

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
THE DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
REPUBLIC OF THE PHILIPPINES

BASIC DESIGN STUDY REPORT
ON
THE URGENT WATER SUPPLY PROJECT
FOR
RESETTLEMENT AREAS AND BARANGAYS
AFFECTED BY
MT. PINATUBO ERUPTION

March, 1993

PACIFIC CONSULTANTS INTERNATIONAL
TOKYO, JAPAN

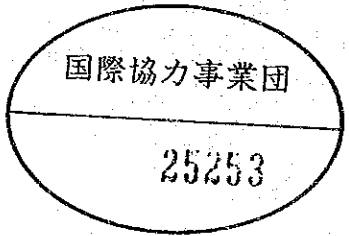
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PREFACE

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct a basic design study on the Urgent Water Supply Project for Resettlement Areas and Barangays affected by Mt. Pinatubo Eruption, and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team headed by Mr. Shigeru Okamoto, Deputy Director, First Basic Design Study Division, Grant Aid Study and Design Department, JICA and constituted by members of Pacific Consultants International, from November 16th to December 15th, 1992 .

The team held discussions with the official concerned of the Government of the Philippines, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to the Philippines in order to discuss on the draft final report and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement 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, 1993



Kensuke Yanagiya
President

Japan International Cooperation Agency

March ,1993

Mr. Kensuke Yanagiya,
President,
Japan International Cooperation Agency,
Tokyo, Japan

Letter of Transmittal

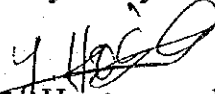
We are pleased to submit the Basic Design Study Report on The Urgent Water Supply Project for Resettlement Areas and Barangays affected by Mt. Pinatubo Eruption in the Republic of the Philippines.

This study has been made by Pacific Consultants International based on a contract with JICA from November 13th, 1992 to March 26th, 1993. Throughout the study we have taken into full consideration the present situation of the Resettlement area affected by Mt. Pinatubo Eruption including the present situation of Philippines and tried to plan the most appropriate project in the scheme of Japan's grant aid.

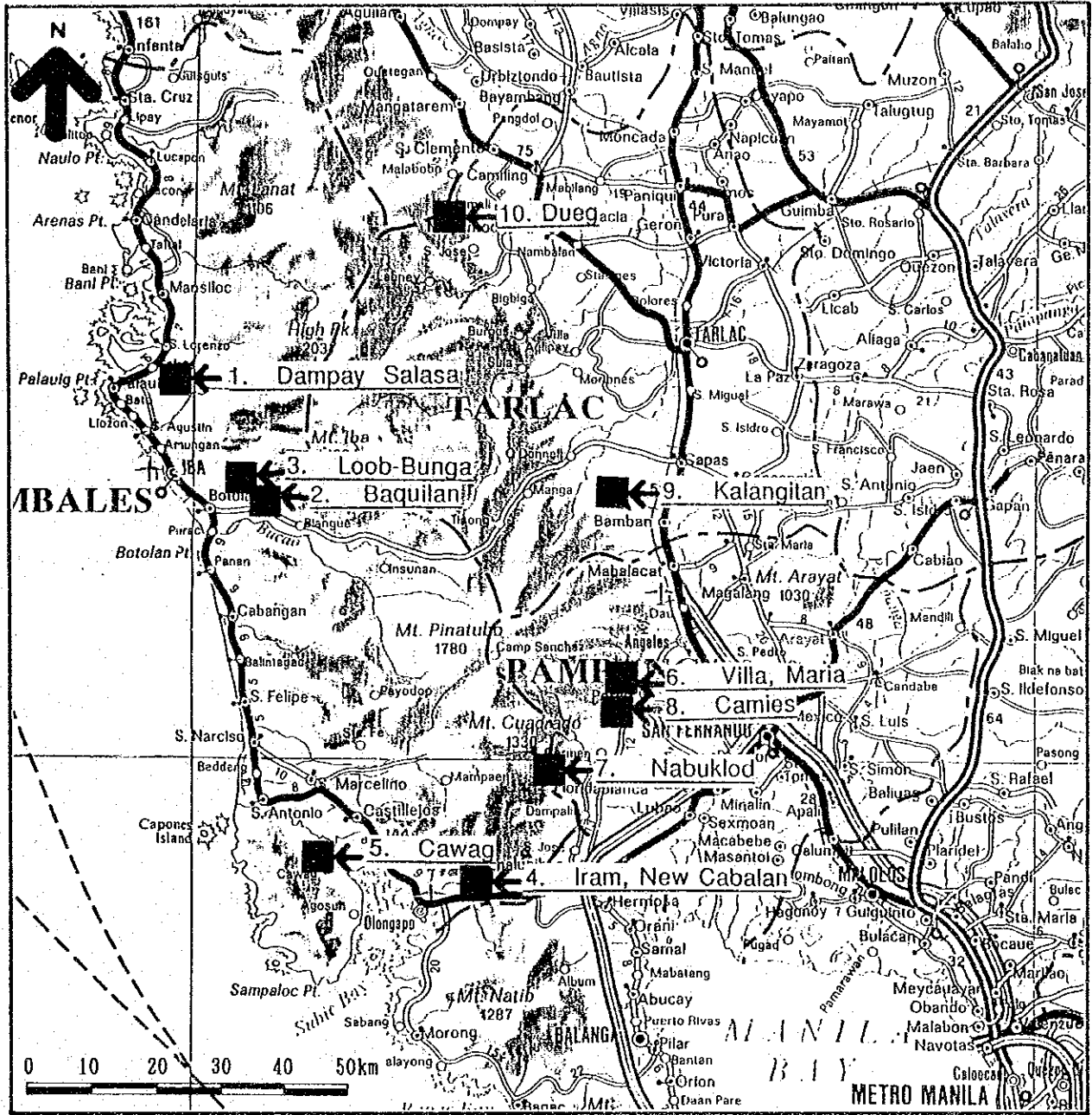
We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA , the Ministry of Foreign Affairs and the Ministry of Health & Welfare. We also wish to express our deep gratitude to the officials concerned of the Department of the Public Works and Highways, the Government of the Philippines, JICA Philippines Office and the Embassy of Japan in Philippines for their close cooperation and assistance during our study.

At last , we hope that this report will be effectively used for the promotion of the project.

Very truly Yours,



Yukio Hoshino, chief
engineer Basic Design Study Team on
the Urgent Water Supply Project for
Resettlement Areas and Barangays
Affected by Mt. Pinatubo Eruption
Pacific consultants International



Location Map

SUMMARY

SUMMARY

Background

1. Mount Pinatubo, located in the central part of Luzon Island in the Philippines, erupted repeatedly during the period from April through June 1991 causing a tremendous amount of damage in the areas within a radius of about 40 kms of Mt. Pinatubo. It has been estimated that approximately two million people suffered from the primary damage caused by the eruption and the secondary damage caused by mud flows and floods, and the total amount of damages exceeded 100 billion yen.
2. Given the severeness of the situation, the Government of the Philippines established the Mount Pinatubo Disaster Relief Task Force on June 26, 1991 consisting of 22 governmental agencies. The Task Force immediately started full-scale relief work, such as the reconstruction and restoration of the damaged areas and the provision of relief to the people who suffered from the disaster. Since November 1992, efforts have been made to organize a new body (the President's Office Pinatubo Committee) to replace the Task Force. The reconstruction policies of the committee will follow those of the Task Force, but it is expected to strengthen the coordination and evaluation functions.
3. After more than a year since the large eruption, the people in the disaster areas continue to face serious problems in maintaining or leading normal living conditions. The essential elements such as the procurement of drinking water directly affect human life conditions. In the disaster areas, there are only a few water supply facilities in comparison to the number of residents. The people find it difficult to secure even the minimum amount of necessary water. Furthermore, there are not many facilities for securing safe drinking water. And, even at the places where water is available, the condition of the sanitary facilities is very poor. Thus, it is feared that contamination by domestic sewerage may cause the spread of contagious diseases.

4. Based on the understanding of the above situations, the Government of the Philippines has been conducting a residents' resettlement program, as well as reconstruction work of the affected barangays' basic infrastructure as the first stage of implementation program. The Government intended to construct deep wells to secure a sufficient amount of safe drinking water in the resettlement areas, the refugee centers where the victims of the volcanic eruption are temporarily being sheltered, and the barangays where the water supply facilities were damaged. For this purpose, in March 1992 it requested for the Grant Aid assistance from the Government of Japan to procure drilling equipment and to construct hand-pump wells.
5. In response to the Government of the Philippines' request, the Government of Japan decided to conduct a Basic Design Study to examine the project component under the Grant Aid Programme and entrusted the study to the Japan International Cooperation Agency(JICA). JICA sent the Basic Design Study Team, headed by Mr. Shigeru Okamoto, the Deputy Director of the Grant Aid Planning and Survey Department, to the Philippines for 30 days from November 16 to December 15, 1992.

As a result of the field survey, the discussions with officials concerned of the Government of the Philippines and the analysis conducted in Japan, the following basic facts were clarified.

Objectives

6. The Project aims at the rehabilitation and reconstruction of Mt. Pinatubo eruption disaster areas, and stabilization of living standard of the residents by providing safe drinking water in the resettlement areas, damaged barangays and at the public facilities. safe and dependable drinking water will be supplied economically by constructing deep wells equipped with hand pumps and spring water use facilities. Mortality and occurrence rate of diseases will be reduced by supplying safe and dependable drinking water throughout the year.

Overall Project Conception:

7. The overall plan of Urgent Water Supply Project which will be completed in 8-year period by the year 2000, is proposed by DPWH, with number of necessary facilities. The outline of overall Project is as follows:

1993 to 1995:

- The construction of water supply facilities in the first priority resettlement areas with grant aid cooperation from the Japanese Government.

1995 to 2000:

- The construction of water supply facilities in all other resettlement areas and the construction of wells for schools in disaster areas.

The overall Project is to construct 866 wells equipped with hand pumps and 8 spring water use facilities in 369 barangays of 46 municipalities.

Situation of Water Supply

8. The water supply rate in Region III (central Luzon) that includes the areas damaged by the eruption of Mt. Pinatubo is 82.6%. 45.7% of the facilities are at Level I (Facilities having point water source). As the percentage of Level I facilities is high in the region, it is regarded as important to urgently improve the water supply facilities to secure safe drinking water in the damaged areas.
9. During the early stages of the rehabilitation works in effected areas of Mt. Pinatubo Eruption, the water supply facilities in resettlement sites were constructed mainly by NHA, but shortly thereafter the task was undertaken either by NGOs or DPWH for projects at the regional level. However, more than 60% of these facilities are not functioning due to the reasons such as bad selection of location, poor construction, and contamination by domestic sewerage.

Necessity of the Project

10. From the above viewpoints, as a first step in the reconstruction and restoration of the disaster areas, supply of safe, reliable drinking water must be made available to the residents in order to stabilize their livelihood and basic living conditions by constructing deep wells in the resettlement areas, and restoring water supply facilities in the damaged barangays. To solve the problems, Grant Aid Cooperation for constructing water supply facilities including the procurement of well drilling equipment is considered to be necessary and evaluated as being appropriate.
11. The project is well coordinated with the Government of the Philippines so as not to overlap with other related projects.
12. The Project, which is a part of the reconstruction and restoration project related to Mt. Pinatubo eruption, has been well adjusted and coordinated with other foreign aided projects at both national level and DPWH level.

Concept of Water Resources Development

13. So far groundwater development in the Project Area is limited to the alluvial plain or lower part of the foothills. On the other hand, as the Project Areas are on hills and mountain areas of hard rock zones, it is judged that groundwater development of these areas will be difficult, except for small discharge development such as hand pump system.
14. On the sites of hilly ridged and massive hard rock area where groundwater development is difficult for handpumps, spring development of piped system (Level II) should be examined. The potential of spring as a water source should be carefully considered and planned.
15. Basically, the water qualities are good because the conductivities were in the range of 100 to 350mmho and the pH values were around 6.0. However, the results of water quality analyses and electrical prospecting conducted at representative sites showed that at shallow depths, there were signs of water contamination by domestic sewerage. Thus, it is believed that it would be appropriate to develop ground water at the depths of 50 to 70 m by avoiding the primary aquifer at 20 to 30 m depths.

The Project Area for Cooperation Construction

16. The following 3 areas were excluded from the Project:

- 1) Evacuation Centers : because they are temporary facilities
- 2) Lowland resettlement Area: because of the difficulty to forecast secondary disaster and Level III is already under NHA projects
- 3) Affected Barangays : because of the impossibility to forecast secondary disaster

17. Ten highland resettlements were first selected, from which following two were finally excluded, leaving 8 areas being part of the Project.

Nabuklod-Floridablanca because of its risk of mud flow damage to the access road;

Villa Maria-Porac because of its risk of mud flow damage to the access road and poor access road conditions.

Basic Conditions of Water Supply Plan

18. Basic conditions for the Water Supply Plan are as follows:

- Design water supply rate per person: 30 liters/day/person
- Design pumping rate : 15 liters/minute (Well capacity)
- Hand pump operating rate : 12 hours/day (maximum operation)

- Design maximum daily pumping amount will be:
 $10,800 \text{ liters/day} = 15 \text{ liters/min. } 60 \text{ min} \times 12 \text{ hr/day}$

- Design maximum water supply population will be:
 $10,800 \text{ liters/day} - 30 \text{ liters/day/person} = 360 \text{ people}$
(60 to 72 units of 5 to 6 member families per well)

19. Based on the above examination, 70 families (maximum figure) per well was basically used to calculate the number of facilities to be constructed by the Project. By taking into account of the possibility of public water use and area communities, number of facilities to be constructed was finally decided upon as the larger value of either the calculated value by using 70 families/well or the total value of one public use well and the number of communities (at least one facility for a community).

The Project under Japan Grant Aid Cooperation

20. The facilities which will be constructed under Japan Grant Aid Cooperation will provide safe, reliable drinking water to 7,541 families (approximately 42,000 people) in the project areas.
21. The construction cooperation of water supply facilities will be conducted with staff training of concerned personnel of the Philippines agencies, as the first stage of the overall Project. Areas to be covered are resettlement areas in Zambales, Pampanga, and Tarlac Provinces that suffered the most from Mt. Pinatubo eruption. The construction cooperation is outlined as below;

- Hand Pump Well (Design Depth of 80 m deep)

Province	Site	No. of Wells	Daily Demand	Served Popul.(Families)
ZAMBALES	Baquilan	8	115 m ³	3,838(887)
	Loob Bunga	13	305	10,170(1,695)
	Cawag	20	288	9,600(1,600)
PAMPANGA	Camies	8	115	3,840(640)
TARLAC	Kalangitan	15	180	6,000(1,000)
<u>Total</u>		<u>64</u>	<u>1,003 m³</u>	<u>33,448(5,822)</u>

- Piped Water Supply System

Province	Site	Intake	Length of Trans /Distrib. Pipe	No. of Stand P.	Served Popul. (Families)
ZAMBALES	Dampay				
	Salasa	61 m ³ /d	1,350 m/2,400 m	14(1-tap)	1,555(330)
	Iram	164	3,450 /1,925	13(3-taps)	4,200(700)
TARLAC	Dueg	117	2,350 /10,255	20(2-taps)	3,000(689)
Total		342 m³/d	7,150 /14,580 m	47	8,755(1,719)

Project construction will be conducted by using new equipment to be procured under the Project.

22. The Project also consists of procurement and transportation of well drilling equipment. After completion of construction cooperation, the Philippines side will continue the water supply facility construction by themselves using the equipment. Required equipment units are as follows :

Equipment

• For well drilling:

Well boring machines (With standard accessories and slurry rotary drilling tools)	5 each
DTH drilling equipment	3 each

• Supporting vehicles:

Medium crane truck	3 each
Medium crane truck, long body	5 each
4WD Pick-up	5 each
Small crane truck	3 each
Water-tank truck	3 each
Fuel-tank truck	2 each

- Testing equipment:

Electrical prospecting equipment	2 sets
Submersible pump with a generator	2 sets
Water level measurement instrument	5 sets
Water quality analyses equipment	5 sets

- Boring machine repair work shop:

Small lathe	1 set
Electrical tool set	1 set
Machine tool set	1 set
Pipe installation tool set	1 set
Diesel generator	1 set
Electrical welder with a generator	3 sets

Materials

- Expendable materials (to be procured):

Casing	1,127 each
Screen	282 each
Slurry material	1 set
Hand pump	70 sets

- Pipeline materials

SGP zinc plated steel pipe(dia. 65-100mm)	1,330 each
FRP storage tank (20-50 m ³)	3 sets
PVC pipe(Dia. 25-100mm)	3,589 each
Faucet for public stand pipe	93 each
Valves and fittings	one complete set
Common materials	one complete set

Implementation Plan

23. MPR-PMO which was newly established within DPWH will undertake Project implementation. It is highly recommended that MPR-PMO will secure its own budgetary funds to continue the construction of the disaster areas' overall water supply development project by efficiently using the provided equipment and transferred technology. The Japanese side will dispatch engineers, provide technical advice, guidance, construction cooperation, and technology transfer for the construction works.
24. Approximately two years period is required for the Project implementation, beginning from the initial detailed design stage and ending with completion of the construction works. But, according to the rules of the Japanese Government's Grant Aid cooperation, it will be planned to implement the Project in two phases. The equipment and material procurement and construction period during the Phase I will be approximately 8 to 9 months and the remaining work shall be completed during Phase II period of 8.5 months.

Evaluation

25. Project implementation will have the following effects:
 - Direct Effects:
 - Improvement of living conditions and reduction of diseases caused by unsanitary drinking water in disaster areas.
 - Stabilization of living base during dry seasons.
 - Reduction of domestic labor required to fetch water from a far-away sources during dry seasons.
 - Stabilization of the victim's living conditions and improvement of their social conditions.

- Indirect Effects:

- Expansion of production activities as the results of the direct effects, stabilization and improvement of residents' livelihood, and activation of local economy.
- Strengthening of residents' social solidarity.

- Other Effects:

- After completing Project construction, the procured equipment for the Project construction and the transferred technologies during the Project construction will enable continuous construction of disaster areas' overall water supply development projects and the overall project's initial objectives can be attained.
- Contribution to the basic preparation for disaster areas' reconstruction and restoration project and strengthening of friendly relationship between Japan and the Philippines.

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ABBREVIATION

ADB	Asian Development Bank
AFP	Armed Forces of the Philippines
BD	Basic Design
BHS	Barangay Health Station
BMGS	Bureau of Mines and Geo-Sciences
BPW	Bureau of Public Works
BWSA	Barangay Waterworks and Sanitation Association
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DD	Detailed Design
DECS	Department of Education, Culture and Sports
DENR	Department of Environment and Natural Resources
DEO	District Engineering Office
DLG	Department of Local Government (GOP)
DOH	Department of Health
DOLE	Department of Labor and Employment
DOST	Department of Science and Technology
DPWH	Department of Public Works and Highways
DSWD	Department of Social Welfare and Development
DTC	Department of Transportation and Communication
DTI	Department of Trade and Industry
E/N	Exchange of Notes
GNP	Gross National Product
GOJ	Government of Japan
GOP	Government of Philippines
JICA	Japan International Cooperation Agency
LGU	Local Government Units
LFPR	Labor Force Participation Rate
LWUA	Local Waterworks and Utilities Administration
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
NEA	National Electrification Administration
NEDA	National Economic and Development Agency
NHA	National Housing Authority
NIA	National Irrigation Administration
NMYC	National Manpower and Youth Council
NPC	National Power Corporation
NWRB	National Water Resources Board
ONCC	Office of Northern Cultural Communities
PHILVOLCS	Philippine Institute of Volcanology & Seismology
TLRC	Technology and Livelihood Resource Center

Definition

1. **The Project** : the initial stage project of the urgent water supply plan which will be implemented under Japanese Grant Aid
2. **The (Project) Site** : the Project site selected for the Project
3. **The Plan** : the overall urgent water supply project plan for resettlement areas and barangays affected by Mt. Pinatubo Eruption
4. **The (Plan) Area** : the area in the affected area by Mt. Pinatubo Eruption selected for the Plan

CHAPTER 1 INTRODUCTION

Chapter 1 Introduction

Mount Pinatubo, located in the central part of Luzon Island in the Philippines erupted repeatedly during the period from April through June 1991 causing a tremendous amount of damage.

According to the damage report published by the Government of the Philippines, the disaster area covered almost the entire part of the Pampanga, Zambales, and Tarlac provinces and a part of the Bataan and Nueva Ecija provinces.

It has been estimated that approximately two million people suffered from the primary damage caused by the eruption and the secondary damage caused by mud flows and floods. The total amount of damages exceeded 100 billion yen.

By taking into consideration the above mentioned damages, the Government of the Philippines established the Mount Pinatubo Disaster Relief Task Force on June 26, 1991 consisting of 22 government agencies. The Task Force immediately started full-scale relief work, such as the reconstruction and restoration of damaged areas and the provision of relief to the people who were affected by the disaster.

The Task Force consists of five committees: welfare, social services, infrastructure, resettlement, science and technology.

The Task Force prepared the guidelines for relief and reconstruction activities. It also has the authority in allocating budgets to the agencies' activities.

The implementation; i.e. use of budget, of relief and reconstruction work is entirely subjected to the discretion of each agency through their respective departments or offices.

More than one year has passed since the eruption of the volcano. Since then, the following problems have emerged in relation to the Task Force organization:

- (1) Insufficient coordination between the respective agencies performing the relief and reconstruction works;

- (2) Improper project planning and implementation to meet the conditions and needs of the damaged areas and its inhabitants. Thus, since November 1992, efforts have been made to organize a new body (the President's Office Pinatubo Committee) to replace the Task Force. The committee's reconstruction policies will follow those of the Task Force, so it is expected to strengthen the coordination and evaluation functions.

The people affected by the large eruption of Mount Pinatubo continue to face serious problems, in maintaining their daily life, in addition to those caused by the primary and secondary damages.

Matters pertaining to securing drinking water are directly related to human life conditions, thus bringing the agencies to expedite their activities in order to improve this situation.

In the disaster areas, there are only a few water supply facilities in comparison to the number of residents, making it difficult to secure even the minimum amount of necessary water. Furthermore, there are not many facilities for securing safe drinking water. Even at places where water is available, the condition of the sanitary facilities are very poor. Thus, it is feared that contamination by domestic sewerage may cause the spread of contagious diseases.

Based on the understanding of the above situation, the Government of the Philippines has been conducting a residents' resettlement program, as well as reconstruction work of the affected barangays' basic infrastructure as a first implementation.

The government intended to construct deep wells to secure a sufficient amount of safe drinking water in the resettlement areas, the refugee centers - where the victims of the volcanic eruption were temporarily being sheltered - and the barangays where the water supply facilities were damaged. In that perspective, Grant Aid was requested from the Government of Japan in March 1992 in order to procure drilling equipment and materials for well construction.

In those barangays that were heavily damaged but not completely destroyed, many of the wells, river intake facilities, and reservoirs for water supply were either destroyed or became heavily contaminated, leaving them in an unusable condition. Thus, the construction of water supply facilities is the most urgent and important subject for stabilization of the residents' daily life.

Immediate implementation of the Project is regarded as being urgent and important from the standpoint of basic existence improvement.

The Japanese Government dispatched the Basic Design Study Team, headed by Mr. Shigeru Okamoto, Deputy Director of the First Basic Design Study Division, Grant Aid Design and Study Department, to the Philippines for 30 days (November 16 to December 15, 1992).

The Team held discussions with the concerned officials of the Government of the Philippines and conducted a field study on water supply conditions and the state of water supply facilities in the Study Areas. They also collected information directly related to the Project.

The basic items agreed upon by both sides were recorded in the Minutes of Discussion that was signed by the Team Leader and the Under-secretary of the Department of Public Works and Highways on November 26, 1992.

The technical items agreed upon by both parties were prepared and signed by Mr. Y.Hoshino, Chief engineer, and Mr. F. Soriques, Director of MPR-PMO.

A list of the Study Team members, the field study schedule, the names of personnel interviewed, the Minutes of Discussions, and a list of materials collected are included in the Appendices.

In Japan, based on the results of the field study, the Basic Design Study Team evaluated the appropriateness of the Project, conducted the design work for the water supply facilities, made the respective equipment selection, prepared cost estimate, and prepared an operation and maintenance plan. As a result, this Basic Design Study Report has been prepared.

CHAPTER 2 BACKGROUND OF THE PROJECT

Chapter 2 Background of the Project

2.1 Background of the Project

2.1.1 Out line of the Philippines

The Philippines is composed of about 7,000 islands that are separated into three groups: Luzon; Visaya; Mindanao. It has a total area of 300,000 km². Administrative wise, there are 13 Regions, 75 provinces, 60 cities, 1,505 town and 40,207 villages (barangay).

According to 1990 statistics, the population was 61 million with 58% of the people living in regional farm villages (63% in 1980). This indicates a sudden increase in urban area population. The annual population increase rate is 2.4%. In 1987 the population density was 195.7 people/km².

Although the GNP in 1984 and 1985 suffered a loss, there was a gain of 1.5% and 5.7% in 1986 and 1987 respectively, showing signs of economical recovery. The Mid-term Development Plan ('87 - '92) that was announced in 1986 estimated a GNP growth of 6.5% during the plan period. However, the sudden and huge eruption of Mt. Pinatubo in June 1991 damaged the nearby agricultural areas, reaching a loss of 107.2 billion yen. Thus, the Gross Regional Domestic Product (GRDP) of the damaged area in Central Luzon (Region III) is estimated to have a minus growth rate. As this Region represents 9.62% of the country's GDP (1990), the effect on the country will be great.

2.1.2 Outline of the Damages

The 1,754 meter high Mt. Pinatubo located in the midwestern part of Luzon erupted in June 1991. This was the first time in 600 years that Mt. Pinatubo erupted and it is considered to be the world's largest eruption of the century. The estimated volume of erupted materials exceeds 6 billion m³. The land within 25 km of the volcano is now uninhabitable. Many houses were destroyed by its violence. The primary afflicted areas were Zambales, followed by Pampanga.

With the arrival of the wet season, typhoons caused mud to flow into the plains, devastating human and materials resources in the surrounding areas (primary damage). The damage was further increased by mud flows during the 1992 wet season (secondary damage).

According to the government's report, damages were inflicted on the entire areas of Pampanga, Zambales, Tarlac, and parts of Bataan and Nueva Ecija. The outline of damages

up to November 21, 1991 categorized the direct damage as a result of the eruption itself and the secondary damages, caused by mud flows.

Table 2.1 Outline of Damages Caused by the Mt. Pinatubo Eruption

	Direct Damage ~ 21 Nov., 1991	Secondary Damage ~ Present	Total
Dead	850	28	878
Injured	184	7	191
Missing	23	4	27
Broken Up Families	249,371	164,408	413,779
Damaged Persons	1,180,132	803,971	1,984,103
Total Damage	-	-	107.2 Bill.yen

Source : Data of Japan Embassy

The DPWH and DSWD reports stated that the damage caused by the Mt. Pinatubo eruption had affected infrastructures, natural environment, industries and livelihood. An outline of the damages to the infrastructure is shown in Table 2.2. However, 58 km of river banks received direct damage.

Table 2.2 Damage to Infrastructures Caused by the Mt. Pinatubo Eruption

<u>Roads and Bridges:</u>	
Length of major roads covered by Volcanic ash	489 km
Length of major road sections inundated by Lahar/Flood-waters	11 km
<u>River Systems:</u>	
Number of major river systems affected	8
Length of river silted by pyroclastic materials and lahar	317 km
<u>School Buildings:</u>	
Damaged schools	4,665 classrooms
<u>Other Public Buildings:</u>	
Damaged hospitals and health centers	98
Damaged public markets	18
Damaged municipal buildings	13
Other damaged government buildings	70

Source : DPWH

Estimation of 8.2 billion pesos (41 billion yen) of damage to the infrastructure was made by the DPWH.

DSWD also prepared the estimate of damages to areas other than infrastructures outlined in the following:

Table 2.3 Outline of Damages to Areas Other Than the Infrastructure

		Scale of Damage	Estimate Amount of Damage
Natural Environment	Natural Material	8,000 ha	
	Plantation Area	63,600 ha	25 m pesos
Agricultural Land		86,000 ha	600 m pesos
Industries		599 facilit.(plants etc)	850 m pesos
Education	Children/Students	236,686	
	Teachers	7,000	990 m pesos
Loss of Employment Opportunities		651,000	

Source : "Rehabilitation and Reconstruction Program for Mt. Pinatubo-Affected Area", Oct. 1991, Task Force Mt. Pinatubo

As shown in Table 2.4, the eruption of Mt. Pinatubo affected various areas, such as the society, the economy, and even job opportunities, striking a serious blow to the country.

Table 2.4 Macroeconomic Index of Damage Affected by the Mt. Pinatubo Eruption

Particulars	Be fore Damage	Later Situation's Provision of Damage
Unemployment (Rate)	290,000 (11.31%)	405,800 (15.8%)
GRDP	68.58 Bill.Peso (1990)	68.36 Bill.Peso (1991 Previ)
GRDP Growth(Rate)	4.71%	-0.32% (1991 Previ.)
GRDP Possession	9.62% (1990)	8.7% (1991 Previ.)

Source: NEDA, Regional Office

Source : NEDA. REGIONAL OFFICE

2.1.3 Outline of the Restoration of Damaged Area

As mentioned in the report submitted by the Task Force to the donor meeting in October 1991 and the most recent September 1992 Program Report, the government has identified the following important points for restoring damaged areas.

- 1) Reduction of secondary damages
- 2) Stabilization of the economy in damaged areas
- 3) Create job opportunities and methods whereby the unemployed, workers and farmers in the damage areas can make a living
- 4) Secure and develop new places of residence/settlement
- 5) Secure a continuous supply of subsistence commodities and services
- 6) Strengthen the functions of regional task forces and increase the inhabitants' awareness of damage prevention measures
- 7) Improve fragile infrastructures
- 8) Prevent further deterioration of the environment and restore a decent way of life.

The basic strategy of the government's restoration plan will center on those people in the following categories: Priority will be given to those who have been most severely affected by the disaster.

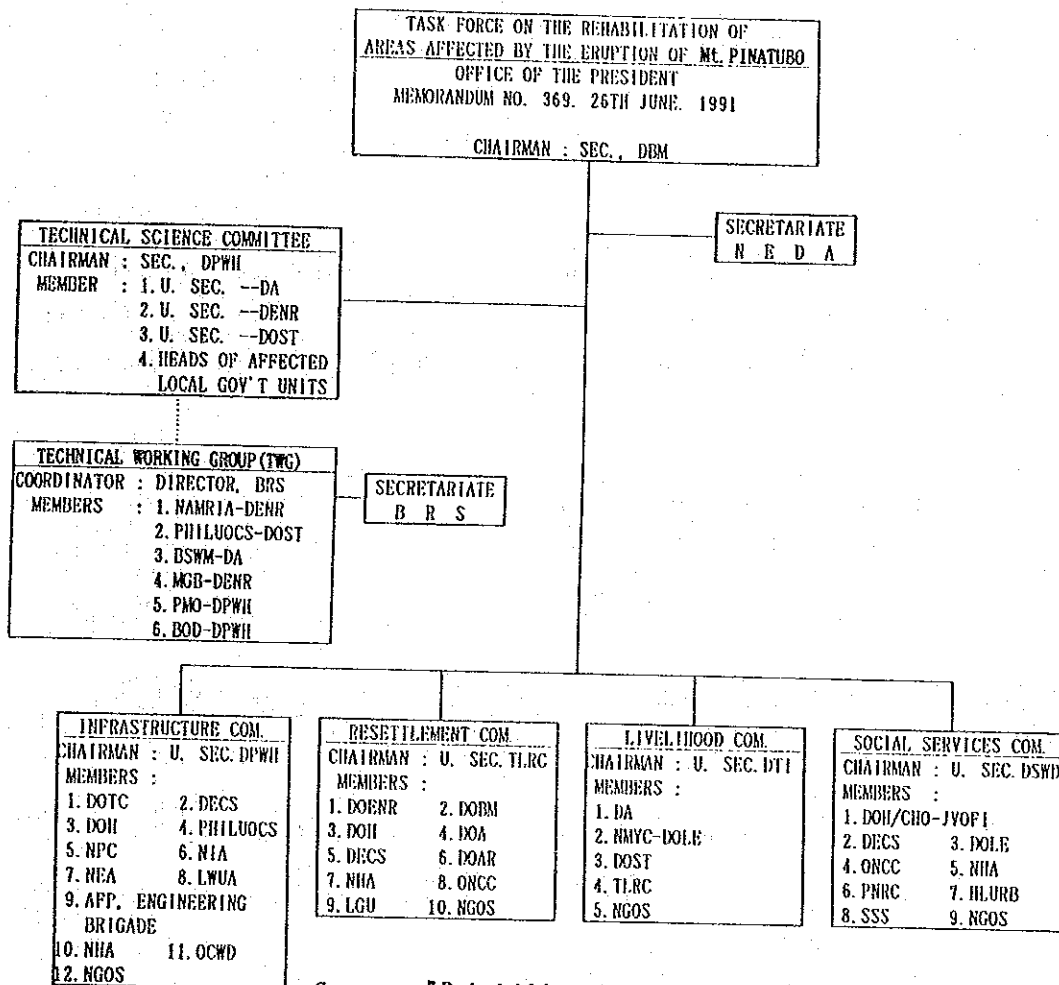
- People who have been deprived of their homes, farmland and means of livelihood.
- People who have been deprived of their homes, but retain their farmland and means of livelihood.
- People who have been deprived of their homes, but retain their livelihood, but continue to have homes.

As the investigational, regulatory and evaluation capabilities of the task force are inadequate, cooperation between departments concerned with the relief and restoration activities are also inadequate.

Some of the projects do not seem to meet the needs or conditions of the disaster areas. Due to the lack of funds and improper forecasting of secondary damage, the government has only been able to perform restoration work on a partial level. A comprehensive restoration plan is necessary to cope with the effects of the Pinatubo eruption on the economy, social infrastructure and industries.

Although accurate forecasting of future disasters is absolutely necessary, there are still no adequate preventative measures. Although secondary disasters are imminent, the restoration

of roads, removal of sediment from rivers and restoration of irrigation facilities conducted by DPWH are temporary measures only.



Source : "Rehabilitation and Reconstruction Program for Mt. Pinatubo-Affected Area", Oct. 1991, Task Force Mt. Pinatubo

Fig. 2.1 Organizational Chart for Task Force on Rehabilitation of Areas Affected by Mt. Pinatubo Eruption

Under such conditions, the government is attempting to strengthen and regulate the Task Force and increase the efficiency of the entire restoration activity.

The organization responsible for the restoration of the damaged areas in terms of rebuilding the infrastructure will be the Mt. Pinatubo Rehabilitation Project Management Office (MPR-PMO) which belongs to the Department of Public Works and Highways (DPWH).

MPR-PMO became a department of DPWH on November 6, 1992 (Ministry Notice 185/186) and is responsible for the rehabilitation of the entire disaster area as well as for the rebuilding of the infrastructures. Thus, MPR-PMO takes over the disaster area water supply project from the Project Management Office for Rural Water Supply (PMO-RWS) and is henceforth responsible for managing this project.

2.1.4 Outline of the Resettlement

(1) Outline

As a part of the restoration program, the government has set up a resettlement project committee within the TF for those people who have had to give up their land, encouraging them to resettle elsewhere. It is estimated that 60,000 households (approx. 300,000 people) need to be resettled.

The government's resettlement program includes the resettlement of 11,070 households (mostly people of the mountain tribe of Aeta) in 10 highland locations, and the resettlement of 57,000 households in 10 lowland locations.

Based on this program, the basic living facilities (State 1) have been completed in the highland locations, and progress is being made in lowland locations.

Given the problems, as follow, of resettlement areas, safe and continuous supply of household water as well as means of living become essentially needed:

- | | |
|-----------|---|
| | - Household water is inadequate |
| Highland | - Means of living have not been assured |
| Locations | - Inadequate social services, such as hygiene and education |
| | - As the settlement area is separated into saleable lots, the people cannot afford them |
| Lowland | - Means of living have not been assured |
| Locations | - The possibility of occurrence of secondary damage. |

(2) Basic Policy

Following the modification of the entire restoration program by the Task Force in September 1992, the resettlement program was also reviewed. The new program will cover the five years from 1992 to 1997.

Main concerns of this Program include the absolute necessity of solving facilities' problems, as well as social and economical ones as for their restoration. This Program will be operated by the following members:

- Overall Coordinator:
Resettlement Committee Chairman-Technology & Livelihood Resource Center
- Agency Members:
 - DSWD - Social Services Committee
 - DTI - Livelihood Services Committee
 - DPWH - Infrastructure Committee
 - Department of Environment and Natural Resources
 - Department of Budget and Management
 - Department of Health
 - Department of Agriculture
 - Department of Education, Culture and Sports
 - Department of Agrarian Reform
 - National Housing Authority
 - Office of Northern Cultural Communities
 - Local Government Units
 - Non-governmental Organizations.

Past experience shows that different kinds of help must be provided to the people living in the highlands around Mt. Pinatubo (10% of the victims) and the people living in the lowlands in central Luzon (Pampanga, Zambales, Tarlac, Bataan) (90% of the victims). Thus, the Program has clearly separated the two groups as follows:

- Program concerning the Aetas who prefer to continue living in the mountains
- Program concerning the lowland people who can make use of their farming experience.

Regarding the provision of support to the inhabitants in order to form and restore their environment and for them to become self-supporting, the basic policy of the Program is the same for both groups. The six major items of assistance are as follows:

- Preparation of the resettlement land
- Promotion of small businesses
- Preparation of production facilities
- Preparation of basic public service facilities
- Restoration of farmlands
- Preparation of financial assistance organization.

The resettlement plan for lowland inhabitants calls for the construction of a new town/collective housing district enabling the interchange between neighboring areas and for economic development purposes.

As for highland inhabitants, the plan aims at providing opportunities for them to become self-supporting.

(3) Outline of the Resettlement Program (1992-1997)

The following resettlement of 10 highlands areas (11,070 households) and 10 lowland areas (57,000 households) were approved by the Task Force as of September 1992:

Upland Settlement Sites

- 1) Cawag, Subic, Zambales
- 2) Loob Bunga, Botolan, Zambales
- 3) Baquilan, Botolan, Zambales
- 4) Dampay-Salaza, Palauig, Zambales
- 5) Iram, New Cabalan, Olongapo City
- 6) Dueg, San Clemente, Tarlac
- 7) Kalangitan, Capas, Tarlac
- 8) Nabuklod, Floridablanca, Pampanga
- 9) Camies, Porac, Pampanga
- 10) Villamaria, Porac, Pampanga

Lowland Settlement Sites

- 1) Taugtog, Botolan, Zambales
- 2) Balagbag, Castillejos, Zambales
- 3) Pio, Porac, Pampanga
- 4) Basa Air Base, Floridablanca, Pampanga
- 5) Pandacaqui, Mexico, Pampanga
- 6) EPZA site, Angeles City
- 7) Clark, Pampanga
- 8) Camachile, Mabalacat, Pampanga
- 9) Dapdap, Bamban, Tarlac
- 10) O'Donnel, Capas, Tarlac I & II

Since the primary preparations have been completed, the maintenance level of the community facilities in the highland and lowland areas are being evaluated. The level of the following highland area facilities is the minimum:

Highland Area Facilities of Standard Preparation

- . a government center
- . school buildings,
- . playgrounds,
- . tribal market,
- . health center,
- . day-care center.
- . Level I(II) water supply system

Basic features of Lowland Resettlement Area are electric power supply, medical facilities and Level III water supply system. The provision for the lot and housing materials is facilitated by a loan package awarded to beneficiaries through a homeowners' association. The terms for the lot and housing materials loan package are as follows:

a. Lot loan

- . Lot size : 94 square meters
- . Lot price : P150 per square meter
- . Amount : P14,100 maximum per member
- . Interest Rate : 6% per annum
- . Repayment : monthly over 25 years
- . Grace period : One year on principal and interest payment

b. Housing Materials Loan

- . Materials Loan : P19,000 maximum
- . Subsistence : P1,000 maximum
- . Interest Rate : 6% per annum
- . Repayment : monthly for 25 years
- . Grace period : One year on principal and interest payment

(4) Budget for Resettlement Area Preparation

Considering the construction, work will continue until 1997, the investment for both highland and lowland areas will reach 3.16 billion pesos, divided as follows:

Highland Area	NHA	77.0 million pesos	
	DPWH	80.5	"
Lowland Area	NHA	232.6	"
	DPWH	2,305.2	"
	NEA	255.0	"
	TLRC	115.0	"
Total		3,165.3 million pesos	

2.1.5 Restoration Program of the DPWH and the Organizational System

To restore the livelihood of the people living in the disaster areas, an infrastructure committee was set up within the Task Force, the actual restoration work being accomplished by DPWH. However, in September 1992, the following infrastructure maintenance policies were adopted in the restoration program:

- To prevent the region from isolation, priority will be given to the maintenance of traffic facilities;
 - .Restoration of roads (removal of volcanic ash and mud)
 - .Restoration of bridges
 - .Construction of traffic facilities in new areas.

- To prevent living and production areas from damage by mud flows and floods:
 - .Classification of danger zones
 - .Improvement and restoration of high risk areas
 - .Setting up an alarm system.

- To restore public facilities:
 - .Construction of school facilities.

- To support other restoration programs and activities (resettlement program, rebuilding of livelihood).

Regarding the entire restoration program, the following plan has been established:

The comprehensive rehabilitation and reconstruction program of Highland Resettlement Area includes the following components:

Community Facilities

Agency Response

- | | |
|---------------------------------|----------|
| a. Foot trails and foot bridges | DENR |
| b. Spring development | DENR/NHA |
| c. Artesian wells | DENR/NHA |
| d. Schools | NHA |
| e. Public market | NHA |
| f. Government house | NHA |

Livelihood Opportunities

- | | |
|---------------------------------|---|
| a. Contract reforestation | DENR |
| b. Specific Livelihood projects | DOST/DTI/DA/Other gov't, and private agencies |

Social Services

- | | |
|--|-----------|
| a. Medical missions and services | DOH/NGOs |
| b. Education | DECS/NGOs |
| c. Specific social services
(Initiated by various agencies) | DSWD/NGOs |

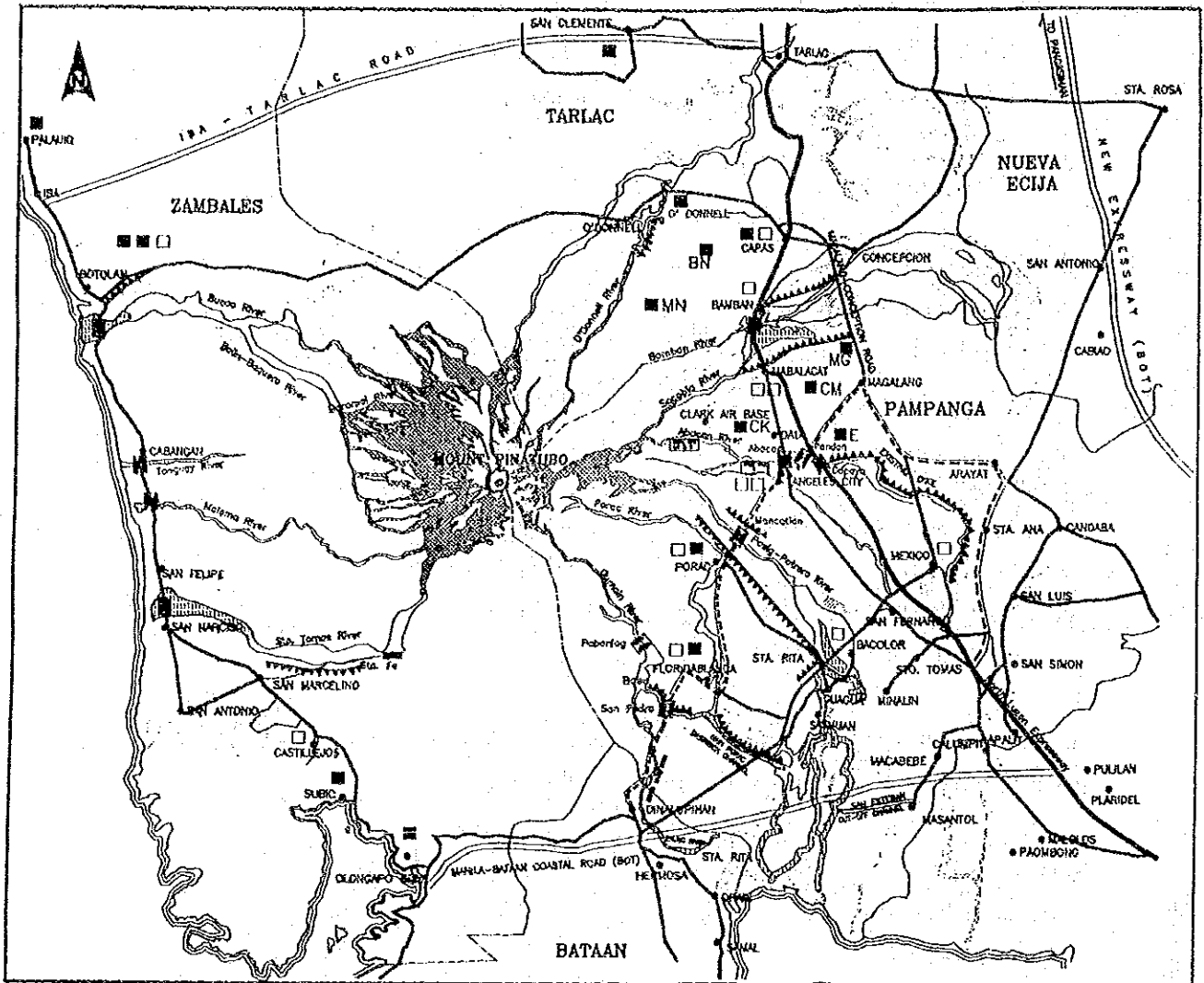
In addition, the Aetas will be provided with survival kits is conceived to give them the necessary means to start a new life on a short term goal.

Survival Kits

Responsible Agency

- | | |
|-------------------------|-----|
| a. Housing materials | NHA |
| b. Carpentry tools | NHA |
| c. Animals (choice of): | |
| Pigs | |
| Native Chickens | |
| Goats | DA |
| Carabaos | |
| Dogs | |
| d. Farming Provisions: | |
| Seeds | |
| Farm implements | DA |

Total cost per family	<u>P7,500</u>
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Source: Data Base of MPR-PMO, DPWH




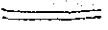


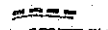





- LEGEND:**
-  PYROCLASTIC FLOW DEPOSIT
 -  MUDFLOW PRONE AREA
 -  DREDGING/DESILTING
 -  DKE
 -  NEW ROAD CONSTRUCTION
 -  EXISTING ROAD
 -  RIVER
 -  BRIDGE
 -  ADB ROAD PROJECT
 -  RESETTLEMENT SITE
 -  UPLAND
 -  LOWLAND

Fig. 2.2 Master Plan for Mt. Pinatubo Eruption Rehabilitation Project

The DPWH is planning to invest 13.1 billion pesos (see below) into the above infrastructure development plan:

Table 2.5 DPWH Infrastructure Component of Master Plan (In Million Pesos)

	Very Urgent	Urgent	Total
1. River Works	3,733	2,096	5,829
2. Roads and Bridges	999	1,111	2,040
(+BOT)	(1,000)	(4,105)	(5,105)
3. Buildings	100	52	152
Total	4,762	3,259	8,021
(+BOT)	(1,000)	(4,105)	(5,105)
Grand Total	5,762	7,364	13,126

Source : Mt. Pinatubo Infrastructure Rehabilitation Program, Revised Master Plan, Oct. 1992, DPWH

The detailed annual investment plans for the restoration are shown in the Appendices.

(2) Project Implementation Structure

To supervise the entire infrastructure preparation for the wide Pinatubo disaster area, MPR-PMO will have the same structure as other DPWH regional offices and will be composed of a main supervision department and 4 regional offices. The supervision department will be located within the Regional Equipment Service Building which is next to the Region III office in San Fernando. The entire coordination department is located in Manila.

The implementation and operation of water supply projects will be conducted by the social infrastructure development division within the infrastructure development department. As with other offices, the disaster area will be separated into five sections. According to MPR-PMO, the Infrastructure Development Department will be in charge of maintaining construction material and equipment which includes well excavators. There will be a well boring team in each district.

MPR-PMO System

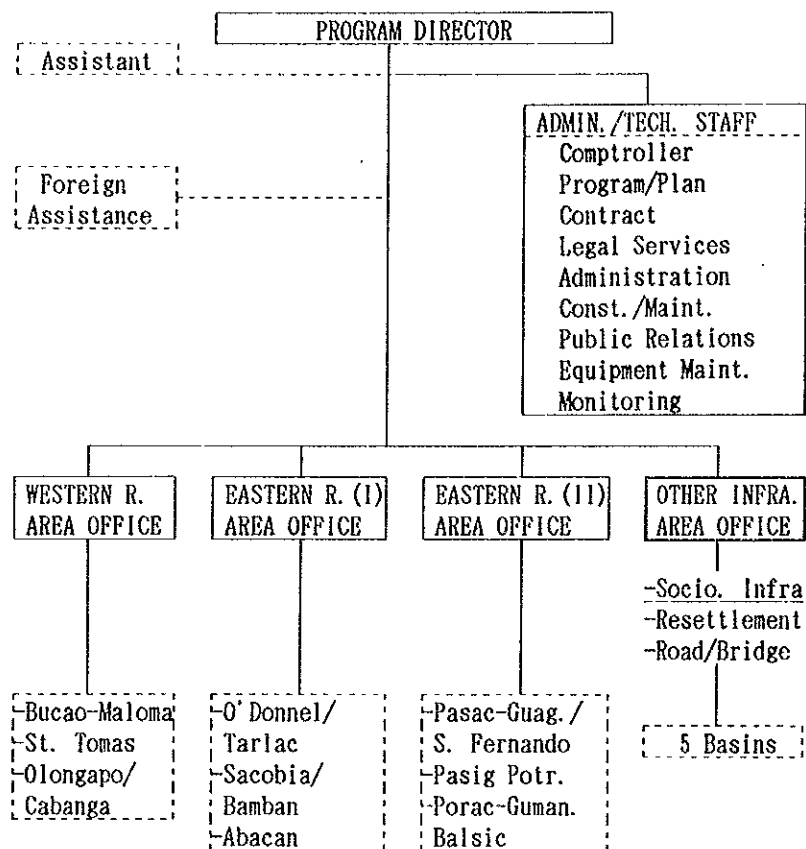


Fig. 2.3 Organizational Chart of MPR-PMO

2.1.6 Water Supply Situation

(1) Outline of the Administrative Organization Related to Water Supply

The improvement of water supply facilities is under the jurisdiction of DPWH and MWSS and LWUA, outer organs of DPWH. MWSS is responsible for the water supply and sewerage systems in the Metro Manila Region. LWUA is responsible for the water supply and sewerage systems in rural areas. These agencies are in charge of the new construction and management of the water supply facilities in the mentioned areas.

DPWH mainly constructs Level I water supply systems in rural areas and provides leadership for the national water supply improvement plan.

Other agencies related to water supply are DLG and NWRB. DLG is in charge of the management and guidance of various water use related organizations.

NWRB is the organization in control of all the above agencies. It is involved in making and adjusting policies, and the improvement of laws related to the use of water resources and water rights throughout the entire Philippines.

LWUA is the government agency that was established to form rural water supply structures for cities in rural areas and give technical and financial aid for the construction and improvement of their water supply facilities. It assists the rural cities' WD that was established for the purpose of expanding water supply projects and RWSA in their fields of finance, engineering, organization, and rules. Its activities are limited to Level II and Level III water supply systems.

Table 2.6 Administrative Organs in Charge of Water Supply and Sanitation

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

LEGEND :

- X DIRECTLY RESPONSIBLE
- C COORDINATION

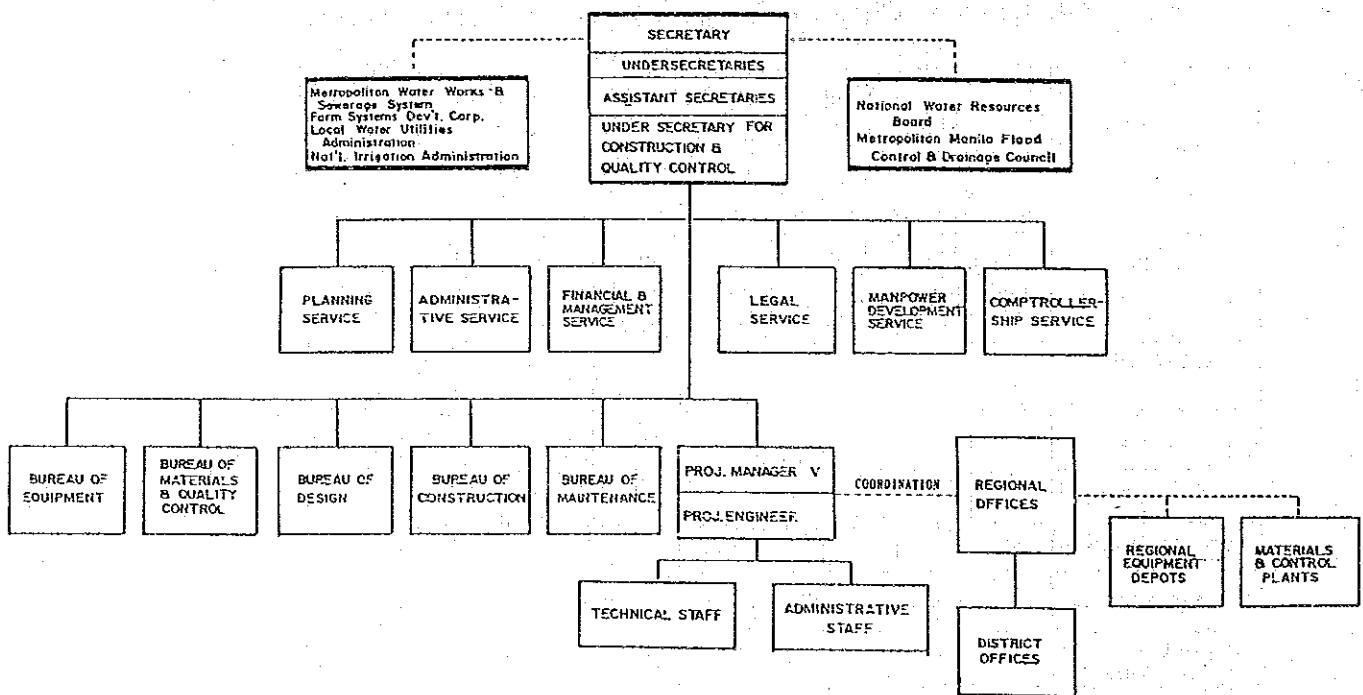
Source : "Water Supply, Sewage and Sanitation Master Plan of Philippines (1988-2000), 1988, NRWC

Public Health is under the joint jurisdiction of DPWH and DOH. The improvement of sanitation facilities are conducted per area or field unit. DOH conducts periodic water quality tests to secure safe drinking water.

- Organization and Structure of DPWH

The organizational structure of DPWH, the agency in charge of the Project, is outlined in the following figure. Water Supply projects are independently implemented either by PMO-RWS, its area office, provincial office, or each project office. Each department of the mentioned offices has several water supply engineers and technicians; they take care of water supply planning, project implementation, and facility maintenance and operation. However, the planning and project management are mainly undertaken by the project management department of PMO-RWS. Facility improvement, maintenance and operation are mainly carried out by the rural or regional offices of DPWH.

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
ORGANIZATIONAL CHART



Source: Organization Chart of DPWH

Fig. 2.4 Organizational Chart of DPWH

(2) General Situation of Water Supply

In the Philippines, the levels of water supply facilities are classified into the following three groups:

Level

- I Facilities having a unique water source, such as a well at one location
- II Public standpipe having pipe supplied water
- III Individual houses supplied by a piped distribution system.

The water supply rate in the Philippines at the time when the water supply master plan was established in 1987 was 62% in rural areas (46% by wells and 16% by piping systems).

Table 2.7 Public Water Supply Facilities Status in Philippine (As of end of 1987)

Classification	Total Population	Population Served		Unserviced Population	
		Well/Dev. Spring POP.	%	Piped System POP.	%
Urban Population					
Metro Manila	8.16M	0.17M	2	6.84M	84
Other Urban	5.37M	2.70M	18	5.68M	37
Rural Population	33.83M	15.38M	46	5.40M	16
Total	57.36M	18.25M	32	17.92M	31

Source : "Water Supply, Sewage and Sanitation Master Plan of Philippines (1988-2000)", 1988, NRWC

In the rural areas, Level I facilities are most common. Commune water supply facilities are one point supply of either one shallow well per five to forty households or one deep well per forty to one hundred households.

In 1987, Level II facilities were regarded as the major water supply facilities, providing water to 3.1 million households throughout the entire Philippines. 2.6 million of these households were located in rural areas.

About 37% of the Philippines population do not receive public water supply services. They rely on either unsafe open dug wells, streams, lakes, or rainwater for the drinking water. This situation make people exposed to the danger of waterborne diseases.

The mountain areas covered by the field survey have technical and financial problems to construct wells in order to obtain water from deep aquifers and to maintain and operate the constructed facilities. It is quite constrained to improve the water supply facilities.

The water supply rate in Region III (central Luzon) that includes the areas damaged by the eruption of Mt. Pinatubo is 82.6% as shown in Table 2.8. 45.7% of the facilities are Level I. As the percentage of Level I facilities is high in the region, it is regarded important to urgently improve the water supply facilities to secure safe drinking water in the damaged areas.

Table 2.8 Water Supply Facilities Status

Region	Total Households	Number	Water Supply Facilities							
			Level I Households Served	Percent	Level II Households Served	Percent	Level III Households Served	Percent		
III. Central Luzon	814,071	6,336	372,343	45.74	1,312	144,803	17.79	95	155,247	19.07
Total	7,663,303	241,972	3,169,455	41.36	7,683	826,256	10.78	837	1,451,072	18.93

Source : Department of Health

(3) Conditions of Diseases Related to Water Supply and Sanitary Facilities

As for the morbidity caused by various diseases, the rates for bronchitis and diarrhea are extremely high. The morbidity for each 100,000 patients is approximately 1,000.

Table 2.9 Morbidity: Leading Causes(Rate/100,000) 5-year average (1981-1985) & 1986

Cause	5-Year Average (1981-1985)		1985	
	Number	Rate	Number	Rate
1. Bronchitis	415,477	798.5	602,851	1,076.4
2. Diarrheal Diseases	397,933	764.8	552,613	986.7
3. Influenza	320,989	616.9	397,715	710.2
4. Pneumonia	150,424	289.1	190,208	339.6
5. Tuberculosis, All Forms	27,053	244.2	153,129	273.4
6. Malaria	73,819	141.9	124,153	221.7

Source : Philippines Almanac, 1991, Aurora Publication

SANITATION SERVICE COVERAGE

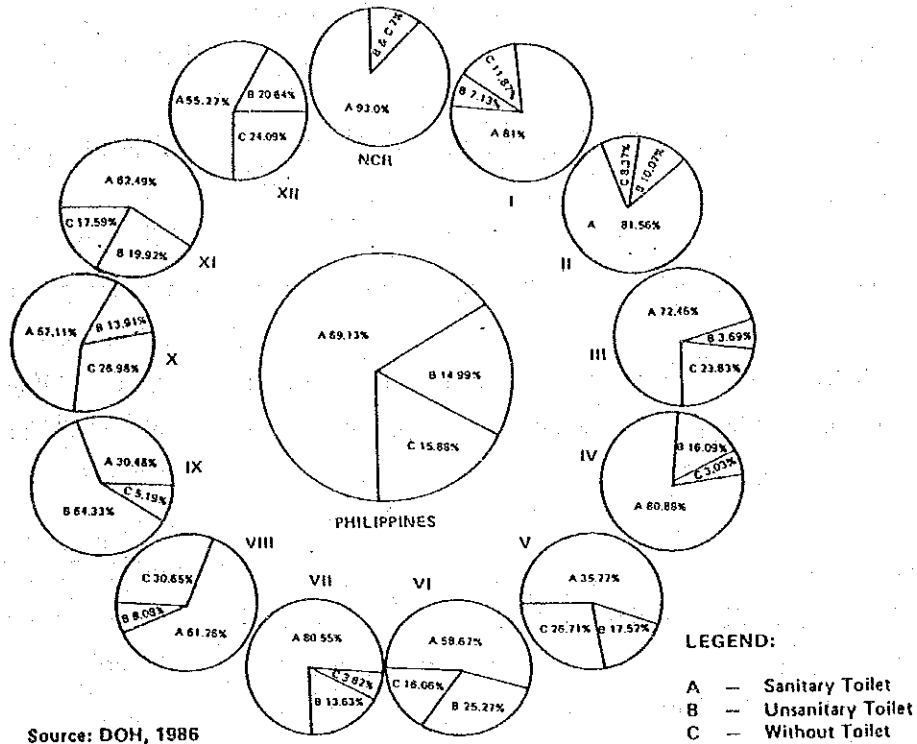


Fig. 2.5 Sanitation Service Coverage

Table 2.10 Sanitation Facilities Status (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

Source : "Water Supply, Sewage and Sanitation Master Plan of Philippines (1988-2000), 1988, NRWC

In the rural and mountain areas that do not have adequate water supply facilities, the rates of digestive organ diseases, such as dysentery and other forms of diarrhea, typhoid, and hepatitis are, in general, high.

Needless to say, improvement of the actual water supply conditions producing such effects on public health is highly desirable.

According to the study made by DOH in 1986, 69% of the households had sanitary toilets, 15% had unsanitary toilets, and 16% had no toilet facilities at all.

The conditions of sanitary facilities in each region are as shown in Fig. 2.5.

The distribution of sanitary toilet installation is shown in Table 2.10. 93% of the toilet installations in Metro Manila are sanitary. In urban areas it reaches 73% and 62% in rural areas.

2.1.7 National Plan for Water Supply

(1) Outline of the Plan

In 1980, the Government of the Philippines established the National Water Supply Plan, targeting the year 2,000 for the water supply improvement's basic direction, priority policies, and smooth implementation.

In 1982, the Government established the rural water supply and sanitary basic plan based on the national water supply plan.

The Water Supply, Sewerage, and Sanitary Master Plan 1988-2000 is the basic plan of the water supply field that was prepared in 1987 based on the examination and modification of the above-mentioned plan. It includes the objectives, policies, coordination with various organizations, and, finally, the economical and financial policies for each sector.

The objectives disclosed in the master plan are as follows:

- a. To provide safe and reliable water supply facilities to most households
- b. To expand the areas provided with sanitary and sewerage facilities
- c. To establish organizations and managing structures for water supply facility improvement.

The master plan deals with project implementation in the following two stages:

Stage I, 1988 - 1992

Water Supply Rate:

- . Metro Manila: 87%
- . Other City Areas: 77%
- . Rural Areas: 92%

Stage II, 1993 - 2000

Water Supply Rate:

- . Metro Manila: 97%
- . Other City Areas: 95%
- . Rural Areas: 93%

Stage II (1993-2000) improvement targets in rural areas are Level I water sources at 13,340 points and 794 Level II and III pipe supply systems. It is planned to provide water supply facilities to approximately 2.7 million residents with a budget of approximately 3 billion pesos.

In March 1989, the Philippines Government prepared the detailed policies of the Three Year Water Supply Promotion Plan as part of the master plan's target and has been improving the water supply in accordance with the established policies.

The targets of this plan are either to construct or rehabilitate a total of 100,000 Level I facilities in order to provide at least one water supply system in each barangay in rural areas.

The Project for supplying domestic water to disaster victims will urgently improve water supply facilities in the damaged area and will contribute to accomplishing the targets of the Water Supply and Sanitary Master Plan on the National level.

(2) Situation of International Cooperation for Rural Water Supply Projects

The Philippines Government has either planned or is implementing the following projects under foreign aid for the master plan by 2000:

- . Rural water supply and sanitary project : DLG
- . The 4th rural water supply project : DPWH, LWUA
- . Rural water supply improvement project : LWUA

Aid from the Japanese Government includes an OECF loan and a grant for a rural water supply project. Major aid for water supply projects comes from Japan and the United States of America.

2.1.8 Other Aid Organizations for the Restoration of Mt. Pinatubo Areas

The Philippines Government repeatedly brought public attention to the condition caused by the eruption of Mt. Pinatubo and provided information concerning their disaster relief and reconstruction plan when appealing to donor countries and international organizations for aid.

The countries and international organizations were quite willing to provide urgent relief goods, such as medicines, food, tents, portable power generators, and money to disaster victims, but were rather reluctant to get involved with the reconstruction and restoration plan except for dispatching various specialists.

Part of the reluctance would mainly come from the risks for secondary disasters, apart that the data analyses and coordination with possible donating countries is inadequate.

Of the 14 listed aid projects, 4 are supported by the Japanese Government. Judging from the number of projects supported by and the amount of money granted by the Japanese Government, it can be assumed that the Philippines Government expects the Japanese Government to cooperate in the reconstruction and restoration work.

DPWH investigated the possibility of obtaining foreign aid. According to its September 1992 plan, they clarified their request for 1993 aid for the following items and expected to receive a total of 2.06 billion pesos in aid during the 5 years period from 1992 to 1996. DPWH expects to receive 1.3 billion pesos in aid during 1993.

Table 2.11 Budget of Foreign Organization Assistance Plan for Recovery
(DPWH)

PARTICULARS	TOTAL COST (P1.0M)	REST OF 1992	1993	1994	1995	LATER YEARS
(1)	(2)	(3)	(4)	(5)	(6)	(7)
FOREIGN-ASSISTED	3,056.622	133.433	1,334.757	588.380	500.052	500.000
ADB	485.232	67.773	329.027	88.380	0.052	0.000
KIW	112.060	53.660	58.400	0.000	0.000	0.000
USAID	1,039.330	12.000	277.330	250.000	250.000	250.000
JICA	1,200.000	0.000	450.000	250.000	250.000	250.000
DUTCH	220.000	0.000	220.000	0.000	0.000	0.000
LOCALLY FUNDED	13,911.475	329.000	1,500.000	4,215.049	3,972.442	3,894.984

Source : Mt. Pinatubo Infrastructure Rehabilitation Program,
Revised Master Plan, 1992, DPWH

- 1) USAID - Social Infrastructure (Schools/Olongapo City General Hospital)
- 2) USAID/PCIS - Equipment Const., O&M
- 3) ADB - Road/Bridge/Social/Infrastructure/Resettlement
- 4) KfW - Social Infrastructure (Schools and Water Supply)
- 5) JICA Equipment Const., O&M
- 6) JICA - Urgent Water Supply Projects
- 7) DUTCH - Equipment Const., O&M

As for the 1992 projects, as demonstrated below, the total cost of these is estimated to be 133 million pesos.

	(million peso)
ADB : Major roads & bridge improvements:	9.55
ADB : School Facilities improvement:	58.22
KFW : School and water supply facility improvements:	53.66
USAID: Hospital facility improvement:	12.00
Total:	133.43 million pesos

In the listing of rural domestic infrastructure fields that were recommended by the World Donor Conference held at the end of 1991, appears the names of Japan, Germany, The Netherlands, The United States of America, and the World Bank.

2.2 Outline of the Request

(1) Background and Contents

The Mt. Pinatubo eruption is believed to be the biggest in this century. An astonishing amount of volcanic ash filled the rivers. When the rains came, the ash and mud began to flow. The mud flowed into various cities and villages located within a 40 km radius around the mountain and caused considerable damage and destruction to houses, farmland, and domestic animals. Residents evacuated from the damaged areas are being sheltered at relief centers; some of them are beginning to move into resettlement areas.

It is in these resettlement areas that the construction of water supply facilities is of primary importance.

In the barangays that suffered damage but were not destroyed by secondary disasters, such as from volcanic ash and mud flows, many water supply facilities, such as wells, stream intakes, and reservoirs, remain unusable. The construction of water supply facilities in these barangays is essential for stabilizing the daily life of the residents and promoting their interest in undertaking the reconstruction and restoration work by themselves.

Through its lower level organization, DPWH is in charge of the country level water supply administration. It has been undertaking well construction throughout the country including the areas damaged by the eruption of Mt. Pinatubo. However, its staff and construction equipment are insufficient for continuing the construction of the water supply facilities necessary for country level administration.

Under the above background, DPWH established an urgent water supply plan for the resettlement areas and damaged barangays in order to improve the endangered water supply situation and to construct more than 600 wells in those areas. The Plan also includes the procurement of well construction equipment and materials.

The purpose of the Plan is to provide adequate water supply facilities to the victims who most severely suffered from the effects of the Mt. Pinatubo eruption in order to maintain their basic daily life standards as well as to secure the foundation for the reconstruction and restoration of the disaster areas.

The Philippines Government expressed the desire to implement the Plan in two phases. The Plan calls for the construction of more than 600 wells equipped with hand pumps at approximately 600 areas, including the barangays that are within a 40 km radius of Mt. Pinatubo and the resettlement areas and refugee relief centers as shown in the following table.

Table 2.12 Requested Plan Areas

Region	Highland Resettlement Area	Lowland Resettlement Area	Damaged Area (No. of Villages)
Pampanga	2	9	11 (299)
Zambales	5	2	8 (128)
Tarlac	2	2	3 (78)
Bataan	-	-	2 (68)
Total	9	13	24 (573)

Following are the contents (based on the Philippine Government's request) of the Plan for constructing wells equipped with hand pumps (Level I water supply facilities) in resettlement areas, in the damaged barangays, and in the refugee relief centers as well as to provide construction equipment and materials in order to accomplish the national urgent water supply plan:

- 1) Construction of wells (80 m deep): 200 each
- 2) Procurement of equipment:
 - i) Vehicle-mounted rotary rig: 5 units
 - ii) Truck equipped with repair tools: 5 units
 - iii) Pickup truck: 5 units
 - iv) Instruments for wells: 5 sets
 - Pumping test instrument
 - Water quality test instrument
 - Water level measuring instrument

In March 1992, the Philippines Government requested Grant Aid from the Government of Japan for the procurement of new equipment and deep well construction in the mountain areas where they are urgently needed.

(2) Confirmation of the Request by Field Surveys

It was confirmed that the agency MPR-PMO will be established within DPWH which will fully manage the implementation of the Plan.

Following discussions, the policy will not provide temporary relief facilities in the Projects areas; accordingly, there is a possibility of developing springs for water sources in the areas having a low potential for ground water development.

For clarity purposes, it will be convenient to denominate that part of the Plan which will be executed through the Japanese Grant Aid as "the Project".

The times and viewpoints that have been revised since the original request as result of the field surveys are as follows:

Project Area:

- . The first priority of water supply facility construction should be given to those resettlement areas where the victims of the volcano moved to, after losing their homes and farms, meaning to say that the well construction portion of the Project will be dedicated mainly for the relief of the highland people.
- . In view of the risk of secondary disasters and the Philippines Government's development policies, areas having a potential for permanent settlement should be included.
- . Being temporary facilities, refugee relief center should be excluded from the Project.

Implementation Organization, Equipment Specifications and Unit Numbers:

- . Overall water supply policies and scale have to be clarified, and the Project implementing organization and program must be defined. The Project should be examined based on MPR-PMO's project plan and structure.

Water Source Plan:

- . To secure reliable water sources, springs should be developed in areas where ground water development is difficult.

Through a series of discussions relevant to the above contents, the Philippine Government's request was revised as outlined below and the Minutes of Discussions was signed on November 26, 1992:

1) Construction of Water Supply Facilities

Water supply facilities are to be constructed at 10 highland resettlement areas. However, after taking into consideration the accessibility, the possibility of secondary disasters, and the appropriateness of the water sources, certain inadequate areas will be excluded. In the areas having ground water development difficulties, springs may be developed as water sources.

2) Procurement of Equipment

In addition of the original request, a complete set of equipment for maintenance and operation of the construction equipment will be provided for a new organization.

It was believed that the Plan implementing structure of the new MPR-PMO would be able to carry out Project implementation once its organization was well formed. It was confirmed through discussions that RWS-PMO (the originally planned Plan implementation agency) can technically support the Project through Project construction and facility monitoring activities with the coordination of DPWH's under-secretary.

2.3 Outline of the Project Area

2.3.1 Location and General Conditions

The Project Area is located in Central Luzon Region III and is neighboring the capital city of Manila. Region III consists of Bulacan, Nueva Ecija, Pampanga, Tarlac, Zambales and Bataan Provinces and the center of the Region is in San Fernando, Pampanga.

As the distance between the Area and Manila is less than 150km, the road network within the Area is well developed. However, many parts are thickly covered by volcanic ash and mud.

The Region had a high population of 6.1 million in 1990 and the population density is 299.3 persons per km². Many towns are scattered in the rural area and many kinds of industries are developed in the Region. A large alluvial plane which is the main granary area is found in the eastern part of the Project Area.

The population of minor tribes in the region were recorded as 108,000 (Aetas: 83,000; others: 26,000) in 1986. Most of them are called as highlanders since they are settled in the highlands. Their settlement areas are strongly damaged by Mt. Pinatubo eruption and it is estimated that 35,000 highlanders (40% of the total) had to be evacuated from their villages to safe lowlands.

The 10 resettlement sites for the highlanders and the surrounding areas surveyed are scattered in 3 administrative provinces as shown in the location map.

The province is divided into 10 - 20 municipalities and the municipalities are separated into 20 - 30 barangays, the lowest administrative unit. Population distribution and density of each barangay are shown in Annex and the population data for 3 provinces are given in Table 2.13

Table 2.13 Population and Population Density in the Project Area

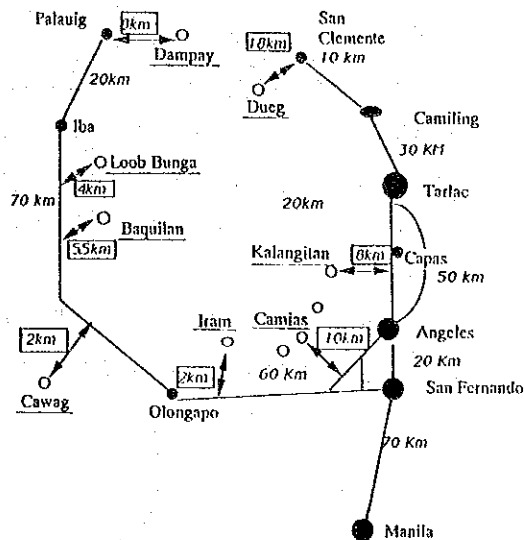
Province	Land Area (km ²)	(Thousands)			
		1988 #1 Population	#1 Density	1980 #2 Population	#2 Density
Pampanga	2,180.7	478.0	219.2	372.0	170.6
Tarlac	3,053.4	799.0	261.7	688.0	225.3
Zambales	3,714.4	546.0	147.0	4,544.0	1,223.3

Source: National Statistics Office

NOTE : #1 Projection based on 1980 census

#2 Actual census date

The distance between Manila and each resettlement site is shown in the Figure below and the access to each site from the capital city and regional center of San Fernando is given in Table 2.14



- Dampay Sala : Paved road (100km) from Olongapo -> Non-paved road (8km)
- Loob Bunga : Paved road (70km) from Olongapo -> Non/bad-paved road (4km)
- Baquillan : Paved road (70km) from Olongapo -> Paved/nonpaved road (4.5km)
- Cawag : Paved road (10km) from Olongapo -> Non-paved road (12km)
- Iram : Paved road (100km) from Olongapo -> Non-paved road (2km)
- Camias : Paved road (30km) from San Fernando -> Non-paved road (10km)
- Kalangitan : Paved road (40km) from San Fernando -> Non-paved road (8km)
- Dueg : Paved road (40km) from Tarlac -> Non-paved road (18km)

Table 2.14 Distance Between Manila City and Project Area

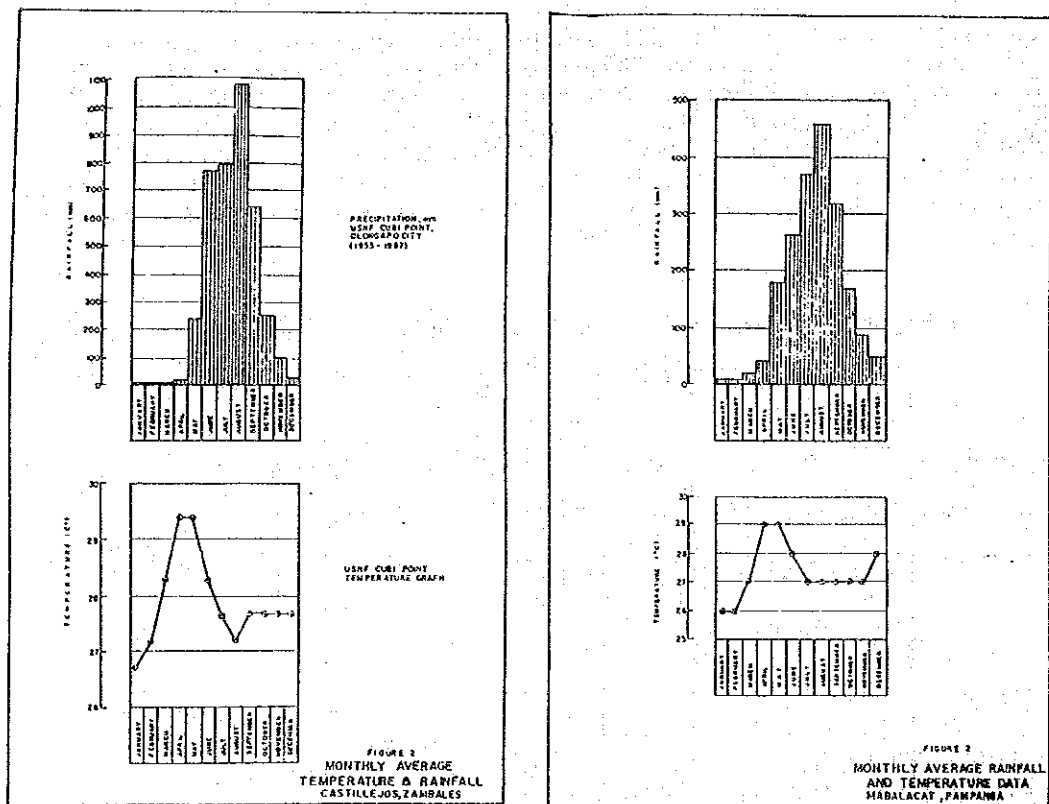
Site	Province	Distance (km)		
		Paved Road (km)	Unpaved Road (km)	Total (km)
Dampay Salasa, Palauig	Zambales	230 (160)	8	238 (168)
Baquillan, Botolan	-	200 (130)	5.5	205.5 (135.5)
Loob-Bunga, Botolan	-	200 (130)	4	204 (134)
Iram, New Cabalan	-	125 (55)	2	127 (57)
Cawag, Subic	-	140 (70)	12	152 (82)
Camias, Porac	Pampanga	100 (30)	10	110 (40)
Kalangitan, Capas	Tarlac	110 (40)	8	118 (48)
Dueg, San Clemente	-	180 (110)	18	198 (128)

Note:
The number in the bracket indicates the distance (km) to each site from San Fernando where the supervising center of the construction works will be set up.

2.3.2 Outline of Natural Conditions

(1) Climate and hydrology

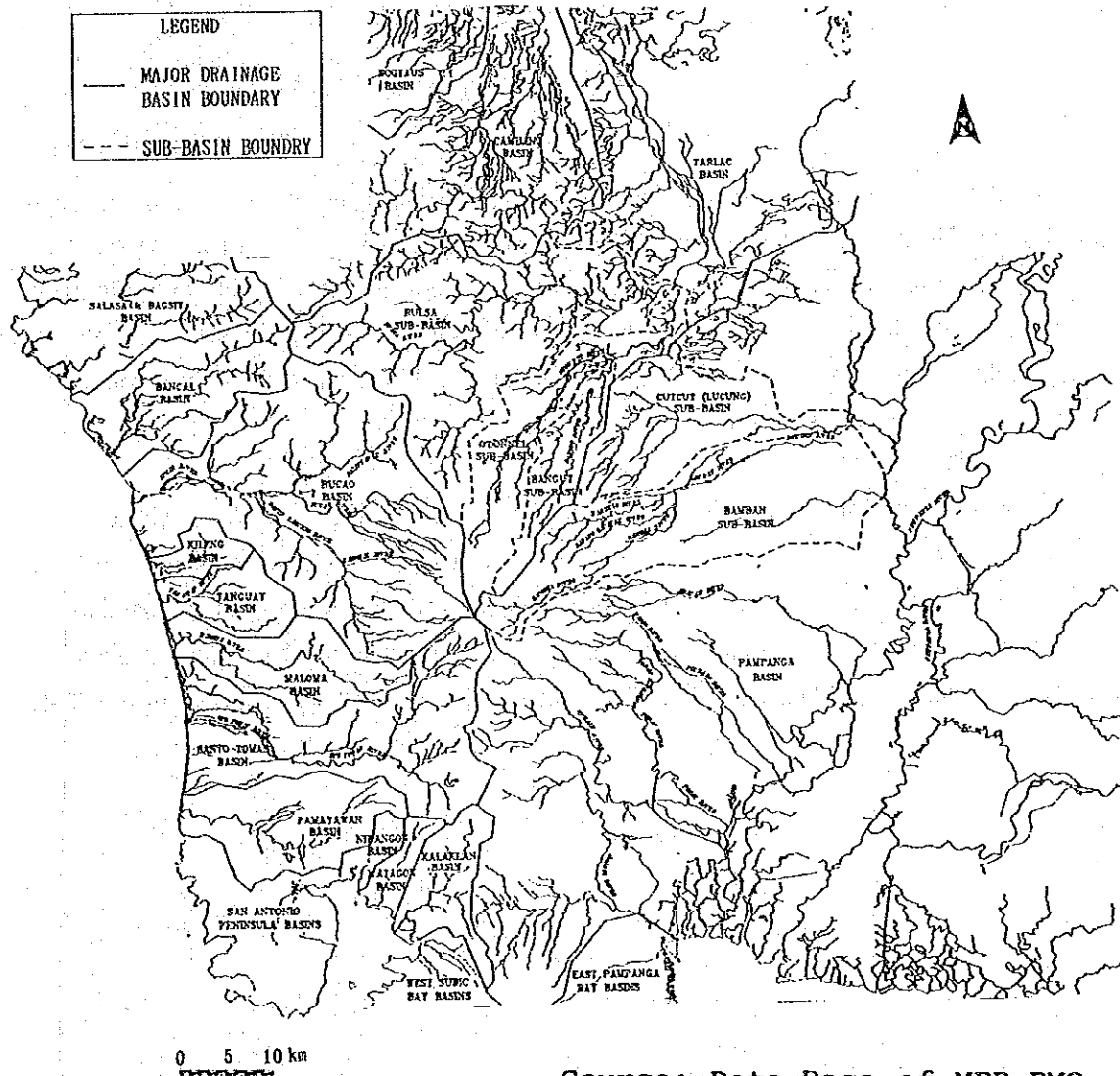
The Project Area is located in a tropical area with a mean annual temperature of 27°C without notable seasonal variations. There are two seasons: dry season from November to May and rainy season from June to October. The mean annual rainfall is 2,500mm and as especially high in Luzon Island as it is a passing path for frequent typhoons.



Source : F/S Report on The Pampanga Delta Development Project, 1982, JICA

Fig. 2.6 Rainfall Pattern

In the eastern side of the Project Area, the Pampanga river flows through a broad alluvial plain. This is the fourth largest river in the country and its annual discharge is 11 billion cubic meters. Besides, many small-medium rivers originate from Zambales Mountains and Pinatubo volcano. Especially the rivers from the latter had become a mud flow pathway at the time of the volcano eruption and caused extensive damage in the downstream of each river.



Source: Data Base of MPR-PMO, DPWH

Fig. 2.7 River System Map around Mt. Pinatubo Volcano

(2) Topography

Zambales Mountains extend to the south-north from the western side of the Project Area and its peak reaches 2,037 m. Volcanoes can be found at the south from the center of its eastern side. Mt. Pinatubo is one of them with a height of 1,745 m, although its height was reduced to 1,350 m due to the eruption. A broad alluvial plain stands in the eastern portion of the area through which the Pampanga River flows down to Manila Bay.

Also on the east side, Sierra Madre Mountains run in north-south direction. The Project Area is located in and around the mountains at a relative high altitude.

(3) Geology

Old Meso-Paleozoic plutonic rocks, the basement rock of Philippine Archipelago, emerge in Zambales and Sierra Madre Mountains. Tertiary formation is distributed in some part of these mountains' piedmont and it is supposed that these underlie the alluvial plain. Pleiocene-Quaternary Volcanic rock is extended to the south from the center of the eastern side of Zambales Mountains and Quaternary formation is deposited broadly in the alluvial plain of the center and west of the same area.

Regarding its rock element, Meso-Paleozoic rocks are mainly composed from gabbro, Tertiary; mudstone and Pleiocene-Quaternary volcanic from pyroclastic rocks, and hard rocks products of an old geologic age. Quaternary formation is made up of clay, sand and gravel and unconsolidated because of their new geologic age origin. Most of the Project Areas are located on the hard rock area of highland and their geology is shown in Fig. 2.8

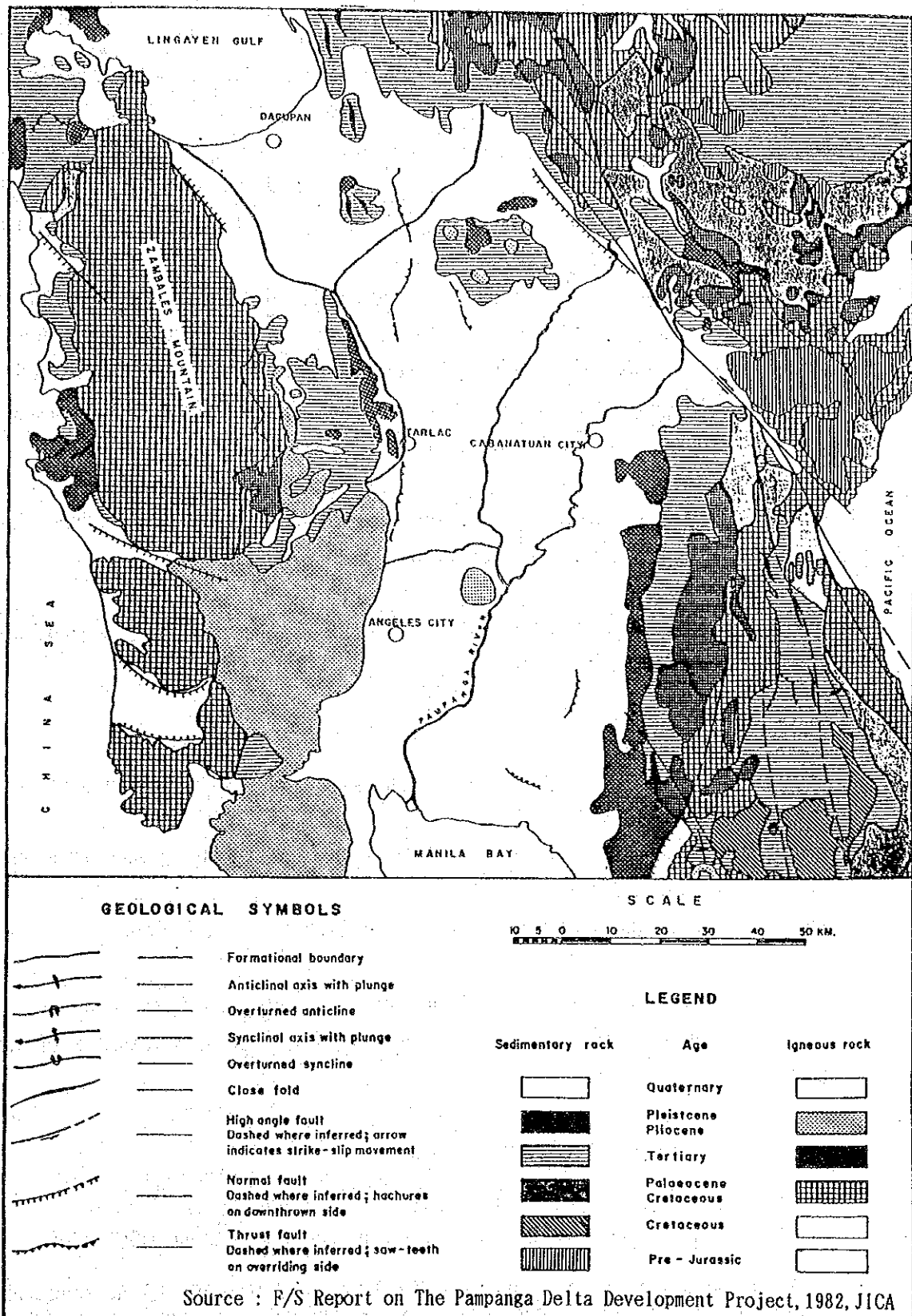


Fig. 2.8 Geological Map of the Central Luzon

(4) Hydrogeology

In the old rock area of Meso-Paleozoic and Tertiary located in the highland and at the piedmont of the Project Areas, aquifer is formed by fissure water stored in the fracture zone of their hard rock base. In the new formation area of Pleiocene and Quaternary, these areas are made up of stratum water stored in the porous spaces of the sediment. But generally the former has a very small discharge due to low permeability and its reserve is very limited.

As shown in the Annex, so far groundwater development in the Project Area is limited to the alluvial plain or lower part of the piedmont. In the alluvial plain, good aquifers are developed and many water wells are drilled from shallow to deeper depths. The data shows that the transmissivity of the aquifer in the alluvial plain is 300 - 500m³/d/m and this lowland area is considered as a very good groundwater resources zone.

On the other hand, as the Project Areas are on hills and mountain of hard rock zones, it is judged that the groundwater development of these areas will be difficult.

The Project Areas are divided hydrogeologically into three zones as follows: Well drilling, identification of well location and discharge.

-Old base rock zone :

Mostly it is composed of hard rock making its groundwater potential as very small

-Tertiary volcanic rock zone:

Mostly of it is composed of medium hard rock making its potential at medium level.

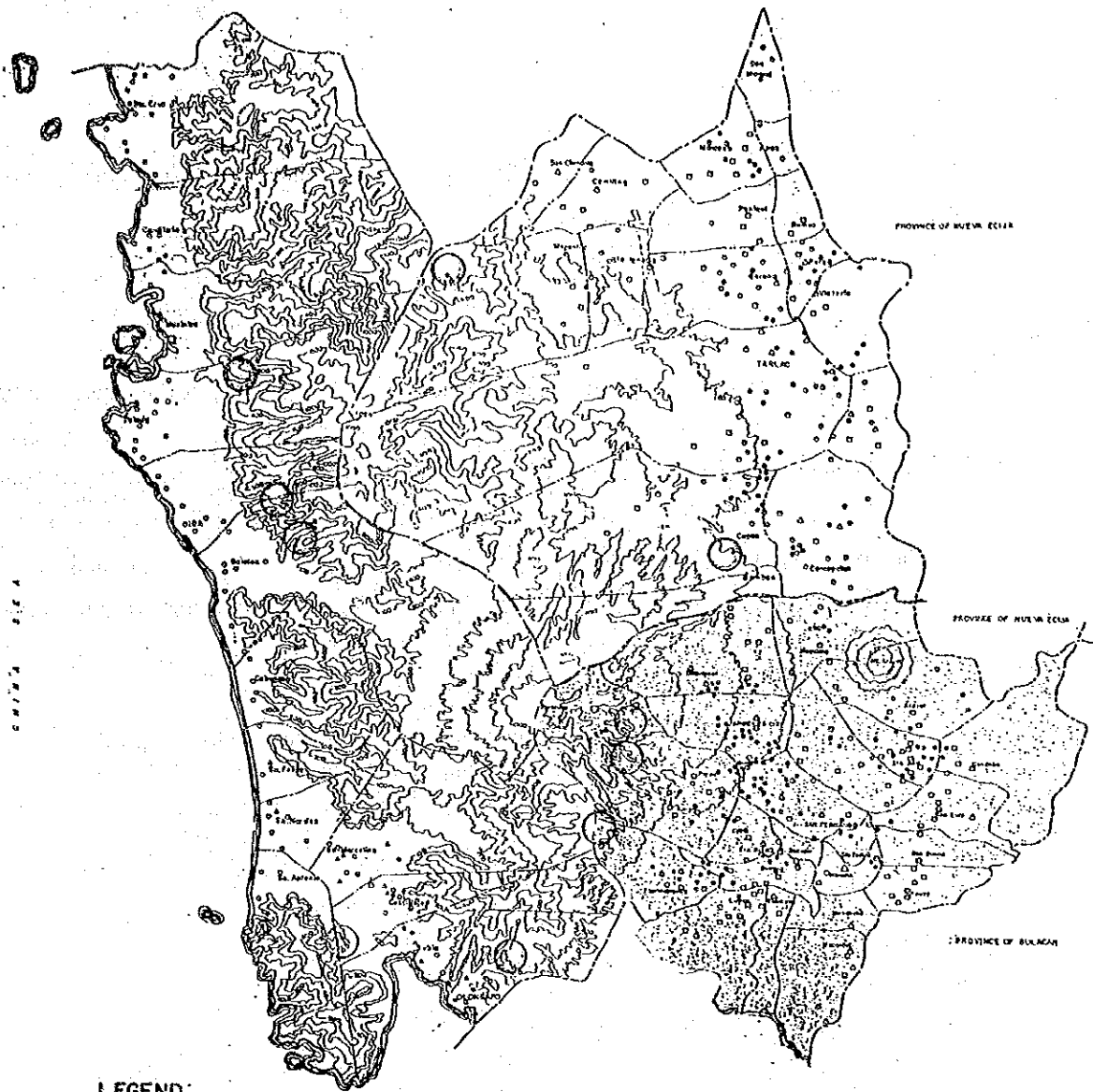
-New volcanic formation zone:

Mostly of it is composed of hard rock making its potential as very high.

The areas are located in the highlands and handpump is mainly used. Even the new volcanic formation zone can not be used for development from the view point of utilization of hand pump equipment.

Hydrology of the sites is summarized as follows:

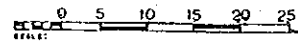
- Catchment area is above 1km² as a minimum. If about 20% of rainfall is recharged, possible development capacity of every site is above 1,500m³/d.
- As discharge per day of handpump is small, around 7-10 m³/d (15 l/m, operated 8-12 hours/d), it is considered that all sites have sufficient capacity for development.



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LEGEND:

- - Well depth ≤ 20 mbs
- - Well depth ≤ 100 mbs
- △ - Well depth > 100 mbs
- - Well with water permit



Source : Hydrogeology (Zambales, Pampanga and Tarlac Province), Natural water Resources council

- - - - - PROVINCIAL BOUNDARY
- - - - - CONTOUR (Relative to mean sea level, in meters)
- - - - - RIVERS
- - - - - MUNICIPAL BOUNDARY
- Site

Fig. 2.9 Well Location Map

(5) Outline of electrical survey

Contents

site number : 4 points (Loob Bunga, Cawag, Kalangitan and Dueg)
 measured method: schlumberger
 measured depth: AB/2 = 120m
 tester : type 3244 (Yokogawa, Japan)

Results

- Three points in hard rock zone of Meso-Paleozoic age and one point in Quaternary volcanic piedmont were carried out. In general, as low resistivity of below 1,000^{-m} is continued to be measured until a depth of roughly 100m and the possibility of containing some aquifer, it is reasonable that the maximum well depth may be planned to be 100m.
- The survey was carried out in the nearby center of each site. In general, shallow depth of underground has very low resistivity. Signs of contamination due to human detritus were detected.

The results of the analysis are arranged as resistivity log as shown in Fig. 2.10.

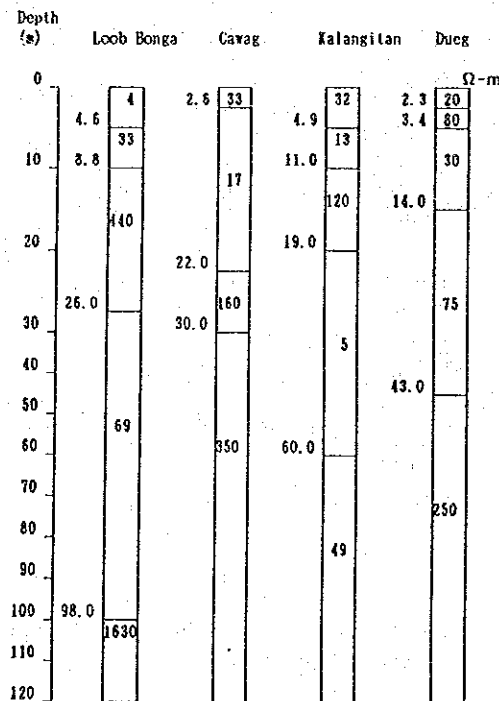


Fig. 2.10 Resistivity Log