

JAPAN INTERNATIONAL COOPERATION AGENCY
DEPARTMENT OF THE INTERIOR AND LOCAL GOVERNMENT
THE REPUBLIC OF THE PHILIPPINES

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

VOLUME III - 2

SUPPORTING AND DATA REPORT

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

RIZAL



FEBRUARY 1996

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**PROVINCIAL WATER SUPPLY, SEWERAGE AND
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VOLUME III - 2 SUPPORTING AND DATA REPORT

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**PROVINCIAL WATER SUPPLY, SEWERAGE AND
SANITATION SECTOR PLAN**

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PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

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SUPPORTING REPORT

**A. BACKGROUND INFORMATION AND
EXISTING CONDITIONS**




1. INTRODUCTION
- 1.3 The Provincial Plan for the Province of Rizal
- 1.3.1 Preparation of the Plan

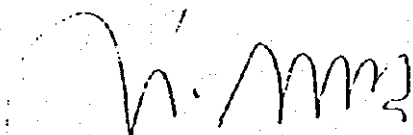
MINUTES OF DISCUSSIONS
ON
THE INCEPTION REPORT
FOR
STUDY ON PROVINCIAL WATER SUPPLY, SEWERAGE AND
SANITATION SECTOR PLAN
IN
THE REPUBLIC OF THE PHILIPPINES

AGREED UPON BETWEEN
THE DEPARTMENT OF THE INTERIOR AND
LOCAL GOVERNMENT
AND
STUDY TEAM OF
JAPAN INTERNATIONAL COOPERATION AGENCY

MANILA, SEPTEMBER 5, 1994



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MR. MASATOSHI MOMOSE
Team Leader, Study Team
Japan Int'l Cooperation Agency

Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, dispatched the Study Team to the Republic of the Philippines on August 31, 1994 to conduct "the Study on Provincial Water Supply, Sewerage and Sanitation Sector Plan" (hereinafter referred to as "the Study") in accordance with the Implementing Arrangement for the Study between the JICA and the Department of the Interior and Local Government (hereinafter referred to as "DILG") on November 19, 1993.

A series of discussions was made on the Inception Report for the Study between the Study Team and officials of DILG. In the course of discussions, both parties have agreed to the main items described in the Inception Report. The list of attendants in the series of discussions is presented in Appendix A.

1. Objectives and Scope of Work for the Study

- (1) Formulation of long-term provincial development plan for water supply, sewerage and sanitation sector to the year 2010 through technical assistance to the provincial staff; and
- (2) Preparation of medium-term (five year) sector investment plan based on the long-term development plan.

The Study will be conducted in two stages for the two batches.

2. Study Area

The study area covers the following nine (9) provinces and are grouped as follows:

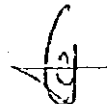
BATCH No. 1

- (1) Zambales
- (2) Rizal
- (3) Mindoro Oriental
- (4) Mindoro Occidental

BATCH No. 2

- (1) Abra
- (2) Ilocos Norte
- (3) Ilocos Sur
- (4) Nueva Vizcaya
- (5) Batanes

For Rizal province, four (4) municipalities covered by the MWSS will be excluded in the future plan. The conduct of the Study for Batch No. 2 shall be finally determined after ascertaining the peace and order conditions in the subject provinces by the end of the Batch No. 1 Study.



3. General Approach and Methodology to the Study

(1) Planning framework for future sector development

- a. Base years shall be determined after discussion with NEDA to conform with national plans and programs.
- b. The PW4SP shall be prepared within the context of existing plans and projects. However some modifications may be made where appropriate to reflect the updated information.
- c. Conformity and consistency of the Study with the national plans and programs such as the NEDA Board Resolutions Nos. 4 and 5 - Series 1994; the Water Sector Reforms Study and the National Urban Sewerage and Sanitation Strategy Plan for the Philippines.

(2) Establishment of data base

To maintain consistency and compatibility with the existing data base of previously developed PW4SPs, the Study will adopt the same in principle and will be modified if needed.

(3) Water source development

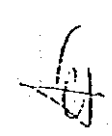
Water Availability Maps will be developed through update of the NWRB's Rapid Assessment Report and other studies.

(4) Community development and training

Training needs assessment will be undertaken to guide the Study in identifying manpower development strategies and programs. Existing local training resources and activities will be evaluated. A community development study will be undertaken entailing model studies for each of the three service levels in every province.

(5) Technology Transfer

Capacity building and technology transfer are important elements of the Study. To the extent possible, counterpart staff at the local and national levels shall participate actively in data collection and analysis, formulation of strategic recommendations, and the preparation of the PW4SP.



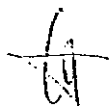
4. Implementation Set-Up for the Study

In accordance with the Implementing Arrangements between the DILG and the JICA, the DILG shall:

- (1) secure the safety of the JICA Study Team;
- (2) assign DILG counterpart staff members who will coordinate and assist PSPTs at the provincial level;
- (3) Set-up PSPTs by respective provincial governments in the study area and secure budget to carry out the Study;
- (4) through PSPT in each study area province; facilitate and coordinate in data gathering with municipal government and other agencies concerned, and participate in workshops and preparation of PW4SP.
- (5) facilitate coordination with concerned agencies like DPWH, DOH, NEDA, LWUA and with appropriate bodies such as PCC (FW4SP) and the like.

The JICA shall:

- (1) pursue technology transfer to the Philippine counterpart personnel in the course of the Study and;
- (2) assist PSPTs in the preparation of the PW4SP.



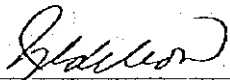
LIST OF ATTENDANTS IN THE SERIES OF DISCUSSIONS

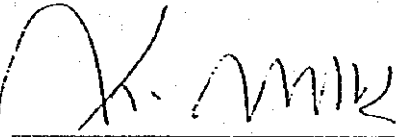
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MINUTES OF DISCUSSIONS
ON
THE PROGRESS REPORT I
FOR
STUDY ON PROVINCIAL WATER SUPPLY, SEWERAGE AND
SANITATION SECTOR PLAN
IN
THE REPUBLIC OF THE PHILIPPINES

AGREED UPON BETWEEN
THE DEPARTMENT OF THE INTERIOR AND
LOCAL GOVERNMENT
AND
STUDY TEAM OF
JAPAN INTERNATIONAL COOPERATION AGENCY

MANILA, DECEMBER 20, 1994


HON. YOLANDA MA. L. DE LEON
Assistant Secretary
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MR. MASATOSHI MOMOSE
Team Leader, Study Team
Japan Int'l. Cooperation Agency

The Stage I field work for "the Study on Provincial Water Supply, Sewerage and Sanitation Sector Plan" (hereinafter referred to as "the Study") started on August 31, 1994 and completed on December 28, 1994.

A series of discussions was held, through the course of the Study, between JICA Study Team and officials concerned including DILG, NEDA, DPWH, LWUA, other central agencies and provinces. General approach and methodologies, as presented in the Inception Report, have been employed for the planning work.

Progress Report I, which covers all outputs during the work period, was prepared entailing part of PW4SP for respective provinces. The contents of the report were basically agreed upon on December 20, 1994 between JICA Study Team and officials concerned in the Philippine side. The list of attendees to the meeting is presented in Appendix A. The following were confirmed and/or agreed upon by both parties.

1. Study Area Coverage

For Rizal province, four (4) municipalities covered by the MWSS were initially agreed to be excluded from the sector plan. However, inclusion of the Talim Island, part of Binangonan (rural area) which is one of the four municipalities, has been reconsidered upon request by the Governor.

2. Planning Conditions

(1) Table of Contents for PW4SP: referring to previous PW4SPs, some modifications were made.

(2) Planning Conditions:

a. Conformity and consistency of the Study shall be ensured especially with "Medium-Term Philippine Development Plan 1993-1998."

b. Planning base year is 1994, while target years are 2000 and 2010 for medium-term and long-term purposes, respectively. The start year of 5-year medium-term development is set to be 1996.

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- c. Population projection: NSO projection was basically adopted. However, some modifications on urban and rural population by municipality were made with reference to re-classification of barangays reviewed by respective PSPTs.
- d. Data management: outputs in tables and graphics are prepared in EXCEL spreadsheets for final analysis and presentation.
- e. Sector arrangements and institutional capacity: previous arrangements adopted and experiences learned by the central government agencies are discussed in detail for reference/basis of LGUs in coming up with sector plan.

(3) Future Arrangements by DILG

- a. Further arrangements with PSPTs will be done by DILG to catch up with the schedule to complete PW4SP within one month during February, 1995 after holding workshop at respective provinces.
- b. Arrangements with Batch No. 2 provinces will be initiated based on the experience in Batch No. 1 study, ascertaining the peace and order in the provinces.
- c. To ensure timely completion/finalization of the Plans, DILG shall work closely with the LGUs and other agencies in getting the comments and recommendations on the Draft Plans.
- d. Adoption of the Plans by the Provincial Council (Sangguniang Panlalawigan) shall also be facilitated by DILG.

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LIST OF ATTENDANTS

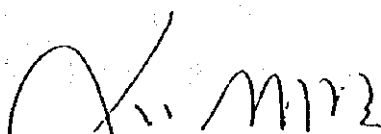
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6. MS. JOSEPHINE RAMOS	DILG Coordinator, Oriental Mindoro
7. MS. LINA GRIEGO	DILG Coordinator, Occidental Mindoro
8. MS. MA. CONTESSA NAVARRO	DILG Coordinator, Rizal
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3. MR. VICTOR SABANDEJA	Chief, Environmental Health Division, DOH
4. MR. ANIANO FORNELOS JR.	Sanitary Engineer II, DOH
C. JICA	
1. MR. EIJE IWASAKI	Asst. Resident Representative, Philippine Office
D. JICA Study Team	
1. MR. MASATOSHI MOMOSE	Team Leader
2. MR. MASUOMI HIROYAMA	Water Supply Engineer
3. MS. YOLANDA M. MINGOA	Sanitary Engineer
4. MR. WILFRIDO C. BARREIRO	Institutional/CD/T Specialist
5. MR. ALLEN LOWE	System Engineer

MINUTES OF DISCUSSIONS
ON
THE PROGRESS REPORT II
FOR
STUDY ON PROVINCIAL WATER SUPPLY, SEWERAGE AND
SANITATION SECTOR PLAN
IN
THE REPUBLIC OF THE PHILIPPINES
AGREED UPON BETWEEN
THE DEPARTMENT OF THE INTERIOR AND
LOCAL GOVERNMENT
AND
STUDY TEAM OF
JAPAN INTERNATIONAL COOPERATION AGENCY

MANILA, MARCH 8, 1995



HON. YOLANDA MA. L. DE LEON
Assistant Secretary
Dept. of the Interior and Local Government



MR. MASATOSHI MOMOSE
Team Leader, Study Team
Japan Int'l. Cooperation Agency

The Stage II field work for "the Study on Provincial Water Supply, Sewerage and Sanitation Sector Plan" (hereinafter referred to as "the Study") resumed on January 14, 1995 and completed on March 14, 1995.

Conditions and assumptions for development of Medium-Term and Long-Term sector plans were discussed and finalized between respective PSPTs and JICA Study Team through the conduct of Workshop No. 3.

Progress Report II, as a draft of PW4SP, was prepared. In this connection, contents of the report were basically agreed upon on March 8, 1995 between JICA Study Team and officials concerned in the Philippine side. The list of attendees to the meeting is presented in Appendix A.

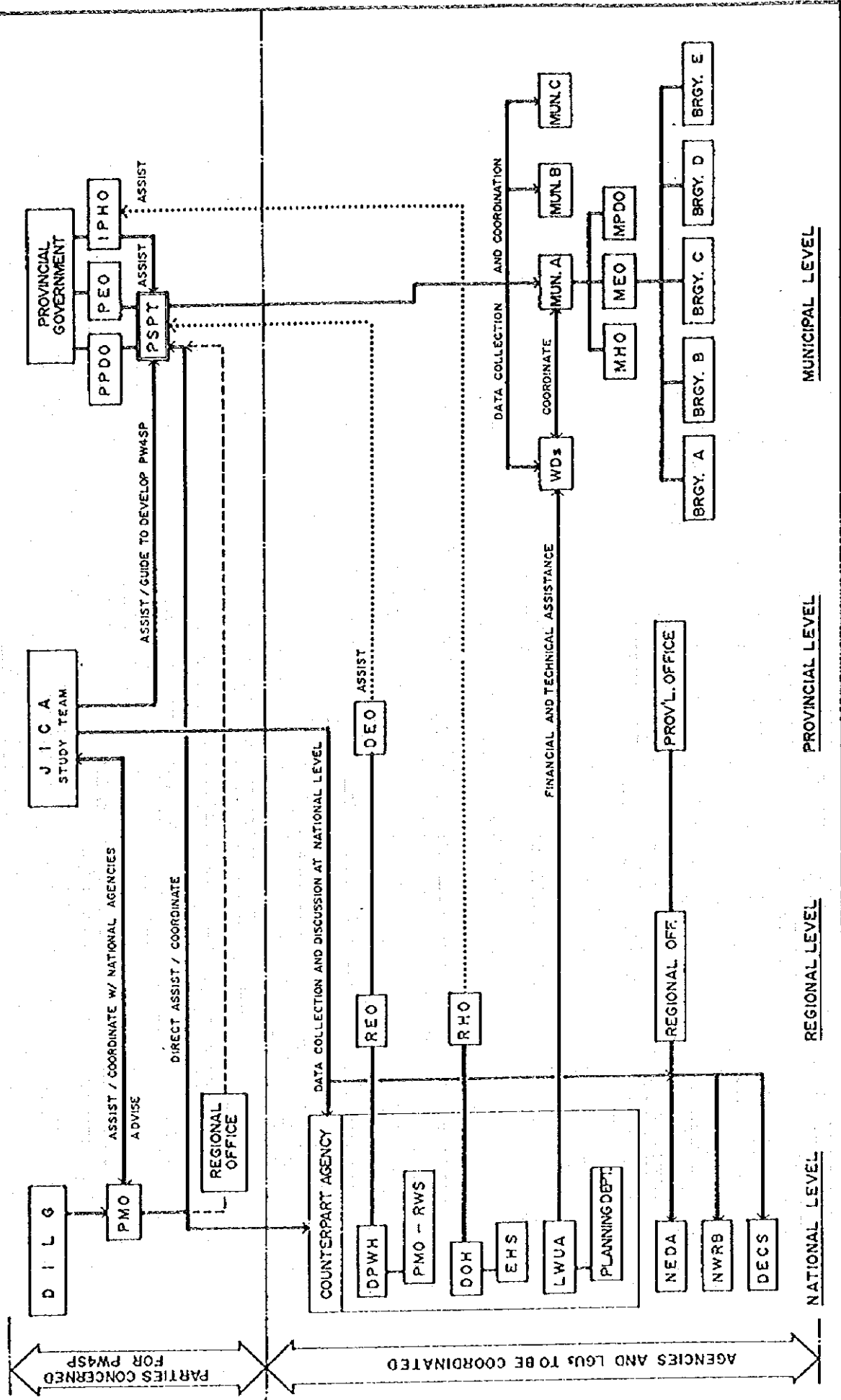
The following are future arrangements required by both parties:

- (1) DILG will follow-up Batch No. 2 provinces for implementation of the PW4SPs, ascertaining the peace and order situation in the provinces.
- (2) The starting date of the third field work by JICA Study Team for Batch No. 2 will be informed to DILG through JICA Philippine Office.

LIST OF ATTENDEES

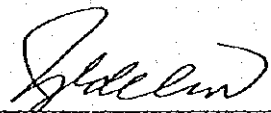
<u>Attendees</u>	<u>Designation</u>
A. DILG	
1. MR. ORVILLE M. ROQUE	Project Manager, PMO
2. MS. ELLEN I. PASCUA	Assistant Project Manager, PMO
3. MR. ROGELIO B. OCAMPO	Chief, Planning Div., PMO
4. MS. FE CRISILLA M. BANLUTA	PW4SP Overall Coordinator, PMO
5. MS. JOSEPHINE RAMOS	DILG Coordinator, Oriental Mindoro
6. MS. LINA GRIEGO	DILG Coordinator, Occidental Mindoro
7. MS. MA. CONTESSA NAVARRO	DILG Coordinator, Rizal
8. MS. VIVIAN BIALA	DILG Coordinator, Zambales
B. OTHER AGENCIES	
1. MR. VIRGILIO GACUSANA	Chief, Planning Division, PMO, DPWH
C. JICA	
1. MR. EIJI IWASAKI	Asst. Resident Representative, Philippine Office
2. MR. NOBUAKI MIYATA	Second Development Study Div., Social Development Study Dept.
D. JICA Study Team	
1. MR. MASATOSHI MOMOSE	Team Leader
2. MR. MASUOMI HIROYAMA	Water Supply Engineer
3. MS. YOLANDA M. MINGOA	Sanitary Engineer
4. MR. WILFREDO C. BARREIRO	Institutional/CD/T Specialist
5. MR. MANABU FUJIKAWA	Financial Specialist
6. MR. ALLEN LOWE	System Engineer

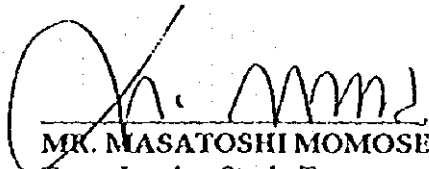
FIGURE 1.3.1 ORGANIZATION CHART FOR IMPLEMENTATION OF PW4SP



MINUTES OF DISCUSSIONS
ON
THE DRAFT FINAL REPORT
FOR
STUDY ON PROVINCIAL WATER SUPPLY, SEWERAGE AND
SANITATION SECTOR PLAN
IN
THE REPUBLIC OF THE PHILIPPINES
AGREED UPON BETWEEN
THE DEPARTMENT OF THE INTERIOR AND
LOCAL GOVERNMENT
AND
STUDY TEAM OF
JAPAN INTERNATIONAL COOPERATION AGENCY

MANILA, DECEMBER 7, 1995


HON. YOLANDA MA. L. DE LEON
Assistant Secretary
Dept. of the Interior and Local Government


MR. MASATOSHI MOMOSE
Team Leader, Study Team
Japan Int'l. Cooperation Agency

The Stage III field work for Batch II for "the Study on Provincial Water Supply, Sewerage and Sanitation Sector Plan" (hereinafter referred to as "the Study") started on May 22, 1995 and will be completed on December 15, 1995.

Major conditions and assumptions for the development of Medium-Term and Long Term sector plans for the remaining five (5) provinces under Batch II were discussed and finalized between respective PSPTs and JICA Study Team through the conduct of Workshop No. 3.

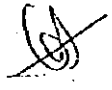
The Draft Final Reports for the nine (9) provinces, which cover all outputs during the study period, were prepared for respective provinces. The contents of the report were basically agreed upon on December 7, 1995 between JICA Study Team and officials concerned in the Philippine side. The list of attendees to the meeting is presented in Appendix A. The following were confirmed and/or agreed upon by both parties.

1. Correction of typographical errors of the Draft Final Report will be undertaken by the Study Team prior to printing of the Final Report.
2. Adoption of the Plans (Batch II) by the Provincial Council (Sangguniang Panlalawigan) shall be facilitated by DILG in the same manner as Batch I.
3. Inclusion of the Message of the Governor in the Main Report of respective PW4SPs.



LIST OF ATTENDEES

<u>Attendees</u>	<u>Designation</u>
A. DILG	
1. HON. YOLANDA MA. L. DE LEON	Assistant Secretary
2. MR. ORVILLE M. ROQUE	Program Manager, PMO
3. MS. ELLEN I. PASCUA	Asst. Program Manager, PMO
4. MR. ROGER OCAMPO	Chief, Planning Div., PMO
5. MR. MARIO VERGEL DE DIOS	Chief, Operations Div., PMO
6. MS. FE CRISILLA M. BANLUTA	PW4SP Overall & Ilocos Norte Coordinator
7. MS. JOSEPHINE RAMOS	DILG Coordinator, Abra & Or. Mindoro
8. MS. LINA GRIEGO	DILG Coordinator, Batanes & Occ. Mindoro
9. MS. MA. CONTESSA NAVARRO	DILG Coordinator, Nueva Vizcaya & Rizal
10. MS. VIVIAN BIALA	DILG Coordinator, Ilocos Sur & Zambales
B. OTHER AGENCIES	
1. MR. ROGELIO A. FLORES	Director, PMO-RWS, DPWH
2. MR. VIRGILIO GACUSANA	Chief, Planning Division, PMO, DPWH
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4. MR. ANIANO FORNELOS JR.	Sanitary Engineer II, DOH
5. MR. JOSE RENE RONCESVALLES	Program Manager, LWUA
C. JICA	
1. MR. SHIGEYUKI MATSUMOTO	2nd Development Study Div., Social Development Study Dept.
D. JICA Study Team	
1. MR. MASATOSHI MOMOSE	Team Leader
2. MR. MASUOMI HIROYAMA	Water Supply Engineer
3. MS. YOLANDA M. MINGOA	Sanitary Engineer
4. MR. WILFRIDO C. BARREIRO	Institutional/CD/T Specialist
5. MR. ALLEN LOWE	System Engineer



2. **PLANNING APPROACH FOR FUTURE SECTOR DEVELOPMENT**
2.6 **Planning Principles and Data Management**
2.6.2 **Data Management**

(1) Computer-based System

The data management system was established to support the Provincial Sector Planning Team (PSPT) in the preparation of the Provincial Water Supply, Sewerage and Sanitation Sector Plan (PW4SP). An essential task of data management is to organize various kind of data into an effective and efficient information base.

A computer-based system was applied as a viable solution to process large amount of data and to minimize the human-error in calculation. For this particular project, a dynamic system is designed to allow the planner to adjust planning factors and update the information when further data becomes available.

It is viable and economical to choose the microcomputer with software suitable for the average skills of the common user. In this connection, of the two types of software package available, *database* and *spreadsheet*, the latter method was selected. Among the available spreadsheet-type software, EXCEL was used. EXCEL supports file conversion (opening and saving), multiple file opening, graphic presentation of data, What-You-See-Is-What-You-Get (WYSIWYG) formatting, scaleable font and view, etc. The following are the advantages and disadvantages of the spreadsheet method with reference to database method.

<u>Advantage</u>	<u>Disadvantage</u>
1. Minimum programming skills	1. Repeated entry of same formula
2. Friendly environment to users	2. Sorting or indexing is done manually
3. Graphic presentation of data at user's option	3. All data are loaded in memory, which require huge amount of memory
4. Execution of data linkage at formula level entry	4. Limited to static data linkages
5. Guided formula creation using function wizard	

Data management task starts from the collection of data using the questionnaire forms. The existence and accuracy of data are major concern at this stage to prepare main information bases. Using the microcomputer provided with EXCEL spreadsheet, data in the questionnaire forms are transferred into the forms constructed in EXCEL. Applicable policy, criteria and assumptions are entered into key parameter tables. These data are then processed and finally consolidated into target forms. These final forms provide a map of provincial profile, service coverage, future requirements, cost estimates for future sector development, and funding requirements.

Table 2.6.2 Key Parameter

No.	Description of Key Parameter		Unit	Values	
1.	Service Level	<i>Water Supply</i>			
		Number of household to be served by Level I Facility	Well/Well		
		Water Consumption Rate for Level III System	Liter/capita/day		
		<i>Sanitation</i>			
2.	Provincial Sector Target	Medium Term Plan	<i>Water Supply</i>		
			Urban Water Supply	% of Population	
			Rural Water Supply	% of Population	
			<i>Sanitation</i>		
			Household Toilet	% of Household	
			Urban Household Toilet		
			Flush	% of Household	
			Pour Flush	% of Household	
			VIP Latrine	% of Household	
			Rural Household Toilet		
		Flush	% of Household		
		Pour Flush	% of Household		
		VIP Latrine	% of Household		
		School Toilet	% of Public Student		
		Public Toilet	% of Public Utility		
		Solid Waste	% of Urban Population		
		Long Term Plan	<i>Water Supply</i>		
			Urban Water Supply	% of Population	
			Rural Water Supply	% of Population	
			<i>Sanitation</i>		
Household Toilet	% of Household				
Urban Household Toilet					
Flush	% of Household				
Pour Flush	% of Household				
VIP Latrine	% of Household				
Urban Household Toilet					
Flush	% of Household				
Pour Flush	% of Household				
VIP Latrine	% of Household				
School Toilet	% of Public Student				
Public Toilet	% of Public Utility				
Urban Sewerage	% of Urban Population				
3.	Percentage of Level I Wells to be Rehabilitation		%		
4.	Percentage of Sector Management Cost to Construction Cost				
	Feasibility and Detail Design	% of Construction Cost			
5.	Contingencies				
	Physical Contingency	% of Construction Cost			
6.	Price Contingency		Percent per annum		
	Community Development and Training Cost				
	Level III	% of Construction Cost			
7.	Recurrent Cost	Level I and II	% of Construction Cost		
		Level III System (Operating Cost)	Pesos/IDU/year		
		Level III System (Spare Parts/Equipment)	% of Construction Cost		
		Level II System (Spare Parts/Equipment)	Pesos/IDU/year		
		Level I System (Spare Parts/Equipment)	Pesos/IDU/year		
		Public School Toilet Maintenance Cost	Pesos/Toilet/year		
8.	Public Utility Toilet Maintenance Cost		Pesos/Toilet/year		
	Allocation factors/Percentages of IRA				
9.	From Provincial		%		
	From Municipality and Brgy.		%		
	Funding Levels/Percentages for Different Financing Scenarios				
	1st Scenario	% Funding Available			
	2nd Scenario	% Funding Available			
3rd Scenario	% Funding Available				
4th Scenario	% Funding Available				
5th Scenario	% Funding Available				

Table 2.6.2 Composition of Well Sources and Specific Capacity

Municipality	Area	Source	Proportion (%)	Standard Specification		
				Depth (m)	SWL (m)	Specific Capacity (lit/sec/m)
	Rural	Shallow Well				
		Deep Well				
	Urban	Shallow Well				
		Deep Well				
	Rural	Shallow Well				
		Deep Well				
	Urban	Shallow Well				
		Deep Well				
	Rural	Shallow Well				
		Deep Well				
	Urban	Shallow Well				
		Deep Well				
	Rural	Shallow Well				
		Deep Well				
	Urban	Shallow Well				
		Deep Well				
	Rural	Shallow Well				
		Deep Well				
	Urban	Shallow Well				
		Deep Well				
	Rural	Shallow Well				
		Deep Well				
	Urban	Shallow Well				
		Deep Well				
	Rural	Shallow Well				
		Deep Well				
	Urban	Shallow Well				
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	Rural	Shallow Well				
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	Urban	Shallow Well				
		Deep Well				
	Rural	Shallow Well				
		Deep Well				
	Urban	Shallow Well				
		Deep Well				
	Rural	Shallow Well				
		Deep Well				
	Urban	Shallow Well				
		Deep Well				
	Rural	Shallow Well				
		Deep Well				
	Urban	Shallow Well				
		Deep Well				

Table 2.6.5 Unit Construction Cost of Different Facilities

Description	Unit Construction Cost (Pesos)	Service Coverage		Unit Cost	
		Served Population	Served Household	Pesos/Person	Pesos/Household
Water Supply					
<i>Level III - New System</i>					
For 5000 Population					
For 10000 Population					
For 15000 Population					
<i>Level III - Expansion</i>					
For 5000 Population					
For 10000 Population					
For 15000 Population					
<i>Level II</i>					
<i>Level I</i>					
Deep Well - 30 meter depth					
Deep Well - 50 meter depth					
Deep Well - 70 meter depth					
Shallow Well					
Spring Development					
<i>Rehabilitation Cost for Level I Deep Well</i>					
<i>Disinfection of Level I Wells</i>					
Sanitation					
Flush					
Pour Flush					
VIP Latrine					
School Toilet					
Public Toilet					
Urban Sewerage					

Table 2.6.6 Scoring Factor for Municipal Investment Ranking for Urban Water Supply

Unit: Percent

Score	Underserved and Underserved Population in Base Year	Underserved and Underserved Population in Phase I	Population Underserved by Level III Systems in Base Year
1.0	< %	< %	< %
0.8	< % <	< % <	< % <
0.6	< % <	< % <	< % <
0.4	< % <	< % <	< % <
0.2	% <	% <	% <
Weight Allocation Score			

Table 2.6.7 Scoring Factor for Municipal Comprehensive Investment Ranking

Unit: Percent

Score	Urban Water Supply	Rural Water Supply	Urban Sanitation	Rural Sanitation
1.0	N.A.	< %	< %	< %
0.8	N.A.	< % <	< % <	< % <
0.6	N.A.	< % <	< % <	< % <
0.4	N.A.	< % <	< % <	< % <
0.2	N.A.	% <	% <	% <
Weight Allocation Score				

3. PROVINCIAL PROFILE

3.3 Socio-economic Conditions

3.3.1 Economic Activities and Household Income

Table 3.3.1 Distribution of Household by Income Class

Income Class	Rizal				Region IV
	Total families		Annual Income		Annual Income
	Number	Share	Total (P 1,000)	Average (Pesos)	Average (Pesos)
Under 15,000	2,018	1.3	24,613	12,198	11,925
15,000 - 19,999	1,180	0.7	20,040	16,986	17,620
20,000 - 29,999	8,512	5.3	209,574	24,621	24,944
30,000 - 39,999	18,391	11.4	651,685	35,435	34,719
40,000 - 59,999	40,335	25.1	1,967,829	48,763	49,230
60,000 - 99,999	46,044	28.6	3,475,353	75,479	76,978
100,000 - 249,999	37,775	23.5	5,541,796	146,706	145,117
250,000 and over	6,494	4	3,068,043	472,428	437,341
Total	160,749	100.0	14,958,932	93,046	68,960
Median				64,800	47,552

Source: 1991 Family Income and Expenditures Survey, NSO

Notes:

- (1) Based on NEDA and other agencies, poverty threshold in Region IV in 1991 was estimated at P 51,486. Proportion of families below poverty level was 31% in the same year.
- (2) For purposes of the survey, a family is defined as a group of persons usually living together and composed of the head and other persons related to the head by blood, marriage or adoption. A single person living alone is considered as a separate family.

Table 3.3.2 Gainful Workers by Occupation Group and Major Industry Group

Major Occupation Group	Gainful Workers 15 Years Old and Over	MAJOR INDUSTRY GROUP				
		Agriculture, Fishery and Forestry	Mining and Quarrying	Manufacturing	Electricity, Gas and Water	Construction
Total	354,338	37,077	1,356	83,548	3,362	39,308
Officials of the Gov't. & Special Interest Org. Corp Exec, Managers, Managing Prop & Supervisors	24,057	377	116	4,991	286	1,803
Professionals	24,243	260	101	1,792	645	1,538
Technicians & Associated Professionals	9,450	61	41	2,720	181	221
Clerks	20,446	182	39	3,240	724	257
Service & Shop Market Sales Workers	16,963	139	20	1,120	164	72
Farmers, Forestry Workers & Fishermen	31,984	31,354	10	384	31	-
Craft and Related Workers	89,559	90	368	54,275	859	25,942
Plant & Machine Operators & Assemblers	36,131	151	371	9,264	387	671
Elementary Occupations	53,072	4,109	207	4,864	42	8,400
Other Occupations	19,488	354	83	888	73	404
Occupation Not Stated	28,945	-	-	10	-	-

Major Occupation Group	MAJOR INDUSTRY GROUP					
	Wholesale and Retail Trade	Transportation and Communication	Financing, Insurance, Real Estate and Business Service	Community, Social and Personal Services	Activities not adequately defined	Not Stated
Total	36,804	30,167	16,142	61,295	41,858	3,421
Officials of the Gov't. & Special Interest Org. Corp Exec, Managers, Managing Prop & Supervisors	11,849	640	1,061	2,481	453	-
Professionals	244	455	3,471	15,437	330	-
Technicians & Associated Professionals	505	522	2,092	2,857	250	-
Clerks	2,307	890	5,965	6,427	415	-
Service & Shop Market Sales Workers	5,073	773	2,401	7,054	147	-
Farmers, Forestry Workers & Fishermen	156	-	-	-	49	-
Craft and Related Workers	452	525	204	6,188	656	-
Plant & Machine Operators & Assemblers	243	23,017	204	1,619	204	-
Elementary Occupations	15,832	2,937	442	15,717	522	-
Other Occupations	143	408	302	3,515	13,318	-
Occupation Not Stated	-	-	-	-	25,514	3,421

Source: NSO Census 1990

3.3.3 Education

Table 3.3.3 Household Population by Highest Educational Attainment

Highest Educational Attainment	Household Population 7 Years Old and Over	AGE GROUP						
		Below 20	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 & Over
Total	791,212	288,153	98,076	88,651	79,822	67,428	50,031	119,051
No Grade Completed	17,926	9,117	540	511	418	466	467	6,407
Pre-School	5,262	5,030	33	37	26	14	12	110
Elementary	337,405	170,699	19,923	21,511	22,725	21,481	18,912	62,154
1st - 4th Grade	155,151	107,770	3,747	3,961	4,318	4,914	5,084	25,357
5th - 7th Grade	182,254	62,929	16,176	17,550	18,407	16,567	13,828	36,797
High School	260,262	83,893	43,045	35,698	30,967	24,075	15,293	27,291
Undergraduate	114,436	58,011	14,460	10,768	9,548	7,624	4,965	9,060
Graduate	145,826	25,882	28,585	24,930	21,419	16,451	10,328	18,231
Post Secondary	19,313	1,391	4,413	4,014	3,454	2,391	1,371	2,279
Undergraduate	5,462	527	1,112	1,062	930	638	460	733
Graduate	13,851	864	3,301	2,952	2,524	1,753	911	1,546
College Undergraduate	83,621	17,095	19,411	13,092	10,515	8,562	5,911	9,035
Academic Degree Holder	65,224	297	10,319	13,478	11,458	10,276	7,942	11,454
Not Stated	2,199	631	392	310	259	163	123	321

Source: NSO Census 1990

3.4 Population
 3.4.2 Classification of Urban and Rural Areas

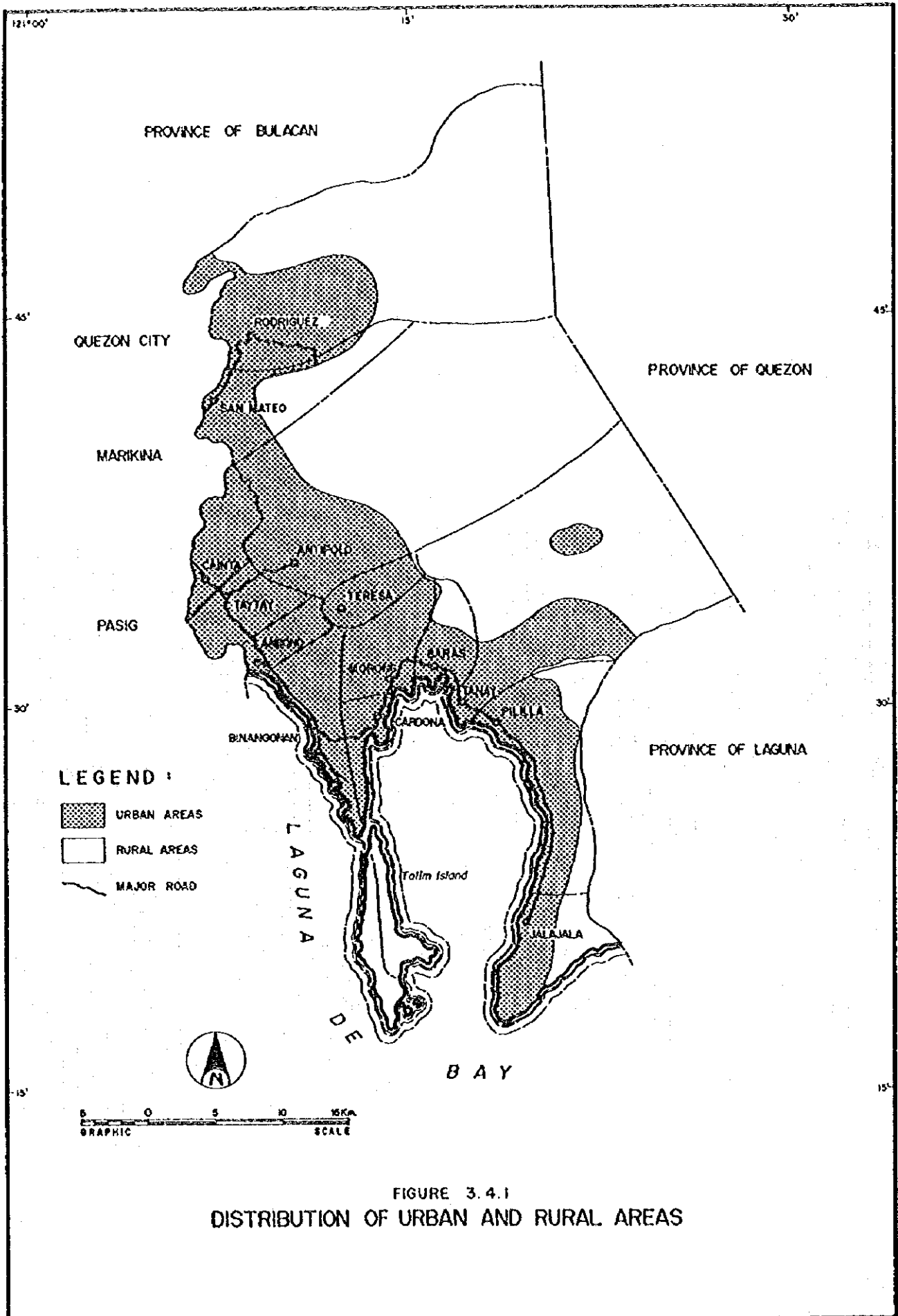


FIGURE 3.4.1
 DISTRIBUTION OF URBAN AND RURAL AREAS

3.5 Health Status

3.5.3 Health Facilities and Practitioners

Table 3.5.1 Number and Ratio of Population to Health Facilities and/or Medical Practitioners

Health Facilities	Rizal		Philippines	
	Number	Ratio	Number	Ratio
Hospitals	6	1:91675	1,733	1:35017
RHUs	29	1:18967	2,295	1:26442
BHSs	171	1:3217	10,151	1:5978
Practitioners				
Doctors	75	1:7334	7,431	1:8166
Nurses	98	1:5613	10,270	1:5909
Midwives	217	1:2535	11,604	1:5230
Dentists	22	1:25002	1,550	1:39152

3.6 Environmental Conditions

3.6.2 Water Pollution

Table 3.6.1 DENR Water Quality Criteria/Water Usage and Classification for Fresh Water

PARAMETER	UNIT	CLASS AA	CLASS A	CLASS B	CLASS C	CLASS D
Color	PCU	15	50	(C)	(C)	(C)
Temperature (max. rise in deg. Celsius)	°C rise	--	3	3	3	3
pH (range)		6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.0-9.0
Dissolved Oxygen (Minimum)	% satn	70	70	70	60	40
	mg/L	5.0	5.0	5.0	5.0	3.0
5-Day 20°C BOD	mg/L	1	5	5	7(10)	10(15)
Total Suspended Solids	mg/L	25	50			
Total Dissolved Solids	mg/L	500	1,000	--	--	1,000
Surfactants (MBAS)	mg/L	nil	0.2(0.5)	0.3(0.5)	0.5	--
Oil/Grease (Petroleum Ether Extract)	mg/L	nil	1	1	2	5
Nitrate as Nitrogen	mg/L	1	10	NR	10	--
Phosphate as Phosphorous	mg/L	nil	0.1	0.2	0.4	--
Phenolic Substances as Phenols	mg/L	nil	0.002	0.005	0.02	--
Total Coliforms	MPN/100mL	50	1,000	1,000	5,000	--
or Fecal Coliforms	MPN/100mL	20	100	200	--	--
Chloride as Cl	mg/L	250	250	--	350	--
Copper	mg/L	1	1	--	0.05	--

Notes:

Class AA - Public Water Supply Class I. Intended for waters having watersheds which are uninhabited and otherwise protected and which require only approved disinfection in order to meet the national standards for drinking water.

Class A - Public Water Supply Class II. Sources of water supply that will require complete treatment (coagulation, sedimentation, filtration and disinfection) in order to meet drinking water standards.

Class B - Recreational Water Class I. For primary contact recreation such as bathing, swimming, skin diving, etc. (particularly for tourism purposes).

Class C - Fishery Water for the propagation and growth of fish and other aquatic resources; recreational (for boating, etc.); industrial water supply class I for manufacturing processes after treatment.

Class D - For agriculture, irrigation, livestock watering, etc.; for industrial water supply class II (cooling, etc.); other inland waters by their quality, belong to this specification.

4. EXISTING FACILITIES AND SERVICE COVERAGE

4.1 Water Supply

4.1.3 Level III Systems

Table 4.1.1 Details on Existing Level III Systems

NEDA Geo- graphic Code	Municipality	Name of System (Operating Body)	Level III Services								
			Number of Barangays Served			Number of Households Served			Number of Population Served		
			Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
045801	Angono	Brgy. Council	6	0	6	544	0	544	2,744	0	2,744
		Subdivision	5	0	5	6,258	0	6,258	31,916	0	31,916
		Municipal Total	11	0	11	6,802	0	6,802	34,660	0	34,660
045802	Antipolo	MWSS	8	0	8	6,006	0	6,006	30,630	0	30,630
		Subdivision	1	0	1	23,910	0	23,910	121,941	0	121,941
		Municipal Total	9	0	9	29,916	0	29,916	152,571	0	152,571
045803	Baras	Baras WS	6	0	6	210	0	210	1,134	0	1,134
		Subdivision	1	1	2	175	978	1,153	945	5,183	6,128
		Municipal Total	7	1	8	385	978	1,363	2,079	5,183	7,262
045804	Binangonan	Brgy. Darangan Coop.	1	0	1	800	0	800	4,080	0	4,080
		Brgy. Palangoy Coop.	1	0	1	140	0	140	714	0	714
		Brgy. Pantok Coop.	1	0	1	235	0	235	1,199	0	1,199
		Mun. Gov't.	7	0	7	3,717	0	3,717	18,957	0	18,957
		Subdivision	5	0	5	1,688	0	1,688	8,609	0	8,609
Municipal Total	10	0	10	4,892	0	4,892	24,949	0	24,949		
045806	Cardona	Brgy. Boor Assn.	1	0	1	32	0	32	166	0	166
		Brgy. Calahan Assn.	1	0	1	255	0	255	1,326	0	1,326
		Brgy. Dalig Assn.	1	0	1	139	0	139	723	0	723
		Brgy. Looc Assn.	1	0	1	430	0	430	2,236	0	2,236
		Brgy. San Roque Ass.	1	0	1	294	0	294	1,529	0	1,529
		Mun. Gov't.	4	0	4	490	0	490	2,548	0	2,548
Municipal Total	9	0	9	1,640	0	1,640	8,528	0	8,528		
045205	Cainta	Subdivision	14	0	14	5,124	0	5,124	26,132	0	26,132
045808	Morong	Morong WD	4	0	4	2,465	0	2,465	12,572	0	12,572
045809	Pililla	Pililla WD	5	0	5	1,216	0	1,216	6,445	0	6,445
		Subdivision	1	0	1	70	0	70	371	0	371
Municipal Total	6	0	6	1,286	0	1,286	6,816	0	6,816		
045810	Rodriguez	MWSS	7	0	7	3,042	0	3,042	15,818	0	15,818
		Subdivision	1	0	1	986	0	986	5,127	0	5,127
Municipal Total	8	0	8	4,028	0	4,028	20,945	0	20,945		
045811	San Mateo	MWSS	9	0	9	3,514	0	3,514	17,921	0	17,921
		Subdivision	2	0	2	6,309	0	6,309	32,176	0	32,176
Municipal Total	11	0	11	9,823	0	9,823	50,097	0	50,097		
045812	Tanay	Tanay Eastern Rizal WD	10	0	10	5,060	0	5,060	26,818	0	26,818
		Subdivision	1	0	1	311	0	311	1,648	0	1,648
Municipal Total	11	0	11	5,371	0	5,371	28,466	0	28,466		
045213	Taytay	Subdivision	7	0	7	5,420	0	5,420	27,642	0	27,642
Provincial Total			107	1	108	77,152	978	78,130	395,457	5,183	400,640

Table 4.1.1 Details on Existing Level III Systems

Sheet 2

NEDA Geo- graphic Code	Municipality	Name of System (Operating Body)	Level II Services								
			Number of Public Faucets			Number of Households Served			Number of Population Served		
			Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
045801	Angono	Brgy. Council	0	0	0	0	0	0	0	0	0
		Subdivision	0	0	0	0	0	0	0	0	0
		Municipal Total	0	0	0	0	0	0	0	0	0
045802	Antipolo	MWSS	0	0	0	0	0	0	0	0	0
		Subdivision	0	0	0	0	0	0	0	0	0
		Municipal Total	0	0	0	0	0	0	0	0	0
045803	Baras	Baras WS	0	0	0	0	0	0	0	0	0
		Subdivision	0	0	0	0	0	0	0	0	0
		Municipal Total	0	0	0	0	0	0	0	0	0
045804	Binangonan	Brgy. Darangan Coop.	0	0	0	0	0	0	0	0	0
		Brgy. Palangoy Coop.	0	0	0	0	0	0	0	0	0
		Brgy. Pantok Coop.	1	0	1	5	0	5	26	0	26
		Mun. Gov't.	1	0	1	5	0	5	26	0	26
		Subdivision	0	0	0	0	0	0	0	0	0
Municipal Total	2	0	2	10	0	10	51	0	51		
045806	Cardona	Brgy. Boor Assn.	0	0	0	0	0	0	0	0	0
		Brgy. Calahan Assn.	0	0	0	0	0	0	0	0	0
		Brgy. Dalig Assn.	0	0	0	0	0	0	0	0	0
		Brgy. Loco Assn.	0	0	0	0	0	0	0	0	0
		Brgy. San Roque Ass.	0	0	0	0	0	0	0	0	0
		Mun. Gov't.	0	0	0	0	0	0	0	0	0
Municipal Total	0	0	0	0	0	0	0	0	0		
045205	Cainta	Subdivision	0	0	0	0	0	0	0	0	0
045808	Mecong	Mecong WD	1	0	1	5	0	5	26	0	26
045809	Pililla	Pililla WD	0	0	0	0	0	0	0	0	0
		Subdivision	0	0	0	0	0	0	0	0	0
		Municipal Total	0	0	0	0	0	0	0	0	0
045810	Rodriguez	MWSS	0	0	0	0	0	0	0	0	0
		Subdivision	0	0	0	0	0	0	0	0	0
		Municipal Total	0	0	0	0	0	0	0	0	0
045811	San Mateo	MWSS	0	0	0	0	0	0	0	0	0
		Subdivision	0	0	0	0	0	0	0	0	0
		Municipal Total	0	0	0	0	0	0	0	0	0
045812	Tanay	Tanay Eastern Rizal WD	6	0	6	30	0	30	159	0	159
		Subdivision	0	0	0	0	0	0	0	0	0
		Municipal Total	6	0	6	30	0	30	159	0	159
045213	Taytay	Subdivision	0	0	0	0	0	0	0	0	0
Provincial Total			9	0	9	45	0	45	236	0	236

Table 4.1.1 Details on Existing Level III Systems

Sheet 3

NEDA Geographic Code	Municipality	Name of System (Operating Body) ¹	Water Sources			Consumption			
			Type ²	Number	Production (cu. m/day)	Domestic	Institutional	Commercial	Industrial
						(cu. m/day)			
045801	Angono	Brgy. Council	DW	6	N.A.	326	0	0	0
		Subdivision	DW	1	N.A.				
		Municipal Total		7	N.A.	326	0	0	0
045802	Antipelo	MWSS	DW	1	N.A.	0	0	0	0
		Subdivision	DW	1	N.A.	0	0	0	0
		Municipal Total		2	N.A.	0	0	0	0
045803	Baras	Baras WS	DW	1	N.A.	70	0	0	0
		Subdivision	DW	1	N.A.	0	0	0	0
		Municipal Total		2	N.A.	70	0	0	0
045804	Binangonan	Brgy. Darangan Coop.	DW	1	N.A.	677	0	0	0
		Brgy. Palangoy Coop.	DW	1	N.A.	28	0	0	0
		Brgy. Pantok Coop.	DW	1	N.A.	13	0	0	0
		Mun. Gov't.	DW	1	N.A.	1,328	0	0	0
		Subdivision	DW	1	N.A.				
		Municipal Total		5	N.A.	2,045	0	0	0
045806	Cardena	Brgy. Boor Assn.	DW	1	N.A.	19	0	0	0
		Brgy. Calahan Assn.	DW	1	N.A.	171	0	0	0
		Brgy. Dalig Assn.	DW	1	N.A.	67	0	0	0
		Brgy. Looc Assn.	DW	1	N.A.	99	0	0	0
		Brgy. San Roque Ass.	DW	1	N.A.	76	0	0	0
		Mun. Gov't.	DW	1	N.A.	407	0	0	0
Municipal Total		6	N.A.	839	0	0	0		
045205	Cainta	Subdivision	DW	1	N.A.				
045808	Merong	Merong WD	DW	2	N.A.	1,883	0	0	0
045809	Pililla	Pililla WD	DW	2	1,939	931	0	0	0
		Subdivision	DW	1	N.A.	0	0	0	0
		Municipal Total		3		931	0	0	0
045810	Rodriguez	MWSS	Surf	1	N.A.	0	0	0	0
		Subdivision	DW	1	N.A.	0	0	0	0
		Municipal Total		2	N.A.	0	0	0	0
045811	San Mateo	MWSS	Surf	1	N.A.	0	0	0	0
		Subdivision	DW	1	N.A.	0	0	0	0
		Municipal Total		2	N.A.	0	0	0	0
045812	Tanay	Tanay Eastern Rizal WD	DW	5	6,926	4,183	0	0	0
		Subdivision	DW	1	N.A.				
		Municipal Total		6	6,926	4,183	0	0	0
045213	Taytay	Subdivision	DW	1	N.A.				
Provincial Total				39	6,926	10,278	0	0	0

Note: 1. Water production data are not available (N.A.) for most operating body.

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

Table 4.1.1 Details on Existing Level III Systems

Sheet 4

NEDA Geographic Code	Municipality	Name of System (Operating Body)	Consumers																			
			Domestic House Connections				Domestic Public Faucets				Institutional				Commercial				Industrial			
			Connection Metered	Connection Unmetered	Consumption (cum/day)	Consumption (cum/day)	Connection Metered	Connection Unmetered	Consumption (cum/day)	Consumption (cum/day)	Connection Metered	Connection Unmetered	Consumption (cum/day)	Consumption (cum/day)	Connection Metered	Connection Unmetered	Consumption (cum/day)	Consumption (cum/day)				
045801	Aguayo	Exec. Council Subdivision	544	0	326	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	6,236	0	326	0	0	0	0	0	0	0	0	0	0	0	0	0				
		MVWSS Subdivision	5,008	0	23,910	0	0	0	0	0	0	0	0	0	0	0	0	0				
045802	Auripob	Municipal Total	29,916	0	70	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Barras WS Subdivision	175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	385	0	70	0	0	0	0	0	0	0	0	0	0	0	0	0				
045804	Banaogonan	Exec. Directorial Coop.	800	0	677	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Exec. Palangkooy Coop.	140	0	28	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Exec. Patriot Coop.	125	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0				
045806	Cerdona	Mun. Govt. Subdivision	2,011	0	1,327	0	1	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	1,688	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Exec. Exec. Assn.	4,764	0	2,044	0	2	0	0	0	0	0	0	0	0	0	0	0				
045808	Carron	Exec. Calihan Assn.	32	0	39	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Exec. Daliz Assn.	255	0	171	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Exec. Look Assn.	139	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0				
045809	Pilla	Exec. San Roque Ass.	430	0	99	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Mun. Govt. Subdivision	294	0	76	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	497	0	407	0	0	0	0	0	0	0	0	0	0	0	0	0				
045810	Rodriguez	Municipal Total	3,640	0	839	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Subdivision	5,124	0	1,883	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	2,354	0	931	0	0	0	0	0	0	0	0	0	0	0	0	0				
045811	San Mateo	Subdivision	1,216	0	70	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	1,286	0	931	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	3,042	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
045812	Tarray	Subdivision	986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	4,028	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	3,574	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
045813	Tarray	Subdivision	6,309	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	9,821	5	4,183	0	0	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	5,060	0	311	0	0	0	0	0	0	0	0	0	0	0	0	0				
Provincial Total		Subdivision	5,420	0	4182.6	6	0	0	0	0	0	0	0	0	0	0	0	0				
		Municipal Total	5,371	0	10,277	6	0	0	0	0	0	0	0	0	0	0	0	0				
		Provincial Total	76,913	0	10,277	6	0	0	0	0	0	0	0	0	0	0	0	0				

4.1.4 Level II Systems

Table 4.1.2 Existing Level II Systems

Sheet 1

NEDA Geographic Code	Municipality	Name of System (Operating System)	Water Source		Existing Facilities				
			Type ¹	Number	Length of Transmission Line (meter)	Reservoir		Length of Distribution Line (meter)	Number of Public Faucets
						Number	Q (cu.m)		
045803	Baras	Rizal Brgy. Council	DW	1		1	4		4
045804	Binangonan	Brgy. Mambog (Coop.)	DW	1		1	4		4
045808	Morong	Brgy. San Guillermo Coop.	DW	1		1	2		2
045810	Rodriguez	Mascap Brgy. Council	SP	1	1,333	1			4
045813	Taytay	Muzon Brgy. Council	DW	1		1	38		6
Provincial Total				5	1,333	5	47	0	20

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

Sheet 2

NEDA Geographic Code	Municipality	Name of System (Operating Body)	Number of Barangays Served			Number of Households Served			Number of Population Served		
			Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
045803	Baras	Rizal Brgy. Council	1	0	1	20	0	20	108	0	108
045804	Binangonan	Brgy. Mambog (Coop.)	1	0	1	20	0	20	102	0	102
045808	Morong	Brgy. San Guillermo Coop.	1	0	2	10	0	40	51	0	51
045810	Rodriguez	Mascap Brgy. Council	0	1	1	0	20	20	0	98	98
045813	Taytay	Muzon Brgy. Council	1	0	1	30	0	30	153	0	153
Provincial Total			4	1	5	80	20	100	414	98	512

Sheet 3

NEDA Geographic Code	Municipality	Name of System (Operating Body)	Service Conditions During Dry Season								
			Supply (Hrs/day)	Dirty Water ¹	Taste/Smell ²	Supply Interruption (number/month)				Supply Water Pressure (% of Total)	
						Power Failure	Pump Breakdown	Pipe Burst	Others	Adequate	Inadequate
045803	Baras	Rizal Brgy. Council	12		G						
045804	Binangonan	Brgy. Mambog (Coop.)	12		G						
045808	Morong	Brgy. San Guillermo Coop.	8		G						
045810	Rodriguez	Mascap Brgy. Council	24		G						
045813	Taytay	Muzon Brgy. Council	24		G						

Note: 1. Dirty Water, E - Everyday, OW - Once a week, OM - Once a month, O - Occasional
2. Taste/Smell: G - Good taste, S - Salty, W - Wood taste, M - Metallic taste, O - Others.

Table 4.1.2 Existing Level II Systems

Sheet 4

NEDA Geo-Graphic Code	Municipality	Name of System (Operating Body)	Number of Staff						
			Technical Professional	Administrative Staff	Collector	Total Number of Staff	Repair Work		
							Local Trademan	MEO/CEO	DEO
045803	Baras	Rizal Brgy. Council			1	1	x		
045804	Binangonan	Brgy. Mambog (Coop.)			1	1	x		
045808	Morong	Brgy. San Guillermo Coop.			1	1	x		
045810	Rodriguez	Mascap Brgy. Council			0	0			
045813	Taytay	Muzon Brgy. Council			1	1	x		

Sheet 5

NEDA Geo-Graphic Code	Municipality	Name of System (Operating Body)	Expenditures							Tariff					Average Collection Efficiency (%)
			Annual	Wages	Fuel, Chem, Mat'l	Transport	Re-pairs	Loan Re-payment	Other	Consumer Payment	Cost per Pall	Cost per Cubic Meter	Cost Per Household	Other	
045803	Baras	Rizal Brgy. Council									2				100
045804	Binangonan	Brgy. Mambog (Coop.)									2				100
045808	Morong	Brgy. San Guillermo Coop.									5				
045810	Rodriguez	Mascap Brgy. Council													85
045813	Taytay	Muzon Brgy. Council									5				100

Sheet 6

NEDA Geo-Graphic Code	Municipality	Name of System (Operating Body)	Billings					Revenues						
			Annual Billing	Public Faucet Consumers	House Connection Consumers	Expected Subsidies	Others	Annual Income	Payment by Public Faucet Consumers	Payment by House Connection Consumer	Subsidies	Others		
													(Thousand of Pesos/year)	
045803	Baras	Rizal Brgy. Council												
045804	Binangonan	Brgy. Mambog (Coop.)												
045808	Morong	Brgy. San Guillermo Coop.												
045810	Rodriguez	Mascap Brgy. Council												
045813	Taytay	Muzon Brgy. Council												

4.1.5 Level I Facilities

Safe and Unsafe Classification of Level I Facilities

In 1993, the PHO conducted water quality analysis of samples collected from public and private Level I wells and classified into safe and unsafe sources/facilities as shown in Table 4.1.3.

Table 4.1.3 Percentage of Unsafe Water Sources by PHO

Municipality	No. of Samples Examined			Unsafe Result			
	PHC Media	Labo. Test	Total	No. of Samples			% of Unsafe
				PHC Media	Labo. Test	Total	
Antipolo	90	8	98	41	2	43	44
Baras	173	5	178	34	2	36	20
Cardona	70	0	70	12	0	12	17
Jala-Jala	145	0	145	61	0	61	42
Morong	134	20	154	63	3	66	43
Pililla	81	14	95	20	4	24	25
Rodriguez	92	0	92	12	0	12	13
San Mateo	132	21	153	19	2	21	14
Tanay	102	0	102	22	0	22	22
Teresa	151	12	163	37	2	39	24
PW4SP Study Area	1,170	80	1,250	321	15	336	27
Angono	154	3	157	39	0	39	25
Binangonan	152	0	152	42	0	42	28
Cainta	254	0	254	79	0	79	31
Faytay	301	32	333	133	15	148	44
Other Area	861	35	896	293	15	308	34
Total	2,031	115	2,146	614	30	644	30

The results of water quality analysis indicated that about 30% of existing wells as the provincial average were contaminated. Since the total number of shallow wells (553) occupied 65% of the reported number of Level I wells (846), PHO analysis results (unsafe percentages) were applied to classify all shallow wells (drilled and driven) into safe and unsafe sources.

The unsafe percentage by municipality was applied common to urban and rural areas both for drilled/driven) public and private shallow wells. While, those sources other than shallow wells were processed as classified in the questionnaire. Table 4.1.4 presents number of Level I facilities by safe and unsafe classification.

Table 4.1.4 Number of Level I Facilities by Safe and Unsafe Classification

NEDA Geographic Code	Municipality	Type	Safe Sources										Unsafe Sources										Grand Total
			Public					Private					Public					Private					
			Deep Well	Shallow Well	Covered/Improved Dug Well	Developed Spring	Sub-total	Shallow Well	Shallow Well	Total	Open Dug Well	Undeveloped Spring	Sub-total	Shallow Well	Open Dug Well	Rain Water Collector	Sub-total	Total					
045801	Aguon*	Urban	13	8	5	0	26	9	35	2	0	2	3	0	0	0	3	5					
		Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Total	13	8	5	0	26	9	35	2	0	2	3	0	0	0	3	5					
045802	Angepo	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
045803	Baras	Urban	60	0	0	1	61	3	64	0	0	0	2	0	0	0	2	2					
		Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Total	60	0	0	1	61	3	64	0	0	0	2	0	0	0	2	2					
045804	Binangonan*	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Rural	19	8	0	0	27	46	67	2	0	2	10	0	0	0	10	12					
		Total	19	8	0	0	27	46	67	2	0	2	10	0	0	0	10	12					
045805	Cainta*	Urban	40	0	0	0	40	1	41	0	0	0	1	0	0	0	1	1					
		Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Total	40	0	0	0	40	1	41	0	0	0	1	0	0	0	1	1					
045806	Cardena	Urban	16	0	0	0	16	12	28	0	0	0	5	0	0	0	5	5					
		Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Total	16	0	0	0	16	12	28	0	0	0	5	0	0	0	5	5					
045807	Jalajala	Urban	7	0	0	0	7	42	49	0	0	0	8	0	0	0	8	8					
		Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Total	7	0	0	0	7	42	49	0	0	0	8	0	0	0	8	8					
045808	Morong	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Rural	0	23	0	0	23	17	40	17	0	17	13	0	0	0	13	30					
		Total	0	23	0	0	23	17	40	17	0	17	13	0	0	0	13	30					
045809	Piliia	Urban	37	0	0	0	37	0	37	0	0	0	4	0	0	0	4	4					
		Rural	0	0	0	0	0	6	43	0	0	0	0	0	0	0	0	0					
		Total	37	0	0	0	37	6	43	0	0	0	4	0	0	0	4	4					
045810	Rodriguez	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
045811	San Mateo	Urban	9	0	0	0	9	26	35	0	0	0	4	0	0	0	4	4					
		Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Total	9	0	0	0	9	26	35	0	0	0	4	0	0	0	4	4					
045812	Tanay	Urban	9	0	0	0	9	26	35	0	0	0	4	0	0	0	4	4					
		Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Total	9	0	0	0	9	26	35	0	0	0	4	0	0	0	4	4					
045813	Taytay*	Urban	20	18	0	2	40	70	110	5	0	5	20	0	0	0	20	25					
		Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Total	20	18	0	2	40	70	110	5	0	5	20	0	0	0	20	25					
045814	Teresa	Urban	5	0	0	0	5	25	30	0	0	0	0	0	0	0	0	0					
		Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
		Total	5	0	0	0	5	25	30	0	0	0	0	0	0	0	0	0					
Provincial Total	Urban	172	38	5	4	219	168	387	12	14	2	57	0	0	0	57	71						
	Rural	108	49	0	4	161	153	314	24	24	0	52	0	0	0	52	76						
	Total	280	87	5	8	380	321	701	36	38	2	109	0	0	0	109	147						

4.1.6 Water Supply Service Coverage

Estimation of Service Coverage in Terms of Safe, Unsafe and Unserved Classification

Through the quick review of the number of water supply systems/facilities and the number of households derived from questionnaire, it was found that a great number of unserved population would be figured out as a balance between the total population and population with any level of services (including unsafe sources/facilities) in application of the service level standard for Level I and II. To come up with a more realistic service percentage/population, the unserved population in 1994 was prefixed referring to the profile in 1990 population census data, "Households by Main Source of Drinking Water and City/Municipality." Of the rest of the population, those who are not served by Level III and/or II systems were considered to be covered by shared or own use of Level I facilities. The calculation procedure is as follows:

1) Coverage by Level III and II systems

Service percentage/population by Level III and Level II systems was estimated based on the questionnaire survey results. Subdivisions not served by public water supply systems were assumed to have their own systems and their number of households was assumed to be the number of lots. (Lists of subdivisions by municipality are included in Table 4.1.3, Data Report.)

2) Unserved population

Percentage of unserved population (using undeveloped spring, lake, river, peddler, etc.) reported in the 1990 population census was assumed to be unchanged up to the present.

3) Coverage by Level I facilities

Population covered by Level I facilities were calculated as a balance figure between the total population, and the population served by Level III and II systems and the unserved population as shown in Table 4.1.5.

Due to insufficient data on number of existing Level I facilities (the official record of public wells was lost by fire at DEO of DPWH), the population covered by Level I facilities could not be classified by safe and unsafe source/facility. In this PW4SP, the percentage of unsafe results reported in PHO water quality analysis was applied to each municipality assuming that those percentages would represent as the municipal average of existing Level I facilities as shown in Table 4.1.5

It shall be noted that the PHO survey is based on random sampling to the limited number of existing wells and the above classification shall be reviewed through in depth data collection of existing Level I facilities.

Table 4.1.5 Estimation of Unserved Population by Municipality

NEDA Geographic Code	Municipality	Type	Population and Household		Served Population			Unserved Population				Population Covered by Level I			
			Number	RH Size	Level III	Level II	Total	Total No. of RHs	Number of Unserved RHs	Unservd Percentage (1990)	Unservd Population (1994)	Total	% Unsafe	Unsafe Sources	
														Pop. Served by Unsafe Facilities	Population Served by Safe Sources
045801	Angono*	Urban	54,949	5.1	34,660	0	34,660	8,941	156	2	959	19,330	25	4,833	14,497
		Rural	0	0.0	0	0	0	0	0	0	0	0	0	0	0
		Total	54,949	5.1	34,660	0	34,660	8,941	156	2	959	19,330	25	4,833	14,497
045802	Autipolo	Urban	196,303	5.1	152,571	0	152,571	29,965	4,532	15	29,689	14,043	44	6,179	7,864
		Rural	68,428	4.9	0	0	0	0	1,473	14	9,258	59,170	33	26,035	33,135
		Total	264,731	5.1	152,571	0	152,571	40,887	6,005	15	38,947	73,213	44	32,214	40,999
045803	Baras	Urban	13,291	5.4	2,079	108	2,187	2,119	180	9	1,129	9,975	20	1,995	7,980
		Rural	6,391	5.3	5,183	0	5,183	1,044	35	3	214	994	795	1,994	7,980
		Total	19,682	5.3	7,262	108	7,370	3,163	215	7	1,343	10,969	20	2,194	8,775
045804	Binangonan*	Urban	100,210	5.1	24,949	153	25,102	16,607	556	3	3,555	71,753	28	20,091	51,662
		Rural	51,967	5.5	0	0	0	7,771	42	1	281	51,686	31	14,472	37,214
		Total	152,177	5.2	24,949	153	25,102	24,378	598	3	3,636	123,439	28	34,563	88,876
045805	Cainta*	Urban	162,108	5.1	26,132	0	26,132	24,775	1,423	6	9,311	126,665	31	39,266	87,399
		Rural	0	0.0	0	0	0	0	0	0	0	0	0	0	0
		Total	162,108	5.1	26,132	0	26,132	24,775	1,423	6	9,311	126,665	31	39,266	87,399
045806	Cardona	Urban	23,528	5.2	8,528	0	8,528	4,933	89	2	483	14,517	17	2,468	12,049
		Rural	10,668	5.3	0	0	0	1,931	14	1	77	10,591	8	1,800	8,791
		Total	34,196	5.3	8,528	0	8,528	6,264	103	2	560	25,108	17	4,268	20,840
045807	Jalajala	Urban	4,861	5.3	0	0	0	892	21	2	114	4,747	42	1,994	2,753
		Rural	12,040	5.4	0	0	0	2,143	10	1	56	11,984	42	5,033	6,951
		Total	16,901	5.4	0	0	0	3,035	31	1	170	16,731	42	7,027	9,704
045808	Morong	Urban	34,361	5.1	12,572	77	12,649	6,255	0	0	0	21,713	43	9,337	12,376
		Rural	0	0.0	0	0	0	0	0	0	0	0	0	0	0
		Total	34,361	5.1	12,572	77	12,649	6,255	0	0	0	21,713	43	9,337	12,376
045809	Pala	Urban	35,092	5.3	6,816	0	6,816	6,131	319	5	1,826	26,450	25	6,613	19,837
		Rural	0	0.0	0	0	0	0	0	0	0	0	0	0	0
		Total	35,092	5.3	6,816	0	6,816	6,131	319	5	1,826	26,450	25	6,613	19,837
045810	Rodriguez	Urban	70,606	5.2	20,945	0	20,945	11,471	903	8	5,555	44,106	13	5,754	38,372
		Rural	8,073	4.9	0	98	98	1,414	419	30	2,392	5,883	13	726	4,857
		Total	78,679	5.2	20,945	98	21,043	12,891	1,322	10	7,947	49,689	13	6,460	43,229
045811	San Mateo	Urban	95,675	5.1	50,097	0	50,097	15,948	286	2	1,716	43,862	14	6,141	37,721
		Rural	723	4.7	0	0	0	131	123	94	679	44	6	6	38
		Total	96,398	5.1	50,097	0	50,097	16,079	409	3	2,395	43,906	14	6,147	37,759
045812	Tanza	Urban	56,523	5.3	28,466	159	28,625	9,241	1,594	17	9,750	18,148	22	3,993	14,155
		Rural	10,339	4.9	0	0	0	1,848	697	38	3,900	6,439	22	1,417	5,022
		Total	66,862	5.1	28,466	159	28,625	11,089	2,291	21	13,650	24,587	22	5,410	19,177
045813	Taytay*	Urban	129,433	5.1	27,642	153	27,795	21,881	2,002	9	11,842	89,796	24	21,551	68,245
		Rural	0	0.0	0	0	0	0	0	0	0	0	0	0	0
		Total	129,433	5.1	27,642	153	27,795	21,881	2,002	9	11,842	89,796	24	21,551	68,245
045814	Teresa	Urban	21,569	5.2	0	0	0	3,978	40	1	217	21,352	27	5,765	15,587
		Rural	0	0.0	0	0	0	0	0	0	0	0	0	0	0
		Total	21,569	5.2	0	0	0	3,978	40	1	217	21,352	27	5,765	15,587
Provincial Total		Urban	998,509	5.2	395,457	650	396,107	162,543	12,101	7	75,946	526,456	30	135,960	390,496
		Rural	168,629	5.1	5,183	98	5,281	27,169	2,813	10	16,857	146,491	30	49,688	96,803
		Total	1,167,138	5.2	400,640	748	401,388	189,712	14,914	8	92,803	672,947	30	185,648	487,299

4.2 Sanitation and Sewerage

4.2.2 Types of Facilities and Definition of Service Level Standard

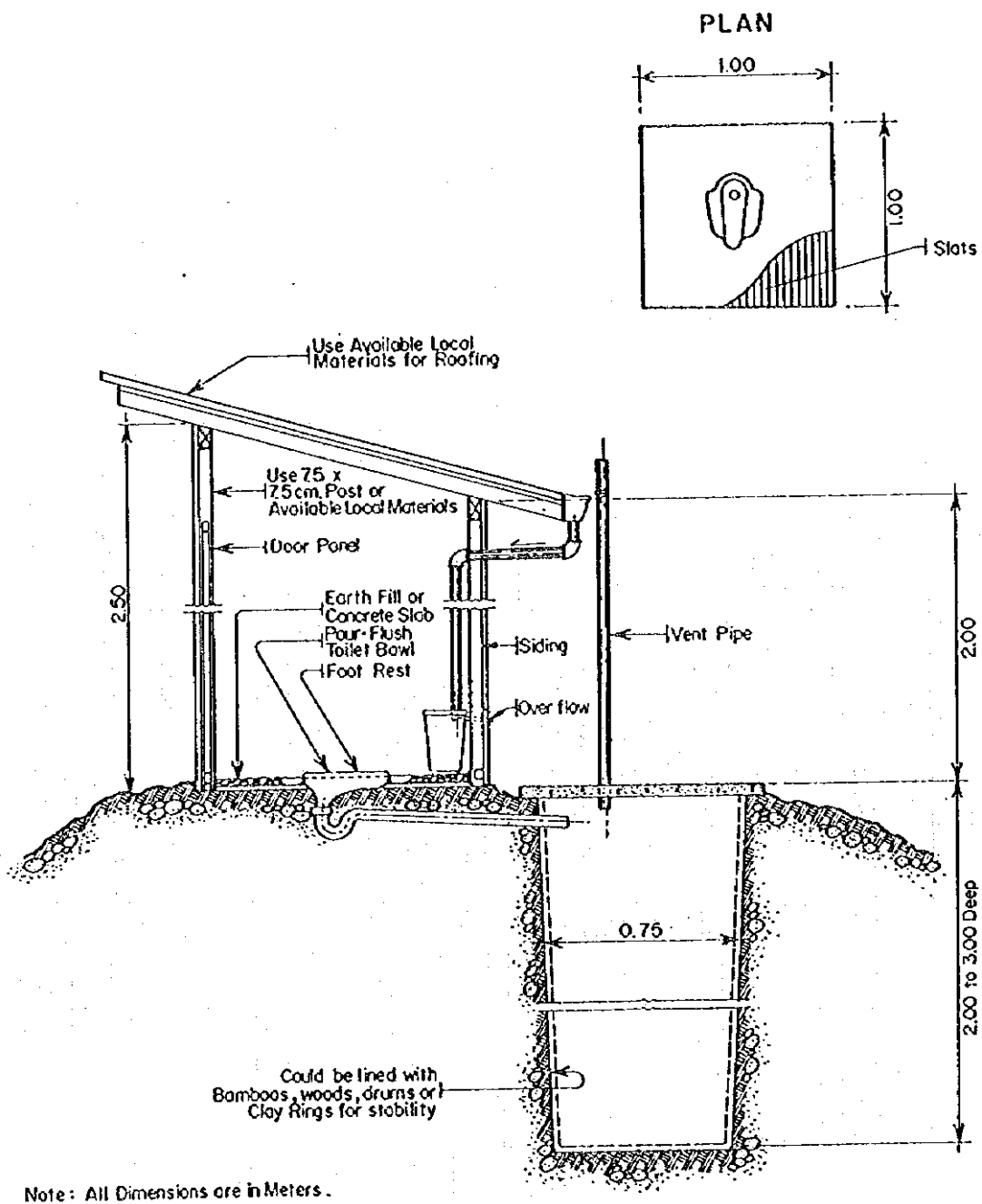
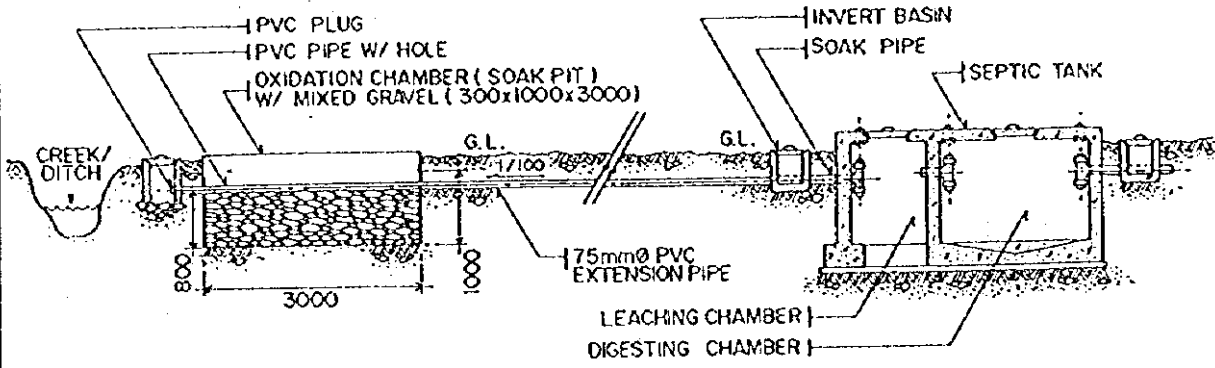
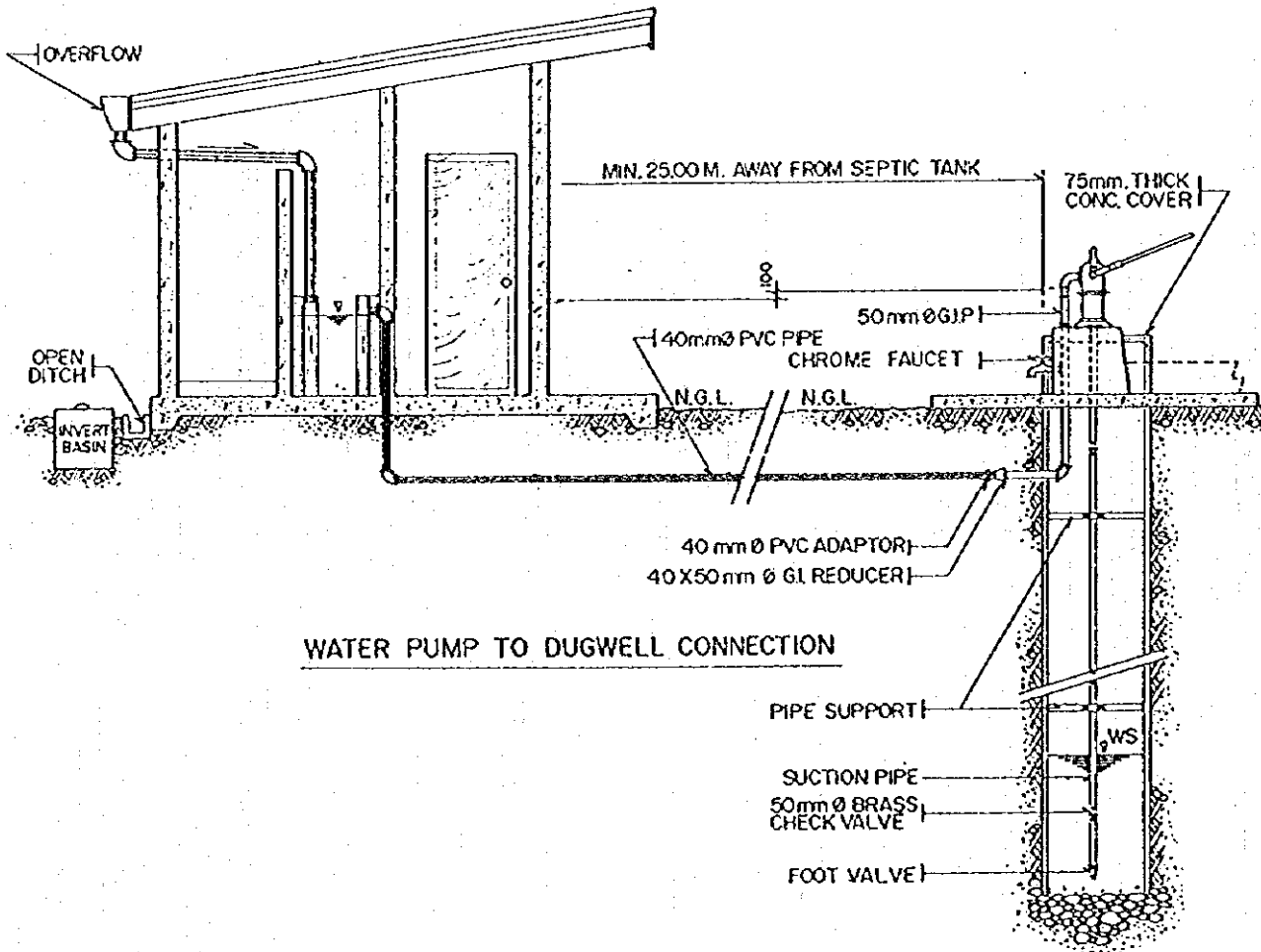


FIGURE 4.2.1
STANDARD STRUCTURE OF HOUSEHOLD TOILET FACILITY



LAYOUT PLAN OF HIGH GROUND WATER SITE



WATER PUMP TO DUGWELL CONNECTION

FIGURE 4.2.2
STANDARD STRUCTURE OF SCHOOL TOILET FACILITY

SOURCE : JICA - DPWH RURAL ENVIRONMENTAL SANITATION PROJECT .

4.2.3 Sanitation Facilities and Service Coverage

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

Municipality	Type	HHs No. 1994	Households Served by Sanitary Toilets								Underserved/Unserviced Households			
			Flush		Pour Flush		VIP		Total		Unsanitary		No Facility	
			Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Antipolo	Urban	36,051	23,933	66	2,781	8	3,549	10	30,263	84	3,093	9	2,695	7
	Rural	13,080	0	0	3,258	25	2,237	17	5,495	42	2,676	20	4,909	38
	Total	49,131	23,933	49	6,039	12	5,786	12	35,758	73	5,769	12	7,604	15
Baras	Urban	2,518	308	12	1,560	62	371	15	2,239	89	171	7	108	4
	Rural	1,234	196	16	558	45	153	12	907	74	134	11	193	16
	Total	3,752	504	13	2,118	56	524	14	3,146	84	305	8	301	8
Binangonan (Talim)	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	3,926	0	0	1,823	46	681	17	2,504	64	529	13	893	23
	Total	3,926	0	0	1,823	46	681	17	2,504	64	529	13	893	23
Cardona	Urban	4,525	1,131	25	815	18	1,539	34	3,485	77	815	18	225	5
	Rural	2,980	0	0	1,907	64	417	14	2,324	78	268	9	388	13
	Total	7,505	1,131	15	2,722	36	1,956	26	5,809	77	1,083	14	613	8
Jala-jala	Urban	917	0	0	147	16	202	22	349	38	568	62	0	0
	Rural	2,705	0	0	1,001	37	325	12	1,326	49	216	8	1,163	43
	Total	3,622	0	0	1,148	32	527	15	1,675	46	784	22	1,163	32
Morong	Urban	6,737	1,752	26	3,705	55	674	10	6,131	91	270	4	336	5
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	6,737	1,752	26	3,705	55	674	10	6,131	91	270	4	336	5
Pililla	Urban	6,621	2,715	41	132	2	1,457	22	4,304	65	1,324	20	993	15
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	6,621	2,715	41	132	2	1,457	22	4,304	65	1,324	20	993	15
Rodriguez	Urban	13,809	3,222	23	2,407	17	3,005	22	8,634	63	4,767	35	408	3
	Rural	1,676	0	0	480	29	609	36	1,089	65	72	4	515	31
	Total	15,485	3,222	21	2,887	19	3,614	23	9,723	63	4,839	31	923	6
San Mateo	Urban	19,109	7,858	41	574	3	1,975	10	10,407	54	8,177	43	525	3
	Rural	157	0	0	23	15	0	0	23	15	22	14	112	71
	Total	19,266	7,858	41	597	3	1,975	10	10,430	54	8,199	43	637	3
Tanay	Urban	11,114	4,297	39	1,671	15	2,465	22	8,433	76	2,573	23	108	1
	Rural	2,199	0	0	941	43	201	9	1,142	52	408	19	649	30
	Total	13,313	4,297	32	2,612	20	2,666	20	9,575	72	2,981	22	757	6
Teresa	Urban	4,148	0	0	3,401	82	373	9	3,774	91	245	6	129	3
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	4,148	0	0	3,401	82	373	9	3,774	91	245	6	129	3
PW4SP Study Area	Urban	105,549	45,216	42	17,193	17	15,610	15	78,019	74	22,003	21	5,527	5
	Rural	27,957	196	1	9,991	35	4,623	17	14,810	52	4,325	15	8,822	32
	Total	133,506	45,412	34	27,184	20	20,233	15	92,829	70	26,328	20	14,349	10
Angono*	Urban	10,763	5,442	51	1,110	10	1,906	18	8,458	79	1,579	15	726	7
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	10,763	5,442	51	1,110	10	1,906	18	8,458	79	1,579	15	726	7
Binangonan* (Other)	Urban	19,813	3,914	20	7,095	36	3,287	17	14,296	72	4,355	22	1,162	6
	Rural	5,324	0	0	2,800	53	875	16	3,675	69	1,279	24	370	7
	Total	25,137	3,914	16	9,895	39	4,162	17	17,971	71	5,634	22	1,532	6
Cainta*	Urban	29,670	4,099	14	14,105	48	4,811	16	23,015	78	5,439	18	1,216	4
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	29,670	4,099	14	14,105	48	4,811	16	23,015	78	5,439	18	1,216	4
Taytay*	Urban	26,293	4,336	16	14,566	55	4,506	17	23,408	89	1,631	6	1,254	5
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	26,293	4,336	16	14,566	55	4,506	17	23,408	89	1,631	6	1,254	5
Provincial Total	Urban	192,088	63,007	33	54,069	28	30,120	16	147,196	77	35,007	18	9,885	5
	Rural	33,281	196	1	12,791	38	5,498	16	18,485	55	5,604	17	9,192	28
	Total	225,369	63,203	28	66,860	30	35,618	16	165,681	74	40,611	18	19,077	8



FIGURE S.5.2
 ORGANIZATIONAL CHART
 PROVINCIAL ENGINEERS OFFICE
 PROVINCE OF RIZAL

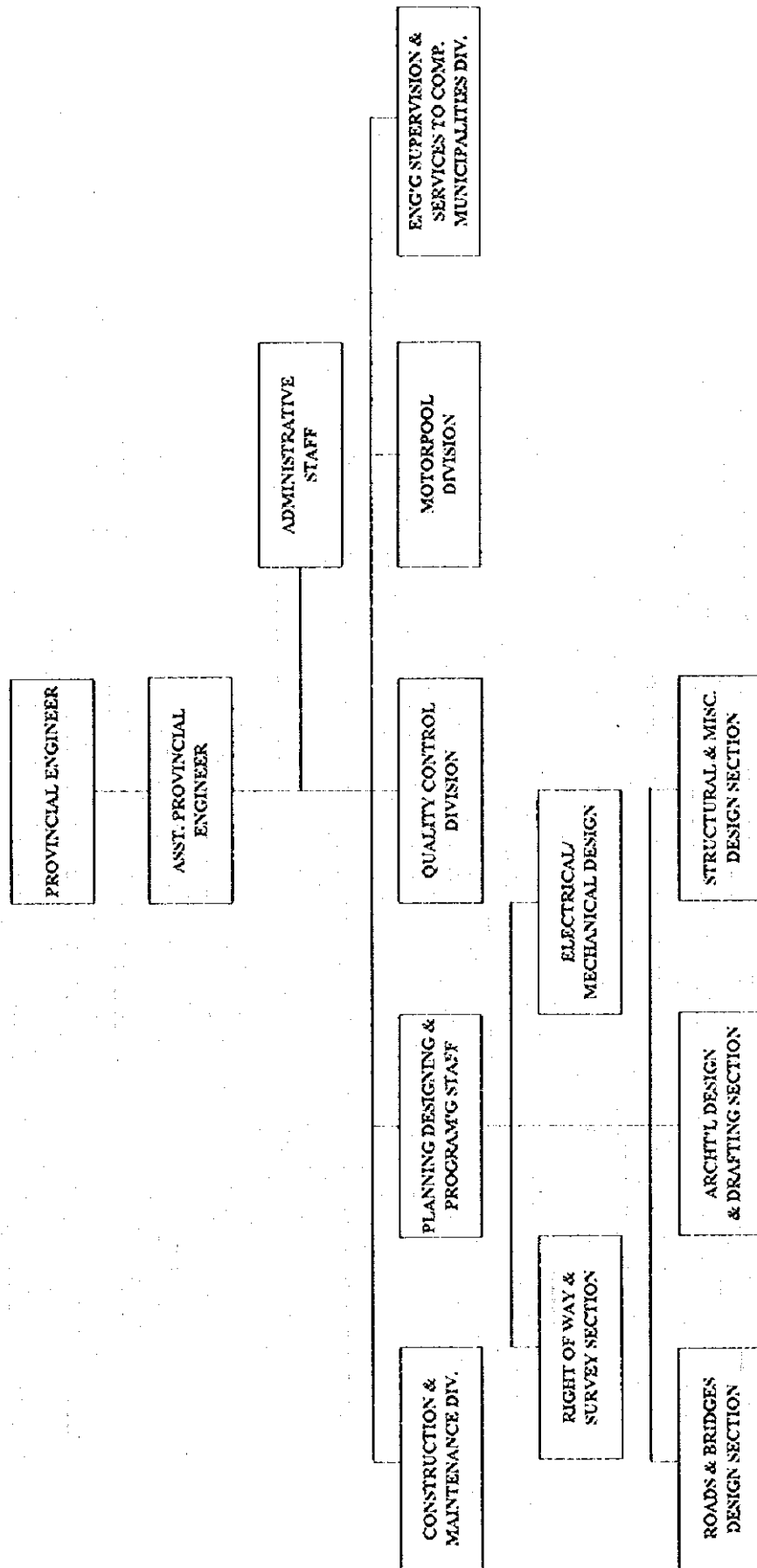
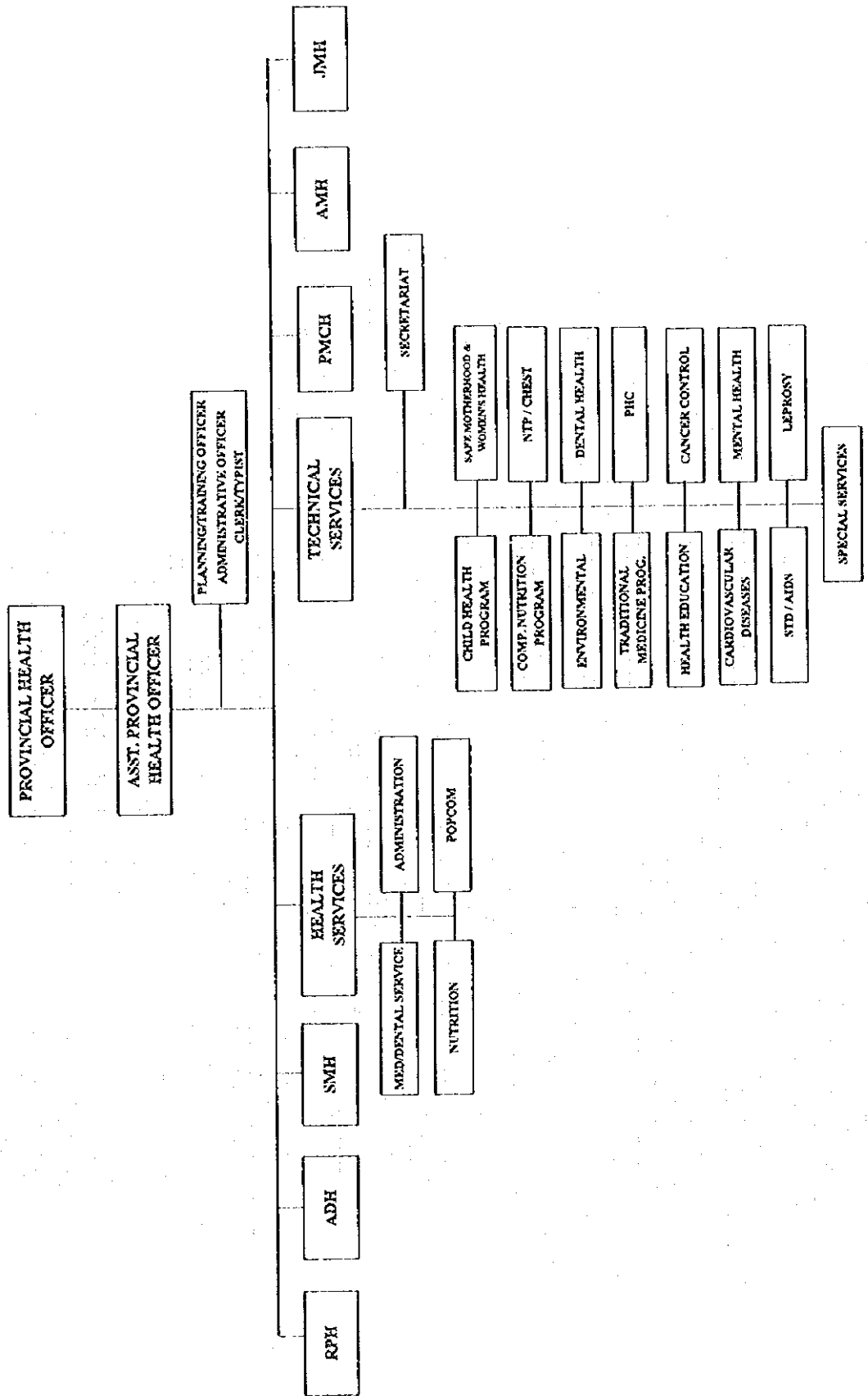


FIGURE 5.5.3
 ORGANIZATIONAL CHART
 PROVINCIAL HEALTH OFFICE
 PROVINCE OF RIZAL





6. PAST FINANCIAL PERFORMANCE IN WATER SUPPLY AND SANITATION

6.2 Past Public Investment

6.2.2 Sources of Local Fund

Table 6.2.1 Past Internal Revenue Allotment to Municipalities from Central Government

Unit: Pesos

	1990	1991	1992	1993
1. IRA to all municipalities (National total)	3,054,601,475	4,046,838,742	7,127,522,550	12,484,800,000
2. IRA to municipalities in Rizal Province				
<i>Total</i>	36,846,218	63,829,983	94,844,404	171,119,807
Angono	1,745,523	2,985,885	4,693,827	8,335,762
Antipolo	4,745,840	12,706,916	17,617,030	32,614,711
Baras	877,267	1,311,910	2,685,703	4,492,447
Binangonan	4,899,140	7,872,840	10,763,364	19,528,248
Cainta	3,538,710	7,483,107	10,159,720	18,744,192
Cardona	1,642,120	2,295,252	3,813,986	6,684,180
Jala-Jala	974,545	1,363,441	2,770,667	4,704,600
Morong	1,669,730	2,267,905	3,798,874	6,650,433
Pililla	1,666,992	2,401,855	4,064,530	7,131,357
Rodriguez	3,239,877	5,062,986	7,888,076	14,257,310
San Mateo	3,248,530	5,219,474	7,486,277	13,517,302
Tanay	2,968,367	4,352,246	6,891,683	12,357,252
Taytay	4,510,571	6,930,017	9,321,948	17,169,554
Teresa	1,119,006	1,576,149	2,888,719	4,932,459
3. Shares (%) in national total by municipality				
<i>Total</i>	1.206	1.577	1.331	1.371
Angono	0.057	0.074	0.066	0.067
Antipolo	0.155	0.314	0.247	0.261
Baras	0.029	0.032	0.038	0.036
Binangonan	0.160	0.195	0.151	0.156
Cainta	0.116	0.185	0.143	0.150
Cardona	0.054	0.057	0.054	0.054
Jala-Jala	0.032	0.034	0.039	0.038
Morong	0.055	0.056	0.053	0.053
Pililla	0.055	0.059	0.057	0.057
Rodriguez	0.106	0.125	0.111	0.114
San Mateo	0.106	0.129	0.105	0.108
Tanay	0.097	0.108	0.097	0.099
Taytay	0.148	0.171	0.131	0.138
Teresa	0.037	0.039	0.041	0.040

Sources: (1) Department of Budget and Management and (2) Bureau of Local Government Finance



7. WATER SOURCE DEVELOPMENT

7.3 Groundwater Sources

7.3.2 Groundwater Availability in the Province

(1) Major Informations and References

Groundwater Availability Map was prepared using the following major information and references.

- Administrative and Topographical Maps of the Province published by NAMRIA with scales of 1/250,000 and 1/50,000, respectively.
- Geological Map of the Philippines published by BMGS (now defunct) with a scale of 1/1,000,000.
- Groundwater Resources Survey Report of BMGS, 1983.
- Water Resource Investigation conducted by NWRB, 1986.
- Well Inventory Database prepared by NWRB, LWUA, DPWH.
- Well Inventory Database in the province.

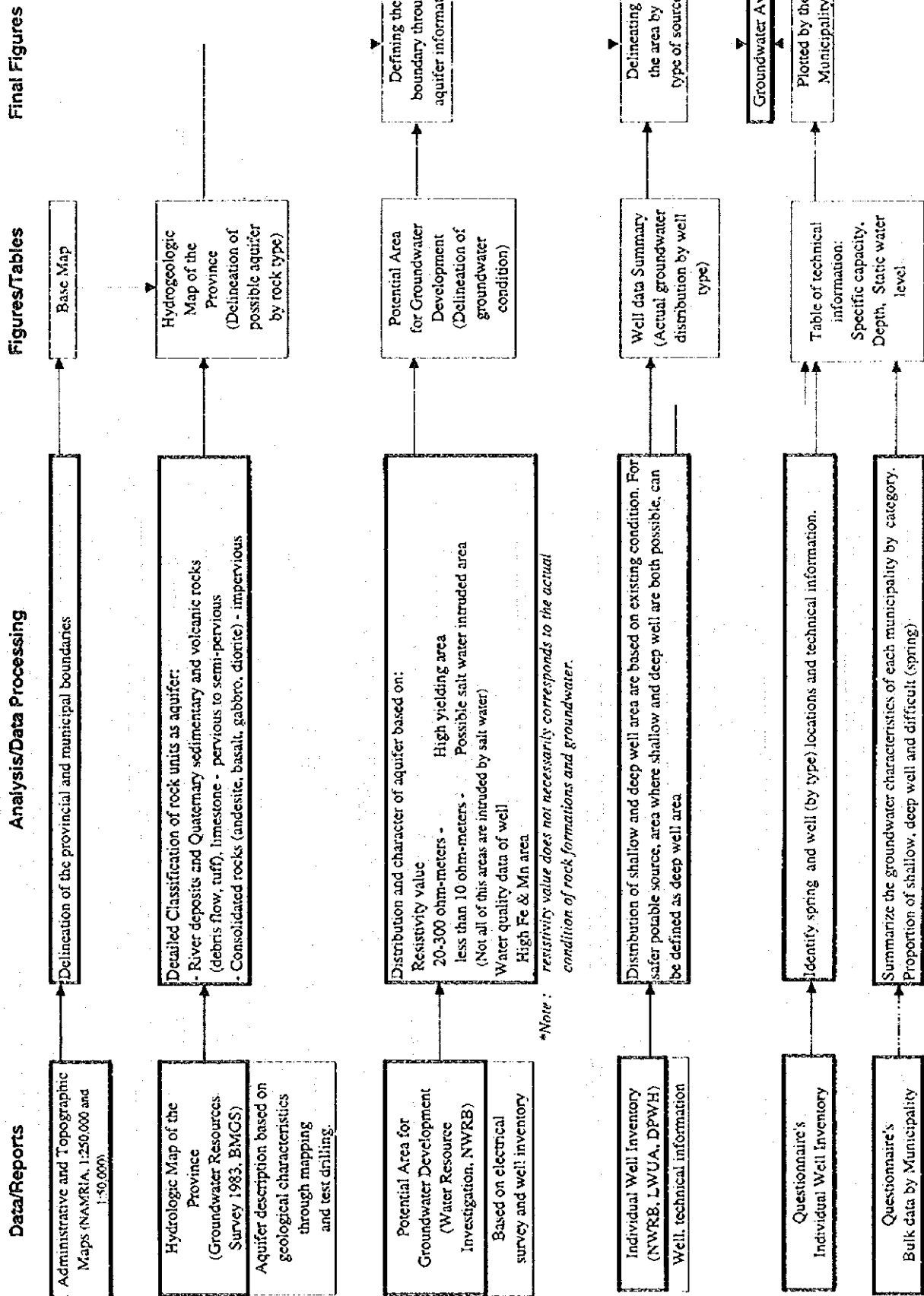
(2) Approach and Methodology

The Groundwater Availability Map was prepared according to the following work flow as presented in Figure 7.3.1.



- 1) Prepare a base map with a scale of 1:250,000 using the Administrative Map (1:250,000) and details are referred from the Topographic Map (1:50,000). Basic information including rivers and provincial/municipal boundaries are indicated on the maps.
- 2) Potential groundwater areas as identified in the Groundwater Resource Survey of BMGS is transferred to the base map. Considering the size of particles and degree of compaction of rock units, alluvial deposits, Quaternary sediments (sandstone and conglomerate) and volcanic rocks (pyroclastics, debris flow and tuff) are regarded as possible aquifers.

In addition to the defined boundaries of the areas underlain by pervious or groundwater bearing formation, difficult areas for the groundwater development are also delineated as presented in Figure 7.3.2.

Figure 7.3.1 WORK FLOW OF GROUNDWATER AVAILABILITY MAP



LEGEND :

-  GROUNDWATER POTENTIAL AREA
-  DIFFICULT AREA FOR GROUNDWATER DEVELOPMENT

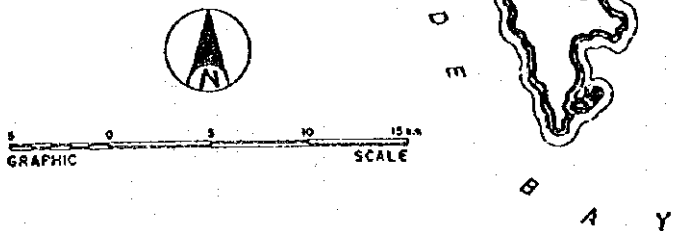


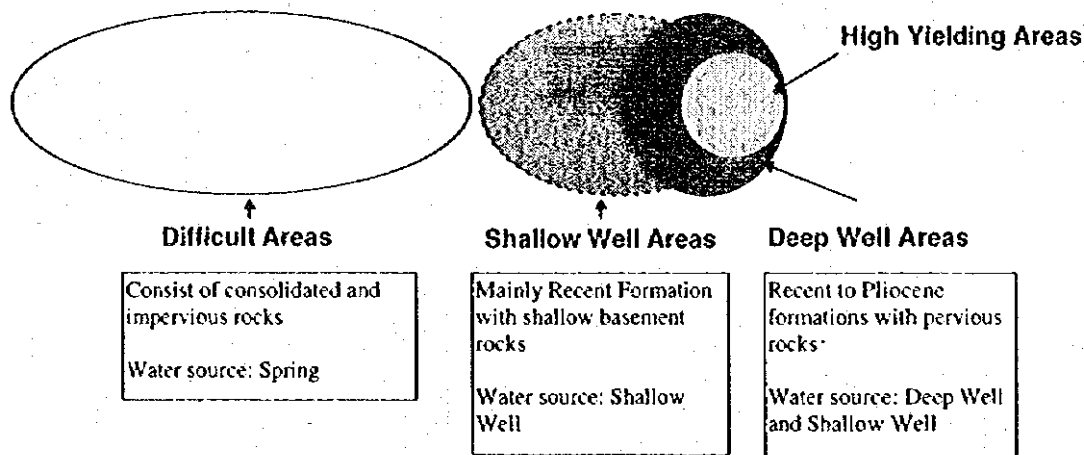
FIGURE 7.3.2
GROUNDWATER POTENTIAL AREA IN THE PROVINCE
(SOURCE : GROUNDWATER RESOURCES SURVEY , BMGS)

- 3) Areas with potential high yielding formations and with salt water intrusion problem, as established in the Water Resources Investigation of NWRB, are reflected within the area identified as potential for groundwater development.

Based on the result of geo-electric survey of the said investigation, resistivity values of 20- 300 ohm-meter are regarded as a potential high yielding formation, while values less than 10 ohm-meter as a potential zone with salty water. Figure 7.3.3. shows the boundaries between high yielding, low yielding, and salty water areas. In addition, considering the results of water quality examination of well, areas with high iron and manganese concentrations are also indicated on the map since these ions produce aesthetic effects when their allowable limits are exceeded.

- 4) Shallow and deep well areas are delineated based on the well inventory by municipality (refer to Table 7.3.1, Data Report). Figure 7.3.4 presents the categorization of areas in terms of groundwater utilization.

Figure 7.3.4 Area Category by Groundwater Utilization



Shallow well areas are defined on the following basis;

- Predominance of serviceable shallow wells and presence of deep aquifer with water quality problem and/or low yielding capacity.
- Occurrence of impervious rock beneath the Recent formation at shallow depth.

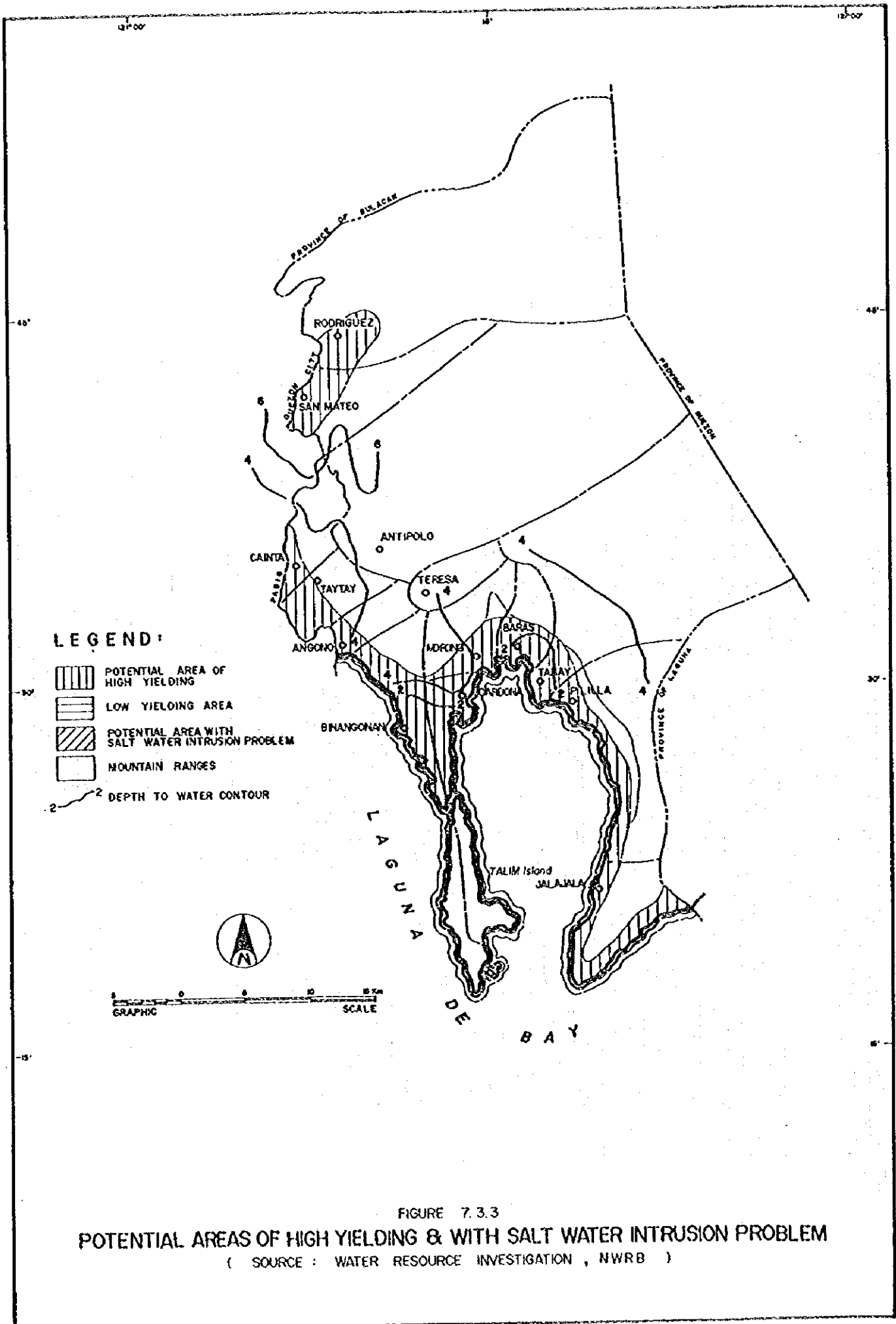


FIGURE 7.3.3
POTENTIAL AREAS OF HIGH YIELDING & WITH SALT WATER INTRUSION PROBLEM
 (SOURCE : WATER RESOURCE INVESTIGATION , NWRB)

5) Standard specifications of wells by municipality presented in the map are based on informations provided by NWRB's well inventory database and provincial database. Individual well locations with technical informations are presented in Figure 7.6.1 Data report.

(3) Manner of updating and utilization of the map

For future updating of the map, the following procedure shall be employed:

- 1) Referring to the results of any further investigation done by BMGS, NWRB or any other agencies, delineation of potential area for groundwater development may be redefined accordingly by applying the above mentioned work process.
- 2) Update the provincial database using the questionnaires to make necessary revision of the boundaries of shallow and deep well areas.

7.4 Spring Sources

Table 7.4.1 Existing Spring Sources by Municipality

Municipality	Total Number	Untapped Spring		Average Yield cu. m/hr
		Number	Percentage (%)	
Angono	0	0	0	
Antipolo	3	0	0	
Baras	0	0	0	
Binangonan	0	0	0	
Cainta	0	0	0	
Cardora	0	0	0	
Jalajala	0	0	0	
Morong	0	0	0	
Pililla	4	2	50	
Rodriguez	1	0	0	
San Mateo	0	0		
Tanay	2	1	50	
Taytay	0	0	0	
Teresa	2	2	0	
TOTAL	12	5	42	

7.5 Surface Water Sources

The water quality analysis of the two selected rivers was undertaken to determine the general characteristics of surface water in the province.

There are two groups of rivers in the province in terms of drainage shape, area, and flow rate. The first type has narrow drainage area less than 100 km² with an average discharge of less than 10 cu.m./sec and empties into the Laguna De Bay. The second type has a drainage area of more than 250 km² and average flow rate above 10 cu.m./sec. Marikina and Tanay rivers were selected for water quality analysis and discharge measurement considering their potential as source of water supply and/or recorded flow measurements. Tanay river, a typical of the first type, was selected based on its potential as water supply since a large population exists in the basin. On the other hand, Marikina river represents the second type of basin and has available flow records. Figure 7.5.1 shows the river basins in the province and Table 7.5.1 presents basic information on the selected rivers.

Table 7.5.1 River Information and Related Data

River	Drainage Area(km ²)	Flow Rate cu. m/sec.			Relevant Information in the Basin	
		Minimum	Average	Maximum	Major Mun. & Population	Water District
Marikina River	282	0.11	16.75	418.5	Rodriguez 47,435	
Tanay River	52		0.91		Tanay 38,483	Eastern Rizal

* The figure measured during sampling time.

(2) Sampling Points and Examination Procedures

Locations of sampling points at the sampled rivers are presented in Figure 7.5.1.

Water sampling was conducted on October 10, 1994 at different points across the river course. The samples were sent to MWSS laboratory within 24 hours after the sample were taken. Flow rates were also measured across the river at the same points where the samples were taken. A composite sample was prepared in proportion to flow rates.

The water quality analysis considers twelve (12) parameters performed in accordance with Philippine Standard Method for Analysis of Air and Water.

(3) Results of Water Quality Analysis

Table 7.5.2 summarizes the results of analysis (refer to Table 7.5.1 data sheets prepared by MWSS Central Laboratory Data Report). Likewise, the flow rate of Marikina river was measured to be 25.71 cu.m./sec at the time of sampling similar to its average flow rate while Tanay river has a flow rate of 0.91 cu.m./sec.

Table 7.5.2 Water Quality Analysis Results

INDICES	UNITS	Class A Water Quality criteria for Fresh Water	SAMPLE RIVER		REMARKS
			MARIKINA	TANAY	
ph		6.5-8.5	8.1	8.1	within standard
Turbidity	units		5.0	10	Tanay river exceeded NSDW
Alkalinity		-	124	177	
Color	units	50	10	15	within standard
Conductivity	ms/cm	-	282	383	
Total Hardness as Ca Co ₃	mg/l	400	116	176	within standard
Sulfate (SO ₄)	mg/l	200	15	11	within standard
Chloride (Cl)	mg/l	200	4.5	5.2	within standard
Manganese (Mn)	mg/l	0.5	0.14	0.15	within standard
Iron (Fe)	mg/l	1.0	0.68	0.78	within standard
Ammonia - Nitrogen	mg/l	-	0.15	.17	
BOD	mg/l	5.0	39.0	54.7	water pollution

Most of the indices meet Class A standard specified in the Water Quality Criteria for fresh water. However, Biochemical Oxygen Demand (BOD assumed conversion rate is BOD/COD = 1/2) of the sampled river water exceeded the 5 mg/liter limit for Class A water. Together with the presence of Ammonia-Nitrogen, the result suggests that organic pollution from wastewater discharge is underway.

7.6 Future Development Potential of Water Sources

The Groundwater Resource Survey Report (BMGS) was prepared based on the geological investigation that covered both physical and chemical characteristics of the different rock units. It revealed that majority of the provincial area is underlain by volcanic rocks, mostly andesite

in Pliocene to Pleistocene pyroclastic rocks and sediments which cover the coastal areas and the plains of Montalban and San Mateo on the west.

In the Water Resources Investigation Report by NWRB, the results of geo-resistivity sounding of 24 points were correlated with regional geology and lithologic log of existing wells to map out the sub-surface geology and groundwater conditions of different formations underlying the province. The results of georesistivity survey suggest that the volcanic formations in the province which include pyroclastics and clastic sediments are potential aquifer. In the municipalities of Binangonan, Angono, Cardona, Morong, Tanay and Pililla resistivity values from 15 to 280 ohm-meters were observed at approximate depth between 2 and 200 mbgl. Accordingly, high yielding wells are found in these areas. Likewise, the water quality of the groundwater is generally good except in the area with limestone aquifer (calcium content).

Questionnaires collected from each municipalities in the province covered 1,041 wells, while NWRB reported 441 wells. Table 7.6.1 presents well information by municipality. The municipalities of Cainta, Taytay, Binangonan, Cardona, Morong, Baras, Tanay, Pililla and Jala-jala are highly potential areas for deep well development. In these areas, the average deep wells are: 34 to 126 mbgl in depth and 3 to 34 mbgl in water level. Specific capacity ranges from 0.17 to 1.90 l/sec/m. Areas along Marikina river are also potential for deep well development with depths ranging from 115 to 131 mbgl with 8.96 to 26.53 mbgl static water level and specific capacity ranging from 0.83 to 1.19 l/sec/m. In the mountainous area, some deep wells with more than 100 mbgl in depth have specific capacity of 1.0 l/sec/m. Detailed investigation entailing test drilling, well logging, geo-resistivity testing and pumping tests are necessary to find adequate aquifers in the area.

Individual well locations and specifications are indicated in Figure 7.6.1, Data Report. Annual review and updating of these database are essential.

The standard specifications of wells are projected based on NWRB data and on the geological continuity in the province. Table 7.6.2 presents potential sources for water supply by municipality for planning purpose. Spring development may be considered in area difficult for groundwater development.

Table 7.6.1 Existing Well Sources (Province of Rizal)

Table 7.6.1 Existing Well Sources (Province of Rizal)

Municipality	Type	Number	Average		
			Depth (m)	SWL.(m)	Specific Capacity (l/sec/m)
ANGONO	Shallow Well	0			
	Deep Well	18	5.95	10.86	0.65
	Total	18	5.95	10.86	0.65
ANTIPOLO	Shallow Well	27	10.00	11.83	0.76
	Deep Well	90	114.48	15.53	0.75
	Total	117	90.37	14.67	0.75
BARAS	Shallow Well	2	12.13	2.43	
	Deep Well	15	33.86	18.12	0.19
	Total	17	31.30	16.27	0.19
BINANGONAN	Shallow Well	20	11.68	18.12	0.62
	Deep Well	56	52.77	18.12	0.65
	Total	76	41.95	18.12	0.65
CAINTA	Shallow Well	2		37.95	1.17
	Deep Well	13	151.80	33.47	1.90
	Total	15	151.80	34.07	1.81
CARDONA	Shallow Well	21	15.91	3.37	0.93
	Deep Well	20	37.76	7.40	1.90
	Total	41	26.57	5.34	1.41
JALA-JALA	Shallow Well	5	13.49	4.34	0.77
	Deep Well	10	45.33	3.64	0.64
	Total	15	34.71	3.87	0.68
MORONG	Shallow Well	9	13.01	7.12	0.93
	Deep Well	31	59.94	17.21	0.17
	Total	40	49.38	14.94	0.34
PILILLA	Shallow Well	6	11.47	3.51	0.25
	Deep Well	18	49.81	3.33	1.04
	Total	24	40.23	3.38	0.84
RODRIGUEZ	Shallow Well	4			
	Deep Well	7	131.26	26.53	0.83
	Total	11	131.26	26.53	0.83
SAN MATEO	Shallow Well	12	18.60	7.81	1.98
	Deep Well	11	114.73	8.96	1.19
	Total	23	64.57	8.36	1.60
TANAY	Shallow Well	3	15.50	0.76	1.56
	Deep Well	14	126.46	15.72	1.10
	Total	17	106.88	13.08	1.18
TAYTAY	Shallow Well	4		16.25	0.15
	Deep Well	15	117.92	29.15	1.63
	Total	19	117.92	26.43	1.32
TERESA	Shallow Well	1			
	Deep Well	7	70.44	18.29	
	Total	8	70.44	18.29	0.00
TOTAL	Shallow Well	116	13.53	6.29	0.86
	Deep Well	325	82.94	15.55	0.80
	Total	441	64.68	13.12	0.82

Table 7.6.2 Standard Specifications of Wells by Municipality

Municipality	Type	Proportion (%)	Standard Specifications			Remarks	
			Depth (m)	SAL (mg)	Specific Capacity (liters/hr)		
Aguayo*	Rural	Shallow Well	-	-	-		
		Deep Well	-	-	-		
		Spring	-	-	-		
	Urban	Shallow Well	0	0	-	0	
		Deep Well	100	50-D<100	-	0.5	C1
		Spring	0	-	-	-	
Aulaydo	Rural	Shallow Well	20	10-D<20	-	0.5	
		Deep Well	80	100-D<150	-	1	
		Spring	0	-	-	-	
	Urban	Shallow Well	0	0	-	0	
		Deep Well	100	100-D<150	-	1	
		Spring	0	-	-	-	
Baras	Rural	Shallow Well	0	0	-	0	
		Deep Well	100	100-D<150	-	2	C1
		Spring	0	-	-	-	
	Urban	Shallow Well	0	0	-	0	
		Deep Well	100	100-D<150	-	2	C1
		Spring	0	-	-	-	
Bisnagoras*	Rural	Shallow Well	0	0	-	0	
		Deep Well	100	50-D<100	-	1	C1
		Spring	0	-	-	-	
	Urban	Shallow Well	0	0	-	0	
		Deep Well	100	50-D<100	-	1	C1
		Spring	0	-	-	-	
Cajón*	Rural	Shallow Well	-	-	-	-	
		Deep Well	-	-	-	-	
		Spring	-	-	-	-	
	Urban	Shallow Well	40	15-D<20	-	1	
		Deep Well	60	50-D<100	-	2	C1
		Spring	0	-	-	-	
Cardano	Rural	Shallow Well	0	0	-	0	
		Deep Well	100	50-D<100	-	2	C1
		Spring	0	-	-	-	
	Urban	Shallow Well	0	0	-	0	
		Deep Well	100	50-D<100	-	2	C1
		Spring	0	-	-	-	
Jala Jala	Rural	Shallow Well	0	0	-	0	
		Deep Well	100	50-D<100	-	2	C1
		Spring	0	-	-	-	
	Urban	Shallow Well	0	0	-	0	
		Deep Well	100	50-D<100	-	2	
		Spring	0	-	-	-	
Miroong	Rural	Shallow Well	-	-	-	-	
		Deep Well	-	-	-	-	
		Spring	-	-	-	-	
	Urban	Shallow Well	0	0	-	0	
		Deep Well	100	100-D<150	-	1	C1
		Spring	0	-	-	-	
Pilla	Rural	Shallow Well	-	-	-	-	
		Deep Well	-	-	-	-	
		Spring	-	-	-	-	
	Urban	Shallow Well	0	0	-	0	
		Deep Well	100	100-D<150	-	2	C1
		Spring	0	-	-	-	
Rodriguez	Rural	Shallow Well	30	10-D<20	-	1	
		Deep Well	70	50-D<100	-	2	
		Spring	0	-	-	-	
	Urban	Shallow Well	20	15-D<20	-	1	
		Deep Well	80	50-D<100	-	2	
		Spring	0	-	-	-	
San Mateo	Rural	Shallow Well	60	10-D<20	-	0.5	
		Deep Well	40	50-D<100	-	1	
		Spring	0	-	-	-	
	Urban	Shallow Well	20	15-D<20	-	0.5	
		Deep Well	80	50-D<100	-	1	
		Spring	0	-	-	-	
Taray	Rural	Shallow Well	0	0	-	0	
		Deep Well	100	100-D<150	-	2	C1
		Spring	0	-	-	-	
	Urban	Shallow Well	0	0	-	0	
		Deep Well	100	100-D<150	-	2	C1
		Spring	0	-	-	-	
Taytay*	Rural	Shallow Well	-	-	-	-	
		Deep Well	-	-	-	-	
		Spring	-	-	-	-	
	Urban	Shallow Well	20	15-D<20	-	1	
		Deep Well	80	50-D<100	-	2	
		Spring	0	-	-	-	
Teresa	Rural	Shallow Well	-	-	-	-	
		Deep Well	-	-	-	-	
		Spring	-	-	-	-	
	Urban	Shallow Well	0	0	-	0	
		Deep Well	100	100-D<150	-	1	
		Spring	0	-	-	-	

* Specifications are estimated using NWRB Well Inventory Database and geological continuity of the aquifer.

Legend Depth (m): 10-D<20 Depth between 10m and 20m
 20-D<50 Depth between 20m and 50m
 50-D<100 Depth between 50m and 100m
 100-D<150 Depth between 100m and 150m

Rural Remarks: C1 Possible salt water intrusion near the water
 Fc High iron content of water
 Mn High manganese content of water

**B. FUTURE REQUIREMENTS AND
DEVELOPMENT PLAN**

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DEVELOPMENT PLAN**



8. FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT

8.2 Targets of Provincial Sector Plan

Table 8.2.1 Estimation of Base Year Service Coverage of Water Supply

Municipality	Type	Population (1994)	Population Served by 1994 Facilities				Pop. Served by Planned/ On-going Projects				Pop. Served in the Base Year (1994)				
			Level III	Level II	Level I	Total	Level III	Level II	Level I	Total	Level III	Level II	Level I	Total	% Coverage
Antipolo	Urban	196,303	152,571	0	7,854	160,435	0	0	153	153	152,571	0	8,017	160,588	82
	Rural	68,428	0	0	33,135	33,135	0	0	0	0	0	0	33,135	33,135	48
	Total	264,731	152,571	0	40,999	193,570	0	0	153	153	152,571	0	41,152	193,723	73
Baras	Urban	13,291	2,079	108	7,980	10,167	0	108	1,296	1,404	2,079	216	9,276	11,571	87
	Rural	6,391	5,183	0	795	5,978	0	0	318	318	5,183	0	1,113	6,296	99
	Total	19,682	7,262	108	8,775	16,145	0	108	1,614	1,722	7,262	216	10,389	17,867	91
Binangonan (Tahim)	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	23,453	0	0	16,802	16,802	0	143	171	314	0	143	16,973	17,116	73
	Total	23,453	0	0	16,802	16,802	0	143	171	314	0	143	16,973	17,116	73
Cardona	Urban	23,528	8,528	0	12,049	20,577	0	0	234	234	8,528	0	12,283	20,811	88
	Rural	10,668	0	0	8,791	8,791	0	0	0	0	0	0	8,791	8,791	82
	Total	34,196	8,528	0	20,840	29,368	0	0	234	234	8,528	0	21,074	29,602	87
Jala-jala	Urban	4,861	0	0	2,753	2,753	0	0	0	0	0	0	2,753	2,753	57
	Rural	12,040	0	0	6,951	6,951	0	194	0	194	0	194	6,951	7,145	59
	Total	16,901	0	0	9,704	9,704	0	194	0	194	0	194	9,704	9,898	59
Morong	Urban	34,361	12,572	77	12,376	25,025	0	0	77	77	12,572	77	12,453	25,102	73
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	34,361	12,572	77	12,376	25,025	0	0	77	77	12,572	77	12,453	25,102	73
Piliña	Urban	35,092	6,816	0	19,837	26,653	0	170	795	965	6,816	170	20,632	27,618	79
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	35,092	6,816	0	19,837	26,653	0	170	795	965	6,816	170	20,632	27,618	79
Rodriguez	Urban	70,606	20,945	0	38,372	59,317	0	0	234	234	20,945	0	38,606	59,551	84
	Rural	8,073	0	98	4,857	4,955	0	0	147	147	0	98	5,004	5,102	63
	Total	78,679	20,945	98	43,229	64,272	0	0	381	381	20,945	98	43,610	64,653	82
San Mateo	Urban	95,675	50,097	0	37,721	87,818	0	0	842	842	50,097	0	38,563	88,660	93
	Rural	723	0	0	38	38	0	0	0	0	0	0	38	38	5
	Total	96,398	50,097	0	37,759	87,856	0	0	842	842	50,097	0	38,601	88,698	92
Tamy	Urban	56,523	28,466	159	14,155	42,780	0	0	0	0	28,466	159	14,155	42,780	76
	Rural	10,339	0	0	5,022	5,022	0	0	0	0	0	0	5,022	5,022	49
	Total	66,862	28,466	159	19,177	47,802	0	0	0	0	28,466	159	19,177	47,802	71
Teresa	Urban	21,569	0	0	15,587	15,587	0	0	156	156	0	0	15,743	15,743	73
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	21,569	0	0	15,587	15,587	0	0	156	156	0	0	15,743	15,743	73
FWASP Study Area	Urban	551,809	282,074	341	168,694	451,112	0	278	3,787	4,065	282,074	622	172,480	455,177	82
	Rural	140,115	5,183	98	76,371	81,672	0	337	636	973	5,183	435	77,027	82,645	59
	Total	691,924	287,257	442	245,065	532,784	0	615	4,423	5,038	287,257	1,057	249,507	537,822	78

Table 8.2.2 Population Coverage in Phase I Provided by Served Population in the Base Year (Water Supply)

Municipality	Type	Population Served by Existing Facilities				1994		2000	
		Level III	Level II	Level I	Total	Total Population	% Coverage	Total Population	% Coverage
Antipolo	Urban	152,571	0	8,017	160,588	196,303	82	282,186	57
	Rural	0	0	33,135	33,135	68,428	48	98,365	34
	Total	152,571	0	41,152	193,723	264,731	73	380,551	51
Baras	Urban	2,079	216	9,276	11,571	13,291	87	16,735	69
	Rural	5,183	0	1,113	6,296	6,391	99	8,047	78
	Total	7,262	216	10,389	17,867	19,682	91	24,782	72
Biangonan (Talin)	Urban	0	0	0	0	0	0	0	0
	Rural	0	143	16,973	17,116	23,453	73	28,565	60
	Total	0	143	16,973	17,116	23,453	73	28,565	60
Cardona	Urban	8,528	0	12,283	20,811	23,528	88	24,862	84
	Rural	0	0	8,791	8,791	10,668	82	11,273	78
	Total	8,528	0	21,074	29,602	34,196	87	36,135	82
Jala-jala	Urban	0	0	2,753	2,753	4,861	57	5,123	54
	Rural	0	194	6,951	7,145	12,040	59	12,691	56
	Total	0	194	9,704	9,898	16,901	59	17,814	56
Morong	Urban	12,572	77	12,453	25,102	34,361	73	37,940	66
	Rural	0	0	0	0	0	0	0	0
	Total	12,572	77	12,453	25,102	34,361	73	37,940	66
Pihlla	Urban	6,816	170	20,632	27,618	35,092	79	38,884	71
	Rural	0	0	0	0	0	0	0	0
	Total	6,816	170	20,632	27,618	35,092	79	38,884	71
Rodriguez	Urban	20,945	0	38,606	59,551	70,606	84	89,702	66
	Rural	0	98	5,004	5,102	8,073	63	10,256	50
	Total	20,945	98	43,610	64,653	78,679	82	99,958	65
San Mateo	Urban	50,097	0	38,563	88,660	95,675	93	121,263	73
	Rural	0	0	38	38	723	5	916	4
	Total	50,097	0	38,601	88,698	96,398	92	122,179	73
Tanay	Urban	28,466	159	14,155	42,780	56,523	76	69,224	62
	Rural	0	0	5,022	5,022	10,339	49	12,662	40
	Total	28,466	159	19,177	47,802	66,862	71	81,886	58
Teresa	Urban	0	0	15,743	15,743	21,569	73	23,034	68
	Rural	0	0	0	0	0	0	0	0
	Total	0	0	15,743	15,743	21,569	73	23,034	68
PW4SP Study Area	Urban	282,074	622	172,481	455,177	551,809	82	708,953	64
	Rural	5,183	435	77,027	82,645	140,115	59	182,775	45
	Total	287,257	1,057	249,508	537,822	691,924	78	891,728	60

Table 8.2.3 Number of Households Served by Sanitary Toilets in the Base Year (1994)

Municipality	Area	1994		Households Using Sanitary Toilets in 1994				Recipient HUs of Planned/On-going Projects				Households Using Sanitary Toilets in Base Year (1994)							
		Population	HUs	Flush	Four Flush	VIP	Total	Flush	Four Flush	VIP	Total	Number				Coverage (%)			
												Flush	Four Flush	VIP	Total	Flush	Four Flush	VIP	Total
Antipolo	Urban	196,303	36,051	23,933	2,781	3,549	30,263	0	198	0	198	23,933	2,949	3,549	30,431	66	8	16	84
	Rural	68,428	13,080	0	3,258	2,237	5,495	0	674	0	674	0	3,932	2,237	6,159	0	30	17	47
	Total	264,731	49,131	23,933	6,039	5,786	35,758	0	842	0	842	23,933	6,881	5,786	36,600	47	14	12	74
Baras	Urban	13,291	2,518	308	1,560	371	2,239	0	9	0	9	308	1,569	371	2,248	12	62	15	87
	Rural	6,991	1,234	196	558	153	907	0	35	0	35	196	593	153	942	16	48	12	76
	Total	19,682	3,752	504	2,118	524	3,146	0	44	0	44	504	2,162	524	3,190	13	58	14	85
Binangonan (Talim)	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	23,453	3,926	0	1,823	681	2,504	0	0	0	0	1,823	681	2,504	0	46	17	64	
	Total	23,453	3,926	0	1,823	681	2,504	0	0	0	0	1,823	681	2,504	0	46	17	64	
Cardona	Urban	23,526	4,525	1,131	815	1,519	3,485	0	19	0	19	1,131	834	1,519	3,504	25	18	34	77
	Rural	10,668	2,980	0	1,907	417	2,324	0	74	0	74	0	1,581	417	2,398	0	66	14	80
	Total	34,196	7,505	1,131	2,722	1,936	5,809	0	93	0	93	1,131	2,815	1,936	5,902	15	38	26	79
Jala-jala	Urban	4,861	917	0	147	200	349	0	22	0	22	0	219	202	421	0	34	22	46
	Rural	12,040	2,705	0	1,601	325	1,926	0	100	0	100	0	1,101	325	1,426	0	41	12	53
	Total	16,901	3,622	0	1,148	527	1,675	0	172	0	172	0	1,320	527	1,847	0	36	15	51
Morong	Urban	34,361	6,747	1,752	3,705	674	6,131	0	0	0	0	1,752	3,705	674	6,131	26	55	16	91
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	34,361	6,747	1,752	3,705	674	6,131	0	0	0	0	1,752	3,705	674	6,131	26	55	16	91
Pililla	Urban	35,092	6,621	2,715	132	1,457	4,304	0	217	0	217	2,715	349	1,457	4,521	41	5	22	68
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	35,092	6,621	2,715	132	1,457	4,304	0	217	0	217	2,715	349	1,457	4,521	41	5	22	68
Rodriguez	Urban	70,606	13,809	3,222	2,407	3,005	8,634	0	79	0	79	3,222	2,486	3,005	8,713	23	18	22	63
	Rural	8,073	1,676	0	480	609	1,089	0	136	0	136	0	616	609	1,225	0	37	36	73
	Total	78,679	15,485	3,222	2,887	3,614	9,723	0	215	0	215	3,222	3,102	3,614	9,938	21	20	23	65
San Mateo	Urban	95,675	19,106	7,858	574	1,975	10,407	0	333	0	333	7,858	907	1,975	10,743	41	5	10	56
	Rural	723	157	0	23	0	23	0	134	0	134	0	157	0	157	0	100	0	100
	Total	96,398	19,266	7,858	597	1,975	10,430	0	467	0	467	7,858	1,064	1,975	10,897	41	6	10	57
Tanay	Urban	56,523	11,114	4,297	1,671	2,455	8,433	0	58	0	58	4,297	1,729	2,455	8,491	39	16	22	76
	Rural	10,339	2,199	0	941	201	1,142	0	231	0	231	0	1,172	201	1,373	0	51	9	62
	Total	66,862	13,313	4,297	2,612	2,656	9,575	0	289	0	289	4,297	2,901	2,656	9,864	32	22	20	74
Teresa	Urban	21,569	4,148	0	3,401	373	3,774	0	0	0	0	3,401	373	3,774	0	82	9	91	
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Total	21,569	4,148	0	3,401	373	3,774	0	0	0	0	3,401	373	3,774	0	82	9	91	
PW4SP Study Area	Urban	551,806	105,549	45,216	17,193	15,610	78,919	0	955	0	955	45,216	18,148	15,610	78,974	43	17	15	75
	Rural	140,115	27,537	196	9,991	4,623	14,810	0	1,384	0	1,384	196	11,375	4,623	16,194	1	41	17	58
	Total	691,921	133,506	45,412	27,184	20,233	93,829	0	2,339	0	2,339	45,412	29,523	20,233	95,168	34	22	15	71

Table 8.2.4 Number of Public School Students Served by School Toilets in Base Year (1994)

Municipality	1994 Total No. of Public School Students	Std. No. of Students that can be Served by 1994 Toilets	No. of Students to be Served by Planned/On-going Projects	Std. No. of Students that can be Served by Toilets in Base Year (1994)	Coverage (%)
Antipolo	44,724	13,850	300	14,150	32
Baras	3,070	1,400	0	1,400	46
Binangonan (Talim)	4,771	1,050	0	1,050	22
Cardona	5,311	2,100	0	2,100	40
Jala-jala	3,952	1,000	0	1,000	25
Morong	3,229	1,750	0	1,750	54
Pililla	7,546	2,650	0	2,650	35
Rodriguez	13,158	7,350	0	7,350	56
San Mateo	15,401	7,000	0	7,000	45
Tanay	14,343	4,850	0	4,850	34
Teresa	3,617	1,350	0	1,350	37
PW4SP Study Area	119,122	44,350	300	44,650	37

Table 8.2.5 Number of Public Utilities with Sanitary Toilets in the Base Year (1994)

Municipality	Type	No. of PU with Toilets in 1994	No. of PU with Sanitary Toilets in 1994	No. of PU with Toilets in Planned/ On-going Project	No. of PU with Sanitary Toilets in Planned/ On-going Projects	No. of PU with Toilets in Base Year 1994	No. of PU with Sanitary Toilets in Base year 1994	Coverage (%)
Antipolo	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
Baras	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
Binangonan (Talim)	Public Market	0	0	0	0	0	0	0
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0
Cardona	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
Jala-jala	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
Morong	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
Pililla	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
Rodriguez	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
San Mateo	Public Market	2	2	0	0	2	2	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	2	2	0	0	2	2	100
Tanay	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	1	0	0	0	1	0	0
	Total	2	1	0	0	2	1	50
Teresa	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
PW4SP Study Area	Public Market	11	11	0	0	11	11	100
	Bus/Jeep Terminal	1	0	0	0	1	0	0
	Total	12	11	0	0	12	11	92

Note: PU - Public Utilities

Table 8.2.6 Households Coverage in Phase I Provided by Existing Facilities in the Base Year (Household Toilets)

Municipality	Area	No. of Household Served by Existing Facilities				Coverage in 1994								Coverage in 2000			
		Flush	Pour Flush	VIP Latrine	Total	Served Households				Served Population		No. of Toilets	Served Households				
						No. of HHs	%	No. of HHs	%	Number	%		Flush	Pour Flush	VIP Latrine	Total	
																	Flush
Antipolo	Urban	23,933	2,949	3,549	30,431	36,051	66	8	10	84	164,875	84	55,331	43	5	0	55
	Rural	0	3,932	2,237	6,169	13,080	0	30	17	47	32,161	47	20,074	0	3	11	31
	Total	23,933	6,881	5,786	36,600	49,131	66	14	12	74	195,904	74	75,405	43	9	11	43
Baras	Urban	308	1,569	371	2,248	2,518	12	62	15	89	11,829	89	3,099	10	53	12	73
	Rural	196	593	153	942	1,234	16	48	12	76	4,857	76	1,518	13	39	10	62
	Total	504	2,162	524	3,190	3,752	13	56	14	85	16,746	85	4,617	11	47	11	69
Binangonan (Talim)	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	1,821	681	2,504	3,926	0	46	17	64	15,016	64	5,011	0	36	14	54
	Total	0	1,821	681	2,504	3,926	0	46	17	64	15,016	64	5,011	0	36	14	54
Cardona	Urban	1,331	834	1,539	3,504	4,525	25	18	34	77	18,117	77	4,781	24	17	32	74
	Rural	0	1,931	417	2,398	2,890	0	66	14	80	8,534	80	2,127	0	93	30	100
	Total	1,331	2,815	1,956	5,902	7,505	15	38	26	79	27,015	79	6,908	16	41	28	85
Jala-jala	Urban	0	219	200	421	917	0	34	22	46	2,236	46	967	0	23	21	43
	Rural	0	1,101	325	1,426	2,705	0	41	12	53	6,381	53	2,350	0	47	13	61
	Total	0	1,320	527	1,847	3,622	0	36	15	51	8,620	51	3,317	0	40	16	56
Morong	Urban	1,752	3,705	674	6,131	6,737	26	55	10	91	31,265	91	7,435	24	50	9	82
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	1,752	3,705	674	6,131	6,737	26	55	10	91	31,265	91	7,435	24	50	9	82
Puhila	Urban	2,715	349	1,457	4,521	6,621	41	5	22	68	23,863	68	7,337	37	5	20	62
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	2,715	349	1,457	4,521	6,621	41	5	22	68	23,863	68	7,337	37	5	20	62
Rodriguez	Urban	3,222	2,456	3,005	8,713	13,839	23	18	22	63	44,482	63	17,250	13	14	17	51
	Rural	0	616	699	1,225	1,676	0	37	36	73	5,873	73	2,093	0	29	29	59
	Total	3,222	3,102	3,614	9,938	15,485	21	20	23	64	50,355	64	19,343	17	16	19	51
San Mateo	Urban	7,858	907	1,975	10,740	19,109	41	5	10	56	53,578	56	23,777	33	4	8	45
	Rural	0	157	0	157	157	0	100	0	100	723	100	195	0	81	0	81
	Total	7,858	1,064	1,975	10,927	19,266	41	6	10	57	54,947	57	23,972	33	4	8	45
Tanay	Urban	4,297	1,728	2,465	8,491	11,114	30	15	22	76	42,957	76	13,061	33	13	19	68
	Rural	0	1,172	201	1,373	2,199	0	53	9	62	6,410	62	2,584	0	45	8	53
	Total	4,297	2,904	2,666	9,864	13,313	32	22	20	74	49,478	74	15,645	27	19	17	63
Teresa	Urban	0	3,421	373	3,774	4,148	0	82	9	91	13,628	91	4,430	0	77	8	85
	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	3,421	373	3,774	4,148	0	82	9	91	13,628	91	4,430	0	77	8	85
PW4SP Study Area	Urban	45,216	18,145	15,616	78,974	105,545	43	17	15	75	412,852	75	137,472	33	13	11	57
	Rural	196	11,375	4,623	16,194	27,657	1	41	17	58	79,970	58	35,952	1	32	13	45
	Total	45,412	29,523	20,239	95,168	133,506	34	22	15	71	492,823	71	173,424	26	17	12	55

Table 8.2.7 Public School Students and Public Utilities Coverage in Phase I Provided by Existing Facilities in the Base Year

Municipality	Public Schools Toilets				Public Toilets						
	Standard No. of Students that can be Served by Base Year (1994)	Coverage in 1994		Coverage in 2000		Coverage in 1994			Coverage in 2000		
		Total No. of Public School Students	%	Total No. of Public School Students	%	No. of PU with Toilets in Base Year	No. of PU with Sanitary Toilets in Base Year (1994)	%	No. of PU with Toilets	No. of PU with Sanitary Toilets	%
Antipolo	14,150	44,724	32	82,462	17	1	1	100	2	1	50
Baras	1,400	3,070	46	4,508	31	1	1	100	2	1	50
Binangonan (Talim)	1,050	4,771	22	7,251	14	0	0	0	1	0	0
Cardona	2,100	5,311	40	5,787	36	1	1	100	2	1	50
Jala-jala	1,000	3,952	25	4,335	23	1	1	100	2	1	50
Morong	1,750	3,229	54	3,804	46	1	1	100	2	1	50
Puhila	2,650	7,546	35	8,901	30	1	1	100	1	1	100
Rodriguez	7,350	13,158	56	19,565	38	1	1	100	2	1	50
San Mateo	7,000	15,401	45	23,000	30	2	2	100	3	2	67
Tanay	4,850	14,343	34	20,137	24	2	1	50	3	1	33
Teresa	1,350	3,617	37	4,012	34	1	1	100	1	1	100
PW4SP Study Area	44,650	119,122	37	183,757	24	12	11	92	21	11	52

Note: PU - Public Utilities

8.3 Projection of Frame Values

8.3.1 Population Projection

(1) Review of past population development

1) 1990 population distribution in urban and rural areas

The 1990 population census results conducted by NSO were reviewed in terms of population distribution in urban and rural areas. In application of revised classification of barangays in urban or rural category, population by municipality was adjusted as shown in Table 8.3.1.

Table 8.3.1 Population Distribution in Urban and Rural Areas

Municipality	Total Population	Census Data		Adjusted Population	
		Urban	Rural	Urban	Rural
Rizal	980,194	914,175	66,019	839,689	140,505
Antipolo	207,842	199,821	8,021	154,119	53,723
Baras	16,880	14,891	1,989	11,399	5,481
Binangonan (Talim Is.)	18,761	0	18,761	0	18,761
Cardona	32,962	32,962	0	22,679	10,283
Jala-Jala	16,318	4,693	11,625	4,693	11,625
Morong	32,165	19,482	12,683	32,165	0
Pililla	32,771	32,771	0	32,771	0
Rodriguez	67,074	60,192	6,882	60,192	6,882
San Mateo	82,310	82,310	0	81,693	617
Tanay	58,410	52,352	6,058	49,378	9,032
Teresa	20,645	20,645	0	20,645	0
PW4SP Study Area	586,138	520,119	66,019	469,734	116,404
Angono	46,014	46,014	0	46,014	0
Binangonan (Others)	108,800	108,800	0	84,699	24,101
Cainta	126,839	126,839	0	126,839	0
Taytay	112,403	112,403	0	112,403	0
Other Area	394,056	394,056	0	369,955	24,101

Note: Classification of barangays in urban and rural was arranged by PPDO.

2) Characteristics of past population development

Major statistical data of past population development are shown in Table 8.3.2.

Table 8.3.2 Past Population Development

Area	Description	Total		Urban		Rural	
		1980	1990	1980	1990	1980	1990
Region IV	Population	6,118,620	8,263,099	2,268,828	4,160,133	3,849,792	4,102,966
	Growth Rate	3.1%		6.3%		0.6%	
Rizal	Population	555,533	980,194	471,823	839,689	83,710	140,505
	Growth Rate	5.8%		5.9%		5.3%	
	Provincial Profile ^{1/}	9.1%	11.9%	20.8%	20.2%	2.2%	3.4%

Note: 1/ Provincial population percentage to regional population

During the census period from 1980 to 1990, the following population development was observed:

- The province recorded 5.8% of annual growth rate higher than that of the region at 3.1%, reflecting rapid urbanization and migration to the province as a part of Metro Manila area.
- Percentage of provincial population to the regional population increased from 9.1% in 1980 to 11.9% in 1990.

The experiences in the past population trend revealed that the province was drastically affected by the economic and population development of Metro Manila area, more than what was observed in the region. The future population may therefore remain under similar conditions as experienced in the last census decade as the outskirts residential area of the Metro Manila.

(2) Population Projection

NSO projected population for the years 2000 and 2010 broken down up to urban and rural population by municipality, base year of which is 1990. Modification of the projected population was made through the following study.

- 1) Review of NSO projection in total population and annual growth rate at regional and provincial level.
- 2) Review of the same at provincial and municipal level.
- 3) Review of population distribution to urban and rural areas at municipal level in comparison with 1990 population distribution under re-classification of barangays.

Population and its growth rates by target year both for the province and the region were confirmed to be reasonable reflecting the trend of past population development, as shown in Table 8.3.3.

Table 8.3.3 Population Projection for Target Years: Region and Province

	Population and Provincial Share in the Region			Growth Rate (%)		
	1990	2000	2010	1980 - 1990	1990 - 2000	2000 - 2010
Region IV	8,263,099	11,273,000	14,087,000	3.1	3.2	2.3
Rizal	980,194 11.9%	1,523,252 13.5%	2,117,760 15.0%	5.8	4.5	3.4

Municipal population projected by NSO for the target years is also within the range of the past population development.

Municipal population distribution to urban and rural areas for the target years was corresponding to reclassification of some barangays arranged for the year 1990. It is assumed that the profile of municipal population distribution in 1990 by urban and rural area will prevail through the future. Population for all municipalities in 1994 by urban and rural area was then projected using respective annual growth rates employed between 1990 and 2000 in the above mentioned study (base year 1990). Table 8.3.4 shows provincial population by urban and rural area for the target years.

Table 8.3.4 Provincial Population of Target Years

Area	Population/ Composition	1990	1994	2000	2010
Total	Population	980,194	1,167,138	1,523,252	2,117,760
Urban Area	Population	839,689	998,509	1,303,782	1,812,633
	Composition (%)	86%	86%	86%	86%
Rural Area	Population	140,505	168,629	219,470	305,127
	Composition (%)	14%	14%	14%	14%

Number of Households in the year 2000 was estimated by urban and rural area at each municipality based on the assumption that the household size (persons/household) given by the 1990 population census will prevail up to the year 2000, while that for the year 2010 was assumed to be 4 persons/household for the whole province in accordance with the target of the national family planning. Table 8.3.5 presents projected number of households of target years.

Table 8.3.5 Projected Number of Households by Urban and Rural Area by Municipality by Target Year

Municipality	Household Size			Number of Households											
	1990			1990			1994			2000			2010		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Antipolo	5.1	4.9	5.1	29,965	10,887	40,852	36,031	13,080	49,111	55,331	20,074	75,405	98,080	34,189	132,269
Baras	5.4	5.3	5.3	2,119	1,044	3,163	2,518	1,234	3,752	3,092	1,518	4,610	5,817	2,797	8,614
Binangonan (Talim)	0.0	5.7	5.7	0	3,267	3,267	0	3,926	3,926	0	5,011	5,011	0	9,929	9,929
Cardona	5.2	5.3	5.3	4,333	1,931	6,264	4,525	2,980	7,505	4,781	2,127	6,908	8,642	3,918	12,560
Jala-jala	5.3	5.4	5.4	892	2,143	3,035	917	2,705	3,622	967	2,350	3,317	1,781	4,411	6,192
Morong	5.1	0.0	5.1	6,255	0	6,255	6,737	0	6,737	7,439	0	7,439	13,187	0	13,187
Pihla	5.3	0.0	5.3	6,131	0	6,131	6,621	0	6,621	7,337	0	7,337	13,515	0	13,515
Rodriguez	5.2	4.9	5.2	11,477	1,414	12,891	13,809	1,676	15,485	17,250	2,093	19,343	31,128	3,565	34,743
San Mateo	5.1	4.7	5.1	15,948	131	16,079	19,109	157	19,266	23,777	195	23,972	42,148	318	42,466
Taney	5.3	4.9	5.3	9,241	1,848	11,089	11,114	2,199	13,313	13,061	2,584	15,645	24,060	4,401	28,461
Teresa	5.2	0.0	5.2	3,978	0	3,978	4,148	0	4,148	4,430	0	4,430	8,006	0	8,006
PW4SP Study Area	5.2	5.1	5.2	90,339	22,665	113,004	105,549	27,957	133,506	137,472	35,952	173,424	246,414	63,528	309,942

8.3.2 School Enrollment Projection

Table 8.3.6 Projected School Enrollment by Municipality by Target Year

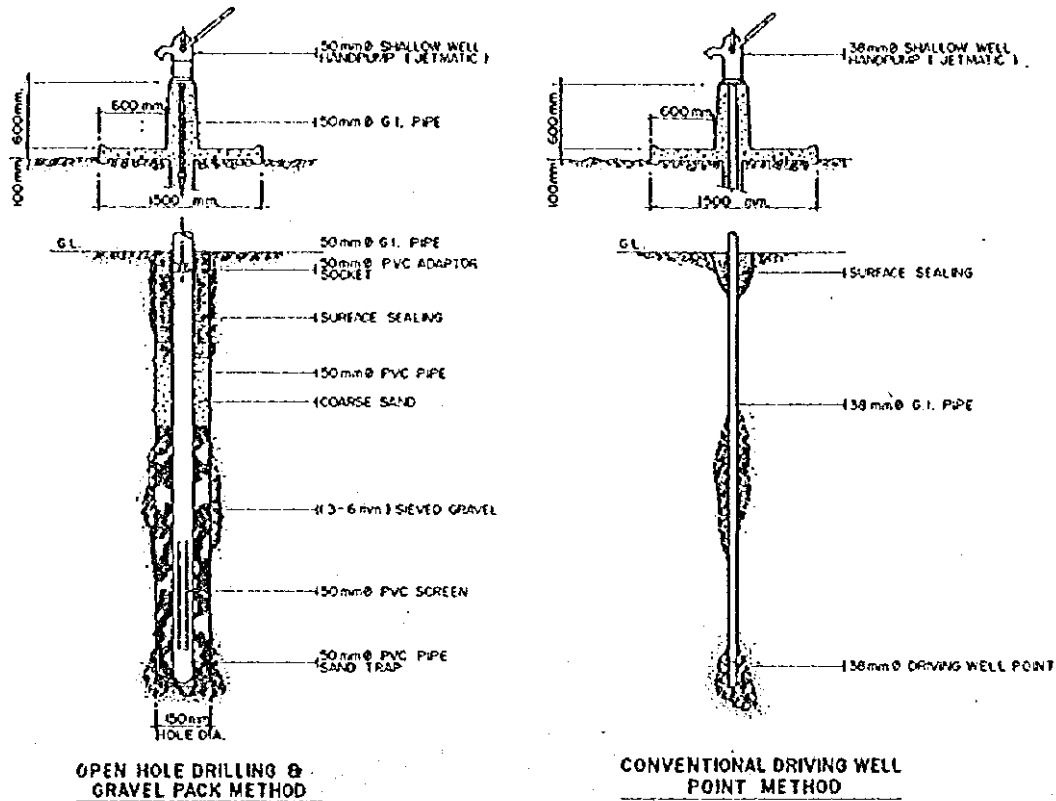
Municipality	1994					2000					2010				
	School Age Population	Total Enrollment		Public School Enrollment		School Age Population	Total Enrollment		Public School Enrollment		School Age Population	Total Enrollment		Public School Enrollment	
		Number	Participation Rate	Number	Participation Rate		Number	Participation Rate	Number	Participation Rate		Number	Participation Rate	Number	Participation Rate
Antipolo	67,228	62,103	92	44,734	67	123,078	113,232	92	82,462	67	171,114	169,493	92	128,336	75
Baras	5,118	3,910	76	3,070	60	7,513	5,710	76	4,508	60	10,446	9,401	90	6,268	60
Binangonan (Talim)	6,028	4,771	79	4,771	79	9,178	7,251	79	7,251	79	19,428	17,455	90	17,455	90
Cardona	8,507	7,368	87	5,311	62	9,326	8,114	87	5,782	62	12,566	11,669	90	7,789	60
Jala-jala	4,842	4,446	92	3,952	82	5,286	4,843	92	4,335	82	7,349	6,614	90	5,512	75
Morong	8,061	4,627	57	3,229	40	9,509	5,420	57	3,864	40	13,220	9,254	70	5,288	43
Pihilla	9,617	8,929	93	7,546	78	11,411	10,612	93	8,901	78	15,855	15,072	95	11,106	70
Rodriguez	20,514	16,161	79	13,158	64	30,574	24,151	79	19,565	64	42,503	38,253	90	27,627	65
San Mateo	24,210	22,831	94	15,401	65	35,937	33,781	94	23,000	64	49,963	48,964	98	32,476	65
Tanay	17,734	15,501	87	14,343	81	24,861	21,629	87	20,132	81	34,564	32,836	95	31,108	90
Teresa	5,367	4,055	76	3,617	67	5,968	4,551	76	4,042	67	8,325	6,244	75	6,244	75
PW4SP Study Area	177,218	154,702	87	119,122	67	272,658	237,212	87	183,757	67	385,743	365,195	95	279,230	75

8.3.3 Projection of the Number of Public Utilities

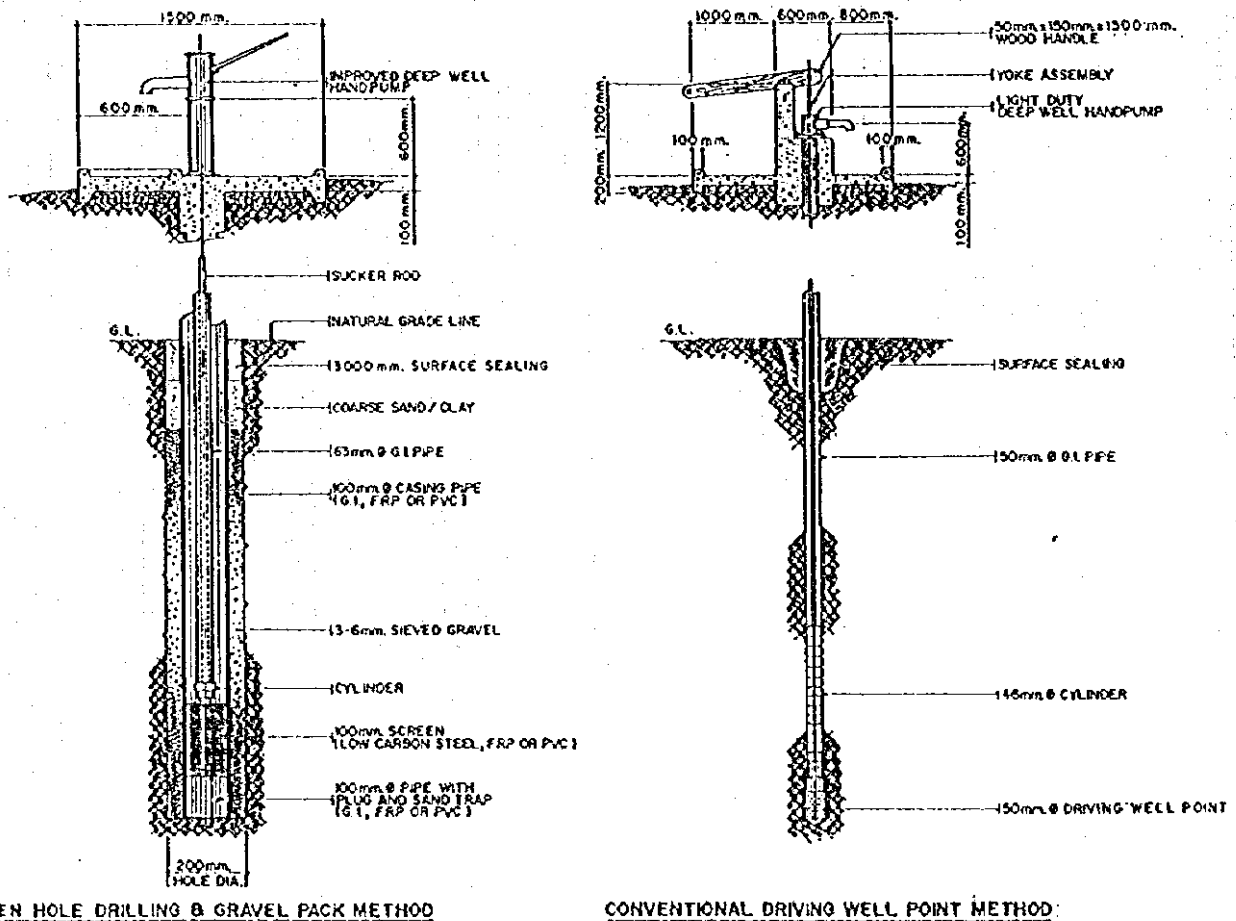
Table 8.3.7 Projected Number of Public Utilities by Municipality by Target Year

Municipality	Type	1994	2000		2010	
		No. of Public Utilities	Proposed Construction	Total	Proposed Construction	Total
Antipolo	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	0	1	1	0	1
	Total	1	1	2	0	2
Baras	Public Markets	1	1	2	0	2
	Bus/Jeep Term.	0	0	0	1	1
	Total	1	1	2	1	3
Binangonan (Talim)	Public Markets	0	1	1	0	1
	Bus/Jeep Term.	0	0	0	1	1
	Total	0	1	1	1	2
Cardona	Public Markets	1	1	2	0	2
	Bus/Jeep Term.	0	0	0	0	0
	Total	1	1	2	0	2
Jala-jala	Public Markets	1	1	2	0	2
	Bus/Jeep Term.	0	0	0	1	1
	Total	1	1	2	1	3
Morong	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	0	1	1	0	1
	Total	1	1	2	0	2
Pihilla	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	0	0	0	1	1
	Total	1	0	1	1	2
Rodriguez	Public Markets	1	1	2	0	2
	Bus/Jeep Term.	0	0	0	1	1
	Total	1	1	2	1	3
San Mateo	Public Markets	2	0	2	1	3
	Bus/Jeep Term.	0	1	1	1	2
	Total	2	1	3	2	5
Tanay	Public Markets	1	0	1	2	3
	Bus/Jeep Term.	1	1	2	1	3
	Total	2	1	3	3	6
Teresa	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	0	0	0	1	1
	Total	1	0	1	1	2
PW4SP Study Area	Public Markets	11	5	16	3	19
	Bus/Jeep Term.	1	4	5	8	13
	Total	12	9	21	11	32

8.4 Types of Facilities and Implementation Criteria
 8.4.1 Water Supply



SHALLOW WELLS



DEEP WELLS

FIGURE 8.4.1
 STANDARD STRUCTURE OF LEVEL I WELLS

FIGURE 8.4.2

