MINISTRY OF HOUSING, CONSTRUCTION AND SANITATION (MVCS)
REPUBLIC OF PERU

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THE PREPARATORY SURVEY FOR WATER SUPPLY AND SANITATION IMPROVEMENT PROJECT IN RURAL AMAZON AREA

FINAL REPORT

VOLUME I MAIN REPORT

MARCH 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

NIPPON KOEI CO., LTD.
NIPPON KOEI LATIN-AMERICA AND CARIBBEAN CO., LTD

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CONTENTS OF VOLUMES

	TITLE OF VOLUME	LANGUAGE
VOLUME I	MAIN REPORT	SPANISH ENGLISH
VOLUME II	APPENDICIES FOR MAIN REPORT	SPANISH ENGLISH
VOLUME III	OPERATION MANUAL	SPANISH ENGLISH
VOLUME IV-1	CONGLOMERATE C-1	SPANISH
VOLUME IV-2	CONGLOMERATE C-2	SPANISH
VOLUME V	SUMMERY IN JAPANESE	JAPANESE

The comments and suggestions provided until 01 Mach 2010 have been incorporated in the Final Reports.

Currency Exchange Rate
US$ 1 = JY 97.5
US$ 1 = S/. 3.00
(As of May 2009)
US$: United States Dollar
JY : Japanese Yen
S/. : Peruvian Nuevo Sol

Foreword

In response to a request from the Government of Peru, the Government of Japan decided to conduct "The Preparatory Survey For Water Supply and Sanitation Improvement Project in Rural Amazon Area" and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA dispatched a study team headed by Mr. Shinya TAKAHASHI of Nippon Koei Co., LTD. in association with Nippon Koei Latin-America and Caribbean CO., LTD during the period from March 2009 to December 2009. In collaboration with Peruvian counterparts the Study Team conducted the field survey and held a series of discussions with the officials concerned of the Government of Peru. After the Team returned to Japan, further studies were made and then the report was finally completed.

I hole that this report will contribute to the improvement of water supply and sanitation in the rural Amazon area of Peru and to the enhancement of the friendship between the two courtiers.

Finally, I whish to express my sincere appreciation to the officials concerned of the Government of Peru for their close cooperation extended to the Study Team.

March, 2010

Izumi TAKASHIMA
Vice-President
Japan International Cooperation Agency

Letter of Transmittal

March 2010

Mr. Izumi TAKASHIMA
Vice President
Japan International Cooperation Agency

We are pleased to submit to you the final report on the Preparatory Survey for the Water Supply and Sanitation Improvement Project in Rural Amazon Area.

This report, prepared according to the contract between JICA and the Consortium of Nippon Koei Co., Ltd. and Nippon Koei Latin-America and Caribbean Co., Ltd.; describes the results of the preparatory survey conducted in the Republic of Peru, during the period from March 2009 to March 2010.

This final report consists of a Main Report, a volume of Appendices for the Main Report, an Operation Manual, two volumes of F/S Report for each Conglomerate C-1 and C-2. This final report is a feasibility report prepared in compliance with the National System of Public Investment (SNIP) that has been established for evaluation of projects at pre-investment, investment and post investment stages. We hope that the final report should contribute to the early implementation of the project for the improvement of water supply and sanitation in rural Amazon area of Peru.

In closing, we would like to express our heartfelt gratitude to JICA, the Japanese Embassy in Peru, the Ministry of Foreign Affaire of Japan, other donors, and our counterpart: the Ministry of Housing, Construction and Sanitation; for their tremendous support and cooperation extended to us during the study period. We hope that the study will open up another path in deepening the close and cordial ties between the two countries.

Very truly yours

Shinya TAKAHASHI
Team Leader,
The Preparatory Survey for Water Supply and Sanitation in Rural Amazon Area in Peru,
Nippon Koei Co., Ltd.

PREPARATORY SURVEY FOR WATER SUPPLY AND SANITATION IMPROVEMENT PROJECT IN RURAL AMAZON AREA

FINAL REPORT

VOLUME I

MAIN REPORT

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ABBREVIATIONS and ACRONYM

	ENGLISH	SPANISH (Official Name)
AOM	Administration, Operation and Maintenance	
CARE-PERU	Cooperative for Assistance and Relief Everywhere - Perú	
CARITAS	Caritas International	
CEPIS	Panamerican Center for Sanitation Engineering	Centro Panamericano de Ingeniería Sanitaria
CGTS	Consultant in Social - Technical Management	Consultor en Gestión Técnico Social
CIDA	Canadian International Development Agency	
CO	Operative Consultant	Consultor Operativo
COSUDE-AGUASAN	Swiss Agency for Development and Cooperation	
CS	Supervisor Consultant	Consultor Supervisor
CTR	Resources Transfer Agreement	Convenio de Traspaso de Recursos
DGCP	General Directorate of Public Credit	Dirección General de Crédito Público
DGPM	General Directorate of Multiannual Programming of MEF	Dirección General de Programación Multianual del MEF
DGPMISP	General Directorate for Multi Year Programming of Public sector Investments	Dirección Nacional de Programación Multianual de Inversiones de Sector Público
DGPMSP	General Directorate of Multiannual Programming of Public Sector	Dirección General de Programación Multianual del Sector Público (Ex-ODI)
DIGESA	Directorate of Environmental Health	Dirección General de Salud Ambiental
DNEE	National Directorate of External Indebtedness	Dirección Nacional de Endeudamiento Externo
DNPP	National Directorate of Public Budget	Dirección Nacional de Presupuesto Público
DNS	National Directorate of Sanitation	Dirección Nacional de Saneamiento
DNT	National Directorate of Public Treasure	Dirección Nacional de Tesoro Público
DSR	Directorate of Rural Sanitation	Dirección de Saneamiento Rural
EDA	Acute Diarrheal Disease	Enfermedades Diarréicas Agudas
ENVIV	Survey of Lives Level	Encuesta de Niveles de Vida
EPS	Public Enterprises of Sanitation	Empresas Públicas de Saneamiento
ESA	Sanitation and Water Enterprise	Empresa de Saneamiento y Agua
FONCODES	Cooperation Fund for Social Development	Fondo de Cooperación para el Desarrollo Social
FONCOMUN	Municipal Compensation Fund	Fondo de Compensación Municipal
GDP	Gross Domestic Product	
GNP	Gross National Product	
GTZ	German Technical Cooperation	
IBRD	International Bank for Reconstruction and Development	
INC	National Institute of Culture	Instituto Nacional de Cultura
ICB	International Competitive Bidding	
IDB	Inter - American Development Bank	
IDH	Human Development Index	Indice de Desarrollo Humano
IEE	Initial Environmental Examination	
INEI	National Statistics and Informatics Institute	Instituto Nacional de Estadística e Informática
JASS	Sanitation Service Administration Boards	Junta Administradora de Servicios de Saneamiento
JBIC	Japan Bank for International Cooperation	
L/A	Loan Agreement	
MEF	Ministry of Economy and Finance	Ministerio de Economía y Finanzas

	ENGLISH	SPANISH (Official Name)
MINSA	Ministry of Health	Ministerio de Salud
MOP	Operation Manual	Manual de Operaciones
MVCS	Ministry of Housing, Construction and Sanitation	Ministerio de Vvienda, Construcción y Saneamiento
NGO	Non-Governmental Organization	
O&M	Operation and Maintenance	
OGA	General office of Administration	Oficina General de Administarción
OGPP	General Office of Planning and Budget	
OPI	Office of Investments Programming	Oficina de Programación de Inversiones
OTS	Technical - Social Operators	Operadores Técnico – Social
PAHO	Pan-american Health Organization	
PAS	Water Program and Sanitation	Programa de Agua y Saneamiento del Banco Mundial – Perú
PCM	Presidency of the Ministries Council	Presidencia del Consejo de Ministros
PMU	Program Management Unit	
POA	Annual Operative Plan	Plan Operativo Annual
PRONASAR	National Program of Rural Water and Sanitation	Programa Nacional de Agua y Saneamiento Rural
SANBASUR	Basic Sanitation Project in South Highland	
SEDAPAL	Water and Sewerage Service of Lima	Servicio de Agua Potable y Alcantarillado de Lima
SIAF	Integrated System of Financial Administration	Sistema Integrado de Administración Financiera
SRF	Request of Retirement of Bottoms	Solicitud de Retiro de Fondos
SUM-CANADA	World University Service of Canada	Servicio Universitario Mundial del Canadá
SUNASS	National Superintendence of Sanitation Services	Superintendencia Nacional de Servicio de Saneamiento
TOR	Terms of Reference	
UBN	Unsatisfied Basic Neeeds	
UCF	Coordination Unit of the Project of FONCODES	Unidad de Coordinación del Proyecto del FONCODES
VMCS	Vice-Ministry of Construction and Sanitation	Vice-Ministro de Construcción y Saneamiento
W&S	Water and Sanitation	
WHO	World Health Organization	
WTP	Willingness to Pay	
SNPV	Social Net Present Value	Valor Actual Neto Social
SIRR	Social Internal Return Rate	Tasa Interna de Retorno Social
ICE	Cost Effectiveness Index	Indice de Costo Efectividad

CHAPTER 1

EXECUTIVE SUMMERY

CHAPTER 1 EXECUTIVE SUMMARY

1.1 Name of the Project

Programa de Agua Potable y Saneamiento para la Amazonía Rural

Water Supply and Sanitation Improvement Project in Rural Amazon Area

1.2 Objectives of the Project

1.2.1 General Objective of the Program

The General Objective of the Program is to improve health and life quality of the rural populations of the five (5) regions of the Amazon Area: Amazonas, San Martin, Loreto, Madre de Dios y Ucayali, through the improvement of the water supply and sanitation conditions.

The Program will contribute to the reduction of water borne diseases, particularly intestinal infectious disease of children.

1.2.2 Specific Objectives of the Program

(1) Infrastructure

1) To construct, improve and/or rehabilitate water and sanitation facilities

(2) Capacity Building

1) To enhance the awareness of the beneficiaries to be served on the value of the water and sanitation services, through participatory processes to be implemented during the project cycle;

2) To strengthen the capacity of community organizations, such as Sanitation Services Administrative Boards (JASS: *Junta Administrativa de Servicios de Saneamiento*) of the localities, for administration, operation and maintenance of the facilities to be provided;

3) To provide hygiene education to the beneficiaries;

4) To strengthen the capacity of the district municipalities for them to: (i) monitor and supervise the water supply and sanitation services of; and (ii) provide technical assistance and support to; the community organizations such as JASSs.

(3) Consulting Services

1) To provide consulting services for the implementation of the Program by preparing the pre-investment studies (*Perfils*) and project files (detailed design studies); providing support and advice to PMU; supervising the constructions works, and others;

2) To strengthen the “Water for All Program” (PAPT: *Programa Agua para todos)* for the execution, management and evaluation of the Program;

3) To provide technical assistance to the PAPT in the evaluation of the *perfils* and the project files (detailed design studies).

1.3 Formulation of Conglomerate

For the formation of conglomerates, criteria such as (a) Geographical region, (b) Locality size by population, (c) Present coverage of water supply and sanitation and (d) Average family income were considered. As the result, (a) Geographical region was selected as the criteria.

- Conglomerate C-1: Localities situated in the Low Forest geographical region,
- Conglomerate C-2: Localities situated in the High Forest and the Front Forest geographical regions,

1.4 Supply Demand Balance of the Goods and Services of the PIP

1.4.1 Design Criteria for the Projects of the Program

The design criteria shall respond to the strategies established by the National Sanitation Plan (*Plan Nacional de Saneamieto 2006 - 2015)*, and shall comply with the policies and strategies of intervention in small localities and the rural area agreed between the Ministry of Housing, Construction and Sanitation (MVCS: *Ministerio de Vivienda Construcción y Saneamineto)* and the Cooperation Agencies[1].

1.4.2 Design Parameter

The values recommended by the Norms of Design of Water and Sanitation Facilities for Rural Populated Centers[2] as shown in Table N° 1.4.2-1 were considered as guideline values.

Table N° 1.4.2-1: Major Design Parameters

Parameter	With Latrines	With Existing Sewerage System
Unit Consumption	80 l/h/d	140 l/h/d
Continuity of Service	12-24 hours	24 hours
Coverage	90%	90%

Source: JICA Study Team (2010), based on the "Norms of Design" Project, currently used by PRONASAR

1.4.3 Projection of Population Growth

To project the population growth in each administrative region of the Program, the Feasibility Study used the population census of 1993 and 2007 of the National Institute of Statistics and Information (INEI: *Instituto Nacional de Estadística e Informática).* With the growth rates obtained by geographical and administrative regions, the population for the period 2008-2030 was projected, with an adjustment by a lineal regression analysis for the case of average growth rate above 2.0%. The projected populations are as shown in Table N° 1.4.3-1.

[1] Ayuda Memoria de Reunión de Trabajo entre VMCS, DNS, BID, BIRF y JICA. (March, 2009)
[2] "Norms of Design" being used by PRNASAR was provided by DNS as the guideline (year proposed not given in the document)

Table N° 1.4.3-1: Population Projection by Program Conglomerate

Year	Conglomerate		Total
	C-1	C-2	
2010	401,721	268,021	669,742
2011	**406,342**	**272,360**	**678,702**
2020	**448,352**	**314,823**	**763,175**
2030	494,997	369,302	864,299

Source: JICA Study Team (2010)

1.4.4 Potable Water Coverage

The coverage of potable water supply for the Program localities has been defined by projecting the coverage based on the results of the 2007 Census; with correction by the results of the diagnosis by the present Study in 50 sample localities. The adjusted potable water coverage is shown in the Table N° 1.4.4-1.

Table N° 1.4.4-1: Coverage of the Water Systems - 2007 Census- Corrected

Description	Front Forest	High Forest	Low Forest	Total
Public network of water – 2007 Census	24%	31%	20%	23%
Effective Coverage – 2007 (after correction)	12%		7%	9%

Source: JICA Study Team (2010)

The Program foresees to reach 85% of coverage by the year 2020 in the localities of both conglomerates. For the period between the years 2021 and 2030, an increase of the coverage up to 90% was considered as the result of the incorporation of new users to the systems that will have already been installed by that time. The water supply coverage until the year 2030 was estimated as shown in the Table N° 1.4.4-2.

Table N° 1.4.4-2: Water Coverage during the Design Period

Potable Water	Year	Population	Coverage (%)	Served Population	incremental Served Population
Conglomerate C-1	2010	401,721	9%	36,155	-
	2030	494,997	90%	445,497	**409,342**
Conglomerate C-2	2010	268,021	14%	37,523	
	2030	369,302	90%	332,372	**294,849**
				Total	**704,191**

Source: JICA Study Team (2010)

1.4.5 Sanitation Coverage

Present coverage of sanitation was estimated taking into consideration the information of the 2007 Census together with the results of the field diagnosis conducted in the 50 sample localities by this Study. The adjusted sanitation coverage is as shown in the Table N° 1.4.5-1.

Table N° 1.4.5-1: Sanitation Coverage for the Design Period

Sanitation	Year	Population	Coverage (%)	Served Population (inhab.)	Incremental Served population (inhab.)
Conglomerate C-1	2010	401,721	5%	20,086	-
	2020	448,352	80%	358,682	**338,596**
Conglomerate C-2	2010	268,021	18%	48,244	-
	2020	314,823	80%	251,858	**203,614**
Source: JICA Study Team (2010)				**Total**	**542,210**

1.5 Technical Description of the Program

1.5.1 Selected Alternatives for the 50 Sample Localities of Program

(1) Water Supply Systems

On the basis of the field survey in the 50 sample localities, water supply systems were proposed. The Table N° 1.5.1-1 shows that majority (82%) of the water supply system in Conglomerate C-1 is "pumping system/facility" of either motorized pump or manual pump; whereas more than 95% of the proposed water supply systems in Conglomerate C-2 is "gravity system". The result clearly indicates the typical characteristics/differences of the Conglomerate C-1 and C-2.

Table N° 1.5.1-1: Proposed Water Supply Systems for the 50 Sample Localities

System	Water Treatment	Code	Conglomerate C-1		Conglomerate C-2						Total	
			Low Forest		High Forest		Front Forest		Total			
Gravity	With Treatment	G-W-T	3	11%	6	50%	7	78%	13	62%	16	33%
Gravity	Without Treatment	G-WO-T	2	7%	5	42%	2	22%	7	33%	9	18%
Pumping	Without Treatment	P-WO-T	14	50%	1	8%	0	0%	1	5%	17	35%
Manual Pumping	Without Treatment	M-P	9	32%	0	0%	0	0%	0	0%	7	14%
Total			**28**	**100%**	**12**	**100%**	**9**	**100%**	**21**	**100%**	**49**	**100%**

Note: One water supply system was proposed to certain two localities out of the 50 sample localities, resulting to a total 49 facilities for 50 localities. Source: JICA Study Team (2010)

(2) Sanitation Systems

The summary of the proposed solutions for the sanitation is as shown in Table N° 1.5.1-2.

Table N° 1.5.1-2: Sanitation Systems Proposed for the Sample Localities

Facility/system	Conglomerate C-1		Conglomerate C-2						Total(*)	
	Low Forest		High Forest		Front Forest		Subtotal			
Dry Pit Latrine	9	33%	7	58%	5	56%	12	57%	21	44%
Composting Latrine	13	48%	0	0%	0	0%	0	0%	13	26%
Dry Pit + Composting Latrine	3	11%	2	17%	1	11%	3	14%	6	13%
Sewerage	1	4%	2	17%	3	33%	5	29%	6	13%
Sewerage + Dry Pit L.	1	4%	1	8%	0	0%	1	5%	2	4%
Total	**27**	**100%**	**12**	**100%**	**9**	**100%**	**21**	**100%**	**48**	**100%**

Source: JICA Study Team (2010)

1.5.2 Proposed Water Supply Systems for the Program

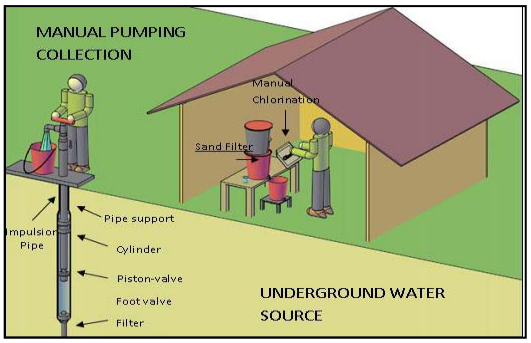
Based on the field survery conducted in the 50 sample localities the following technical solutions were proposed for the Program.

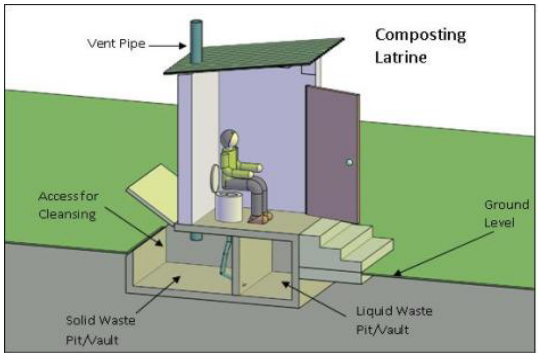
(1) Gravity System

(2) Pumping System

(3) Individual Solution

The proposed technical options for water supply will not exclude other possible options, which are to be determined for particular conditions as, for instances, rain water collection, intra-house treatment, solar disinfection or others.





1.5.3 Proposed Sanitation Solutions

(1) Ventilated Dry Pit Latrine

(2) Double-vault Ventilated Composting Latrine

(3) Collective Solution (sewerage network).

1.5.4 Program Components

The Study considers that the Program should consist of three (3) components, as shown in Table Nº 1.5.4-1.

Table Nº 1.5.4-1: Summary of Program Components

Component	Definition	Scope

Component-1	Conglomerate C-1
	Localities in Low Forest
		• Construction or rehabilitation/extension of system/facility
		• Soft Component
		• Consultant Services
		  • Development of *Perfils*
		  • Development of technical files (detailed designs)
		  • Development of various manuals
		  • Supervision of works
		  • Evaluation of *Perfils*, technical files (detailed designs) and various manuals

Component-2	ConglomerateC-2 Localities in High Forest, Front Forest	
Component-3	Program Administration	• Management, monitoring, and evaluation of Program in all project cycle stages and execution phases directed by PMU-PAPT • Support for and strengthening of PMU

Source: JICA Study Team (2010)

1.6 Costs of the Project

The total cost of the Water and Sanitation Improvement Project for the Rural Amazon will be 507.2 million US dollars, including 19% of Value Added Tax (VAT). This is equivalent to S/. 1,521.566 million (JPY 49,451 million). These amounts are shown in Table Nº 1.6-1, and the exchange rates are indicated on the second page of the present report.

Table Nº 1.6-1 Summary of Program Costs for the Water and Sanitation Project for the Rural Amazon
(Expressed in Thousands of Price Units at Exchange Rates in May 2009)

Item	Description	Total			
		Nuevos Soles	JPY	USD	%
1)	**Component 1 – Conglomerate C-1**	**816,735**	**26,543,890**	**272,245**	**53.7%**
1.1	Water Infrastructure	316,783	10,295,449	105,594	20.8%
1.2	Sanitation Infrastructure	159,272	5,176,333	53,091	10.5%
1.3	Soft-component implementation (implementation stage)	82,359	2,676,652	27,453	5.4%
1.4	*Perfils* (Water and Sanitation)	52,930	1,720,223	17,643	3.5%
1.5	Detailed Design of Works and Soft-component (Water and Sanitation)	85,345	2,773,723	28,448	5.6%
1.6	Advisory and Supervision of Works and Soft-component implementation (Water and Sanitation)	100,661	3,271,478	33,554	6.6%
1.7	Supervision de *Perfils* (Water and Sanitation)	7,154	232,510	2,385	0.5%
1.8	Supervision of Design (Water and Sanitation)	12,231	397,523	4,077	0.8%
2)	**Component 2 – Conglomerate C-2**	**401,005**	**13,032,665**	**133,668**	**26.4%**
2.1	Water Infrastructure	152,026	4,940,847	50,675	10.0%
2.2	Sanitation Infrastructure	70,619	2,295,126	23,540	4.6%
2.3	Soft-component implementation (implementation stage)	57,423	1,866,244	19,141	3.8%
2.4	*Perfils* (Water and Sanitation)	24,857	807,842	8,286	1.6%
2.5	Detailed Design of Works and Soft-component (Water and Sanitation)	40,125	1,304,076	13,375	2.6%
2.6	Advisory and Supervision of Works and Soft-component implementation (Water and Sanitation)	47,306	1,537,447	15,769	3.1%
2.7	Supervision de *Perfils* (Water and Sanitation)	3,157	102,600	1,052	0.2%
2.8	Supervision of Design (Water and Sanitation)	5,492	178,482	1,831	0.4%
3)	**Component 3**	**60,887**	**1,978,828**	**20,296**	**4.0%**
3.1	Program Administration 1/	60,887	1,978,828	20,296	4.0%
4)	**VAT (19%)**	**242,939**	**7,895,523**	**80,980**	**16.0%**
	Total	**1,521,566**	**49,450,905**	**507,189**	**100%**

Source: JICA Study Team (2010)

1.7 Benefits of the Project

The Program will benefit 704,200 inhabitants, with water supply and 542,200 inhabitants with the installation of sanitation systems and, therefore, will contribute to reducing poverty, through the improvement the quality of life and health.

The most important benefits of the Program will be the improvement of the district municipalities' capacity of supervising the sanitation services in the localities of their area and the strengthening and /or creation of the community organizations for AOM of the systems. Another of the benefits will be the creation of temporary jobs opportunities for the construction of the projects.

These services; along with the development of improved habits by educating the benefiting population about hygiene; contribute to the reduction of the prevalence of intestinal and parasitic diseases. The benefits derived from improvements in health are difficult to quantify, but they have been included in the project evaluation for an approximation in monetary terms.

1.7.1 Economic Benefits

(1) Water Supply Projects

i) Estimation of the benefits arising from freeing of resources previously engaged in water acquisition before the project, and increased consumption are made from demand curves.

1) Non-incremental: Benefits derived from the freeing of resources that are previously engaged in water acquisition before the project and are to be resulted from the implementing the project,
2) Incremental: Benefits derived from incremental consumption that are to be resulted from implementation of Program projects,

ii) Benefits generated from health improvement

MINSA (Ministry of Health) considers that in areas where there is no access to water services or sanitation, combined with wrong hygiene practices, an average of ten (10) to twelve (12) diarrheic infection episodes (ADE: acute diarrheic episode) take place every year.

Infectious diseases generate economic costs to both families and the Government. The Peruvian Government spends resources through health related organizations. According to this information, the savings in costs, due to reduction of ADE are estimated in monetary terms in the present Study and has been used for the cost-benefit analysis for the water supply projects of the Program:

Total Cost per ADE (S/. case)	**26.30**

(2) Sanitation Projects

For the sanitation projects it is not possible to calculate the economic benefits in monetary terms. Therefore, evaluation will be carried out by cost effectiveness method.

1.8 Results of the Social Evaluation

1.8.1 Social Evaluation Methodology

1) For the social evaluation of the projects of water supply the cost-benefit analysis has been used. Net present value (NPV) and internal rate of return (IRR) are used as profitability indicators. Social Discount Rate (SDR) is 11%;
2) The Program duration time is 10 years; the design horizon of the water projects is 20 years, and the design horizon of the sanitation projects is 10 years;
3) Social evaluation at the Program level is based on net per-capita benefits;
4) Cost savings generated by health improvements are quantified in monetary terms and are added to the project benefits;
5) For sanitation projects the CEI (Cost Effectiveness Index) cutoff line is used.

1.6.2 Economic Evaluation of the sample localities

(1) Water supply projects

The NPV for the 22 sample localities in Conglomerate C-1 is positive S/. 3.4 million, and the IRR is 15.4%.

The NPV for the 15 sample localities in Conglomerate C-2 is S/. positive 5.6 million while the IRR is 19.1%.

(2) Sanitation Projects

The average of the CEI (Cost Effectiveness Index) indicators (*ICE* in Spanish), or incremental costs per capita, resulted in S/.740 for composing latrines in Conglomerate C-1, S/.563 for the system of dry pit latrines in Conglomerate C-1, and S/.452 for those in Conglomerate C-2. Also, S/.808 for the sewerage improvement and expansion works, including waste water treatment (S/.501 for intake and connections and S/.307 for treatment plant), and S/.1,077 for new works (S/.771 for intake and connections and between S/.254 and S/.307 for treatment plant).

1.8.3 Economic Evaluation at Program Level

(1) Water Supply Projects

From the per capita net benefits of the sample localities, economic benefits for each Conglomerate have been calculated and investment costs have been corrected to social prices.

As a result of the economic evaluation, the NPV for Conglomerate C-1 is positive S/. 21.4 million, and the IRR is 14.1%; whereas the NPV for Conglomerate C-2 is also positive S/. 78.1 million, and the IRR is 24.3%.

In conclusion, it has been proved that the Water Supply and Sanitation Improvement Project for Rural Amazon Area is viable, from a social point of view, for conglomerate level.

For the Program level the NPV and IRR can be obtained by such way that the benefits and costs from the two Conglomerates are added in a single cash flow. As a result, the NPV is positive S/. 86.5 million and the IRR is 16.4%, and therefore the Program can be judged viable.

The summary of the evaluation results is shown in Table Nº 1.8.3-1.

Table Nº 1.8.3-1: Summary of Economic Evaluation of the Water Supply and Sanitation Projects at Sample and Program Level

Indicators	Sample			Program		
	Water Projects					
	Conglomerate C-1	Conglomerate C-2	**Total**	Conglomerate C-1	Conglomerate C-2	**Total**
NPV (S/.)	3,361,198	5,649,629	**9,010,827**	21,389,441	78,044,292	**86,515,746**
IRR (%)	15.4	19.1	**16.9**	14.1	24.3	**16.4**

Source: JICA Study Team (2010)

(2) Sanitation Projects

The cutoff lines for CEI at social prices (or “reference values”) for different types of sanitation facilities and Conglomerates are calculated based on the sample localities. These CEIs at private prices, excluding soft-component intervention costs, would have to be compared with the referential values of the per-capita costs that were previously-calculated as cut-off lines for the different types of Program Installations as shown in See Annex 7.

Table N° 1.8.3-2: Average CEI Values for the Sanitation Program

(Expressed in Price Units at Exchange Rates in May 2009)

Type of Installation	CEI (Soles/inhabitant)		
	Conglomerate C-1	Conglomerate C-2	Program
Ventilated Dry Pit Latrine	563	452	-
Composting Latrine	740	762	-
Sewerage (new works)	-	-	771
Sewerage (improvement and expansion works)	-	-	501
Treatment	-	-	307

Source: JICA Study Team (2010)

1.9 Sensitivity Analysis

The following two factors were used to identify sensitivity (to what extent the such uncertain factors should affect social profitability) of the projects and the Program:

1) Variation in investment and operation and maintenance costs: Conglomerate C-1 remains profitable only up to 8% of cost increase, while Conglomerate C-2 remains economically viable with an increase up to 58%.

2) Variation in benefits: Conglomerate C-1 projects maintain their profitability with 8.5% per-capita-net-decrease in benefit and Conglomerate C-2 maintains profitability of the projects up to 36% decrease in benefit.

For the Program (the sum of both Conglomerates), the profitability maintains up to a 19% increase in investment costs and a 17.5% decrease in benefits.

1.10 Risk Analysis

A risk analysis is proposed for the present feasibility study of the social evaluation of the NPV behavior in each conglomerate, considering the variations in investment costs and economic benefits in the case of the water supply projects, and the increases in investments costs in the case of the sanitation projects.

These variations in cost and benefit are linked to the type of technical options selected for the water supply via house connections or public taps, and to the type of solution accepted by the inhabitants for the sanitation projects in each of the localities in the Conglomerates.

It is proposed that risks be assigned in a conservative, non-random manner, based on the results of the sensitivity analysis of the evaluation indicators for the water projects, and based on the values of the average direct per-capita costs for the sanitation projects. Accordingly, the proposal for assigning the types of risks in order to make a decision based on the obtained results are as follows:

1) High Risk: (a) for water projects, with a 8% decrease in benefits or a 9% increase, the NPV turns to be in a value close to, equal to or less than zero; or (b) for sanitation projects, with an increase in investment costs of less than 30%, the NPV turns to be in a value close to, equal to or less than zero.
Increases in costs for sanitation projects will be a consequence of changing the technical option for sanitation because of the reluctancy or non-acceptance by the benefited population.

2) Moderate Risk: (a) for water projects, with a 20% decrease in benefits or a 20% increase, the NPV turns to be in a value close to, equal to or less than zero; or (b) for sanitation projects, with an increase in investment costs of less than 30%, the NPV turns to be in a value close to, equal to or less than zero.
Increases in costs for sanitation projects will be a consequence of changing the technical option for sanitation because of the reluctance or non-acceptance by the beneficieries.

Table N° 1.10-1 shows the results obtained for the NPV and the assignment of the type of risk assumed by each of the Conglomerates. The conclusion is that the water projects in Conglomerate C-1 have high risk due to the fact that for a decrease in benefits (consumption and health benefits) of greater than 8%, the NPV is negative. In the same way for an increase in costs of greater than 9%, the NPV is also negative. The water projects in Conglomerate C-2 have moderate risks, due to the fact that for a 20% decrease in benefit and a 20% increase in cost, the NPV remains positive.

Table N° 1.10-1: Risk Assignment for the Conglomerates – Water Projects

Conglom-erate	Type of Risk		
	High Risk: 8.5% Decrease of Benefits or 9% Increase in Costs VAN≈0 or ≤0	**Moderate Risk: 20 % in Benefits VAN≈0 or ≤0**	**Moderate Risk: 20 % Increase in Costs VAN≈0 or ≤0**
C-1	Yes	No	No
C-2	No	Yes	Yes

Source: JICA Study Team (2010)

Table N° 1.10-2: Risk Assignment for the Conglomerates – Sanitation Projects

Conglomerate	Type of Risk	
	High Risk, >30% Increase in Costs VAN≈0 or ≤0	**Moderate Risk, < 30% Increase in Costs VAN≈0 or ≤0**
C-1	No	Yes
C-2	Yes	No

Source: JICA Study Team (2010)

In the sanitation projects in Conglomerate C-2, there is a high risk of an increase in the average direct per-capita costs caused by changes in the type of latrines, especially from dry pit latrines to pour-flush latrines with septic tanks. In the case that the beneficiaries rejects the application of the former (dry pit latrines) in more of 50% of the localities, the cost would increase by 30%.

In Conglomerate C-1, this risk is only moderate, since most of the localities are foreseen to have composting latrines to be installed, whose direct per-capita cost is 40% lower than that of pour-flush latrines. Even if a change in the type of latrines from dry pit latrines to pour-flush latrines should be in 25% of the localities, the total sanitation project cost would not increase up by 30% (see Table N° 1.10-2).

1.11 Sustainability of the PIP

1.11.1 Institutional Arrangements

The Program expects that, within the existing institutional framework of the Sanitation Sector, the following entities will have made the institutional arrangements necessary to execute all the phases of the Program: DNS, PAPT, JICA, Municipalities, and Community Organizations (JASS).

1.11.2 Normative Framework

For the pre-investment stage of the projects of the Program, the Directive N° 001-2009-EF/68.01, *Directiva General del Sistema Nacional de Inversión Pública* (General Directive of the National Public Investment System) will be applied until the Declaration of Viability by the DGPM.

For the execution stage of the Program the following documents are applicable: i) Loan Agreement between the MVCS and JICA, ii) Guidelines for Procurement under ODA Loans, iii) Guidelines for the Employment of Consultants under ODA Loans; and iv) Law of contracting of the State (*Ley de Contrataciones del Estado, Decreto Legislativo Nº 184-2008-EF)* and its regulations (*Decreto Supremo Nº 184-2008-EF),* in a complementary way and when it is not opposite to the norms of the financial entity.

For the stage of operation the Program shall comply with the specifications of the Unique Organized Text (TUO: *Texto Único Ordenado*) of the General Law of Sanitation Services (*Ley General de Servicios de Saneamiento – Ley Nº 26338).*

1.11.3 Management Capacity

A complete social capacity building program has been proposed aiming to support the local district governments, community organizations, and the population of the community, in the formation and strengthening of their capacities for administration, operation and maintenance of the services, and for the improvement of hygiene habits and practices through hygiene education activities.

1.11.4 Cost Coverage of the Administration, Operation and Maintenance

In Conglomerate C-1, the proposed family fees for the water service vary from S/ 3.01 to S/ 30.5 per month and the percentage against the family income varies between 0.4% and 6.5%; out of 29 sample localities of the Conglomerate C-1, the family fee of 26 localities (90%) fall in a range below 3.0 % .

In Conglomerate C-2, the family fee for the water service varies between S/ 2.3 to S/ 16.3 per month and the percentage against the family income between 0.5% and 3.5% as shown in the table. In all of 21 sample localities in the Conglomerate C-2, the family fee are smaller than 3.0% of the family income.

With comprehensive soft-component activities to be given to the localities, the cost for AOM as compared with the family income is considered to be within a sustainable range.

1.11.5 Participation of the beneficiaries

One of the requirements to select the localities is that each locality should express their willingness to participate in the Program. After the construction of such facility/system, the system/facility will be handed over from the National Government through the PAPT to the district municipalities first, and thereafter to each locality. Therefore not only locality but the district municipality shall be responsible for the sustainability of the facility/system.

As one of the essential policies of the Sector, the Feasibility Study proposed the co-financing approach as has been practiced by various past projects. Based on the past experiences, however, co-financing with monetary term will be in many cases not realistic, because of financial constraint of district municipalities and localities. The Feasibility Study therefore proposed that the co-financing shall be in non-monetary forms.

1.11.6 Analysis of Vulnerability of the Program

The present Program will require various activities in localities of the Amazon Area. All of these activities in the area as a matter of course subject to risks, to some extent, of facing eventual dangers, especially natural threats.

The structural measures are parts of the engineering designs of each project, in which the possible threats have been considered, such as flooding in some low forest areas, mudslides in the ravine's hillsides in the Front Forest and earthquakes; as well appropriate designs that comply with the government's policies, technical regulations and norms.

Other types of natural threats such as hurricanes and volcanoes have not been considered, nor forest fires due to its less frequency in the area. Cases of drought have not been considered either due to the small volumes of water required for each project.

The Program is exposed to the risk of the recurrence of conflicts originated from the social demands of the Amazon population, a case that reached a critical peak on June 2009 during the field survey. In the event of a similar situation, the implementation plan must be reconsidered to excluded the areas in conflict, in order to secure the safety of the personnel in charge of the Program implementation. Possible delays may occur.

1.11.7 Conclusion of the Sustainability Analysis

After the analyzing the factors that have positive effects on the sustainability of the water and sanitation systems, and considering measures and activities that will be implemented in each one of the projects, it is concluded that these systems will be sustainable during the life-time or design period of the facilities.

1.12 Environmental Impact

1.12.1 Environmental Legal Framework

In accordance with the relevant norms, environmental impact assessment is to be defined to be conducted within the respective sector and shall be examined by a regulator organization within such sector.

The Office of Environment (OMA: *Oficina del Medio Ambiente*) of the Ministry of Housing, Construction and Sanitation (MVCS) is the agency responsible for conducting the System of Evaluation of Environmental Impact (SEIA), for projects of MVCS.

1.12.2 Categorization according to JICA Guidelines

The Feasibility Study conducted the categorization in accordance with the JICA guidelines for environmental assessment. The observations, considerations and results are as follows:

There are national protected areas in the target areas of the Program, such as national reserves, and protected woods designated by the National System of Natural Protected Areas" (*Sistema Nacional de Áreas Naturales Protegidas por el Estado)*. In the Low Forest Region, the rain forests prevail, there may be rare species, and a number of ethnical minorities inhabit the territory.

However, considering the nature and characteristics of the rural water supply and sanitation improvement projects no considerable hazardous impacts to the environment are foreseen. Therefore, the Program is not categorized in the Category-A (that requires a further environmental assessment study) and is considered that a detailed EIA is not necessary for the Program.

1.12.3 Initial Environmental Assessment

(1) Identification of possible impacts and mitigation measures

Possible impacts on the environment and its mitigation measures were evaluated in accordance to the guidelines.

Table N° 1.12.3-1: Summary of the Possible Impact

Social Environment		Natural Environment		Pollution	
Items		**Items**		**Items**	
1. Involuntary resettlement	D	12. Land form	D	19. Air Pollution	D
2. Local Economy	+	13. Erosion	D	20. Water Pollution	D
3. Land use, local resources	C	14. Groundwater	D	21. Soil Pollution	D
4. Social Institution	+	15. Water environment	D	22. Waste	D
5. Existing social services	+	16. Ecosystem	C	23. Noise, vibration	C
6. The poor, indigenous, minor ethnic	+	17. Landscape	C	24. Ground subsidence	D
7. Misdistribution of benefits or damages	D	18. Protected land	C	25. Offensive odors	D
8. Cultural heritage	C			26. Accident	D
9. Local conflict of interest	C				
10. Water right	C				
11. Health	+				
12. Disease	+				
A: Serious impacts are anticipated; B: Impacts are anticipated; C: Impacts uncertain, needs to be surveyed at the *Perfil* study; D: Conceivable impacts are not anticipated or negligible; (+): Positive impacts are anticipated					

Source: JICA Study Team (2010)

(2) Conclusions

There may be environmental impacts due to the implementation of the Program. However, the Program has been so formulated and the projects will be so designed by the forth-coming pre-investment studies (*Perfils*) that the social and natural environmental impacts should be minimal. On the other hand, the benefits from the Program for the inhabitants of the target area will be significant.

Availability of clean and potable water is of paramount importance. There will be no other options other than constructing or rehabilitating water supply and sanitation facilities in localities where clean and potable water is not sufficient or even not available. Therefore, the implementation of this program in the rural Amazon area shall be indispensably.

Therefore, it is proposed that the Program will be categorized as Category-I, of the categorization set forth by the OMA; “Declaration of the Environmental Impact (DIA)”, on condition that IEEs shall be conducted in each locality at the pre-investment studies (*Perfils*) once the Program is to be implemented.

1.13 Organization and Management for the Program Implementation

1.13.1 Actors to be involved

The proposal for Program execution considers the participation of two types of actors:

(1) Core Actors (Regular organization/group)

1. Ministry of Housing, Construction and Sanitation
2. District Municipalities
3. Communities (Localities)
4. Regional Government, Provincial Municipality as required

(2) Contracted Actors (to be employed for implementation):

1. Operating Consultant
2. Supervising Consultant
3. Contractors for construction works and soft-component implementation)

Table 1.13-1 Implementation Model

Project Cycle / Work Items	Pre-Cycle	Pre-Investment	Investment			Post-Investment
		Perfil	Project-Files (Detailed Design)	Execution of Works	Soft-component	Soft-component
Program Management	PMU/ PAPT	PMU/ PAPT	PMU/ PAPT	PMU /PAPT	PMU/ PAPT	PMU/ PAPT
Supervision	-	Supervising Consultant	Supervising Consultant	Operating Consultant	Operating Consultant	Operating Consultant
Pre-investment Study, Detailed Design	-	Operating Consultant	Operating Consultant	-	-	-
Construction Works and Capacity Strengthening	-	-	-	Contactors	Contactors	Contactors

1.13.2 Rolls of Participants

It is proposed that the Program will be implemented by the organizations/group outlined hereunder.

(1) National Sanitation Directorate (*DNS*)

The Ministry of Housing, Construction, and Sanitation (MVCS), through the National Sanitation Directorate (*DNS*) establishes the Sector´s policies and strategies. The Program will be conducted in accordance to the Sector's policies established.

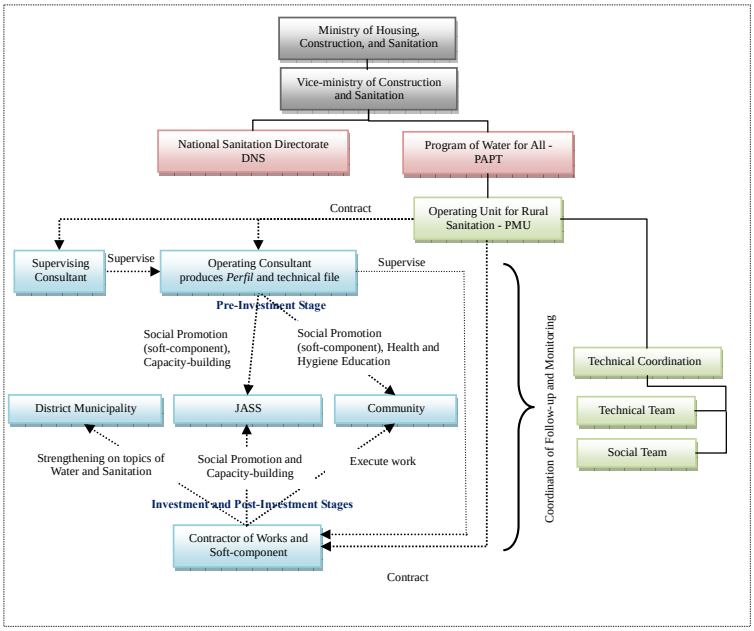
(2) Program of Water for All (PAPT)

The PAPT belongs to the Vice-ministry of Construction and Sanitation; it is the executing agency for investment projects for the implementation of MVCS sanitation policies at the national level.

The Program will be executed by the PAPT through the Program Management Unit (PMU) to be newly formed exclusively for the Program implementation.

Figure N° 1.13-1 Intervention and Responsibilities Model

(3) PMU Water and Sanitation Project for the Rural Amazon



It is proposed that the PAPT shall form a PMU exclusively for the Program. The PMU shall take on the role of the Rural Sanitation Operating Unit, a unit that will form a part of the organizational structure of the PAPT.

The PMU shall consist of units of General Coordination, Technical Coordination, and Coordination of Soft-Component and Management.

The principal functions of the PMU are: (i) to execute and conduct the Program (implementation); (ii) to report to the DNS, PAPT, VMCS and JICA about Program progress; (iii) to evaluate and monitor the execution of all Program components and to supervise the execution of soft-component and capacity-building activities..

The PMU should also be in charge of the follow-up, monitoring, and evaluation of the work of the Operating Consultant, the Supervising Consultant, and the Executing Contractor(s) in charge of works and soft-component implementation.

The PMU will be responsible for following up with the participation of all Program actors (Municipality, community organizations, communities) and motivating the Program actors to participate in the Program.

The PMU should have sufficient autonomy to be able to endorse the such contracts necessary for representing the MVCS and the PAPT, as respective contracts with the Operating Consultant, the Supervising Consultant, and the Executing Contractors.

(4) Operating Consultant (OC)

Program implementation at the local level shall take place through a consulting firm selected and contracted by the PMU, which shall be called the Operating Consultant (OC).

There are two main activities to be carried out by the Operating Consultant.

The first includes: (i) project promotion in each locality, (ii) development of Project *Perfils*, (iii) development of Detailed Design (which includes technical files with the project designs and the capacity-building plan), and (iv) prequalification, notification, evaluation, and preparation of the allocation of contractors to execute works and soft-component implementation.

In the second part of this contract, the OC shall supervise the phases of investment and post-investment, including: (i) technical supervision of construction works; (ii) supervision of implementation of soft-component activities: plans for capacity-building and hygiene education for the community, Community Organizations, and municipalities; and (iii) supervision of the post-execution, the reinforcement of capacity-building activities, hygiene education and capacity-strengthening of the municipalities during execution.

(5) Supervising Consultant

The Supervising Consultant (SC) shall be a consulting firm to be selected and contracted by the PMU and shall participate only in the Pre-Investment stage. The SC will be in charge of supervising, evaluating and approving the *Perfils* and project files (detailed design of infrastructures and soft-component) that the Operating Consultant will formulate. The Supervising Consultant shall verify the viability of technical, economic, environmental, and social aspects of the *Perfils* and project files proposed by the Operating Consultant.

(6) Contractors of Works and Soft-Component

The Contractors shall be responsible for the implementation of the two Program components. First, the Contractor shall be the executors of works, also shall be responsible to manage and promote community participation through the contribution of unskilled labor.

Second, this contractor shall be in charge of the implementation of the soft-component: (i) the implementation of soft-component activities in the execution phase: plans for capacity-building and hygiene education for the community, Community Organizations and municipalities, and (ii) execution of the post-execution phase, which involves reinforcement of the actions of capacity-building, hygiene education, and capacity-strengthening of the municipalities.

It is recommended that such contractors be selected that have enough capacity to administrate and manage the construction of 20 - 50 works under a single contract, in order to realize the smooth implementation and fulfillment of the Program within the period of time proposed.

(7) Local Government (District Municipality)

The local governments should select and prioritize localities, contribute co-finance (if affordable) and participate in the execution of the projects throughout the entire project cycle, specifically during the pre-execution, execution, and post-execution stages, and should participate in capacity-

strengthening so that the District Municipality may always provide technical advice and supervise sanitation systems within its jurisdiction, assuming its role and responsibility for services through a Council Agreement.

It is expected that after their participation in the Program, the municipalities have the capacity to assign personnel to fulfill their role in administrative aspects of the water and sanitation services.

(8) Sanitation Services Administrative Board (Community Organization, or JASS)

This board is a local organization that represents the community and is in charge of the administration, operation, and maintenance (AOM) of the sanitation services in its locality. It is also responsible for proposing the family water and sanitation fee to be approved by the community. It may be a JASS or any other form of organization. It shall be made up of five (5) members.

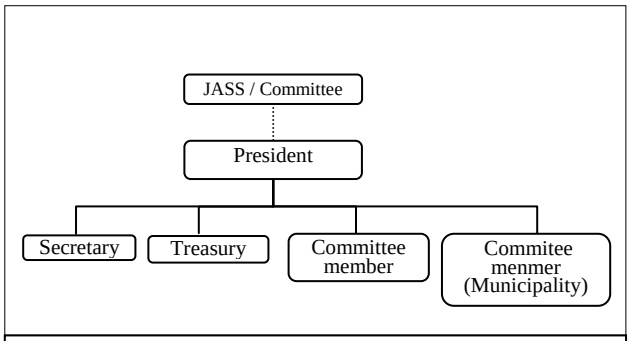


Figure 1.13-2 Organization of the Community Organization

This community organization participates during the Program implementation together with the population in coordination of the district municipality in the capacity-building processes for the management of sanitation services and hygiene education.

(9) Community

The community shall participate in the project throughout the project cycle:

The community should:

a) be given information about the project in order to provide knowledge on water and sanitation, to promote/induce their demand for water and sanitation, to obtain acceptance of the technical option and the level of service to be provided by the project. It will be informed that technology to be proposed will depend on their affordability-to-pay and willingness-to-pay the family fee for the administration, operation, and maintenance of services (AOM),

b) proceed the selection of the administrative board member,

c) participate in the project implementation during the execution and contribute unskilled labor,

d) attend to the capacity-building and hygiene education activities; until the post-execution phase.

1.14 Implementation Plan

A considerable amount of capital investment will be required for the implementation of sub-projects in 1,500 localities. The present Feasibility Study recommended the application of a phased-implementation plan where implementation will be realized step by step in phases.

It was also recommended that projects in Conglomerate C-1 and C-2 should not be separately implemented.

The Feasibility Study considered it reasonable and suitable that the Program shall be executed within ten (10) years, taking into account the viability/reliability of the conditions based on which the present Program has been formulated. In conclusion, a three (3) phased implementation plan was proposed as shown in the Figure N° 1.14-1.

1) In the first phase, approximately 130 projects are to be implemented, of which 92 localities belong to Conglomerate C-1 and 38 localities belong to Conglomerate C-2. The time period required from the procurement of the consulting firms to the completion of the construction will be about 3.5 to 4 years.
2) In the second and third phases, an estimated 732 and 638 projects respectively are to be implemented in each phase, with five (5) main contractors who shall employ a necessary number of sub-contractors. Each main contractor shall be responsible for maximum 160 projects to be completed within one year; respectively. The time period required from the Perfil studies to the completion of the construction will be about 3.2 years, for the second phase and the third phase respectively.
3) Total implementation period will be 9.7 years including the defect liability period (including monitoring period) of one year.

Figure N° 1.14-1: Recommended Implementation Schedule for Three-phases Plan

Alternativa D : 10 Años (116 meses: 9.7 años)

		año / Mes(es)
1	Contrato de Préstamo (☆) y Creación de las UGP	2
2	Obtención de Consultor y Evaluador de Diseño	6
3	Perfiles Individuales y Evaluación	6
4	Expediente Técnico y Evaluación	7
5,1	Precalificación y Evaluación: Lote No.1	2
5,2	Precalificación y Evaluación: Lote No.2	2
5,3	Precalificación y Evaluación: Lote No.3	2
5,4	Precalificación y Evaluación: Lote No.4	2
5,5	Precalificación y Evaluación: Lote No.5	2
6,1	Licitación y Evaluación : Lote No.1	5
6,2	Licitación y Evaluación : Lote No.2	5
6,3	Licitación y Evaluación : Lote No.3	5
6,4	Licitación y Evaluación : Lote No.4	5
6,5	Licitación y Evaluación : Lote No.5	5
7,1	Construcción y Supervisión : Lote No.1	12
7,2	Construcción y Supervisión : Lote No.2	12
7,3	Construcción y Supervisión : Lote No.3	12
7,4	Construcción y Supervisión : Lote No.4	12
7,5	Construcción y Supervisión : Lote No.5	12
8,1	Período de Garantía por Defectos : Lote No.1	12
8,2	Período de Garantía por Defectos : Lote No.2	12
8,3	Período de Garantía por Defectos : Lote No.3	12
8,4	Período de Garantía por Defectos : Lote No.4	12
8,5	Período de Garantía por Defectos : Lote No.5	12

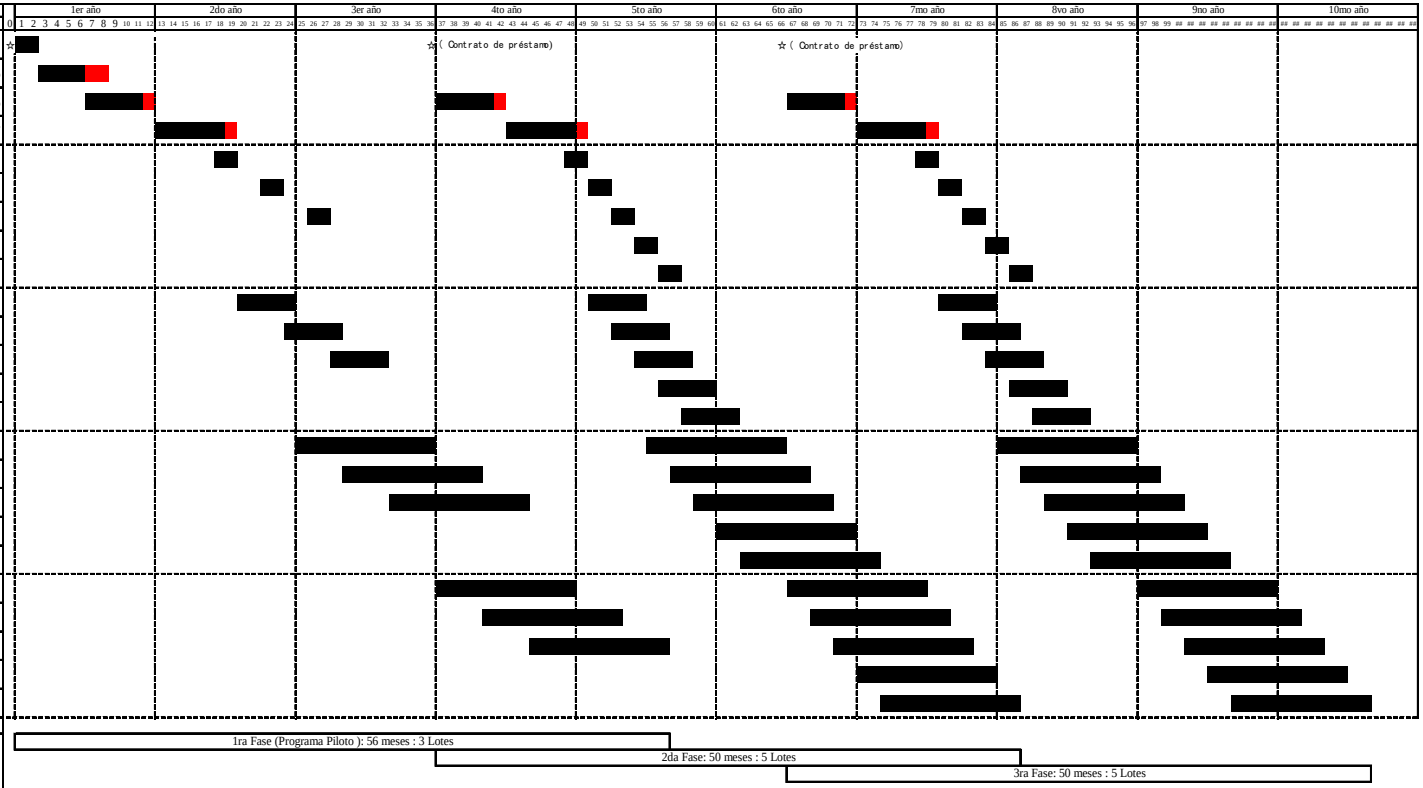


Gráfico de Barras por Fase

Concept of Altenative

1) Dividido en 3 pasos : 3 Préstamos y 3 fases
2) Número de Lotes (13=3+5+5) en 3 fases
3) Con Programa Piloto para la prueba del Programa

Programa Piloto y 10 Lotes(140Localidades/Lote)

Condition of Alternative

1) Program Piloto en la 1ra etapa deberá incluir todas las condiciones caracteristicas del Program.
2) En la 2da Fase se requiere de un consultor principal con gran capacidad administrativa y con muchos subconsultores (14 x 2 veces).
3) El número de contratos (Precalificación,Licitación, Contratista) deberá ser minimizado.(3 Lotes en la 1ra etapa y 10 Lotes (5 Lotes x 2 veces) en la 2da y 3ra).
4) Se requiere de **Contratistas Principales**(13) con gran capacidad para la administración en construcción y muchos sub-contratistas.
El Numero de Contratistas Principales en la 1ra 2da y 3ra Fase, are 3, 5 and 5 respectivamente.
5) El Número de Localidades de 1 Lote en la 2da Fase es de 140.

Source: JICA Study Team (2010)

The allocation of localities to each phase is proposed in Table N° 1.14.1-1

Table N° 1.14.1-1: Proposed Allocation of Localities for Each Phase

Region	1st Phase (Pilot Program)			2nd Phase			3rd Phase			TOTAL		
	C1	C2	Total	C1	C2	Total	C1	C2	Total	C1	C2	Total
Amazonas	28	4	32	61	222	283				89	226	315
San martin	14	32	46	57	103	160	92	214	306	163	349	512
Madre de Dios	-	-	-				40	4	44	40	4	44
Ucayali	-	-	-	139	14	153				139	14	153
Loreto	50	2	52	133	3	136	288	0	288	471	5	476
Total	92	38	130	390	342	732	420	218	638	**902**	**598**	**1,500**

Source: JICA Study Team, (2010)

Table Nº 1.14.1-2: Proposed Contract Packaging

Contract Packaging	1st Phase (Pilot Program)		2nd Phase		3rd Phase	
	Region	Localities (Nº)	Region	Localities (Nº)	Region	Localities (Nº)
Lot No.1	Amazonas	32	Amazonas	143	San Martin	153
Lot No.2	San Martin	46	Amazonas	140	San Martin	153
Lot No.3	Loreto	52	San Martin	160	Madre de Dios	44
Lot No.4	-		Ucayali	153	Loreto	144
Lot No.5	-		Loreto	136	Loreto	144
		130		732		**638**

Source: JICA Study Team, (2010)

1.15 Financial Risk Analysis

1.15.1 Financing from JICA

1) Interest rate: 0.65% annual
2) Charges for non-disbursed balances (commitment charge): 0.10%
3) Charges for the extension of disbursement periods: 0.20%
4) Period of debt repayment: 40 years
5) Grace Period: ten year

1.15.2 Peruvian Government

Authorities informed that the Peruvian Government (GoP) requested to JICA an financial assistance of 20 million USD and would allocate 20 million USD from the national budget to the first phase of the Program; and for the second phase and onward, approximately 60% of the budget from external resource, and 40% from the national fund were to be assumed.

The financing amount from JICA resources may be increased in the following execution phases, taking into consideration that the maximum percentage to be assigned to Peru is 85%.

1.15.3 Program Financial Scheme

Financing Outline for the three execution phases is as follows:

1) JICA: 59.6% (USD 302.4 millions)
2) MVCS: 38.3% (USD 193.9 millions)
3) Municipalities 1.5 % (USD 7.6 millions)
4) Communities: 0.6 % (USD 3.2 millions)

Table Nº 1.15.3-1: Financial Scheme

(USD x 1,000)

Program Total	Total Cost	(%)	Allocation of JICA - GoP				Allocation of MVCS - Municipality/Community			
			JICA	(%)	GoP	(%)	MVCS	(%)	Municip. Commun.	(%)
Phase-1	46,344	9%	27,954	60%	18,390	40%	17,418	95%	973	5%
Phase-2	243,170	48%	145,121	60%	98,049	40%	92,867	95%	5,183	5%
Phase-3	217,674	43%	129,234	59%	88,440	41%	83,734	95%	4,707	5%
Program Total	507,189	100%	302,309	60%	204,880	40%	194,018	95%	10,862	5%

Source: JICA Study Team (2010); GoP = Government of Peru

1.16 Conclusions and Recommendations

(1) The target area of the Water Supply and Sanitation Improvement Project for Rural Amazon Area is classified as poverty-prone area in Peru due to, among other basic needs, the lack or inadequacy of sanitation.

(2) The Conglomerates are defined by geographic region and are as follows:

- Conglomerate C-1: Localities located in the region of Low Forest, (906 locations)
- Conglomerate C-2: Localities located in the High Forest and in the Front Forest (594 locations)

(3) The Water Supply and Sanitation Improvement Project in Rural Amazon Area will have three (3) components:

- Component 1: Conglomerate C-1
- Component 2: Conglomerate C-2
- Component 3: Program Administration

(4) The total Program cost for the three (3) components amounts to S/. 1,521.6 million (507.2 million USD). Its execution is scheduled in three phases, each one with an execution time of four (4) years, during the period 2010 -2020. Costs are: S/. 139.1 million (46.3 million USD) for the first phase, S/.729.5 million (243.2 million USD) for the second phase and S /. 653.1 million (217.7 million USD) for the third phase.

(5) The Study concludes that Conglomerate C-1 and C-2 are viable from the technical, economical and environmental standpoints.

(6) For the sanitation Project, values of cutoff lines have been proposed in social prices, that is considered to be reasonable according to the proposed technical options.

(7) The economic evaluation of the water supply projects for Conglomerates C-1 and C-2, and for the Program resulted in a NPV of S/.86.5 million and an IRR of 16.4% for the Program. The Study concluded that the Program is viable from the technical and economic point of view.

(8) The costs analysis of AOM for projects in the sample localities indicated that the estimated family fee for AOM is within affordability. The facilities will be selected, through demand driven approaches through participation. This is an aspect that will ensure in the medium and long term sustainability of water services.

(9) The implementation of the projects that will be through demand-driven approach, follows the two (2) basic policies: (i) the integrated implementation policy and (ii) the policy of co-financing through non-monetary contributions - the provision of the community's unskilled labor for labor works. The program will set equal importance to both the implementation of infrastructure works and activities for strengthening and/or capacity building for the

organization, planning, promotion, development and management of sanitation and health education in each of the localities and municipalities (- integrated implementation).

(10) The organization has been proposed for implementing the Program, which is headed by the Program Management Unit (PMU) in the PAPT. The PMU will be subject to strengthening, as part of the activities of Component 3 of the Program. It also will receive technical assistance from the Operating Consultant in the tendering of works projects.

(11) It was proposed that the Program should be executed in three (3) phases, during a period of ten (10) years (2010 to 2020). The first phase should be implemented as a Pilot Program, with the aim of accessing the applicability of the proposed program and the improvement needed for the following phases. In the first phase, 130 prioritized water supply and sanitation projects should be implemented (92 localities in Conglomerate C-1 and 38 localities in Conglomerate C-2); in the second phase, 732 projects (390 localities in Conglomerate C-1 and 342 localities in Conglomerate C-2); in the third phase, 638 projects (420 localities in Conglomerate C-1 and 218 localities in Conglomerate C-2).

(12) To finance the Program it is planned to use resources from a financial cooperation from the Japanese Government through JICA that could be coordinated by the Peruvian Government (PG). According to this understanding, a financing outline for the phased implementation of the Program has been proposed. For the first phase the financing is foreseen in such way that a 60% is from JICA, and a 40% is from national counterpart funds (95% by the MVCS and 5% co financing of municipalities and communities). JICA's contributions would be increased taking into consideration the limit of 85% designated for projects in Peru. For the three phases of the Program financing outline is as follows; 59.6% by the JICA; 38.3% by the MVCS; and 1.5% by communities; and 0.6% by municipalities

(13) The Study recommends to declare the viability of the Water Supply and Sanitation Improvement Project for the Rural Amazon Area, with its two Conglomerates, on the basis of the study results that the present Feasibility Study has shown that each Conglomerate (Conglomerate C-1 and Conglomerate C-2) and the Program as a whole have shown to be economically viable and socially sustainable; and projects that comprise the Program are consistent with the policy guidelines of the sanitation sector.

1.17 Logical Framework

1.17.1 Logic Framework Matrix of the Potable Water & Sanitation Program for the Amazon Rural Area

OBJECTIVES	AIMS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
AIM: To contribute with the improvement of health and life quality of the rural population.				
COMPONENTS 1 & 2				
PURPOSE: To diminish the incidence of intestinal infectious diseases of the rural population in the administrative regions of Loreto, Madre de Dios, San Martin, Amazonas and Ucayali.	♦ A 50% reduction in the incidence of intestinal infectious diseases (ADD´s) in children of the rural area under 5 years of age, from the current 23.4% to 11.7% in the year 2020.	♦ Intestinal infectious diseases incidence rate mainly in the children population under 5 years of age.	♦ Results reports of the base line. ♦ Results reports of the Program's impact evaluation. ♦ Annual reports of the Ministry of Health centers.	♦ Compromises fulfillment by the main actors: the Municipality and the population.
RESULTS: 1. Rural population within the area of intervention, with access to sustainable water and sanitation services in suitable conditions: quality, quantity and continuity.	♦ To increase in 85% the coverage of the water supply services for human consumption, in the intervened localities by 2020. ♦ 1500 localities with water service for human consumption by 2020. (with 12 hours per day as a minimum continuous supply and with disinfection) Localities attended in phases: -1st implementation phase: 130 localities with W&S services by 2013.	♦ % of coverage of water service for human consumption within the intervention area. ♦ Nº of localities with continuous water service for human consumption no less than 12 hours	♦ Final Report of the Works Liquidation. ♦ Results report of the Ex Post evaluation. ♦ Reports of the Ministry of Health Water Quality Surveillance Program	♦ Population's active participation in the project's implementation. ♦ Administrative and financing processes.

OBJECTIVES	AIMS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
	-2nd implementation phase: 732 localities with W&S services by 2017 -3rd implementation phase: 638 localities with W&S services by 2020.	♦ Nº of systems that applied disinfection to the water supply service for human consumption.		
2. The population in the intervention area, with access to a system of excreta disposal in suitable conditions.	♦ To increase by 80% the sanitation coverage (latrines) in the intervened localities by 2020. ♦ 70% of families of the total of the localities have suitable practices of sanitary excreta disposal, by 2020	♦ % of sanitation coverage (latrines) in the intervened localities ♦ % of families that properly use the latrines	♦ Final Report of the Liquidation of the Works ♦ Results report of the Ex Post Evaluation. ♦ Results reports of the Program's Impact Evaluation	♦ Population's participation in the Project's implementation.
3. Improve the hygiene habits of the population in the rural localities with intervention	♦ By 2020, 100% of families have knowledge of the critical times for hand washing: ▪ Before eating ▪ After going to the bathroom ▪ After changing diapers or cleaning the baby´s feces ▪ Before feeding the baby ▪ Before cooking ♦ By 2020, 50% of families practice proper hand washing: ▪ With water ▪ With soap or ashes ♦ By 2020, 70% of families properly use and maintain their latrines: ▪ Without fecal remains ▪ Without urinary remains ▪ Without foul odors ▪ Without waste or remains of the material used to wipe themselves	♦ % of families that have knowledge of the five critical times for hand washing ♦ % of families that wash their hands correctly ♦ % of families that adequately maintain their latrines	♦ Follow-up reports for the soft-component ♦ Results of ex post evaluation ♦ Report of Impact Evaluation Results	♦ Families recognize and understand the need to modify their behavior patterns with relation to health and hygiene ♦ Use of suitable capacity building and communication strategies to achieve the behavior improvement. ♦ Participation of qualified trainers.

OBJECTIVES	AIMS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
4. The community organizations (JASS) in the intervention area have the abilities of administrating, operating and maintaining (AOM) the water and sanitation services.	♦ 100% of the Community Organizations that have AOM knowledge for the water services. ♦ No less than 10 people of each intervened locality are trained in AOM of the water services. ♦ 80% of the families of each locality pay their fees for the water service.	♦ Nº of Community Organizations that perform adequate AOM for water services ♦ Nº of people trained in water services AOM at each intervened locality ♦ Nº of the families of each locality that pay their fees for the water service on time	♦ Final Report of the JASS capacity building. ♦ Results report of the Ex Post evaluation ♦ Reports of the supervision to the JASS, carried out by the Municipality's water services responsible. ♦ Results reports of the Program's impact Evaluation	♦ Population's commitment to assume the services management responsibility. ♦ Fulfillment of the Municipality's Commitment ♦ Participation of the JASSs members and the population in the capacity building workshops.
5. The local governments have the capacities to give basic technical assistance and support the community organizations in the localities within their scope of jurisdiction.	♦ 90% of the municipalities successfully carry out their functions of supervision and technical assistance to the community organizations ♦ 100% of the commercial information is adequately registered and current (Nº of Community Organizations, Nº of users of W&S services, hours of water service, Nº of supervision visits made, etc.)	♦ Nº of Community Organizations registered with the Municipality ♦ % of W&S service coverage at the district level in the scope of intervention ♦ Nº of hours of water service ♦ Nº of supervisión visits made ♦ % progress in Financial Plan ♦ % progress in actions of technical assistance	♦ Supervision reports to the community organizations, from those responsible for the water services in each municipality ♦ The Municipal plan incorporates water and sanitation activities ♦ Nº of Community Organizations with a registry of supervision visits and/or technical assistance to the municipality ♦ Results of the ex-post evaluation	♦ Fulfillment of the municipalities`commit ments with respect to their participation in the implementation of W&S services

ACTIVITIES: I. Development of *Perfils* and detailed design files 1. Development of pre-investment studies 2. Development of detailed designs	I. Pre-investment studies (*Perfils*) and detailed designs for US $80.6 million ♦ 1,500 perfiles formed for US $30.8 million ♦ 1,500 detailed designs developed for US $49.8 million	♦ Nº of studies at the perfil level of the W&S projects in the Program ♦ N° of detailed designs for the W&S projects in the Program	♦ Reports from the PMU, the PAPT, and the OC on the development of the *Perfils* ♦ Reports from the PMU, the PAPT, and the OC on the development of detailed designs	♦ Sectoral, Regional, and Local Policy for W&S intervention in rural Amazon areas
II. Evaluation of *Perfils* and detailed design files 1. Evaluation of pre-investment studies 2. Evaluation of detailed designs	II. Evaluation and approval of pre-investment studies and detailed designs for US $11.1 million ♦ 1,500 perfiles declared viable ♦ 1,500 detailed designs approved by Ministerial Decision	♦ N° of perfils declared viable ♦ N° of detailed designs approved with Ministerial Decision	♦ Registry of *Perfils* declared viable in the MEF Project Bank ♦ Registry of Ministerial Decision approval of the detailed designs	♦ Opportune fulfillment of established co-financing obligations by communities and municipalities
III. Water storage and sanitation, Conglomerates 1 and 2 1. Rehabilitation, improvement, and expansion of existing water systems 2. Construction of new water systemsr 3. Installation of household latrines	III. W&S infrastructure for US $277.2 million ♦ N° of water supply systems rehabilitated and-or improved in the year 2020 ♦ N° of new water systems in the year 2020 ♦ N° of families with latrines installed	♦ N° of operative water storage systems rehabilitated, improved, or expanded ♦ N° of new operative water systems ♦ N° of latrines constructed and operative	♦ Final liquidation report of works of rehabilitation, improvement, and/or expansion of water systems ♦ Final liquidation report of new water works ♦ Final liquidation report of sanitation works	♦ Fulfillment of agreement to assume responsibility for supervising and watching over water services

IV. Soft-component implementation 1. Development of capacity-building and hygiene education Program 2. Development of AOM capacity-building for water services for the Community Organizations 3. Development of capacity-building Program for municipalities to provide support and basic technical assistance to the Community Organizations in localities with intervention V. Consulting for Tendering Process, supervision of the works and Soft Component	IV. Soft-component implementation for US $55.4 million ♦ 1,500 Community Organizations with AOM capacities for water services ♦ 15,000 people with AOM capacities for water and sanitation services ♦ 400 district municipality employees with capacities to provide support and basic technical assistance to the Community Organizations V. Consulting for Tendering Process, supervision of the works and Soft Component for USD 58.7 million	♦ N° of families with knowledge of hygiene education and practices of cleaning and hygiene ♦ N° of people with knowledge of AOM of water services ♦ N° of employees with knowledge to carry out their functions of supervision, financing, and technical support for the Community Organizations ♦ Item III and IV	♦ Final report of capacity-building in hygiene education ♦ Final report of capacity-building in AOM in the Community Organizations ♦ Final report of capacity-building and strengthening of the municipalities ♦ Ex post evaluation of Program ♦ Evaluation of Program Impact	♦ Participation by the population in the capacity-building workshops for hygiene education ♦ Participation by members of the Community Organizations and the population in the capacity-building workshops ♦ Fulfillment of commitments to assume responsibility for supervising and watching over the water services

COMPONENT 3 (Activities of Program Administration)

OBJECTIVES	AIMS	INDICATORS	VERIFICATION MEANS	ASSUMPTIONS
I. Administration and Program Management 1. Executing Unit of Program implemented 2. Contracting of OC, SC, and Executing Contractors for implementation in Conglomerates 1 and 2 3. Development of Annual Operative Plan for the Management of annual budgets for the functioning of the Program 4. Follow-up and evaluation of Program implementation	♦ Program PMU is functioning as of 2011-2020 for USD24.2 million ♦ Operating Consultants contracted ♦ Supervising Consultants contracted ♦ Executing Contractors contracted by year ♦ Annual Operative Plan for Program approved ♦ 06 reports of follow-up and evaluation of the Program per year ♦ 130 works concluded and operative in the year 2013 ♦ 732 works concluded and operative in the year 2015 ♦ 638 works concluded and operative in the year 2020	♦ N° of OC Contracts ♦ N° of SC Contracts per year ♦ N° of contracts with Executing Contractors per year ♦ N° of follow-up and evaluation reports per year ♦ N° of works concluded and operative by the year 2013 ♦ N° of works concluded and operative by the year 2015 ♦ N° of works concluded and operative by the year 2020	♦ Resolution of the Creation of Program´s PMU ♦ Contracts or assignments of PAPT of the Program´s PMU specialists ♦ Contracts signed by OC´s ♦ Contracts signed by SC´s ♦ Contracts signed by the Contractors of Works ♦ Reports from the PMU for follow-up and evaluation of the Program ♦ Resolutions for Liquidation of Works by the year 2013 ♦ Resolutions for Liquidation of Works by the year 2015 ♦ Resolutions for Liquidation of Works by the year 2020	♦ Commitments from the sector institutions to participate according to the sectorial guidelines ♦ Sectorial and Regional Policy for the intervention in W&S in the rural Amazon area

CHAPTER 2

GENERAL ASPECTS

CHAPTER 2 GENERAL ASPECTS

2.1 Name of Project

Programa de Agua Potable y Saneamiento para la Amazonía Rural *(Original Spanish)*

Water Supply and Sanitation Improvement Project in Rural Amazon Area*(English translation)*

2.2 Formulating and Executing Unit

2.2.1 Formulating Unit

NAME	: NATIONAL SANITATION DIRECTORATE (DNS).
AREA	: Housing, Construction and Sanitation.
RESPONSIBLE	: Eng. Juan Carlos Paredes
CHARGE	: Sanitation National Director
ADDRESS	: Av. Paseo de la República 3361, Piso 3
TELEPHONE	: 2117930

2.2.2 Executing Unit

NAME	: WATER FOR ALL PROGRAM (PAPT).
AREA	: Housing, Construction and Sanitation.
RESPONSIBLE	: Ing. Felix Agapito Acosta
CHARGE	: Executive Director
ADDRESS	: Av. Paseo de la República 3361; Piso 3.
TELEPHONE	: 2117930

2.3 Participation of the concerned entities and the beneficiaries

2.3.1 Ministry of Housing, Construction and Sanitation MVCS

The Ministry of Housing, Construction and Sanitation (MVCS) is the governing entity over the area of water and sanitation, which formulates, approves, executes and supervises application of the nationwide policies with regard to sanitation subject through the Vice-ministry of Construction and Sanitation (VMCS).

The National Sanitation Directorate (DNS) under the VMCS is in charge of fortifying the sanitation sector within the framework of the national policies and strategic targets in agreement with the development goals; This fortification is to be done through the increasing efficiency, productivity and sustainability of the services; by means of the promotion of the recognition of the economic value of sanitation, the fixation of suitable prices and the formulation of projects and programs, according to the guideline of the National System of Public Investment (SNIP).

The execution of the investments has been delegated to the *Programa Agua para Todos* (Program Water for All –PAPT), also under jurisdiction of the VMCS, through Ministerial Resolution N° 087-2009-VIVIENDA. This Ministerial Resolution approves the PAPT's Operations Manual and appoints that it will be the Executing Unit of the Water Supply and Sanitation Improvement Project in Rural Amazon Area. The operating capacity of the PAPT will be reinforced so they may be in the capacity to be in charge of the management of the Program, and to receive the delegation of faculties from the General Directorate of Multi-annual Programming (DGPM) of the Ministry of Economy and Finances (MEF) to declare the viability of the public investment projects of each *conglomerado* of the Program. (Art. 4ª de la RM Nº 314-2007-EF/15).

The Office of the Environment (OMA: Oficina del Medio Ambiente) is the organization under VMCS in charge of the National System of the Environment of the Sector; this organization will also formulate and implement the policy guidelines, norms, plans, programs, projects, investigations and environmental initiatives of the Sector.

2.3.2 Japan International Cooperation Agency -JICA

JICA was established on August 1st, 1974 as the official entity of the Japanese government, in order to contribute to the social and economic development of developing regions and to promote the International Cooperation. The Representative Office in Peru was founded in September 1977 and its activities were formalized in the framework of the Basic Agreement for Technical Cooperation of 1979, signed by the Japanese and Peruvian governments. Since October, 2008, JICA has assumed the projects in execution financed with then-JBIC (Japanese Bank for International Cooperation that was merged with JICA, in October 2008) loans, that

include loans to support the sanitation sector in cities like Lima, Chimbote, Piura and Castilla, Iquitos, Cusco and Sicuani. It is the financing entity of the present Feasibility Study.

2.3.3 Ministry of Health

The Ministry of Health (MINSA), through the Environmental Health General Department (DIGESA), carries out functions in the sanitary aspects of control of the quality of water for human consumption and in the protection of health through the protection of the environment. The Ministry´s participation in this Program will be through health centers and stations already existing in the rural areas, managed by health networks and micro networks and that will exercise the functions of their sectors in the regions where the Water Supply and Sanitation Improvement Program for the Rural Amazon will be implemented.

2.3.4 Ministry of Education

The Ministry of Education (MINEDU), as a sector of government, has as a policy in its strategic institutional plan (2007-2011): (a) “to contribute to the implementation of nationwide programs and projects and to sectoral policies for the integral development for the Andean, Amazonian, Afro-Peruvian and Asian-Peruvian villages”; (b) as well as “to promote the comprehensive development of such social groups that are traditionally excluded and/or marginalized from the society for economic, racial, cultural or geographic reasons, groups that are mainly located in the rural areas and/or organized in rural and native communities”. Its participation in this Program will be through the Local Educational Management Units (UGEL) and the Educational Institution, which locally develop the functions of their sector.

2.3.5 Ministry of the Environment

The Ministry of the Environment (MINAM) was founded by Legislative Decree Nº 1013 on May 14th, 2008, as the governing entity of the national environmental sector and that coordinates at national, regional, and local government levels. Its mission is to preserve the quality of the environment. One of its specific functions is to direct the National System of Environmental Impact Assessment, created by Law Nº 27446, modified by Legislative Decree Nº 1078. Other of its functions is to randomly review the environmental impact studies, approved by the competent authorities; to approve the Strategic Environmental Assessments of policies, plans and programs; and to control and supervise the application of its rules.

Its specific objectives are assuring the fulfillment of the constitutional mandate regarding the conservation and the sustainable use of the natural resources, the biological diversity and the protected natural areas and the sustainable development of the Amazon; as well as to promote the participation of citizens in the decision-making process for the sustainable development.

2.3.6 Regional Governments

The Program will keep the Regional Governments informed about the projects within their territory. It is expected that regional governments will provide the necessary support to the district municipalities of their regions if they require it.

2.3.7 District Municipalities

District Municipalities, as local governments, will be one of the main actors in program implementation. The municipalities participation shall start in the project promotion will continue during the intervention period and will last throughout the lifetime of the systems that are to be implemented. As a sector policy, municipalities and communities shall co-finance the projects. In some small villages, the municipality authority is represented by a Municipal Agent.

2.3.8 Consultants, NGOs, Contractor Companies

Non-governmental organizations (NGOs), consultants (of companies or individuals) and contractor companies will participate in the implementation of the projects.

2.3.9 Benefited Populations

Communities shall participate in the entire project cycle as the main actor of the Program, since the election/formation of its organization for the administration of services, during project implementation through the tasks and contribution agreed upon and by taking part in the training programs for operation and management of the facilities to be implemented and for hygiene education. During the post-execution stage and throughout the lifetime of the infrastructure, they shall participate through the regular payment of fees for the regular administration, operation and maintenance of the services. Extraordinary fees shall be paid for the smaller repairs which the systems may require during their lifetime. The population benefitted by the Program is limited to the rural population defined as those in villages with populations between 200 and 2,000 inhabitants located in the regions called Low Forest, High Forest and Front Forest. All of which are located in less than 2,300 masl and shall belong to the Amazonian departments of Amazonas, San Martin, Madre de Dios, Ucayali and Loreto.

2.3.10 Services Providers (JASS)

At the first steps, to include a locality in the Program's scope, the population should express its agreement with the implementation of the project to have the potable water and sanitation services. The population should have a disposition to participate in project financing through cash contributions, unskilled labor or others. They should also show willingness to commit to the operation and maintenance through the formation of a communal organization which will be constituted by the "services providers¨. This organization could be a committee or other type of organization, the most common form being the Administration Board of the Sanitation Services (JASS).

2.3.11 Matrix of Involved Parties

The Matrix of Involved Parties is presented as follows, showing the description of the interests of each group involved in the execution of the Program, the problems identified and the strategy to solve such problems.

Table Nº 2.3.11-1: Matrix of Involved Parties

GROUPS	INTERESTS	PROBLEMS IDENTIFIED	ESTRATEGY TO SOLVE THE PROBLEM
Ministry of Housing, Construction and Sanitation	It is the governing entity of the sanitation sector, which formulates, approves, executes and supervises the application of national policies in the area of water and sanitation, through the VMCS	Low coverage of the water and sanitation services in the localities of the Amazon Area. The execution of works cannot be financed with the collection of family fees, which in few cases cover the AOM costs,	The execution of the investments has been assigned to the Agua Para Todos Program (PAPT), and such investment will be subside through the Program, technical assistance will be provided to the municipalities and JASSs and awareness of the value of water will be raised through sanitary education programs to the community
Japan International Cooperation Agency -JICA	It is the official entity of the Japanese government whose objective is to contribute to the social and economic development of the developing regions by financing their projects	JICA senses that in order to execute the Program it is indispensable to demonstrate its feasibility and put it at the disposal of the Peruvian Government with the resources for its execution.	Finances the development of the present Feasibility Study and part of the resources through a loan for the execution of the Program.
Ministry of Health	Carries out functions in the sanitary aspects of quality control of water for human consumption and the protection of the environment for health. Establishes technical sanitation norms for the supply of water used for human consumption, for the handling and reuse and disposal of domestic residual waters and excreta disposal.	The execution of works to provide the rural localities with potable water services is not in their scope but the control of its consequences for health is.	Their participation in this Program will be through the existing health centers and stations nation-wide, administered by the health networks and micro-networks.
Ministry of Education	It has as a policy to contribute in programs and projects for the integral development of the amazonic populations, as well as to promote the economic, social, political and cultural inclusion of social groups traditionally excluded and marginalized due to economic, racial, cultural and geographic reasons, which are mainly located in the rural ambit and/or organized in farming and native communities.	The incidence of water-borne diseases generates school absences and dropouts and limits the learning capacity of children complicating the achievement of their goals.	Their participation in this Program will be through the UGELs and the Educational Institutions that carry out the sector's functions locally, in activities that may be of their competence, especially educational campaigns in schools related to the good use of water
Ministry of the Environment	It is the governing entity of the environmental sector that coordinates with the local, regional and national government levels. Its mission is to preserve the quality of the environment.	It must assure the preservation and sustainable use of the natural resources, particularly the ones of the Amazon Area, and the fulfillment of the constitutional mandate on the conservation of the biological diversity and the protected natural areas.	This entity shall promote the participation of the population in the decision-making processes for sustainable development.

GROUPS	INTERESTS	PROBLEMS IDENTIFIED	ESTRATEGY TO SOLVE THE PROBLEM
Regional Governments	The Organic Law of Regional Governments and its modifications of 2003 states that the regional governments are to provide technical and financial assistance to the local governments for the provision of sanitation services.	The regional governments will hardly be able to assists all the district in their jurisdiction participating in the Program	In case it is required, the district municipalities will request the regional government for technical and/or financial assistance for the Program. Such municipalities will keep the regional Government Informed of the schedule and progress.
District Municipalities	They shall receive the sanitation facilities as property from the National or Regional Government, although the AOM will be in charge or the legally-constitutes communal organization	As a policy of the Sector, both the municipality and the community shall co-finance the project in their respective localities. However, the previous experiences indicate that this requirement might be a factor of delay of the Program. The municipalities shall provide technical assistance to the JASS and supervise them. There are few resource availability.	The participation of the municipalities will start with the promotion of the project, continuing during the period of intervention and last all along the useful life of the systems to be implemented. The co-financing may consist of the valuation of the personnel that will work in the Management Unit for the supervision and administration of the Program.
Consultants, NGO, Contracting Companies	To be awarded with contracts whose execution is viable and that assure a reasonable profit, with foreseeable and manageable risks.	Dispersion of the locations were the execution of works and training will take place. Te concentration of works and scale economies depend n the results of the Program's promotion.	The implementation of the projects will be done by forming packages of works concentrated geographically, including the social intervention activities, and in a number sufficient to accumulated amounts that result attractive for contracting companies.
Benefited population	To have a water service at a fair price.	Insufficient Willingness to Pay due to the low valuing of the service. Unsanitary habits and customs.	The population shall show willingness to contribute with cash and/or un-skilled manpower and to participate in the administration operation and maintenance of through the payment of family fees that cover the AOM costs.
Service Providers (JASS)	Its constitution will be a pre-requirement for the incorporation of the locality to the Program.	Its members will require training and technical assistance, as well as to be motivated to give their time for the AOM of the water system. The operators are compensated but the members of JASS are not.	The Program expects this to be resolved through the social intervention activities in the entire cycle of the project.

2.4 Frame of Reference

2.4.1 Background and Development of the Program

THE PROBLEMS: The access to potable water and sanitation in rural areas of the country are barely of 62% and 33% respectively. These rates are even lower in Amazon regions: FONCODES Poverty Map points out that the lack of these services ranges from 35% to 62%. The five (5) departments of the Amazon Region represent 50% of national territory and 9% of the whole country's population; but only 5% of GDP.

INCEPTION STUDY: An exploratory study regarding water supply and sanitation in the rural Amazon population that comprises five (5) countries, including Peru, was implemented on 2005 by NIPPON KOEI LAC. CO., Ltd. (NKLAC) with the financial support of the Water and Sanitation Program (WSP). The study was conducted in the context of multilateral cooperation, managed by the World Bank and it has developed activities that intend to support the water and sanitation services in the Latin-American countries, especially in the less favored communities. The objectives of the study were to analyze the situation of the water resources and water and sanitation services in the rural area and small villages of the Amazon region and to evaluate the options for support in these underprivileged communities.

PRE INVESTMENTS STUDY - *PERFIL*: Based on the study, the former Japan Bank for International Cooperation (JBIC) expressed its interest in supporting the Peruvian Amazon area and consequently entered into a dialogue with the National Sanitation Department (DNS) of the MVCS for a project identification and formulation. The pre-investment study at the *Perfil* level required by the National System for Public Investment (SNIP) was carried out from June to September, 2008. The *Perfil* was evaluated and approved by OPI-VIVIENDA and shortly thereafter, DNS requested the General Directorate of Multiannual (DGPM) of the Ministry of Economy and Finance (MEF), through Official Letter N° 295-2009/VIVIENDA-OGPP dated July, 1st, to authorize the elaboration of Feasibility Study.

On September, 9th 2009 the DGPM of the Ministry of Economy and Finance authorized the DNS to proceed with the elaboration of the F/S, through Official Letter N° 118-2009 and Technical Report N° 118-2009-EF/68.01.

The DNS sent the consultant the above mentioned documents, through Official Letter N° 1274-2009-VIVIENDA/VMCS-DNS dated on September, 9th, 2009; and recommended to take into consideration its observations and those made by OPI VIVIENDA to the Feasibility Report presented by the Consultant.

2.4.2 Political Will

The Government's political will to carry on programs to improve the access to improved water supply and sanitation services as one of the highest priorities of development

The Article 7 of the Constitution of Peru 1993 stipulates that everyone has a right to the protection of their health, the family environment and the community. Following the constitutional mandate, national development strategies and policies reflect the Government's motivation to improve the sanitation situation. The National Agreement policies, National Plan for Overcoming Poverty and National Strategy CRECER all identify the improved access to quality water supply and sanitation as one of the highest development priorities.

Also, the Millennium Development Goals of Peru hold up, in Goal 7 - Target 10, a target to halve the proportion of people without sustainable access to safe water and sanitation facilities by the year 2015. The Multi-year Social Framework 2009-2011, an integral policy orientation for the social programs, also places sanitation issues at the top of its agenda and indicates that lack of access to water, (electricity) and hygienic services has adverse effects on the poor.

The Government's firm will toward the sector has been affirmed in recent events. In September 2006, the Government announced an ambitious investment plan for the water and sanitation sector called "Water for all" (*Agua para todos*), aiming to accelerate the expansion of water coverage to its people, particularly to the marginalized segment of population. Then, following the UN General Assembly's declaration of the year 2008 as the International Year of Sanitation, the MVCS (Ministry of Health and Ministry of Environment) took an initiative to convene the first Peruvian Conference on Sanitation, PERUSAN 2008 "Proposals for Sustainable Sanitation" in November 2008. The conference contributed to defining a strategy to implement the National Sanitation Plan 2006-2015 (PNS in Spanish) from a multi-sectoral perspective.

For the formulation of criteria of sectoral policy and strategy of intervention in small localities and the rural ambit, the MVCS organized, on March 6th of 2009, a meeting with the representatives of cooperation agencies (BID, BIRF y JICA). As a result of such meeting an Aidé Memoire was signed[1], in which, among other aspects, it was established that the model for the execution of projects will be of an integral intervention that will cover infrastructure, management and the social and environmental components.

2.4.3 Conformity with the Sector Policies

Although much progress has been achieved in the sanitation sector over the past 2 decades, many challenges remain, such as insufficient service coverage, poor service quality, lack of sustainability in the systems built, etc. These challenges are more severe in rural areas. Based on the clear recognition of the present situation, sector policies such as PNS 2006-2015 and Multi-year Sector Strategic Plan 2008-2015 (PESEM) establish the sectoral strategies, action agenda and goals, etc. with the aim of making the interventions in the sector more efficient and harmonized. These sector policies also give much consideration to the severe conditions in rural areas and establish strategies and goals tailored to the peculiar conditions of rural areas.

[1] Ayuda Memoria entre el MVCS y BID, BIRF y JICA (06.03.2009)

PNS 2006-2015 delineates strategies for the interventions in rural areas and emphasizes the importance of promoting sustainability in rural projects. PESEM 2008-2015 includes among the priority action points in its agenda the promotion of public investment in the water supply and sanitation infrastructure and the use of adequate technology in rural areas. In light of this, the Program for Water Supply and Sanitation Improvement in Rural Amazonia has been implemented, designed to amplify the coverage area of water and sanitation services and improve the sanitation environment of rural communities, conforming to the themes and aims of the sector policies. Hereafter, the outlines of PNS 2006-2015, PESEM 2008-2015 and the laws of reference to the sector are presented.

(1) National Sanitation Plan 2006-2015

PNS 2006-2015 is the backbone sectoral policy which serves to coordinate and harmonize the initiatives taken by different institutions in the sanitation sector. It was formulated by the MVCS and approved by Supreme Decree No. 007-2006-VIVIENDA in 2006.

Table 2.4.3-1: Outline of National Sanitation Plan 2006-2015

	Details
Principle Policies	▪ The water rate must cover operation, maintenance and investment costs. ▪ The subsidies must be targeted to the areas that have more need. ▪ The subsidies to investments must be linked to the efficiency in the provision of services. ▪ To promote public - private alliances to achieve the financing viability and improve the management of the service rendering companies.
Vision	▪ The population will have access to sanitation services of suitable quality and price, through efficient service of rendering companies regulated by the State, based on sectoral development policies and environmental sustainability.
Mission	▪ To strengthen the Sanitation Sector in the policies framework and strategic objectives of the National Government in accordance with the development goals, sustainability, increase of efficiency and productivity in the rendering of services, promoting the recognition of the economic value of such services, the adherence of appropriate prices and the execution of investments according to the guidelines of the National System of Public Investment and the participation of the Private sector.
General Objective	▪ To contribute to expansion of coverage and improvement of quality and sustainability of the potable water services, sewerage, sewage treatment and disposal of excreta in agreement with the National Plan of Poverty Surmounting and the Policies Thirtieth and Twentieth - First drawn up in the National Agreement and the Millennium Development Objectives, mainly with the goal 10 of the Objective 7 which proposes, by the year 2015, to reduce by half the population without sustainable access to safe water and basic sanitation facilities.

<table>
<tr><td>Specific Objectives</td><td>1. To modernize the management of the Sanitation Sector
2. To increase the sustainability of services
3. To improve the quality of services
4. To achieve the financing viability of the service rendering companies
5. To increase access to the services by promoting the execution of works that will increase the coverage with household connections and public taps for eater supply and latrines or others for sanitation.</td></tr>
<tr><td>Goals (only goals for water supply and sanitation sector coverage are presented here)</td><td>▪ Water supply and sanitation coverage
<table>
<tr><th></th><th colspan="3">Water supply</th><th colspan="3">Sanitation</th></tr>
<tr><th></th><th>2005</th><th>2010</th><th>2015</th><th>2005</th><th>2010</th><th>2015</th></tr>
<tr><td>Urban</td><td>81</td><td>85</td><td>89</td><td>72</td><td>80</td><td>84</td></tr>
<tr><td>Rural</td><td>64</td><td>67</td><td>70</td><td>30</td><td>43</td><td>60</td></tr>
<tr><td>National Average</td><td>76</td><td>80</td><td>83</td><td>59</td><td>69</td><td>77</td></tr>
</table></td></tr>
<tr><td>Strategies (only strategies for rural areas are presented here)</td><td>▪ Health and Hygiene Education as well as duties and rights for the services of water and sanitation
▪ Capacity building, both at community level (JASS for the service administration) and in the local governments for the technical assistance, monitoring and supervising of the implemented services
▪ Co-financing of the infrastructure, both by the municipality and by the population, differentiating between the construction of new works and the rehabilitation of existing works, giving a bigger subsidy to the construction of new works
▪ The service rendering fees to be paid must cover at least: administration, operation, maintenance, equipments replacement and infrastructure rehabilitation
▪ To provide different services levels or technical options in water and sanitation according to the implementation feasibility (Social, economic and technique) of each one of them</td></tr>
<tr><td>Proposed Actions for Rural Areas</td><td>▪ To promote the demand for services
▪ To expand the water coverage with connections and public taps, the latter being used more often in populations with large dispersion
▪ To promote solutions with latrines for sanitary disposal of excreta
▪ To direct the donations of the technical cooperation projects towards this area
▪ A contribution, of at least 20% between the Community and the Municipality for the financing of its investments is considered.
▪ The payments made by the users should cover at least the costs of operation and maintenance services.
▪ To encourage the participation of the community in the decisions about the services
▪ The conformation of communal organizations will be promoted, previous to the execution of any work.</td></tr>
</table>

Source: National Sanitation Plan 2006-2015

(2) Sectoral Multi-annual Strategic Plan 2008-2015 (PESEM)

PESEM 2008-2015 is multi-annual strategic plan for the MVCS, and it is an institutional operation framework with which the internal units of MVCS must consider for the design of their operations.

PESEM 2008-2015 identifies the 5 global underlying challenges in the sectors of housing, construction and sanitation. In the thematic area of sanitation, the underlying challenge is identified as "limited access to quality sanitation services." In order to respond to this challenge, PESEM 2008-2015 define the strategic objectives, action agenda, goals and indicators for which the performance is evaluated.

Table 2.4.3-2: Outline of Sectoral Multi-annual Strategic Plan 2008-2015

	Details
Vision	The country has an organized territory and a competitive and sustainable system of populated centers that offer the conditions for the continuous improvement of the population's quality of life.
Mission	At urbanism, housing, construction and sanitation we are the governing body responsible for designing, regulating, promoting, supervising, evaluating and executing sectoral policies, contributing with the territorial competitiveness and sustainable development of the country, preferably in benefit of the population with less resources.
Objectives	1. To promote the rational, orderly and sustainable occupation of the national territory 2. To promote the access of the population to an adequate house, especially in the middle and low sectors 3. To promote the access of the population to a sustainable sanitation to sustainable and quality sanitation services 4. To regulate and promote the sustainable development of the construction, infrastructure and equipment market 5. To fortify the capacity of the Sector and its relations with the entities and sub-national governments within its scope

Source: Multi-year Sector Strategic Plan 2008-2015

Table 2.4.3-3: Strategies and Action Agenda for Strategic Objectives No.3 of PESEM 2008-2015

Strategies	Action Agenda
Expand and promote the sanitation infrastructure	Promotion of the public investment in urban sanitation Promotion of the private investment in sanitation Promotion of public investment in rural sanitation systems Promotion of the use of valid technology in rural areas
Promote the Sustainability of services	Strengthening of capacities of service rendering companies and service administrators Improvement of operational and commercial management Promotion of risk-prevention programs
Optimize the use of water resources	Promotion of the adequate use of water sources Promotion of the adequate management of potable water by users

Source: Multi-year Sector Strategic Plan 2008-2015

Table 2.4.3-4: Indicators and Goals for Strategic Objective No.3 of PESEM 2008-2015

Indicators	Base Year 2007	Target Year 2015
Water supply coverage in urban areas	82	98
Sewerage system coverage in urban areas	73	93
Water treatment coverage in urban areas	24	68
Basic sanitation coverage in rural areas	33	70
Water supply coverage in rural areas	62	78

Source: Multi-year Sector Strategic Plan 2008-2015

(3) Legal Framework of Reference for the Sector

i) Rural Sector Development

Organized efforts to provide sanitation services to rural areas, have more than four decades, when Law No. 13,997 of Rural Sanitation (1962) was enacted and the Ministry of Health implemented the National Plan for Rural Water through its Department of Rural Sanitation. Water systems of various types were constructed, and its administration, operation and maintenance was put in charge of the communities who constituted the administrative boards.

Since then investments with different approaches have been made. In the following decade the sanitation sector was undertaken by the Central Government through the Ministry of Housing for the urban area and the Ministry of Health for rural areas. In the eighties, it was intended that the provision of services in the urban area had a business approach, and the National Water and Sewerage Service (SENAPA) was created, which

remaining under the Ministry of Housing, had affiliated companies in the departments. The rural sector continued to be under the Ministry of Health.

In the nineties, SENAPA subsidiaries were transferred to the municipalities and the Ministry of Health ceased to have responsibility for the rural services, and the General Law of Sanitation Services, Law No. 26,338, by its 5th Article commissioned provincial municipalities with full responsibility for the services in their jurisdiction. In July 2002 the Ministry of Housing, Construction and Sanitation was created, in whose organizational structure is the Vice Ministry of Construction and Sanitation (VMCS), which oversees the National Sanitation Directorate (DNS), under which one starts PRONASAR. Thus, the water and sanitation sector was transferred to MVCS.

In August 1995 the Regulations of the General Law of Sanitation Services approved (Supreme Decree No. 09-95-PRES), and after five revisions, in December 2005, its Unique Organized text (TUO) was approved by Supreme Decree No. 023-2005-HOUSING. In its 169th Article it was established that in rural areas, district municipalities are responsible for planning and promoting the development of sanitation services and for managing them directly or through specialized operators or community organizations, in which case they should constitute a Management Unit within the municipality and keep accounts separate. But same provision also states that the district municipality should promote the formation of community organizations for the management of sanitation services, which are to be recognized and registered, provided with technical assistance and monitored, and finally, that they must also ensure the sustainability of services and participate in financing.

Article 170 of the same norm established that in rural areas, it is the responsibility of community organizations - which includes the administrative boards of Sanitation Services (JASS) to manage, operate and maintain the sanitation services and, among other functions, to determine the family fee. In the latest amendment of the Unique Organized Text (TUO) of the Regulation of the above referenced Act, enacted by Supreme 031-2008-HOUSING, November 30th, 2008, some aspects relevant to the services in rural areas are specified, such as the definition of a rural locality as one that has less than 2,000 inhabitants (in no definition a lower limit is determined), the composition and use of the family fee, the relationship between provincial and district municipalities and the powers of the latter when the service is not provided by an EPS. Furthermore, article 2 of this norm modified the TUO stating that when the service is provided by community organizations, the district municipality and the provincial, supplementary, should constitute a technical area to oversee, monitor and provide technical assistance to these services providers.

These provisions of the General Law of Sanitation Services are not entirely clear on those aspects that the Organic Law on Municipalities, Law No. 27,972, also rules in article 80th

stating as "specific shared functions" of the provincial municipalities, the provision of rural sanitation when they cannot be met by the district municipalities or rural localities. Also, among the district municipalities' "specific shared functions", are those of managing the services of water, sewerage and drainage (it is deduced this is for urban areas), "when they are able to do it", and also includes providing rural sanitation.

As the organic laws prevail over general, these last provisions prevail over those of the General Law of Sanitation Services.

ii) Norms

The policies and sector strategies formulated in documents such as the PNS, Pesem 2006-2015 and the 2008-2015 are based on current regulations given by the following laws and regulations:

Table 2.4.3-5: List of Laws of Reference for the Sector

Perspective	Laws
Provision of services	▪ Sanitation Services General Law - Law Nº 26338 (24 July, 1994) ▪ Supreme Decree Nº 09-95-PRES, Regulation of the Sanitation Services General Law and its modifications (28 August, 1995) ▪ Organized Unique Text of the General Law of Sanitation Services, approved by Supreme Decree Nº 023-2005-VIVIENDA (01 December, 2005), modified by r D.S. 010 y 024-2007-VIVIENDA, and lastly by D.S. 031-2008-VIVIENDA of November 0th, 2008.
Institutional reform and functions	▪ Law of Creation of the National Superintendence of Sanitation Services, SUNASS, Law Decree Nº 25965 (19 December, 1992) ▪ Organic Law that modifies the organization and functions of the ministries. Creates the Ministry of Housing, Construction and Sanitation, Law Nº 27779 (11 July, 2002) ▪ Law of Organization and Functions of the Ministry of Housing, Construction and Sanitation, Law Nº 27792 (25 July, 2002) ▪ Regulation of Organization and Functions of the Ministry of Housing, Construction and Sanitation, Supreme Decree Nº 002-2002-VIVIENDA (09 September, 2002)
Investment/ Finance	▪ Law of the National System Public Investment, SNIP. Law Nº 27293 (28 June, 2000) ▪ Supreme Decree Nº 157-2002-EF, that approves the regulation of the Law of the National System of Public Investment (17 October, 2007)
Decentralization/ Administrative structure	▪ Law Nº 27680 – Law of the Constitutional Reform (March 7th, 2002): Modifies Chapter XIV "Decentralization" of Title IV "Structure of the State". Establishes, among others, that the provincial and district municipalities are the local government entities and that those are autonomous and competent to develop, and regulate activities and/or services in education, health,

	housing, sanitation, environment, transportation, etc. ▪ Law of Decentralization Bases, Law Nº 27783 (20 July, 2002) ▪ Organic Law of Regional Governments and its modifications, Law Nº 27867 (16 April 2003). States that eh regional governments are to provide technical and financial assistance to the local governments for the provision of sanitation services. ▪ Organic Law of Municipalities, Law Nº 27972 (27 May, 2003). Item No. 2.1 of article 80º states shared functions of the provincial municipalities to manage and determine the water, sewage and sewerage services directly or by providing subsidies.
Laws related to other sectors	▪ Health Law, Law Nº 26842, (1997) ▪ General Water Law, Law Decree Nº 17752 ▪ General Environmental Law, Law Nº 28611 (15 October, 2005). This law gives different faculties to the sector in matters of regulation and supervision to prevent and minimize the risk to the environment due to sanitation activities; these faculties appear in different norms of specific matters.

Source: National Sanitation Plan 2006-2015 and Multi-year Sector Strategic Plan 2008-2015

CHAPTER 3

DIAGNOSIS OF PRESENT SITUATIONS

CHAPTER 3 DIAGNOSIS OF THE EXISTING SITUATION

3.1 Population in the Program and its Characteristics

The Amazon Forest consists of eleven (11) administrative regions. The five (5) target regions (Amazonas, Loreto, Madre de Dios, San Martín and Ucayali), that occupy more than 50% of the country's territory, are mostly in the rain forest areas. All the five (5) regions are located below 2,300 masl, except San Martín that includes some localities in higher altitude zones.

The results of the 1993 and 2007 censuses conducted by the National Institute of Statistics (INEI) were used as basic information for the population estimate. It was noted that the information do not include date of some localities, especially of the smallest ones.

According to the 2007 National Census, a rural area is defined as a part of a district territory consisting of rural localities that spread from the edges of urban centers to the district limits. In the Organized Unique Text of the Regulation of the General Law of Sanitation Services, Act Nº26338, rural localities are defined as those that do not have population more than 2,000, though the lower limit of the population range is not specified.

3.1.1 Population, Housing and Localities per Region

(1) Population

As presented in Table N° 3.1.1-1, the rural population within the five (5) forest regions of the Program is 910,442 people, of which 54% are men and 46% women.

Table Nº 3.1.1-1: Population by Gender

Administrative Region	Population			Rural Population		
	Total	Men	Women	Total	Men	Women
Amazonas	375,993	192,940	183,053	209,990	109,622	100,368
San Martín	728,808	382,517	346,291	256,053	140,346	115,707
Madre de Dios	109,555	59,499	50,056	29,246	17,624	11,622
Ucayali	432,159	222,132	210,027	106,812	58,488	48,324
Loreto	891,732	456,962	434,770	308,341	164,477	143,864
Forest Total	**2,538,247**	**1,314,050**	**1,224,197**	**910,442**	**490,557**	**419,885**

Source: JICA Study Team (2010) based on INEI – National Censuses 2007: XI of Population and VI of Housing

(2) Housing

Regarding the households, those abandoned or those whose occupational state was not specified have been excluded, under the criteria that these households will not demand potable water and sanitation services. In Table Nº 3.1.1-2: private households, the number of rural households per each region is presented, with a total of 228,484 households.

Table Nº 3.1.1-2: Number of Private Households in the Amazon Forest

Administrative Region	Number of Households	
	Total	Rural
Amazonas	107,088	60,811
San Martín	186,478	69,935
Madre de Dios	29,175	7,915
Ucayali	99,709	26,790
Loreto	179,911	63,033
Total	**602,361**	**228,484**

Source: JICA Study Team (2010) based on INEI – National Censuses 2007: XI of Population and VI of Housing

(3) Localities

As part of the Program in the pre-investment study at the *Perfil* level previously conducted, 1,961 localities were identified using INEI's information of 2006, regarding localities that have households between 40 and 400, which corresponds to the population range of "a rural locality", assuming a family size of five (5) people per household.

The National Census Database of 2007 was used in order to identify the localities with populations between 200 and 2,000 inhabitants as the target localities for the present Feasibility Study of the Program. The census 2007 did not include several minor localities, probably because such localities are classified as "disperse".

In Table N° 3.1.1-3: Number of Rural Localities By Natural Region, the total of rural Amazon localities is presented (1,538), classified by five (5) administrative regions and the geographical regions they belong to. It can be observed that 60.3 % of the localities are located in the Low Forest, 22.8 % are in the High Forest and the rest in the Front Forest. With respect to the administrative regions, the 87.2% of such localities are located within the Loreto, Amazonas and San Martín regions.

Table N° 3.1.1-3: Number of Rural Localities by Geographic Region

Region	Number of Rural Localities				
	Low Forest	High Forest	Front Forest	Total	%
Amazonas	94	69	159	**322**	20.9%
San Martín	183	268	92	**543**	35.3%
Madre de Dios	40	4	0	**44**	2.9%
Ucayali	139	4	10	**153**	9.9%
Loreto	471	5	0	**476**	30.9%
Total	**927**	**350**	**261**	**1,538**	100.0%
%	**60.3%**	**22.8%**	**17.0%**	**100.0%**	

Source: JICA Study Team (2010) based on INEI – National Censuses 2007: XI of Population and VI of Housing

(4) Population and Housing by Geographical Regions

Table N° 3.1.1-4 shows the population data obtained from the 2007 National Census regarding the rural population ranging from 200 to 2,000 inhabitants, being classified by geographic regions,. The total population of the 1,538 localities is 664,612 inhabitants, which represents 73% of the Amazon Forest's total rural population in the five regions. Of this total population, 60.5% is in the Low Forest, 30.5% is in the High Forest and Front Forest; and 88% of the population corresponds to the regions of Loreto (28.9 %), Amazonas (20.1 %) and San Martín (39.0 %).

Table N° 3.1.1-4: Population By Geographic Region

Administrative Region	Population				
	Low Forest	High Forest	Front Forest	Grand Total	%
Amazonas	38,094	29,835	65,359	**133,288**	20.1%
San Martín	100,816	121,083	37,404	**259,303**	39.0%
Madre de Dios	19,899	1,592	0	**21,491**	3.2%
Ucayali	53,102	1,775	3,456	**58,333**	8.8%
Loreto	190,198	1,999	0	**192,197**	28.9%
Total	**402,109**	**156,284**	**106,219**	**664,612**	100.0%
%	60.5%	23.5%	16.0%	100.0%	
	84.0%				

Source: JICA Study Team (2010) based on INEI – National Censuses 2007: XI of Population and VI of Housing

Table N° 3.1.1-5 shows the housing data from the 2007 National Censuses, regarding the target localities, classified by geographic regions, considering the population range between 200 and 200 inhabitants. There is a total of 155,866 households in the 1,538 localities.

Table N° 3.1.1-5: Number of Households By Geographic Region (in localities between 200 and 200 inhabitants)

Administrative Region	Number of Households				
	Low Forest	High Forest	Front Forest	Grand Total	%
Amazonas	8,364	8,270	17,837	**34,471**	20.1%
San Martín	25,172	30,303	9,013	**64,488**	39.0%
Madre de Dios	4,969	397	0	**5,366**	3.2%
Ucayali	12,226	474	736	**13,436**	8.8%
Loreto	37,806	319	0	**38,125**	28.9%
Total	**88,537**	**39,763**	**27,586**	**155,886**	100.0%
%	56.8%	25.5%	17.7%	100.0%	

Source: JICA Study Team (2010) based on INEI – National Censuses 2007: XI of Population and VI of Housing

3.1.2 Size of the Localities by Household

Most of the localities, represented by 68.1% of the total localities, have less than 100 households, as shown in Table N° 3.1.2-1. Likewise, most of the localities, or 71.7%, are located in the Low Forest, followed by the High Forest and the Front Forest respectively.

Table N° 3.1.2-1: Number of Localities by Number of Households

Households per Locality	Number of Localities							%
	Low Forest		High Forest		Front Forest		Grand Total	
34< Households <100	665	71.7%	214	61.1%	169	64.8%	1,048	68.1%
100 <Households<200	182	19.6%	98	28.0%	69	26.4%	349	22.7%
200<Households	80	8.6 %	38	10.9%	23	8.8%	141	9.2%
Total	**927**	(100%)	**350**	(100%)	**261**	(100%)	**1,538**	100.0%

Source: JICA Study Team (2010) based on INEI – National Censuses 2007: XI of Population and VI of Housing

3.1.3 Population Growth Rates and Family Size

Population growth rates and family sizes of the rural areas in the five (5) regions area have been determined based on the results of the IX National Population Census of 1993 and IV Housing Census of 2007 as shown in Table N° 3.1.3-1.

Table N° 3.1.3-1: Rural Population Growth Rate

Administrative Region	Population		Average Annual Growth rate
	1993	2007	
Amazonas	216,726	209,990	-0.23%
San Martín	215,645	256,053	1,23%
Madre de Dios	28,575	29,246	0.17%
Ucayali	110,015	106,812	-0,21%
Loreto	288,860	308,341	0.47%
Total	**859,820**	**910,442**	**0.41%**

Source: JICA Study Team (2010) based on IX National Census of Population and IV of Housing 1993; XI National Census of Population and VI of Housing 2007

The family sizes in the five (5) regions varies between 3.45 and 4.89 inhabitants per household for all localities as shown in Table N° 3.1.3-2 and Table Nº 3.1.3-3. These family sizes of localities with populations between 200 to 2,000 inhabitants are slightly larger, ranging from 3.87 to 5.04 inhabitants per household. Therefore, it can be concluded that there is a larger number of inhabitants per household, than what was previously estimated.

Table N° 3.1.3-2: Rural Family Size
(All localities)

Administrative Region	Households	Population	Family Size (inhab/household)
Amazonas	60,811	209,990	3.45
San Martín	69,935	256,053	3.66
Madre de Dios	7,915	29,246	3.70
Ucayali	26,790	106,812	3.99
Loreto	63,033	308,341	4.89
Total	**228,484**	**910,442**	**3.98**

Source: JICA Study Team (2010) based on XI National Census of Population and VI of Housing 2007.

Table N° 3.1.3-3: Rural Family Size
(Localities with between 200 and 2,000 inhabitants)

Administrative Region	Households	Population	Family Size (inhab/household)
Amazonas	13,436	58,333	4.34
San Martín	34,471	133,288	3.87
Madre de Dios	38,125	192,197	5.04
Ucayali	64,488	259,303	4.02
Loreto	5,366	21,491	4.01
Total	**155,886**	**664,612**	**4.26**

Source: JICA Study Team (2010) based on XI National Census of Population and VI of Housing 2007.

3.1.4 Localities in the Program Area

For the present Feasibility Study, thirty eight (38) localities shall be excluded, as they will have the intervention of the National Program for Rural Water and Sanitation (PRONASAR: *Programa Nacional de Agua y Saneamiento Rural*) through the Water for All Program (PAPT: *Programa Agua para Todos*). These localities, shown in Table N° 3.1.4-1, are located in the regions of San Martín (7 localities) and Amazonas (31 localities).

Table N° 3.1.4-1: Number of Localities to be Intervened by PRONASAR
(Localities with between 200 and 2,000 inhabitants)

Administrative Region	Number of Localities			
	Low Forest	High Forest	Front Forest	Grand Total
Amazonas	20	10	1	**31**
San Martín	5	1	1	**7**
Total	**25**	**11**	**2**	**38**

Source: PRONASAR

Based on the aforementioned information, 1,500 localities will be considered for the present Program; the details for each region are shown in Table N° 3.1.4-2. It is observed that 88 % of the localities are located in the Loreto (31.7%), Amazonas (21%) and San Martín (34.1%)

regions; and that 60.1 % are located in the Low Forest, 22.6% in the High Forest and 17.3% in the Front Forest .

Table N° 3.1.4-2: Number of Rural Localities in the Program Area

Administrative Region	Number of Rural Localities				%
	Low Forest	High Forest	Front Forest	Grand Total	
Amazonas	89	68	158	**315**	21.0%
San Martín	163	258	91	**512**	34.1%
Madre de Dios	40	4	0	**44**	2.9%
Ucayali	139	4	10	**153**	10.2%
Loreto	471	5	0	**476**	31.7%
Total	**902**	**339**	**259**	**1,500**	100.0%
%	**60.1%**	**22.6%**	**17.3%**	**100.0%**	

Source: JICA Study Team (2010) based on XI National Census of Population and VI of Housing 2007

The population for the Program localities within the five (5) regions totals to 643,411 inhabitants; which represents 71% of the total population (910,442) in the rural Amazon area within the five regions. Tables N° 3.1.4-3 and N° 3.1.4-4 show the population and number of households per administrative and geographical regions.

Table N° 3.1.4-3: Population of the Program Localities (inhabitants)

Administrative Region	Population				%
	Low Forest	High Forest	Front Forest	Grand Total	
Amazonas	35,413	29,432	64,982	**129,827**	20.2%
San Martín	89,343	116,034	36,186	**241,563**	37.5%
Madre de Dios	19,899	1,592	0	**21,491**	3.3%
Ucayali	53,102	1,775	3,456	**58,333**	9.1%
Loreto	190,198	1,999	0	**192,197**	29.9%
Total	**387,955**	**150,832**	**104,624**	**643,411**	**100.0%**
%	**60.3%**	**23.4%**	**16.3%**	**100.0%**	

Source: JICA Study Team (2010) based on XI National Census of Population and VI of Housing 2007.

Table N° 3.1.4-4: Number of Households in Program Localities

Region	Number of Households				%
	Low Forest	High Forest	Front Forest	Grand Total	
Amazonas	7,824	8,200	17,680	**33,704**	22.4%
San Martín	22,264	29,060	8,719	**60,043**	39.8%
Madre de Dios	4,969	397	0	**5,366**	3.6%
Ucayali	12,226	474	736	**13,436**	8.9%
Loreto	37,806	319	0	**38,125**	25.3%
Total	**85,089**	**38,450**	**27,135**	**150,674**	**100.0%**
%	**56.5%**	**25.5%**	**18.0%**	**100.0%**	

Source: JICA Study Team (2010) based on XI National Census of Population and VI of Housing 2007.

3.1.5 Morbidity

(1) Relation between Morbidity and Sanitation Conditions

Based on the statistical information about morbidity by age and gender groups registered in outpatients consultations in years 2006 (at regional level) and 2007 and 2008 of the Health Ministry, the ten (10) main causes of general morbidity have been identified in twenty-nine (29) districts of the sample localities in the Program, located in the regions of Amazonas (9 districts), San Martin (11 districts), Loreto (3 districts), Madre de Dios (2 districts) and Ucayali (4 districts). Among these ten main causes of morbidity, there is a high incidence of intestinal infectious diseases and subcutaneous tissue and skin infections.

The incidence of these diseases is directly related to lack of and/or insufficient supply of potable water and the inadequate final disposal of the population's waste. The morbidity table by age groups shows the noticeable high incidence of the aforementioned diseases that prevails mainly in children under fourteen (14) years of age.

This information for each one of the districts and by regions is shown in the Table N° 3.1.5-1, as a summary of the information in Appendix 2

(2) Morbidity in the sample localities

According to the data from the health centers considered in the projects of the Program's sample localities, the figures for gastro-intestinal, diarrheic, skin and parasite-related diseases of the years 2006, 2007 and 2008 have been identified for the localities of Monterrey, Tres Islas and Sudadero in the department of Madre de Dios.

For the localities of San Francisco, Curiaca, Sharara and San Martin de Mojaral in the administrative region of Ucayali, the figures for infectious intestinal, parasite-related, skin and sub-cutaneous tissue diseases for the years 2003 to 2008 have been identified.

As well, the figures for diarrheic, skin and parasite-related diseases for the years 2006, 2007 y 2008 have been identified for the localities of Mishquiyacu, Sapotillo, Barranquita, Perla de Cascayunga, Lahuarpía, Posic and Yacucatina in the administrative region of San Martin.

In the localities of Amazonas, San Juan de Puritana, Veinte de Enero, Santa Amelia, Apayacu and Buen Jesús de Paz in the administrative region of Loreto, the figures for acute diarrheic diseases for the years 2007 and 2008 have been identified.

In the localities of Casual, Misquiyacu Bajo, San José Bajo and Naranjitos in the administrative region of Amazonas, the figures for infectious intestinal, parasite-related, skin and sub-cutaneous tissue diseases of the year 2008 have been identified.

In the morbidity tables presented in Appendix 2, it is noticeable that the biggest incidence of these diseases is directly related to the lack of water supply or to an inappropriate water supply, as well as to the inappropriate disposal of excreta of the population, as described in the above paragraphs, especially in the regions of Loreto and Ucayali, where the water coverage is low.

Table N° 3.1.5-1: Morbidity Related to Water Supply and Sanitation

Administrative Region /District	Intestinal Infectious Diseases (%)		Subcutaneous Tissue and Skin Infections (%)	
	2007	2008	2007	2008
Amazonas				
Jalca	5.5	4.3	3.0	2.6
Mariscal Castilla	3.0	3.0	-	-
La Peca	6.3	5.5	2.9	2.6
Aramango	9.4	7.6	5.4	-
Lonya Chico	7.2	7.1	7.7	4.9
San Cristobal	3.2	5.8	-	-
Bagua Grande	8.2	7.7	5.2	4.3
Cajacuro	11.0	8.9	5.4	5.7
Jamalca	6.3	5.2	-	-
San Martin				
Jepelacio	6.0	4.4	4.0	3.1
San Rafael	7.0	5.4	6.1	5.3
San Jose de Sisa	4.8	4.1	4.8	4.9
San Martín	5.8	6.4	3.3	-
Cuñunbuque	6.3	4.1	5.8	5.0
Rumisapa	7.7	8.2	5.1	4.0
Buenos Aires	4.4	3.2	3.2	-
Pilluana	6.2	3.5	6.1	5.7
Tres Unidos	8.2	8.2	5.8	4.3
Rioja	4.3	4.0	3.3	3.0
Posic	3.2	4.5	3.9	3.3
Madre de Dios				
Tambopata	6.2	6.2	3.5	3.2
Las Piedras	6.1	5.9	3.2	3.7
Ucayali				
Calleria	7.2	6.9	2.4	-
Campo Verde	8.0	7.3	2.5	-
Iparía	10.4	10.7	5.3	4.3
Yarinacocha	9.4	8.7	3.0	2.5
Loreto				
Iquitos	6.5	6.9	3.1	2.9
Belen	9.1	8.2	3.0	4.0
San Juan Bautista	9.2	8.1	-	3.4

Source: JICA Study Team (2010) based on information of Ministry of Health (See appendix)

(3) Demographic Survey and Family Health (ENDES Continua 2004-2006)

This investigation is made within the framework of the global Demographic and Health Surveys program, currently known as the DHS+. The *ENDES Continues 2004-2006*

constitutes the continuation of the efforts initiated with the Global Fertility Survey in 1977-78 and the Survey of the Prevalence of Contraceptives in 1981, in order to obtain current information and to analyze change, tendencies, and determinants of fertility, mortality and health in Peru.

The Demographic and Family Health Surveys (ENDES) have been taking place in Peru since 1986, and they have been very useful for the decision and formation of policies in the field of health, especially for mothers at the reproductive age and children under 5 years old. The results of the ENDES surveys have also been valuable in associated fields, such as the measuring of the status of women and the situation of intra-family violence, as well as for other uses: the preparation of population projections, education needs, housing, etc.

The objectives of this program are a) to provide a database and analyses to the executive organizations in the field of population in order to facilitate the consideration of alternatives and well-informed decision making; b) to expand the international database in the fields of population and mother-infant health; c) to contribute advances in survey methodology by sampling; d) to consolidate the technical capacity and resources for the execution of complex demographic surveys in participating countries.

The National Statistics and Information Institute (*INEI*) has performed five national demographic and health surveys in the framework of the DHS Program, the first in 1986 and the most recent in 2006 (*ENDES Continua 2004-2006*), from which the following was quoted from its Chapter 9.6[1]:

9.6 ACUTE DIARRHEA

Acute diarrheic disease in children continues to be a significant cause of mortality in that population group. The **ENDES Survey 2004-2006** asked mothers of fertile age about the occurrence of diarrhea in their children under 5 years old in the two weeks before the survey (Table 9.13).

Table 9.13

Prevalence of Diarrhea

- The prevalence of diarrhea among children younger than 5 years old reaches 15%, the same level that was found in the year 2000. Almost no difference was found between sexes. Then there are differences in age: as expected, before 6 months (when there is protection provided through maternal breast-milk), the prevalence is lower (12 per cent), rising to 20 and 24 per cent in the age groups when the child is more active and in contact with the environment (6-11 moths and 12-23 moths, respectively). Then the figures drop to 7 per cent for children between 48 and 59 months, when the child acquires better immunity and a behavior with less exposure to infectious diseases (e.g. hand-mouth).
- In terms of physical characteristics, the lowest prevalence is found among children that live in Metropolitan Lima (12 per cent), in Tumbes (8 per cent), La Libertad, Ancash, or Puno (10 per cent in each case); on the other hand, there is a higher prevalence among children that live in rural or tropical areas, as is the case with Ayacucho and Junín (21 per cent in each case), San Martin (23 per cent), Loreto (24 per cent), Pasco (25 per cent) and Ucayali (27 per cent).
- Less variation is found with mothers that have higher education (11 per cent). The economic capacity is lightly associated with the prevalence of diarrhea, with 19 per cent prevalence among children of mothers in the lowest quintile for wealth and 11 per cent prevalence among those in the highest quintile. Another important factor is the water source used for drinking: when this is superficial water, the prevalence of diarrhea is 18 per cent, compared with 13 per cent when the water is water from a pipe.

[1] Demographic Survey and Family Health (ENDES Continua 2004-2006) Final Report (USAID August 2007)

Table 9.13 - Prevalence of Diarrhea in children under 5 years old[2]

The percentage of children less than 5 years old that had diarrhea in the two weeks preceding the survey, according to the characteristics selected.

Characteristics	Percentage with diarrhea	Number of children
Age in months		
Less than 5 years old	11.5	607
6-11 months	20.2	641
12-23 months	24.2	1,383
24-35 months	14.7	1,206
36-47 months	10.7	1,230
48-59 months	7.0	1,250
Sex		
Male	15.1	3,169
Female	14.4	3,148
Área of residence		
Urban	13.8	3,543
Rural	15.9	2,775
Natural Region		
Metropolitan Lima	12.4	1,395
Coast (non-Lima)	12.6	1,433
Mountains	13.9	2,467
Jungle	22.7	1,022
Source of Drinking Water		
Pipes	13.2	2,860
Open well	14.1	221
Superficial	18.3	679
Other/ no information	15.5	2,558
Total 2004-2006	**14.7**	**6,317**
Total 2000	15.4	11,754

Note: The estimates refer to the children born in the period 1-59 months preceding the survey, excluding those born in the month of the survey.

From the same source where information can be obtained regarding the children under 5 that had diarrhea in the two weeks preceding the survey, by department and by natural region, it is also possible to obtain the percentage of children that were treated with oral rehydration and those that received no treatment; this is shown in Table N° 3.1.5-2: Prevalence of and Treatment for Diarrhea in Children under 5 Years, 2004-2006.

[2] Demographic Survey and Family Health (ENDES Continua 2004-2006) Final Report (USAID August 2007)

Table N° 3.1.5-2: Prevalence of and Treatment for Diarrhea in Children under 5 Years age, 2004-2006

Department/Natural Region	Percentage with Diarrhea (%)	Treatment		
		Health Care Provider (%)	ORT (%)	No Treatment (%)
Amazonia Region				
Amazonas	19.8	46.2	70.7	7.8
Loreto	24.1	43.4	56.9	8.4
Madre de Dios	23.5	35.5	73.9	14.0
San Martin	22.9	33.4	58.2	8.4
Ucayali	26.9	39.4	79.0	3.8
Promedio	23.4	40.6	62.6	7.8
Natural Region				
Metropolitan Lima	12.4	46.5	86.7	9.7
Coast (non-Lima)	12.6	29.7	796.2	11.1
Mountains	13.9	45.1	67.2	9.9
Jungle	22.7	41.3	62.2	10.3
Total				
National	14.7	41.4	71.3	10.2

ORT: Oral Rehydration Therapy

Source: JICA Study Team (2010), based on ENDES (2004-2006)

3.1.6 Coverage of Water Supply and Sanitation Services in the Localities of the Program

In the localities of the Program, the coverage of water distributed by house connections is 23% and the coverage of water distributed by public taps is 2.5%. The first coverage varies between 5.6% in the region of Loreto, and 33.9% in the administrative region of Amazonas. The coverage of the water distributed through public taps varies between 1.6% in the region of San Martin and 4.7 % in the Region of Ucayali. Charts N° 3.1.6-1 and Nº 3.1.6-2 show the water coverage by house connection and public taps by geographic and administrative regions.

Table N° 3.1.6-1: Water Services Coverage 2007

Administrative Region	House connection				Public Taps			
	Low Forest	High Forest	Front Forest	Average (Adm. Region)	Low Forest	High Forest	Front Forest	Average (Adm. Region)
Amazonas	18.9%	43.0%	28.2%	29.4%	3.3%	2.1%	1.0%	1.8%
San Martín	47.3%	28.6%	16.5%	33.9%	0.9%	1.7%	2.7%	1.6%
Madre de Dios	26.4%	0.3%	-	24.6%	3.7%	0.0%	-%	3.4%
Ucayali	9.1%	4.2%	18.2%	9.4%	5.1%	1.0%	0.9%	4.7%
Loreto	5.6%	0.3%	-	5.6%	3.6%	0.0%	-%	3.5%
Average Geo. Region	**19.3%**	**30.7%**	**24.1%**	**23.0%**	**3.1%**	**1.7%**	**1.6%**	**2.5%**

Source: JICA Study Team (2010) based on XI National Census of Population and VI of Housing 2007.

Regarding sanitation, the coverage through house connections is barely 7.2%, the highest percentage being in Amazonas with 22.4%. The coverage through cesspits or latrines rises to 66.8%, being the highest percentage also in Amazonas administrative region. This information from the census must be corroborated with field results of the Program's sample localities, due to the fact that the census in the rural areas include latrines that were mostly built in a handmade manner by the inhabitants, without the technical requirements for hygiene and ventilation conditions. Table N° 3.1.6-2 shows the different sanitation coverage by house connection and cesspits/latrines according to natural and geographic regions.

Table N° 3.1.6-2: Sanitation Services Coverage, 2007

Administrative Region	Distribution Network				Blind Pit/Latrine			
	Low Forest	High Forest	Front Forest	Average (Adm. Region)	Low Forest	High Forest	Front Forest	Average (Adm. Region)
Amazonas	6.6%	24.9%	28.7%	22.4%	87.3%	79.2%	81.7%	81.3%
San Martín	4.6%	3.4%	1.5%	3.6%	54.6%	63.0%	70.3%	60.4%
Madre de Dios	9.6%	12.6%	-	9.8%	41.8%	40.9%	61.5%	59.7%
Ucayali	1.6%	4.2%	2.4%	1.7%		28.7%	46.4%	45.2%
Loreto	1.6%	0.3%	-	1.6%		22.2%	55.8%	55.5%
Average Geo. Region	**3.3%**	**7.9%**	**19.1%**	**7.2%**	**64.9%**	**74.4%**	**64.1%**	**66.8%**

Source: JICA Study Team (2010) based on XI National Census of Population and VI of Housing 2007.

3.1.7 Socio-economic Conditions

(1) Socio-economic Indicators

The total population in the five (5) regions represents around 9% of the total population in Peru, while the regional GDP represents only 5% of the national level. In terms of the national GDP, Loreto is in 11th place, San Martin 16th, Ucayali 17th, Amazonas 21st, and Madre de Dios

24th among the 24 regions in Peru.[3] The poverty is more rampant in these ¨Forest regions,¨ given the poverty index in all of the regions; except Madre de Dios, which is above the national average according to the INEI statistics shown in Table N° 3.1.7-1. The INEI has been measuring the poverty level since 1997, based on monthly costs per capita. In 2007, the predetermined threshold for ¨poverty¨ was S/.229.4 per household per month, and for ¨extreme poverty¨ it was S/.121.2 per household per month.

Table N° 3.1.7-1: Demographic and Socio-economic Indicators for the Five (5) Target Regions

Nation /Region	Population 2007		Poverty - 2007		Monthly Spending per capita -2007 (S/.)	Regional GDP - 2006	
	Thousands of inhabitants	%	Poverty (%)	Extreme Poverty (%)		Millions of Soles	%
National Level	**27,412.2**	**100.0%**	**39.30%**	**13.70%**	**438.9**	**276.6**	**100.0%**
Average in Five Regions	**2,538.2**	**9.3%**	**43.40%**	**18.90%**	**378.7**	**14.8**	**5.3%**
Amazonas	376.0	1.4%	55.0%	19.6%	332.2	1.5	0.5%
San Martin	728.8	2.7%	44.0%	16.9%	366.9	3.1	1.1%
Madre de Dios	109.6	0.4%	15.6%	1.8%	557.8	1.2	0.4%
Ucayali	432.2	1.6%	45.0%	15.8%	414.1	2.8	0.1%
Loreto	891.7	3.3%	54.6%	23.8%	368.8	6.3	2.3%

Source: JICA Study Team (2010) based on National INEI Census of 2007 and the INEI Statistic Compendium 2007-2008.

The socio-economic conditions in the different regions in Peru can be perceived from a different angle. The FONCODES Poverty Map classifies twenty-five (25) regions at five (5) levels according to the Deficiency Index, which has been developed independently (see Table N° 3.1.7-2). In the next item, it will described the difference between the INEI Technical Report and the FONCODES Poverty Map.

[3] The Republic of Peru is divided into twenty-five (25) administrative regions and the Metropolitan Province of Lima. The Constitutional Province of Callao constitutes by itself the Region of Callao.

Table N° 3.1.7-2: Poverty Rate (FONCODES Poverty Map – 2006)

Categories	Names of Administrative Regions	No. of Regions	Total Population and %
Total		**25**	**27,412,157 (100%)**
Poorest	Huancavelica, Huánuco, Cajamarca, Apurímac, Ayacucho, **Loreto**, **Amazonas**, Pasco	8	5,169,682 (19%)
2nd Poorest	Cusco, Puno, **Ucayali**, Piura, **San Martin**	5	5,277,126 (19%)
3rd Poorest	Ancash, Junín, **Madre de Dios**, La Libertad, Lambayeque, Tumbes, Ica	7	6,040,644 (22%)
4th Poorest	Moquegua, Arequipa, Tacna	3	1,602,617 (6%)
Least Poor	Lima, Callao	2	9,322,088 (34%)

Source: New FONCODES Regional Poverty Map, 2006

The Deficiency Index of the FONCODES Poverty Map is based on the following social indicators: i) percentage of the population without potable water, sewerage and electricity service, ii) illiteracy rate among women, iii) percentage of children under twelve (12) years old and iv) the chronic malnutrition rate among children between six (6) and nine (9) years old. This is measured on a scale between zero (0) and one (1), one (1) being the most severe and zero (0) the least severe level of deficiency. Table N° 3.1.7-3 shows a summary of these social indicators in the five (5) regions of the Program scope.

Table N° 3.1.7-3: Social Indicators in the Five Regions

Administrative Region	Deficiency Index *	% of Population without			Illiteracy Rate among Women	Chronic Malnutrition
		Potable Water	Sanitation	Electricity		
At the National Level	---	27%	20%	27%	27%	28%
Amazonas	0.7816	37%	17%	58%	19%	43%
San Martin	0.5604	38%	15%	45%	13%	31%
Madre de Dios	0.4224	35%	20%	42%	7%	21%
Ucayali	0.6332	62%	18%	38%	7%	30%
Loreto	0.8246	62%	37%	47%	10%	38%

Note: All indicators are based on 2005 statistics except for ¨Chronic malnutrition,¨ which is based on information from the 1999 Census.
Source: JICA Study Team (2010), based on FONCODES New Regional Poverty Map, 2006

(2) Poverty Map

The 2007 Technical Report on Poverty of the National Institute of Statistics (INEI)[4] developed the poverty map, focusing on the deficiency index of unsatisfied basic needs and on the expense per capita of the inhabitants who live in each one of the 1,832 districts of Peru. This information also is at provincial, regional and national levels.

[4] Source: Technical report "The poverty in Peru in 2007" - INEI

This map combines the information from the Population and Housing Census of 2007 with the 2007 National Survey database of Households (ENAHO), with the aim of determining a large number of indicators that could explain the reasons for poverty in a determined geographic area.

For that purpose, it uses an objective, monetary-based approach to poverty. According to this definition of poverty, poor are defined as those residents in private homes whose monetary-valued expenditure per capita does not exceed the threshold of the poverty line or minimum value necessary to satisfy food-related and non-food-related needs.

According to the results at region, provincial and district levels, four (4) or five (5) groups can be formed according to their poverty levels, Group 1 being the poorest.

In that sense, the poverty line is determined by the minimum expense that a person needs in order to survive. The average expense per month is S/.445.3 in the urban scope and S/.178.8 in the rural area. Those that are under these minimum values will be considered in poverty status and those which are above these values will be considered ¨not poor,¨ as shown in Table N° 3.1.7-4.

Table Nº 3.1.7-4: Average Monthly per Capita Expenditure, Geographical Regions, 2007

(Constant prices in 2007= Metropolitan Lima)

Geographic Domain	2007 Annual (S/.)	2007* Annual (S/.)	Percentage validation 2007*/2007
National	**352.2**	**352.6**	**0.1**
Urban	445.3	445.8	0.1
Rural	178.8	178.8	0.0
Lima and others			
Metropolitan Lima	523.4	526.6	0.6
Remaining Urban	382.6	380.9	-0.5
Rural	178.8	178.8	0.0
Region			
Urban Coast	404.8	396.6	-2.0
Rural Coast	251.9	252.0	0.1
Urban highlands	381.3	384.2	0.8
Rural Highland	160.5	160.5	0.0
Urban Forest	321.4	328.7	2.3
Rural Forest	**185.8**	**185.9**	**0.1**
Metropolitan Lima	523.4	526.6	0.6

* New blocks and urbanizations are excluded with nil probability of selection in ENAHO 2001 to 2006
Source: JICA Study Team (2010) based on INEI – National Survey of Households ENAHO, 2007

For the localities of the present Program, the average spending is S/.185.9 per month. Likewise, the poverty map analysis is executed first at administrative-regional level and then at provincial and district levels.

i) At Administrative-Regional Level

At the administrative-regional level, the poverty mainly affects the regions located the "Andean Trapezoid", the Highlands and part of the northern Forest of the country.

Huancavelica is the region with the greatest incidence of total poverty, classified in the highest Rank of total poverty, higher than 75.2%. Huancavelica is followed by the other seven “Poorest” regions of Amazonas, Loreto, Cajamarca, Huánuco; and tow “2nd Poorest” regions of Pasco, Ayacucho, Apurímac, Cusco and Puno with poverty percentages between 51.9% and 75.1%.

ii) At Provincial Level

In the regions of the five (5) Forest regions, the distribution of the percentage rank of total poverty is heterogeneous. There are provinces with high poverty rankings like Condorcanqui in Amazonas with 76.3% of the population in poverty conditions, Datem del Marañón in Loreto with 79% and Atalaya in Ucayali with 64.4%.

iii) At District Level

The spatial organization of the information at this level of the smallest territorial unit division (districts) permits us to focus and identify where the different ranks are found, which are expressed in the existing inequality of poverty at a national level.

Throughout the five (5) Forest administrative regions, there is a marked incidence of poverty, with the exception of the Madre de Dios district, which has a low percentage of poverty.

For the explanation of poverty conditions in the different levels of division (administrative region, province and district), it becomes necessary to show that poverty evaluated in an independent way, such as through a regional analysis at the district level, resides in the fact that the minimum and maximum percentages of poverty in each region are different. For example, the territorial analysis of the total and extreme poverty condition refers only to the districts of the region. The Amazonas administrative region has extreme and total poverty percentage rankings, referring to its 83 districts, concentrated in the three (3) districts in the Condorcanqui province, among which are Nieva, El Cenepa, and Río Santiago with higher than 77.2%. The least number of poor districts in the Amazonas administrative region are found in the provinces of Utcubamba, Bongará and Rodríguez de Mendoza.

The Loreto administrative region has the greatest number of districts with total poverty: four (4) districts of the Datem del Marañon province—Morona, Andoas, Barranca and

Cahuapanas—with values higher than 77.2%. The lowest percentage of total poverty in Loreto is found in the Alto Amazonas province in the districts of Maynas and Requena.

In FONCODES [5] poverty maps, updated with the results of the 2007 Census, the unsatisfied basic needs are considered as indicators which determine poverty, i.e: i) potable water, sewerage and electricity service, ii) illiteracy rate among women, iii) percentage of children between zero (0) and twelve (12) years old and iv) the chronic malnutrition rate among children whose age oscillate between six (6) and nine (9) years old. This method does not follow the direct measurement of economic riches; instead it tries to identify the regions of Peru that present great vulnerability to poverty: a home without water, sewerage or electricity is poor not only because economic income must be scarce to live in such conditions, but also because the basic needs for human development are not being fulfilled.

At the same time, these last three (3) indicators of human development, along with the three (3) previously mentioned indicators of access to basic goods can show us which regions are more or less prone to rise out of poverty or to fall into it. Based on these six (6) indicators, the poverty map divides the 1,832 districts of Peru into five (5) parts (called "quintiles") according to deficiency index.

Table N° 3.1.7-5: Deficiency Index by Administrative Regions (2006)

(Quintile "1" the poorest and Quintile "5" the least poor)

Administrative Region	Quintile (Deficiency Index)
Amazonas	1
San Martín	2
Madre de Dios	3
Ucayali	2
Loreto	1

Sources: Poverty Map 2006 - FONCODES, Population and Housing Census 2007- INEI

Also for localities of the present Program where it is found the 1,500 localities, the poverty map is analyzed at the administrative-region level, then at provincial and district levels.

i) At Regional Level

The administrative regions of Amazonas, Apurímac, Ayacucho, Cajamarca, Huancavelica, Huánuco, Loreto and Pasco are framed within Quintile 1, which represents the highest deficiency index.

Cusco, Piura, Puno, San Martin and Ucayali regions fall within Quintile 2.

ii) At Provincial Level

[5] Geographic Focus: New Poverty Map - Foncodes 2006

In the Loreto administrative region, the poverty Rank is high; six (6) of the seven (7) provinces are situated within the Quintile 1: Alto Amazonas, Loreto, Mariscal Ramón Castilla, Requena, Ucayali and Datem del Marañón.

In the Amazonas administrative region, the Condorcanqui province is within Quintile 1.

In the Ucayali administrative region, three (3) of four (4) of the existing provinces are currently in Quintile 1: Atalaya, Padre Abad and Purús.

iii) At District Level

The Mariscal Ramón and Datem del Marañon districts in the Alto Amazonas province in the Loreto administrative region are found completely in Quintile 1—defined as a poor zone.

In the same manner, the Condorcanqui province in the Amazonas administrative region has a high deficiency index, and all of its districts are in Quintile 1.

In conclusion, both measurement methods of poverty show that the localities situated in Amazonas and Loreto administrative regions would be considered poor.

On the other hand, for the eligibility criteria or prioritization of the program localities, the analysis of the focalization of poverty should be one of the criteria to keep in mind. Focalization of poverty can be determined with the poverty maps at district level, according to the geographical region to which the locality belongs, the accessibility, and the population size or volume.

3.2 Criteria for Selection of Sample Localities for the Program Formation

3.2.1 Introduction

For the formulation of the Feasibility Study for Program for Water Supply and Sanitation for Amazon Areas Program, the new Pre-Investment Studies at *Perfil* level (*Perfil* Study) of sample localities within the Program are required as the first step. The group of the localities (sample localities) shall be a representative sample of the all localities within the area of the Program. The content of such studies shall be in accordance with the content of the SNIP Directives-Annex SNIP 05A.

The initial conditions established for the selection of the sample localities of the Program were as follows.

1) Sample size, which was estimated to be about 50 localities.
2) Each locality was to be located in one of the five administrative regions of the Program.
3) The population in each locality will be between 200 and 2,000 inhabitants.
4) The localities which form part of the sample of the previous pre-investment study at *Perfil* level were to be included.
5) The localities that have potable water or sanitation projects in execution by any public organizations or that are included in programs financed by other organizations of international cooperation should be excluded.

3.2.2 Tool for the Allocation of Sample Localities

The sample localities of the Program should represent the characteristics of all localities in the Program area. Therefore, the target localities shall be allocated or grouped mainly based on the geographic location and number of households of each locality.

The characteristics representing the sample localities shall include eminent primary information for the planning of a water supply and sanitation improvement investment program. Such characteristics will be reflected by natural or geographic conditions and socio-economic conditions. On the basis of these considerations, the classification of the "Geographical regions of the Amazon Forest Area" was proposed to be used as a tool of selection and allocation of sample localities.

3.2.3 Geographical Regions of the Amazon Forest Area

The Amazon Forest area is subdivided into three geographical regions[6], which are classified by their altitude:

[6] PULGAR VIDAL, Javier: Las Ocho Regiones Naturales, Lima, 1938. Thesis used by the National Institute of Geography (IGN)

Table Nº 3.2.3-1: Sub-Division of the Rain Forest Region

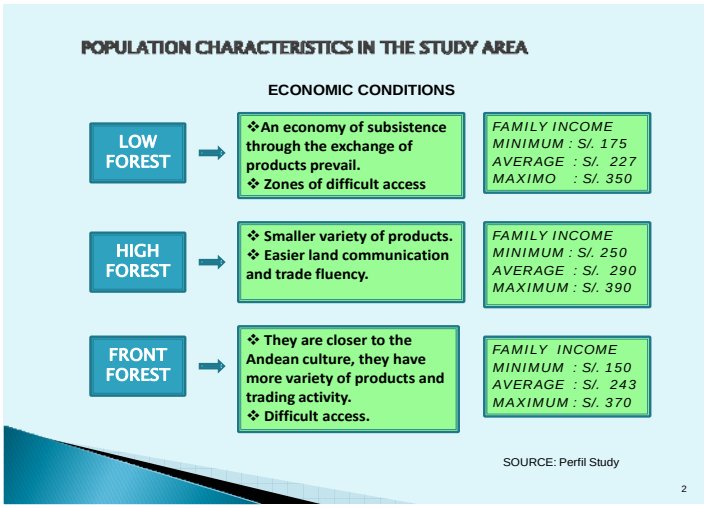
Geographical region	Altitude (masl)
Low Forest	Lower than 400
High Forest	401-1000
Front Forest	1000-2300
For practical purposes the elevation range of the Low Forest will not have an inferior elevation limit.	

Although this classification is just based on the altitude (elevation), it will also group the varieties of the Amazon area into similar categories according to characteristics such as environment, geomorphology, climate, vegetation and so on, that may be reflected in the socio-economic conditions of the localities. Therefore, it is generally accepted that this classification may be utilized to classify various aspects in the Amazon area.

3.2.4 Applicability - Preliminary Assessment by the Program's *Perfil*

The previous Pre-Investment Study at the *Perfil* level of the Program considered that the classification by geographical regions represented the general characteristics of the present conditions of water supply and sanitation in the Amazon area for the five (5) regions of the study area. Therefore, it described the following aspects based on the study results.

1) *Selva Baja* (Low Forest): characterized by greatest difficulties in accessibilities due to transportation by river. Family monthly income ranges from S/. 175 to S/. 350 (average S/. 227), the lowest among the three (3) geographical regions.

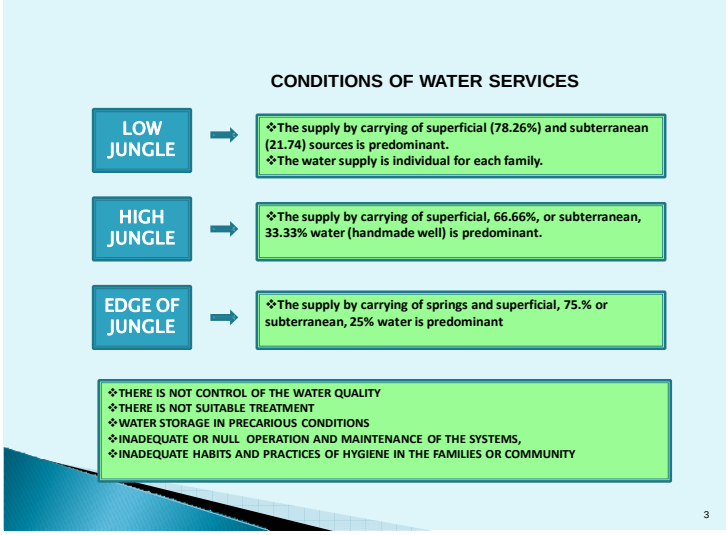


2) *Selva Alta* (High Forest): characterized by easier land accessibility and fluent trading activities. Family monthly income ranges from S/. 250 to S/. 390 (average S/. 290), the highest among the three (3) geographical regions.

3) *Ceja de Selva* (Front Forest): characterized by having more variety of products and despite the fact that access is not easy, they have great trading activity. Family monthly income ranges from S/. 150 to S/. 370 (average S/. 243), a similar level to the Low Forest (*Selva Baja*).

It is obvious that the classification of the localities by the geographical region shows the differences of accessibility and income level, which will be important factors in the development of the Program´s Feasibility Study.

As for water supply conditions, the predominant types of water sources vary among the geographical regions, as follows:

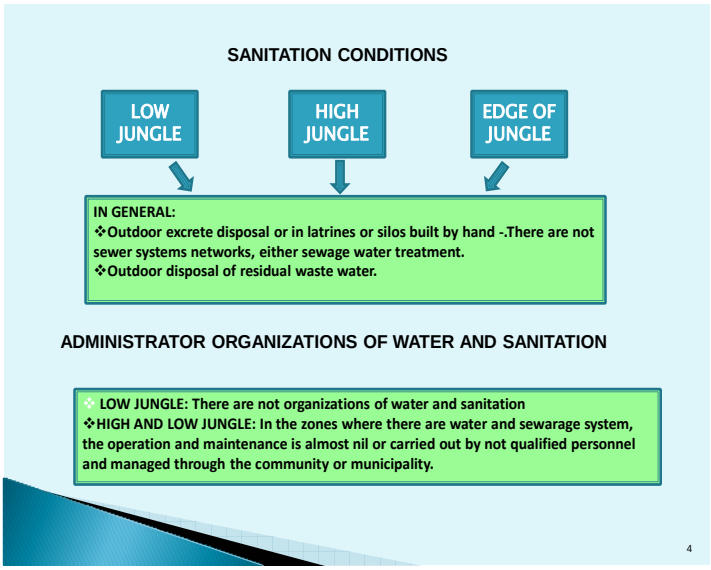


1) Low Forest: Superficial water probably from rivers, 78%; and groundwater, 22%
2) High Forest: Superficial spring water, 67%; and groundwater, 33 %
3) Front Forest: Spring water, 75 %; and groundwater, 25 %.

The characteristics of the type of raw water sources will have great importance for the consideration of the design of potable water supply facilities, which includes the type of treatment or purification process. Therefore, the classification of the geographical regions is applicable for the Feasibility Study of the Program.

In addition, the majority of the localities have inadequate water treatment systems and/or quality control systems, because that these facilities were constructed years ago.

The previous *Perfil* Study of the Program did not identify evident differences in sanitation conditions among the three (3) geographical regions. In very few cases, appropriately-used latrines were found; in localities with a sewage system available, the network of treatment systems does not work correctly, possibly due to lack of house connections and/or the adequate maintenance by the community.



Regarding Administration, Operation and Maintenance (AOM) of the sanitation services in each case:

1) In Low Forest, water and sanitation organizations have generally not been found.

2) In High Forest and Front Forest in general, organizations are already formed at locality level, but the operation and maintenance is inefficient due to lack of qualified personnel and economic resources. In several cases, the administration of the services is carried out by the municipalities.

It may be preliminarily considered that the approach for AOM may vary between the geographical regions of Low Forest, High Forest and Front Forest, taking into consideration the type of source and the technical alternative or design for the potable water service infrastructure for each locality. This analysis will be developed in the sustainability analysis of the Program´s Feasibility Study.

Having executed the preliminary assessments carried out in the previous *Perfil* study of the Program, the conclusion is that the classification of the geographical regions also shows some characteristics and/or general conditions related to water supply and sanitation, which could be applicable in the development of the present Feasibility Study.

3.2.5 Selection of Sample Localities

On the basis of the conclusion that the classification by the geographical regions can be the base tool for the selection of sample localities of the Program, the following criteria were proposed for the allocation of the 50 sample localities, defined as the representative sample size:

1) The distribution of the sample localities shall be allocated to each geographical region in proportion to the actual total number of localities in the corresponding geographical region.

2) The number of localities is not located evenly in five (5) regions; therefore, the sample localities shall be allocated to each administrative region in proportion to the actual number of localities in the administrative regions, while maintaining the proportion of the number of localities in the geographical regions.

3) The rank of population size of the localities in the scope of the Program is between 200 and 2,000 inhabitants; the number of localities with between 40 and 100 households represents 80 % of the all localities according to information indicated in the previous *Perfil* of the Program. Therefore, the number of sample localities classified by the locality´s population size shall be determined proportionally in all target regions, while maintaining the proportion of the number of localities in the geographical regions.

4) The sample localities shall be accessible for the field survey within a reasonable time period to complete the diagnosis within the time period given as part of the Feasibility Study.

5) In addition, in this phase of the study, the Study Team was advised by JICA not to select sample localities in areas with potential security risks, such as the Tocache province in San Martín Region and the Padre Abad province in Ucayali Region.

In the previous *Perfil* study of the Program, the sample localities have been selected by referencing the national localities database file from INEI (2006). The localities have been sorted out by the geographical regions, administrative regions and number of households as shown in the Table Nº 3.2.5-1 and Table Nº 3.2.5-2, respectively.

For this present Feasibility Study of the Program, these percentages were used to allocate the 50 sample localities to the geographical and administrative regions with the criteria previously described. The location of the sample localities was also confirmed with topographic maps of the National Geographical Institute (IGN), which are in the scale of 1:600,000 – 1:1,600,000[7], with consideration of accessibilities for the field work.

Table Nº 3.2.5-1: Number of Localities, by Administrative and Geographical Regions

Geo. Region / Adm. Region	Number of Localities			
	Low Forest	**High Forest**	**Front Forest**	**Total**
Amazonas	134 (7%)	197 (10%)	223 (12%)	554 (28%)
San Martín	297 (15%)	250 (13%)	47 (2%)	594 (30%)
Madre de Dios	46 (2%)	2 (0%)	-	48 (2%)
Ucayali	246 (13%)	-	-	246 (13%)
Loreto	505 (26%)	14 (1%)	-	519 (27%)
Total	**1,228 (63%)**	**463 (24%)**	**270 (14%)**	**1,961**

Source: Perfil Study of the Water and Sanitation Program for Rural Amazon-2008

Table N° 3.2.5-2: Number of Localities according to the Number of Households

Nos. of household per locality	Number of Localities			
	Low Forest	**High Forest**	**Front Forest**	**Total**
40 to 100	996 (81%)	359 (77%)	210 (78%)	**1,565 (80%)**
101 to 200	176 (14%)	75 (16%)	44 (16%)	**295 (15%)**
201 to 300	38 (3%)	20 (4%)	9 (3%)	**67 (3%)**
301 to 400	18 (2%)	9 (3%)	7 (3%)	**34 (2%)**
Total	**1,228(100%)**	**463 (100%)**	**270 (100%)**	**1,961 (100%)**

Source: Perfil Study of the Water and Sanitation Program for Rural Amazon-2008

The allocation of sample localities has been carried out as it has been explained above and it is shown in Table Nº 3.2.5-3. These results and the list of the localities selected based on the

[7] Topographic administrative maps of the regions of Amazonas, Loreto, Madre Dios, San Martín y Ucayali.- IGN..

available information, were submitted[8] to the National Directorate of Sanitation (DNS: *Dirección Nacional de Saneamiento*) and the Office of Investments Programming (OPI VIVIENDA: *Oficina de Programación de Inversiones*) for their corresponding approval.

Table Nº 3.2.5-3: Allocation of the 50 Sample Localities[9]

Region	Low Forest	High Forest	Front Forest	Total
Amazonas	3 (6%)	5 (10%)	6 (12%)	14 (28%)
San Martín	8 (16 %)	6 (12 %)	1(2%)	15 (30%)
Madre de Dios	3 (6 %)	-	-	3 (6 %)
Ucayali	6 (12%)	-	-	6 (12%)
Loreto	12 (24%)	-	-	12 (24%)
Total	**32 (64%)**	**11 (22 %)**	**7 (14%)**	**50**

Source: JICA Study Team (2010)

3.2.6 Replacement of Sample Localities During Field Work

During the field work carried out by the Consultant team, some of localities selected had to be replaced due to reasons listed below:

a) Localities that have on-going sanitation projects in the process of implementation with public resources budgeted and available

b) Localities that are part of the EPS coverage of a municipal administration area including in an urban service area

c) Localities where the population does not want to participate in the Program

d) Localities where the survey could not be conducted due to the blocked access caused by social disturbances in the Amazon region (four localities within the Bagua and Utcubamba provinces, close to Santa María de Nieva)

The replacements were made while trying to maintain the initial percentage distribution by geographical regions to prevent an alteration of the sample's representativeness. A total of thirteen (13) localities were replaced during the field work due to the reasons presented above, as shown in Table Nº 3.2.6-1.

[8] Work meeting between the Study Team of JICA, DNS and OPI Housing
[9] Work meeting between JICA Study Team, DNS and OPI Vivienda held on 15.04.2009

Table Nº 3.2.6-1: Replaced Localities

Nº	Region	Province	District	Locality	Locality Replaced	Reason for Change
1	Amazonas	Bagua	Aramango	Miraflores	Nuevo Siásme	Due to social reasons (blockage and strikes)
2	Amazonas	Bagua	Aramango	Tutumberos	Bajo Canampa	For social reasons (blockage and strikes)
3	Amazonas	Bagua	La Peca	Guadalupe	Tunants	Due to social reasons (blockage and strikes)
4	Amazonas	Utcubamba	Bagua Grande	El Balcón	Sinai	Due to social reasons (blockage and strikes)
5	Amazonas	Chachapoyas	Mariscal Castilla	Cielachi	Yerba Buena	Already has a budget
6	San Martin	Moyobamba	Jepelacio	Barranquita	Tambo	Is part of a group of projects
7	San Martín	Bellavista	San Rafael	Nueva Palestina	Intiyacu	Belongs to an urban water and sanitation system
8	San Martín	Picota	Pilluana	Misquiyacu	Villanueva Reubicada	Belongs to an urban water and sanitation system
9	San Martín	Picota	Tres Unidos	Sapotillo	Shimbillo	Belongs to an urban water and sanitation system
10	Ucayali	Coronel Portillo	Campoverde	San Martin De Mojarral	Misión Suiza	The locality is under private administration and project execution
11	Loreto	Loreto	Nauta	20 De Enero	San Jorge	Already has a budget
12	Loreto	Maynas	Iquitos	San Pablo	San Pedro	Already has a budget
13	Loreto	Mariscal Ramón Castilla	Pebas	Buen Jesús De Paz	Nuevo Pebas	The locality did not want to participate in the project because they have other community plans

Source: JICA Study Team (2010)

In some cases, there is no information in the 2007 Census regarding the existing population of each locality, probably because they are included in the "disperse" category. Also, in many cases, the information indicated in the census were different from the population data obtained in the field. Due to those, the following cases were considered:

1) When selecting some localities, only the number of households was known. With those figures it was estimated that the number of inhabitants would exceed 200 people. This is the case of Curiaca de Caco, Cielachi, Tres Islas and San Juan. In the first three (3) localities, it was found that the populations were above 200 inhab. (433, 207 and 252 hab. respectively). However, in San Juan only 182 people were found in the households of the project's area.

2) One criteria of selection was to maintain the localities that were considered in the *Perfil*. Thus, the localities of Perla de Cascayunga (182 inhab), Ubillón (176 inhab) and Monterrey (157 inhab) were included. (Figures from the field work).

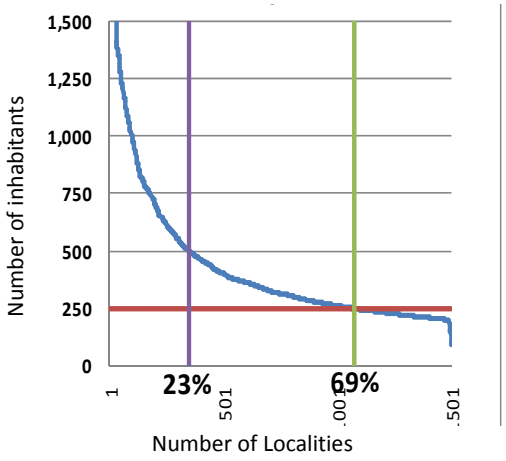
3) Yacucatina had 47 households that represented 235 inhabitants. However, in the field work only 186 people were found. While continuing the field works the number was corrected to 192, figure slightly under 200. The average projected population is 202 inhabitants.

4) In the case of San Martín de Mojaral and 10 de Julio, the information given by the local authorities (obtained in the area) indicated that the localities had 431 and 305 inhabitants respectively. However, after the field works it was verified that the concentrated populations considered to be included in a project, were only of 128 and 97 inhabitants, respectively. Nonetheless, the field works has already been done.

5) In Miraflores, El Balcón and San Pedro, the information of the 2007 Census indicated that the three (3) localities have populations above 200 inhabitants. However, the results of the field works showed that the design populations would be 195, 133 and 144 inhabitants, respectively.

Also, it was considered that the cases described above may be encountered during the execution of the Program, while selecting localities based on data from the censuses or provided by a community, and then the consultant may determine may include such localities with population below 200 inhabitants, once expectations have been generated in the population and the Program has already been accepted. Therefore, it was concluded that all the selected localities are representative to provide useful information for the projection of data for the Program.

Figure N° 3.2.6-1: Locality Size



Source: JICA Study Team (2010)

Furthermore, considering that; since the census does not specify the encompassing area of each locality, it is not possible to determine its degree of dispersion or density. As shown in Figure N° 3.2.6-1, 69% of the 1,500 localities have less than 250 inhabitants; and 23% less than 500; that is, there may be a large number of localities that after having been included in the Program may not reach a design population of 200 inhabitants and, thus, will have to be disqualified from the Program.

The list of the localities where the field works were executed is presented in Table: Nº 3.2.6-2: Sample Localities of the Program, which will be the basis for the formulation of the Feasibility Study of the Program. The figures of population and number of households correspond to the results of the fieldworks that will make up the sample. However, for the Program´s cost-

benefit analysis, the impact of this segment on the entire set of target localities will have to be kept in mind; this will be evaluated in the following chapters.

Table Nº 3.2.6-2: Sample Localities of the Program

N°	Administrative Region	Province	District	Locality	Natural Region	Number of Houses	Population (inhab)	Elevation (m.a.s.l.)
1	AMAZONAS	BAGUA	ARAMANGO	MIRAFLORES	CEJA DE SELVA	50	195	1,769
2	AMAZONAS	BAGUA	ARAMANGO	TUTUMBEROS	SELVA BAJA	54	216	379
3	AMAZONAS	BAGUA	LA PECA	GUADALUPE	SELVA BAJA	75	330	384
4	AMAZONAS	UTCUBAMBA	JAMALCA	PUERTO NARANJITOS	SELVA ALTA	170	680	488
5	AMAZONAS	UTCUBAMBA	CAJARURO	NARANJITOS	SELVA ALTA	215	925	573
6	AMAZONAS	UTCUBAMBA	CAJARURO	MISQUIYACU BAJO	SELVA ALTA	68	252	578
7	AMAZONAS	UTCUBAMBA	CAJARURO	SAN JOSE BAJO	SELVA ALTA	99	366	641
8	AMAZONAS	BAGUA	LA PECA	CASUAL	SELVA ALTA	56	218	402
9	AMAZONAS	BAGUA	BAGUA GRANDE	EL BALCON	CEJA DE SELVA	35	133	1,650
10	AMAZONAS	BAGUA	LA JALCA	UBILON	CEJA DE SELVA	43	176	2,301
11	AMAZONAS	CHACHAPOYAS	MARISCAL CASTILLA	CIELACHI	CEJA DE SELVA	53	207	2,301
12	AMAZONAS	LUYA	LONYA CHICO	LONYA CHICO	CEJA DE SELVA	117	456	2,306
13	AMAZONAS	LUYA	SAN CRISTOBAL	SAN JUAN	CEJA DE SELVA	70	266	2,506
14	AMAZONAS	LUYA	SAN CRISTOBAL	OLTO	CEJA DE SELVA	168	665	2,552
15	SAN MARTIN	MOYOBAMBA	JEPELACIO	LAHUARPIA	SELVA ALTA	200	898	798
16	SAN MARTIN	RIOJA	RIOJA	PERLA DE CASCAYUNGA	SELVA ALTA	41	180	924
17	SAN MARTIN	RIOJA	POSIC	POSIC	SELVA ALTA	331	1420	824
18	SAN MARTIN	MOYOBAMBA	JEPELACIO	BARRANQUITA	CEJA DE SELVA	74	350	1,063
19	SAN MARTIN	EL DORADO	SAN JOSE DE SISA	LA FLORIDA	SELVA ALTA	63	296	596
20	SAN MARTIN	EL DORADO	SAN MARTIN	MONTE DE LOS OLIVOS	CEJA DE SELVA	44	253	1,100
21	SAN MARTIN	LAMAS	RUMISAPA	RUMISAPA	SELVA BAJA	220	880	329
22	SAN MARTIN	LAMAS	RUMISAPA	PACCHILLA	SELVA ALTA	120	530	922
23	SAN MARTIN	LAMAS	RUMISAPA	CHURUZAPA	SELVA BAJA	96	407	375
24	SAN MARTIN	LAMAS	CUÑUMBIQUI	LA MARGINAL	SELVA BAJA	57	243	350
25	SAN MARTIN	BELLAVISTA	SAN RAFAEL	PALESTINA	SELVA BAJA	58	228	258
26	SAN MARTIN	PICOTA	PILLUANA	MISQUIYACU	SELVA BAJA	121	515	238
27	SAN MARTIN	PICOTA	TRES UNIDOS	SAPOTILLO	SELVA ALTA	59	244	683
28	SAN MARTIN	PICOTA	BUENOS AIRES	SANTA ROSILLO DE UPAQUIHUA	SELVA ALTA	111	472	530
29	SAN MARTIN	SAN MARTIN	JUAN GUERRA	YACUCATINA	SELVA BAJA	38	192	297
30	MADRE DE DIOS	TAMBOPATA	TAMBOPATA	TRES ISLAS	SELVA BAJA	56	252	210
31	MADRE DE DIOS	TAMBOPATA	LAS PIEDRAS	SUDADERO	SELVA BAJA	51	274	248
32	MADRE DE DIOS	TAMBOPATA	LAS PIEDRAS	MONTERREY	SELVA BAJA	41	157	248
33	UCAYALI	CORONEL PORTILLO	CAMPO VERDE	SAN MARTIN DE MOJARAL	SELVA BAJA	30	127	167
34	UCAYALI	CORONEL PORTILLO	YARINACOCHA	SAN FRANCISCO	SELVA BAJA	248	1538	150
35	UCAYALI	CORONEL PORTILLO	CAMPO VERDE	10 DE JULIO	SELVA BAJA	21	97	148
36	UCAYALI	CORONEL PORTILLO	CALLERIA	SAN PEDRO	SELVA BAJA	29	144	149
37	UCAYALI	CORONEL PORTILLO	IPARIA	SHARARA	SELVA BAJA	75	353	167
38	UCAYALI	CORONEL PORTILLO	IPARIA	CURIACA DE CACO	SELVA BAJA	83	514	165
39	LORETO	MAYNAS	SAN JUAN BAUTISTA	CAHUIDE	SELVA BAJA	99	518	102
40	LORETO	LORETO	NAUTA	SAN JUAN DE PURITANIA	SELVA BAJA	80	496	88
41	LORETO	LORETO	NAUTA	AMAZONAS	SELVA BAJA	6980	382	90
42	LORETO	LORETO	NAUTA	20 DE ENERO	SELVA BAJA	49	245	105
43	LORETO	MAYNAS	IQUITOS	SAN PABLO DE CUYANA	SELVA BAJA	50	207	92
44	LORETO	MAYNAS	IQUITOS	TARAPOTO	SELVA BAJA	50	238	96
45	LORETO	MAYNAS	FERNANDO LORES	PANGUANA II	SELVA BAJA	74	405	94
46	LORETO	MAYNAS	BELEN	LUPUNA II	SELVA BAJA	69	323	150
47	LORETO	MARISCAL RAMON CASTILLA	PEBAS	APAYACU	SELVA BAJA	56	244	96
48	LORETO	MARISCAL RAMON CASTILLA	PEBAS	BUEN JESUS DE PAZ	SELVA BAJA	60	348	84
49	LORETO	MARISCAL RAMON CASTILLA	PEBAS	HUANTA	SELVA BAJA	144	739	86
50	LORETO	MARISCAL RAMON CASTILLA	PEBAS	SANTA AMELIA	SELVA BAJA	50	252	100

Ceja de Selva (Front Forest), *Selva Baja* (Low Forest), *Selva Alta* (High Forest)

Source: JICA Study Team (2010)

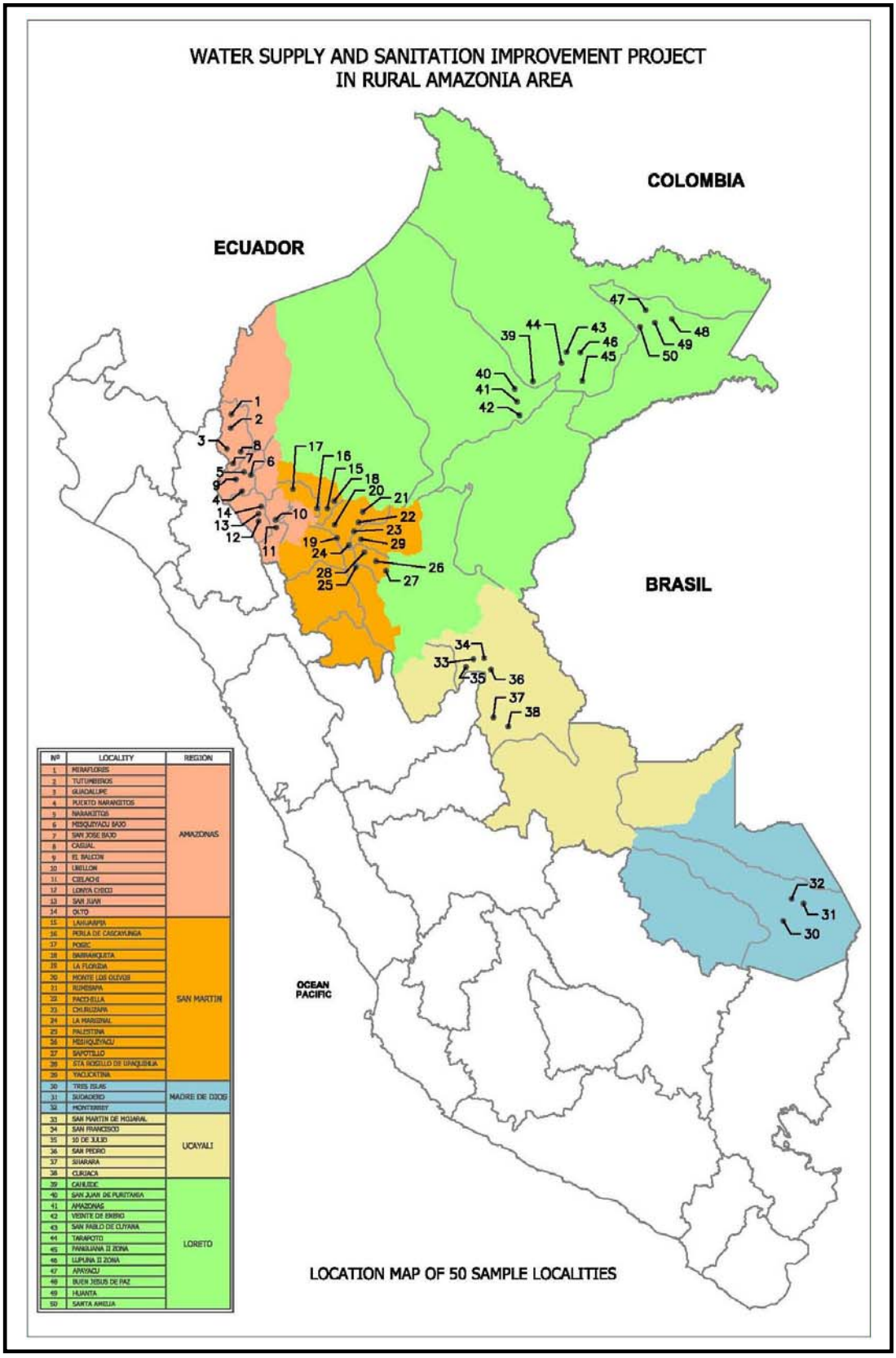
From the definitive list of sample localities presented in Table Nº: 3.2.6-2, a revised percentage distribution of the localities by geographical and administrative regions was obtained, as shown in Table 3.2.6-3.

Table Nº 3.2.6-3: Sample Localities Surveyed

Region	Low Forest	High Forest	Front Forest	Total
Amazonas	2 (4%)	5 (10%)	7 (14%)	14 (28%)
San Martín	6 (12%)	7 (14%)	2 (2%)	15 (30%)
Madre de Dios	3 (6 %)	-	-	3 (6 %)
Ucayali	6 (12 %)	-	-	6 (12%)
Loreto	12 (24%)	-	-	12 (24%)
Total	**29 (58%)**	**12 (24%)**	**9 (18%)**	**50**

Source: JICA Study Team (2010)

Figure Nº 3.2.6-2: Location of the 50 Sample Localities



Source: JICA Study Team (2010); Base Map: Ministry of Education (2009)

3.3 Present Situation of the Sample Localities

The information presented in this sub-chapter regarding the present socioeconomic conditions of the water and sanitation infrastructure was elaborated based on the results of the field works for the pre-investment studies at *Perfil* level in 50 sample localities for the Program.

3.3.1 Socio-economic Aspects of the 50 Sample Localities

(1) Population and Households

The total population of the 50 sample localities is 19,950 inhabitants, as shown in the Table Nº 3.3.1-1below.

Table Nº 3.3.1-1: Population of the Sample

Administrative Region	Population			Total Population
	Low Forest	High Forest	Front Forest	
Amazonas	546	2,441	2,095	4,995
San Martin	2,466	4,040	603	7,109
Madre de Dios	683	-	-	683
Ucayali	2,772	-	-	2,772
Loreto	4,395	-	-	4,395
Total	**10,862**	**6,481**	**2,607**	**19,950**

Source: Socio-economic-Survey; JICA Study Team (2010)

The greatest concentration of the population is in San Martin Region, where 36% of the population out of the sample localities is settled. Of the geographical regions, the most populated region is the Low Forest reaching 54% of the total, of which almost half corresponds to the Loreto administrative region. The High Forest is the second populated geographical regions with 32% of the total, most of which settle in San Martin as shown in the Table 3.3.1-2 below.

Table Nº 3.3.1-2: Percentage of Population

Administrative Region	Percentage of Population			% Population
	Low Forest	High Forest	Front Forest	
Amazonas	3%	12%	10%	25%
San Martin	12%	20%	3%	36%
Madre de Dios	3%	-	-	3%
Ucayali	14%	-	-	14%
Loreto	22%	-	-	22%
Geo. Regions	**54%**	**32%**	**13%**	**100%**

Source: Socio-economic-Survey; JICA Study Team (2010)

The percentage distribution of households per administrative and geographical region is proportional to the population, as is shown in the following tables:

Table Nº 3.3.1-3: Number of Households

Administrative Region	Number of Households			Total Households
	Low Forest	High Forest	Front Forest	
Amazonas	129	608	514	1,251
San Martin	590	925	118	1,633
Madre de Dios	148	-	-	148
Ucayali	486	-	-	486
Loreto	848	-	-	848
Total	**2,201**	**1,533**	**632**	**4,366**

Source: Socio-economic-Survey, JICA Study Team (2010)

Table Nº 3.3.1-4: Percentage of Population

Administrative Region	Percentage of Population			% Households
	Low Forest	High Forest	Front Forest	
Amazonas	3%	14%	12%	29%
San Martin	14%	21%	3%	38%
Madre de Dios	3%	-	-	3%
Ucayali	11%	-	-	11%
Loreto	19%	-	-	19%
Total %	**50%**	**35%**	**15%**	**100%**

Source: Socio-economic-Survey ; JICA Study Team (2010)

(2) Family size (Population per household)

In the classification of sample localities by family size, it is observed that the total of 38 localities (or 76%) were allocated to the group with household less than 100, among those 25 localities (or 50%) were in Low Forest as shown in Table No. 3.3.1-5

Table Nº 3.3.1-5: Number of Localities by Size

Households	Number of Localities			Total
	Low Forest	High Forest	Front Forest	
HH<100	25	6	7	38
100<HH<200	2	3	2	7
200<HH	2	3	0	5
Total	**29**	**12**	**9**	**50**

HH: Households
Source: Socio-economic-Survey; JICA Study Team (2010)

The average family size shows variability ranging from 3.90 to 5.70 with an average of 4.57. See Table Nº 3.3.21-6.

Table Nº 3.3.1-6: Family Size

Administrative Region	Family Size			Average
	Low Forest	High Forest	Front Forest	
Amazonas	4.23	4.01	3.90	3.99
San Martin	4.18	4.37	5.11	4.35
Madre de Dios	4.61	-	-	4.61
Ucayali	5.70	-	-	5.70
Loreto	5.18	-	-	5.18
Total	**4.93**	**4.23**	**4.13**	**4.57**

Source: Socio-economic-Survey ; JICA Study Team (2010)

The construction material of households varies according to geographical region. In the Low Forest, households are predominantly constructed of wood; nevertheless, in the localities in the High Forest and Front Forest , the greatest percentage of construction is based on adobe. The majority of the construction is performed with materials from the zone that are easy to obtain as shown in the Table 3.3.1-7.

Table N° 3.3.1-7: Construction Material of Households

Geographical Region	Construction Materials of Households			
	Wood	Adobe with Straw	Adobe	Brick
Front Forest	22%	11%	58%	9%
High Forest	16%	17%	51%	16%
Low Forest	79%	11%	7%	3%

Percentage calculated for each geographical region.
Source: Socio-economic-Survey; JICA Study Team (2010)

(3) Health

Interview survey were conducted to the population about the diseases that have most frequently affected the members of their family as socio-economic-surveys and the results of the waterborne diseases have been summarized as shown in the following tables.

Among the water-borne or unsanitary-origin diseases listed, respiratory is the most eminent disease in the target regions followed by diarrhea parasitic.

Table Nº 3.3.1-8: Common Diseases in the Sample Localities (by Administrative Regions)

Administrative Region	Disease			
	Diarrheic	Parasitic	Dermic (Skin-related)	Respiratory
Amazonas	24%	13%	3%	60%
San Martin	29%	27%	8%	36%
Madre de Dios	24%	40%	4%	32%
Ucayali	51%	10%	3%	36%
Loreto	28%	10%	13%	49%
Average	**30%**	**18%**	**7%**	**45%**

Percentage calculated for each administrative region.
Source: Socio-economic-Survey; JICA Study Team (2010)

Table N° 3.3.1-9: Common Diseases in the Sample Localities (by Geographical Region)

Geographical Region	Admin. Region	Disease			
		Diarrheic	Parasitic	Dermic (Skin-related)	Respiratory
Low Forest	Amazonas	6%	4%	0%	2%
	San Martin	10%	9%	6%	10%
	Madre de Dios	24%	40%	4%	32%
	Ucayali	51%	10%	3%	36%
	Loreto	28%	10%	13%	49%
High Forest	Amazonas	11%	4%	2%	25%
	San Martin	16%	16%	2%	24%
Front Forest	Amazonas	7%	5%	1%	33%
	San Martin	3%	2%	0%	3%

Percentage calculated for each administrative region.
Source: Socio-economic-Survey; JICA Study Team (2010)

(4) Hygiene Habits

The surveys indicate that 95% of the population of the Low Forest uses soap and water for personal hygiene, along with 85% in the High Forest and 88% in the Front Forest. These percentages indicate that most of the population recognizes the importance of water and good hygiene habits.

However, it is observed that a high percentage of families do not appropriately handle the water that they consume. This situation does not guarantee suitable water for consumption, creating risks in health, especially for the younger/infant population.

According to the information obtained in the field work in the 50 localities visited, the existing systems do not adequately treat water that is consumed by the population. The treatment or non-treatment of water in the homes varies from the boiling of water to disinfection for its direct consumption without any treatment at the homes, as shown in the Table Nº 3.3.1-10.

Table N° 3.3.1-10: Water Treatment and Storage in Houses

Geographical Region	Household treatment			Storage	
	No treatment	Water Boiling	Disinfection Using Bleach	Adequate	Inadequate
Front Forest	50%	50%	0%	60%	40%
High Forest	46%	52%	2%	87%	13%
Low Forest	50%	44%	6%	86%	14%

Source: Socio-economic-Survey. JICA Study Team (2010)

(5) Educational Structure

In the area of the Program, the educational infrastructure includes the following levels: preschool, primary school, secondary school (high school) and, in a low percentage, higher technical school.

In the Front Forest, 22% of the nine (9) sample localities have schools at the level of preschool and 33% at the primary level.

In the High Forest, 33% of the eleven (11) localities have schools at the level of preschool and primary school and 27% at the level of secondary school. The sample localities do not have higher technical schools in this geographical region.

In the Low Forest, the highest percentage of educational infrastructure is represented with 83% of the twenty-nine (29) localities having preschool; 90%, primary school; 52%, secondary school; and 7%, higher technical school.

(6) Accessibility – Transportation to Localities

In the five (5) target administrative regions, only main roads are paved (the roads connecting major cities). Most of roads connecting to rural localities with the major roads are unpaved; i.e. compacted clay roads, clay/dirt roads. Remote localities are usually only accessible by foot-paths or trails.

Transportation by water is also common in the Loreto and Ucayali administrative regions, via the Amazonian rivers. With harbors in the main cities of the regions, rural localities, which are mostly settled nearby the rivers, are accessible by water. The most commonly-used form of transportation are small boats or motor canoes known as “peque peque” or outboard motor boats commonly known as gliders (¨deslizadores¨), which are the fastest of these boats.

At the 50 sample localities, depending on the closeness and location relative to other urban centers, land access is achieved by paved roads, compacted clay/dirt roads, clay/dirt roads or trails, and by water via rivers, meanders or floodplains.

The greatest difficulties in accessibility on land occur during rainy seasons. In particular, clay/dirt roads and trails become such quagmires that even access oby foot may be difficult or impossible.

The effects of the access difficulties reflect on the budgets that are included in the reports of each sample locality, which will be identifiable in items such as ground and river freight and whose percentage incidence on the direct cost will be calculated.

Table Nº 3.3.1-11: Access to the Sample Localities

Ways of Access	Amazonas		San Martín		Madre de Dios		Ucayali		Loreto	
	Loc.	%	Loc.	%	Loc.	%	Loc.	%	Loc.	%
Asphalted	5	36 %	3	20 %	1	33%	1	17%	1	8 %
Compacted Clay Road	5	36 %	2	13 %	2	67%	2	33%	-	-
Clay Road	1	7 %	10	67 %	-	-	-	-	-	-
Trail	3	21 %	-	-	-	-	-	-	-	-
By River	-	-	-	-	-	-	3	50 %	11	92 %
Total	**14**	**100%**	**15**	**100%**	**3**	**100%**	**6**	**100 %**	**12**	**100 %**

Percentage calculated for each administrative region.
Source: Information from the field works; JICA Study Team (2010)

Regarding the road accessibility of the 50 sample localities, it is found that eleven (11) localities were accessible by asphalted roads; another eleven (11) by compacted clay roads; other eleven (11) by clay/dirt roads; and three (3) by trails. The other fourteen (14) localities were accessible by river.

(7) Electricity Services

Through the field survey in the sample localities, it was found that a significant number of localities have electricity services. Three (3) administrative regions (Amazonas, Madre de Dios and San Martin) located in the High Forest and Front Forest show more than 79 % availability of services, as shown in Table Nº 3.3.1-12.

Among the target five (5) administrative regions, Loreto is the region with the least access to electricity services. In Loreto's remote zones like Pebas and Nauta, most of the localities (9) do not have electricity. Even in the localities with access to electricity, it is on restricted basis, i.e. on alternate days (two localities) or for limited hours (one locality).

Table Nº 3.3.1-12: Electricity Services in the Sample Localities

Electricity Service	Amazonas		San Martín		Madre de Dios		Ucayali		Loreto	
	Loc.	%	Loc.	%	Loc.	%	Loc.	%	Loc.	%
Available	11	79 %	12	80 %	3	100 %	3	50 %	3	25 %
Not Available	3	21 %	3	20 %	-	-	3	50 %	9	75 %
Total	**14**	**100 %**	**15**	**100 %**	**3**	**100 %**	**6**	**100 %**	**12**	**100 %**

Electricity Service	Total	
	Loc.	%
Available	32	64%
Not Available	18	36%
Total	**50**	**100%**

Percentage calculated for each administrative region.
Source: the field works; JICA Study Team (2010)

From the table above, thirty-two (32) sample localities (or 64%) have public electricity services and eighteen (18) localities (or 36%) do not.

Solar panels are commonly used in some of the most remote localities, which do not have electricity services. Only some households or small businesses rely on this system.

(8) Tele-Communication Services

Communication by telephone (fixed line, mobile, satellite and radio communication) is very widespread within the localities surveyed. The following table shows the predominant means of communication in each administrative region.

Table Nº 3.3.1-13: Communication Service at the Sample Localities

System(s) of Communication	Amazonas		San Martín		Madre de Dios		Ucayali		Loreto	
	Loc.	%	Loc.	%	Loc.	%	Loc.	%	Loc.	%
a. Fixed Line	2	14 %	3	20 %	3	100 %	3	50 %	5	42 %
b. Mobile	7	50 %	7	47 %	-	-	-	-	-	-
c. Fixed Line and Mobile	2	14 %	3	20 %	-	-	-	-	-	-
d. Fixed line and Internet	-	-	-	-	-	-	3	50 %	-	-
e. Radio Communication	2	14 %	-	-	-	-	-	-	6	50 %
f. No Facility	1	7 %	2	13 %	-	-	-	-	1	8 %
Total	**14**	**100 %**	**15**	**100 %**	**3**	**100 %**	**6**	**100 %**	**12**	**100 %**

Table Nº 3.3.1-14: Summery of Communication Service

Communication Systems	Locality coverage	
	N° Loc.	%
Fixed Line (a + c)	23	46%
Mobile Phone (b + c)	19	38%
Internet (d)	3	6%
Radio Communication (e)	8	16%
No Facility (f)	5	10%

Percentage calculated for each administrative region.
Source: the field works; JICA Study Team (2010)

As it can been seen in the table above, the most commonly used systems are the fixed line and mobile telephone, which provide communication service to forty-one (41) localities, representing 84% of the sample localities. Only five (5) localities do not have communication systems or services.

There are also some localities with fixed line and mobile telephones (5 localities) or fixed line telephone and Internet (3 localities).

Other possible means of communication are through digital TV signals, open TV signals, and radio broadcasting signals, especially present at the localities that have electricity.

(9) Economic Activity

The Economically Active Population (EAP) mainly works in the primary sector with an 87% for agriculture, stockbreeding, fishing and forestry activities.

In the Low Forest, 86.1% of the working population is in the primary sector, where 83.7% work in agriculture, 0.8% in stockbreeding and 0.8% in fishing, basically for self-consumption, 6.7% of the EAP is dedicated to small scale commerce, such as small convenience stores, restaurants, handcrafts selling and 6.3% are workmen, drivers, teachers or employees and finally, 0.9% work in transportation.

Low Forest	Surveyed Pop
Agriculture	83.7%
Stockbreeding	0.8%
Forestry	0.8%
Commerce	2.3%
Others (handcraft)	4.4%
Worker	2.0%
Driver	1.2%
Employee	1.2%
Teacher	1.9%
Fisherman	0.8%
Transportation	0.9%
Total	100.0%

The main economic activity in the High Forest, similarly to the Low Forest, is agriculture with 85.1%. 1% of the population works in stockbreeding; 6.3% works in small scale commerce, like small convenience stores and restaurants; and 7.7% work as workmen, drives, construction workers, mechanics, teachers or carpenters.

High Forest	Surveyed Pop
Agriculture	85.1%
Stockbreeding	1.0%
Commerce	4.7%
Others (handcraft)	0.8%
Worker	3.7%
Driver	1.4%
Construction Work	0.8%
Mechanic	0.3%
Teacher	1.4%
Carpenter	0.8%
Total	100.0%

The main economic activities in the Front Forest, like those of the High Forest and Low Forest, are located in the primary sector. 91.64% of the population is dedicated to agriculture; 2.3% work in commerce and handcrafting and the remaining 6% are workmen, teachers or employees.

High Forest	Surveyed Pop
Agriculture	90.3%
Stockbreeding	1.3%
Commerce	1.3%
Others (handcraft)	1.0%
Workman	1.0%
Teacher	2.3%
Employee	2.7%
Total	100.0%

In the three (3) geographical regions, the productive activities, such as agriculture and stockbreeding, cover the basic family needs (self-consumption), .The exchange of products and small commerce is also present.

(10) Family Income and Expenditure levels

i) Income

The survey results indicate that there are thirty-three (33) localities, representing 66.0% of the sample localities, where the monthly average income per family ranges from S/.351 to 600. Those localities are mainly located in the Low Forest Region, (sixteen (16) localities). See Table Nº 3.3.1-15.

Table N° 3.3.1-15: Income Range per Geographical Region

Income Range (S/.)	Geographical Region			Each Range
	Low Forest	High Forest	Front Forest	
Income≤350	24% (7)	-	22% (2)	18% (9)
351<Income< 600	55% (16)	83% (10)	78% (7)	66% (33)
601< Income	21% (6)	17% (2)	-	16% (8)
Total	**100% (29)**	**100% (12)**	**100% (9)**	**100% (50)**

Note: The digits in parentheses indicate the number of localities.
Source: Socio-economic-Survey; JICA Study Team (2010)

It was also found that in the localities of Guadalupe and San Francisco, there were average family incomes of around S/.900 monthly, the highest of all localities, which had no relation to the level of expenditures. For this reason, these are considered as exceptional cases and were not taken into account to average calculation. This case of exception is well depicted in the following figure 3.3.1-1.

By analyzing the averages per geographical region, it is found that the lowest average income is in the populations of the Low Forest with S/.175, according to Table N° 3.3.1-16. The same table shows maximum and minimum incomes per geographical region, where the Low Forest is the region with the most significant maximum and minimum values.

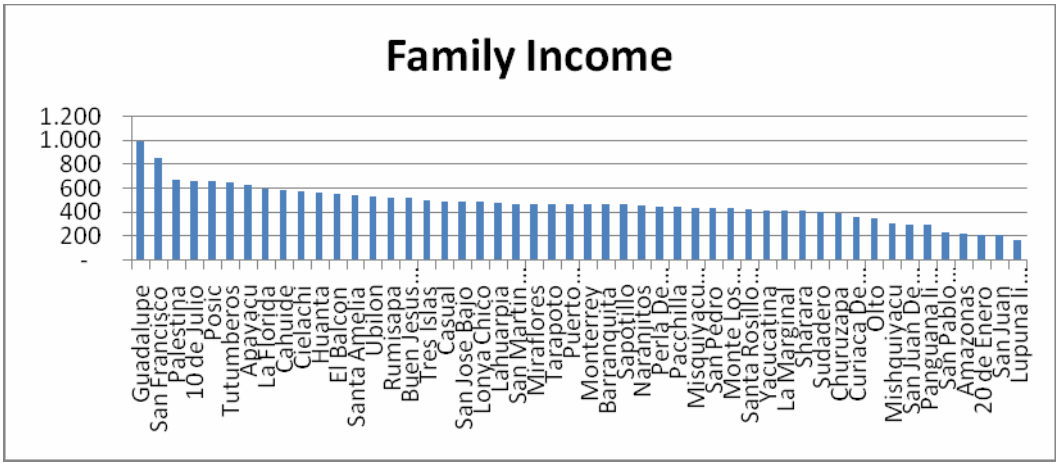
Table N° 3.3.1-16: Average Family Income by Geographical Region

Income Range (S/.)	Geographical Region		
	Low Forest (*)	High Forest	Front Forest
Maximum	677	660	583
Minimum	175	431	211
Average	458	492	457

Source: Socio-economic-Survey; JICA Study Team (2010)

The average income in the 50 sample localities is S/.466, correcting the distortion of the atypical values in Guadalupe and San Francisco. The following figure shows the values without correction.

Figure 3.3.1-1: Family Income per Month



Source: JICA Study Team (2010)

ii) Expenditures

As for expenditures in the sample localities the information was only obtained in 47 localities. A 53% of localities shows average expenditures between S/. 351 and S/.600, as shown in Table N° 3.3.1-17.

Table N° 3.3.1-17: Range of Expenditures by Geographical Region

Expenditure Range (S/.)	Geographical Region			Total
	Low Forest	High Forest	Front Forest	
Exp.<350	54% (14)	17% (2)	22% (2)	38% (18)
351<Exp. <600	38% (10)	83% (10)	56% (5)	53% (25)
601 <Exp	8% (2)	0%	22% (2)	9% (4)
Total	**100% (26)**	**100% (12)**	**100% (9)**	**100% (47)**

Notes: 1) The digits in parentheses indicate the number of localities.
2) Information from 47 localities.
Source: Socio-economic-Survey; JICA Study Team (2010)

Table N° 3.3.1-18 shows the average expenditures per geographical region. The lowest value is in the populations of the Low Forest: S/.376. The average of expenditure in the 47 sample localities is S/. 404.

Table N° 3.3.1-18: Expenditures by Geographical Region

Expenditures (S/.)	Geographical Region		
	Low Forest (*)	High Forest	Front Forest
Maximum	677	535	753
Minimum	134	313	194
Average	376	431	452

Source: Socio-economic-Surveys; JICA Study Team (2010)

(11) Fees and Willingness to Pay for Services (Families´ capacity to pay)

In the localities whose populations have water supply services, the families pay a monthly fee. Amounts vary according to region and water supply system.

In the administrative regions where gravity systems with or without treatment are predominant, such as Amazonas and San Martin, the fee amounts are the lowest (S/. 1), as the costs of operation and maintenance are low. In Table N° 3.3.1-19, the highest average payment is found to be S/.10 in the localities of Madre de Dios, where the existing supply systems requires pumping, which generates higher operation costs.

Table Nº 3.3.1-19: Fees Collected by Administrative and Geographical Regions

Geographical Region	Region	Maximum (S/.)	Minimum (S/.)	Average (S/.)
Front Forest	Amazonas	2.0	0	1.1
	San Martin	2.0	0	1.0
High Forest	Amazonas	6.0	0	3.6
	San Martin	7.0	0	2.3
Low Forest	Amazonas	5.0	1.0	3.0
	San Martin	5.0	0	2.8
	Madre de Dios	10.0	0	6.7
	Ucayali	2.5	0	0.4
	Loreto	0	0	0

Source: Socio-economic-Surveys; JICA Study Team (2010)

As a result of the field survey, it was found that there is willingness to increase the monthly fees paid in order to obtain better water supply and sanitation services or the implementation of new systems.

Table N° 3.3.1-20 shows that the current average family fee paid in the sample localities is S/.1.78 per month and that the inhabitants surveyed are willing to pay an additional S/.4.14, with which the total Willingness to Pay rises to S/.5.92. This value shows the importance that the inhabitants place on having reliable potable water and sanitation systems that offer a good service.

Table Nº 3.3.1-20: Willingness to Pay, by Geographical and Administrative Regions

Geographical Region	Adm. Region	Current average fee per family (S/.)	Average Additional Willingness to Pay(S/.)	Average Total Willingness to Pay (S/.)	
Front Forest	Amazonas	1.07	2.03	3.10	3.13
	San Martin	1.00	2.25	3.25	
High Forest	Amazonas	3.60	3.98	7.58	6.52
	San Martin	2.32	3.44	5.77	
Low Forest	Amazonas	2.79	3.48	6.27	6.54
	San Martin	0.42	6.22	6.64	
	Madre de Dios	6.67	5.93	12.60	
	Ucayali	0.42	6.22	6.64	
	Loreto	-	5.36	5.36	
General Average		**1.78**	**4.14**	**5.92**	

Source: Socio-economic-Surveys; JICA Study Team (2010)

(12) Population's Willingness to Participate in the Program

The population's willingness to participate in the works of the projects in their respective localities was one of the topics of the socio-economic-survey carried out. The results will

indicate the willingness of the future users to participate in the project and to assume the responsibilities to be required.

Table Nº 3.3.1-20 shows a summary of the answers given by the interviewed people. It shall be noticed that 43% of the people does not have connections and that 100% of this group is willing to participate. Also, 99.6% of them responded to confirm their Willingness to Pay (WTP) for the service. All the interviewed people expressed that they would undertake one or several types of contributions. It is noted that the Low Forest shows the lowest willingness to contribute to projects through unskilled manpower (80%), but the highest willingness to contribute with tools (29%), materials (10%) an even money (4%). In the High Forest, the willingness to contribute with labor reaches 92% and in the Front Forest it reaches 87%.

Table Nº 3.3.1-21: Population's Willingness to Participate

Willingness To Pay (WTP) and to participate in the Program		**Geographical Region**						**Total**	
		Low Forest		**High Forest**		**Front Forest**			
With connection		387	37%	492	79%	245	82%	1124	57%
Without connection		673	63%	131	21%	53	18%	857	43%
Total surveyed		1060	100%	623	100%	298	100%	1981	100%
Survey to People without connection	WTP	673	100%	131	100%	50	94%	854	99.6%
	Willing to Cooperate (multiple answers allowed)	**673**	**100%**	**131**	**100%**	**53**	**100%**	**857**	**100%**
	With labor	536	80%	121	92%	46	87%	703	82%
	With tools	192	29%	4	3%	7	13%	203	24%
	Only in meetings	284	42%	12	9%	4	8%	300	35%
	With materials	67	10%	0	0%	2	4%	69	8%
	With money	30	4%	4	3%	0	0%	34	4%

Source: Socio-economic-Surveys; JICA Study Team (2010)

In order to illustrate life-style in these localities, the main characteristics of the housing and economic activities of the surveyed people are shown in Table 3.3.1-22. It shall be observed that between 89% and 95% of the households are owned by their residents; 69% of the households are made of wood in the Low Forest, material that barely reaches 12% and 15% in the other two (2) regions, where materials based on clay are predominant, such as quincha, brick and mud walls. The main economic activity is agriculture, which is the activity of 85% of the surveyed population. Commerce and stockbreeding are also important, varying by administrative and geographic regions.

Table Nº 3.3.1-22: Main Characteristics of Predominant Housing and Economic Activities

Main characteristics of housing	Natural Region						Total	
	Low Forest		High Forest		Front Forest			
	With connection	Without connection	With connection	Without connection	With connection	Without connection	With connection	Without connection
Total Households	387	673	492	131	245	53	1124	857
Owned by residents	364	641	446	117	229	49	1039	807
% of households owned by their residents	94%	95%	91%	89%	93%	92%	92%	94%
With electricity	340	194	348	69	183	15	871	278
% households with electricity	88%	29%	71%	53%	75%	28%	77%	32%
Predominant Material of the households								
Adobe/quincha/ brick	29%		62%		75%		46%	
Wood	69%		12%		15%		43%	
Mudwall/mud/stone	1%		20%		10%		8%	
Predominant economic activity								
Agriculture	83.7%		85.1%		90.3%		85.1%	
Commerce/stockbreeding	3.1%		4.7%		2.6%		3.5%	

Source: Socio-economic-Surveys; JICA Study Team (2010)

Another manifestation of such willingness to participate in the Program, due to the population's demand of the services, is reflected on the formation of communal administrative boards in all the localities. When the intervention of the consultant in each locality for the field survey, the population were made aware of the project and every community expressed their decision to participate in their project and selected the member of their communal organization, which was in every case the Administrative Board (JASS), through an assembly; as it is evidenced in the Minutes included in the field reports of each *Perfil* Study of the 50 sample localities.

In these Minutes it was agreed that not only the locality would participate in the Program but also the members of the Community Organization were designated and their obligations were established. In only one case, the district municipality preferred to assume the administration, as it is permitted by the legal frame.

The summary of the information regarding the formation of each Community Organization is shown in Table Nº 3.3.1- 23.

Table Nº 3.3.1-23: Administrative Boards Formed in the Sample Localities

Nº	Administrative Region	Localities	Type of Region	Status	Existing Communal Organization	Members of the JASS) (President Treasurer Secretary controller)	Date of formation of the JASS.
1	Amazonas	Miraflores	F-F	Poor	JASS	4 members	01/06/2009
2	Amazonas	Tutumberos	L-F	Poor	JASS	4 members	30/05/2009
3	Amazonas	Guadalupe	L-F	Poor	JASS	4 members	29/05/2009
4	Amazonas	Puerto Naranjitos	H-F	Poor	JASS	4 members	21/05/2009
5	Amazonas	Naranjitos	H-F	Bad	JASS	4 members	20/05/2009
6	Amazonas	Misquiyacu Bajo	H-F	Poor	JASS	4 members	25/05/2009
7	Amazonas	San Jose Bajo	H-F	Poor	JASS	4 members	19/05/2009
8	Amazonas	Casual	H-F	No service available	-	4 members	23/05/2009
9	Amazonas	El Balcón	F-F	No service available	-	4 members	03/05/2009
10	Amazonas	Ubillón	F-F	Out of operation	-	4 members	15/05/2009
11	Amazonas	Cielachi	F-F	Poor	JASS	4 members	16/05/2009
12	Amazonas	Lonya Chico	F-F	Poor	Municipality	4 members	18/05/2009
13	Amazonas	San Juan y Olton	F-F	Poor	Municipality	4 members	20/05/2009
				Poor		4 members	20/05/2009
15	San Martin	Lahuarpía	H-F	Poor	Municipality	4 members	17/05/2009
16	San Martin	Perla de Cascayunga	H-F	Bad	N/A	4 members	17/05/2009
17	San Martin	Posic	H-F	Poor	Municipality	4 members	01/06/2009
18	San Martin	Barranquita	F-F	Poor	JASS	4 members	05/06/2009
19	San Martin	La Florida	H-F	Poor	Water committee	4 members	13/05/2009
20	San Martin	Monte de los Olivos	F-F	Poor	N/A	4 members	24/05/2009
21	San Martin	Rumisapa	L-F	Poor	Municipality	Not formed	Municipal Management Unity
22	San Martin	Pacchilla	H-F	Bad	N/A	4 members	16/05/2009
23	San Martin	Churuzapa y La Marginal	L-F	Poor	Water committee	4 members	15/05/2009
				Poor		4 members	15/05/2009
25	San Martin	Palestina	L-F	Poor	Water committee	4 members	12/05/2009
26	San Martin	Mishquiyacu	L-F	Bad	Water committee	4 members	20/05/2009
27	San Martin	Sapotillo	H-F	No service available	-	4 members	17/05/2009
28	San Martin	Santa Rosillo de Ipaquihua y anexo Nuevo México	H-F	Insufficient	N/A	4 members	22/05/2009
29	San Martin	Yacucatina	L-F	Out of operation	-	4 members	13/05/2009
30	Madre de Dios	Tres Islas	L-F	No service	-	4 members	14/05/2009
31	Madre de Dios	Sudadero	L-F	Poor	Water committee	4 members	16/05/2009
32	Madre de Dios	Monterrey	L-F	Poor	Water committee	4 members	19/05/2009
33	Ucayali	San Martin de Mojaral	L-F	Insufficient	N/A	4 members	25/05/2009
34	Ucayali	San Francisco	L-F	Poor	Water committee	4 members	14/05/2009
35	Ucayali	10 de Julio	L-F	No service available	-	4 members	12/05/2009

Nº	Administrative Region	Localities	Type of Region	Status	Existing Communal Organization	Members of the JASS) (President Treasurer Secretary controller)	Date of formation of the JASS.
36	Ucayali	San Pedro de Bello Horizonte	L-F	No service available	-	4 members	17/05/2009
37	Ucayali	Sharara	L-F	No service available	-	4 members	22/05/2009
38	Ucayali	Curiaca	L-F	No service available	-	4 members	21/05/2009
39	Loreto	Cahuide	L-F	No service available	-	4 members	28/05/2009
40	Loreto	San Juan De Puritania	L-F	No service available	-	4 members	26/05/2009
41	Loreto	Amazonas	L-F	No service available	-	4 members	27/05/2009
42	Loreto	20 de Enero	L-F	No service available	-	4 members	27/05/2009
43	Loreto	San Pablo De Cuyana	L-F	No service available	-	4 members	19/05/2009
44	Loreto	Tarapoto	L-F	No service available	-	4 members	25/05/2009
45	Loreto	Panguana Zone II	L-F	No service available	-	4 members	24/05/2009
46	Loreto	Lupuna Zona II	L-F	No service available	-	4 members	21/05/2009
47	Loreto	Apayacu	L-F	No service available	-	4 members	21/05/2009
48	Loreto	Buen Jesús De Paz	L-F	No service available	-	4 members	22/05/2009
49	Loreto	Huanta	L-F	No service available	-	4 members	19/05/2009
50	Loreto	Santa Amelia	L-F	No service available	-	4 members	20/05/2009

Source: Socio-economic-surveys; JICA Study Team (2010)**;**
F-F: Front Forest *(Ceja de Sellva***)**, H-F: **High Forest (***Selva Alta)***, L-F (***Selva Baja)*

In determining the conditions of existing infrastructures (State), these have been considered as follows: "Poor" for those systems functioning with accessories showing little deterioration, that require reparation and/or maintenance; "Bad" where the service is discontinued due to provisional systems or components, deteriorated systems with interruptions in their design that require change or rehabilitation; and "Insufficient" for those systems that require rehabilitation and/or expansion of the systems.

3.3.2 Condition of Potable Water and Sanitation Supply Services

Most of the existing structures and facilities were implemented by the Cooperation Fund for Social Development – FONCODES between the years 1991 and 2008. Some structures, in particular reservoirs and water treatment plants implemented by the former Basic Rural Sanitation Directory Region - DISABAR (since 1962) of the Ministry of Health, are still operational even though they are around 40 years old.

As of 1991, FONCODES constructed water supply and sanitation facilities in regions, mainly in the rural areas, by financing investment projects for social and economic infrastructure aiming at reducing poverty, in coordination with the Regional Governments, Local Governments and the strategic alliance with the Civil Society.

In the target area of the present Program, there are a total of 2,175 facilities constructed by FONCODES in localities with populations between 50 and 20,000. The most of these localities (98%) have populations of less than 2,000 people.

There were 1,008 facilities implemented in the Amazonas administrative region, while in Madre de Dios there were only 110. The implementation may have been executed in stages, because several facilities were implemented in one locality over different periods of time.

(1) Potable Water Supply Infrastructure

The information regarding the current conditions of the water supply and sanitation facilities in the rural Amazon area was obtained as a result of the field works conducted in the 50 sample localities of the Program.

i) Definitions of the types of water supply facilities in the sample localities

G-W-T: The Gravity System with Treatment (G-W-T) includes one or more intake structure/s at the water sources in rivers or streams, conduction pipe-lines, water treatment plant (sand trap, sedimentation, pre-filter, slow filter), reservoirs (elevated or on-ground), adduction pipe lines and distribution network with public taps or house connections.

G-WO-T: The Gravity System without Treatment (G-WO-T) is different from the previous one mainly because of the water source (good quality water form a spring) and because the intake facility in built on such source. The other components are similar to the ones of the G-W-T.

P-W-T: Pumping System with Treatment (P-W-T) is the system using superficial/ground waters that cannot be delivered by gravity and that need treatment before drinking. The water is pumped up to the treatment plant, from which water is delivered by gravity.

P-WO-T: The Pumping System without Treatment (P-WO-T) is the system that uses underground water of good quality. The water is driven from a well/s up to a reservoir/s and thereafter to a distribution line.

Others: In the cases where Carrying with Treatment (W-C-T) is used, the inhabitants carry the raw water from available sources, and it is then treated with sand filters.

The types of existing water supply systems in the 50 sample localities are summarized in Table Nº 3.3.2-1, with indication of the region where they are located in, their condition, their water source and the continuity and coverage of the service.

The conditions in which the existing systems operate are the result of the lack of operation and maintenance of the systems, as a consequence of the lack of technical personnel to carry out the tasks. Also, such conditions are due to the improvisation that the inhabitants have carried

out in order to solve their problems regarding water supply, the continuity of the service and the quality of the water.

The inhabitants have carried out their own home connections without technical supervision, by connecting to the distribution pipe of the public taps; without knowing the capacity of the system. Thus, the home connections generate more losses because of its installation without technical supervision and decreasing the capacity of coverage of the installed infrastructure.

In Table N° 3.3.2-1, it has been noted that:

1) The sources are not protected to damages done by third parties and/or are vulnerable to pollution.
2) The built intake facilities are currently without maintenance and require rehabilitation and/or upgrade of their hydraulic system. Some intakes have been provisionally built, without professional direction or suitable materials. In such cases it is necessary to build a new water intake facility.
3) The water treatment plants are in poor to good physical condition and they mainly require the replacement of the filter beds and the rehabilitation of the hydraulic systems.
4) Most of reservoirs are in poor to “fair” conditions and they require maintenance, cleaning and replacement of their hydraulic systems.
5) In the case of the pipes that are part of conveyance facilities, transmission pipes and distribution network, they are installed in the surface or exposed to the environment and, therefore, to landslides and damages by third parties. It is common in such cases the appearance of bursts, fissures and leaks. It becomes necessary, then, the replacement of pipes or to carry out the new traverses.
6) Most of home connections are in bad conditions, as a result of the clandestine installations, provisional home connections and the lack of maintenance or rehabilitation.

Table N° 3.3.2-1 Summary of Existing Water Supply Systems in the Sample Localities- Part A

Nº	Region	Locality	Natural Region	Houses			Supply System				Water-Intake Facilities			Conveyance facilities			Suction				Riser pipe			Treatment							
																								Sand trap		Settler		Pre filter		Slow Filter	
				Total Nº of houses	W/connections	Coverage	Type of System Installed	Cont Horas /Dia	Source	Energy Source	Type	Material	Condition	Diam (plg)	Material	Condition	Diam (plg)	Material	Impulse Pump	Condition	Diam (plg)	Material	Condition	Material	Condition	Material	Condition	Material	Condition	Material	Condition
1	Amazonas	Miraflores	F. F.	50	30	60%	G.W.O.T.	10	Spring	-	Bottom spring	Concrete	Bad	2"	PVC	Good	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Amazonas	Tutumberos	L. F.	54	40	74%	G.W.T.	5	Superficial	-	Artesanal	Wood and stone	Bad	1 1/2"	PVC	Bad	-	-	-	-	-	-	-	Concrete	Good	-	-	Concrete	Good	Concrete	Good
3	Amazonas	Guadalupe	L. F.	75	50	67%	G.W.T.	9	Superficial	-	Canal de Dirt	Dirt	Bad	-	PVC	Bad	-	-	-	-	-	-	-	-	-	-	-	-	-	Concrete	Good
4	Amazonas	Puerto Naranjitos	H. F.	170	124	72.9%	G.W.T.	22	Superficial	-	Barrage	Concrete	Poor	3"-4"	PVC	Bad	-	-	-	-	-	-	-	-	-	-	-	Concrete	Bad	-	-
5	Amazonas	Naranjitos	H. F.	215	177	82%	G.W.T.	4	Superficial	-	Barrage	Stone, wood	Bad	2"-3"-4"	PVC	Bad	-	-	-	-	-	-	-	-	-	Concrete	Bad	-	-	Concrete	Poor
6	Amazonas	Misquiyacu Bajo	H. F.	68	58	85%	G.W.T.	9	Superficial		Barrage	Stone, wood	Bad	2 1/2"	PVC	Bad	-	-	-	-	-	-	-	-	-	Concrete	Good	Concrete	Good	Concrete	Good
7	Amazonas	San Jose Bajo	H. F.	99	82	83%	G.W.O.T.	5	Spring	-	Spring	Concrete	Poor	2"	PVC	Poor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Amazonas	Casual	H. F.	56	0	0%	W.O.S/water fetching	-	Stream and irrigation channel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	Amazonas	El Balcon	F. F.	35	0	0%	W.O.S/water fetching	-	Spring	-	Spring	Stone	Bad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Amazonas	Ubilon	F. F.	43	24	56%	G.W.O.T.,(w.o. service)	0.8	River water fetching and contiguous localities	--	---	---	Collapsed	2"	PVC	Collapsed	-	-	-	-	-	-	-	-	-	-	-	-	-	---	---
11	Amazonas	Cielachi	F. F.	53	40	75%	G.W.O.T.	12	Spring		Caja de Concrete	Concrete	Poor	2"	PVC	Poor	---	---	---	---	----	----	---	---	---	---	---	---	---	---	---
12	Amazonas	Lonya Chico	F. F.	117	113	97%	G.W.O.T.	14	Superficial		TypeBarrage	Concrete	Poor	2"	PVC	Poor	---	---	---	---	----	----	---	---	---	---	---	---	---	---	---
13	Amazonas	San Juan	F. F.	48	45	94%	G.W.O.T.	21	Superficial		TypeBarrage trapezoidal	Concrete	Poor	3"	PVC	Poor	---	---	---	---	----	----	---	---	---	---	---	---	---	---	---
14	Amazonas	Olto	F. F.	168	161	96%	G.W.O.T.	16	Superficial		TypeBarrage trapezoidal	Concrete	Poor	3"	PVC	Poor	---	---	---	---	----	----	---	---	---	---	---	---	---	---	---
15	San Martin	Lahuarpia	H. F.	200	188	94%	G.W.O.T.	13	Superficial	--	TypeBarrage fijo	Reinforced concrete	Poor	3", 21/2"	PVC	Poor	-	-	-	-	-	-	-	-	-	-	-	-	-	---	---
16	San Martin	Perla de Cascayunga	H. F.	41	12	29%	G.W.O.T.	24	Spring	--	Bottom spring	Concrete	Bad (w/o technical supervision)	3"	PVC	Bad (w/o technical supervision)	-	-	-	-	-	-	-	-	-	-	-	-	-	---	---
17	San Martin	Posic	H. F.	331	287	87%	B.S.T.	24	Well	Electricidad publica	Well tubular	Well tubular.	Poor		----	-	3"	Cast Iron	Submersible Water Pump of 15 lps.	Poor	3"	Fierro Fundido	Poor	-	-	-	-	-	-	---	---
18	San Martin	Barranquita	F. F.	74	68	92%	G.W.T.	24	Superficial	--	TypeBarrage lateral	Reinforced concrete	Poor	1 1/2"	PVC	Poor	-	-	-	-	-	-	-	Reinforced concrete	Good	-	-	Reinforced concrete	Poor	Reinforced concrete	Poor
19	San Martin	La Florida	H. F.	63	63	100%	G.W.T.	24	Superficial	-	Barrage	Concrete	Poor	2"	PVC	Poor , (damaged valves)	-	-	-	-	-	-	-	Reinforced concrete	Poor	-	-	-	-	Reinforced concrete	Poor (without filter bed)
20	San Martin	Monte de los Olivos	F. F.	44	42	95%	G.W.O.T.	24	Spring	-	De ladera	Concrete	Bad (w/o technical supervision)	2"	PVC	Bad (w/o technical supervision)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	San Martin	Rumisapa	L. F.	220	192	87%	G.W.O.T.	1.1	Spring	-	De ladera	Concrete	Poor.	2"	PVC	Poor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	San Martin	Pacchilla	H. F.	120	100	83%	G.W.O.T.	24	Spring	-	De ladera	Concrete	Bad, construction deficiency.	2"	PVC	Poor, superficial piping.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	San Martin	Churuzapa	L. F.	96	82	85%	G.W.T.	5	Superficial	-	Barrage	Concrete	Good	2"	PVC	Poor , superficial pipe network.	-	-	-	-	-	-	-	Reinforced concrete	Poor	-	-	-	-	Reinforced concrete	Poor
24	San Martin	La Marginal	L. F.	57	47	82%	G.W.T.	4	Superficial	-	Barrage	Concrete	Good	2"	PVC	Good	-	-	-	-	-	-	-	Reinforced concrete	Good	-	-	-	-	Reinforced concrete	Good
25	San Martin	Palestina	L. F.	58	57	98%	B.S.T.	24	Well	Electricity	Well artesiano	Concrete	Poor	-	-	-	2"	Galv. Iron	Electropumpo of 2 HP	Poor	11/2"	PVC	Poor	-	-	-	-	-	-	-	-
26	San Martin	Mishquiyacu	L. F.	121	120	99%	G.W.T.	24	Spring	-	De ladera	Reinforced concrete	Poor	2" ,3"	PVC	Bad, with fissures, superficial stretchs	-	-	-	-	-	-	-	-	-	-	-	-	-	Reinforced concrete	Poor, (without filter bed).
27	San Martin	Sapotillo	H. F.	59	0	0%	W.O.S/water fetching	-	Stream and irrigation channel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	San Martin	Santa Rosillo de Ipaquihua y anexo Nuevo Mexico	H. F.	111	58	52%	G.W.O.T.	1.3	Spring	-	De ladera	Concrete	Bad and inadequate	2"	PVC	Poor, expose streches	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	San Martin	Yacucatina	L. F.	38	0	0%	P.W.O.T. water fetching.	-	Well, stream, water fetching	-	Well artesiano	Reinforced concrete	Poor.	-	-	-	2"	PVC	Doesn't have any	Bad (cracked)	2"	PVC	Bad, (deformada y defectuosa)	-	-	-	-	-	-	-	-
30	Madre de Dios	Tres Islas	L. F.	56	0	0%	W.O.S/water fetching	-	Springs	-	---	---	---	----	----	---	-	-	-	-	-	-	---	-	-	-	-	-	-	---	---
31	Madre de Dios	Sudadero	L. F.	51	41	80%	B.S.T.	5	Superficial	Electricity	Caja de derivacion	Reinforced concrete	Poor	----	----	---	2"	PVC	Electropumpo of 5HP	Poor	2"	PVC	Bad (expuesto al ambiente)	-	-	-	-	-	-	---	---
32	Madre de Dios	Monterrey	L. F.	41	20	49%	B.S.T.	19	Superficial	Electricity	Caja de derivacion	Reinforced concrete	Bad	4"	PVC	Poor	4"	PVC	Electropumpo of 5HP	Bad (presenta fugas)	4"	PVC	Bad (present leaks)	-	-	-	-	-	-	-	-
33	Ucayali	San Martin de Mojaral	L. F.	30	0	0%	B.S.T.	2.5	Well	Electricity	Well tubular	Concrete	Poor	----	----	---	1"	PVC	Electropumpo of 1.5HP	Buena	1"	PVC	Good	-	-	-	-	-	-	---	---
34	Ucayali	San Francisco	L. F.	248	142	57%	B.S.T.	4	Well	Electricity	Well tubular	Concrete	Poor	----	----	---	2"	PVC	Electropumpo of 2HP	Bad	2"	PVC	Good	-	-	-	-	-	-	---	---
35	Ucayali	10 de Julio	L. F.	21	0	0%	W.O.S/water fetching	-	Well built w.o. technical supervision, streams, irrigation channels	---	-	-	-	----	----	---	-	-	-	-	-	-	---	-	-	-	-	-	-	---	---
36	Ucayali	San Pedro de Bello Horizonte	L. F.	29	0	0%	W.O.S/water fetching	-	Streams, well built w.o. technical supervision	---	---	---	----	----	----	---	-	-	-	-	-	-	-	-	-	-	-	-	-	---	---
37	Ucayali	Sharara	L. F.	75	0	0%	W.O.S/water fetching	-	River, well built w.o. technical supervision	---	---	---	----	----	----	---	-	-	-	-	-	-	-	-	-	-	-	-	-	---	---
38	Ucayali	Curiaca	L. F.	83	0	0%	W.O.S/water fetching	-	River, well built w.o. technical supervision	---	---	---	----	----	----	---	-	-	-	-	-	-	-	-	-	-	-	-	-	---	---
39	Loreto	Cahuide	L. F.	99	0	0%	W.O.S/water fetching	-	Rain water well (school)	-	Well	Concrete	Poor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40	Loreto	San Juan De Puritania	L. F.	80	0	0%	W.O.S/water fetching	-	Dug well	--	--	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	Loreto	Amazonas	L. F.	69	0	0%	W.O.S/water fetching	-	River	--	--	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42	Loreto	20 de Enero	L. F.	49	0	0%	W.O.S/water fetching	-	Wells, river, water rain (school)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
43	Loreto	San Pablo De Cuyana	L. F.	50	0	0%	W.O.S/water fetching	-	River, well built w.o. technical supervision	Solar Panel (operative)	Well	Concrete	Non operative	-	-	-	6"	PVC	Doesn't have any	Bad	160 mm	PVC	Bad (broken)	-	-	-	-	-	-	-	-
44	Loreto	Tarapoto	L. F.	50	0	0%	W.O.S/water fetching	-	River, Wells excavados	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45	Loreto	Panguana II Zona	L. F.	74	0	0%	W.O.S/water fetching	-	River, Dug wells	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46	Loreto	Lupuna II Zona	L. F.	69	0	0%	W.O.S/water fetching	-	River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
47	Loreto	Apayacu	L. F.	54	0	0%	W.O.S/water fetching	-	River	--	--	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
48	Loreto	Buen Jesus De Paz	L. F.	60	0	0%	W.O.S/water fetching	-	River, stream, water rain (school)	--	--	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	Loreto	Huanta	L. F.	144	0	0%	W.O.S/water fetching	-	River and lagoon	--	--	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
50	Loreto	Santa Amelia	L. F.	50	0	0%	S.S. Acarreo	-	Lagoon	--	--	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Self produce

F.F.: Front Forest L. F.: Low Forest H.F. : High Forest

W.O.S: Without Svstem

G.W.T.: Gravity With treatment

G.W.O.T.: Gravity Without treatment

P.W.O.T.: Pumping Without treatment

P.W.T.: Pumping with treatment

Table N° 3.3.2-1 Summary of Existing Water Supply Systems in the Sample Localities- Part B

N°	Region	Locality	Natural Region	Reservoir			Chlorination			Transmission pipe			Distribution Network			Intrahome Connections/Public taps				Comments
				Vol (m3)	On ground/ Elevated	Condition	Yes	No	Equipment	Diam (plg)	Material	Condition	Diam (plg)	Material	Condition	Conex (N°)	Condition Domic.Conex.	Public tap (N°)	Condition Public Taps	
1	Amazonas	Miraflores	F. F.	30	On ground	Good		X		2"	PVC	Good	1"	PVC	Good	-	Good	-	Bad	Public taps were installed inicially, after some time Intrahomes conecctions were installed without technical supervision.
2	Amazonas	Tutumberos	L. F.	10	On ground	Poor		X		1 1/2"	PVC	Poor	1" , 3/4"	PVC	Poor	-	Bad	-	Bad	Public taps were installed inicially the connections were done later, the system is not working. Landslide caused by rains destroyed the water intake and part of the conveyance lines. The pre filter and filter are not currently in use
3	Amazonas	Guadalupe	L. F.	12.5	On ground	Poor		X		2"	PVC	Bad	1" , 1 1/2"	PVC	Good	-	Bad	3	Bad	Intrahome connections were installed later on, inicially they had public taps (3)
4	Amazonas	Puerto Naranjitos	H. F.	90	On ground	Good		X		2"	PVC	Good	1"	PVC	Good	-	Bad	4	Bad	Intrahome connections were installed later on, inicially they had public taps (4)
5	Amazonas	Naranjitos	H. F.	30	On ground	Poor	X		Hypochlorinator by diffusion	2´´	PVC	Poor	1"	PVC	Bad	-	Bad	12	Bad	Intrahome connections were installed later on, inicially they had public taps(12)
6	Amazonas	Misquiyacu Bajo	H. F.	15	On ground	Good	X		Hypochlorinator by diffusion	2 1/2"	PVC	Poor	1" , 1 1/2"	PVC	Poor	-	Bad	4	Bad	Intrahome connections were installed later on, inicially they had public taps (4)
7	Amazonas	San Jose Bajo	H. F.	13.5	On ground	Poor		X		2"	PVC	Poor	1"	PVC	Poor	82	Bad	12	Bad	New conections installed without technical assistance (12 deteriorated public taps)
8	Amazonas	Casual	H. F.	-	-	-				-	-	-	-	-	-	-	-	-		Does not count with water system. The Source is vulnerable to contamination
9	Amazonas	El Balcon	F. F.	-	-	-				-	-	-	-	-	-	-	-	-		Does not count with water system. The Source is vulnerable to contamination
10	Amazonas	Ubilon	F. F.	----	----	---		X		-	-	-	1"	PVC	Bad (collapsed)	24	Bad	-		A Landslide caused by rains, buried the water intakes and part of the Conveyance lines, the system is not currently working and population consumes water fetching it form the river or neighboring localities
11	Amazonas	Cielachi	F. F.	15	On ground	Poor		X		2"	PVC	Poor	2"	PVC	Poor	40	Poor	-		The river flow in the low water season gets significantly low
12	Amazonas	Lonya Chico	F. F.	30	On ground	Poor		X		3"	PVC	Bad	1", 1 1/2", 2"	PVC	Poor	113	Poor	-		The Municipality asume the total operation cost
13	Amazonas	San Juan	F. F.	20	On ground	Poor		X		2"	PVC	Good	1 ", 2"	PVC	Good	45	Poor	-		The water intake facility, the Conveyance lines are shared with the locality of Olto from the Conveyance lines
14	Amazonas	Olto	F. F.	20	On ground	Poor		X		----	----	---	1/2", 1", 2"	PVC	Poor	161	Poor	-		The water intake facility, the Conveyance lines are shared with the locality of San Juan from the Conveyance lines
15	San Martin	Lahuarpia	H. F.	90	On ground	Poor		X		2 1/2"	PVC	Bad	3/4", 1", 2" , 21/2"	PVC	Bad	188	Bad (w.o. technical supervision)	-		Part of the water system was constructed four years ago, by the Municipality of Moyobamba, but without any technical assistance
16	San Martin	Perla de Cascayunga	H. F.	----	----	---		X		-	-	-	3"	PVC	Bad (w/o technical supervision)	19	Bad (w.o. technical supervision)	-		The water system was constructed without technical assistance, through labor days.
17	San Martin	Posic	H. F.	60	Elevated	Good	X		Manual by weight (Calcium Hypochlorite at the 33%)	4"	-	-	4", 3", 2"	PVC	Poor	287	Bad (w.o. technical supervision)	-		The well presents sanding problems due to a slight depression shown with respect to the land level
18	San Martin	Barranquita	F. F.	30	On ground	Poor		X		4"	PVC	Poor	11/2"	PVC	Bad (w/o technical supervision)	66	Bad (w.o. technical supervision)	-		Public taps were installed inicially, after some time Intrahomes conecctions were installed without technical supervision.
19	San Martin	La Florida	H. F.	8	On ground	Bad (cracked , not enough capacity)		X		2"	PVC	Poor	11/2"	PVC	Bad (deteriorated , superficial)	-	Bad, (deteriorated)	-		Like the Distribution Network, the intrahome connections have been made in a precarious manner.
20	San Martin	Monte de los Olivos	F. F.	-	-	-		X		-	-	-	2"	PVC	Bad (w/o technical supervision)	42	Bad	-		system was constructed without technical assistance, and its condition is precarious.
21	San Martin	Rumisapa	L. F.	70	On ground	Poor		X		2"	PVC	Poor	1",11/2",2"	PVC	Poor, (superficial network)	182	Poor	-		The system was constructed 10 years ago by the municipality. In most of the cases the pipes are exposed
22	San Martin	Pacchilla	H. F.	20	On ground	the 12m3 in good Conditions and the 8m3 in bad condition		X		2"	PVC	Bad, deteriorated pipes	1/2",1"	PVC	Bad(recycled pipes)	109	Bad (recycled pipes)	-		There are two Reservoirs, one of 12 m3 (good conditions) and other of 8 m3 (bad conditions)
23	San Martin	Churuzapa	L. F.	20	On ground, floating Type	Good				2"	PVC	Poor, superficial network	1",11/2",2"	PVC	Poor, (superficial network)	82	Bad	-		La Marginal and Churuzapa share the same system. From the slow filter three Conveyance lines comes out, to the locality of Maceda, La Marginal and Churuzapa
24	San Martin	La Marginal	L. F.	20	On ground, floating Type	Good		X		2"	PVC	Bad (river flow restiction)	3/4",1" , 2"	PVC	Poor, (superficial network)	47	Bad	-		La Marginal and Churuzapa share the same system. From the slow filter three Conveyance lines comes out, to the locality of Maceda, La Marginal and Churuzapa
25	San Martin	Palestina	L. F.	16	Elevated	Good		X		-	-	-	2", 1"	PVC	Poor (w/o technical supervision)	57	Poor	-		The water intake well is located in the middle of the locality.
26	San Martin	Mishquiyacu	L. F.	30	On ground	Poor, non operative valves chest		X		2"	PVC	Poor	2",11/2",1", 3/4",1/2"	PVC	Poor	114	Poor	6	Poor	The slope water intake is located downstream form the outcrop.Exposed to contamination. All the Supply System requires restoration and improvement mejoramiento
27	San Martin	Sapotillo	H. F.	-	-	-		-		-	-	-	-	-	-	-	-	-		the sources tend to contamination, especially the bacteriologic one. It does not guarantee the quality for consumption.
28	San Martin	Santa Rosillo de Ipaquihua y anexo Nuevo Mexico	H. F.	18	On ground	Poor , valves in bad conditions.		X		-	-	-	2",3/4",1/2"	PVC	Poor, (superficial network)	65	Poor	-		The slope water intake is located downstream form the outcrop. The Water-Intake is vulnerable to contamination. The intrahome connections require improvement.
29	San Martin	Yacucatina	L. F.	12	Elevated	Good.		X		-	-	-	2", 1"	PVC	Poor (non technical assistance installation)	15	Bad	-		The Supply System is not working for the lack of a motor-driven pump. Well is vulnerable to contamination and intrahome connections are in bad conditions due to the lack of maintenance and use.
30	Madre de Dios	Tres Islas	L. F.	----	----	---		X		-	-	-	-	-	-	-	-	-		The inhabitants fetch water from nearby Springs. The sources are vulnerable to contamination
31	Madre de Dios	Sudadero	L. F.	15	Elevated	Poor, (requires a new hydraulic system)	X		Manual (Calcium Hypochlorite at the 33%)	11/2"	PVC	Poor	11/2", 1", 3/4"	PVC	Poor	38	Bad	-		The Source is superficial, the system will requrequire treatment. The intrahome connections require change and/or restoration.
32	Madre de Dios	Monterrey	L. F.	8.75	Elevated	Good (requires a new hydraulic system)		X		3"	PVC	Poor	2", 11/2"	PVC	Poor (strechts with leakage)	25	Bad	-		Intrahome Connections have been deteriorated for the construction works of the highway that crosses the locality being buried, requiring restoration and improvement.
33	Ucayali	San Martin de Mojaral	L. F.	18	Elevated	Poor (requires mant. of the hydraulic system)		X		2"	PVC	Bad (requires change)	-	-	Not working	-	Not working	3	Collapsed	The inhabitants fetch water from the elevated reservoir. The Distribution Network installed by FONCODES, year 2000 does not bring service several years ago.
34	Ucayali	San Francisco	L. F.	22	Elevated	Poor (requires mant. of the hydraulic system)		X		2 1/2"	F°G°	Good	2" , 1/2"		Poor (requires installation of blowoff and air valves)	-	Poor	-		The components of the pumping system are vulnerable to damage by thirds.
35	Ucayali	10 de Julio	L. F.	----	----	---		X		-	-	-	-	-	-	-	---	-		Water fetching. The supply sources are vulnerable to contamination.
36	Ucayali	San Pedro de Bello Horizonte	L. F.	----	----	---		X		-	-	-	-	-	-	-	-	-		Being the well far from the locality (754m), most of the inhabitants fetch the water from a branch of the Ucayali river, without taking in count that the water of the well is of better quality.
37	Ucayali	Sharara	L. F.	----	----	---		X		-	-	-	-	-	-	-	-	-		Water fetching. The supply sources are vulnerable to bacteriological contamination.
38	Ucayali	Curiaca	L. F.	----	----	---		X		-	-	-	-	-	-	-	-	-		Water fetching, mainly form the wells (61%). The supply sources are vulnerable to bacteriological contamination.
39	Loreto	Cahuide	L. F.	-	-	-		X		-	-	-	-	-	-	-	-	-		Manual pumps in operation. However, the inhabitants that live near the superficial water courses, supply themselves with them. There are also wells dug by local people.
40	Loreto	San Juan De Puritania	L. F.	-	-	-		X		-	-	-	-	-	-	-	-	-		Most percentage of the inhabitants get supply of the dug well located in the locality.
41	Loreto	Amazonas	L. F.	-	-	-		X		-	-	-	-	-	-	-	-	-		Sources are vulnerable to contamination, mainly bacteriological
42	Loreto	20 de Enero	L. F.	1	Elevated	Poor		X		-	-	-	-	-	-	-	-	-		Sources are vulnerable to contamination, mainly bacteriological
43	Loreto	San Pablo De Cuyana	L. F.	5	Elevated	Bad		X		-	-	Non operative	90 mm, 60 mm	PVC	Bad Conditions			SI	Bad	Supply System non operative for the lack of replacemnet of the pumping equipment.
44	Loreto	Tarapoto	L. F.	-	-	-		X		-	-	-	-	-	-	-	-	-		Sources are vulnerable to contamination, mainly bacteriogical
45	Loreto	Panguana II Zona	L. F.	-	-	-		X		-	-	-	-	-	-	-	-	-		the source does not guarantee adequated quality for human consumption
46	Loreto	Lupuna II Zona	L. F.	-	-	-		X		-	-	-	-	-	-	-	-	-		the source does not guarantee adequated quality for human consumption
47	Loreto	Apayacu	L. F.	-	-	-		X		-	-	-	-	-	-	-	-	-	-	the source does not guarantee adequated quality for human consumption
48	Loreto	Buen Jesus De Paz	L. F.	-	-	-		X		-	-	-	-	-	-	-	-	-		the source does not guarantee adequated quality for human consumption
49	Loreto	Huanta	L. F.	-	-	-		X		-	-	-	-	-	-	-	-	-		the source does not guarantee adequated quality for human consumption
50	Loreto	Santa Amelia	L. F.	-	-	-		X		-	-	-	-	-	-	-	-	-		the source does not guarantee adequated quality for human consumption

Self produce

F.F.: Front Forest L. F.: Low Forest H.F. : High Forest

ii) Observations

The existent water supply infrastructures at the Program's sample localities consist of several types as listed in the Table Nº 3.3.2-2. The Table shows the types of water supply in the 50 sample localities, which total 54 facilities since (4) localities have two supply sources, one of superficial water and one of underground water.

The following observations are made:

1) The Gravity system with or without treatment facilities prevails in the Front Forest and the High Forest, representing 90% and 77%, respectively.

2) In the Front Forest area, eight (8) localities out of nine (9) localities obtain water through G-WO-T; which suggests that clean water is available through the gravity system. In the High Forest area, four (4) localities are G-WO-T, and six (6) localities are G-W-T out of twelve (12) localities; which suggests that the gravity system is predominant using potable or un-potable water sources.

3) On the other hand, "water fetching" is predominant in the Low Forest area, suggesting that water supply facilities are not available in the area or are not in operational conditions. This also implies that the gravity system may not be applicable in the Low Forest area, suggesting that sustainability of facilities will be the main subject in this area.

4) Pumping systems were not identified in the Front Forest, whereas in the Low Forest, seven (7) localities (23%) use a pumping system without treatment facilities and two (2) localities (6%) use manual pumps. This also suggests that pumping systems of any type will be necessary for most cases in the Low Forest.

5) Out of the thirteen (12) sample localities located in the High Forest, only one (1) has a pumping system without treatment facilities.

In Table N° 3.3.2-2 the types of water supply for the 50 sample localities are presented. It has been noted that, in total, the 54 systems are required, because four (4) of the localities will have two (2) supply sources: one of superficial water and the other of underground water.

Table N° 3.3.2-2: Water Supply Method of the Sample Localities

Supply Method	Low Forest		High Forest		Front Forest		Total
	Total	%	Total	%	Total	%	
Gravity With Treatment	1	10%	4	31%	4	16%	**10**
Gravity Without Treatment	8	80%	6	46%	1	3%	**15**
Pumping without Treatment	-	-	1	8%	7	23%	**8**
Manual Pump	-	-	-	-	2	6%	**2**
Carrying with Treatment	-	-	-	-	1	3%	**1**
Carrying Superficial Water			2	15	8	26%	**10**
Carrying Underground Water	1	10%	-	-	7	23%	**8**
Total	**10**	**100%**	**13**	**100%**	**31**	**100%**	**54**

(*) Out of 29 localities in Low Forest, three localities have two water acquiring methods
(**) Out of 12 localities in High Forest, one locality use two water acquiring methods
Source: Socio-economic-Surveys; JICA Study Team (2010)

iii) Condition of the Infrastructure

The results obtained from the selected sample localities, Table N° 3.3.2-3, have been obtained based on the localities that already have water supply structures or systems. These are classified by geographical regions.

Among the potable water supply facilities observed, more than 65% are in “poor” to “Bad” conditions, as a whole.

The reinforced concrete structures, which have a longer useful life, such as the water treatment plants and reservoirs, are the facilities in the fair condition. As shown in the Table 3.3.2-3, 33.3% of the treatment plants and 30% of the reservoirs are in good conditions. On the other hand, the larger percentages of infrastructures, such as 55% of house connections, 66% of riser pipe lines and 63% of public taps are in bad conditions, which are vulnerable component due to being constantly handled by the people as well as to the lack of maintenance and rehabilitation.

Table N° 3.3.2-3: Condition of the Water Supply Infrastructure

Components	Condition				Geographical region
	Fair	Poor	Bad	Inoperative	
Water Intake	-	5	2	(1)	Front Forest
	-	5	5	-	High Forest
	1	9	3	-	Low Forest
Total (35 localities)	**3% (1)**	**62% (19)**	**32% (10)**	**3% (1)**	**100.0 %**
Conveyance Facility	1	5	1	-	Front Forest
	-	5	4	-	High Forest
	-	4	3	-	Low Forest
Total (22 localities)	**4% (1)**	**61% (14)**	**35% (8)**	**-**	**100.0 %**
Riser pipe /Pressure pipe	-	-	-	-	Front Forest
	-	-	-	-	High Forest
	1	1	4	-	Low Forest
Total (07 localities)	**17% (1)**	**17% (1)**	**66% (4)**		**100.0 %**
Treatment Facility	-	1	-	-	Front Forest
	1	2	-	-	High Forest
	2	3	-	-	Low Forest
Total (09 localities)	**33.3% (3)**	**66.7% (6)**	**-**	**-**	**100.0 %**
Reservoir	1	5	-	-	Front Forest
	3	5	1	-	High Forest
	4	7	1	-	Low Forest
Total (27 localities)	**31% (8)**	**65% (17)**	**4% (1)**	**-**	**100.0 %**
Transmission Pipe	1	5	-	1	Front Forest
	1	3	2	-	High Forest
	-	5	1-	1	Low Forest
Total (14 localities)	**10% (2)**	**65% (13)**	**15% (3)**	**10% (2)**	**100.0 %**
Distribution Pipe	-	4	3	-	Front Forest
	1	4	5	-	High Forest
	1	9	1	1	Low Forest
Total (29 localities)	**7% (2)**	**59% (17)**	**31% (9)**	**3% (1)**	**100.0 %**
House Connection	1	4	3	-	Front Forest
	1	1	8	-	High Forest
	-	6	5	-	Low Forest
Total (26 localities)	**7% (2)**	**38% (11)**	**55% (16)**	**0%**	**100.0 %**
Public Taps (*)	-	-	-	-	Front Forest
	1	-	3	-	High Forest
	-	-	2	2	Low Forest
Total (08 localities)	**13% (1)**	**-**	**63% (5)**	**25% (2)**	**100.0 %**

(*) Localities with house connections.

Source: JICA Study Team (2010) - Diagnosis of the Program's sample localities

Definition of facility conditions for field observation
(These definitions were used for subjective observation for a rapid field assessment)

Fair: Functional capacity more than a half of original level
Poor: Functional capacity more than a quarter of the original level,
Bad: Functional capacity less than a quarter of the original level,

iv) Water Sources

The fifty (50) sample localities obtain water from superficial water (rivers and streams) and underground water (springs and tubular or excavated well) as water supply sources. Table N° 3.3.2-4 summarizes the types of water sources and the percentage use in each geographical region.

In Low Forest there are schools of rain water fetching and temporary storage for its basic sanitation units. However, in Table N° 3.3.2-4 this type of source has not been considered. Because it is not part of the water supply system for human consumption.

In the High Forest, in twelve (12) localities superficial water sources (river, pond, lake and others) provides water for 62% of the total population; and underground water provides to 33% of the population underground water.

In the nine (9) localities of the Front Forest, the use of superficial water (rivers and stream) prevails with a 62% and 38%, for spring u underground water.

Table N° 3.3.2-4: Water Sources of the Sample Localities

Source	Low Forest		High Forest		Front Forest	
	Total	%	Total	%	Total	%
Superficial	-	-	5	5	17	55%
Underground	17	55%	5	5	14	45%
- Spring	14	45%	5	5	4	-
-Well (Tubular or Hand-dug)	4	-	-	-	11	-
Total	**11**	**-**	**10**	**10**	**31**	**100%**

Source: JICA Study Team (2010) - Diagnosis of the Program's sample localities

v) Service Continuity and Per Capita Consumption

a) Continuity

Out of the 50 sample localities, twenty-two (22) -or 44%- localities have water supply service; out of the twenty-eight (28) localities with service, thirteen (13) localities or 26% have continuous service and the remaining fifteen (15) localities, or 30%, have non-continuous service. (See Table N° 3.3.2-5.)

The lack of continuity is due to the following reasons: a) deficiency in the operation and maintenance, b) facilities in poor conditions that have not been rehabilitated, c) insufficient capacity of the water source, or d) inefficient use of the water at the household level.

Table N° 3.3.2-5: Service Continuity- Potable Water Supply

Geographical Region	Administrative Region	Service Continuity- Potable Water Supply					Total
		24 hr./day	12<hr/day< 24	2<hr/day<12	Alternate days, from 1 to 3 hr.	No Service	
Low Forest: 6.88 hr/day	Amazonas	-	-	50% (1)	50% (1)	-	100% (2)
	San Martin	33% (2)	-	33% (2)	17% (1)	17% (1)	100% (6)
	Madre de Dios	-	33% (1)	33% (1)	-	33% (1)	100% (3)
	Ucayali	-	-	33% (2)	-	67% (4)	100% (6)
	Loreto	-	-	-	-	100% (12)	100% (12)
High Forest: 10.21 hr/day	Amazonas	-	20% (1)	60% (3)	-	20% (1)	100% (5)
	San Martin	71% (5)	-	-	14% (1)	14%- (1)	100% (7)
Front Forest 15.01 hr/day	Amazonas	57% (4)	-	14% (1)	-	29% (2)	100% (7)
	San Martin	100% (2)	-	-	-	-	100% (2)
Total (50 localities)		**26% (13)**	**4% (2)**	**20% (10)**	**6% (3)**	**44% (22)**	**100% (50)**
Continuity of the 28 with service		**46% (13)**	**7% (2)**	**36% (10)**	**11% (3)**	**-**	**100% (28)**

Source: Socio-economic-Surveys; JICA Study Team (2010)

b) Per Capita Consumption

The results of the field surveys in the "localities with supply system" show that the per capita consumption ranges from 15 to 87 L/capita/day in average (See Table N° 3.3.2-6). The lowest consumption ranging from 15 to 50 L/capita/day predominates in nine (9) localities out of eleven (11) localities of the Low Forest.

Out of the twenty-eight (28) localities with water supply systems in operation; seventeen (17) localities consume between fifteen (15) and fifty (50) liters per person; whereas eleven (11) localities consume between fifty (50) and eighty-seven (87) lit ers per capita. The low water consumption in these localities may be related to the restrictions of the service, due to lack of pressure and continuity in the distribution network.

Table N° 3.3.2-6: Per Capita Consumption in the Localities with a Supply System in Operation

Administrative Region	Volume of per capita consumption of water in localities with existing facilities						Total /Region	
	Low Forest		High Forest		Front Forest			
	15 - 50 (L/capita)	50 - 87 (L/capita)	15 - 50 (L/capita)	50 - 87 (L/capita)	15 - 50 (L/capita)	50 - 87 (L/capita)	15 - 50 (L/capita)	50 - 87 (L/capita)
Amazonas	50% (1)	50% (1)	25% (1)	75% (3)	60% (3)	40% (2)	45% (5)	55% (6)
San Martin	80% (4)	20% (1)	50% (3)	50% (3)	50% (1)	50% (1)	62% (8)	38% (5)
Madre de Dios	100% (2)	0% (0)	-	-	-	-	100% (2)	0% (0)
Ucayali	100% (2)	0% (0)	-	-	-	-	100% (2)	0% (0)
Loreto	-	-	-	-	-	-	-	-
% Natural Region	**82% (9)**	**18% (2)**	**40% (4)**	**60% (6)**	**57% (4)**	**43% (3)**	**61% (17)**	**39% (11)**

Source: Socio-economic-Surveys; JICA Study Team (2010)
Note: 1) the data in parenthesis indicate the number of localities within the indicate consumption range.
2) the number of system does not include those that do not operate (two(2))

Table N° 3.3.2-7 shows the per capita consumption in the twenty-two (22) localities "without water supply system", of which twenty-one (21) localities (95%) are in the range of 15 to 50 L/capita/day. Water fetching from water source is common to these localities; the water delivered through "water fetching" is mainly used to satisfy basic needs, such as drinking and cooking.

Table N° 3.3.2-7: Per Capita Consumption in the Localities without a Supply System in Operation

Region	Volume of per capita consumption of water in localities without existing facilities						Total /Region	
	Low Forest		High Forest		Front Forest			
	15 - 50 (L/capita)	50 – 87 (L/capita)	15 - 50 (L/capita)	50 - 87 (L/capita)	15 - 50 (L/capita)	50 - 87 (L/capita)	15 - 50 (L/capita)	50 - 87 (L/capita)
Amazonas	0% (0)	0% (0)	100% (1)	0% (0)	50% (1)	50% (1)	67% (2)	33% (1)
San Martin	100% (5)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)
Madre de Dios	100% (3)	0% (0)	-	-	-	-	100% (1)	0% (0)
Ucayali	100% (6)	0% (0)	-	-	-	-	100% (4)	0% (0)
Loreto	100% (12)	0% (0)	-	-	-	-	100% (12)	0% (0)
% Natural Region	**100 % (18)**	**0% (0)**	**100% (2)**	**0% (0)**	**50% (1)**	**50% (1)**	**95% (21)**	**5% (1)**

Source: Socio-economic-Survey; JICA Study Team (2010)
Note: 1) the data in parenthesis indicate the number of localities within the indicate consumption range.

vii) Water Quality

During the field work stage, water samples were taken for analysis and comparison with the parameters indicated by the Guidelines for Drinking Water of the World Health Organization (WHO). The results obtained show such physical-chemical values as: Ph ranging from 4.80 to 6.45; Color indicating above 20 Color Units (CU); Turbidity being within the permitted limits below 10 TUN in many cases.

The water samples from nine (9) localities show high iron contents, ranging from 0.3 to 0.6 mg/L, higher than the Taste Threshold (acceptability issue) given by the WHO (<0.3 mg/L). According to the guidelines of the WHO consumption of water with higher iron contents does not affect human health, acceptability will be subject to the consumer. If these water sources are to be used for human consumption, preference of water by the consumer has to be interviewed. If it should not be accepted, a treatment facility such as sand-filtration and/or aerations has to be considered to diminish the concentration of iron, otherwise an alternative source shall be used.

The Bacteriological analysis of the water supply sources shows the presence of fecal coliforms in the superficial waters as well as in the underground waters. This is due to insufficient protection of the water sources, the presence of animals in the surroundings and provisional intake facilities installed that do not allow the control of the contamination of the sources, specially the underground water sources. The results of the different analysis conducted on the water samples are shown in Table Nº 3.3.2.8.

The table does not include the results of the bacteriological analysis of eleven (11) localities of the Low Forest, located in the surrounding of rivers, whose proposed supply source are underground waters. Considering that there are no wells in the studied localities or in the proximities, the physical-chemical characteristics of the superficial waters located close to the projected location of the wells were considered. Taking into account that the rivers are the recharge source of the underground waters, as a result natural filtration, the underground will have a bacteriological quality superior to the superficial water.

The presence of fecal coliforms in the samples confirms the results of Table Nº 3.3.1-8: Most Common Diseases in the Sample, where 48% of the surveyed population has suffered diarrheic diseases (30%) and parasitosis (18%), which are waterborne diseases.

In the 50 sample localities, chlorination is practically not carried out. Table N° 3.3-2-8 shows that disinfection is not practiced at twenty-five (25) localities (89%) of the twenty-eight (28) localities that have water supply facilities; due to: a) lack of supplies, b) poorly qualified personnel to carry out the chlorination or c) lack of personnel. The absence of chlorination increases the risk of waterborne diseases such as diarrheas, in the populations of the sample localities.

Table N° 3.3.2-8: Water Chlorination in the Sample Localities

Geographic Region	Chlorination	
	Yes	No
Low Forest	(01)	(10)
High Forest	(02)	(08)
Front Forest	-	(07)
Total (31 localities)	**11% (03)**	**89% (25)**

Source: JICA Study Team (2010), Diagnosis of the localities of the Program's Sample
Note: The results have been calculated based on the total of localities per region.

Table Nº 3.3.2-9: Results of the Water Quality Test on the Existing and Proposed Sources

Water Quality Test Results

N°	Parameter	WHO	Unit	Amazonas													San Martin															
				Miraflores	Tutumberos	Guadalupe	Puerto Naranjitos	Naranjitos	Mesquiyacu Bajo	San Jose Bajo	Cesual	El Balcon	Ushlon		Cielachi	Lonya Chico	Otto y San Juan	Lahuanpia	Perla de Cascayunga		Pesic		Barranquita			La Florida	Monte de los Olivos	Rumisapa	Pacchilla	Chunzapa	La Marginal	Palestina	Mishquiyacu	Sapotillo
	Water Source			M1	M1	M1	M1	M1	M1	M1	M1	M1	M 1	M2	M1	M1	M2	M1	M1	M2	M1	M2	M1	M2	M3	M1	M1	M1	M1	M1	M1	M1	M1
1	Turbidity	5	UNT	**7.99**	1.52	**8.53**	**6.14**	**7.59**	**14.8**	0.35	1.89	**25**	**14.1**	**33**	3.14	3.21	3.1	**6.48**	4.96	0.45	4.92	2.22	**18.4**	**18.8**	0.74	4.4	-	**5.1**	0.68	-	**6.48**	0.74	0.62	0.83
2	Color	15	U.C.	**15**	10	**20**	**65**	10	**30**	0	**95**	**120**	10	**50**	12	**70**	**25**	**50**	**40**	10	10	10	**40**	**40**	5	<1		<1	<1	-	-	<1	1	<1
3	Temperature		º C																							-	-	-	-	-	-			
4	Odor		Ausencia																							-	-	-	-	-	-	-		
5	Taste		Ausencia																							-	-	-	-	-	-			
6	Conductivity		microsiemens	111.8	141.6	731	198.5	271	501	586	686	253	355	487	76.1	9.68	231	86.9	411.7	136.2	188.8	210.2	182	208	232	111.6	228	40.4	41.3	105.2	105.2	1161	15.1	27.9
7	Total Dissolved solid	< 1000	ppm CaCo3	53	67.4	356	95	129.9	242	284	7.7	122.5	171.3	196.2	36	4.7	110.6	60	280	94	136	7.2	182	208	232	122	-	39	39	92	-	716	26	21
8	Ph	< 8		6.98	7.78	7.78	7.33	7.83	7.13	7.43	6.73	7.76	7.68	**8.2**	6.8	6.15	7.3	5.9	7.1	5.6	5.8	7.2	**8**	7.6	7	6.7	-	5.1	4.8	-	-	7.4	6.3	5.2
9	Salinity		%																							-	-	-	-	-	-	-		
10	Alkalinity		ppm CaCo3	44.69	83.79	227.16	100.55	126.62	212.27	290.47	16.76	134.06	180.61	210.41	5.59	3.72	130.3									-	-	-	-	-	-	-		
11	Hardness		ppm CaCo3	55.02	86.76	315.28	152.35	173.51	228.78	357.6	27.51	177.74	247.57	287.77	80.41	65.59	201									-	-	-	-	-	-	-		
12	Residual Color		ppm.																							-	-	-	-	-	-	-		
13	Nitrate	50	ppm NO3			5												< 0.01	0.11	0.22	1.75	< 0.01	0.72	1.02	0.66	-		-	-	-	-	1.5	<0.023	
14	Nitrite	3	ppm NO2			0.13												< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-		-	-	-	-	-		
15	Magnesium					0.19												0.84	2.07	6.34	1.47	3.87	5.13	4.26	6.51	2.78	1.15	0.89	0.47	2.3	2.3	0.96	<0.01	0.2
16	Potassium					1.53												2.14	3.18	7.2	6.72	3.25	2.13	3.18	2.47	2.6	0.3	1.7	2.4	2.8	2.8	<0,1	2.3	2.1
17	Chloride	<250	ppm CL-			5												2	1.1	6.8	21.8	2.4	1	0.1	< 0.1	4	<1	<1	2	2	2	-	<1	<1
18	Calcium		ppm CaCo3																							12.1	32.5	2	1.4	8.8	8.8	-	0.3	0.4
19	Sulfate	250	ppm SO4			2												2	11	3	2	10	2	4	4	-	2	-	-	-	14	130	5	5
20	Aluminum	0.2	ppm AL	0	0.02	0.03	0.04	0.02	0.02	0.01	0.06	0.08	0.02	0.01	0	0.19	0.04									**0.35**	0.14	0.02	0.1	**0.41**	**0.41**	-	<0.01	<0.01
21	Iron	0.3	ppm Fe			0.005												**0.35**	0.03	0.07	**0.46**	0.07	**0.48**	**0.43**	0.07	**0.6**	<0,1	<0.1	<0.1	**0.6**	**0.6**	<0,1	<0.1	<0.1
22	Manganese	0.1	ppm Mn			0.002												< 0.004	< 0.004	< 0.004	0.012	< 0.004	< 0.004	<0.004	< 0.004	0.054	< 0.002	0.024	0.059	0.019	0.019	0.016	<0.002	0.015
23	Arsenic	0.01	ppm As				0	0	0		0															<0.005	<0.005	<0.005	<0.005	<0.005	<0,005	-	<0.005	<0.005
24	Total coliformes		NMP/100ml.	**52**	**320**	**198**	**236**	**182**	**65**	**14**	**75**	**376**	**48**	**272**	**424**	**240**	**448**	**1.1 x 10³**	**< 1.1**	**< 1.1**	**3**	**3.2 x10²**	**10**	**1.2 x 10**	**1 x 10**						-	-		
25	Coliformes fecales	0	UF/100ml	**44**	**280**	**106**	**170**	**10**	**60**	**4**	**24**	**340**	**3**	**168**	**248**	**10**	**360**	**3.0 x 10**	**< 1.1**	**< 1.1**	**< 1.8**	**4.5 x 10**	**< 1.8**	**< 1.8**	**< 1.8**		**7.8**	**6.8**	**7.8**	**130**	**130**	**46**	**33**	**9.3**
26	Aerobic Bacteria		UF/100ml																												-	-		
	Situacion de fuentes de abastecimiento			Nueva	Nueva	Nueva	En uso	En uso	En uso	En uso	Nueva	Nueva	Nueva	Nueva	Nueva	En uso	En uso	Nueva	En uso	Nueva	Nueva	Nueva	En uso	Nueva	Nueva	En uso	En uso	En uso	En uso	En uso	En uso	En uso	En uso	En uso

N°	Parameters	WHO	Unit	S. Martin		Madre de Dios					Ucayali						Loreto															
				Santa Rosillo	Yaucatina	Tres Islas			Soledero	Monterrey		San Martin de Mojaral	San Francisco	10 de Julio	San Pedro	Sharara	Curiaca	Cahuide		San Juan de Puritan	Amazonas	20 de Enero	San Pablo de Cuyana		Tiraqpoto		Pangyana	Lupuna II Zona		Apayacu	Buen Jesus de Paz		Huanta	Santa Amelia
				28	29	30	30	30	31	32	32	33	34	35	36	37	38	39	39	40	41	42	43	43	44	44	45	46	46	47	48	48	49	50
	Water Source			M1	M1	M1	M2	M3	M1	M 1	M2	M1	M1	M1	M1	M1	M1	M1	M2	M1	M1	M1	M1	M2	M1	M2		M1	M2	M1	M1	M2	M1	M1
1	Turbidity	5	UNT	4.38	0.3	**5.5**	.85	**39.3**	1.04	1.05	1.57	**6.3**	0.44	**10.26**	**5.82**	2.54	1.55	**16.21**	1.3	**12.1**	**5.3**	1.4	**16.2**	1.3	**18.1**	1.3		1.3	1.4	1.2	**6.2**	1.7	3.3	2.3
2	Color	15	U.C.	<1	<1	**30**	10	**>150**		**20**	10	**20**	12	**54**	**20**	15	8	4.08	13	**47**	**90**	**98**	4.06	13	4.08	13		13	**98**	**53**	**69**	**97**	**50**	**52**
3	Temperature		º C	-	-					20	20	21.9	21.10	20.50	19.9	30.2	30.3																	
4	Odor		Ausencia	-	-																													
5	Taste		Ausencia	-	-																													
6	Conductivity		microsiemens	999	834					10.27	11.51	54.2	258	23.10	686	68.3	142.7	40	44.8	13.2	23.2	143.6	40	44.8	30	44.8		44.8	143.6	90.4	51.3	91	86	79.5
7	Total Dissolved solid	< 1000	ppm CaCo3	704	504	32	32	28	28	16	18	37.4	181.2	16	495	40.4	84.2	0.03					0.03		0.05									
8	Ph	< 8		7.4	7.5	5.8	5.7	5.8	5.2	5.4	5.3	6.4	7.34	4.86	7.19	6.26	6.86	5.18	6.45	6.75	6.63	6.84	5.13	6.45	5.36	6.45		6.45	6.84	7.05	6.45	6.7	6.4	6.2
9	Salinity		%	-								0	0.1	0.1	0.4	0	0.1																	
10	Alkalinity		ppm CaCo3	-								36	128	8	60	17	18	10					7		20									
11	Hardness		ppm CaCo3	-								28	80	8	360	15	24	40					40		60									
12	Residual Color		ppm.									0.36	0.68	0.33	0.35	0.2	0.22																	
13	Nitrate	50	ppm NO3	1.454	0.14	1.07	1.17	1.56	1.74	0.27	0.65	0.7	0.1	1.1	0.7	0.8	4.2	0.28	7.8	7.9	5.8	4.7	0.3	7.8	0.29	7.8		7.8	4.7	6.1	6.5	6.5	6.16	6.2
14	Nitrite	3	ppm NO2	-		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.001	0	0	0.008	0.003	0.02					0.01		0.01									
15	Magnesium			12.7	9.1	1.05	1.1	1.38	0.27	0.13	0.09	-				-	-	0.12	10.06	9.03	2.21	2.68	0.1	10.06	0.07	10.06		10.06	2.68	3.33	2.36	3.92	1.47	1.98
16	Potassium			-	8.6	.47	.14	.44	0.16	0.03	0.05	-				-	-	1.19	0.21	0.14	0.02		1.15	0.21	1.18	0.21		0.21			0.03		0.01	0.02
17	Chloride	<250	ppm CL-	9	14	1.5	1.2	1.5	3.5	0.6	0.6	5	4.5	6	19	22	4.5	10	4.26	2.13	2.52	5.33	10	4.26	7	4.26		4.26	5.33	3.55	2.49	2.84	4.26	4.97
18	Calcium		ppm CaCo3	-	31.7							12	60	2	300	24	58																	
19	Sulfate	250	ppm SO4	157		5	2	4	3	2	2	4	0	0.038	30	2	61	13.35	13	15	8.1	6.4	12.42	13	14.02	13		13	6.4	6.2	4.3	5.4	4.6	8.6
20	Aluminum	0.2	ppm AL	-	<0.01							0.011		0	0.007	0.003	0.004																	
21	Iron	0.3	ppm Fe	0.2	<0.1	**0.55**	0.07	**0.53**				**0.41**	**0.3**	0.1	0.03	0.29	0.1	0,16	0.18	0.23	0.03	0.08	0.16	0.18	0.17	0.18		0.18	0.08	0.09	0.12	0.11	0.18	0.04
22	Manganese	0.1	ppm Mn	0.024	<0.002	< 0.04	< 0.04	0.096	0.041			0.5	0.1	0.1	0	0	0	1.1					0.08		<1,10									
23	Arsenic	0.01	ppm As	-	<0.005							0	0	0	0	0	0														0	0	0	
24	Total coliformes		NMP/100ml.			**3.3x10**	**3.7 x10**	**4.1 x 10**	**4.9 x 100**	**400**	**380**	**528**	**32**	**486**	**236**	**81**	**32**																			
25	Coliformes fecales	0	UF/100ml	**<1,8**	**11**	**< 1.8**	**< 1.8**	**< 1.8**	**3x10**	**23**	**35**	**11**	0	**12**	**6**	**4**	**1**						**2**		**4**										
26	Aerobic Bacteria		UF/100ml									663	112	539	427	62	26																	
	Situacion de fuentes de abastecimiento			Nueva	En uso	En uso	En uso	En uso	En uso	En uso	En uso	En uso	En uso	En uso	En uso	En uso	En uso	Nueva	Nueva	Nueva	Nueva	Nueva	En uso	En uso	En uso	En uso		Nueva	Nueva	Nueva	Nueva	Nueva	Nueva	Nueva

viii) Coverage of the Potable Water and Systems

The coverage of the water supply services has been estimated by administrative region and geographic region in each of the 50 sample localities. However, such values do not consider the conditions of operation and maintenance or the conservation state of the systems.

Service coverage percentages are shown in Table Nº 3.3.2-10 by administrative and geographic region. The highest coverage is 77% of Amazonas and 81 % of San Martin. In Loreto, the coverage of water supply is zero (0).

Table N° 3.3.2-10: Coverage of the Water Supply Services in the Sample Localities

Administrative Region	Low Forest	High Forest	Front Forest	Total (%)
Amazonas	78%	72%	82%	77%
San Martin	80%	81%	93%	81%
Madre de Dios	39%	-	-	39%
Ucayali	27%	-	-	27%
Loreto	0%	-	-	0%
Average	**34%**	**78%**	**84%**	**57%**

Source: Diagnosis of the Water Supply and Sanitation Systems in the localities of the Program's sample. JICA Study Team (2010)

Regarding geographic regions, the Front Forest presents the highest coverage of 84%, and the Low Forest shows the lowest coverage of 34%. In general, as the average of all the sample localities, the coverage reaches 57% in average. It may be inferred from the N° 3.3.2-10 table that the localities located in remote areas with greater access difficulties represent the lowest coverage and have less installed infrastructure.

Taking into account the information obtained from the sample localities, regarding the conditions of the existing infrastructure, Table N° 3.3.2-1 (Summary of the Existing Water Supply Systems in the 50 Sample Localities) and the data of Table N° 3.3.2-3 (Conditions of the Infrastructure of the Potable Water Systems); especially the home connections. From all those data, Table N° 3.3.2-11 was elaborated, where the current conditions that affect the coverage establish in Table N° 3.3.2-10

Table N° 3.3.2.11: Present Condition of the Existing Water Facilities

Administrative Regions	Low Forest		High Forest		Front Forest		Total	
	Poor	Bad	Poor	Bad	Poor	Bad	Poor	Bad
Amazonas	0%	100%	20%	60%	71%	14%	43%	43%
San Martin	83%	17%	14%	71%	0%	100%	40%	53%
Madre de Dios	-	-	-	-	-	-	0%	67%
Ucayali	100 [(a)]	-	-	-	-	-	17%	0%
Loreto	-	-	-	-	-	-	0%	0%
Promedio	21%	17%	17%	67%	56%	33%	26%	32%

Source: Diagnosis of the Water Supply and Sanitation Systems in the localities of the Program's sample. JICA Study Team (2010)

The data of Table N° 3.3.2-10 (Coverage of Water Supply Services in the Sample Localities) has been corrected with the data from Table N° 3.3.2-11 (Present Condition of the Existing Water Facilities) and the coverage of service in the sample localities has been determined in Table N° 3.3.2-12. The highest coverage is found in Front Forest with 53% and the lowest one, in High Forest with 16%. In average, the coverage of the services is of 27%.

Table N° 3.3.2.12: Service Coverage – Existing Water Systems

Administrative Regions	Service Coverage – Existing Water Systems			Total
	Low Forest	High Forest	Front Forest	
Amazonas	0%	14%	59%	33%
San Martín	67%	12%	0%	32%
Madre de Dios	-	-	-	0%
Ucayali	-	-	-	5%
Loreto	-	-	-	0%
Average	**7%**	**13%**	**47%**	**15%**

Source: Diagnosis of the Water Supply and Sanitation Systems in the localities of the Program's sample. JICA Study Team (2010)

(2) Sanitation

The interventions carried out in the sanitation works are scarce. The localities of the 50 samples for the Program indicate the absence of sanitation services and the lack of adequate use and maintenance of the existing infrastructure. In Table N° 3.3.2-13, it has been summarized the current situation of the existing sanitation systems in the 50 sample localities, appointing the used method and the condition in which it was found at the time of inspection. It has been noted the use of latrines is predominant, but also that the existence of sewerage systems in seven (7) localities, even though they are partial and one (1) of them is in process of construction; two (2) are inoperative and the other four (4) are in "poor condition". In the sewerage systems it is noticeable the lack of operation, which increases the number of

blockages in the systems and the deterioration of the structures, due to null maintenance. This becomes even more noticeable in treatment systems, for all the systems are in total abandon and non-operation

In the case of latrines, due to lack of direction or assessment in the installation, construction and type of suitable latrine for geographic characteristics, the inhabitants have built dry-pit latrines or a simple silo for excreta disposal. Amongst the sample localities, some of them use discharge with pour flush systems directly to the rivers (without any treatment), main characteristic of the localities in the riversides.

Precarious constructions do not provide to the inhabitants an adequate service, generating odors and the proliferation of insects and rats; besides, the ignorance regarding the use life of latrines does not allow an opportune replacement of the latrines, in accordance with the capacity of the dry pit. Therefore, the current coverage will be the one resulting from the number of latrines or operative systems.

In Table N° 3.3.2-14, it is noticed that out of the twenty-nine (29) localities in Low Forest, located in the regions of Amazonas, Madre de Dios, Ucayali and Loreto, twenty-four (24) of them (83%) do not have suitable systems. As a consequence, the inhabitants relief themselves in the open or in latrines built without technical supervision. The localities that do have sewerage systems in this region are three (3), including the system under construction for the locality of Rumisapa in San Martin. In the other two (2), FONCODES has installed dry-pit latrines, most of which are now in abandon or just about to reach their use life without being replaced.

Table N° 3.3.2-13: Summary of the Existing Sanitation Services in the 50 Sample localities

Nro	Region	Localidad	Región Natural	Instalaciones Existentes						Estado de Conservacion						Comentario
				Tipo de sistema	Letrina	Pozo septico	Otros	Campo	Alcantarillado	letrinas	Alcantarillado					
											Red de Colección	Emisor	Conex. Domic.	Sistema de Tratamiento	Estado	
1	Amazonas	Miraflores	C. S.	Letrinas artesanales-pozo ciego	100%	0%	0%	0%	0%	Malo	-	-	-	-	-	El estado de las letrinas es precario y muchos de ellos ya ha culminado su vida util
2	Amazonas	Tutumberos	S. B.	Letrinas artesanales-pozo ciego	47%	23%	30%	0%	0%	Malo	-	-	-	-	-	La evacuacion de las letrinas se hace directamente a pozos ciegos artesanales construidos dentro de cada vivienda
3	Amazonas	Guadalupe	S. B.	Letrinas	73%	0%	27%	0%	0%	Malo	-	-	-	-	-	Letrinas construidas por Foncodes, sin embargo estas son de pequeñas dimensiones, por esta razon la poblacion ha construido precariamente otras de manera artesanal .
4	Amazonas	Puerto Naranjitos	S. A.	Letrinas de arrastre hidraulico	62%	22%	7%	9%	0%	Regular	-	-	-	-	-	Existen letrinas (62%) de arrastre hidraulico que descargan directo al río Utcubamba, y otras (22%) uso de hoyo seco. La proximidad entre las viviendas genera problemas de olores, que se debe resolver.
5	Amazonas	Naranjitos	S. A.	Letrinas artesanales arrastre hidráulico/pozo ciego	42%	15%	42%	1%	0%	Regular	-	-	-	-	-	Existen letrinas (42%) de arrastre hidraulico que descargan directo al río Utcubamba, y otras (15%) uso de hoyo seco. La proximidad entre las viviendas genera problemas de olores, vectores de enfermedades..
6	Amazonas	Misquiyacu Bajo	S. A.	Letrinas artesanales/pozo ciego	100%	0%	0%	0%	0%	Malo	-	-	-	-	-	Cuenta con letrinas y pozos septicos en estado precario y muchos de ellos ya han sobrepasado su vida util
7	Amazonas	San Jose Bajo	S. A.	Letrinas artesanales/pozo ciego	77%	23%	0%	0%	0%	Malo	-	-	-	-	-	Letrinas construidas de manera artesanal, sin criterio tecnico. Las cuales actulmente se encuentran en estado precario
8	Amazonas	Casual	S. A.	Letrinas	100%	0%	0%	0%	0%	Malo	-	-	-	-	-	Letrinas construidas artesanalmente; muchas de estas ya tienen mas de cuatro años y se encuentran colapsadas
9	Amazonas	El Balcon	C. S.	Letrinas artesanales	100%	0%	0%	0%	0%	Malo	-	-	-	-	-	Letrinas construidas artesanalmente; muchas de estas ya tienen mas de cuatro años y se encuentran colapsadas
10	Amazonas	Ubilon	C. S.	Alcantarillado	23%	17%	0%	10%	50%	Malo	Regular	Malo	Regular	Colapsado	Colapsado	El tanque séptico fue arrasado por un deslizamiento, actulmente no se hace uso del alcantarillado
11	Amazonas	Cielachi	C. S.	Letrinas	27%	33%	20%	20%	0%	Malo	-	-	-		-	Construidas por Foncodes en los domicilios, muchos han sobrepasado su vida útil. Estado precario
12	Amazonas	Lonya Chico	C. S.	Alcantarillado/ Letrinas/Campo	10%	13%	0%	7%	70%	-	Bueno	Regular	Regular	Tanques sépticos	Malo	El tanque esta saturado y no abastece a la poblacion. En epoca de lluvias genera que se anieguen ciertos sectores.
13	Amazonas	San Juan	C. S.	Letrina / Campo	43%	37%	17%	3%	0%	Malo	-	-	-	-	-	Construidas de forma artesanal
14	Amazonas	Olto	C. S.	Alcantarillado/ Letrinas	3%	44%	0%	19%	35%	Malo	Regular	Regular	Regular	Tanque septico y pozos de percolacion	Malo	Los pozos percoladores han colapsado
15	San Martin	Lahuarpia	S. A.	Letrina de hoyo seco semielevadas	99%	1%	0%	0%	0%	Malo	-	-	-	-	-	Construidas de forma artesanal letrinas de hoyo seco semielevadas, debido a la napa freatica. La gran mayoria inoperativas y abandonadas
16	San Martin	Perla de Cascayunga	S. A.	Letrina/Campo	87%	0%	0%	13%	0%	Malo	-	-	-	-	-	Construidas de forma artesanal, debido a la falta de mantenimiento estas se han ido deteriorando
17	San Martin	Posic	S. A.	Alcantarillado/letrinas	95%	3%	0%	3%	0%	Malo	Bueno	Malo	No existe	Imhoff	Malo	La planta esta a medio construir, pero por falta de presupuesto esta inoperativa. Asi mismo las letrinas existentes fueron construidas artesanalmente, encontrándose deterioradas
18	San Martin	Barranquita	C. S.	Letrina de hoyo seco	93%	0%	0%	3%	0%	Malo	-	-	-	-	-	Letrinas de hoyo seco construidas artesanalmente, y con una infraestructura inadecuada, muchas de ellas expuestas a la intemperie
19	San Martin	La Florida	S. A.	letrina hoyo seco	74%	4%	15%	7%	0%	Malo	-	-	-	-	-	Letrinas artesanales; sin criterio en la operacion de dichas letrinas generando malos olores, presencia de insectos , roedores.
20	San Martin	Monte de los Olivos	C. S.	letrina hoyo seco	90%	5%	0%	5%	0%	Malo	-	-	-	-	-	Letrinas artesanales individuales, sin criterio en la operacion de dichas letrinas generando un presencia de insectos , roedores, etc
21	San Martin	Rumisapa	S. B.	Red de alcantarillado condominial	100%	0%	0%	0%	0%	Malo	-	-	-	No se especifica	-	Tienen letrinas de hoyo seco, las cuales estan deterioradas. Actualmente el municipio contempla un proyecto de alcantarillado
22	San Martin	Pacchilla	S. A.	letrina hoyo seco	100%	0%	0%	0%	0%	Malo	-	-	-	-	-	Letrinas artesanales, las cuales se encuentran en malas condiciones sin la ventilacion adecuada.
23	San Martin	Churuzapa	S. B.	letrina hoyo seco	94%	0%	0%	6%	0%	Malo	-	-	-	-	-	El mayor problema es en epoca de lluvias, debido a la ubicacion de las letrinas en zonas con poco drenaje generando problemas de aniego
24	San Martin	La Marginal	S. B.	letrina hoyo seco	83%	0%	0%	17%	0%	Malo	-	-	-	-	-	El mayor problema es en epoca de lluvias, debido a la ubicacion de las letrinas en zonas con poco drenaje generando problemas de aniego
25	San Martin	Palestina	S. B.	letrina hoyo seco	47%	17%	23%	13%	0%	Malo	-	-	-	-	-	Letrinas de hoyo seco construidas artesanalmente, el problema ocurre en epocas de lluvias debido a zonas de poco drenaje, generando el aniego de algunos sectores
26	San Martin	Mishquiyacu	S. B.	red de alcantarillado	77%	6%	0%	4%	13%	Malo	Bueno	Bueno	Bueno	laguna de oxidacion	Malo	Falta mejoras en tapas de buzones y limpieza general en las redes. En el interior de la lagunas prolifera la maleza , no se realiza limpieza
27	San Martin	Sapotillo	S. A.	letrina hoyo seco	43%	27%	10%	20%	0%	Malo				-		Las letrinas de hoyo seco han sido construidas artesanalmente, con un promedio de 5 años. Algunas letrinas sufren de anegamiento en épocas de lluvias al estar mal ubicadas y/o construidas. En general se requiren de nuevas instalaciones.
28	San Martin	Santa Rosillo de Ipaquihua, anexo Nuevo Mexico	S. A.	letrina hoyo seco	82%	0%	3%	15%	0%	Malo	-	-	-	-	-	Las letrinas de hoyo seco han sido construidas artesanalmente, con un promedio de 4 años. Algunas letrinas sufren de anegamiento en épocas de lluvias al estar mal ubicadas y/o construidas. En general se requieren de nuevas instalaciones.
29	San Martin	Yacucatina	S. B.	letrina hoyo seco	33%	37%	10%	20%	0%	Malo	-	-	-	-	-	Las letrinas de hoyo seco han sido construidas artesanalmente, con un promedio de 4 años. Algunas letrinas sufren de anegamiento en épocas de lluvias al estar mal ubicadas y/o construidas. En general se requieren de nuevas instalaciones.
30	Madre de Dios	Tres Islas	S. B.	Letrinas/Pozo séptico	3%	40%	0%	57%	0%	Malo	-	-	-	-	-	Letrinas de arrastre hidráulico se han instalado en el colegio. Es utilizada por algunos pobladores, sin embargo carecen de agua para su funcionamiento.
31	Madre de Dios	Sudadero	S. B.	Letrinas/pozo septico	63%	20%	0%	17%	0%	Regular	-	-	-	-	-	32 letrinas de hoyo seco fueron instaladas por FONCODES, en el año 2000, sin embargo solo algunas continúan en servicio ante la carencia de mantenimiento adecuado.
32	Madre de Dios	Monterrey	S. B.	Alcantarillado	23%	0%	0%	20%	57%	Malo	Regular	Regular	Malo	Rejas,Tanque septico,campo de infiltracion	Malo	Tanque septico carece de mantenimiento y adecuada operación. Las letrinas existentes han sido construidas sin dirección técnica y se encuentran en mal estado.
33	Ucayali	San Martin de Mojaral	S. B.	Letrinas	53%	0%	0%	47%	0%	Malo	-	-	-	-	-	Existen 16 letrinas de hoyo seco instaladas por FONCODES, años 1998 y 2000, se encuentran en mal estado. Proliferación de insectos y mal olor.
34	Ucayali	San Francisco	S. B.	Letrinas	55%	0%	0%	45%	0%	Malo	-	-	-	-	-	Existen 40 letrinas de hoyo seco instaladas en los años 1998 y 2000. 13 de las cuales aún tienen vida útil. Sin embargo su estado de conservación no es óptimo.
35	Ucayali	10 de Julio	S. B.	Letrinas/Pozo séptico	17%	17%	0%	66%	0%	Malo	-	-	-	-	-	Las letrinas de hoyo seco han sido construidas artesanalmente. Algunas letrinas sufren de anegamiento en épocas de lluvias al estar mal ubicadas y/o construidas. En general se requieren de nuevas instalaciones.
36	Ucayali	San Pedro de Bello Horizonte	S. B.	Campo	7%	0%	0%	93%	0%	Malo	-	-	-	-	-	Sólo existe 2 letrinas, ubicadas en la escuela.
37	Ucayali	Sharara	S. B.	Letrinas de hoyo seco	70%	0%	0%	30%	0%	Malo	-	-	-	-	-	Letrinas de hoyo seco construidas por la Cooperación de médicos, en el 2002. Presenta problemas de malos olores, insectos, roedores a consecuencia de una adecuada operación y mantenimiento.
38	Ucayali	Curiaca	S. B.	Letrinas/pozo séptico	7%	3%	0%	90%	0%	Malo	-	-	-	-	-	Existen letrinas de hoyo seco instaladas por FONCODES, años 1998 y 2000, algunas selladas y otros se encuentran en mal estado. Proliferación de insectos y mal olor.
39	Loreto	Cahuide	S. B.	Letrinas de hoyo seco	30%	0%	0%	50%	0%	Malo	-	-	-	-	-	Letrinas de hoyo seco construidas artesanalmente por los pobladores. Malas condiciones de conservación y servicio.
40	Loreto	San Juan De Puritania	S. B.	Letrinas de hoyo seco	87%	0%	0%	13%	0%	Malo	-	-	-	-	-	Letrinas de hoyo seco construidas artesanalmente por los pobladores. Malas condiciones de conservación y servicio.
41	Loreto	Amazonas	S. B.	Letrinas de hoyo seco	57%	0%	0%	43%	0%	Malo	-	-	-	-	-	Letrinas de hoyo seco construidas artesanalmente por los pobladores. Malas condiciones de conservación y servicio.
42	Loreto	20 de Enero	S. B.	Letrinas de hoyo seco	100%	0%	0%	0%	0%	Malo	-	-	-	-	-	Letrinas de hoyo seco construidas artesanalmente por los pobladores, sin dirección técnica apropiada. Malas condiciones de conservación y servicio.
43	Loreto	San Pablo De Cuyana	S. B.	Letrinas de hoyo seco	50%	0%	0%	50%	0%	Malo	-	-	-	-	-	Letrinas de hoyo seco construidas artesanalmente por los pobladores, sin dirección técnica apropiada. Malas condiciones de conservación y servicio. Sólo el 13% de las mismas reciben operación y mantenimiento
44	Loreto	Tarapoto	S. B.	Letrinas de hoyo seco	5%	0%	0%	95%	0%	Malo	-	-	-	-	-	Existen sólo algunas letrinas de hoyo seco, construidas artesanalmente por los pobladores, sin dirección técnica apropiada y en malas condiciones de conservación y servicio.
45	Loreto	Panguana Ii Zona	S. B.	Letrinas de hoyo seco	13%	0%	0%	87%	0%	Malo	-	-	-	-	-	Muchos pobladores realizan sus deposiciones directamente al río. Las letrinas existentes se han construido de forma artesanal.
46	Loreto	Lupuna Ii Zona	S. B.	Letrinas de hoyo seco	3%	0%	0%	97%	0%	Malo	-	-	-	-	-	Muchos pobladores realizan sus deposiciones directamente al río. Las letrinas existentes se han construido de forma artesanal.
47	Loreto	Apayacu	S. B.	Letrinas de hoyo seco/Pozo séptico	37%	27%	17%	20%	0%	Malo	-	-	-	-	-	Letrinas de hoyo seco construidas artesanalmente por los pobladores, sin dirección técnica apropiada para definir la mejor solución, ya que en época de crecida del río las letrinas se inundan.
48	Loreto	Buen Jesus De Paz	S. B.	Letrinas de hoyo seco	5%	0%	0%	95%	0%	Malo	-	-	-	-	-	Existen sólo algunas letrinas de hoyo seco, construidas artesanalmente por los pobladores, sin dirección técnica apropiada y en malas condiciones de conservación y servicio.
49	Loreto	Huanta	S. B.	Letrinas de hoyo seco	5%	0%	0%	95%	0%	Malo	-	-	-	-	-	Letrinas de hoyo seco construidas artesanalmente por los pobladores sin dirección técnica apropiada para definir la mejor solución; ya que en época de crecida del río las letrinas se inundan.
50	Loreto	Santa Amelia	S. B.	Letrinas de Hoyo seco	5%	0%	0%	95%	0%	Malo	-	-	-	-	-	Letrinas de hoyo seco construidas artesanalmente por los pobladores sin dirección técnica apropiada para definir la mejor solución; ya que en época de crecida del río las letrinas se inundan.

Elaboración propia

C.S: Ceja de Selva; S.A.: Selva Alta; S.B.: Selva Baja

C-S:*Ceja de Selva* (Front Forest), S-A: *Selva Alta* (High Forest), S-B: *Selva Baja* (Low Forest)

Table Nº 3.3.2.13 shows:

In the High Forest, in the twelve (12) sample, the results of field surveys indicate that ten (10) of the localities have no sewage disposal systems. One (1) locality, Posic in San Martin, has a sewerage system, however it has not yet been connected to the households and the people dispose their waste either in empirically constructed latrines or in the outdoors.

In the Front Forest, three (3) of the nine (9) localities have a sewerage system with wastewater treatment by septic tanks or Imhoff tanks. Locality of Loya Chico with sewerage systems covers 70% of the localities. Sewerage systems that were installed by FONCODES have not received adequate maintenance and rehabilitation and have often been left abandoned or with a decreased useful lifetime. The systems of wastewater treatment have not been well maintained. In five (5) localities of the region, people use latrines and the outdoors to relieve themselves. Sewage from domestic waste (bathing, clothes' and cooking utensils' washing) is thrown into the streets, thereby polluting the environment and causing serious sanitation problems.

Table N° 3.3.2-14: Sanitation Facilities in the Sample Localities

Type of Excretes Disposition	Low Forest		High Forest		Front Forest		Adm. Region
	Total	%	Total	%	Total	%	
Latrines	2	7%	1	8%	1	11%	4
Sewerage	3	10%	1	8%	3	33%	7
Pit Latrines /Outdoors	24	83%	10	83%	5	56%	39
Total	**29**	**100%**	**12**	**100%**	**9**	**100%**	**(50)**

Source: Diagnosis of the Program's sample localities. JICA Study Team (2010)
Note: the percentages are calculated on the total of localities in each region.

i) Latrines

Table N° 3.3.2-15 shows the summary of conditions of the latrines in the 50 sample localities. Of the 50 localities, forty-seven (47) of the latrines (94%) are in "Bad" condition and 6% (or 3 localities) in "Poor" condition. Latrines in good condition have not been located.

Latrines in "bad conditions" are mainly in Front Forest, where 100% are in such condition. "Poor" to "Bad" latrine conditions are mainly due to lack of maintenance, or inadequate use. In particular, the presence of underground water affects the applicability of latrines.

Table N° 3.3.2-15: Condition of the Latrines in the Localities *

Administrative Regions	Low Forest		High Forest		Front Forest		Total	
	Poor	Bad	Poor	Bad	Poor	Bad	Poor	Bad
Amazonas	0%	100%	40%	60%	0%	100%	14%	86%
San Martin	0%	100%	0%	100%	0%	100%	0%	100%
Madre de Dios	33%	67%	-	-	-	-	33%	67%
Ucayali	0%	100%	-	-	-	-	0%	100%
Loreto	0%	100%	-	-	-	-	0%	100%
Average	**3%**	**97%**	**17%**	**83%**	**0%**	**100%**	**6%**	**94%**

Source: Diagnosis of the Program's sample localities. JICA Study Team (2010).
(*) Localities with latrines constructed with or without technical direction.

ii) Sewerage

The existing systems in seven (7) localities represent 14% of the sample localities, whose treatment systems are all in "bad conditions" both of operation and conservation as a result of lack of maintenance and/or rehabilitation.

Most of the components are in "poor" to "bad" conditions. On the other hand, the components with a greater grade of conservation correspond to the conveyance network, with 33%; home connections with 20% and the emitter with 17%. (See Table N° 3.3.2-16)

Table 3.3.2-16: Condition of the Sewerage and Treatment Systems

Components	Condition				Natural Region
	Fair	Poor	Bad	Inoperative	
Collection Networks	0	2	1	0	Front Forest
	1	0	0	0	High Forest
	1	1	0	0	Low Forest
Total (6) localities	**33% (2)**	**50% (3)**	**17% (1)**	**0% (0)**	**100%**

Components	Condition				Natural Region
	Fair	Poor	Bad	Inoperative	
Emitter	0	2	1		Front Forest
	0	0	1		High Forest
	1	1	0		Low Forest
Total (6) localities	**17% (1)**	**50% (3)**	**33% (2)**	**0% (0)**	**100%**

Components	Condition				Natural Region
	Fair	Poor	Bad	Inoperative	
House connection	0	3	0		Front Forest
	0	0	0		High Forest
	1	0	1		Low Forest
Total (5) localities	**20% (1)**	**60% (3)**	**20% (1)**	**0% (0)**	**100%**

Components	Condition				Natural Region
	Fair	Poor	Bad	Inoperative	
Treatment Facility	0	0	2	1	Front Forest
	0	0	1	0	High Forest
	0	0	2	0	Low Forest
Total (6) localities	**0% (0)**	**0% (0)**	**83% (5)**	**17% (1)**	**100%**

Source: JICA Study Team (2010) - Diagnosis of the Program's sample localities
Note: The percentages are calculated on the number of existing structures or components.
The results in the table have been generated based on 6 existing systems, considering that in the locality of The sewerage system in Rumisapa is under construction, not for evaluation.

iii) Sanitation Coverage

To determine the coverage of sanitation is necessary to take into account the localities that are being served by sewerage systems, as well as those that are being served by latrines. In addition, it is necessary to consider their state of conservation, operation and maintenance, taking into account all the installed latrines that are in bad conditions and the sewerage systems that even though they have treatment systems in fair conditions of operation, do not provide service.

There are cases of latrines being used whose saturation will be reached in short time, as noticed in the field evaluation; in that sense new locations will be necessary for replacements. Also, new locations for huts will be required. Therefore, only those

systems that remain in good conditions, or at least in "poor" condition, will be considered for the calculation of the coverage.

Taking into consideration that in all the sample, there are only six (6) sewerage system in operative conditions, the coverage of sanitation with these systems is low; although it is complemented with latrines, septic tanks or silos. Most sanitation coverage will be carried out through latrines.

Similar to the case of coverage of the water systems, the localities with more access difficulties, in special the Loreto (Low Forest) localities, present the lowest sanitation coverage.

a) Coverage by Latrines

In Table Nº 3.3.2-17, it can be noted that the highest coverage rates appear in San Martin and in Amazonas with 91% and 69% respectively. The lowest coverage is in the region of Loreto with 17%.

Regarding geographic regions, the localities in the High Forest have the highest coverage rates in sanitation as 88% and the Low Forest has the lowest coverage as 48 %. The average coverage with latrines in the sample localities is 64%.

Table 3.3.2-17: Sanitation Facilities in the Sample Localities– Latrines

Regions	Low Forest	High Forest	Front Forest	Adm. Region (%)	Total Localities
Amazonas	72%	80%	54%	69%	14
San Martin	88%	93%	96%	91%	15
Madre de Dios	52%	-	-	52%	3
Ucayali	47%	-	-	47%	6
Loreto	17%	-	-	17%	12
Geo. Region	**48%**	**88%**	**62%**	**64%**	**50**

Note: 1) The percentage of coverage with latrines includes latrines built with and without technical instruction
Source: Diagnosis of the Water Supply and Sanitation Systems in the localities of the Program's sample. JICA Study Team (2010).

From the results shown in Table N° 3.3.2-15 and Table 3.3.2-17, the percentages of sanitation coverage by latrines have been estimated. Table N° 3.3.2-18 shows that the highest coverage percentage is in the High Forest region (15%) and the lowest coverage levels are in the Low Forest (1.5%) and Front Forest (0%).

To determine the effective coverage in sanitation by latrines, it has been considered the fact that only latrines that are, at least, in "poor" conditions provide coverage. Due to which, the percentages of Table N° 3.3.2-15 that indicate such conditions were used to make the adjustment of the figures of the existence of

latrines, without making any precision of their conditions. As a result, Table N° 3.3.2-18 has been prepared.

Table 3.3.2-18: Effective Coverage of Sanitation by Latrines in the Localities

Regions	Geographical Regions			Adm. Region
	Low Forest	High Forest	Front Forest	
Amazonas	0%	32.0%	0%	10.0%
San Martín	0%	0%	0%	0%
Madre de Dios	17.2%	-	-	17.2%
Ucayali	0%	-	-	0%
Loreto	0%	-	-	0%
Geo. Region	**1.7%**	**14.6%**	**0%**	**3.9%**

Source: Diagnosis of the Program's sample localities. JICA Study Team (2010).

b) Coverage by Sewerage

Based on the information obtained from the sample localities regarding the conditions of the existing infrastructure (in particular the conveyance networks), the percentages for current conditions of the sewerage systems have been calculated, as indicated in Table N° 3.3.2-19

Table Nº 3.3.2-19: Current Condition of the Sewerage Systems

Condition	Selva Baja		Selva Alta		Ceja de Selva		Total	
Fair	0	(0%)	1	(100%)	0	(0%)	1	(17%)
Poor	1	(50%)	0	(0%)	2	(67%)	3	(50%)
Sub Total	**1**	**(50%)**	**1**	**(100%)**	**2**	**(67%)**	**4**	**(67%)**
Poor	1	(50%)	0	(0%)	1	(33%)	2	(33%)
Total	**2**	**(100%)**	**1**	**(100%)**	**3**	**(100%)**	**6**	**(100%)**

Note: 1) The coverage in the High Forest is cero , therefore, it is not shown en in the table
Source: Diagnosis of the Water Supply and Sanitation Systems in the localities of the Program's sample. JICA Study Team (2010)

Table N° 3.3,2-20 show the percentages that represent the existence of installation of sewerage infrastructure in the sample localities, as a result of the system's diagnosis. These results are high for Front Forest, because in this region there are (Amazonas administrative region) three (3) of the six (6) existing sewerage systems. In total, from the 50 sample localities, only 4.7% of the households have sewerage systems.

Whereas in the Low Forest there is no sewerage system in the sample localities, in Low Forest the administrative region of Madre de Dios stands out, where one of its three (3) localities have sewerage systems. This figure elevates to 18.9% the percentage of households with sewerage infrastructure in the administrative

region. In spite of that, only 2% of the households in Low Forest have that kind of service.

Table Nº 3.3.2-20: Percentage of Households with Sewerage Systems in the Sample Localities

Administrative Regions	Low Forest	High Forest	Front Forest	Total (%)
Amazonas	-	-	31.5%	12.9%
San Martín	2.6%	-	-	1.0%
Madre de Dios	18.9%	-	-	18.9%
Ucayali	-	-	-	-
Loreto	-	-	-	-
Total	**2.0%**	**0%**	**25.7%**	**4.7%**

Source: Diagnosis of the Water and Sanitation Systems of the Program's Sample. JICA Study Team (2010).

The coverage of the sewerage service in the 50 sample localities are obtained by affecting the percentages of the households with sewerage, from the previous table, with the percentages of Table N° 3.3.2-19 that match the addition of "fair" and "poor" and the obtained results are:

Table N° 3.3.2-21: Effective Coverage of Sewerage Service – Existing Systems

Administrative Regions	Low Forest	High Forest	Front Forest	Total (%)
Amazonas	-	-	21.1%	8.6%
San Martín	1.3%	-	-	0.7%
Madre de Dios	9.5%	-	-	12.6%
Ucayali	-	-	-	-
Loreto	-	-	-	-
Total	**1.0%**	**0%**	**17.2%**	**3.1%**

Source: JICA Study Team (2010)

c) Total Coverage in Sanitation

The coverage service for both systems (latrines and sewerage) is summarized in the following table:

Table N° 3.3.2-22: Total Coverage of the Sanitation Services

Service Coverage	Low Forest	High Forest	Front Forest	Total (%)
By Latrines	1.7%	14.6%	0%	3.9%
By Sewerage	1.0%	0%	17.2%	3.1%
Total	**2.7%**	**14.6%**	**17.2%**	**7.0%**

Source: JICA Study Team (2010)

3.3.3 Administration, Operation, and Maintenance - Current Situation

(1) Water Supply Facility

Having completed the field studies in the 50 sample localities, it has been found that only twenty-eight (28) localities have operational water supply system with an average coverage of 83% as a whole. Eighteen (18) do not have a water supply system, including two (2) localities of the Low Forest with only wells with manual pump. In four (4), the system they used to have is currently completely inoperative. See Table Nº 3.3.3-1

Table Nº 3.3.3-1: Quantity and Condition of Systems, by Region

Water	Low Forest	High Forest	Front Forest	Total
Without system	15	2	1	**18**
With system	-	-	-	**-**
Not functioning	2	1	1	**4**
Functioning	**12**	9	**7**	**28**
Total	29	**12**	9	**50**

Source: JICA Study Team (2010)

(2) Administration of the Sanitation Services

In the localities with system, there is generally a Committee or a Sanitation Service Administration Board (*Junta Administradora de los Servicios de Saneamiento* – JASS), whose members have been elected by the community. If JASS should not be formed, there is at least one operator that in most cases depends on the district municipality. These local organizations do not function well. They do not have an appropriate functional structure or premises, sufficient tools, systems for commercial or land registries and so on. In the same way, the water fee collected only covers a part of the operation and maintenance costs. When major repairs are needed, they are obligated to turn to the municipality in search for help.

Of the twenty-eight (28) localities whose systems are operational (58%), there are two (2) localities in Amazonas (San Juan and Olto) and two (2) in San Martin (Churuzapa and La Marginal) that share systems and therefore share their administration, due to which the administrations are twenty-six (26) in total.

Of these twenty-six (26) existing administrations, in each of nine (9) there is a board organized by the community for the administration of their system; in each of seven (7) there is Water Committee that has only one operator; in each of five (5) localities, the system is operated by the Municipality; and in each of five (5) localities, the system works and operates without a formal organization. See Table N° 3.3.3 – 2.

Table 3.3.3-2: Administration of the Operational Systems

Administrative Region	Administration of the Water Systems									
	JASS		Water Committee		Municipality		Not available *		Total	
Amazonas	80%	(8)	0%	(0)	20%	(2)	0%	(0)	100%	(10)
San Martin	8%	(1)	33%	(4)	25%	(3)	33%	(4)	100%	(12)
Madre de Dios	0%	(0)	100%	(2)	0%	(0)	0%	(0)	100%	(2)
Ucayali	0%	(0)	50%	(1)	0%	(0)	50%	(1)	100%	(2)
Loreto		(0)		(0)		(0)		(0)		(0)
Total	**35%**	**(9)**	**27%**	**(7)**	**19%**	**(5)**	**19%**	**(5)**	**100%**	**(26)**
JASS	Made up by a president, a secretary and a treasurer.									
Water committee	The president of the community is usually in charge of this task otherwise a delegate is elected.									
Municipality	The Municipality assumes the administration of the water system, assigning one person as the operator with a respective monthly salary.									
*****In all the cases an operator is designated to be in charge of the operation and maintenance of the system, with a salary or tip fluctuating between S/. 20.00 and S/. 600.00 per month, depending on the type of job to be done. Generally, such operators are local people with no technical instruction.										

Source: Socio-economic-Survey; JICA Study Team (2010)

In Table Nº 3.3.3-3, detail information are given regarding the twenty-six (26) existing organization in charge of the administration, operation and maintenance of the twenty-eight (28) systems in operation. Their participation, members, range of average monthly costs, fees paid and operator's salary is detailed. Also, the number of systems for each administration method is indicated.

Table Nº 3.3.3-3 Characteristics of the Organizations for Administration of Services

Existing Organization in Charge of the Service					Cost Range		Staff		Type of Water System			
Organization	**Nº of Localities**	**% of localities**	**Participation**	**Members**	**Operation and Maintenance (Monthly**	**Monthly Fee per Locality**	**Staff**	**Operator's Compensation**	**Gravity with Treatment**	**Gravity without Treatment**	**Pumping without Treatment**	**Perception**
JASS	9	35%	They were trained by an institution	President, Secretary and treasurer	S/.38-S/.790	S/.40-S/.885	A wage-earning operator is assigned to the operation and maintenance.	S/.20 - S/.600	6	3	0	In general, they were installed by an institution, but in most cases they have fulfill their useful lifetime
Water Committee	7	27%	Formed in an informal way with no training at all	President, Secretary and treasurer	S/.152- S/.442	S/.259 - S/.510	A tip-earning operator is assigned to the operation and maintenance.	S/.35 - S/.147	3	0	4	The higher costs are observed in the pumping systems due to the high cost of operation.
Municipality	5	19%	Subsides the additional payments for the service	Mayor	S/.227-S/.1394	S/.234 - S/.1680	A salary-earning operator is assigned to the operation and maintenance.	S/.147-S/.300	0	4	1	The higher costs are observed in the pumping systems due to the high cost of operation.
Region	5	19%	The governor of the area assumes this role in an informal way and without any knowledge of the matter.	Governor	No maintenance is done	No fees are collected d for the service, since it is inadequate	No staff is available, unless repairs are required, which would be done by an inhabitant of the locality.	-	0	4	1	The systems are generally built without technical guidance and do not cover a big part of the population.
Total	**26**	**100%**							**9**	**11**	**6**	

Source: JICA Study Team (2010)

(3) Present Water fee and Willingness to Pay

The present fees paid by the families for service are as low as 0.76% of the average family income. Some localities in Loreto and Ucayali indicate null, because no fees are paid in areas where there is no service.

Table Nº 3.3.3-4: Average Fees and Incomes – Willingness to Pay (S/.)

Region	Family Income	Monthly fee	% Fee/ Income	Willingness to Pay	% WTP/ Income
Amazonas	494	2.25	0.46%	4.98	1.01%
San Martin	479	2.33	0.49%	5.63	1.18%
Madre de Dios	459	6.67	1.45%	12.60	2.74%
Ucayali	501	0.42	0.08%	6.64	1.33%
Loreto	400	0.00	0.00%	5.36	1.34%
Average	**465**	**2.33**	**0.50%**	**5.92**	**1.27%**

Source: JICA Study Team (2010)

In the localities where there are no existing systems, there are evidently not any functional organizations such as administrative entities for water and sanitation services, nor are there administrative office, operative personnel or any related documentation. Only localities where there has been intervention, as are the cases of the sample localities, or where the expectation for the execution of a water system arose on its own, a JASS has been formed.

(4) User's Perception for the present Water Supply Services

Due to the deficiencies in operation and maintenance, the population´s biggest complaint about the distribution network is that the water is generally of poor quality due to insufficient treatment. In such localities, population is boiling water before consumption or using other sources when available. Another major complaint is that the supply hours are insufficient.

(5) Present Conditions of Sanitation Facility

In terms of sanitation, sewerage systems exist in only seven (7) of the localities, which represent 14% of the sample. Of these seven (7) localities, two (2) systems are currently not operating.

Table Nº 3.3.3-5: Sewerage Systems, by Region

Region	Low Forest	High Forest	Front Forest	Total
Amazonas	-	-	3	**3**
San Martin	2	1	-	**3**
Madre de Dios	1	-	-	**1**
Ucayali	-	-	-	**0**
Loreto	-	-	-	**0**
Total	**3**	**1**	**3**	**7**

Source: JICA Study Team (2010)

The habit of relieving[10] oneself in the outdoors is very widespread, especially in the population in the Low Forest; it was reported in the surveys that this is the only option in twelve (12) localities in Loreto and two (2) in Ucayali, in the localities that coincidentally do not have water supply systems and have only partial latrines.

Table Nº 3.3.3-6: Systems of Waste Disposal by Administration Region

Region	Sewerage	Latrines	Outdoors	Other
Amazonas	13%	69%	6%	13%
San Martin	1%	91%	5%	2%
Madre de Dios	19%	52%	29%	0%
Ucayali	0%	47%	53%	0%
Loreto	0%	22%	78%	0%
Average	**7%**	**56%**	**34%**	**3%**

Source: Socio-economic-Survey; JICA Study Team (2010)

Table Nº 3.3.3-7: Systems of Latrine Treatment by Geographical Region

Geographic Region	Ashes	Detergent with bleach	Bleach	Kerosene/ Other
Front Forest	35%	12%	40%	13%
High Forest	30%	61%	0%	9%
Low Forest	39%	49%	1%	11%
Average	**34%**	**45%**	**10%**	**11%**

Source: Socio-economic-Survey; JICA Study Team (2010)

[10] ¨relieving oneself¨ is understood as the act of relieving one´s need to urinate or defecate

3.4 Objectives of the Program

3.4.1 General Objective of the Program

The General Objective of the Program is to improve health and life quality of the rural populations of the five (5) regions of the Amazon Area: Amazonas, San Martin, Loreto, Madre de Dios and Ucayali; through the improvement of the water supply and sanitation conditions.

The Program will contribute to the reduction of water borne diseases, particularly intestinal infectious disease of children under 6 years of age.

3.4.2 Specific Objectives of the Program

(1) Infrastructure

1) To construct, improve and/or rehabilitate water and sanitation facilities.

(2) Social Intervention

1) To raise awareness about the value of the water and sanitation services in the populations to be served, through participatory approach to be implemented during the project cycle;

2) To strengthen the Community Organizations of the localities to be served by establishing capacity-building programs in the areas of administration, operation and maintenance (AOM);

3) To provide hygiene education for the users

4) To strengthen the technical capacity of the district municipalities so that they may (i) monitor and supervise the water supply and sanitation services, and (ii) provide technical assistance and support to the Community Organization.

(3) Consulting Services

1) To provide consulting services for the implementation of the Program by conducting the pre-investment studies, giving technical advice during tender processes, supervising the constructions works, and others.

2) To strengthen the "Water for All Program" (PAPT: *Programa Agua para todos)* for the execution, management and evaluation of the Program.

3) To provide technical assistance to the PAPT in the evaluation of the *Perfil* and in the review of the project files (detail design).

CHAPTER 4

FORMULATION AND EVALUATION

CHAPTER 4 FORMULATION AND EVALUATION

4.1 Conglomerate Criteria

The present Investment Program consists of multiple potable water and sanitation projects for localities in the five (5) administrative regions of the rural Amazon Forest area, and each of the projects should contribute to achieve the ultimate goal of the Program. For this reason, the formation of conglomerates is recommended, taking into consideration the General Directive Definition of SNIP (Directive N°001-2009-EF/68.01) that defines a conglomerate as a group of public investment projects of small scale, each of which shares similar characteristics regarding design, size or unit cost.

In the previous pre-investment study stage at the *Perfil* level of the Program, five (5) conglomerates were proposed, mainly based on the technical criteria about the method or type of water supply and sanitation facility/system and other complementary criteria such as: i) population size, ii) socio-economic characteristics and iii) the geographic region where the localities are situated. Unit costs of the technical alternatives were not considered for the formation of conglomerates.

For the formation of conglomerates at this Feasibility Study stage, the following criteria were taken into consideration in the present Feasibility Study of the Program:

1) Geographic region where the localities are situated (Table 4.1-1)
2) Locality size, according to the number of households and inhabitants (Table 4.1-2)
3) Present coverage level of water supply and sanitation (Table 4.1-3, Table 4.1-4)
4) Average family income (Table 4.1-5)
5) Investment per capita costs of the selected technical alternatives.

Based on the first criterion, the decision was made to form two (2) conglomerates:

1) Conglomerate-1: Localities situated in the Low Forest (*Selva Baja*) region and
2) Conglomerate-2: Localities situated in High Forest (*High Forest)* and Front Forest (*Ceja de Selva*).

The two (2) conglomerates by geographic region was corroborated with the analysis of other criteria that are described as follows.

(1) Distribution of Localities

Table N° 4.1-1 shows the distribution of the localities for the two (2) proposed conglomerates, corresponding 902 localities in Conglomerate-1 and 598 localities in Conglomerate-2. The Program will have more significant impact on Conglomerate-1 than on Conglomerate-2.

In Conglomerate-1, a 52.2 % of the localities are situated in Loreto administrative region, followed by the localities in the administrative regions of San Martín (18.1%) and in Ucayali

(15.4%). The remaining 14.3% localities in the Conglomerate-1 are in the Amazonas and Madre de Dios administrative regions.

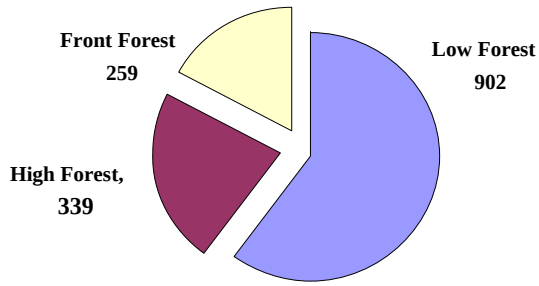
Table N° 4.1-1: Locality Distribution by Conglomerate

Administrative Region	Conglomerate-1		Conglomerate-2						Total	
	Low Forest		High Forest		Front Forest		Total			
Amazonas	89	9.9%	68	20.1%	158	61.0%	226	37.8%	**315**	21.0%
San Martín	163	18.1%	258	76.1%	91	35.1%	349	58.4%	**512**	34.1%
Madre de Dios	40	4.4%	4	1.2%	-	-	4	0.7%	**44**	2.9%
Ucayali	139	15.4%	4	1.2%	10	3.9%	14	2.3%	**153**	10.2%
Loreto	471	52.2%	5	1.5%	-	-	5	0.8%	**476**	31.7%
Total	**902**	**100%**	**339**	**100%**	**259**	**100%**	**598**	**100%**	**1,500**	**100%**

Source: JICA Study Team (2010) (Identical to Table 3.1.4-2)

Conglomerate-2 consists of 339 localities in the High Forest and 259 in the Front Forest. The largest number of localities in the Conglomerate-2 is situated in San Martín and Amazonas regions, which represent 58.4% and 37.8%, respectively of the total of localities in the Conglomerate-2.

Figure N° 4.1-1: Distribution of Localities



Source: JICA Study Team (2010)

(2) Locality Size (Population and Household)

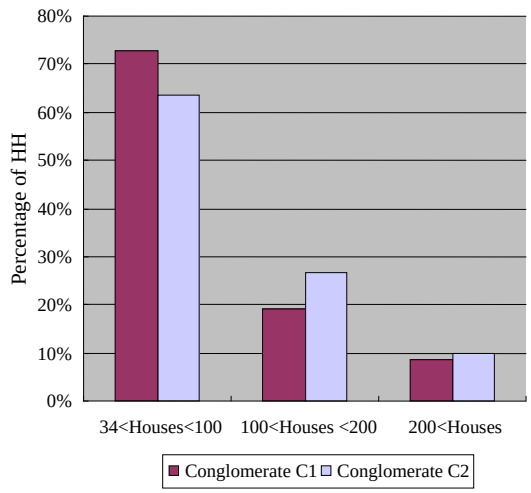
The majority of the localities have less than 100 households in each locality, which represent an approximate population between 200 and 400. Table N° 4.1-2 shows a 72.6% of localities in the Low Forest (Conglomerate-1) with households less than 100; 61.9% of localities in High Forest and 65.3% of localities in the Front Forest of Conglomerate-2. The percentage of households less than 100 per locality in the Conglomerate-1 is slightly higher than that of the Conglomerate-2.

Table N° 4.1-2: Locality Size by Conglomerate

Size of Localities Range	Conglomerate-1		Conglomerate-2						Total	
	Low Forest		High Forest		Front Forest		Total			
a) 34 <households< 100	655	72.6%	210	61.9%	169	65.3%	379	63,4%	1,034	68.9%
b) 100 <households< 200	171	19.0%	92	27.1%	68	26.2%	160	26.7%	331	22.1%
c) 200 <households< 501	76	8.4%	37	10.9%	22	8.5%	59	9.9%	135	9.0%
Total	**902**	**100%**	**339**	**100%**	**259**	**100%**	**598**	**100%**	**1,500**	**100%**

Source: JICA Study Team (2010)

Figure N° 4.1-2: Locality Size by Conglomerate



Source: JICA Study Team (2010)

(3) Coverage of water supply and sanitation services

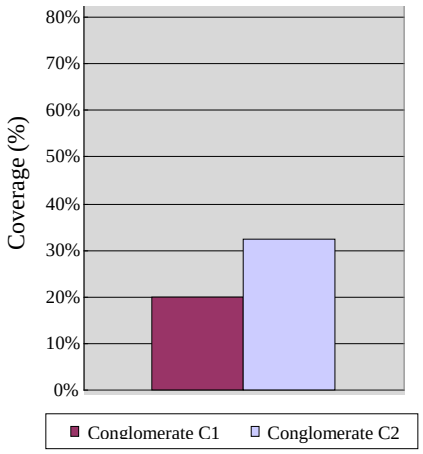
Regarding the current coverage of potable water supply services through house connections and public taps, a low coverage of 7% in the Low Forest (Conglomerate-1) and a higher coverage in the Conglomerate-2 % are observed; i.e. in the High Forest (13%) and in Front Forest (47%), as presented in Table N° 4.1-3.

Table N° 4.1-3: Water Service Coverage in Sample Localities

Administrative Region	Low Forest	High Forest	Front Forest	Total
Amazonas	0%	14%	59%	33%
San Martín	67%	12%	0%	32%
Madre de Dios	-	-	-	0%
Ucayali	-	-	-	5%
Loreto	-	-	-	0%
Total	**7%**	**13%**	**47%**	**15%**
(Identical to Table No. 3.3.2.12)				

Source: JICA Study Team (2010)

Figure N° 4.1-3: Water Supply Coverage



Source: JICA Study Team (2010)

For the coverage of sanitation, it is considered that only latrines in good conditions should contribute to the "effective" coverage. Due to this reason, the coverage shown in Table N° 3.3.2-17 (that shows the coverage based on physical number of facilities available without consideration of conditions) has been adjusted using the conditions shown in Table N° 3.3.2-15.

As a result, effective coverage was obtained ad shown in Table N° 4.1-4. It is observed that coverage in Low Forest is 2.7%, and that the coverage observed in High Forest and Front Forest, 14.6% and 17.2% respectively. The coverage of sanitation in the Conglomerate-1 is much lower than that of the Conglomerate-2.

Table N° 4.1-4: Effective Sanitation Coverage in the Sample Localities

Administrative Region	Conglomerate-1			Conglomerate-2					
	Low Forest			High Forest			Front Forest		
	Latrine	Sewerage	Total	Latrine	Sewerage	Total	Latrine	Sewerage	Total
Amazonas	0%	-	0%	32.0%	-	32.0%	0%	21.1%	21.1%
San Martin	0%	1.3%	1.3%	0%	-	0%	0%	-	0%
Madre de Dios	17.2%	9.5%	26.7%	-	-		-	-	
Ucayali	0%	-	0%	-	-		-	-	
Loreto	0%	-	0%	-	-		-	-	
Total	**1.7%**	**1.0%**	**2.7%**	**14.6%**	**0%**	**14.6%**	**0%**	**17.2%**	**17.2%**
(See Table 3.3.2-18, Table 3.3.2-21)									

Source: JICA Study Team (2010) –Diagnosis of the sample localities for the Program

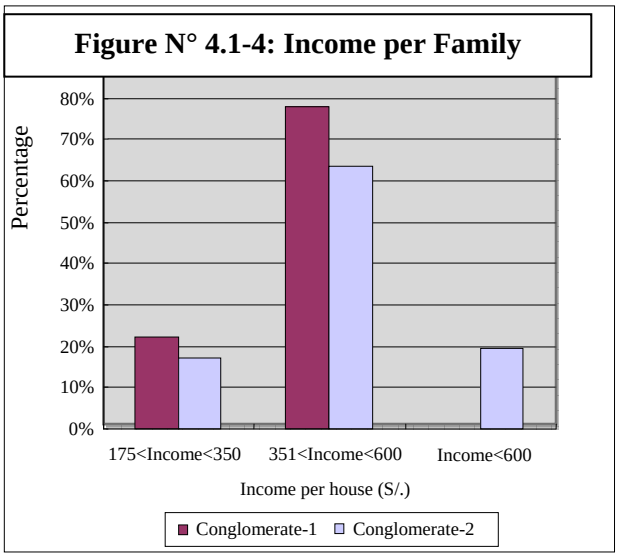
(4) Monthly family income

It is observed that the average family income per month in the three (3) geographic regions ranges from S/. 350 to S/.600. Since there are not clear differences in family income among the three (3) geographic regions, this variable will not be a criterion for the formation of conglomerates. The results of the economic income surveys are shown below in Table N° 4.1-5.

Table N° 4.1-5: Monthly Family Income in the Sample Localities (%)

Income Range (I.R) (S/.)	Conglomerate-1	Conglomerate-2		Total
	Low Forest	High Forest	Front Forest	
175< I.R <350	24%	0%	22%	18%
351< I.R <600	55%	83%	78%	66%
600<I.R	21%	17%	0%	16%
5 Regions	**58%**	**24%**	**18%**	**100%**

Source: JICA Study Team (2010) –Diagnosis of the sample localities for the Program



JICA Study Team (2010)

(5) Per-Capita-Cost

As explained in previous paragraphs, the principal variable used to dictate Conglomerate formation was the location or settlement of the localities by natural region. In addition to this variable, it has been considered that the per-capita investment costs are a function of the type of technical option used for safe water supply and sanitation in each natural region. A detailed explanation of the calculation methodology and conclusions can be found in the following chapters of the present report.

4.2 Target Year for Evaluation of the Program Projects

(1) Target Year of Project Evaluation

The target year for evaluation of the Program´s water and sanitation projects depends on the design periods of the components and system elements, which are a function of the effective lifetime of the structures and equipment, the grade of difficulty for the expansion, the requirements of the demand growth and the availability of economic resources for the execution of required works.

In that sense, the following target years for evaluation of the projects are proposed:

1) Systems of potable water (Water intake, conveyance facilities, treatment facilities and networks): 20 years
2) Pour-flush Latrines: 10 years
3) Double-vault composting latrines: 10 years
4) Dry pit latrines: 5 years

(2) Program Implementation Period

On the other hand, the implementation in the localities will be carried out progressively for years until the target of the Program has been achieved. To that effect, it is proposed that the Program should be executed for ten (10) years, starting in the years 2011 (year 1) and ending in the year 2020 (year 10); taking into general consideration of availability of financing for the scale of the Program, a viable period of the plan of the Feasibility Study, and the capacity of organizations to be involved in the Program.

(3) Target Coverage of the Program

To set up the target coverage of the Program, the Feasibility Study considered the national target established by the National Sanitation Plan: NSP (2006-2015) that the coverage of 85% for water supply and 80% for the sanitation should be achieved by the year 2015. Having this in mind, the present Feasibility Study proposes the same coverage as the ones of the NSP, i.e. 85% for water supply and 80% for the sanitation, for the 1,500 target localities by the year 2020 when the Program implementation will have been completed.

Needless to say, achievement of this target year will depend on the availability of financing, the capacity of the organizations to be involved, and the participation of the community in each stage of the Program's implementation.

4.3 Demand Analysis

4.3.1 Design Criteria for the Program Projects

The criteria of design for the projects in the rural localities of the Program should be established according to the ¨Design Regulation for Water and Sanitation Infrastructure for Rural Localities¨ Project (*Norma de Diseño de Infraestructura de Agua y Saneamiento para Centros Poblados Rurales*)[1]. In order to apply these, it will be necessary to keep the following in mind: geographic location, climatic conditions, zone topography, accessibility of localities and socio-economic conditions that allow for the sustainability of proposed systems throughout the design period. As a result of the evaluation of the aforementioned aspects, the most adequate systems shall be proposed for each region, which should be accepted by the benefitting population, according to the special features of each region.

The design criteria should also be in accordance with the strategies for the rural water supply projects established in the National Sanitation Plan (*Plan Nacional de Saneamiento 2006-201*). The Plan prioritizes actions: (i) to increase the number of water supply systems with disinfection systems; (ii) to provide various levels of service or technical options in water and sanitation, according to the feasibility of implementation (social, economic and technical) in each locality; and (iii) to promote solutions with latrines for sanitary disposal of excreta.

Similarly, these criteria should be in accordance with 'the Policies and Strategies of implementation in small localities and the rural sector' that were agreed by the Ministry of Housing, Construction and Sanitation (MVCS) and the various Cooperation Agencies[2] in principle. These policies and strategies have pointed out that as the implementation models of project execution, the water supply facilities/system should have house connections (except in dispersed rural areas); and in the case of rural sanitation, individual solutions are to be considered and sewerage could also be considered in small cities.

4.3.2 Design Parameters

In the localities of the rural Amazon area, it is not feasible to obtain information about historical water consumption, the continuity of the services, or the level of water loss. Therefore, the values recommended by the Design Regulation for Water and Sanitation Infrastructure for Rural Localities were considered as guidelines for the Feasibility Study. Such values are presented in the Table N° 4.3.2-1.

[1] This is being used by PRONASAR and was given to the Study Team by DNS. The date drafted is not given in the document. This has not been approved as an official norm.

[2] Minutes from Work Meeting with MVCS, DNS, BID, BIRF y JICA (06.03.2009)

Table N° 4.3.2-1: Design Parameter

Parameter	With Latrines	With Existing Sewerage System
Unit Consumption (litres/capita/day)	80 l/h/d	140 l/h/d
Service hour a day	12-24 hours	24 hours
Storage Volume	Minimum: a) 15% of average water volume-continuous source, b) 20% of average water volume-pump supply	Minimum: a) 15% of average water volume-continuous source, b) 20% of average water volume-pump supply
Losses	25%	25%
Daily Variation Coefficient	1.3	1.3
Hourly Variation Coefficient	2.0	2.0
Water volume by pump	Q_{md} x 24/N	Q_{md} x 24/N
Coverage	90%	90%

Q_{md}: Maximum Daily Volume of water, l/h/d: liters/inhabitant/day, N: Number of hours of pumping
Source: JICA-Study Team (2010) based on Sanitation Infrastructure for Rural Localities (PRONASAR)

In the case that service hours per day has to be reduced due to limitations or difficulties in the continuous supply of electricity for the activation of electromechanical equipment, the continuity of service could decrease in order to assure economic viability. In that case, the per-capita-consumption shall not be smaller than 20 L/capita/day to satisfy the basic needs of water for food and drink.

If public taps or other solutions (like manual pumps, pumps powered by wind or solar energy and rain water supply) should be applied, the following minimal unit consumption values were proposed:

1) Public taps: 30 L/capita/day
2) Manual pumps, wind-powered or solar pumps, rainwater: 20 L/capita/day

Unit consumption value less than 20 L/capita/day were not being adopted in any cases.

4.3.3 Population Projection

To project the population in each administrative region of the Program, the Feasibility Study used the information from the INEI population census data from the years 1993 to 2007.

The population in each locality was grouped by administrative region and geographic region. It was noticed that 356 localities were not yet located at the time of the 1993 census. Therefore, the analysis of the population growth in the period between censuses was made on the base of the population of 1,144 localities (77% of the total localities) that have information in the censuses from 1993 to 2007. Table N° 4.3.3-1 shows the population growth rates obtained from the censuses from 1993 to 2007. The population growth rates vary from 0.04% of the Front Forest in the Amazonas administrative region to 5.45% of the High Forest in the Madre de Dios administrative region. The average growth rate for Program localities

was 1.20%, a value slightly lower than the growth rate of 1.50% in the entire country in the same period (1993-2007).

Table N° 4.3.3-1: Rate of Population Growth in the Localities (1993 -2007)

Administrative Region	Low Forest	High Forest	Front Forest	Adm. Region
Amazonas	1.07%	0.02%	0.04%	0.30%
San Martín	0.89%	1.92%	4.09%	1.69%
Madre De Dios	2.83%	5.45%		3.06%
Ucayali	0.80%	2.72%	4.79%	1.04%
Loreto	1.27%	3.79%		1.29%
Total	**1.14%**	**1.52%**	**0.99%**	**1.20%**

Source: Population and House Census of 1993 and 2007. Summarized by JICA Study Team (2010)

With the population growth rates obtained by geographic and administrative regions, a population projection was made for the period of year from 2008 to 2030. In the case of growth rates higher than 2.0%, corrections were made according to the behaviour of the average annual growth[3] at the administrative region level, by applying a linear regression analysis. For this analysis, the independent variable (X-axis) was the years of the censuses and the dependent variable (Y-axis) was the growth rate. With these adjustments, the calculations of the population by administrative region and geographic region are shown in Tables N° 4.3.3-2 to N°4.3.3-6.

Table N° 4.3.3-2: Population Projection in the Ucayali Administrative Region

Year	Low Forest	High Forest	Front Forest	Total
2007	53,102	1,775	3,456	58,333
2008	53,528	1,823	3,622	58,973
2009	53,958	1,871	3,793	59,622
2010	54,391	1,919	3,969	60,279
2011	54,828	1,967	4,150	60,945
2015	56,610	2,152	4,920	63,682
2020	58,918	2,367	5,982	67,267
2025	61,320	2,552	7,133	71,005
2030	63,820	2,696	8,342	74,858

Source: JICA Study Team (2010), based on Population and Housing Censuses of 2003 and 2007

[3] National Census of Population and Housing 1940,1961,1972,1981,1993 y 2007-INEI and Appendix 3 – Future Population

Table N° 4.3.3-3: Population Projection in the Madre de Dios Administrative Region

Year	Low Forest	High Forest	Front Forest	Total
2007	19,899	1,592	-	21,491
2008	20,462	1,679	-	22,141
2009	21,028	1,769	-	22,797
2010	21,596	1,863	-	23,459
2011	22,165	1,961	-	24,126
2015	24,438	2,393	-	26,831
2020	27,218	3,025	-	30,243
2025	29,835	3,765	-	33,600
2030	32,186	4,614	-	36,800

Source: JICA Study Team (2010), based on Population and Housing Censuses of 2003 and 2007

Table N° 4.3.3-4: Population Projection in the Loreto Administrative Region

Year	Low Forest	High Forest	Front Forest	Total
2007	190,198	1,999	-	192,197
2008	192,607	2,075	-	194,682
2009	195,016	2,153	-	197,169
2010	197,425	2,234	-	199,659
2011	199,832	2,318	-	202,150
2015	209,432	2,680	-	212,112
2020	221,305	3,203	-	224,508
2025	232,940	3,814	-	236,754
2030	244,232	4,525	-	248,757

Source: JICA Study Team (2010), based on Population and Housing Censuses of 2003 and 2007

Table N° 4.3.3-5: Population Projection in the Amazonas Administrative Region

Year	Low Forest	High Forest	Front Forest	Total
2007	35,413	29,432	64,982	129,827
2008	35,792	29,437	65,009	130,238
2009	36,175	29,442	65,036	130,653
2010	36,562	29,447	65,063	131,072
2011	36,954	29,452	65,090	131,496
2015	38,563	29,472	65,198	133,233
2020	40,672	29,497	65,333	135,502
2025	42,898	29,522	65,468	137,888
2030	45,243	29,547	65,603	140,393

Source: JICA Study Team (2010), based on Population and Housing Censuses of 2003 and 2007

Table N° 4.3.3-6: Population Projection in the San Martin Administrative Region

Year	Low Forest	High Forest	Front Forest	Total
2007	89,343	116,034	36,186	241,563
2008	90,137	118,260	37,665	246,062
2009	90,938	120,499	39,195	250,632
2010	91,747	122,749	40,777	255,273
2011	92,563	125,010	42,412	259,985
2015	95,899	134,138	49,513	279,550
2020	100,239	145,663	59,753	305,655
2025	104,774	157,185	71,666	333,625
2030	109,516	168,550	85,425	363,491

Source: JICA Study Team (2010), based on Population and Housing Censuses of 2003 and 2007

The projections made for each administrative region was converted into the population projection for the total Program population by geographical regions for the period 2007-2030 as presented in Table N° 4.3.3-7. For the purpose of the analysis, the year 2011 is considered as the first year of the Program; 2020 as the tenth year; and 2030 as the twentieth year (target year for project planning for the first stage of the Program).

Table N° 4.3.3-7: Projection of Total Project Population

Year	Low Forest	High Forest	Front Forest	Total
2007	387,955	150,832	104,624	643,411
2008	392,526	153,274	106,296	652,096
2009	397,115	155,734	108,024	660,873
2010	401,721	158,212	109,809	669,742
2011	406,342	160,708	111,652	678,702
2015	424,942	170,835	119,631	715,408
2020	448,352	183,755	131,068	763,175
2025	471,767	196,838	144,267	812,872
2030	494,997	209,932	159,370	864,299

Source: JICA Study Team (2010), based on Population and Housing Censuses of 2003 and 2007

The total Program population of the five (5) administrative regions in 2009 is 660,873 inhabitants; it will reach 678,702 inhabitants in the year 2011 (the first year of the Program); 763,175 inhabitants in the year 2020 (target year for evaluation of the Program); and 864,299 inhabitants in the year 2030 (end of target year for evaluation of the projects in the first stage of the program).

The projected population was grouped according to the proposed conglomerates, according to the conglomerate formation criteria mentioned in the present Feasibility Study. Conglomerate C-1 groups together the localities in the Low Forest, and Conglomerate C-2 groups together

the populations in the High Forest and Front Forest. Table N° 4.3.3-8 shows the population projections per conglomerate until the year 2030.

Table N° 4.3.3-8: Population Projection by Program Conglomerate

Year	Conglomerate		Total
	C1	C2	
2007	387,955	255,456	643,411
2008	392,526	259,570	652,096
2009	397,115	263,758	660,873
2010	401,721	268,021	669,742
2011	**406,342**	**272,360**	**678,702**
2015	**424,942**	**290,466**	**715,408**
2020	**448,352**	**314,823**	**763,175**
2025	471,767	341,105	812,872
2030	494,997	369,302	864,299

Source: JICA Study Team (2010), based on Population and Housing Censuses of 2003 and 2007

4.3.4 Coverage of Potable Water

The information on coverage of water supply house connections and public taps in the Program localities has been obtained from the data of the INEI Census of 2007. The INEI information does not indicate the necessary information about the present conditions such as usage conditions/percentage or the operation conditions of the systems in the localities; the information of which is necessary for the estimation of coverage of water supply services.

For an approximation of the "effective coverage" in the localities of the Program, an adjustment to the Census results has been made, taking into consideration the results obtained from the 50 sample localities shown in Table N° 3.3.2-11. The results of the approximation with the adjustments are shown in Table N° 4.3.4-1.

Table N° 4.3.4-1: Coverage of Potable Water Supply (2007)

Description	Front Forest	High Forest	Low Forest	Total
Public Water Network- Census 2007 (1)	24%	31%	20%	23.0%
Conditions of the existing water systems (2)	56%	17%	21%	26.0%
Water System Coverage, Census 2007 – Adjusted [(1) x (2)]	14%	5%	4.0%	6.0%
With Connections	10%		4.0%	-
With Public Taps	2%		3%	3%
Effective Coverage	12%		7%	9%

Source: JICA Study Team (2010)
(1) From Table N° 3.1.6-1: Coverage of Water Services with Connections – 2007
(2) From Table N° 3.2.2-11: Current Conditions of the Existing Water Systems.

As a result of the adjustments, effective coverage rates turn out to be 4% in the Low Forest; 5% in High Forest; and 14% in Front Forest, and the coverage rates by the conglomerates, including the coverage by public taps, the effective coverage are as follows:

1) Conglomerate-1: 7% (Low Forest)
2) Conglomerate-2: 12% (High Forest and Front Forest)

Coverage by conglomerate is projected with the following procedure: (i) an increase-tendency of 0.5% is assumed until the year 2010 for the ¨without project¨ situation, taking into consideration that works with other types of financing may be executed. (ii) A significant increase of coverage is to be considered due to the Program implementation from the year 2011 (year 1 of the Program), a coverage of up to 85% is to be reached by 2020 (year 10 of the Program) in localities of both conglomerates.

Table N° 4.3.4-2 presents the family size (by regions) that was used in the coverage calculation. The values were obtained according to the Population and Housing data from Census 2007 – INEI.

Table N° 4.3.4-2 Family Size by Geographic Region

Year	Front Forest			High Forest			Low Forest		
	Population (inhab.)	Housing (Units)	Density (inhab./ House.)	Population (inhab.)	Housing (Units)	Density (inhab./ House.)	Population (inhab.)	Housing (Units)	Density (inhab./ House.)
2007	104,624	23,943	4.37	150,832	34,391	4.39	387,955	78,867	4.92

Source: Population and Housing Census 2007. JICA Study Team (2010).

Table N° 4.3.4-3 shows the projections of coverage, population served, and households served during the period 2007-2020 (2020: the proposed last year of Program implementation). The table also show the projection from the 2021 to 2030. In this period the coverage will be expected to increase until 90%, because new users may have connections to the systems/facilities that will have been installed by the Program. In the same manner, the coverage of water rate has been developed for each one of the five (5) administrative regions, as shown in the Appendix N° 4 (Appendix Demand by Regions 161009)

Table N° 4.3.4-3: Projected Coverage for Potable Water, by Population and Households

Year	Conglomerate-1						Conglomerate-2						Total					
	Population (inhab)	Coverage (%)	Served Population (inhab.)	Increasing Served Population	Served houses (units)	Increasing Served Houses	Population (inhab)	Coverage (%)	Served Population (inhab.)	Increasing Served Population	Served houses (units)	Increasing Served Houses	Population (inhab)	Coverage (%)	Served Population (inhab.)	Increasing Served Population	Served houses (units)	Increasing Served Houses
2007	387,955	7%	27,530	0	5,597	0	255,456	12%	31,437	0	7,181	0	643,411	9%	58,967	0	12,778	0
2008	392,526	8%	31,402	3,872	6,384	787	259,570	13%	33,744	2,307	7,708	527	652,096	10%	65,146	6,179	14,092	1,314
2009	397,115	8%	31,769	367	6,458	75	263,758	13%	34,289	544	7,832	124	660,873	10%	66,058	912	14,291	199
2010	401,721	9%	36,155	4,386	7,350	892	268,021	14%	37,523	3,234	8,571	739	669,742	11%	73,678	7,620	15,921	1,630
2011	**406,342**	**16%**	**65,015**	**28,860**	**13,217**	**5,867**	**272,360**	**19%**	**51,748**	**14,225**	**11,821**	**3,249**	**678,702**	**17%**	**116,763**	**43,085**	**25,038**	**9,116**
2012	410,975	22%	90,415	25,400	18,380	5,163	276,772	24%	66,425	14,677	15,173	3,353	687,747	23%	156,840	40,077	33,554	8,516
2013	415,620	28%	116,374	25,959	23,657	5,277	281,261	29%	81,566	15,140	18,632	3,458	696,881	29%	197,939	41,100	42,289	8,736
2014	420,276	34%	142,894	26,520	29,049	5,391	285,825	35%	100,039	18,473	22,852	4,220	706,101	34%	242,933	44,993	51,900	9,611
2015	**424,942**	**40%**	**169,977**	**27,083**	**34,554**	**5,506**	**290,466**	**40%**	**116,186**	**16,148**	**26,540**	**3,689**	**715,408**	**40%**	**286,163**	**43,231**	**61,095**	**9,194**
2016	429,615	49%	210,511	40,535	42,795	8,240	295,184	49%	144,640	28,454	33,040	6,500	724,799	49%	355,152	68,988	75,834	14,740
2017	434,293	58%	251,890	41,379	51,206	8,412	299,978	58%	173,987	29,347	39,743	6,704	734,271	58%	425,877	70,726	90,950	15,115
2018	438,977	67%	294,115	42,225	59,790	8,584	304,850	67%	204,250	30,262	46,656	6,913	743,827	67%	498,364	72,487	106,446	15,497
2019	443,664	76%	337,185	43,070	68,546	8,756	309,799	76%	235,447	31,198	53,783	7,126	753,463	76%	572,632	74,268	122,329	15,882
2020	**448,352**	**85%**	**381,099**	**43,915**	**77,473**	**8,927**	**314,823**	**85%**	**267,600**	**32,152**	**61,127**	**7,344**	**763,175**	**85%**	**648,699**	**76,067**	**138,600**	**16,272**
2021	453,041	85%	385,589	4,490	78,386	913	319,925	86%	275,075	7,476	62,835	1,708	772,966	85%	660,664	11,966	141,221	2,620
2022	457,729	86%	391,936	6,347	79,676	1,290	325,104	86%	281,154	6,078	64,223	1,388	782,833	86%	673,090	12,426	143,900	2,679
2023	462,413	86%	398,329	6,392	80,976	1,299	330,361	87%	287,352	6,198	65,639	1,416	792,774	86%	685,680	12,590	146,615	2,715
2024	467,093	87%	404,766	6,437	82,284	1,309	335,694	87%	293,669	6,317	67,082	1,443	802,787	87%	698,435	12,754	149,366	2,752
2025	471,767	87%	411,245	6,480	83,602	1,317	341,105	88%	300,108	6,439	68,553	1,471	812,872	88%	711,354	12,919	152,155	2,788
2026	476,434	88%	417,767	6,522	84,928	1,326	346,592	88%	306,669	6,560	70,052	1,499	823,026	88%	724,436	13,082	154,979	2,824
2027	481,092	88%	424,329	6,562	86,262	1,334	352,156	89%	313,352	6,684	71,578	1,527	833,248	89%	737,682	13,246	157,840	2,861
2028	485,739	89%	430,930	6,600	87,603	1,342	357,795	89%	320,159	6,807	73,133	1,555	843,534	89%	751,089	13,407	160,736	2,897
2029	490,375	89%	437,568	6,638	88,953	1,349	363,510	90%	327,090	6,931	74,716	1,583	853,885	90%	764,659	13,570	163,669	2,933
2030	**494,997**	**90%**	**445,497**	**7,929**	**90,565**	**1,612**	**369,302**	**90%**	**332,372**	**5,281**	**75,923**	**1,206**	**864,299**	**90%**	**777,869**	**13,211**	**166,488**	**2,818**

Source: JICA Study Team (2010), based on the INEI Census of 2007 at locality level

Table N° 4.3.4-3 shows that the target coverage projected from year 2011 until year 2030 of the design period (20 years) will allow the Program to provide potable water supply to an incremental population of 704,191 inhabitants, as summarized in Table N° 4.3.4-4.

Table N° 4.3.4-4: Water Coverage for the Design Period

Potable Water	Year	Population	Coverage (%)	Served Population (inhab)	Incremental Served Population (inhab)
Conglomerate-1	2010	401,721	9%	36,155	-
	2030	494,997	90%	445,497	**409,342**
Conglomerate-2	2010	268,021	14%	37,523	-
	2030	369,302	90%	332,372	**294,849**
Total					**704,191**

Source: JICA Study Team (2010)

4.3.5 Sanitation Coverage

The coverage (with sewerage, latrines, septic tanks or blind shafts) of sanitation was determined based on information of the Census 2007 with an adjustment/corrections by the information obtained in the 50 sample localities, because the Census 2007 include information of 'physical existence of facility/system" but not include information on present operation conditions.

The adjustment has been made according to the maintenance status of the latrines and sewerage systems, on the basis of the information gathered in the field works for the pre-investment studies at the *Perfil* level of in 50 sample localities.

Table N° 4.3.5-1: Sanitation Coverage - Latrines 2007

Description	Front Forest	High Forest	Low Forest	Total
Blind pits or latrines installations – 2007 Census -(1)	64.1%	74.4%	64.9%	66.8%
Well or latrines status -(2)	0%	17%	3.0%	6%
Coverage of latrines and blind shafts- 2007 Census – Adjusted -[(1)x(2)]	0%	127%	1.9%	4%
	6.4%			

JICA Study Team (2010)
(1) From Table 3.1.6-3: Coverage of Sanitation Services Census 2007
(2) From Table N° 3.2.2-14: Conditions of Latrines in the Program's sample localities

Table N° 4.3.5-2: Sanitation Coverage – Sewerage Systems 2007

Description	Front Forest	High Forest	Low Forest	Total
Sewerage installation – 2007 Census 2007 -(1)	19.1%	7.9%	3.3%	7.2%
Status of sewerage systems -(2)	67.0%	100%	50.0%	67.0%
Sewerage Coverage – 2007 Census – Adjusted -[(1)x(2)]	12.8%	7.9%	1.7%	4.8%
	10.3%			

JICA Study Team (2010)
(1) From Table N° 3.1.6-3: Coverage of Sanitation Services Census 2007
(2) From Table N° 3.2.2-17: Current Conditions of the Sewerage Systems in the sample localities

The results in Tables N° 4.3.5-2 and 4.3.5-2 allow the establishing a more accurate approximation of the coverage by the conglomerates:

(1) Connections/Sewerage Networks

1) Conglomerate-1: 1.7% (Low Forest)
2) Conglomerate-2: 10.3% (High Forest and Front Forest)

(2) Latrines/Septic Tanks

1) Conglomerate-1: 1.9% (Low Forest)
2) Conglomerate-2: 6.4% (High Forest and Front Forest)

For sanitation, an initial coverage increase of 0.5% is proposed until the year 2010. There will be a significant increase in coverage in the year 2011 due to the implementation the Program. It is envisaged that an 80% coverage level is to be attained in the year 2020.

Table N° 4.3.5-3 shows the projection of sanitation coverage by Conglomerate until the year 2030, with 85% of coverage as a result of the soft-component implementation during Program intervention.

The calculation of the sanitation coverage has been carried out for each of the five (5) administrative regions. This calculation is shown in Appendix N° 4 (Demand by Regions).

Table N° 4.3.5-3: Projected Coverage for Sanitation, by Population and Households

Year	Conglomerate-1						Conglomerate-2						Total					
	Population (inhab)	Coverage (%)	Served Population (inhab.)	Incremental Served Population	Served Household (units)	Incremental Served Households	Population (inhab)	Coverage (%)	Served Population (inhab.)	Incremental Served Population	Served Household (units)	Incremental Served Households	Population (inhab)	Coverage (%)	Served Population (inhab.)	Incremental Served Population	Served Household (units)	Incremental Served Households
2007	387,955	4%	13,848	0	2,815	0	255,456	17%	42,527	0	9,714	0	643,411	9%	56,374	0	12,529	0
2008	392,526	4%	15,701	1,854	3,192	377	259,570	17%	44,127	1,600	10,080	366	652,096	10%	59,828	3,454	13,272	742
2009	397,115	5%	19,856	4,155	4,036	845	263,758	18%	47,476	3,350	10,845	765	660,873	10%	67,332	7,504	14,881	1,610
2010	401,721	5%	20,086	230	4,083	47	268,021	18%	48,244	767	11,020	175	669,742	11%	68,330	998	15,103	222
2011	**406,342**	**10%**	**40,634**	**20,548**	**8,260**	**4,177**	**272,360**	**22%**	**59,919**	**11,675**	**13,687**	**2,667**	**678,702**	**16%**	**100,553**	**32,224**	**21,948**	**6,844**
2012	410,975	16%	65,756	25,122	13,367	5,107	276,772	27%	74,728	14,809	17,070	3,383	687,747	21%	140,484	39,931	30,438	8,490
2013	415,620	21%	87,280	21,524	17,743	4,376	281,261	31%	87,191	12,462	19,917	2,847	696,881	25%	174,471	33,987	37,660	7,222
2014	420,276	26%	109,272	21,992	22,214	4,471	285,825	35%	100,039	12,848	22,852	2,935	706,101	30%	209,311	34,839	45,065	7,405
2015	**424,942**	**32%**	**135,981**	**26,710**	**27,644**	**5,430**	**290,466**	**40%**	**116,186**	**16,148**	**26,540**	**3,689**	**715,408**	**35%**	**252,168**	**42,857**	**54,184**	**9,118**
2016	429,615	41%	176,142	40,161	35,808	8,164	295,184	48%	141,688	25,502	32,366	5,825	724,799	44%	317,830	65,663	68,173	13,990
2017	434,293	51%	221,489	45,347	45,026	9,219	299,978	56%	167,988	26,299	38,373	6,007	734,271	53%	389,477	71,647	83,399	15,226
2018	438,977	61%	267,776	46,287	54,436	9,410	304,850	64%	195,104	27,116	44,567	6,194	743,827	62%	462,880	73,403	99,003	15,604
2019	443,664	70%	310,565	42,789	63,134	8,699	309,799	72%	223,055	27,951	50,952	6,385	753,463	71%	533,620	70,740	114,086	15,083
2020	**448,352**	**80%**	**358,682**	**48,117**	**72,916**	**9,782**	**314,823**	**80%**	**251,858**	**28,803**	**57,531**	**6,579**	**763,175**	**80%**	**610,540**	**76,920**	**130,447**	**16,361**
2021	453,041	80%	364,016	5,334	74,000	1,084	319,925	80%	257,259	5,401	58,765	1,234	772,966	80%	621,275	10,735	132,765	2,318
2022	457,729	81%	370,208	6,193	75,259	1,259	325,104	81%	263,098	5,839	60,099	1,334	782,833	81%	633,306	12,032	135,358	2,593
2023	462,413	81%	376,447	6,239	76,528	1,268	330,361	81%	269,054	5,956	61,459	1,360	792,774	81%	645,501	12,195	137,987	2,629
2024	467,093	82%	382,733	6,286	77,805	1,278	335,694	82%	275,126	6,072	62,846	1,387	802,787	82%	657,859	12,358	140,652	2,665
2025	471,767	82%	389,063	6,330	79,092	1,287	341,105	82%	281,317	6,191	64,261	1,414	812,872	82%	670,380	12,522	143,353	2,701
2026	476,434	83%	395,437	6,374	80,388	1,296	346,592	83%	287,627	6,310	65,702	1,441	823,026	83%	683,065	12,684	146,090	2,737
2027	481,092	84%	401,853	6,416	81,692	1,304	352,156	84%	294,058	6,431	67,171	1,469	833,248	84%	695,912	12,847	148,863	2,773
2028	485,739	84%	408,309	6,456	83,005	1,312	357,795	84%	300,610	6,551	68,668	1,497	843,534	84%	708,919	13,007	151,672	2,809
2029	490,375	85%	414,805	6,496	84,325	1,321	363,510	85%	307,283	6,674	70,192	1,524	853,885	85%	722,089	13,170	154,517	2,845
2030	**494,997**	**85%**	**420,747**	**5,942**	**85,533**	**1,208**	**369,302**	**85%**	**313,907**	**6,623**	**71,705**	**1,513**	**864,299**	**85%**	**734,654**	**12,566**	**157,238**	**2,721**

Source: JICA Study Team (2010), based on the INEI Census of 2007 at locality level

From Table N° 4.3.5-3, the proposed coverage from 2011 until 2020 will allow the Program to provide sanitation coverage to an incremental population of 542,210 inhabitants by the end of program execution period (10 years) and for as shown in Table N° 4.3.5-4.

Table N° 4.3.5-4: Sanitation Coverage for the Design Period

Sanitation	Year	Population	Coverage (%)	Served Population (inhab)	Incremental Served Population (inhab)
Conglomerate-1	2010	401,721	5%	20,086	-
	2020	448,352	80%	358,682	**338,596**
Conglomerate-2	2010	268,021	18%	48,244	**-**
	2020	314,823	80%	251,858	**203,614**
Total					**542,210**

Source: JICA Study Team (2010)

4.4 Supply Analysis

The supply analysis was made independently each for potable water and sanitation, in accordance with the capacity of the existing infrastructure of the potable water and sanitation systems. This information was obtained from the *Perfils* studies of the 50 sample localities and the adjusted current coverage, based on the results of the INEI Census of 2007 and the diagnosis of the current situation of the services in the 50 localities.

4.4.1 Potable Water

In the *Perfil* studies of the 50 sample localities of the Program, the capacity of the infrastructure of the existing potable water services was determined. This capacity of infrastructure shows that supply in the "without project" situation does exist, meaning that there are facilities of a technical potable water supply system that could be improved and rehabilitated with the implementation of Program projects.

Item 3.3 of the present Feasibility Study identified that twenty-eight (28) localities, or 56% of the studied localities, have infrastructure for water supply. However, the lack of adequate operation and maintenance results in many of the facilities of the systems not fulfilling their functions. Some of these systems are in poor conditions, especially the intake facilities.

In these localities, the current status of its systems has been evaluated (see Table N° 3.3.2-11). This indicates that 26%, approximately, of the systems are in poor state and 32%, in bad conditions. This situation affects the operability of the systems, restricting the effective access to water service to population, even more if it is taken into consideration that the water that reaches the houses or public taps has not be disinfected due to lack of coloration system and/or lack of inputs and/or unqualified personnel.

Taking into consideration of the present conditions of the systems mentioned above, the supply analysis of potable water will be defined with the data of coverage from the 2007 Census, by making the corrections according to the results of the diagnosis, because the results of the census do not indicate the state or condition of the infrastructure. Table N° 4.4.1-1 shows the current supply of the water systems by conglomerate.

Table N° 4.4.1-1: Current Potable Water Supply by Conglomerate

Year	Conglomerate		Total
	C1	C2	
2007	14%	12%	13%

Source: JICA Study Team (2010), based on INEI Census of 2007 at the locality level

4.4.2 Sanitation

In the same way as the case of the water supply system, the capacity of sanitation infrastructure of sewerage and latrine systems was established through the evaluation of the existing systems in the 50 sample localities. In the sample localities, there are five (5) localities that have sewerage in operation: one in the Posic locality lacking house connections and another under construction in Rumisapa, indicating a limited supply of sewerage networks. The localities, in general, have latrines, made both with and without technical instruction, in poor or normal state and in poor conditions of operation and maintenance.

For the Program, the supply analysis has been made with the information of the 2007 Census, as a reference. The information in the Census indicates that there is 36.8% coverage for localities in the Low Forest; 64.1%, in the High Forest; and 74.4%, for the Front Forest. However, the results of the Census do not identify the state of the infrastructure of the sanitation systems like latrines or septic tanks.

Adjustments have been made to the information of the 2007 Census, regarding the coverage by means of latrines or septic tanks and sewerage, as mention in Item 4.3.5. Table N° 4.4.2-1 shows the percentages of sanitation supply in the year 2007 by Conglomerate.

Table N° 4.4.2-1: Current Sanitation Supply by Conglomerate

Year	Conglomerate		Total
	C1	C2	
2007	4%	17%	9%

Source: JICA Study Team (2010) based on:
1) INEI Census of 2007 at the locality level
2) Diagnostic of the sample localities of the Program

4.5 Supply-Demand Balance

The supply-demand balance for the Program will be established based on the analysis of the supply and the demand, according to the goals of coverage (demand) and the current coverage (supply "without project").

4.5.1 Potable Water

According to the supply analysis in the "without project" situation, low coverage percentages are observed: with house connections at 4% in Conglomerate-1 and 9.3% in Conglomerate-2. Such rates indicate that a limited supply of house connections exists in the "without project" situation. In addition, there is 3.1% coverage of public taps in Conglomerate-1 and 1.6% coverage in Conglomerate-2.

Regarding the demand, it is proposed that the coverage goal of 39% (with inter-house connections and public taps) should be achieved during the first five (5) years in the Program localities; through the implementation of each one of the projects and according to the technical and economic options.

This implementation will be oriented towards the construction of new potable water systems in localities which do not currently have any type of safe water supply system in sanitary conditions. Likewise, the implementation will be oriented towards improvement, rehabilitation and expansion of the existing services in the localities that do have water supply systems.

Table N° 4.5.1-1: Supply-Demand Balance of Water Supply by Conglomerate

Year	Conglomerate-1		Conglomerate-2		Total	
	Balance	Non Served Population (inhab.)	Balance	Non Served Population (inhab.)	Balance	Non Served Population (inhab.)
2007	-93%	360,425	-88%	224,019	-90%	584,444
2008	-92%	361,124	-87%	225,826	-90%	586,950
2009	-92%	365,346	-87%	229,469	-90%	594,815
2010	-91%	365,566	-86%	230,498	-89%	596,064
2011	**-84%**	**341,327**	**-81%**	**220,612**	**-83%**	**561,939**
2012	-78%	320,561	-76%	210,347	-77%	530,907
2013	-72%	299,246	-71%	199,695	-72%	498,942
2014	-66%	277,382	-65%	185,786	-66%	463,168
2015	**-60%**	**254,965**	**-60%**	**174,280**	**-60%**	**429,245**
2016	-51%	219,104	-51%	150,544	-51%	369,647
2017	-42%	182,403	-42%	125,991	-42%	308,394
2018	-33%	144,862	-33%	100,601	-33%	245,463
2019	-24%	106,479	-24%	74,352	-24%	180,831
2020	**-15%**	**67,253**	**-15%**	**47,223**	**-15%**	**114,476**
2021	-15%	67,452	-14%	44,850	-15%	112,302
2022	-14%	65,793	-14%	43,950	-14%	109,743
2023	-14%	64,084	-13%	43,009	-14%	107,094
2024	-13%	62,327	-13%	42,025	-13%	104,352
2025	-13%	60,522	-12%	40,997	-13%	101,518
2026	-12%	58,667	-12%	39,923	-12%	98,590
2027	-12%	56,763	-11%	38,804	-12%	95,566
2028	-11%	54,809	-11%	37,636	-11%	92,445
2029	-11%	52,807	-10%	36,420	-11%	89,226
2030	**-10%**	**49,500**	**-10%**	**36,930**	**-10%**	**86,430**

Source: JICA Study Team

Table N° 4.5.1-1 shows the supply-demand analysis. The existing deficit is considerably high in the first years, before the implementation of the Program. This allows the Study to confirm the requirements of investment in potable water in rural Amazon Forest populations, with the aim of reducing this deficit until reaching an order of 60% in the first five (5) years of the Program and -15% by the end of the period of the Program, year 2020.

4.5.2 Sanitation

According to the supply analysis in the "without project" situation, a minimum coverage percentage is observed for sewerage: with 1.7% in Conglomerate-1 and 10.3% in Conglomerate-2. These rates show that there is a limited sewerage supply in the "without

project" situation. In addition, the percentage of coverage through latrines and septic tanks or blind shafts is 1.9% in Conglomerate-1 and 6.4%, in Conglomerate-2.

Regarding the demand, it has been proposed that the coverage goal of 35% is to be achieved in the first five (5) years; through latrines in the Program localities, by means of the implementation of each project, according to the technical options that are proposed in the present study.

In the same way, this implementation will be oriented towards the construction of new systems for the adequate and hygienic disposal of excreta, in the localities in which there is currently no system of any type. It will also be oriented towards the improvement, rehabilitation and expansion of existing services in the localities that have sewerage systems.

Table N° 4.5.2-1: Supply-Demand Balance of Sanitation by Conglomerate

Year	Conglomerate-1		Conglomerate-2		Total	
	Balance	Non Served Population (inhab.)	Balance	Non Served Population (inhab.)	Balance	Non Served Population (inhab.)
2007	-96%	374,107	-83%	212,929	-91%	587,037
2008	-96%	376,825	-83%	215,443	-90%	592,268
2009	-95%	377,259	-82%	216,282	-90%	593,541
2010	-95%	381,635	-82%	219,777	-89%	601,412
2011	**-90%**	**365,708**	**-78%**	**212,441**	**-84%**	**578,149**
2012	-84%	345,219	-73%	202,044	-80%	547,263
2013	-79%	328,340	-69%	194,070	-75%	522,410
2014	-74%	311,004	-65%	185,786	-70%	496,790
2015	**-68%**	**288,961**	**-60%**	**174,280**	**-65%**	**463,240**
2016	-59%	253,473	-52%	153,496	-56%	406,969
2017	-49%	212,804	-44%	131,990	-47%	344,794
2018	-39%	171,201	-36%	109,746	-38%	280,947
2019	-30%	133,099	-28%	86,744	-29%	219,843
2020	**-20%**	**89,670**	**-20%**	**62,965**	**-20%**	**152,635**

Source: JICA Study Team (2010)

Table N° 4.5.2-1 shows that the existing deficit is considerably high in the first years, before the implementation of the Program. This allows us to confirm the necessity of the requirements of investment in potable water in the rural Amazon Forest populations, with the aim of reducing this deficit until reaching an order of -65% in the first five (5) years of the Program and to reduce the deficit to -20% until year 2020, at the end of the period of the Program.

4.6 Analysis of the Local Capacity for the Management of the Water and Sanitation Services

(1) Present situations- Users

In the diagnosis made for the sample localities, it is noticed that in most of those localities a proper management of the water and sanitation services is not executed. In principle, this is due to the fact that these services are incipient and limited; and also because the collection of fees is partial and even if they were complete, their amount is insufficient for the operation and maintenance of the systems. In general, they do not have offices, clear organizations or documentation regarding the services. In some cases, the District Municipality is the one in charge of the fees collection, even though the municipality is the one that should take an independent account in order to register incomes and expenditures. Some localities do not have personnel to be in charge of the operation. This is the case of Santa Rosillo, where several times it has been reported that the Mayor himself had to be in charge of the repairs. There are no blueprints, cadastre nor information regarding operation costs.

Such conditions show that the existing capacities in this type of communities make them not suitable for administration, operation and maintenance of the infrastructure to be built.

(2) Capacity Building to the Users

In order to assure that there will be available people qualified in administration, operation and administration of the systems, the Program will implement courses or workshops on these topics. Workshops shall be attended by personnel that represent the Project in each district and the members of the already formed Community Organization. In addition, concepts of hygiene education will be diffused among the members of the community, future users of the new system.

(3) Present Conditions - District Municipalities

In the field studies of the sample localities, it was proven that five (5) of the existing systems are administrated and operated by municipalities. For the fulfilment of this function, each of the municipalities designates a person from their technical unit. However, this does not represent an advantage with regard to the administration of the system, as this labour is an additional task to the other functions or obligations that this person already has with the municipality. In addition, municipalities are also lack of available budgets.

(4) Capacity Building to District Municipalities

The mode proposed for the execution of the Program implies the necessity of the participation of the municipal district authorities in the Program. Although the provincial and regional governments should also be involved, the municipal district authorities are especially important, as they are the ones who shall be involved with the projects in their area. They shall participate from the beginning with project co-financing and shall agree to assign part of their operative capacity to project supervision and monitoring. It is also expected that they

will support the Community Organization that will be in charge of the water and sanitation services while the project is functioning.

(5) Conclusions

In general terms, it is observed the current inexistence of local capacity for the administration of water and sanitation services. For that reason, local capacity building is part of the Program components, as a part of the policies and principles of implementation that are described in Chapter 4.20.

4.7 Analysis of the Capacity of the Executing Unit for the Implementation of the Program

(1) Legal Framework

The ¨Water for All Program¨ (PAPT – *Programa de Agua Para Todos*) in the Vice-ministry of Construction and Sanitation of the MVCS was created in February of 2007 by means of the Supreme Decree N° 006-2007-Vivienda. The PAPT is responsible for coordinating actions corresponding to the phases of the cycle of projects and programs in the sanitation sector, located in urban and rural areas.

(2) Objectives of PAPT

In the projects cycles, the responsibility of the PAPT is to produce pre-investment studies and technical files and to execute potable water and sanitation works in urban and/or rural areas. The post-investment stage that corresponds to the operation and maintenance of the sanitation systems is the responsibility of the service providers.

The general objective of the PAPT is to contribute to the population's access to sustainable and high-quality water and sanitation services, through the coordination of the actions for formulation, execution, and/or financing of the public investment programs and projects for sanitation, with the different levels of the government (regional and local) and the service providers.

Accordingly, the PAPT is responsible for the execution of the investment programs and projects, contributing to the sustainability of the sanitation services directed by the service providers. It also develops actions of coordination, monitoring and evaluation of the programs and projects within its area and takes actions for the capacity building of the local executing entities in the formulation and execution of projects.

The Ministerial Resolution N° 087-2009-Vivienda on February 24th, 2009 approved the Manual of Operations for the PAPT, establishing the structure and functions of the Program. The PAPT has one Executive Directorate that is the final decision-making authority of the Program, advisory bodies (Legal Matters Unit and Planning, Budgetary and Information and Technology Unit), support bodies (Administration Unit) and line bodies (Operations Unit for Urban Sanitation, Operations Unit for Rural Sanitation, Investment Shock Unit). Currently they are in the process of approving the required processes, procedures, and human resources.

(3) PAPT: Executing Unit of Projects for Water Supply and Sanitation

The Executing Unit of the present Program for the Rural Amazon Area will be the PAPT, through the Rural Sanitation Operative Unit in the PAPT, for which the Program Management Unit (PMU) will be created. Currently, the Rural Sanitation Operative Unit is in the process of implementation with the existing PAPT personnel. The National Program for Rural Water and Sanitation (PRONASAR: *Programa Nacional de Agua y Sanemiento*) is under the work scope of this unit; however in accordance with the conditions established in the Loan Agreement

and amendments signed between the Republic of Peru and the International Bank of Reconstruction and Promotion (BIRF: *Banco Internacional de Reconstrucción y Fomento*), the PRONASAR will continue to be executed independently from the unit in the frame of the agreement until its conclusion.

(4) Capacity Building of PAPT

For the execution of the present Program for the Rural Amazon Area, it will be necessary to strengthen the PAPT, with the purpose of designing the processes for the programming, follow-up and monitoring of the projects that are implemented with the Program's resources in all stages. It will also be necessary to improve the PAPT's current internal processes in the different planning and administration units. PRONASAR's experience will be taken into consideration for the Program's and all of its project cycles; especially the mechanisms of programming, monitoring and follow-up that are applied to the execution of different projects in the rural Program area.

(5) Operations Manual proposed by the Feasibility Study

The operations manual shall be be reviewed by the Operating Consultant for the Program during the implementation stage of the Program , from the point of views described hereafter.

(6) Review of the Operations Manual

The Program will complement the institutional diagnosis and evaluation of the existing functional structure of the PAPT The number of personnel and the level of qualification of the staff assigned to different projects and to the Program, the system of information and communication system, the support processes (facilities, administrative aspects, accounting, logistics and finances, among others.); with the purpose of allowing PAPT to develop processes and activities of their competence, for the administration, programming, execution, monitoring and evaluation of the program's components. The integral-implementation model and the policies and strategies for small rural localities will be considered.

Based on the above-referenced analysis and assessments, the Operating Consultant shall design the processes of programming, follow up and monitoring for the implementation of the Program in charge of the PMU. With such purpose the OC shall describe the main processes included in the chain of value and support, which will allow the increase of the efficiency of the implementation of the projects. Likewise, the objective, activities, characteristics and time required by each process shall be evaluated, as well as the responsible people, to accomplish the goals and objectives of the Program and the inter-relation with the involved organizations (PMU, municipality, communities, JICA, Operating Consultant, supervisor, JICA). All this is proposed in Iten 4.20 of the Present Study Asimismo, se deberá revisar el objetivo, actividades, características, el tiempo que requiere cada proceso y los responsables de cada uno de ellos, hasta lograr los objetivos y metas del Programa y las interrelaciones con los

organismos involucrados (UGP, municipalidades, comunidades, JICA, consultor operativo, consultor, supervisor, JICA). Todo esto se encuentra planteado en el acápite 4.20 del presente estudio.

Likewise, the flow chart of programming, monitoring and evaluation procedures proposed in this Study shall be reviewed. Also the times required by each process shall be indicated; the participation of the involved parties (PMU, municipalities, communities, JICA, Operating Consultant, Supervisor) shall be defined; and the time line and critical route shall be determined to identify the activities whose delay may extend the total length of the Program's execution, whose period of implementation is 10 years.

(7) Requirement to be determined by PAPT/PMU

Presently, the Rural Sanitation Operative Unit is in the process of implementation and the PMU for the Program will be formed in this unit. The organizational structure of the PMU was proposed in the latter part of this report. The PAPT or PMU should determine the required inputs and resources for the formation of the PMU such as personnel, materials, equipment and financial resources with reference to the organizational structure proposed by the Study. In regards to the personnel, they shall specify the characteristics of the required porfessionals and the number of people necessary, with the purpose of determining the requirements of capacity-building for the current. For this, a functional structure is to be designed, allowing PAPT to carry out its activities as the Executing Unit. Regarding the materials and equipment, the requirements of infrastructure (facilities), furniture, and equipment will be taken into consideration, among others that allow the personnel to implement the activities of each process. The requirements of financial resources should be established in order to cover the costs and/or expenditures of the materials, equipment and personnel in charge of the PMU.

(8) Indicators for Monitoring

The PMU together with the consultant for the Program should select the indicators of management or the performance, according to criteria for the efficiency, effectiveness and quality so that a timely decision are to be made by the Executive Direction of the PAPT. Such indicators should reflect the critical activities of the programmed processes, the specific need of the beneficiaries of the information and the ease for its application and follow up.

(9) Involvement of Technical Adviser/s in PMU

During the execution of the Program, the main consultant for the Program (Operating Consultant) shall select/design the facilities and the other consulting group (Design Evaluator) will evaluate the selection/design for approval under the supervision of the PMU. Because selection/design of facility/system itself will have significant impacts on operation and

maintenance of the facility/system, sustainability will be largely depending on the selection and design of the facilities/systems. The Feasibility Study has noted during its execution of the study that the tendency is to prefer more sophisticated facilities/systems than what is considered to be more suitable to the locality from sustainability point of view.

To this effect, the Feasibility Study considers that the PMU itself shall have capacity of technical evaluation so that the PMU is able to counter check the selection of technical solutions by the consultants (Operating Consultant and the Designs Evaluator), from the sustainable point of view. For this purpose it may be recommended that a technical adviser to be invited with the support of the prospective financer.

4.8 Description of the Technical Alternatives in the Program's Project

4.8.1 General Considerations and Criteria for the Selection

(1) General Considerations

As stated previously in chapter 4.3, technical alternatives should comply with the strategies established in the National Plan for Sanitation (2006 – 2015) that prioritized the following actions: (i) to increase the number of water supply systems with disinfection systems, (ii) to provide different levels of service or technical options for feasible and sustainable implementation of the systems; and (iii) to promote solutions with latrines for sanitary disposal excreta as stated in the clause 2.7.3 of the Plan 2006 - 2015.

It is also noted that the policies and strategies of implementation in small localities and the rural sectors in the Minutes of discussion by the MVCS and the Cooperation Organizations[4] state that for the implementation models for project executions must be considered that: (i) the water supply should have house connections, except in dispersed rural areas; (ii) individual sanitation solutions are considered for rural sanitation and sewerage could also be considered in small cities.

One of the main characteristics of the five (5) administrative regions of the Amazon Forest is that most of the localities (68.9%) have less than 100 houses and that barely 9.0% have more than 200 houses. This is further evident when it is considered that there are 902 localities (60.1%) out of the total 1,500 of the target localities and about 72% of the localities have not more than 100 houses (43.2% of the total)[5].

Due to the aforementioned conditions in the Program's area, in particular in the Low Forest region (Conglomerate-1), the Feasibility Study should emphasize and prioritize that technical options shall be flexible in accordance with the conditions of the target area. It must be taken into consideration that there is very little experience regarding water and sanitation projects in the Low Forest region.

(2) General Criteria

The selection of technical alternatives for the 50 sample localities shall be made in accordance with the following general criteria:

1) To be appropriate for the conditions of the rural areas
    - Natural conditions; such as, climate, geography, water table level, flood areas, topography
    - Socio-economic conditions
    - Capacity of population for administration, operation and maintenance
    - Cultural aspects of the population toward the water and sanitation

[4] Minutes of the Working meeting among VMVCS, DNS, BID, BIRF and JICA (06 march 2009)
[5] Table N° 4.-2: Locality Size by Conglomerate

- Availability of the existing facilities

2) To be widely diffused and known by the sector

- Minimum facilities and equipment necessary
- Easy operation and maintenance
- Efficient use of the existing capacity, through restoration of the already installed systems, where feasible
- Selection of gravity system, where possible

3) To allow the introduction of experiences that are appropriate in the rural Amazon area, previously applied in other projects in the region.

For the identification of the technical options or alternatives for the potable water and sanitation projects of the present Program, the results of the experiences of other projects (ADRA Peru, CARE, FONCODES and MINSA) carried out in the country were taken into consideration. Also, it was taken into account the experience of projects in rural Amazon area in other countries of the region.

4.8.2 Identification and Applicability of Technical Alternatives

The classification of the technical options by conglomerate was carried out according to the proposals presented, analyzed and evaluated in each one of the localities' *Perfils* of the sample localities for the Program, which were grouped in the respective conglomerate.

For the application of the technical alternatives, the initial promotion and the participation of the population in the selection of the technical option are key factors. This selection shall be made from a menu of pre-established options considering the sensitivity factor for the acceptability of the water supply and sanitation systems.

Likewise, non conventional options that could be applied, especially in the Low Forest region, was taken into account, considering that "*factors that are to be insisted in the selection of a technical solution for water supply are of technical, economic, social and cultural type". In addition, "one of the causes of the lack of sustainability of the water supply systems is the selection of technologies that, in most cases, exceeded the capacity of operation, maintenance and administration of the benefited community, leading to deterioration and abandonment of the facilities before the useful life of their components*"[6].

[6] Considerations for the Selection of the Technical Option and Level Service in Water Supply Systems - OPS/CEPIS. Lima, 2006

(1) Water Supply Systems

i) Applicability of Technical Solution

The essential factor for the selection of technical alternatives of water supply system will be the type of water sources, because this will have close relation with the difficulty or easiness of operation and maintenance of water supply systems. From this point of view, applicable types of water supply systems were classified as (i) Gravity system and (ii) Pumping system, as proposed in the previous pre-investment *Perfil* study for the Program. When a 'system' for water supply was not considered applicable, it was classified as (iii) individual solution.

Also, it was taken into account the document[7] elaborated by OPS[8]/CEPIS[9], as a tool for the identification of the most suitable technical option and service level for the rural area. The factors in the document are mainly referred to technical, economic, social and cultural aspects that by interrelating, will allow the selection of a suitable technical option and service level for the community's needs and expectations, as shown in Figure Nª 4.8.2-1. This figure is recommended to be used as a guideline for the selection of the technical alternative for water supply.

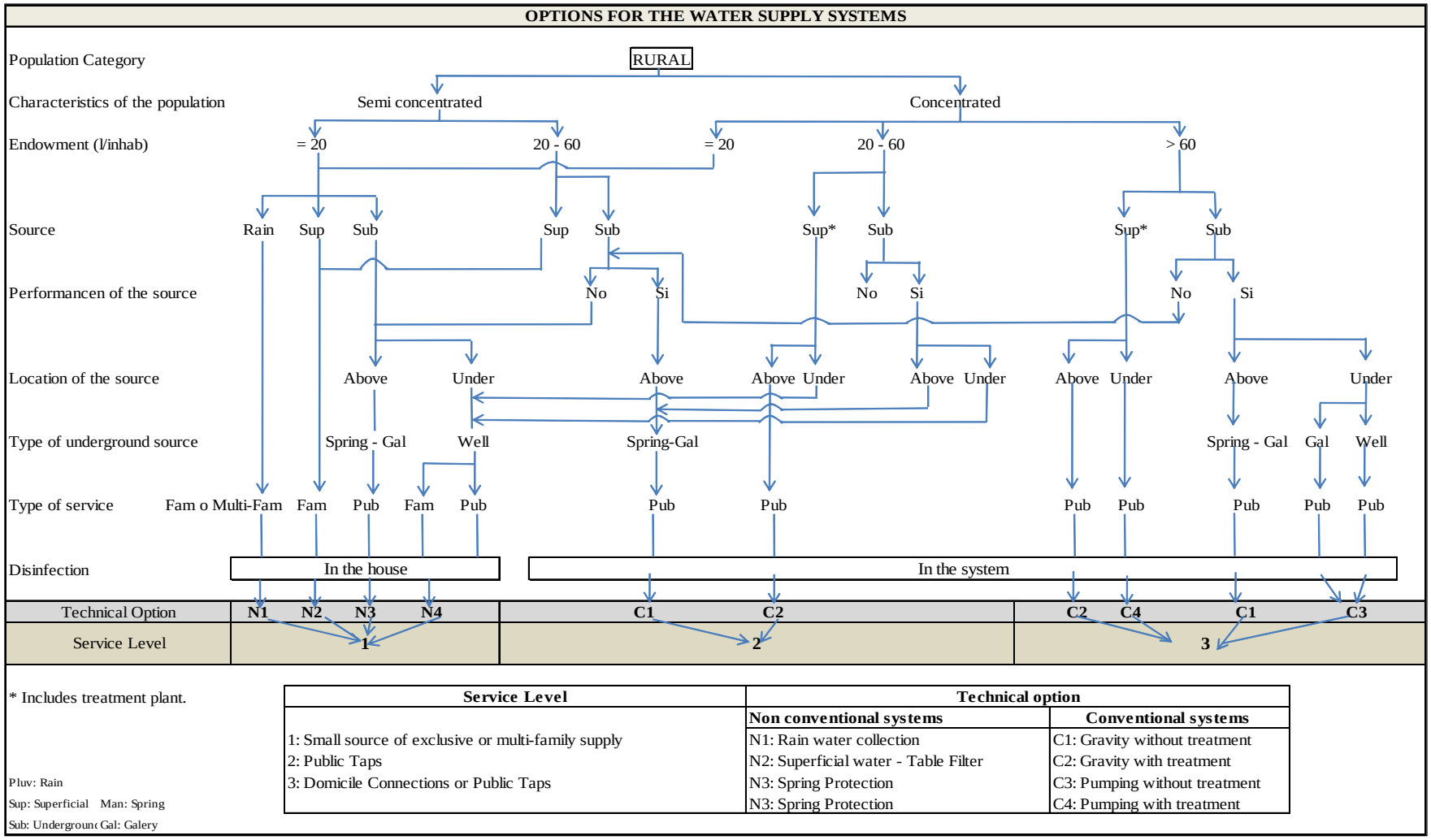
ii) Alternatives of the Water Supply Technical Solutions

Table N° 4.8.2-1 presents the classification of the water supply systems, taking mainly into account the type of water source and the required treatment system for each case.

The "conventional" systems provide a public water supply at household level, through house connections, using water distribution network. On the other hand, the "non-conventional" systems consist of individual and multi-family solutions; and demand transportation. These systems are, for instance: rain water collection, superficial water – table filters, spring protection and well with manual pumps. The characteristics of these water supply systems are summarized in Table N° 4.8.2-2.

[7] Considerations for the Selection of the Technical Option and Level Service in Water Supply Systems - OPS/CEPIS. Lima, 2006
[8] Pan American Organization of Health (*Organization Panamericana de la Salud*)
[9] Pan American Center for Sanitation Engineering (*Centro Panamericano para la Ingeniería Sanitaria y Ambiental*)

Figure Nº4.8.2-1: Guideline of Options for the Selection of the Water Supply Systems



* Includes treatment plant.

Service Level	Technical option	
	Non conventional systems	**Conventional systems**
1: Small source of exclusive or multi-family supply	N1: Rain water collection	C1: Gravity without treatment
2: Public Taps	N2: Superficial water - Table Filter	C2: Gravity with treatment
3: Domicile Connections or Public Taps	N3: Spring Protection	C3: Pumping without treatment
	N3: Spring Protection	C4: Pumping with treatment

Pluv: Rain
Sup: Superficial Man: Spring
Sub: Undergroun Gal: Galery

Source: Document "Considerations for the Technical Option and Level of Service Selection In Water Supply Systems". Produced by: JICA Study Team (2010)

Table N° 4.8.2-1: Identification of Technical Solutions – Potable Water Supply

Method of Water Acquisition					Water Source		Treatment		Distribution Methods
					Clean or Turbid	Possible Water Source	Filtration	Disinfection	
1	Gravity System			G-W/O-T	Clean	Spring	Non	Chlorination (boiling) (note-1)	Home, Public taps
				G-W-T	Turbid	River, Stream, Lake	Sedimentation, Slow sand-filter		
2	Non-Gravity System	Motorized Pump	- Public Elec. Grid, - Solar Gen. - Petrol-driven Gen..	P-W/O-T	Clean	Tube well, dug well	Non		
				P-W-T	Turbid	Tube well, Dug well, River, Stream, Lake	Slow sand-filter		
		Manual Pump + (Elevated) Tank		P-M	Clean	Tube well, Dug well	non	Boiling, (Chlorination) (note-2)	Public tap at source
				P-M-T	Turbid	Tube well, Dug well	Home sand-filter		
3	Individual Solution ・ Protection of water source, ・ Rain water, ・ Hand-dug or Tube well with hand pump			I-S	Clean	Spring, Stream, Rain	Non	Boiling, (Chlorination) (note-2)	Water fetching
					Turbid	River, stream, Lake, Pond	Home sand-filter		
4	Other options				As to be identified as appropriate in the field				

1. This table shall be regarded as a guideline and does not exclude other possible options.
2. A technical option shall be selected through participatory approach by the potential users with technical advice of the field operators.
3. Cost implication for AOM must be clearly stated to the potential users.
4. A technical option that imposes the AOM cost exceeding the capacity to pay of the potential users shall not be selected.
5. Note-(1): If the users do not prefer the chlorination, boiling of water for drinking shall be recommended.
6. Note-(2): Boiling will be recommended for this option.

Source: JICA Study Team (2010)

Table N° 4.8.2-2 Alternatives of Technical Solution

System		Facility Alternatives	Salient Features
Conventional Infrastructure			
Gravity System	G-W-T	Water intake, conveyance facilities, treatment facility (sedimentation, sand slow filter), reservoir, disinfection, distribution pipe, house connection (intra house connection) or public taps.	Free water-flow by gravity (energy free) for water intake. Treatment facility required. The second minimum O&M among the four (4) system alternatives.
	G-WO-T	Water intake, conveyance facilities, reservoir, disinfection, distribution pipe, house connection (intra house connection) or public taps.	Free water-flow by gravity (energy) for water intake, The minimum O&M among the four system alternatives
Pumping System	P-W-T	Water intake with pump (riser pipe), sand slow filter, reservoir, disinfection, distribution pipe, house connection (intra house connection) or public taps.	Pumping needed, Treatment facility required The largest O&M needed among the four (4) system alternatives
	P-WO-T	Water intake with pump (riser pipe), sand slow filter, reservoir, disinfection, distribution pipe, house connection (intra house connection) or public taps.	Pumping required. The second largest O&M needed among the four (4) system alternatives.
Non Conventional Infrastructure			
Manual Pump (Multi-family type)	P-M-T	Intake with pump to reservoir, disinfection and taps.	Manual pump operation.
	P-M	Intake with pump to reservoir, disinfection and taps.	Manual pump operation, The minimum O&M among the alternatives, except individual solution
Individual solution		(i) Spring protection and water fetching (ii) Hand-dug-well or tube-well with manual pump (iii) Rain water harvesting with home treatment facility (filter) if required[10].	Individual solution.
Others		Others as may be identified and adapted to the geographic and socio-cultural conditions of the Amazon Forest.	

Source: JICA Study Team (2010)

iii) Individual Solutions

In the localities where any types of water supply facilities/systems are considered not to be feasible due to reasons of economical, natural conditions or else, individual solutions will be recommended. The main characteristics of such methods are described in the following items.

a) Manual Pump

The facility consists of a (multi-family) manual pump for the extraction of underground water from a hand-dug or excavated tube well. Water will be conducted to an (elevated)

[10] 'Bio-sand filter or similar one (http://www.biosandfilter.org/biosandfilter/)

reservoir placed next to the well and, then, it will be lead to the public taps, for the water fetching. The installation of a (elevated) reservoir allows the chlorination with a sufficient contact time for an adequate disinfection by residual action of chlorine, and alleviation of peak operations of the pumping.

An additional 30% of the well excavations has been estimated, in case the water obtained is not usable, due to low flow of exploitation or a quality of water not fit for human consumption.

b) Rain Water Intake

The rain water will be collected from the roofs of the households through gutters that will carry the recollected water to the PVC tanks for the filtration and subsequent disinfection, through chlorination or boiling before consumption. Depending on the quality of the obtained water, home filters may be used. The application of this alternative will depend, also, on the rainfall seasons (m^3/m^2, period) and depending on the possibility of storage for dry season or the use of a complementary source of water for this season.

c) Water Fetching with Treatment

The inhabitants will fetch the water from the water courses or meanders and lagoons; afterwards it will be treated through filtration equipment installed in the households or multi-family equipment. Later, they will proceed to disinfection of the water before its consumption, by means of chlorination, boiling or solar radiation.

iv) Service Levels

Although the house connection should be considered as the main option for the water supply facility, the policy of the Sector also encourages the provision of different levels of service or technical options. Particularly, this provision will be important for the case of the water supply systems in the Amazon area, where not many experiences on water supply projects have yet been in place. At the IT/R meeting11, it was recommended that technical options shall not be limited and shall remain opened to all possibilities that have not been identified yet but may be identified in the course of the implementation of the Program (formulation stage of the pre investments studies of the projects for the localities of the Program).

Taking the above aspects into consideration, the Feasibility Study proposes the following service levels (water distribution type) for water supply.

1) House connections

[11] Work Meeting, presentation of the Interim Report of the Feasibility Study, on October, 24Th 2009 (VMCS, DGPM and the Consultant Team)

2) Pubic Taps
3) Individual solutions

v) Regional and National Experiences of Water supply with non-conventional Systems

The experiences for water supply with "non-conventional" systems in the rural zones in Central and South American countries with environmental conditions similar to those in the rural Peruvian Amazon are shown as alternative systems or technical options that would be possible to apply, especially in localities in the Low Forest zones.

Manual Pump

In Honduras, the Program of Water and Sanitation Latin America and The Caribbean, sponsored by the World Bank and carried out by the Honduran Found of Social Inversion (*Fondo Hondureño de Inversión Social*) and the International Foundation SODIS (Solar Disinfection[12]), has gathered information regarding the implementation of solutions such as long-distance manual pump, rain water intake and solar disinfection that has benefited more than 10,000 inhabitants.

In the case of **manual pumps**, the water is conducted through pipes to small elevated reservoirs (with capacity of 75 liters), placed in the houses. From there, the water distribution will be carried out by gravity towards house connection generally consisting of two branch pipes: one in the shower and the other in the sink. This technology is applicable to those places where water sources are located lower than the households with an approximate altitude difference of 30 meters and at a distance of 800 meters. These systems have been applied in the Peruvian Forest and Bolivian rural areas.

Rain Water Intake

As far as the **rain water collection system,** the roofs of households have been adapted as 'catchments of rain' with a tank/reservoir of

[12] Soluciones Innovadoras para el suministro de agua en comunidades rurales dispersas en Honduras-Programa de Agua y Saneamiento. 2003

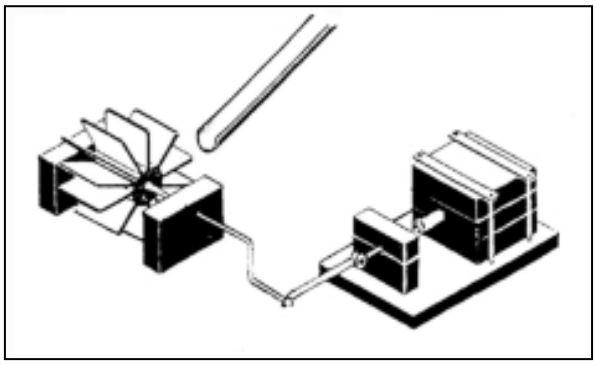
4.5 to 5.0 m^3 for the storage of water for dry seasons. This "technology is applicable in those places where other type of water sources are not available".

The experience in **disinfection through solar radiation** is not useful for treatment of large volumes of water. It requires relatively clear water (turbidity under 30 Units) to be filled in transparent bottles. After shaking, the bottles are to be exposed to solar radiation for at least six (6) hours or, in case of cloudy days, for two (2) days.

Solar Disinfection

The experience in these types of solutions of non-conventional supply in the regions of the Program's area may allow a better acceptance in the localities in accordance to the requirement of localities.

An appropriate technology for water impulsion is the **Wooden Pump**[13] for eater, which p umps the water from one place to another with no type of effort and faster, using the water itself as its energy source. The system consists of: a) a basic hydraulic impulsion pump, which is activated by a rod-crank mechanism; b) a positive-displacement pump built from a car damper and embedded in a wooden block. The 60 lt/minute capacity will depend on the fall of the hydraulic wheel, the diameter of the damber used as a cilinder, and the pump head.

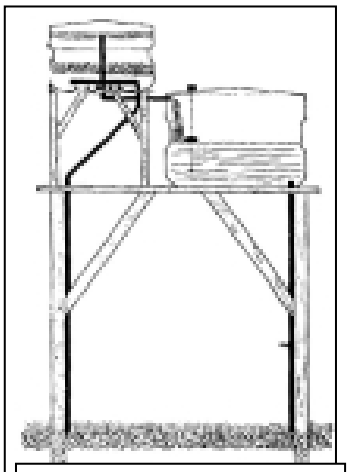


Bomba de Madera

The valves are made of pieces of leather or tire in two other wooden blocks. A bottle is used as a pneumatic damper. This type of pump has been used in the region of Capizal, SC. (Brazil).

Among the technical solutions for water supply, the "**In-reservoir Filter"** [14] has been installed in Cándido Godoi (Brasil); this system consists of two (2) elevated reservoirs; the first one, which is the filter, is a 150 lt. Is fed through the bottom in a bed of middle-size gravel; the water rises through a layer of fine sand, one of wood charcoal and comes out to the surface through a layer of fine gravel.

This system or technical option is recommendable to purify the water in volumes over 500 liters, so it may be fully used.



Filtro en Tanque

[13] Programa de las Naciones Unidad para el Desarrollo. Tecnologìas en la Erradicación de la Pobreza (1987)

A pump is required to raise the water up to the filter.

In Peru, water supply projects using manual pumps have been implemented in several administrative regions, such information has been gathered by CEPIS, in the framework of the Agreement with the Swiss Agency for Development and Cooperation (COSUDE) for the "Evalution Study of Manual Pumps", carried out in 2003. Institutions like ADRA-Perú[14], CARE Perú[15], FONCODES y DIGESA[16], the Hospital of Huacho, Huara, Oyón in Lima and the La Caleta Hospital in Chimbote, have installed manual pumping systems in the regions of Ancash, Lambayeque, Lima, Loreto, Puno and Ucayali.

The manual pumps installed in the administrative regions within the Program's Área have been implemented thanks to FONCODES. This instalations include Flexi-OPS manual pumps and basic pumps of easy operation and maintanance.

Acoording to the information of the study, a total of 1468 pumps were installed in the above-mentioned regions. From all these, 53 are located in Loreto (years 1999 and 2000) and 6 in Ucayali (years 1998 – 1999), benefitting 114 and 18 families, respectively. Although, the status is not indicated, these manual pumps have, in average, ten years of installation, and from the localities of the sample where they have been installed it is inferred that 50% of the manual pumps are in operation, in average.

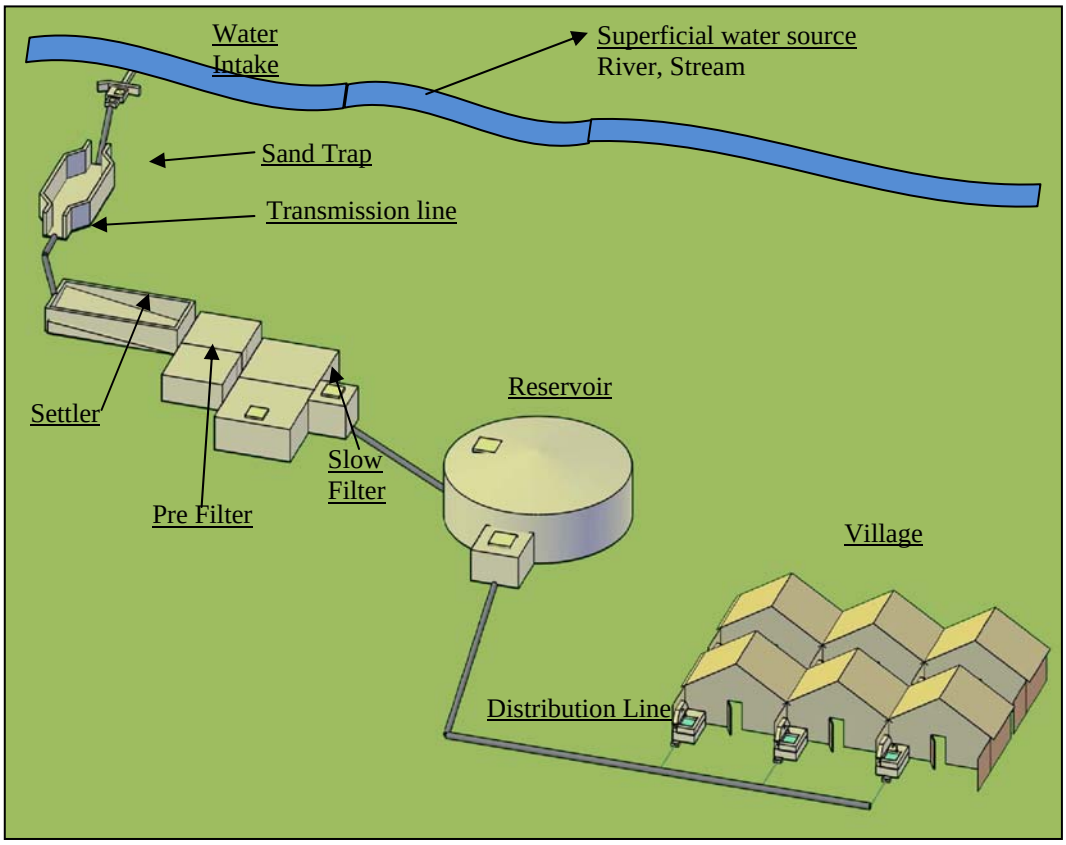
The existing experiences in the regions of the Program's Área for these type of unconventional supply solutions will allow for a better acceptance of these systems among the populations in which these solution shall be implemented.

vi) Figures of Potable Water Supply

The following figures present the supply systems proposed for the 50 sample localities of the Program.

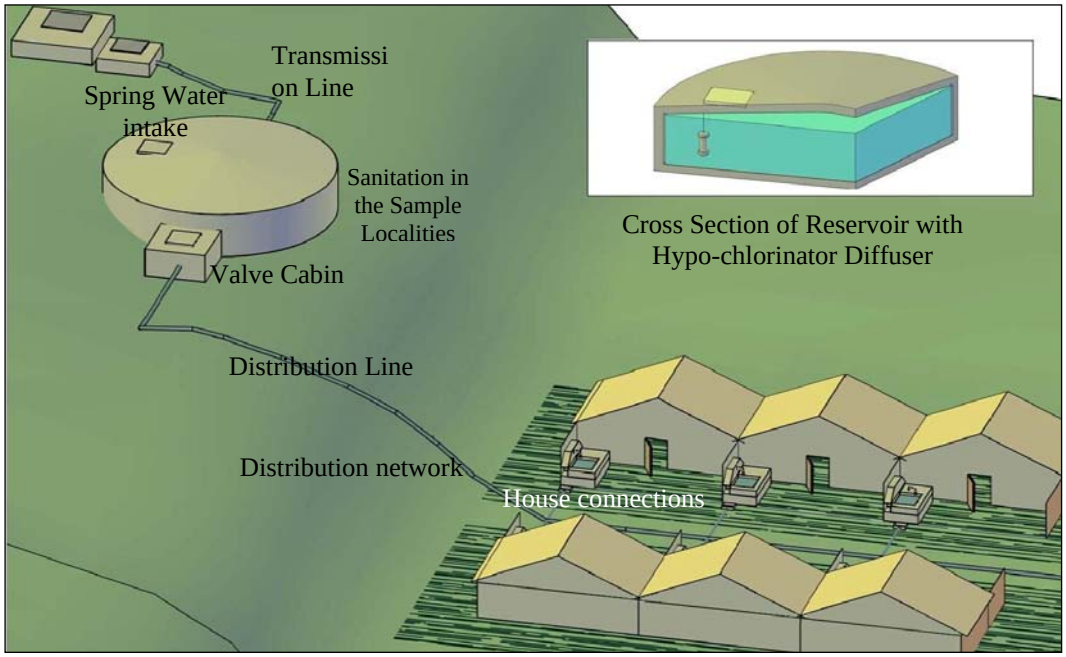
[14] ADRA Peru: Adventist Development and Relief Agency - Perú
[15] Cooperative for Assistance and Relief Everywhere - Peru
[16] Dirección General de Salud Ambiental.

Figure N° 4.8.2-2: Supply System by Gravity with Treatment



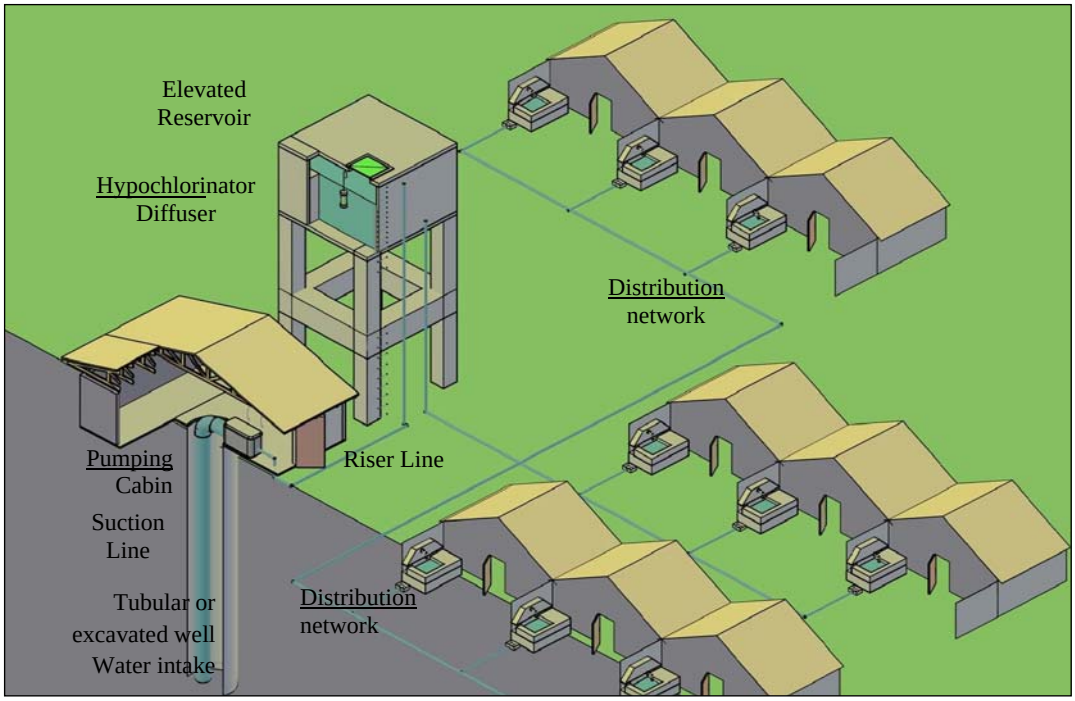
Source: JICA Study Team (2010)

Figure N° 4.8.2-3: Supply System by Gravity without Treatment



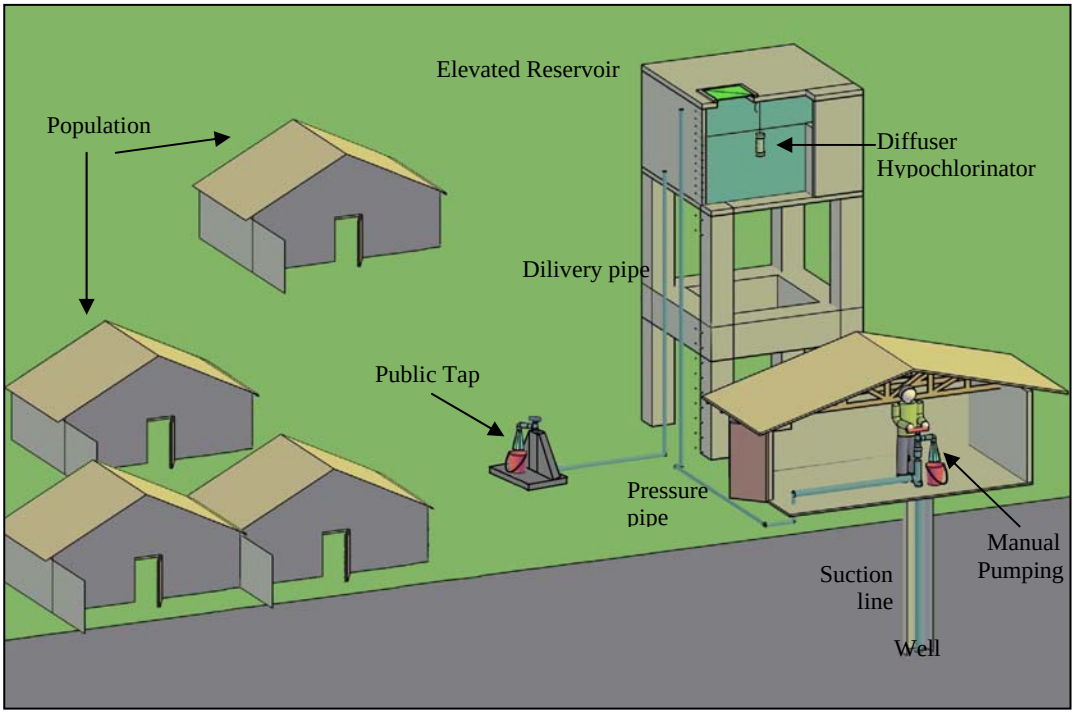
Source: JICA Study Team (2010)

Figure N° 4.8.2-4: Supply System by Pumping with Treatment



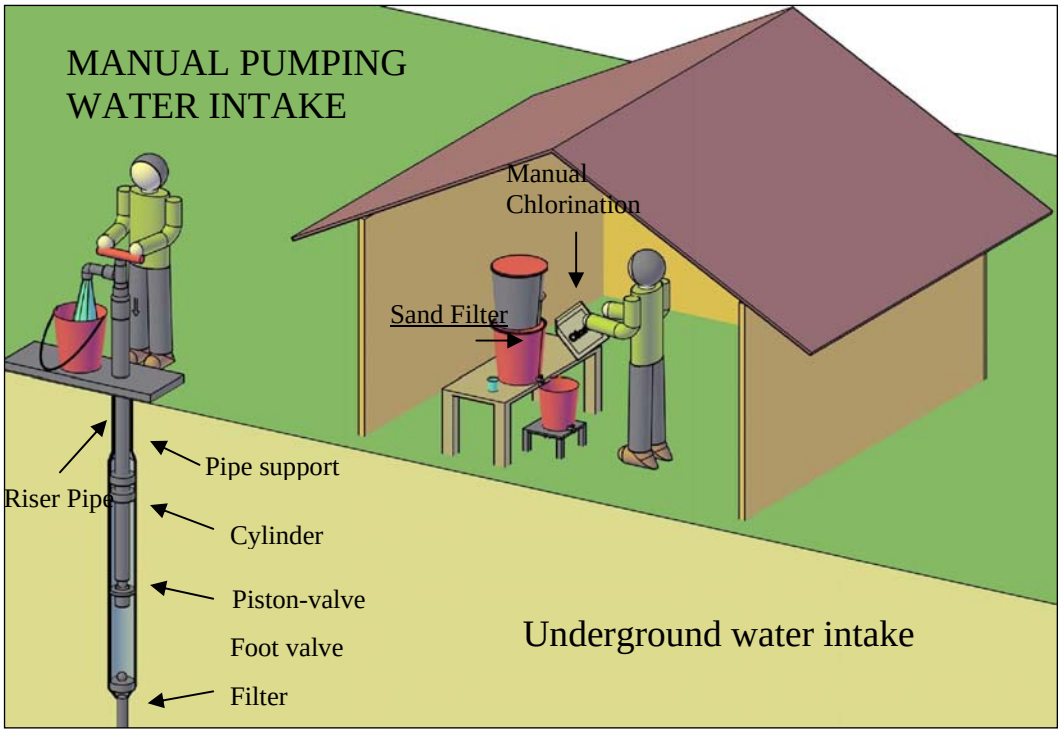
Source: JICA Study Team (2010)

Figure N° 4.8.2-5: Supply System by Manual Pumping – Reservoir and Public Tap



Source: JICA Study Team (2010)

Figure N° 4.8.2-6: Supply System by Manual Pumping and System by Carrying out with Treatment



Source: JICA Study Team (2010)

(2) Sanitation Alternatives

i) Application of Technical Solution

The proposed solutions for sanitary disposal of excreta are framed within the considerations of the sector's development policies, specifically within the policy that establishes that the solutions for sanitation should be individual and that the services should be sustainable.

The field studies at *Perfil* level in the 50 sample localities confirmed the application of such policies; because the sewerage systems have rarely been operational for long periods in the localities of the rural areas, because of lack of proper operation and maintenance and even because of insufficient number of family connections to the public network.

However, there are cases of rural localities with urban characteristics, where there is insufficient land space for individual installation of dry pit latrines or septic tanks. Therefore, the Feasibility Study includes collective solutions (sewerage), as an exceptional case though the collective solution should not be recommended in principle. .

For the case of flood prone areas or areas with shallow groundwater, such areas in Low Forest region, special attention needs to be given for the selection of the systems and/or

facilities of sanitation. In the sample localities of such conditions, composting latrine was proposed rather than simplest solution of dry-pit-latrine option.

The following solutions were proposed for the 50 sample localities:

1) Ventilated dry pit latrine
2) Double-vault ventilated composting latrine
3) Flush-pour latrines with septic tank or bio-digesters and percolation pit
4) Collective solution (sewerage network)

In the case of the collective solution, the households are to be connected to the sewerage network that collects the disposals and conveys them to a treatment system, such as septic tanks, Imhoff tanks, biological filters or oxidation lagoons. Final disposal may be carried out through irrigation canals, dry gullies, water flows or others that may be suitable. The sewerage systems could be of the conventional, simplified or reduced-diameter types.

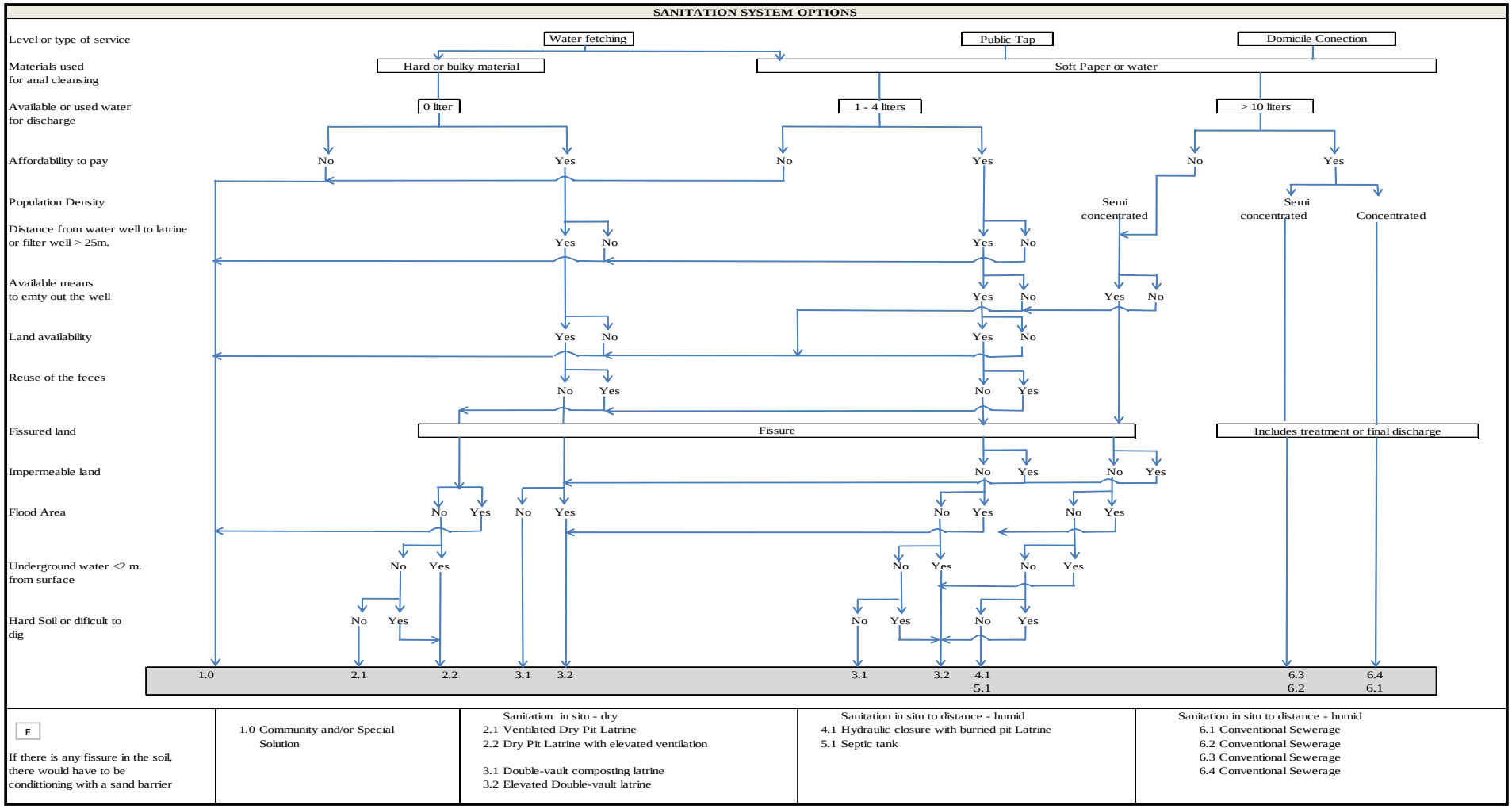
The design of sewerage networks and treatment units shall be carried out according to the current norms, such as the National Construction Regulations and the Design Norm Project for Water and Sanitation Infrastructure for Rural Population Centers.

Possible application of sanitation system/facilities are shown in the Table N° 4.8.2-3.

For the selection of the technical solutions the document[17] produced by OPS/CEPIS shall be taken into account as a tool to identify the most appropriate technical option and level service for the rural area, as show in Figure Nª 4.8.2-2 that will be useful as a guideline in the selection of the technical option or alternative for sanitation.

[17] Algorithm for the Selection of the Technical Option and Service Level of Sanitation OPS/CEPIS/UNATSABAR. Lima 2002

Figure Nº 4.8.2-7: Guide for the Selections of Technical Options for Sanitation Systems



Source: Document "Low Cost Products Supply and Sanitation Services Study of the Water Supply in Perú".
JICA Study Team (2010)
Note: The technical alternatives will take in account the policies and strategies established in the Sanitation National Plan (2006 - 2015), within the ones, the excretes disposal is promote through latrines.

ii) Service Level

1) Basic Sanitation Unit with or without pour flush
2) House connection

Table N° 4.8.2-3: Identification of the Technical Solution and its Implementation

Solution Type	Technical Solution	Operations Principles	Implementation	
Individual Solution	Ventilated dry pit latrine	Excreta (organic matter) deposited in dry pit will get decomposed, while the liquids are infiltrated in the surrounding soil. The ventilation duct that comes from the pit eliminates odors sending the toxic fumes towards the atmosphere, above the superior part of the facility or cabin. The interior is kept in the dark, in order to attract the insects that come into the pit towards the light of the superior part of the ventilation pipe, so that they stay trapped in the mosquito net.	The location must be selected to prevent the entry of water or underground water to the pit. This option is recommended in areas with little access to water. The poor results in the implementation and use of dry pit latrines are generally because of inadequate education of the user, regarding the use of the facility and /or a bad design and construction.	Suitable primarily for Conglomerate-2
	Double-vault ventilated Composting latrine	The excreta are evacuated to a chamber. Dry and absorbent organic material, like sawdust, ash, vegetable matter (dry) are added after each use to control the odors of the fecal matter in decomposition state and/or to control the humidity and to facilitate biological decomposition (Composting). In the process of dehydration, the ventilation system promotes the humidity evaporation.	The control of the humidity's content is important for the suitable operation. Many times high humidity's content turns the chamber into unhygienic and generates foul smell and therefore it's difficult to evacuate. The requirements of continue sanitary education to the users are important for the suitable operation, especially in the composting process.	Suitable primarily for Conglomerate-1 Intensive education is necessary
	Pour-flush latrines with septic tank and percolation well	The excreta are hauled hydraulically towards the sedimentation chamber of the septic tank, where they are retained to allow the sedimentation and biological decomposition. The liquids, partially treated, will go then from the tank to well or percolation ditch for the final disposal. The digested mud gets accumulated inside the tank and it is required for it to be evacuated periodically.	Applicable where the soil has a big permeability for the infiltration of sewerage A supply of safe water is required. The lean results are due generally to a poor design and construction and the use of inadequate material for anal cleaning.	Suitable primarilyfor Conglomérate-2

Solution Type	Technical Solution	Operations Principles	Implementation	
Collective Solutions	Sewerage networks	The sanitations units with pour flush in each house are connected to a main sewerage and to the treatment facilities like: septic tank, Imhoff tank and biological filter or oxidation lagoons. The final disposal will be carried out in the subsoil or water bodies or will be reused in agriculture and aquaculture.	It should only be applied in villages where there is not enough space for individual solutions.	Applicable only for areas with dense population.
Others		Other individual solutions as it is identified		

Source: JICA Study Team (2010)

The experience in sanitation in the rural areas, concerning the sanitary excreta disposal in flood-prone areas or areas with shallow groundwater in the Peruvian Amazon Forest has been gathered in a document produced by the OPS[18]. The evaluated information was provided by public and private institutions, such as FONCODES, MINSA, CARE Peru and ADRA Peru. These organizations have developed projects regarding excreta disposal in floodplains or low water level areas.

The proposed systems for the disposal of excreta in flood-prone areas or areas with shallow groundwater consist basically of composting latrines located at higher levels than the flood levels (whether they are hanging, elevated or floating) The facilities include simple constructions with concrete vaults or prefabricated systems for continuous composting. The success or failure of the systems depends on the operation, maintenance and good care that the users or families give to the facilities.

Other described systems (with filtration in the underground or excavated pits) will be located in hilly (higher altitude) zones that are not prone to flood. In the information obtained in the document of the OPS, it is mentioned that the project of the International Federation of Red Cross Societies and Red Crescent of Latin America, that have carried out works since 1998 in Amazonas area communities. Up to 2005, “more than 65,000 people in 26 communities in the Amazon areas of Bolivia, Brazil, Colombia, Ecuador, Peru and Venezuela” in flood prone areas have been benefited. The system used in these areas was the model of composting dry latrines, installed in the houses and with a bowl that separates urine from faeces.

The implemented technologies for sanitary disposal of excreta in flood areas of the country are referred to composting processes. The concept of operation of such processes has been implemented around the world, with varieties of ecological system design,

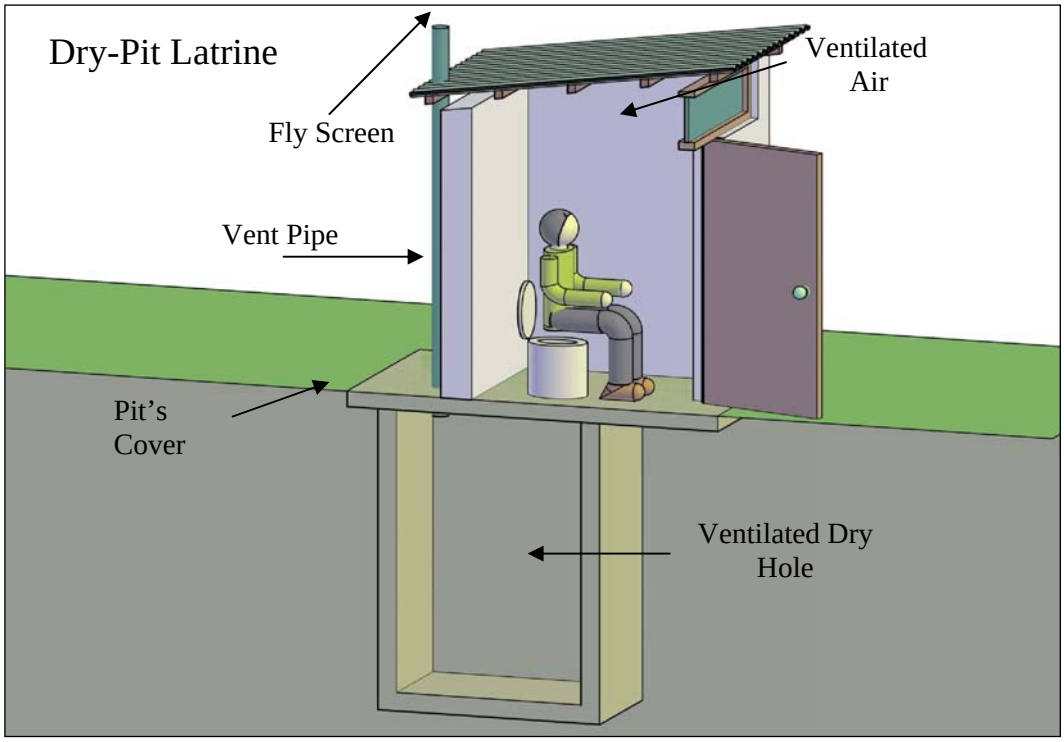
[18] Latrines in Flood Areas – Pan American Health Organization – Lima, 2005

based on the dehydration or continuous composting. These models can be adapted to flood areas or low water level areas localities in the Low Forest area of the Program.

iii) Sanitation Services Figures

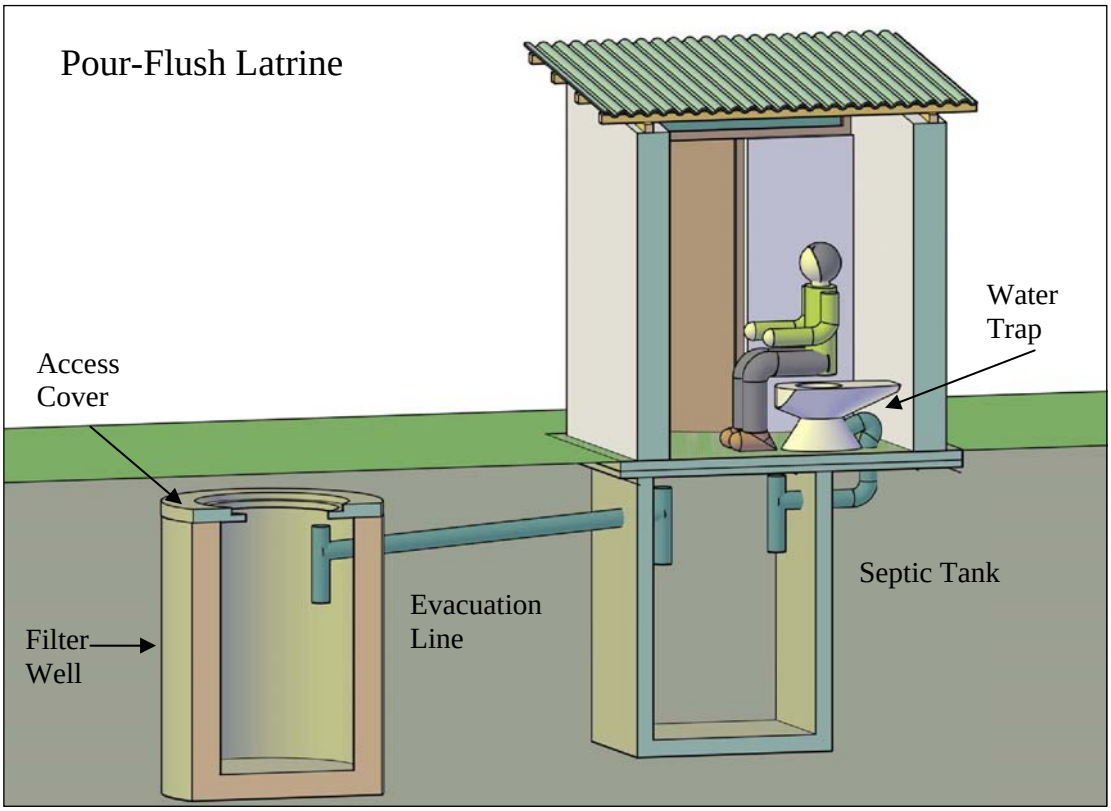
In the following figures, the technical solutions for sanitation for the 50 sample localities of the Program are presented.

Figure 4.8.2-8: Ventilated Dry-Pit Latrine



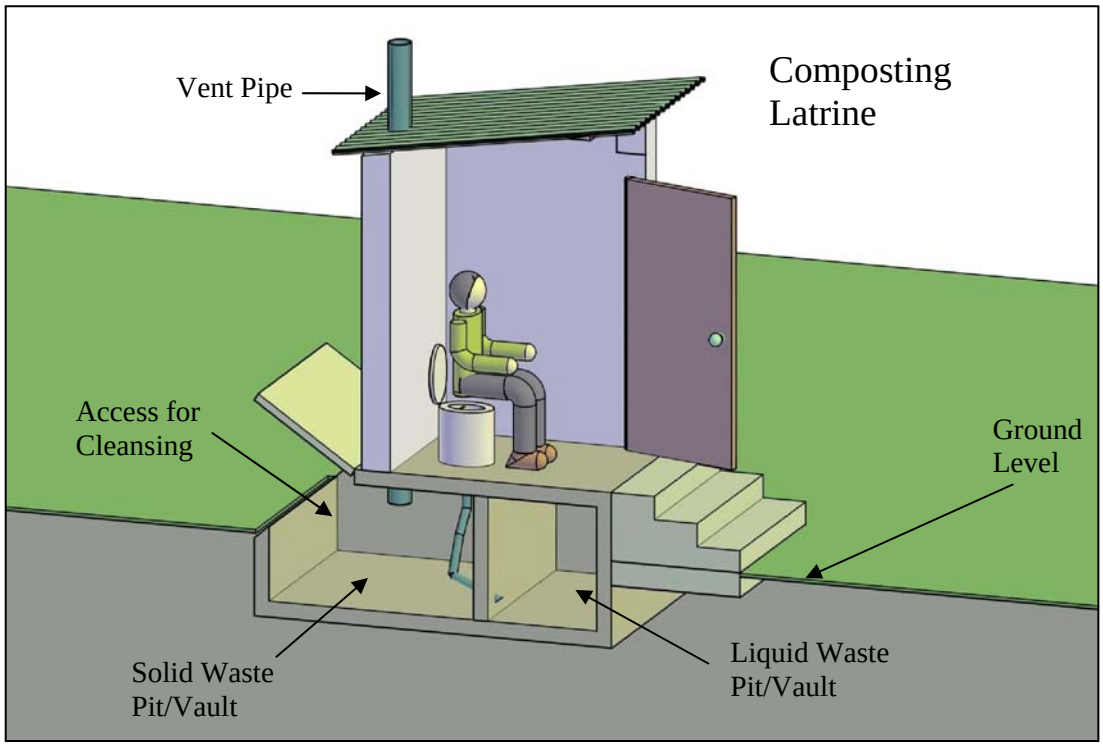
Source: JICA Study Team (2010)

Figure N° 4.8.2-9: Pour-Flush Latrine



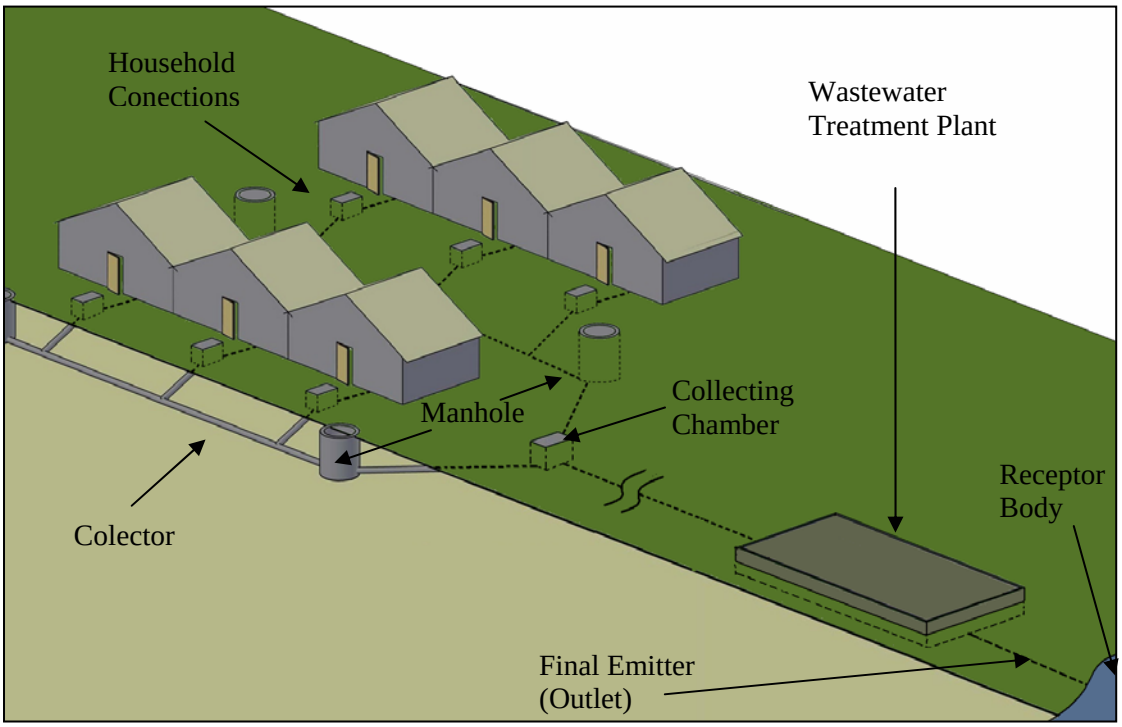
Source: JICA Study Team (2010)

Figure N° 4.8.2-10: Composting Latrine



Source: JICA Study Team (2010)

Figure N° 4.8.2-11: Sewerage System



Source: JICA Study Team (2010)

4.8.3 Technical options selected for the 50 sample localities

Based on the field survey, the analysis and selection of the 50 sample localities for water supply and sanitation facility, the Feasibility Study has identified the technical proposals for each one of these localities. The technical alternatives were selected based on the natural conditions of the localities, in accordance with the general criteria presented in the previous sub-chapters. Also, sustainable aspects such as cost effectiveness including O&M were considered.

Table N° 4.8.3-1 shows the list of 50 sample localities and the technical alternative proposes for each one of them.

The proposed alternatives for water supply take into consideration the existing facilities, the installed capacity, the use of the proposed systems and the requirements for its restoration and upgrade.

The existing concrete infrastructures, such as the intake facilities, treatment plants and reservoirs are the facilities that are in better conditions and that have been well used. On the other hand, the installation of new chlorination systems in all the localities was proposed, due to the inexistence of such systems in most of the localities.

Regarding the conveyance facilities, there are twenty-nine (29) proposed systems. Sixteen (16) of these require improvement and thirteen (13) require new facilities.

The transmission pipes proposed as new installation include twelve (12) improved systems and twelve (12) new systems. Four (4) existing transmission systems continue providing service under the current conditions.

For the distribution networks, the upgrade of twelve (12) systems and twenty (20) new facilities has been considered. The existing distribution networks in ten (10) sample localities require no changes. Seven (7) of the localities will have public taps for water supply that shall be installed in areas near to the elevated tanks.

In the localities with house connections, the conducted studies indicate that thirteen (13) systems are to be improved, and that twenty-one (21) new systems are to be installed. Seven (7) localities will be provided with water supply through public taps, which are systems that consist of manual pumps, reservoirs and taps. In seven (7) localities, the household connections will be restored and the number of connections may be increased.

Table N° 4.8.3-1: Summary of Technical Options for Water Supply and Sanitation in the 50 Sample Localities

N°	Administrative Region	Locality	Geographic Region	Type of System	POTABLE WATER																																SANITATION						
					Water Intake		Conduction Line					Cistern		Pumping System							Reservoir						Disinfection System		Aduction			Distribution			Connections										
					Upgrade/ Expansion	New	Diam.	Long.		Otros		Vol.	Material	Caseta de Bombeo	Pump	Diameter of the Impulsion	Lenght of the Impulsion Pipe	Energy	Condition	Treatment		Type	Apoyado	Elevado	Vol.	Material			Diameter	Length		Diameter	Lenght		Type	Number	Otros		Type		Intervencion	Treatment	Diam.	Long.	Number of facilities/connections
1	AMAZONAS	MIRAFLORES	F-F	G-WO-T		SPRING	2"	2015(N)	N	CRP=3 VP=1 VA=1	-	-	-	-	-	-	-	-	-	-	On the ground (N)	N		10 m3	C°	D-H(N)	N	2"	110(N)	N	(k)	(k)		H-C	48(U)	-	N	D-P-L (N)	L	N	-	-	-	51
2	AMAZONAS	TUTUMBEROS	L-F	G-W-T	SUP		2"	1000(N)	N	VP=1 VA=1	-	-	-	-	-	-	-	-	-	P-F/01 unit(U),S-L/1unit(U)	I	On the ground (U	I		10 m3	C°	D-H(N)	N	1 1/2"	34(U)	I	(k)	(k)		H-C	55(U)	-	I	D-P-L (N)	L	N	-	-	-	55
3	AMAZONAS	GUADALUP	L-F	G-W-T	SPRING		2"	10740(N)	N	CRP=5	-	-	-	-	-	-	-	-	-	S-L/01	I	On the ground (U	I		10 m3	C°	D-H(N)	N	2"	92(U)	I	(k)	(k)		H-C	77(U)	-	I	D-P-L (N)	L	N	-	-	-	77
4	AMAZONAS	PUERTO NARANJITOS	H-F	G-W-T	SUP		3"	1881(U)	I	VP=1 VA=1	-	-	-	-	-	-	-	-	-	S/01 unit(N),P-F/01unit(N),S-L/01 unit (U)	N	On the ground (U	I		90 m3	C°	D-H(N)	N	2"	762(U)	I	1"	842(I)	I	H-C	124(N), 42(U)	-	I	S-S(N)	N	N	I-T	8"	-	164
5	AMAZONAS	NARANJITOS	H-F	G-W-T	SUP		2"	2385(IU)	I	CRP=4 VP=1 VA=3	-	-	-	-	-	-	-	-	-	S/01 unit (U),S-L/01 unit (U)	I	On the ground (U	I		30 m3	C°	D-H(N)	N	2"	186(U)	I	(k)	(k)		H-C	215(I)	-	I	S-S(N)	N	N	S-L	8"	3082	215
6	AMAZONAS	MISQUIYACU BAJO	H-F	G-W-T	SUP		2 1/2"	3681.50(U)	I	CRP=4 VA=6 VP=6	-	-	-	-	-	-	-	-	-	S/01 unit (U),P-F/01unit (U)	I	On the ground (U	I		15 m3	C°	D-H(N)	N	UE	UE	I	(k)	(k)		H-C	58(U),11(N)	-	I	D-P-L (N)	L	N	-	-	-	69
7	AMAZONAS	SAN JOSE BAJO	H-F	G-WO-T	SPRING		2"	104(U)	I	VP=1	-	-	-	-	-	-	-	-	-	-		On the ground (U	I		13,5 m3	C°	D-H(N)	N	2"	48(U)	I	(k)	(k)		H-C	99(U)	-	I	D-P-L (N)	L	N	-	8"	1640	101
8	AMAZONAS	CASUAL	H-F	G-W-T		P-B-C	11/2"	5675(N)	N	CRP=4 VA=5 VP=8	-	-	-	-	-	-	-	-	-	S/01 unit(N), P-F/01unit (N), S-	N	On the ground (N)	N		10 m3	C°	D-H(N)	N	1 1/2"	211(N)	N	1"	687(N)	N	H-M/L	57(N)	-	N	D-P-L (N)	L	N	-	-	-	57
9	AMAZONAS	EL BALCON	F-F	G-W-T		SPRING	2"	3389(N)	N	CRP=3 VP=3 VA=1	-	-	-	-	-	-	-	-	-	P-F/01 unit (N),S-L/01 unit (N)	N	On the ground (N)	N		10 m3	C°	D-H(N)	N	2"	362(N)	N	2",11/2"	714.00(N)	N	H-M/L	26(N)	CV=5	N	D-P-L (N)	L	N	-	-	-	36
10	AMAZONAS	UBILLON	F-F	G-W-T		SUP (02)	2"	426(N)	N	-	-	-	-	-	-	-	-	-	-	P-F/01 unit (N), S-L/01	N	On the ground (N)	N		10 m3	C°	D-H(N)	N	2	710(N)	N	1"	1127(U)	I	H-C	20(N),24(U)	-	I	S-S(N)	N	I	S-T	6"	167	23
11	AMAZONAS	CIELACHI	F-F	G-W-T	SPRING		2"	100.46(U)	I	-	-	-	-	-	-	-	-	-	-	P-F/ 2unit(N), S-L/ 2unit(N)	N	On the ground (U	I		15 m3	C°	D-H(N)	N	(k)	(k)		(k)	(k)		H-C/L	40(U),11(N)	-	I	D-P-L (N)	L	I	-	-	-	54
12	AMAZONAS	LONYA CHICO	F-F	G-W-T	SUP		3"	323.00(U)	I	PV=5und AV= 5und	-	-	-	-	-	-	-	-	-	S /01 unit(N), P-F/01unit(N)	N	On the ground (U		NI	15m3(02 unit)	C°	D-H(N)	N	3"	198.14(U)	I	(k)	(k)		H-C/L	4(U)	-	I	S-S(U)	N	I	I-T	6"	295	34
13	AMAZONAS	SAN JUAN	F-F	G-W-T	SUP		3"	735(N)	N	AV=1und	-	-	-	-	-	-	-	-	-	S/01 unit(N), S-L/01	N	On the ground (U	I		20 m3	C°	D-H(N)	N	(k)	(k)		(k)	(k)		(k)	(k)	-	I	D-P-L (N)	L	N	-	-	-	48
14	AMAZONAS	OLTO	F-F	G-W-T	Common intake with San Juan de		3"	290(U)	I	CV 1/2"=5und CV 2"= 8und	-	-	-	-	-	-	-	-	-	P-F/ 01unit(N), S-L/ 01 unit(N)	N	On the ground (U	I		20 m3	C°	D-H(N)	N	(k)	(k)		(k)	(k)		H-C/L	8(N)	-	I	S-S(U)	N	I	I-T	6"	876.39	79
15	SAN MARTIN	LA HUARPIA	H-F	G-W-T		SUP	2"	4310(U)	I	CRP=3 VA=15 VP=19	-	-	-	-	-	-	-	-	-	S-T/01 unit(N), S-L/ 02 unit(N)	N	On the ground (U	I		90 m3	C°	D-H(N)	N	-	-		11/2",1"	4656.00(N)	N	H-C/L/F-W	222(N)	-	N	D-P-L/C-L (N)	L	N	-	-	-	221
16	SAN MARTIN	PERLA DE CASCAYUNGA	H-F	G-WO-T		SPRING	1"	193.3(N)	N	-	-	-	-	-	-	-	-	-	-	-		On the ground (N)	N		7.5 m3	C°	D-H(N)	N	11/2"	1058.57 (N)	N	1"-11/2"	1655.83(N)	N	H-C/L/F-W	48(N)	LV=7 PV=2	N	D-P-L/C-L (N)	L	N	-	-	-	49
17	SAN MARTIN	POSIC	H-F	P-WO-T	T-W		-	-	-	-	-	-	-	1 glb	10 hp	3",4"	905(N),30(U)	E°E°	U	-		Elevated (N) Elevated (U)		NI	75m3 60m3	C°	D-H(N)	N	4"	67.22(U)	I	2"	2001.57(U)	I	H-C/L	57(N),296(U)	-	I	S-S(U)	N	I	I-T	-	-	335
18	SAN MARTIN	BARRANQUITA	F-F	G-W-T		SPRING	2"	2000(U)	I	PV=2und VA= 3und CRP=03und	-	-	-	-	-	-	-	-	-	S /01 unit (U) , P-F/01 unit (U), S-	I	On the ground (U	I		30 m3	C°	D-H(N)	N	2"	405 (U)	I	2"	1990.37(N)	N	H-C/L/F-W	78(N)	LV=7 PV=2	N	D-P-L/C-L (N)	L	N	-	-	-	79
19	SAN MARTIN	LA FLORIDA	H-F	G-W-T	SUP		2"	363(U)	I	AV=2und PV= 3und	-	-	-	-	-	-	-	-	-	S-T(U)/01unit, S(N)/01unit, A-	I	On the ground (N)	N		5m3	C°	D-H(N)	N	-	-	I	2",1",3/4"	1314(U)	I	HC/L	56(U)	LV=3 PV=1	I	D-P-L (N)	L	N	-	-	-	57
20	SAN MARTIN	MONTE DE LOS	F-F	G-WO-T		SPRING	11/2"	145(U)	I	PV=2und CV= 3und	-	-	-	-	-	-	-	-	-	-		On the ground (N)	N		5m3	C°	D-H(N)	N	11/2"	550.74(N)	N	11/2",3/4",1"	213.94(U)	I	H-C/L	49(U)	-	I	D-P-L (N)	L	N	-	-	-	50
21	SAN MARTIN	RUMISAPA	H-F	G-WO-T	SPRING		2"	170.3(U)	I	-	-	-	-	-	-	-	-	-	-	-		On the ground (U	I		70 m3	C°	D-H(N)	N	2"	57.30(U)	I	2"	838.4 (U)	I	H-C/L	233(U)	LV=19 PV=1	I	( ))	-		(j)	(j)	(j)	(j)
22	SAN MARTIN	PACCHILLA	H-F	G-WO-T		SPRING	2" - 11/2"	15.00 (U)	I	01 und CRP,	-	-	-	-	-	-	-	-	-	-		On the ground (N) On the ground (U	NI		2.5m3 12 m3	C°	D-H(N)	N	11/2" 2"	399.13(U)	I	3/4",1",11/2", 2"	2516.90 (U)	I	H-C/L	130(U)	LV=8 PV=2	I	D-P-L (N)	L	N	-	-	-	131
23	SAN MARTIN	CHURUZAPA	L-F	G-W-T	SUP		2"	80 (U) Marg. y Churuz.	I	PV=7	CRP=3und CP	-	-	-	-	-	-	-	-	S-T /01 unit(I), S/01 unit (N), A-L/01 unit (N),	I	On the ground (U	I		20 m3	C°	D-H(N)	N	-	-		11/2",1"	344.20(I)	I	H-C/L/F-W	18 (N),87 (U)	LV=8 PV=2	I	D-P-L (N)	L	N	-	-	-	102
24	SAN MARTIN	LA MARGINAL	L-F	G-W-T	Common intake with Churuzapa		2"	2628.5		PV=5	CRP=3und, CP	-	-	-	-	-	-	-	-	Treatment in common with Churuzapa		On the ground (U	I		20 m3	C°	D-H(N)	N	-	-		11/2",1",3/4"	553.75(U)	I	H-C/L	11N), 51(U)	LV=14 PV=1	I	L-C(N)	L	N	-	-	-	60
25	SAN MARTIN	PALESTINA	L-F	P-WO-T	T-W		-	-		-	-	-	-	1 glb	1hp(2)	2"	23.84	E°E°	U	-		Elevated (U)		I	16 m3	C°	D-H(N)	N	11/2"	33.3(U)	I	11/2",1"	1457.55(U)	I	H-C/L/F-W	66(U)	LV=11 PV=2	I	D-P-L (N)	L	N	-	-	-	63
26	SAN MARTIN	MISQUIYACU	L-F	G-WO-T		SPRING	2"	4166.3(U)	I	CRP=11 CV=5	CRP=11und CP	-	-	-	-	-	-	-	-	-		On the ground (U	I		30m3	C°	D-H(N)	N	-	-		2",11/2",1",3/4"	1689.45 (U)	I	H-C/L/F-W	129(U)	LV=15 PV=5	I	D-P-L(N)/S-S(U)	N/L	I	I-T	8"	186.35	105
27	SAN MARTIN	SAPOTILLO	H-F	G-WO-T		SPRING	11/2"	663.5(N)	N	CRP=06	-	-	-	-	-	-	-	-	-	-		On the ground (N)	N		5m3	C°	D-H(N)	N	11/2"	1210.5(N)	N	11/2",1",3/4"	1155.05(N)	N	H-C/L/F-W	65(N)	LV=5 PV=2	N	PFL(N)	L	N	-	-	-	62
28	SAN MARTIN	STA ROSILLO	H-F	G-WO-T		SPRING	11/2"	2477.3(N)	N	LA=1 PV=3 Pase Aereo=2	-	-	-	-	-	-	-	-	-	-		On the ground (N)	N		8m3	C°	D-H(N)	N	-	-	N	2" ,11/2",1",3/4"	6490.51(N)	N	H-C/L/F-W	126(U)	-	I	D-P-L (N)	L	N	-	-	-	123
29	SAN MARTIN	YACUCATINA	L-F	P-WO-T	T-W		-	-		-	-	-	-	-	1 hp (02)	2"	15	E°E°	N	-		Elevated (U)		I	12 m3	C°	D-H(N)	N	11/2"	161.35(U)	I	11/2",1",3/4"	831.1 (U)	I	H-C/L/F-W	42(U)	LV=8 PV=2	I	D-P-L (N)	L	N	-	-	-	40
30	M. D. DIOS	TRES ISLAS	L-F	P-WO-T		CAP(04)	2"	183.20(N)		CR(Caja de reunion)	-	2.5m3	C°	1 glb	1,10kw.	2"	195.25	E°E°	N	A-L/01 unit (N)		Elevated (N)		N	10m3	C°	Tank +leak(N)	N	-	-		1 1/2",2"	6386.30(N)	N	H-C/L/F-W	66(N)	PV=5und.	N	D-P-L (N)	L	N	-	-	-	69
31	M. D. DIOS	SUDADERO	L-F	P-WO-T		D-W	-	-		-	CP	-	-	1 glb	1 kw	2" y 3"	84.6	E°E°	N	-		Elevated (U)		I	15m3	C°	H-D(N)	N	-	-		3",2",4"	2210.42(N)	N	H-C/L/F-W	59(N)	LV=9 PV=4	N	D-P-L (N)	L	N	-	-	-	66
32	M. D. DIOS	MONTERREY	L-F	P-WO-T		D-W	-	-		-	CP	-	-	1 glb	1,5kw	2"/F°G°	15	E°E°	N	-		Elevated (U)		I	8.75 m3	C°	Tank +leak(N)	N	-	-		2"	1764.88(N)	N	H-C/L/F-W	25(N)	LV=8 PV=3	N	S-S(U)	N	I	S-T	6"	845.81	14
33	UCAYALI	SAN MARTIN DE MOJARRAL	L-F	P-WO-T	T-W		-	-		-	CP	-	-	1 glb	1,5hp(02)	4",11/2",1"	40.86	E°E°	U	-		Elevated (U)		I	18m3	C°	D-H(N)	N	-	-		1 1/2",1"	802.27(N)	N	H-C/L	32(N)	LV=2 PV=1	N	C-L(N)	L	N	-	-	-	34
34	UCAYALI	SAN FRANCISCO	L-F	P-WO-T	T-W		-	-		-	CP	-	-	1 glb	2hp(02)	2 "	396.63	E°E°	N	-		Elevated (U) Elevated (N)		NI	22m3 10m3	C°	D-H(N)	N	-	-		2 1/2",2",1 1/2",1",1/2"	4896.64(N)	N	H-C/L	132(N)	PV=5und. LV: 3und.	N	D-PL/C-L (N)	L	N	-	-	-	277
35	UCAYALI	10 DE JULIO	L-F	M-P		T-W(02)	-	-		-	CP	-	-	1 glb	(02)	-	-	Manual	N	-		Elevated (N)		N	2.5 m3(02 unit)	PF	D-H(N)	N	-	-		-	-	N	P-T	02(N)	PV=1und. LV: 6und.	N	C-L(N)	L	N	-	-	-	24
36	UCAYALI	SAN PEDRO DE BELLO HORIZONTE	L-F	M-P		T-W(04)	-	-		-	CP	-	-	1 glb	(04)	-	-	Manual	N	-		Elevated (N)		N	1.5m3(04 unit)	PF	D-H(N)	N	-	-		-	-	N	P-T	04(N)	-	N	C-L(N)	L	N	-	-	-	35
37	UCAYALI	SHARARA	L-F	P-WO-T		D-W	-	-		-	CP	-	-	1 glb	1 hp	2"	26.85	P°G°	N	-		Elevated (N)		N	10.00 m3	C°	D-H(N)	N	-	-		2",1",3/4"	1394.16 (N)	N	H-C/L/F-W	83(N)	PV=2und. LV: 2und.	N	C-L(N)	L	N	-	-	-	86
38	UCAYALI	CURIACA	L-F	P-WO-T		D-W(4)	-	-		-	CP	-	-	1 glb	2 hp	-	-	P°G°	N	-		Elevated (N)		N	2.5 m3(04 unit)	P-F	D-H(N)	N	-	-		2",11/2",1"	1958.72(N)	N	H-C/L	91(N)	PV=2und. LV: 6und.	N	C-L(N)	L	N	-	-	-	94
39	LORETO	CAHUIDE	L-F	P-WO-T		SPRING	-	-		-	-	22m3	C°	1 glb	1 hp	2"	30.5	P°G°	N	-		Elevated (N)		N	10m3	C°	D-H(N)	N	2"	94.18(N)	N	2",1",3/4",1/2"	2685.55(N)	N	H-C/L/F-W	105(N)	PV=6und. LV: 5und.	N	D-PL/C-L (N)	L	N	-	-	-	109
40	LORETO	SAN JUAN DE	L-F	P-WO-T		D-W	-	-		-	-	-	-	1 und, glb	2.5hp(02)	2"	104.58	S°P°	N	-		Elevated (N)		N	15m3	C°	D-H(N)	N	1 1/2"	60.00(N)	N	1",3/4"	1576.50(N)	N	H-C/L/F-W	82(N)	PV=1und. LV: 5und.	N	D-P-L (N)	L	N	-	-	-	84
41	LORETO	AMAZONAS	L-F	M-P		T-W	-	-		-	-	-	-	2 und, glb	-	-	-	Manual	N	-		Elevated (N)		N	-	P-F	D-H(N)	N	-	-	N	-	-	N	P-T/F-W	-	PV=2und. LV: 4und.	N	C-L(N)	L	N	-	-	-	74
42	LORETO	20 DE ENERO	L-F	M-P		T-W(4)	-	-		-	-	-	-	1 glb	(04)	-	-	Manual	N	-		Elevated (N)		N	2.5m3(03unit) 3.6m3(01unit	P-F	D-H(N)	N	-	-	N	-	-	N	P-T/F-W	04(N)	PV=2und. LV: 4und.	N	C-L(N)	L	N	-	-	-	57
43	LORETO	SAN PABLO DE	L-F	P-WO-T		SPRING	1"	1.7		-	-	4m3	C°	1 glb	1.5 hp(2)	1 1/2"	85	P°G°	N	-		Elevated (N)		N	5m3	C°	D-H(N)	N	1 1/2"	33.75(N)	N	11/2",1",3/4", 1/2"	1381.75(N)	N	H-C/L/F-W	57(N)	PV=7und. LV: 6und.	N	C-L(N)	L	N	-	-	-	60
44	LORETO	TARAPOTO	L-F	M-P		T-W(04)	-	-		-	-	-	-	1 glb	(04)	-	-	Manual	N	-		Elevated (N)		N	2.5m3(04 unit),1.10m3(01 unit)	P-F	D-H(N)	N	-	-	N	-	-	N	P-T/F-W	04(N)	PV=3und. LV=4und.	N	C-L(N)	L	N	-	-	-	58
45	LORETO	PANGUANA	L-F	M-P		T-W(08)	-	-		-	-	-	-	1 glb	(08)	-	-	Manual	N	-		Elevated (N)		N	2.5m3(08unit)	P-F	D-H(N)	N	-	-	N	-	-	N	P-T/F-W	08(N)	PV=6und. LV=2und.	N	C-L(N)	L	N	-	-	-	83
46	LORETO	LUPUNA	L-F	M-P		T-W(05)	-	-		-	-	-	-	1 glb	(05)	-	-	Manual	N	-		Elevated (N)		N	2.5m3(05 unit)	P-F	D-H(N)	N	-	-	N	-	-	N	P-T/F-W	05(N)	PV=7und. LV=5und.	N	C-L(N)	L	N	-	-	-	83
47	LORETO	APAYACU	L-F	M-P		T-W	-	-		-	-	-	-	1 glb	-	-	-	Manual	N	-		Elevated (N)		N	-	P-F	D-H(N)	N	-	-	N	-	-	N	P-T/F-W	-	PV=2und. LV=3und.	N	C-L(N)	L	N	-	-	-	57
48	LORETO	BUEN JESUS DE	L-F	P-WO-T		D-W(02)	-	-		-	-	-	-	1 glb	1hp(4)	1 1/2"	289.91	P°G°	N	-		Elevated (N)		N	15m3	C°	D-H(N)	N	1 1/2"	56.2(N)	N	11/2",1",3/4"	1193.50(N)	N	H-C/L	66(N)	PV=2und. LV=6und.	N	C-L(N)	L	N	-	-	-	69
49	LORETO	HUANTA	L-F	P-WO-T		D-W(02)	-	-		-	-	-	-	1 glb	1.5 hp(4)	2 1/2"	74.8	P°G°	N	-		Elevated (N)		N	20 m3	C°	D-H(N)	N	2"	38.30(N)	N	2",11/2",1",3/4"	2101.50(N)	N	H-C/L	152(N)	PV=2und. LV=2und.	N	C-L(N)	L	N	-	-	-	155
50	LORETO	SANTA AMELIA	L-F	P-WO-T		D-W(02)	-	-		-	-	-	-	1 glb	1hp(4)	1 1/2"	73.82	P°G°	N	-		Elevated (N)		N	10 m3	C°	D-H(N)	N	1 1/2"	6(N)	N	1",3/4"	1154.50(N)	N	H-C/L	52(N)	PV=1und. LV=3und.	N	C-L(N)	L	N	-	-	-	53

Geographic region:
L-F: Low Forest
H-F: High Forest
F-F: Front Forest

Type of system:
G-WO-T: Gravity without treatment.
G-W-T: Gravity with treatment
P-WO-T: Pumping without treatment
M-P: Manual Pump

Type of water intake:
SUP: superficial water
SPRING: Spring water
T-B: tubular well
D-W: dug well
P-B-C: Pressure-breaking chamber

State of conservation:
N : New Infrastructure
U: Upgraded Infrastructure

Type of Energy:
E°E° : Electric Energy
P°G° : Power Generator
S°P° : Solar Pannel

Type of treatment:
P-F : Pre filter
S-L: Slow filter
S-T: Sand Trap
A-L: Aeration ladder
S: Settler

Observations:
(k): The use of existing facilities is planned.
(j): Does not consider sanitation, because the facility-builiding is in execution by another entity.

Material:
C°: Concrete
P-F : Pre fabricated

Disinfection System:
H-D : Hipoclorinator Difusor

Connection type:
F-W: Filter well
H-C: Home connection
L:Lavatory
P-T: Public Tap

Sanitation facility type:
D-P-L: Dry-Pit Latrine
S-S: Sewerage System
C-L: Composting latrine
P-F-L: Pour Flush Latrine

SanitationTreatment:
S-T: Septic tank
I-T: Imhoff tan
S-L: Stabilization Lagoon

Source: JICA Study Team (2010)

From the alternatives proposed for the water supply and sanitation systems in the 50 sample localities for the Program, the following possible systems are to be implemented. Those sample localities with populations under 200 inhabitants (10 localities) have not been considered. The following systems have been identified in the other forty (40) localities as possible systems to be implemented in the localities of the Program Area.

(1) Potable Water supply systems

Table N° 4.8.3-2 shows a summary of the technical solutions for water supply for the forty (40) sample localities. An illustration of the percentage of the solutions is given in the Figure 4.8.3-1. For the two localities of Churuzapa and La Marginal in San Martin, one G-WO-T is proposed. Therefore the system/facilities totals to thirty-nine (39) for a total of 40 sample localities.

The percentages are presented in Table Nº 4.8.3-2 may vary in the universe of the 1490 localities, being values obtained from a sample of 40 localities. Likewise, the water supply systems indicated do not exclude other systems like pumping and treatment systems that may be suitable to the particularities of each locality in the Program sample.

Table 4.8.3-2: Proposed Water Supply Systems for the Sample Localities

System	Water Treatment	Code	Conglomerate-1		Conglomerate-2						Total	
			Low Forest		High Forest		Front Forest		Total			
Gravity	With Treatment	G-W-T	3	13%	6	55%	4	80%	10	63%	13	33%
Gravity	Without Treatment	G-WO-T	2	9%	4	36%	1	20%	5	31%	7	18%
Pumping	Without Treatment	P-WO-T	11	48%	1	9%	0	0%	1	6%	12	31%
Manual Pumping	Without Treatment	MP	7	30%	0	0%	0	0%	0	0%	7	18%
Total			**23**	**100%**	**11**	**100%**	**5**	**100%**	**16**	**100%**	**34**	**100%**

Source: JICA Study Team 2009

i) Conglomerate-1

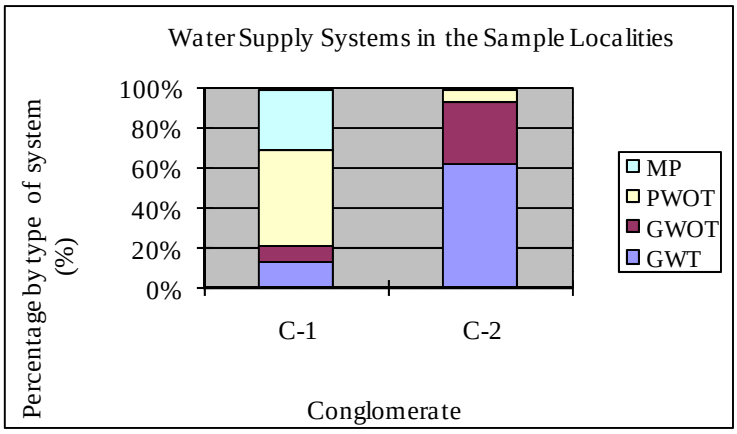
Table N° 4.8.3-2 shows that out of the total of twenty-three(23) localities in Conglomerate-1, eleven (11) will have a pumping system without treatment and seven (7) a manual pump system. The other five (5) localities will have gravity systems: three (3) G-W-T systems and two (2) G-WO-T systems. It is evident that the pumping option is predominant in the Conglomerate-1, as a reflex of the natural conditions of the areas where water sources are only available at similar or even lower height levels as the land where the households are located.

ii) Conglomerate-2

On the other hand, the majority of the proposed technical solutions for the Conglomerate-2 are gravity systems; i.e.: ten (10) G-W-T systems and five (5) G-WO-T systems, totalling fifteen (15), i.e. 94 % of sixteen (16) localities; whereas only one (1) pumping system without treatment was proposed. Such proposed alternatives indicate a great advantage of the natural conditions of the area of the Conglomerate-2, in comparison with the case of the area of the Conglomerate-1.

As a whole, out of the 39 samples localities, the gravity systems were proposed for twenty (20) sample localities: thirteen (13) G-W-T systems and seven (7) G-WO-T systems. Pumping systems were proposed for the other nineteen (19) sample localities: twelve (12) P-WO-S systems and seven (7) MP facilities.

Figure 4.8.3-1: Proposed Water Supply Systems/Facilities for the Sample Localities



(2) Sanitation Systems

Table N° 4.8.3-3 shows a summary of the technical solutions of sanitation systems or facilities of the 40 Sample localities. An illustration of the percentage of the solutions is given in the Figure N° 4.8.3-2. Same as the case of the technical solutions for water supply systems/facilities, the two localities of Churuzapa and La Marginal in San Martin (Low Forest) are considered as one. A sewerage system is under construction in Rumisapa and in the case of Misquiyacu, the population that does not have access to the sewerage system currently in operation, will be provided with individual sanitation solutions. Both in San Martin region (Low Forest). As a result, 39 systems/facilities were proposed for the sample localities.

De manera similar a lo expresado para los sistemas de abastecimiento de agua potable propuestos, los porcentajes y sistemas propuestos para el saneamiento pueden variar, por ejemplo pueden implementarse sistemas no mencionados, tales como letrinas con arrastre hidráulico.

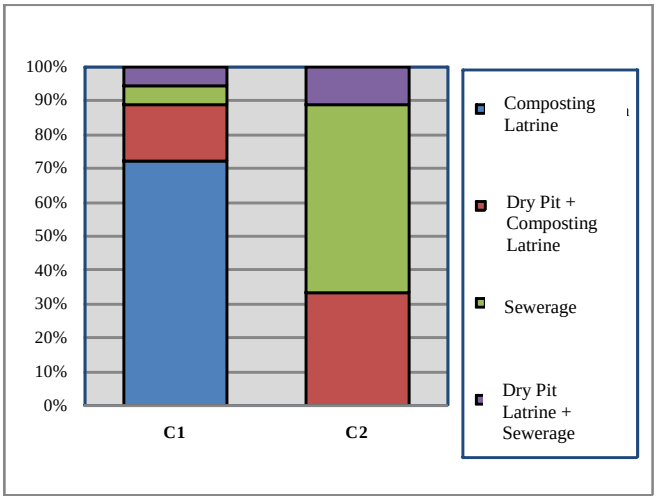
Table N° 4.8.3-3: Proposed Sanitation Systems/Facilities for the Sample Localities

Facility/ system	C 1		C 2						(*) Total	
	Low Forest		High Forest		Front Forest		Subtotal			
Dry Pit Latrine	9	39%	7	64%	2	40%	9	56%	18	46%
Composting Latrine	11	48%	0	0%	0	0%	0	0%	11	28%
Dry Pit + Composting Latrine	2	9%	1	9%	1	20%	2	13%	4	10%
Sewerage	0	0%	2	18%	2	40%	4	25%	4	10%
Dry Pit + Sewerae	1	4%	1	9%	0	0%	1	6%	2	5%
Total	**23**	100%	**11**	100%	**5**	100%	**16**	100 %	**39**	100%

Source: JICA Study Team (2010)

i) Conglomerate-1

Figure 4.8.3-2: Proposed Sanitation Systems/Facilities for the Sample Localities



Among the twenty-three (23) localities in Conglomerate-1 (Low Forest), composting latrines were proposed for eleven (11), since this is a flood prone area, where the groundwater is usually shallow. Therefore, the "composting latrine" is the technical alternative primarily recommended for Conglomerate 1. On the other hand, the use of dry pit latrines is applicable for higher (hilly) zones that may exist in the Low Forest and that do not present a high water table. As for the sewerage system, it has been propose to restore only one existing system in Monterrey in Madre de Dios.

ii) Conglomerate-2

In the areas of the Conglomerate-2, in nine (9) localities (56%) the technical solution 'dry pit latrine', due to the advantage of natural conditions. The sewerage system was proposed for a total of four (4) localities. The considerations for the selection of the sewerage systems were summarized in Table Nº 4.8.3-4.

Table Nº 4.8.3-4: Reasons for the Selection of Sewerage System in the Conglomerate-2

S/N	Administrative Region	Locality	Geographic Region	Pop (2007)	Reason for Selection
4	Amazonas	Puerto Naranjitos	High Forest	453	Limited space for individual solutions due to high concentration of households and because of the existence of latrines with discharge of disposals to the river.
5	Amazonas	Naranjitos	High Forest	666	Similar to Puerto Naranjitos.
12	Amazonas	Lonya Chico	Front Forest	345	Extension of the existing system
14	Amazonas	Olto	Front Forest	498	Extension of the existing system
17	San martin	Posic	High Forest	1081	System already available. House connection awaited

Source: JICA Study Team (2010)

Out of the five (5) localities mentioned in Table Nº 4.8.3-4, sewerage systems have been proposed for only two (2) localities (Puerto Naranjitos and Naranjitos) as a result of the evaluation carried out during the field survey works. The other three (3) localities already have their systems, but they require extension or complementary construction. However, for the Program level, sewerage construction is not encouraged.