JAPAN INTERNATIONAL COOPERATION AGENCY

DEPARTMENT OF THE INTERIOR AND LOCAL GOVERNMENT
THE REPUBLIC OF THE PHILIPPINES

STUDY ON THE PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN IN THE REPUBLIC OF THE PHILIPPINES

VOLUME II - 9

DRAFT MAIN REPORT

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN FOR THE PROVINCE OF

NUEVA VIZCAYA

FEBRUARY 1996

NIPPON JOGESUIDO SEKKEI CO., LTD.

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M E S S A G E

Greetings !

The formulation of the Provincial Master Plan on Provincial Water Supply, Sewerage and Sanitation Sector Plan (PW4SP) for the province of Nueva Vizcaya marks a highpoint in our efforts in attaining sustainable development and initiatives towards the Philippines 2000 vision.

This vital document that consist of a Long-Term Development Plan with target year 2010 for the Water Supply, Sewerage and Sanitation Sector, and a Medium-Term Investment Plan covering 1996-2000 will be the basis for implementing foreign and locally funded projects. Arrangements and logistics for implementation are herein recommended and those needing institutional strengthening are clearly identified.

These aforementioned objectives are achieved through the concerted efforts of the Provincial Sector Planning Team (PSPT); the extended cooperation, support and assistance in sharing essential data and planning principles by the Department of Interior and Local Government (DILG) and other national, regional, provincial and barangay institutions; and the technical assistance generously provided by the Japanese Government through Japan International Coordinating Agency (JICA). To them, we sincerely extend our gratitude.

I am certain that this Provincial Master Plan will be of extreme relevance as we pursue with vigor a meaningful implementation work in this sector.

I enjoin, therefore, all Provincial Officials and employees concerned and to all Vizcayanos to give their utmost support in implementing the plan.

Governor RODOLFO Q. AGBAYANI
December, 1995

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

VOLUME II - 9 MAIN REPORT

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PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

LIST OF ABBREVIATIONS

ADB	-	Asian Development Bank
AIDAB	-	Australian International Development Assistance Bureau
AIM	-	Asian Institute of Management
AIP	-	Annual Investment Plans
BC	-	Barangay Council
BMGS	-	Bureau of Mines and Geo-Sciences (defunct), the now Mines and Geo-Sciences Bureau
BOD	-	Biochemical Oxygen Demand
BWP	-	Barangay Water Program
BWSA	-	Barangay Waterworks and Sanitation Association
CBO	-	Community-Based Organizations
CDF	-	Countryside Development Fund
CDTS	-	Community Development and Training Specialist
CIDA	-	Canadian International Development Agency
CPC	-	Country Program for Children
CPH	-	Census on Population and Housing
CPSO	-	Central Project Support Office
CSC	-	Civil Service Commission
D/D	-	Detailed Design
DA	-	Department of Agriculture
DAP	-	Development Academy of the Philippines
DBM	-	Department of Budget and Management
DECS	-	Department of Education, Culture and Sports
DENR	-	Department of Environment and Natural Resources
DEO	-	District Engineering Office
DILG	-	Department of the Interior and Local Government
DOF	-	Department of Finance
DOH	-	Department of Health
DPWH	-	Department of Public Works and Highways
DSWD	-	Department of Social Welfare and Development
DTI	-	Department of Trade and Industry
F/S	-	Feasibility Study
FW4SP	-	First Water Supply, Sewerage and Sanitation Sector Project
GOP	-	Government of the Philippines
IBRD	-	International Bank for Reconstruction and Development
IEC	-	Information, Education and Communication
IRA	-	Internal Revenue Allotment
IRR	-	Implementing Rules and Regulations
ITN	-	International Training Network
JICA	-	Japan International Cooperation Agency
LGC	-	Local Government Code
LGU	-	Local Government Unit
LWUA	-	Local Water Utilities Administration
MEO	-	Municipal Engineer's Office
MLGOO	-	Municipal Local Government Operations Officer
MPDO	-	Municipal Planning and Development Office
MS	-	Monitoring Specialist
MSL	-	Municipal Sector Liaison

MTPDP	-	Medium-Term Philippine Development Plan
MWSS	-	Metropolitan Waterworks and Sewerage System
NAMRIA	-	National Mapping and Resource Information Authority
NDCC	-	National Disaster Coordinating Council
NEDA	-	National Economic and Development Authority
NGOs	-	Non-Governmental Organizations
NMP	-	National Master Plan
NMYC	-	National Manpower Youth Council
NSMP	-	National Sector Master Plan
NSO	-	National Statistics Office
NWRB	-	National Water Resources Board
O&M	-	Operation and Maintenance
PD	-	Presidential Decree
PDC	-	Provincial Development Council
PEO	-	Provincial Engineer's Office
PHO	-	Provincial Health Office
PLGOO	-	Provincial Local Government Operations Officer
PMO	-	Project Management Office
PMU	-	Provincial Monitoring Unit
POPCOM	-	Population Commission
PoW	-	Program of Work
PPAC	-	Philippine Plan of Action for Children
PPDC	-	Provincial Planning and Development Coordinator
PPDO	-	Provincial Planning and Development Office
PSPT	-	Provincial Sector Planning Team
PST	-	Provincial Sector Team
PW4SP	-	Provincial Water Supply, Sewerage and Sanitation Sector Plan
PWSO	-	Provincial Water and Sanitation Office
RA	-	Republic Act
RHUs	-	Rural Health Units
RWSA	-	Rural Waterworks and Sanitation Association
UNDP	-	United Nations Development Programme
UNICEF	-	United Nations International Children's Emergency Fund
VIP	-	Ventilated Improved Pit Latrine
WASAMS	-	Water and Sanitation Monitoring System
WATSAN	-	Water and Sanitation
WD	-	Water District
WHO	-	World Health Organization
WSSE	-	Water Supply and Sanitation Engineer

Chapter 1

INTRODUCTION

1. INTRODUCTION

1.1 Sector Development in the Philippines

The Government of the Philippines (GOP) has, over the last decade, with the assistance from external donors, made considerable progress in developing the water supply and sanitation sector. Developments have covered physical and institutional framework nationwide.

Nevertheless, infrastructure service delivery including this sector during the period of 1987 to 1995 has been insufficient to keep pace with the demand which was magnified by natural calamities.

About 66% (42.6 M) of the population nationwide enjoyed access to potable water supply in 1992 (61% in 1986). In urban areas outside Manila, 47% (9.97 M) had access to safe water supply services, while in the rural areas, 80% (26.65 M) was covered by point water sources. However, of the rural population, it was estimated that only 72% (23.9 M) was served by the existing facilities because some facilities were damaged or non-functioning. Furthermore, population served adequately by safe sources may be discounted.

Private sanitary toilets were available to 77% (9.4 M) of the total household nationwide in 1992. About 87% (5.3 M) of the households in urban areas was served by sanitary toilets, while only 67% (4.1 M) of the rural households was served. Comparing the service coverage of 77% in 1992 with that of 73% in 1987, an increase of a mere 5% of the number of available sanitary toilets was achieved within a 5 year period. Communal toilet facilities are generally found only at schools, public markets and in some cases bus terminals and town parks. For sewerage, only portions of the cities of Metro Manila, Cebu and Baguio have sewerage systems. Municipal refuse collection using trucks is limited to urban areas. In 1992, majority of the households (81%) practiced individual disposal, while the remaining 19% relied on municipal refuse collection and disposal.

Activities in the sector are currently guided by the Water Supply, Sewerage and Sanitation Master Plan of the Philippines 1988-2000, issued in 1988 and the Medium-Term Philippine Development Plan (MTPDP: 1993-1998) in 1992. The National Sector Master Plan (NSMP) sets ambitious targets to reach large segments of the population and to redress the imbalances between rural and urban areas. Meanwhile, the MTPDP revised the targets for water supply services based on current conditions.

Development in the sector has previously to a high degree been directed by central government agencies. However, the GOP is currently in the process of decentralizing the responsibilities for implementation of infrastructure projects to Local Government Units (LGUs), in line with the Local Government Code of 1991.

The GOP is under preparation on detailed arrangements in accordance with broad reforms aimed at streamlining sectoral activities. Therefore, the institutional framework in the provincial plan is tentative.

1.2 Provincial Sector Planning

1.2.1 Objectives of Sector Planning

The main objectives of the provincial sector plan are:

(1) To prepare a Long-Term Development Plan with a target year of 2010 for the water supply, sewerage and sanitation sector;

(2) To prepare a Medium-Term Investment Plan for the sector covering the years 1996-2000 to form the basis for implementing foreign and locally funded projects;

(3) To recommend arrangements and logistics for implementing; and

(4) To identify the needs for institutional strengthening.

1.2.2 Scope of Sector Planning

The study covers the following major elements to achieve the objectives mentioned above.

(1) Collection and Review of Previous Studies and Existing Data, and Establishment of Data Base: Inventories on existing conditions and facilities

1) Natural conditions and geographical features
2) Socio-economic conditions
3) Population
4) Health status
5) Environmental conditions
6) Existing facilities and service coverage
   - Water Supply
   - Sanitation and Sewerage
7) Existing sector arrangements and institutional capacity
   - Sector institution

- Current community development and training approaches
- Existing sector monitoring systems

8) Past financial performance in the sector development

(2) Long-Term Development Plan

1) Projection and assumption of planning framework: projection of population and relevant frame values, and targets of the sector plan
2) Service coverage by target year
   - Water Supply
   - Sanitation and Sewerage
3) Water source development
4) Service expansion plan
5) Estimation of project cost
6) Investment program

(3) Medium-Term Investment Plan (5-year)

1) Facilities and equipment, and rehabilitation required to meet the target services
2) Identification of priority projects
3) Sector management plan
   - Institutional arrangements
   - Community development and training
   - Procurement, construction and operation and maintenance
   - Sector coordination
4) Estimation of project cost
5) Financial arrangements
   - Sources of fund
   - Additional funding requirements
   - Investment need ranking of municipalities
   - Implementation arrangements
   - Cost recovery

(4) Monitoring for Evaluation of Provincial Plan Implementation

1.2.3 Financing of Sector Plan

The First Water Supply, Sewerage and Sanitation Sector Project (FW4SP) has been implemented with financial assistance of the World Bank (IBRD). With reference to the Project, the technical assistance to help Provincial Government prepare 37 provincial sector plans in Luzon area is financed by various bilateral and multilateral agencies. Among them, nine (9) provinces including Nueva Vizcaya province are assisted by the Japan International Cooperation Agency. The PW4SP will be the basis to permit execution of the sector development from the proceeds of the IBRD financed sector loan and other donors in addition to LGUs budget and internal revenue allotment from National Government.

1.3 The Provincial Plan for the Province of Nueva Vizcaya

1.3.1 Preparation of the Plan

The PW4SP for the Province was prepared by a Provincial Sector Planning Team (PSPT) organized by the provincial government consisting of the Provincial Planning and Development Coordinator (PPDC), Provincial Local Government Operations Officer (PLGOO), Provincial Waterworks Officer (PWO), planning and development officers from PPDO, and staff members from Provincial Engineers Office (PEO) and Provincial Health Office (PHO). Preparation of the plan was also assisted by the Department of the Interior and Local Government (DILG), the Department of Public Works and Highways (DPWH), the Department of Health (DOH), the Local Water Utilities Administration (LWUA), the National Economic and Development Authority (NEDA), and other national line agencies as well as Non-Government Organizations (NGOs) active in the sector. The PSPT was assisted in the preparation of the plan by the JICA Study Team through technical grant assistance from the Japanese Government (refer to Minutes of Discussions between DILG and JICA, and Figure 1.3.1 Organization Chart, 1.3.1 Preparation of the Plan, Supporting Report).

The PW4SP has been prepared at municipal level covering all sub-sectors for each municipality of the Province.

The report consists of three (3) volumes: I - Summary Report, II - Main Report and III - Supporting and Data Report.

1.3.2 Outline of the Report

The PW4SP is a framework plan that would serve as the basis for the future implementation work in the sector. It will be carried out either as large scale projects funded by international agencies or as a small size project carried out by local parties. It should be noted that the PW4SP is a sector development plan for the entire province and that it does not include detailed planning of individual projects. The individual projects will commonly cover selected sub-sector/s for limited areas and detailed planning/design work has to be conducted for the respective projects before start of construction work. The planning process is presented in Figure 1.3.1 and the following are the contents of the Main Report (List of data and information collected is included in 1.3.2 Outline of the Report, Data Report).

Chapter 2 describes the planning approach for the sector development, which guides the preparation of the plan: the background and rationale for provincial planning, and a planning tool that would rely heavily on local participation and flexible to improve planning and implementation.

Chapter 3 provides provincial profile with reference to current sector conditions: natural conditions and geographical features, socio-economic conditions, demographic trends, health status and environmental conditions as the planning environment.

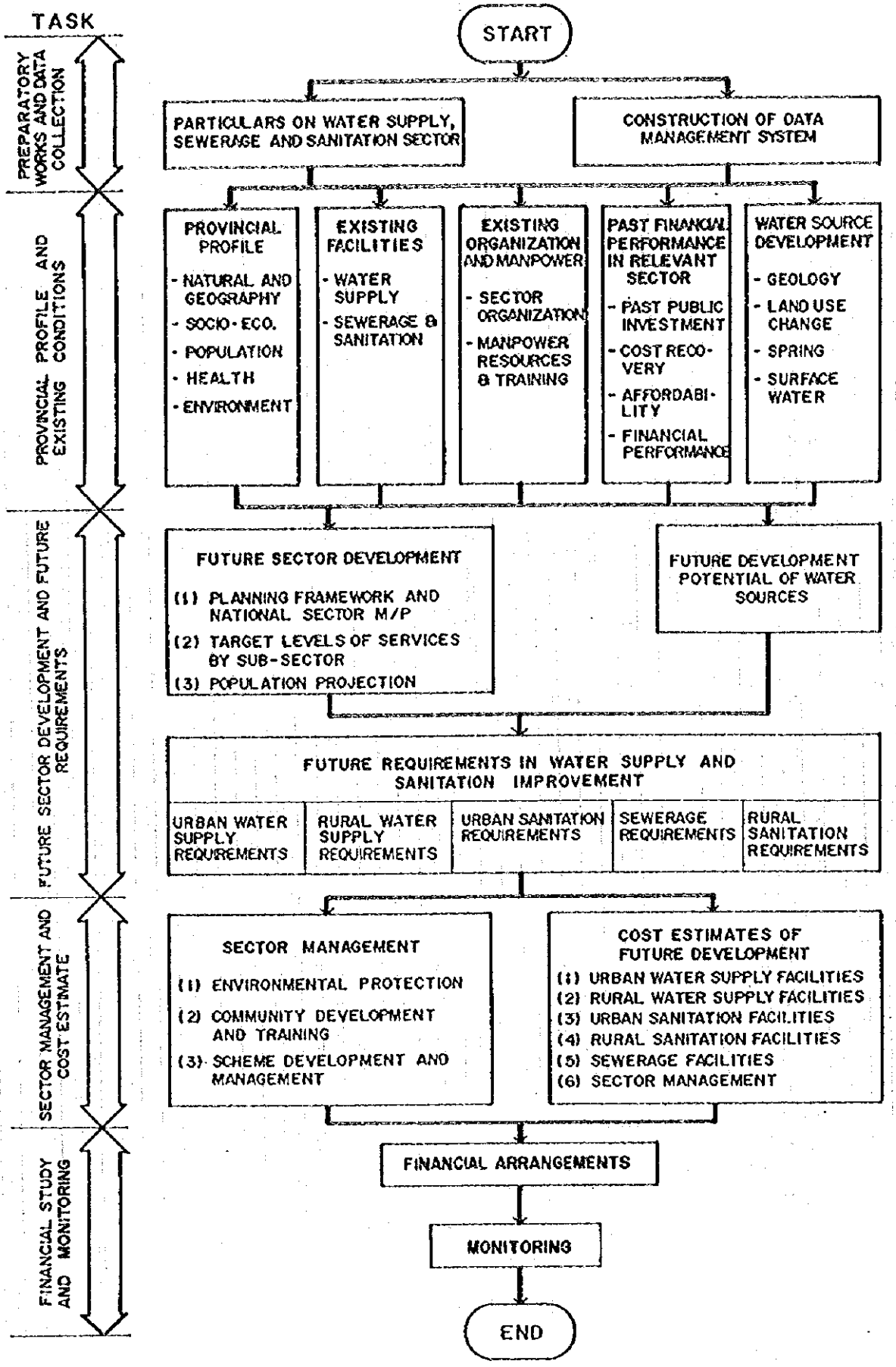
Chapter 4, 5, and 6 provide existing sector conditions in physical, managerial and financial aspects: existing water supply and sanitation facilities by service level and service coverage; sector institutions, community development, training and monitoring systems; and financial performances entailing cost recovery and affordability, which are the basis and references to come up with future development plan.

Chapter 7 analyzes the possibility of water source development for the water supply component: geological and hydrological conditions in the province, and future development potential of different water sources.

Chapter 8, 9 and 10 develop the Long-Term Development Plan and the Medium-Term Investment Plan both for physical and sector management requirements. Emphasis is placed on the sector management entailing institutional arrangements, community development, training and project implementation needs. Required costs for physical and institutional elements are also presented according to the implementation arrangements.

FIGURE 1.3.1

FLOW DIAGRAM OF SECTOR PLANNING



Chapter 11 presents financial arrangements based on identified sources of fund. The shortfall in terms of finance is shown to meet provincial targets established for the Medium-Term Investment Plan. Manner of national budget (IRA) allocation to municipalities by sub-sector is illustrated and trial calculation was made for the target year. Investment need ranking of municipalities as a factor of financial allotment is considered based on synthetic evaluation of sector components. Cost recovery by both beneficiaries and LGUs is also discussed.

Chapter 12 provides recommendations on monitoring of implemented projects covering procedures and responsibilities in different administrative levels. Periodic monitoring will allow for the updating of the PW4SP and modification of respective projects both in quality and quantity.

1.4 Acknowledgments

The Provincial Sector Planning Team (PSPT), responsible for the preparation of the PW4SP, acknowledges the extended cooperation, support and assistance in sharing essential data and planning principles by the Department of the Interior and Local Government (DILG), and other national, regional, provincial, municipal and/or city, and barangay institutions (List of individuals and their corresponding offices who directly participated in the preparation of the plan is included in 1.4 Acknowledgments, Data Report). The Japanese Government through JICA has generously provided technical assistance to the PSPT throughout the course of the planning work.

Chapter 2

PLANNING APPROACH FOR FUTURE SECTOR DEVELOPMENT

2. PLANNING APPROACH FOR FUTURE SECTOR DEVELOPMENT

2.1 General

The primary basis of the PW4SP is summarized referring to national sector policy and strategies as well as major legislation and regulations relevant to the sector. Planning framework is also discussed with reference to key measurable targets. Guiding principles for preparation of the plan are described in application of computer-aided planning approach.

2.2 Planning Framework

The GOP, through the *Water Supply, Sewerage and Sanitation Master Plan of the Philippines 1988-2000* and the Medium Term Philippine Development Plan (MTPDP): 1993-98, has manifested its commitment to the development of safe and dependable water supply and sanitation facilities. Policies and investment programs are compiled in these documents which lay out the basis of a strategy to accelerate sector development through the equitable mobilization of resources between urban and rural areas and institutional reforms at all government levels. Guiding principles set in the MTPDP include: decentralization; private sector-led development; democratic consultation; full cost recovery; social equity; and macro-economic stability.

According to MTPDP targets for the year 1998, the population served with potable water shall be increased up to 79% (57.1M). This corresponds to 71% (9.1M) of the Metro Manila population; 71% (15.5M) in other urban areas, and 85% (32.5M) in the rural areas. Sewerage facilities in Metro Manila and other highly urbanized areas will be constructed. About 1.8 million toilets will be built nationwide.

Given these MTPDP targets, as well as the goals set in the 1988 National Sector Master Plan, the current indications and the planning cycle adopted for this provincial sector planning, the national targets as shown in Table 2.2.1 will be used as the basis for setting the provincial targets.

Table 2.2.1: National Sector Coverage Targets

Sub-Sector	Year 1992	Year 2000[1]	Year 2010[2]
Urban Water Supply	47%	71%	93%
Rural Water Supply	80%	85%	95%
Sanitation	77%	93%	94%

Note: [1]Based on the 1998 MTPDP targets.
[2]Based on the long-term targets set in the previous National Sector Master Plan.

2.3 Sector Objectives

The objectives of the sector are:

(1) To provide safe and adequate water supply and sanitation to meet basic needs;

(2) To pursue proper O & M of facilities for sustainable water supply;

(3) To undertake the phased construction and installation of sewerage facilities; and

(4) To develop the capabilities of LGUs to implement water supply, sewerage and sanitation programs with the national government providing assistance in the areas of community participation, sub-sector planning, program management, regulation of development, selection of technologies, financial management, construction supervision, monitoring and reporting.

2.4 Current Sector Policies and Strategies

(1) One clear policy shift has been towards the promotion of **self-reliance** and **local community management** of services. Since the seventies, formation of local water districts in provincial urban areas has been aggressively pursued. During the eighties, this shift was further induced with the establishment of community-run BWSAs and RWSAs to provide services in smaller rural and peri-urban areas.

(2) An **integrated approach to water, sanitation and hygiene education** has been prescribed in order to achieve full health benefits of improved services. The GOP promotes intensified health education and information programs to improve hygiene practices at the household level.

(3) **Cost recovery** of capital and O & M is promoted in urban areas for piped water systems; partial recovery of operating costs in rural and low-income areas is advocated. This is a clear switch from subsidies which characterized previous strategies. Current priorities also stress the need to improve collection of water tariffs.

Reviews of previous projects have repeatedly highlighted the need to focus on **sustainability** of the projects through a truly **demand-driven** and community-based approach.

(4) **Private sector participation** is encouraged to bring into the sector business principles and practices and private capital to accelerate social and economic development; to

improve sector efficiencies; and to ease the burden on the GOP's budget and foreign borrowing.

(5) **An integrated water resources strategy** has been adopted in areas combining irrigation, power, flood control, and domestic and industrial water supply. Small and medium scale water resources projects through the active participation of the populace are encouraged. **Watershed management**; water conservation and erosion and sediment control are deemed critical.

2.5 Major Legislation and Regulations Affecting the Sector

(1) The **Local Government Code of 1991** (RA 7160) provides for a more responsive and accountable local government structure. Local government units now exercise more authority and responsibilities and provide resources to accelerate the provision of basic services and facilities, including water supply, sanitation and sewerage. The Implementing Rules and Regulations (IRR) to effect the devolution of water and sanitation responsibilities and resources are under preparation.

(2) The **Water Code of the Philippines** (PD 1067) consolidates legislation relating to the ownership, development, utilization, exploitation and conservation of water resources. The Code established the basic principles and framework on the appropriation, control and conservation of water resources to achieve their optimum economic efficiency and rational development. In addition, PD 424, declares that the National Water Resources Board (NWRB) shall be responsible for coordinating and integrating all activities related to water resources. PD 1067 also pertains to the grant of water right privileges (water permits) to appropriate and use water. Water permit applications are reviewed and granted by the NWRB.

(3) The **Provincial Water Utilities Act of 1973** (PD 198) authorizes the formation of local water districts in the provincial areas outside the Metropolitan Manila area, and provides for their administration and operation. It also created the Local Water Utilities Administration (LWUA) as a specialized lending institution for the promotion, development and financing of local water districts.

(4) The **Metropolitan Waterworks and Sewerage System (MWSS) Charter** (RA 6234) was enacted in 1971. The utility was formed to take over the facilities of NAWASA in

1971. The Charter was amended by PD 1046 expanding further its territorial jurisdiction to include areas that may be included in the growing metropolis.

(5) The **Philippine Environmental Policy (PD 1151)** requires all public and private entities to undertake an environmental impact assessment of all projects which significantly affect the quality of the environment. The **Philippine Environmental Code** (PD 1152) establishes standards for air and water quality, and guidelines for land use management, natural resource management and conservation, utilization of surface and groundwater, and waste management.

(6) The **Sanitation Code (1975)** was promulgated to deal with water supply, excreta disposal, sewerage and drainage issues. The Sanitation Code and the **National Building Code (1977)** require that new buildings be connected to a water-borne sewerage system. Where such systems do not exist, sewage must be disposed of onto Imhoff tanks or septic tanks with a subsurface absorption field. In addition, the facilities are required to conform with the **1959 National Plumbing Code.**

(7) The **1981 Rules and Regulations for Domestic Wastewater Disposal** require all subdivisions and condominiums, etc. to have adequate sewage collection, conveyance, treatment and disposal facilities. A permit must be obtained prior to commissioning a new system.

2.6 Planning Principles and Data Management

2.6.1 Planning Principles

The PW4SP shall be prepared to ensure that the sector investments are optimized under the constraints of funds and water source availability as well as planning capability. Furthermore, the plan shall ensure its sustainability at the provincial level. The overviews of the plan will be progressively adjusted and refined at different detailed implementation stages. Accordingly, the demarcation is a prerequisite between a sector plan and succeeding detailed plan/s. Specifically, the following are required as planning principles.

(1) The plan is conceived to be flexible, consistent and as simple as possible to respond to the changing socio-economic conditions of the province, accumulated technical information and updated policy of local governments allowing for periodic upgrading.

(2) The plan is arranged to allow planners to run different scenarios for project implementation, especially with reference to the interface between the provincial plan (break-down) and project proposals from municipalities (bottom-up).

(3) The plan is conceived to be adaptable to the local planning capacity and to ensure its full "ownership" by LGUs.

In addition, the following shall be taken into account to help the provincial planners perform their tasks.

(1) The plan follows existing provincial and municipal planning routines to minimize duplicated planning activities. It is essential to maintain and extend the involvement of local officials for data collection.

(2) The plan, as a comprehensive tool, considers the consistency to derive the next level of planning.

(3) The plan entails monitoring and evaluation of actual implementation progress, as investments are undertaken.

The guideline for preparation of the PW4SP is included in the Planning Approach for Future Sector Development, Data Report. It identifies all tables and figures with respective forms by main, supporting and data report.

2.6.2 Data Management

The data management system was established to come up with the basic outputs commensurate to the objectives of the provincial plan and at the same time reflect the planning approach mentioned above. It will provide a map of relative needs in the province allowing for adjustment and updating when further information becomes available. Monitoring and evaluation are to be done using the tool, thereby serving as baseline information for the improvement of planning and implementation. Different scenarios may be worked out by planners using the program in application of variable parameters.

The need for full and continuous involvement of local officials is indispensable to establish a reliable database.

(1) Computer-based system

Data management system is designed to perform simple and direct interfaces in data processing. Since a limited number of municipalities is the planning level entailing data collection from the administrative units, EXCEL was selected to facilitate data storage, retrieval, updating and processing.

The data storage system was arranged to parallel the structure of questionnaires and contain the same system of logical categories under institutional hierarchical system of the Philippines (refer to Figures 2.6.1 and 2.6.2). Data are encoded into the hierarchical level.

A series of EXCEL routines was established to allow summaries and consolidation of data into the forms required for analysis and presentation. Details are included in 2.6.2 Data Management, Supporting Report (Questionnaire Forms together with User's Guide for Computer-Aided Planning are referred to 2.6.2 Data Management, Data Report).

(2) Key Parameters

Establishment of criteria and assumptions are requisites in the planning process. In this connection, key parameters are identified to allow for preparation of alternative plans and updating in accordance with sector improvement policy in the future. The parameters for relevant sub-sectors are assumed on an urban and rural basis for respective municipalities referring to current conditions and practices on national and provincial levels. The following are selected parameters in this context.

1) Number of households to be served by a Level I facility
2) Safe and unsafe percentages of Level I facilities
3) Standard number of students to be served by a unit of sanitary toilet
4) Standard number of toilets for a public utility
5) Provincial sector targets by sub-sector
6) Composition of different types of toilets
7) Per capita water consumption for Level III system
8) Composition of different types of well sources and their specifications
9) Percentage of Level I wells to be rehabilitated
10) Unit construction cost of different facilities per person/household/facility/system
11) Percentage of sector management cost to construction cost
12) Physical and price contingencies
13) Unit recurrent cost of different systems/facilities
14) Allocation factors/percentages of IRA

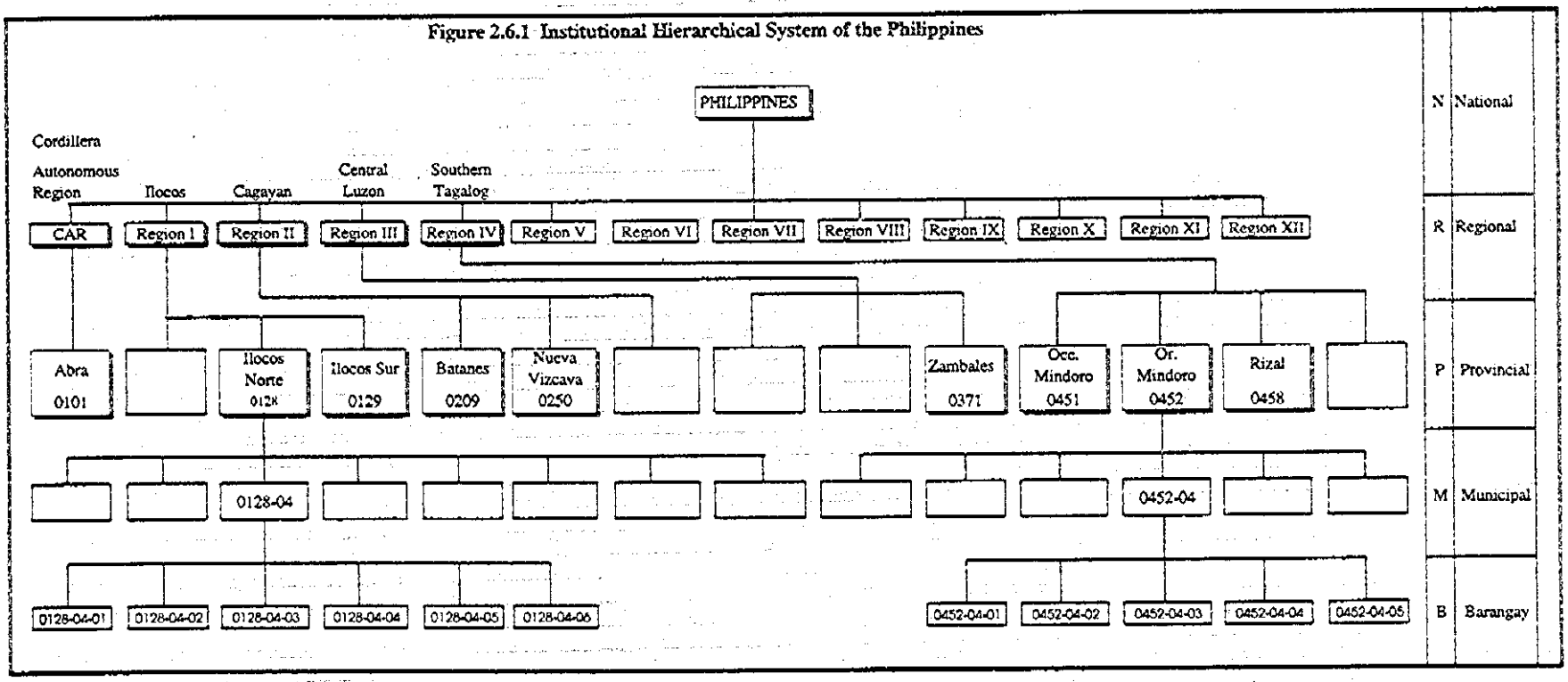


Figure 2.6.1 Institutional Hierarchical System of the Philippines
PHILIPPINES
Cordillera Autonomous Region
Ilocos
Cagayan
Central Luzon
Southern Tagalog
CAR
Region I
Region II
Region III
Region IV
Region V
Region VI
Region VII
Region VIII
Region IX
Region X
Region XI
Region XII
Abra 0101
Ilocos Norte 0128
Ilocos Sur 0129
Batanes 0209
Nueva Vizcaya 0250
Zambales 0371
Occ. Mindoro 0451
Or. Mindoro 0452
Rizal 0458
0128-04
0452-04
0128-04-01
0128-04-02
0128-04-03
0128-04-04
0128-04-05
0128-04-06
0452-04-01
0452-04-02
0452-04-03
0452-04-04
0452-04-05
N National
R Regional
P Provincial
M Municipal
B Barangay

Figure 2.6.2 Structure of Questionnaire

Grouping of Data	Data Collection Level					
	Nat. N	Reg. R	Prov. P	Mun. M	Bar. B	Sys. S
1 SOCIO ECONOMIC CONDITIONS						
1.1 Area and Population			P 1.1	M 1.2		
1.2 Past Population			P 1.2.1	M 1.2.1		
			P 1.2.2	M 1.2.2		
1.3 Projected Population			P 1.3	M 1.3		
1.4 Household Number			P 1.4	M 1.4		
1.5 Services			P 1.5	M 1.5		
1.6 Occupation Category			P 1.6	M 1.6		
1.7 Family Income, Education and Literacy			P 1.7	M 1.7		
2 LAND USE						
2.1 Existing Land Use			P 2.1	M 2.1		
2.2 Future Land Use			P 2.2	M 2.2		
3 HEALTH						
3.1 Morbidity and Mortality			P 3.1	M 3.1		
3.2 Facility and Practioner			P 3.2	M 3.2		
4 WATER SOURCE						
4.1 General Information			P 4.1	M 4.1		
4.2 Water Source			P 4.2	M 4.2		
5 WATER SUPPLY SYSTEMS						
5.1 Level II Systems						S 5.1.1
						S 5.1.2
5.2 Level III Systems						S 5.2.1
						S 5.2.2
						S 5.2.3
						S 5.2.4
6 ENVIRONMENTAL SANITATION						
6.1 Private Toilet			P 6.1	M 6.1		
6.2 School/Public Toilet			P 6.2	M 6.2		
6.3 Drainage Facility			P 6.3	M 6.3		
6.4 Solid Waste Collection and Disposal			P 6.4	M 6.4		
7 INVESTMENT						
7.1 Previous Annual Investment			P 7.1			
7.2 Planned Annual Investment			P 7.2			

15) Funding levels/percentages for different financing scenarios

16) Scoring factors for municipal investment ranking

17) Annual distribution of investment cost (medium-term development)

These parameters are not included in the database program, since they are to be established through sensitivity analysis. Assumed figures are directly entered into a separate spreadsheet that is linked to the output files.

(3) Data Processing

Collected data are entered into the forms constructed in EXCEL database. The data are consolidated into final forms in application of small programs prepared for this planning. Linked outputs in tables and graphics are prepared in EXCEL spreadsheets for final analysis and presentation. Key parameters are entered in a key parameter table linked to the output tables (refer to 2.6.2 Data Management, Supporting Report).

Data in the questionnaire forms (database) are transferred to the output tables for final calculations. Adjustments are made through manipulation of the key parameter table.

Chapter 3

PROVINCIAL PROFILE

3. PROVINCIAL PROFILE

3.1 General

Nueva Vizcaya is one of the five (5) provinces comprising Region II (Cagayan Valley). Bayombong, the provincial capital is about 268km north of Metro Manila. It is bounded on the north and northeast by the provinces of Ifugao and Isabela, on the east and southeast by Quirino and Aurora, on the west and southwest by Benguet and Pangasinan, and on the south by Nueva Ecija. Its natural physical boundaries are the Lamut river on the north, the Sierra Madre range on the east, the Cordillera mountains on the west, and the Caraballo mountains on the south. Figure 3.1.1 presents the Location Map.

The landlocked province has a total area of 3,903.9sq.km that is 1.30% of the Philippine total land area of about 300,000sq.km. It is composed of 15 municipalities. Based on the 1990 NSO classification, there are 275 barangays, of which 30 are urban and 245 rural. Provincial total population was 301,179 in 1990. About 76% of the population resided in rural areas, while the remaining 24% in urban areas. At present, there are 3 Level III systems (2 provincial/municipal waterworks and 1 privately operated) in the province. Table 3.1.1 presents the breakdown per municipality of the land area, population and its gross density, as well as administrative composition.

Table 3.1.1 Outline of Municipalities

Municipality		Land Area (sq.km)	1990 Population		Number of Barangay		
Code	Name		Number	Density (person/sq.km)	Urban	Rural	Total
025015	Alfonso Castañeda	375.40	3,751	10	0	6	6
025001	Ambaguio	185.60	7,241	39	0	8	8
025002	Aritao	265.60	25,942	98	1	21	22
025003	Bagabag	183.90	26,028	142	4	13	17
025004	Bambang	345.00	33,663	98	4	21	25
025005	Bayombong	136.00	39,886	293	7	18	25
025006	Diadi	181.20	11,351	63	1	18	19
025007	Dupax del Norte	347.30	20,904	60	1	14	15
025008	Dupax del Sur	374.70	12,297	33	3	16	19
025009	Kasibu	318.80	21,425	67	0	30	30
025010	Kayapa	482.90	18,685	39	1	29	30
025011	Quezon	176.20	12,206	69	0	12	12
025012	Santa Fe	310.00	9,960	32	1	15	16
025013	Solano	139.80	44,246	316	6	16	22
025014	Villaverde	81.50	13,594	167	1	8	9
Provincial Total		3,903.90	301,179	39	30	245	275

Notes: Municipal Code corresponds to NEDA Geographic Coding System.
Number of barangays includes the 3 newly created in 1992.

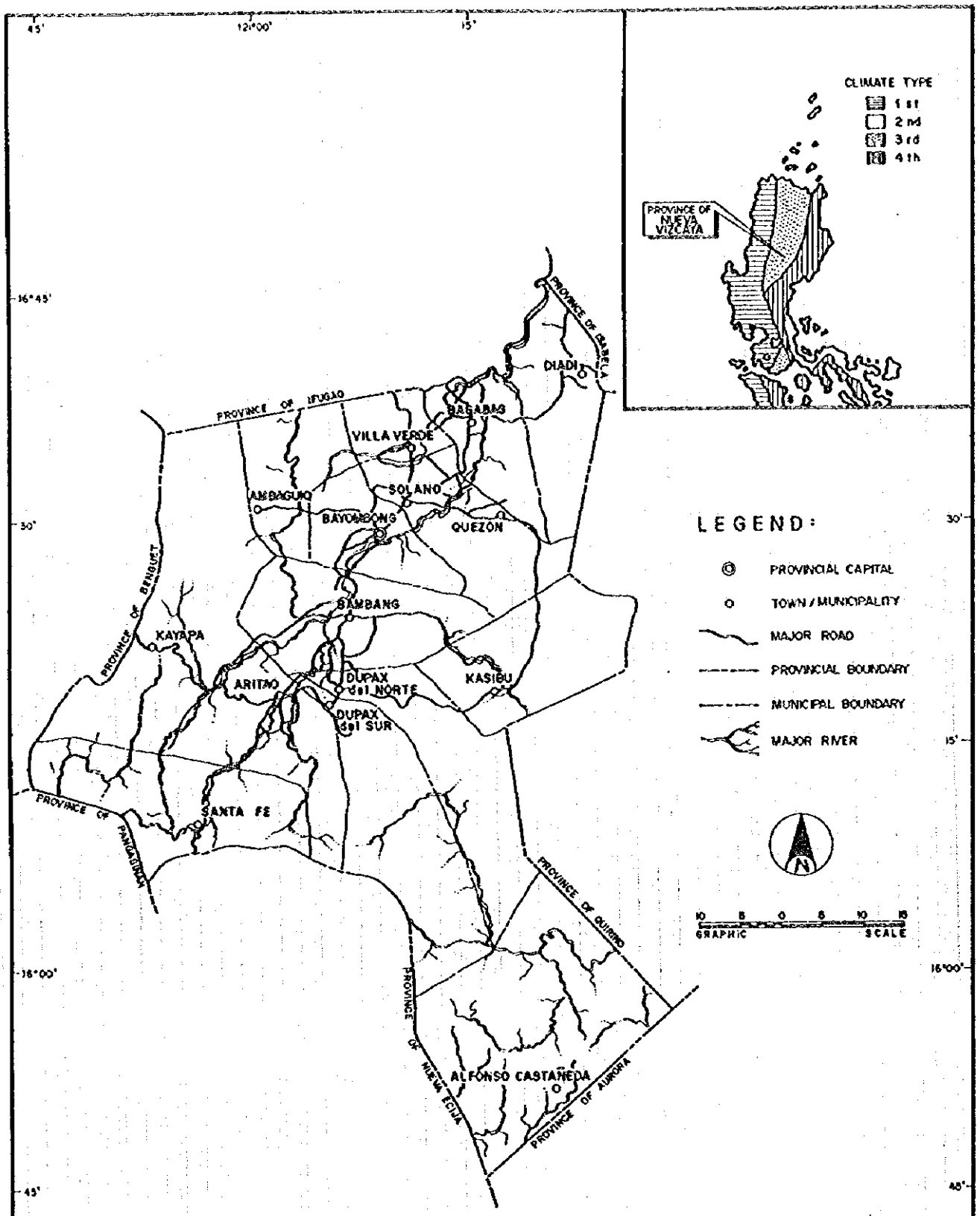


FIGURE 3.1.1

LOCATION MAP

PROVINCE OF NUEVA VIZCAYA

3.2 Natural Conditions and Geographical Features

3.2.1 Meteorology

The province has Type III climate under the Coronas classification. The seasons are not very pronounced: relatively dry from November to April and wet the rest of the year as reflected in Figure 3.1.1, Location Map. The annual rainfall varies with location: about 1,400mm in the lowland and about 2,400mm in the highland. Maximum rainfall is observed during the months of September and October, while the minimum is during February.

The maximum temperature ranges from 22°C to 25°C in April and May, while the minimum ranges from 12°C to 15°C in December and January. The province is within the typhoon belt in Northern Luzon, but is not in the direct path of cyclones that visit the region.

3.2.2 Land Use

Forest area constitutes about 29% of the total area of the province located mostly in the Sierra Madre, Cordillera and Caraballo mountain ranges. Agricultural land comprises about 15%, while Built-up areas are limited to a mere 0.4%. Major settlements are often concentrated along the national roads and the banks of Magat River. Grassland and Openland represent 53% of the total. The existing land use pattern is presented in Table 3.2.1. The remaining forest cover primarily serves as watershed rather than as source of timber. An efficiently managed watershed collects and regulates flow of water, controls soil erosion and minimizes water pollution. Conversion of forest lands to other uses will restrict its function as a watershed. Correspondingly, a significant increase in agricultural area will result in a high demand of water for agricultural use.

Table 3.2.1 Current Land Use

Land Use	Area (sq. km)	Percentage over Total Land Area
Forest Land	1,135.70	29.09
Agricultural	602.98	15.45
Built-up Area	16.62	0.43
In-land Water Area	61.37	1.57
Grassland and Openlands	2,087.23	53.46
TOTAL	3,903.90	100.00

3.2.3 Topography and Drainage

The topography of the province is generally mountainous with plains on the Magat river valley floor. Approximately 86% of the total land area is rolling to steep, while the remaining is flat to nearly flat. Elevation ranges from 200 to 2,150m above mean sea level. Mt. Pulog in the municipality of Kayapa is the highest mountain with a peak elevation of 2,150m. Other mountains are the knob peak and different high relief along the Sierra Madre, Luzon Cordillera and Caraballo mountain ranges.

The principal natural drainage system of the province is the Magat river system that discharges into the Cagayan river. It has 4 major tributaries: Matuno, Sta. Cruz, Sta. Fe and Marang rivers. The rivers of Matuno and Sta. Cruz as well as their tributaries originate from the Luzon Central Cordillera, while the rivers of Sta. Fe and Marang and their tributaries originate from the western slopes of Caraballo mountain. Also, the eastern and southeastern portions of the province are drained by the rivers of Kasibu and Casecnan and their tributaries. These rivers are flowing into the Cagayan river. Figure 3.2.1 shows the drainage systems of Nueva Vizcaya. Table 3.2.2 is a list of the main rivers and their corresponding drainage areas with recorded flow rates (refer to Table 3.2.1 flow data of major rivers, Data Report). Two (2) typical rivers in the province were selected for water quality analysis, namely: Magat and Matuno rivers. The results of the analysis showed that these river waters are turbid with considerable amount of organic impurities, exceeding the maximum limit of Class "A" fresh surface water classification. The water of Matuno river is slightly acidic, possibly caused by geological feature of its basin.

Table 3.2.2 Drainage Areas and Flow Rates of Major Rivers

River Name	Station ID Number	Drainage Area (sq.km)	Flow Rate (cu.m/sec)			Water Districts (using river water)
			Minimum	Average	Maximum	
Matuno River	02SW162210PW040	558	11.32	68.15	467.00	NONE
Magat River	02SW162210PW030	1,784	13.04	54.41	348	NONE
Sta. Cruz River	N.A	162	N.A.	4.58	N.A.	NONE
Sta. Fe River	N.A.	547	N.A.	4.33	N.A	NONE

Source: Philipine Water Resources Summary Data Volume 1,2 (Department of Public Works and Highways, 1991)
Nueva Vizcaya

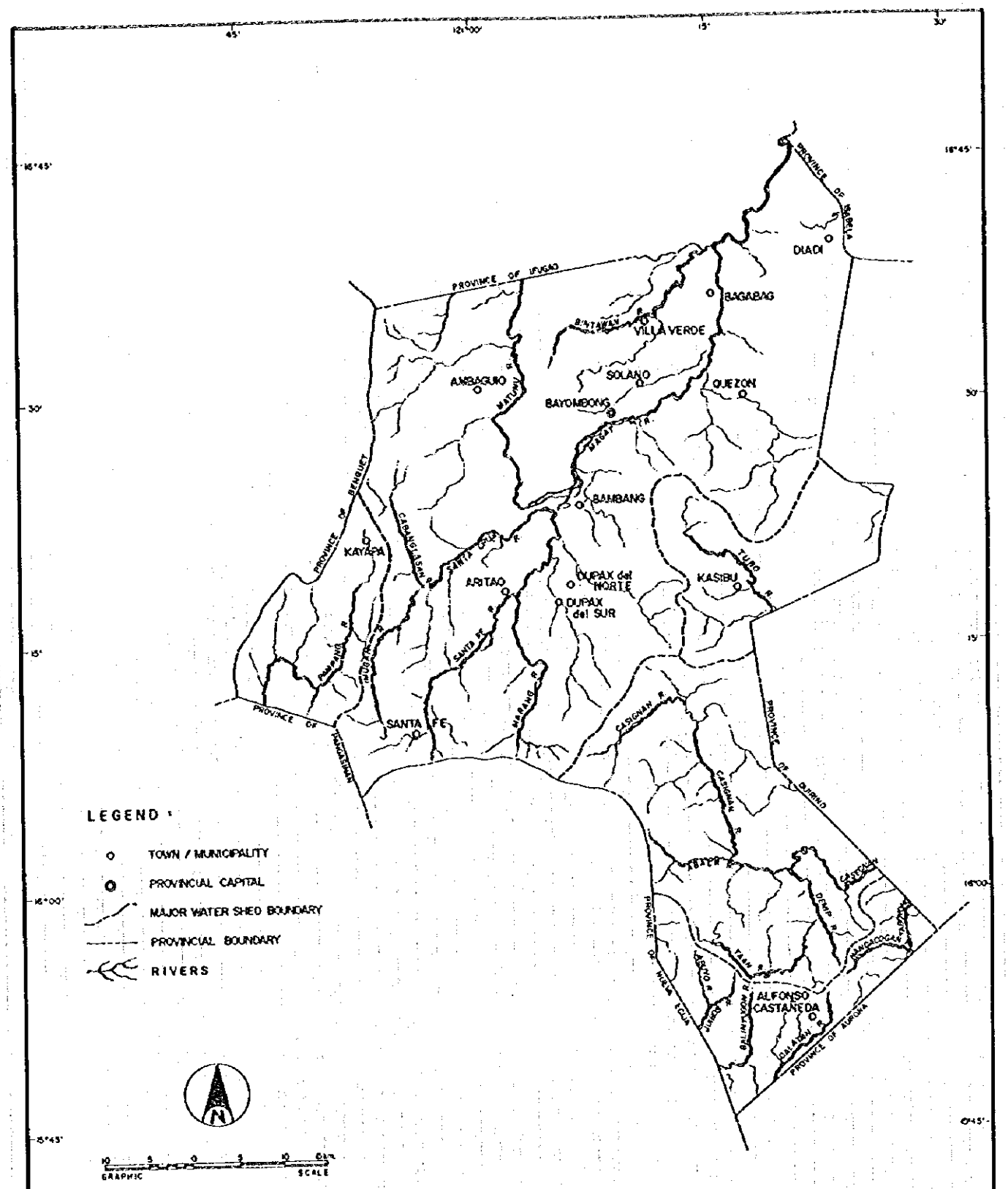


FIGURE 3.2.1
MAJOR RIVER NETWORKS
PROVINCE OF NUEVA VIZCAYA

3.3 Socio-economic Conditions

3.3.1 Economic Activities and Household Income

Agriculture is the major economic activity in the province. Major crops cultivated are rice, corn, fruits and vegetables as well as roots and tubers. Commerce is also an important activity. The greater bulk of commercial activities is seen in Solano, Bayombong and Bambang. Cutflower production is also one of the promising economic activities in the province.

The National Statistics Office (NSO) Family Income and Expenditures Survey in 1991 showed that the mean annual family income of the province was ₱ 52,961, while the median was at ₱ 36,132. Distribution of households by income class in the region and province is shown in Figure 3.3.1 (refer to Table 3.3.1, Supporting Report). Percentages of households of lower income levels were lower than that of the region. Based on the established poverty threshold income of ₱ 42,400 in Region II for 1991, approximately 56% of the total number of families lived within and below the poverty threshold.

As to the number of workers by major industry group, agriculture, fishery and forestry had the dominant share followed by community, social and personal services, and wholesale and retail trade (refer to Table 3.3.2, Supporting Report). By major occupation group, farmers, forestry workers and fishermen had the highest share of 38%, followed by elementary occupations as indicated in Figure 3.3.2.

3.3.2 Basic Infrastructure

Electric supply and telecommunication service cover 93% and 100% of the municipalities, respectively. There are 15 post offices or stations in the province. Land transportation is available by means of jeepneys, minibuses and buses. The province has 1 airport. There are 337 business establishments and 16 tourism facilities. Table 3.3.1 presents a provincial outline of public services and Table 3.3.2 reflects the number of public facilities and services by municipality (refer to Table 3.3.1, Data Report).

3.3.3 Education

The province has a total of 329 schools consisting of 290 elementary schools, 35 high schools and 4 colleges/vocational institutions. The 1990 NSO census indicated that the province had a 90.50% literacy of household population 10 years old and over. A large part of the population had attained elementary or high school levels of education as reflected in Figure 3.3.3 (refer to Table 3.3.3, Supporting Report).

Figure 3.3.1 Distribution of Households by Income Class

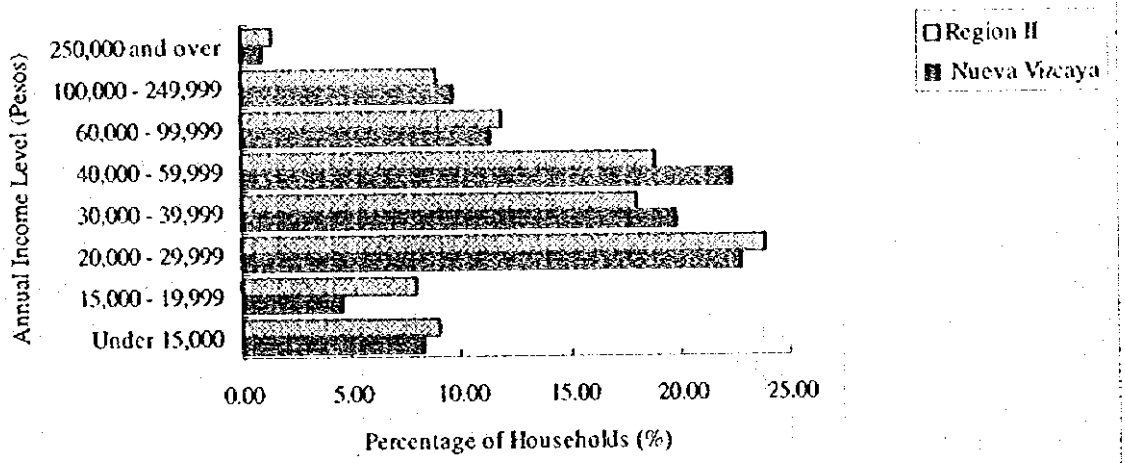


Figure 3.3.2 Population Distribution by Occupation

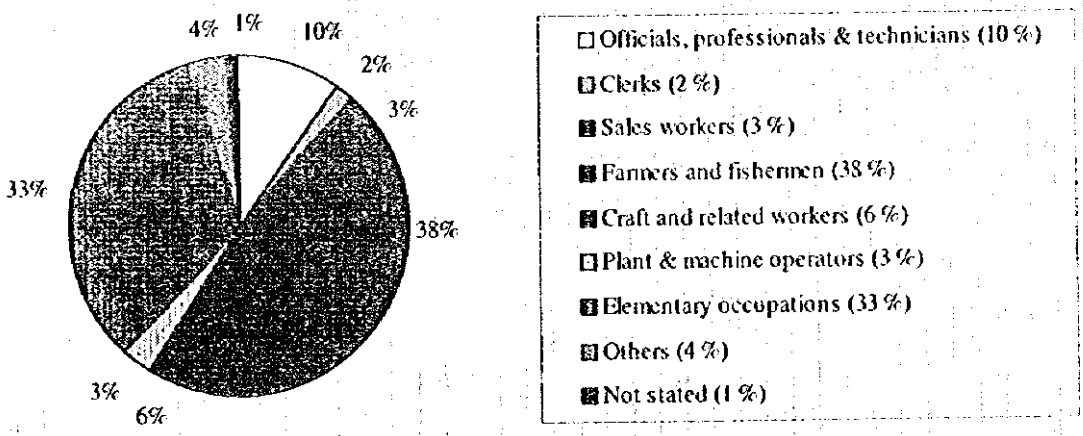


Figure 3.3.3 Population Distribution by Highest Attainment of Education

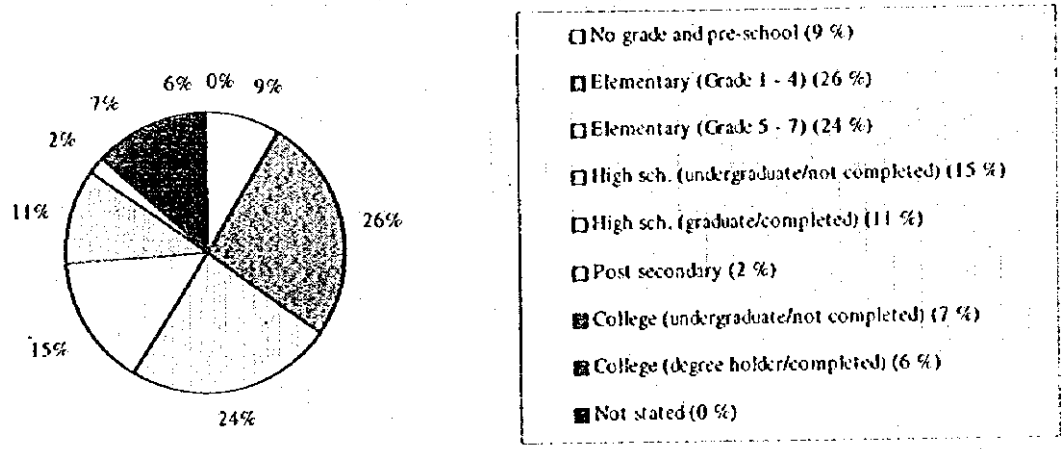


Table 3.3.1 Provincial Outline on Public Services

Items	Unit		Items	Unit	
(1) Roads			(8) Tourism Facilities	Number	16
a) Total Length	km	2,430	(Hotels, lodges, resort,etc.)		
b) Barangay roads	Percent	58.4			
			(9) Schools		
(2) Electricity Service Coverage			a) Elementary level	Number	290
a) Municipality	Percent	93.3	b) Secondary level	Number	35
b) Barangay	Percent	59.7	c) Tertiary level	Number	4
c) Household	Percent	54.4			
			(10) Health Facilities		
(3) Telecommunication Services			a) Hospital/clinics	Number	5
a) Availability in municipality	Percent	100	b) Main health centers,	Number	111
b) Telegraph station	Number	15	barangay health centers		
c) Telephone station	Number	3			
			(11) Labor		
(4) Post Office	Number	15	a) Labor force participation ratio	Percent	63.5
			b) Employment rate	Percent	93.4
(5) Transportation Services	Mode (ex. Bus, jeep)	All modes, 1 airport	(12) Average family income		
			a) Monthly income	Pesos/Month	4,413
			b) Monthly expenditure	Pesos/Month	4,067
(6) Banking Facilities	Number	20			
a) Private bank	(by Private				
b) Public bank	and public)				
(7) Industrial/Business/Commercial establishment	Number	337			

Sources:
PSPT, Provincial Socio-economic Profile Development Plan, 1990 Population Census, 1991 Family Income and Expenditures Survey by NSO

Table 3.3.2 Public Facilities and Services by Municipality

Municipality	High School			College	Hospital	Public Market	Bank	Annual Growth Rate of Population (1980-1990)
	Public	Private	Total					
	nos.	nos.	nos.	nos.	nos.	nos.	nos.	%
Alfonso Castañeda	1	0	1	0	0	1	0	3.0
Ambaguio	1	0	1	0	0	1	0	6.5
Aritao	1	2	3	0	0	1	1	1.7
Bagabag	2	2	4	0	0	1	1	2.2
Bambang	1	1	2	1	1	2	2	2.5
Bayombong	2	1	3	2	1	2	3	2.2
Diadi	1	0	1	0	0	1	1	2.8
Dupax del Norte	4	0	4	0	1	3	1	2.2
Dupax del Sur	1	1	2	0	0	1	0	2.5
Kasibu	1	0	1	0	1	1	0	3.6
Kayapa	3	0	3	0	1	4	0	-0.9
Quezon	1	0	1	0	0	0	0	2.3
Santa Fe	1	1	2	0	0	5	1	4.6
Solano	2	3	5	1	0	1	9	1.9
Villaverde	1	1	2	0	0	1	1	2.5
PROVINCIAL TOTAL	23	12	35	4	5	25	20	2.2

3.4 Population

3.4.1 Previous Population Development

A declining provincial population growth rate had been experienced since the last four (4) census years (1970-1990) as indicated in Figure 3.4.1. From an average annual growth rate of 4.23% during the period 1960 to 1970, it gradually decreased to 2.20% (1980-1990). A summary of the average annual growth rates is as follows:

Year	Population	Ave. Annual Growth Rate (%)	Period
1960	113,824	2.95%	1948 - 1960
1970	172,198	4.23%	1960 - 1970
1975	213,151	4.36%	1970 - 1975
1980	241,690	2.54%	1975 - 1980
1990	301,179	2.20%	1980 - 1990

A consideration on how the population growth behaved in the past and how it is likely to behave in the future is important because of the issue of resource allocation including the water supply and sanitation sector requirements.

The 1995 population was estimated to provide the planning base for the Master Plan (refer to Section 8.3.1, Population Projection, Main Report). Table 3.4.1 shows a breakdown of the past population development by municipality including the 1995 estimated population.

3.4.2 Classification of Urban and Rural Areas

NSO classifies a barangay as urban when it satisfies any of the following conditions on the economic and social functions.

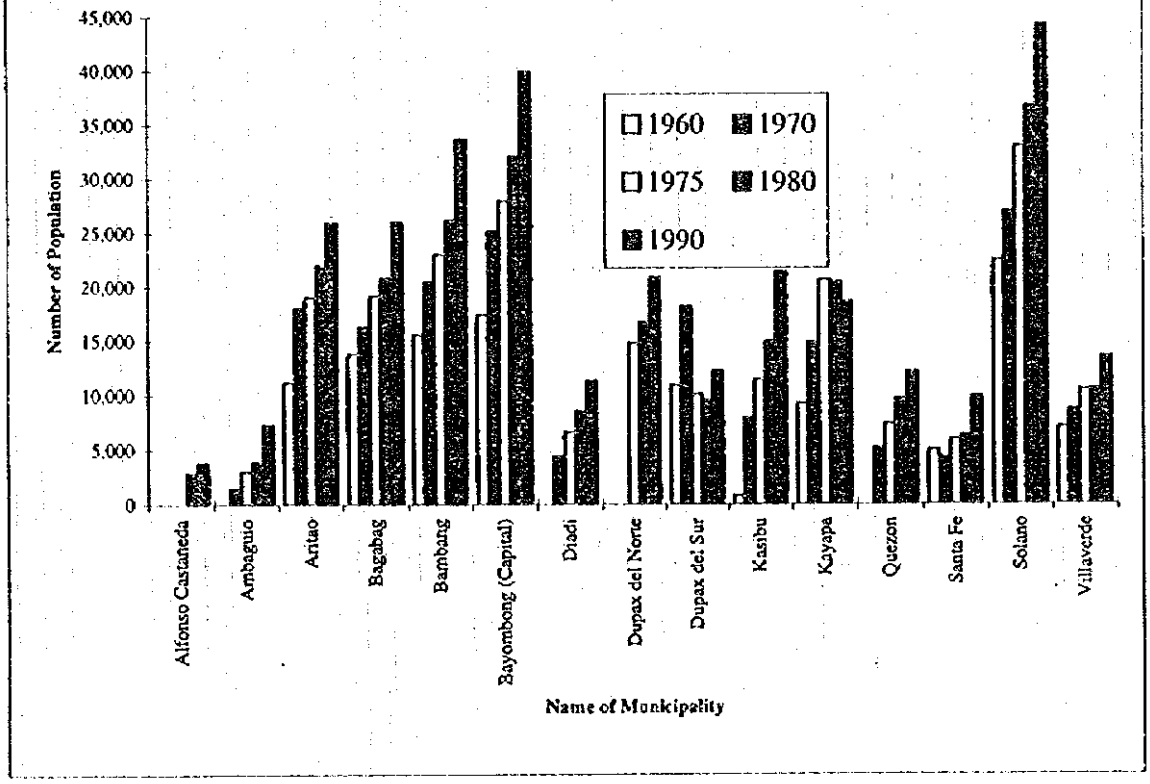
(1) In their entirety, all municipal jurisdictions which, whether designated as chartered cities, provincial capital or not, have a population density of at least 1,000 persons per square kilometer.

(2) Poblaciones or central districts of municipalities and cities which have a population density of at least 500 persons per square kilometer.

Table 3.4.1 Previous Population Development by Municipality

Municipality	Previous Population						Est. Pop.
	1948	1960	1970	1975	1980	1990	1995
Alfonso Castaneda	0	0	0	0	2,797	3,751	4,344
Ambaguio	0	0	1,416	3,000	3,856	7,241	9,923
Aritao	7,322	11,209	18,098	19,075	22,004	25,942	28,168
Bagabag	10,288	13,805	16,327	19,188	20,855	26,028	29,252
Bambang	11,188	15,592	20,474	23,073	26,204	33,663	38,164
Bayombong (Capital)	14,078	17,499	25,212	27,987	32,066	39,886	44,783
Diadi	0	0	4,407	6,649	8,605	11,351	13,038
Dupax del Norte	0	0	0	14,818	16,743	20,904	23,400
Dupax del Sur	8,904	10,993	18,241	10,161	9,632	12,297	13,928
Kasibu	693	803	7,952	11,490	15,029	21,425	25,581
Kayapa	5,759	9,298	14,920	20,718	20,491	18,685	20,863
Quezon	0	0	5,156	7,405	9,716	12,206	13,681
Santa Fe	2,126	4,982	4,254	5,961	6,338	9,960	12,582
Solano	19,840	22,523	27,032	33,036	36,710	44,246	48,776
Villaverde	0	7,120	8,709	10,590	10,644	13,594	15,364
Provincial Total	80,198	113,824	172,198	213,151	241,690	301,179	341,847

Figure 3.4.1 Previous Population Development of the Province



(3) Poblaciones or central districts (not included in nos. 1 and 2) regardless of population size which have the following:

1) Street pattern, i.e., network of streets either at parallel or in right angle orientation;
2) At least six establishments (commercial, manufacturing, recreational and/or personal services); and
3) At least three of the following:
   a) a town hall, church or chapel with religious services at least once a month;
   b) a public plaza, park or cemetery;
   c) a market place or building where trading activities are carried on at least once a week; and
   d) a public building like school, hospital, puericulture and health center or library.

(4) Barrios/Barangays having at least 1,000 inhabitants which meet the conditions setforth in no. 3 above, and in which the occupation of the inhabitants is predominantly non-farming/fishing.

All areas not falling under the urban classification are defined as rural area. Distribution of the classified area is shown in Figure 3.4.1, Supporting Report.

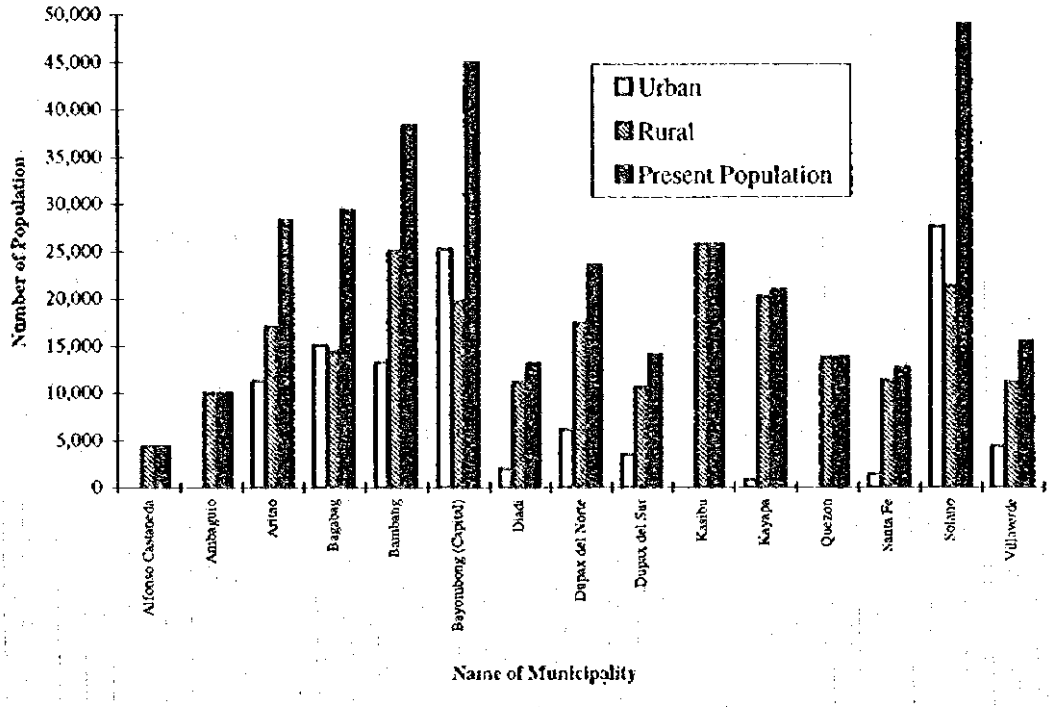
For this Master Plan, the 1990 NSO classification of urban and rural barangays was modified by the PPDO to reflect the actual conditions prevailing in the area. A total of 13 rural barangays was re-classified as urban. With the re-classification, there are 43 urban barangays and 232 rural barangays for a total of 275 barangays in Nueva Vizcaya. This number includes the 3 newly created barangays in 1992: Barangays Magsaysay Hill and Sto. Domingo West in Bambang; and Barangay Pilar D. Galima in Solano.

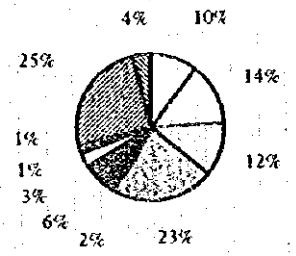
3.4.3 Present Population Distribution

Utilizing the modified classification of the barangays, the 1995 urban-rural population was estimated. Rural population accounts for 68% of the provincial total, while 32% is urban as reflected in Figure 3.4.2. Table 3.4.2 presents the breakdown of the number of urban and rural barangays by municipality and its corresponding present population distribution.

There are 66,491 households with 68% residing in rural areas and 32% households in urban areas. The average provincial household size is 5.1 persons/household. Table 3.4.3 presents

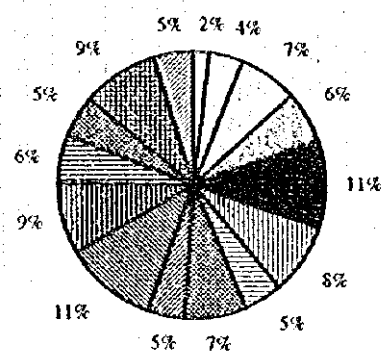
Figure 3.4.2 Present Population Distribution





Urban Population (32%)

Alfonso Castaneda (0 %)	Ambaguio (0 %)
Aritao (10 %)	Bagabag (14 %)
Bambang (12 %)	Bayombong (Capital) (23 %)
Diadi (2 %)	Dupax del Norte (6 %)
Dupax del Sur (3 %)	Kasibu (0 %)
Kayapa (1 %)	Quezon (0 %)
Santa Fe (1 %)	Solano (25 %)
Villaverde (4 %)	



Rural Population (68%)

Alfonso Castaneda (2 %)	Ambaguio (4 %)
Aritao (7 %)	Bagabag (6 %)
Bambang (11 %)	Bayombong (Capital) (8 %)
Diadi (5 %)	Dupax del Norte (7 %)
Dupax del Sur (5 %)	Kasibu (11 %)
Kayapa (9 %)	Quezon (6 %)
Santa Fe (5 %)	Solano (9 %)
Villaverde (5 %)	

a breakdown per municipality in the number of households and household sizes by urban and rural area.

Table 3.4.2 Outline of Urban and Rural Areas in the Province

Municipality	Land Area (sq.km)	Number of Barangay			Estimated Population (1995)		
		Urban	Rural	Total	Urban	Rural	Total
Alfonso Castaneda	375.40	0	6	6	0	4,344	4,344
Ambaguio	185.60	0	8	8	0	9,923	9,923
Aritao	265.60	3	19	22	11,204	16,964	28,168
Bagabag	183.90	8	9	17	14,942	14,310	29,252
Bambang	345.00	4	21	25	13,190	24,974	38,164
Bayombong	136.00	12	13	25	25,140	19,643	44,783
Diadi	181.20	1	18	19	1,931	11,107	13,038
Dupax del Norte	347.30	2	13	15	6,084	17,316	23,400
Dupax del Sur	374.70	3	16	19	3,423	10,505	13,928
Kasibu	318.80	0	30	30	0	25,581	25,581
Kayapa	482.90	1	29	30	744	20,119	20,863
Quezon	176.20	0	12	12	0	13,681	13,681
Santa Fe	310.00	1	15	16	1,366	11,216	12,582
Solano	139.80	7	15	22	27,494	21,282	48,776
Villaverde	81.50	1	8	9	4,300	11,064	15,364
Provincial Total	3,903.90	43	232	275	109,818	232,029	341,847

Table 3.4.3 Household Numbers and Household Sizes

Municipality	Number of Households (1995)			Household Size (person / HH)		
	Urban	Rural	Total	Urban	Rural	Total
Alfonso Castaneda	0	822	822	0.0	5.3	5.3
Ambaguio	0	1,773	1,773	0.0	5.6	5.6
Aritao	2,164	3,287	5,451	5.2	5.2	5.2
Bagabag	2,799	2,816	5,615	5.3	5.1	5.2
Bambang	2,623	4,944	7,567	5.0	5.1	5.0
Bayombong	4,522	4,511	9,033	5.6	4.4	5.0
Diadi	366	2,144	2,510	5.3	5.2	5.2
Dupax del Norte	1,184	3,374	4,558	5.1	5.1	5.1
Dupax del Sur	632	1,942	2,574	5.4	5.4	5.4
Kasibu	0	4,956	4,956	0.0	5.2	5.2
Kayapa	139	3,757	3,896	5.4	5.4	5.4
Quezon	0	2,699	2,699	0.0	5.1	5.1
Santa Fe	239	2,161	2,400	5.7	5.2	5.2
Solano	5,539	4,240	9,779	5.0	5.0	5.0
Villaverde	778	2,080	2,858	5.5	5.3	5.4
Provincial Total	20,985	45,506	66,491	5.2	5.1	5.1

3.5 Health Status

3.5.1 Morbidity, Mortality and Infant Mortality

The number one cause of morbidity was acute respiratory infection followed by bronchitis and nutritional deficiencies. Anemias and skin diseases ranked fourth and fifth, respectively. Other causes of morbidity in descending order were: intestinal parasitism, influenza,

diarrhea, pneumonia, influenza and scabies. Regarding mortality, the number one cause was pneumonia, followed by heart diseases. Vascular diseases and other accidents ranked third and fourth, respectively. Other causes include malignant neoplasm, tuberculosis, senility, kidney/nephritis and ill-defined condition. Respiratory condition of fetus/newborn, pneumonia, prematurity and ARI were the 4 leading causes of infant mortality in the province.

The general health status of the populace of the province was relatively inferior to the national condition. Except for some causes of mortality, the incidences of diseases were higher in Nueva Vizcaya than the Philippines as a whole. Table 3.5.1 presents a comparative statistics on the ten leading causes of morbidity, mortality and infant mortality of the province as well as of the Philippines (details are referred to Table 3.5.1, Data Report).

Table 3.5.1 Number and Rates of Ten Leading Causes of Morbidity, Mortality and Infant Mortality

Rate: 1/100,000

		Nueva Vizcaya		Philippines		
		Number	Rate	Number	Rate	Ranking
Morbidity	1. ARI	23,217	6,791.63	875,289	1,456.50	3
	2. Bronchitis	10,921	3,194.70	951,305	1,583.10	1
	3. Nutritional Deficiencies	7,260	2,123.76	206,164	343.10	8
	4. Anemias	6,941	2,030.44	-	-	-
	5. Skin Disease	5,139	1,503.30	-	-	-
	6. Intestinal Parasitism	4,424	1,294.15	245,827	409.10	6
	7. Diarrhea	4,234	1,238.57	894,116	1,487.80	2
	8. Pneumonia	3,205	937.55	204,959	341.10	7
	9. Influenza	2,131	623.38	694,956	1,156.40	5
	10. Scabies	1,678	490.86	-	-	-
Mortality	1. Pneumonia	182	53.24	50,609	84.20	1
	2. Heart Diseases	173	50.61	33,917	56.40	2
	3. Vascular Diseases	140	40.95	26,436	43.90	3
	4. Other Accidents	111	32.47	15,193	25.30	5
	5. Malignant Neoplasms	76	22.23	14,723	24.50	6
	6. Tuberculosis	44	12.87	20,949	34.90	4
	7. Senility	22	6.44	-	-	-
	8. Kidney/Nephritis	19	5.56	-	-	-
	9. Ill-Defined Condition	15	4.39	-	-	-
Infant Mortality	1. Resp. Fetus/Newborn	28	8.19	1,167	n.a	6
	2. Pneumonia	22	6.44	11,942	n.a.	1
	3. Prematurity	13	3.80	4,786	n.a	2
	4. ARI	10	2.93	730		9
	5. Congenital Anomalies	10	2.93	1,705	n.a.	5
	6. Septicemia	6	1.76	2,212	n.a	4
	7. Heart Diseases	3	0.88	773	n.a.	8
	8. Vascular Diseases	3	0.88	-	-	-
	9. Diarrhea	2	0.59	2,430	n.a	3
	10. Meningitis	2	0.59	-	-	-

Water-related diseases in the ten leading causes of morbidity include skin diseases, intestinal parasitism and diarrhea. Diarrhea ranked 4th for infant mortality.

3.5.2 Water Related Diseases

An indicator of health problems related to water supply and sanitation is the incidence of water-related diseases. The World Health Organization (WHO) has classified diseases related to water into four (4) categories: 1) water-borne diseases e.g., cholera, typhoid, hepatitis A, diarrhea and dysentery; 2) water-based diseases e.g., schistosomiasis; 3) water-washed diseases e.g., diarrhea, intestinal parasitism, scabies, conjunctivitis (sore eyes), and skin diseases; and 4) water-vector related diseases i.e., malaria, filariasis and dengue or H-fever, although the control of malaria, dengue fever and filariasis is beyond the scope of this Master Plan. A safe water supply, sanitary latrine and proper hygiene practices are conditions necessary for the control and prevention of these diseases.

Water-related diseases reported in the province were typhoid/paratyphoid, viral hepatitis, diarrhea, dysentery, intestinal parasitism, scabies, conjunctivities, skin diseases, malaria and dengue fever. Table 3.5.2 presents the reported cases and deaths of notifiable water-related diseases in the province.

Table 3.5.2 Reported Cases and Deaths of Notifiable Water Related Diseases

Rate: 1/100,000

Diseases	Morbidity		Mortality		Infant Mortality	
	Number	Rate	Number	Rate	Number	Rate
Water-borne						
1. Typhoid/Parathyphoid	130	38.03	1	0.29	-	-
2. Viral Hepatitis	207	60.55	4	1.17	-	-
3. Diarrhea	4,234	1,238.57	9	2.63	2	0.59
4. Dysentery	259	75.76	-	-	-	-
Water-washed						
1. Intestinal Parasitism	4,424	1,294.15	-	-	-	-
2. Scabies	1,678	490.86	-	-	-	-
3. Conjunctivities	792	231.68	-	-	-	-
4. Skin Diseases	5,139	1,503.30	-	-	-	-
Water vector						
1. Malaria	672	196.58	1	0.29	-	-
2. Dengue Fever	4	1.17	-	-	-	-

3.5.3 Health Facilities and Practitioners

Present facilities servicing the health care of the population are 5 hospitals, 15 rural health units and 96 barangay health stations. The ratio of the population to these facilities and to the medical practitioners are higher than the national average figures (refer to Table 3.5.1, Supporting Report and Table 3.5.2, Data Report).

3.6 Environmental Conditions

3.6.1 General

Environmental issues and problems directly affecting the sector and/or how the sector affects these environmental concerns are dealt with in this sub-section. Specifically, the problems of water pollution and solid waste disposal spawned by rapid population growth and increasing industrial and economic activities are discussed. These problems put a strain on the provincial water resources and hinder their optimum utilization.

3.6.2 Water Pollution

There is no existing sanitary sewerage system in the province. Majority of the drainage facilities in all municipalities are open canals or ditches. The rivers and streams function as the drainage system. These rivers receive the domestic wastewater and storm water collected by the segmented drainage facilities in urban centers or poblacions.

A major water pollution source in urban areas is domestic wastewater. Graywater generated by households is simply allowed to discharge into nearby channels. Effluent from septic tanks/cesspool is also flowing into the streams. Other major pollutants are wastes from backyard piggery raising and dumped refuse that finds its way to the river systems during rain or is thrown indiscriminately into the rivers. In rural areas, natural assimilation may be expected to purify organic substances. However, pollution or contamination is anticipated caused by agricultural activities especially with reference to fertilizers and pesticides.

The province has no major pollution related industries. Only small-scale and cottage industries exist. Hence, the waterbodies are not yet polluted/contaminated by industrial pollutants. As of now, the rivers in the province have not been classified as to their usage by the Department of Environment and Natural Resources (refer to general information in Table 3.6.1 DENR Water Quality Criteria/Water Usage and Classification, Supporting Report).

3.6.3 Solid Waste Disposal

Of the 15 municipalities, almost half (8) have no municipal refuse collection and disposal service. The 7 municipalities with service have 1 to 2 units of open dump truck. In the province, only 11% of the households is served, while 89% is unserved. Table 3.6.1 reflects

the breakdown of the manner of solid waste collection and disposal, and service coverage by municipality (details are referred to Table 3.6.1, Data Report).

Open dumping is commonly practiced by the LGUs as a disposal of solid wastes. The dumped refuse is usually burned or left unattended. Some significant negative effects associated with this unsanitary method are surface and groundwater pollution, air pollution, scattered solid waste, breeding grounds for insects, rodents and other disease vectors and fire hazard. At the household level, unserved households by the LGUs primarily depend on individual disposal such as dumping in vacant lots or body of water, burying and composting.

Table 3.6.1 Municipal Solid Waste Collection and Disposal, and Service Coverage, 1995

Municipality	Numbers of Households 1995	With Service						Without Service				Percentage of Households Served	Percentage of Households Unserved
		Number of Collection Trucks			Disposal			Manner of Disposal (Number of Household)					
		Open Dump Trucks	Closed Type Trucks	Total Units	Number of Households Served by Open Dump Site	Number of Households Served by Sanitary Landfill	Total Households Served	Dumping (Land and Water)	Burying	Composting	Total Households Unserved		
Alfonso Castañeda	822	0	0	0	0	0	0	97	139	586	822	0	100
Ambaguio	1,773	0	0	0	0	0	0	243	0	1,530	1,773	0	100
Aritao	5,451	2	0	2	490	0	490	45	2,938	1,978	4,961	9	91
Bagabag	5,615	1	0	1	115	0	115	480	1,857	3,163	5,500	2	98
Bambang	7,567	1	1	2	823	0	823	975	1,442	4,327	6,744	11	89
Bayombong	9,033	1	1	2	1,126	0	1,126	1,190	2,015	4,702	7,907	12	88
Diadi	2,510	0	0	0	0	0	0	361	513	1,636	2,510	0	100
Dupax del Norte	4,558	1	0	1	247	0	247	227	423	3,661	4,311	5	95
Dupax del Sur	2,574	1	0	1	452	0	452	297	313	1,511	2,121	18	82
Kasibu	4,956	0	0	0	0	0	0	669	357	3,930	4,956	0	100
Kayapa	3,896	0	0	0	0	0	0	407	347	3,143	3,897	0	100
Quezon	2,699	0	0	0	0	0	0	222	557	1,920	2,699	0	100
Santa Fe	2,400	0	0	0	0	0	0	360	593	1,447	2,400	0	100
Solano	9,779	1	1	2	4,035	0	4,035	1,230	1,211	3,303	5,744	41	59
Villaverde	2,858	0	0	0	0	0	0	368	896	1,594	2,858	0	100
Provincial Total	66,491	8	3	11	7,288	0	7,288	7,171	13,601	38,431	59,203	11	89

Chapter 4

EXISTING FACILITIES AND SERVICE COVERAGE

4. EXISTING FACILITIES AND SERVICE COVERAGE

4.1 Water Supply

4.1.1 General

Existing water supply facilities and conditions were surveyed by municipality under the category of urban and rural areas (as of July, 1995). Facilities are classified into three service levels, of which Level I facilities are further classified into safe and unsafe for drinking purpose.

The percentages of service coverage by different service levels were estimated covering urban and rural areas by municipality. The served population is defined as "population served adequately with access to safe water sources/facilities." The rest of the population with unsafe sources/facilities and without access to water supply facilities was then defined as "underserved population" and "unserved population," respectively. The service coverage was figured out using estimated population in 1995.

Service profile and operating conditions of existing facilities are summarized by service level to come up with problem areas and the need of rehabilitation to reflect in the development plan.

As a provincial total, approximately 64% of the present population (of which 42% in urban area and 58% in rural area) is considered as adequately served (refer to detailed study in Supporting Report). Under the area classification, 86% of urban population and 55% of rural population have access to safe water sources/facilities, while the rest is underserved and/or unserved. About 76,400 persons or 81% of the served population depend on Level I facilities, while 17,500 persons or 19% are served by Level III and/or Level II systems. Lower service coverage in rural area is caused by the existence of many unsafe shallow wells and/or no provision of facilities.

4.1.2 Types of Facilities and Definition of Service Level Standard

(1) Composition of water supply system/facility

The NSMP defines service level and system components of the water supply systems/facilities as shown in Table 4.1.1.

Table 4.1.1 Composition of Water Supply System/Facility by Service Level

Description	Level I (Point Source Facility)	Level II (Communal Faucet System)	Level III (Individual House Connection)
1. Water Source	Drilled/driven shallow well Drilled/driven deep well Dug well Spring Rain collector	Drilled shallow/deep well Spring Infiltration gallery	Drilled deep well Spring Infiltration gallery Surface water intake
2. Water Treatment	Generally none. Disinfection of wells is conducted periodically by local health authorities. Iron removal facilities are provided in problem areas.	Generally none. Disinfection facility is sometimes provided.	Disinfection is provided. Systems with a surface water source have a series of water treatment facilities.
3. Distribution	None	Piped system provided with reservoir/s.	Piped system provided with reservoir/s and pumping facilities.
4. Delivery & Service Level	At point (within 250 m radius)	Communal faucet (within 25 m radius)	Individual house connection/ household tap
5. Consumption Rate (adequately served)	at least 20 lpcd	at least 60 lpcd	at least 100 lpcd

(2) Safe and unsafe classification of water sources

DOH has classified Level I water source facilities as safe (reliable water source) and unsafe sources/facilities under the drinking water quality standard.

Safe source: Protected deep well, protected shallow well, improved/covered dug well and developed spring

Unsafe source: Unprotected deep well, unprotected shallow well, open dug well, undeveloped/unprotected spring and rain collector

Water sources other than the above, such as untreated surface water of rivers, lakes and ponds are among unsafe sources. Level II and III water supply systems are, on the other hand, regarded to have safe/reliable sources in a provision of adequate treatment.

(3) Service level standard

The NSMP defines "adequate service level" by different water supply system. Improvement in the number of households per system may be expected for Level I services in the future. On the contrary, the number of households served by a unit of private/public source is sometimes beyond the standard on a current basis.

Level III: 1 household/connection

Level II: 5 (4 to 6) households/communal faucet

Level I: 15 households/point source

1 household/private well

4.1.3 Level III Systems

Level III (individual house connection) systems at municipal level are usually established and operated by WD under technical and financial assistance of LWUA. Some LGUs also implement and operate Level III systems commonly at barangay level.

There are 3 Level III systems in the province operated under different kinds of ownership (authority or association) as shown in Table 4.1.2 together with their service coverage in 1995. These are:

- Provincial waterworks catering municipalities of Bayombong and Solano;
- Municipal waterworks for 4 urban barangays in municipality of Bagabag;
- Arwasa, Inc., a private enterprise being operated by the Pastoral Council at Aritao municipality covering 1 urban and 2 rural barangays.

Table 4.1.2 Information on Existing Level III Systems

Municipality	Name of System (Operating Body)	Water Source and Consumption			Service Coverage						
		Type of Water Source[1]	Water Consumption (cu. m/day)	Domestic Supply (%)	Number of Barangays Served			Number of Hhs/Pop. Served			
					Urban	Rural	Total	Hhs Pop.	Urban	Rural	Total
Aritao	Arwasa, Inc.	SP	233*	100	1	2	3	Hhs	271	118	389
								Pop.	1,626	708	2,334
Bagabag	Bagabag Water System	DW	204*	100	4	0	4	Hhs	361	0	361
								Pop.	2,035	0	2,035
Bayombong	Prov. Water System	SP	1,356	95.65	7	3	10	Hhs	574	247	821
								Pop.	6,599	2,268	8,867
Solano			811	95.56	6	0	6	Hhs	489	0	489
								Pop.	4,970	0	4,970
Provincial Total			2,167	95.62	12	5	17	Hhs	1,698	365	2,063
								Pop.	15,230	2,976	18,206

Note: 1. Type of Water Source: *DW* - Deep Well, *Surf.* - Surface Water (River), *SP* - Spring, *IG* - Infiltration Gallery.
2. * - Estimated at 100 lpcd.

The Provincial Water System is the largest system in the province that covers two (2) municipalities in provision of one spring source (Borobbob Spring). Bagabag Water System utilizes a deep well as water source (details are referred to in Table 4.1.1, Supporting Report).

4.1.4 Level II Systems

Level II (communal faucet) systems are designed to cater for barangay level water supply with a limited service coverage and supply capacity. These systems have been implemented by different agencies (DPWH, LWUA, DILG, DENR, LGUs) encouraging the use of spring sources and are operated by LGUs, RWSAs or NGOs.

There are 93 Level II systems and all of these are utilizing spring sources. The municipality of Kayapa has the largest number, 22 systems or 24% of the total as shown in Table 4.1.3 together with service coverage in 1995 (details are referred to in Table 4.1.2, Supporting Report). Some of these systems have encountered supply interruption caused by burst of PVC pipes due to inappropriate pipe installation and high water pressure. Inadequate supply quantity is also experienced during dry season.

There are also 6 non-functioning Level II systems and all of them rely on deep wells.

Problem areas identified on existing Level II systems and necessary countermeasures for the improvement are discussed both in managerial and technical aspects.

(1) Management practice

Although most of the Level II systems are presently operational to some extent of current management practices, prevailing practice of flat rate water bill at the minimum level will lead to any one of them to become non-operational sooner or later. This is because financial saving to cope with future repair and depreciation of existing facilities are not duly considered under the current management practice, while the cost recovery by operating bodies is a prerequisite in the sector management.

To attain financial and managerial sustainability, reinforcement of the RWSA or other operating body shall be promoted with reference to the institutional development.

(2) Technical skill for O&M of facilities

Utilization of spring source usually tends to less attention to daily O&M practice in appreciation of gravity flow of water to service area. However, inappropriate care of spring box and pipeline leads to various problems, e.g. turbid water, less water flow by clogging at spring box and pipeline, etc. Physical damage may also happen to transmission line exposed on the ground in the mountainous area due to land slide, etc. associated with heavy rainfall, when proper protection of pipeline is not taken up.

Expansion of distribution line and installation of additional public faucets are usually undertaken without appropriate technical study on the capacities of water sources and distribution facilities, resulting to decrease of supply pressure and quantity.

To attain technical sustainability of existing facilities, an appropriate technical guidance and skills training for operating bodies shall be arranged by concerned agencies/LGUs.

Table 4.1.3 Information on Existing Level II Systems

Municipality	Name of System (Operating Body)	Type and No. of Water Source[1]		Number of Barangay Served			Number of Household Served			Number of Population Served		
				Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Alfonso Castañeda	Olong-Olong W.S.S	SP	1	0	1	1	0	100	100	0	600	600
	Piculiat - Amot W.S.S	SP	1	0	1	1	0	200	200	0	1,200	1,200
	Sitio Marikit W.S.S	SP	1	0	1	1	0	15	15	0	90	90
Municipal Total			3	0	3	3	0	315	315	0	1,890	1,890
Ambaguio	Naduntog W.S	SP	1	0	1	1	0	118	118	0	603	603
Antao	Anayo W.S.S	SP	1	0	1	1	0	28	28	0	166	166
	Boyot Cueva Cili W.S.S	SP	1	0	1	1	0	28	28	0	143	143
	Calitlitan W.S.S	SP	1	0	1	1	0	30	30	0	300	300
	Darapidap W.S.S	SP	1	0	1	1	0	60	60	0	300	300
	Kalipkip W.S.S	SP	1	0	1	1	0	40	40	0	240	240
	Lactawan W.S.S	SP	1	0	1	1	0	30	30	0	148	148
	Lobo-Kirang W.S.S	SP	1	0	1	1	0	50	50	0	300	300
	Lukib W.S.S	SP	1	0	1	1	0	22	22	0	121	121
	Mansoyosoy W.S.S	SP	1	0	1	1	0	22	22	0	126	126
	Ocao-Capinaan W.S.S	SP	1	0	1	1	0	26	26	0	138	138
	Tucanon W.S.S	SP	1	0	1	1	0	98	98	0	519	519
	Yaway W.S.S	SP	1	0	1	1	0	22	22	0	132	132
Municipal Total			12	0	12	12	0	574	574	0	3,236	3,236
Bagabag	Murong W.S.S	SP	1	0	1	1	0	79	79	0	474	474
	Sta.Cruz W.S.S	SP	1	0	1	1	0	88	88	0	480	480
Municipal Total			2	0	2	2	0	167	167	0	954	954
Bambang	Bansing Water System	SP	1	0	1	1	0	81	81	0	476	476
	Manamtam W.S	SP	1	0	1	1	0	69	69	0	348	348
	Pallas Tribal Council W.S.S	SP	1	0	1	1	0	27	27	0	115	115
	Sto. Domingo W.S.S	SP	1	0	1	1	0	57	57	0	319	319
Municipal Total			4	0	4	4	0	234	234	0	1,258	1,258
Diadi	Duruarog W.S	SP	1	0	1	1	0	30	30	0	150	150
	Rosario W.S	SP	1	0	1	1	0	0	0	0	0	0
	San Luis W.S	SP	1	0	1	1	0	30	30	0	150	150
	Villa Aurora W.S	SP	1	0	1	1	0	20	20	0	150	150
Municipal Total			4	0	4	4	0	80	80	0	450	450
Dupax del Norte	Malasin W.S.S	SP	1	1	0	1	250	0	250	1,250	0	1,250
	Belance W.W.S	SP	1	0	1	1	0	140	140	0	900	900
	Bitnong W.S	SP	1	0	1	1	0	15	15	0	77	77
	Brgy. Oyao W.S	SP	1	0	1	1	0	9	9	0	45	45
	Inaban W.S	SP	1	0	1	1	0	12	12	0	68	68
	Lamo W.S	SP	1	0	1	1	0	68	68	0	196	196

Table 4.1.3 Information on Existing Level II Systems (Cont'd.)

Municipality	Name of System (Operating Body)	Type and No. of Water Source[1]		Number of Barangay Served			Number of Household Served			Number of Population Served		
				Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Dupax del Norte	Mabasa W.S	SP	1	0	1	1	0	32	32	0	130	130
	Macabenga W.S	SP	1	0	1	1	0	40	40	0	100	100
	Mayputo W.W.S	SP	1	0	1	1	0	32	32	0	125	125
	Munguia	SP	1	0	1	1	0	59	59	0	319	319
	Parasi W.S	SP	1	0	1	1	0	86	86	0	437	437
	Pudi W.S.S	SP	1	0	1	1	0	30	30	0	120	120
	Takbaw W.S	SP	1	0	1	1	0	51	51	0	229	229
	Tigep W.S	SP	1	0	1	1	0	27	27	0	50	50
	Yabbi W.S	SP	1	0	1	1	0	50	50	0	200	200
Municipal Total			15	1	14	15	250	651	901	1,250	2,996	4,246
Dupax del Sur	Biruk	SP	1	0	1	1	0	29	29	0	56	56
	Gabut R.W.S.S	SP	1	0	1	1	0	64	64	0	384	384
	Ganao W.S	SP	1	0	1	1	0	27	27	0	145	145
	Kinabuan W.S	SP	1	0	1	1	0	80	80	0	320	320
	Macatbeng W.S	SP	1	0	1	1	0	20	20	0	80	80
	Palabotan W.S	SP	1	0	1	1	0	106	106	0	422	422
Municipal Total			6	0	6	6	0	326	326	0	1,407	1,407
Kasibu	Dine W.S	SP	1	0	1	1	0	30	30	0	120	120
	Muta Tribal Council W.S	SP	1	0	1	1	0	60	60	0	317	317
	Poblacion Water System	SP	1	0	1	1	0	106	106	0	573	573
	Siguem Tribal Council W.S	SP	1	0	1	1	0	49	49	0	247	247
	Watwat Tribal Council	SP	1	0	1	1	0	24	24	0	120	120
Municipal Total			5	0	5	5	0	269	269	0	1,377	1,377
Kayapa	Ambalata W.S.S	SP	1	0	1	1	0	39	39	0	215	215
	Babadi W.S.S	SP	1	0	1	1	0	30	30	0	162	162
	Balwang Resettlement Area W.S.S	SP	1	0	1	1	0	30	30	0	162	162
	Butilao W.S.S	SP	1	1	0	1	30	0	30	162	0	162
	Capulang W.S.S	SP	1	0	1	1	0	36	36	0	209	209
	Caritas Village W.S	SP	1	0	1	1	0	32	32	0	156	156
	Liten W.S.S	SP	1	0	1	1	0	35	35	0	200	200
	Lower Tubong W.S	SP	1	0	1	1	0	60	60	0	342	342
	Mapayao W.S.S	SP	1	0	1	1	0	80	80	0	424	424
	Nanciakan W.S.S	SP	1	0	1	1	0	47	47	0	250	250
	Nayao W.S.S	SP	1	0	1	1	0	59	59	0	331	331
	Oliweg W.S.S	SP	1	0	1	1	0	14	14	0	73	73
	Padang W.S.S	SP	1	0	1	1	0	28	28	0	157	157
	Pampang W.S	SP	1	1	0	1	95	0	95	505	0	505

Table 4.1.3 Information on Existing Level II Systems (Cont'd.)

Municipality	Name of System (Operating Body)	Type and No. of Water Source[1]		Number of Barangay Served			Number of Household Served			Number of Population Served		
				Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Kayapa	Patkiaw W.S.S	SP	1	0	1	1	0	40	40	0	232	232
	Salicpan W.S.S	SP	1	0	1	1	0	62	62	0	360	360
	San Fabian W.S.S	SP	1	0	1	1	0	94	94	0	564	564
	Sayuding W.S.S	SP	1	0	1	1	0	20	20	0	108	108
	Tahhte W.S.S	SP	1	0	1	1	0	10	10	0	53	53
	Talecabcab W.S.S	SP	1	0	1	1	0	30	30	0	177	177
	Tuppan W.S.S	SP	1	0	1	1	0	45	45	0	266	266
	Tuyongan W.S.S	SP	1	0	1	1	0	25	25	0	145	145
Municipal Total			22	2	20	22	125	816	941	667	4,586	5,253
Quezon	Totong W.S	SP	1	0	1	1	0	23	23	0	92	92
Santa Fe	Baliling W.S.S	SP	1	0	1	1	0	200	200	0	1,120	1,120
	Bantinan W.S	SP	1	0	1	1	0	17	17	0	96	96
	Bayabas W.S.S	SP	1	0	1	1	0	17	17	0	97	97
	Bollong W.S.S	SP	1	0	1	1	0	123	123	0	689	689
	Butao W.S.S	SP	1	0	1	1	0	43	43	0	241	241
	Mag-asawang Kahoy W.S.S	SP	1	0	1	1	0	29	29	0	151	151
	Mangcate Tribal Council	SP	1	0	1	1	0	15	15	0	105	105
	Mangga W.S.S	SP	1	0	1	1	0	18	18	0	107	107
	Melina W.S.S	SP	1	0	1	1	0	72	72	0	360	360
	Pacalbo W.S.S	SP	1	0	1	1	0	15	15	0	81	81
	Perez Park W.S.S	SP	1	0	1	1	0	23	23	0	138	138
	Pulao W.S.S	SP	1	0	1	1	0	10	10	0	56	56
	Salacsac W.S.S	SP	1	0	1	1	0	20	20	0	106	106
	Tactac W.S.S	SP	1	0	1	1	0	14	14	0	73	73
	VillaFlores W.S	SP	1	0	1	1	0	32	32	0	107	107
Municipal Total			15	0	16	16	0	671	671	0	3,619	3,619
Solano	Dadap W.S.S	SP	1	0	1	1	0	98	98	0	558	558
Villaverde	Brgy. Cabuluan W.S.S	SP	1	0	1	1	0	25	25	0	133	133
	Ocapon W.S.S	SP	1	0	1	1	0	20	20	0	106	106
Municipal Total			2	0	2	2	0	45	45	0	239	239
Provincial Total			93	3	91	94	375	4,387	4,762	1,917	23,265	25,182

Note: 1. Type and No. of Water Source: DW - Deep Well

4.1.5 Level I Facilities

Level I facilities (point source) are common in rural barangays, majority of which are owned privately. Major facilities are different types of wells equipped with handpumps or developed spring with transmission line and one communal faucet. A rain collector is also used in some areas.

Level I facilities are classified in terms of safe and unsafe sources referring to the water quality examination results conducted by PHO as presented in Table 4.1.4 (details are referred to in Supporting Report). Served population in 1995 is also estimated as shown in the same table.

Of the operational Level I facilities (total of 16,859 facilities), more than 88% is shallow wells. According to the PHO water quality analysis results, about 17% of Level I facilities is determined to be unsafe as the provincial average of random samples. All deep wells were regarded as safe water sources. In application of the unsafe percentage to shallow wells for each municipality, 13,447 Level I facilities are classified as safe sources, while 3,412 facilities are under unsafe sources.

Problem areas observed on Level I facilities and necessary countermeasures for the improvement are summarized in terms of potable condition and functioning.

(1) Unsafe water sources

Most of the cases declared as unsafe sources are driven shallow wells which are unprotected against seepage of surface water and usually located nearby potential pollution sources, such as septic tank and piggery. (The Code on Sanitation of DOH requires a minimum 25 m distance between water source and pollution sources.)

These shallow wells shall be provided with concrete apron on the ground surface and proper drainage facility at the surrounding area. Relocation of wells or pollution sources may be another countermeasure. For new construction of shallow wells, proper site selection and appropriate construction method shall be applied together with periodic monitoring of water quality.

(2) Non-functioning/abandoned wells

There are a lot of non-functioning public wells in the province as shown in Table 4.1.5.

Table 4.1.4 Information on Existing Level I Facilities

Municipality	Number of Safe Water Sources					Number of Unsafe Water Sources					Served by Safe Sources					
											Number of Households			Number of Population		
	Deep Wells	Shallow Wells	Covered/ Improved Dug Wells	Developed Springs	Total	Shallow Wells	Open Dug Wells	Rain Collectors	Undeveloped Spring	Total	Urban	Rural	Total	Urban	Rural	Total
Alfonso Castañeda	10	9	0	9	28	2	0	0	0	2	0	112	112	0	593	593
Ambaguio	0	0	0	30	30	0	7	13	0	20	0	128	128	0	717	717
Aritao	92	384	0	12	488	78	74	0	0	152	1,514	1,338	2,852	7,872	6,959	14,831
Bagabag	206	858	0	5	1,069	175	5	0	3	183	2,078	2,046	4,124	11,015	10,433	21,448
Bambang	170	1,462	0	6	1,638	299	16	0	0	315	2,187	3,603	5,790	10,934	18,375	29,309
Bayombong	28	3,795	0	16	3,839	778	17	0	0	795	2,705	3,049	5,754	15,143	13,413	28,556
Diadi	73	87	0	16	176	19	23	0	16	58	324	1,127	1,451	1,718	5,858	7,576
Dupax del Norte	22	322	0	23	367	66	176	0	14	256	706	864	1,570	3,596	4,406	8,002
Dupax del Sur	26	91	0	19	136	19	0	40	0	59	537	404	941	2,897	2,177	5,074
Kasibu	32	451	0	58	541	92	55	143	1	291	0	656	656	0	3,414	3,414
Kayapa	2	3	0	61	66	1	0	0	0	1	0	865	865	0	4,667	4,667
Quezon	118	288	0	15	421	58	268	0	10	336	0	985	985	0	5,024	5,024
Santa Fe	3	7	0	31	41	3	3	0	0	6	182	207	389	1,040	1,072	2,112
Solano	20	3,583	0	9	3,612	733	4	0	0	737	3,720	3,269	6,989	18,598	16,343	34,941
Villaverde	4	980	0	11	995	200	0	0	1	201	646	1,537	2,183	3,556	8,143	11,699
Provincial Total	806	12,320	0	321	13,447	2,523	648	196	45	3,412	14,599	20,190	34,789	76,369	101,594	177,963

Table 4.1.5 Operating Status of Existing Wells in the Province

Operating Status	Unit	Public Facility		Private Facility		Total
		Deep Well	Shallow Well	Deep Well	Shallow Well	
Functioning	No.	218	287	588	14,556	15,649
	Percent	43	68	93	99	96
Non-Functioning	No.	294	137	43	94	568
	Percent	57	32	7	1	4
Total Number		512	424	631	14,650	16,217

Note: Number of non-functioning wells includes abandoned wells, but details in number and reasons are not available.

Among others, deep wells usually necessitate repair/replacement of mechanical parts and redevelopment of the well itself. Aside from the same problems as deep wells, shallow wells have principal disadvantages in use of shallow aquifer easily affected by surrounding environmental conditions and caused by a simple construction method (driving well point) making it difficult to rehabilitate.

To prolong the service life of public deep wells, periodic check-up entailing preventive maintenance and redevelopment of wells are to be performed. Meanwhile, a proper site selection and protection of well sources are requisites for shallow wells.

4.1.6 Water Supply Service Coverage

According to the definition of DOH in terms of safe and unsafe sources, service coverage was studied under "served", "underserved" and "unserved" categories.

The present population of the municipalities as of 1995, base year for planning purpose, was estimated using 1990 population census data and annual growth rate between 1980 and 1990 census period. However, population distribution in 1990 by urban and rural barangay prepared by NSO was adjusted to meet actual conditions in the classification of barangays. Details are referred to section 8.3 1 Population Projection.

Water supply service coverage by service level is estimated for urban and rural areas covering all municipalities under the following conditions and assumptions:

- Service percentage/population by Level III and Level II systems was estimated based on the questionnaire survey results.
- Unserved population was estimated using the percentages of unserved households to the total number of households by urban and rural area based on the 1990 population census data; "Households by Main Source of Drinking Water and City/Municipality."

- The rest of the population was considered to be served by Level I facilities assuming that 50% of private facilities was shared by neighbors to supplement insufficiency of public facilities.

Average number of households sharing at each Level I public/private facility was calculated with a range of 2 to 18 households/facility under the above assumptions (details are referred to in Supporting Report).

Table 4.1.6 presents the profile of the service coverage in terms of served, underserved and unserved. As a provincial total, 65% of the population is adequately served (85% of urban population and 55% of rural population). The lower percentage of service coverage in the rural area is affected by a huge number of unsafe shallow/open dug wells and rain collectors (214 public and 1,773 private wells used by about 30,250 persons) and/or no provision of facilities. Among the unserved population, considerable number of population depending on non-reported undeveloped spring sources would be included. The provincial service coverage at present is exhibited in Figures 4.1.1 and 4.1.2 (details are referred to Supporting Report).

Among different service levels, Level I facilities have a dominant role in service coverage over 11 municipalities out of 15 municipalities in the province. As a whole, 52% of the total population (70% of urban population and 44% of rural population) relies on Level I facilities.

Contribution of Level III systems to the service coverage is minimal in every operating municipality. Only 5% of the total population (14% of urban population and 1% of rural population) avails Level III service.

Level II systems take major part of drinking water supply in limited municipalities:

- urban area of Kayapa (90%),
- rural area of Alfonso Castaneda (44%), and
- rural area of Santa Fe (31%).

As a provincial total, about 7% is served by Level II systems (2% of urban population and 10% of rural population).

In view of municipal service coverage, Bayombong is the highest at 84% (88% of urban population and 80% of rural population), while Ambaguio consisting of 8 rural barangays is the

Table 4.1.6 Water Supply Service Coverage by Municipality

Municipality	Type	Population (1995)	Population Coverage							Percentage of Population Coverage						
			Served by Safe Source				Underserved/Unserved			Served by Safe Source				Underserved/Unserved		
			Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total	Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total
Alfonso Castañeda	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	4,344	0	1,890	593	2,483	38	1,823	1,861	0	44	14	57	1	41	43
	Total	4,344	0	1,890	593	2,483	38	1,823	1,861	0	44	14	57	1	41	43
Ambaguio	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	9,923	0	603	717	1,320	313	8,290	8,603	0	6	7	13	3	84	87
	Total	9,923	0	603	717	1,320	313	8,290	8,603	0	6	7	13	3	84	87
Aritao	Urban	11,204	1,626	0	7,872	9,498	1,655	51	1,706	15	0	70	85	15	0	15
	Rural	16,964	708	2,633	6,959	10,300	3,355	3,309	6,664	4	16	41	61	19	20	39
	Total	28,168	2,334	2,633	14,831	19,798	5,010	3,360	8,370	8	9	53	70	18	12	30
Bagabag	Urban	14,942	2,035	0	11,015	13,050	1,873	19	1,892	14	0	74	87	12	0	13
	Rural	14,310	0	954	10,433	11,387	1,840	1,083	2,923	0	7	73	80	12	8	20
	Total	29,252	2,035	954	21,448	24,437	3,713	1,102	4,815	7	3	73	84	13	4	16
Bambang	Urban	13,190	0	0	10,934	10,934	2,222	34	2,256	0	0	83	83	17	0	17
	Rural	24,974	0	1,258	18,375	19,633	3,267	2,074	5,341	0	5	74	79	13	8	21
	Total	38,164	0	1,258	29,309	30,567	5,489	2,108	7,597	0	3	77	80	14	6	20
Bayombong	Urban	25,140	6,599	275	15,143	22,017	3,099	24	3,123	26	1	60	88	13	0	12
	Rural	19,643	2,268	0	13,413	15,681	2,814	1,148	3,962	12	0	68	80	14	6	20
	Total	44,783	8,867	275	28,556	37,698	5,913	1,172	7,085	20	1	64	84	12	3	16
Diadi	Urban	1,931	0	0	1,718	1,718	170	43	213	0	0	89	89	9	2	11
	Rural	11,107	0	450	5,858	6,308	2,368	2,431	4,799	0	4	53	57	21	22	43
	Total	13,038	0	450	7,576	8,026	2,538	2,474	5,012	0	3	58	62	20	19	38
Dupax del Norte	Urban	6,084	0	1,250	3,596	4,846	1,140	98	1,238	0	21	59	80	18	2	20
	Rural	17,316	0	2,996	4,406	7,402	3,722	6,192	9,914	0	17	25	43	21	37	57
	Total	23,400	0	4,246	8,002	12,248	4,862	6,290	11,152	0	18	34	52	21	27	48

Table 4.1.6 Water Supply Service Coverage by Municipality (Cont'd.)

Municipality	Type	Population (1995)	Population Coverage							Percentage of Population Coverage						
			Served by Safe Source				Underserved/Unserved			Served by Safe Source				Underserved/Unserved		
			Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total	Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total
Dupax del Sur	Urban	3,423	0	0	2,897	2,897	429	97	526	0	0	85	85	12	3	15
	Rural	10,505	0	1,407	2,177	3,584	963	5,958	6,921	0	13	21	34	9	57	66
	Total	13,928	0	1,407	5,074	6,481	1,392	6,055	7,447	0	10	36	47	10	44	53
Kasibu	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	25,581	0	1,377	3,414	4,791	1,785	19,005	20,790	0	5	13	19	7	75	81
	Total	25,581	0	1,377	3,414	4,791	1,785	19,005	20,790	0	5	13	19	7	75	81
Kayapa	Urban	744	0	667	0	667	0	77	77	0	90	0	90	0	10	10
	Rural	20,119	0	4,586	4,667	9,253	80	10,786	10,866	0	23	23	46	0	54	54
	Total	20,863	0	5,253	4,667	9,920	80	10,863	10,943	0	25	22	48	0	53	52
Quezon	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	13,681	0	92	5,024	5,116	4,724	3,841	8,565	0	1	37	37	34	28	63
	Total	13,681	0	92	5,024	5,116	4,724	3,841	8,565	0	1	37	37	34	28	63
Santa Fe	Urban	1,366	0	0	1,040	1,040	224	102	326	0	0	76	76	17	7	24
	Rural	11,216	0	3,527	1,072	4,599	78	6,539	6,617	0	31	10	41	1	58	59
	Total	12,582	0	3,527	2,112	5,639	302	6,641	6,943	0	28	17	45	2	53	55
Solano	Urban	27,494	4,970	100	18,598	23,668	3,810	16	3,826	18	0	68	86	14	0	14
	Rural	21,282	0	558	16,343	16,901	3,310	1,071	4,381	0	3	77	79	15	5	21
	Total	48,776	4,970	658	34,941	40,569	7,120	1,087	8,207	10	1	72	83	15	2	17
Villaverde	Urban	4,300	0	0	3,556	3,556	725	19	744	0	0	83	83	17	0	17
	Rural	11,064	0	239	8,143	8,382	1,593	1,089	2,682	0	2	74	76	14	10	24
	Total	15,364	0	239	11,699	11,938	2,318	1,108	3,426	0	2	76	78	15	7	22
Provincial Total	Urban	109,818	15,230	2,292	76,369	93,891	15,347	580	15,927	14	2	70	85	13	1	15
	Rural	232,029	2,976	22,570	101,594	127,140	30,250	74,639	104,889	1	10	44	55	13	32	45
	Total	341,847	18,206	24,862	177,963	221,031	45,597	75,219	120,816	5	7	52	65	13	22	35

Figure 4.1.1 Water Supply Coverage by Municipality

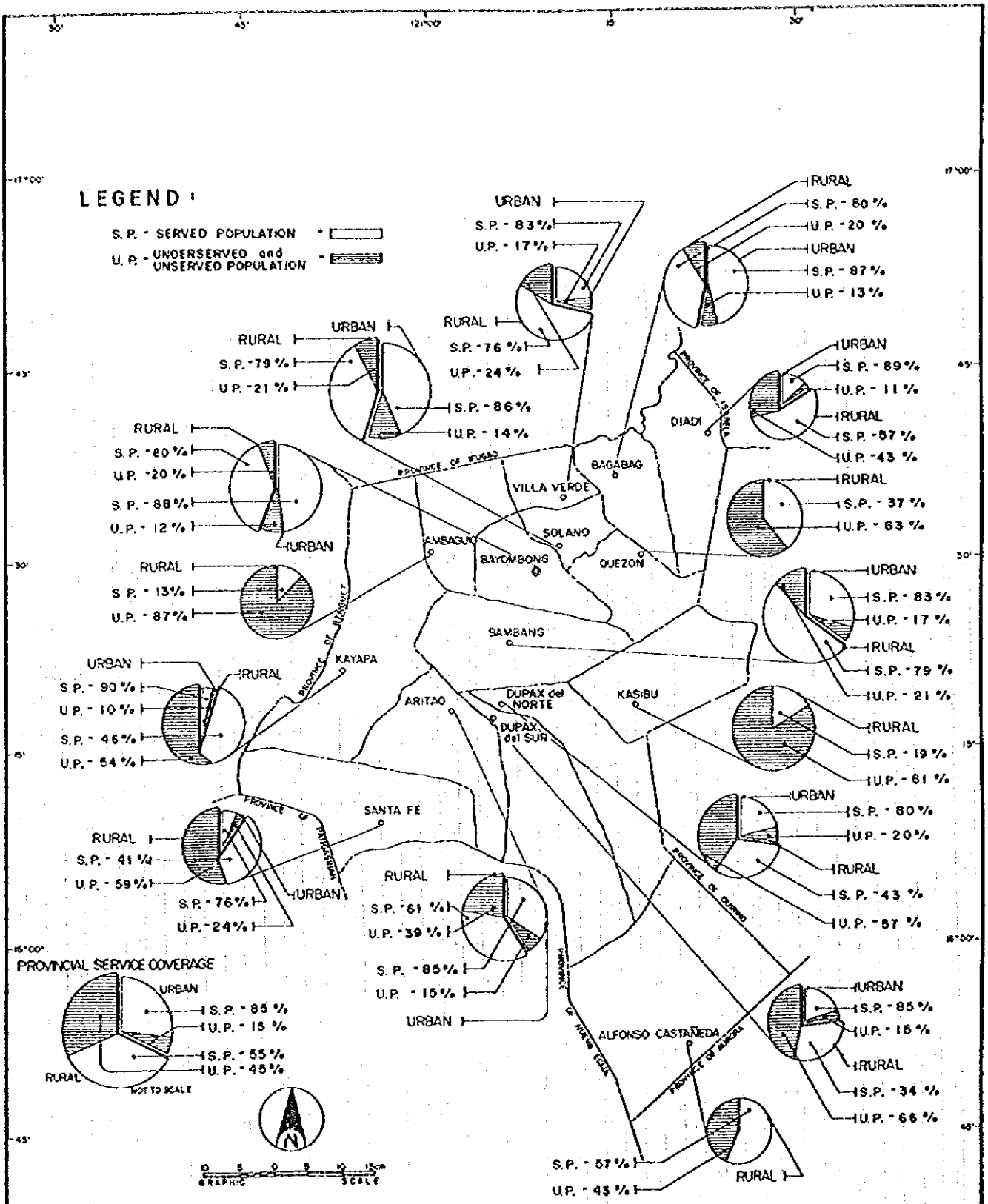


FIGURE 4.1.2
EXISTING WATER SUPPLY SERVICE COVERAGE MAP

lowest at 13%. The unserved population (84% or about 8,290 persons) of Ambaguio is most likely caused by the presence of non-reported Level I facilities such as undeveloped spring.

Municipalities having higher service coverage than the provincial average of 65% are:

- Bayombong (84%)
- Bagabag (84%)
- Solano (83%)
- Bambang (80%)
- Villaverde (78%)
- Aritao (70%)

4.2 Sanitation and Sewerage

4.2.1 General

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

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

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

4.2.2 Types of Facilities and Definition of Service Level Standard

For this Master Plan, the types of household toilet facilities commonly used are categorized into: 1) sanitary toilets - approved types of toilet facilities include water-sealed pour flush or flush-type toilets either with receiving space/pit or septic tanks/vaults, and ventilated

improved pit latrines and sanitary privy considering its low construction cost especially in rural areas; and 2) unsanitary facilities - these include the types of facilities used for receiving and disposing human waste which do not fall under the category of approved types of toilet facilities such as open pit privy and over-hung latrines (refer to Figure 4.2.1 DOH standard structure of a household toilet that meets the minimum requirements of a sanitary facility, Supporting Report).

In terms of service level, households are classified into: 1) served households - households with at least one (1) sanitary toilet; 2) underserved households - households with unsanitary toilets; and 3) unserved households - households without toilet. Coverage of adequately served households (with sanitary toilets) was estimated by urban and rural area of municipalities. The remaining households were considered as underserved and/or unserved. The service coverage was determined using the estimated number of households in 1995.

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

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

4.2.3 Sanitation Facilities and Service Coverage

(1) Household Toilets

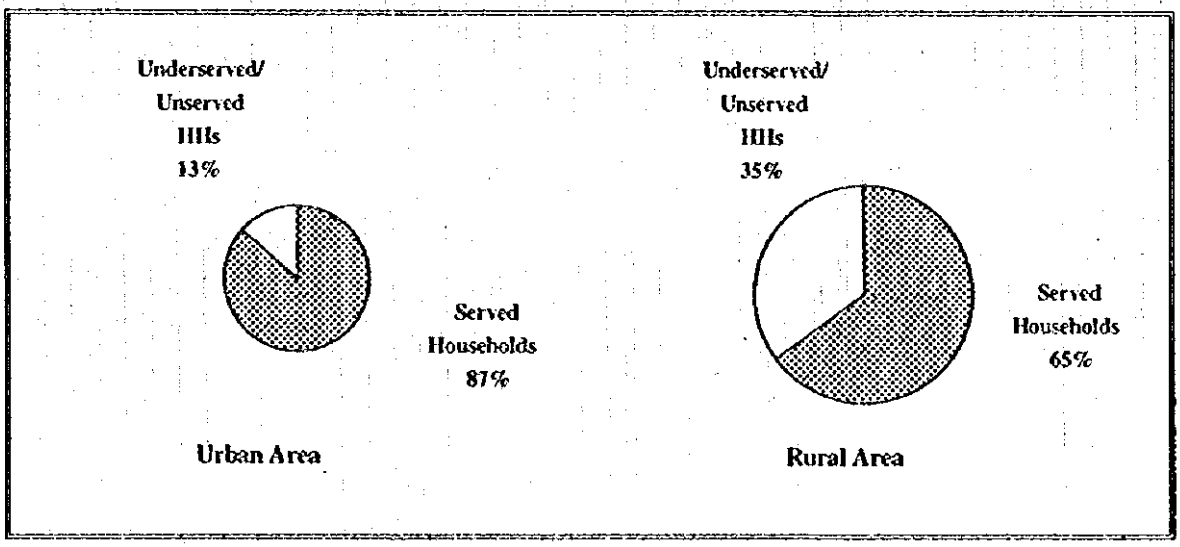
The service coverage of sanitary toilets in the province is 72% of the total number of households. The rest is underserved and/or unserved. Of this, almost 57% is without toilet facilities (refer to Table 4.2.1, Supporting Report and 4.2.3 Sanitation Facilities and Service Coverage, Data Report).

In urban areas, approximately 87% of the total households is served. A much lower served households of 65% exists in rural area. Table 4.2.1 shows the municipal breakdown in the number of urban and rural household toilets by category, and service coverage. Figures 4.2.1 and 4.2.2 reflect the provincial service coverage of household toilet facilities for urban and rural areas.

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

Municipality	Households 1995			Household Toilet Facilities and Service Coverage											
				Urban				Rural				Municipal Total			
	Urban	Rural	Total	Households Served by Sanitary Toilets		Underserved/ Unserved HHs		Households Served by Sanitary Toilets		Underserved/ Unserved HHs		Households Served by Sanitary Toilets		Underserved/ Unserved HHs	
				Number	% of HH	Number	% of HH	Number	% of HH	Number	% of HH	Number	% of HH	Number	% of HH
Alfonso Castañeda	0	822	822	0	0	0	0	478	58	344	42	478	58	344	42
Ambaguio	0	1,773	1,773	0	0	0	0	705	40	1,068	60	705	40	1,068	60
Aritao	2,164	3,287	5,451	1,728	80	436	20	2,215	67	1,092	33	3,943	72	1,508	28
Bagabag	2,799	2,816	5,615	2,571	92	228	8	2,156	77	660	23	4,727	84	888	16
Bambang	2,623	4,944	7,567	2,187	83	436	17	3,726	75	1,218	25	5,913	78	1,654	22
Bayombong	4,522	4,511	9,033	3,989	88	533	12	2,695	60	1,816	40	6,684	74	2,349	26
Diadi	366	2,144	2,510	241	66	125	34	1,150	54	994	46	1,391	55	1,119	45
Dupax del Norte	1,184	3,374	4,558	1,097	93	87	7	2,960	88	414	12	4,057	89	501	11
Dupax del Sur	632	1,942	2,574	628	99	4	1	887	46	1,054	54	1,515	59	1,058	41
Kasibu	0	4,956	4,956	0	0	0	0	2,767	56	2,189	44	2,767	56	2,189	44
Kayapa	139	3,757	3,896	139	100	0	0	1,701	45	2,053	55	1,843	47	2,053	53
Quezon	0	2,699	2,699	0	0	0	0	1,975	73	724	27	1,975	73	724	27
Santa Fe	239	2,161	2,400	188	79	51	21	1,078	50	1,083	50	1,266	53	1,134	47
Solano	5,539	4,240	9,779	4,842	87	697	13	3,767	89	473	11	8,609	88	1,170	12
Villaverde	778	2,080	2,858	675	87	103	13	1,433	69	647	31	2,108	74	750	26
Provincial Total	20,985	45,506	66,491	18,285	87	2,700	13	29,696	65	15,809	35	47,981	72	18,509	28

Figure 4.2.1 Provincial Service Coverage of Household Toilet Facilities, 1995



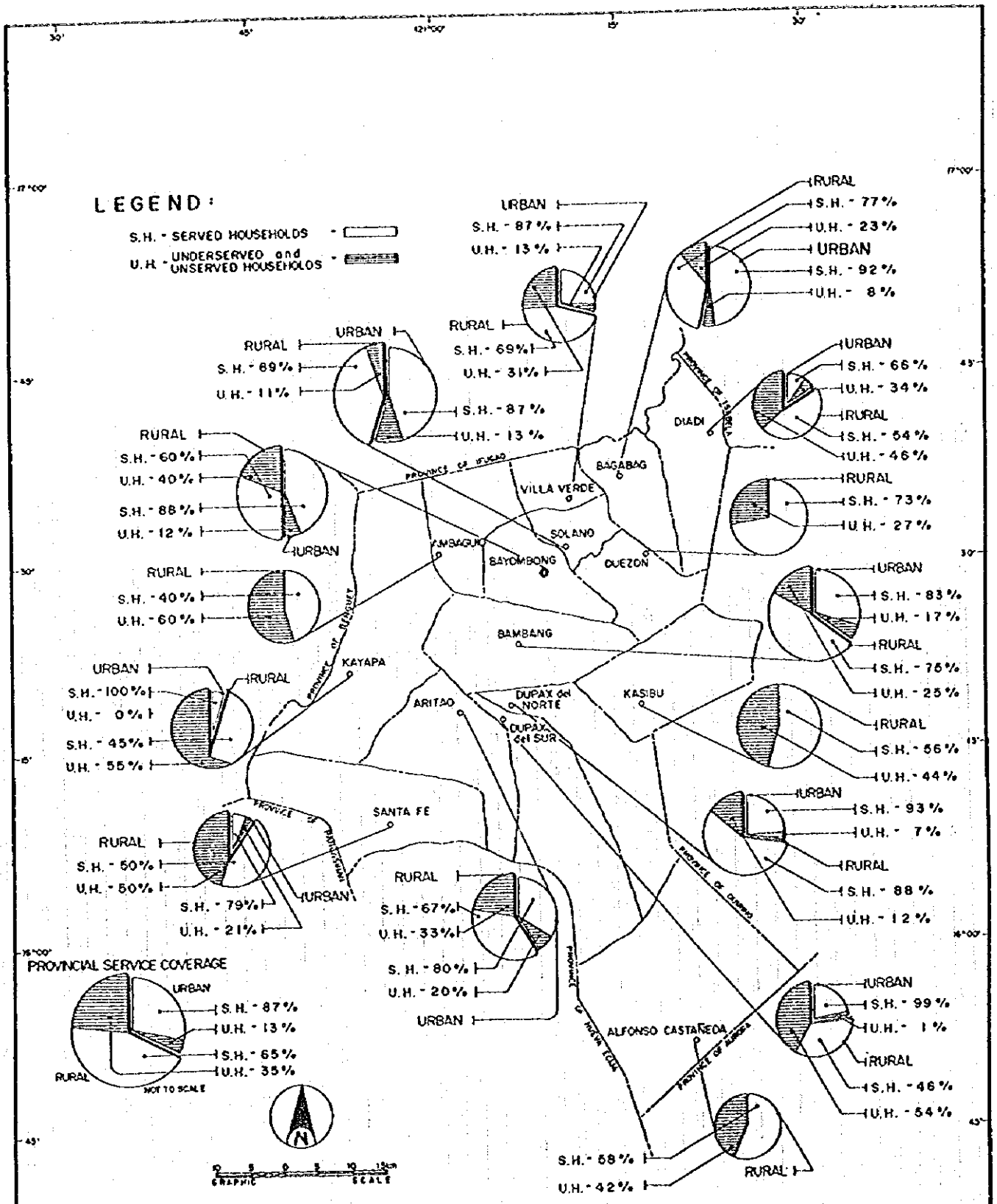


FIGURE 4.2.2
EXISTING HOUSEHOLD TOILETS SERVICE COVERAGE MAP

(2) School and Public Toilets

Toilet facilities in elementary and secondary schools for both public and private schools were investigated. The province has a total of 1,094 toilet units found in 329 schools. Only 53% of the students is adequately served by sanitary toilets. The rest, 47% is underserved and/or unserved.

There are 35 public markets, bus/jeepney/airport terminals and parks/playgrounds in the province. About 49% of these public utilities is served, while the rest, 51% is underserved and/or unserved. Table 4.2.2 and Table 4.2.3 provide the number and service coverage of toilet facilities of schools and public utilities, respectively.

(3) On-going Projects

A total of 870 toilet bowls through the FW4SP/GOP is being distributed to each of the equivalent number of households as follows:

Municipality	No. of HHs	Municipality	No. of HHs
A. Castañeda	20	Dupax del Sur	90
Ambaguio	63	Kasibu	157
Aritao	40	Kayapa	20
Bagabag	21	Quezon	40
Bambang	70	Santa Fe	49
Bayombong	110	Solano	20
Diadi	40	Villaverde	40
Dupax del Norte	90		

The recipient households are providing the superstructure and the depository of the sanitary toilet. With the distribution, the coverage of served households will increase from 72% to 73%.

(4) Problem Areas

Compared to the national service coverage of sanitary household toilets of 77%, the province showed a lower sanitation level.

The number of sanitary school toilets is slightly low to meet the service level standard of 50 students per sanitary facility. At present, the average ratio is 81 students per sanitary toilet. In some areas, this problem is compounded when access to the sanitary facility is limited to only the teachers.

Table 4.2.2 School Toilet Facilities and Service Coverage in 1995

Municipality	Number of Schools			Number of Students			Number of Toilet Units						Total Units	Service Coverage										
							Sanitary			Unsanitary				Served						Underserved/Unserved					
														Public		Private		Total		Public		Private		Total	
	Public	Private	Total	Public	Private	Total	Public	Private	Total	Public	Private	Total		Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Alfonso Castañeda	9	0	9	1,003	0	1,003	11	0	11	3	0	3	14	550	55	0	0	550	55	453	45	0	0	453	45
Ambaguio	9	0	9	994	0	994	0	0	0	0	20	20	20	0	0	0	0	0	0	994	100	0	0	994	100
Aritao	24	3	27	4,460	2,395	6,855	75	14	89	0	0	0	89	3,750	55	700	10	4,450	65	710	10	1,695	25	2,405	35
Bagabag	26	2	28	4,728	1,276	6,004	221	8	229	0	0	0	229	4,728	79	400	7	5,128	85	0	0	876	15	876	15
Bambang	27	1	28	8,625	1,733	10,358	124	18	142	12	0	12	154	6,200	60	900	9	7,100	69	2,425	23	833	8	3,258	31
Bayombong	21	1	22	8,970	1,081	10,051	79	22	101	2	0	2	103	3,950	39	1,081	11	5,031	50	5,020	50	0	0	5,020	50
Diadi	19	0	19	3,598	0	3,598	48	0	48	10	0	10	58	2,400	67	0	0	2,400	67	1,198	33	0	0	1,198	33
Dupax del Norte	20	0	20	4,899	0	4,899	28	0	28	14	0	14	42	1,400	29	0	0	1,400	29	3,499	71	0	0	3,499	71
Dupax del Sur	18	1	19	2,351	634	2,985	12	0	12	6	0	6	18	600	20	0	0	600	20	1,751	59	634	21	2,385	80
Kasibu	35	0	35	4,757	0	4,757	10	0	10	48	0	48	58	500	11	0	0	500	11	4,257	89	0	0	4,257	89
Kayapa	33	0	33	3,599	0	3,599	39	0	39	30	0	30	69	1,950	54	0	0	1,950	54	1,649	46	0	0	1,649	46
Quezon	17	0	17	2,868	0	2,868	50	0	50	6	0	6	56	2,500	87	0	0	2,500	87	368	13	0	0	368	13
Santa Fe	16	1	17	2,511	238	2,749	26	2	28	11	0	11	39	1,300	47	100	4	1,400	51	1,211	44	138	5	1,349	49
Solano	29	4	33	8,692	2,536	11,228	83	16	99	0	0	0	99	4,150	37	800	7	4,950	44	4,542	40	1,736	15	6,278	56
Villaverde	12	1	13	3,242	445	3,687	36	10	46	0	0	0	46	1,800	49	445	12	2,245	61	1,442	39	0	0	1,442	39
Provincial Total	315	14	329	65,297	10,338	75,635	842	90	932	142	20	162	1,094	35,778	47	4,426	6	40,204	53	29,519	39	5,912	8	35,431	47

Table 4.2.3 Public Toilet Facilities and Service Coverage in 1995

Municipality	Public Markets				Jeepney/Bus/Airport Terminals				Parks/Playgrounds				Total No. of Public Utilities	Served		Underserved/Unserved	
	Number	Number of Toilets			Number	Number of Toilets			Number	Number of Toilets				No. of Sanitary Toilets	%	No. of Unsanitary Toilets	%
		Sanitary	Unsanitary	No Facility		Sanitary	Unsanitary	No Facility		Sanitary	Unsanitary	No Facility					
Alfonso Castaneda	1	1	0	0	0	0	0	0	1	0	0	1	2	1	50	1	50
Ambaguio	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	100
Aritao	1	1	0	0	0	0	0	0	0	0	0	0	1	1	100	0	0
Bagabag	1	1	0	0	1	1	0	0	0	0	0	0	2	2	100	0	0
Bambang	2	1	0	1	0	0	0	0	1	0	0	1	3	1	33	2	67
Bayombong (Capital)	2	1	0	1	0	0	0	0	2	1	0	1	4	2	50	2	50
Diadi	1	1	0	0	0	0	0	0	0	0	0	0	1	1	100	0	0
Dupax del Norte	3	1	0	2	0	0	0	0	0	0	0	0	3	1	33	2	67
Dupax del Sur	1	1	0	0	0	0	0	0	1	0	0	1	2	1	50	1	50
Kasibu	1	1	0	0	0	0	0	0	0	0	0	0	1	1	100	0	0
Kayapa	4	1	2	1	0	0	0	0	1	0	1	0	5	1	20	4	80
Quezon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Fe	5	1	1	3	0	0	0	0	1	1	0	0	6	2	33	4	67
Solano	1	1	0	0	1	1	0	0	1	1	0	0	3	3	100	0	0
Villaverde	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	100
Provincial Total	25	12	3	10	2	2	0	0	8	3	1	4	35	17	49	18	51

Public toilets at markets, bus/jeepney terminals and parks/playgrounds, although culturally acceptable, are improperly used and maintained resulting in unsanitary conditions. In most cases, no specific arrangements are made for the operation and maintenance and for the collection of fees to cover such costs. Although it is considered as sanitary because of its structure, majority of these facilities have unsanitary conditions.

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

4.2.4 Sewerage Facilities

There are no existing sewerage facilities in the province. Most of the wastewater from the dwelling units with acceptable facilities finds its way to open drains and eventually to watercourses. These deficiencies are the major contributing factors to the poor condition of the water environment in some areas of the province.