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 - 7

MAIN REPORT

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

ILOCOS SUR

FEBRUARY 1996

NIPPON JOGESUIDO SEKKEI CO., LTD.

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Republic of the Philippines
PROVINCE OF ILOCOS SUR
Vigan

OFFICE OF THE GOVERNOR

MESSAGE

It is with great relief and satisfaction that finally the Provincial Water System, Sanitation, and Sewerage Master Plan for the Province of Ilocos Sur is completed. Henceforth, our Province has now a master plan which will guide the national and local officialdom and all concerned in directing the proper courses of actions on water system, sanitation, and sewerage.

At this juncture, I commend first of all the members of the Province's Technical Working Group who worked painstakingly in the study and formulation of the plan. It is also noteworthy to mention the vital role played by DILG and JICA consultants in providing timely and vital technical expertise without whose assistance the plan would not have materialized.

Water is a vital resource and a human need. In fact, life is not possible without water. And the need for water for human consumption becomes very critical as the years go by. Due to the continuous increase of population nationwide and even worldwide, more and more people will consume water that will make precarious the carrying capacity of Mother Earth. And with rapid urbanization and concentration of people, the need is aggravated with consequent concerns on sanitation and sewerage.

In the next 10 years and beyond, the need will become more and more critical. It is for this reason that the preparation and formulation of the master plan is paramount.

It is the fondest hope that with the master plan, water system, sanitation, and sewerage shall be adequately addressed.

LUIS " CHAVIT " SINGSON
Governor

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

VOLUME II - 7 MAIN REPORT

TABLE OF CONTENTS

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

LIST OF TABLES

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

LIST OF FIGURES

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 Sur 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 Sur

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.

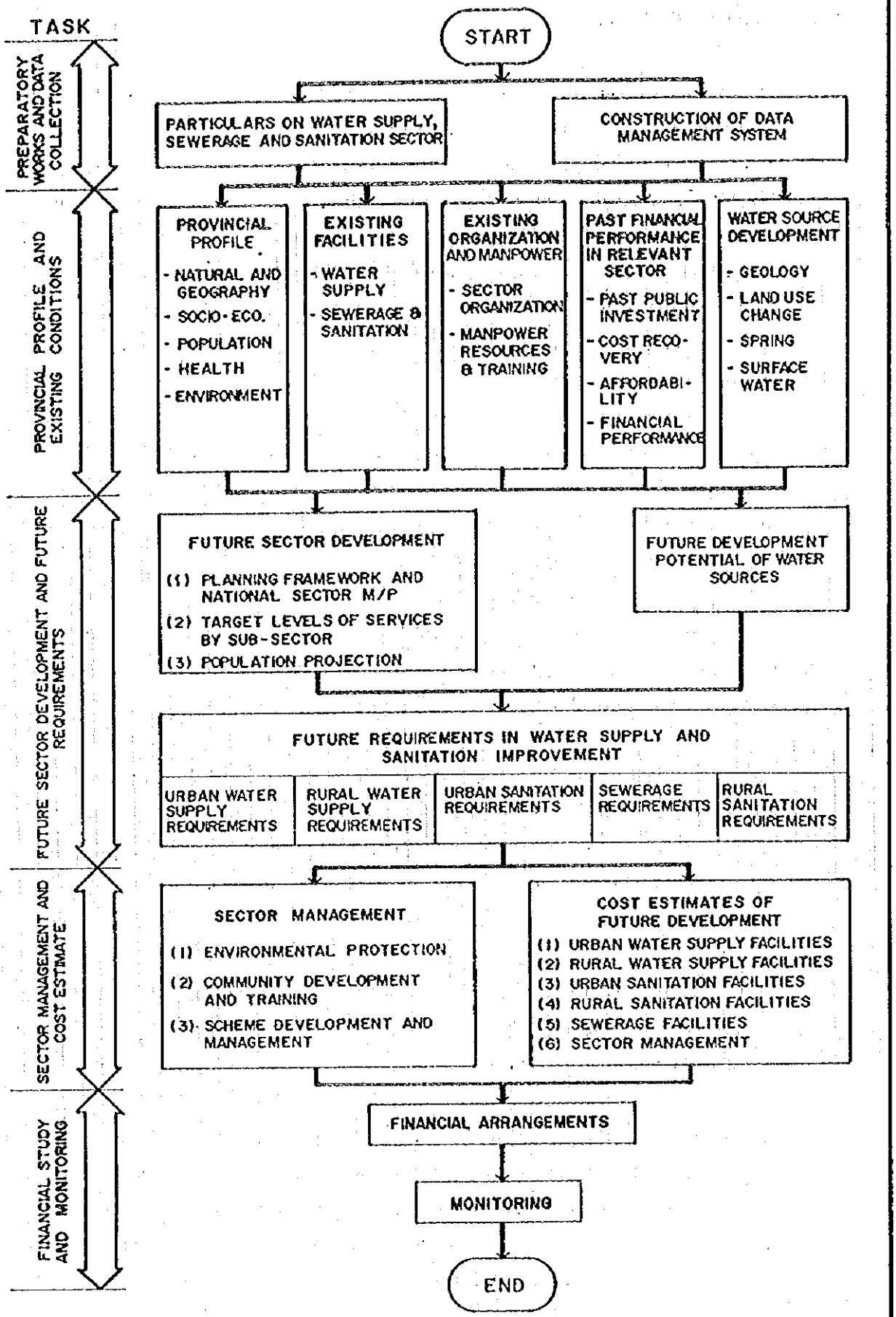
Chapter 4, 5, and 6 provide existing sector conditions in physical, managerial and financial aspects: existing water supply and sanitation facilities by service level and service coverage; sector institutions, community development, training and monitoring systems; and financial performances entailing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

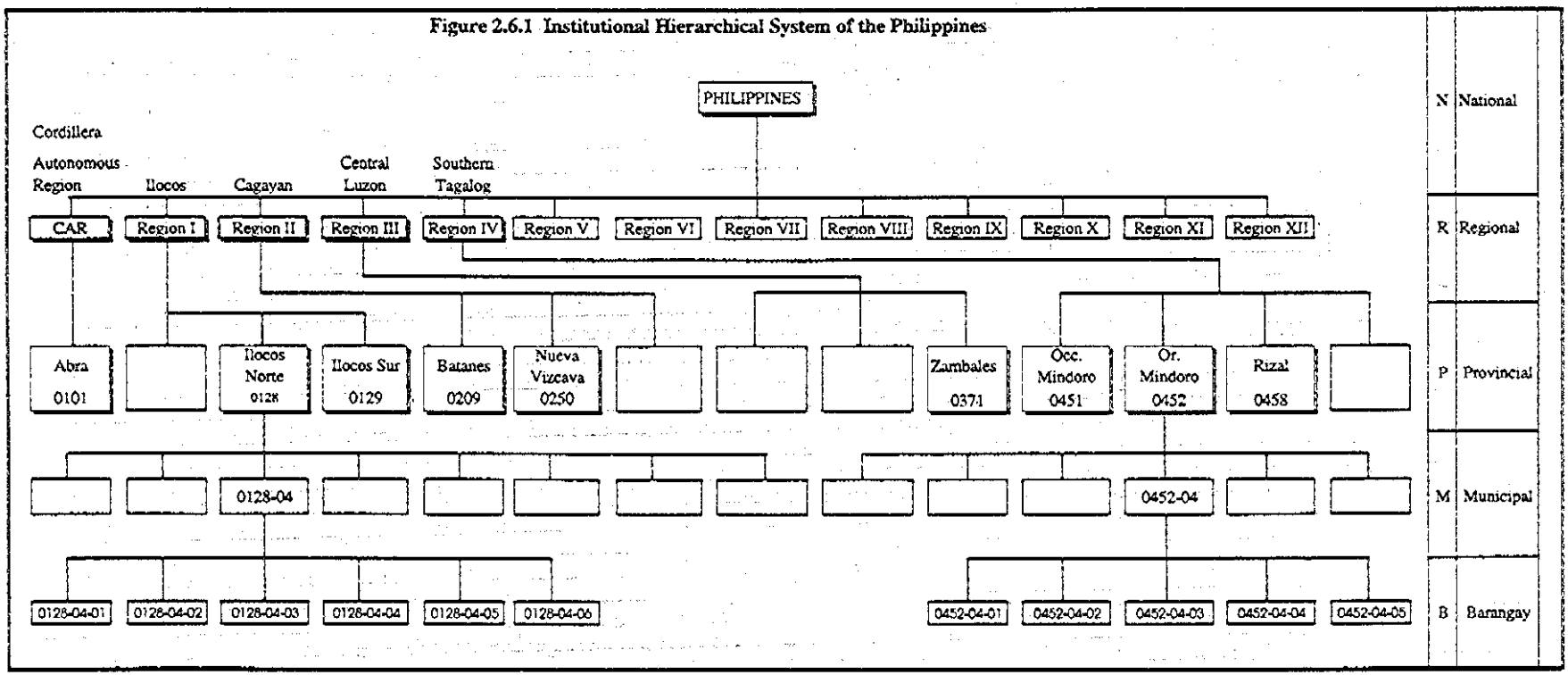


Figure 2.6.2 Structure of Questionnaire

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 Sur province is located along the western coast of Northern Luzon. Vigan, the provincial capital, is approximately 395km from Metro Manila. It is bounded on the north by Ilocos Norte, on the northeast by Abra, on the east by Mountain Province, on the southeast by Benguet, on the south by La Union, and on the west by Luzon Sea and Lingayen Gulf. Figure 3.1.1 presents the Location Map.

The province has a total land area of 2,579.60sq.km that is 0.85% of the Philippine total land area of about 300,000sq.km. It is composed of 34 municipalities. There are 767 barángays, of which 17% is urban and 83% rural. Provincial total population was 519,930 in 1990. About 76% of the population resided in rural areas, while the remaining 24% 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.

3.2 Natural Conditions and Geographical Features

3.2.1 Meteorology

The province has Type I climate under the Coronas classification. It is characterized by very pronounced seasons, dry from October to April, and wet the rest of the year as reflected in Figure 3.1.1, Location Map. Using the 30-year (1961-1990) rainfall records of the Vigan meteorological station, the average annual rainfall was registered at 2,484mm. Maximum rainfall was observed during August, while the minimum was experienced during February and March.

Mean annual air temperature is 27°C. The hottest months are April and May (28.7°C), while the coldest month is January (25.4°C). The province is situated between 17° and 18° north latitudes, which is considered as less visited area by typhoons.

3.2.2 Land Use

Forest area constitutes only 10% of the total land area of the province. Agricultural land comprises about 24% while Built-up area is limited to 4%. Most of the settlements are on the

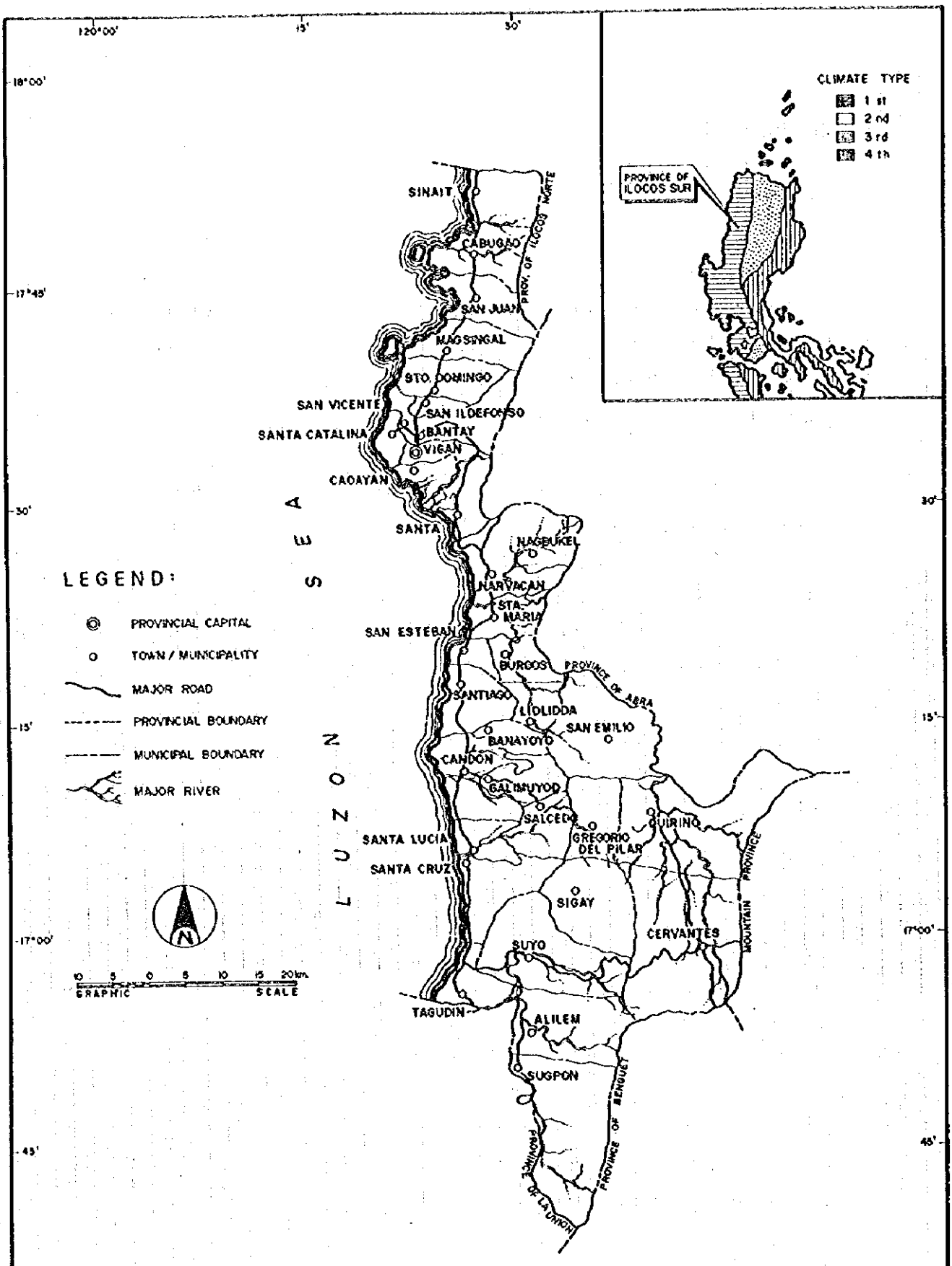


FIGURE 3.1.1

LOCATION MAP

PROVINCE OF ILOCOS SUR

Table 3.1.1 Outline of Municipalities

Municipality		Land Area (sq.km)	1990 Population		Number of Barangay		
Code	Name		Number	Density (persons/sq.km)	Urban	Rural	Total
012901	Alilem	156.20	5,314	34	1	8	9
012902	Banayoyo	31.20	5,864	188	1	13	14
012903	Bantay	76.60	26,024	340	4	30	34
012904	Burgos	44.30	9,601	217	2	24	26
012905	Cabugao	60.70	27,997	461	6	27	33
012906	Candon	76.90	43,473	565	5	37	42
012907	Caoayan	26.00	15,637	601	7	11	18
012908	Cervantes	230.70	12,476	54	2	11	13
012909	Galimuyod	34.40	7,941	231	1	23	24
012910	G. del Pilar	104.20	3,417	33	1	6	7
012911	Lidlidda	29.70	3,515	118	2	9	11
012912	Magsingal	85.00	22,271	262	6	24	30
012913	Nagbukel	34.90	3,806	109	0	12	12
012914	Narvacan	98.40	35,153	357	2	32	34
012915	Quirino	240.10	6,623	28	1	8	9
012916	Salcedo	23.40	9,397	402	2	19	21
012917	San Emilio	132.80	5,649	43	2	6	8
012918	San Esteban	23.40	6,327	270	1	9	10
012919	San Ildelfonso	17.20	4,528	263	2	13	15
012920	San Juan	52.10	20,328	390	4	28	32
012921	San Vicente	15.10	9,989	662	1	6	7
012922	Santa	51.60	12,570	244	4	22	26
012923	Santa Catalina	13.50	11,388	844	6	3	9
012924	Santa Cruz	101.60	28,764	283	7	42	49
012925	Santa Lucia	49.90	20,504	411	3	31	34
012926	Santa Maria	49.60	23,821	480	2	31	33
012927	Santiago	74.50	14,427	194	3	21	24
012928	Santo Domingo	57.80	20,720	358	3	33	36
012929	Sigay	114.60	1,964	17	0	7	7
012930	Sinait	80.70	21,779	270	4	40	44
012931	Sugpon	182.80	2,844	16	1	5	6
012932	Suyo	124.00	7,950	64	1	7	8
012933	Tagudin	58.30	29,295	502	5	38	43
012934	Vigan (Capital)	27.40	38,574	1,408	39	0	39
Provincial Total		2,579.60	519,930	202	131	636	767

western plain. Grassland, Openland, Wetland, Mangroves and Fishponds represent 62% 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	256.63	9.95
Agricultural	628.16	24.35
Built-up Area	108.31	4.20
Mangrove, Fishponds, In-land Water Areas, Grassland and Openlands	1,586.50	61.50
TOTAL	**2,579.60**	**100.00**

3.2.3 Topography and Drainage

The province is part of the Ilocos Coastal Plain that starts from Cape Bojeador on the north to the coast of Lingayen Gulf on the south. Its topography is flat to undulating on the western section , and mountainous area on the eastern part. This section forms part of the foot slope of the Luzon Central Cordillera. Elevation ranges from near sea level to 1,760m above mean sea level. The ridges of the mountains generally follow a north-south direction conformable with the major geologic lineaments in the region.

The natural drainage systems generally flow westward and empty into Luzon Sea. Major rivers are Abra, Sta. Maria, Buaya, Oaig Daya, Bucong, Narvacan, Amburayan and Cabugao. Most of the headwaters of these rivers are located in the adjacent provinces of Abra, Ilocos Norte, Benguet and La Union. Figure 3.2.1 shows the drainage systems of Ilocos Sur. 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: Abra and Santa Maria rivers. The results of the analysis showed that the rivers are turbid and have considerable amounts 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	
Abra River	01SW173202PW004	4,813	53.53	240.28	2,915.80	NONE
Sta Maria River	01SW171203PW009	123	0.116	1.31	30.45	NONE
Buaya River	01SW170203PW011	195	0.346	9.63	213.848	NONE

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

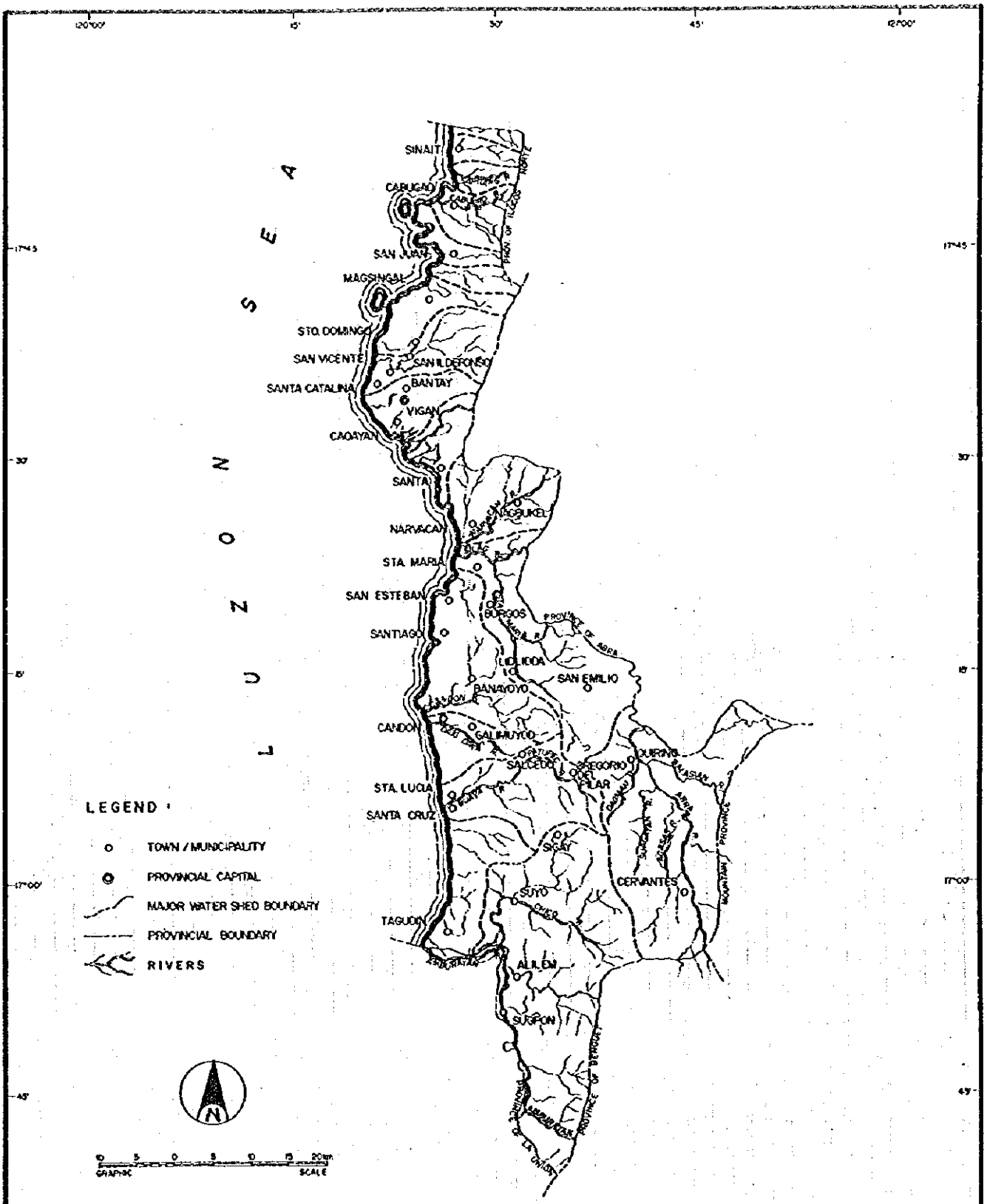


FIGURE 3.2.1
MAJOR RIVER NETWORKS
PROVINCE OF ILOCOS SUR

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, and tobacco. Fishing is also an important activity. The greater bulk of commercial activities is seen in Vigan. Tourism and cottage industry are also promising economic activities in the province.

The National Statistics Office (NSO) Family Income and Expenditures Survey in 1991 showed that the mean annual family income of the province was ₱ 30,576, while the median was at ₱ 39,050. 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 greater than 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 45%, followed by elementary occupations as indicated in Figure 3.3.2.

3.3.2 Basic Infrastructure

Electric supply and telecommunication service cover 82% and 47% of the municipalities, respectively. There are 40 post offices or stations in the province. Land transportation is available by means of jeepneys, minibuses and buses. The province has one secondary airport and 2 sea ports. There are 1,001 business establishments and 109 (rooms) 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 547 schools consisting of 464 elementary schools, 78 high schools and 5 colleges/vocational institutions. The 1990 NSO census indicated that the province had a 94% literacy of household population 10 years old and over. A large part of the population had attained elementary or high school levels of education as reflected in Figure 3.3.3 (refer to Table 3.3.3, Supporting Report).

Figure 3.3.1 Distribution of Households by Income Class

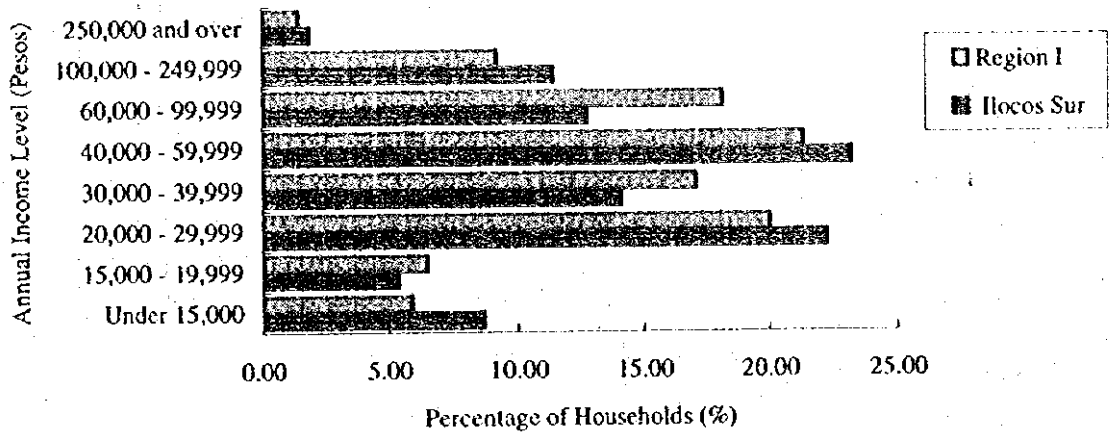


Figure 3.3.2 Population Distribution by Occupation

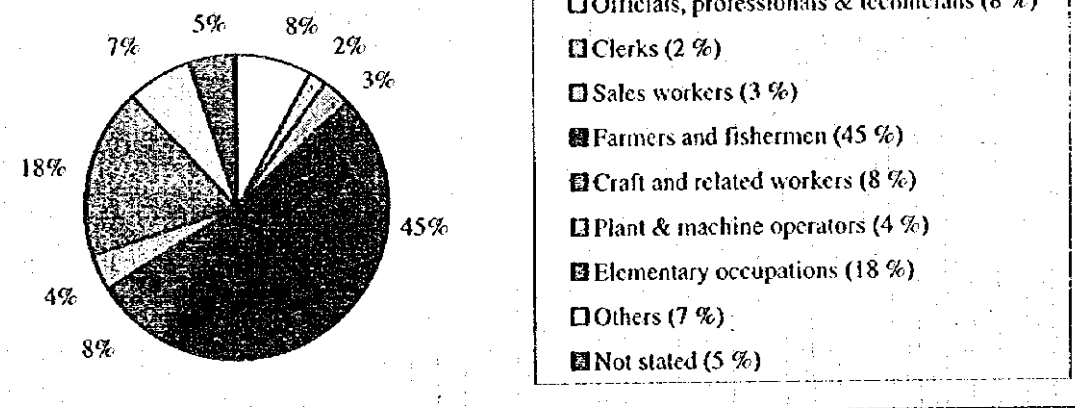


Figure 3.3.3 Population Distribution by Highest Attainment of Education

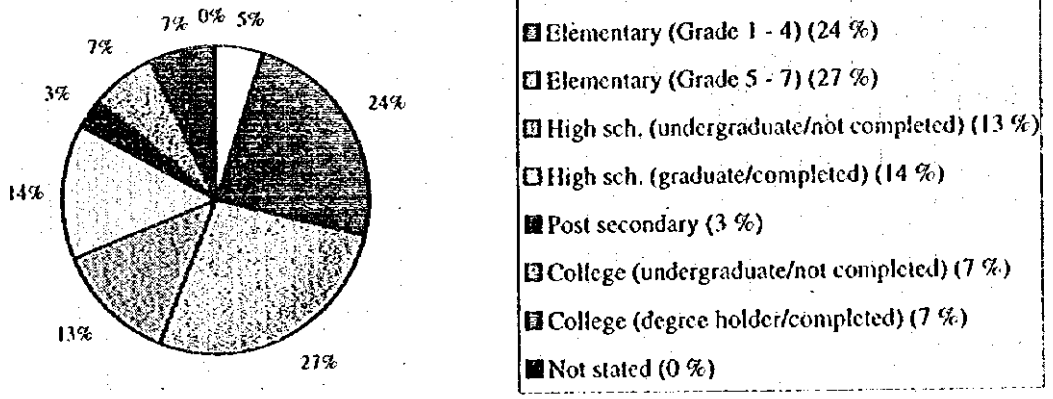


Table 3.3.1 Provincial Outline on Public Services

Items	Unit		Items	Unit	
(1) Roads			(8) Tourism Facilities	Number	109
a) Total Length	km	2,847	(Hotel resort, lodges, recreational		(rooms)
b) Barangay roads	Percent	69	facilities, etc.)		
(2) Electricity Service Coverage			(9) Schools		
a) Municipality	Percent	82	a) Elementary level	Number	464
b) Barangay	Percent	86	b) Secondary level	Number	78
c) Household	Percent	76	c) Tertiary level	Number	5
(3) Telecommunication Services			(10) Health Facilities		
a) Availability in municipality	Percent	47	a) Hospital/clinics	Number	23
b) Telegraph station	Number	29	b) Main health centers, rural health	Number	
c) Telephone station	Number	11	units, barangay health center, etc.		191
(4) Post Office	Number	40	(11) Labor		
(5) Transportation services	Mode	All modes	a) Labor force participation ratio	Percent	50.8
	(ex. Bus,	1-airport	b) Employment rate	Percent	88.4
	jeep, taxi)	2-seaports	(12) Average Family Income		
(6) Banking Facilities	Number	40	a) Monthly income	Pesos/Month	4,897
a) Private bank	(by Private		b) Monthly expenditure	Pesos/Month	4,144
b) Public bank	and public)				
(7) Industrial/Business/Commercial					
Establishment	Number	1,001			

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
Alilem	1	0	1	0	0	0	0	1.5
Banayoyo	1	0	1	0	0	0	0	1.5
Bantay	0	1	1	0	1	0	1	1.6
Burgos	1	1	2	0	0	0	0	1.4
Cabugao	1	1	2	0	2	1	1	1.4
Candon	4	1	5	1	2	1	9	1.7
Caoayan	2	0	2	0	0	0	0	1.1
Cervantes	1	1	2	0	1	1	0	2.6
Calimuyod	1	1	2	0	0	0	1	1.9
G. del Pilar	0	1	1	0	0	0	0	1.0
Lidlidda	1	0	1	0	0	0	0	2.5
Magsingal	1	2	3	0	1	1	1	1.5
Nagbukel	1	0	1	0	0	0	0	0.7
Narvacan	4	2	6	0	1	1	2	1.4
Quirino	1	1	2	0	0	1	0	2.3
Salcedo	2	1	3	0	1	1	0	1.2
San Emilio	1	1	2	0	0	0	0	2.5
San Esteban	1	1	2	0	0	0	1	1.4
San Idelfonso	1	0	1	0	0	1	0	2.2
San Juan	3	1	4	0	1	1	1	1.5
San Vicente	0	1	1	0	1	1	1	1.6
Santa	2	1	3	0	0	1	1	1.0
Santa Catalina	1	1	2	0	0	0	1	1.6
Santa Cruz	2	4	6	0	0	1	2	2.2
Santa Lucia	3	2	5	0	1	1	1	1.7
Santa Maria	1	1	2	2	1	1	1	1.1
Santiago	1	2	3	0	0	1	1	2.0
Santo Domingo	2	1	3	0	0	1	1	1.6
Sigay	0	0	0	0	0	0	0	1.2
Sinait	1	0	1	0	1	1	1	1.3
Suggon	1	0	1	0	0	0	0	-0.6
Suyo	1	0	1	0	0	0	1	2.1
Tagudin	1	1	2	0	1	1	1	2.3
Vigan	1	3	4	2	8	1	11	1.4
PROVINCIAL TOTAL	45	33	78	5	23	19	40	1.6

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 1.70% during the period 1948 to 1960, it decreased to 1.11% (1975-1980) and recovered to 1.60% (1980-1990). A summary of the average annual growth rates is as follows:

Year	Population	Ave. Annual Growth Rate (%)	Period
1960	338,058	1.70	1948 - 1960
1970	385,139	1.31	1960 - 1970
1975	419,776	1.74	1970 - 1975
1980	443,591	1.11	1975 - 1980
1990	519,930	1.60	1980 - 1990

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

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

3.4.2 Classification of Urban and Rural Areas

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

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

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

(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

Figure 3.4.1 Previous Population Development of the Province

Table 3.4.1 Previous Population Development by Municipality

Municipality	Previous Population						Est. Pop.
	1948	1960	1970	1975	1980	1990	1995
Alilem	3,049	3,594	4,145	4,409	4,599	5,314	5,718
Banayoyo	2,572	3,252	3,970	4,585	5,037	5,864	6,328
Bantay	12,714	15,833	19,164	20,666	22,282	26,024	28,135
Burgos	4,782	5,804	6,868	7,858	8,364	9,601	10,287
Cabugao	14,823	17,791	20,444	22,664	24,424	27,997	29,995
Candon	22,362	27,780	31,116	34,701	36,802	43,473	47,271
Caoayan	9,064	11,045	12,670	13,375	14,070	15,637	16,487
Cervantes	4,346	7,063	8,223	8,976	9,617	12,476	14,211
Galimuyod	3,418	4,670	5,288	6,281	6,576	7,941	8,728
G. del Pilar	1,819	2,164	2,657	2,950	3,080	3,417	3,599
Lidlidda	1,673	1,972	2,369	2,635	2,736	3,515	3,986
Magsingal	11,697	13,437	16,117	17,341	19,177	22,271	24,001
Nagbukel	2,345	2,874	2,978	3,226	3,539	3,806	3,948
Narvacan	22,237	26,872	26,962	28,516	30,682	35,153	37,637
Quirino	3,130	4,318	5,539	5,646	5,283	6,623	7,415
Salcedo	4,771	6,005	6,992	7,978	8,302	9,397	9,999
San Emilio	3,245	3,582	4,464	4,253	4,398	5,649	6,407
San Esteban	3,617	4,269	4,848	5,275	5,504	6,327	6,785
San Ildelfonso	2,034	2,601	3,400	3,249	3,640	4,528	5,070
San Juan	9,777	12,654	14,987	16,329	17,443	20,328	21,965
San Vicente	6,151	7,094	7,539	8,299	8,488	9,989	10,836
Santa	8,917	10,214	10,859	11,799	11,359	12,570	13,228
Santa Catalina	7,125	8,414	8,921	9,391	9,761	11,388	12,310
Santa Cruz	13,799	16,954	20,459	22,688	23,027	28,764	32,158
Santa Lucia	10,021	12,197	14,619	16,703	17,344	20,504	22,301
Santa Maria	13,637	16,313	18,819	19,857	21,308	23,821	25,187
Santiago	6,610	8,213	10,224	11,245	11,843	14,427	15,928
Santo Domingo	11,082	13,685	14,980	15,957	17,728	20,720	22,401
Sigay	1,571	1,371	1,475	1,571	1,741	1,964	2,086
Sinait	12,015	15,170	16,429	17,952	19,050	21,779	23,292
Sugpon	2,159	1,968	2,432	2,380	3,018	2,844	2,786
Suyo	3,012	4,704	5,355	6,163	6,454	7,950	8,837
Tagudin	15,637	18,191	19,575	22,887	23,432	29,295	32,804
Vigan (Capital)	21,067	25,990	30,252	31,971	33,483	38,574	41,403
Provincial Total	276,278	338,058	385,139	419,776	443,591	519,930	563,529

3) At least three of the following:
   a) a town hall, church or chapel with religious services at least once a month;
   b) a public plaza, park or cemetery;
   c) a market place or building where trading activities are carried on at least once a week; and
   d) a public building like school, hospital, puericulture and health center or library.

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

All areas not falling under the urban classification are defined as rural area. Distribution of the classified area is shown in Figure 3.4.1, Suporting 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 5 urban barangays was re-classified as rural, while 9 rural barangays to urban. With the re-classification, there are 135 urban barangays and 632 rural barangays for a total of 767 barangays in Ilocos Sur. This number includes the 5 newly created barangays: 3 (urban) in Caoayan, 1 (rural) in Narvacan and 1 (rural) in San Emilio.

3.4.3 Present Population Distribution

Utilizing the modified classification of the barangays, the urban-rural population was estimated. Rural population accounts for 77% of the provincial total, while 23% is urban as reflected in Figure 3.4.2. Table 3.4.2 presents the breakdown of the number of urban and rural barangays by municipality and its corresponding present population distribution.

There are 106,955 households with 76% residing in rural areas and 24% households in urban areas. The average provincial household size is 5.3 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
Number of Population
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Urban
Rural
Present Population
Name of Municipality
Allem
Banayoyo
Banay
Burgos
Cabugao
Candon
Caoayan
Cervantes
Galimuyod
G. del Pilar
Lidlidda
Magsingal
Nagbukel
Narvacan
Quirino
Salcedo
San Emilio
San Esteban
San Ildefonso
San Juan
San Vicente
Santa
Santa Catalina
Santa Cruz
Santa Lucia
Santa Maria
Santiago
Santo Domingo
Sigay
Sinait
Sugpon
Suyo
Tagudin
Vigan (Capital)

Figure 3.4.2 Present Population Distribution
(Urban - 23 %)

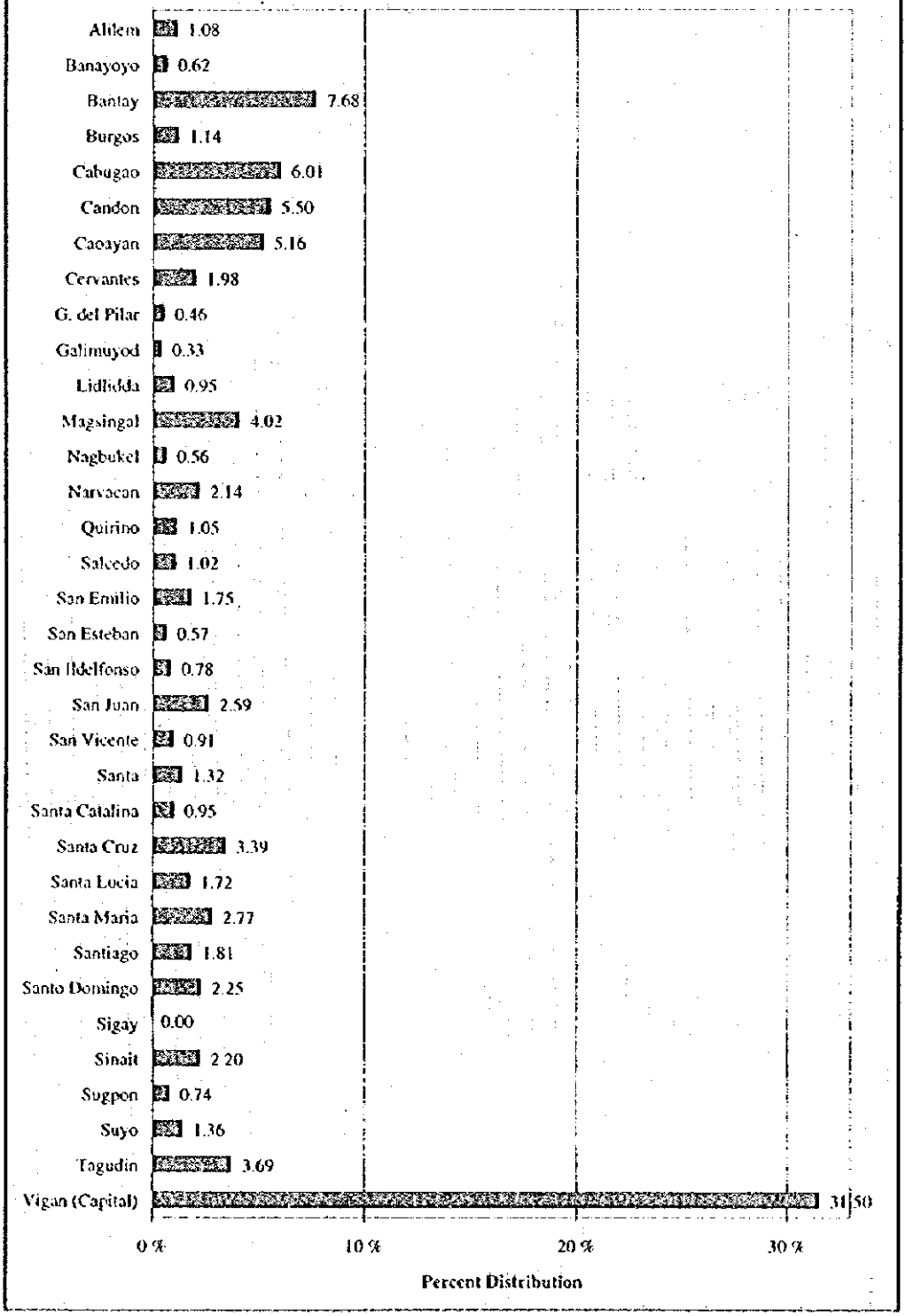


Figure 3.4.2 Present Population Distribution (Rural - 77 %)

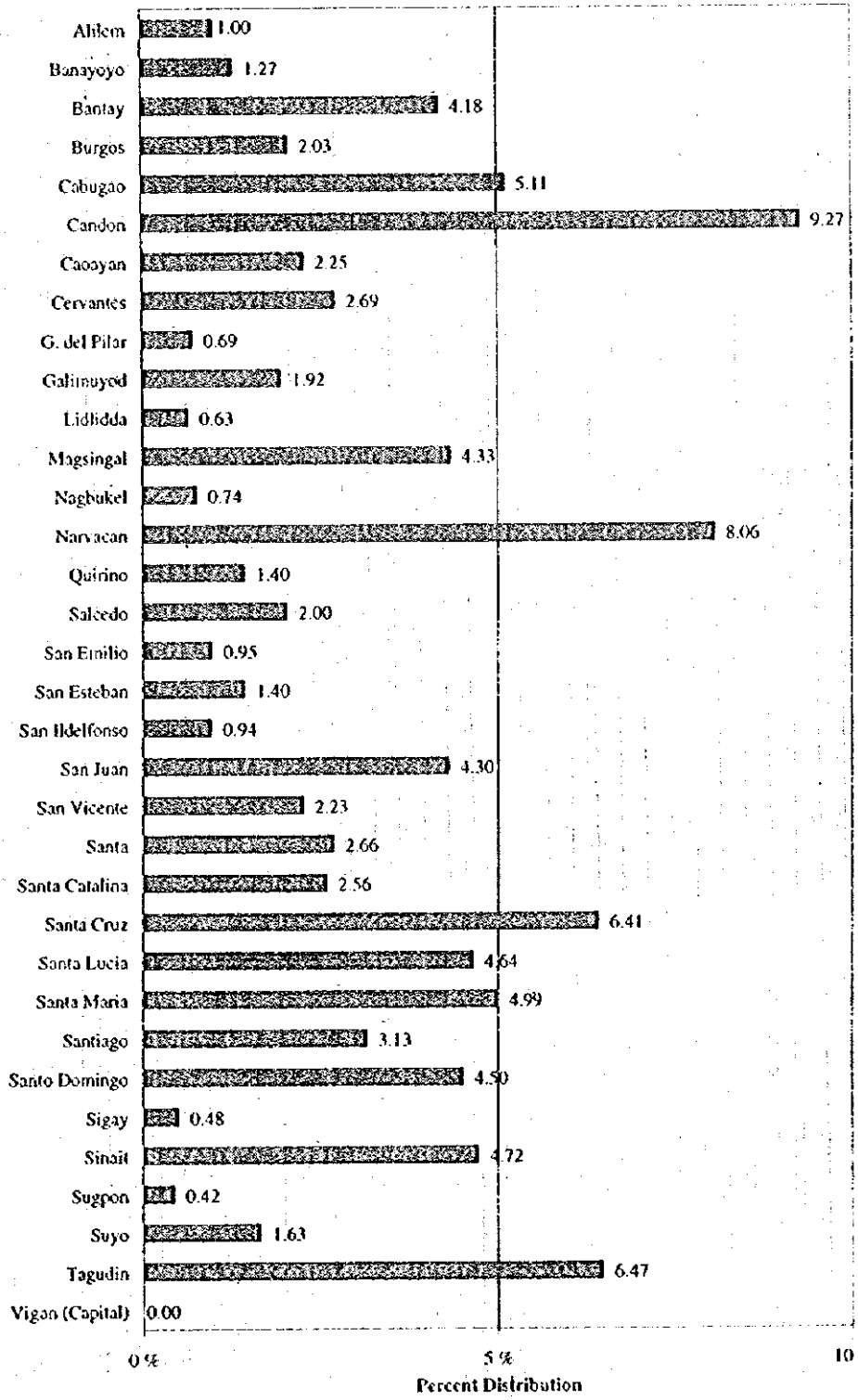


Table 3.4.2 Outline of Urban and Rural Areas in the Province

Municipality	Land Area (sq.km)	Number of Barangay			Est. Population (1995)		
		Urban	Rural	Total	Urban	Rural	Total
Alilem	156.20	1	8	9	1,411	4,307	5,718
Banayoyo	31.20	1	13	14	818	5,510	6,328
Bantay	76.60	9	25	34	10,098	18,037	28,135
Burgos	44.30	3	23	26	1,494	8,793	10,287
Cabugao	60.70	6	27	33	7,904	22,091	29,995
Candon	76.90	5	37	42	7,229	40,042	47,271
Caoayan	26.00	7	11	18	6,787	9,700	16,487
Cervantes	230.70	2	11	13	2,608	11,603	14,211
Galimuyod	34.40	1	23	24	430	8,298	8,728
G. del Pilar	104.20	1	6	7	607	2,992	3,599
Lidlidda	29.70	2	9	11	1,247	2,739	3,986
Magsingal	85.00	7	23	30	5,278	18,723	24,001
Nagbukel	34.90	2	10	12	732	3,216	3,948
Narvacan	98.40	2	32	34	2,816	34,821	37,637
Quirino	240.10	1	8	9	1,381	6,034	7,415
Salcedo	23.40	2	19	21	1,344	8,655	9,999
San Emilio	132.80	2	6	8	2,303	4,104	6,407
San Esteban	23.40	1	9	10	752	6,033	6,785
San Ildelfonso	17.20	2	13	15	1,024	4,046	5,070
San Juan	52.10	4	28	32	3,400	18,565	21,965
San Vicente	15.10	1	6	7	1,193	9,643	10,836
Santa	51.60	4	22	26	1,731	11,497	13,228
Santa Catalina	13.50	1	8	9	1,242	11,068	12,310
Santa Cruz	101.60	7	42	49	4,461	27,697	32,158
Santa Lucia	49.90	3	31	34	2,256	20,045	22,301
Santa Maria	49.60	2	31	33	3,644	21,543	25,187
Santiago	74.50	3	21	24	2,385	13,543	15,928
Santo Domingo	57.80	3	33	36	2,951	19,450	22,401
Sigay	114.60	0	7	7	0	2,086	2,086
Sinait	80.70	4	40	44	2,891	20,401	23,292
Sugpon	182.80	1	5	6	976	1,810	2,786
Suyo	124.00	1	7	8	1,790	7,047	8,837
Tagudin	58.30	5	38	43	4,853	27,951	32,804
Vigan (Capital)	27.40	39	0	39	41,403	0	41,403
Provincial Total	2,579.60	135	632	767	131,439	432,090	563,529

Table 3.4.3 Household Numbers and Household Sizes

Municipality	Number of Households (1995)			Household Size (person / HH)		
	Urban	Rural	Total	Urban	Rural	Total
Alilem	265	773	1,038	5.3	5.6	5.5
Banayoyo	163	991	1,154	5.0	5.6	5.5
Bantay	1,927	3,340	5,267	5.2	5.4	5.3
Burgos	295	1,678	1,973	5.1	5.2	5.2
Cabugao	1,568	4,152	5,720	5.0	5.3	5.2
Candon	1,398	7,484	8,882	5.2	5.4	5.3
Caoayan	1,344	1,895	3,239	5.0	5.1	5.1
Cervantes	454	2,145	2,599	5.7	5.4	5.5
Galimuyod	81	1,528	1,609	5.3	5.4	5.4
G. del Pilar	119	541	660	5.1	5.5	5.5
Lidlidda	245	519	764	5.1	5.3	5.2
Magsingal	1,082	3,539	4,621	4.9	5.3	5.2
Nagbukel	143	624	767	5.1	5.2	5.1
Narvacan	542	6,801	7,343	5.2	5.1	5.1
Quirino	269	1,132	1,401	5.1	5.3	5.3
Salcedo	273	1,707	1,980	4.9	5.1	5.1
San Emilio	416	766	1,182	5.5	5.4	5.4
San Esteban	148	1,221	1,369	5.1	4.9	5.0
San Ildefonso	198	753	951	5.2	5.4	5.3
San Juan	707	3,612	4,319	4.8	5.1	5.1
San Vicente	219	1,913	2,132	5.4	5.0	5.1
Santa	363	2,194	2,557	4.8	5.2	5.2
Santa Catalina	233	2,031	2,264	5.3	5.4	5.4
Santa Cruz	868	5,101	5,969	5.1	5.4	5.4
Santa Lucia	431	3,651	4,082	5.2	5.5	5.5
Santa Maria	732	4,175	4,907	5.0	5.2	5.1
Santiago	442	2,485	2,927	5.4	5.4	5.4
Santo Domingo	577	3,705	4,282	5.1	5.2	5.2
Sigay	0	361	361	0.0	5.8	5.8
Sinait	561	4,250	4,811	5.2	4.8	4.8
Sugpon	192	323	515	5.1	5.6	5.4
Suyo	309	1,335	1,644	5.8	5.3	5.4
Tagudin	889	5,009	5,898	5.5	5.6	5.6
Vigan (Capital)	7,768	0	7,768	5.3	0.0	5.3
Provincial Total	25,221	81,734	106,955	5.2	5.3	5.3

3.5 Health Status

3.5.1 Morbidity, Mortality and Infant Mortality

The number one cause of morbidity was diarrhea, followed by bronchitis and influenza. Tuberculosis and pneumonia ranked fourth and fifth, respectively. Other causes of morbidity in descending order were: heart diseases, intestinal parasitism, urinary infections, anemias and nutritional deficiencies. Regarding mortality, the number one cause was heart diseases, followed by malignant neoplasms. Pneumonia and suffocation of foreign body ranked third and fourth, respectively. Other causes include tuberculosis, nutritional deficiencies and vascular diseases. Respiratory fetus/newborn, prematurity and filariasis 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 Sur 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).

Water-related diseases in the ten leading causes of morbidity include diarrhea (rank 1st) and intestinal parasitism (7th). Filariasis ranked 3rd as the leading causes of infant mortality.

3.5.2 Water Related Diseases

An indicator of health problems related to water supply and sanitation is the incidence of water-related diseases. The World Health Organization (WHO) has classified diseases related to water into four (4) categories: 1) water-borne diseases e.g., cholera, typhoid, hepatitis A, diarrhea and dysentery; 2) water-based diseases e.g., schistosomiasis; 3) water-washed diseases e.g., diarrhea, intestinal 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, dysentery, intestinal parasitism, diarrhea, cholera, dengue fever, viral hepatitis, skin diseases, scabies, filariasis and malaria. Table 3.5.2 presents the reported cases and deaths of notifiable water-related diseases in the province.

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

Rate: 1/100,000

	Causes	Ilocos Sur		Philippines		
		Number	Rate	Number	Rate	Ranking
Morbidity	1. Diarrhea	5,369	952.75	894,116	1,487.8	2
	2. Bronchitis	3,802	674.68	951,305	1,583.1	1
	3. Influenza	3,124	554.36	694,956	1,156.4	5
	4. Tuberculosis	1,468	260.50	208,436	346.8	9
	5. Pneumonia	1,405	249.32	204,959	341.1	7
	6. Heart Diseases	1,243	220.57	-	-	-
	7. Intestinal Parasitism	300	53.24	245,827	409.1	6
	8. Urinary Infections	293	51.99	-	-	-
	9. Anemias	290	51.46	-	-	-
	10. Nutritional Deficiencies	253	44.90	206164	343.1	8
Mortality	1. Heart Diseases	41	7.28	33,917	56.4	2
	2. Malignant Neoplasms	36	6.39	14,723	24.5	6
	3. Pneumonia	34	6.03	50,609	84.2	1
	4. Suffoc. Foreign Body	24	4.26	-	-	-
	5. Tuberculosis	20	3.55	20,949	34.9	4
	6. Nutritional Deficiencies	16	2.84	1,897	3.2	9
	7. Vascular Diseases	11	1.95	26,436	43.9	3
	8. Tetanus	9	1.60	-	-	-
	9. Leukemia	8	1.42	-	-	-
	10. Anemias	6	1	-	-	-
Infant Mortality	1. Resp. Fetus/Newborn	38	6.74	1,167	-	6
	2. Prematurity	10	1.77	4,786	-	2
	3. Filariasis	6	1.06	-	-	-
	4. Congenital Anomalies	2	0.35	1,705	-	5
	5. Nervous System	2	0.35	-	-	-
	6. Birth Injuries & Difficult Labor	2	0.35	-	-	-
	7. Other Prenatal Causes	1	0.18	-	-	-
	8. Leukemia	1	0.18	-	-	-
	9. Vascular Diseases	1	0.18	-	-	-
	10. Birth Trauma	1	0.18	-	-	-

Table 3.5.2 Reported Cases and Deaths of Notifiable Water Related Diseases

Rate: 1/100,000

Diseases	Morbidity		Mortality		Infant Mortality	
	Number	Rate	Number	Rate	Number	Rate
Water-borne						
1. Typhoid/Parathyphoid	205	36.38	1	0.18	0	0.00
2. Viral Hepatitis	52	9.23	1	0.18	0	0.00
3. Diarrhea	5,369	952.75	0	0.00	0	0.00
4. Dysentery	21	3.73	0	0.00	0	0.00
5. Cholera	12	2.13	0	0.00	0	0.00
6. Gastroent. Colitis	75	13.31	0	0.00	0	0.00
Water-washed						
1. Intestinal Parasitism	300	53.24	0	0.00	0	0.00
2. Scabies	39	6.92	0	0.00	0	0.00
3. Conjunctivities	1,468	260.50	20	3.55	0	0.00
4. Skin Diseases	46	8.16	0	0.00	0	0.00
Water vector						
1. Malaria	19	3.37	2	0.35	0	0.00
2. Dengue Fever	18	3.19	0	0.00	0	0.00
3. Filariasis	6	1.06	0	0.00	6	1.06

3.5.3 Health Facilities and Practitioners

Present facilities servicing the health care of the population are 23 hospitals, 34 rural health units and 157 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

Except for Vigan which has an obsolete sewerage system (built in 1914 and therefore has already exceeded its service life), there are no sewerage systems in other urban areas of the province. Majority of the drainage facilities 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 the province 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.

There are no large manufacturing establishments in Ilocos Sur that are identified as water pollutive industries. 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 34 municipalities, 28 have no municipal refuse collection and disposal service. The 6 municipalities with service have 1 to 4 units of open dump truck. In the province, only 5% of the households is served, while majority (95%) 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		
Alitem	1,038	0	0	0	0	0	0	803	235	0	1,038	0	100
Banayoyo	1,154	0	0	0	0	0	0	934	220	0	1,154	0	100
Bantay	5,267	1	0	1	0	0	0	2,203	3,064	0	5,267	0	100
Burgos	1,973	0	0	0	0	0	0	251	1,416	306	1,973	0	100
Cabugao	5,720	0	0	0	0	0	0	3,293	1,891	536	5,720	0	100
Candon	8,882	0	1	1	0	0	0	2,049	6,265	568	8,882	0	100
Caoayan	3,239	0	0	0	0	0	0	1,456	1,783	0	3,239	0	100
Cervantes	2,599	0	0	0	0	0	0	1,878	721	0	2,599	0	100
Galimuyod	1,609	0	0	0	0	0	0	196	472	941	1,609	0	100
G. del Pilar	660	0	0	0	0	0	0	660	0	0	660	0	100
Lidlidda	764	0	0	0	0	0	0	367	319	78	764	0	100
Magsingal	4,621	0	0	0	0	0	0	689	3,867	65	4,621	0	100
Nagbukel	767	0	0	0	0	0	0	158	482	127	767	0	100
Narvacan	7,343	0	0	0	0	0	0	868	6,268	207	7,343	0	100
Quirino	1,401	0	0	0	0	0	0	495	513	393	1,401	0	100
Salcedo	1,980	0	0	0	0	0	0	480	1,232	268	1,980	0	100
San Emilio	1,182	0	0	0	0	0	0	927	39	216	1,182	0	100
San Esteban	1,369	0	0	0	0	0	0	279	955	135	1,369	0	100
San Ildelfonso	951	0	0	0	0	0	0	410	473	68	951	0	100
San Juan	4,319	0	0	0	0	0	0	2,669	1,526	124	4,319	0	100
San Vicente	2,132	0	0	0	0	0	0	1,443	689	0	2,132	0	100
Santa	2,557	0	0	0	0	0	0	1,782	708	67	2,557	0	100
Santa Catalina	2,264	0	0	0	0	0	0	458	1,806	0	2,264	0	100
Santa Cruz	5,969	0	0	0	0	0	0	2,279	3,150	540	5,969	0	100
Santa Lucia	4,082	1	0	1	331	0	331	932	2,017	802	3,751	8	92
Santa Maria	4,907	1	0	1	696	0	696	788	3,347	76	4,211	14	86
Santiago	2,927	1	0	1	1,407	0	1,407	697	473	350	1,520	48	52
Santo Domingo	4,282	0	0	0	0	0	0	324	0	3958	4,282	0	100
Sigay	361	0	0	0	0	0	0	115	126	120	361	0	100
Sinait	4,811	0	0	0	0	0	0	2,788	1,792	231	4,811	0	100
Sugpon	515	0	0	0	0	0	0	369	21	125	515	0	100
Suyo	1,644	0	0	0	0	0	0	672	671	301	1,644	0	100
Tagudin	5,898	0	0	0	0	0	0	1,328	4,411	159	5,898	0	100
Vigan (Capital)	7,768	3	1	4	2,330	529	2,859	0	4,909	0	4,909	37	63
Provincial Total	106,955	7	2	9	4,764	529	5,293	35,040	55,861	10,761	101,662	5	95

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 69% of the present population (of which 24% in urban area and 76% in rural area) is considered as adequately served (refer to detailed study in Supporting Report). Under the area classification, 72% of urban population and 69% of rural population have access to safe water sources/facilities, while the rest is underserved and/or unserved. About 345,400 persons or 88% of the served population depend on Level I facilities, while 46,100 persons or 12% are served by Level III and/or Level II systems.

4.1.2 Types of Facilities and Definition of Service Level Standard

(1) Composition of water supply system/facility

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

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

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

(2) Safe and unsafe classification of water sources

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

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

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

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

(3) Service level standard

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

Level III: 1 household/connection

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

Level I: 15 households/point source
1 household/private well

4.1.3 Level III Systems

Level III 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 13 Level III systems in the province being operated under different kinds of ownership (authority or association) as shown in Table 4.1.2. These are:

- Water Districts in the municipalities of Vigan (including Bantay and Caoayan), Narvacan, Santa, Santa Lucia and Tagudin.
- Municipal waterworks in Cabugao, Santiago, Santo Domingo and Sinait, and
- Barangay waterworks for Alfonso, Dapdapig and Concepcion in G. del Pilar municipality and Nalvo in Santa Maria municipality.

The largest system in the province is the Metro Vigan WD covering 12 urban barangays of Vigan, 6 urban and 9 rural barangays of Bantay, and 7 urban and 2 rural barangays of Caoayan in provision of 1 spring source for Vigan and each 1 deep well source for Bantay and Caoayan. WDs in the other 4 municipalities serve mainly for urban barangays extended to their neighboring rural barangays, while small scale systems being operated by municipality or barangay are catering to a limited number of barangays.

Major water sources of these systems are deep 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 93% of service connections are provided for domestic use affected by commercial use in Vigan, otherwise almost 100% are domestic service. Water consumption of some municipalities in Table 4.1.2 was estimated in use of 100 lpcd due to absence of data. Per capita consumption rate ranges from 104 liters/day in Sinait to 135 liters/day in Narvacan WD.

Average collection efficiency of reported WDs is about 80% ranging from 95% at Tagudin WD to 65% at Santa Lucia WD, while an average percentage of accounted-for water to the water production is about 63% varying from 83% at Santa Lucia WD to 46% at Metro

Table 4.1.2 Information on Existing Level III Systems

Municipality	Name of System (Operating Body)	Water Source and Consumption			Service Coverage						
		Type of Water Source[1]	Water Consumption (cu. m/day)[2]	Domestic Supply (%)	Number of Barangays Served			Number of HHs/Pop. Served			
					Urban	Rural	Total	HHs Pop.	Urban	Rural	Total
Bantay	Metro Vigan W.D.	SP	Included in Vigan	94	6	9	15	HHs	230	520	750
								Pop.	1,150	3,750	4,900
Cabugao	Cabugao Waterworks System	SP	* 256	100	5	11	16	HHs	970	342	1,312
								Pop.	850	1,710	2,560
Caoayan	Metro Vigan W.D.	DW	Included in Vigan	91	7	2	9	HHs	214	126	340
								Pop.	630	1,700	2,330
G. del Pilar	Barangay Alfonso W.S	SP	* 54	100	0	1	1	HHs	0	108	108
								Pop.	0	540	540
	Barangay Dapdapig W.S	SP	* 26	100	1	0	1	HHs	120	52	172
								Pop.	600	260	860
	Barangay Concepcion W.S	SP	* 60	100	0	1	1	HHs	0	0	0
								Pop.	0	0	0
	Municipal Total		* 140	100	1	2	3	HHs	120	160	280
								Pop.	600	800	1,400
Narvacan	Narvacan W.D.	DW	114	61	2	0	2	HHs	168	0	168
								Pop.	874	0	874
Santa	Santa D.W.	SP	260	100	4	5	9	HHs	151	19	170
								Pop.	755	95	850
Santa Lucia	Santa Lucia W.D.	SW	365.5	97	3	2	5	HHs	184	129	313
								Pop.	920	645	1,565
Santa Maria	Nalvo Water System	DW	* 25	100	0	1	1	HHs	0	50	50
								Pop.	0	250	250
Santiago	Santiago Water System	DW	110	64	2	0	2	HHs	67	0	67
								Pop.	335	0	335
Santo Domingo	Sto. Domingo Water System	SP	* 4	100	1	1	2	HHs	5	2	7
								Pop.	25	10	35
Sinait	Sinait Waterworks	DW	103	100	4	0	4	HHs	199	0	199
								Pop.	995	0	995
Tagudin	Tagudin W.D.	DW	581.3	38	5	18	23	HHs	532	511	1,043
								Pop.	2,660	2,555	5,215
Vigan (Capital)	Metro Vigan W.D.	DW	1,586	77	12	0	12	HHs	1,260	0	1,260
								Pop.	6,300	0	6,300
Provincial Total			3,684.3	86	52	51	103	HHs	4,100	1,859	5,959
								Pop.	16,094	11,515	27,609

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

2. *100 lpcd is assumed for those waterworks system where no data available.

Vigan WD. The lower percentage of the accounted-for water at Metro Vigan WD indicates the need to scrutinize wastage, illegal connection, and leakage of transmission/distribution facilities for improvement of its O&M.

Table 4.1.3 Information on Water Districts

Name of Water District	Number of Connections						Water Production (cu.m/mo.)	Accounted for Water	
	Domestic	Com'l.	Inst.	Ind'l.	Total	Metered		Volume (cu. m/month)	Ave. Collection Efficiency (%)
Metro Vigan W.D	2,350	185	0	6	2,541	2,541	102,899	47,566	84
Narvacan W.D	168	4	1	0	173	173	18,000	N.A.	89
Santa W.D	170	0	0	0	170	170	25,920	N.A.	N.A.
Santa Lucia W.D	313	8	2	0	323	323	13,260	10,965	65
Tagudin W.D	1,043	103	0	0	1,146	1,146	30,000	17,440	95

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 28 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 in Quirino (1 urban and 6 rural barangays), San Juan (4 rural barangays), Sigay (7 rural barangays) and Sugpon (1 urban and 5 rural barangays)
- 6 barangay waterworks in Burgos
- 4 barangay waterworks in Santa Cruz
- 7 barangay waterworks in Suyo
- 1 barangay waterworks each in Candon, G. del Pilar, Nagbukel, Narvacan, Santa Lucia, Santo Domingo and Tagudin

All Level II systems using spring sources are reported to have been providing potable water throughout the day, although no disinfection is provided. The collection efficiency of water bill is not answered by any system to the questionnaires.

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

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
Burgos	Brgy. Balugang W.S	SP	2	0	1	1	0	40	40	0	200	200
	Brgy. Bessang W.S	SP	2	0	1	1	0	25	25	0	125	125
	Brgy. Mapanit W.S	SP	2	0	1	1	0	45	45	0	225	225
	Brgy. Taliao	SP	1	0	1	1	0	40	40	0	200	200
	Brgy. Lubing W.S	SP	1	0	1	1	0	15	15	0	75	75
	Brgy. Manaboc W.S	SP	1	0	1	1	0	30	30	0	150	150
	Municipal Total		9	0	6	6	0	195	195	0	975	975
Candon	Brgy. Bugnay	SP	1	0	1	1	0	110	110	0	550	550
G. del Pilar	Brgy. Matue-Butaray	SP	2	0	1	1	0	110	110	0	550	550
Nagbukel	Brgy. Taleb	SP	1	0	1	1	0	10	10	0	50	50
Narvacan	Brgy. Marozo	SP	1	0	1	1	0	90	90	0	450	450
Quirino	Municipal W.S	SP	14	1	6	7	200	420	620	1,020	2,226	3,246
San Esteban	Poblacion W.S.	DW	1	1	0	1	50	0	50	255	0	255
	Brgy. Villa Quirino	DW	1	0	1	1	0	30	30	0	149	149
	Municipal Total		2	1	1	2	50	30	80	255	149	404
San Juan	San Juan Waterworks	SP	1	0	4	4	0	65	65	0	325	325
Santa	Barasibis W.S.	SP	1	0	1	1	0	60	60	0	312	312
	Banari W.S.	SP/DW	1/1	0	1	1	0	35	35	0	182	182
	Municipal Total		3	0	2	2	0	95	95	0	494	494
Santa Cruz	Brgy. Paratong W.S	SP	1	0	1	1	0	30	30	0	150	150
	Brgy. Bugbuga W.S	SP	1	0	1	1	0	65	65	0	325	325
	Brgy. Daligan W.S	SP	1	0	1	1	0	25	25	0	125	125
	Brgy. Pidpid W.S	SP	1	0	1	1	0	95	95	0	475	475
	Municipal Total		4	0	4	4	0	215	215	0	1,075	1,075
Santa Lucia	Barangay W.S	SP	1	0	2	2	0	25	25	0	125	125
Santo Domingo	Brgy. Lussoc	SP	1	0	1	1	0	25	25	0	125	125
Sigay	Municipal W.S	SP	7	0	7	7	0	325	325	0	1,625	1,625
Sugpon	Municipal W.S	SP	9	1	5	6	45	235	280	225	1,175	1,400
Suyo	Brgy. Poblacion W.S	SP	1	0	1	1	0	190	190	0	950	950
	Brgy. Urdazan W.S	SP	1	0	1	1	0	150	150	0	750	750
	Brgy. Man-Atong W.S	SP	5	0	1	1	0	260	260	0	1,300	1,300
	Brgy. Cabugao W.S	SP	1	0	1	1	0	85	85	0	425	425
	Brgy. Patoc-Ao W.S	SP	5	1	0	1	225	0	225	1,275	0	1,275
	Brgy. Uso W.S	SP	2	0	1	1	0	90	90	0	450	450
	Brgy. Baringeucurong W.S	SP	1	0	1	1	0	165	165	0	825	825
	Municipal Total		16	1	6	7	225	940	1,165	1,275	4,700	5,975
Tagudin	Barangay W.S	SP	3	0	3	3	0	135	135	0	675	675
	Provincial Total		74	4	51	55	520	3,025	3,545	2,775	15,269	18,044

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

(1) Management practice

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

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

(2) Technical skill for O&M of facilities

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

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

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

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). Served population in 1995 is also estimated as shown in the same table.

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
Alilem	0	21	0	15	36	10	0	0	0	10	171	315	486	905	1,758	2,663
Banayoyo	0	563	0	0	563	93	15	0	0	108	137	827	964	685	4,629	5,314
Bantay	32	777	36	0	845	445	0	0	0	445	1,143	1,725	2,868	5,945	9,311	15,256
Burgos	13	486	0	6	505	310	0	0	0	310	176	916	1,092	899	4,763	5,662
Cabugao	14	207	30	3	254	64	32	0	0	96	848	2,770	3,618	4,236	14,679	18,915
Candon	31	1,442	25	3	1,501	869	11	0	0	880	877	4,592	5,469	4,560	24,796	29,356
Caoayan	0	451	4	0	455	304	117	0	0	421	676	818	1,494	3,379	4,167	7,546
Cervantes	0	10	23	30	63	5	1	0	0	6	327	1,678	2,005	1,863	9,063	10,926
Galimuyod	45	198	0	6	249	41	3	0	2	46	71	1,303	1,374	375	7,036	7,411
G. del Pilar	0	1	0	11	12	1	0	0	1	2	0	256	256	0	1,407	1,407
Lidlidda	69	0	0	11	80	0	0	0	1	1	221	463	684	1,129	2,454	3,583
Magsingal	7	1,104	43	0	1,154	409	13	0	0	422	798	2,589	3,387	3,908	13,719	17,627
Nagbukel	20	234	0	2	256	156	1	0	3	160	92	362	454	469	1,880	2,349
Narvacan	0	2,659	19	0	2,678	2,159	0	0	0	2,159	200	3,597	3,797	1,040	18,344	19,384
Quirino	0	0	0	0	0	0	0	0	12	12	0	0	0	0	0	0
Salcedo	4	136	0	14	154	44	5	0	0	49	212	1,303	1,515	1,036	6,644	7,680
San Emilio	6	5	0	13	24	3	0	0	0	3	390	660	1,050	2,141	3,563	5,704
San Esteban	2	500	0	0	502	277	5	0	0	282	63	769	832	318	3,770	4,088
San Ildefonso	3	274	1	0	278	62	12	0	0	74	154	576	730	802	3,110	3,912
San Juan	12	919	17	0	948	305	0	0	3	308	538	2,689	3,227	2,582	13,712	16,294
San Vicente	0	408	0	0	408	183	24	0	0	207	142	1,288	1,430	763	6,440	7,203
Santa	12	280	0	0	292	180	0	0	0	180	126	1,307	1,433	606	6,792	7,398
Santa Catalina	0	559	10	0	569	204	1	0	0	205	178	1,501	1,679	941	8,101	9,042
Santa Cruz	3	1,059	2	2	1,066	454	10	0	0	464	603	3,416	4,019	3,075	18,448	21,523
Santa Lucia	0	450	6	2	458	225	2	0	0	227	173	2,350	2,523	896	12,923	13,819
Santa Maria	20	934	3	0	957	829	5	0	0	834	390	2,165	2,555	1,947	11,258	13,205
Santiago	53	636	21	2	712	289	9	0	3	301	252	1,767	2,019	1,361	9,539	10,900
Santo Domingo	0	1,242	8	0	1,250	309	3	0	0	312	459	2,920	3,379	2,343	15,179	17,522
Sigay	0	0	4	0	4	0	0	0	0	0	0	78	78	0	455	455
Sinait	1	1,230	5	0	1,236	613	5	0	0	618	238	2,789	3,027	1,236	13,389	14,625
Sugpon	3	12	0	0	15	7	0	0	6	13	135	6	141	690	0	690
Suyo	0	90	0	17	107	22	0	0	5	27	0	55	55	0	294	294
Tagudin	16	1,009	16	0	1,041	291	0	0	0	291	304	3,335	3,639	1,674	18,679	20,353
Vigan (Capital)	8	703	15	0	726	365	0	0	0	365	4,397	0	4,397	23,300	0	23,300
Provincial Total	374	18,599	288	137	19,398	9,528	274	0	36	9,838	14,491	51,185	65,676	75,104	270,302	345,406

Of the operational Level I facilities (total of 29,236 facilities), more than 96% are shallow wells. According to the PHO water quality analysis results, about 35% of Level I facilities is determined to be unsafe as the provincial average of random samples (0 to 47% on a municipal level). All deep wells were regarded as safe water sources. In application of the unsafe percentage to shallow wells for each municipality, 19,398 Level I facilities are classified as safe sources, while 9,838 facilities are under unsafe sources.

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

(1) Unsafe water sources

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

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

(2) Non-functioning/abandoned wells

There are a lot of non-functioning public and private wells in the province as shown in Table 4.1.6.

Table 4.1.6 Operating Status of Existing Wells in the Province

Operating Status	Unit	Public Facility		Private Facility		Total
		Deep Well	Shallow Well	Deep Well	Shallow Well	
Functioning	No.	256	3263	104	24,786	28,409
	Percent	64	75	85	95	92
Non-Functioning	No.	146	1,108	19	1,192	2,465
	Percent	36	25	15	5	8
Total Number		402	4,371	123	25,978	30,874

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

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

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

4.1.6 Water Supply Service Coverage

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

The present population of the municipalities as of 1995, base year for planning purpose, was estimated using 1990 population census data and annual growth rate between census period of 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 2 to 10 households/facility in most of the municipalities 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, 69% of the population is adequately served both in urban and rural areas. The percentage of underserved population is calculated at 31% of the total population (28% of urban population and 31% of rural population) who are depending on 9,838 unsafe sources/facilities. The provincial service coverage at present is exhibited in Figures 4.1.1 and 4.1.2 (details are referred to Supporting Report).

Among different service levels, Level I water supply facility has a predominant service coverage over 29 municipalities out of 34 municipalities in the province. Level III systems take major part of service coverage in urban water supply for municipalities of G. del Pilar (99% of urban population), Santa (44%), Santa Lucia (41%) and Tagudin (55%). Metro Vigan W.D., the largest water supply system in the province, caters to only 15% of urban population of Vigan, while 56% of population depends on Level I facilities. Level II systems play majority of service coverage in Quirino (74% of urban population), Sigay (78% of total population), Sugpon (65% of rural population) and Suyo (71% of urban and 67% of rural population).

As a whole, Sigay has almost 100% of service coverage in the municipality (no urban area), while Quirino has only 18% of total population (33% in urban area and 15% in rural area). Low service coverage in Quirino, an upland municipality, is assumed to be caused by the presence of non-reported Level I facilities.

Among 34 municipalities in the province, 22 municipalities are above the provincial average of service coverage (69%). The highest coverage is seen in Sigay at almost 100%, wherein 2,080 persons out of the total 2,086 residing in rural barangays are served by Level II systems and Level I facilities (no urban area in the municipality). Following Sigay are G. del Pilar (93%), Lidlidda (90%), San Emilio (89%) and Banayoyo (84%). Vigan's service coverage is 71%, close to the provincial average.

In contrast to the above, 12 municipalities are below the provincial average. The lowest is Quirino at 44%, followed by Alilem (47%), Santa Maria (53%) and Narvacan (55%). Quirino, situated on the mountainous area, is being served by municipal Level II systems covering 1 urban and 6 barangays with 14 spring sources. There seems to be non-reported households utilizing Level II systems and/or considerable number of non-reported/unidentified Level I facilities.

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[1]				Underserved/Unserved		
			Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total	Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total
Alilem	Urban	1,411	0	0	905	905	362	144	506	0	0	64	64	25	11	36
	Rural	4,307	0	0	1,758	1,758	448	2,101	2,549	0	0	41	41	10	49	59
	Total	5,718	0	0	2,663	2,663	810	2,245	3,055	0	0	47	47	14	39	53
Banayoyo	Urban	818	0	0	685	685	133	0	133	0	0	84	84	16	0	16
	Rural	5,510	0	0	4,629	4,629	881	0	881	0	0	84	84	15	1	16
	Total	6,328	0	0	5,314	5,314	1,014	0	1,014	0	0	84	84	16	0	16
Bantay	Urban	10,098	1,150	0	5,945	7,095	2,998	5	3,003	11	0	59	70	29	1	30
	Rural	18,037	3,750	0	9,311	13,061	4,879	97	4,976	21	0	52	72	27	1	28
	Total	28,135	4,900	0	15,256	20,156	7,877	102	7,979	17	0	54	72	27	1	28
Burgos	Urban	1,494	0	0	899	899	585	10	595	0	0	60	60	39	1	40
	Rural	8,793	0	975	4,763	5,738	2,877	178	3,055	0	11	54	65	32	3	35
	Total	10,287	0	975	5,662	6,637	3,462	188	3,650	0	9	55	65	33	2	35
Cabugao	Urban	7,904	850	0	4,236	5,086	2,621	197	2,818	11	0	54	64	33	3	36
	Rural	22,091	1,710	0	14,679	16,389	4,978	724	5,702	8	0	66	74	22	4	26
	Total	29,995	2,560	0	18,915	21,475	7,599	921	8,520	9	0	63	72	25	3	28
Candon	Urban	7,229	0	0	4,560	4,560	2,653	16	2,669	0	0	63	63	36	1	37
	Rural	40,042	0	550	24,796	25,346	14,428	268	14,696	0	1	62	63	36	1	37
	Total	47,271	0	550	29,356	29,906	17,081	284	17,365	0	1	62	63	36	1	37
Caoayan	Urban	6,787	630	0	3,379	4,009	2,778	0	2,778	9	0	50	59	40	1	41
	Rural	9,700	1,700	0	4,167	5,867	3,833	0	3,833	18	0	43	60	39	1	40
	Total	16,487	2,330	0	7,546	9,876	6,611	0	6,611	14	0	46	60	40	0	40
Cervantes	Urban	2,608	0	0	1,863	1,863	619	126	745	0	0	71	71	23	6	29
	Rural	11,603	0	0	9,063	9,063	847	1,693	2,540	0	0	78	78	7	15	22
	Total	14,211	0	0	10,926	10,926	1,466	1,819	3,285	0	0	77	77	10	13	23
Galimuyod	Urban	430	0	0	375	375	55	0	55	0	0	87	87	12	1	13
	Rural	8,298	0	0	7,036	7,036	1,262	0	1,262	0	0	85	85	15	0	15
	Total	8,728	0	0	7,411	7,411	1,317	0	1,317	0	0	85	85	15	0	15
G. del Pilar	Urban	607	600	0	0	600	7	0	7	99	0	0	99	1	0	1
	Rural	2,992	800	550	1,407	2,757	235	0	235	27	18	47	92	7	1	8
	Total	3,599	1,400	550	1,407	3,357	242	0	242	39	15	39	93	6	1	7

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[1]				Underserved/Unserved		
			Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total	Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total
Lidlidda	Urban	1,247	0	0	1,129	1,129	98	20	118	0	0	91	91	7	2	9
	Rural	2,739	0	0	2,454	2,454	0	285	285	0	0	90	90	0	10	10
	Total	3,986	0	0	3,583	3,583	98	305	403	0	0	90	90	2	8	10
Magsingal	Urban	5,278	0	0	3,908	3,908	1,370	0	1,370	0	0	74	74	25	1	26
	Rural	18,723	0	0	13,719	13,719	5,004	0	5,004	0	0	73	73	26	1	27
	Total	24,001	0	0	17,627	17,627	6,374	0	6,374	0	0	73	73	26	1	27
Nagbukel	Urban	732	0	0	469	469	258	5	263	0	0	64	64	35	1	36
	Rural	3,216	0	50	1,880	1,930	1,167	119	1,286	0	2	58	60	36	4	40
	Total	3,948	0	50	2,349	2,399	1,425	124	1,549	0	1	59	61	36	3	39
Narvacan	Urban	2,816	874	0	1,040	1,914	814	88	902	31	0	37	68	28	4	32
	Rural	34,821	0	450	18,344	18,794	14,829	1,198	16,027	0	1	53	54	42	4	46
	Total	37,637	874	450	19,384	20,708	15,643	1,286	16,929	2	1	52	55	41	4	45
Quirino	Urban	1,381	0	1,020	0	1,020	325	36	361	0	74	0	74	23	3	26
	Rural	6,034	0	2,226	0	2,226	3,238	570	3,808	0	37	0	37	53	10	63
	Total	7,415	0	3,246	0	3,246	3,563	606	4,169	0	44	0	44	48	8	56
Salcedo	Urban	1,344	0	0	1,036	1,036	308	0	308	0	0	77	77	22	1	23
	Rural	8,655	0	0	6,644	6,644	1,960	51	2,011	0	0	77	77	22	1	23
	Total	9,999	0	0	7,680	7,680	2,268	51	2,319	0	0	77	77	22	1	23
San Emilio	Urban	2,303	0	0	2,141	2,141	145	17	162	0	0	93	93	6	1	7
	Rural	4,104	0	0	3,563	3,563	327	214	541	0	0	87	87	7	6	13
	Total	6,407	0	0	5,704	5,704	472	231	703	0	0	89	89	7	4	11
San Esteban	Urban	752	0	255	318	573	179	0	179	0	34	42	76	23	1	24
	Rural	6,033	0	149	3,770	3,919	2,114	0	2,114	0	2	62	65	35	0	35
	Total	6,785	0	404	4,088	4,492	2,293	0	2,293	0	6	60	66	33	1	34
San Ildelfonso	Urban	1,024	0	0	802	802	222	0	222	0	0	78	78	21	1	22
	Rural	4,046	0	0	3,110	3,110	909	27	936	0	0	77	77	22	1	23
	Total	5,070	0	0	3,912	3,912	1,131	27	1,158	0	0	77	77	22	1	23
San Juan	Urban	3,400	0	0	2,582	2,582	818	0	818	0	0	76	76	24	0	24
	Rural	18,565	0	325	13,712	14,037	4,528	0	4,528	0	2	74	76	24	0	24
	Total	21,965	0	325	16,294	16,619	5,346	0	5,346	0	1	74	76	24	0	24

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[1]				Underserved/Unserved		
			Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total	Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total
San Vicente	Urban	1,193	0	0	763	763	430	0	430	0	0	64	64	36	0	36
	Rural	9,643	0	0	6,440	6,440	3,203	0	3,203	0	0	67	67	33	0	33
	Total	10,836	0	0	7,203	7,203	3,633	0	3,633	0	0	66	66	33	1	34
Santa	Urban	1,731	755	0	606	1,361	370	0	370	44	0	35	79	21	0	21
	Rural	11,497	95	494	6,792	7,381	4,116	0	4,116	1	4	59	64	35	1	36
	Total	13,228	850	494	7,398	8,742	4,486	0	4,486	6	4	56	66	33	1	34
Santa Catalina	Urban	1,242	0	0	941	941	301	0	301	0	0	76	76	24	0	24
	Rural	11,068	0	0	8,101	8,101	2,967	0	2,967	0	0	73	73	26	1	27
	Total	12,310	0	0	9,042	9,042	3,268	0	3,268	0	0	73	73	26	1	27
Santa Cruz	Urban	4,461	0	0	3,075	3,075	1,371	15	1,386	0	0	69	69	30	1	31
	Rural	27,697	0	1,075	18,448	19,523	7,930	244	8,174	0	4	67	70	28	2	30
	Total	32,158	0	1,075	21,523	22,598	9,301	259	9,560	0	3	67	70	28	2	30
Santa Lucia	Urban	2,256	920	0	896	1,816	440	0	440	41	0	40	80	19	1	20
	Rural	20,045	645	125	12,923	13,693	6,352	0	6,352	3	1	64	68	31	1	32
	Total	22,301	1,565	125	13,819	15,509	6,792	0	6,792	7	1	62	70	30	0	30
Santa Maria	Urban	3,644	0	0	1,947	1,947	1,682	15	1,697	0	0	53	53	46	1	47
	Rural	21,543	250	0	11,258	11,508	9,767	268	10,035	1	0	52	53	45	2	47
	Total	25,187	250	0	13,205	13,455	11,449	283	11,732	1	0	52	53	45	2	47
Santiago	Urban	2,385	335	75	1,361	1,771	555	59	614	14	3	57	74	23	3	26
	Rural	13,543	0	0	9,539	9,539	3,900	104	4,004	0	0	70	70	28	2	30
	Total	15,928	335	75	10,900	11,310	4,455	163	4,618	2	0	68	71	27	2	29
Santo Domingo	Urban	2,951	25	0	2,343	2,368	583	0	583	1	0	79	80	19	1	20
	Rural	19,450	10	475	15,179	15,664	3,786	0	3,786	0	2	78	81	19	0	19
	Total	22,401	35	475	17,522	18,032	4,369	0	4,369	0	2	78	80	19	1	20
Sigay	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	2,086	0	1,625	455	2,080	0	6	6	0	78	22	100	0	0	0
	Total	2,086	0	1,625	455	2,080	0	6	6	0	78	22	100	0	0	0
Sinait	Urban	2,891	995	0	1,236	2,231	634	26	660	34	0	43	77	21	2	23
	Rural	20,401	0	0	13,389	13,389	6,671	341	7,012	0	0	66	66	32	2	34
	Total	23,292	995	0	14,625	15,620	7,305	367	7,672	4	0	63	67	31	2	33

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[1]				Underserved/Unserved		
			Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total	Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total
Sugpon	Urban	976	0	225	690	915	0	61	61	0	23	71	94	0	6	6
	Rural	1,810	0	1,175	0	1,175	0	635	635	0	65	0	65	0	35	35
	Total	2,786	0	1,400	690	2,090	0	696	696	0	50	25	75	0	25	25
Suyo	Urban	1,790	0	1,275	0	1,275	359	156	515	0	71	0	71	20	9	29
	Rural	7,047	0	4,700	294	4,994	74	1,979	2,053	0	67	4	71	1	28	29
	Total	8,837	0	5,975	294	6,269	433	2,135	2,568	0	68	3	71	4	25	29
Tagudin	Urban	4,853	2,660	0	1,674	4,334	459	60	519	55	0	34	89	9	2	11
	Rural	27,951	2,555	675	18,679	21,909	5,188	854	6,042	9	2	67	78	18	4	22
	Total	32,804	5,215	675	20,353	26,243	5,647	914	6,561	16	2	62	80	17	3	20
Vigan (Capital)	Urban	41,403	6,300	0	23,300	29,600	11,712	91	11,803	15	0	56	71	28	1	29
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	41,403	6,300	0	23,300	29,600	11,712	91	11,803	15	0	56	71	28	1	29
Provincial Total	Urban	131,439	16,094	2,850	75,104	94,048	36,244	1,147	37,391	12	2	57	72	27	1	28
	Rural	432,090	11,515	15,619	270,302	297,436	122,698	11,956	134,654	3	4	63	69	28	3	31
	Total	563,529	27,609	18,469	345,406	391,484	158,942	13,103	172,045	5	3	61	69	28	3	31

Note: 1/ Percentage of Population Coverage does not tally to the total due to round off.

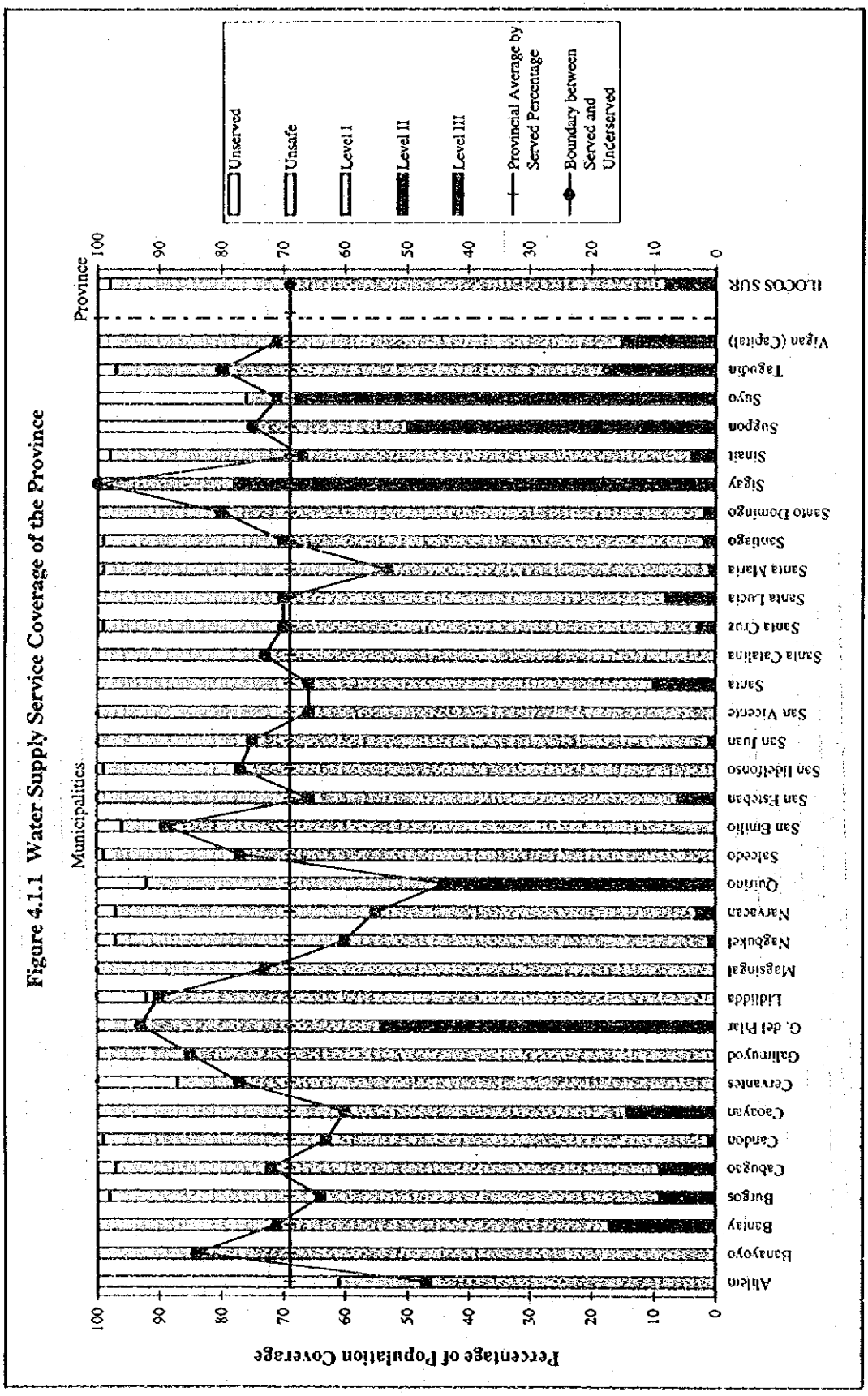


Figure 4.1.1 Water Supply Service Coverage of the Province

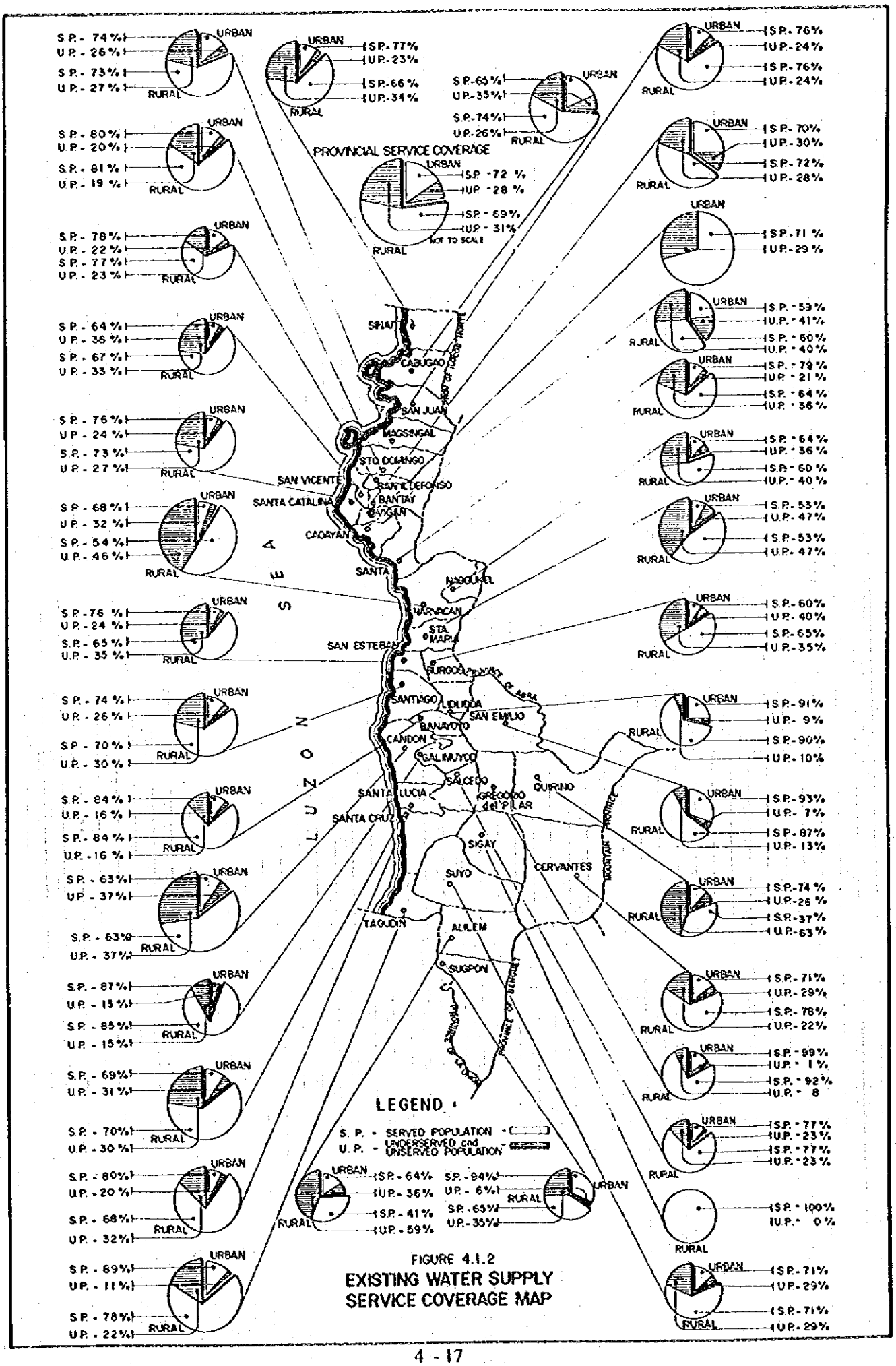


FIGURE 4.1.2
EXISTING WATER SUPPLY
SERVICE COVERAGE MAP