" shall be used only in cases

where well specifications are established in the specified area with sufficient information on the hydrogeological condition including existence of natural gravel at the expected aquifer.

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

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

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

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

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/sanitary pit latrine. 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 and sanitary pit latrine 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 (40 students per unit facility) is employed for both phases.

The standard toilet facility (1 building) with 5 units of toilet bowl to serve for 200 students is adopted for the planning purpose, which is modified from FW4SP design to provide a shallow well as a water source.

(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.

The utilization of untapped springs for Level II systems was given priority during Phase I period for rural water supply. At the time of this plan preparation, 49 untapped springs in 6 municipalities were identified.

(2) Phase II requirements

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

Table 8.5.1 exhibits the population to be served by target year (details are referred to Supporting Report).

Through the Phase I development, approximately 90,100 persons in the province will be served by additional water supply services, of which 20,200 persons or 22% of the total will be urban population and 69,900 persons or 78% will be rural population.

In the Phase II period, a total of 239,500 persons, of which 106,000 persons or 44% in urban area and 133,500 persons or 56% in rural area, will be further benefited by water supply services. This additional service coverage in urban area includes upgrade of service level for 56,400 persons served by Level I and II facilities in 1997.

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

Name of Municipality	Area	Phase I Coverage (2003)						Phase II Coverage (2010)					
		Total Population			Service Coverage			Additional Population to be Served			Total Population		
		Level III	Level II	Level I	Level III	Level II	Level I	Level III	Level II	Level I	Level III	Level II	Level I
Baguio	Urban	15,310	4,461	3,540	10,717	4,451	8,461	16,141	3,882	27,496	16,141	9,410	9,410
	Rural	30,404	3,882	14,360	18,242	8,846	8,846	33,740	3,882	27,496	31,378	13,136	13,136
	Total	45,714	8,343	17,900	28,959	13,297	17,307	50,700	7,764	54,992	47,518	22,546	22,546
Bantayan	Urban	12,459	9,456	17,377	17,377	17,377	17,377	14,037	13,335	13,335	13,335	13,335	13,335
	Rural	26,382	1,324	11,909	26,833	1,324	1,324	29,722	4,144	22,173	27,641	10,264	10,264
	Total	38,841	1,324	21,365	44,210	1,324	1,324	49,444	5,468	23,506	35,282	20,528	20,528
Boracay	Urban	2,719	1,121	782	1,003	1,121	1,121	3,013	2,862	2,862	2,862	2,862	2,862
	Rural	9,248	4,387	1,162	5,549	1,737	840	10,250	4,387	5,146	9,533	3,984	3,984
	Total	11,967	5,508	1,944	6,592	2,858	840	13,263	6,273	5,146	12,395	3,984	3,984
Cebu	Urban	6,000	3,548	652	4,200	1,527	6,647	6,647	6,315	6,315	6,315	2,767	2,767
	Rural	30,274	1,849	14,775	18,164	8,380	8,380	33,536	1,849	1,540	27,799	13,024	13,024
	Total	36,274	5,397	15,549	26,364	1,527	15,760	40,183	3,694	3,090	34,598	16,048	16,048
Cebu	Urban	6,326	2,098	2,330	4,428	2,098	2,098	6,977	6,628	6,628	6,628	4,530	4,530
	Rural	24,703	2,098	8,049	14,822	4,264	806	27,244	6,773	18,564	25,337	10,515	10,515
	Total	31,029	4,196	10,379	19,250	2,098	806	34,221	13,441	25,192	31,965	21,045	21,045
Governor Generoso	Urban	10,823	2,929	4,647	7,576	1,452	1,452	11,883	11,289	11,289	11,289	8,360	8,360
	Rural	36,137	15,479	6,203	21,682	7,364	7,364	39,678	15,479	15,479	21,422	15,219	15,219
	Total	46,960	18,408	10,850	29,258	1,452	8,816	51,561	30,968	30,968	42,711	30,579	30,579
Lupat	Urban	20,310	2,825	821	11,025	14,071	3,126	43,094	129	33,404	39,147	11,742	11,742
	Rural	37,941	129	5,614	21,662	27,405	3,126	64,627	21,535	5,614	60,553	18,581	18,581
	Total	58,251	2,954	13,635	32,687	41,476	6,252	108,721	23,164	11,218	121,106	30,333	30,333
Manay	Urban	8,988	5,492	800	6,292	3,992	3,992	9,983	9,484	9,484	9,484	3,992	3,992
	Rural	31,809	351	18,734	19,085	17,376	17,376	35,333	351	32,509	32,840	13,775	13,775
	Total	40,797	3,843	20,514	38,170	21,368	21,368	45,316	882	33,313	42,324	17,767	17,767
Man (Capital)	Urban	47,488	16,453	162	16,627	33,242	1,925	51,551	48,973	48,973	48,973	32,520	32,520
	Rural	57,185	3,049	24,157	7,105	34,311	6,445	62,077	3,049	24,157	30,526	23,421	23,421
	Total	104,673	19,502	40,679	43,553	37,553	12,370	113,628	52,022	73,130	79,499	55,941	55,941
San Isidro	Urban	10,465	3,721	800	2,805	7,326	1,561	11,566	10,988	10,988	10,988	7,267	7,267
	Rural	24,163	1,60	8,824	5,514	14,498	4,833	26,705	160	8,824	24,836	10,338	10,338
	Total	34,628	3,881	9,624	8,319	21,824	6,394	38,271	11,148	8,824	35,824	20,675	20,675
Tarragona	Urban	5,210	2,109	1,500	38	3,647	2,109	5,853	5,853	5,853	5,853	3,482	3,482
	Rural	18,090	3,005	7,849	10,854	2,109	5,853	20,430	5,853	3,005	19,000	8,146	8,146
	Total	23,300	5,114	9,349	14,502	5,756	8,962	25,315	11,706	8,858	24,991	11,628	11,628
Provincial Total	Urban	146,098	47,027	5,181	51,250	103,458	25,986	161,065	153,012	153,012	153,012	105,985	105,985
	Rural	326,336	6,511	78,156	117,322	201,989	43,884	360,809	6,511	78,156	250,886	135,564	135,564
	Total	472,434	53,538	83,337	168,572	305,447	69,870	521,874	159,523	231,168	403,898	241,549	241,549

8.5.2 Sanitation

(1) Household toilets

The service coverage (number of households to be served) by different types of sanitary facility is estimated by urban and rural area by municipality for the years 2000 and 2010.

The future service coverage and additional households to be served are estimated to meet the provincial targets using the number of household served in the base year and the number of households in target years.

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

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

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

The projected number of served households at the end of the Phase I period is 72,200. The additional households to be served totaled to 17,800 of which 30% is urban households and 70% is rural households. While at the end of Phase II period, the number of served households is 121,300 with an additional households to be served at 49,100. Table 8.5.2 summarizes the number of households to be served by target year for urban and rural areas by municipality.

Table 8.S.2 Additional Number of Households to be Served by Target Year (Household Toilets)

Name of Municipality	Area	Phase I Coverage (2003)										Phase II Coverage (2010)										
		Total Households					No. of Served Households					Add'l. No. of Households to be Served					Total Households					
		Flush	Pour	VIP/Dry	Total	Flush	Pour	VIP/Dry	Total	Flush	Pour	VIP/Dry	Total	Flush	Pour	VIP/Dry	Total	Flush	Pour	VIP/Dry	Total	
Baganga	Urban	2,814	788	1,182	1,970	630				630				630	4,248	1,976	1,975	3,951	1,188	793		1,981
	Rural	5,825	4,208	743	4,951			738			738			738	8,435		7,102	743	7,845		2,894	2,894
	Total	8,639	788	5,390	743	630			738	1,368				1,368	12,683	1,976	9,077	743	11,796	1,188	3,687	4,875
Danao/Banay	Urban	2,324	350	1,277	1,627			87			87			87	3,509	1,632	1,631	3,263	1,282	354		1,636
	Rural	4,841	3,498	617	4,115			391			391			612	7,431	6,294	617	6,911				2,796
	Total	7,165	350	4,775	617	5,742			478	612	1,060			612	10,940	1,632	7,925	617	10,174	1,282	3,150	4,432
Boston	Urban	507	34	387		421									753	350	350		700	316		316
	Rural	1,597		1,153	204	1,357			232	199	481			2563		2,180	204	2,384		1,027		1,027
	Total	2,104	34	1,540	204	1,778			232	199	481			3,316	350	2,530	204	3,084	316	1,027		1,343
Canga	Urban	1,153	324	487		811			197					197	1,662	773	773	1,546	449	286		735
	Rural	5,734	4,143	731	4,874									726	8,384		7,066	731	7,797		2,923	2,923
	Total	6,887	324	4,630	731	5,685			197					726	10,046	773	7,839	731	9,343	449	3,209	3,658
Cateel	Urban	1,182	95	756		851									1,744	811	811	1,622	716	55		771
	Rural	4,635	3,349	591	3,940			333	586	919				586	6,811	5,743	591	6,334		2,394		2,394
	Total	5,817	95	4,105	591	4,791			333	586	919			586	8,555	6,111	6,554	591	7,956	716	2,449	3,165
Governor Generoso	Urban	2,054	575	863	1,438	468								468	2,971	1,382	1,381	2,763	807	518		1,525
	Rural	6,870	4,964	876	5,846			397	871	1,268				871	9,920		8,350	876	9,226		3,386	3,386
	Total	8,924	575	5,827	876	7,278			468	871	1,736			871	12,891	1,382	9,731	876	11,989	807	3,904	4,711
Lupon	Urban	3,803	1,065	1,597		2,662			694					694	5,633	2,620	2,619	5,239	1,555	1,022		2,577
	Rural	7,282	5,269	930	6,199									925	10,524		8,857	930	9,787		3,588	3,588
	Total	11,085	1,065	6,866	930	6,199			694	925	2,106			925	16,157	2,620	11,476	930	15,026	1,555	4,610	6,165
Manay	Urban	1,683	471	707	1,178	233								233	2,496	1,161	1,160	2,321	690	453		1,443
	Rural	6,153	4,445	785	5,230			520	780	1,300	8,833			780	9,920		7,450	785	8,215		2,985	2,985
	Total	7,836	471	5,152	785	6,403			524	780	1,577			780	11,329	1,161	8,590	785	10,536	690	3,438	4,128
Mari (Capital)	Urban	9,293	2,602	3,903	6,505			1,901			12,888			1,901	12,888	5,993	5,993	11,986	3,391	2,090		5,481
	Rural	11,040	7,976	1,408	9,384			2,659	1,401	4,060				4,060	15,519		13,025	1,408	14,433		5,049	5,049
	Total	20,333	2,602	11,879	1,408	15,889			4,560	1,401	5,961			5,961	28,407	5,993	19,018	1,408	26,419	3,391	7,139	10,530
San Isidro	Urban	1,907	559	839	1,398	332								332	2,892	1,345	1,345	2,690	786	506		1,292
	Rural	4,500		3,251	574	3,825								569	6,676		5,635	574	6,209		2,384	2,384
	Total	6,407	559	4,090	574	5,223								569	9,568	1,345	6,980	574	8,899	786	2,890	3,676
Tarragona	Urban	1,010	283	424		707			218					218	1,471	684	684	1,368	401	260		661
	Rural	3,459	2,499	441	2,940			117	436	553				436	5,103		4,309	441	4,750		1,810	1,810
	Total	4,469	283	2,923	441	3,647			169	436	823			436	6,579	684	4,993	441	6,118	401	2,070	2,471
Provincial Total	Urban	27,825	7,146	12,422		19,568			2,531					5,303	40,267	18,727	18,727	37,449	11,581	6,337		17,918
	Rural	61,936	44,755	7,900	52,655			4,699	7,843	12,542				7,843	90,204	75,991	7,900	83,891		31,236		31,236
	Total	89,761	7,146	57,177	7,900	72,223			7,230	7,843	17,845			7,843	130,471	18,727	94,713	7,900	121,340	11,581	6,337	49,154

(2) School toilets

The service coverage (number of public school students to be served) is estimated by municipality for the years 2000 and 2010.

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

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

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

The projected number of served students at the end of Phase I period is 89,000. The additional students to be served are 33,000. While at the end of Phase II period, the projected number of served students is 128,700 with an additional students to be served at 39,700.

Table 8.5.3 summarizes the number of public school students to be served by target year.

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

Name of Municipality	Phase I Coverage (2003)			Phase II Coverage (2010)		
	Total No. of Public School Students	Std. No. of Public School Students to be Served	Add'l. No. of Public School Students to be Served	Total No. of Public School Students	Std. No. of Public School Students to be Served	Add'l. No. of Public School Students to be Served
Baganga	11,331	8,498	5,218	13,008	12,358	3,860
Banaybanay	8,746	6,560		9,853	9,360	2,800
Boston	3,787	2,840	2,360	3,557	3,379	539
Caraga	10,005	7,504	4,464	11,445	10,873	3,369
Cateel	8,282	6,212	2,652	9,231	8,769	2,557
Governor Generoso	12,306	9,230	5,590	14,271	13,557	4,327
Lupon	14,262	10,697	3,577	16,902	16,057	5,360
Manay	9,314	6,986	2,946	10,477	9,953	2,967
Mati (Capital)	27,247	20,435	4,115	29,578	28,099	7,664
San Isidro	8,543	6,407	567	9,862	9,369	2,962
Tarragona	4,858	3,644	1,524	7,315	6,949	3,305
Provincial Total	118,681	89,013	33,013	135,499	128,723	39,710

(3) Public toilets

The service coverage of public utilities with sanitary toilet facility is estimated by municipality for the years 2000 and 2010.

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

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

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

The number of served public utilities at the end of Phase I period is 49. The additional public utilities to be served are 26. While at the end of Phase II period, the number of served public utilities is 124 with an additional public utilities to be served at 75. Table 8.5.4 summarizes the additional number of public utilities to be served by municipality by target year.

8.5.3 Urban Sewerage

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

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

Name of Municipality	Type	Phase I Coverage (2003)		Phase II Coverage (2010)	
		Add'l. No. of Public Utility with Sanitary Toilets	No. of Public Utility with Sanitary Toilets	Add'l. No. of Public Utility with Sanitary Toilets	No. of Public Utilities with Sanitary Toilets
Baganga	Public Market	1	2	3	5
	Bus/Jeepney Terminal	1	2	3	5
	Parks/Playground	1	2	5	7
	Total	3	6	11	17
Banaybanay	Public Market		1	1	2
	Bus/Jeepney Terminal	1	2		2
	Parks/Playground		1	5	6
	Total	1	4	6	10
Boston	Public Market	1	2	1	3
	Bus/Jeepney Terminal	1	1	2	3
	Parks/Playground	1	1	4	5
	Total	3	4	7	11
Caraga	Public Market	1	2	1	3
	Bus/Jeepney Terminal	1	1	1	2
	Parks/Playground	1	1	4	5
	Total	3	4	6	10
Cateel	Public Market	1	1	1	2
	Bus/Jeepney Terminal	1	1	1	2
	Parks/Playground	1	2	5	7
	Total	3	4	7	11
Governor Generoso	Public Market	1	1	1	2
	Bus/Jeepney Terminal	1	1	1	2
	Parks/Playground		1	4	5
	Total	2	3	6	9
Lupon	Public Market	1	2	1	3
	Bus/Jeepney Terminal	1	1	1	2
	Parks/Playground	1	2	5	7
	Total	3	5	7	12
Manay	Public Market		1	1	2
	Bus/Jeepney Terminal	1	1	1	2
	Parks/Playground		1	2	3
	Total	1	3	4	7
Mati (Capital)	Public Market	1	2	3	5
	Bus/Jeepney Terminal	1	2	1	3
	Parks/Playground	1	4	9	13
	Total	3	8	13	21
San Isidro	Public Market		1	1	2
	Bus/Jeepney Terminal	1	2	1	3
	Parks/Playground		1	4	5
	Total	1	4	6	10
Tarragona	Public Market	1	2		2
	Bus/Jeepney Terminal	1	1		1
	Parks/Playground	1	1	2	3
	Total	3	4	2	6
Provincial Total	Public Market	8	17	14	31
	Bus/Jeepney Terminal	11	15	12	27
	Parks/Playground	7	17	49	66
	Total	26	49	75	124

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

Name of Municipality	Urban Population in 2010	Level III Water Supply Coverage	Population to be Served
Baganga	16,990	16,141	8,495
Banaybanay	14,037	13,335	7,019
Governor Generoso	11,883	11,289	5,942
Lupon	22,533	21,406	11,267
Mati (Capital)	51,551	48,973	25,776
San Isidro	11,566	10,988	5,783
Provincial Total	161,065	153,012	64,282

8.5.4 Solid Waste

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

Service coverage in Phase I is assumed to be 75% with reference to the current service coverage of 64%. Additional service coverage in Phase I is calculated as a shortfall of target coverage in Phase I comparing with existing service coverage. Table 8.5.6 presents additional service coverage for Phase I in the urban area.

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

Name of Municipality	No. of Urban Households Served in the Base Year	Phase I Coverage (2003)		
		No. of Urban Households	Urban Households Coverage	Add'l. No. of Urban Households to be Served
Baganga	1,851	2,814	2,111	260
Banaybanay	832	2,324	1,743	911
Boston	244	507	381	137
Caraga	809	1,158	869	60
Cateel	791	1,182	887	96
Governor Generoso	1,107	2,054	1,541	434
Lupon	2,521	3,803	2,853	332
Manay	996	1,683	1,263	267
Mati (Capital)	5,376	9,293	6,970	1,594
San Isidro	897	1,997	1,498	601
Tarragona	618	1,010	758	140
Provincial Total	16,042	27,825	20,874	4,832

8.6 Facilities, Equipment and Rehabilitation to Meet the Target Services

8.6.1 Water Supply

(1) Required facilities

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

Urban water supply:

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

Rural water supply:

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

Furthermore, as for Level I facilities, in this PW4SP, 70% of the total required facilities will be implemented by public (LGUs) and 30% of these public Level I facilities will be allocated to spring development.

(2) Rehabilitation

Rehabilitation requirements are estimated as 10% of the total number of deep wells to be constructed under PW4SP. Rehabilitation work is mainly redevelopment of wells by means of air surging, while minor repair of concrete apron and handpump was considered to be undertaken by respective beneficiary organizations.

(3) Equipment

Logistic support:

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

Transportation- service vehicle.

Table 8.6.1 Water Supply Facilities Required by Target Year

Name of Municipality	Phase I (2003) Requirements										Phase I (2010) Requirements									
	Urban Water Supply (Level III)					Rural Water Supply					Urban WS (Level III)					Rural Water Supply				
	Mode of Project	No. of Add'l. Deep Wells	No. of HHs Connection	Level II		Level I				Total No. of Wells	No. of Add'l. Deep Wells	No. of HHs Connection	Level I				Total No. of Wells	No. of Add'l. Deep Wells	No. of HHs Connection	Total No. of Wells
				No. of System	No. of Communal Faucets	30 m	50 m	70 m	Sub-total				30 m	50 m	70 m	Sub-total				
Baganga	Expansion	1	818							113	2	2,353					113	2	2,353	219
Banaybanay	N/A										2	3,334		43				2	3,334	172
Boston	New	1	209	3	60					10	1	435					10	1	435	67
Caraga	Expansion	1	295				91		91	106	1	692		186			106	1	692	218
Cateel	New	1	392	8	160					10	1	1,133					10	1	1,133	176
Governor Generoso	Expansion	1	276	14	280						2	2,090	254					2	2,090	254
Lupon	N/A			6	120						3	4,645						3	4,645	196
Manay	Expansion	1	748							224	1	998					224	1	998	230
Mati (Capital)	Expansion	1	377	9	180			4	4	19	5	8,130			59		19	5	8,130	391
San Isidro	Expansion	1	298	9	180						1	1,817	18					1	1,817	173
Tarragona	New	1	409			8			8	67	1	871	14				67	1	871	136
Provincial Total	Exp.-6	9	3,822	49	980	8	91	4	103	458	20	26,498	286	229	59	574	1,658	20	26,498	2,232
	New-3																			

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

Field equipment- water testing kit, sound system, tape recorder and tools for maintenance.

For urban water supply, no hardware was considered.

Well drilling and rehabilitation equipment:

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

During the Phase I period, a total of 51 Level I deep wells shall be newly constructed and 10% of these deep wells shall be rehabilitated annually. Although there 2 units of truck-mounted percussion drilling rig available at DPWH-DEO in the province, these were purchased in early 1980.

Therefore, one set of drilling rigs (medium size percussion type) together with 1 set of well rehabilitation equipment, 1 unit of support vehicles for well rehabilitation and 1 units of service trucks for deep well construction shall be mobilized/procured either by private sector or LGUs (details are referred to Supporting Report).

Selection of well drilling machine

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

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

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

(4) Laboratory

Required Building:

To ensure potability of drinking water supplies, a new laboratory facility in Baganga to cover the far-flung towns of Boston, Cateel, Caraga and also Baganga will be provided because of the difficulty of transporting the water samples to Mati. Water samples have to be examined on time to avoid unpredictable changes of the quality due to long storage (details are referred to 8.6.1, Supporting Report). The new building will have a floor area of 57m² to house an examining laboratory, an office space, a storage room and a toilet. Water and power supplies will be provided.

Instrument/Equipment and Other Laboratory Accessory:

Two (2) sets of instrument/equipment will be necessary to undertake regular water quality monitoring and surveillance activities. The distribution would be: 1 set for the upgrading of the existing provincial laboratory, and the other set, to the new laboratory. The new laboratory will also be provided with laboratory accessories such as sink, working table, etc. The following are the requirements:

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

8.6.2 Sanitation

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

(1) Household toilets

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

(2) School toilets

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

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

(3) Public toilets

Future requirements in the number of toilet facilities are estimated based on the additional number of toilets for public markets and bus/jeepney terminals located in urban areas (details are referred to Supporting Report).

8.6.3 Urban Sewerage and Solid Waste

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

As reference information, the number of refuse collection trucks is estimated for the urban area in Phase I. Eleven (11) additional units of truck are required to meet assumed service coverage as reflected in Table 8.6.3.

Table 8.6.2 Sanitation Facilities Required by Target Year

Name of Municipality	Phase I (2003) Requirements														Phase II (2010) Requirements													
	Urban Sanitation							Rural Sanitation							Urban Sanitation							Rural Sanitation						
	No. of Households				No. of Public Toilets			No. of Households				No. of Public Toilets			No. of Households				No. of Public Toilets			No. of Households				No. of Public Toilets		
	Flush	Pour Flush	VIP/ Dry	Total	No. of Public Sch. Toilets	Public Market	Bus/ Jeopardy Terminal	Partia/ Playground	Flush	Pour Flush	VIP/ Dry	Total	No. of Public Sch. Toilets	Public Market	Bus/ Jeopardy Terminal	Partia/ Playground	Flush	Pour Flush	VIP/ Dry	Total	No. of Public Sch. Toilets	Public Market	Bus/ Jeopardy Terminal	Partia/ Playground	Flush	Pour Flush	VIP/ Dry	Total
Baganga	630			630	14	1	1	1				738	738	28	1,188	793				1,981	21	3	3	5				2,804
Banyanay		87		87	11		1			391	612	1,003	22	1,282	354					1,636	15	1		5				2,796
Boston					3	1	1	1		282	199	481	11	316						316	4	1	2	4				1,027
Casta	197			197	6	1	1	1				726	726	31	449	286				735	9	1	1	4				2,923
Catuel					6	1	1	1		333	586	919	25	716	55					771	9	1	1	5				2,394
Governor General	468			468	11	1	1	1		397	871	1,268	36	807	518					1,325	16	1	1	4				3,386
Lupon	604	487		1,091	19	1	1	1			925	925	35	1,555	1,022					2,577	28	1	1	5				3,588
Manay	233	4		237	8		1			520	780	1,300	27	690	453					1,143	11	1	1	2				2,985
Man (Capital)		1,901		1,901	46	1	1	1		2,659	1,401	4,060	56	3,391	2,090					5,481	64	3	1	9				5,049
San Isidro	332			332	10		1				569	569	22	786	506					1,292	14	1	1	4				2,384
Ternigona	218	52		270	4	1	1	1		117	436	553	14	401	260					661	8			2				1,810
Provincial Total	2,772	2,531		5,303	134	8	11	7		4,699	7,843	12,542	307	11,581	6,337					17,918	199	14	12	49				31,236

Table 8.6.3 Number of Refuse Collection Trucks Required in Phase I

Name of Municipality	Add'l. Urban Households to be Served	Estimated Daily Amount of Refuse to be Generated, (Kg)	Number of Collection Truck Required
Baganga	260	109	1
Banaybanay	911	381	1
Boston	137	58	1
Caraga	60	26	1
Cateel	96	41	1
Governor Generoso	434	182	1
Lupon	332	139	1
Manay	267	112	1
Mati (Capital)	1,594	667	1
San Isidro	601	252	1
Tarragona	140	59	1
Provincial Total	4,832	2,026	11

8.7 Identification of Priority Projects for Medium-Term Development Plan

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

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

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

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

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

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