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 - 6

MAIN REPORT

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

ILOCOS NORTE

FEBRUARY 1996

NIPPON JOGESUIDO SEKKEI CO., LTD.

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LAOAG CITY 2900

OFFICE OF THE GOVERNOR

Atty. Rodolfo C. Fariñas
GOVERNOR

MESSAGE

The Provincial Water Supply, Sewerage and Sanitation Sector Master Plan (PW4SP) is a document that will translate the policies, development goals and objectives of the Province of Ilocos Norte into a general water use plan indicating the medium (1996-2000) and long (2001-2010) - term water supply and sanitation needs of the province. This sector plan will provide the Provincial Government of Ilocos Norte the means to determine its development direction for its requirements and priorities, investment programs and details of operationalizations.

In this context, realization of this plan will answer the basic needs of our constituents for a potable water as embodied in our Provincial Master Plan: Strategies and Investment Program.

We convey our sincere thanks and gratitude to the Department of Interior and Local Government (DILG) and the Japan International Cooperation Agency (JICA) personnel/experts for assisting the Provincial Sector Planning Team (PSPT) of the province in the formulation of this vital document.

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

VOLUME II - 6 MAIN REPORT

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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 Ilocos Norte 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 Ilocos Norte

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), 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.

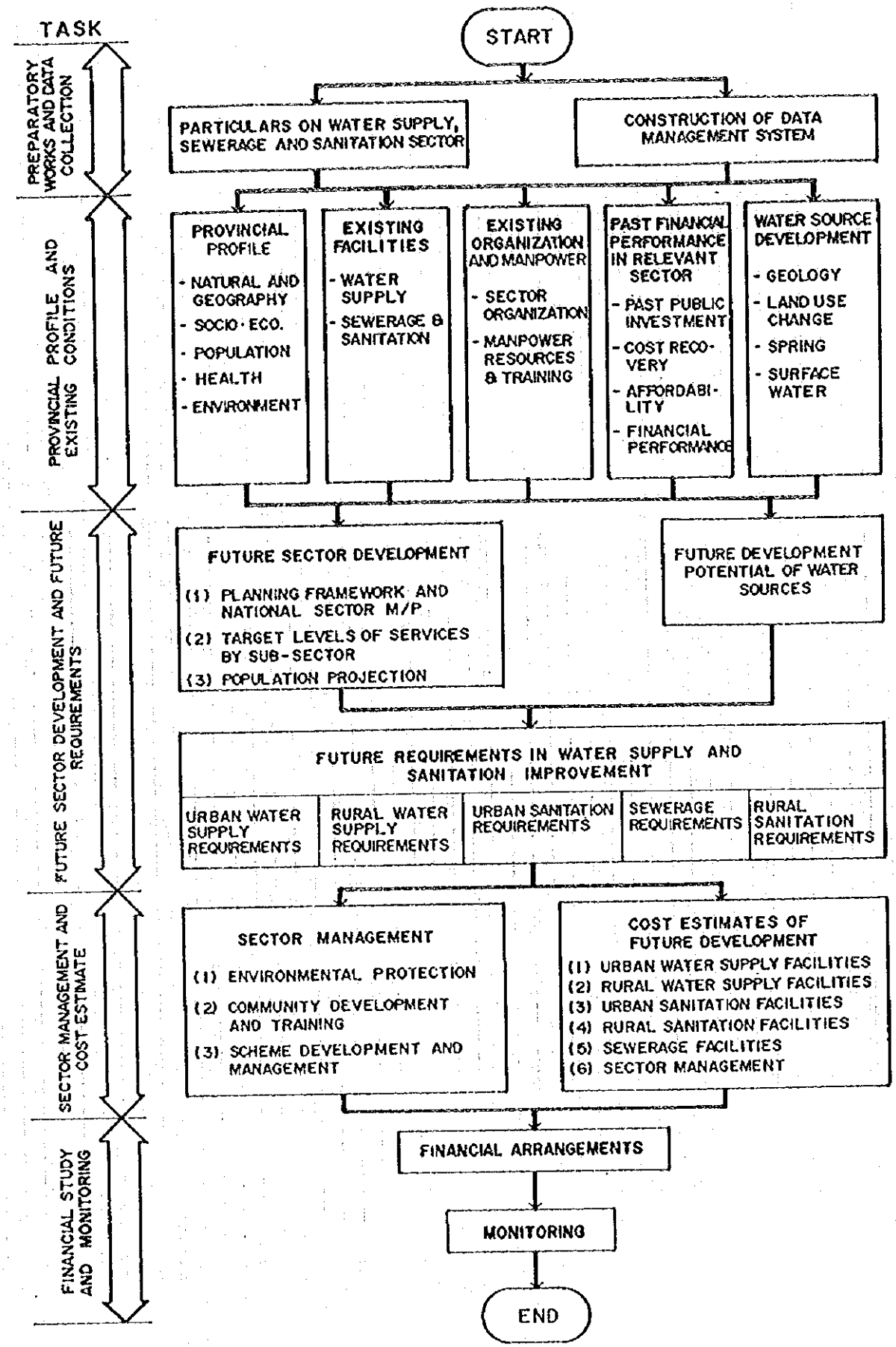
Chapter 4, 5, and 6 provide existing sector conditions in physical, managerial and financial aspects: existing water supply and sanitation facilities by service level and service coverage; sector institutions, community development, training and monitoring systems; and financial performances entailing 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

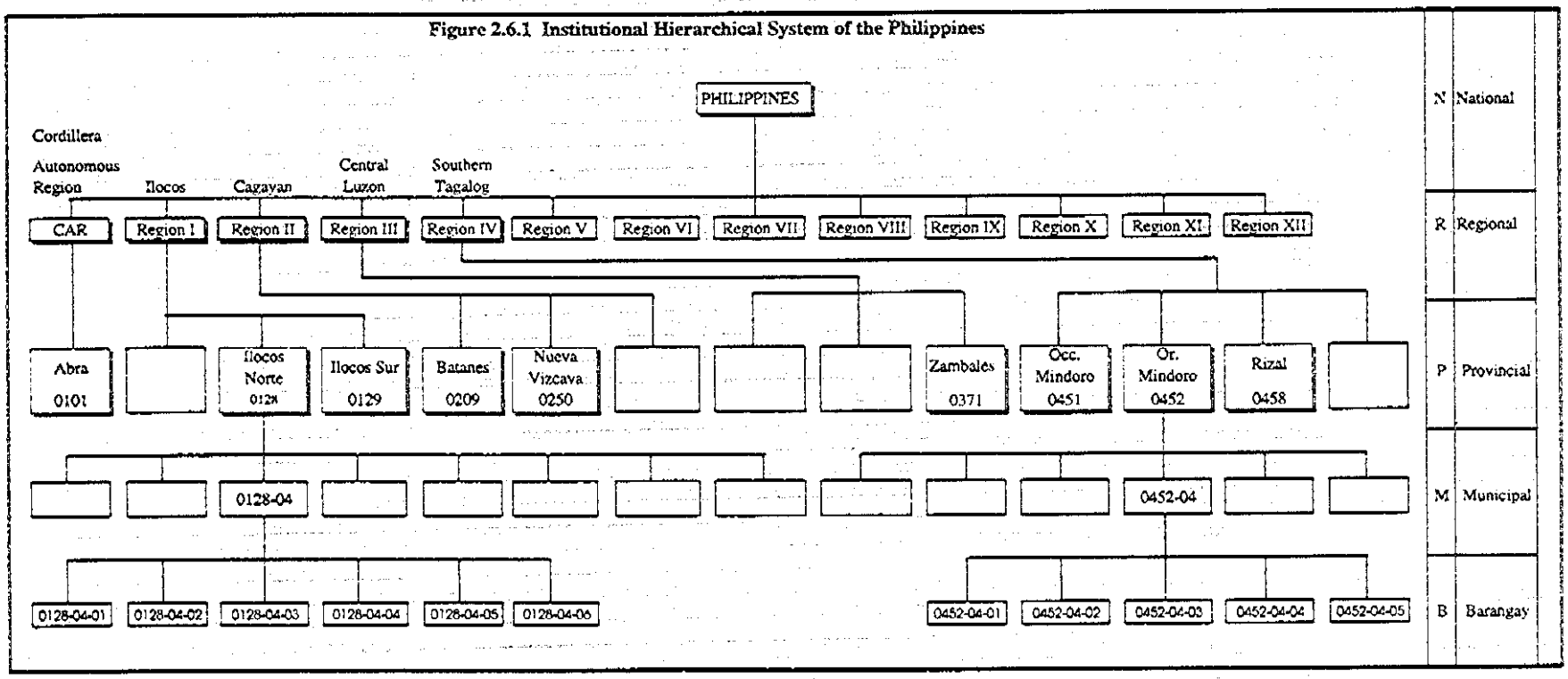


Figure 2.6.2 Structure of Questionnaire

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

Ilocos Norte province is located on the northwestern part of Luzon. Laoag City, the provincial capital, is approximately 487km from Metro Manila. It is bounded on the north by South China Sea/Babuyan Channel, on the east by the provinces of Cagayan and Kalinga-Apayao, on the south and southeast by Ilocos Sur and Abra, and on the west by Luzon Sea/South China Sea. Figure 3.1.1 presents the Location Map.

The province has a total land area of 3,399.34sq.km that is 1.13% of the Philippine total land area of about 300,000sq.km. It is composed of 22 municipalities and 1 city. There are 557 barangays, of which 131 are urban and 426 rural. Provincial total population was 461,661 in 1990. About 71% of the population resided in rural areas, while the remaining 29% in urban areas. At present, there are 5 water districts in the province. Table 3.1.1 presents the breakdown per municipality of the land area, population and its density, as well as administrative composition.

Table 3.1.1 Outline of City and Municipalities

Municipality		Land Area (sq.km)	1990 Population		Number of Barangay		
Code	Name		Number	Density (persons/sq.km)	Urban	Rural	Total
012801	Adams	117.20	1,119	10	1	0	1
012802	Bacarra	51.60	26,940	522	10	33	43
012803	Badoc	66.60	25,627	385	3	28	31
012804	Bangui	105.20	12,921	123	3	12	15
012805	Batac	152.10	43,092	283	14	29	43
012806	Burgos	200.80	7,643	38	1	10	11
012807	Carassi	121.90	632	5	1	2	3
012808	Currimao	20.80	9,467	455	2	21	23
012809	Dingras	100.20	30,519	305	6	26	32
012810	Dumalneg	60.90	828	14	1	0	1
012811	Espiritu	74.50	15,342	206	4	16	20
012812	Laoag City	107.50	83,756	779	30	50	80
012813	Marcos	79.40	12,990	164	2	10	12
012814	Nueva era	644.70	5,238	8	1	10	11
012815	Pagudpud	214.00	16,558	77	2	14	16
012816	Paoay	67.70	20,680	305	15	16	31
012817	Pasuquin	152.10	21,410	141	4	29	33
012818	Piddig	179.70	17,078	95	3	20	23
012819	Pinili	76.00	14,950	197	2	23	25
012820	San Nicolas	49.30	27,632	560	15	9	24
012821	Sarrat	80.70	21,272	264	4	20	24
012822	Solsona	163.50	18,883	115	2	20	22
012823	Vintar	512.90	27,084	53	5	28	33
Provincial Total		3,399.30	461,661	136	131	426	557

Note: Municipal Code corresponds to NEDA Geographic Coding System.

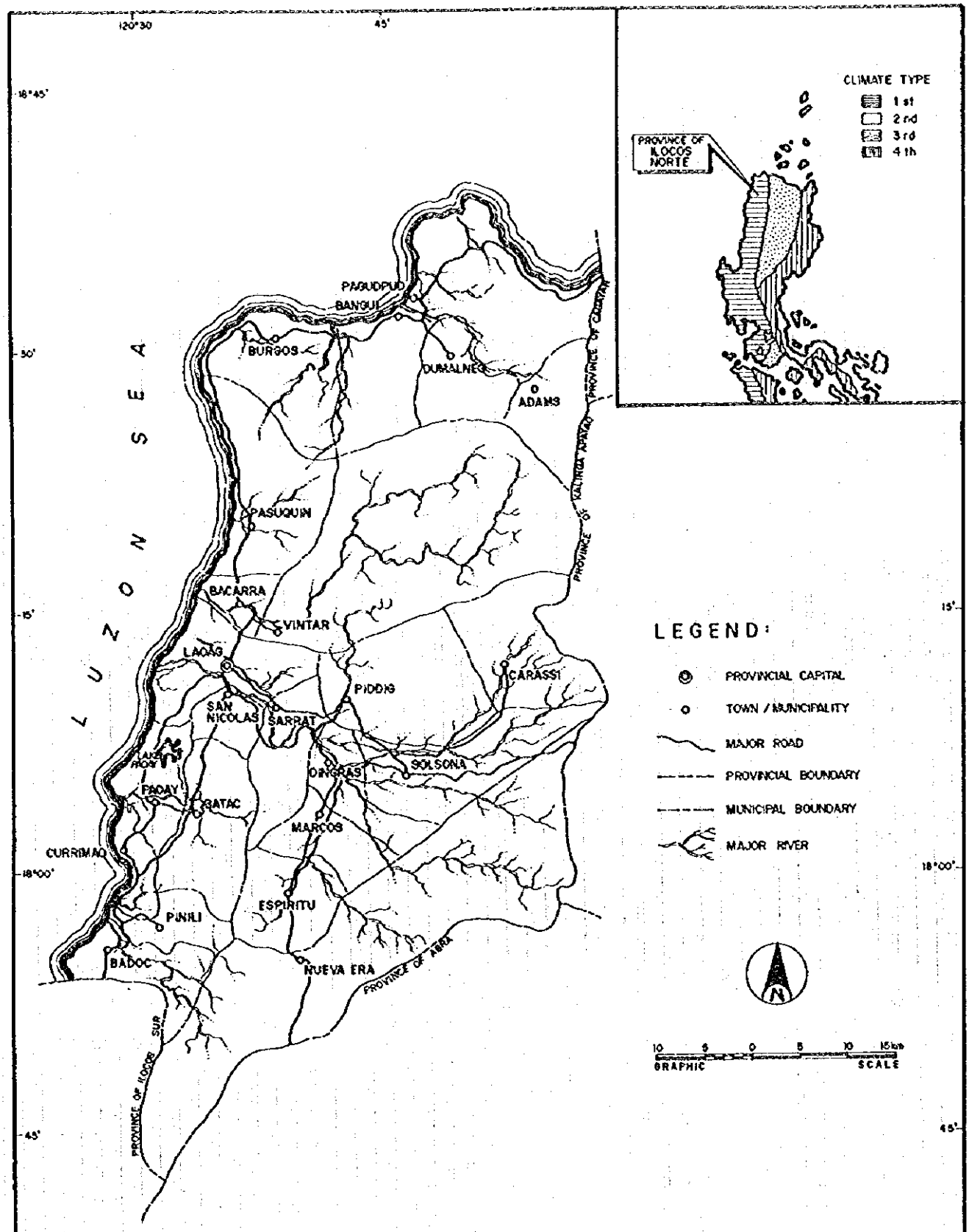


FIGURE 3.1.1

LOCATION MAP

PROVINCE OF ILOCOS NORTE

3.2 Natural Conditions and Geographical Features

3.2.1 Meteorology

The province has Type I climate under the Coronas classification and is characterized by very pronounced seasons that is usually dry from October to April and wet from May to September as reflected in Figure 3.1.1, Location Map. Using the 30-year (1961-1990) records of the meteorological station in Laoag City, the mean annual rainfall is registered at 2,080mm. Maximum rainfall is recorded during August, while the minimum is in February.

The mean annual temperature is 26.8°C with January as the coolest, while April and May as the hottest. The province lies between latitudes 18° and 19°, which is considered as less visited area by typhoon. Typhoons usually occur during southwest monsoon and is prevalent from May to October.

3.2.2 Land Use

Forest area constitutes only 28% of the total area of the province located mostly in the Cordillera ranges. Agricultural land comprises about 68%, while Built-up area is limited to a mere 0.61%. These settlements are often concentrated in the lowlands. Mangroves, Fishponds, Grassland, Wetland and Openland represent 4% 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	944.02	27.77
Agricultural	2,309.53	67.94
Built-up	20.76	0.61
Mangrove, Fishponds, In-land Water Areas,Grassland and Openlands	125.03	3.68
TOTAL	3,399.34	100.00

3.2.3 Topography and Drainage

General topography of the province is characterized by flat to mountainous area, with north-northeast trending mountain ranges, and coastal and alluvial plains. Its eastern segment forms part of the Luzon Central Cordillera and Ilocos ranges, while the western segment belongs to the Ilocos Coastal Plain that extends from Cape Borjeador on the north and to Lingayen Gulf on the south. About 60% of the total land area is rolling to steep, while the remaining is flat and undulating. Elevation ranges from near sea level to 1,850m above mean sea level. Mt. Nagdubaduhan in the municipality of Carasi is the highest mountain with a peak elevation of 1,850m. Other geomorphic features of interest are Lake Paoay and the high dunes along the west coast.

The province is principally drained by Laoag and Vintar rivers. Laoag river drains the south and southeast sections of the province and flows westerly into the Luzon Sea. The tributaries include Bonga, Boyog, Solsona, Cura and Ampagang rivers. Vintar river drains the northeast section and flows south-southwesterly into the Luzon Sea. Its major tributary is the Tamdagan river. Small river systems that complement these 2 major systems are the Bulu, Pasuquin, Pagudpud, Quiaoit, Badoc and Bamban rivers. Figure 3.2.1 shows the drainage systems of Ilocos Norte. 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:Laoag and Vintar rivers. The results of the analysis showed that both river waters were turbid with considerable amount of organic impurities, exceeding the maximum limit for Class "A" fresh surface water classification.

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	
Laoag River	01SW181203PW001	1,355	5.85	127.88	4,271.71	NONE
Bonga River	01SW80204PW002	534	0.512	11.04	506.69	NONE
Gasgas River (Solsona River)	01SW180205PW003	73	0.814	2.90	40.25	NONE

Source: Philippine Water Resources Summary Data Volume 1,2 (Department of Public Works and Highways, 1991) Ilocos Norte

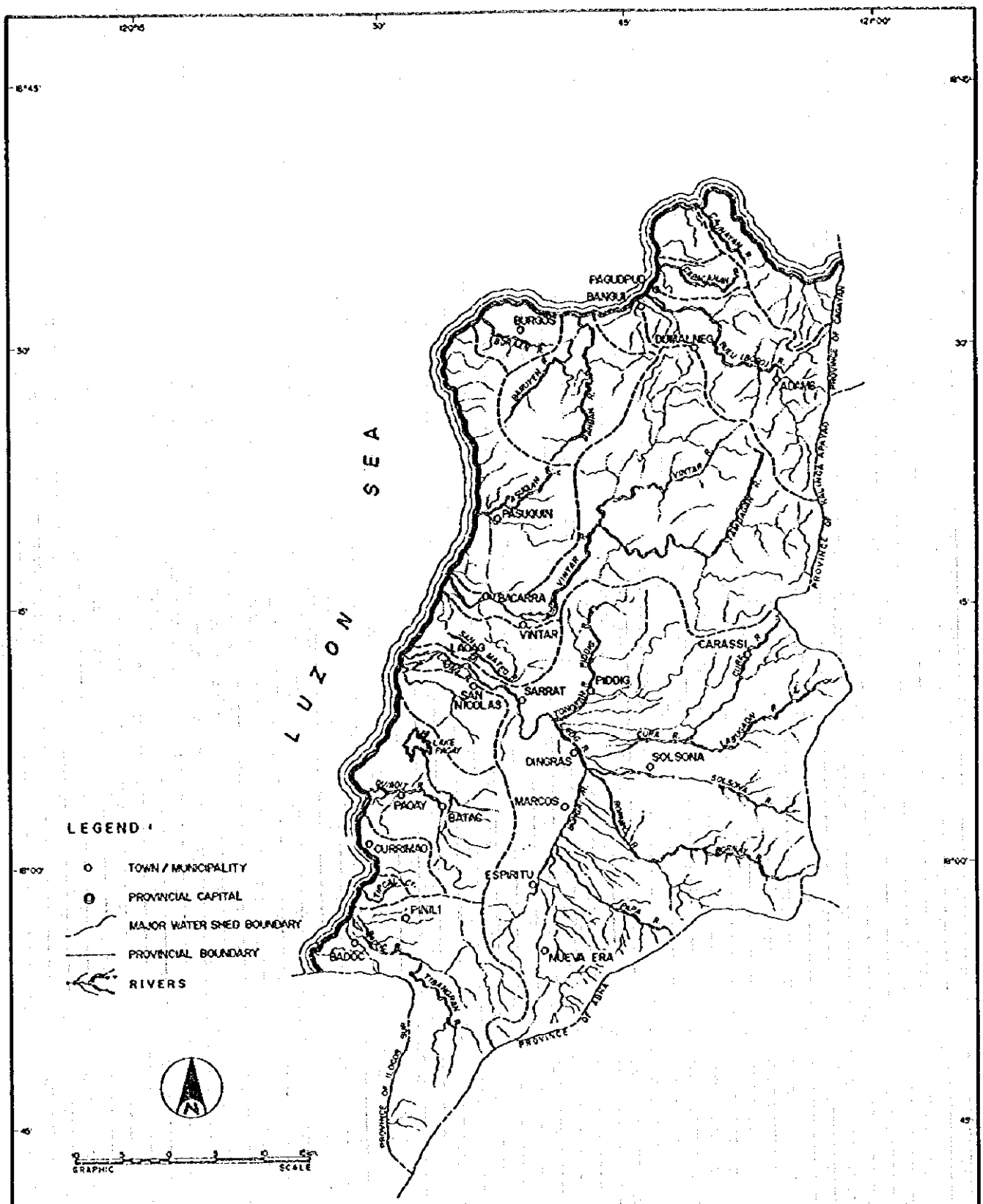


FIGURE 3.2.1
MAJOR RIVER NETWORKS
PROVINCE OF ILOCOS NORTE

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, vegetables, corn, garlic and tobacco. Other important activities are commerce and tourism. There are daily direct flights from Taiwan to Laoag International Airport that bring in tourists as well as businessmen. The greater bulk of commercial activities is seen in Laoag City.

The National Statistics Office (NSO) Family Income and Expenditures Survey in 1991 showed that the mean annual household income of the province was ₱ 58,330, while the median was at ₱ 36,683. 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 almost equal with that of the region. Based on the established poverty threshold income of ₱ 48,700 in Region I for 1991, approximately 62% 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 47%, followed by elementary occupations as indicated in Figure 3.3.2.

3.3.2 Basic Infrastructure

Electric supply and telecommunication service cover 100% and 98% of the municipalities, respectively. There are 31 post offices or stations in the province. Land transportation is available by means of jeepneys, minibuses and buses. The province has 1 international airport and 1 sea port. There are 2,406 business establishments and 9 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.

3.3.3 Education

The province has a total of 441 schools consisting of 362 elementary schools, 67 high schools, and 12 colleges/vocational institutions. The 1990 NSO census indicated that the province had a 95% 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

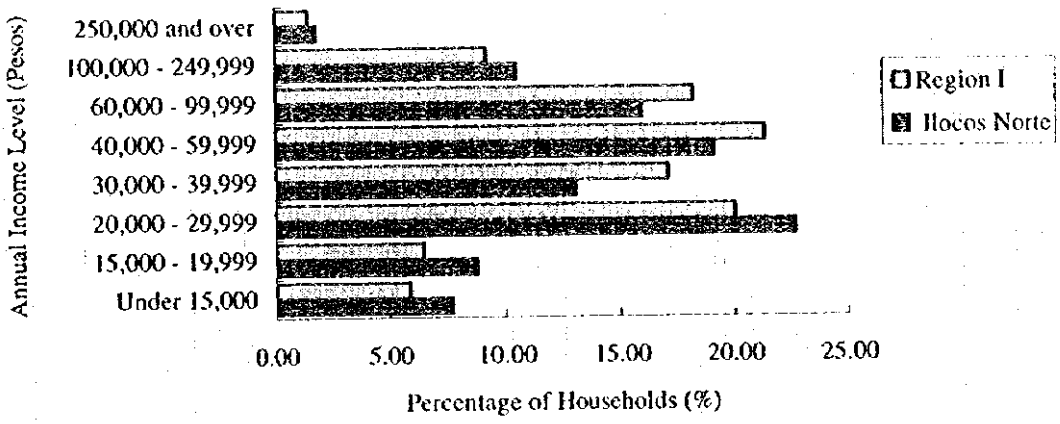


Figure 3.3.2 Population Distribution by Occupation

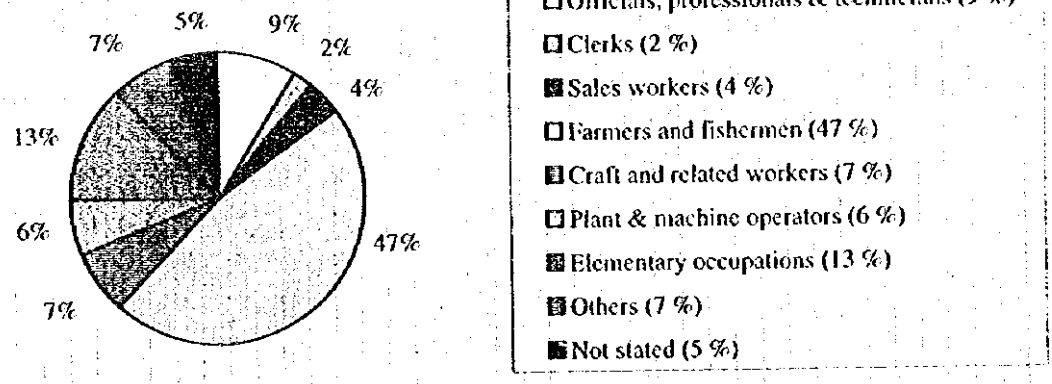


Figure 3.3.3 Population Distribution by Highest Attainment of Education

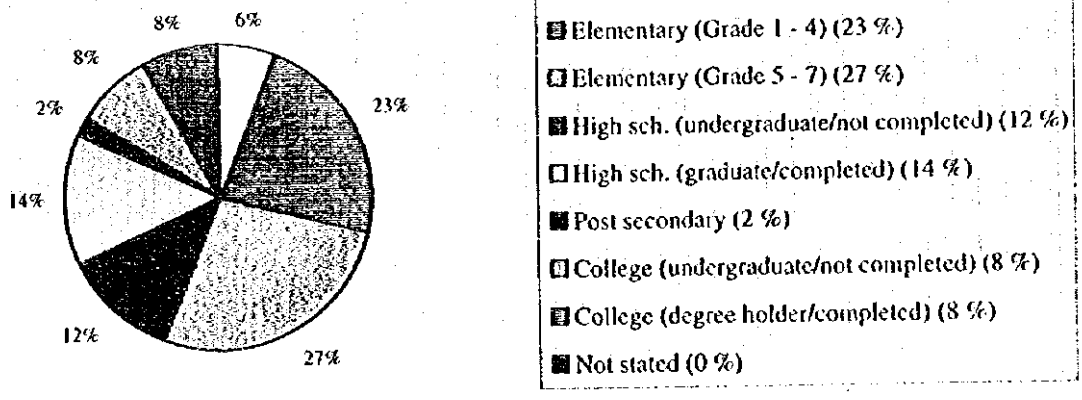


Table 3.3.1 Provincial Outline on Public Services

Items	Unit	Quantity	Items	Unit	Quantity
(1) Roads			(8) Tourism Facilities	Number	9
a) Total Length	km	3,575.40	(Hotel resort, lodges, recreational		
b) Barangay roads	Percent	58	facilities, etc.)		
(2) Electricity Service Coverage			(9) Schools		
a) Municipality	Percent	100	a) Elementary level	Number	362
b) Barangay	Percent	99.8	b) Secondary level	Number	67
c) Household	Percent	97.7	c) Tertiary level	Number	12
(3) Telecommunication Services			(10) Health Facilities		
a) Availability in municipality	Percent	98	a) Hospital/clinics	Number	15
b) Telegraph station	Number	5	b) Main health centers, rural health	Number	150
c) Telephone station	Number	2	units, barangay health center, etc.		
(4) Post Office	Number	31	(11) Labor		
			a) Labor force participation ratio	Percent	53.8
(5) Transportation Services	Mode	All modes	b) Employment rate	Percent	92.8
	(ex. Bus,	1 Int'l. Airport			
	jeep, taxi,)	1 Seaport	(12) Average Family Income		
			a) Monthly income	Pesos/Month	4,861
(6) Banking Facilities	Number	30	b) Monthly expenditure	Pesos/Month	3,753
a) Private bank	(by Private				
b) Public bank	and public)				
(7) Industrial/Business/Commercial					
Establishment	Number	2,406			

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.	Percent
Adams	1	0	1	0	0	1	0	-0.8
Bacarra	1	1	2	1	1	2	1	1.4
Badoc	2	3	5	2	0	1	1	1.4
Bangui	4	1	5	1	1	2	0	1.5
Batac	2	5	7	1	1	1	5	1.4
Burgos	1	0	1	0	0	1	0	2.7
Carassi	1	0	1	0	0	1	0	4.1
Currimao	2	0	2	1	0	1	1	1.9
Dingras	2	1	3	1	1	1	1	1.4
Dumalneg	1	0	1	0	0	1	0	3.2
Espiritu	3	1	4	0	0	1	0	1.8
Laoag City	5	5	10	5	6	2	15	1.9
Marcos	1	0	1	0	1	1	0	2.3
Nueva era	1	0	1	0	0	1	0	2.9
Pagudpud	3	1	4	0	1	1	0	1.9
Paoay	2	1	3	0	0	1	1	2.0
Pasuquin	1	2	3	0	0	1	2	1.9
Piddig	1	2	3	0	1	1	0	1.5
Pinili	1	1	2	0	0	2	0	1.0
San Nicolas	1	1	2	0	2	1	1	1.7
Sarrat	1	0	1	0	0	1	2	1.2
Solsona	1	1	2	0	0	1	0	2.5
Vintar	1	2	3	0	0	1	0	1.5
PROVINCIAL TOTAL	39	28	67	12	15	27	30	1.7

3.4 Population

3.4.1 Previous Population Development

A fluctuating provincial population growth rate had been experienced since the last six (6) census years (1948-1990) as indicated in Figure 3.4.1. From an average annual growth rate of 1.12% during the period 1948 to 1960, it decreased to 1.00% (1975-1980) and recovered to 1.68% (1980-1990). A summary of the average annual growth rates is as follows:

Year	Population	Ave. Annual Growth Rate (%)	Period
1960	287,333	1.12	1948 - 1960
1970	343,427	1.80	1960 - 1970
1975	371,724	1.60	1970 - 1975
1980	390,666	1.00	1975 - 1980
1990	461,661	1.68	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 present population (1995) 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 projected population.

Table 3.4.1 Previous Population Development by Municipality

Municipality	Previous Population						Est. Pop.
	1948	1960	1970	1975	1980	1990	1995
Adams	170	414	560	863	1,213	1,119	1,165
Bacarra	15,851	18,570	20,736	22,118	23,371	26,940	28,967
Badoc	13,573	12,210	19,000	20,805	22,330	25,627	27,537
Bangui	14,126	9,026	11,053	11,480	11,122	12,921	13,937
Batac	22,587	27,139	33,114	35,230	37,579	43,092	46,152
Burgos	3,003	3,984	5,013	5,274	5,871	7,643	8,724
Carassi	231	222	340	374	421	632	774
Currimao	4,296	5,435	8,369	10,018	7,810	9,467	10,435
Dingras	24,481	28,308	22,751	25,530	26,511	30,519	32,761
Dumalneg	454	554	435	570	602	828	971
Espiritu	8,611	9,972	11,671	12,434	12,887	15,342	16,742
Laoag City (Capital)	44,406	50,198	61,727	66,259	69,648	83,756	91,857
Marcos	0	0	9,406	9,804	10,306	12,990	14,584
Nueva Era	1,971	2,803	3,413	3,608	3,927	5,238	6,060
Pagudpud	0	8,702	11,283	12,388	13,675	16,558	18,223
Paoay	11,257	13,189	15,218	15,994	17,016	20,680	22,808
Pasuquin	12,407	12,262	14,775	16,258	17,813	21,410	23,491
Piddig	10,496	11,614	13,065	13,933	14,774	17,078	18,363
Pinili	8,318	10,472	12,211	12,741	13,521	14,950	15,729
San Nicolas	15,567	17,721	20,182	22,175	23,384	27,632	30,052
Sarrat	14,345	15,136	16,847	18,071	18,798	21,272	22,629
Solsona	10,423	12,043	12,803	14,142	14,731	18,883	21,380
Vintar	14,882	17,359	19,455	21,655	23,356	27,084	29,180
Provincial Total	251,455	287,333	343,427	371,724	390,666	461,661	502,521

Figure 3.4.1 Previous Population Development of the Province
Number of Population
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1960
1970
1975
1980
1990
Adams
Bacarra
Badoc
Bangui
Batac
Burgos
Carasi
Currimao
Dingras
Dumalneg
Espiritu
Laoag City (Capital)
Marcos
Nueva Era
Pagudpud
Paoay
Pasuquin
Piddig
Pinili
San Nicolas
Sarrat
Solsona
Vintar
Name of Municipality

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.

(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) 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 and 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, however, 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 6 urban barangays was re-classified as rural, while 10 rural barangays to urban. With the

re-classification, there are now 135 urban barangays and 422 rural barangays for a total of 557 barangays in Ilocos Norte.

3.4.3 Present Population Distribution

Utilizing the modified classification of the barangays, the urban-rural population was estimated. Rural population accounts for 72% of the provincial total, while 28% 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.

Table 3.4.2 Outline of Urban and Rural Areas in the Province

Municipality	Land Area (sq.km)	Number of Barangay			Population (1995)		
		Urban	Rural	Total	Urban	Rural	Total
Adams	117.20	0	1	1	0	1,165	1,165
Bacarra	51.60	18	25	43	8,649	20,318	28,967
Badoc	66.60	3	28	31	1,744	25,793	27,537
Bangui	150.20	1	14	15	3,964	9,973	13,937
Batac	152.10	14	29	43	13,989	32,163	46,152
Burgos	155.80	1	10	11	1,459	7,265	8,724
Carassi	121.90	0	3	3	0	774	774
Currimao	20.81	2	21	23	1,068	9,367	10,435
Dingras	100.20	6	25	31	6,003	26,758	32,761
Dumalneg	60.90	0	1	1	0	971	971
Espiritu	74.50	4	16	20	3253	13,489	16,742
Laoag City	107.51	30	50	80	42,262	49,595	91,857
Marcos	79.41	1	12	13	1,497	13,087	14,584
Nueva era	644.70	1	10	11	1,416	4644	6,060
Pagudpud	214.00	2	14	16	4,158	14,065	18,223
Paoay	67.70	15	16	31	7,230	15,578	22,808
Pasuquin	152.11	4	29	33	5,663	17,828	23,491
Piddig	179.70	3	20	23	3,238	15,125	18,363
Pinili	76.00	2	23	25	2,032	13,697	15,729
San Nicolas	49.30	15	9	24	20,168	9,884	30,052
Sarrat	80.70	6	18	24	7,400	15,229	22,629
Solsona	163.50	2	20	22	3,361	18,019	21,380
Vintar	512.90	5	28	33	4,662	24,518	29,180
Provincial Total	3,399.34	135	422	557	143,216	359,305	502,521

There are 99,695 households with 71% residing in rural area and 29% households in urban area. The average provincial household size is 5.0 persons/household. Table 3.4.3 presents a breakdown per municipality in the number of households and household sizes by urban and rural area.

Figure 3.4.2 Present Population Distribution
Urban
Rural
Present Population
Number of Population
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Adams
Bacarra
Badoc
Bangui
Batac
Burgos
Carasi
Currimao
Dingras
Dumalneg
Espiritu
Laoag City (Capital)
Marcos
Nueva Era
Pagudpud
Paoay
Pasuquin
Piddig
Pinili
San Nicolas
Sarrat
Solsona
Vintar
Name of Municipality

Figure 3.4.2 Present Population Distribution (Urban) (Cont.)

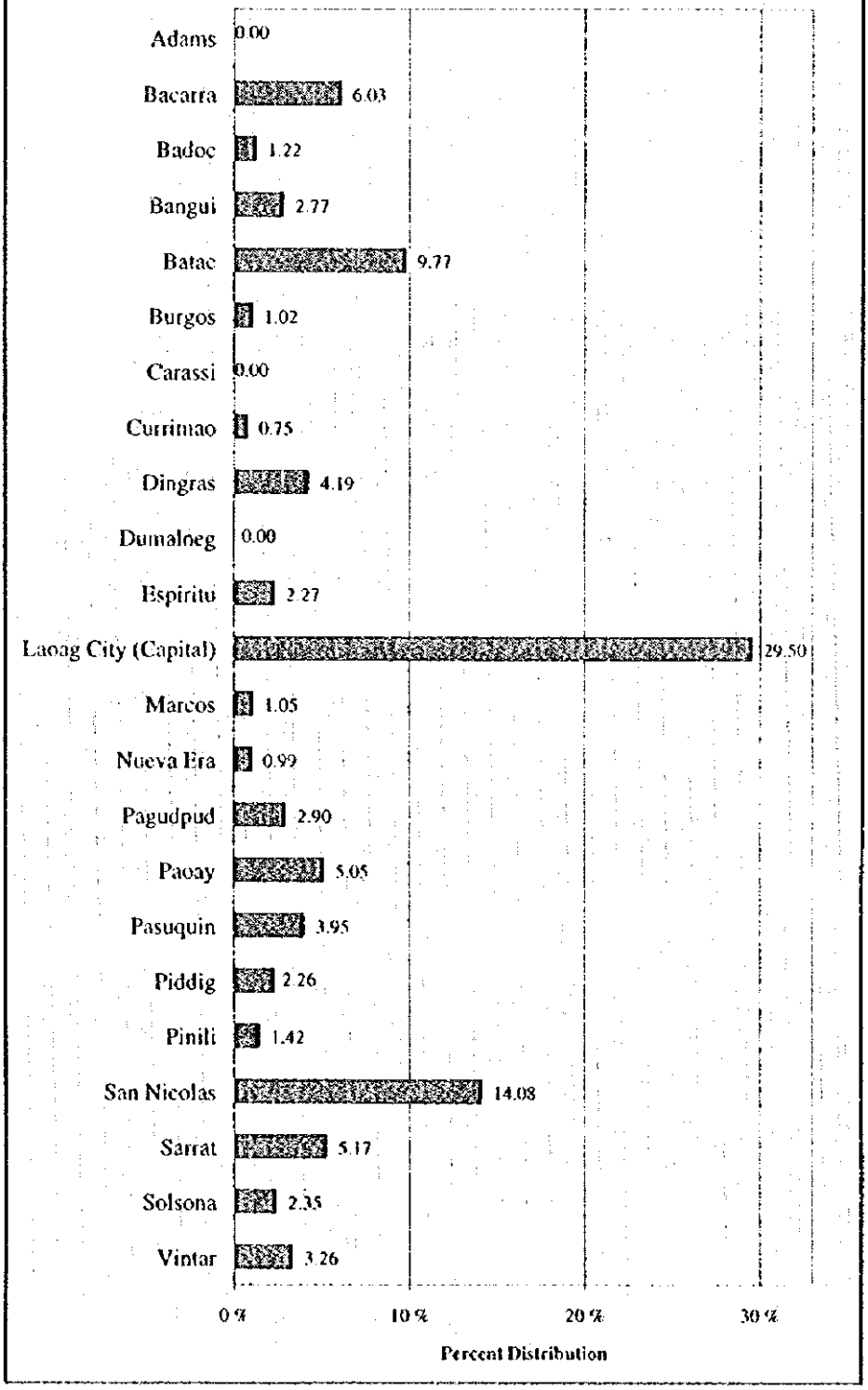


Figure 3.4.2 Present Population Distribution (Rural) (Cont.)

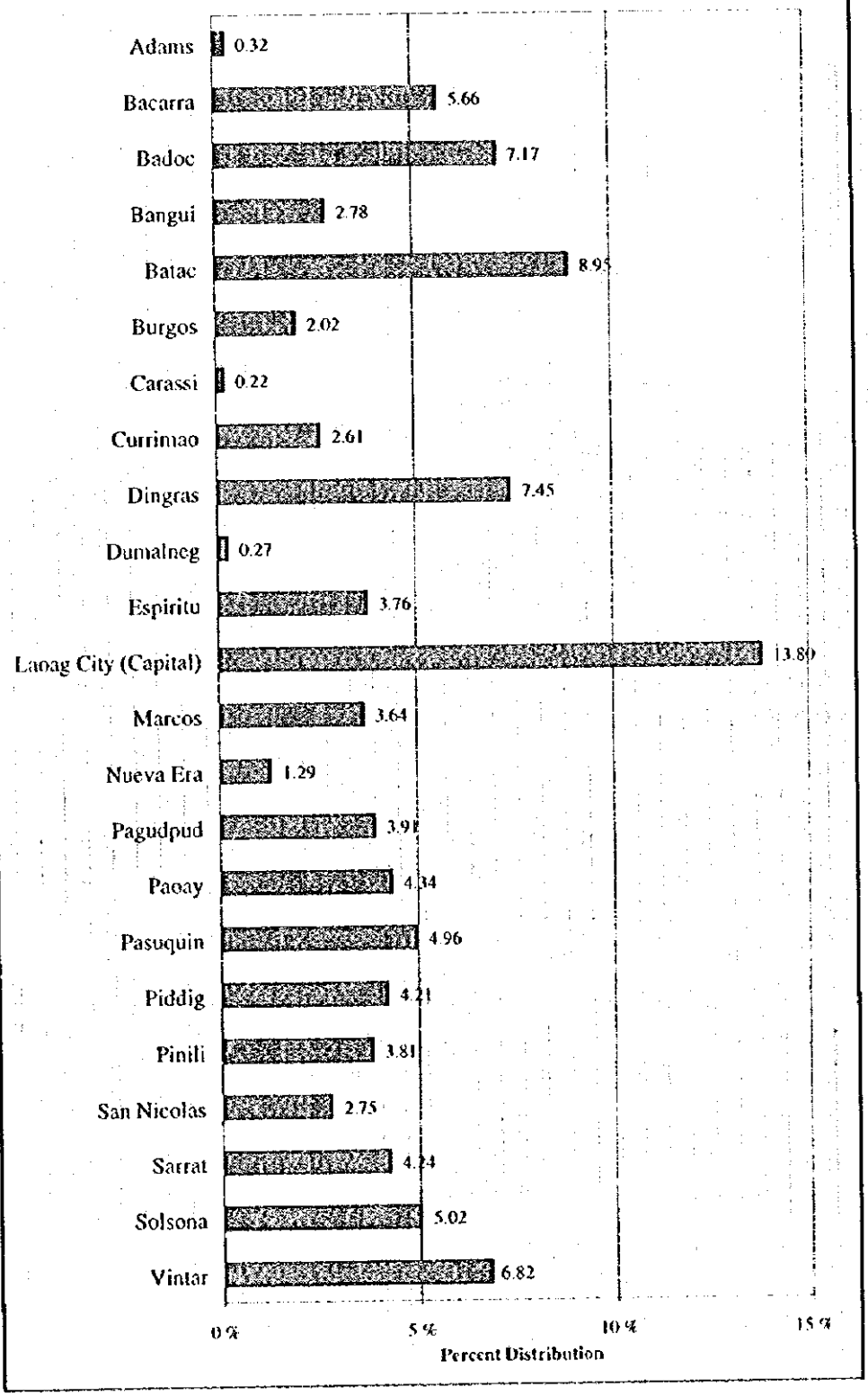


Table 3.4.3 Household Numbers and Household Sizes

Municipality	Number of Households (1995)			Household Size (person/HH)		
	Urban	Rural	Total	Urban	Rural	Total
Adams	0	213	213	0.0	5.5	5.5
Bacarra	1,798	4,149	5,947	4.8	4.9	4.9
Badoc	358	5,098	5,456	4.9	5.1	5.0
Bangui	794	2,049	2,843	5.0	4.9	4.9
Batac	2,700	6,351	9,051	5.2	5.1	5.1
Burgos	285	1,390	1,675	5.1	5.2	5.2
Carassi	0	159	159	0.0	4.9	4.9
Currimao	219	1,844	2,063	4.9	5.1	5.1
Dingras	1,179	5,199	6,378	5.1	5.1	5.1
Dumalneg	0	183	183	0.0	5.3	5.3
Espiritu	649	2,566	3,215	5.0	5.3	5.2
Laoag City	8,540	9,956	18,496	4.9	5.0	5.0
Marcos	291	2,552	2,843	5.1	5.1	5.1
Nueva era	266	934	1,200	5.3	5.0	5.1
Pagudpud	806	2,575	3,381	5.2	5.5	5.4
Paoay	1,419	2,933	4,352	5.1	5.3	5.2
Pasuquin	1,184	3,556	4,740	4.8	5.0	5.0
Piddig	646	3,081	3,727	5.0	4.9	4.9
Pinili	387	2,626	3,013	5.3	5.2	5.2
San Nicolas	4,089	1,915	6,004	4.9	5.2	5.0
Sarrat	1,487	3,160	4,647	5.0	4.8	4.9
Solsona	673	3,539	4,212	5.0	5.1	5.1
Vintar	968	4,929	5,897	4.8	5.0	4.9
Provincial Total	28,738	70,957	99,695	5.0	5.1	5.0

3.5 Health Status

3.5.1 Morbidity, Mortality and Infant Mortality

The number one cause of morbidity was acute respiratory infection, followed by skin diseases and nutritional deficiencies. Diarrhea and anemias ranked fourth and fifth, respectively. Other causes of morbidity in descending order were: obstructive pulmonary, throat/ear/nose diseases, bronchitis, influenza and rheumatism. Regarding mortality, the number one cause was pneumonia, followed by vascular diseases. Tuberculosis and malignant neoplasm ranked third and fourth, respectively. Other causes include suffocation of foreign body, heart diseases, senility, bronchitis, septicemia and obstructive pulmonary. Pneumonia, congenital anomalies and septicemia were the three (3) leading causes of infant mortality in the province.

The general health status of the populace of the province was relatively fair as compared with the national condition. The incidence of diseases was lower in Ilocos Norte 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

	Causes	Ilocos Norte		Philippines		
		Number	Rate	Number	Rate	Ranking
Morbidity	1. ARI	33,330	6,632.56	875,289	1,456.5	3
	2. Skin Diseases	7,146	1,422.03	-	-	-
	3. Nutritional Deficiencies	6,654	1,324.12	206,164	343.1	8
	4. Diarrhea	6,267	1,247.11	894,116	1,487.8	2
	5. Anemias	5,743	1,142.84	-	-	-
	6. Obstructive Pulmonary	5,260	1,046.72	840,215	1,398.1	4
	7. Throat/Ear/Nose	4,762	947.62	-	-	-
	8. Bronchitis	3,713	738.87	951,305	1,583.1	1
	9. Influenza	3,568	710.02	694,956	1,156.4	5
	10. Arthrop., Rheumatism	2,933	583.66	-	-	-
Mortality	1. Pneumonia	306	60.89	50,609	84.2	1
	2. Vascular Diseases	195	38.80	26,436	43.9	3
	3. Tuberculosis	87	17.31	20,949	34.9	4
	4. Malignant Neoplasms	85	16.91	14,723	24.5	6
	5. Suffoc. Foreign Body	66	13.13	-	-	-
	6. Heart Diseases	61	12.14	33,917	56.4	2
	7. Senility	55	10.94	-	-	-
	8. Bronchitis	41	8.16	-	-	-
	9. Septicemia	19	3.78	2,049	3.4	8
	10. Obstructive Pulmonary	15	3	-	-	-
Infant Mortality	1. Pneumonia	18	3.58	11,942	-	1
	2. Congenital Anomalies	17	3.38	1,705	-	5
	3. Septicemia	8	1.59	2,212	-	4
	4. Prematurity	6	1.19	4,786	-	2
	5. Resp. Fetus/Newborn	6	1.19	1,167	-	6
	6. Intestinal Parasites	4	0.80	-	-	-
	7. Obstructive Pulmonary	3	0.60	-	-	-
	8. Anemias	2	0.40	-	-	-
	9. Bronchitis	2	0.40	730	-	9
	10. Typhoid/Parathyphoid	1	0.20	-	-	-

Water-related diseases in the ten leading causes of morbidity include skin diseases (rank 2nd) and diarrhea (4th). Also, intestinal parasitism and typhoid/paratyphoid ranked 6th and 10th as the leading causes of infant mortality, respectively.

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 parasites, 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 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, gastroenteritis/colitis, intestinal parasitism, scabies, conjunctivities, skin diseases, dengue fever and malaria. 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

Diseases	Morbidity		Mortality		Infant Mortality	
	Number	Rate	Number	Rate	Number	Rate
Water-borne						
1. Typhoid/Parathyphoid	11	2.19	0	0.00	1	0.20
2. Viral Hepatitis	28	5.57	0	0.00	0	0.00
3. Diarrhea	6,267	1,247.11	7	1.39	0	0.00
4. Dysentery	6	1.19	1	0.20	0	0.00
5. Gastroent./colitis	1,267		0	0.00	0	0.00
Water-washed						
1. Intestinal Parasites	1,944	386.85	1	0.20	4	0.80
2. Scabies	97	19.30	0	0.00	0	0.00
3. Conjunctivities	512	101.89	87	17.31	0	0.00
4. Skin Diseases	7,146	1,422.03	0	0.00	0	0.00
Water vector						
1. Malaria	212	42.19	0	0.00	0	0.00
2. Dengue Fever	12	2.39	0	0.00	0	0.00

3.5.3 Health Facilities and Practitioners

Present facilities servicing the health care of the population are 15 hospitals/clinics, 27 rural health units, and 123 barangay health stations. The number and ratio to population of health facilities and/or medical practitioners in the province as well as in the Philippines are presented in Table 3.5.1, Supporting Report (details are referred to 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. The other major pollutant is dumped refuse that finds its way to the river systems during rain or is thrown indiscriminately into the rivers and seashores. 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.

Only 3 large-scale food processing establishments (tomato puree, noodle, beverage) in Laoag City, Sarat and San Nicolas are identified as potential pollution sources in the province. As of now, the rivers of 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 23 municipalities, only 8 have municipal refuse collection and disposal service. These municipalities with service have 1 to 3 units of open dump truck. In the province, only 13% of the households is served, while a large number (87%) 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		
Adams	213	0	0	0	0	0	0	8	180	25	213	0	100
Bacarra	5,947	1	0	1	900	0	900	3,555	80	1,399	5,034	15	85
Badoc	5,456	2	0	2	889	0	889	1,301	982	2,284	4,567	16	84
Bangui	2,843	0	0	0	0	0	0	379	853	1,611	2,843	0	100
Batac	9,051	2	0	2	112	0	112	7,635	47	1,306	8,988	1	99
Burgos	1,675	0	0	0	0	0	0	503	583	540	1,626	0	97
Carassi	159	0	0	0	0	0	0	0	80	79	159	0	100
Currimao	2,063	0	0	0	0	0	0	443	1,161	459	2,063	0	100
Dingras	6,378	1	1	2	1149	0	1,149	1,306	2,798	1,125	5,229	18	82
Dumalneg	183	0	0	0	0	0	0	0	0	183	183	0	100
Espiritu	3,215	0	0	0	0	0	0	1,541	1,412	262	3,215	0	100
Laoag City (Capital)	18,496	0	3	3	6763	0	6,763	7,978	2,253	1,502	11,733	37	63
Marcos	2,843	0	0	0	0	0	0	33	1,164	1,628	2,825	0	99
Nueva Era	1,200	0	0	0	0	0	0	60	900	240	1,200	0	100
Pagudpud	3,381	0	0	0	0	0	0	1,690	990	701	3,381	0	100
Paoay	4,352	0	0	0	0	0	0	388	3,146	818	4,352	0	100
Pasuquin	4,740	0	0	0	0	0	0	193	0	4,547	4,740	0	100
Piddig	3,727	1	0	1	35	0	35	0	0	3,692	3,692	1	99
Pinili	3,013	0	0	0	0	0	0	399	0	2,614	3,013	0	100
San Nicolas	6,004	1	0	1	662	0	662	1,399	2,012	1,931	5,342	11	89
Sarrat	4,647	0	0	0	0	0	0	288	1,138	3,221	4,647	0	100
Solsona	4,212	1	0	1	875	0	875	2,107	552	678	3,337	21	79
Vintar	5,897	0	0	0	1800	0	1,800	2,233	1,115	749	4,097	31	69
Provincial Total	99,695	9	4	13	13185	0	13,185	33,439	21,446	31,594	86,479	13	87

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 level 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 70% of the present population (of which 34% in urban area and 66% in rural area) is considered as adequately served (refer to detailed study in Supporting Report). Under the area classification, 83% of urban population and 64% of rural population have access to safe water sources/facilities, while the rest is underserved and/or unserved. About 207,700 persons or 59% of the served population depend on Level I facilities, while 142,000 persons or 41% 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/open dug 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 National Sector Master Plan 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 National Sector Master Plan 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 systems (individual house connection system) 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 24 Level III systems in the province operated under different kinds of ownership (authority or association) as shown in Table 4.1.2. Service coverage by these systems is also presented in the same table for reference. These are:

- Water Districts in Laoag City (including municipalities of Bacarra, Paoay, Pasuquin and Vintar) and in municipalities of Batac, Dingras, San Nicolas and Sarrat,
- Municipal waterworks in Currimao, Dumalneg, Espiritu, Pagudpud and Pinili,
- Barangay waterworks for Bangui (2 systems), Burgos (4 systems), Laoag City (5 systems) and Paoay (2 systems), and
- Save the Children, Inc., an NGO, for rural barangay waterworks in Adams.

The largest system in the province is the Ilocos Norte Water District (INWAD) which caters for a total of 87 urban and 15 rural barangays consisting of 39 urban barangays of Laoag City, 18 urban and 10 rural barangays of Bacarra, 15 urban and 4 rural barangays of Paoay in provision of 10 deep wells. WDs in the other 4 municipalities serve mainly for urban barangays extended to their neighboring rural barangays, while small scale systems operated by municipality or barangay are catering to a limited number of barangays.

Different kind of water sources are availed including deep well, dug well and spring (details are referred to in Table 4.1.1, Supporting Report).

Information on Water Districts shown in Table 4.1.3 revealed that 99% of service connections is provided for domestic use. Per capita consumption rate ranges from 64 liters/day in Dingras WD to 160 liters/day in INWAD. Collection efficiency of water bills were reported ranging from 80% in Dingras WD to 97% in San Nicolas WD.

With regard to the percentage of accounted-for water to the water production, San Nicolas WD shows the highest at 80%, while INWAD is the lowest at 44%. An average percentage of 5 WDs is 62%. The lower percentage indicates the presence of wastage, leakage, illegal/unmetered connections and the need for improvement of O & M and management to attain sound financial and technical performances.

Table 4.1.2 Information on Existing Level III Systems

Municipality	Name of Sytem (Operating Body)	Water Source and Consumption			Service Coverage						
					Number of Barangays Served			Number of HHs/Pop. Served			
		Type of Water Source[1]	Water Consumption (cu.m/day)	Domestic Supply (%)	Urban	Rural	Total	HHs Pop.	Urban	Rural	Total
Adams	Save the Children Inc.	SP	N.A.	N.A.	0	1	1	HHs	0	117	117
								Pop.	0	644	644
Bacarra	INWAD	DW	N.A.	N.A.	18	10	28	HHs	1,357	915	2,272
								Pop.	5,970	4,667	10,637
Bangui	Malasin WS	SP	N.A.	N.A.	0	1	1	HHs	0	120	120
								Pop.	0	600	600
	San Lorenzo W.S	SP	N.A.	N.A.	1	0	1	HHs	305	0	305
								Pop.	1,525	0	1,525
Municipal Total			N.A.	N.A.	1	1	2	HHs	305	120	425
								Pop.	1,525	600	2,125
Batac	Batac Water District	DW	52.7	37.00	16	0	16	HHs	844	0	844
								Pop.	4,389	0	4,389
Burgos	Nagpurtian W.S	SP	N.A.	N.A.	1	0	1	HHs	99	0	99
								Pop.	505	0	505
	Ablan W.S	SP	N.A.	N.A.	0	1	1	HHs	0	53	53
								Pop.	0	276	276
	Agaga W.S	SP	N.A.	N.A.	0	1	1	HHs	0	57	57
								Pop.	0	296	296
	Tanap W.S	SP	N.A.	N.A.	0	1	1	HHs	0	70	70
								Pop.	0	364	364
Municipal Total			N.A.	N.A.	1	3	4	HHs	99	180	279
								Pop.	505	936	1,441
Currimao	Currimao W.S	DW	N.A.	N.A.	1	1	2	HHs	189	195	384
								Pop.	926	996	1,922
Dingras	Dingras W. D.	DW	400.5	94.58	6	2	8	HHs	604	41	645
								Pop.	5,805	1,408	7,213
Dumalneg	Dumalneg WS	SP	N.A.	N.A.	0	1	1	HHs	0	156	156
								Pop.	0	828	828
Espiritu	Espiritu WS	SP	487.2	100.00	4	0	4	HHs	607	0	607
								Pop.	3,035	0	3,035
Laoag City (Capital)	INWAD	DW	888	N.A.	39	0	39	HHs	4,247	0	4,247
								Pop.	21,235	0	21,235
	Dibwa North W.S	SP	N.A.	N.A.	0	1	1	HHs	0	133	133
								Pop.	0	665	665
	Dibwa South W.S	SP	N.A.	N.A.	0	1	1	HHs	0	147	147
								Pop.	0	735	735
	Bacsil North W.S	SP	N.A.	N.A.	0	1	1	HHs	0	167	167
								Pop.	0	835	835
	Bacsil South W.S	SP	N.A.	N.A.	0	1	1	HHs	0	226	226
								Pop.	0	1,130	1,130
	La Paz Proper W.S	DW	N.A.	N.A.	0	1	1	HHs	0	119	119
								Pop.	0	595	595
Municipal Total			888	97.52	39	5	44	HHs	4,247	792	5,039
								Pop.	21,235	3,960	25,195
Pagudpud	Municipal Gov't	SP	N.A.	N.A.	2	3	5	HHs	678	439	1,117
								Pop.	3,390	2,195	5,585
Paoay	INWAD	DW	N.A.	N.A.	15	4	19	HHs	242	87	329
								Pop.	1,210	461	1,671
	Callaguip W.S	DW	N.A.	N.A.	0	1	1	HHs	0	120	120
								Pop.	0	636	636
	Nagbacalan W.S	DW	N.A.	N.A.	0	1	1	HHs	0	30	30
								Pop.	0	159	159
Municipal Total			N.A.	N.A.	15	6	21	HHs	242	237	479
								Pop.	1,210	1,256	2,466
Pasuquin	INWAD	DW	N.A.	N.A.	10	0	10	HHs	1,035	0	1,035
								Pop.	5,175	0	5,175
Piddi	Piddi WS	DW	N.A.	N.A.	2	0	2	HHs	126	0	126
								Pop.	2,010	0	2,010
San Nicolas	San Nicolas W.D.	DW	2,105.6	74.75	15	0	15	HHs	4,897	0	4,897
								Pop.	17,356	0	17,356
Sarrat	Sarrat Water District	1 Dug Well & 2 Spring	N.A.	N.A.	6	0	6	HHs	463	0	463
								Pop.	5,385	0	5,385
Vintar	INWAD	DW	N.A.	N.A.	5	1	6	HHs	462	15	477
								Pop.	2,310	75	2,385
Provincial Total			3,934.0	Not Applicable	141	34	175	HHs	16,155	3,207	19,362
								Pop.	80,226	17,565	97,791

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

Table 4.1.3 Information on Water District

Name of Water District	Number of Connections						Water Production (cu.m/mo.)	Accounted for Water	
	Domestic	Comm'l.	Insti.	Others	Total	Metered		Volume (cu.m/mo.)	Ave. Collection Eff. (%)
Batac W. D.	844	0	3	55	902	902	21,626	14,865	92
Dingras W. D.	1,210	0	13	27	1,250	645	18,960	12,015	80
INWAD	7,742	0	0	0	7,742	6,465	424,450	184,871	88
San Nicolas W.D.	1,910	0	10	1	1,921	1,921	47,760	38,328	97
Sarrat Water W.D.	565	0	0	0	565	463	12,960	7,230	85

4.1.4 Level II Systems

Level II systems (communal faucet system) are designed to cater to 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 79 Level II systems as enumerated below and shown in Table 4.1.4 (details are referred to in Table 4.1.2, Supporting Report).

- Municipal waterworks for 1 urban barangay of Marcos, 1 urban and 5 rural barangays of Nueva Era, and 12 rural barangays of Pasuquin,
- A total of 76 barangay waterworks are being operated in the municipalities of Bacarra (2 systems), Badoc (2 systems), Bangui (6 systems), Carassi (3 systems), Dingras (2 systems), Pagudpud (6 systems), Piddig (1 system), Sarrat (1 system), Solsona (1 system) and Vintar (52 systems including 29 "sitio {cluster in barangay}" based waterworks).

Out of 79 Level II systems, deep well sources are used only at 2 systems and all the rest are utilizing spring sources. Majority of these systems rely on only each one water source. The collection efficiency of water bill was answered only by Fermin Afaga waterworks to the questionnaire at 100%.

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

Insufficient management practices are assumed to be common to almost all Level II systems. Questionnaire survey on financial performance and managerial set-up revealed the status without answering thereto. As it is common to Level II systems utilizing spring

Table 4.1.4 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
Bacarra	Femin Afaga WS	DW	1	0	1	1	0	112	112	0	560	560
	Parinaan WS	SP	2	0	1	1	0	104	104	0	520	520
Municipal Total			3	0	2	2	0	216	216	0	1,080	1,080
Badoc	Camanga WS	SP	1	0	1	1	0	156	156	0	952	952
	Madupayas WS	SP	1	0	1	1	0	200	200	0	1,000	1,000
Municipal Total			2	0	2	2	0	356	356	0	1,952	1,952
Bangui	Abacca W.S	SP	1	0	1	1	0	189	189	0	926	926
	Baruyen W.S	SP	1	0	1	1	0	198	198	0	970	970
	Lanao W.S	SP	2	0	1	1	0	215	215	0	1,054	1,054
	Manayon W.S	SP	1	0	1	1	0	130	130	0	637	637
	Nagbalagan W.S	SP	1	0	1	1	0	72	72	0	353	353
	San Isidro W.S	SP	1	0	1	1	0	89	89	0	436	436
Municipal Total			7	0	6	6	0	893	893	0	4,376	4,376
Carassi	Angset WS	SP	1	0	1	1	0	19	19	0	122	122
	Barbequeso WS	SP	1	0	1	1	0	66	66	0	330	330
	Virbira WS	SP	1	0	1	1	0	29	29	0	150	150
Municipal Total			3	0	3	3	0	114	114	0	602	602
Dingras	Capasan WS	SP	1	0	1	1	0	79	79	0	301	301
	San Marcelino WS	SP	2	0	1	1	0	184	184	0	938	938
Municipal Total			3	0	2	2	0	263	263	0	1,239	1,239
Marcos	Marcos WS	DW	1	1	0	1	90	0	90	0	540	540
Nueva era	Nueva Era WS	SP	1	1	5	6	174	334	508	870	1,670	2,540
Pagudpud	Caparispisan WS	SP	1	0	3	3	0	200	200	0	1,225	1,225
	Dampig	SP	1	0	1	1	0	134	134	0	773	773
	Pansian	SP	1	0	1	1	0	224	224	0	1,444	1,444
	Pasateng WS	SP	1	0	1	1	0	226	226	0	1,269	1,269
	Subec WS	SP	1	0	1	1	0	196	196	0	1,142	1,142
	Tarrag WS	SP	1	0	1	1	0	136	136	0	774	774
Municipal Total			6	0	8	8	0	1,136	1,136	0	6,627	6,627

Table 4.1.4 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
Pasuquin	Municipal WS	SP	7	0	12	12	0	430	430	0	2,150	2,150
Piddig	San Antonio-Tangaoan	SP	1	0	2	2	0	150	150	0	650	650
Sarrat	San Andres W.S	SP	1	0	1	1	0	97	97	0	475	475
Solsona	LGU'S	SP	1	0	6	6	0	1,007	1,007	0	4,422	4,422
Vintar	Abu	SP	1	0	1	1	0	135	135	0	815	815
	Alsem	SP	1	0	1	1	0	16	16	0	55	55
	Bago	SP	1	0	1	1	0	221	221	0	1,146	1,146
	Barenganobong	SP	1	0	1	1	0	47	47	0	179	179
	Bengbangcog	SP	1	0	1	1	0	285	285	0	1,357	1,357
	Bulbulala	SP	1	0	1	1	0	115	115	0	516	516
	Cabangaran	SP	1	0	1	1	0	69	69	0	315	315
	Colombia	SP	1	0	1	1	0	42	42	0	171	171
	Dagupan	SP	1	0	1	1	0	171	171	0	815	815
	Diaton	SP	1	0	1	1	0	47	47	0	218	218
	Ester	SP	1	0	1	1	0	123	123	0	620	620
	Isic-Isic	SP	1	0	1	1	0	35	35	0	176	176
	Lubnac	SP	1	0	1	1	0	22	22	0	117	117
	Mabonbonag	SP	1	0	1	1	0	23	23	0	123	123
	Malampa	SP	1	0	1	1	0	102	102	0	540	540
	Manarang	SP	1	0	1	1	0	69	69	0	374	374
	Maypangal	SP	1	0	1	1	0	50	50	0	264	264
	Padayan	SP	1	0	1	1	0	9	9	0	60	60
	Porpororoc	SP	1	0	1	1	0	37	37	0	171	171
	Salsalamague	SP	1	0	1	1	0	37	37	0	172	172
	SitioBalbalay(Brgy. Cabayo)	SP	1	0	1	1	0	105	105	0	496	496
	SitioBato(Brgy. Isic-Isic)	SP	1	0	1	1	0	51	51	0	245	245
	SitioBaybayawa(Brgy. Diaton)	SP	1	0	1	1	0	38	38	0	200	200
	SitioBoao(Brgy. Dipilat)	SP	1	0	1	1	0	61	61	0	206	206
	SitioCaocaouayan(Brgy. Cabayo)	SP	1	0	1	1	0	54	54	0	258	258
	SitioDangagan(Brgy. Dagupan)	SP	1	0	1	1	0	93	93	0	459	459

Table 4.1.4 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
Vintar	SitioDasar(Brgy. Isic-Isic)	SP	1	0	1	1	0	25	25	0	116	116
	SitioDicawa(Brgy. Diaton)	SP	1	0	1	1	0	46	46	0	240	240
	SitioDimamaga(Brgy. Tamdagan)	SP	1	0	1	1	0	33	33	0	187	187
	SitioDitulang(Brgy. Alsem)	SP	1	0	1	1	0	192	192	0	941	941
	SitioGubang(Bgry. Canaan)	SP	1	0	1	1	0	28	28	0	129	129
	SitioLepanto(Brgy. Isic-Isic)	SP	1	0	1	1	0	83	83	0	479	479
	SitioLipay(Brgy. San Jose)	SP	1	0	1	1	0	25	25	0	88	88
	SitioMagabobo(Brgy. Salsalamague)	SP	1	0	1	1	0	27	27	0	120	120
	SitioMangmanoga(Brgy. Cabayo)	SP	1	0	1	1	0	21	21	0	94	94
	SitioMangrapon(Brgy. Canaan)	SP	1	0	1	1	0	78	78	0	352	352
	SitioMarabanos(Brgy. Malampa)	SP	1	0	1	1	0	15	15	0	105	105
	SitioNagkamotigan(Brgy. Tamdagan)	SP	1	0	1	1	0	12	12	0	66	66
	SitioNangalangan(Brgy. Tamdagan)	SP	1	0	1	1	0	69	69	0	568	568
	SitioNasbatan(Brgy. Isic-Isic)	SP	1	0	1	1	0	25	25	0	135	135
	SitioPadayan(Brgy. Tamdagan)	SP	1	0	1	1	0	27	27	0	358	358
	SitioPalisian(Brgy. Dagupan)	SP	1	0	1	1	0	47	47	0	219	219
	SitioPaninoan(Brgy. Malampa)	SP	1	0	1	1	0	46	46	0	240	240
	SitioParparingit(Brgy. Cabayo)	SP	1	0	1	1	0	33	33	0	153	153
	SitioSagpat(Brgy. Dipilat)	SP	1	0	1	1	0	25	25	0	87	87
	SitioSaricao(Brgy. San Jose)	SP	1	0	1	1	0	21	21	0	67	67
	SitioSinagban(Brgy. Cabangaran)	SP	2	0	1	1	0	98	98	0	440	440
	SitioTungel(Brgy. Isic-Isic)	SP	1	0	1	1	0	36	36	0	187	187
	SitioVira-Medesi(Brgy. Bago)	SP	1	0	1	1	0	99	99	0	410	410
	Tamdagan	SP	1	0	1	1	0	51	51	0	276	276
	Tomogan	SP	1	0	1	1	0	82	82	0	413	413
	Visaya	SP	1	0	1	1	0	79	79	0	352	352
Municipal Total			53	0	52	52	0	3,380	3,380	0	16,890	16,890
Provincial Total			89	2	101	103	264	8,376	8,640	870	42,673	43,543

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

sources that the water bill is mostly minimum flat rate or free of charge and the financial saving to cope with future repair/replacement is minimal. It is anticipated that any Level II system may become non-operational due to managerial incapability and lack of sustainability to operate the systems. To attain financial and managerial sustainability, reinforcement of the RWSA shall be promoted with reference to the institutional development.

(2) Technical skill for O&M of facilities

Several original systems have been expanded to increase service coverage without appropriate technical study on the capacities of water sources and distribution facilities. Problems on low water pressure, supply interruption and turbid water, etc. are reported to questionnaires. To attain satisfactory water supply service, an appropriate technical guidance and skills training shall be arranged by concerned agencies/LGUs.

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.

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 4.1.5. (details are referred to in Supporting Report).

Of the operational Level I facilities (total of 31,191 facilities), about 55% is shallow wells. For classification of shallow well into safe and unsafe category, 30% is adopted as reference figure of unsafe percentage. All deep wells were regarded as safe water sources. In application of the unsafe percentage to shallow wells for each municipality, 18,123 Level I facilities are classified as safe sources, while 13,067 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

Table 4.1.5 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
Adams	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bacarra	28	514	0	1	543	221	783	0	0	1,004	229	1,032	1,261	1,099	5,053	6,152
Badoc	68	49	668	8	793	21	1,447	0	2	1,470	120	1,691	1,811	584	8,621	9,205
Bangui	14	232	0	15	261	98	70	0	0	168	320	532	852	1,599	2,605	4,204
Batac	15	908	294	9	1,226	389	0	0	1	390	1,443	4,646	6,089	7,501	23,691	31,192
Burgos	17	166	35	4	222	72	114	0	0	186	125	597	722	634	3,102	3,736
Carassi	0	10	9	3	22	5	0	0	3	8	0	23	23	0	110	110
Currimao	13	385	193	0	591	164	480	0	3	647	79	744	823	81	3,793	3,874
Dingras	3	151	2,100	5	2,259	65	891	0	0	956	306	3,274	3,580	85	16,695	16,780
Dumalneg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Espiritu	64	97	0	1	162	42	0	0	0	42	26	1,973	1,999	126	10,457	10,583
Laoag City (Capital)	490	1,400	460	2	2,352	600	1,005	0	2	1,607	2,255	6,018	8,273	11,048	30,089	41,137
Marcos	4	298	96	5	403	129	38	0	3	170	191	1,708	1,899	972	8,710	9,682
Nueva Era	10	21	27	9	67	9	248	0	1	258	20	127	147	104	634	738
Pagudpud	8	113	0	8	129	49	103	0	0	152	49	301	350	254	1,655	1,909
Paoay	34	2,867	0	1	2,902	1,228	952	0	0	2,180	625	1,569	2,194	3,185	8,317	11,502
Pasuquin	12	1,283	0	2	1,297	550	300	0	1	851	61	1,862	1,923	293	9,306	9,599
Piddig	13	360	0	6	379	153	0	0	0	153	492	2,043	2,535	2,460	10,010	12,470
Pinili	3	745	94	0	842	319	557	0	0	876	44	1,210	1,254	0	6,290	6,290
San Nicolas	17	73	366	6	462	30	295	0	0	325	360	1,060	1,420	1,762	5,512	7,274
Sarrat	23	1,920	0	0	1,943	823	0	0	1	824	292	1,668	1,960	884	8,002	8,886
Solsona	5	206	574	8	793	88	267	0	0	355	586	1,102	1,688	2,930	5,620	8,550
Vintar	25	198	252	0	475	84	361	0	0	445	278	499	777	1,330	2,493	3,823
Provincial Total	866	11,996	5,168	93	18,123	5,139	7,911	0	17	13,067	7,901	33,679	41,580	36,931	170,765	207,696

pollution sources, such as septic tank and piggery. The rest of unsafe sources is open dug wells. (The Code on Sanitation of DOH requires a minimum 25m distance between water source and pollution sources.)

These shallow wells and open dug 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 4.1.6, while information on private wells is not available.

Table 4.1.6 Operating Status of Existing Wells in the Province

Operating Status	Unit	Public Wells		Private	Total
		Deep Well	Shallow Well	Shallow Well	
Functioning	No.	766	1,905	15,231	17,902
	Percent	64	83	-	96
Non-Functioning	No.	424	397	N/A	821
	Percent	36	17	-	4
Total Number		1,190	2,302	15,231	18,723

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

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. 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 1 to 10 households/facility under the above assumptions (details are referred to in Supporting Report).

Table 4.1.7 presents the profile of the service coverage in terms of served, underserved and unserved. As a provincial total, 70% of the population is adequately served (83% of urban population and 64% of rural population). The lower percentage of service coverage in the rural area is affected by a huge number of unsafe shallow wells (570 public and 4,569 private wells) and 7,911 open dug wells used by about 136,900 persons) and/or no provision of facilities. The provincial service coverage at present is exhibited in Figures 4.1.1 and 4.1.2 (details are referred to Supporting Report).

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.

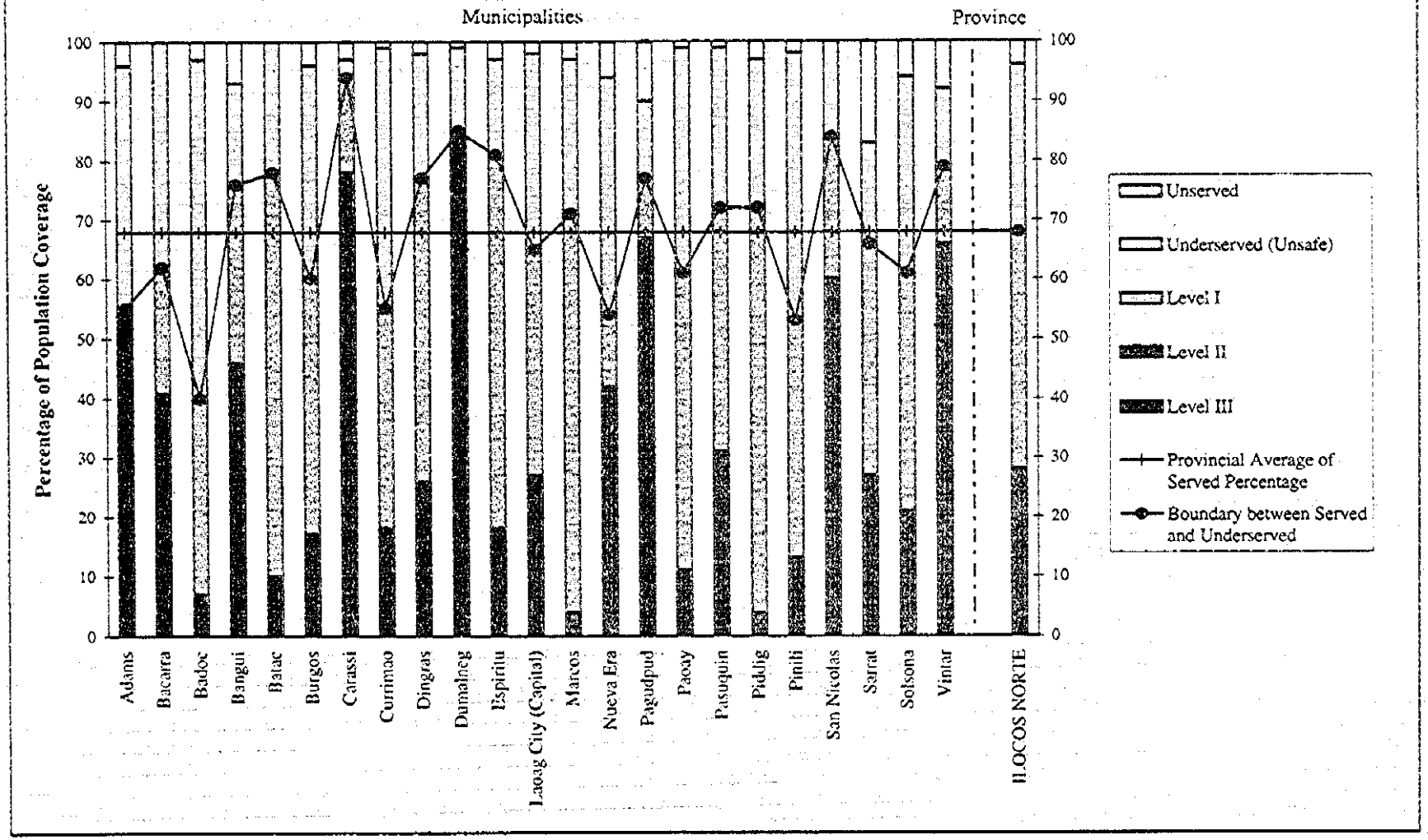
Table 4.1.7 Water Supply Service Coverage by Municipality

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
Adams	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	1,165	644	0	0	644	477	44	521	55	0	0	55	41	4	45
	Total	1,165	644	0	0	644	477	44	521	55	0	0	55	41	4	45
Bacarra	Urban	8,649	5,970	0	1,099	7,069	1,570	10	1,580	69	0	13	82	18	0	18
	Rural	20,318	4,667	1,080	5,053	10,800	9,474	44	9,518	23	5	25	53	47	0	47
	Total	28,967	10,637	1,080	6,152	17,869	11,044	54	11,098	37	4	21	62	38	0	38
Badoc	Urban	1,744	0	0	584	584	1,077	83	1,160	0	0	33	33	62	5	67
	Rural	25,793	0	1,952	8,621	10,573	14,719	501	15,220	0	8	33	41	57	2	59
	Total	27,537	0	1,952	9,205	11,157	15,796	584	16,380	0	7	33	41	57	3	59
Bangui	Urban	3,964	1,525	0	1,599	3,124	720	120	840	38	0	40	79	18	4	21
	Rural	9,973	600	4,376	2,605	7,581	1,715	677	2,392	6	44	26	76	17	7	24
	Total	13,937	2,125	4,376	4,204	10,705	2,435	797	3,232	15	31	30	77	17	6	23
Batac	Urban	13,989	4,389	0	7,501	11,890	2,032	67	2,099	31	0	54	85	15	0	15
	Rural	32,163	0	0	23,691	23,691	8,102	370	8,472	0	0	74	74	25	1	26
	Total	46,152	4,389	0	31,192	35,581	10,134	437	10,571	10	0	68	77	22	1	23
Burgos	Urban	1,459	505	0	634	1,139	264	56	320	35	0	43	78	18	4	22
	Rural	7,265	936	0	3,102	4,038	2,903	324	3,227	13	0	43	56	40	4	44
	Total	8,724	1,441	0	3,736	5,177	3,167	380	3,547	17	0	43	59	36	5	41
Carrassi	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	774	0	602	110	712	38	24	62	0	78	14	92	5	3	8
	Total	774	0	602	110	712	38	24	62	0	78	14	92	5	3	8
Currimao	Urban	1,068	926	0	81	1,007	61	0	61	87	0	8	94	5	1	6
	Rural	9,367	996	0	3,793	4,789	4,578	0	4,578	11	0	40	51	48	1	49
	Total	10,435	1,922	0	3,874	5,796	4,639	0	4,639	18	0	37	56	44	0	44
Dingras	Urban	6,003	5,805	0	85	5,890	37	76	113	97	0	1	98	1	1	2
	Rural	26,758	1,408	1,239	16,695	19,342	6,984	432	7,416	5	5	62	72	26	2	28
	Total	32,761	7,213	1,239	16,780	25,232	7,021	508	7,529	22	4	51	77	21	2	23
Dumalneg	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	971	828	0	0	828	132	11	143	85	0	0	85	14	1	15
	Total	971	828	0	0	828	132	11	143	85	0	0	85	14	1	15
Espiritu	Urban	3,253	3,035	0	126	3,161	32	60	92	93	0	4	97	1	2	3
	Rural	13,489	0	0	10,457	10,457	2,669	363	3,032	0	0	78	78	20	2	22
	Total	16,742	3,035	0	10,583	13,618	2,701	423	3,124	18	0	63	81	16	3	19
Laoag City (Capital)	Urban	42,262	21,235	0	11,048	32,283	9,801	178	9,979	50	0	26	76	23	1	24
	Rural	49,595	3,960	0	30,089	34,049	14,515	1,031	15,546	8	0	61	69	29	2	31
	Total	91,857	25,195	0	41,137	66,332	24,316	1,209	25,525	27	0	45	72	26	2	28
Marcos	Urban	1,497	0	0	972	972	463	62	525	0	0	65	65	31	4	35
	Rural	13,087	0	540	8,710	9,250	3,473	364	3,837	0	4	67	71	27	2	29
	Total	14,584	0	540	9,682	10,222	3,936	426	4,362	0	4	66	70	27	3	30

Table 4.1.7 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
Nueva Era	Urban	1,416	0	870	104	974	383	59	442	0	61	7	69	27	4	31
	Rural	4,644	0	1,670	634	2,304	2,037	303	2,340	0	36	14	50	44	6	50
	Total	6,060	0	2,540	738	3,278	2,420	362	2,782	0	42	12	54	40	6	46
Pagudpud	Urban	4,158	3,390	0	254	3,644	277	237	514	82	0	6	88	7	5	12
	Rural	14,065	2,195	6,627	1,655	10,477	2,141	1,447	3,588	16	47	12	74	15	11	26
	Total	18,223	5,585	6,627	1,909	14,121	2,418	1,684	4,102	31	36	10	77	13	10	23
Paoay	Urban	7,230	1,210	0	3,185	4,395	2,799	36	2,835	17	0	44	61	39	0	39
	Rural	15,578	1,256	0	8,317	9,573	5,793	212	6,005	8	0	53	61	37	2	39
	Total	22,808	2,466	0	11,502	13,968	8,592	248	8,840	11	0	50	61	38	1	39
Pasuquin	Urban	5,663	5,175	0	293	5,468	162	33	195	91	0	5	97	3	0	3
	Rural	17,828	0	2,150	9,306	11,456	6,166	206	6,372	0	12	52	64	35	1	36
	Total	23,491	5,175	2,150	9,599	16,924	6,328	239	6,567	22	9	41	72	27	1	28
Piddig	Urban	3,238	0	0	2,460	2,460	688	90	778	0	0	76	76	21	3	24
	Rural	15,125	0	650	10,010	10,660	3,950	515	4,465	0	4	66	70	26	4	30
	Total	18,363	0	650	12,470	13,120	4,638	605	5,243	0	4	68	71	25	4	29
Pinili	Urban	2,032	2,010	0	0	2,010	0	22	22	99	0	0	99	0	1	1
	Rural	13,697	0	0	6,290	6,290	7,011	396	7,407	0	0	46	46	51	3	54
	Total	15,729	2,010	0	6,290	8,300	7,011	418	7,429	13	0	40	53	45	2	47
San Nicolas	Urban	20,168	17,356	558	1,762	19,676	492	0	492	86	3	9	98	2	0	2
	Rural	9,884	0	0	5,512	5,512	4,326	46	4,372	0	0	56	56	44	0	44
	Total	30,052	17,356	558	7,274	25,188	4,818	46	4,864	58	2	24	84	16	0	16
Sarrat	Urban	7,400	5,385	150	884	6,419	379	602	981	73	2	12	87	5	8	13
	Rural	15,229	0	475	8,002	8,477	3,378	3,374	6,752	0	3	53	56	22	22	44
	Total	22,629	5,385	625	8,886	14,896	3,797	3,976	7,773	24	3	39	66	17	17	34
Solsona	Urban	3,361	0	0	2,930	2,930	251	180	431	0	0	87	87	7	6	13
	Rural	18,019	0	4,422	5,620	10,042	6,903	1,074	7,977	0	25	31	56	38	6	44
	Total	21,380	0	4,422	8,550	12,972	7,154	1,254	8,408	0	21	40	61	33	6	39
Vintar	Urban	4,662	2,310	0	1,330	3,640	719	303	1,022	50	0	29	78	15	7	22
	Rural	24,518	75	16,890	2,493	19,458	3,160	1,900	5,060	0	69	10	79	13	8	21
	Total	29,180	2,385	16,890	3,823	23,098	3,879	2,203	6,082	8	58	13	79	13	8	21
Provincial Total	Urban	143,216	80,226	1,578	36,931	118,735	22,207	2,274	24,481	56	1	26	83	16	1	17
	Rural	359,305	17,565	42,673	170,765	231,003	114,644	13,658	128,302	5	12	48	64	32	4	36
	Total	502,521	97,791	44,251	207,696	349,738	136,851	15,932	152,783	19	9	41	70	27	3	30

Figure 4.1.1 Water Supply Service Coverage by Municipality



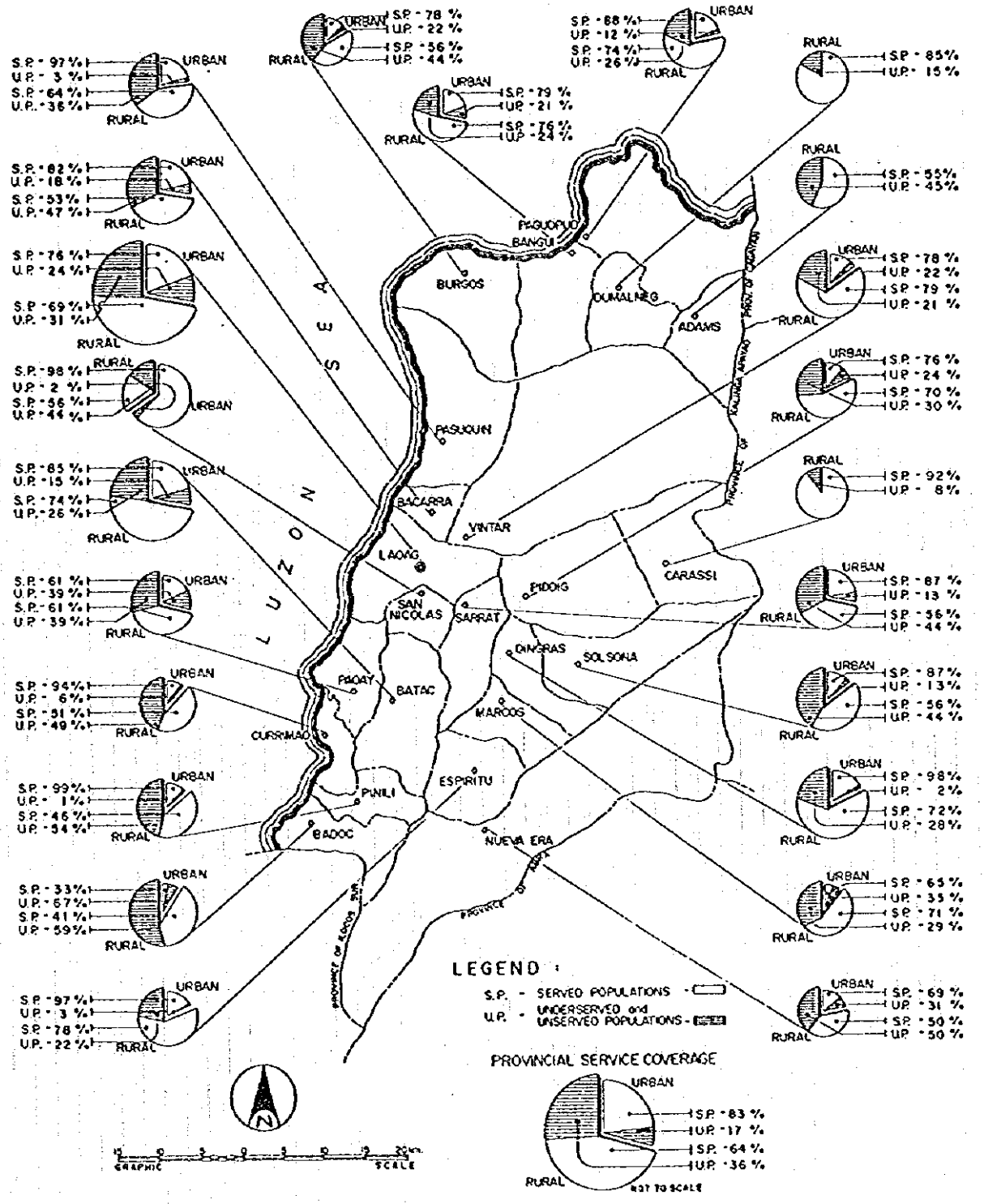


FIGURE 4.1.2
EXISTING WATER SUPPLY SERVICE COVERAGE MAP

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