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 - 1

MAIN REPORT

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

ZAMBALES

FEBRUARY 1996

NIPPON JOGESUIDO SEKKEI CO., LTD.

EXCHANGE RATE (As of 1 August 1995)

US $ 1.0 = Peso 25.7 = Yen 88.3

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 - 1

MAIN REPORT

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

ZAMBALES

FEBRUARY 1996

NIPPON JOGESUIDO SEKKEI CO., LTD.

Republic of the Philippines
PROVINCE OF ZAMBALES
I B A

OFFICE OF THE GOVERNOR

August 15, 1995

MESSAGE

TO THE GOOD PEOPLE OF ZAMBALES:

Greetings!!!

It is indeed a pleasure and privilege to present to you the Provincial Water Supply, Sewerage and Sanitation Sector Plan (PW4SP) that is envisaged to be implemented by the provincial government starting in 1996 up to the year 2010. The Master Plan covers the provision of adequate, safe and potable water supply; sanitary toilet facilities to private households, public places and public schools; and proper sewage disposal system to rural and urban areas/barangays.

In our desire to maximize the provision of the sectoral services to our people, we adopted a two-pronged approach to the problem. First, a Medium-Term Development Plan (1996-2000) was prepared for immediate impact assessment midway in the implementation period, and second, a Long Term Development Plan that will cover 2001 up to 2010. The latter will enable implementors to re-direct and re-focus the plan to address problem areas which will redound to a more vigorous implementation in consonance with changing realities.

The Provincial Sector Planning Team (PSPT), which formulated the Master Plan with technical assistance from the Department of Interior & Local Government/Japanese International Cooperation Agency (DILG/JICA) Study Team consultants, attempted to

arrive at a comprehensive analysis of the prevailing problems in the sector in order to achieve a realistic assessment of present and future needs of the people, from whence the investment plan can be derived. The investment plan will be used as a guideline for identifying and prioritizing specific project requirements of the province.

In our earnest desire to keep pace with development trends geared towards the attainment of Philippines 2000, we who were mandated by the people to enhance the delivery of basic services are committed to provide the mechanism for the realization of that mission and vision for our people. Hopefully this Master Plan will solve our water and sanitation problems in the long term at the same time that agro-industrial and commercial development in the province are being promoted.

It is our fervent hope that we in government will persevere in meeting this challenge and continue to orient ourselves towards providing our people with the most basic services.

My best wishes to all of you!!!

ATTY. AMOR D. DELOSO
Governor

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

VOLUME II - 1 MAIN REPORT

TABLE OF CONTENTS

CHAPTER			PAGE NO.
MESSAGE OF THE GOVERNOR			
LIST OF TABLES			v
LIST OF FIGURES			vii
LIST OF ABBREVIATIONS			viii
1.	INTRODUCTION		
1.1	Sector Development in the Philippines		1 - 1
1.2	Provincial Sector Planning		1 - 2
	1.2.1	Objectives of Sector Planning	1 - 2
	1.2.2	Scope of Sector Planning	1 - 2
	1.2.3	Financing of Sector Plan	1 - 4
1.3	The Provincial Plan for the Province of Zambales		1 - 4
	1.3.1	Preparation of the Plan	1 - 4
	1.3.2	Outline of the Report	1 - 5
1.4	Acknowledgments		1 - 7
2.	PLANNING APPROACH FOR FUTURE SECTOR DEVELOPMENT		
2.1	General		2 - 1
2.2	Planning Framework		2 - 1
2.3	Sector Objectives		2 - 2
2.4	Current Sector Policies and Strategies		2 - 2
2.5	Major Legislation and Regulations Affecting the Sector		2 - 3
2.6	Planning Principles and Data Management		2 - 4
	2.6.1	Planning Principles	2 - 4
	2.6.2	Data Management	2 - 5
3.	PROVINCIAL PROFILE		
3.1	General		3 - 1
3.2	Natural Conditions and Geographical Features		3 - 3
	3.2.1	Meteorology	3 - 3
	3.2.2	Land Use	3 - 3
	3.2.3	Topography and Drainage	3 - 4
3.3	Socio-economic Conditions		3 - 4
	3.3.1	Economic Activities and Household Income	3 - 4
	3.3.2	Basic Infrastructure	3 - 6
	3.3.3	Education	3 - 6
3.4	Population		3 - 6
	3.4.1	Previous Population Development	3 - 6

CHAPTER		PAGE NO.
	3.4.2 Classification of Urban and Rural Areas	3 - 9
	3.4.3 Present Population Distribution	3 - 11
3.5	Health Status	3 - 13
	3.5.1 Morbidity, Mortality and Infant Mortality	3 - 13
	3.5.2 Water Related Diseases	3 - 14
	3.5.3 Health Facilities and Practitioners	3 - 15
3.6	Environmental Conditions	3 - 15
	3.6.1 General	3 - 15
	3.6.2 Water Pollution	3 - 15
	3.6.3 Solid Waste Disposal	3 - 16
4.	**EXISTING FACILITIES AND SERVICE COVERAGE**	
4.1	Water Supply	4 - 1
	4.1.1 General	4 - 1
	4.1.2 Types of Facilities and Definition of Service Level Standard	4 - 1
	4.1.3 Level III Systems	4 - 3
	4.1.4 Level II Systems	4 - 4
	4.1.5 Level I Facilities	4 - 6
	4.1.6 Water Supply Service Coverage	4 - 8
4.2	Sanitation and Sewerage	4 - 12
	4.2.1 General	4 - 12
	4.2.2 Types of Facilities and Definition of Service Level Standard	4 - 12
	4.2.3 Sanitation Facilities and Service Coverage	4 - 13
	4.2.4 Sewerage Facilities	4 - 18
5.	**EXISTING SECTOR ARRANGEMENTS AND INSTITUTIONAL CAPACITY**	
5.1	General	5 - 1
5.2	Sector Reforms	5 - 1
5.3	Sector Institutions	5 - 2
5.4	Sector Agencies at the National Level	5 - 4
5.5	Sector Agencies at the Local Level	5 - 11
5.6	External Support Agencies Active in the Sector	5 - 15
5.7	Current Community Development and Training Approaches	5 - 17
	5.7.1 Community Development	5 - 17
	5.7.2 Human Resources Development Training	5 - 17
	5.7.3 Sanitation/Hygiene Education	5 - 18
5.8	Existing Sector Monitoring	5 - 19
6.	**PAST FINANCIAL PERFORMANCE IN WATER SUPPLY AND SANITATION**	
6.1	General	6 - 1
6.2	Past Public Investment	6 - 1
	6.2.1 Past Public Investment by the Central Government Agencies and LGUs	6 - 1
	6.2.2 Sources of Local Fund	6 - 2
6.3	Cost Recovery	6 - 4
6.4	Affordability	6 - 4
6.5	Past Financial Performance of WDs and RWSAs/BWSAs	6 - 5

CHAPTER		PAGE NO.
7.	**WATER SOURCE DEVELOPMENT**	
7.1	General	7 - 1
7.2	Geology	7 - 2
7.3	Groundwater Sources	7 - 4
	7.3.1 Classification of Groundwater Sources	7 - 4
	7.3.2 Groundwater Availability in the Province	7 - 4
7.4	Spring Sources	7 - 7
7.5	Surface Water Sources	7 - 7
7.6	Future Development Potential of Water Sources	7 - 7
8.	**FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT**	
8.1	General	8 - 1
8.2	Targets of Provincial Sector Plan	8 - 2
8.3	Projection of Frame Values	8 - 8
	8.3.1 Population Projection	8 - 8
	8.3.2 School Enrollment Projection	8 - 10
	8.3.3 Projection of the Number of Public Utilities	8 - 11
	8.3.4 Planning Area and Population to be Served by the Sewerage System	8 - 11
	8.3.5 Number of Households to be Served by Municipal Solid Waste Collection System	8 - 12
8.4	Types of Facilities and Implementation Criteria	8 - 12
	8.4.1 Water Supply	8 - 12
	8.4.2 Sanitation	8 - 14
	8.4.3 Urban Sewerage	8 - 15
	8.4.4 Solid Waste	8 - 16
8.5	Service Coverage by Target Year	8 - 16
	8.5.1 Water Supply	8 - 16
	8.5.2 Sanitation	8 - 17
	8.5.3 Urban Sewerage	8 - 27
	8.5.4 Solid Waste	8 - 27
8.6	Facilities, Equipment and Rehabilitation to Meet the Target Services	8 - 28
	8.6.1 Water Supply	8 - 28
	8.6.2 Sanitation	8 - 30
	8.6.3 Urban Sewerage and Solid Waste	8 - 32
8.7	Identification of Priority Projects for Medium-Term Development Plan	8 - 32
9.	**SECTOR MANAGEMENT PLAN**	
9.1	General	9 - 1
9.2	Sector Management	9 - 1
9.3	Institutional Arrangements	9 - 8
9.4	Project Management Arrangements	9 - 12
9.5	Community Development Models	9 - 16
9.6	Human Resources Development and Training	9 - 20
10.	**COST ESTIMATES FOR FUTURE SECTOR DEVELOPMENT**	
10.1	General	10 - 1
10.2	Assumptions for Cost Estimates	10 - 1

CHAPTER		PAGE NO.
10.3	Costs of Required Facilities and Equipment	10 - 6
	10.3.1 Cost of Required Facilities	10 - 6
	10.3.2 Cost of Required Equipment and Vehicle	10 - 6
10.4	Recurrent Cost	10 - 7
11.	**FINANCIAL ARRANGEMENTS**	
11.1	General	11 - 1
11.2	Projection of IRA	11 - 1
11.3	Additional Funding Requirements	11 - 7
11.4	Medium-Term Implementation Arrangements	11 - 9
	11.4.1 Reference Scenarios in Different Funding Levels	11 - 9
	11.4.2 Alternative Countermeasures	11 - 12
11.5	Cost Recovery	11 - 16
12.	**MONITORING**	
12.1	General	12 - 1
12.2	Sector Monitoring	12 - 1
12.3	Project Monitoring	12 - 4
12.4	Evaluation of Plan Implementation and Updating the PW4SP	12 - 7

PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

LIST OF TABLES

Table No.	Title	Page No.
2.2.1	National Sector Coverage Targets	2 - 1
3.1.1	Outline of City and Municipalities	3 - 1
3.2.1	Current Land Use	3 - 3
3.2.2	Drainage Areas and Flow Rates of Major Rivers	3 - 4
3.3.1	Provincial Outline on Public Services	3 - 8
3.3.2	Public Facilities and Services by Municipality	3 - 8
3.4.1	Previous Population Development by Municipality	3 - 10
3.4.2	Outline of Urban and Rural Areas in the Province	3 - 11
3.4.3	Household Numbers and Household Sizes in 1990	3 - 13
3.5.1	Number and Rates of Ten Leading Causes of Morbidity, Mortality and Infant Mortality	3 - 14
3.5.2	Reported Cases and Deaths of Notifiable Water Related Diseases	3 - 15
3.6.1	Municipal Solid Waste Collection and Disposal, and Service Coverage in 1994	3 - 17
4.1.1	Composition of Water Supply System/Facility by Service Level	4 - 2
4.1.2	Information on Existing Level III Systems	4 - 3
4.1.3	Information on Water District	4 - 4
4.1.4	Information on Existing Level II Systems	4 - 5
4.1.5	Information on Existing Level I Facilities	4 - 6
4.1.6	Operating Status of Existing Wells in the Province	4 - 7
4.1.7	Water Supply Service Coverage by Municipality	4 - 9
4.2.1	Sanitation Facilities and Service Coverage of Household Toilets, Urban and Rural, 1994	4 - 14
4.2.2	School Toilet Facilities and Service Coverage in 1994	4 - 17
4.2.3	Public Toilet Facilities and Service Coverage in 1994	4 - 17
6.2.1	Previous Sector Investment to the Province by Concerned Agency	6 - 1
6.2.2	Past Internal Revenue Allotment to the Province from Central Government	6 - 3
6.4.1	Affordability in Water and Sanitation Services	6 - 5
6.5.1	Financial Indicators of Water Districts	6 - 6
6.5.2	Loan Status of Water Districts	6 - 6
7.1.1	Existing Groundwater Sources in the Province	7 - 2
8.2.1	Provincial Sector Targets	8 - 3
8.2.2	Base Year Service Coverage of Water Supply	8 - 4
8.2.3	Base Year Service Coverage of Household Toilets	8 - 6
8.2.4	Base Year Service Coverage of Public School Toilets and Public Toilets	8 - 7
8.2.5	Base Year Service Coverage of Municipal Solid Waste System in 1994	8 - 8
8.3.1	Future Population by Urban and Rural Area by Municipality	8 - 10

Table No.	Title	Page No.
8.3.2	Projected Public School Enrollment and Number of Public Utilities by Municipality	8 - 11
8.4.1	Standard Specifications of Level I Wells	8 - 14
8.5.1	Population to be Served by Target Year (Water Supply)	8 - 18
8.5.2	Additional Number of Households to be Served by Target Year (Household Toilets)	8 - 22
8.5.3	Additional Number of Public School Students to be Served by Target Year (School Toilets)	8 - 25
8.5.4	Additional Number of Public Utilities with Sanitary Toilets by Target Year	8 - 26
8.5.5	Population to be Served by Urban Sewerage in Phase II	8 - 27
8.5.6	Add'l. No. of Urban Households to be Served by Municipal Solid Waste System in Phase I	8 - 27
8.6.1	Water Supply Facilities Required by Target Year	8 - 29
8.6.2	Sanitation Facilities Required by Target Year	8 - 31
8.6.3	Number of Refuse Collection Trucks Required in Phase I	8 - 32
9.5.1	Summary of Community Development Study Sites	9 - 18
10.2.1	Unit Cost of Facilities by Type and Service Level	10 - 3
10.2.2	Unit Cost of Equipment and Vehicle	10 - 3
10.3.1	Construction Cost of Required Facilities by Municipality	10 - 6
10.3.2	Cost of Equipment and Vehicle	10 - 6
10.4.1	Recurrent Cost	10 - 7
11.2.1	Projected Internal Revenue Allotment for Medium-Term Sector Development	11 - 5
11.2.2	Projected Allotment of IRA to the Relevant Sector by Component, 1996-2000	11 - 6
11.3.1	Financing Requirements by Sector Component for the Province	11 - 8
11.3.2	Additional Fund Requirements for the Medium-Term Plan	11 - 8
11.3.3	Internal Revenue Allotment for Water Supply and Sanitation Sector by Municipality (Medium-Term Development/1996-2000)	11 - 9
11.4.1	Municipal Investment Need Ranking for Urban Water Supply	11 - 15
11.4.2	Distribution of Provincial IRA to Municipalities for Urban Water Supply	11 - 15
11.4.3	Municipal Investment Need Ranking	11 - 16

LIST OF FIGURES

Figure No.	Title	Page No.
1.3.1	Flow Diagram of Sector Planning	1 - 6
2.6.1	Institutional Hierarchical System of the Philippines	2 - 7
2.6.2	Structure of Questionnaire	2 - 8
3.1.1	Location Map, Province of Zambales	3 - 2
3.2.1	Major River Networks	3 - 5
3.3.1	Distribution of Households by Income Class	3 - 7
3.3.2	Population Distribution by Occupation	3 - 7
3.3.3	Population Distribution by Highest Attainment of Education	3 - 7
3.4.1	Previous Population Development of the Province	3 - 10
3.4.2	Present Population Distribution	3 - 12
4.1.1	Water Supply Coverage by Municipality	4 - 10
4.1.2	Existing Water Supply Service Coverage Map	4 - 11
4.2.1	Provincial Service Coverage of Household Toilet Facilities, 1994 (PW4SP Study Area)	4 - 14
4.2.2	Existing Household Toilets Service Coverage Map	4 - 15
5.3.1	Functional Relationship	5 - 3
7.2.1	Geological Map	7 - 3
7.3.1	Groundwater Availability Map	7 - 5
8.5.1	Map Showing Future Water Supply Service Coverage by 2000	8 - 19
8.5.2	Map Showing Future Water Supply Service Coverage by 2010	8 - 20
8.5.3	Map Showing Household Toilets Service Coverage by 2000	8 - 23
8.5.4	Map Showing Household Toilets Service Coverage by 2010	8 - 24
9.2.1	Sector Management Model	9 - 2
9.2.2	Flow of Funds	9 - 7
11.1.1	Sector Budget Allocation	11 - 2
11.1.2	General Flow of Financial Arrangements for Relevant Sector Development	11 - 3
11.2.1	Trial Allocation of Internal Revenue Allotment (IRA) to Municipalities for Relevant Sector Development	11 - 4
11.4.1	Relationship Between Funding Levels and Percent of Coverage for Water Supply Sector	11 - 10
11.4.2	Relationship Between Funding Levels and Percent of Coverage for Sanitation Sector	11 - 11

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
SBMA	-	Subic Bay Metropolitan Authority
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 the 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 Zambales 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 the National Government.

1.3 The Provincial Plan for the Province of Zambales

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), 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 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.

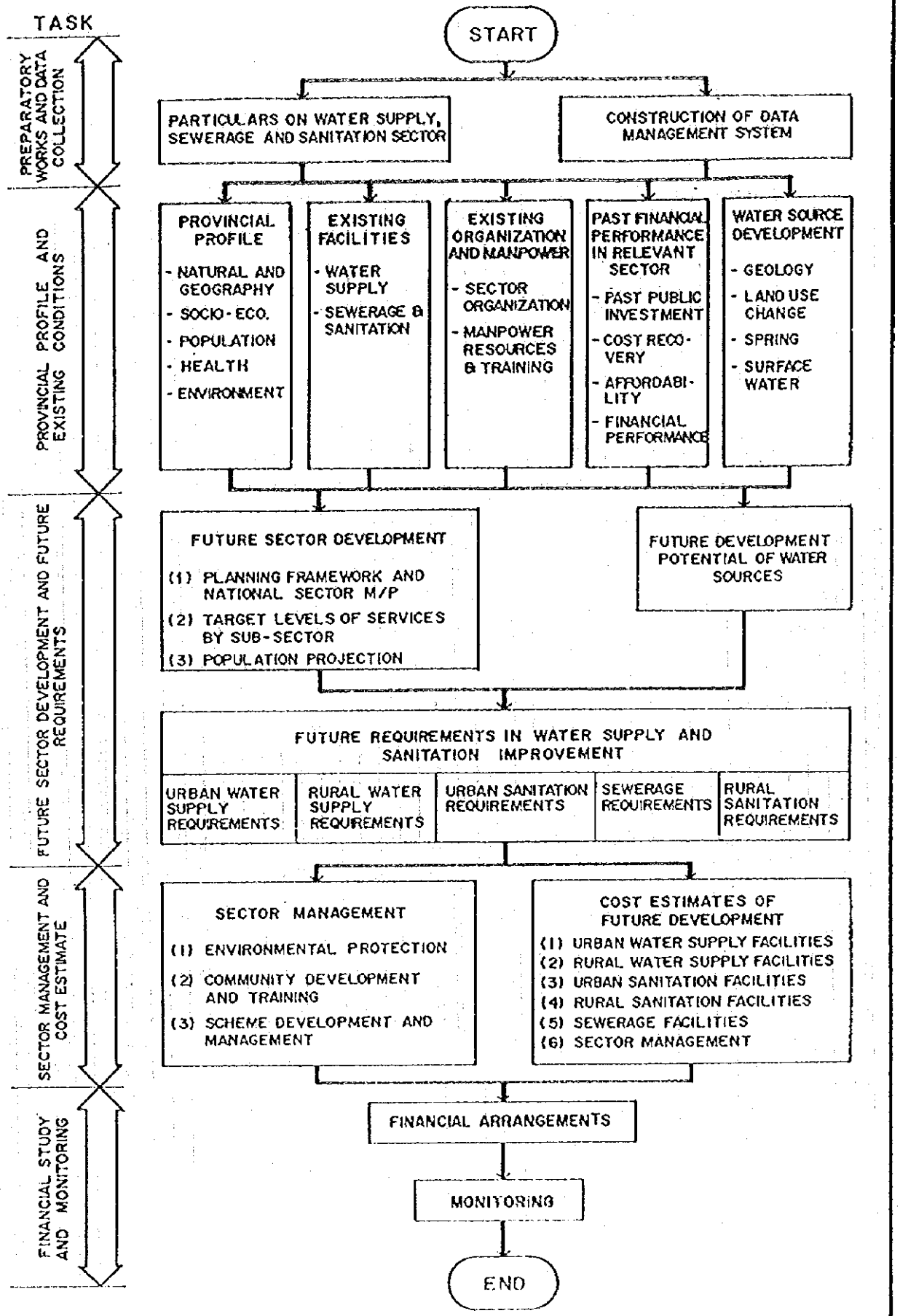
Chapter 4, 5, and 6 provide existing sector conditions in physical, managerial and financial aspects: existing water supply and sanitation facilities by service level and service coverage; sector institutions, community development, training and monitoring systems; and financial performances entailing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

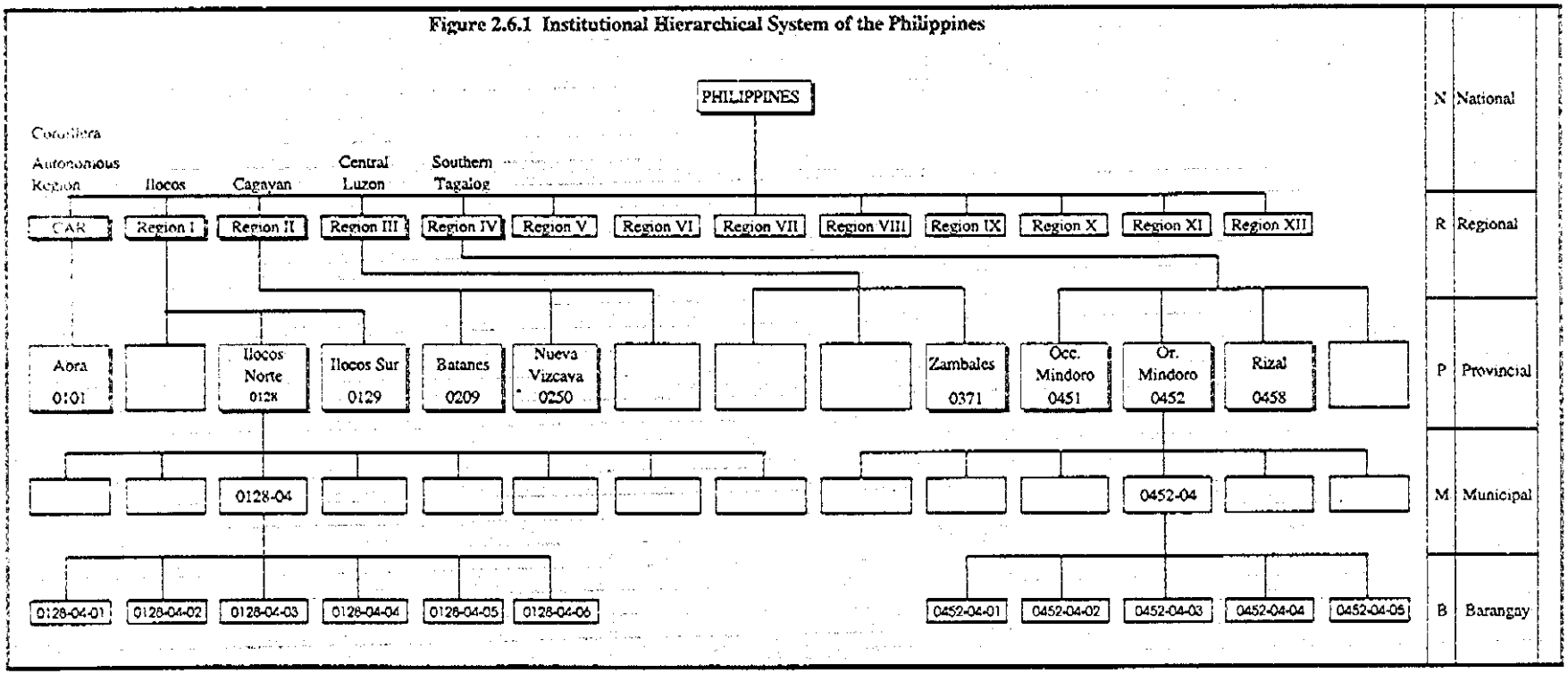


Figure 2.6.2 Structure of Questionnaire

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

Zambales province is located at the western coast of Central Luzon. It is bounded on the north by Pangasinan, on the east by Tarlac and Pampanga, on the west by the South China Sea, and on the south by Bataan. The southern border of the province is shared by the chartered city of Olongapo (used to be a component city of the province) where the Subic Bay Metropolitan Authority (SBMA) is located. Figure 3.1.1 presents the Location Map.

The province has a total land area of 3,714.4sq.km that is 1.23% of the Philippine total land area of about 300,000sq.km. It is composed of 13 municipalities with Iba as the provincial capital. There are 239 barangays of which 102 are urban and 137 rural. Provincial total population was 562,992 in 1990. About 65% resided in urban areas, while the remaining 35% in rural areas. At present, there are eight (8) water districts in the province including Olongapo WD. Table 3.1.1 presents the breakdown per municipality of the land area, population and its density, as well as administrative composition (NSO population census in 1990).

Table 3.1.1 Outline of City and Municipalities

Municipality		Land Area	1990 Population		Number of Barangay		
Code	Name	(sq.km)	Number	Density (persons/sq.km)	Urban	Rural	Total
037101	Botolan	613.70	35,604	58	2	21	23
037102	Cabangan	239.40	15,337	64	5	17	22
037103	Candelaria	387.60	18,539	48	3	13	16
037104	Castillejos	86.50	26,753	309	9	5	14
037105	Iba	153.38	29,221	191	7	7	14
037106	Masinloc	306.00	32,375	106	5	8	13
037107	Olongapo City	103.30	193,327	1872	17	0	17
037108	Palauig	310.00	21,577	70	2	17	19
037109	San Antonio	205.00	26,944	131	10	4	14
037110	San Felipe	103.70	15,624	151	8	3	11
037111	San Marcelino	440.92	36,598	83	12	6	18
037112	San Narciso	71.60	22,891	320	9	8	17
037113	Santa Cruz	414.10	41,273	100	3	22	25
037114	Subic	279.20	46,929	168	10	6	16
Provincial Total		3,714.40	562,992	152	102	137	239

Note: Municipal Code corresponds to NEDA Geographic Coding System.

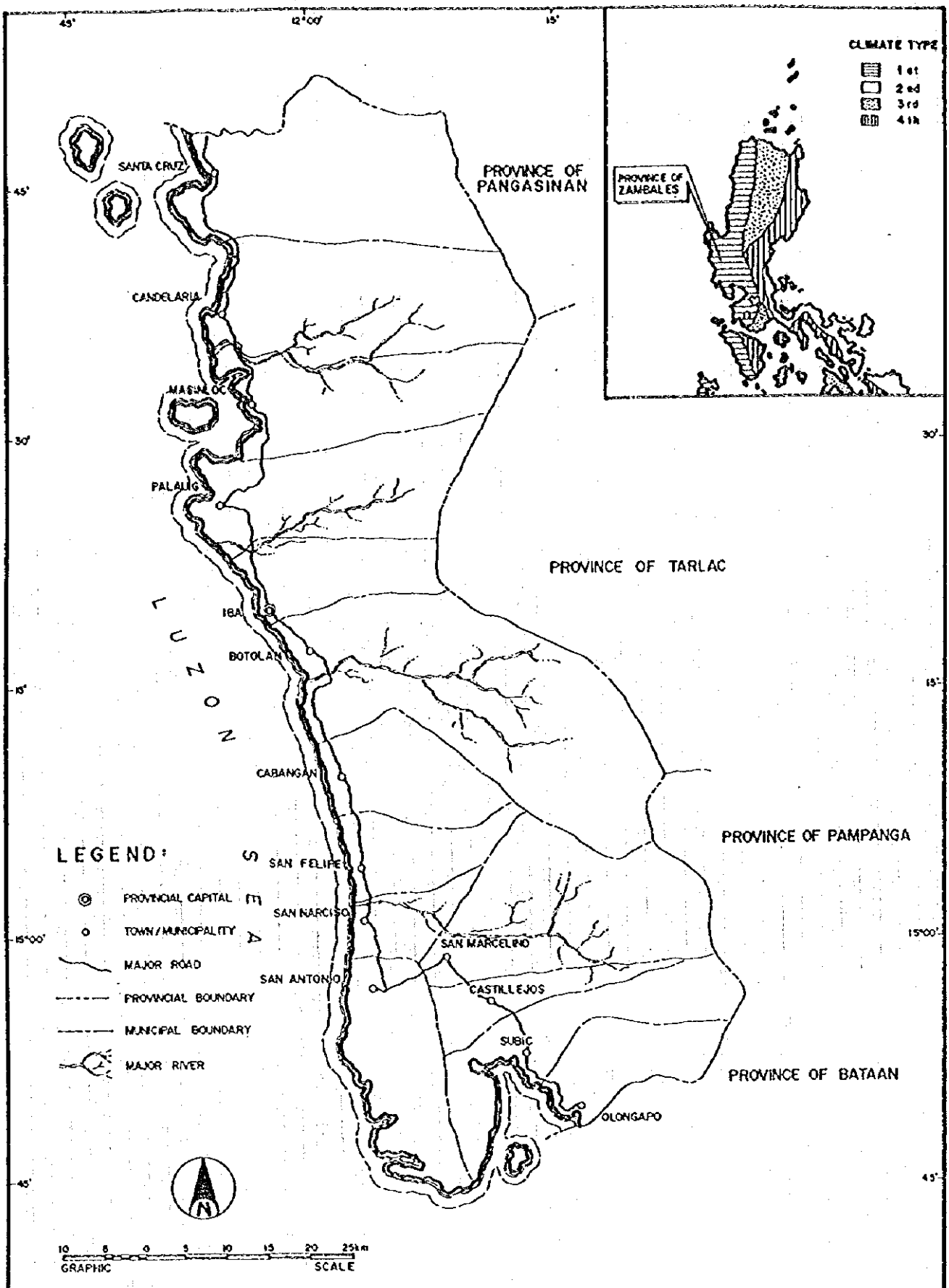


FIGURE 3.1.1

LOCATION MAP

PROVINCE OF ZAMBALES

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 dry and wet seasons as reflected in Figure 3.1.1, Location Map. It is normally wet during the months of May to October and dry the rest of the year. Using the 20-year records of the Iba Station, the average annual rainfall is registered at 3,601.9mm. Average maximum rainfall of 989mm was recorded during the month of August, while the average minimum of 14.8mm was in April.

The annual average temperature is 27°C with a range of 29°C in May to 26°C in January. The prevailing wind is southeasterly with wind speed varying by the month.

3.2.2 Land Use

Forest area constitutes about 49% of the total land area of the province found mostly on the mountain ranges in the eastern part. Agricultural land and Built-up areas comprise 11% and 8%, respectively. Grassland and Openland represent 27% of the total. The remaining 5% is Mangroves, Fishponds and other inland waters. The forest that still constitutes almost half of the land area primarily serves as watershed, rather than as source of timber. An efficiently managed watershed collects and regulates flow of water, controls soil erosion and minimizes water pollution. Conversion of forest land 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	1806.44	48.63
Grass land	935.76	25.19
Built-up area	284.45	7.66
Agricultural	396.78	10.68
Mangrove, Fishponds, Inland water area	196.94	5.30
Openlands	94.03	2.53
TOTAL	3714.40	100.00

3.2.3 Topography

General topography of the province is characterized by rugged mountains rising moderately to steeply sloping and relatively flat areas along the coast. About 70% of total land area falls within the hilly to mountainous sections, while the remaining 30% is plain. Broad plain areas are located in the municipalities of San Felipe and San Antonio. Elevation ranges from near sea level to 2,037 meters above mean sea level. Mt. High Peak in Masinloc is the highest mountain with a peak elevation of 2,037m. Other major mountains are Mt. Botolan, Mt. Mabangkil, Mt. Santa Cruz, Mt. Pinatubo, Mt. Iba, Mt. Gata, Mt. Masinloc and Mt. Lanot.

The natural drainage systems generally flow westward and empty into South China Sea. Principal rivers are the Sto. Tomas, Bucao, and Nayum. Secondary rivers include Bagsit, Bancad, Anonang, Lawis and Cabanlungan. Figure 3.2.1 shows the drainage systems of Zambales. Table 3.2.2 is a list of the main rivers and their corresponding drainage areas with recorded flow rates (refer to Table 3.2.1 Flow Data of Major Rivers, Data Report). Two (2) typical rivers in the province were selected for water quality analysis, namely: Nayum and Bagsit. Examined river water was turbid and showed some color. Also, a high level of Iron (Fe) content was observed in Bagsit River probably due to the highly mineralized rocks found in the Zambales Range.

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	
Nayum River	03SW154195PW025	128	1.36	8.52	160.48	NONE
Bagsit River	03SW152201PW092	68	0.77	7.42	73.59	NONE
Sto. Tomas River	03SW145201PW094	177	1.42	16.1	250.88	NONE
Bucao River	03SW151200PW093	615	9.88	54.06	784.78	NONE

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

3.3 Socio-economic Conditions

3.3.1 Economic Activities and Household Income

Agriculture is the major economic activity in Zambales. Major crops cultivated are rice, coconut, corn, vegetables and fruits. Fishing and mining are also main sources of livelihood especially in the rural areas. With its vast coastline and mineral rich mountain range, the province has an advantage of vital fishery and mining activities. Other sources of livelihood are livestock production, brick making, handicraft and fish processing. Tourism is another potential industry, but it was adversely affected by the Mt. Pinatubo eruption in 1991.

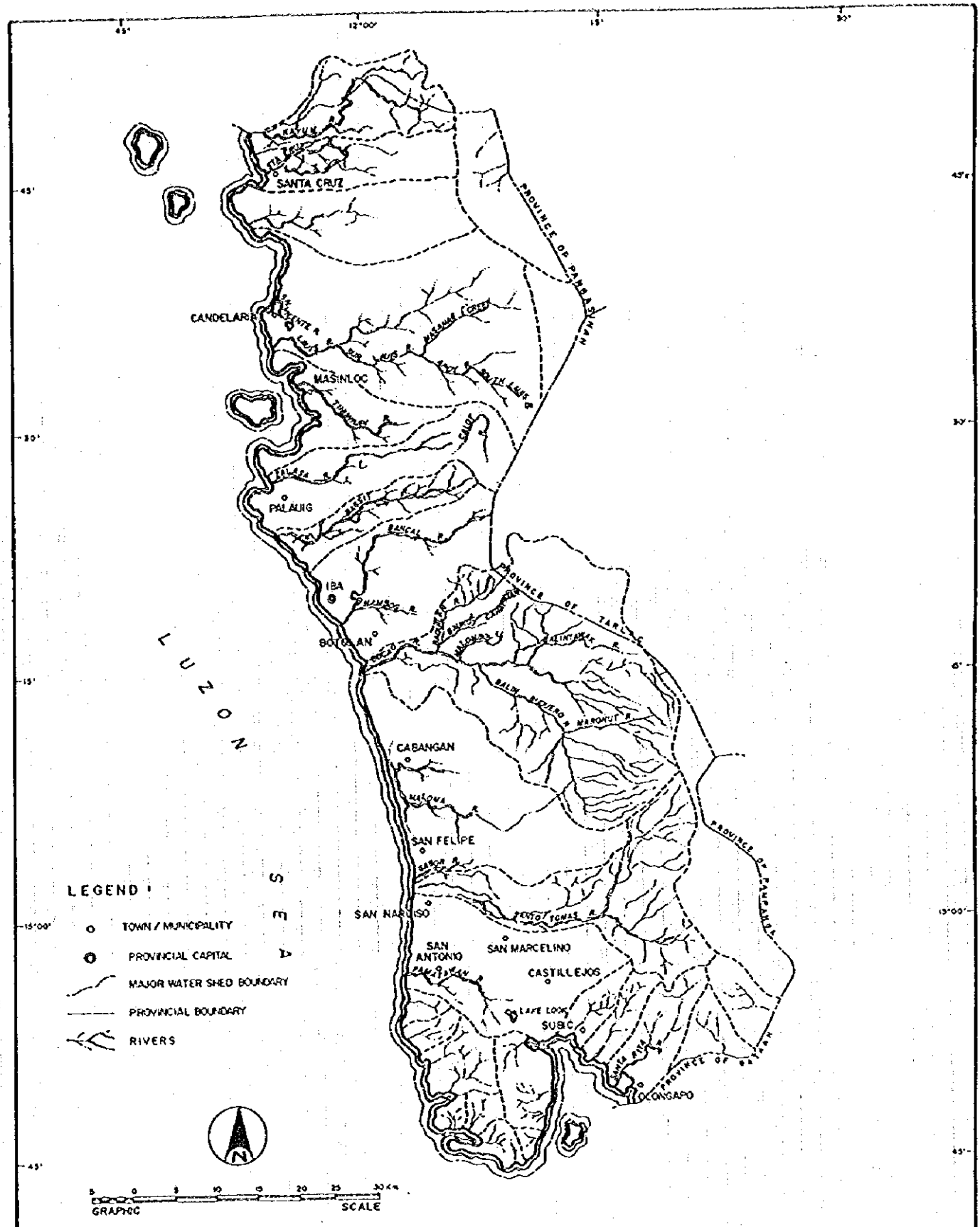


FIGURE 3.2.1

MAJOR RIVER NETWORKS

PROVINCE OF ZAMBALES

The National Statistics Office (NSO) Family Income and Expenditures Survey in 1991 showed that the average annual household income of the province (excluding Olongapo City) was P71,469, while the median was at P46,796. 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 average figures in the region. Based on the established poverty threshold income of P52,377 in Region III for 1991, approximately 52% of the total number of families lived within and below the poverty threshold.

As to the number of workers by major industry group, social and personal services had the dominant share followed by agriculture, fishery and forestry, 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, followed by elementary occupations, craft and related workers, and service and shop market sales workers as shown in Figure 3.3.2.

3.3.2 Basic Infrastructure

All municipalities are energized with 88% of the household served. Ten of the municipalities have telephone service or an 88% service coverage. There are 14 post offices or stations in the province. Land transportation is available by jeepneys, buses and mini-buses. The province has 3 public airports. There are 7,341 business establishments and 181 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 321 schools consisting of 253 elementary schools, 58 high schools and 10 colleges. The 1990 NSO census indicated that the province had a 97.7% literacy rate of household population 10 years old and over. A large part of the population had attained elementary or high school levels of education as reflected in Figure 3.3.3 (refer to Table 3.3.3, Supporting Report).

3.4. Population

3.4.1 Previous Population Development

A fluctuating provincial population growth rate had been experienced since the last six (6) census years (1948-1990) as indicated in Figure 3.4.1. From an average annual growth rate of 4.0% during the period 1970 to 1975, it drastically decreased to 1.2% (1975-1980) and

Figure 3.3.1 Distribution of Households by Income Class

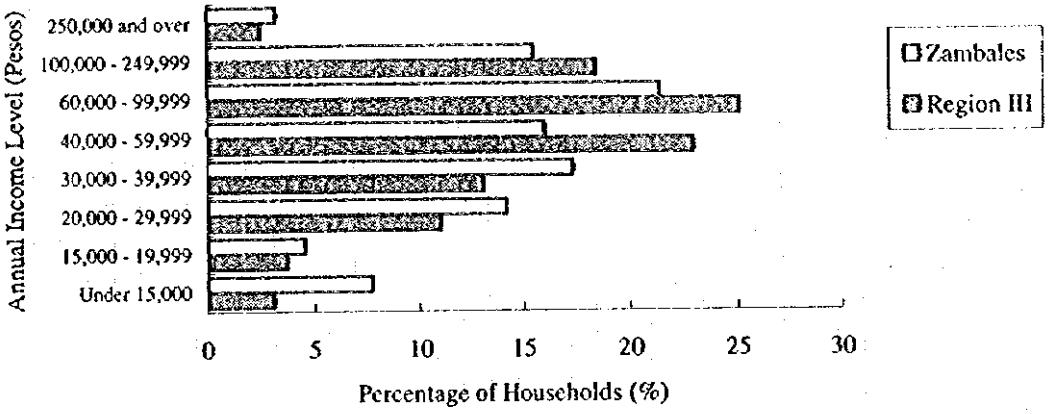


Figure 3.3.2 Population Distribution by Occupation

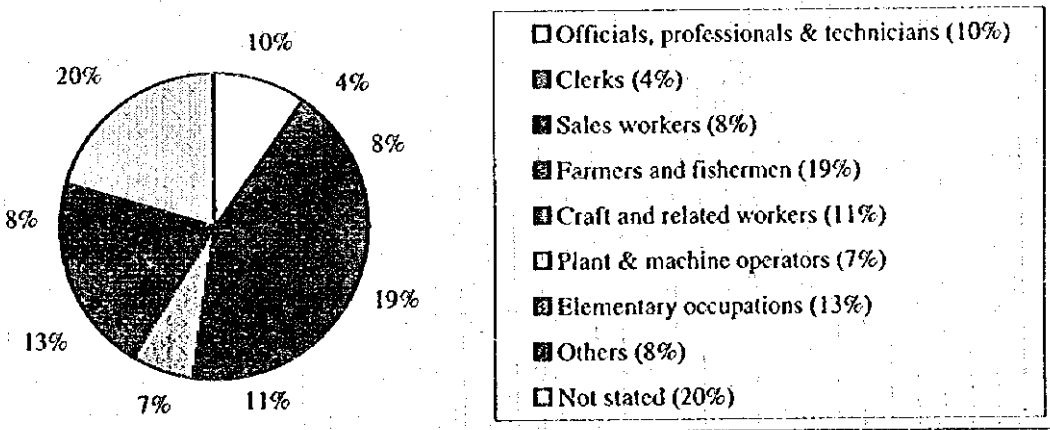


Figure 3.3.3 Population Distribution by Highest Attainment of Education

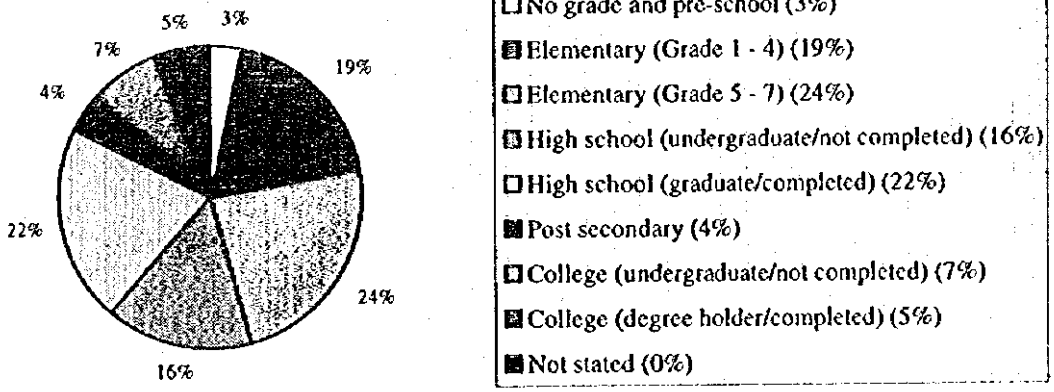


Table 3.3.1 Provincial Outline on Public Services

Items	Unit	Qty.	Items	Unit	Qty.
(1) Roads			**(8) Tourism facilities**	Number	181
a) Total Length	Km	1,163.01	(Hotel resort, lodges, recreational		
b) Barangay roads	Percent	49.47	facilities, etc.)		
(2) Electricity service coverage			**(9) Schools**		
a) Municipality	Percent	100	a) Primary level	Number	253
b) Barangay	Percent	96.86	b) Secondary level	Number	58
c) Household	Percent	88.13	c) Tertiary level	Number	10
(3) Telecommunication Services			**(10) Health Facilities**		
a) Availability in municipality	Percent	88.46	a) Hospital/clinics	Number	19
b) Telegraph station	Number	15	b) Main health centers, rural health	Number	118
c) Telephone station	Number	13	units, barangay health center, etc		
(4) Post Office	Number	14	**(11) Labor**		
			a) Labor force participation ratio	Percent	55.17
(5) Transportation services	Mode	Bus,PUJ	b) Employment rate	Percent	87.5
	(ex. Bus,	3 Public			
	jeep, etc.)	Airports	**(12) Average family income**		
			a) Monthly income	Pesos/Month	5,956
(6) Banking Facilities			b) Monthly expenditure	Pesos/Month	4,405
a) Private bank	Number	22			
b) Public bank	Number	3			
(7) Industrial/business/commercial establishment	Number	7,341			

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.	%
Botolan	2	2	4	1	1	1	0	2.8
Cabangan	1	1	2	0	0	1	1	2.8
Candelaria	1	1	2	0	1	1	1	1.7
Castillejos	1	1	2	0	1	1	1	3.4
Iba	1	1	2	2	1	1	3	2.5
Masinloc	2	3	5	0	1	1	1	1.6
Olongapo City	6	10	16	5	10	3	11	2.1
Palauig	1	2	3	0	0	1	0	2.3
San Antonio	1	2	3	0	0	1	1	1.8
San Felipe	1	2	3	0	1	1	1	1.2
San Marcelino	3	2	5	1	2	1	1	3.9
San Narciso	2	1	3	1	0	1	1	1.8
Santa Cruz	4	1	5	0	1	2	2	1.5
Subic	1	2	3	0	0	1	1	4.4
TOTAL	27	31	58	10	19	17	25	2.4

recovered to 2.4% (1980-1990). A summary of the average annual growth rates of the province is as follows:

Year	Population	Ave Annual. Growth Rate (%)	Period
1960	213,442	3.7	1948 - 1960
1970	342,709	4.8	1960 - 1970
1975	417,101	4.0	1970 - 1975
1980	444,037	1.2	1975 - 1980
1990	562,992	2.4	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 1994 population was estimated to provide the planning base for this 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 1994 estimated population.

3.4.2 Classification of Urban and Rural Areas

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

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

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

(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;

Figure 3.4.1 Previous Population Development of the Province

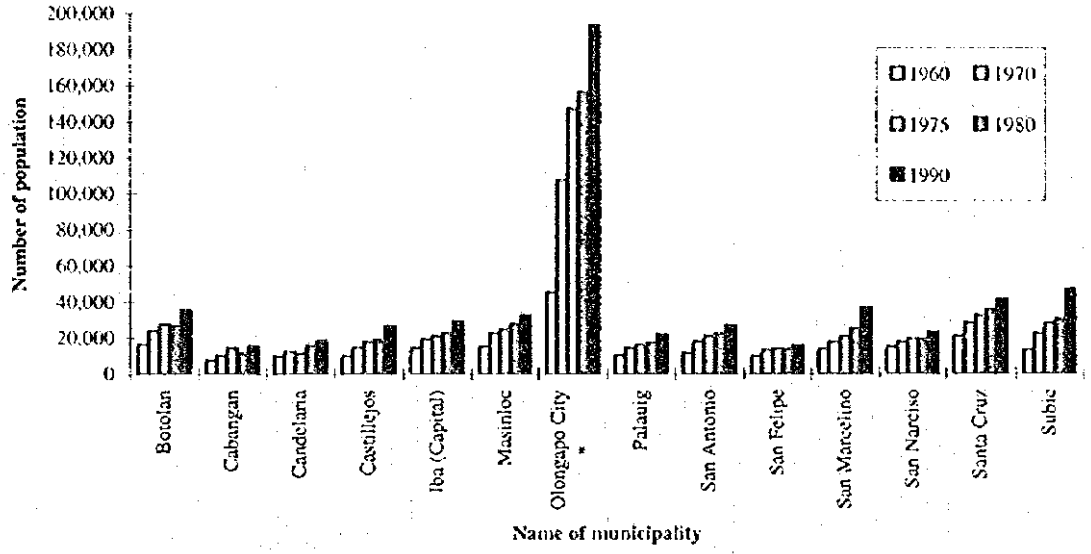


Table 3.4.1 Previous Population Development by Municipality

Municipality	Previous Population						Proj. Pop.
	1948	1960	1970	1975	1980	1990	1994
Botolan	11,535	16,417	23,848	27,807	27,125	35,604	37,035
Cabangan	5,519	7,484	10,113	14,630	11,636	15,337	17,194
Candelaria	7,167	9,799	12,376	11,586	15,686	18,539	21,264
Castillejos	7,699	10,049	14,807	17,999	19,154	26,753	27,672
Iba (Capital)	9,741	14,555	19,521	21,020	22,791	29,221	34,938
Masinloc	8,090	15,258	22,736	24,807	27,735	32,375	40,083
Olongapo City *	0	45,330	107,460	147,430	156,430	193,327	217,353
Palauig	8,386	10,392	14,546	16,359	17,176	21,577	27,023
San Antonio	8,381	11,596	18,048	21,099	22,382	26,944	30,004
San Felipe	7,781	9,861	13,283	13,905	13,834	15,624	16,548
San Marcelino	10,316	13,914	17,801	20,735	24,964	36,598	29,365
San Narciso	14,085	14,993	17,622	19,278	19,119	22,891	22,732
Santa Cruz	14,613	20,809	28,282	32,307	35,665	41,273	47,194
Subic	25,223	12,985	22,266	28,139	30,340	46,929	56,745
TOTAL	138,536	213,442	342,709	417,101	444,037	562,992	625,150

* Excluded from PW4SP Study Area.

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 102 urban barangays and 137 rural barangays for a total of 239 barangays in 1994. Distribution of the classified areas is shown in Figure 3.4.1, Supporting Report.

3.4.3 Present Population Distribution

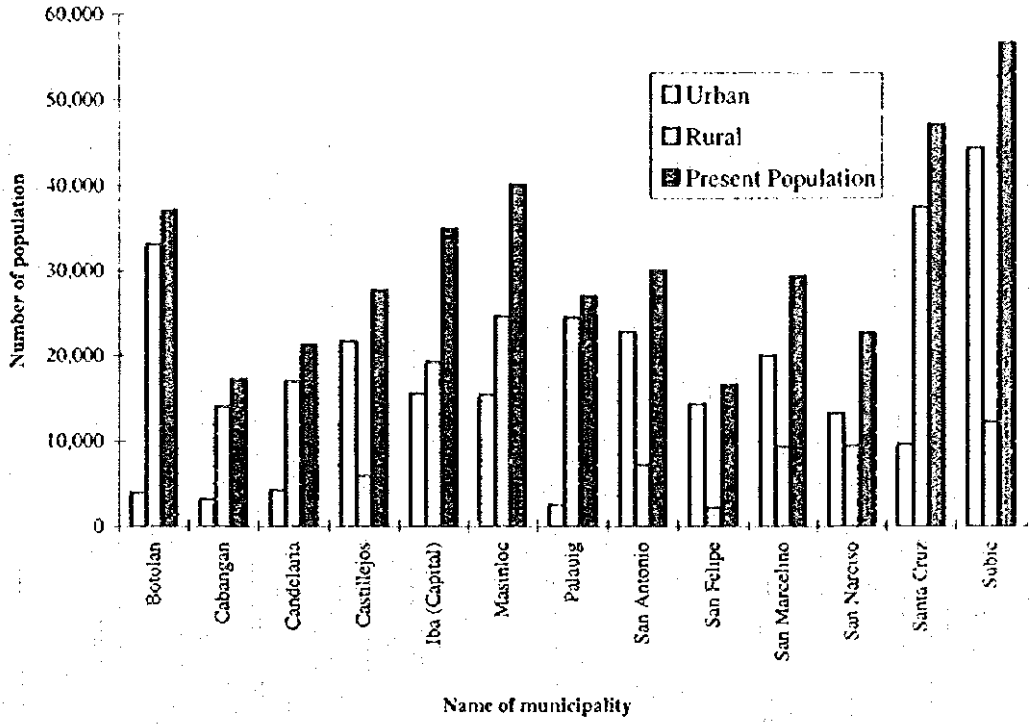
From the 1990 NSO census, the 1994 urban-rural population was estimated. Urban population accounts for 47% of the provincial total (excluding Olongapo City), while the remaining 53% is rural as reflected in Figure 3.4.2. Table 3.4.2 presents the breakdown of the number of urban and rural barangays by municipality and its corresponding present population.

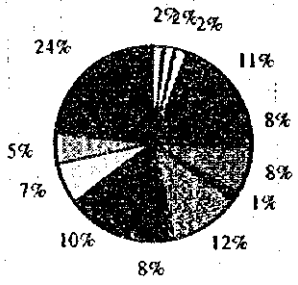
Table 3.4.2 Outline of Urban and Rural Areas in the Province*

Municipality	Land Area (sq.km)	Number of Barangay			Population (1994)		
		Urban	Rural	Total	Urban	Rural	Total
Botolan	613.70	2	21	23	3,915	33,120	37,035
Cabangan	239.40	5	17	22	3,145	14,049	17,194
Candelaria	387.60	3	13	16	4,229	17,035	21,264
Castillejos	86.50	9	5	14	21,713	5,959	27,672
Iba	153.38	7	7	14	15,616	19,322	34,938
Masinloc	306.00	5	8	13	15,456	24,627	40,083
Palauig	310.00	2	17	19	2,500	24,523	27,023
San Antonio	205.00	10	4	14	22,807	7,197	30,004
San Felipe	103.70	8	3	11	14,341	2,207	16,548
San Marcelino	440.92	12	6	18	20,001	9,364	29,365
San Narciso	71.60	9	8	17	13,266	9,466	22,732
Santa Cruz	414.10	3	22	25	9,695	37,499	47,194
Subic	279.20	10	6	16	44,443	12,302	56,745
Provincial Total	3,611.10	85	137	119	191,127	216,670	407,797

* Excluding Olongapo City.

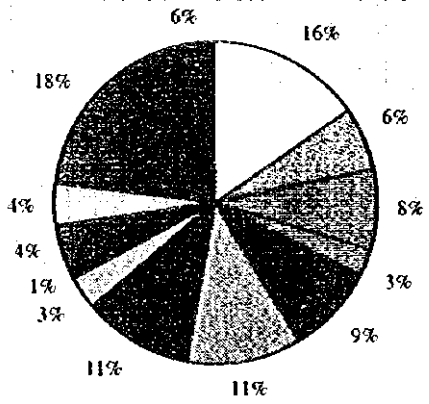
Figure 3.4.2 Present Population Distribution





Urban Population (65%)

Botolan (2 %)	Cabangan (2 %)
Candelaria (2 %)	Castillejos (11 %)
Iba (Capital) (8 %)	Masinloc (8 %)
Palauig (1 %)	San Antonio (12 %)
San Felipe (8 %)	San Marcelino (10 %)
San Narciso (7 %)	Santa Cruz (5 %)
Subic (24 %)	



Rural Population (35)

Botolan (16 %)	Cabangan (6 %)
Candelaria (8 %)	Castillejos (3 %)
Iba (Capital) (9 %)	Masinloc (11 %)
Palauig (11 %)	San Antonio (3 %)
San Felipe (1 %)	San Marcelino (4 %)
San Narciso (4 %)	Santa Cruz (18 %)
Subic (6 %)	

Excluding Olongapo City, there are 80,183 households in 1994 with 38,503 residing in urban area and 41,680 households in rural area. The average provincial household size is 5.1 persons/household. Table 3.4.3 presents a breakdown per municipality on the number of household sizes by urban and rural area.

Table 3.4.3 Household Numbers and Household Sizes

Municipality	Number of Households (1994)			Household Size (person / HH)		
	Urban	Rural	Total	Urban	Rural	Total
Botolan	739	6,369	7,108	5.3	5.2	5.2
Cabangan	655	2,867	3,522	4.8	4.9	4.8
Candelaria	755	2,937	3,692	5.6	5.8	5.8
Castillejos	4,343	1,268	5,611	5.0	4.7	4.9
Iba	3,003	3,716	6,719	5.2	5.2	5.2
Masinloc	2,810	4,478	7,288	5.5	5.5	5.5
Palauig	472	4,459	4,931	5.3	5.5	5.5
San Antonio	4,958	1,565	6,523	4.6	4.6	4.6
San Felipe	3,118	460	3,578	4.6	4.8	4.7
San Marcelino	4,082	1,951	6,033	4.9	4.8	4.8
San Narciso	2,884	1,972	4,856	4.6	4.8	4.7
Santa Cruz	1,795	7,075	8,870	5.4	5.3	5.3
Subic	8,889	2,563	11,452	5.0	4.8	4.9
Provincial Total	38,503	41,680	80,183	4.9	5.2	5.1

3.5 Health Status

3.5.1 Morbidity, Mortality and Infant Mortality

The number one cause of morbidity in 1990 was obstructive pulmonary followed by diarrhea. Anemias and intestinal parasitism ranked third and fourth, respectively. Other causes of morbidity in descending order were skin diseases, nutritional deficiencies, bronchitis, influenza, pneumonia and tuberculosis. Regarding mortality, the number one cause was pneumonia, followed by vascular diseases. Tuberculosis and septicemia ranked third and fourth, respectively. Other causes include nervous system and heart diseases, prematurity, senility obstructive pulmonary and bronchitis. Accidents, pneumonia and prematurity were the three (3) leading causes of infant mortality in the province.

The general health status of the populace in the province in 1990 was relatively fair compared with the national condition. Except for water-related diseases, the incidence of other diseases was lower in Zambales than the Philippines as a whole. Table 3.5.1 presents comparative statistics on the ten leading causes of morbidity, mortality and infant mortality of the province as well as of the Philippines (details are referred to Table 3.5.1, Data Report).

Water-related diseases in the ten leading causes of morbidity were diarrhea (rank 2nd), intestinal parasitism (rank 4th) and skin diseases (rank 5th).

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

Rate: 1/100,000

	Causes	Zambales		Philippines		
		Number	Rate	Number	Rate	Ranking
Morbidity	1. Obstructive Pulmonary	194,129	35,293.00	-	-	-
	2. Diarrhea	46,413	8,438.00	943,580	1,520.7	2
	3. Anemias	26,903	4,891.00	-	-	-
	4. Intestinal Parasites	26,144	4,753.00	-	-	-
	5. Skin Diseases	23,498	4,272.00	-	-	-
	6. Nutritional Deficiencies	20,968	3,812.00	-	-	-
	7. Bronchitis	17,112	3,111.00	980,557	1,580.3	1
	8. Influenza	7,613	1,384.00	544,768	878.0	3
	9. Pneumonia	4,296	781.00	235,947	380.3	4
	10. Tuberculosis	3,916	712.00	152,688	246.1	5
Mortality	1. Pneumonia	1,788	325.00	41,240	66.5	2
	2. Vascular Diseases	1,210	220.00	33,729	54.2	3
	3. Tuberculosis	924	168.00	24,307	39.1	4
	4. Septicemia	204	37.00	5,835	9.4	8
	5. Nervous System	176	32.00	-	-	-
	6. Heart Diseases	143	26.00	46,272	74.4	1
	7. Prematurity	127	23.00	-	-	-
	8. Senility	105	19.00	-	-	-
	9. Obstructive Pulmonary	99	18.00	-	-	-
	10. Bronchitis	83	15.00	-	-	-
Infant Mortality	1. Other Accidents	407	74.00	-	-	-
	2. Pneumonia	242	44.00	9,383	-	1
	3. Prematurity	127	23.00	-	-	-
	4. Obstructive Pulmonary	99	18.00	5,985	-	2
	5. Other Prenatal Causes	83	15.00	-	-	-

3.5.2 Water-Related Diseases

An indicator of health problems related to water supply and sanitation is the incidence of water-related diseases. The World Health Organization (WHO) has classified diseases related to water into four (4) categories: 1) water-borne diseases e.g., cholera, typhoid, hepatitis A, diarrhea and dysentery; 2) water-based diseases e.g., schistosomiasis; 3) water-washed diseases e.g., diarrhea, intestinal parasitism, scabies, conjunctivities (sore eyes), and skin diseases; 4) water-vector related diseases e.g., 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 viral hepatitis, diarrhea, dysentery, intestinal parasitism, sore eyes, skin diseases 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						
1. Viral Hepatitis	176	32	0	0	0	0
2. Diarrhea	46,413	8,438	17	3	17	3
3. Dysentery	44	8	0	0	0	0
Water-washed						
1. Intestinal Parasites	26,144	4,753	0	0	0	0
2. Conjunctivities	1,916	712	924	168	0	0
3. Skin Diseases	23,498	4,272	0	0	0	0
Water vector						
1. Malaria	622	113	0	0	6	1

3.5.3 Health Facilities and Practitioners

Present facilities serving the health care of the populace are 19 hospitals, 36 rural health units and 81 barangay health stations. The ratio of population to these facilities and to the health 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 Condition

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, except in the chartered city of Olongapo (secured area of SBMA). Majority of the drainage facilities in all municipalities are open canals or ditches (refer to Table 3.6.1 types of drainage facilities, Supporting Report). 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 or cesspools 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 of the river may be expected to purify organic substances. However, pollution or contamination is anticipated by agricultural activities especially with reference to fertilizers and pesticides.

There exist three (3) large-scale copper mining companies in the province. However, the extent of pollution or contamination of mine wastes and tailings to the river systems is undetermined because of the absence of regular water quality monitoring program. As of now, the rivers in the province have not been classified as to their usage by the Department of Environment and Natural Resources (refer to general information in Table 3.6.2 DENR Water Quality Criteria/Water Usage and Classification, Supporting Report).

3.6.3 Solid Waste Disposal

Of the 14 municipalities and/or city, only ten (10) have municipal/city refuse collection and disposal service as of 1994, namely: Candelaria, Castillejos, Iba, Masinloc, San Antonio, Santa Cruz, San Marcelino, San Narciso, Subic and Olongapo City. A total of 25 units of collection truck (13 units of open dump truck and 12 units of closed type refuse truck) is used by these municipalities/city. In the province, about 52% of the households is served, while 48% is unserved. Table 3.6.1 reflects 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 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, scattered solid waste, breeding grounds for insects, rodents and other disease vectors and fire hazard. Meanwhile, Olongapo City has a sanitary landfill. At the household level, unserved households by the LGUs primarily depend on individual disposal such as dumping in vacant lots or body of water and burying.

Table 3.6.1 Municipal Solid Waste Collection and Disposal, and Service Coverage, 1994

Municipality	Number of Households 1994	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		
Botolan	7,108	0	0	0	0	0	0	5960	968	180	7108	0	100
Cabangan	3,522	0	0	0	0	0	0	3070	416	36	3522	0	100
Candelaria	3,692	0	2	2	718	0	718	2610	342	22	2974	19	81
Castillejos	5,611	0	1	1	1476	0	1476	3474	623	38	4135	26	74
Iba (Capital)	6,719	1	0	1	2622	0	2622	3636	443	18	4097	39	61
Masinloc	7,288	1	1	2	2600	0	2600	3942	718	28	4688	36	64
Olongapo City *	47,920	8	5	13	0	43025	43025	4427	328	140	4895	90	10
Palauig	4,931	0	0	0	0	0	0	4477	412	43	4932	0	100
San Antonio	6,523	1	0	1	3471	0	3471	2758	276	16	3050	53	47
San Felipe	3,578	0	0	0	0	0	0	3302	266	10	3578	0	100
San Marcelino	6,033	0	1	1	1808	0	1808	3884	287	54	4225	30	70
San Narciso	4,856	0	1	1	2731	0	2731	1613	470	42	2125	56	44
Santa Cruz	8,870	1	0	1	2110	0	2110	5716	958	86	6760	24	76
Subic	11,452	1	1	2	6437	0	6437	4476	527	12	5015	56	44
Provincial Total	128,103	13	12	25	23973	43025	66998	53345	7034	725	61104	52	48

* Excluded from PW4SP Study Area.

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 October 1994). 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 for the PW4SP area which excludes Olongapo City 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 1994.

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.

Approximately 58% of the present population (of which 68% in urban area and 32% in rural area) is considered as adequately served in the PW4SP area (refer to detailed study in Supporting Report). Under the area classification, 84% of urban population and 36% of rural population have access to safe water sources/facilities, while the rest is underserved and/or unserved. About 189,900 persons or 80% of the served population depend on Level I facilities, while 47,800 persons or 20% are served by Level III and/or Level II systems. Lower service coverage in rural area is caused by the existence of many unsafe shallow wells, open dug wells and 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 levels 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 9 Level III systems in the province, which are managed by WDs as shown in Table 4.1.2. WDs are located in municipalities of Candelaria, Masinloc, San Antonio, San Felipe, Santa Cruz, and Subic as well as in Iba City and Olongapo City. Subic Bay Metropolitan Authority (SBMA) has also an independent Level III system limited to its jurisdiction and its service is rather concentrated on industrial and institutional uses.

Table 4.1.2 Information on Existing Level III Systems

Municipality	Name of System (Operating Body)	Water Source and Consumption			Service Coverage						
					Number of Barangays Served			Number of HHs/Pop. Served			
		Type of Water Source[1]	Water Consumption (cu. m/day)	Domestic Supply (%)	Urban	Rural	Total	HHs/ Pop.	Urban	Rural	Total
Candelaria	Candelaria WD	DW	179.00	98.32	2	2	4	HHs	313	237	550
								Pop.	1,565	1,185	2,750
Iba (Capital)	Iba WD	DgW	489.00	87.12	7	2	9	HHs	512	226	738
								Pop.	2,560	1,130	3,690
Masinloc	Masinloc WD	Surf	748.00	92.11	5	1	6	HHs	1,052	159	1,211
								Pop.	5,260	795	6,055
Olongapo City	Olongapo WD	DW/SP/Surf	15,065.00	87.87	17	0	17	HHs	13,617	0	13,617
								Pop.	68,085	0	68,085
San Antonio	San Antonio WD	DW	607.00	90.12	8	0	8	HHs	1,325	0	1,325
								Pop.	6,095	0	6,095
San Felipe	San Felipe WD	DW	381.10	96.30	8	1	9	HHs	809	28	837
								Pop.	3,721	132	3,853
Santa Cruz	Sta. Cruz WD	DW	247.00	68.02	2	0	2	HHs	336	0	336
								Pop.	1,680	0	1,680
Subic	Subic WD	DW/SP	3,483.27	95.63	10	3	13	HHs	3,305	394	3,699
								Pop.	16,525	1,889	18,414
Provincial Total			55,376.00	34.21	59	9	68	HHs	21,269	1,044	22,313
								Pop.	105,491	5,131	110,622

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

The largest system in the province is Olongapo City WD covering 17 urban barangays in provision of 5 sources (2 deep wells, 1 spring and 2 surface water intakes). As a whole, WDs serve for a total of 59 urban barangays extended to their neighboring 9 rural barangays.

Majority of the systems utilize deep wells, however Masinloc W.D. and Olongapo City WD avail surface water and Subic WD utilizes spring source (details are referred to in Table 4.1.1, Supporting Report).

Information on Water Districts shown in Table 4.1.3 revealed that all service connections are metered and services are dominately provided for domestic use. Per capita consumption rate ranges from 65 liters/day in Candelaria to 195 liters/day in Olongapo City WD.

Table 4.1.3 Information on Water Districts

Name of W.D.	Number of Connections						Consump. (cu.m/ month)	Accounted-for Water (cu.m/ month)
	Domestic	Comm.	Inst.	Others	Total	Metered		
Candelaria W.D.	540	10	0	0	550	550	N/A	5,370
Iba W.D.	738	23	0	0	761	761	24,720	14,670
Masinloc W.D.	1,214	21	7	0	1,242	1,091	570,240	22,440
San Antonio W.D.	1,286	35	4	0	1,325	1,325	24,480	18,210
San Felipe W.D.	837	11	9	11	868	868	20,190	11,433
Santa Cruz W.D.	336	16	7	0	359	359	7,560	7,410
Subic W.D.	3,535	143	20	0	3,698	3,698	244,830	104,498
Olongapo W.D.	13,617	1,309	97	0	15,023	15,023	769,260	451,950

Note: N/A - Data not available

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 8 Level II systems in the province as enumerated below and shown in Table 4.1.4 (details are referred to in Table 4.1.4, Supporting Report). These are:

- Respective RWSAs for Baquilan Resettlement area, Porac Resettlement area and Barangay Pana in Botolan municipality,
- Cabangan RWSA for the Poblacion in Cabangan municipality,
- Barangay Garetta RWSA and Barangay Pangolingan RWSA in Palauig municipality, and
- Barangay Namatacan RWSA and Simminublan RWSA in San Narciso municipality.

Table 4.1.4 Information on Existing Level II Systems

Municipality	Name of System (Operating Body)	Type and No. of Water Source[1]		Number of Barangay Served			Number of Household Served			Number of Population Served		
				Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Botolan	Baquilan Resett.	SP	1	0	6	6	0	245	245	0	1,225	1,225
	Pana	SP	1	0	1	1	0	185	185	0	925	925
	Porac Resett.	SP	1	0	1	1	0	65	65	0	325	325
Municipal Total			3	0	8	8	0	495	495	0	2,475	2,475
Cabangan	Cabangan RWS	SW	1	0	3	3	0	50	50	0	250	250
Palauig	Brgy. Garreta	DW	1	0	1	1	0	150	150	0	750	750
	Pangolingan	DW	1	0	1	1	0	65	65	0	325	325
Municipal Total			2	0	2	2	0	215	215	0	1,075	1,075
San Narciso	Namatacan	DW	1	0	1	1	0	140	140	0	700	700
	Simminublan	DW	1	0	1	1	0	140	140	0	700	700
Municipal Total			2	0	2	2	0	280	280	0	1,400	1,400
Provincial Total			7	0	12	12	0	990	990	0	4,950	4,950

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

Four (4) Level II systems in Botolan and Cabangan utilize spring sources, while the remaining 4 systems in Palauig and San Narciso avail deep well sources. Operating status of these systems is as follows:

- Six (6) systems (Baquilan Resettlement area, Barangay Pana in Botolan and four systems in Palauig and San Narciso) are serving potable water (no information is available from the remaining 2 systems).
- Three (3) systems (Baquilan Resettlement, Porac Resettlement in Botolan and Barangay Simminublan in San Narciso) supply water throughout the day, while other 3 systems (Barangays Garetta, Pangolingan in Palauig and Barangay Namatacan) provide a limited supply with 1.5 to 4 hours/day.

In addition to the above, there were several Level II systems which were reported to have been abandoned due to Mt. Pinatubo eruption.

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

(1) Management practice

Insufficient management practices are common to almost all Level II systems. Questionnaire survey on financial performance and managerial set-up revealed the status without answering thereto. It is anticipated that any Level II systems may become non-operational due to managerial incapability and lack of sustainability to operate the systems. To attain financial and managerial sustainability, reinforcement of the RWSA shall be promoted with reference to the institutional development.

(2) Technical skill for O&M of facilities

Several original systems have been expanded to increase service coverage without appropriate technical study on the capacities of water sources and distribution facilities. Water quality problem with turbid water has also been experienced without a provision of proper maintenance. 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. A rain collector is also used in some areas.

Level I facilities are classified in terms of safe and unsafe sources referring to the water quality examination results conducted by PHO as presented in Table 4.1.5 (details are referred to Supporting Report).

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 Well	Shallow Well	Covered/ Improved Dug Well	Developed Spring	Total	Shallow Well	Undeveloped Spring	Open Dug Well	Rain Water Collector	Total	Urban	Rural	Total	Urban	Rural	Total
Bocaue	37	1,439	0	1	1,477	196	0	1,100	0	1,296	660	1,937	2,597	3,561	20,074	11,638
Cabungan	18	643	0	0	661	88	0	7	0	95	526	2,387	2,963	2,763	11,698	14,462
Candelaria	26	777	0	0	803	100	0	142	0	218	344	1,368	1,712	2,308	7,935	10,243
Castillejos	17	1,080	0	0	1,097	147	0	111	0	258	3,701	893	4,593	18,502	4,199	22,701
Iba (Capital)	28	141	0	0	169	20	0	70	0	90	1,762	2,443	4,206	9,166	12,710	21,871
Masinloc	16	486	0	0	502	65	0	420	0	485	1,501	480	1,981	8,257	2,639	10,895
Olongapo City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Palauig	29	665	0	1	695	90	0	800	0	890	308	490	798	1,987	2,694	4,681
San Antonio	14	934	0	0	948	127	1	160	0	288	2,974	1,051	4,025	13,680	4,837	18,517
San Felipe	20	1,146	0	0	1,166	456	0	9	0	465	2,023	387	2,410	9,304	1,793	11,097
San Marcelino	20	998	0	1	1,019	136	0	390	0	526	3,265	114	3,379	15,995	547	16,541
San Narciso	16	1,314	0	0	1,330	179	0	400	0	579	2,363	1,272	3,635	11,416	1,555	13,000
Santa Cruz	29	1,590	0	0	1,619	218	0	734	0	952	2,449	4,714	7,163	4,816	4,427	9,043
Subic	36	877	0	0	913	119	0	644	0	763	14,611	16,961	31,572	23,616	1,652	25,262
Provincial Total	306	12,090	0	3	12,399	1,643	1	4,957	0	6,605	36,533	34,496	71,031	123,112	66,759	189,870

Of the total number of operational Level I facilities (19,004 facilities including developed spring and open/improved dug well), 72% is shallow wells and 26% is open dug wells (unsafe sources). According to the PHO water quality analysis results, 12% of shallow wells is determined to be unsafe as an average of the province. All deep wells were confirmed to be potable. In application of uniform unsafe percentage to the shallow wells of the municipality, 12,399 Level I facilities are classified as safe sources, while 6,605 facilities are under unsafe sources.

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

(1) Unsafe water sources

Most of the cases declared as unsafe sources are open dug wells and 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 sources 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 periodical monitoring of water quality.

(2) Non-functioning/abandoned wells

There is a considerable number of non-functioning wells in the province as shown in Table 4.1.6.

Table 4.1.6 Operating Status of Existing Wells in the Province

Operating Status	Unit	Public Wells		Private Shallow Well	Total
		Deep Well	Shallow Well		
Functioning	No.	306	284	13,453	14,043
	Percent	15	16	74	64
Non-Functioning	No.	1,758	1,483	4,650	7,891
	Percent	85	84	26	36
Total Number		2,064	1,767	18,103	21,934

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

Among others, deep wells usually necessitate repair/replacement of mechanical parts and redevelopment of well itself. Aside from the same problems as deep wells, shallow wells have principal disadvantages in use of shallow aquifer that is 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, periodical check-up entailing preventive maintenance and redevelopment of wells are to be performed. While 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.

Present population of the municipalities as of 1994, base year for planning purpose, was estimated using 1990 population census data, 1993 POPCOM survey data and annual growth rate between 1990 and 2000 employed by NSO. Population distribution in 1990 by urban and rural barangay prepared by NSO were adjusted to meet actual conditions in 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 based on 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 covered 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 2 to 28 households/facility under the above assumptions (details are referred to in Supporting Report).

Table 4.1.7 and Figure 4.1.1 present the profile of service coverage in terms of served, underserved and unserved. As a provincial total (PW4SP study area excluding Olongapo City), 58% of the population is adequately served (84% of urban population and 36% of rural population). The lower percentage of service coverage in the rural area is affected by a huge number of unsafe shallow wells (21 public wells, 243 private wells and 3,746 open dug wells used by about 134,700 persons) and no provision of facilities. The provincial service coverage at present is exhibited in Figure 4.1.2.

Table 4.1.7 Water Supply Service Coverage by Municipality

Municipality	Type	Population (1994)	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	Un-served	Total	Level III	Level II	Level I	Total	Unsafe Source	Un-served	Total
Botolan	Urban	3,915	0	0	1,564	1,564	1,161	1,190	2,351	0	0	40	40	30	30	60
	Rural	33,120	0	2,475	10,074	12,549	18,600	1,971	20,571	0	7	30	38	56	6	62
	Total	37,035	0	2,475	11,638	14,113	19,761	3,161	22,922	0	7	31	38	53	9	62
Cabangan	Urban	3,145	0	0	2,764	2,764	381	0	381	0	0	88	88	12	0	12
	Rural	14,049	0	250	11,698	11,948	2,101	0	2,101	0	2	83	85	15	0	15
	Total	17,194	0	250	14,462	14,712	2,482	0	2,482	0	1	84	86	14	0	14
Candelaria	Urban	4,229	1,565	0	2,308	3,873	356	0	356	37	0	55	92	8	0	8
	Rural	17,035	1,185	0	7,935	9,120	7,915	0	7,915	7	0	47	54	46	0	46
	Total	21,264	2,750	0	10,243	12,993	8,271	0	8,271	13	0	48	61	39	0	39
Castillejos	Urban	21,713	0	0	18,502	18,502	3,177	35	3,212	0	0	85	85	15	0	15
	Rural	5,959	0	0	4,199	4,199	1,681	79	1,760	0	0	70	70	28	1	30
	Total	27,672	0	0	22,701	22,701	4,857	114	4,971	0	0	82	82	18	0	18
Iba (Capital)	Urban	15,616	2,560	0	9,160	11,720	3,896	0	3,896	16	0	59	75	25	0	25
	Rural	19,322	1,130	0	12,710	13,840	5,482	0	5,482	6	0	66	72	28	0	28
	Total	34,938	3,690	0	21,870	25,560	9,377	1	9,378	11	0	63	73	27	0	27
Masinloc	Urban	15,456	5,260	0	8,257	13,517	1,442	498	1,939	34	0	53	87	9	3	13
	Rural	24,627	795	75	2,639	3,509	19,787	1,332	21,118	3	0	11	14	80	5	86
	Total	40,083	6,055	75	10,896	17,026	21,228	1,829	23,057	15	0	27	42	53	5	58
Palauig	Urban	2,500	0	0	1,907	1,907	570	23	593	0	0	76	76	23	1	24
	Rural	24,523	0	1,075	2,694	3,769	20,706	49	20,755	0	4	11	15	84	0	85
	Total	27,023	0	1,075	4,601	5,676	21,276	72	21,348	0	4	17	21	79	0	79
San Antonio	Urban	22,807	6,095	0	13,680	19,775	3,016	16	3,032	27	0	60	87	13	0	13
	Rural	7,197	0	0	4,837	4,837	2,326	34	2,360	0	0	67	67	32	0	33
	Total	30,004	6,095	0	18,517	24,612	5,343	50	5,393	20	0	62	82	18	0	18
San Felipe	Urban	14,341	3,721	0	9,304	13,025	1,301	15	1,316	26	0	65	91	9	0	9
	Rural	2,207	132	0	1,793	1,925	257	25	282	6	0	81	87	12	1	13
	Total	16,548	3,853	0	11,097	14,950	1,558	40	1,598	23	0	67	90	9	0	10
San Marcelino	Urban	20,001	0	0	15,995	15,995	3,141	865	4,006	0	0	80	80	16	4	20
	Rural	9,364	0	0	547	547	7,521	1,296	8,817	0	0	6	6	80	14	94
	Total	29,365	0	0	16,542	16,542	10,663	2,160	12,823	0	0	56	56	36	7	44
San Narciso	Urban	13,266	0	0	11,446	11,446	1,811	9	1,820	0	0	86	86	14	0	14
	Rural	9,466	0	1,400	1,555	2,955	6,504	7	6,511	0	15	16	31	69	0	69
	Total	22,732	0	1,400	13,001	14,401	8,316	15	8,331	0	6	57	63	37	0	37
Santa Cruz	Urban	9,695	1,680	0	4,616	6,296	3,391	8	3,399	17	0	48	65	35	0	35
	Rural	37,499	0	0	4,427	4,427	33,035	37	33,072	0	0	12	12	88	0	88
	Total	47,194	1,680	0	9,043	10,723	36,426	45	36,471	4	0	19	23	77	0	77
Subic	Urban	44,443	16,525	0	23,610	40,135	4,289	19	4,308	37	0	53	90	10	0	10
	Rural	12,302	1,889	0	1,652	3,541	8,755	6	8,761	15	0	13	29	71	0	71
	Total	56,745	18,414	0	25,262	43,676	13,044	25	13,069	32	0	45	77	23	0	23
PW4SP Study Area	Urban	191,127	37,406	0	123,113	160,519	27,931	2,677	30,608	20	0	64	84	15	1	16
	Rural	216,670	5,131	5,275	66,760	77,166	134,669	4,835	139,504	2	2	31	36	62	2	64
	Total	407,797	42,537	5,275	189,873	237,685	162,601	7,512	170,112	10	1	47	58	40	2	42
Olongapo City	Urban	217,353	68,085	0	0	68,085	134,592	14,676	149,268	31	0	0	31	62	7	69
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	217,353	68,085	0	0	68,085	134,592	14,676	149,268	31	0	0	31	62	7	69
Provincial Total	Urban	408,480	105,491	0	123,113	228,604	162,523	17,353	179,876	26	0	30	56	40	4	44
	Rural	216,670	5,131	5,275	66,760	77,166	134,669	4,835	139,504	2	2	31	36	62	2	64
	Total	625,150	110,622	5,275	189,873	305,770	297,193	22,188	319,380	18	1	30	49	48	4	51

Figure 4.1.1 Water Supply Service Coverage by Municipality

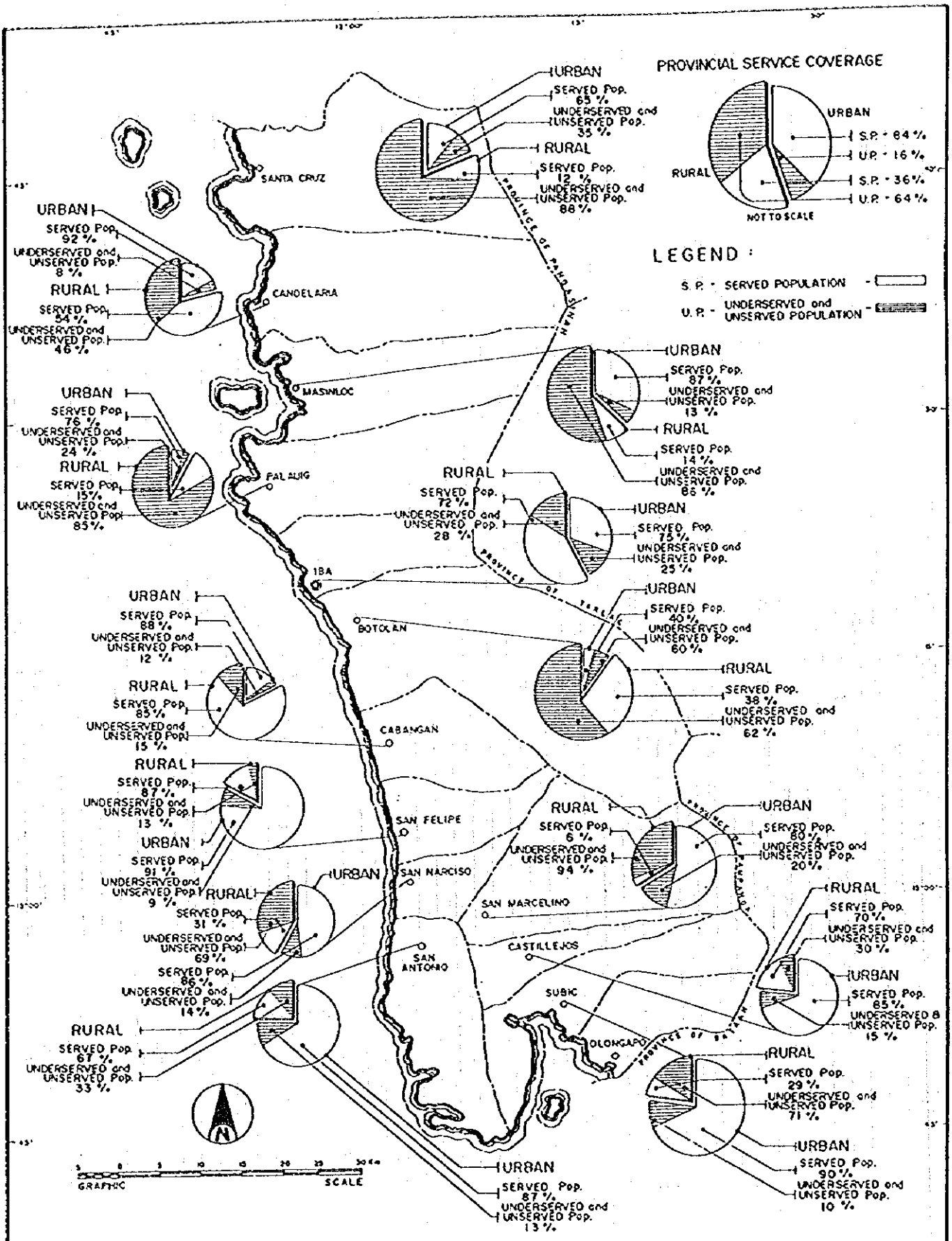


FIGURE 4.1.2
EXISTING WATER SUPPLY SERVICE COVERAGE MAP

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 the case of household toilets, data were consolidated by urban and rural area. These facilities were classified into sanitary and unsanitary in terms of structure rather than the surrounding conditions.

The Code on Sanitation of the Philippines provides the minimum standards for services dealing with public health. Specifically, Chapter XVII on Sewage Collection and Disposal, Excreta Disposal and Drainage defines alternatives for on-site sanitation and sewage collection and disposal. At present, the development of sewerage systems, even in urban centers of the province, is not given priority because of the huge investment costs 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 pit privy considering its low construction cost especially in rural areas; and 2) unsanitary toilets - 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 private 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 the municipalities. The remaining households were considered as underserved and/or unserved. The service coverage was determined using the estimated number of households in 1994.

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 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

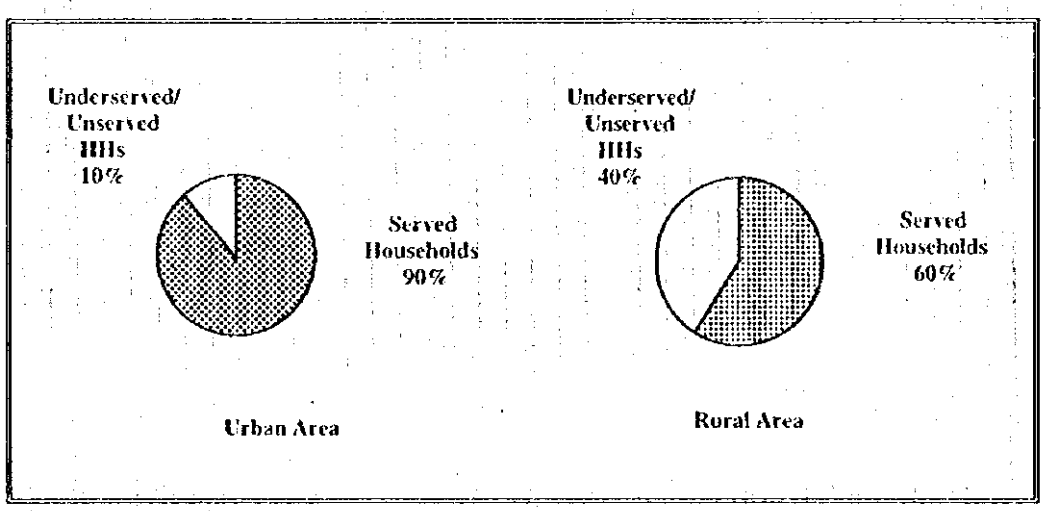
The service coverage of sanitary toilets in the province is 79% of the total number of households. The rest is underserved and/or unserved (3% is without toilet facilities). In urban areas, about 87% of the total households is served. A much lower served households of 60% exists in rural areas comparing with urban areas..

In the PW4SP study area, the service coverage is 75% of the total number of households. About 5% is without toilets (refer to Table 4.2.1 on the number of households using sanitary and unsanitary facilities, and without facilities, Supporting Report). Urban areas of the PW4SP study area have a service coverage of 90%, while in rural areas, it is 60%. Figures 4.2.1 and 4.2.2 reflect the provincial service coverage of household toilet facilities by urban and rural area in the study area. Table 4.2.1 shows the municipal breakdown in the number of urban and rural household toilets by category, and the level of service coverage.

Table 4.2.1 Sanitation Facilities and Service Coverage of Household Toilets, Urban and Rural, 1994

Municipality	Households 1994			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
Botolan	739	6,369	7,108	624	84	115	16	4,375	69	1,994	31	4,999	70	2,109	30
Cabangan	655	2,867	3,522	638	97	17	3	1,913	67	954	33	2,551	72	971	28
Candelaria	755	2,937	3,692	659	87	96	13	1,777	61	1,160	39	2,436	66	1,256	34
Castillejos	4,343	1,268	5,611	4,318	99	25	1	605	48	663	52	4,923	88	688	12
Iba (Capital)	3,003	3,716	6,719	1,891	63	1,112	37	3,414	92	302	8	5,305	79	1,414	21
Masinloc	2,810	4,478	7,288	2,720	97	90	3	2,429	0	2,049	0	5,149	71	2,139	29
Palauig	472	4,459	4,931	441	0	31	0	2,436	55	2,023	45	2,877	58	2,054	42
San Antonio	4,958	1,565	6,523	4,323	87	635	13	865	55	700	45	5,188	80	1,335	20
San Felipe	3,118	460	3,578	2,908	93	210	7	39	8	424	92	2,947	82	631	18
San Marcelino	4,082	1,951	6,033	4,079	100	3	0	905	0	1,046	0	4,984	83	1,049	17
San Narciso	2,884	1,972	4,856	2,871	100	13	0	1,234	1	738	1	4,105	85	751	15
Santa Cruz	1,795	7,075	8,870	1,792	100	3	0	3,908	2	3,167	2	5,700	64	3,170	36
Subic	8,889	2,563	11,452	7,394	83	1,495	17	1,260	3	1,303	3	8,654	76	2,798	24
PW4SP Study Area	38,503	41,680	80,183	34,658	90	3,845	10	25,160	60	16,520	40	59,818	75	20,365	25
Olongapo City	42,920	0	47,920	40,831	85	7,089	15	0	0	0	0	40,831	85	7,089	15
Provincial Total	86,423	41,680	128,103	75,489	87	10,934	13	25,160	60	16,520	40	100,649	79	27,454	21

Figure 4.2.1 Provincial Service Coverage of Household Toilet Facilities, 1994 (PW4SP Study Area)



(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 930 toilet units found in 311 schools. Only 32% of the students is adequately served by sanitary toilets. The rest is underserved and/or unserved. In the PW4SP study area, 35% of the students is adequately served. The remaining 65% is underserved and/or unserved.

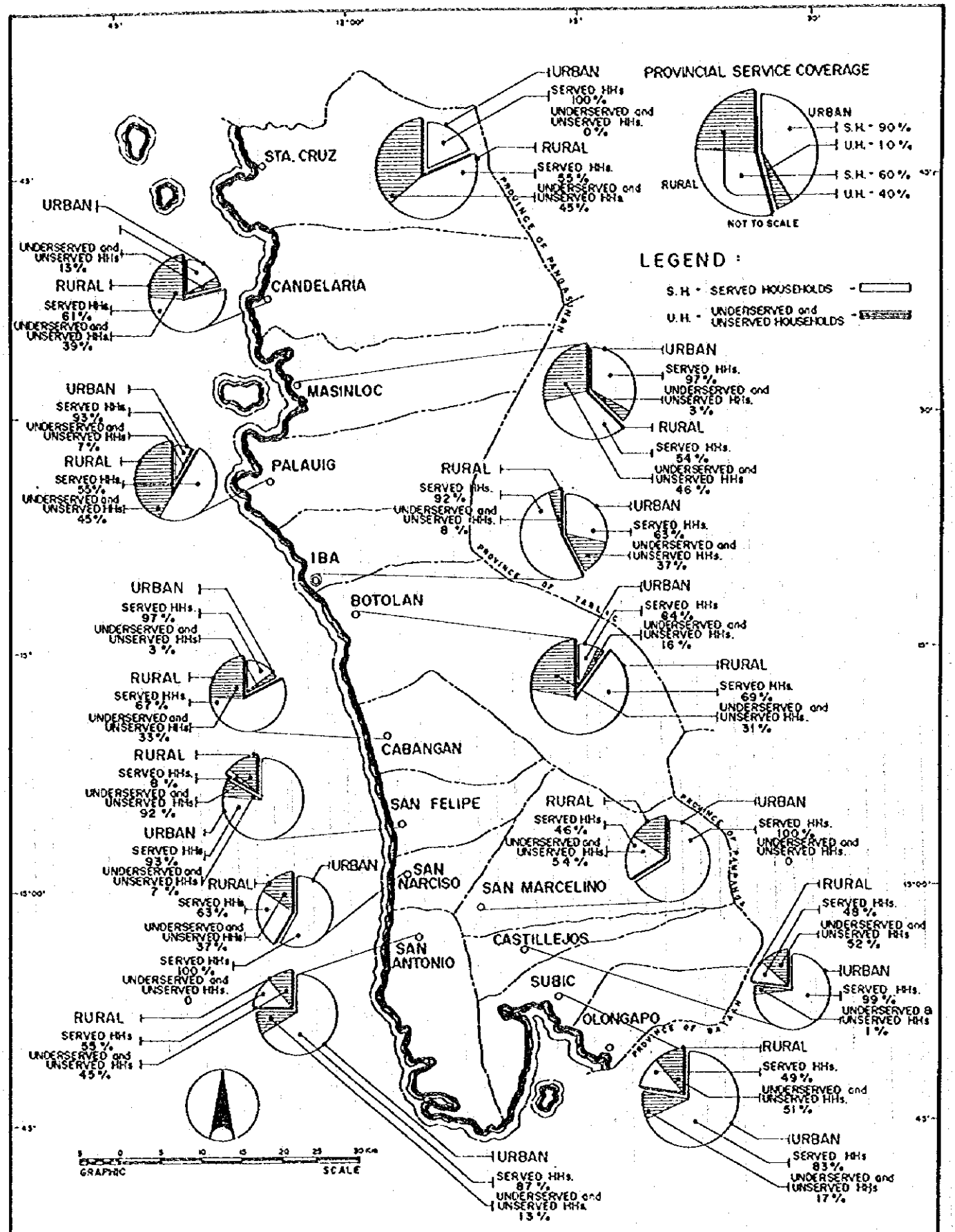


FIGURE 4.2.2
EXISTING HOUSEHOLD TOILETS SERVICE COVERAGE MAP

There are 31 public toilets located at public markets and bus/jeepney terminals. Toilets in parks or plazas are not accounted. Sanitary toilets are provided for all the utilities in the province. Table 4.2.2 and Table 4.2.3 provide the number and service coverage of toilet facilities of schools and public utilities, respectively.

(3) On-going Projects

A total of 3,549 toilet bowls through the FW4SP is being distributed to each of the 3,549 households as follows:

Municipality	No. of HHs	Municipality	No. of HHs
Botolan	997	Palauig	314
Cabangan	135	San Antonio	64
Candelaria	214	San Felipe	101
Castillejos	183	San Marcelino	68
Iba	312	San Narciso	565
Masinloc	190	Santa Cruz	406
Olongapo City	-	Subic	-

The recipient households are providing the superstructure and the depository of the sanitary toilet. With the distribution, the coverage of served households will increase from 79% to 82%.

Also from the same project, the province has allocated 19 school toilets to serve an estimated 7,220 students. The distribution is as follows:

Municipality	No. of School Toilets	Est. Served Students
Cabangan	1	300
Candelaria	2	900
Iba	4	1,600
Olongapo City	8	2,800
San Felipe	1	320
Sta. Cruz	3	1,300

The coverage of served students will increase from 32% to 38% with the additional toilets.

Table 4.2.2 School Toilet Facilities and Service Coverage in 1994

Municipality	Number of Schools			Number of Students			Number of Toilets							Served						Underserved/ Unserved					
							Sanitary			Unsanitary				Public		Private		Total		Public		Private		Total	
	Public	Private	Total	Public	Private	Total	Public	Private	Total	Public	Private	Total	Total Unit	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Botolan	26	2	28	6,578	839	7,417	98	4	102	0	0	0	102	4,900	66	200	3	5,100	69	1,678	23	639	9	2,317	31
Cabangan	17	1	18	2,924	411	3,335	22	2	24	15	0	15	39	1,100	33	100	3	1,200	36	1,824	55	311	9	2,135	64
Candelaria	16	1	17	4,501	556	5,057	18	2	20	18	0	18	38	900	18	100	2	1,000	20	3,601	71	456	9	4,057	80
Castillejos	15	1	16	4,463	1,055	5,518	22	2	24	15	0	15	39	1,100	20	100	2	1,200	22	3,363	61	955	17	4,318	78
Iba (Capital)	15	2	17	8,374	949	9,323	83	8	91	0	0	0	91	4,150	45	400	4	4,550	49	4,224	45	549	6	4,773	51
Masinloc	19	3	22	6,973	2,447	9,420	65	6	71	0	0	0	71	3,250	35	300	3	3,550	38	3,723	40	2,147	23	5,870	62
Palauig	19	2	21	4,863	1,121	5,984	20	4	24	18	0	18	42	1,000	17	200	3	1,200	20	3,863	65	921	15	4,784	80
San Antonio	12	3	15	3,569	1,561	5,130	32	6	38	0	0	0	38	1,600	31	300	6	1,900	37	1,969	38	1,261	25	3,230	63
San Felipe	11	2	13	2,408	972	3,380	17	12	29	12	0	12	41	850	25	600	18	1,450	43	1,558	46	372	11	1,930	57
San Marcelino	17	3	20	4,665	1,341	6,006	19	6	25	12	0	12	37	950	16	300	5	1,250	21	3,715	62	1,041	17	4,756	79
San Narciso	17	1	18	3,521	1,284	4,805	32	16	48	8	0	8	56	1,600	33	800	17	2,400	50	1,921	40	484	10	2,405	50
Santa Cruz	30	1	31	8,807	1,979	10,786	67	2	69	1	0	1	70	3,350	31	100	1	3,450	32	5,457	51	1,879	17	7,336	68
Subic	20	2	22	11,293	1,539	12,832	49	4	53	0	0	0	53	2,450	19	200	2	2,650	21	8,843	69	1,339	10	10,182	79
PW4SP Study Area	234	24	258	72,939	16,054	88,993	544	74	618	99	0	99	717	27,200	31	3,700	4	30,900	35	45,739	51	12,354	14	58,093	65
Olongapo City	29	24	53	30,867	11,398	42,265	213	0	213	0	0	0	213	10,650	25	0	0	10,650	25	20,217	48	11,398	27	31,615	75
Provincial Total	263	48	311	103,806	27,452	131,258	757	74	831	99	0	99	930	37,850	29	3,700	3	41,550	32	65,956	50	23,752	18	89,708	68

Table 4.2.3 Public Toilet Facilities and Service Coverage in 1994

Municipality	Public Utilities									
	Public Markets			Jeepney/Bus Terminals			Total Toilets	Served		Underserved	
	No. of Sanitary Toilets	Number of Unsanitary Toilets	Sub-total	No. of Sanitary Toilets	Number of Unsanitary Toilets	Sub-total		No. of Sanitary Toilets	%	No. of Underserved	%
Botolan	1	0	1	0	0	0	1	1	100	0	0
Cabangan	1	0	1	0	0	0	1	1	100	0	0
Candelaria	1	0	1	0	0	0	1	1	100	0	0
Castillejos	1	0	1	0	0	0	1	1	100	0	0
Iba (Capital)	1	0	1	1	0	1	2	2	100	0	0
Masinloc	1	0	1	0	0	0	1	1	100	0	0
Palauig	1	0	1	0	0	0	1	1	100	0	0
San Antonio	1	0	1	0	0	0	1	1	100	0	0
San Felipe	1	0	1	2	0	2	3	3	100	0	0
San Marcelino	2	0	2	0	0	0	2	2	100	0	0
San Narciso	1	0	1	0	0	0	1	1	100	0	0
Santa Cruz	1	0	1	2	0	2	3	3	100	0	0
Subic	1	0	1	0	0	0	1	1	100	0	0
PW4SP Study Area	14	0	14	5	0	5	19	19	100	0	0
Olongapo City	1	0	1	8	0	8	9	9	100	0	0
Provincial Total	15	0	15	13	0	13	28	28	100	0	0

(4) Problem Areas

Compared to the national service coverage of sanitary household toilets of 77%, the province shows a higher coverage of 82% (including service coverage of on-going projects).

The number of sanitary school toilets is very low to meet the service level standard of 50 students per sanitary facility. At present, the ratio is an average of 158 students per sanitary toilet.

Public toilets at markets and bus/jeepney terminals, 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 in some municipalities 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 apart from Olongapo City (secured area of SBMA). Most of the wastewater from dwelling units with acceptable facilities finds its way to open drains and watercourses. These deficiencies are the major contributing factors to the poor condition of the water environment in some areas of the province.

Chapter 5

EXISTING SECTOR ARRANGEMENTS AND INSTITUTIONAL CAPACITY

5. EXISTING SECTOR ARRANGEMENTS AND INSTITUTIONAL CAPACITY

5.1 General

Much has happened in the sector since 1987 when the national master plan was initially prepared. The water supply, sewerage and sanitation sector today is in a transition stage. The Local Government Code (LGC) has essentially re-defined the role, relationship and linkages of central, provincial, municipal and barangay institutions in the provision of basic services, including water and sanitation. The responsibility for water supply and sanitation functions were lodged with various national agencies. The new direction mandates the LGUs to play a larger role in planning and implementing water supply and sanitation projects. This raises serious institutional capacity and resource reallocation issues.

Chapter Five provides an overview of existing sector policies and arrangements as a basis for formulating modifications and improvements. It identifies current capacity building issues which need to be addressed in the early stages of master plan implementation. Most importantly, it assesses the impact of the present centralized delivery system at the local levels.

5.2 Sector Reforms

The GOP has set the future agenda for sector reform. These initiatives followed the completion of the Water Supply Sector Reform Study and the National Urban Sewerage and Sanitation Strategy Study. The GOP has endorsed the major recommendations of these studies through the following NEDA resolutions:

(1) NEDA Resolution No. 4 (series of 1994): LGUs, in the context of the LGC and related decentralization efforts, now play a lead role in service delivery. The resolution allows LGUs to implement all levels of water supply projects and redefines the roles of other sector agencies. LWUA shall implement only financially viable Level III water supply projects in areas outside the MWSS jurisdiction. DILG's participation will consist of general administration and institution building, such as assistance to the LGUs in the formation of Rural and/or Barangay Waterworks and Sanitation Association and in the identification of water supply systems. *DPWH, together with DILG and DOH, will provide technical assistance (within a period of about 2 years) to LGUs in the planning, implementation and operation and maintenance of water supply facilities.*

(2) NEDA Resolution No. 5 reaffirms the principle of provision of sewerage and sanitation services on the basis of willingness-to-pay. The resolution mandates the establishment of a Central Project Support Office (CPSO) at LWUA to assist LGUs in the formulation, preparation and implementation of sewerage and sanitation projects.

5.3 Sector Institutions

(1) Existing Institutional Arrangements

In the beginning of this chapter, it was noted that the sector is in transition. The LGC, however, mandates major changes on sector structure and performance in the future. New Implementing Rules and Regulations (IRR) reflecting the new sector role of the LGUs and national agencies are being prepared. Sector projects are still led generally by national agencies, in coordination with LGUs. The following discussion on institutional arrangements therefore presents the starting point of the transition (i.e., the existing set-up).

At the central level, there are three (3) line departments (DILG, DPWH and DOH) and two (2) government owned and controlled corporations (LWUA and MWSS) responsible for planning and implementation (refer to Figure 5.3.1, Functional Relationship). Other GOP departments are concerned with macro-planning, national resource allocation decisions, as well as exercise of regulatory powers for tariff setting, and environmental protection and management issues.

At the provincial and municipal levels, there are central agency field offices (of DPWH and DILG) and LGU offices working in the sector. DOH field offices have since been devolved and most of its resources are already under LGU supervision. Water districts, RWSAs and BWSAs have been organized to deal with the actual delivery of services. Some LGUs continue to operate municipal or provincial water and sanitation systems. As the LGC is gradually put into operation, many of the responsibilities and resources currently administered by central departments may be devolved to LGUs. Project management offices (PMOs, at the central level), *ad hoc* inter-agency committees and task forces have been organized to address coordination issues.

Figure 5.3.1 - Functional Relationships