JAPAN INTERNATIONAL COOPERATION AGENCY

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

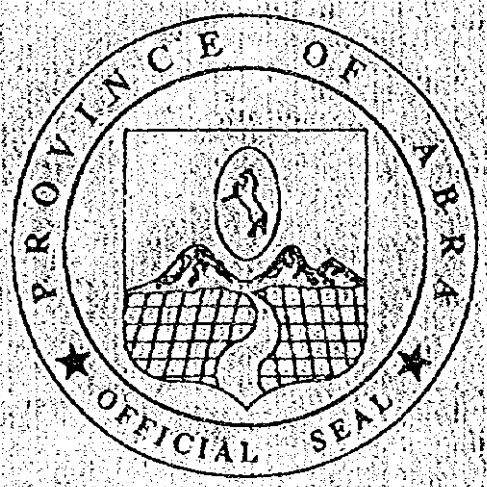
STUDY ON THE PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN IN THE REPUBLIC OF THE PHILIPPINES

VOLUME II - 5

MAIN REPORT

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

ABRA



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PROVINCE OF ABRA

OFFICE OF THE GOVERNOR

M E S S A G E

Among man's most basic needs in order to live, water ranks second, next to air, and higher than food.

Aside from its potable function, water is also useful for man's sanitation needs.

It is therefore understandable and logical that man should focus his attention on how best to harness this very important resource. This is in order to maximize its use for humanity, particularly those in third world countries like ours.

Isn't it ironic that while everybody knows that three fourths of our world is made up of water, yet up to this modern time, there are still many parts of the world where man encounters problems related to the use and availability of water.

Let this study therefore serve as a jumping board for all of us, to pool our efforts in order to make water and sanitation, within the easy reach of our fellow men, especially those living close to us.

GOV. VICENTE P. VALERA

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

VOLUME II - 5 MAIN REPORT

TABLE OF CONTENTS

CHAPTER		PAGE NO.

CHAPTER		PAGE NO.

CHAPTER	PAGE NO.

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

LIST OF TABLES

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

LIST OF FIGURES

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

LIST OF ABBREVIATIONS

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

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

Chapter 1

INTRODUCTION

1. INTRODUCTION

1.1 Sector Development in the Philippines

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

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

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

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

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

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

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

1.2 Provincial Sector Planning

1.2.1 Objectives of Sector Planning

The main objectives of the provincial sector plan are:

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

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

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

(4) To identify the needs for institutional strengthening.

1.2.2 Scope of Sector Planning

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

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

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

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

8) Past financial performance in the sector development

(2) Long-Term Development Plan

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

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

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

(4) Monitoring for Evaluation of Provincial Plan Implementation

1.2.3 Financing of Sector Plan

The First Water Supply, Sewerage and Sanitation Sector Project (FW4SP) has been implemented with financial assistance of the World Bank (IBRD). With reference to the Project, the technical assistance to help Provincial Government prepare 37 provincial sector plans in Luzon area is financed by various bilateral and multilateral agencies. Among them, nine (9) provinces including Abra 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 Abra

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.

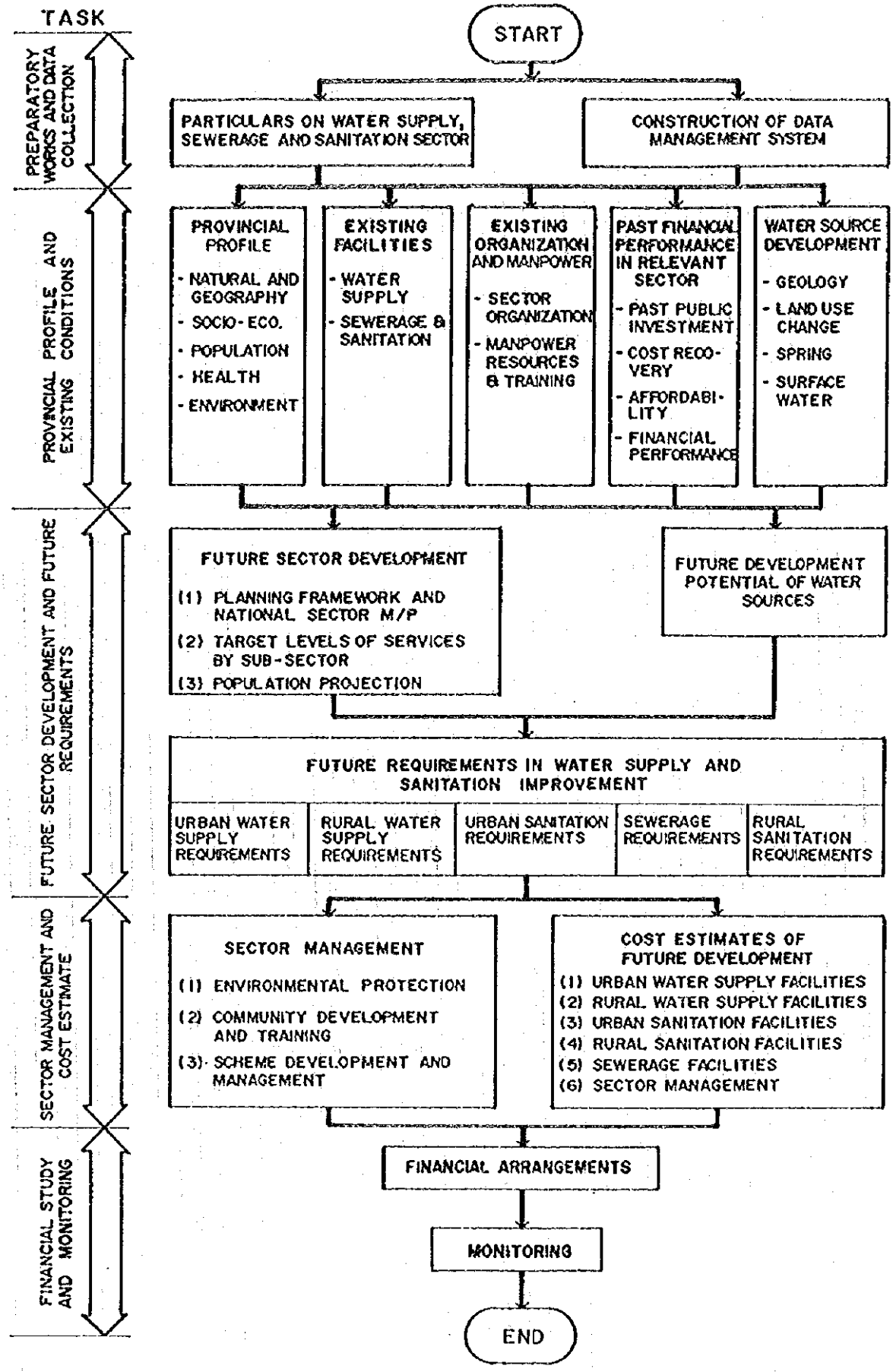
Chapter 4, 5, and 6 provide existing sector conditions in physical, managerial and financial aspects: existing water supply and sanitation facilities by service level and service coverage; sector institutions, community development, training and monitoring systems; and financial performances entailing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

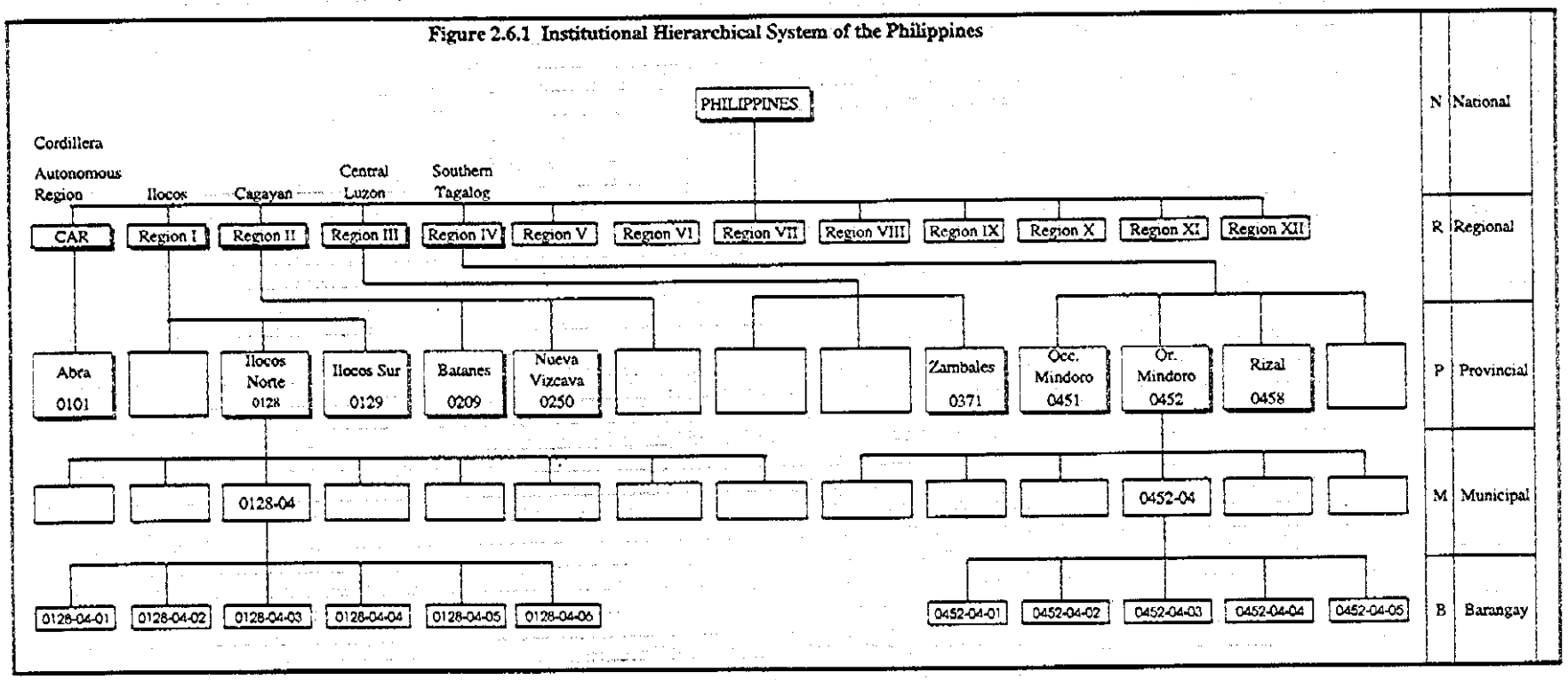


Figure 2.6.2 Structure of Questionnaire

Grouping of Data		Data Collection Level					
		Nat. N	Reg. R	Prov. P	Mun. M	Bar. B	Sys/Fac. S/F
1	SOCIO ECONOMIC CONDITIONS						
	1.1 Administrative Composition				M 1.1	B 1.2	
	1.2 Past Population				M 1.2.1	B 1.2.1	
					M 1.2.2	B 1.2.2	
	1.3 Projected Population				M 1.3	B 1.3	
	1.4 Household Number				M 1.4	B 1.4	
	1.5 Services				M 1.5	B 1.5	
	1.6 Occupation Category				M 1.6	B 1.6	
	1.7 Family Income, Education and Literacy				M 1.7	B 1.7	
2	LAND USE						
	2.1 Existing Land Use				M 2.1	B 2.1	
	2.2 Future Land Use				M 2.2	B 2.2	
3	HEALTH						
	3.1 Morbidity and Mortality				M 3.1	B 3.1	
	3.2 Facility and Practitioner				M 3.2	B 3.2	
4	WATER SOURCE						
	4.1 General Information				M 4.1	B 4.1	
	4.2 Water Source					B 4.2	
						B 4.3	
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
	5.3 Level I Facilities						F 5.3.1
6	ENVIRONMENTAL SANITATION						
	6.1 Private Toilet				M 6.1	B 6.1	
	6.2 School Toilet				M 6.2	B 6.2	
	6.3 Public Toilets				M 6.3	B 6.3	
	6.4 Drainage Facility				M 6.4	B 6.4	
	6.5 Solid Waste Collection and Disposal				M 6.5	B 6.5	
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

The landlocked province of Abra is one of the six (6) provinces/city comprising the Cordillera Autonomous Region (CAR). Bangued, the provincial capital, is about 406km from Metro Manila. It is bounded on the north by Ilocos Norte, on the east by Kalinga-Apayao, and on the west and south by Ilocos Sur and Mountain Province, respectively. Figure 3.1.1 presents the Location Map.

The province has a total land area of 3,975.55sq.km that is 1.32% of the Philippine total land area of about 300,000sq.km. It is composed of 27 municipalities. There are 303 barangays, of which 40 are urban and 263 rural. Provincial total population was 184,743 in 1990. About 76% of the population resided in rural areas, while the remaining 24% in urban areas. At present, only one (1) water district is operating in the province. Table 3.1.1 presents the breakdown per municipality of the land area, population and its density, as well as administrative composition.

Table 3.1.1 Outline of Municipalities

Municipality		Land Area (sq.km)	1990 Population		Number of Barangay		
Code	Name		Number	Density (persons/sq.km)	Urban	Rural	Total
010101	Bangued	109.35	34,184	313	8	23	31
010102	Boliney	216.92	3,773	17	1	7	8
010103	Bucay	131.85	13,346	101	3	18	21
010104	Bucloc	58.50	1,932	33	0	4	4
010105	Daguioman	71.50	1,413	20	0	4	4
010106	Danglas	178.57	3,042	17	2	5	7
010107	Dolores	103.70	8,577	83	1	14	15
010108	Lacub	281.58	2,326	8	1	5	6
010109	Lagangilag	73.50	11,248	153	2	15	17
010110	Lagayan	101.44	3,771	37	1	4	5
010111	Langiden	108.64	2,452	23	1	5	6
010112	La Paz	85.50	11,240	131	2	10	12
010113	Licuan	254.71	3,697	15	2	9	11
010114	Luba	117.28	5,563	47	1	7	8
010115	Malibcong	301.62	3,494	12	0	12	12
010116	Manabo	72.50	7,797	108	3	8	11
010117	Penarrubia	42.50	4,893	115	1	8	9
010118	Pidigan	55.20	8,807	160	2	13	15
010119	Pilar	139.95	8,451	60	1	18	19
010120	Sal-lapadan	106.33	4,941	46	2	8	10
010121	San Isidro	36.50	3,744	103	1	8	9
010122	San Juan	75.00	8,445	113	2	17	19
010123	San Quintin	69.50	4,293	62	1	5	6
010124	Tayum	49.00	11,045	225	1	10	11
010125	Tineg	757.89	3,068	4	0	10	10
010126	Tubo	249.82	4,589	18	0	9	9
010127	Villaviciosa	126.70	4,612	36	1	7	8
Provincial Total		3,975.55	184,743	46	40	263	303

Note: Municipal Code corresponds to NEDA Geographic Coding System.

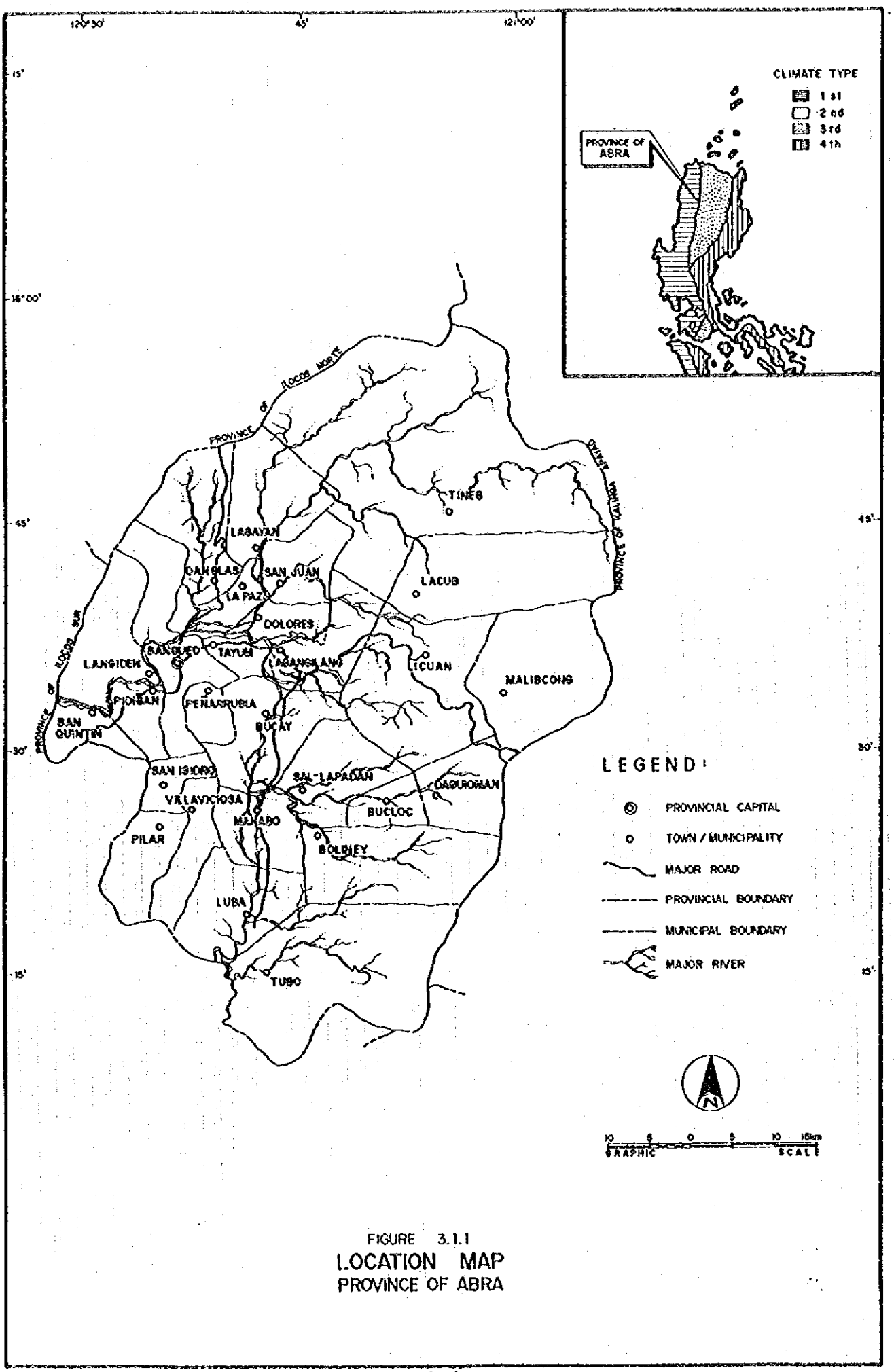


FIGURE 3.1.1
LOCATION MAP
PROVINCE OF ABRA

3.2 Natural Conditions and Geographical Features

3.2.1 Meteorology

The province has Type I climate under the Coronas classification and is characterized by pronounced seasons, dry from November to April, and wet the rest of the year as reflected in Figure 3.1.1, Location Map. The mean annual rainfall was recorded at 3,000mm. The maximum rainfall was observed during August, while the minimum was during February.

The mean annual air temperature is 27°C. The hottest month is May (28.8°C), while the coolest is January (25.5°C). The province is located between 17° and 18° north latitudes, which is considered as less visited area by typhoon.

3.2.2 Land Use

Forest area constitutes almost 29% of the total area of the province located mostly in the Cordillera range. Agricultural land comprises about 12%, while Built-up area is limited to a mere 0.35%. Fishponds, Grassland, Wetland and Openland represent approximately 59% of the total. The existing land use pattern as presented in Table 3.2.1 depicts a sustainable growth deserving and enhancing its present trend. The remaining forest cover serves as watershed rather than as source of timber. An efficiently managed watershed collects and regulates flow of water, controls soil erosion and minimizes water pollution. Conversion of forest lands to other uses will restrict its function as a watershed. Correspondingly, a significant increase in agricultural area will result in a high demand of water for agricultural use.

Table 3.2.1 Current Land Use

Land Use	Area (sq. km)	Percentage over Total Land Area
Forest Land	1,144.00	28.78
Agricultural	478.49	12.04
Built-up	13.92	0.35
Fishponds, In-land Water Areas,Grassland and Openlands	2,339.14	58.84
TOTAL	3,975.55	100.00

3.2.3 Topography and Drainage

General topography of the province is mountainous with narrow strips of flat land along Abra and Tineg rivers. About 90% of the total land area falls within the hilly to mountainous sections, while the remaining 10% is plain. Elevation ranges from 20 to 2,468m above mean sea level. Mt. Bangbanglan in the municipalities of Boliney and Tubo is the highest mountain with a peak elevation of 2,468m. The ridges of the mountains generally follow a north-south direction conformable with the major geologic lineaments in the region.

The province is principally drained by Abra river which flows northward and changes its course westward to discharge into Luzon Sea in Cauayan, Ilocos Sur. Its tributaries include Tineg, Sinalang, Soot, Malapaao, Ulep, Ikmin, Manikbel, Bucloc and Baay rivers and assume a trellis drainage pattern. Figure 3.2.1 shows the drainage systems of Abra. 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.). To represent a typical river in the province, the upstream and downstream portions of Abra river were selected for water quality analysis. The results of the analysis showed that the river water was turbid and considerable amount of organic impurities, exceeding the maximum limit for Class "A" fresh surface water classification.

Table 3.2.2 Drainage Areas and Flow Rates of Major Rivers

River Name	Station ID Number	Drainage Area (sq.km)	Flow Rate (cu.m/sec)			Water Districts (using river water)
			Minimum	Average	Maximum	
Abra River	01SW173204PW006	2,575	19.43	100.86	2,267.36	NONE
Tineg River	01SW174204PW005	664	3.32	46.11	949.78	NONE
Sinalang River	01SW173203PW007	120	0.13	10.81	315.85	NONE

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

3.3 Socio-economic Conditions

3.3.1 Economic Activities and Household Income

Agriculture is the major economic activity in the province. Major crops cultivated are rice, corn, rootcrops, and fruits such as banana and citrus. Livestock production is also an important activity because of the extensive grassland and pasture areas. The greater bulk of commercial activities is seen in Bangued. Agro-based industries such as furniture making, rattancraft and bamboocraft are also promising economic activities in the province.

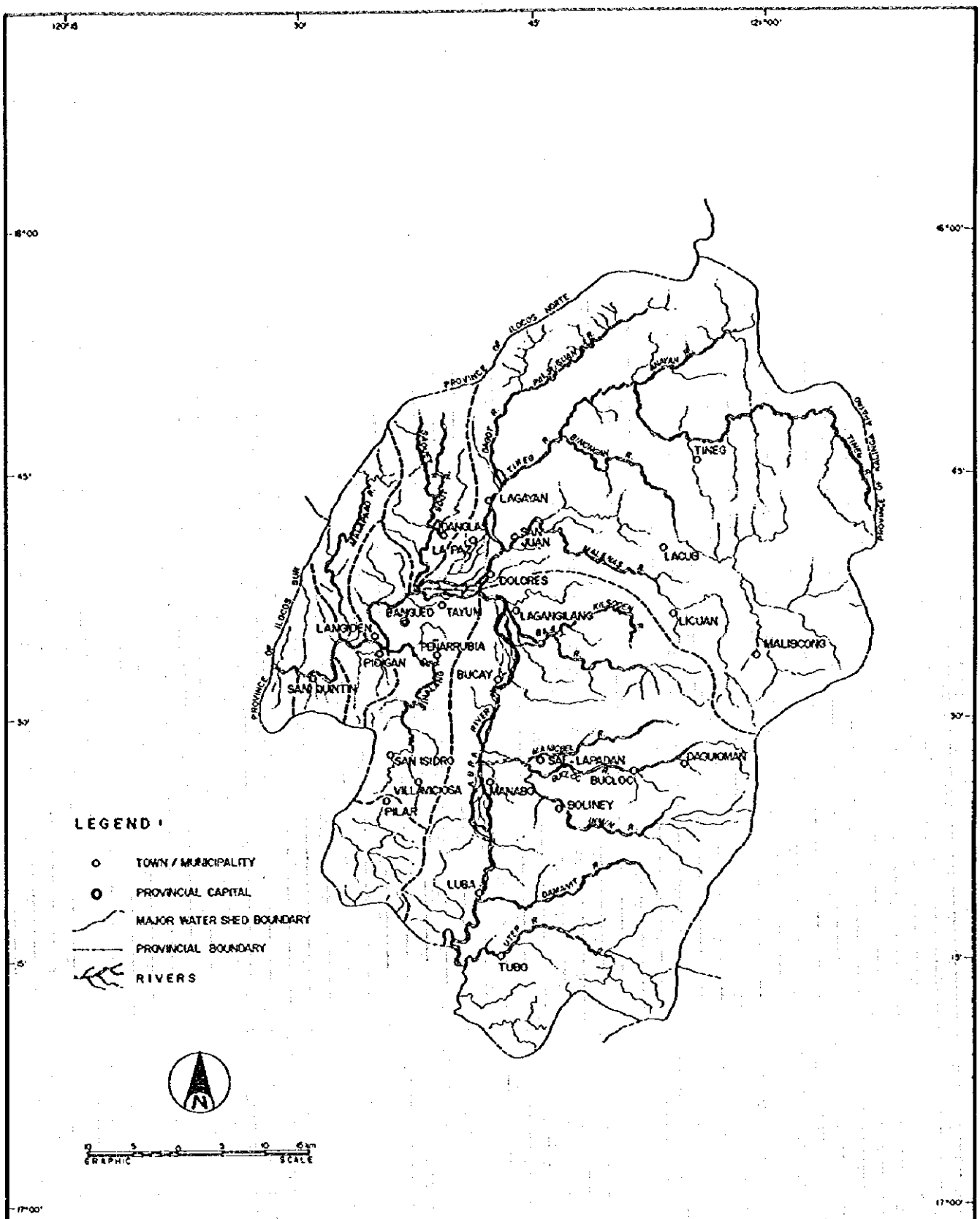


FIGURE 3.2.1
MAJOR RIVER NETWORKS
PROVINCE OF ABRA

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 ₱ 21,239. 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 the figures in the region. Based on the established poverty threshold income of ₱ 39,400 in CAR for 1991, approximately 76% 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 53%, followed by elementary occupations as indicated in Figure 3.3.2.

3.3.2 Basic Infrastructure

Electric supply and telecommunication service cover 85% and 100% of the municipalities, respectively. There are 29 post offices or stations in the province. Land transportation is available by means of jeepneys, tricycles, minibuses and buses. There are 92 business establishments and 27 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 305 schools consisting of 250 elementary schools, 50 high schools and 5 colleges/vocational institutions. The 1990 NSO census indicated that the province had a 92.5% literacy of household population 10 years old and over. A large part of 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).

3.4 Population

3.4.1 Previous Population Development

A declining 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

Figure 3.3.1 Distribution of Households by Income Class

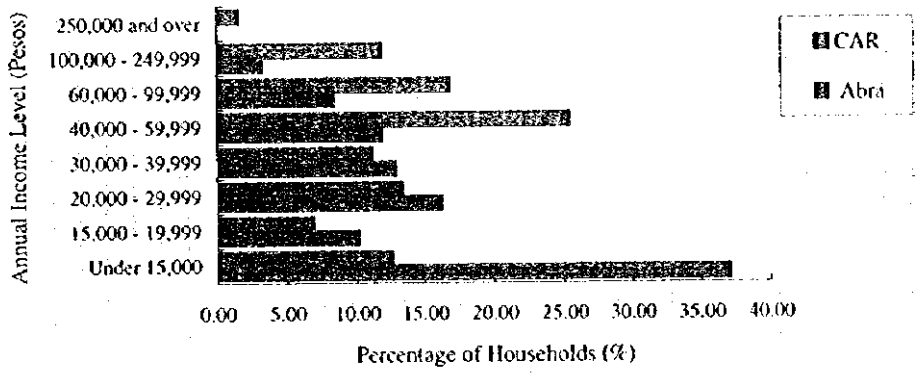


Figure 3.3.2 Population Distribution by Occupation

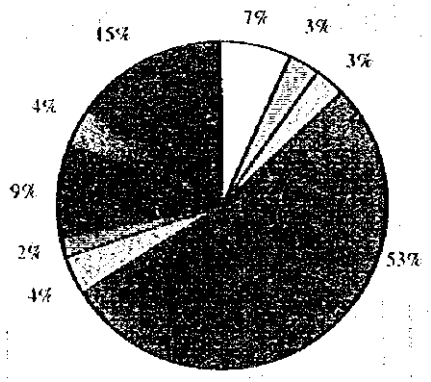


Figure 3.3.3 Population Distribution by Highest Attainment of Education

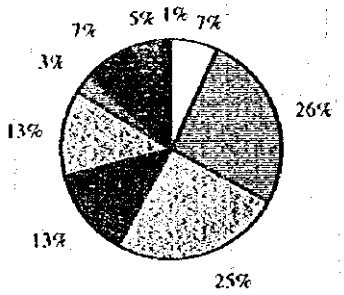


Table 3.3.1 Provincial Outline on Public Services

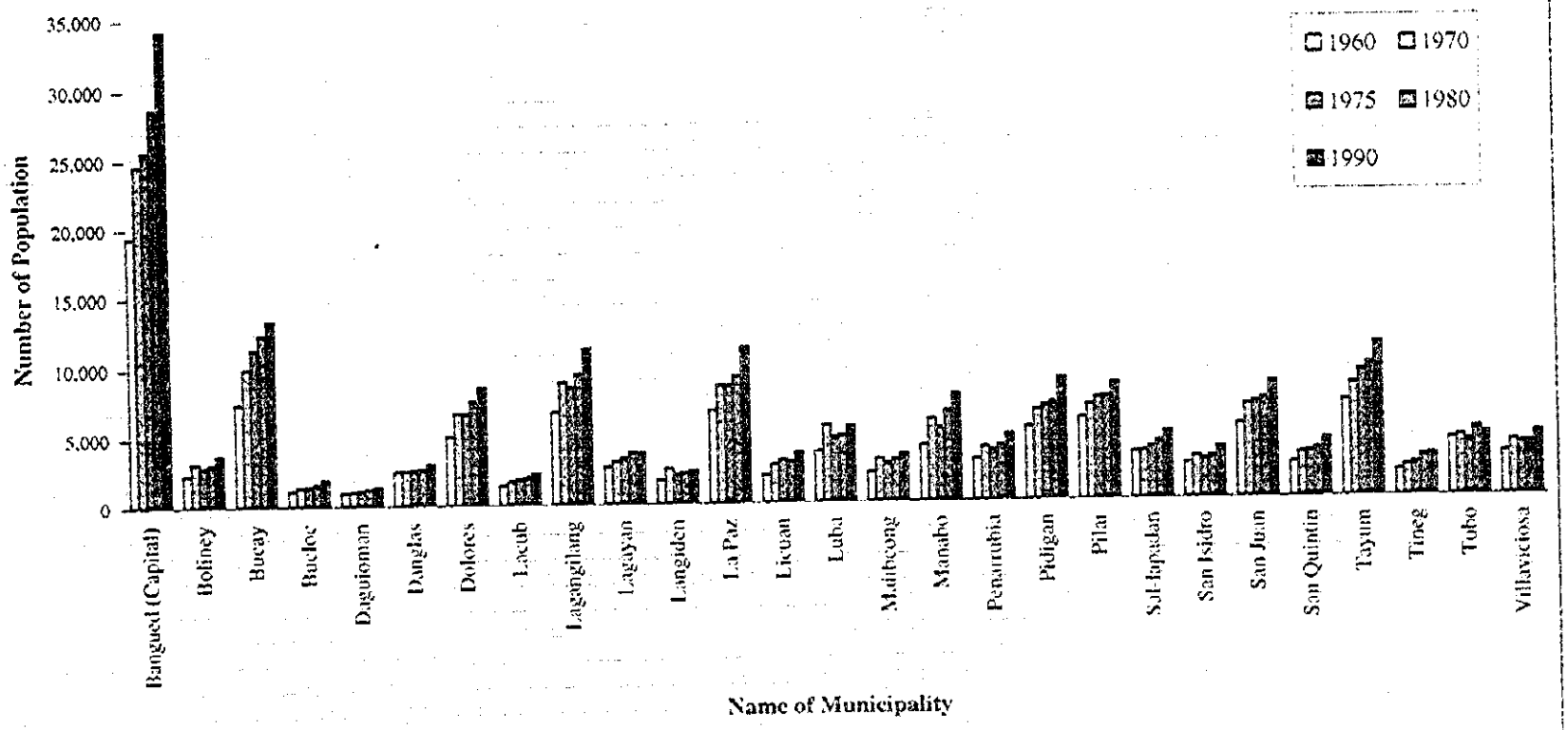
Items	Unit	Qty.	Items	Unit	Qty.
(1) Roads			**(8) Tourism Facilities**	Number	27
a) Total Length	km	493.03	(Hotel resort, lodges, recreational		
b) Barangay roads	Percent	55.33	facilities, etc.)		
(2) Electricity Service Coverage			**(9) Schools**		
a) Municipality	Percent	85	a) Elementary level	Number	250
b) Barangay	Percent	87	b) Secondary level	Number	50
c) Household	Percent	12.4	c) Tertiary level	Number	5
(3) Telecommunication Services			**(10) Health Facilities**		
a) Availability in municipality	Percent	100	a) Hospital/clinics	Number	5
b) Telegraph station	Number	9	b) Main health centers, rural health	Number	121
c) Telephone station	Number	24	units, barangay health center, etc.		
(4) Post Office	Number	29	**(11) Labor**		
			a) Labor force participation ratio	Percent	64.85
(5) Transportation Services	Mode	Bus,Jeep	b) Employment rate	Percent	97.10
	(ex. Bus,	Tricycle			
	jeep, taxi,.)		**(12) Average Family Income**		
			a) Monthly income	Pesos/Month	2,548
(6) Banking Facilities	Number	6	b) Monthly expenditure	Pesos/Month	2,252
a) Private bank	(by Private				
b) Public bank	and public)				
(7) Industrial/Business/Commercial					
Establishment	Number	92			

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.	%
Bangued	1	3	4	3	1	1	5	1.8
Boliney	1	0	1	0	0	0	0	2.1
Bucay	3	1	4	0	1	1	0	0.8
Bucloc	0	1	1	0	0	0	0	1.9
Daguioman	1	0	1	0	0	0	0	1.2
Danglas	0	0	0	0	0	0	0	1.4
Dolores	1	1	2	0	1	1	0	1.2
Lacub	0	1	1	0	0	0	0	1.3
Lagangilag	2	1	3	1	0	1	0	1.7
Lagayan	1	0	1	0	0	0	0	-0.1
Langiden	0	0	0	0	0	0	0	0.8
La Paz	0	2	2	0	1	0	0	2.0
Licuan	0	0	0	0	0	0	0	1.8
Luba	2	1	3	0	0	0	0	1.3
Malibcong	1	1	2	0	0	0	0	1.2
Manabo	1	1	2	0	0	1	1	1.7
Penarrubia	0	1	1	0	0	1	0	1.8
Pidigan	2	2	4	0	0	0	0	2.1
Pilar	3	1	4	1	0	1	0	1.2
Sal-lapadan	1	1	2	0	0	0	0	1.5
San Isidro	1	0	1	0	0	0	0	1.9
San Juan	2	1	3	0	0	1	0	1.6
San Quintin	1	0	1	0	0	0	0	1.8
Tayum	1	1	2	0	0	0	0	1.4
Tineg	1	0	1	0	0	0	0	0.3
Tubo	3	0	3	0	0	0	0	-0.8
Villaviciosa	0	1	1	0	1	1	0	1.6
PROVINCIAL TOTAL	29	21	50	5	5	9	6	1.4

Figure 3.4.1 Previous Population Development of the Province



of 2.4% during the period 1948 to 1960, it gradually decreased to 1.4% (1980-1990). A summary of the average annual growth rates is as follows:

Year	Population	Ave. Annual Growth Rate (%)	Period
1960	115,193	2.41	1948 - 1960
1970	145,508	2.36	1960 - 1970
1975	147,010	0.20	1970 - 1975
1980	160,198	1.73	1975 - 1980
1990	184,743	1.44	1980 - 1990

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

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

Table 3.4.1 Previous Population Development by Municipality

Municipality	Previous Population						Est. Pop.
	1948	1960	1970	1975	1980	1990	1995
Bangued	14,792	19,368	24,587	25,597	28,666	34,184	37,359
Boliney	1,579	2,326	3,175	2,902	3,060	3,773	4,194
Bucay	6,215	7,473	9,937	11,337	12,375	13,346	13,860
Bucloc	827	1,152	1,401	1,447	1,605	1,932	2,120
Daguioman	666	1,003	1,050	1,124	1,254	1,413	1,500
Danglas	1,738	2,475	2,508	2,572	2,657	3,042	3,256
Dolores	4,065	5,065	6,751	6,767	7,615	8,577	9,262
Lacub	944	1,424	1,706	1,927	2,038	2,326	2,486
Lagangilag	5,450	6,762	8,905	8,532	9,466	11,248	12,262
Lagayan	2,222	2,750	3,182	3,372	3,827	3,771	3,434
Langiden	1,297	1,743	2,558	2,194	2,256	2,452	2,556
La Paz	5,444	6,808	8,527	8,529	9,205	11,240	12,420
Licuan	1,477	2,066	2,821	3,144	3,094	3,697	4,045
Luba	2,276	3,710	5,666	4,712	4,911	5,563	5,932
Malibcong	1,676	2,163	3,158	2,817	3,108	3,494	3,705
Manabo	3,658	4,111	6,009	5,384	6,590	7,797	8,483
Penarrubia	2,262	3,117	3,955	3,737	4,096	4,893	5,348
Pidigan	3,473	5,414	6,605	6,897	7,162	8,807	9,768
Pilar	5,944	6,025	6,959	7,453	7,518	8,451	8,963
Sal-lapadan	2,313	3,450	3,551	3,838	4,274	4,941	5,316
San Isidro	0	2,605	3,098	2,924	3,087	3,744	4,124
San Juan	4,603	5,400	6,833	6,989	7,233	8,445	9,126
San Quintin	1,518	2,495	3,259	3,374	3,574	4,293	4,706
Tayum	6,281	7,025	8,211	9,126	9,621	11,045	11,837
Tineg	1,425	1,871	2,254	2,432	2,988	3,068	3,109
Tubo	1,981	4,198	4,386	4,018	4,985	4,589	5,111
Villaviciosa	2,474	3,194	4,006	3,865	3,933	4,612	4,997
TOTAL	86,600	115,193	145,058	147,010	160,198	184,743	199,279

3.4.2 Classification of Urban and Rural Areas

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

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

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

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

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

(4) 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. Considering the 1990 NSO classification of urban and rural barangays, there are 40 urban barangays and 263 rural barangays for a total of 303 barangays in 1995. Distribution of the classified area is shown in Figure 3.4.1, Supporting Report.

3.4.3 Present Population Distribution

From the 1990 NSO census, the 1995 urban-rural population was estimated. Rural population accounts for 76% of the provincial total, while 24% is urban as reflected in Figure 3.4.2. Table 3.4.2 presents the breakdown of the number of urban and rural barangays by municipality and its corresponding present population distribution.

Table 3.4.2 Outline of Urban and Rural Areas in the Province

Municipality	Land Area (sq.km)	Number of Barangay			Estimated Population (1995)		
		Urban	Rural	Total	Urban	Rural	Total
Bangued	109.35	8	23	31	14,904	22,455	37,359
Boliney	216.92	1	7	8	770	3,424	4,194
Bucay	131.85	3	18	21	2,753	11,107	13,860
Bucloc	58.50	0	4	4	0	2,120	2,120
Daguioman	71.50	0	4	4	0	1,500	1,500
Danglas	178.57	2	5	7	1,555	1,701	3,256
Dolores	103.70	1	14	15	1,867	7,395	9,262
Lacub	281.58	1	5	6	671	1,815	2,486
Lagangilag	73.50	2	15	17	2,490	9,772	12,262
Lagayan	101.44	1	4	5	854	2,580	3,434
Langiden	108.64	1	5	6	350	2,206	2,556
La Paz	85.50	2	10	12	3,362	9,058	12,420
Licuan	254.71	2	9	11	654	3,391	4,045
Luba	117.28	1	7	8	1,167	4,765	5,932
Malibcong	301.62	0	12	12	0	3,705	3,705
Manabo	72.50	3	8	11	3,968	4,515	8,483
Penarrubia	42.50	1	8	9	1,049	4,299	5,348
Pidigan	55.20	2	13	15	2,655	7,113	9,768
Pilar	139.95	1	18	19	1,303	7,660	8,963
Sal-lapadan	106.33	2	8	10	1.424	3,892	5,316
San Isidro	36.50	1	8	9	552	3,572	4,124
San Juan	75.00	2	17	19	1,329	7,797	9,126
San Quintin	69.50	1	5	6	738	3,968	4,706
Tayum	49.00	1	10	11	2,268	9,569	11,837
Tineg	757.89	0	10	10	0	3,109	3,109
Tubo	249.82	0	9	9	0	5,111	5,111
Villaviciosa	126.70	1	7	8	788	4,209	4,997
Provincial Total	3,975.55	40	263	303	47,471	151,808	199,279

There are 37,038 households with 76% residing in rural area and 24% households in urban area. The average provincial household size is 5.4 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

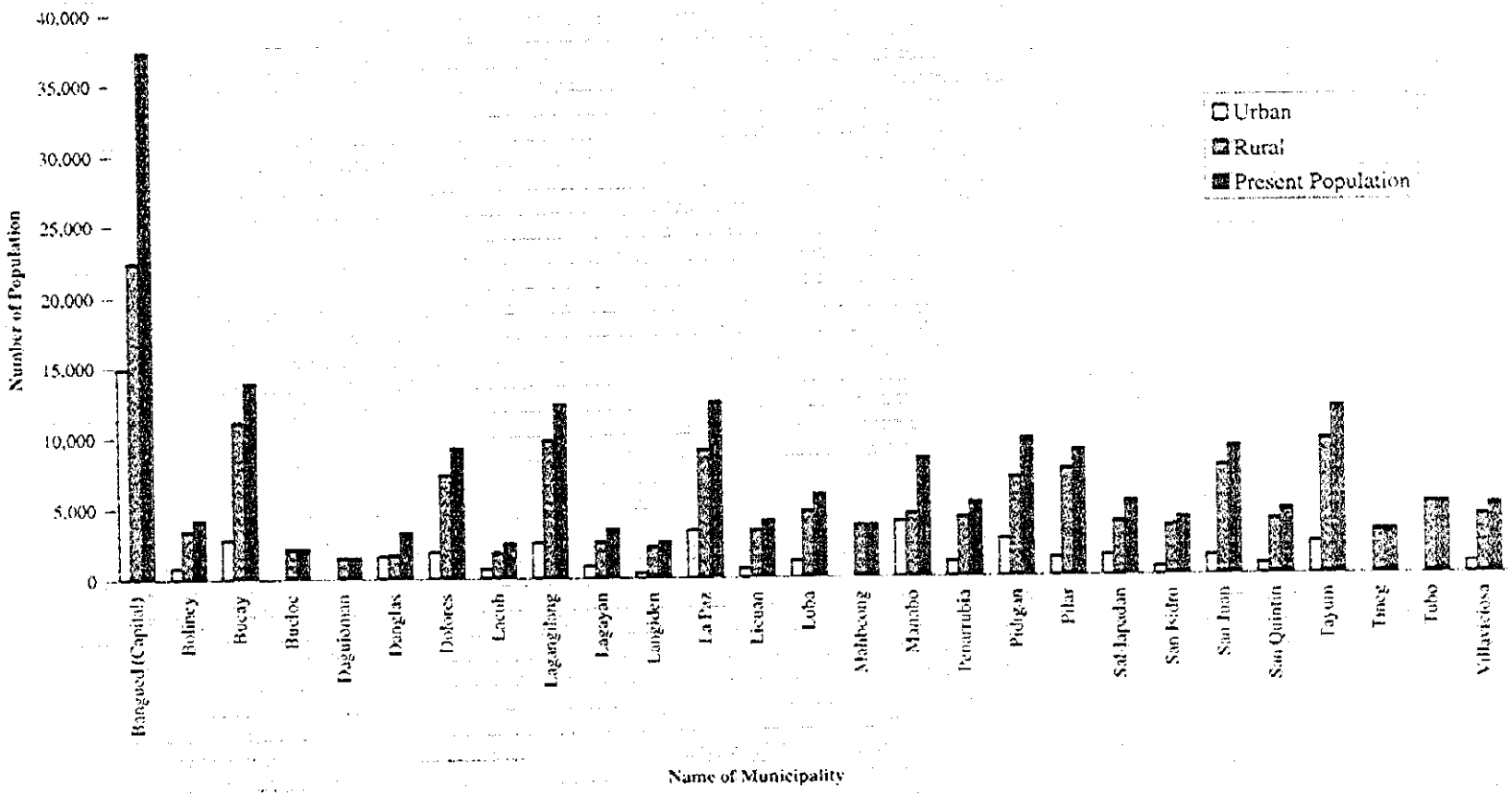


Figure 3.4.2 Present Population Distribution (Urban-24 %)

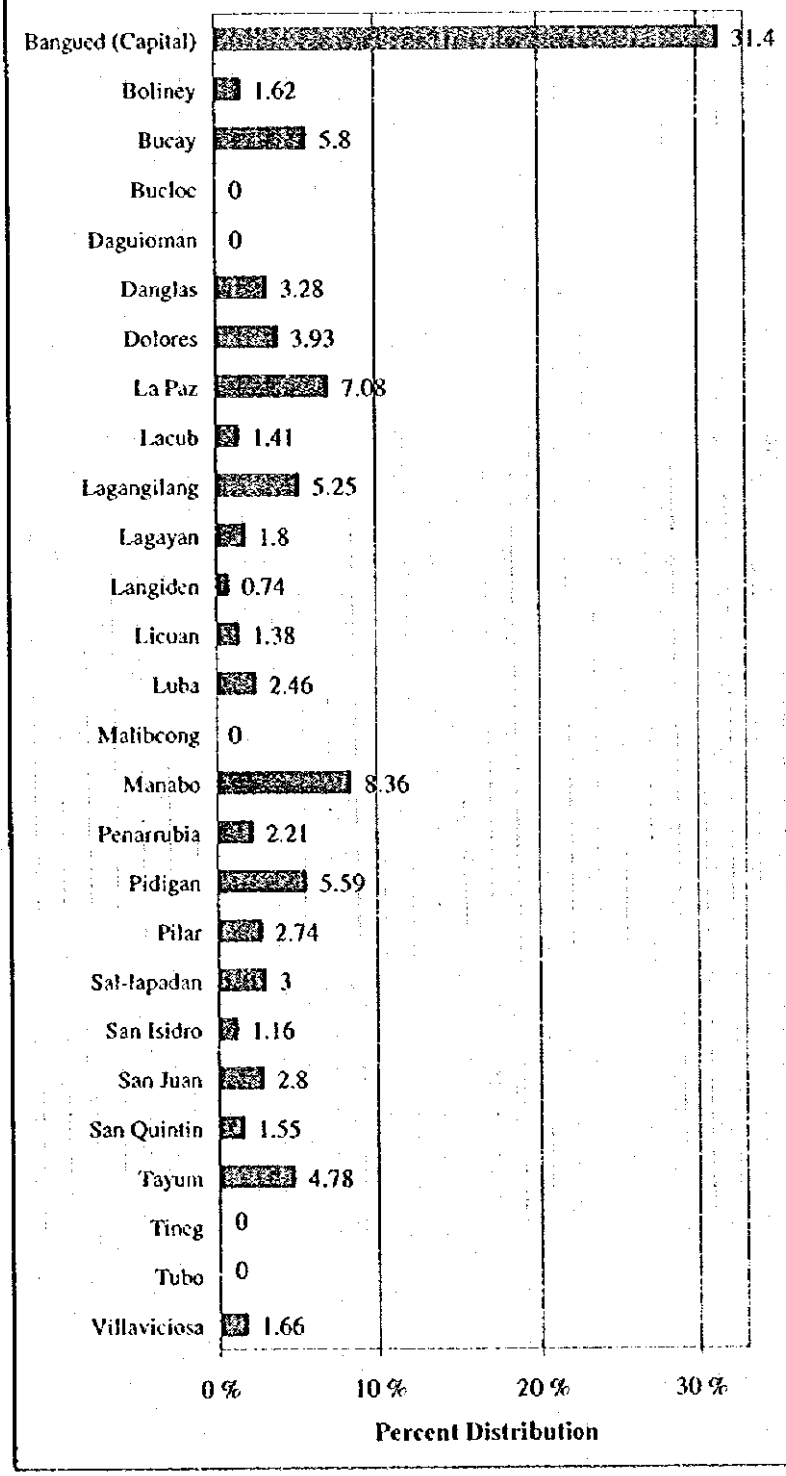


Figure 3.4.2 Present Population Distribution (Rural-76 %)

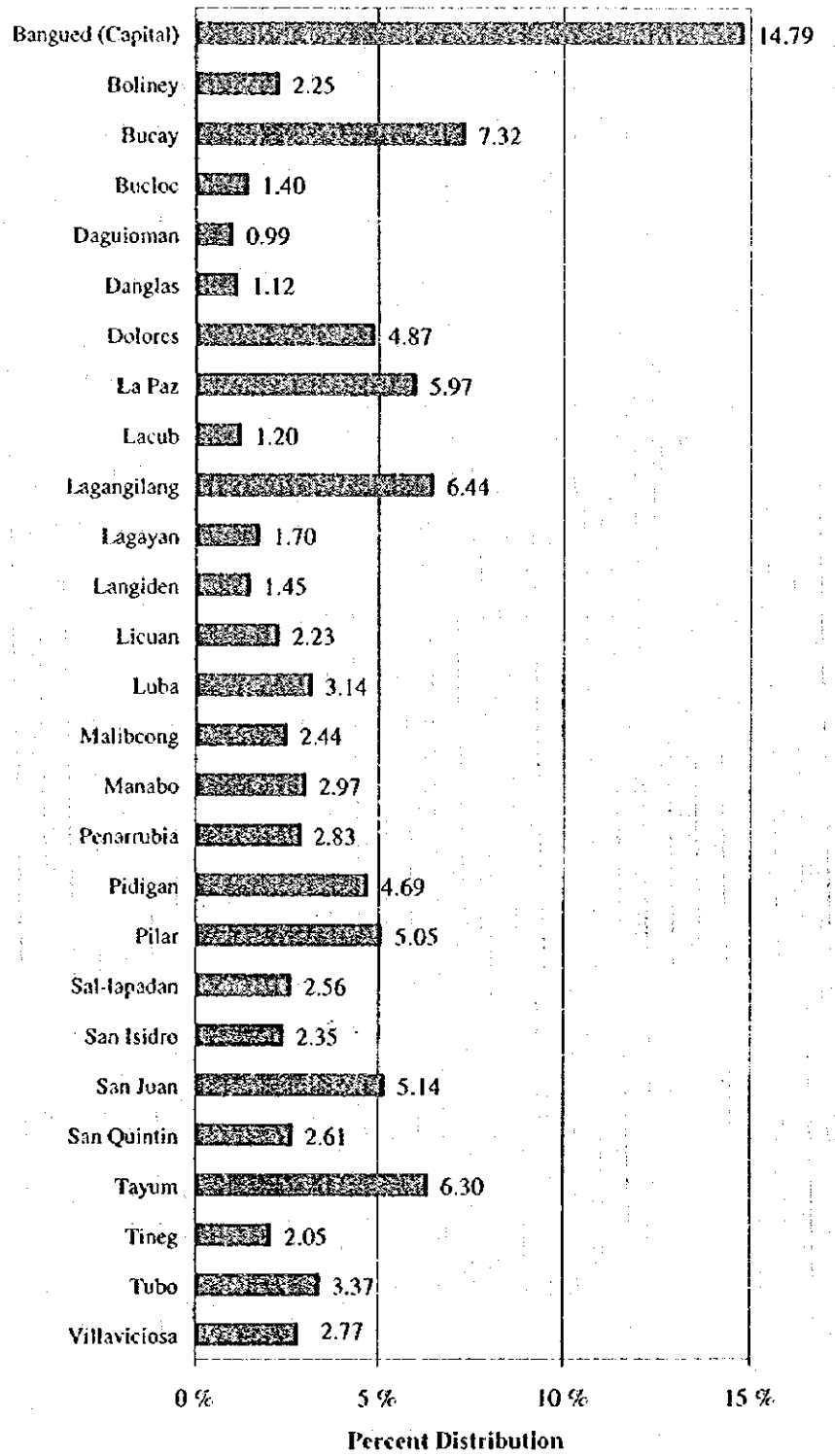


Table 3.4.3 Household Numbers and Household Sizes

Municipality	Number of Households (1995)			Household Size (person/HH)		
	Urban	Rural	Total	Urban	Rural	Total
Bangued	2,816	4,152	6,969	5.3	5.4	5.4
Boliney	139	630	769	5.5	5.4	5.5
Bucay	511	1,966	2,477	5.4	5.6	5.6
Bucloc	0	379	379	0.0	5.6	5.6
Daguioman	0	284	284	0.0	5.3	5.3
Danglas	302	334	636	5.2	5.1	5.1
Dolores	375	1,346	1,721	5.0	5.5	5.4
Lacub	123	326	449	5.4	5.6	5.5
Lagangilag	467	1,747	2,214	5.3	5.6	5.5
Lagayan	161	485	646	5.3	5.3	5.3
Langiden	74	454	528	4.8	4.9	4.8
La Paz	638	1,799	2,437	5.3	5.0	5.1
Licuan	121	576	697	5.4	5.9	5.8
Luba	202	886	1,088	5.8	5.4	5.4
Malibcong	0	632	632	0.0	5.9	5.9
Manabo	757	891	1,648	5.2	5.1	5.1
Penarrubia	191	767	958	5.5	5.6	5.6
Pidigan	476	1,302	1,778	5.6	5.5	5.5
Pilar	236	1,442	1,678	5.5	5.3	5.3
Sal-lapadan	261	710	971	5.5	5.5	5.5
San Isidro	91	652	743	6.0	5.5	5.5
San Juan	278	1,544	1,822	4.8	5.1	5.0
San Quintin	143	789	932	5.2	5.0	5.1
Tayum	449	1,686	2,135	5.1	5.7	5.5
Tineg	0	578	578	0.0	5.4	5.4
Tubo	0	923	923	0.0	5.5	5.5
Villaviciosa	151	796	947	5.2	5.3	5.3
Provincial Total	8,962	28,076	37,038	5.3	5.4	5.4

3.5 Health Status

3.5.1 Morbidity, Mortality and Infant Mortality

The number one cause of morbidity was diarrhea followed by bronchitis and pneumonia. Influenza and obstructive pulmonary ranked fourth and fifth, respectively. Other causes of morbidity in descending order were: throat/ear/nose diseases, malaria, heart diseases, varicella/chickenpox and measles. Regarding mortality, the number one cause was pneumonia followed by vascular diseases. Suffocation of foreign body and tuberculosis ranked third and fourth, respectively. Other causes include other malignant neoplasm, heart disease, kidney/nephritis and diarrhea. Pneumonia, septicemia, heart diseases and diarrhea were the 4 leading causes of infant mortality in the province.

The general health status of the populace of the province was relatively inferior than the national condition. The incidence of diseases was higher in Abra than the Philippines as a

whole. Table 3.5.1 presents a comparative statistics on the leading causes of morbidity, mortality and infant mortality of the province as well as of the Philippines (details are referred to Table 3.5.1, Data Report).

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

Rate: 1/1000,000

	Causes	Abra		Philippines		
		Number	Rate	Number	Rate	Ranking
Morbidity	1. Diarrhea	8,809	4,420.44	894,116	1,487.8	2
	2. Bronchitis	5,219	2,618.94	951,305	1,583.1	1
	3. Pneumonia	3,207	1,609.30	204,959	341.1	7
	4. Influenza	2,823	1,416.61	694,956	1,156.4	5
	5. Obstructive Pulmonary	733	367.83	875,289	1,457	3
	6. Throat/Ear/Nose	646	324.17	-	-	-
	7. Malaria	625	313.63	-	-	-
	8. Heart Diseases	400	200.72	-	-	-
	9. Varicella, Chickenpox	156	78.28	-	-	-
	10. Measles	103	51.69	-	-	-
Mortality	1. Pneumonia	211	105.88	50,609	84.2	1
	2. Vascular Diseases	172	86.31	26,436	43.9	3
	3. Suffoc. Foreign Body	70	35.13	15,193	25.3	5
	4. Tuberculosis	55	27.60	20,949	34.9	4
	5. Malignant Neoplasms	52	26.09	14,723	24.5	6
	6. Heart Diseases	29	14.55	33,917	56.4	2
	7. Kidney/Nephritis	25	12.55	-	9.6	-
	8. Diarrhea	20	10.04	5,777	-	7
	9. Senility	13	6.52	0	0.0	0
	10. Kidney/ Nephritis	12	6.00	2,049	3.4	8
Infant Mortality	1. Pneumonia	10	5.02	11,942	-	1
	2. Septicemia	5	2.51	2,212	-	4
	3. Heart Diseases	3	1.51	773	-	8
	4. Diarrhea	2	1.00	2,430	-	3
	5. Bronchitis	2	1.00	730	-	9
	6. Nutritional Deficiencies	1	0.50	-	-	-
	7. Meningitis	1	0.50	-	-	-
	8. Congenital Anomalies	1	0.50	1,705	-	5

Water-related diseases in the ten leading causes of morbidity include diarrhea (rank 1st) and malaria (7th). Diarrhea also ranked 8th as the leading causes of mortality and 4th in infant mortality, respectively.

3.5.2 Water Related Diseases

An indicator of health problems related to water supply and sanitation is the incidence of water-related diseases. The World Health Organization (WHO) has classified diseases

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

Water-related diseases reported in the province were diarrhea and malaria. Table 3.5.2 presents the reported cases and deaths of notifiable water-related diseases in the province.

Table 3.5.2 Reported Cases and Deaths of Notifiable Water Related Diseases

Rate: 1/100,000

Diseases	Morbidity		Mortality		Infant Mortality	
	Number	Rate	Number	Rate	Number	Rate
Water-borne						
Diarrhea	8,809	4,420.44	19	9.53	2	1.00
Water vector						
Malaria	625	313.63	0	0.00	0	0.00

3.5.3 Health Facilities and Practitioners

Present facilities servicing the health care of the population are 5 hospitals, 27 rural health units, and 94 barangay health stations. The ratio of the population to these health facilities and practitioners is above the national average figures (refer to Table 3.5.1, Supporting Report and Table 3.5.2, Data Report).

3.6 Environmental Conditions

3.6.1 General

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

3.6.2 Water Pollution

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

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

The province has no major pollution related industries. Only small-scale and cottage industries such as food processing and handicrafts are existing. Hence, the waterbodies are not yet polluted/contaminated by industrial pollutants. 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 27 municipalities, only Bangued has a municipal refuse collection and disposal service with 3 units of open dump truck. In the province, a mere 2% of the households is served, while majority (98%) 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		
Bangued (Capital)	6,968	3	0	3	702	0	702	914	4,849	500	6,263	10	90
Boliney	769	0	0	0	0	0	0	49	676	44	769	0	100
Bucay	2,477	0	0	0	0	0	0	563	1,710	204	2,477	0	100
Bucloc	379	0	0	0	0	0	0	193	57	129	379	0	100
Daguioman	284	0	0	0	0	0	0	5	205	74	284	0	100
Danglas	636	0	0	0	0	0	0	6	585	45	636	0	100
Dolores	1,721	0	0	0	0	0	0	259	1,274	188	1,721	0	100
Lacub	449	0	0	0	0	0	0	65	342	42	449	0	100
Lagangilang	2,214	0	0	0	0	0	0	299	1,712	203	2,214	0	100
Lagayan	646	0	0	0	0	0	0	24	555	67	646	0	100
Langiden	528	0	0	0	0	0	0	53	387	88	528	0	100
La Paz	2,437	0	0	0	0	0	0	174	2,169	94	2,437	0	100
Licuan	697	0	0	0	0	0	0	258	396	43	697	0	100
Luba	1,088	0	0	0	0	0	0	360	662	66	1,088	0	100
Malibcong	632	0	0	0	0	0	0	14	249	369	632	0	100
Manabo	1,648	0	0	0	0	0	0	116	747	785	1,648	0	100
Penarrubia	958	0	0	0	0	0	0	219	699	40	958	0	100
Pidigan	1,778	0	0	0	0	0	0	288	1,394	96	1,778	0	100
Pilar	1,678	0	0	0	0	0	0	337	924	417	1,678	0	100
Sal-lapadan	971	0	0	0	0	0	0	222	689	60	971	0	100
San Isidro	743	0	0	0	0	0	0	77	643	23	743	0	100
San Juan	1,822	0	0	0	0	0	0	76	1,514	232	1,822	0	100
San Quintin	932	0	0	0	0	0	0	78	825	29	932	0	100
Tayum	2,135	0	0	0	0	0	0	159	1,624	352	2,135	0	100
Tineg	578	0	0	0	0	0	0	7	559	12	578	0	100
Tubo	923	0	0	0	0	0	0	192	716	15	923	0	100
Villaviciosa	947	0	0	0	0	0	0	90	806	51	947	0	100
Provincial Total	37,038	3	0	3	702	0	702	5,097	26,968	4,268	36,333	2	98

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 81% of the present population (of which 27% in urban area and 73% in rural area) is considered as adequately served (refer to detailed study in Supporting Report). Under the area classification, 90% of urban population and 77% of rural population have access to safe water sources/facilities, while the rest is underserved and/or unserved. About 88,800 persons or 55% of the served population depend on Level I facilities, while 71,800 persons or 45% are served by Level III and/or Level II systems. Lower service coverage in rural area is caused by the existence of many unsafe sources and/or no provision of facilities.

4.1.2 Types of Facilities and Definition of Service Level Standard

(1) Composition of water supply system/facility

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

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

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

(2) Safe and unsafe classification of water sources

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

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

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

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

(3) Service level standard

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

Level III: 1 household/connection

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

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

4.1.3 Level III Systems

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

There are 31 Level III systems in the province operated under different kinds of ownership (authority or association) as shown in Table 4.1.2. These are:

- Water Districts in the municipalities of Bangued/Penarubia, Dolores and Lagangilang, and

- A total of 28 Barangay Water Systems in Boliney (6 systems), Bucay (1 system), Danglas (1 system), Dolores (1 system), Licuan (7 systems), Luba (2 systems), Pilar (4 systems), Tayum (2 systems) and Tubo (4 systems).

The largest system in the province is the Bangued WD with the use of a spring source covering 2 municipalities; 8 urban and 14 rural barangays in Bangued and 1 urban and 2 rural barangays in Penarubia. Dolores WD serves only one urban barangay, while Lagangilang WD is for 2 urban and 2 rural barangays. Small scale systems operated by the barangay are catering for limited number of urban or rural barangays. As a whole, 12 municipalities out of the total 27 municipalities in the province have Level III systems.

Majority of the systems utilize spring, however, Lagangilang WD avails deep well source (details are referred to in Table 4.1.1, Supporting Report).

Information on Water Districts shown in Table 4.1.3 revealed that approximately 98% of service connections are provided for domestic use. Per capita consumption rate ranges from 103 liters/day in Dolores WD to 120 liters/day in Bangued WD The collection efficiency of water bill is reported at 93% by Bangued WD. It shall be noted that Bangued WD has an abundant water production being overflowed from the ground reservoir.

Table 4.1.2 Information on Existing Level III Systems

Municipality	Name of System (Operating Body)	Water Source and Consumption: Type of Water Source[1]	Water Consumption (cu.m/day)	Domestic Supply (%)	Service Coverage: Number of Barangays Served: Urban	Rural	Total	Number of HHs/Pop. Served[2]: HHs/Pop.	Urban	Rural	Total
Bangued (Capital)	Bangued W.D	SP	1,885	92.73	8	14	22	HHs	1,945	798	2,743
								Pop.	10,302	4,302	14,628
Boliney	Boayan W.S	SP	N.A.	N.A.	0	1	1	HHs	0	63	63
								Pop.	0	315	315
	Boliney W.S	SP	N.A.	N.A.	1	0	1	HHs	135	0	135
								Pop.	675	0	675
	Danac W.S	SP	N.A.	N.A.	0	2	2	HHs	0	189	189
								Pop.	0	945	945
	Dawangan W.S	SP	N.A.	N.A.	0	1	1	HHs	0	98	98
								Pop.	0	490	490
	Dumagas W.S	SP	N.A.	N.A.	0	1	1	HHs	0	40	40
								Pop.	0	200	200
	Kilong-Olao W.S	SP	N.A.	N.A.	0	1	1	HHs	0	53	53
								Pop.	0	315	315
Municipal Total			N.A.	N.A.	1	6	7	HHs	135	443	578
								Pop.	675	2,265	2,940
Bucay	Bangagan B.W.S.A	SP	N.A.	N.A.	0	1	1	HHs	0	58	58
								Pop.	0	290	290
Danglas	Abaquid W.A.	SP	N.A.	N.A.	0	1	1	HHs	0	43	43
								Pop.	0	215	215
Dolores	Cabaroan W.S	SP	N.A.	N.A.	0	1	1	HHs	0	25	25
								Pop.	0	125	125
	Dolores W.D	SP	N.A.	N.A.	1	0	1	HHs	250	0	250
								Pop.	1,250	0	1,250
Municipal Total			N.A.	N.A.	1	1	2	HHs	250	25	275
								Pop.	1,250	125	1,375
Lagangilang	Lagangilang W.D	DW	192	100.00	2	2	4	HHs	295	87	382
								Pop.	1,025	435	1,460
Lacub	Bonglo W.S	SP	N.A.	N.A.	0	1	1	HHs	0	31	31
								Pop.	0	155	155
	Bulbulala W.S	SP	N.A.	N.A.	0	1	1	HHs	0	56	56
								Pop.	0	280	280
	Candyan W.S	SP	N.A.	N.A.	0	1	1	HHs	0	37	37
								Pop.	0	185	185
	Domingday W.S	SP	N.A.	N.A.	0	1	1	HHs	0	29	29
								Pop.	0	145	145
	Mapisla W.S	SP	N.A.	N.A.	1	0	1	HHs	43	0	43
								Pop.	215	0	215
	Poblacion W.S	SP	N.A.	N.A.	1	0	1	HHs	36	0	36
								Pop.	180	0	180
	Tumalip W.S	SP	N.A.	N.A.	0	1	1	HHs	0	40	40
								Pop.	0	200	200
Municipal Total			N.A.	N.A.	2	5	7	HHs	79	193	272
								Pop.	395	965	1,360
Luba	Bangel W.S	SP	N.A.	N.A.	1	0	1	HHs	163	0	163
								Pop.	815	0	815
	Luzong W.S	SP	N.A.	N.A.	0	1	1	HHs	0	121	121
								Pop.	0	605	605
Municipal Total			N.A.	N.A.	1	1	2	HHs	163	121	284
								Pop.	815	605	1,420
Pamucuan	Bangued W.D	SP	N.A.	N.A.	1	2	3	HHs	85	69	154
								Pop.	407	812	1,219
	Poblacion W.S.	SP	N.A.	N.A.	1	0	1	HHs	36	0	36
								Pop.	180	0	180
	Sagsagacat W.S	SP	N.A.	N.A.	1	3	4	HHs	30	146	176
								Pop.	104	784	938
Municipal Total			N.A.	N.A.	3	5	8	HHs	151	200	351
								Pop.	811	1,596	2,407
Pilar	Dalit W.S	SP	N.A.	N.A.	0	1	1	HHs	0	90	90
								Pop.	0	450	450
	Olitan W.S	SP	N.A.	N.A.	0	1	1	HHs	0	45	45
								Pop.	0	225	225
	Pangat W.S	SP	N.A.	N.A.	0	1	1	HHs	58	58	116
								Pop.	0	290	290
	Poblacion W.S	SP	N.A.	N.A.	1	0	1	HHs	36	0	36
								Pop.	180	0	180
Municipal Total			N.A.	N.A.	1	3	4	HHs	94	193	287
								Pop.	180	965	1,145
Tayum	Tayum Water Service Corp.	DgW	2	100.00	1	0	1	HHs	300	0	300
								Pop.	1,500	0	1,500
	Deet W.S	DW	N.A.	N.A.	0	1	1	HHs	0	104	104
								Pop.	0	520	520
Municipal Total			N.A.	N.A.	1	1	2	HHs	300	104	404
								Pop.	1,500	520	2,020
Tubo	Poblacion W.S	SP	N.A.	N.A.	0	1	1	HHs	0	51	51
								Pop.	0	255	255
	Supet W.S	SP	N.A.	N.A.	0	1	1	HHs	0	74	74
								Pop.	0	370	370
	Tub-tuba	SP	N.A.	N.A.	0	1	1	HHs	0	40	40
								Pop.	0	200	200
	Wayangao W.S	SP	N.A.	N.A.	0	1	1	HHs	0	76	76
								Pop.	0	380	380
Municipal Total			N.A.	N.A.	0	4	4	HHs	0	243	243
								Pop.	0	1,215	1,215
Provincial Total			N.A.	N.A.	30	44	64	HHs	4,494	4,036	8,528
								Pop.	22,586	21,761	44,347

Note: 1. Type of Water Source: *DW* - Deep Well, *Surf.* - Surface Water (River), *SP* - Spring, *IG* - Infiltration Gallery
2. No. of HHs/Pop Served includes those which served by Level II services.
N.A.: Not Applicable

Table 4.1.3 Information on Water District

Name of W.D.	Number of Connections						Water Production (cu.m/mo.)	Accounted for Water	
	Domestic	Comm.	Inst.	Ind'l.	Total	Metered		Volume (cu.m/mo.)	Average Collection Eff. (%)
Bangued W.D.	2,888	107	30	0	3,025	2,967	539,136	56,550	93
Dolores W.D.	250	0	0	0	250	250	3,888	N.A.	N.A.
Lagangilang W.D.	292	0	0	0	292	292	7,230	4,560	80

4.1.4 Level II Systems

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

There are 137 Level II systems covering 22 urban and 138 rural barangays in 24 municipalities, as shown in Table 4.1.4 (details are referred to in Table 4.1.2, Supporting Report).

All Level II systems in the 24 municipalities depend on spring sources, except Caupasan WSA in Danglas with dug well. All these systems are reported to have been providing potable water throughout the day, although no disinfection is provided. The collection efficiencies of water bill are reported by 10 systems ranging from 50% in Caupasan Water & Sanitation Association in Danglas to 100% in Banglolao DWSI and Tabiog WSA, both in Bucay. All other Level II systems are free of charge.

In addition to these systems, there are 2 non-operational Level II systems in La Paz and 1 in Lagayan. These systems need a repair of motor pump and a rehabilitation of distribution pipelines.

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

(1) Management practice

All the Level II systems, except the one in Danglas, utilize spring sources in appreciation of well forested watershed. However, majority of them did not answer to the questionnaire form pertaining to financial performance and managerial set-up. It is commonly known

Table 4.1.4 Information on Existing Level II Systems

Municipality	Name of System (Operating	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
Bangued	Angad W.S	SP	1	0	1	1	0	74	73	0	400	400
	Liogtan W.S	SP	1	0	1	1	0	60	60	0	324	324
	Mkarcamay W.S	SP	1	0	1	1	0	75	75	0	405	405
	Palao W.S	SP	1	0	1	1	0	175	175	0	945	945
	Macay W.S	SP	1	0	1	1	0	60	60	0	324	324
	San Aton W.S	SP	1	0	1	1	0	27	27	0	146	146
Municipal Total			6	0	6	6	0	471	471	0	2,544	2,544
Boccay	Abang BWSA	SP	1	0	1	1	0	100	100	0	560	560
	Bangbangcag BWSA	SP	1	0	1	1	0	60	60	0	336	336
	Bangbolao DWSI	SP	1	0	1	1	0	50	50	0	280	280
	Bugbug BWSA	SP	1	0	1	1	0	25	25	0	140	140
	Calao BWSA	SP	1	0	1	1	0	60	60	0	336	336
	Dugong BWSA	SP	1	1	0	1	150	0	150	810	0	810
	Lubon BWSA	SP	1	0	1	1	0	60	60	0	336	336
	Luyugan BWSA	SP	1	0	1	1	0	20	20	0	112	112
	Madalupay BWSA	SP	1	0	1	1	0	30	30	0	168	168
	Pakiling BWSA	SP	1	0	1	1	0	50	50	0	280	280
	Palaquio BWSA	SP	1	0	1	1	0	100	100	0	560	560
	Quinlong WSA	SP	1	0	1	1	0	60	60	0	336	336
	Salnec BWSA	SP	1	0	1	1	0	40	40	0	224	224
	Siblong BWSA	SP	1	0	1	1	0	25	25	0	140	140
	Tabiog WSA	SP	1	0	1	1	0	15	15	0	84	84
	Bocay WS	SP	1	2	5	7	50	50	100	270	280	550
Municipal Total			16	3	19	22	200	745	945	1,080	4,172	5,252
Bucloc	Labaan WS	SP	1	0	1	1	0	20	20	0	112	112
	Lainao WS	SP	1	0	1	1	0	40	40	0	224	224
	Duchigan WS	SP	1	0	1	1	0	15	15	0	84	84
	Lingey WS	SP	1	0	1	1	0	105	105	0	588	588
Municipal Total			4	0	4	4	0	180	180	0	1,008	1,008
Dagalioman	Cabaruyan WS	SP	1	0	1	1	0	20	20	0	106	106
	Pikek WS	SP	1	0	1	1	0	20	20	0	106	106
	Tui WS	SP	1	0	1	1	0	60	60	0	318	318
	Ablog WS	SP	1	0	1	1	0	15	15	0	80	80
Municipal Total			4	0	4	4	0	115	115	0	610	610
Danglas	Donegunay WSA	SP	1	1	0	1	20	0	20	104	0	104
	Caupasan WSA	DgW	1	1	0	1	50	0	50	266	0	266
	Danglas WSA	SP	1	0	1	1	0	55	55	0	281	281
	Cabaruan WS	SP	1	0	1	1	0	60	60	0	306	306
Municipal Total			4	2	2	4	70	115	185	364	587	951
Dolores	Taping WS	SP	1	0	1	1	0	15	15	0	83	83
	Namitangan WS	SP	1	0	1	1	0	30	30	0	165	165
	Bayaan WS	SP	1	0	1	1	0	35	35	0	193	193
	Kamanlubo WS	SP	1	0	1	1	0	25	25	0	138	138
Municipal Total			4	0	4	4	0	105	105	0	579	579
Lacub	Sapsal WS	SP	1	0	1	1	0	20	20	0	112	112
	Balanseng WS	SP	1	0	1	1	0	10	10	0	56	56
	Poblacion WS	SP	1	1	0	1	60	0	60	324	0	324
	Bacag WS	SP	1	0	1	1	0	20	20	0	112	112
	Bungg WS	SP	1	0	1	1	0	20	20	0	112	112
	Pacoc WS	SP	1	0	1	1	0	15	15	0	84	84
Municipal Total			6	1	5	6	60	85	145	324	476	800
Lagayan	Collago WS	SP	1	0	1	1	0	65	65	0	345	345
	Calamba	SP	1	0	1	1	0	35	35	0	186	186
Municipal Total			2	0	2	2	0	100	100	0	531	531
Langiden	Quillat WS	SP	1	0	1	1	0	25	25	0	123	123
	Boac WS	SP	1	0	1	1	0	20	20	0	98	98
	Poblacion WS	SP	1	1	0	1	0	0	0	0	0	0
Municipal Total			3	1	2	3	0	45	45	0	221	221
Licuan	Lemieng WS	SP	1	0	1	1	0	20	20	0	118	118
	Magao WS	SP	5	0	1	1	0	40	40	0	236	236
	Nalbuan-Subagan WS	SP	2	0	2	2	0	60	60	0	354	354
Municipal Total			8	0	4	4	0	120	120	0	708	708
Luba	Pega WS	SP	1	1	0	1	20	0	20	116	0	116
	Lul-Iano WS	SP	1	0	1	1	0	30	30	0	162	162
	Nagtogaupa WS	SP	1	0	1	1	0	30	30	0	162	162
	Aingalok WS	SP	1	0	1	1	0	35	35	0	189	189
	Barit WS	SP	1	0	1	1	0	30	30	0	162	162
	Guyaman WS	SP	1	0	1	1	0	60	60	0	324	324
Municipal Total			6	1	5	6	20	185	205	116	999	1,115
Malibcong	Malibcong WS	SP	1	0	1	1	0	60	60	0	354	354
	Taripan WS	SP	1	0	1	1	0	40	40	0	236	236
	Dulduao WS	SP	1	0	1	1	0	50	50	0	295	295
	Gocab WS	SP	1	0	1	1	0	60	60	0	354	354
	Bayabas WS	SP	1	0	1	1	0	29	29	0	171	171
	Dulao WS	SP	1	0	1	1	0	30	30	0	177	177
	Manapnap WS	SP	1	0	1	1	0	15	15	0	89	89
	Mataragan WS	SP	1	0	1	1	0	30	30	0	177	177
	Malubleng WS	SP	1	0	1	1	0	20	20	0	118	118
	Pacqued WS	SP	1	0	1	1	0	40	40	0	236	236
	Adugao WS	SP	1	0	1	1	0	13	13	0	77	77
	Umnap WS	SP	1	0	1	1	0	30	30	0	177	177
	Buanao WS	SP	1	0	1	1	0	50	50	0	295	295
	Cabcuba WS	SP	1	0	1	1	0	15	15	0	89	89
Municipal Total			14	0	14	14	0	482	482	0	2,845	2,845

Table 4.1.4 Information on Existing Level II Systems (Cont.)

Municipality	Name of System (Operating	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
Manabo	San Juan WS	SP	1	0	2	2	0	100	100	0	510	510
	Liogan WS	SP	1	1	0	1	75	0	75	590	0	590
	Ayyeng WS	SP	1	1	0	1	65	0	65	338	0	338
	Madago WS	SP	1	0	1	1	0	50	50	0	255	255
	Luzong WS	SP	1	1	0	1	90	0	90	468	0	468
	Sn. Jose WS	SP	1	0	2	2	0	80	80	0	408	408
	Sto. Tomas WS	SP	1	0	1	1	0	35	35	0	179	179
	Catacdegan WS	SP	1	0	2	2	0	80	80	0	408	408
	Banat WS	SP	1	0	1	1	0	50	50	0	255	255
	Villa Conchita W.S.A	SP	1	0	1	1	0	40	40	0	204	204
Municipal Total			10	3	10	13	230	435	665	1,196	2,219	3,415
Pintuyubin	Lusiac WS	SP	1	1	5	6	40	140	180	220	784	1,004
Pidigan	Malabloho & Tambo	SP	2	2	2	4	175	75	250	980	413	1,393
	Suyo WS	SP	1	0	1	1	0	20	20	0	110	110
	Inmuli WS	SP	1	0	1	1	0	20	20	0	110	110
	Pangtod WS	SP	1	0	1	1	0	18	18	0	99	99
Municipal Total			5	2	5	7	175	133	308	980	732	1,712
Pilar	Nagcawisan WS	SP	1	0	1	1	0	30	30	0	159	159
	Sumara WS	SP	1	0	1	1	0	30	30	0	159	159
	San Juan WS	SP	1	0	1	1	0	30	30	0	159	159
	Paficao WS	SP	1	1	0	1	25	0	25	138	0	138
	Ocop WS	SP	1	0	1	1	0	30	30	0	159	159
Municipal Total			5	1	4	5	25	120	145	138	636	774
Sal-lapadan	Bazar WS	SP	4	0	1	1	0	100	100	0	550	550
	Ud-pdao WS	SP	3	0	1	1	0	75	75	0	413	413
	Bilabila WS	SP	1	0	1	1	0	50	50	0	275	275
	Nagulilim WS	SP	3	0	1	1	0	75	75	0	413	413
	Sacaang WS	SP	2	0	1	1	0	25	75	0	413	413
	Magayepyep WS	SP	3	0	1	1	0	60	60	0	330	330
	Saflapadan WS	SP	1	0	1	1	0	40	40	0	220	220
	Gangal WS	SP	2	1	0	1	60	0	60	330	0	330
	Subasub WSA	SP	2	1	0	1	60	0	60	330	0	330
Municipal Total			21	2	7	5	120	475	595	660	2,614	3,274
San Isidro	San Isidro WS	SP	1	1	2	3	40	60	100	240	330	570
San Juan	Poblacion WS	SP	1	2	0	2	45	0	45	216	0	216
San Quintin	Poblacion WS	SP	1	1	0	1	0	0	0	0	0	0
	Pulang WS	SP	1	0	1	1	0	25	25	0	125	125
	Puntoc WS	SP	1	0	1	1	0	103	103	0	515	515
	Tangadan WS	SP	3	0	1	1	0	155	155	0	775	775
	Carsuan WS	SP	1	0	1	1	0	15	15	0	75	75
	Tabaytay WS	SP	1	0	1	1	0	10	10	0	50	50
	Labuan WS	SP	1	0	1	1	0	155	155	0	775	775
	Villa Mercedes WS	SP	1	0	1	1	0	15	15	0	75	75
Municipal Total			10	1	7	8	0	478	478	0	2,390	2,390
Tayum	Budac WS	SP	1	0	1	1	0	100	100	0	570	570
	Basbasa WS	SP	1	0	1	1	0	50	50	0	285	285
	Gaddani WS	SP	1	0	1	1	0	100	100	0	570	570
	Velasco WS	SP	1	0	2	2	0	110	110	0	627	627
Municipal Total			4	0	5	5	0	360	360	0	2,052	2,052
Tineg	Lapat-Balantay WS	SP	1	0	1	1	0	25	25	0	135	135
	Agsimao WS	SP	1	0	1	1	0	60	60	0	324	324
	Apao WS	SP	1	0	1	1	0	20	20	0	108	108
	Lahee WS	SP	1	0	1	1	0	25	25	0	135	135
	Cogon WS	SP	1	0	1	1	0	25	25	0	135	135
	Alada WS	SP	1	0	1	1	0	20	20	0	108	108
	Caganayan WS	SP	1	0	1	1	0	50	50	0	270	270
Municipal Total			7	0	7	7	0	225	225	0	1,215	1,215
Tubo	Antugan WS	SP	1	0	1	1	0	55	55	0	303	303
	Baclingayan WS	SP	1	0	1	1	0	34	34	0	187	187
	Tiempo WS	SP	1	0	1	1	0	40	40	0	220	220
	Alangan WS	SP	1	0	1	1	0	50	50	0	275	275
	Kili-Tubo WS	SP	1	0	1	1	0	28	28	0	154	154
	Bana WS	SP	1	0	1	1	0	18	18	0	99	99
	Apitan WS	SP	1	0	1	1	0	16	16	0	88	88
	Tubatab WS	SP	1	0	1	1	0	35	35	0	193	193
Municipal Total			8	0	8	8	0	276	276	0	1,519	1,519
Villaviciosa	Lumaba WS	SP	1	0	2	2	0	100	100	0	530	530
	Tuquib WS	SP	1	0	1	1	0	132	132	0	700	700
	Laplapog WS	SP	1	0	1	1	0	100	100	0	530	530
	Bolilising WS	SP	1	0	1	1	0	20	20	0	106	106
	Calao WS	SP	1	0	1	1	0	75	75	0	398	398
	Talanac WS	SP	1	0	1	1	0	60	60	0	318	318
	Poblacion WS	SP	1	1	0	1	0	0	0	0	0	0
Municipal Total			7	1	7	8	0	487	487	0	2,582	2,582
Provincial Total			157	22	138	160	1,025	5,937	6,962	5,534	32,353	37,882

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

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

(2) Technical skill for O & M facilities

Problems on the existing water supply are reported to the questionnaire which include inadequate supply pressure, turbid water, odor and supply interruption. Most of these problems are usually caused by inappropriate O & M of facilities, especially spring box and transmission pipeline. Some of them are anticipated to be caused by inappropriate expansion of distribution lines and public faucets. To cope up with these problems, an appropriate technical guidance and skills training shall be arranged by concerned agencies/LGUs.

4.1.5 Level I Facilities

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

Level I facilities are classified in terms of safe and unsafe as presented in Table 4.1.5 mainly referring to the definition provided by DOH. Shallow wells both public and private are also classified assuming that 70% of them are safe sources/facilities in the absence of appropriate water quality analysis results, however the presence of shallow wells in the province is insignificant to the overall service coverage (details are referred to in Supporting Report).

Of the operational Level I facilities (total of 2,350 facilities), 17% is shallow wells. All deep wells were regarded as safe water sources. In application of the unsafe percentage to shallow wells for each municipality and considering open dug wells and rainwater collector as unsafe sources, 2,245 Level I facilities are classified as safe sources, while 188 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.

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/Im-proved Dug Wells	Developed Springs	Total	Shallow Wells	Open Dug Wells	Rain Collectors	Undeveloped Spring	Total	Urban	Rural	Total	Urban	Rural	Total
Bangued (Capital)	59	51	328	11	449	23	0	0	0	23	776	2,549	3,325	4,115	13,762	17,877
Boliney	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bucay	16	9	80	0	105	5	0	0	0	5	272	871	1,143	1,467	4,877	6,344
Bucloc	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0
Daguioman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Danglas	8	0	63	5	76	0	0	0	0	0	227	126	353	1,157	641	1,798
Dolores	205	1	81	2	289	1	0	0	0	1	119	1,176	1,295	595	6,466	7,061
Lacub	0	1	0	0	1	1	0	0	0	1	0	68	68	0	382	382
Lagangilang	105	1	4	5	115	1	0	0	8	9	228	1,166	1,394	1,206	6,531	7,737
Lagayan	5	1	6	0	12	1	10	0	0	11	112	60	172	594	318	912
Langiden	10	2	6	0	18	0	0	0	0	0	47	387	434	220	1,894	2,114
La Paz	203	0	70	0	273	0	0	0	0	0	583	1,367	1,950	3,089	6,835	9,924
Licuan	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0
Luba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malibcong	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0
Manabo	0	32	160	0	192	13	0	0	0	13	483	379	862	2,511	1,934	4,445
Penarrubia	3	1	0	2	6	1	0	0	0	1	0	272	272	0	1,525	1,525
Pidigan	39	7	30	0	76	3	0	0	0	3	293	1,031	1,324	1,638	5,671	7,309
Pilar	61	10	0	6	77	3	0	0	12	15	5	677	682	0	3,587	3,587
Sal-lapadan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Isidro	68	0	0	0	68	0	3	0	0	3	47	501	548	285	2,753	3,038
San Juan	75	129	21	0	225	55	0	0	0	55	183	1,120	1,303	877	5,601	6,478
San Quintin	15	2	11	0	28	1	0	0	0	1	0	178	178	0	889	889
Tayum	22	34	45	0	101	15	0	0	0	15	122	936	1,058	621	5,332	5,953
Tineg	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0
Tubo	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0
Villaviciosa	17	0	25	9	51	0	0	0	5	5	45	217	262	236	1,152	1,388
Provincial Total	911	281	930	40	2,162	123	13	0	52	188	3,542	13,081	16,623	18,611	70,150	88,761

(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 25m 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 is a considerable number of non-functioning public wells in the province as shown in Table 4.1.6, while there is no sufficient iformation on private wells.

Table 4.1.6 Operating Status of Existing Wells in the Province

Operating Status	Unit	Public Wells		Private Shallow Well	Total
		Deep Well	Shallow Well		
Functioning	No.	401	255	149	656
	Percent	91	87	-	89
Non-Functioning	No.	39	38	N/A	77
	Percent	9	13	-	11
Total Number		440	293	NA	733

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

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

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

4.1.6 Water Supply Service Coverage

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

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

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

- Service percentage/population by Level III and Level II systems was estimated based on the questionnaire survey results.
- Unserved population was estimated using the percentages of unserved households to the total number of households by urban and rural area based on the 1990 population census data; "Households by Main Source of Drinking Water and City/Municipality."
- The rest of the population was considered to be served by Level I facilities assuming that 50% of private Level I 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 5to 30 households/facility under the above assumptions (details are referred to in Supporting Report).

Table 4.1.7 presents the profile of the service coverage in terms of served, underserved and unserved. As a provincial total, 81% of the population is adequately served (90% of urban population and 77% of rural population). The lower percentage of service coverage in the rural area is affected by the presence of unsafe sources (134 public and 188 private sources used by about 8,600 persons) and/or no provision of facilities. The provincial service coverage at present is exhibited in Figures 4.1.1 and 4.1.2 (details are referred to Supporting Report).

Among 27 municipalities in the province, 11 municipalities are served higher than or equal to the provincial average of 81%. The highest service coverage is seen in Dolores at 97%. Nine

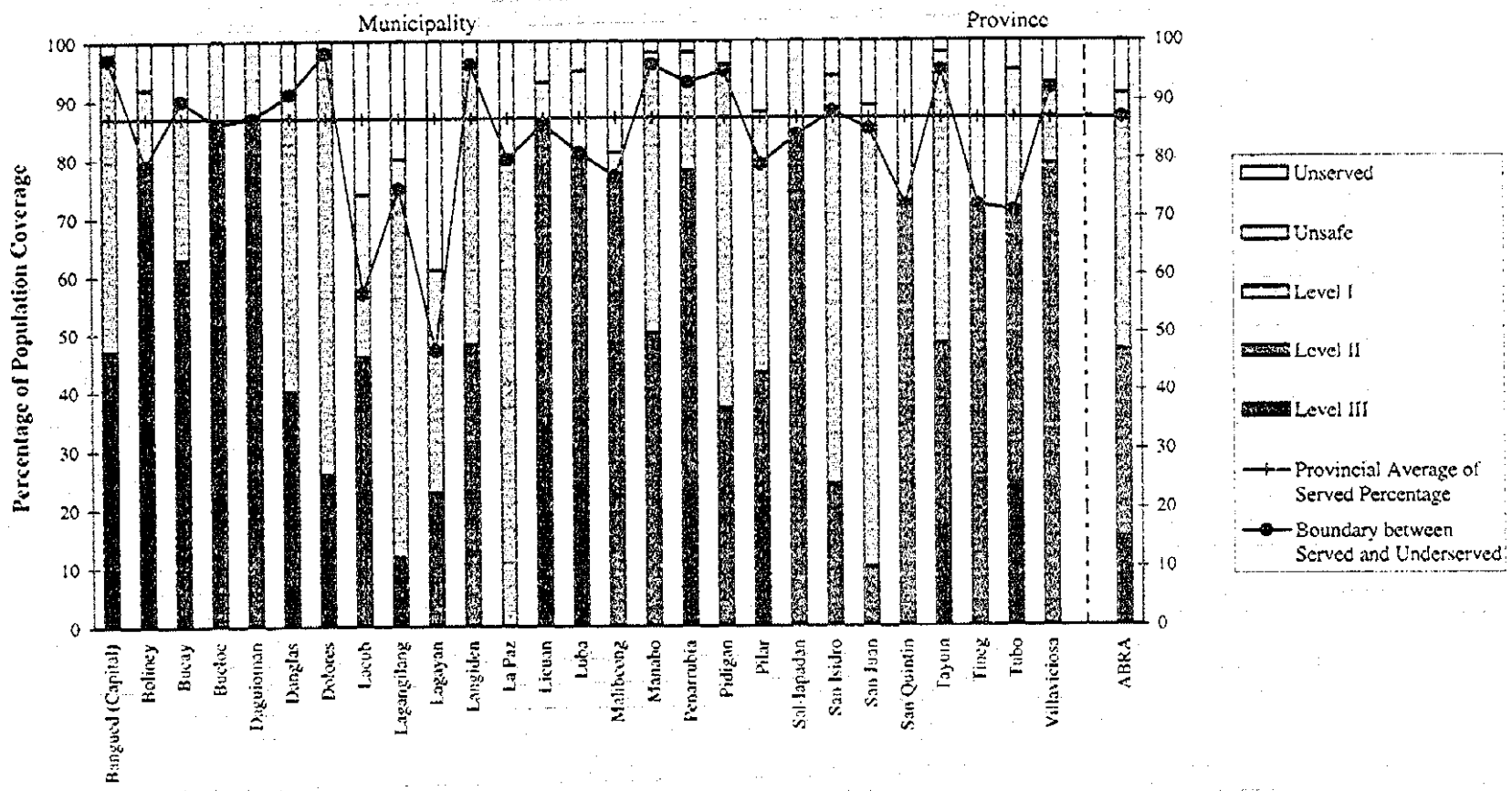
Table 4.1.7 Water Supply Service Coverage by Municipality

Municipality	Type	Population (1995)	Population Coverage							Percentage of Population Coverage						
			Served by Safe Source				Underserved/Unserved			Served by Safe Source				Underserved/Unserved		
			Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total	Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total
Bangued (Capital)	Urban	14,904	10,309	0	4,115	14,424	379	101	480	69	0	28	97	3	0	3
	Rural	22,455	4,309	2,544	13,762	20,615	924	916	1,840	19	11	61	91	4	5	9
	Total	37,359	14,618	2,544	17,877	35,039	1,303	1,017	2,320	39	7	48	94	3	3	6
Boliney	Urban	770	675	35	0	710	19	41	60	88	5	0	93	2	5	7
	Rural	3,424	2,265	340	0	2,605	532	287	819	66	10	0	76	16	8	24
	Total	4,194	2,940	375	0	3,315	551	328	879	70	9	0	79	13	8	21
Bucay	Urban	2,753	0	1,080	1,467	2,547	78	128	206	0	39	53	92	3	5	8
	Rural	11,107	290	4,357	4,877	9,524	437	1,146	1,583	3	39	44	86	4	10	14
	Total	13,860	290	5,437	6,344	12,071	515	1,274	1,789	2	39	46	87	4	9	13
Bucloc	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	2,120	0	1,008	0	1,008	1,112	0	1,112	0	48	0	48	52	0	52
	Total	2,120	0	1,008	0	1,008	1,112	0	1,112	0	48	0	48	52	0	52
Daguioman	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	1,500	0	610	0	610	890	0	890	0	41	0	41	59	0	59
	Total	1,500	0	610	0	610	890	0	890	0	41	0	41	59	0	59
Danglas	Urban	1,555	0	364	1,157	1,521	0	34	34	0	23	74	97	0	3	3
	Rural	1,701	215	587	641	1,443	0	258	258	13	35	38	86	0	15	15
	Total	3,256	215	951	1,798	2,964	0	292	292	7	29	55	91	0	9	9
Dolores	Urban	1,867	1,250	0	595	1,845	0	22	22	67	0	32	99	0	1	1
	Rural	7,395	125	579	6,466	7,170	35	190	225	2	8	87	97	0	3	3
	Total	9,262	1,375	579	7,061	9,015	35	212	247	15	6	76	97	0	3	3
Lacub	Urban	671	0	324	0	324	282	65	347	0	48	0	48	42	10	52
	Rural	1,815	0	476	382	858	382	575	957	0	26	21	47	21	32	53
	Total	2,486	0	800	382	1,182	664	640	1,304	0	32	15	47	27	26	53
Lagangilang	Urban	2,490	1,025	0	1,206	2,231	0	259	259	41	0	48	89	0	11	11
	Rural	9,772	435	0	6,531	6,966	594	2,212	2,806	4	0	67	71	6	23	29
	Total	12,262	1,460	0	7,737	9,197	594	2,471	3,065	12	0	63	75	5	20	25
Lagayan	Urban	854	0	0	594	594	97	163	260	0	0	70	70	11	19	30
	Rural	2,580	0	531	318	849	548	1,183	1,731	0	21	12	33	21	46	67
	Total	3,434	0	531	912	1,443	645	1,346	1,991	0	15	27	42	19	39	58
Langiden	Urban	350	0	120	220	340	0	10	10	0	34	63	97	0	3	3
	Rural	2,206	0	221	1,894	2,115	0	91	91	0	10	86	96	0	4	4
	Total	2,556	0	341	2,114	2,455	0	101	101	0	13	83	96	0	4	4
La Paz	Urban	3,362	0	0	3,089	3,089	0	273	273	0	0	92	92	0	8	8
	Rural	9,058	0	0	6,835	6,835	0	2,223	2,223	0	0	75	75	0	25	25
	Total	12,420	0	0	9,924	9,924	0	2,496	2,496	0	0	80	80	0	20	20
Licuan	Urban	654	395	190	0	585	41	28	69	60	29	0	89	6	5	11
	Rural	3,391	965	1,198	0	2,163	948	280	1,228	28	35	0	63	28	9	37
	Total	4,045	1,360	1,388	0	2,748	989	308	1,297	34	34	0	68	24	8	32
Luba	Urban	1,167	815	116	0	931	196	40	236	70	10	0	80	17	3	20
	Rural	4,765	605	1,139	0	1,744	2,762	259	3,021	13	24	0	37	58	5	63
	Total	5,932	1,420	1,255	0	2,675	2,958	299	3,257	24	21	0	45	50	5	55

Table 4.1.7 Water Supply Service Coverage by Municipality (Cont'd.)

Municipality	Type	Population (1995)	Population Coverage							Percentage of Population Coverage						
			Served by Safe Source				Underserved/Unserved			Served by Safe Source				Underserved/Unserved		
			Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total	Level III	Level II	Level I	Total	Unsafe Source	Unserved	Total
Malibcong	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	3,705	0	2,845	0	2,845	151	709	860	0	77	0	77	4	19	23
	Total	3,705	0	2,845	0	2,845	151	709	860	0	77	0	77	4	19	23
Manabo	Urban	3,968	0	1,196	2,511	3,707	244	17	261	0	30	63	93	6	1	7
	Rural	4,515	0	2,219	1,934	4,153	231	131	362	0	49	43	92	5	3	8
	Total	8,483	0	3,415	4,445	7,860	475	148	623	0	40	52	92	6	2	8
Penarrubia	Urban	1,049	829	220	0	1,049	0	0	0	79	21	0	100	0	0	0
	Rural	4,299	1,596	784	1,525	3,905	254	140	394	37	18	35	90	6	4	10
	Total	5,348	2,425	1,004	1,525	4,954	254	140	394	45	19	29	93	5	2	7
Pidigan	Urban	2,655	0	980	1,638	2,618	0	37	37	0	37	62	99	0	1	1
	Rural	7,113	0	732	5,671	6,403	399	311	710	0	10	80	90	6	4	10
	Total	9,768	0	1,712	7,309	9,021	399	348	747	0	18	75	93	4	3	7
Pilar	Urban	1,303	1,000	178	0	1,178	0	125	125	77	14	0	91	0	9	9
	Rural	7,660	965	1,156	3,587	5,708	882	1,070	1,952	13	15	47	75	12	13	25
	Total	8,963	1,965	1,334	3,587	6,886	882	1,195	2,077	22	15	40	77	10	13	23
Sal-lapadan	Urban	1,424	0	660	0	660	764	0	764	0	46	0	46	54	0	54
	Rural	3,892	0	2,614	0	2,614	1,278	0	1,278	0	67	0	67	33	0	33
	Total	5,316	0	3,274	0	3,274	2,042	0	2,042	0	62	0	62	38	0	38
San Isidro	Urban	552	0	240	285	525	0	27	27	0	43	52	95	0	5	5
	Rural	3,572	0	330	2,753	3,083	290	199	489	0	9	77	86	8	6	14
	Total	4,124	0	570	3,038	3,608	290	226	516	0	14	74	88	7	5	12
San Juan	Urban	1,329	0	216	877	1,093	138	98	236	0	16	66	82	10	8	18
	Rural	7,797	0	0	5,601	5,601	1,350	846	2,196	0	0	72	72	17	11	28
	Total	9,126	0	216	6,478	6,694	1,488	944	2,432	0	2	71	73	16	11	27
San Quintin	Urban	738	0	260	0	260	298	180	478	0	35	0	35	40	25	65
	Rural	3,968	0	1,665	889	2,554	47	1,367	1,414	0	42	22	64	1	35	36
	Total	4,706	0	1,925	889	2,814	345	1,547	1,892	0	41	19	60	7	33	40
Tayum	Urban	2,268	1,500	50	621	2,171	76	21	97	66	2	27	95	3	2	5
	Rural	9,569	520	2,227	5,332	8,079	1,263	227	1,490	5	23	56	84	13	3	16
	Total	11,837	2,020	2,277	5,953	10,250	1,339	248	1,587	17	19	50	86	11	3	14
Tineg	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	3,109	0	1,215	0	1,215	0	1,894	1,894	0	39	0	39	0	61	61
	Total	3,109	0	1,215	0	1,215	0	1,894	1,894	0	39	0	39	0	61	61
Tubo	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	5,111	1,215	1,814	0	3,029	1,823	259	2,082	24	35	0	59	36	5	41
	Total	5,111	1,215	1,814	0	3,029	1,823	259	2,082	24	35	0	59	36	5	41
Villaviciosa	Urban	788	0	520	236	756	0	32	32	0	66	30	96	0	4	4
	Rural	4,209	0	2,582	1,152	3,734	169	306	475	0	61	27	88	4	8	12
	Total	4,997	0	3,102	1,388	4,490	169	338	507	0	62	28	90	3	7	10
Provincial Total	Urban	47,471	17,798	6,749	18,611	43,158	2,612	1,701	4,313	37	14	39	90	6	4	10
	Rural	151,808	13,505	33,773	70,150	117,428	17,301	17,079	34,380	9	22	46	77	11	12	23
	Total	199,279	31,303	40,522	88,761	160,586	19,913	18,780	38,693	16	20	45	81	10	9	19

Figure 4.1.1 Water Supply Service Coverage by Municipality



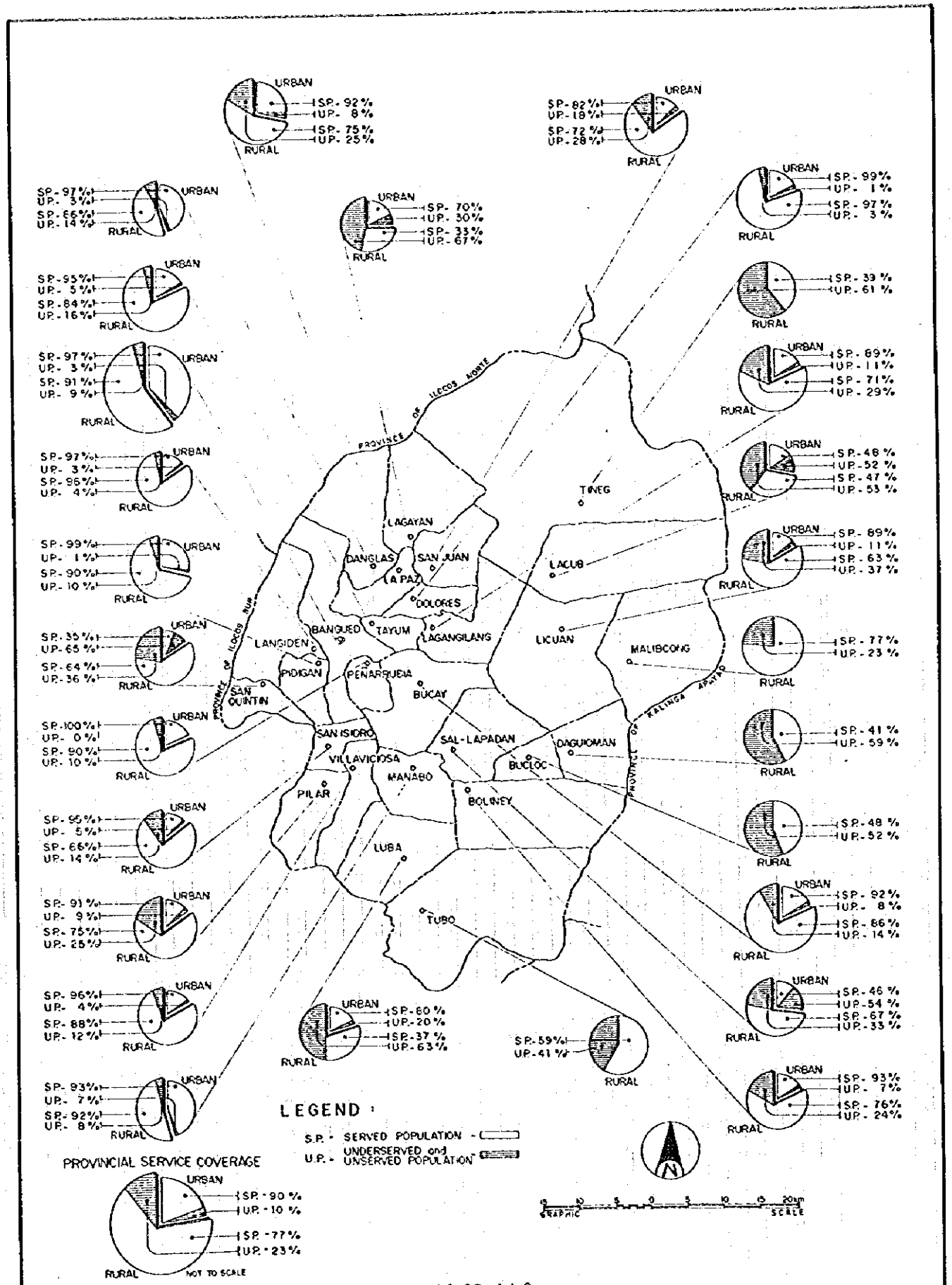


FIGURE 4.1.2

EXISTING WATER SUPPLY SERVICE COVERAGE MAP

(9) other municipalities (Bangued, Danglas, Langiden, Manabo, Peñarrubia, Pidigan, and Villaviciosa) also exceed 90% of service coverage. While, remaining 16 municipalities are below the provincial average. Tineg is as low as 39%, followed by Daguioman (41%), Lagayan (42%), and Luba (45%).

4.2 Sanitation and Sewerage

4.2.1 General

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

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

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

4.2.2 Types of Facilities and Definition of Service Level Standard

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

In terms of service level, households are classified into: 1) served households - households with at least one (1) sanitary toilet; 2) underserved households - households with unsanitary

toilets; and 3) unserved households - households without toilet. Coverage of adequately served households (with sanitary toilets) was estimated by urban and rural area of municipalities. The remaining households were considered as underserved and/or unserved. The service coverage was determined using the estimated number of households in 1995.

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

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

4.2.3 Sanitation Facilities and Service Coverage

(1) Household Toilets

The service coverage of sanitary toilets in the province is 52% of the total number of households. The rest is underserved and/or unserved, of which almost 21% is without toilet facilities (details are referred to Table 4.2.1, Supporting Report and 4.2.3, Data Report). The existence of households without toilets can be attributed to those households sharing the same facility with their relatives or neighbors. According to PHO, about 20% of the households without toilet is considered as "shared users".

In urban areas, approximately 75% of the total households is served. A much lower served households of 45% exist in rural area comparing with urban area. Table 4.2.1 shows the municipal breakdown in the number of urban and rural household toilets by category, and service coverage. Figures 4.2.1 and 4.2.2 reflect the provincial service coverage of household toilet facilities for urban and rural areas.

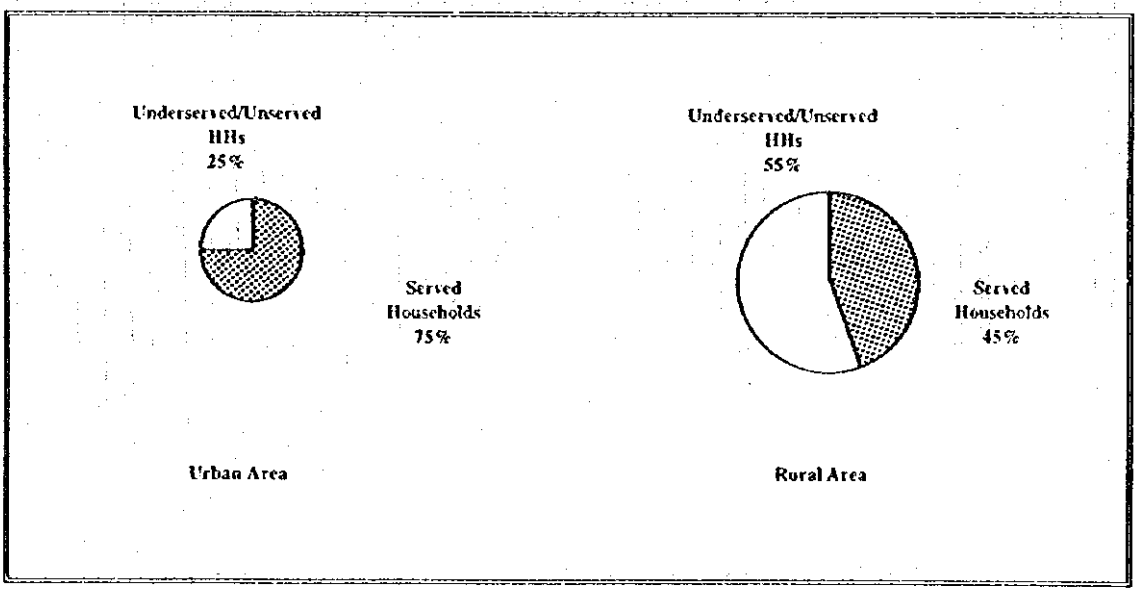
(2) School and Public Toilets

Toilet facilities in elementary and secondary schools for both public and private schools were investigated. The province has a total of 725 toilet units found in 301 schools.

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

Municipality	Households 1995			Household Toilet Facilities and Service Coverage											
				Urban				Rural				Municipal Total			
	Urban	Rural	Total	Households Served by Sanitary Toilets		Underserved/ Unserved HHs		Households Served by Sanitary Toilets		Underserved/ Unserved HHs		Households Served by Sanitary Toilets		Underserved/ Unserved HHs	
				Number	% of HH	Number	% of HH	Number	% of HH	Number	% of HH	Number	% of HH	Number	% of HH
Bangued (Capital)	2,816	4,152	6,968	2,435	86	381	14	152	4	4,000	96	2,587	37	4,381	63
Boliney	139	630	769	20	14	119	86	95	15	535	85	115	15	654	85
Bucay	511	1,966	2,477	203	40	308	60	691	35	1,275	65	894	36	1,583	64
Bucloc	0	379	379	0	0	0	0	135	36	244	64	135	36	244	64
Daguioman	0	284	284	0	0	0	0	96	34	188	66	96	34	188	66
Danglas	302	334	636	211	70	91	30	184	55	150	45	395	62	241	38
Dolores	375	1,346	1,721	232	62	143	38	621	46	725	54	853	50	868	50
Lacub	123	326	449	123	100	0	0	206	63	120	37	329	73	120	27
Lagangilang	467	1,747	2,214	307	66	160	34	848	49	899	51	1,155	52	1,059	48
Lagayan	161	485	646	104	65	57	35	285	59	200	41	389	60	257	40
Langiden	74	454	528	61	82	13	18	207	46	247	54	268	51	260	49
La Paz	638	1,799	2,437	624	98	14	2	935	52	864	48	1,559	64	878	36
Licuan	121	576	697	107	88	14	12	381	66	195	34	488	70	209	30
Luba	202	886	1,088	174	86	28	14	493	56	393	44	667	61	421	39
Malibcong	0	632	632	0	0	0	0	370	59	262	41	370	59	262	41
Manabo	757	891	1,648	427	56	330	44	521	58	370	42	948	58	700	42
Penarrubia	191	767	958	186	97	5	3	757	99	10	1	943	98	15	2
Pidigan	476	1,302	1,778	426	89	50	11	970	75	332	25	1,396	79	382	21
Pilar	236	1,442	1,678	99	42	137	58	611	42	831	58	710	42	968	58
Sal-Lapadan	261	710	971	108	41	153	59	578	81	132	19	686	71	285	29
San Isidro	91	652	743	77	85	14	15	411	63	241	37	488	66	255	34
San Juan	278	1,544	1,822	223	80	55	20	537	35	1,007	65	760	42	1,062	58
San Quintin	143	789	932	103	72	40	28	485	61	304	39	588	63	344	37
Tayum	449	1,686	2,135	341	76	108	24	1,202	71	484	29	1,543	72	592	28
Tineg	0	578	578	0	0	0	0	206	36	372	64	206	36	372	64
Tubo	0	923	923	0	0	0	0	254	28	669	72	254	28	669	72
Villaviciosa	151	796	947	106	70	45	30	476	60	320	40	582	61	365	39
Provincial Total	8,962	28,076	37,038	6,697	75	2,265	25	12,707	45	15,369	55	19,404	52	17,634	48

Figure 4.2.1 Provincial Service Coverage of Household Toilet Facilities, 1995



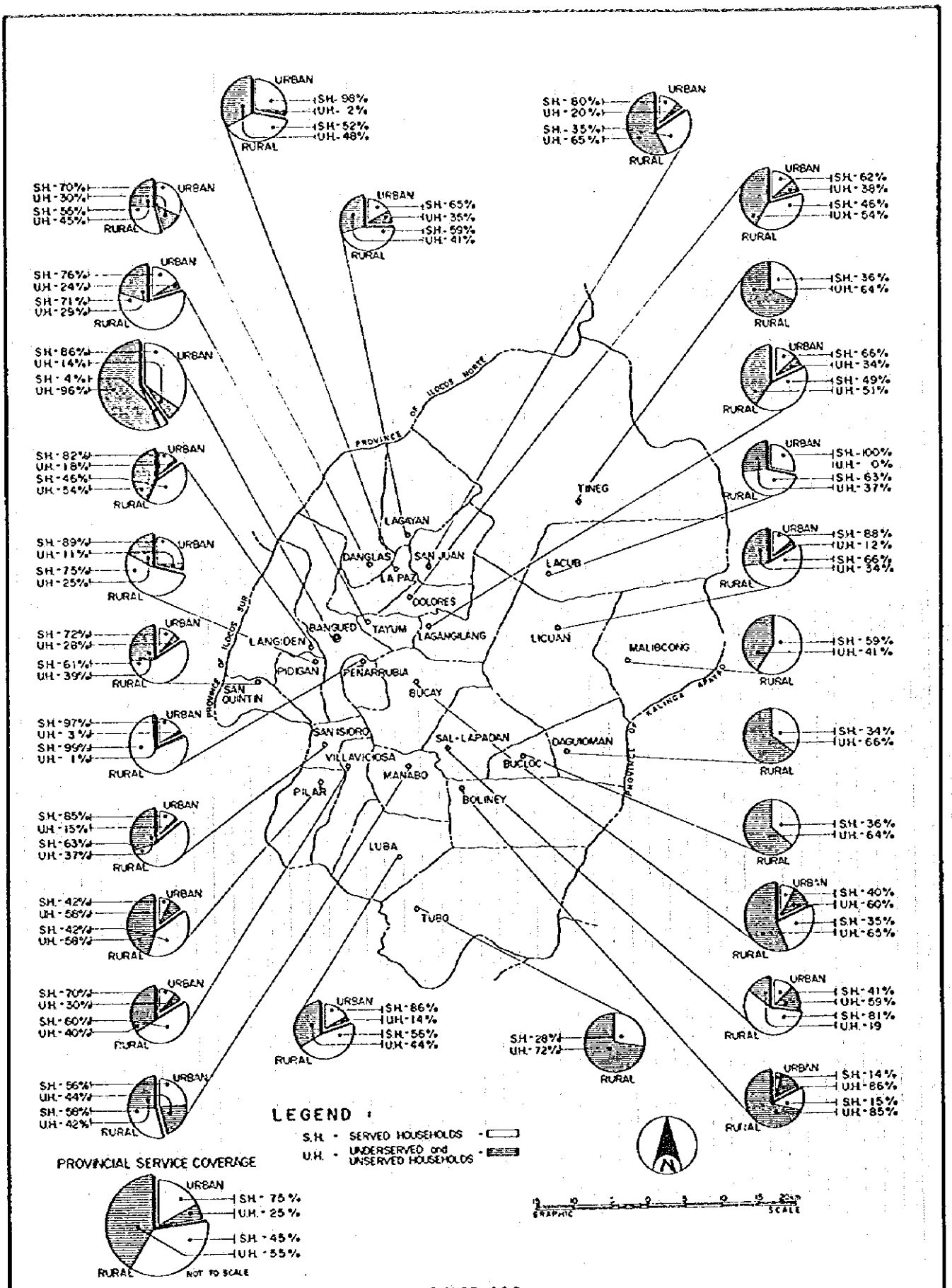


FIGURE 4.2.2

EXISTING HOUSEHOLD TOILETS SERVICE COVERAGE MAP

Only 53% of the students is adequately served by sanitary toilets. The rest, 47% is underserved and/or unserved.

There are 22 public markets, bus/jeepney terminals and parks or plazas in the province. About 82% of these public utilities is served, while the rest, 18% is underserved and/or unserved. Table 4.2.2 and Table 4.2.3 provide the number and service coverage of toilet facilities of schools and public utilities, respectively.

(3) Problem Areas

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

The number of sanitary school toilets is slightly low to meet the service level standard of 50 students per sanitary facility. At present, the average ratio is 83 students per sanitary toilet.

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

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

4.2.4 Sewerage Facilities

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

Table 4.2.2 School Toilet Facilities and Service Coverage in 1995

Municipality	Number of Schools			Number of Students			Number of Toilet Units						Total Units	Service Coverage											
							Sanitary			Unsanitary				Served						Underserved/Unserved					
														Public		Private		Total		Public		Private		Total	
	Public	Private	Total	Public	Private	Total	Public	Private	Total	Public	Private	Total		Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Bangued (Capital)	20	8	28	6,690	2,082	8,772	51	61	112	5	0	5	117	2,550	29	2,082	24	4,632	53	4,140	47	0	0	4,140	47
Boliney	10	0	10	785	0	785	16	0	16	0	0	0	16	785	100	0	0	785	100	0	0	0	0	0	0
Bucay	20	2	22	4,472	301	4,773	36	19	55	5	0	5	60	1,800	38	301	6	2,101	44	2,672	56	0	0	2,672	56
Bucloc	5	1	6	358	129	487	2	10	12	4	0	4	16	100	21	129	26	229	47	258	53	0	0	258	53
Daguioman	3	0	3	367	0	367	8	0	8	1	0	1	9	367	100	0	0	367	100	0	0	0	0	0	0
Danglas	5	0	5	557	0	557	11	0	11	0	0	0	11	550	99	0	0	550	99	7	1	0	0	7	1
Dolores	10	1	11	1,617	408	2,025	26	6	32	0	0	0	32	1,300	64	300	15	1,600	79	317	16	108	5	425	21
Lacub	7	2	9	294	217	511	10	4	14	0	0	0	14	294	58	200	39	494	97	0	0	17	3	17	3
Lagangilang	13	2	15	2,254	484	2,738	49	4	53	0	0	0	53	2,254	82	200	7	2,454	90	0	0	284	10	284	10
Lagayan	9	0	9	955	0	955	23	0	23	0	0	0	23	955	100	0	0	955	100	0	0	0	0	0	0
Langiden	5	0	5	423	0	423	9	0	9	0	0	0	9	423	100	0	0	423	100	0	0	0	0	0	0
La Paz	12	3	15	2,146	956	3,102	15	6	21	3	0	3	24	750	24	300	10	1,050	34	1,396	45	656	21	2,052	66
Licuan	9	0	9	557	0	557	6	0	6	7	0	7	13	300	54	0	0	300	54	257	46	0	0	257	46
Luba	16	1	17	1,106	253	1,359	4	2	6	24	0	24	30	200	15	100	7	300	22	906	67	153	11	1,059	78
Malibcong	7	2	9	799	174	973	0	1	1	19	0	19	20	0	0	50	5	50	5	799	82	124	13	923	95
Manabo	8	1	9	1,949	436	2,385	12	5	17	6	0	6	23	600	25	250	10	850	36	1,349	57	186	8	1,535	64
Penarrubia	6	1	7	816	392	1,208	18	5	23	0	0	0	23	816	68	250	21	1,066	88	0	0	142	12	142	12
Pidigan	10	2	12	2,197	325	2,522	27	15	42	0	0	0	42	1,350	54	325	13	1,675	66	847	34	0	0	847	34
Pilar	15	1	16	2,268	291	2,559	14	2	16	28	0	28	44	700	27	100	4	800	31	1,568	61	191	7	1,759	69
Sal-lapadan	11	1	12	935	271	1,206	10	4	14	2	0	2	16	500	41	200	17	700	58	435	36	71	6	506	42
San Isidro	7	0	7	883	0	883	4	0	4	6	0	6	10	200	23	0	0	200	23	683	77	0	0	683	77
San Juan	12	1	13	2,264	281	2,545	28	4	32	4	0	4	36	1,400	55	200	8	1,600	63	864	34	81	3	945	37
San Quintin	5	0	5	870	0	870	17	0	17	0	0	0	17	850	98	0	0	850	98	20	2	0	0	20	2
Tayum	8	1	9	1,919	274	2,193	18	2	20	0	4	4	24	900	41	100	5	1,000	46	1,019	46	174	8	1,193	54
Tineg	12	0	12	818	0	818	0	0	0	12	0	12	12	0	0	0	0	0	0	818	100	0	0	818	100
Tubo	17	1	18	1,556	44	1,600	11	0	11	6	0	6	17	550	34	0	0	550	34	1,006	63	44	3	1,050	66
Villaviciosa	7	1	8	743	185	928	0	2	2	12	0	12	14	0	0	100	11	100	11	743	80	85	9	828	89
Provincial Total	269	32	301	40,598	7,503	48,101	425	152	577	144	4	148	725	20,494	43	5,187	11	25,681	53	20,104	42	2,316	5	22,420	47

Table 4.2.3 Public Toilet Facilities and Service Coverage in 1995

Municipality	Public Markets				Jeepney/Bus/Airport Terminals				Parks/Playgrounds				Total No. Public Utilities	Served		Underserved/Unserved	
	Number	Number of Toilets			Number	Number of Toilets			Number	Number of Toilets				No. of Sanitary Toilets	%	Number of Unsanitary Toilets	%
		Sanitary	Un-sanitary	No Facility		Sanitary	Un-sanitary	No Facility		Sanitary	Un-sanitary	No Facility					
Bangued (Capital)	1	1	0	0	5	5	0	0	2	2	0	0	8	8	100	0	0
Boliney	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bucay	1	1	0	0	0	0	0	0	0	0	0	0	1	1	100	0	0
Bucloc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daguioman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Danglas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dolores	1	1	0	0	0	0	0	0	0	0	0	0	1	1	100	0	0
Lacub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagangilang	1	1	0	0	0	0	0	0	0	0	0	0	1	1	100	0	0
Lagayan	0	0	0	0	0	0	0	0	1	1	0	0	1	1	100	0	0
Langiden	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
La Paz	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	100
Licuan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malibcong	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manabo	1	1	0	0	0	0	0	0	1	0	0	1	2	1	50	1	50
Penarrubia	1	1	0	0	0	0	0	0	1	1	0	0	2	2	100	0	0
Pidigan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilar	1	0	0	1	0	0	0	0	1	1	0	0	2	1	50	1	50
Sal-lapadan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Isidro	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Juan	1	1	0	0	0	0	0	0	0	0	0	0	1	1	100	0	0
San Quintin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tayum	0	0	0	0	0	0	0	0	1	1	0	0	1	1	100	0	0
Tineg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tubo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Villaviciosa	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	100
Provincial Total	9	7	0	2	5	5	0	0	8	6	0	2	22	18	900	4	300