

NO. 01

**BASIC DESIGN STUDY REPORT
ON
THE RURAL ENVIRONMENTAL SANITATION PROJECT
(PHASE II)
IN
THE REPUBLIC OF THE PHILIPPINES**

MARCH 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

G R F

90-21

BASIC DESIGN STUDY REPORT ON THE RURAL ENVIRONMENTAL SANITATION PROJECT IN THE REPUBLIC OF THE PHILIPPINES

JICA LIBRARY



1082747(5)

21229

BASIC DESIGN STUDY REPORT
ON
THE RURAL ENVIRONMENTAL SANITATION PROJECT
(PHASE II)
IN
THE REPUBLIC OF THE PHILIPPINES

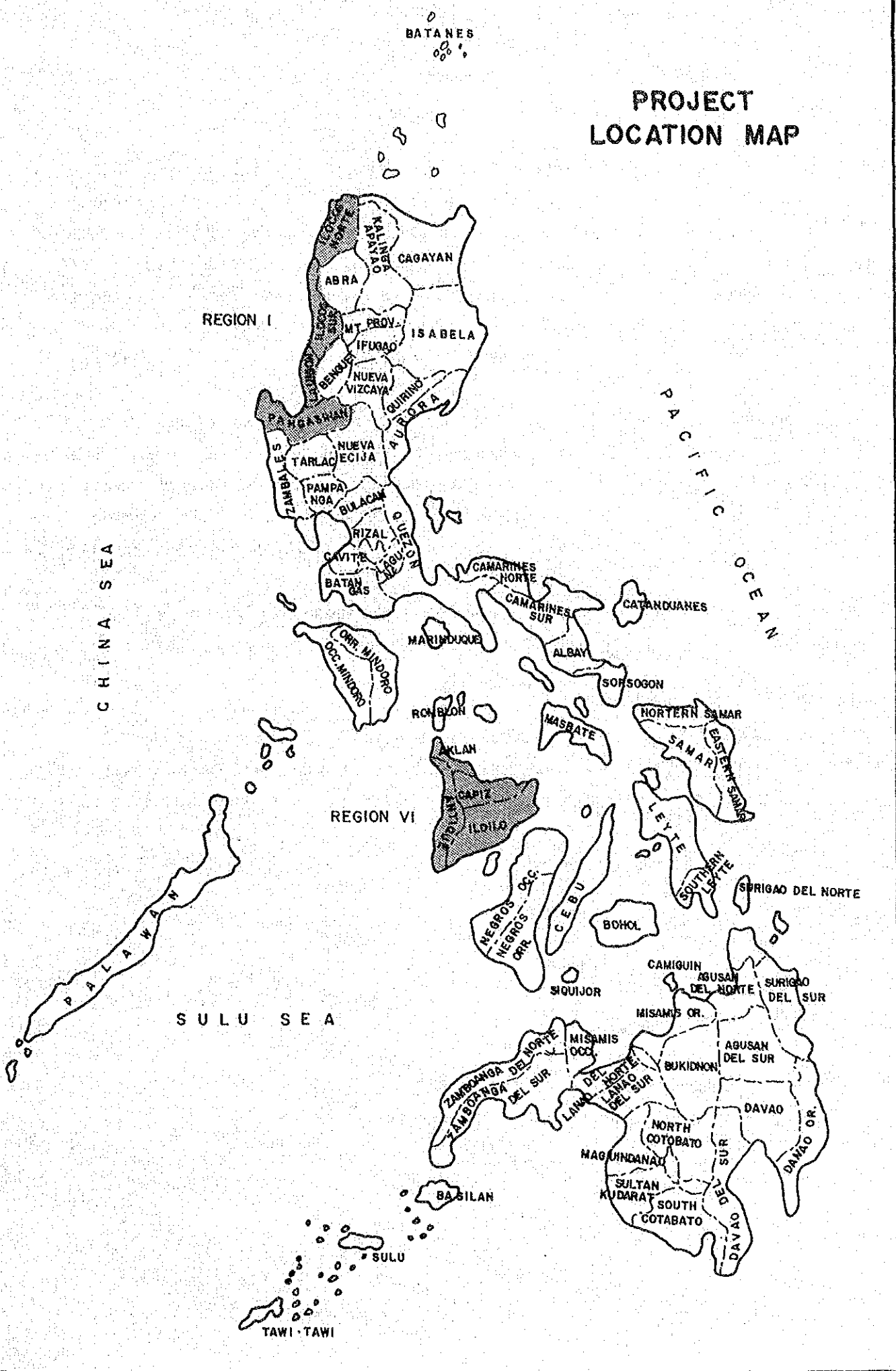
MARCH 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

国際協力事業団

21229

PROJECT LOCATION MAP



PREFACE

In response to the request of the Government of the Republic of the Philippines, the Government of Japan decided to conduct a Basic Design Study on the Rural Environmental Sanitation Project (Phase II) and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to the Philippines a study team headed by Mr. Hiroshi Igarashi, Chief of First Design Section, Construction and Engineering Department, Sapporo City Waterworks Bureau from September 20 to November 3, 1989.

The team exchanged views with the officials concerned of the Government of the Philippines and conducted a field survey (in Regions I and VI). After the team returned to Japan, further studies were made. Then, a mission was sent to the Philippines in order to discuss the draft report and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the team.

March, 1990



Kensuke Yanagiya

President

Japan International Cooperation Agency

LIST OF ACRONYMS AND ABBREVIATIONS

ACRONYMS

BHS	Barangay Health Station
BMGS	Bureau of Mines and Geo-Sciences
BPW	Bureau of Public Works
BWSA	Barangay Waterworks and Sanitation Association
DECS	Department of Education, Culture and Sports (GOP)
DEO	District Engineering Office
DLG	Department of Local Government (GOP)
DOH	Department of Health (GOP)
DPWH	Department of Public Works and Highways (GOP)
E/N	Exchange of Notes
GNP	Gross National Product
GOJ	Government of Japan
GOP	Government of the Philippines
JICA	Japan International Cooperation Agency
LGU	Local Government Units
LFPR	Labor Force Participation Rate
MFA	Ministry of Foreign Affairs (GOP)
MHC	Municipal Health Center
MWSS	Metropolitan Waterworks and Sewerage System
NCSO	National Census and Statistics Office (NEDA-GOP)
NGO	Non-Government Organization
NWRB	National Water Resources Board

NWRC	National Water Resources Council
PBME	Project Benefit Monitoring and Evaluation
PCC	Project Coordinating Committee
PHO	Provincial Health Office
PMO-RWS	Project Management Office for Rural Water Supply
PTA	Parent-Teacher's Association
RDO	Regional Director Office
RHU	Rural Health Unit
RHO	Regional Health Office
RWSA	Rural Waterworks and Sanitation Association
WD	Water District

ABBREVIATIONS

ha	hectare
km	kilometre
lpcd or l/c.d	litre per capita per day
lps or l/s	litre per second
lps/m	litre per second per metre
m	metre
mbgs	metre below ground surface
mm	millimetre
sq.km	square kilometre

BASIC DESIGN STUDY ON RURAL ENVIRONMENTAL SANITATION PROJECT PHASE II

	TABLE OF CONTENTS	PAGE
LOCATION MAP		
PREFACE		i
LIST OF ACRONYMS AND ABBREVIATIONS		iii
TABLE OF CONTENTS		v
LIST OF TABLES		viii
LIST OF FIGURES		ix
SUMMARY		S-1/S-6
CHAPTER 1	INTRODUCTION	1-1
CHAPTER 2	BACKGROUND OF THE PROJECT	
2.1	Outline of Related Sectors in the Philippines..2-1	
2.1.1	Socio-Economic Conditions	2-1
2.1.2	Water Supply Situation	2-2
2.1.3	Health and Sanitation Conditions	2-3
2.1.4	Present Organizational and Management Set-up in the Water Supply, Sewerage and Sanitation Sector	2-3
2.2	Plans and Programs at the National and Regional Levels with Reference to the Project..2-6	
2.3	Relevant Project Information and Contents of the GOP Request	2-9
CHAPTER 3	DESCRIPTION OF THE PROJECT AREAS/PROVINCES	
3.1	Location and General Conditions of the Selected Provinces	3-1
3.2	Natural Conditions	3-5
3.2.1	Climate	3-5
3.2.2	Topography and Geology	3-6
3.2.3	Hydrogeology and Groundwater	3-18
3.3	Socio-Economic Conditions Including Basic Infrastructures	3-29

3.4	Present Situation of the Related Sectors in the Areas	3-33
3.4.1	Health and Sanitation Conditions	3-33
3.4.2	Water Service Situation	3-35

CHAPTER 4 THE PROJECT

4.1	Objectives	4-1
4.2	Evaluation of the Requested Project	4-1
4.2.1	Needs and Appropriateness of the Project	4-1
4.2.2	Implementation Arrangements	4-4
4.2.3	Relationship with Similar Locally Funded and Foreign-Assisted Projects	4-6
4.2.4	Composition of the Project	4-8
4.2.5	Requirements for Facilities, Equipment and Service Vehicles	4-9
4.2.6	Needs of the Technical Cooperation	4-16
4.2.7	Conclusion and Basic Policy in Provision of Grant-Aid Program	4-17
4.3	Project Description	4-18
4.3.1	Organization and Management for Implementation of the Project	4-18
4.3.2	Project Components and Physical Targets.	4-19
4.3.3	Locations and Background Information of the Project Sites	4-22
	(1) Water Supply Facilities	4-22
	(2) School Toilets	4-33
4.3.4	Plan for Operation and Maintenance	4-34
	(1) Water Supply Facilities	4-34
	(2) School Toilet Facilities	4-38
	(3) Monitoring System	4-39
4.4	Technical Cooperation for Implementation of the Project	4-41

CHAPTER 5 BASIC DESIGN OF THE FACILITIES AND SPECIFICATION OF EQUIPMENT AND SERVICE VEHICLE

5.1	Primary Consideration for Planning and Design..	5-1
5.2	Fundamentals for Planning and Design	5-3
5.2.1	Water Supply Facilities	5-3
5.2.2	School Toilet Facilities	5-6
5.3	Basic Plan and Design	5-7
5.3.1	Water Supply Facilities	5-7
5.3.2	School Toilet Facilities	5-7

5.3.3	Equipment and Service Vehicle Specification	5-18
5.4	Project Implementation Plan	5-21
5.4.1	Present Situation of Relevant Fields of Construction in the Philippines	5-21
	(1) Water Supply Facilities	5-21
	(2) School Toilet Facilities	5-22
5.4.2	Implementation Method	5-22
5.4.3	Major Undertakings by Japanese and Philippine Governments	5-24
5.4.4	Implementation Schedule	5-26
5.4.5	Cost Estimates	5-26
	(1) Construction Cost	5-26
	(2) Operation and Maintenance Cost ...	5-28

CHAPTER 6 CONCLUSION AND RECOMMENDATIONS ON THE PROJECT

APPENDICES

NO.	TITLE	PAGE
A.1	Groundwater Map	A.1-1/A.1-16
A.2	Organizational and Functional Charts of Implementing Agencies for the Project..	A.2-1/A.2-6
A.3	Location of Proposed Project Sites	A.3-1/A.3-16
A.4	Typical Schematic Diagram for Level II System	A.4-1/A.4-6
A.5	Standard Design Drawings of Facilities for Level II System	A.5-1/A.5-7
A.6	Standard Types of Toilet Unit With Standard Well Source	A.6-1/A.6-5
A.7	Details of Cost Estimates	A.7-1/A.7-2
B.1	Composition of the Study Team	B.1
B.2	Minutes of Discussion	B.2-1/B.2-5
B.3	Field Work Schedule in the Philippines ...	B.3-1/B.3-3
B.4	Local Agencies and Official Met With	B.4-1/B.4-3
B.5	Data List	B.5-1/B.5-2
B.6	Joint Department Order Creating the Project Coordinating Committee	B.6

LIST OF TABLES

Table No.	Title	Page
2.1	Existing Water Supply Coverage (As of End of 1987)	2-4
2.2	Existing Sanitation Coverage (As of End of 1986)	2-4
2.3	Contents of Request	2-12
3.1	Permeability and Infiltration Capacity by Lithology	3-24
3.2	Data on Socio-Economic Conditions and Basic Infrastructure	3-30
3.3	Status of Sanitation Facilities as of 1986 .	3-34
3.4	Reported Cases and Deaths of Notifiable Waterborne and Water-Related Diseases	3-36
3.5	Water Supply Service Coverage Status as of 1987	3-37
4.1	Existing Drilling Rigs in the DPWH	4-11
4.2	Distribution of Existing Drilling Rigs in the DEOs of Subject Provinces	4-12
4.3	Existing Vehicles in DEOs of Subject Provinces as of 1989	4-14
4.4	1987-1989 DPWH Infrastructure Program	4-15
4.5	Summary of Physical Targets and Population/ Pupils to be Served by Facility	4-21
4.6	Project Location and Service Level with Population to be Served	4-23
4.7	Coverage of Water Supply Facilities	4-33
4.8	Coverage of School Toilets	4-34
5.1	Standard Specification of Level I Well Construction/Standard Specification of Level II Well Construction	5-15
5.2	Summary of Number of Wells by Provinces	5-17
5.3	Types of Toilet Unit	5-18
5.4	Summary of School Toilets	5-19
5.5	Number of Schools by Pupil Distribution	5-20
5.6	Price Index of Construction Materials	5-28

LIST OF FIGURES

Figure No.	Title	Page
2.1	Sanitation Service Coverage	2-5
2.2	Agency Responsibility	2-7
3.1	Climate in Luzon and Visayas Areas	3-7
3.2	Stratigraphy in Ilocos Provinces and Pangasinan	3-10
3.3	Geologic Map (Province of Ilocos Norte)	3-11
3.4	Geologic Map (Province of Ilocos Sur)	3-12
3.5	Geologic Map (Province of La Union)	3-13
3.6	Geologic Map (Province of Pangasinan)	3-14
3.7	Stratigraphy in the Panay Island	3-19
3.8	Geologic Structural Map of Panay Island	3-20
3.9	Geologic Map (Panay River Basin)	3-22
3.10	Geologic Map (Province of Antique)	3-23
4.1	Institutional Development Flow Chart	4-20
5.1	Typical Spring Intake Box	5-8
5.2	Typical Design of Small Intake Dam	5-9
5.3a	Standard Design for Level I Deepwell (Jetmatic Pump)	5-10
5.3b	Standard Design for Level I Deepwell (Improved Deepwell Handpump)	5-11
5.3c	Standard Design for Level I Dugwell	5-12
5.4a	Standard Design for Level II Deepwell	5-13
5.4b	Standard Design for Level II Water Source Facilities	5-14
5.5	Project Organization and Work/Fund Flow Chart	5-23
5.6	Project Implementation Schedule	5-27

SUMMARY

SUMMARY

The Philippines is an archipelago of roughly 7,100 islands divided into 3 main island groups, namely, Luzon, Visayas and Mindanao, and has a land area of about 300,000 sq km. The country has 13 administrative regions 75 provinces, 60 cities, 1,505 municipalities and 40,207 barangays. It experiences a tropical monsoon climate and a mean annual rainfall ranging from 1,000 mm to 4,000 mm and averaging 2,269 mm. Topography contrasts widely as the lowlands of Central Luzon, Cagayan, Agusan and Cotabato, and the mountain areas of the Cordilleras, Zambales, etc. Major geologic features of significance to groundwater occurrence are faulted formations for spring in mountain ranges, for aquifers Tertiary and Quaternary sediments and pyroclastics in lowlands/valleys, and reefal limestone near some coastlines. Sustained by a relatively generous rainfall, the water resource of the country is generally abundant.

In 1987, the Philippines had a population of 57,360,000, of which 59 percent lived in the rural area. For the same year, the Gross National Product (GNP) increased 5.7 percent from the previous year and the labor force participation rate of persons 15 years and older was 65.6 percent. In 1986, about 60 percent of households were on or below the poverty line, the lowest 20 percent having received only 6 percent of the total generated income. During the period 1977 to 1984, waterborne and water-related diseases were among the three leading causes of morbidity and the second ranking cause of infant mortality. Average human life span in 1987 was 63.7 years.

About 63 percent of the total population in 1987 was served by public water supply systems, the coverage in the rural area being 62 percent. The remaining unserved population, many of whom reside in the rural areas, derive water from sources which are considered generally unsafe and are the most affected by waterborne and water-related diseases. Technical and financial problems associated with difficulty of extracting water from deep aquifer, saltwater intrusion and high iron/manganese content, and lack of support infrastructure, prevent development of effective water sources in some areas and the efficient operation of some existing systems.

In 1986, 69 percent of the total household in the country had sanitary toilets, 15 percent had unsanitary toilets, while 16 percent had no toilet facilities at all. The coverage of adequate sanitation facilities in the rural areas is 62 percent. This lack of sanitary toilets has resulted to unhygienic environment and spread of contagious diseases, which are aggravated when pit privies and other unsanitary toilets are flooded and contaminate water sources.

The GOP is advocating a policy, as part of its development strategy, for the improvement of living standard of the rural population through the provision of basic social infrastructures. One of the sectors which need to be addressed urgently is that of water supply and sanitation where the existing facilities are still inadequate. This fact is underscored in the 1988-2000 Water Supply, Sewerage and Sanitation Master Plan of the Philippines, and the recently launched Accelerated Water Supply Program. As a contribution to the attainment of the goal set by the national policy, the GOP requested the GOJ the Rural Environmental Sanitation Project Phase II under a Grant-Aid Program in provision of water supply and sanitation facilities for selected regions and provinces. A project of the same nature known as the Pilot Rural Environmental Sanitation Project was implemented in 1985 and 1986 with encouraging results.

In response to the GOP request, the GOJ decided to conduct the Basic Design Study on the proposal and subsequently, the JICA dispatched a Study Team to the Philippines from September 20 to November 3, 1989. Meetings were held between the Study Team and relevant Philippine officials to establish the terms and framework of the Project, the Minutes of Discussion of which was signed on October 2, 1989. The Study Team then proceeded with the field survey of the Project Area and prepared the Draft Final Report which contains the results of the study. Discussions on this report were held between the GOJ and GOP from January 25 to January 31, 1990, the agreements reached in the meeting forming the basis for this Final Report.

The agreed Project Area covers the provinces of Ilocos Norte, Ilocos Sur, La Union, and Pangasinan in Region I, and Aklan, Capiz, Iloilo, and Antique in Region VI. Region X provinces were excluded because of the limited period of implementation required by the policy of the Grant-Aid Program.

In the socio-economic aspects, most provinces except Ilocos Norte and La Union have monthly average household income equal or less than the national average. Waterborne and water-related diseases are consistently among the leading causes of morbidity and mortality, with rates among the highest in the country. In comparison with national average figures, the water supply coverage in La Union, Aklan and Capiz is lower, and Capiz and Antique have fewer percentage of households with sanitary toilets.

Annual rainfall in Region I ranges from 2,000 mm to 2,500 mm while in Region VI it varies from 1,938 mm at Iloilo to 3,971 mm at Antique. All provinces front the sea and are characterized by generally narrow coastal flats which rise abruptly towards the inland except for Pangasinan, Capiz and Iloilo where extensive river plains exist. Groundwater can generally be extracted at varying depths through wells, although saltwater intrusion is a problem in some stretches of coastal towns of all provinces except Antique.

Results of the study disclosed the effectiveness and appropriateness of the facilities in the attainment of objectives including the capability of existing institutions of the GOP to implement post-construction activities on these facilities, and the Project's compatibility with the mechanism of a grant project, thus is recommended for implementation under a Grant-Aid Program in accordance with certain arrangements. GOP agencies that shall be principally responsible for the implementation of the Project are the DPWH, LWUA and DOH, in cooperation with the DLG, DECS, provincial/municipal councils and NGOs. Operation, maintenance and management of facilities shall be handled by the BWSA/RWSA for water supply, and by the DOH and DECS for school toilets. An inter-agency committee, the Project Coordinating Committee (PCC), will be created to provide over-all coordination and direction.

The GOJ shall be responsible for the complete delivery through contract Project components including design, procurement, construction supervision and training in well construction. For its part, the GOP shall provide full support to the GOJ to assure smooth implementation including right-of-way acquisition, arrangements for entry/tenure and exemption from taxes of GOJ nationals and imported commodities for

the Project, and undertake the operation and maintenance and facilities.

Recommended facilities for the water supply component are 78 Level I systems and 16 Level II systems, and 217 toilet units for 159 public elementary schools for the sanitation component. Equipment and vehicles to be procured for construction, monitoring and training purposes are 2 truck-mounted rotary type drilling machine, 10 pickups, 11 sets of water quality analysis equipment and water level indicator and 8 sets of pumping test equipment. Level III or individual house connection water supply systems, toilet bowls for individual households, and vacuum trucks were deleted from the original GOP request.

Fundamentals for the planning of required facilities are given in the following page.

<u>WATER DEMAND</u>	<u>WATER SUPPLY FACILITIES</u>	<u>SCHOOL TOILET FACILITIES</u>
o Design year: Five (5) year period following current practice in the Philippines	o Pressure reducing tank: Installed to ensure static water pressure less than 70 m (2 cu m tank)	o Number of toilet bowls: 20 percent of pupils use the toilet to defecate and 50 percent to urinate
o Design population: 10 percent increase of present population using average annual increase rate of 2 percent	o Reservoir (Ground or Elevated Tank): 1/4 of maximum day demand	o Water requirement: 2 l/capita for flushing of water sealed toilet and 0.5l/capita for hand washing
o Water consumption rate: 30 to 40 l/c.d for Level I and 40-60 l/c.d (daily average) for Level II	o Pipes: GI or PE pipe is used for transmission line. GI pipe is also used for river/road crossing in distribution line. PE or PVC pipe is used under normal conditions of distribution line.	o Facilities:
o Average day demand: Design population x water consumption rate	Well casing is either GI, PVC, FRP or Steel depending on well depth and substrata conditions.	- Urinals and wash basins in all facilities - Toilet and urinal for every 50 males - Toilet for every 30 females - Appropriate number of windows at least 0.50 m x 0.50 m in size to allow sufficient ventilation and light particularly in each cubicle - Non-slip floor with cement tile and provision of drain with appropriate slope in both floor and surrounding area of toilet bowl - Provision of the roof above the sink/cistern
o Maximum day demand: 1.3 x Average Day Demand	o Pump Type and its Operation Period: Either submersible, centrifugal pump, and engine drive borehole turbine pump is used and operation of the pump is between 8 to 10 hours/day.	
o Maximum hour demand: 2.5 x Average day Demand/24		
o Hydraulic pressure: 5 psi (3.5 m) at end-faucet		

Basic plan and design of water supply facilities are standardized, most of which are currently used in the Philippines. These include those for spring intake, well source, transmission, storage and distribution facilities. Well design provides for open-hole gravel pack construction. For school toilets, four standard types are developed in consideration of the number of beneficiary pupils and in conformity with DOH standards.

The Project is proposed to be implemented in two stages, each stage to entail one-year construction period and consists of Ilocos Sur, Pangasinan, Iloilo and Antique for the Stage I, and Ilocos Norte, La Union, Aklan and Capiz for the Stage II.

Once completed, the water supply and school toilet facilities will provide direct benefit to 42,107 people and 82,423 pupils, respectively, in 8 provinces of 2 regions. Recipients of water supply facilities are 97 barangays in 62 municipalities, while 159 barangays in 95 municipalities are beneficiaries of school toilet facilities. Additionally, residents of neighboring barangays may likely be influenced by favorable results of the Project and ultimately follow suit. As a fringe benefit, GOP field personnel will be introduced to proper well construction by open-hole gravel pack method.

Taking into account the above effects and extent of contribution that the Project will bring coupled with the facts that it is in the category of a non-profit socially-oriented infrastructure designed to sustain life and serve basic human needs, it is relevant to the GOP water supply and sanitation program, it can indirectly influence promotion of agricultural production, it will contribute remarkably to the improvement of living standard of beneficiaries, and that the GOP can operate and maintain the facilities with its own resources, the implementation of the Project through a Grant-Aid Program is strongly recommended.

However, the GOP should assure at the earliest practicable time the acquisition of land and right-of-access for construction, formation of BWSA/RWSA, and adequate training of operation and maintenance personnel. Furthermore, it is advisable for the GOP to give priority to the Project Area in future sanitation-related projects, and create

a working group within the PCC to oversee the Project beyond the turnover of facilities, to ensure a more effective and practical implementation.,

CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

The Government of the Philippines (GOP), through its various relevant agencies, is currently implementing the 1988-2000 Water Supply, Sewerage and Sanitation Master Plan, which is aimed at improving living standard and promoting proper sanitary practices through the provision of adequate water supply and sanitation facilities.

To achieve the purposes especially for the rural area, the massive Three-Year (1989-1991) Accelerated Water Supply Program is currently in full operation. However, due to the large number of facilities required, the widely dispersed location of sites nationwide and financial and technical difficulties, service coverage for the sector is still low.

One of the projects which was implemented towards this established objective was the Pilot Rural Environmental Sanitation Project assisted by Japan International Cooperation Agency (JICA). Started in January 1985, and satisfactorily completed in March 1986, the pilot project was responsible for the construction of 40 Level I water supply system (point sources), 20 Level II water supply systems (communal faucet/standpipe system), and 51 school toilets.

Recognizing the urgent need to further extend the benefits of improved water supply conditions and living environment to other rural areas in the same context of the Pilot Project and in line with the implementation of the Master Plan, the GOP has requested the Rural Environmental Sanitation Project, Phase II for further Grant-Aid from the GOJ through the JICA. In response to this request, the GOJ had decided to conduct the Basic Design Study on the particular project and subsequently, the JICA dispatched a Study Team to the Philippines.

The Study Team was composed of Mr. Hiroshi Igarashi, Team Leader and Chief of First Design Section, Construction and Engineering Department, Sapporo City Waterworks Bureau; Mr. Takeshi Imazu, Project Coordinator and Director, First Basic Design Study Division, Grant-Aid Planning and Survey Department, JICA and 4 other experts. The Study was conducted from September 20 to November 3, 1989 in the

Philippines. The list of members and their participation is shown in Appendix B.1.

In order to establish the terms and framework of the Project, the Study Team and relevant Philippine officials held a series of discussions, the official record of proceedings which is embodied in the Minutes of Discussion in Appendix B.2. This minutes was then jointly agreed and signed on October 2, 1989, by Mr. Hiroshi Igarashi for the JICA, and Mr. Teodoro T. Encarnacion, DPWH Undersecretary, Dr. Manuel G. Roxas, DOH Undersecretary, and Mr. Ricardo T. Quebral, LWUA Administrator, for the GOP.

The Study Team then proceeded with the field survey of the eight provinces in the two regions covered by the proposed Project as outlined in Appendix B.3. Activities in the field included finalization of project sites in consultation with provincial/municipal and other local officials, observation of the present water supply and sanitation conditions, and collection of data and information on technical, socio-economic and institutional aspects. The agencies and their respective staff members who had rendered timely support and assistance to the Study Team are listed in Appendix B.4. Reports, maps and other documents gathered from these agencies and other offices are listed in Appendix B.5. After the field work, the Study Team prepared the Draft Final Report in Japan. Discussions on the said report were held between the two parties for a period of 7 days from January 25 to January 31, 1990. The Final Report was completed based on the agreements reached during those discussions, the minutes of which is attached in Appendix B.2.

With reference to the arrangement by the GOP to ensure efficient and effective implementation of the Project, a Rural Environmental Sanitation Project Coordinating Committee (PCC) which is composed of key officials from the Department of Public Works and Highways (DPWH), Department of Health (DOH) and the Local Water Utilities Administration (LWUA) will be created to provide over-all coordination and direction. The Joint Department Order of the DPWH and the DOH creating the said PCC and its composition is shown in Appendix B.6.

In the arrangement of the GOP for the construction of facilities in this Project, the DPWH will be responsible for Level I systems: the DOH in close collaboration with the DPWH for the school toilets: and the LWUA for the Level II systems to be installed. The Department of Local Government (DLG) will be the primary agency for operation and maintenance of the facilities.

CHAPTER 2

BACKGROUND OF THE PROJECT

CHAPTER 2 BACKGROUND OF THE PROJECT

2.1 Outline of Related Sectors in the Philippines

2.1.1 Socio-Economic Conditions

In 1987, the reported population count in the Philippines was 57,360,000, consisting of 8,160,000 (14.2 percent) in Metro Manila, 15,370,000 (26.8 percent) in other urban areas except Metro Manila, and 33,830,000 (59.0 percent) in the rural areas. Average population density nationwide was estimated at 190 persons per sq. km.

Population of rural areas in the regions which cover the provinces under this study (Region I and Region VI) was about 6,700,000, or roughly 20 percent of the rural population of the country. Average annual rate of increase in rural population in the said regions was placed at 2.7 percent. Except for Ilocos Norte, Ilocos Sur and Antique, the average population densities in the provinces covered by the study were greater than the national average.

The Gross National Product (GNP), which registered declines of negative 6.8 percent and negative 3.6 percent in 1984 and 1985, increased by 2.0 percent and 5.7 percent in 1986 and 1987, respectively, because of the stimulation of economic activities. During these latter years of gains in the GNP, inflation rate was kept to a relatively low 3.8 percent.

Between 1986 and 1987, the labor force participation rate (LFPR) of persons 15 years old and over increased from 63.8 percent in 1986 to 65.6 percent in 1987. This increase is attributed to the implementation of an employment generation program in the rural areas, incentives given by the GOP to the local investment program, and increased job opportunities for Filipinos in foreign countries.

Based on the 1986 statistics on household income, about 60 percent were on or below the poverty line with the lowest 20 percent having received only 6 percent of the total income generated. In contrast, the upper 20 percent of the households got a share of 50 percent of the total income. Most recent information indicates a national average monthly household income of ₱2,000.

The figure for average life span or longevity in 1987 was 63.7 years. During the period 1977 to 1984, waterborne and water-related diseases were among the three leading causes of morbidity and the second ranking cause of infant mortality.

2.1.2 Water Supply Situation

Service population coverage of public water supply systems for the entire Philippines in 1987 was 63 percent, (See Table 2.1) broken down into: 86 percent in Metro Manila, 55 percent in other urban areas and 62 percent in the rural areas. The remaining 37 percent of the population, many of whom reside in the rural areas, derive water for their domestic use from open dug wells, surface waters like streams and lakes, and rainwater collectors, which are generally considered as unsafe sources. It is believed that the segment of the rural population that remains unserved by public water supplies experiences a high incidence of waterborne and water-related diseases.

Technical problems prevent development of effective water sources in some areas and the efficient operation of some existing systems. These problems include difficulty in abstracting with reasonable economy groundwater from wells with low water level, saltwater intrusion in coastal areas, high contents of iron and manganese in groundwater, and lack of support infrastructures like a reliable electric power supply. Countermeasures taken or are being considered by GOP implementors are the construction of surface water intake and treatment facilities, infiltration gallery, or in very extreme cases, solar desalination plant. These structures generally are more expensive and/or entails more extensive treatment than those commonly employed in rural water supply development like wells and spring intakes. Research and development activities on the removal of limited concentrations of iron and manganese bicarbonates in groundwater through simple aeration and filtration processes had yielded encouraging results.

2.1.3 Health and Sanitation Conditions

According to a survey conducted by the DOH in 1986, 69 percent of the total household in the country had sanitary toilets, 15 percent had unsanitary toilets, while 16 percent had no toilet facilities at all. These statistics, together with similar graphic representations by region are shown in Figure 2.1. With regard to the coverage of adequate sanitation facilities by sector, Metro Manila was the highest placed at 93 percent, urban areas other than Metro Manila had about 73 percent, and rural areas were the lowest at around 62 percent, as given in Table 2.2.

Present sanitation conditions in most parts of the countryside require urgent improvement. Lack of sanitary toilets, both private and communal, has brought about an unhygienic environment and has been the cause of incidence and spread of contagious diseases. Pit privies are the most common toilet facilities in the rural areas. Therefore, conditions are aggravated during the rainy season when faeces brought to the surface by flood contaminate unprotected and improperly constructed water sources, thereby increasing the risks of the rural population of contracting waterborne and water-related diseases. As a large number of the rural population are unable to shoulder the cost of constructing sanitary facilities or are unaware of the importance of these facilities, the GOP within its limited resources has been providing these depressed sectors with said sanitary facilities.

2.1.4 Present Organizational and Management Set-up in the Water Supply, Sewerage and Sanitation Sector

Provision of water supply facilities are the responsibilities of the DPWH and two of its attached agencies namely: the Metropolitan Waterworks and Sewerage System (MWSS) and the LWUA. The MWSS operates the water supply and sewerage systems in Metro Manila and its contiguous area while the LWUA handles the development and improvement of water and sewerage systems in the provincial areas not covered by the MWSS.

TABLE 2.1 EXISTING WATER SUPPLY COVERAGE
(AS OF END OF 1987)

CLASSIFICATION (1)	TOTAL POPULATION (2)	POPULATION SERVED				UNDERSERVED/ UNSERVED POPULATION	
		POINT SOURCE		PIPED SYSTEM		POP. (7)	%
		POP. (3)	% (4)	POP. (5)	% (6)		
URBAN POPULATION							
METRO MANILA	8.16 M*	0.17 M	2	6.84 M	84	1.15 M	14
OTHER URBAN	15.37 M	2.70 M	18	5.68 M	37	6.99 M	45
RURAL POPULATION	33.83 M	15.38 M	46	5.40 M	16	13.05 M	38
TOTAL	57.36 M	18.25 M	32	17.92 M	31	21.19 M	37

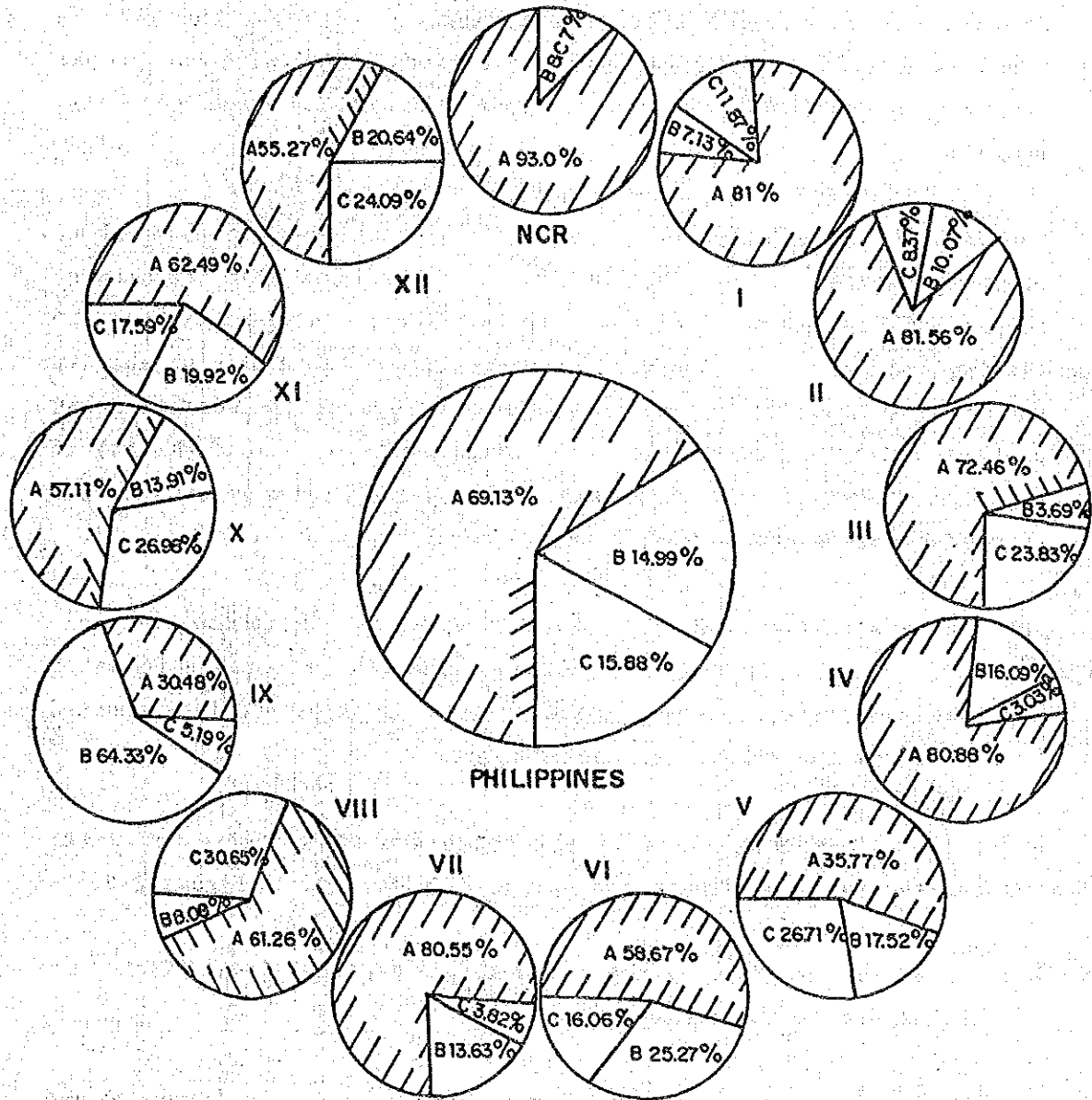
NOTE: * EXCLUDING THE 303,443 POPULATION IN THE TOWNS OF RIZAL

TABLE 2.2 EXISTING SANITATION COVERAGE
(AS OF END OF 1986)

CLASSIFICATION (1)	SERVED		UNDERSERVED/UNSERVED		TOTAL	
	POPULATION (2)	% (3)	POPULATION (4)	% (5)	POPULATION (6)	% (7)
METRO MANILA	6.65 M	93.00	0.5 M	7.15	7.00 M	12.72
OTHER URBAN	11.72 M	73.48	4.23 M	26.52	15.95 M	28.38
RURAL	20.48 M	61.87	12.62 M	38.13	33.10 M	58.90
TOTAL	38.85 M	69.13	17.35 M	30.87	56.20 M	100.00

SOURCE : DOH

FIGURE 21 SANITATION SERVICE COVERAGE



LEGEND :

- A - SANITARY TOILET
- B - UNSANITARY TOILET
- C - WITHOUT TOILET
- I~XII - REGION NUMBER
- NCR - NATIONAL CAPITAL REGION

SOURCE : DOH, 1986

The DPWH is concerned mainly with the development of Level I system and also takes the lead in establishing national water supply plans and programs upon which all involved agencies in the sector base their respective development plans. Other agencies which have been involved in the water supply include the National Water Resources Board (NWRB). The DLG's participation is limited to the general administrative and institution building activities. The NWRB is involved mainly in policies and regulations concerning the proper utilization and rights thereof of water resources all over the Philippines.

The LWUA is a specialized government corporation established to promote, develop and finance local water utilities within its area of responsibility in the provinces. It is chiefly concerned with establishing and providing financial, technical, and institutional assistance to the utilities constituted as Water Districts (WDs) in urban centers and Rural Waterworks and Sanitation Associations (RWSAs) in the rural areas in the provinces. The LWUA provides water services through Level II and Level III water supply systems.

For sanitation, the DPWH works jointly with the DOH to improve sanitation facilities in the Philippines. The DOH promotes safe water supplies and exercise surveillance of water quality and is supported by funds from the annual national budget.

A matrix of responsibility of the concerned agencies in the water supply, sewerage and sanitation sector is presented in Figure 2.2.

2.2 Plans and Programs at the National and Regional Levels With Reference to the Project

Past national and local investments in the water supply, sewerage and sanitation sector had been directed mostly for Metro Manila and other urban areas, with less priority given to the urban fringes and the rural areas. This investment imbalance, coupled with the facts that sanitation projects are receiving attention only in recent years and sewerage projects had been minimal, has installed waterborne and water-related diseases as perennial major problems particularly in the rural areas.

FIGURE 2.2 AGENCY RESPONSIBILITY

RESPONSIBILITY AREA	AREA COVERAGE / CATEGORY / AGENCY																					
	METRO MANILA AND ITS CONTIGUOUS AREAS								OTHER URBAN AND RURAL AREAS													
	WATER SUPPLY				SEWERAGE				SANITATION				WATER SUPPLY				SEWERAGE				SANITATION	
	MWSS	DPWH	NWRB	MWSS	DOH	MWSS	DOH	DOH	LWUA	DPWH	DLG	NWRB	LWUA	DPWH	DOH	LWUA	DOH	LWUA	DOH			
PLANNING	X	SECTOR (AREA WIDE)	C	X	C	X	X	OTHER & RURAL AREAS (AREA WIDE)			C	X		C	X		X		X			
PROGRAMMING	X			X		X	X	L-II/III	L-I SOURCE DEV.							X		X	X			
FINANCING	X			X		X	X	X	X							X		X	X			
INSTITUTIONAL	X			X		X	X	X	INTERIM	X					X		X		X			
ENGINEERING	X			X		X	X	X	X						X	C	X		X			
CONSTRUCTION	X			X		X	X	L-II/III SOURCE DEV.	L-I							X		X	X			
OPERATION AND MAINTENANCE	X			X		X	X	WD / RWSA							WD		WD		WD			

LEGEND :

- X DIRECTLY RESPONSIBLE
- C COORDINATION

To provide direction, establish priorities, and rationalize implementation of projects in the sector, the GOP developed in 1980 the Integrated Water Supply Program for the years 1980-2000, and the 1982 Philippine Rural Water Supply and Sanitation Master Plan. These were later superseded by the Water Supply, Sewerage, and Sanitation Master Plan for the years 1988-2000 which was formulated in 1987. The Master Plan contains the sectoral objectives, policies, programs, institutional arrangements, and financial and economical considerations.

The objectives of the sector program as defined in the Master Plan are: the provision of reliable and safe water supply that are easily accessible to the majority of the households within the shortest time, practicable in a cost-effective manner to increase sanitation and sewerage service coverages as well as institutionalize the delivery of services.

The Master Plan calls for a two-stage implementation of projects: the first stage covering the period 1988 to 1992 and the second stage encompassing the period 1993-2000. It is envisioned that at the end of the first stage in 1992, water supply coverage will expand to 87 percent in Metro Manila, 77 percent in other urban areas apart from Metro Manila and 92 percent in the rural areas; a sewerage system covering the southern part of Metro Manila and 12 sewerage systems (6 conventional and 6 small-bore with stabilization ponds) for other urban areas will be constructed; and around 1.5 million sanitary toilets will be installed. At the end of the second stage, it is expected that the water supply coverage will increase to 97 percent in Metro Manila, 95 percent in other urban areas and 93 percent in the rural areas; a sewerage system covering the northern part of Metro Manila and 12 more sewerage systems (4 conventional and 8 small-bore with stabilization ponds) for other urban areas will be constructed; and additional 2.8 million sanitary toilet facilities will be constructed.

In recognition of the urgency of the need to upgrade the living conditions of the least endowed Filipinos, most of which are believed to reside in the rural barangays, and in line with fulfilling the targets set in the current Master Plan, the GOP passed a law in March

17, 1989 providing for the construction and rehabilitation of 100,000 Level I (point source) water supply systems by June 1, 1991. The law which is better known as the Three-Year Accelerated Water Supply Program covers all barangays in the Philippines, with each barangay to be provided with at least one system.

The proposed Project is expected to contribute towards the realization of the Master Plan objectives and to the provision of the water supply and sanitation needs of the least endowed rural population which are the target beneficiaries of the Accelerated Water Supply Program.

2.3 Relevant Project Information and Contents of the GOP Request

The implementation of the Pilot (Phase I) Rural Environmental Sanitation Project was authorized by the signing of an Exchange of Notes on December 20, 1984, between the GOP and the GOJ. The Project which was executed in 1985 and 1986 under a 15-month Grant-Aid Program of the GOJ, was responsible for the construction of 40 Level I systems, 20 Level II systems and 51 school toilets, and for the provision of training equipment and materials. Beneficiary areas of the pilot project are the provinces of Bulacan, Pampanga, Cavite and Batangas, where toilets are now available to 17,000 elementary grade school pupils, and 39,600 people are enjoying the benefits of the water supply systems.

Field inspections conducted by the Study Team in areas covered by the pilot project disclosed a fairly successful operation of facilities. Some problems had been observed but it is deemed that most of them can be offset by proper countermeasures. With respect to the water supply aspect, 4 out of the 40 Level I systems had been upgraded to Level II systems while 9 of the original 20 Level II systems had been converted to Level III systems. Water quality problems are being encountered in some water sources: specifically, saltwater intrusion in Bulacan and high iron/manganese content in Cavite and Batangas.

Operation problems in some pumped systems are being experienced due to the unreliability of electric power supply system. Water charges are being collected by the RWSAs based on water meter readings except

in some systems where such institutional arrangements are inadequate. In the sanitation aspects, school toilets are generally kept in clean conditions, but water for handwashing and flushing is either not sufficient or not provided. Water-sealed type toilet may be preferable over the flush-type toilet for the rural locality considering economic constraints and the semi-permanent nature of use. Sanitary practices like handwashing seem to need broader dissemination in the rural areas.

As a follow through of the pilot project and in consonance with the execution of works contemplated under the Master Plan and the Accelerated Water Supply Program, the GOP represented by the DPWH, has requested a Phase II Project for consideration in the Grant-Aid Program from the GOJ. The proposed Project is principally aimed to extend the benefits of adequate water supply and sanitation facilities to the least endowed segment of the rural population, towards the broader goal of improving living standards and attaining socio-economic development.

The GOP in its request proposed to carry out the Project in two stages: Stage I to be implemented in 1990 covering provinces in Region I (Ilocos Norte, Ilocos Sur, La Union, Pangasinan) and Region VI (Aklan, Capiz, Iloilo, Antique); and Stage II to be implemented in 1991 covering provinces in Region X (Agusan del Sur, Agusan del Norte, Misamis Oriental, Misamis Occidental, Bukidnon, Surigao del Norte, Camiguin). Requested components consist of Level I systems, Level II/Level III systems, school toilets, and toilet facilities for individual households including equipment and support vehicles. The types and physical targets of the request components covered under the two stages of implementation are shown in Table 2.3.

An adhoc committee will be created to manage the day-to-day affairs of the Project. Being named the Rural Environmental Sanitation Project Coordinating Committee for the Implementation of the Rural Environmental Sanitation Project, Phase II, the committee is composed of the DPWH Undersecretary as chairman, the DOH Undersecretary as co-chairman, and the LWUA Deputy Administrator, the Project Management Office for Rural Water Supply (PMO-RWS) Project Director, and one representative each from the DOH and DLG (by invitation) as

members. The DPWH (for Level I systems) and the LWUA (for Level II systems) will be responsible for the water supply components while the DOH will take care of the health and sanitation component.

TABLE 2.3 CONTENTS OF REQUEST

Stage/ Region/ Province	Water Supply Facility			Sanitation facility					Equipment & Vehicle					
	Level I		Level II/III	School Toilet	Sit Type Bowl with Treatm't Facility	Squat Type Bowl with Treatm't Facility	Squat Type Bowl	Truck Mounted Rotary Drilling Rig	Vacuum Truck	Pick-Up	Pump's Test Equip.	Water Quality Analysis Equip	Water Level Indicator	
	Deep Well	Deep Well with Gene. Set												Spring
STAGE I (1990)														
Region I														
Ilocos Norte	4	1	1	2	15	227	29	643			1+1	1	1	1
Ilocos Sur	6	2	2	2	15	155	28	720			2+1	2	2	2
La Union	9	1	2	2	19	198	30	895			1+1	1	1	1
Pangasinan	9	2	1	2	30	650	70	2,759			2+1	2	2	2
Sub Total	28	6	6	8	79	1,238	157	5,017	1	1	10	6	6	6
Region VI														
Aklan	6	1	1	2	16	156	26	714			1+1	1	1	1
Capiz	8	2	2	2	22	252	37	1,143			1+1	1	1	1
Iloilo	7	2	2	2	24	454	60	2,057			2+1	2	2	2
Antique	6	1	2	2	20	176	23	670			1+1	1	1	1
Sub Total	27	6	7	8	82	1,038	146	4,584	1	1	9	5	5	5
STAGE I TOTAL	55	12	13	16	161	2,276	303	9,601	2	2	19	11	11	11
STAGE II (1991)														
Region X														
Surigao del Norte	5	2	2	2	15	153	37	869			2+1	2	2	2
Agusan del Norte	2	1	2	2	13	107	25	588			1+1	1	1	1
Agusan del Sur	7	1	2	2	15	154	21	704			1+1	1	1	1
Bukidnon	4	1	1	2	15	190	25	707			1+1	1	1	1
Misamis Occ.	4	1	2	2	10	167	29	763			1+1	1	1	1
Misamis Or.	2	1	1	2	15	222	34	1,005			1+1	1	1	1
Comiguin	1	1	2	2	15	111	26	763			1+1	1	1	1
STAGE II TOTAL	25	8	12	14	98	1,104	197	5,339	1	1	15	8	8	8
GRAND TOTAL	80	20	25	30	259	3,380	500	15,000	3	3	34	19	19	19

CHAPTER 3

**DESCRIPTION OF THE PROJECT
AREAS / PROVINCES**

CHAPTER 3 DESCRIPTION OF THE PROJECT AREA/PROVINCES

3.1 Location and General Conditions of the Selected Provinces

The Project Area agreed between the JICA Study Team and concerned GOP authorities (Refer to the Project Location Map) covers the provinces of Ilocos Norte, Ilocos Sur, La Union and Pangasinan in Region I, and the provinces of Aklan, Capiz, Iloilo and Antique in Region VI. The Region I group is located in the northwestern part of Luzon island, between 15°35' to 18°00' north latitudes and 119°14' to 121°55' east longitudes. On the other hand, the Region VI group is situated in Panay island approximately at the center of the Philippine archipelago, between 10°25' to 12°01' north latitudes and 121°48' to 123°15' east longitudes.

General conditions of the provinces covered by the Project Area, based on Socio-Economic Profile reports for 1987 or 1988 prepared by the respective Provincial Planning and Development Office, are described in the ensuing paragraphs.

(1) Ilocos Norte

Laoag City, the capital of Ilocos Norte is, by road, 480 km from Manila and 200 km from the regional center, San Fernando, La Union. The city is connected to other major cities and municipalities in Luzon island by a generally well-paved road network. Air transportation between Laoag City and Manila is available three times a week.

Ilocos Norte has an area of around 340,000 ha. It has one city, 22 municipalities and 557 barangays. Total provincial population in 1987 was 431,677 of which about 27.4 percent lived in the urban areas and 72.6 percent in the rural areas. Number of urban and rural households was 82,716.

The province is basically an agricultural area, producing rice, garlic, tobacco and various food crops. Garlic accounts for 84 percent of the region's output and about half the production of the entire country. Other industries include forestry, fishery, mining and cottage industry.

(2) Ilocos Sur

Vigan, the capital of Ilocos Sur, is by road, about 395 km from Manila and 115 km from the regional center, San Fernando, La Union. It is linked to major cities and municipalities in Luzon island by a national road network which is generally in good condition.

The province occupies an area of around 260,000 ha. It has 34 municipalities and 764 barangays. In 1987, Ilocos Sur had a population of 508,274, of which 18.6 percent resided in the urban areas and 81.4 percent in the rural areas. Number of urban and rural household was 83,614.

Principal agricultural products in the province are rice, tobacco, various food crops, livestock and poultry. The province is also engaged in fishery and cottage industries.

(3) La Union

San Fernando, the capital of La Union and also the regional center, is by land travel, 280 km from Manila. A national road system of generally good condition connects San Fernando to the major cities/municipalities in Luzon island.

La Union has 20 municipalities and 575 barangays and occupies an area of around 149,300 ha. The National Census and Statistics Office (NCSO) projected a population of 544,265 for 1988. Census data for 1980 indicated that 16.8 percent of the population lived in the urban areas and 83.2 percent in the rural areas.

Agricultural products consist of rice, tobacco, fruits and vegetables, miscellaneous food crops, and livestock and poultry. The province also engages in fishery and mining.

(4) Pangasinan

Lingayen, the capital of Pangasinan, is about 200 km from Manila and 70 km from the regional center, San Fernando, La Union. Generally well-maintained national roads link the province to other major cities and municipalities of the Luzon island.

The province has a land area of 536,920 ha. It has two cities (Dagupan and San Carlos), 46 municipalities and 1,345 barangays. Estimated population in Pangasinan in 1988 was 1,823,255. The 1987 projected population indicated that urban and rural population constituted 29 percent and 71 percent, respectively. There were around 316,000 households in 1985.

Agricultural production comprises mainly of rice, corn, sugar cane, tobacco and coconut. Pangasinan also engages in forestry, mining and cottage industries. Coastal areas of San Fabian, Alaminos, Bolinao and Dagupan City are center of tourism industry in the province.

(5) Aklan

Kalibo, the capital of Aklan is, by road, 160 km from the regional center in Iloilo City, 90 km from Roxas City, and 370 km by air from Manila. The province is connected to cities and municipalities in Panay island by a national road network. Within the province, all towns except Poblacion Madalag, are interconnected by an all-weather road system. Air transportation between Kalibo and Manila is available two times daily, as well as a shuttle flight to and from Cebu. Manila is 20 hours away by boat from New Washington.

Aklan has an area of around 182,000 ha. It has 17 municipalities and 327 barangays. Total provincial population in 1980 was 324,563 of which about 12.2 percent lived in the urban areas and 87.8 percent in the rural areas. Based on the annual growth rate of 2.04 percent reported by the NCSO, the projected population of the province in 1988 was 381,472.

Farming is the main livelihood in Aklan where rice and corn are the principal food crops while coconut and abaca are the leading commercial crops. Its long coastline makes fishing another major source of livelihood of the provincial folks. Cottage industries also support a large number of families, although partially in most cases. The influx of tourists, both local and foreign to the Ati-Atihan festivities in Kalibo and to its famous tourist spot, Boracay island, is a major boost to the economy of Aklan.

(6) Capiz

Roxas City, the capital of Capiz is 120 km by road from the regional center, Iloilo City. A national road interconnects cities and municipalities in Panay island. Air transportation between Roxas City and Manila, which is 400 km away, is available 2 times daily.

Capiz has one city, 16 municipalities and 472 barangays, and occupies an area of around 263,300 ha. The NCSO projected a population of 586,751 for 1988. Census data for 1980 indicated that 13.5 percent of the population lived in the urban areas and 86.5 percent in the rural areas.

Agriculture is the main source of livelihood in the province. Agricultural products include rice, corn, coconut, sugar cane, food crops, and livestock and poultry. Being a coastal province, Capiz engages extensively in fishing. Forestry and cottage industries are other source of livelihood in the province. Tourism is a flourishing industry in Capiz with its numerous tourist attractions.

(7) Iloilo

Iloilo City, the capital of Iloilo and at the same time the regional center is about 450 km by air from Manila and is linked to the cities and municipalities in Panay island by a national road network. Air transportation between Iloilo and Manila is available 4 times daily. Travel by boat from the provincial capital to Manila takes around 18 hours.

The province occupies an area of around 632,400 ha. It has one city, 46 municipalities and 1,993 barangays including those of Guimaras island. Based on projections, Iloilo has a present population of 1,205,645, of which 17 percent reside in the urban areas and 83 percent in the rural areas. Annual population growth rate is placed at 1.7 percent.

Iloilo leads the other provinces in the region in terms of agricultural production. Agricultural products include rice, corn, cotton, food crops, livestock and poultry. Fishery and aquaculture are the

biggest industries in the province, with prawn farming being a big dollar venture. Large-scale industries fed by vast agricultural resources abound in Iloilo, with some indigenous products being brought to foreign markets. The province with its numerous places of interest is a primary tourist attraction in the region.

(8) Antique

San Jose, the capital of Antique is about 120 km by road from the regional center, Iloilo City. The province is linked to cities and municipalities in Panay island by a national road network, while commercial flights are not available in the province. One passenger vessel is serving the Antique-Manila route at a frequency of 5 times a month.

The province occupies an area of around 252,000 ha. It has 18 municipalities and 590 barangays. In 1980, Antique had a population of 344,879 of which 20.6 percent resided in the urban areas and 79.4 percent in the rural areas. Based on the annual growth rate of 2.26 percent for the 1980-1985 census period reported by the NCSO, the projected population of the province in 1988 was 412,395.

Agriculture including forestry and fishery, provides the main source of livelihood in the province. Agricultural products include rice, food crops, coconut, and livestock and poultry. Antique also boasts of historical places which attract tourists and bolsters the tourism industry.

3.2 Natural Conditions

3.2.1 Climate

The Philippines experiences the so-called tropical monsoon climate, which is classified into four distinct types according to the pattern of rainfall occurrence. Type 1 is characterized by two pronounced seasons, dry from November to April and wet the rest of the year. Type 2 has no distinct dry season with a very pronounced maximum rainfall from November to January. In the Type 3 climate, seasons are not very pronounced, it is relatively dry from November to April