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MINISTRY OF HOUSING, CONSTRUCTION AND SANITATION (MVCS)

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

FINAL REPORT

VOLUME ENG-I MAIN REPORT

FEBRUARY 2011

JAPAN INTERNATIONAL COOPERATION AGENCY

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

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VOLUME			TITLE OF VOLUME
SPANISHI	ENGLISH	JAPANESE	
ESP-I	ENG-I	-	MAIN REPORT
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ESP-IV	-	-	CONGLOMERATE C-1
ESP-V	-	-	CONGLOMERATE C-2
-	-	SUMMARY	SUMMERY IN JAPANESE

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

FINAL REPORT

VOLUME ENG-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

PART-I

BASIC INFORMATION

FINAL REPORT

PART-I
BASIC INFORMATION

CHAPTER 1 GENERAL INFORMATION

1.1 Preface

According to the Sector Multiannual Strategic Plan 2008-2015 (*Plan Estratégico Sectorial Multianual 2008-1015)* of the Ministry of Housing, Construction and Sanitation (MVCS: *Ministerio de Vivienda, Construccion y Saneamiento*), the baseline for 2007 indicates that the access rates to potable water and sanitation facilities in Peru remain at 82% and 73% respectively in the urban areas; these rates are lower than the average rates in all Latin American countries: 92% access to potable water and 79% access to sanitation facilities. In particular, water and/or sanitation facilities in rural areas of Peru have not sufficiently developed, resulting in much lower access rates: 62% access to potable water and 33% to sanitation facilities, according to the same source.

The Government of Peru pays special attention to the water and sanitation sector among the sectors relating to poverty reduction, which should be essential as a national policy. As a result, having announced as a policy the “Program of Water for All¨ (PAPT: *Programa Agua Para Todos*), the Government intends to increase the investments in the water and sanitation sector.

Although cooperating agencies, including Japan, have supported the sector, such support/investment has mainly been directed towards urban areas and/or the mountainous rural areas, while Amazon areas have not received much investment or continual support. This is mainly due to the fact that access roads to Amazon areas are in worse conditions than those in the mountainous rural areas. Furthermore, the Amazon areas are much larger and more spread-out and populations are sparse; all of this, results in less information available regarding water and sanitation conditions in the areas. It is thought that the access rate would be as low as 20% to water supply facilities and 15% to sanitary facilities.

Under such circumstances, MVCS considers requesting Japan to finance a program for water supply and sanitation improvement in five regions of the Amazon area.

On the other hand, public investment projects/programs in Peru that are financed with indebtedness need to be assessed, approved and be declared viable by the General Directorate of Multiannual Programming (DGPM: *Direccion General de Programacion Multianual*) of the Ministry of Economy and Finance (MEF: *Ministerio de Economia y Finanzas*) in accordance with norms established by the National Public Investment Assessment System (SNIP: *Sistema Nacional de Inversion Pública*) before implementation. In line with the procedure required by the SNIP, the MVCS prepared the pre-investment study report (*Perfil*) of the above mentioned program for Amazon areas, and the DGPM of MEF declared viability to the *Perfil* on 04 September 2009. In accordance with the requirements of SNIP, a feasibility study at the program level is being required to obtain the final approval (variability) of the MEF for the realization of a Japan-assisted loan program for The Water Supply and Sanitation Improvement Project in the Rural Amazon Areas (hereinafter referred to as the Program).

Thus, this preparatory study was initiated to conduct the Feasibility Study for the Program

1.2 Objectives of the Study

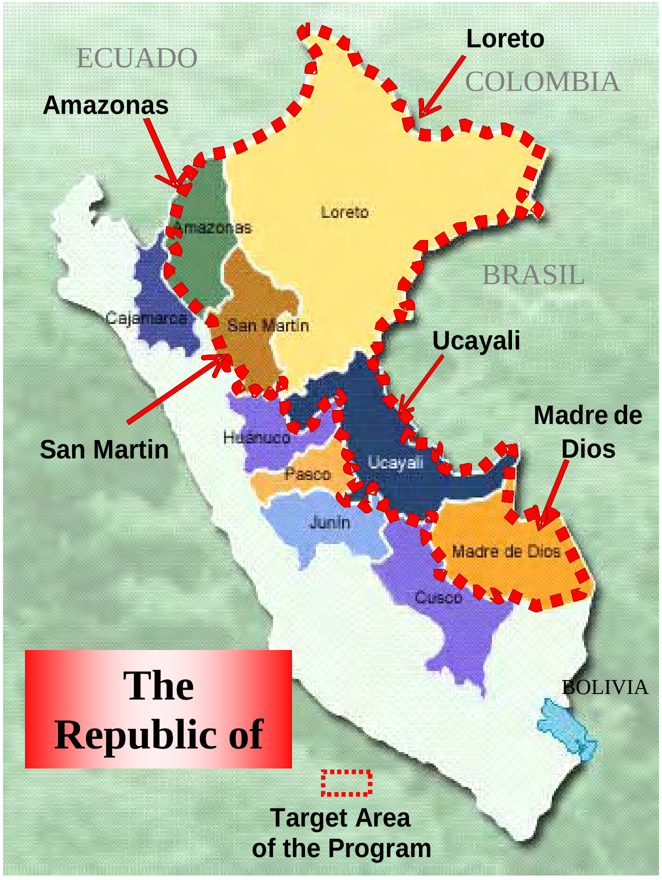
1) To review the *Perfil* already prepared for the Program,

2) To prepare the feasibility study report for the Program based on the *Perfil* studies of 50 sample localities to be carried out during the preparatory study,

3) To assist the MVCS in obtaining approval from SNIP, in such ways as preparing responses to comments from the Office of Investments Programming (OPI: *Oficina De Programación de Inversiones*) of the sector and/or DGPM, in order to formulate the request for a Japan-assisted loan program for the rural Amazon area,

4) The targets for the present preparatory study are localities (villages) distributed in five Amazonian administrative regions: (1) Loreto, (2) Amazonas, (3) Madre de Dios, (4) San Martin, (5) Ucayali, as shown in the Figure-1.2-1

Figure 1.2-1: Target Area of the Program



CHAPTER 2 GENERAL CONDITIONS

2.1 Natural Conditions

2.1.1 Geographic Regions of Peru

The territory of Peru is geographically and traditionally classified into three great geographic regions, (a) Coast (*Costa*), (b) Highland (*Sierra*) and (c) Forest (*Selva*).

Figure 2.1.1-1: Geographic Regions

The coast (*Costa)* geographic region follows the country's Pacific coastline from north to south and forms a long narrow region between the ocean and the Andes Mountain Range. Most of the Costa consists of dry and sometimes extremely arid desert regions.

The highland (*Sierra)* geographic region is the area of Andes Mountain Range and its foothills, which dominate central Peru. The Andes Mountain Range is a vast mountain area covering the western side of the South American continent.

The forest (*Selva)* geographic region is the isolated rain forest region in the eastern part of Peru, and it occupies half of the country’s territory. The forest (*Selva)* is the area located between the eastern foot (piedmont) of the Andes and the rain forests of the Amazon Basin, where the Amazon River finds its Peruvian roots.

Table 2.1.1-1: Surface Territory of Peru

Peru	Surface (Km2)	Territory (%)
Coast (*Costa*)	136,768	10.6
Highland (*Sierra*)	404,929	31.5
Forest (*Selva*)	743,518	57.9
TOTAL	**1,285,215**	**100.00**
Source: Based on "*Gran Atlas del Peru 2005*"		

2.1.2 Geographic Regions of the Target Area – *Selva Baja*, *Selva Alta*, *Ceja de Selva*

The geographer Javier Pulgar Vidal further classified the Peruvian territory into eight regions; this classification was followed by several attempts of similar classifications by others. It is thought that the most complete method to define the geographic regions is the classifications based on altitude and geomorphology, which is in more agreement with the biographical reality of the Peruvian territory. According to such classification, the Forest (*Selva)* is further subdivided into (a) Low Forest (*Selva Baja*), (b) High Forest (*Selva Alta*) and (c) Front Forest (*Ceja de Selva*) as follows:

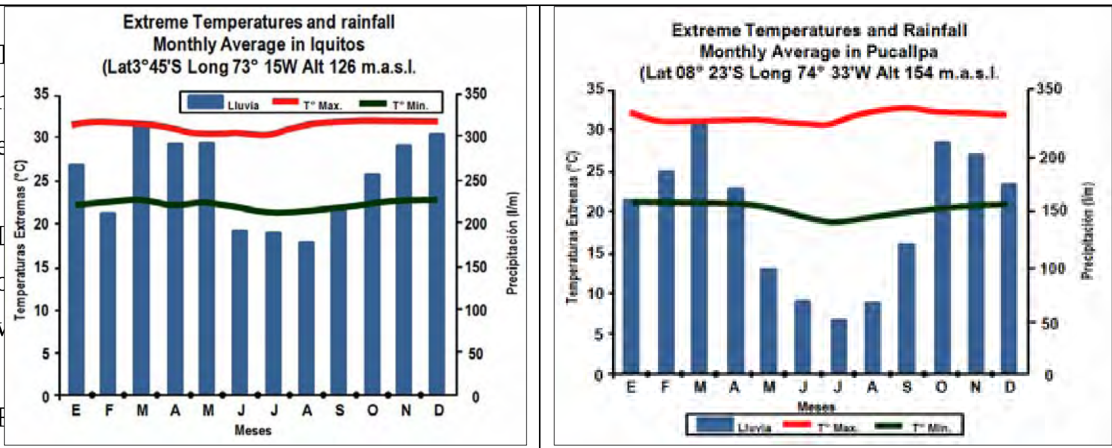
Table 2.1.2-1 Definition of the Geographic Region of the Forest

Geographic Forest Region		Altitude
(a) *Selva Baja*	Low Forest	Below 400m
(b) *Selva Alta*	High Forest	400 – 1,000m
(c) *Ceja de Selva*	Front Forest	1,000 – 2,300m
Source: based on National Institute of Geographic Resources, Peru		

(1) Low Forest (*Selva Baja*)

The Low Forest is the area below 400 meters in altitude, located in the vast area of eastern Peru. The area is comprised predominantly of plains with undulations associated with gentle hills. The rivers there in the Amazon River basin tend to meander due to lack of significant ground gradients, and most of the Low Forest contains flood prone areas, in particular in the areas facing the confluences of big rivers.

Figure 2.1.2-1: Climate in Low Forest

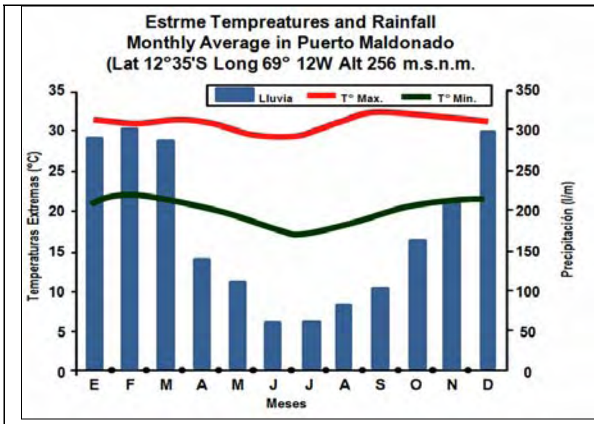


Iquitos, Loreto	Pucallpa, Ucayali
Data source: SENAMHI[1]	

est is characterized by high rainfall reaching 2,880 mm a year (Iquitos); the high rain season appears from October – December to March – May, when the maximum rainfall a month exceeds 300 mm; the less rainy season appears from April – June to September – October, when the rainfall is reduced to 50 mm a month in Puerto Maldonado.

Among three target regions, Iquitos in Loreto is the wettest; rainfall, even in less rainy season, exceeds 150 mm a month in Iquitos (2,880 mm a year), whereas Puerto Maldonado in Madre de Dios shows less rainfall, around 50 mm a month in less rainy season (1,890 mm a year).

Figure 2.1.2-2 Climate in Low Forest



Puerto Maldonado, Madre de Dios

Data source: SENAMHI

The majority of the area in the administrative regions of Loreto, Ucayali and Madre de Dios are located in the Low Forest.

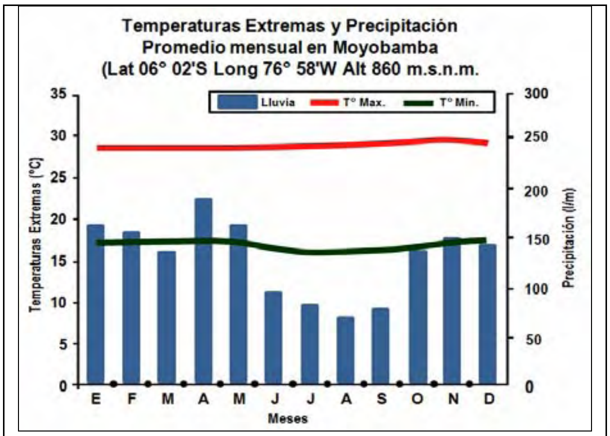
The geographic conditions of the Low Forest have great significance that raises difficulties in improving the water supply and sanitation conditions, due to food prone natural conditions.

[1] Source: Touristic Climate Guideline of the National Service of Meteorology and Hydrology of Peru (SENAMHI)

(2) High Forest (*Selva Alta*)

The High Forest (*Selva Alta*) is the area between 400 m – 1,000 m in altitude, located in between the Low Forest and the Andes Mountain Range. The High Forest presents a steep relief on the hills, long narrow valleys and a flat relief on the bottoms of the valleys. A number of terraces have developed at many levels.

Figure 2.1.2-3: Climate in High Forest



Moyobamba, San Martin

Data source: SENAMHI

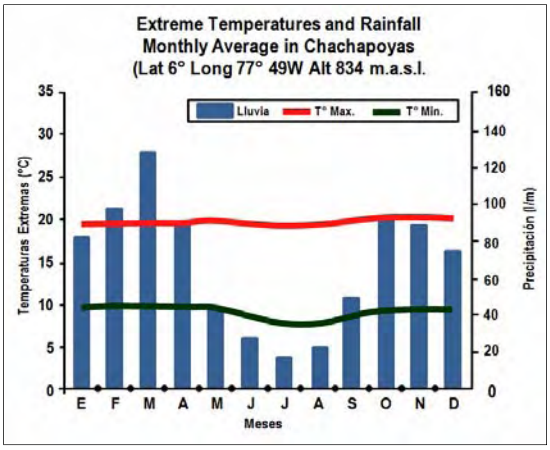
Rainfall in the High Forest is represented by the information gathered at Moyobamba, San Martin. The high rain season appears from October to May with rainfall exceeding 150 mm a month, whereas the less rainy season appears from June to September with rainfall less than 100 mm a month, totaling approximately 1,350 mm a year. The temperature stays constant at around 28 degrees Celsius as the maximum and 18 degrees Celsius as the minimum throughout a year.

Most of San Martin and the northern part of Amazonas are located in the High Forest.

(3) Front Forest (*Ceja de Selva*)

The Front Forest is the area between 1,000 m – 2,300 m in altitude, located at the eastern foot (piedmont) of the Andes Mountain Range. The Front Forest has an uneven landscape with narrow valleys, deep gorges, and fast-flowing water along the gorges.

Figure 2.1.2-4: Climate in Front Forest



Chachapoyas, Amazonas

Data source: SENAMHI

The climate of the Front Forest is dryer than the other two geographic regions of the Forest. The high rain season appears from October to April with rainfall exceeding 80 mm a month approximately and the less rainy season appears from May to September with rainfall less than 50 mm a month; totaling approximately 820 mm a year. The temperature stays constant at around 20 degrees as the maximum and around 10 degrees as the minimum. The western edge of San Martin and the southern part of the Amazonas Region are located in the Front Forest.

2.1.3 Water Sources for Water Supply in the Study Area

The target area are located in a tropical rainforest, which is blessed with plenty of precipitation through out year generally as stated in the previous pages. It is reported that about 97%[2] of precipitation our of the whole rainfalls in the Peru falls in the hydrographic basins west of the Andes mountain range. Month periods with less rainfall generally range from one to two months and have even rainfalls as against the climate in the Costa area of Peru. Accordingly, many of rivers are perennial and therefore water from rivers of various scales are being used as water source for water supply schemes in the target area. However, water is usually turbid and contaminated with coliform bacteria; which necessitates the water supply schemes with river water to be equipped with water treatment facilities such as sedimentation and/or sand-filter in many cases.

As for groundwater, the target area is underline mainly by sedimentary rock of Tertiary Period, and sporadically by Pre-Cambrian basement and/or sedimentary rock of Mesozoic Period. However, groundwater has yet been much exploited in the Amazon area[3] and therefore information on development potential are not much available[4]. It is verbally reported that some tube wells drilled in the Low Forest penetrated clayey geology and produced insufficient water with unavailable water quality. The water in a dug well in San Martin, observed by the Study Team, was saline and not used for drinking purposes. Investigation are therefore necessary if water supply schemes should use groundwater as the water source.

[2] According to the National Water Authority, Peru
[3] As against the case in Amazon area, groundwater has been excessively pumped up in the Costa; which has resulted in groundwater depression in Lima. The authority now therefore restrict the groundwater development.
[4] Food and Agriculture Organization. "Perfiles de Paises:Peru". *Aquastat*. http://www.fao.org/nr/water/aquastat/countries/peru/indexesp.stm. Retrieved 15 February 2008.

2.2 Socio-Economic Conditions

2.2.1 Socio-Economic Conditions of Peru

Peru has experienced unprecedented economic growth in recent years. Much of this growth is due to increased foreign investment in the country and increased exports of minerals. From 2002 to 2007, the Peruvian economy experienced an average growth rate of 6.2%, and in 2008 the figure reached 9.8%, the highest in Latin America. Inflation in 2007 was the lowest among Latin American countries at only 1.8%. Public debt fell quickly from 46% of GDP in 2001 to 24 % in 2008. Despite the current international recession, the Peruvian economy is expected to remain robust in the medium-and long-term. MEF estimates[5] that the average economic growth for the period of 2010 through 2012 will be 5.6%.

Sustained economic growth has had a positive impact on reducing poverty. Poverty incidence decreased from 54.8% in 2001 to 39.6% in 2007. Over the same period, extreme poverty dropped 10.7 percentage points, from 24.4% to 13.7%. Other social indicators[6] have shown positive signs as well. Mortality rate for children under five (5) fell from 33 per 1,000 in the year 2000 to 21 per 1,000 in the year 2006. Life expectancy at birth rose from 69.2 years in 2000 to 71.1 years in 2006. High school enrollment rose from 63% in 1998 to 72% in 2006.

With almost 28 million inhabitants, Peru is the fourth most populous country in South America as from 2007. The population is expected to reach 32 million in 2020, according to INEI estimate[7]. Since 2007, 75.9% of Peruvian inhabitants live in urban areas and 24.1% live in rural areas.

Table 2.2.1-1: Demographic / Socio-Economic Indicators of Peru

Description	Indicators
Population - 2007 (millions)	27.41
Population growth - 2007 (annual %)	1.1
GDP - 2007 (current USD) (billions)	107.30
GDP per capita - 2007 (current USD)	3,410
GDP growth - 2007 (annual %)	9.0
Inflation - average consumer prices - 2007 (annual %)	1.78
Unemployment rate - only Metropolitan Lima - 2004 (annual %)	8.4
Population below poverty - 2007 (%)	39.3
Mortality rate for children under 5 per 1,000 children- 2007	33
Literacy rate - 2007 (%)	92.9

Source: World Bank's World Development Indicators 2008

Despite the remarkable economic growth of late years, the gaps between the rich and the poor remain profound. Poverty is more widespread in the mountain region (*Sierra*) compared to the

[5] Marco Macroeconómico Multianual 2010-2012, MEF, May 2009
[6] World Bank's World Development Indicators 2008
[7] INEI: *Instituto Nacional de Estadística e Informática, "Perú: Estimaciones y Proyecciones de Población* 1950-2050"

other two geographic regions, namely the coastal region (*Costa*) and rainforest region (*Selva*). In terms of residential area, the poverty index tends to be higher in rural areas than urban areas. The following table shows Peru's poverty incidence according to different geographic classifications.

Table 2.2.1-2: Poverty Incidence in Peru from 2004 to 2007

	Poverty Incidence 2004-2007				Extreme Poverty Incidence 2004-2007			
	2004	2005	2006	2007	2004	2005	2006	2007
Total	**48.6**	**48.7**	**44.5**	**39.3**	**17.1**	**17.4**	**16.1**	**13.7**
Residential Area								
- Urban	37.1	36.8	31.2	25.7	6.5	6.3	4.9	3.5
- Rural	69.8	70.9	69.3	64.6	36.8	37.9	37.1	32.9
Geographic								
- Coast Region	35.1	34.2	28.7	22.6	4.0	3.8	3.0	2.0
- Mountain Region	64.7	65.6	63.4	60.1	33.2	34.1	33.4	29.3
- Rainforest Region	57.7	60.3	56.6	48.4	25.0	25.5	21.6	17.8
Residential Area/ Geographic								
- Coast/Urban	37.1	32.2	29.9	25.1	5.6	4.0	3.0	2.1
- Coast/Rural	51.2	50.0	49.0	38.1	13.8	13.4	14.4	10.5
- Mountain/Urban	44.8	44.4	40.2	36.3	13.6	11.6	10.3	8.5
- Mountain/Rural	75.8	77.3	76.5	73.3	44.0	46.6	46.5	40.8
- Rainforest/Urban	50.4	53.9	49.9	40.3	18.7	22.5	18.1	11.0
- Rainforest/Rural	63.8	65.6	62.3	55.3	30.4	28.0	24.6	23.4
- Metropolitan Lima	30.9	32.6	24.2	18.5	1.3	2.0	0.9	0.5

Source: INEI (2007)

2.2.2 Overview of Socio-Economic Conditions in the Project's Target Areas

(1) Socio-Economic Indicators

The total population of the five (5) target regions of the Program represents around 9% of the total population of Peru, while their combined regional GDP makes up about only 5% of the national GDP. In terms of regional GDP, Loreto ranks 11th; San Martin, 16th; Ucayali, 17th; Amazonas, 21st; and Madre de Dios, 24th among the 24 regions[8] in Peru. Poverty is more rampant in these administrative regions of rainforest (*regiones de la Selva*), as the poverty incidence in the all regions except Madre de Dios exceeds the national average according to INEI statistics as shown in Table 2.2.2-1. The INEI has been measuring the level of poverty since 1997 based on the monthly spending per capita. The predetermined threshold for "poverty" for year 2007 was S/. 229.4 and for "extreme poverty" S/. 121.2.

[8] Peru is divided into 25 regions and the Metropolitan Province of Lima. In the source used, the figure of the Lima Region includes that of the Metropolitan Province of Lima and the Constitutional Province of Callao, which alone constitutes the Region of Callao according to the current administrative demarcation of the country.

Table 2.2.2-1: Demographic and Socio-Economic Indicators for the Five Target Regions

	Population - 2007	Poverty 2007	Extreme Poverty 2007	Monthly Spending per capita -2007 in S/.	Regional GDP - 2006 In thousand S/.
Nationwide	**27,412,157 (100%)**	**39.3%**	**13.7%**	**438.9**	**276,553,154 (100%)**
5 regions combined	**2,538,247 (9.3%)**	**43.4%**	**18.9%**	**378.7**	**14,782,924 (5.3%)**
1. Amazonas	375,993 (1.4%)	55.0%	19.6%	332.2	1,484,210 (0.5%)
2. San Martin	728,808 (2.7%)	44.5%	16.9%	366.9	3,076,384 (1.1%)
3. Madre de Dios	109,555 (0.4%)	15.6%	1.8%	557.8	1,160,101 (0.4%)
4. Ucayali	432,159 (1.6%)	45.0%	15.8%	414.1	2,787,364 (1.0%)
5. Loreto	891,732 (3.3%)	54.6%	23.8%	368.8	6,274,865 (2.3%)

Source: JICA Study Team (2010) based on the data from INEI *Censos Nacionales* 2007 and INEI *Compendio Estadistíco* 2007-2008

Socio-economic conditions of different regions in Peru can be perceived from a different angle. The FONCODES[9] Poverty Map classifies 25 regions to five (5) ranks according to Deficiency Index (*Indice de Carencias*) it has developed independently, as shown in Table 2.2.2-2.

Table 2.2.2-2: Rating of Poverty according to FONCODES Poverty Map 2006

Categories	Names of Regions	No. of Regions	Total Population and %
	Total	**25**	**27,412,157 (100%)**
Poorest	Huancavelica, Huánuco, Cajamarca, Apurimac, 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, Junin, **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: *Nuevo Mapa de Pobreza Departamental de FONCODES,* 2006

Deficiency Index of FONCODES Poverty Map is based on the following social indicators; i) percentage of population without potable water, sanitation and electricity, ii) illiteracy rate among women, and iii) chronic malnutrition among the children aged six (6) through nine (9). It is measured on the scale from zero (0) to one (1), in which one (1) is the most severe and zero (0) the less severe. Table 2.2.2-3 summarizes these social indicators in the five target regions and Figure 2.2.2-1 shows the deficiency index of all 25 regions.

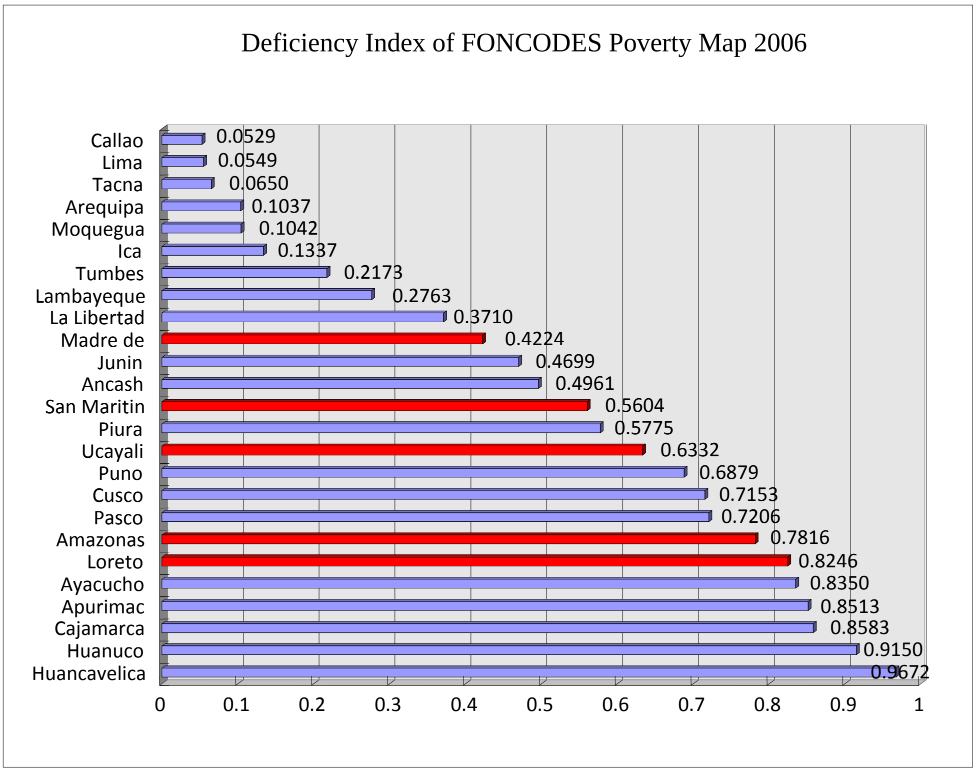
[9] FONCODES: *Fondo de Cooperacion para el Desarrollo Social*

Table 2.2.2-3: Social Indicators of Five Regions based on FONCODES Poverty Map 2006

	Deficiency Index *	% of population without			Illiteracy rate among women	Chronic Malnutrition
		water	drainage	electricity		
Nationwide	**---**	**27%**	**20%**	**27%**	**27%**	**28%**
1. Amazonas	0.7816	37%	17%	58%	19%	43%
2. San Martin	0.5604	38%	15%	45%	13%	31%
3. Madre de Dios	0.4224	35%	20%	42%	7%	21%
4. Ucayali	0.6332	62%	18%	38%	7%	30%
5. Loreto	0.8246	62%	37%	47%	10%	38%

Note: All indicators are based on the statistics of 2005 except "chronic malnutrition" which is based on 1999 census data. Elaborated by JICA Study Team based on the data of Nuevo Mapa de Pobreza Departamental de FONCODES, 2006

Figure 2.2.2.-1: Deficiency Index of 25 Regions, FONCODES Poverty Map



Source: JICA Study Team (2010) based on the data of *Nuevo Mapa de Pobreza Departamental de FONCODES*, 2006

(2) Financial Level of the Program Region's District Municipalities

The scales of finance and investment as compared to expenditure of district municipalities in the five (5) target regions are summarized in Table 2.2.2-4. Looking at the expenditure aspect of district municipalities finances in the five regions, one can easily discern that the district municipalities in Loreto and Ucayali have distinctive structures. They receive a relatively sizable amount of oil canon (*canon pertrolero*), due to the oil operations in these regions.

Table 2.2.2-4: Financial Conditions of 199 District Municipalities in the Target Regions

	No. of Provinces	No. of Districts	Population	Expenditure *	Investment within expenditure *	Percentage of Investment to Expenditure
Amazonas	7	84	375,933	125,031,125.59	68,952,548.87	55.15%
San Martin	11	77	728,808	166,805,489.04	65,674,515.79	39.37%
Madre de Dios	3	11	109,555	33,649,596.29	13,052,018.24	38.79%
Ucayali	4	15	432,159	187,566,601.73	113,556,004.93	60.54%
Loreto	7	51	891,732	378,459,711.29	170,221,970.52	44.98%
Total	**32**	**238**	**2,643,301**	**891,512,523.94**	**431,457,058.35**	**48.40%**

Note *: “Revenue” and “Investment within expenditure” are both from the closing accounts in nuevos soles.
Elaborated by JICA Study Team based on the financial data obtained from Mesa de *Concertación* para la Lucha contra la Pobreza

The investment percentage with respect to the total expenditures is higher than 38% in the five regions of the Program, showing a higher percentage in Ucayali.

2.3 Outline of the Water and Sanitation Sector

2.3.1 Organization

(1) The Ministry of Housing, Construction and Sanitation

The Ministry of Housing, Construction and Sanitation (MVCS: *Ministerio de Vivienda, Construcción y Saneamiento*) holds jurisdiction over water supply and sanitation. The MVCS consists of a General Secretariat and two vice-ministries (Figure 2.3.1-1 Organization of MVCS). Under one of the vice-ministries, i.e. the Vice-ministry of Construction and Sanitation (VMCS: *Vice-Ministerio de Construcción y Saneamiento*), there is the National Directorate of Sanitation (DNS: *Dirección Nacional de Saneamiento*) that is in charge of core roles such as policy making for water supply and sanitation at the national level (Figure 2.3.1-2 organization of DNS).

The Office of Program and Investment (OPI: *Oficina de Programación de Inversión*) under General Office of Plan and budget (OGPP: *Oficina General de Planificación y Presupuesto*) within the Ministry will be involved in the prioritization of projects/programs proposed, together with the DNS.

In order to execute the programs of water supply and sanitation, an organization called “Water for All (PAPT: *Programa Agua Para Todos*) was created on 2007 under jurisdiction of the Vice Ministry of Construction and Sanitation. The Ministerial Resolution N° 087-2009-VIVIENDA Operation Manual (*Manual de operaciones*) was issued on February, 24th, 2009. All the water and sanitation projects/programs formulated and executed at national level, including the Water Supply and Sanitation Program for the Rural Amazon Area, will be handled by the PAPT. (Figure 2.3.1-3 Organization of PAPT). Inside the PAPT, a Project Management Unit (PMU) will be created and it will be exclusively in charge of the management of the Program for Amazon Rural Areas.

The environmental matters of the Sector are handled by the Office of the Environment (OMA: *Oficina del Medio Ambiente*) under the Vice Ministry of Construction and Sanitation (Figure 2.3.1-1).

Figure 2.3.1-1 Organization of Ministry of Housing, Construction and Sanitation

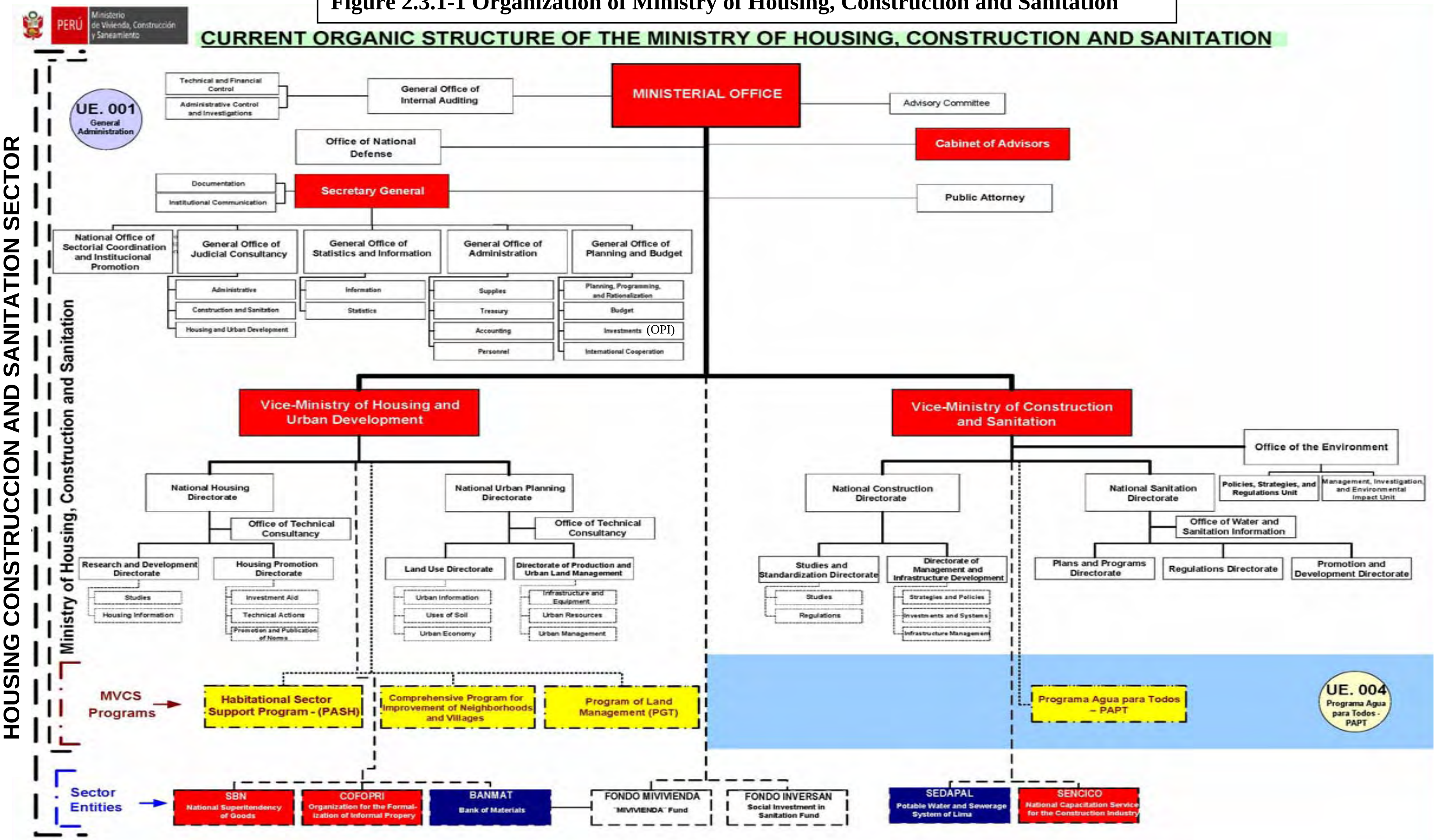
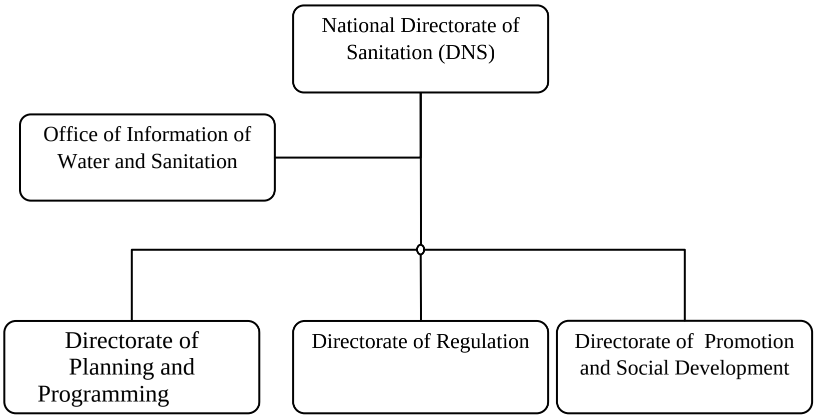
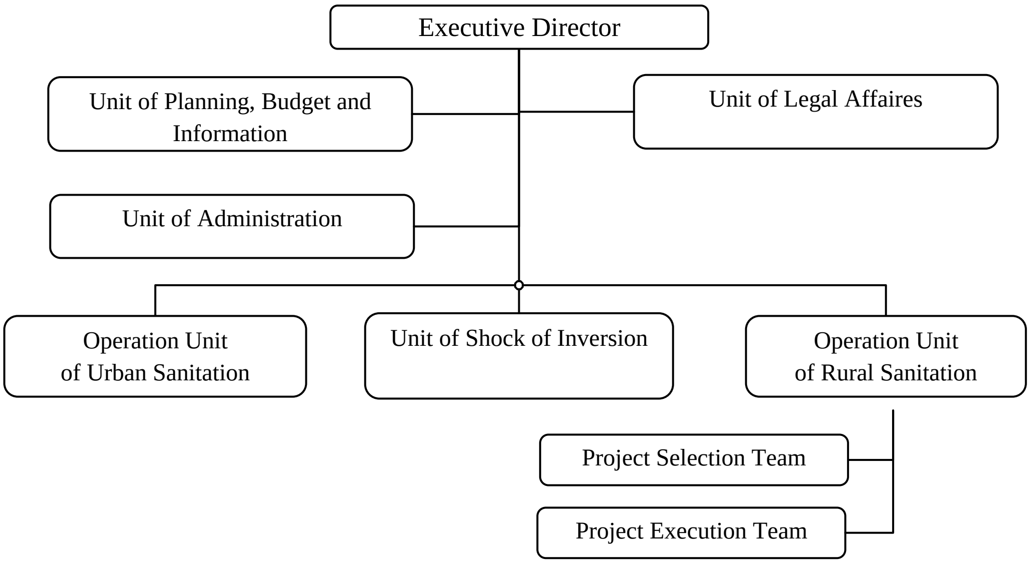


Figure 2.3.1-2_ Organization of DNS



Source: JICA Study Team (2010), based on the information from DNS)

Figure 2.3.1-3: Organization of PAPT



Source: JICA Study Team (2010), based on the information from DNS)

(2) Present Coverage of Water and Sanitation

According to the census conducted by INEI in 2007, the present coverage of water and sanitation are as shown in the table below. The table indicates:

1) The nationwide coverage of water supply shows 75.5%, whereas the coverage in rural areas is only 44.2 %.
2) Household connection of water supply facilities is 54.8% nationwide and only 13.1% in rural areas.

Table 2.3.1-1 Coverage of Water Supply and Sanitation

Type of facilities	Nation wide		Rural	
Water Supply Coverage (against total household)				
In-house connection	54.8%	75.5 %	13.1%	44.2 %
Out-house connection	8.9%		8.7%	
Communal taps	3.8%		3.6%	
Well	8.0%		18.8%	
Water Tank Truck	4.2%	24.5 %	1.2%	55.8 %
River, canal, spring	16.0%		50.5%	
Given water	3.2%		2.8%	
Others	1.1%		1.3%	
Sanitation Coverage (against total household)				
In-house connection	48.0%	54.1 %	1.7%	2.5%
Communal	6.1%		0.8%	
Septic – tank	4.9%	26.7%	5.2%	52.5%
Latrine	21.8%		47.3%	
River, cannel	1.8%	19.2%	3.1%	45.0%
Not available	17.4%		42.0%	
Source: INEI Census (2007)				

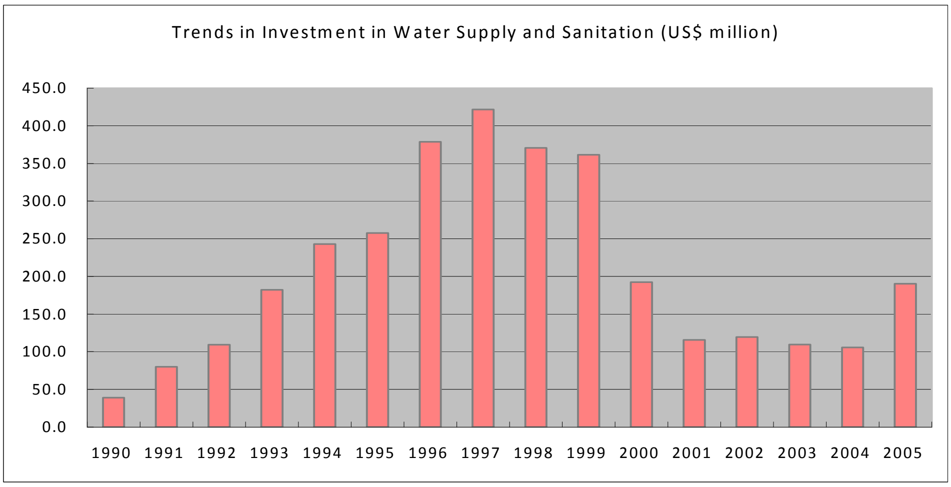
3) Households having any type of water supply facilities are 75.5% nationwide and 44.2% in rural areas.
4) More than half of households (50.5%) in rural areas depend on superficial water such as rivers, canals and/or springs.
5) Household connections for sanitation are 48% nationwide and only 13.1% in rural areas.
6) Septic tanks and Latrines prevail in rural areas, and households without any type of facilities are 45%.

Information on the target area will be presented in Part-II Chapter 3 of the report, as a part of the diagnosis.

2.3.2 Trends of Investment in the Sector

Investment levels increased substantially during most of the 1990s, from US$ 39 million in 1990 to a peak of US$ 422 million in 1997. Since then, investments have declined again to US$ 106 million in 2004 and US$ 190 million in 2005.

Figure 2.3.2-1: Annual Investment in Water Supply and Sanitation



Source: MEF

The Government's Multi-annual Sector Strategic Plan[10] points out that investments of US$ 4,789 million would be needed in the period of 2005-2015 (US$497 million/year) to achieve the Millennium Development Goals in the sector.

2.3.3 Budget Allocations to the Sector within MVCS Portfolio

Table 2.3.3-1 shows the annual expenditure of the MVCS from 2005 to 2008. Within its portfolio, the MVCS has five major programs, namely (1) Program Water for All *(Programa Agua para Todos)*, (2) Neighborhood improvement, (3) Land titles, (4) Housing and (5) Capacity development.

[10] *Plan Estratégico Sectorial Multianual 2008-2015, Ministerio de Vivienda, Construcción y Saneamiento, Diciembre 2008*

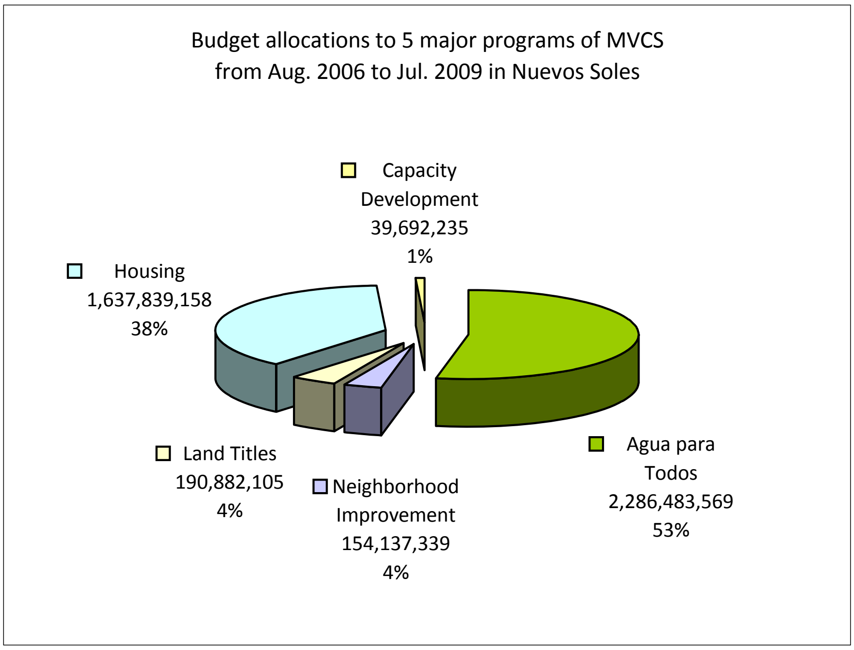
Table 2.3.3-1: Annual Budget of MVCS from 2005 to 2008

		2005	2006	2007	2008
(a)	Total Expenditure ((b)+(c))	387,385,505	470,930,976	1,036,801,539	1,583,353,896
(b)	Operating Expenditure	34,348,680	33,580,682	40,451,262	48,840,640
(c)	Investment Expenditure ((c1)+(c2))	353,036,825	437,350,294	996,350,277	1,534,513,256
	(c1) 5 major programs	349,831,878	434,542,094	931,425,355	988,738,151
	(c2) Other program	3,204,947	2,808,200	64,924,922	545,775,105

Source: MVCS (http://www.vivienda.gob.pe/tablero/externo/consolidado_ext.aspx)

Budget allocations to the sector of water supply and sanitation are shown in the Figure 2.3.3-1. Among the aforementioned five (5) major programs of the MVCS, the PAPT accounts for more than 50% of the total spending of the MVCS.

Figure 2.3.3-1: Budget Allocations to 5 Major Programs of MVCS



Source: MVCS

2.4 Activities of Other International Cooperation Agencies in the Sector

2.4.1 Overview of International Cooperation in the Sector

International cooperation, refundable and not refundable, has become an important factor for infrastructure development in the country, since a few decades ago. The following international cooperation agencies have played important roles in investment, financing and in technical assistance in Peru's water supply and sanitation sector:

(1) Multilateral financial institutions

- World Bank (WB)
- Inter-American Development Bank (IDB)

(2) Bilateral Cooperation Agencies

- German *Kreditanstalt für Wiederaufbau* (KfW) and *Gesellschaft für Technische Zusammenarbeit* (GTZ)
- Swiss Agency for Development and Cooperation (SDC)
- Canadian International Development Agency (CIDA)
- Japan International Cooperation Agency (JICA) [11]

In the rural areas, the World Bank , the Swiss Agency for Development and Cooperation (SDC) and The Canadian International Development Agency (CIDA) have been predominant cooperation agencies for support to both rural areas and small towns. This support has been given through programs like the Peru Water Supply and Sanitation Project and SANBASUR *(Proyecto de Saneamiento Ambiental Básico en la Sierra Sur*). The WB also finances National Water Program and Rural Cleaning (PRONASAR: *Programa Nacional de agua y Saneamiento Rural*). This is the main project, now in execution, for rural areas sanitation and it includes a component for small cities. Small cities like Ayacucho, Cajamarca and Puno received much support from KfW.

In the urban areas, larger cities, such as Tumbes, Piura and Cusco received support from the IDB and the former JBIC[12]. The Andes Promotion Corporation (CAF: *Corporación Andina de Fomento*), WB and the former JBIC (now JICA) have supported the water supply and sanitation company, Potable water and Sewerage Service Enterprise (SEDAPAL*: Servicio de Agua Potable y Alcantarillado*) in Lima and Callao. The current loans that the former JBIC gave to this entity are P16, P21 and P30.

[11] The JICA is now responsible for the yen loan financing scheme which was administered by the former Japan Bank for International Cooperation (JBIC). This overseas concessional loan assistance was transferred from the JBIC to the JICA in October, 2008.

[12] The JBIC provided loans to Piura-Castilla and Chimbote though its PE-P25 and Cusco, Iquitos and Sicuani through PE-P29.

Several international cooperation agencies assisted regional governments in the formulation of the sector strategies at regional level. The WB's Water and Sanitation Program[13] (WSP) together with the SDC supported the Regional Governments of Cajamarca, Lambayeque, La Libertad and San Martín in the formulation of their Comprehensive Sanitation Regional Plan ("*Planes Regionales de Saneamiento Integral*"). These plans were developed with the explicit goal of creating a shared vision of the sector strategy among the three levels of government (regional, provincial and district) so as to prevent duplication of efforts.

The WB, IDB and KfW are also active in the areas of institutional capacity-building at national level, public policy reform in the sector and private sector participation. For instance, the German-supported PROAGUA (*Programa de Agua Potable y Alcantarillado de la Cooperación Técnica Alemana*) assists in the modernization of the National Superintendence for Water and Sanitation (SUNASS) and the strengthening of the National Water and Sanitation Companies Association (known by its Spanish acronym "ANEPSSA"). The IDB's Sanitation Sector Development Programs I and II support a series of policy reforms in order to improve the service providers' governance, transparency and corporate decision-making to promote long-term sustainability of services. This Policy-based Loan (PBL), consisting of three phases, also aims to strengthen the operational capacities of the governing and regulatory authorities, improve the quality of the tariff system and promote the participation of specialized operators to ensure the effectiveness of the public utilities management.

International cooperation agencies also play an important role in inter-sectorial coordination and integration in Peru. The WSP and several bilateral cooperation agencies forming part of the Water Group[14] (*Grupo Agua*) catalyzed the formation of an agreement for policy coherence to support sustainable sanitation among the MVCS, Ministry of Health and Ministry of Environment. It was signed by the 3 parties at the first-ever national conference on sanitation, PERUSAN 2008 "Proposals for Sustainable Sanitation". The conference contributed to defining a strategy to implement the National Sanitation Plan, raising public awareness of sanitation issues, and promoting a new vision regarding sanitation in Peru, from a multi-sectorial perspective.

The following table summarizes some of the major international cooperation strategies and programs in the sector.

[13] WSP began in 1979 as a cooperative effort between the WB and the United Nations Development Program to look at cost-effective technologies and models for providing safe water and sanitation to the world's disadvantaged people.

[14] The Water Group is comprised of the main Cooperation Agencies working on water and sanitation and Peru, whose role is to serve as an advisory body to the MVCS.

Table 2.4.1-1: Major Projects Assisted by Cooperation Agencies in the WSS Sector

	Assistance Strategies/Target Areas	**Major Projects**
World Bank (WB)	The WB's portfolio in the water supply and sanitation sector covers basically all WSS sub-sectors. The WB is an active Cooperation Agency in the rural setting through its projects such as Peru Water Supply and Sanitation Project and PRONASAR.	1) PRONASAR (2002-2010) US$80million 2) Lima Water Rehabilitation and Management Project (1995-2008) [*1] 3) Peru Water Supply and Sanitation Project (1982-1998)
Inter-American Development Bank (IDB)	One of the principal areas of the IDB's support to Peru is ensuring greater access to basic services (IDB Country Strategy with Peru 2007-2011). This includes access to safe drinking water and sanitation facilities. With its Water and Sanitation Initiative (2007-2011)[*2] launched in 2007, the IDB has funded a PBL program "Sanitation Sector Development Program".	1) Sanitation Sector Development Program (I and II) (2007-) 2) Improved Access to Water and Sanitation Services in Small Municipalities (2008-2010) 3) Support to Water for Everyone Program - SEDAPAL (SPDL)
German KfW/GTZ	Traditionally the German cooperation has supported small and medium EPSs in the improvement/expansion of facilities as well as in the institutional capacity building. PROAGUA is a flagship program of German cooperation in Peru.	1) *Programa de Agua Potable y Saneamiento* (PROAGUA) [*3] 2) *Programa de Participación del Sector Privado* (PSP) 3*) Apoyo Programatico para Reforma Sectorial*
Swiss Development Cooperation (SDC)	The Swiss Agency for Development and Cooperation concentrates its assistance on three of the poorest regions in the country's mountain area: Cajamarca, Cusco and Apurimac. SDC is present in Peru since 1964 and it focuses on rural development.	1) SANBASUR (1996-2006) 2) PROPILAS (2002-2006)
CIDA	Since 1968 CIDA has supported poor urban communities in building safe water and sanitation services. It claims to have benefited more than 700,000 through its sanitation sector implementations.	1) Peru Water Supply and Sanitation Project (1982-1998) 2) PRONASAR US$5million (2002-201)
Japan International Cooperation Agency (JICA)	Japan cooperation has an important place in infrastructure financing of sanitation at national level. JICA has assume since 2008 the projects (now in execution) financed by JBIC. Some of the main projects are:	1) JBIC P16: Upgrading of the Disposal of black waters System in the south area of Lima, MESIAS, MVCS. 2) JBIC P21: Strengthening of the water sources for Lima, Marca I y Marca II. 3) JBIC P25: (US$ 119million): Upgrading and Enlargement of the Sewerage an Potable Water System

	Assistance Strategies/Target Areas	Major Projects
		in Chimbote, Piura and Castilla – MVCS-PAPT 4) JBIC P30 (US$ 213million): Upgrading and Enlargement of Potable Water System and Sewerage in Iquitos, Cusco y Sicuani – MVCS-PAPT 5) JBIC P30 (US$ 213million): Upgrading and Enlargement of the Potable Water System and Sewerage in the peripheral areas of Lima, Plant AP Huachipa, North Branch Line and Complementary Works. SEDAPAL.

Notes:
*1 The project aims to improve the efficiency of water and sanitation delivery in the Lima-Callao metropolitan area through support for SEDAPAL's privatization, rehabilitation of water and sewerage systems and expansion of services to urban poor in the Pueblos Jovenes.
*2 In 2007 the IDB launched the Water and Sanitation Initiative (2007-2011), which plans to provide water and sanitation services to 100 cities and 3,000 rural communities in Latin America. After a short while, the IDB decided to lend more than US$ 350 million to Peru over the next five years for the development of sanitation and water projects, benefiting over 100,000 families. The funding will cover investment, structural reforms and technical cooperation, assisting initiatives in the areas surrounding capital Lima and other cities.
*3 This program includes as its components sub-programs like Programa de Proyectos Integrales (PPI) and Programa de Medidas de Rapido Impacto (PMRI).

Source: Elaborated by JICA Study Team based on the information obtained from the homepages of relevant organizations

2.4.2 International Cooperation in the Rural Setting

The "Peru Water Supply and Sanitation Project" is one of the oldest among rural projects. The first two phases of the program (1982-1986) focused on the installation of water and sewerage systems in the peripheral urban areas of Lima. During the third (1986-1988), fourth (1988-1994) and fifth **phases** (1994-1998), the program expanded to include a rural component, consisting of water supply systems and latrines for rural communities in the Region of Ancash, as well as several other rural areas.

The Cooperation Fund for Social Development (FONCODES), created in 1991, has channeled substantial resources to the investments in rural areas in various sectors including water supply and sanitation[15]. However, since the start of PRONASAR, FONCODES has retired from water

[15] Within the framework of the state decentralization process, since October 2003, FONCODES transfers resources to the district city councils verified for social infrastructure projects, offering technical assistance and contributes to the capacity building for the responsible handling of social investments. FONCODES is now under the jurisdiction of the Ministry of Women and Social Development (MIMDES).

supply and sanitation activities. FONCODES was the single largest funding source for the sector, especially for the marginalized communities during the 1990s[16].

Relatively recent projects in the sector are the SDC-funded SANBASUR and PROPILAS; and the WB-funded PRONASAR. SANBASUR in the Region of Cusco developed innovative designs for water-flush latrines and small diameter sewerage systems and met with considerable success in rural communities. PROPILAS, executed by CARE Peru in the Region of Cajamarca, helped build district municipalities' capacity to efficiently direct water and sanitation services in their communities. With a loan of US$ 50 million from the WB and a grant US$ 5 million from the CIDA, PRONASAR benefits around 1.3 million people in rural areas and small cities with populations less than 30,000.

Among on-going projects in rural areas is "Improved Access to Water and Sanitation Services in Small Municipalities", funded by the IDB. The total project cost is around US$ 3 million and it is executed by a non-governmental organization called "*Agua limpia*". From the outset, the program serves the regions of Ancash and Ayacucho; and later on, two additional regions.

Several projects and programs targeting rural areas are currently in the planning stage. The biggest program among them, in terms of the number of target communities and beneficiaries, is a Spanish-funded program called *Programa de Mejoramiento y Ampliación de Servicios de Agua Potable y Saneamiento en el Perú con la Cooperación Española*. This program will be financed through the Spanish Cooperation Fund for Water Supply and Sanitation,. The administration of this program is entrusted to the IDB.

Hereafter, the details of PRONASAR, SANBASUR and a pipeline Spanish-supported program are presented.

(1) PRONASAR (WB and CIDA)

PRONASAR aims to increase the sustainable use of new and rehabilitated water supply and sanitation facilities in rural areas and small cities, and it will benefit approximately 1.3 million people. With a US$ 50 million loan from the World Bank, it started in 2004 and is scheduled to run until the end of 2010. Apart from infrastructure-related components, PRONASAR provides training in the operation and management of water and sanitation facilities and hygiene education in the target areas. Through the access of these services, this program aims to improve the population's health and living conditions.

[16] 85% of investments in rural areas were made by FONCODES in the 1990s ("Evaluation of Peru's National Sanitation Policies" (August 2004).

Table 2.4.2-1: Project Description - PRONASAR

Components	1) Rural Water Supply, Sanitation, Training and Hygiene Education 1-A) Rehabilitation and Expansion of Existing Systems 1-B) Construction of New Systems 2) Water Supply and Sanitation in Small Towns 3) Capacity-building 4) Project Management, Monitoring, Evaluation and Supervision
Program Financing Plan	Total: US$80.00 million 1) Government of Peru: US$12.58 million 2) WB: US$50.00 million 3) CIDA: US$5.00 million 4) Local Communities: US$7.57 million 5) Municipalities: US$4.85 million
Individual Project Financing Mechanism	1-A) Rehabilitation and Expansion of Existing Systems - external assistance: 60% - local government and community: 40% 1-B) Construction of New Systems - external assistance: 80% - local government and community: 20%

Elaborated by JICA Study Team based on the information obtained from the MVCS *Programa Agua para Todos* and Project Appraisal Document of PRONASAR 2002

The projects implemented to date under PRONASAR are summarized in the table below.

Table 2.4.2-2: Achievements of PRONASAR as of June 30th, 2008

Names of Regions	No. of Projects	No. of Beneficiary	Total Project Cost *
Arequipa	24	10,613	S/. 2,710,990
Ayacucho	115	48,994	S/. 11,775,161
Huancavelica	74	30,667	S/. 10,782,252
Huánuco	33	12,823	S/. 3,511,813
Lima	52	34,993	S/. 4,676,465
Junín	83	53,487	S/. 8,895,808
Pasco	29	17,807	S/. 2,088,277
Piura	82	65,759	S/. 10,956,566
Total	**492**	**275,143**	**S/. 55,397,577**

Note *: Figures are based on the detailed design plans.

Source: *Agua para Todos* PRONASAR

(2) SANBASUR (SDC)

Basic Sanitation Project in the Southern Highlands (SANBASUR: *Proyecto de Saneamiento Ambiental Básico en la Sierra Sur*), is a bilateral cooperation project financed by the Swiss Confederation. It aimed to promote the improvement of basic rural sanitation conditions in the Region of Cusco, through the development of basic infrastructure and self-management skills among the community organizations and local and regional governments. The institutional capacity development included the strengthening of institutional linkages between the regional governments and local governments and those between local governments and community organizations, Sanitation Service Administration Board (JASS: *Juntas Administradoras de Servicios de Saneamiento*).

The project was implemented from 1996 to 2006, in four stages. During the first three stages the activities were concentrated at the micro or community level. The communities' capacity to manage the sanitation facilities in a sustained manner was developed with the involvement of the users, JASSs, community leaders, local (district and provincial) authorities and diversified units of the Ministry of Education and the Ministry of Health. The fourth stage of the project involved the capacity development at the meso level, that is, with the involvement of the Regional Government of Cusco. The following table shows the project summary.

Table 2.4.2-3: Project Description - SANBASUR

Components	1) Infrastructure 2) Soft component (project familiarization/promotion at the stages of pre-investment, implementation and post-implementation, capacity development, and environmental/hygienic education)
Areas	1) Water supply 2) Sanitation (latrines) 3) Solid waste management
Financing Mechanism	1) External assistance: 60% 2) Local (provincial and district) government: 20% 3) Community (as unqualified manual labor): 20%
Role of local government	1) Implementation of the project 2) Follow-up 3) Technical assistance during the post-implementation phase

a Elaborated by JICA Study Team based on the information obtained from COSUDE homepage
m

(3) Program of Improvement and Enlargment of the Potable Water and Sanitation Services with the Spanish Cooperation *(Programa de Mejoramiento y Ampliación de Servicios de Agua Potable y Saneamiento en el Perú con la Cooperación Española*)

This Program is financed through the Water and Sanitation Spanish Fund *(el Fondo de Cooperación para Agua y Saneamiento*). This is a special grant fund created by the Government of Spain in 2007 to help countries in Latin America and the Caribbean expand water and sanitation services and support their efforts to reach the Millennium Development Goals for the sector[17]. The management of this fund is entrusted to the IDB and the total program in Peru amounts to US$ 90 million.

The program is intended to expand and improve the existing water supply systems in rural areas and in small towns where EPS (Public Enterprises of Sanitation) are operating. The program is still in the planning stage and 80 projects were already identified in three regions;

[17] In November 2007 the Government of Spain announced in the XVII *Cumbre Iberoamericana* the creation of the Fund for Cooperation for Water Supply and Sanitation with the support of US$ 1,500 million for 4 years.

namely Huancavelica, Ancash, and Ucayali. Out of US$ 90 million, the Spanish Fund is to finance 80% and the remaining is funded by the Peruvian National Government. The financing plan of the program is as follows.

Table 2.4.2-4: Financing Plan for Spanish-funded Program

Components	US$ million
Consultant Fees (pre-investment studies, etc.)	4.00
Infrastructure and capacity-building of management after works	85.00
Capacity-building at pre-investment and implementation stages	1.00
Total	**90.00**

Source: VMCS-DNS

2.4.3 Relations of Other Projects with the present Program for Rural Amazon Area

Among the projects and programs mentioned above, the PRONASAR was originally designed to implement projects in the Amazon area, within which the five (5) target administrative regions of the present Program are located. As of 30th June 2008, the PRONASAR had implemented no projects in any localities within these five target administrative regions as shown in the Table 2.4.2-2. However, the PRONASAR has informed the Study Team that such program will execute projects in a total 38 localities before completing its activates: seven (7) localities in the Amazonas administrative region and in thirty-one (31) localities in the San Martin administrative region,. The present Feasibility Study will therefore exclude the 38 localities from the target locality list as will be explained in chapter 3.1.4.

On the other hand, the FONCODES that had retired after the PRONASAR started its activities, implemented water supply and sanitation projects in 1990th and in the beginning of 2000th. It is reported that many of the facilities have been deteriorated and need rehabilitations. In addition to the projects implemented by the FONCODES, it is expected, though such information is not available, that there will be facilities/systems implemented by various organizations in the target area of the Program. The present Feasibility Study will include such projects that need rehabilitations and/or extensions that should be considered reasonable and sustainable.

2.5 National System of Public Investment

2.5.1 Objectives of SNIP

National System for Public Investment (SNIP: *Sistema Nacional de Inversión Públic*a) was first established by the Law Nº 27293, published on 28 June, 2000, followed by modifications on 25 May, 2005 and 21 July, 2006. The Law states the creation of SNIP in order to optimize the use of the public resources for public investment, by means of the establishment of principles, processes, methodologies and practical standards for various phases of the investment projects. The Directorial Resolution Nº 002-2009-EF/68.01 was published in February 2009 to establish the practical standards, methods and procedures of obligatory observance applicable to the phases of pre investment, investment and post investment and to the conforming organs of the SNIP.

Public investments need to be examined and approved through the process directed in the law, before they are implemented. It is noted that the approval (declaration of viability) given through the SNIP examinations shall not ensure/guarantee the implementation of the public investment. The formulating unit (FU) that formulates the public investment project, for which the declaration of viability has been given shall arrange the financing separately by itself.

2.5.2 Public Investment Project and Public Investment Program

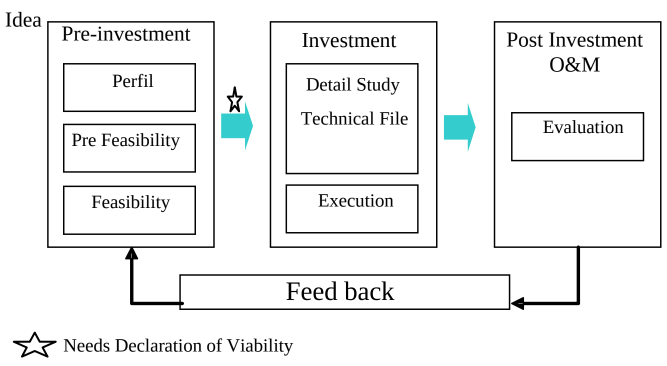
A public investment project (PIP) may be executed individually, or execution may be carried out as a set of PIPs and/or ‘conglomerates’ that are designed for the attainment of a common objective. In the case of individual implementation of a PIP, each project shall be subject to the SNIP examination process. In the other case, if an investment program consisting of many numbers of projects for a common objective, the program itself, not each project included in the program, shall be subject to the SNIP examination process. Projects in the program can be categorized as ‘conglomerate/s’ that is/are set/s of PIPs that shall be of small scale, sharing similar characteristics regarding design, size or unit cost, corresponding to a same function and program.

2.5.3 Cycle of Project / Program and SNIP Process

The SNIP process is as shown in the Figure 2.5.3-1. The process consists of (i) Pre-investment stage, (ii) Investment stage, and (iii) Post investment stage, according to the *Resolucion Directoral* (Nº 002-2009-EF/68.01).

In the pre-investment stage, in addition to the three (3) steps of studies, ‘Simplified *Perfil* study’ has been supplemented before the *Perfil* Study. Requirements of a study level are defined according to the investment amount as shown in Table 2.5.3-1 below.

Figure 2.5.3-1 SNIP Process



Source: the Resolucion Directoral (Nº 002-2009-EF/68.01))

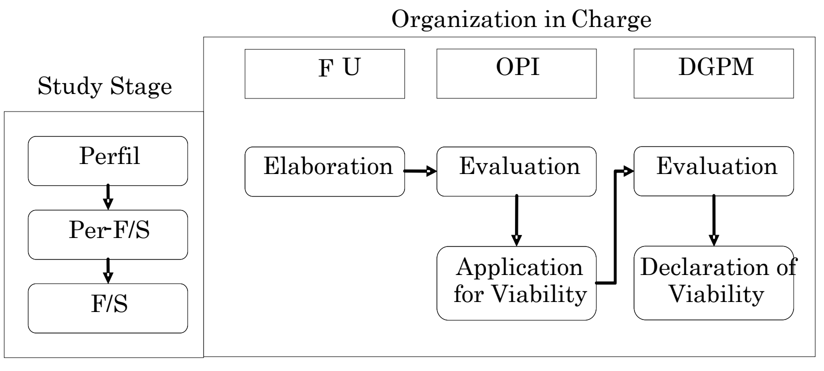
Table 2.5.3-1 Required Study Level by SNIP

Project scale	Investment Scale (S/.)	Required Study
Smallest	Not more that 1,200,000(*)	Simplified PERFIL (formant)
Small	Up to 6,000,000	PERFIL
Medium	Between 6,000,001～ 10,000,000	PERFIL, PRE-F/S
Large	Not less than 10,000,000	PERFIL, PRE-F/S, F/S
(Source: Homepage of MEF, (*) newly revised in February 2009)		

2.5.4 Required Studies for Pre-Investment stage for Public Investment with indebtedness

Before the implementation of a project/program with an indebtedness, the formulating unit (FU) of the project/program shall elaborate, step by step, three types of studies, i.e. (i) *Perfil*, (ii) Pre-F/S and (iii) F/S, in accordance to the requirement shown in the Figure 2.5.4-1.

Figure-2.5.4-1 SNIP Process in Pre-Investment Stage



(Source: Summarized by the Study Team(2010))

The step of Pre-F/S may sometimes be omitted according to the significance of the project/program, subject to the decision of the General Directorate of Multi-annual Programming for Public Sectors (DGPM: *Dirección General de Programación Multianual del Sector Público*[18]) of the MEF: Ministry of Economy and Finances. Each study shall be examined by the Office of Program and Investment (OPI: *Oficina de Programación de Inversiones*[19]) belonging to the sector organization to which the FU belongs; and by the DGPM. The DGPM shall be responsible to declare the 'Viability' that is required for the implementation of the project/program. Costs for the studies in the pre-investment stage shall be procured by the organization of FU.

2.5.5 Period of Evaluation

The evaluation period of a PIP or an investment program are defined in the *Resolución Directoral* as shown in the Table 2.5.5-1.

Table2.5.5-1 Required Period for Evaluation

Study Level	Period of evaluation (Working days)
Perfil	Twenty (20) working days
Pre-feasibility	Thirty (30) working days
Feasibility	Forty (40) working days
(Source: the Resolucion Directoral Nº 002-2009-EF/68.01	

2.5.6 Bank of Projects

Once a *Perfil* of a PIP is submitted to the OPI, the OPI shall register the project to the 'Bank of Projects' that has been established under the MEF[20] for the registration of all PIPs in the country; in order to avoid duplication of similar project in an area or for same beneficiaries. Before the registration, the OPI shall verify in the bank of projects that other PIPs do not exist with the same objectives, beneficiaries, geographic location and components; and the OPI shall be responsible for maintaining updated information registered in the Bank of Projects. The bank of projects is accessible through a MEF website so that one can monitor all the projects and their present status, such as 'Under examination' or 'Approved' or 'Under implementation" and so on.

2.5.7 Investment stage of a Program

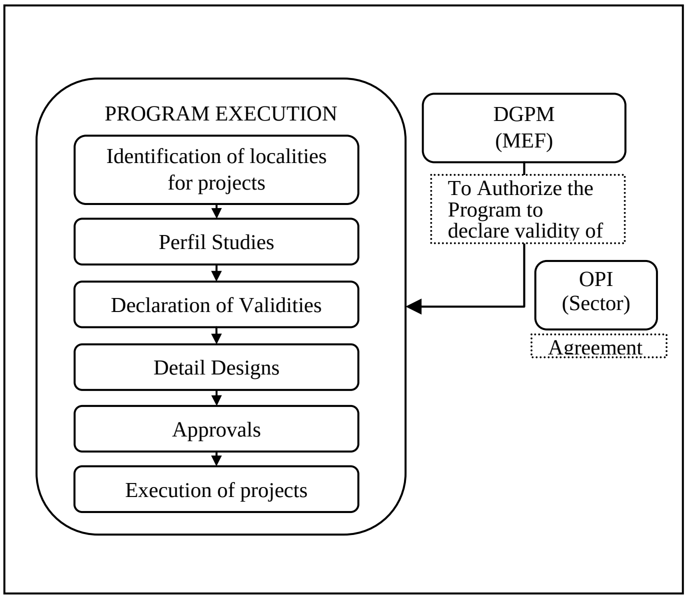
In the case of the program to which the 'Viability' has been given by the DGPM based on the 'conglomerates', the *Perfil* studies have to be conducted for each project by the executing agency.

[18] Directorate General of Multi-annual Planning for Public Sector
[19] Office of Planing and Investiment
[20] Ministry of Economy and Finance

For the implementation stage of the program, the DGPM is entitled to authorize another organization being involved in the SNIP process, to declare 'the Viability of the *Perfil*s', if the corresponding OPI should agree with the DGPM. The executing agency of the program may be the organization who should 'declare the Viability' of the *Perfil* of a project under the program. Thus, in the implementation stage, the DGPM or the OPI may not directly be involved in the process of evaluations of the *Perfil* studies and the detailed design studies needed for the implementation.

The executing agency shall also elaborate the definitive studies (detailed design) of the projects in conformity with the parameters under which the viability of the program was granted in the pre-investment stage for the implementation of the project. In this stage, the executing agency is responsible for updating the information registered with the Bank of Projects.

Figure 2.5.7: Process to Project Execution



Source: JICA Study Team (2010)

CHAPTER 3 PREVIOUS STUDIES AND PAST EXPERIENCES

3.1 Review of the previous Perfil for the Program of Potable Water and Sanitation for Rural Amazon Areas

3.1.1 Target localities

Approximately 80% of the target localities comprise a number of households between 40 and 100, and a corresponding population of between 200 and 500 inhabitants. From this it is understand that the Program consists of small-scale rural localities, located in the Amazon area. In the Feasibility Study, the information to be used is the one to be found in the results of the 2007 Census. This available information will be useful to reevaluate the number of localities and target population.

3.1.2. Criteria of the conglomerates

The previous Perfil categorizes the target localities in five (5) conglomerates based on the results of the studies in the 34 sample localities. This categorization was done considering the base of the technical criteria of shape and type of water supply and sanitation and other complementary criteria such as: (i) size of population, (ii) socioeconomic characteristics of the benefited families and (iii) geographical region where the locality is settled. Unit cost of the technical alternatives was not taken in consideration.

Table 3.1-1: Conglomerate in the Previous Perfil Study

Conglomerate	Households (HH)		Condition of		Natural Region		
	100< HH	HH<100	Water	Sanitation	Low Forest	High Forest	Front Forest
C1	○		P-W-T, P-WO-T, G-W-T, G-WO-T	Sewerage, Composting	○	○	○
C2		○	P-W-T, P-WO-T, G-W-T, G-WO-T	Composting	○	○	○
C3		○	Roof Top System	Composting	○		
C4		○	Communal Well	Composting	○	○	
C5		○	BST (Public taps)	Composting	○		
P-WO-T: Pumping System without Treatment, P-W-T: Pumping System with Treatment, G-WO-T: Gravity System without Treatment, G-W-T: Gravity System without Treatment							

Source: Previous Perfil Study.

On the other hand, the information available for the classification of all the target localities was limited and, therefore, the classification of the localities in five (5) conglomerates is not well defined in the previous *Perfil*. The use of some of the conglomerates has become irrelevant in the previous *Perfil* when projection was made to the program level.

In response to a question raised by the consultant for the present Feasibility Study in regards to the number of conglomerates proposed in the previous *Perfil*, the DNS together with the MEF Ministry of Economy and Finance) responded that the number of the conglomerate would not be so many and suggested that the criterion for the formation of the conglomerates could be based on the geographic regions of the Forest Region, e.g. Front Forest, High Forest and Low Forest.

3.1.3 Target year for evaluation of the Projects and the Program

The target year for evaluation for each one of the sample projects in the previous *Perfil* is considered to be appropriate, given that this will depend on the type of system proposed for each of the localities, in agreement with what has been established by the water and sanitation sector. For systems of potable water with sewerage and treatment of residual waters, the target year for evaluation should be twenty (20) years; and for unconventional potable water systems (public taps, communal wells, and other) with sanitation by means of individual systems like latrines, the target year for evaluation is ten (10) years, as has been presented in the Feasibility Study. With regard to the target year for execution of the Program, it has been established in five (5) years, time that seems very optimistic, considering PRONASAR's experience, which execution until present date is over six (6) years.

3.1.4 Demand Analysis

(1) Methodology

In the previous *Perfil*, an analysis of the current demand for the services of potable water and sanitation in the sample localities and its population was done, having the survey results of the coverage of the sample localities and its projection with the goals set by the Sanitation National Plan 2006-2015. In the present Feasibility Study, with the detailed field study results, a current demand analysis for potable water and sanitation needs to be refined to a F/S level. All of these will help define the design criteria.

(2) The study of the previous *Perfil* has adequately considered the variables:

1) Current population
2) Population growth rate
3) Population density
4) Coverage of potable water and sanitation
5) Number of public taps

3.1.5 Supply Analysis

The previous *Perfil* study presents the supply analysis of the current coverage of water and sanitation services at conglomerate level, having the survey results of coverage of each one of the sample localities to a level of *Perfil* level. However, such information should be improved to a F/S level according to the field work that is being performed in the sample localities.

3.1.6 Balance of Supply and Demand

The previous *Perfil* study presents the balance of supply and demand in percentages for each conglomerate. This is the respective percentage of localities for each conglomerate that do not have water and sanitation services.

3.1.7 Technical Description of the Alternatives

The alternatives considered in the previous *Perfil* study have been suggested according to the characteristics of each locality, and seven system patterns have been identified:

1) Potable water system: Pumping with treatment (C1 and C2), sewerage system and/or latrines.
2) Potable water system: Pumping without treatment (C1 and C2), sewerage system and/or latrines.
3) Potable water system: Gravity with treatment (C1 and C2), sewerage system and/or latrines.
4) Potable water system: Gravity without treatment (C1 and C2), sewerage system and/or latrines.
5) Potable water system: Roof system and latrines (C3).
6) Potable water system: Communal well and latrines (C4).
7) Potable water system: Pumping without treatment and latrines (C5).

The present Feasibility Study considers that some of the technical solutions proposed above would not be suitable for the sustainable point of view. It is therefore necessary to revise and analyze the proposed alternative approaches with the aim of improving this proposal from a sustainability viewpoint.

3.1.8 Components of the Program

The study has identified three components of the Program:

1) Supply of potable water and rural sanitation.
2) Capacity building for the management of the potable water supply and sanitation services.
3) Administration of the Program.

The proposal of the previous *Perfil* was created based on the model of ¨Direct Implementation¨ adopted by PRONASAR. The Feasibility Study will review the composition of the components according to the analysis of the current situation and the experience of PRONASAR.

3.1.9 Costs

The costs of implementation have been calculated at market cost and social cost for the three (3) components of the program, for the ¨without project¨ situation as well as the ¨with project¨ situation:

1) Supply of potable water and rural sanitation.
2) Capacity building for the management of the potable water supply and sanitations services.
3) Administration of the program.

However, the information recently obtained by the Study Team for the Feasibility Study, has indicated indicates that the market prices or private prices proposed in the previous *Perfil* are considered to be lower that the actual. Transportation costs also appear to be lower than the actual. The Program cost has to be reviewed based on the field survey results in the sample localities.

3.1.10 Benefits

The benefits have been calculated for the conglomerates 1, 2, and 5, due to the fact that these conglomerates will have the potable water system through a household connection.

The benefits have been estimated based on the demand curve, keeping in mind the freeing up of the resources of the families that are not connected to the actual system (social value of transport time) and the consumer surplus that benefits old and new users.

These benefits should be revised, keeping in mind the guidelines of SNIP with the new cost estimate that will be made by the Feasibility Study.

3.1.11 Social Evaluation

The social evaluation has been performed for the potable water systems with the cost-benefit and cost-effectiveness methodologies; and for the sewers, waste water treatment plants and latrines, cost-effectiveness methodology has been used.

The *Perfil* concluded that the IRR (Internal Return Rate) will be 11.3% which exceeds the cut-off line of 11% established by SNIP. The IRR will be revised based on the new cost estimate.

3.1.12 Sensitivity Analysis

For the sensitivity analysis, various percentage deviations have been carried out in the investment costs, operation and maintenance costs and in the benefits, which turned out to be very considerable in the face of an increase of 12% of the costs due to low profitability.

3.1.13 Sustainability

In the sustainability analysis the *Perfil* has developed the themes of participation of the communities, participation of the beneficiaries, participation of local and regional authorities, financing, family installments and family incomes.

Some themes must be studied in depth, such as the institutional changes in the stages of operation, implementation and maintenance; the capacity of the population to pay; income-installments analysis; and the organization in charge of the Program, capacity for management in the stages of investment, operation and maintenance.

The sustainability must be revised based on the information from the field regarding the capacity and willingness to pay; as well as the approach of implementation for the communities in the rural Amazon areas.

3.1.14 Environmental Impact

In the study of the *Perfil*, probable positive and negative impacts derived from project implementation have been identified and a general approach has been taken for actions of mitigation. Nevertheless, the costs of mitigation have not been estimated.

The procedure and categorization of environmental evaluation for the Program should be clarified by the Ministry of Environment.

3.1.15 Selection of Alternatives

In the study, the selection of the alternatives has been made; nevertheless these selected alternatives should be analyzed with more detail, on the basis of technical, economic, socio-cultural, environmental, and management criteria.

In many cases, an adequate selection of the alternatives has not actually been made because there was only one proposed alternative.

3.1.16 Organization and Management

The study has raised a proposal of organization in which each of the principal actors has been identified that will participate in the stages of implementation of the program projects, based primarily on the experiences of PRONASAR, which adopted the ¨direct Implementation¨ model.

The Feasibility Study will revise the proposal based on the diagnosis and analysis of the experiences of PRONASAR and the Program requirements.

3.1.17 Implementation Plan

The implementation plan shows the execution of the scheduling of Program activities. The financial implementation of the program should be added.

The *Perfil* proposes an implementation period of five (5) years for 1,961 localities. A more practical and realistic proposal should be considered.

3.1.18 Financing

In the Investment stage, the study has identified the financial sources for Program implementation. It is necessary to identify the financial sources for the stages of administration, operation, and maintenance of water and sanitation services, as well.

In the investment stage:

- JBIC: 74% (US$ 99.1 million)
- MVCS National Contribution (National Treasury): 14% (US$ 19.2 million)
- Regional Governments (Regional Budget): 4 % (US$ 5.0 million)
- Municipal districts (including the contribution from the communities): 8% (US$ 10.1 million)

In particular, the contribution of the local government and contribution of the community's working force should be revised.

3.2 Lessons learned from other potable water and sanitation programs or projects for the rural *area*.

3.2.1 General

The rural water and sanitation programs carried out during the past years have been diverse and can be classified according to diverse criteria. Regarding implementation and administration, there have been and there are projects and programs executed or under execution by the public or private sectors, with different sources of financing. With regards to the public sector, the biggest investment has been made by FONCODES, which, according to the ITDG[21], spent 245.9 million US dollars between 1990 and 1998. A much smaller amount has been invested by institutions like the Ministry of Health (MINSA: *Ministerio de Salud*). In general, these investments have been based on a centralized management and a supply-driven model.

> FONCODES :
> Cooperation Fund for Social Development (*Fondo de Cooperation para el Desarrollo Social*) was an organization established in August 1991 under the direct rule of the President in order to alleviate poverty. FONCODES executes projects of installation/improvement of economic and/or social infrastructures, development/ improvement of productivities, social supports; based on the requests of localities. This organization has now been under Ministry of Women and Social Development (MIMDES: *Ministerio de la Mujer y Desarrollo Social*)l since 2002. Since the start of PRONASAR in 2003, FONCODES has been retiring from the activities for water supply and sanitation.

On the other hand, some experiences conducted by the public sector have rehearsed strategic alliances with different actors. Some of these experiences are, for instance, the ones from SANBASUR (see 2.4.2 (2)) in the Region of Cusco and APRISABAC, in the Region of Cajamarca. Projects in the private sector have been basically conducted by NGOs (ADRA, CARE, ITDG, SER, among other). In spite of having lesser resources, around 76,9 million dollars, these organizations have made innovations and rehearsed alternatives methods, establishing the foundations of the so-called demand-driven approach.

Also, the Peruvian Government has implemented the National Rural Water and Sanitation Program (PRONASAR) having a total cost of US$ 80 million (see 2.4.2 (1)). The objective of this Program is to contribute to the improvement of the life conditions of the rural population and the population of small towns of the country by serving 1,153 localities of between 200 and 3000 inhabitants each. The PRONASAR practiced “the Model of Direct Implementation” as an implementation model on the basis of demand-driven approach.

There is not much documentation to describe ‘Lessons learned” from the above precedent programs/projects. The following descriptions have been made mainly based on the information of ITDG report (2004) and interview surveys to relevant organizations.

[21] Intermediate Technology Development Group – *El Caso del Perú Rural, Informe Final, Octubre 2004*. (http://www.cepis.ops-oms.org/cursodesastres/diplomado/pdf/AyS.rural.pdf)

3.2.2 FONCODES

(1) ITDG report (2004)

The ITDG report (2004) describes that: In the year 1999 World Bank WSP (Water abd Sanitation Program) conducted a survey in 104 localities on the sustainability conditions of water supply systems, including AOM (Administration, Operation and Maintenance). The survey concluded that 31.7 % of water services was ‘sustainable’, 44.3 % was ‘more or less sustainable’ (totaling to 76% in a category of ‘sustainable’); 22.1 % was ‘unsustainable’, due to dilapidated infrastructure and AOM issues; and 1.9% had collapsed. It was further confirmed that only 30 % of the build system was sustainable (MVCS 2003). The report stated that “Increase in coverage of water and sanitation services was achieved at the cost of low sustainability” and listed up the several reasons as follows:

1) Limited participation and sense of ownership,
2) Subsidy-oriented financial policy,
3) Centralized decision making,
4) Undefined property of constructed system/facilities (who owns the facility?),
5) Separate implementation of infrastructure construction from the health, hygiene education,
6) Limited inclusion of successful previous experiences in the design of the new investment,
7) Absence of strategy for sanitation,
8) Weak capacity in operation and maintenance,
9) Lack of motivation to private service provider for AOM,

The ITDG report (2004) also pointed out that FONCODES’s work was built on a direct relationship with the community through the “Core Executor (*Nuclear Ejecutor*)”, not involving district municipality that was responsible for local development; and that FONCODES emphasized the construction of infrastructure without other components.

(2) Post-project evaluation report (2006) by JICA (then JBIC)

On the other hand, a post-project evaluation report [22] describes that sub-projects under FONCODES were created through the following procedures:

Table 3.2-1 JICA (then-JBIC) fund to FONCODES

	Social Infrastructure Improvement Project in Amazon Areas	Social Infrastructure Improvement Project in Mountain Areas
Loan amount	JPY 5,976 million	JPY 7,003 million
Period	November 1997 February 2004	April 1999 August 2003

1) Dissemination of information to

[22] An evaluation report of Japan Yen Loan Project by an external evaluator (in Japanese): http://www.jica.or.id/activities/evaluation/oda_loan/after/2006/pdf/project47_full.pdf; http://www.jica.or.id/activities/evaluation/oda_loan/after/2006/pdf/project_47.pdf

invite applications of sub-projects from localities.
2) Formation of "the core executor" by the locality by themselves.
3) Selection of sub-project by the locality by themselves.
4) Application of the project from the "the core executor" to FONCODES.
5) Evaluation and approval of the project by FONCODES.
6) Contract with contractors and commencement of construction of the project."

The report pointed out that sub-projects were formed by inhabitants in participatory manners and proposed through "the core executor" to the FONCODES. The needs from the inhabitants influenced the formation and/or modification of the sub-project.

The report describes its observation regarding the sustainability as follows:

1) The local office of FONCODES, one in each region, was in charge of supporting the users (or its organization) for operation and maintenance.
2) FONCODES distributed Operation Manual for AOM and gave training to the users during the construction period.
3) The users (or its organization) were in charge of AOM. They collected water fee and were responsible for usual operation and maintenance.

In addition, FONCODES gave initial training to users and users' organizations on the operation and maintenance, but did not conduct monitoring and/or follow-up activities after the construction, according to interviews by the Study Team.

The report (2006) conducted an interview survey to households on the operational conditions of the facilities build though the FONCODES and presented the results as quoted in the Table 3.2-1.

Table 3.2-2: Interview Survey on Operational Conditions

<table>
<tr><th rowspan="2"></th><th rowspan="2">Infrastructure</th><th colspan="4">Operation Conditions (%)</th></tr>
<tr><th>Good</th><th>Fair
- more or less sustainable -</th><th>Trouble-some</th><th>Notes</th></tr>
<tr><td rowspan="3">Selva (Forest)</td><td>Water supply</td><td>69.3</td><td>14.9</td><td>15.9</td><td rowspan="3">Answers form 143 households</td></tr>
<tr><td>Sewerage</td><td>100</td><td>0</td><td>0</td></tr>
<tr><td>Latrines</td><td>48.0</td><td>24.0</td><td>28.0</td></tr>
<tr><td rowspan="3">Sierra (Highlands)</td><td>Water supply</td><td>71.4</td><td>26.2</td><td>2.4</td><td rowspan="4">Answers form 165 households</td></tr>
<tr><td>Sewerage</td><td>91.1</td><td>8.9</td><td>0</td></tr>
<tr><td>Latrines</td><td>87.0</td><td>10.9</td><td>2.2</td></tr>
<tr><td colspan="2">Overall*</td><td>78</td><td>14</td><td>8</td></tr>
<tr><td colspan="6">Quoted from the Japan loan post-project evaluation report (see the foot note).
(*): Calculated by the Study Team</td></tr>
</table>

It is thus reported that facilities are fairly well in sustainable conditions.

The Feasibility Study noted that the results of this interview survey regarding operation conditions are in a similar range of the results conducted by World Bank (1999), described in the previous item (1); which implies the facilities/systems implemented by FONCODES should have contribution to an appreciable level.

3.2.3 SAMBASUR (see 2.4.2 (2) for the outline)

SAMBASUR was a bilateral cooperation project initiated in 1996 by the Governments of Peru and Switzerland, in order to improve rural sanitation conditions in Cusco, with the active participation of the organized population.

SAMBASUR introduced the following approaches:

1) Domicile connection for potable water supply
2) Organization of JASS and capacity building in administration, operation and maintenance.
3) Incorporation of a social component, including health education, promotion of health and hygiene.
4) Co-financing in either form of building facilities with unskilled labor (100%), materials from the area, and cash.

The ITDG report (2004) evaluated that among those above, domicile connections allowed greater sustainability in the process of ownership and commitment of the users. Also, they improved hygiene and living conditions, leading to improvement of health conditions of the population. The domicile connections resulted in greater motivation on users and encouraged their active participation during the work, improving the conditions of operation and maintenance of the system, since each family took its responsibility at the household level and put pressure on the JASS to operating the services. The domicile connection also facilitated a culture of payment for operation and maintenance work and, eventually, promoted better-controlled water users.

Furthermore, the ITDG report (2004) pointed out that SAMBASUR Program constitutes “good practice”, because the Program was assumed directly by central government institutions (MINSA, MINEDU, PCM) and developed a strategy of inter-agency partnerships, including municipalities. On the contrary, in the case of FONCODES, the central government acted in general terms in isolation and without institutional bridges.

It is recorded that total per capita cost of systems installed was $ 53, which includes input from community, municipality and the donor agency.

3.2.4 Paradigm shift from “Supply driven approach” to “Demand Driven Approach”

As a result of the experiences in 1990th, it is reported that the Sanitation Sector adopted the ‘demand-driven-approach’, replacing with the traditional model of ‘supply-driven-approach’

(The ITDG report (2004)). A table of comparison of the both approach is summarized by the report and quoted in the following table.

Table 3.2.3: Supply Driven Approach and Demand Driven Approach

	Supply-Driven-Approach	**Demand-Driven-Approach**
Definition	With the initiative of the offer/supply (State, NGO) to install the service in localities	With the initiative of demand, i.e. the locality requesting the service and makes commitments.
Sustainability	Low	High
	A. Provision of utilities (such as public wells) not to ensure the users to AOM.	A. Domicile connections to motivate the user for AOM
	B. Subsidy for all project costs with no co-financing by people not to motivate user to assume their responsibility as the owner.	B. Consideration of economic contribution of the user, co-financing to Investment from donor, municipalities and communities to motivate the users and municipalities assume their ownership.
	C. Priority given to infrastructure construction only be critical for sustainable AOM	C. Empowerment of communities be important rather than the infrastructure, for sustainable AOM.
	D. Local training being left aside, leading to sustainability problems	D. Health education from the start, resulting in、 positive impact on AOM.
	E. Municipalities not to participate in the provision of services.	E. Municipalities to lead local consultation.
	F. Private sector participation not to be encouraged	F. Private sector participation to be encouraged
Examples	Investment of FONCODES NGOs.	Project of CARE, other NGOs.

Source: Water and Sanitation: Case Study of Peru (*Agua y Saneamiento: El caso del Peru Rural, Informe final)*, ITDG (2004)

3.2.5 PRONASAR

(1) Outline of PRONASAR (also see 2.4.2 (1)).

The PRONASAR its loan agreement entered on September 13, 2002. The first disbursement from the World Bank was receive on June of 2003 and started the tendering processes for the execution of the projects in 2004. It was meant to be programmed initially that a total of 2,940 localities were to be intervened (Feasibility Study 2002) and thereafter reduced to 1,132 (Re-evaluation 2005). By the end of 2008, the program had intervened in 492 localities in the rural area of Arequipa, Lima, Ayacucho, Huancavelica, Huánuco, Pasco, Junín, Piura. The PRONASAR will intervene seven (7) more localities in Amazonas and 31 localities in San Martin until the loan closing in December, 2010.

(2) Major characteristics of the PRONASAR

i) Demand-Driven-Approach,

Learned from experiences in the past, the PRONASAR proposed the model of demand-driven-approach. The main points of the approach may be summarized as follows:

1) To promote projects in demand-driven-approach, where prospective users are to be consulted before the decision of project implementation.
2) To motivate people's participation in the decision making process, including planning and designing stages and implementation stage throughout the O&M stage.
3) To obligate localities and the corresponding municipalities to contribute to the project in the form of money, materials and/or manpower for labor works.
4) To let users construct the facilities under technical direction of 'operators' to be employed by the Program.
5) To hand-over the facility to the users for their own O&M through the JASS.

As a part of demand-driven-approach and a core policy of PRONASAR complying with the National Policy of Sanitation (2006-2015), the following policy was established:-

Financial Policy: The Program established conditions for the financing of water and sanitation projects in rural localities, between the National Government, the community and the local governments, with a limit to PRONASAR's subvention to the investment, according to the type of implementation (new system or rehabilitation). The co-financing to the execution of the works for new systems will be the minimum amount of 20% of the infrastructure investment cost, and 40% for the rehabilitation, expansion and/or improvement of the existing systems. The co-financing shall be made in either form of monetary contribution, contribution of 100% of unskilled labor, materials or other forms made available to the works.

ii) Model of Direct Implementation

The PRONASAR also proposed Model of Direct Implementation (*Modelo de Intervención Directa*). The main points of the model of the direct intervention may be summarized as follows:

1) A technical social operator (OTS: *Operador Tecnico Social*) employed by the PMU is in charge of all the field activities: (1) capacity building to municipality, (2) social promotion of community and (3) technical assistance and education to JASS, under the supervision of a supervising operator (OS: *Operador Supervisor*) employed by the PMU.
2) In principle, JASS is in co-responsible with the VMCS for the execution of works, under the technical manual of the OTS and the supervision of the OS.
3) Community contributes to the construction work with 100% of un-skilled labor works.
4) Materials necessary for the construction are procured by the PMU through OTS.

iii) Integral Implementation Principle:

This principle gives equal importance to the technical, environmental and social components. The activities of the technical engineering component (design and construction of infrastructure) and the technical social component (promotion, capacity-building in administration, operation and maintenance) are developed in an integrated, simultaneous and complementary manner.

(3) Experiences − Lessons Leaned

Having executed the projects within the above framework, the PRONASAR has faced a series of challenges. Lessons learned from the PRONASAR’s experiences could be focused on the progress of the program as was seen in the item (1) above. The major reasons for the progress matters are summarized as follows:

i) Co-financing

1) There were district municipalities and/or localities that did not have enough financial capacity for co-financing to the facility construction required. These conditions resulted in: (i) a decision of district municipalities for giving-up participating in the program (giving-up the construction/rehabilitation of facility), (ii) delay in transferring the co-financing budget to the PRONASAR, leading to delay not only in the project implementation, but also in the progress of the whole Program itself.
2) There might have been cases that types and/or sizes of facilities were optimized to suit with the size of co-financing, not the size of demand of water and sanitation.
3) In cases, district municipalities requested financial supports to provincial or regional governments, which may not be in accordance with the basic philosophy of co-financing that should be made from own sources or its kinds as an indication of demand.
4) It is understood that the PRONASAR investigated the possibility to utilize the mechanism of FONCOMUN. It was concluded that the mechanism does not suite with this co-financing requirement.

Despite all efforts endeavoured by PRONASAR, the issues raised from the co-financing have still remained as one of the main issuers to be addressed.

ii) Direct Implementation

1) It is pointed out that ‘direct execution’ by mobilizing prospective users in communities had not always worked well as planned or scheduled due to various reasons, such as unpredictable or insufficient number of participants from as manpower and etc.
2) Procurement material and/or equipment through the direct implementation needed long procedures in some cases.
3) With these experiences, the PRONASAR has decided to employ contractors for the construction works through tendering processes.

4) The PRONASAR also experienced that city-based contractors did not express their interest in the projects in rural areas. As a result, the PRONASAR has procured local-city based contractors. In this way, it is explained that the progress of construction works are now well maintained as planned.

iii) Contribution of Unskilled labour works

1) Contribution through unskilled labour works is the one of the major obligations of the population as the co-financing. This is believed to forester the ownership of the facilities within the populations.
2) On the other hand, it is informed that mobilization of population was not always easy, neither has it been done on time. The contractor should, in such case, have to discontinue the works.

3.2.6 Lessons Learned

(1) Demand-Driven-Approach

The current policy for rural sanitation, directed by the DNS of the MVCS, is the result of the evaluation of two management models: the supply-driven approach and the demand-driven approach. The demand-driven-approach was validated by the results of pilot projects such as SANBASUR, PRONASAR and other private entities such as NGOs, which acted based on the demand formulated by the beneficiaries, who participated in the selection of the type of technology to be applied. The demand-driven approach entails that the community requests the service level, selects the technology to be applied and contributes labor and/or money to the execution of the works as a token of their demand. And more importantly, the population accepts the responsibility of operation and maintenance by themselves in principle.

The paradigm shift from the ‘supply-driven-approach’ to the ‘demand-driven-approach’ occurred in various sectors, in mid 1990th to early 2000th ,based on the experiences that supplying tangible things only from supply sides did not fully improve the situations the population in need. It is understood that the PRONASAR has rightly exercised this approach for the sustainable water supply and sanitation. The Feasibility Study shall also consider the ‘demand-driven-Approach’ for the Program of Potable Water and Sanitation for Rural Amazon Areas.

(2) Integrated implementation approach

It may be also accepted that operation and maintenance of facilities constructed are crucial matter for sustainability and that solely ‘demand-driven-approach’ would not assure it.. Facility has to be properly operated and maintained, based on proper technical knowledge with a firm financial base. In the field of rural water supply and sanitation, users are usually responsible for the operation and maintenance. Close cooperation or support from the local government will also be emphasized from a viewpoint of administration services of local government, in accordance with jurisdiction and responsibility. Therefore, proper knowledge and training will have to be provided to users and local government for the operation and maintenance. It is also accepted in the field of rural water supply and sanitation that hygiene education will be the base and essential knowledge to motivate the population to maintain the facilities.

PRONASAR adopted 'Integrated approach' that integrates confirmation of demand and responsibility, facility construction based on the demand, capacity building for administration, operation and maintenance of the facility, hygiene education and capacity building of the local government to monitor the activities of the localities and offer technical support when required.

This integrated implementation approach has also been world-widely accepted and adopted for sustainable implementation of projects. The Feasibility Study will take this in to consideration for the implementation of the Program's projects.

(3) Public Investment Aspects

On the other hand, one must consider that a program/project will be implemented as a public investment, which shall include: (i) the target to be attained, (ii) a pre-determined time period within which the target to be attained and (iii) a pre-determined budgetary scale within which the targets to be accomplished. To formulate the program as a public investment, factors that may hamper the program to accomplish the above three described conditions will have to be minimized or substituted with other options. In executing the PRONASAR, it is understood that the Program progress has not been satisfactorily realized as scheduled due to reasons, some of which are described in the previous item. The Feasibility Study will have to propose options in order to ensure the smooth implementation and progress of the Program.

In conclusion, the current policy for development of rural sanitation in Peru has opened up a great opportunity for the involvement and support of international cooperation in different terms and the participation of the private sector in different modes. It is acknowledged that the financial resources are clearly insufficient to tackle the existing deficit and seek to achieve the Millennium Development Goals for the year 2015.

PART-II

FEASIBILITY STUDY

CHAPTER-I

EXECUTIVE SUMMARY

FINAL REPORT

PART-II
FEASIBILITY STUDY

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 Water Supply and Sanitation Improvement Project in Rural Amazon Area (hereinafter referred to as 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.

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 on the value of the water and sanitation services in the beneficiaries to be served, 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

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 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 conducting the pre-investment studies (*Perfils*) and project files (detailed design studies); providing support and advice to PMU (Program Management Unit); 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 (*Selva Baja*) geographical region,
- Conglomerate C-2: Localities situated in the High Forest (*Selva Alta*) and the Front Forest (*Ceja de Selva*) 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 Feasibility Study considered the design criteria that should respond to the strategies established by the National Sanitation Plan (*Plan Nacional de Saneamieto 2006 - 2015)*, and should 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 1.4.2-1 were considered as guideline values.

[1] Minutes of Meeting among VMCS, DNS, BID, BIRF y JICA. (March 2009)
[2] "Norms of Design" being used by PRONASAR was provided by DNS as the guideline (year proposed not given in the document)

Table 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 1.4.3-1.

Table 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 was defined by projecting the coverage based on the results of the 2007 census; with correction by the results of the diagnosis by the present Feasibility Study in 50 sample localities. The adjusted potable water coverage is shown in the Table 1.4.4-1.

Table 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 1.4.4-2.

Table 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 Feasibility Study. The adjusted sanitation coverage is as shown in the Table 1.4.5-1.

Table 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**
				Total	**542,210**

Source: JICA Study Team (2010)

1.5 Technical Description of the Program

1.5.1 Selected Alternatives for the 50 Sample Localities of Program

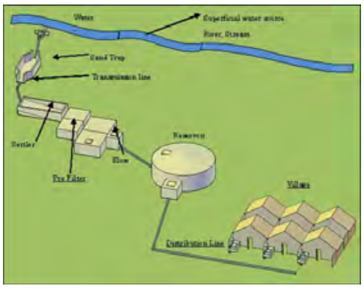
(1) Water Supply Systems

On the basis of the field survey in the 50 sample localities[3], water supply systems were proposed. Table 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.

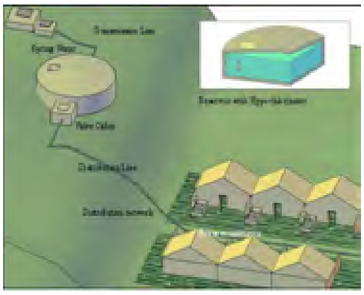
Table 1.5.1-1: Proposed Water Supply Systems for the 50 Sample Localities[4]

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	16	57%	1	8%	0	0%	1	5%	17	35%
Manual Pumping	Without Treatment	M-P	7	25%	0	0%	0	0%	0	0%	7	14%
Total			**28**	**100%**	**12**	**100%**	**9**	**100%**	**21**	**100%**	**49**	**100%**

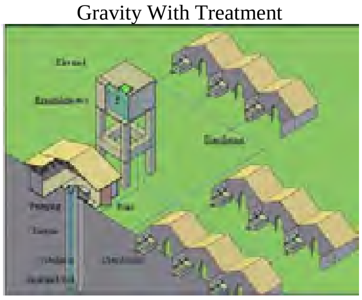
Note: One water supply system was proposed to certain two localities out of the 50 sample localities, resulting to a total 49 facilities for 50 localities. Source: JICA Study Team (2010)



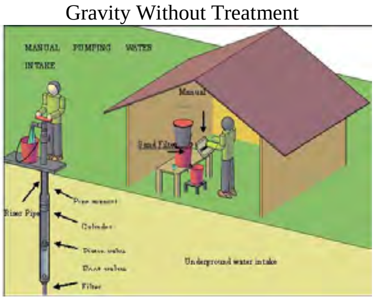
Gravity With Treatment



Gravity Without Treatment



Pumping Without Treatment



Manual Pumping Without Treatment

[3] Thirty-eight (38) localities were considered for the economic evaluation.
[4] Two localities have a system for communal use. As such, there are 49 systems for 50 localities.

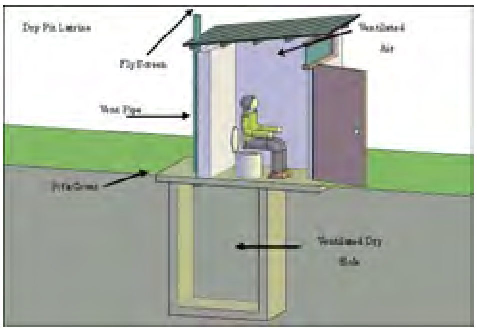
(2) Sanitation Systems

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

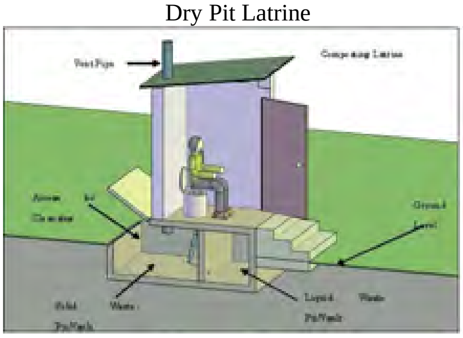
Table 1.5.1-2: Sanitation Systems Proposed for the Sample Localities

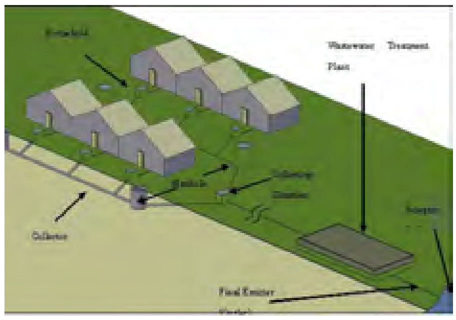
Facility/system	Conglomerate C-1		Conglomerate C-2						Total(*)	
	Low Forest		High Forest		Front Forest		Subtotal			
Dry Pit Latrine	9	33%	7	58%	5	56%	12	57%	21	44%
Composting Latrine	13	48%	0	0%	0	0%	0	0%	13	26%
Dry Pit + Composting Latrine	3	11%	2	17%	1	11%	3	14%	6	13%
Sewerage	1	4%	2	17%	3	33%	5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

Note: Certain two localities already have sewerage systems, resulting in a total 48 facilities proposed.
Source: JICA Study Team (2010)


Dry Pit Latrine


Pour-Flush Latrine


Composting Latrine


Sewerage

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 Feasibility Study will not exclude other possible options than the proposed technical 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 Feasibility Study considers that the Program should consist of four (4) components, as shown in Table 1.5.4-1.

Table 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 the Program in all project cycle stages and execution phases directed by PMU-PAPT and RMU.
Component-4	Strengthening of Government Function	• Strengthening of the regulatory framework of the sector and development of human resources, investigation and technology, socio-cultural anthropological support studies in the communities of the Rural Amazon Area, and the management of SIAS

Source: JICA Study Team (2010)

1.5.5 Program Goals – First Phase

According to the results for Program costs for the three phases indicated in Item 1.6 of the present summary, Table 1.5.5-1 shows the goals that shall be reached with the first phase of Program implementation for the two (2) conglomerates. Program implementation in this phase is foreseen in 162 localities, distributed in three (3) regions: Amazonas, Loreto, and San Martín.

Table 1.5.5-1: Physical Goals for the Water and Sanitation Project for the Rural Amazon – First Phase (2010-2013)

Description	Amazonas		Loreto		San Martin		Total	
	C-1	C-2	C-1	C-2	C-1	C-2	C-1	C-2
1. No. of localities with a water supply system (improvement, expansion and new system)	24	9	65	1		63	89	73
2. No. of localities with a sanitation system (new system and improvement of sewerage system)	24	9	65	1		63	89	73
3. No. of contractors for works (water supply and sanitation)	1		2		2		5	
4. No. of Executing Boards (NN.EE)	12	4	33	1		31	45	36
5. No. of trained staff from the district municipality	2	0	2	0		2	4	2
6. No. of community organization and/or JASS	24	9	65	1		63	89	73
7. No. of trained people from the community organization and/or JASS	72	27	195	3		189	267	219
8. No. of individual consultants for the Soft Component	12	4	32	1		32	44	37
9. No. of localities with Initial Diagnosis and Baseline	24	9	65	1		63	89	73
10. No. of individual consultants for the preparation of Initial Diagnosis	1		3			3	4	3
11. No. of district municipalities for strengthening of management	1		3			3	4	3
12. No. of water supply and sanitation project *perfils*	24	9	65	1		63	89	73
13. No. of project files (detail designs)	24	9	65	1	0	63	89	73
14. No. of operating consultants (preparation of *perfils* + detail designs)	1		1		1		3	
15. No. of supervising consultants (*perfils* + detail designs)	1						1	
16. No. of consulting firms for the supervision of works (contractors)	1						1	
17. No. of individual consultants for the supervision of works (NN.EE)	6	2	21			21	27	23
18. No. of trained staff from the regional PMUs	6		8		8		22	
19. No. of trained staff in the PMU	12						12	
20. No. of pilot projects for the development of technical alternatives	1						1	
21. No. of socio-cultural anthropological support studies	1						1	

Source: JICA Study Team (2010)

1.6 Costs of the Project

1.6.1 Program Cost

The total cost of the water and sanitation improvement projects for the rural Amazon will be S/.1,338.8 million (JPY 43,210.3 million = USD 471.2 million), including all components and items described in the previous chapters.

The costs calculated for the Program are shown in Table 1.6-1, separated by components and their equivalents in millions of Soles, American dollars, and Yen.

The Program Cost in the First Phase will be S/ 156.2 million (JPY 5,044.6 million = USD 55.0 million)[5]. Program execution is foreseen in 162 localities distributed in Amazonas, Loreto, and San Martín, and details are shown in Table 1.6-2.

Table 1.6-1 Itemized Total Cost of Water and Sanitation Program in the Rural Amazon

(x 1,000 units at the exchange rates in May 2010)

Item	Description	Total			
		Nuevos Soles	JPY	USD	%
1)	**Component 1 – Conglomerate C-1**	**661,221**	**21,357,423**	**232,905**	**49.4%**
1.1	Water Infrastructure	283,051	9,142,559	99,701	21.2%
1.2	Sanitation Infrastructure	167,947	5,424,698	59,157	12.6%
1.3	Soft-component implementation	58,500	1,889,550	20,606	4.4%
1.4	Initial Diagnosis and Baseline	2,808	90,698	989	0.2%
1.5	*Perfils* and Detailed Design of Works (Water and Sanitation)	77,483	2,502,712	27,292	5.8%
1.6	Supervision of Works (Water and Sanitation – Works Contractor)	30,399	981,879	10,708	2.3%
1.7	Supervison of Works (Water and Sanitation – Executing Boards)	16,667	538,333	5,871	1.2%
1.8	Supervision de *Perfils* and Detailed Design (Water and Sanitation)	24,365	786,992	8,582	1.8%
2)	**Component 2 – Conglomerate C-2**	**373,720**	**12,071,171**	**131,638**	**27.9%**
2.1	Water Infrastructure	136,018	4,393,368	47,910	10.2%
2.2	Sanitation Infrastructure	97,643	3,153,883	34,393	7.3%
2.3	Soft-component implementation	38,748	1,251,560	13,648	2.9%
2.4	Initial Diagnosis and Baseline	1,854	59,884	653	0.1%
2.5	*Perfils* and Detailed Design of Works (Water and Sanitation)	52,002	1,679,651	18,317	3.9%
2.6	Supervision of Works (Water and Sanitation – Works Contractor)	20,128	650,132	7,090	1.5%
2.7	Supervison of Works (Water and Sanitation – Executing Boards)	11,074	357,693	3,901	0.8%
2.8	Supervision de *Perfils* and Detailed Design (Water and Sanitation)	16,254	525,001	5,725	1.2%
3)	**Component 3 – Program Administration**	**86,125**	**2,781,825**	**30,336**	**6.4%**
3.1	Program Administration	86,125	2,781,825	30,336	6.4%
4)	**Component 4 = Strengthening of Government Function**	**3,120**	**100,776**	**1,099**	**0.2%**
4.1	Strengthening of the Human Resources	1,410	45,543	497	0.1%
4.2	Research and Technical Development	1,500	48,450	528	0.1%
4.3	Socio-Cultural, Anthropological support studies	210	6,783	74	0.0%
5)	**VAT (19%)**	**213,595**	**6,899,127**	**75,236**	**16.0%**
	Total	**1,337,781**	**43,210,322**	**471,214**	**100%**

Source: JICA Study Team (2010)

[5] The costs have been carried out with prices current as of May 2009 when USD1.0=JY97.5=S/.3.0). The exchange rate used was USD1.0 = S/.2.84 = JPY91.7; S/.1.0 = JPY 32.3 (as of June 2010).

Table 1.6-2: Total Cost of the Program - First Phase (2010-2013)

(x 1,000 units at the exchange rates in May 2010)

Description	Conglomerate C-1								Conglomerate C-2								Program Total	
	Amazonas		Loreto		San Martin		Total		Amazonas		Loreto		San Martin		Total			
	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD
Water and Sanitation Works (Contractors)	6,715	2,365	18,187	6,406			24,902	8,771	1,965	692	218	77	13,757	4,846	15,941	5,615	40,843	14,386
Water and Sanitation Works (Core Executors)	5,895	2,076	15,966	5,624			21,861	7,700	1,725	608	192	68	12,077	4,254	13,994	4,929	35,854	12,629
Soft Component	1,556	548	4,216	1,485			5,772	2,033	580	204	64	23	4,060	1,430	4,704	1,657	10,476	3,690
Initial Diagnosis and Base Line	73	26	197	69			270	95	29	10	3	1	202	71	234	82	504	178
Perfils and Detailed Design of Works (Water and Sanitation)	2,434	857	5,892	2075			8,326	2,933	913	321	91	32	5,872	2,068	6,875	2,422	15,201	5,354
Supervision of Works (Water and Sanitation) – Contractor	928	327	2,514	885			3,442	1,212	339	120	38	13	2,376	837	2,754	970	6,196	2,182
Supervision of Works (Water and Sanitation) – Core Executor	449	158	1,217	429			1,667	587	164	58	18	6	1,151	405	1,333	470	3,000	1,057
Supervision of *Perfiles* and Detailed Design of Works (Water and Sanitation)	920	324	2,490	877			3,410	1,201	345	121	38	13	2,414	850	2,797	985	6,207	2,186
Total (Without IGV)	**18,970**	**6,682**	**50,679**	**17,851**			**69,649**	**24,533**	**6,061**	**2,135**	**663**	**233**	**41,908**	**14,762**	**48,631**	**17,130**	**118,281**	**41,663**
Program Administration (Component 3)																	9,843	3,467
Strengthening of the Government Function (Component 4)																	3,120	1,099
IGV (19%)	**3,604**	**1,270**	**9,629**	**3,392**			**13,233**	**4,661**	**1,152**	**406**	**126**	**44**	**7,963**	**2,805**	**9,240**	**3,255**	**24,936**	**8,783**
Total	**22,574**	**7,952**	**60,308**	**21,243**			**82,882**	**29,194**	**7,212**	**2,540**	**789**	**278**	**49,871**	**17,566**	**57,871**	**20,384**	**156,180**	**55,012**

Source: JICA Study Team (2010)

1.7 Benefits of the Project

The Program will implement water supply and sanitation projects in 1,500 localities of the five regions of the rural Amazon area, benefiting 777,869 people with water supply facilities and 610,540 people with the installation of sanitation facilities.

In the first phase, water supply and sanitation projects will be implemented in 162 localities (89 of Conglomerate C-1 and 73 of Conglomerate C-2) in three (3) regions, namely: Amazonas (33 localities), Loreto (66 localities) and San Martin (63 localities). Approximately 84,500 people will be benefited with water supply facilities and 66,000 people with the installation of sanitation facilities.

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 areas and the strengthening and /or creation of the community organizations for AOM of the facilities. Another aspect of the benefits will be the creation of temporary jobs opportunities for the construction of the projects.

These services, along with the development of sanitary habits to be improved through education of the benefiting population, 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 previously engaged in water acquisition before the project, by implementing the project,
2) Incremental: Benefits derived from incremental consumption resulting from implementation of Program projects

ii) Benefits generated from health improvement

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

Due to the fact that there is no detailed data available for the calculation of cost/savings per ADE in the country, adjustments for taxes or other possible effects to the market prices were not considered. Also, the calculation in the present Feasibility Study used the frequency of seven to eight ADEs per year, as opposed to the statistics of MINSA, which used the frequency of 10 to 12 episodes per year. This is justified by the fact that the prevalence of ADEs in the Amazon region is two times that in Lima according to the analysis conducted in the present Feasibility Study.

Infectious diseases incur economic losses (costs) to both families and the Government. The Peruvian Government spends its national 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 Feasibility Study and have been used for the cost-benefit analysis for the water supply projects of the Program:

Total population in year 1 of the Project's operation (inhabitant) [1/]	Po
Population of children under 5 years old (%) [1/]	r
Population of children under 5 years old (inhabitant in year 1) [1/]	A=Po x r
Number of diarrheic episodes per child per year (case)	8
Total cost per ADE (2009)	Costs (S/.)
To be borne by the family (S/. per case)	20.8
To be borne by the government (S/. per case)	5.5
Total cost per ADE (S/. per case)	26.30
Total Annual Cost of ADEs (S/.)	A x 8 x 26.30

1/ : The numbers of children were calculated for each locality for the cost-benefit analysis
Source：JICA Study Team (2010)

Sanitation Projects

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

1.8 Results of the Social Evaluation

1.8.1 Social Evaluation Methodology

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)" were used as profitability indicators.

1) "Social discount rate (SDR)" was set at 11% in accordance with SNIP;
2) The Program duration time was regarded as 10 years; the design horizon of the water projects as 20 years, and the design horizon of the sanitation projects as 10 years;
3) Social evaluation at the Program level was made based on net per-capita benefits;
4) Cost savings generated by health improvements were quantified in monetary terms and were added to the project benefits;
5) For sanitation projects the CEI (Cost effectiveness index) cutoff line was used.

1.8.2 Economic Evaluation of the sample localities

(1) Water supply projects (See Table 1.8.3-1)

The NPV at an 11% social discount rate for the 23 sample localities in Conglomerate C-1 resulted in positive S/. 3.0 million, and the IRR is 15.0%.

The NPV for the 15 sample localities in Conglomerate C-2 resulted in positive S/. 4.3 million while the IRR is 19.0%.

(2) Sanitation Projects (See the Table 1.8.3-2)

The average of the CEI, or incremental costs per capita, resulted in S/.740 for composing latrines and S/. 563 for the ventilated dry pit latrines in Conglomerate C-1; in S/.762 and S/.452 respectively 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 (See Table 1.8.3-1)

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 the social prices.

As a result of the economic evaluation, the NPV for Conglomerate C-1 at a social discount rate of 11.0% is positive S/. 66.6 million, and the IRR is 17.0% for the three phases. The indicators for the phases are as follows:

1) **First Phase : NPV = S/. 6.1 million, IRR = 13.4%**
2) Second Phase : NPV = S/. 32.6 million, IRR = 16.8%
3) Third Phase : NPV = S/. 27.9 million, IRR = 19.1 %
4) Program (1+2+3) : NPV = S/. 66.6 million, IRR = 17.0%

The NPV for Conglomerate C-2 is also positive S/. 111.0 million for the three phases, and the IRR is 22.9%. The indicators for the phases are as follows:

1) **First Phase : NPV = S/. 16.6 million, IRR = 28.5%**
2) Second Phase : NPV = S/. 69.7 million, IRR = 23.6%
3) Third Phase : NPV = S/. 24.7 million, IRR = 25.8 %
4) Program (1+2+3) : NPV = S/. 111.0 million, IRR = 22.9%

For the assessment of the whole Program, the benefits and costs of the two conglomerates were added in a single cash flow. Thereafter, the costs of program administration (Component 3) and strengthening of the government function (Component 4) were also summed up. Consequently, the indicators of the whole Program resulted in an NPV of positive S/.142.5 million and an IRR of 17.6%. The Program can therefore be judged as viable from a social point of view. The indicators for the three phases of the Program are as follows:

1) **First Phase : NPV = S/. 15.3 million, IRR = 14.1%**
2) Second Phase : NPV = S/. 85.7 million, IRR = 18.2%
3) Third Phase : NPV = S/. 41.5 million, IRR = 19.1%
4) Program (1+2+3) : NPV = S/.142.5 million, IRR = 17.6%

The summary of the evaluation results is shown in Table 1.8.3-1.

Table 1.8.3-1: Summary of Economic Evaluation of the Water Supply Projects at Sample and Program Levels

(x 1,000 units at exchange rates for May 2010) [1/]

Indicator	Sample			Program Phase (1+2+3)		
	Water Projects					
	Conglomerate C-1	Conglomerate C-2	**Total**	Conglomerate C-1	Conglomerate C-2	**Total**
NPV (x 1,000 S/.)	3,049.8	4,310.7	7,360.4	66,595.5	111,028.9	142,551.3
IRR (%)	15.0	19.0	16.6	17.0	22.9	17.6

1/ The costs were updated for prices as of May 2010.Source: JICA Study Team (2010)

(2) Sanitation Projects

The cutoff lines for CEI at social prices (or "reference values") according to the types of sanitation facilities and conglomerates were calculated based on the sample localities (see Table 1.8.3-2). These values, or per capita costs at private prices, exclude the soft-component costs, costs of latrine operation and maintenance, as well as the replacement of latrines (in the case of dry pit latrines); and these costs would have to be compared with the referential per-capita costs values or preliminary cut-off lines calculated for the different types of facilities in the Program (See Table 1.8.3-3, Table 1.8.3-4 and Appendix 10).

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

(Expressed in monetary units at **Social Prices** in May 2009)

Type of Facility	CEI (Soles/inhabitant)		
	Conglomerate C-1	**Conglomerate C-2**	**Program**
Ventilated Dry Pit Latrine	563	452	501
Composting Latrine	740	762	741
Sewerage (new works)	-	-	771
Sewerage (improvement and expansion works)	-	-	501
Treatment	-	-	307

(Average value of the per-capita-cost of **the total project costs at Social Price)**
Source: JICA Study Team (2010)

Table 1.8.3-3: Average CEI Values (Per Capita Costs) for the Sanitation Program

(Expressed in monetary units at **Market Prices** in May 2009)

Type of Facility	CEI (USD/inhabitant)		
	Conglomerate C-1	Conglomerate C-2	Program
Ventilated Dry Pit Latrine	114	95	105
Composting Latrine	245	245/1	245

Average (mean value) of the per capita cost of the direct cost of the projects at market price
/1: Considered to be similar to C-1
Source: JICA Study Team (2010)

Table 1.8.3-4: Reference Cost Values or Preliminary Cut-off Lines

(Expressed in monetary units **at Market Prices** in May 2009)

Type of Facility	Per Capita Cost (USD/inhabitant)
Ventilated Dry Pit Latrine, Conglomerate C-1	137
Ventilated Dry Pit Latrine, Conglomerate C-2	104
Ventilated Dry Pit Latrine, Conglomerate C-1 and Conglomerate C-2	118
Composting Latrine, Conglomerate C-1 and Conglomerate C-2	283
Pour-flush Latrine, Conglomerate C-1 and Conglomerate C-2	377

Values taken at the upper limit of the 99% confidence interval of the samples
Source: JICA Study Team (2010)

1.9 Sensitivity Analysis

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

1) Variation in investment and AOM costs: Conglomerate C-1 remains profitable with an increase of up to 16% of the investment and AOM costs, while Conglomerate C-2 remains economically viable with an increase of up to 62%.

2) Variation in benefits: Conglomerate C-1 projects maintain their profitability with a reduction of benefits to 14%, and Conglomerate C-2 maintains profitability with a reduction of 39% in benefits.

For the Program (sum of both conglomerates), the profitability is maintained even up to a 21% increase in investment costs and an 18% decrease in benefits.

1.10 Sustainability of the PIP

1.10.1 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).

1.10.2 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) the 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).*

1.10.3 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.

1.10.4 Cost Coverage of the Administration, Operation and Maintenance

In Conglomerate C-1, the proposed family fees for the water service vary from S/ 4.0 to S/ 12.2 per month and the percentage against the family income varies between 0.6% and 2.6%.

In Conglomerate C-2, the family fee for the water service varies between S/ 2.3 to S/ 10.3 per month and the percentage against the family income between 0.4% and 1.6% as shown in the table.

From this information, derived from the results of the project *Perfils* in the sample, it can be seen that the AOM costs would be covered by the family fees calculated for the water system.

In the operation stage, the district municipality is resposible for watching over the sustainability of services, providing technical assistance and supervising the management of the community organizations within its jurisdiction, and thus it shall support them with technical and administrative consultancy, and if necessary, it could also contribute with funds from its emergency budget, especially for the replacement of pumping equipment or other types of equipment that could be utilized for water collection or treatment process.

1.10.5 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.

However, participation of the beneficiaries with tangible contributions will be of importance from a sustainable point of view. In this sense, it was proposed that the regional governments share a part of the Program cost, thereby the regional governments will take part in the follow-up activities of the operation and maintenance to be executed by the users supported by the district municipalities.

1.10.6 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 exclude 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 Environmental Impact

1.11.1 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.

1.11.2 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.

1.11.3 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 1.11.3-1: 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, under the categorization set forth by the OMA: “Declaration of the Environmental Impact (DIA)”.

Also, the National Sanitation Department, through Letter No. 076-2010-VIVIENDA/VMCS-DNS of January 13, 2010, included in the Appendix, indicated the procedures to be followed to conduct the environmental evaluation of the Water and Sanitation Program, during the pre-investment stage and the implementation stage of the Program. Based on this procedure, the *Formulario Descripción Ambiental para Programas de Saneameinto* (Environmental Description Form for Sanitation Programs) has been attached to this document in Appendix 12.

For the EIAs to be carried out for each project during the implementation stage of the Program, it is recommended to classify the projects of each conglomerate into such categories as: i) protected natural areas and/or communal reservations, ii) accessibility to the localities and iii) proximity of the localities (see Appendix 12).

1.12 Organization and Management for Program Implementation

1.12.1 Actors to be involved

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

(1) Core Actors (in order of involvement)

1. Ministry of Housing, Construction and Sanitation
2. District municipalities
3. Organized communities (Core Executor[6] or JASS)
4. Regional governments and provincial municipalities

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

1. Operating consultant
2. Supervising consultant
3. Consulting firm for the supervision of construction works
4. Specialized consulting firm or individual consultants for implementation of the soft component.
5. Contractors
6. Individual consultants (for supervision of construction works by Core Executors)

Table 1.12-1 summarizes the participation model to be executed through the Core Executors (NN.EE: *Núcleos Ejecutores*), and Table 1.12-2 provides the implementation model for the contractors.

Table 1.12.1-1 Implementation Model (NN.EE. : *Núcleos Ejecutores*)

Project Cycle / Work Items	Pre-Cycle	Pre-Investment		Investment			Post-Investment
		Perfil	Soft Component	Project Files (Detailed Design)	Execution of Works	Soft Component	Soft Component
Pre-investment Study, Detailed Design		Operating Consultant		Operating Consultant			
Construction Works, Capacity-strengthening NNEE Modality			Individual Consultant		Core Executors	Individual Consultants	Individual Consultants
Supervision		Supervising Consultant		Supervising Consultant	Individual Consultant	RMU/1	RMU/1
Responsible for Program Management - Regional	RMU	RMU		RMU	RMU	RMU	RMU
Responsible for Program Management	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT

/1 Follow up and monitoring

Source: JICA Study Team (2010)

6 Core Executors= *Núcleos Ejecutores* (in Spanish) to be abbreviated as **NN.EE.**

Table 1.12.1-2 Implementation Model (Contractors)

Project Cycle / Work Items	Pre-Cycle	Pre-Investment		Investment			Post-Investment
		Perfil	**Soft Component**	**Project-Files (Detailed Design)**	**Execution of Works**	**Soft-component**	**Soft-component**
Pre-investment Study, Detailed Design		Operating Consultant		Operating Consultant			
Construction Works and Capacity Strengthening,			Individual Consultant		Works Contractor	Individual Consultant	Individual Consultant
Supervision		Supervising Consultant		Supervising Consultant	Consulting Firm	RMU/1	RMU/1
Responsible for Program Management - Regional	RMU	RMU		RMU	RMU	RMU	RMU
Responsible for Program Management	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT

/1 Follow up and monitoring

Source: JICA Study Team (2010)

1.12.2 Roles of Participants

The Program will be implemented by the organizations/groups outlined hereunder.

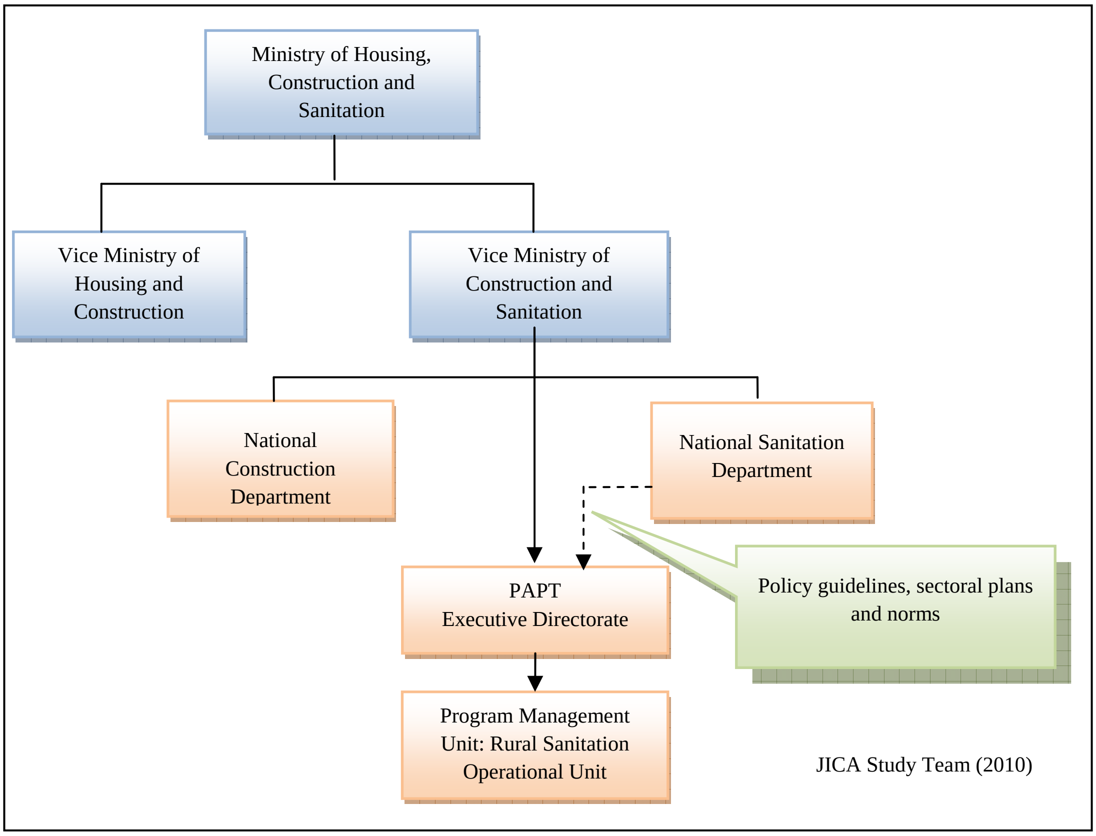
(1) Ministry of Housing, Construction and Sanitation (MVCS: *Ministerio de Vivienda, Construcción y Saneamiento***)**

The Ministry of Housing, Construction, and Sanitation plans, formulates, conducts, coordinates and evaluates the policies and strategies in matters of housing, urbanization, construction and basic sanitation, in harmony with the general government policy and the country’s development plans.

1) Vice Ministry of Construction and Sanitation (VMCS)

The Vice Ministry’s role is to propose, implement and supervise the application of the sector’s policies in coordination with the Ministry, and to direct the activities of the organizations of the Ministry, sectoral and multi-sectoral committees, and the projects under VMCS. The Vice Ministry is also competent to formulate and adopt general policies in matters of infrastructure and sanitation, in accordance with the directives established by the Ministry.

Figure 1.12.2-1 Organization of the Ministry for the Program



2) National Sanitation Department (*DNS*)

The Ministry of Housing, Construction, and Sanitation (MVCS) establishes the Sector´s policies and strategies through the National Sanitation Departments (*DNS*).

3) Program of Water for All (PAPT)

The PAPT, which is under the Vice Ministry of Construction and Sanitation, is the executing agency for investment projects for the implementation of MVCS sanitation policies at the national level. The Program will be executed by PAPT through the Program Management Unit (PMU) to be newly formed exclusively for its implementation.

4) PMU of the Water and Sanitation Program for the Rural Amazon Area

This unit of PAPT will be in charge of the execution of the Water and Sanitation Program. The Rural Sanitation Operational Unit, which belongs to the organizational structure of the PAPT, will act as the PMU for the Program. The main functions of the PMU are:

(i) to implement and supervise the Program, including the soft component and capacity-building activities;

(ii) to report to the DNS, PAPT, VMCS and JICA about the Program's progress; and

(iii) to monitor, evaluate and follow-up the execution of all the Program's components, and to supervise the execution the soft-component activities.

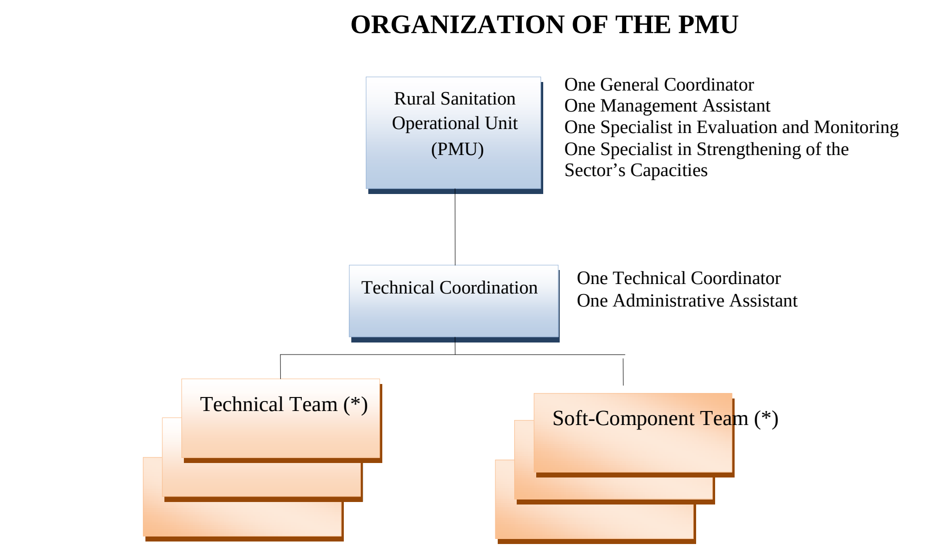
Through these activities, the PMU will also be responsible for assuring the viability of the Program. Thus, the PMU shall have sufficient autonomy to be able to endorse the necessary agreements on behalf of the MVCS and PAPT, as well as the respective contracts with the Operating Consultant, Supervising Consultant, Consulting Firm for the supervision of works, and the Individual Consultants for the soft-component, the Works Contractors, Core Executors and Individual Consultants (Works Supervision and Resident Engineers).

The PMU shall be responsible for the follow-up, monitoring and evaluation of the Operating Consultant, the Supervising Consultant, the Consulting Firm for works supervision, and the Contractors or Core Executors in charge of works. Even when the PMU's Technical Team shall be the one approving and giving final conformity to the *Perfils* and project files, the execution and liquidation of works; the firms that represent the actors contracted have civil and penal responsibility if applicable, when the technical files that support the investments (*perfils*, project files and executed works) have hidden faults, in which case the PMU shall make the corresponding reports and execute the penalties given in the contract.

The PMU shall conduct the processes of contracting the Operating Consultant, Supervising Consultant, Consulting Firm for the supervision of works, and Works Contractors.

The Rural Sanitation Operational Unit of PAPT (Program Management Unit) will be organized as follows:

Figure 1.12.2-2: Organization of the PMU - Rural Amazon Area



(*) Technical and soft-component teams for the supervision of contracts

JICA Study Team (2010)

5) Regional Management Unit (RMU)

The RMU shall be responsible for the management of the projects of the Program in the regional area. The RMU shall also monitor the activities of core actors in its responsible area (regional governments, municipalities, core executors, JASSs, communities) and motivate these actors for timely participation in the Program/projects, in accordance with the scheduling and the agreements signed.

Within this framework, the PAPT and PMU at the central level will monitor and follow up the processes and activities of the Program. For this purpose, the RMU shall have the appropriate number of staff with acceptable experience and qualifications for the Program.

(2) Regional Government

The regional governments will participate in the Program by co-financing the projects, in order for the selected municipalities to fulfill their responsibilities as established by the Program, in accordance with the policies of the sanitation sector. Likewise, the regional governments are expected to provide the municipalities with technical assistance for the purpose of facilitating the fulfillment of the municipalities' responsibilities to assist the communities in sustainable AOM of the water and sanitation projects to be provided by the Program.

(3) Local Government (District Municipality)

The local governments should select and prioritize the communities, co-finance (if affordable) the projects and participate in the execution of the projects throughout the entire project cycle, specifically during the pre-execution, execution and post-execution stages. The local governments also should participate in the soft-component activities for capacity building so that the local governments may always supervise the AOM activities of the communities and provide technical advice to the communities within the jurisdiction, assuming its role and responsibility for the services through a Council Agreement. In addition, each local government shall sign the Annex SNIP – 13 with PAPT for the agreement on the project implementation within its district.

(4) Community Organization or Sanitation Services Administrative Board (JASS)

This organization is a local organization that represents the community and is in charge of the administration, operation, and maintenance (AOM) of the water supply and sanitation services in its locality. It is also responsible for proposing family fees to be approved by the community and to be collected from the users monthly. Other contributions that may be required may also be proposed and become an extraordinary income for the financing of its AOM activities in the community. It may be a JASS or any other form of organization; or the Core Executor that may become the JASS; one of which shall be decided in a community assembly. The organization will be made up of five (5) members.

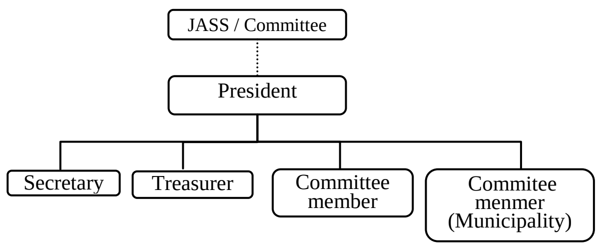


Figure 1.12.2-3 Organization of the Community Organization

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 AOM of sanitation services, and hygiene education.

(5) Community

The community shall participate in the Program during the formulation and execution of the project. Once the construction of the facilities is concluded, the JASS or the community organization will be in charge of the AOM. The population will contribute through 'water fee' (monthly or for other period as required) which will be proposed by the JASS or the community organization. This fee will cover at least the AOM costs of the services.

1.12.3 Contracted Actors

They shall have the following functions:

(1) Operating Consultant (OC)

The implementation of the pre-investment stage and the detailed design stage of the projects included in the Program will be conducted by a consulting firm selected and contracted by the PMU, which shall be called the Operating Consultant (OC).

The main activities to be carried out by the OC are: (i) development of Project *Perfils*, (ii) development of detailed designs (including technical and environmental aspects) and (iii) preparation of the proposal, in coordination with the Regional-PMU, for the implementation mode “with NN.EE.” or “with Contractors” for each project.

(2) Supervising Consultant (SC)

The Supervising Consultant (SC) shall be a consulting firm to be selected and contracted by the PMU and shall be responsible before the PMU for products meeting terms of quality and opportunity. The SC will participate in two stages, i.e., first, in the pre-investment stage, the SC shall be in charge of supervising, evaluating and approving the *Perfils*, and second, he shall supervise, evaluate and approve the project files (detailed design, including technical and environmental matters) that the OC shall formulate. The SC shall verify the viability of technical, economic, environmental, and social aspects of the *Perfils* and project files to be proposed and prepared by the OC. Experience indicates that special attention should be given to the scope of this type of contracts; the indicators to be used to evaluate the performance of the SC shall be well-defined.

(3) Consulting Firm for the Supervision of Works

For the construction works stage to be executed by the contractors, the supervision shall be conducted by a consulting firm to be selected and contracted by the PMU.

The main activity to be performed by the consulting firm is the technical supervision of the construction works and the liquidation of the corresponding contract for the handing over of the facilities to the municipalities and JASS.

(4) Specialized Consulting Firm for the Soft Component

The activities of the soft component in the pre-investment, investment and post-investment stages shall be conducted through a specialized consulting firm to be selected and contracted by the PMU.

The main activities to be performed by the consulting firm are as follows:

i) Project promotion in communities at the very initial stage, assistance for the formation of the JASS and social activities in the community during the development of the *Perfil* and the project file (detailed design);

ii) Preparation of the soft component implementation documents; and

iii) Implementation of the soft component: (a) in the project execution stage, implementation of the capacity-building and hygiene education for the communities, JASSs and municipalities; and (b) in the post-execution stage, monitoring and following-up the activities of the community, JASSs and municipalities for reinforcement of soft-component activities given in the execution stage

(5) Modality of Execution through Contractors

Contractor: For contracting out to the contractors, the OC will prepare the documents for the tender process. This process will be carried out by the PMU with the participation of the technical team of the RMU who will administrate the contract. The PMU will sign the contract with the awarded contractor. It is recommended that the contractors to be selected have enough capacity to administrate and manage the construction of 20 to 50 works under a single contract, in order to realize the smooth implementation and fulfillment of the Program within a reasonable period of time.

(6) Modality of Execution through Core Executors

Core Executor: Any institution or organization that represents its organized group can be a Core Executor and receive funding for the execution of its proposed public investment projects (PIP's) or maintenance of infrastructure (MI). The Core Executor is formed by not less than one hundred people who live in a determinate rural or urban locality categorized under a situation of poverty or extreme poverty. For its participation in this Program, the Core Executor shall sign an agreement with the Ministry of Housing, Construction and Sanitation through the PAPT/Regional PMU.

The Core Executors, referred to by the *Decreto de Urgencia* No. 085-2009, will have a temporary nature only for the proposed works and legal capacity to conduct any necessary action prior or during the execution of the works or the maintenance of the infrastructure.

The Core Executors will be able to participate in administrative procedures and legal processes (through their representatives), following the norms of the private sector.

1.13 Implementation Plan

A considerable amount of capital investment will be required for the implementation of sub-projects in 1,500 localities. Therefore, the Feasibility Study recommended 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 years, taking into account the viability/reliability of the conditions based on which the present Program has been formulated. In conclusion, implementation in three phases was recommended, as shown in Table 1.13-1.

In the first phase, approximately 162 projects are to be implemented, of which 89 localities belong to Conglomerate C-1, and 73 localities belong to Conglomerate C-2.

The time period required from the procurement of the consulting firms to the completion of construction was estimated to be about 3.2 years. This period may be extended to one additional year in the first phase since this will be considered as the pilot phase of the Program and it will require a learning period during its implementation.

In the second and third phases, 713 and 625 projects, respectively, are to be implemented by either main contractors, who shall employ the necessary number of sub-contractors, or the Core Executors, whichever is considered to be more appropriate. The time period required from the *Perfil* studies to the completion of construction will be 3.2 years each for the second and third phases.

The total implementation period of ten years for the three phases includes the defects liability period (including monitoring period) of 7 to 12 months.

Table 1.13-1: Estimated Implementation Period for 50 Localities

	Main Activities	Estimated Period
i)	Initial diagnosis and baseline	2 to 3 months
ii)	Development of individual *perfils*, social preparation These activities should be executed by the OCs contracted for regions.	5 months
iii)	Evaluation and approval of the *perfils* above This shall be carried out by the SC.	1 month
iv)	Project file (detailed design) including the preparation of the tender documents. The soft-component file will be prepared in parallel. This will be developed by the OC by regions and by consulting firms specializing in the soft-component for both cases.	5-6 months
v)	Evaluation and approval of the project file (design of works). This shall be carried out by the SC.	2 months
vi)	Procedure for the pre-qualification of contractors. This shall be conducted by the PMU/RMU through a pre-qualification procedure carried out prior to the tender process.	3 months
vii)	Tender process and contract negotiation (contractors of works). This shall be carried out by the PMU/RMU. Formation of Core Executors. This shall be conducted with the technical assistance of the RMU.	3-4 months
viii)	Construction of facilities by contractors or Core Executors, soft component implementation by a specialized consulting firm, supervision of works (consulting firm or individual consultant). Each contract of works (contractors) shall include nearby localities in the same district. Core Executors for each locality.	12 months
ix)	Defects liability period. Monitoring and follow up of the soft component activities (post-investment	7 to 12 months
	Total	(40-48) ~50 months

Note: Estimated period for the basic implementation of 50 localities
Source: JICA Study Team (2010)

The allocation of localities to each phase was proposed as shown in Table 1.14.1-1

Table 1.13-2: 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	24	9	33	65	217	282	0	0	0	89	226	315
San Martin	0	63	63	33	119	152	130	167	297	163	349	512
Madre de Dios	0	0	0	0	0	0	40	4	44	40	4	44
Ucayali	0	0	0	139	14	153	0	0	0	139	14	153
Loreto	65	1	66	126	0	126	280	4	284	471	5	476
Total	**89**	**73**	**162**	**363**	**350**	**713**	**450**	**175**	**625**	**902**	**598**	**1,500**

Source: JICA Study Team, (2010)

1.14 Financial Risk Analysis

1.14.1 Financing from JICA

General conditions of the financing from JICA will be as follows:

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 (10) years

1.14.2 Peruvian Government

The DNS (the competent authorities of the Peruvian Government) requested for a loan from JICA in the amount of USD 35 million as a part of the total cost for the execution of the first phase of the Program; the balance of the cost will be covered by national resources allocated to the Project.

The financing amount from JICA resources may be increased in the following execution phases of Phase-2 and Phase-3, taking into consideration that the maximum percentage of funding to be assigned by JICA for projects in Peru is 85% of the cost. excluding the VAT.

1.14.3 Program Financial Scheme

The financial scheme for the three phases of Program execution is as follows:

1) JICA:	67% (USD 315.0 million)
2) MVCS:	18 % (USD 83.3 million)
3) Regional Governments:	15% (USD 72.8 million)
Total	100%(USD 471.1 million)

The contribution of the Regional Governments shall be as follows:

1) Regional Government of Amazonas	: USD 14.1 million
2) Regional Government of Loreto	: USD 26.5 million
3) Regional Government of San Martín	: USD 21.6 million
4) Regional Government of Ucayali	: USD 8.0 million
5) Regional Government of Madre de Dios	: USD 2.6 million
Total	: USD 72.8 million

Table 1.14.3-1: Financial Scheme **（USD x 1,000）**

Phase	Allocation of JICA - GoP				Program Cost	
	JICA		Peru			
Phase-1	35,000	63.6%	20,012	36.4%	55,012	100%
Phase-2	147,387	67.4%	71,322	32.6%	218,710	100%
Phase-3	132,664	67.2%	64,828	32.8%	197,492	100%
Total	315,051	66.9%	156,163	33.1%	471,214	100%
Phase	Allocation of MVCS − Regional Government				Total of GoP	
	MVCS		Regional Government			
Phase-1	12,512	62.5%	7,500	37.5%	20,012	100%
Phase-2	37,226	52.2%	34,096	47.8%	71,322	100%
Phase-3	33,560	51.8%	31,269	48.2%	64,828	100%
Total	83,298	53.3%	72,865	46.7%	156,163	100%

Phase	Allocation of JICA – MVCS – Regional Government						Program Cost	
	JICA		MVCS		Regional Government			
Phase-1	35,000	63.6%	12,512	22.7%	7,500	13.6%	55,012	100%
Phase-2	147,387	67.4%	37,226	17.0%	34,096	15.6%	218,710	100%
Phase-3	132,664	67.2%	33,560	17.0%	31,269	15.8%	197,492	100%
Total	315,051	66.9%	83,298	17.7%	72,865	15.5%	471,214	100%

情報源: JICA Study Team (2010); GoP = Government Peru、

Among those, the financing outline for the first phase that is expected to be financed once this Feasibility Study be declared to be viable, is as follows:

1) JICA: 64% (USD 35.0 million)
2) MVCS: 23% (USD 12.5 million)
3) Regional Governments: 14% (USD 7.5million)
Total 100%(USD 55.0 million)

The contribution of the regional governments will be as follows:

1) Regional Government of Amazonas : USD 1.6 million
2) Regional Government of Loreto : USD 2.9 million
3) Regional Government of San Martín : USD 3.0 million
Total : USD 7.5 million

Table 1.14.3-2 shows the financial scheme for the first phase of the Program, in which the amounts include prices escalation, physical contingencies, interest during construction, and or commitment charges on undisturbed balances.

Table 1.14.3-2: Financial Scheme for the Program – First Phase (2010-2013)
(Expressed in Thousands of Monetary Units)

Description	Nuevos Soles	JPY	USD
Total Program Cost [1/]	**156,180**	**5,044,608**	**55,012**
Price Escalation [1/]	3,471	112,123	1,223
Physical Contingencies [1/]	1,816	58,656	640
Total I	**161,467**	**5,215,387**	**56,874**
Interest during Construction	2,483	80,190	874
Commitment charges for undisturbed balances	497	16,049	175
Grand Total	**164,447**	**5,311,626**	**57,924**

1/ Includes VAT

The interest costs during construction and the Commitment charges for undisturbed balances shall be covered by the MVCS. Similarly, an amount shall be included in the planned budget to cover the possible sums due to price escalation and physical contingencies of the execution of the first phase of the Program.

Conclusions and Recommendations

(1) The target area of the Program is classified as poverty-prone area in Peru due to, among other basic needs, the lack or inadequacy of sanitation.

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

- Conglomerate C-1: Localities located in the region of Low Forest (902 localities)
- Conglomerate C-2: Localities located in the High Forest and in the Front Forest (598 localities)

(3) The Program shall have four components:

- Component 1: Conglomerate C-1
- Component 2: Conglomerate C-2
- Component 3: Program Administration
- Component 4: Strengthening of the Government Function

(4) The total Program cost for the four (4) components amounted to S/. 1337.8 million (JPY 43,210 million, USD 471.2 million). Its execution was scheduled in three phases, each one with an execution period of approximately four (4) years, during the period 2010-2020. The <u>cost allocation for each phase was: S/.156.2 million (USD 55.0 million) for the first phase</u>, S/.620.9million (USD 218.7 million) for the second phase, and S /.560.7 million (USD 197.5 million) for the third phase.

(5) The first phase was planned to be in 162 localities, of which 89 localities are located in the Low Forest (C-1), 57 in the High Forest (C-2) and 16 in the Front Forest (C-2), in the three administrative regions of Amazonas, Loreto and San Martín.

(6) The Feasibility Study concluded that Conglomerate C-1 and C-2, constituted by the water supply projects, should be viable in the three implementation phases from technical, economical and environmental standpoints.

(7) For the sanitation projects, reference values or cutoff lines, which are considered to be reasonable according to the proposed technical options, have been proposed in market prices.

(8) The economic evaluation of the program was carried out based on the results of the economic evaluation of the water supply projects of conglomerates C-1 and C-2, for the three phases, resulting in an NPV of S/.142.6 million and an IRR of 17.6%. Therefore, the Feasibility Study has concluded that the Program should be viable from the technical and economic point of view. It shall also be noted that the economic indicators of the first phase of the Program have an NPV of S/.14.6 million and an IRR of 13.9%.

(9) The costs analysis of the AOM for projects in the sample localities indicated that the estimated family fees for AOM were within affordable range. The facilities will be selected through

demand driven approaches and through active participation of the population. This is an aspect that will ensure sustainability of water services in the medium and long term.

(10) The Program will be implemented by the Regional Program Management Units (RMUs) of the Program, and coordinated at the central level by the Rural Sanitation Operational Unit, which will act as the PMU, located within the Water for All Program (PAPT). The Program emphasized equal importance to the execution of infrastructure works (design and construction of facilities), as well as soft component activities that will include (i) capacity building for planning, promotion, development, management and AOM of sanitation services, and (ii) hygiene education in each locality and municipality, contributing to the creation of awareness on the benefits of the project and generating demand for these services.

(11) The construction of the water supply and sanitation facilities will be carried out through contractors awarded through a tender process or through Core Executors to be formed by the communities.

(12) The organization for the implementation of the Program was proposed to be headed by the PMU in the PAPT and RMU (regional PMU). As part of the activities of Component 4 of the Program, the PMU and RMU will be subject to strengthening.

(13) It was proposed that the Program should be executed in three phases, during a period of ten years from 2010 to 2020. The first phase should be implemented as a Pilot Program, with the aim of assessing the applicability of the proposed program and the improvements needed for the following phases. In the first phase, 162 prioritized water supply and sanitation projects should be implemented (89 localities of Conglomerate C-1 and 73 localities of Conglomerate C-2); in the second phase, 713 projects (363 localities of Conglomerate C-1 and 350 localities of Conglomerate C-2); and in the third phase, 625 projects (450 localities of Conglomerate C-1 and 175 localities of Conglomerate C-2).

(14) For the financing of the Program, the Government of Peru expects the financial cooperation to be extended by the Japanese Government through JICA. According to this understanding, a financing outline for the phased implementation of the Program has been proposed. For the first phase, financing was foreseen to be 64% from JICA (USD 35.0 million) and 36% (USD 20.0 million) from national counterpart funds. The national funds will consist of 63% from the MVCS and 27% from the co-financing of the regional governments of Amazonas, Loreto and San Martín. JICA's shall be maintained, taking into consideration the upper limit of 85% for construction cost, which is the limit designated for projects in Peru. For the three phases of the Program, the financing outline is summarized as follows: 67% by JICA; 17% by the MVCS; and 16% by the regional governments of Amazonas, Loreto, San Martin, Ucayali and Madre de Dios.

(15) The Feasibility Study has recommended to declare the viability of the first phase of the Program, with its two conglomerates, on the basis of the results of the Feasibility Study. The

conclusion is that each conglomerate (Conglomerate C-1 and Conglomerate C-2), and the Program as a whole, is socially profitable and sustainable, and that the projects that comprise the Program are consistent with the policy guidelines of the sanitation sector.

1.16 Logical Framework

1.16.1 Logical 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 (ADDs) in the population of the rural Amazon area, from the current 23.9% 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: 162 localities with W&S services by 2013. -2nd implementation phase: 713 localities	♦ % 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 ♦ Nº of systems that applied	♦ 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
	with W&S services by 2017 -3rd implementation phase: 625 localities with W&S services by 2020.	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.
4. The community organizations (JASS) in the intervention area have the abilities of administrating, operating and	♦ 100% of the Community Organizations that have AOM knowledge for the water services. ♦ No less than 10 people of each	♦ Nº of Community Organizations that perform adequate AOM for water services	♦ Final Report of the JASS capacity building. ♦ Results report of the Ex Post evaluation	♦ Population's commitment to assume the services management

OBJECTIVES	AIMS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
maintaining (AOM) the water and sanitation services.	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 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	♦ Reports of the supervision to the JASS, carried out by the Municipality's water services responsible. ♦ Results reports of the Program's impact Evaluation	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 supervision 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' commitment with respect to their participation in the implementation of W&S services

OBJECTIVES	AIMS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
ACTIVITIES:				
I. Development of Initial Diagnosis and Baseline	I. Initial Diagnosis and Baseline for US$1.9 million.	♦ Nº of initial diagnosis of localities and situation of the W&S services.		
II. Development of *Perfils* and detailed design files 1. Development of pre-investment studies 2. Development of detailed designs	II. Pre-investment studies (*Perfils*) and detailed designs for US$54.3. million ♦ 1,500 *perfils* ♦ 1,500 detailed designs for works	♦ N° 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 ♦
III. Evaluation of *Perfils* and detailed design files 1. Evaluation of pre-investment studies 2. Evaluation of detailed designs	III. Evaluation and approval of pre-investment studies and detailed designs for US$17.0 million ♦ 1,500 *perfils* 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 ♦

OBJECTIVES	AIMS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
IV. Water storage and sanitation, Conglomerates 1 and 2 1. Rehabilitation, improvement, and expansion of existing water systems 2. Construction of new water systems 3. Installation of household latrines	IV. W&S infrastructure for US$286.9 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 ♦
V. 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. Soft component implementation for US$40.7 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	♦ 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	♦ 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
VI. Supervision of works	VI. Supervision of the works for US$32.8 million	♦ Item III and IV		

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 and Regional PMU are functioning as of 2011-2020 for US$36.5 million ♦ Individual Consultants for the Diagnostic and Baseline ♦ Operating Consultants contracted ♦ Supervising Consultants contracted by year ♦ Consulting Firm for Works Supervision ♦ Individual Consultants Specialized in Soft Component Intervention ♦ Individual Consultants for Works Supervision ♦ Executing Contractors contracted by year ♦ Forming of Core Executors ♦ Annual Operative Plan for Program approved ♦ Six reports of follow-up and evaluation of the Program per year ♦ 162 works concluded and operative in the year 2013	♦ No. of contracts with consultant per year ♦ No. of contracts with Executing Contractors per year ♦ No. 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 Consultants ♦ Contracts signed by the Contractors of Works ♦ Document proving the formation of the Core Executors ♦ 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

COMPONENT 3 (Activities of Program Administration)				
OBJECTIVES	**AIMS**	**INDICATORS**	**VERIFICATION MEANS**	**ASSUMPTIONS**
	♦ 713 works concluded and operative in the year 2015 ♦ 625 works concluded and operative in the year 2020			

COMPONENT 4 (Strengthening of the Government Function)

OBJECTIVES	AIMS	INDICATORS	VERIFICATION MEANS	ASSUMPTIONS
RESULTS: I. Strengthening of Government Function 1. Strengthening of Program Executing Unit and Regional Units 2. Contracting of Consultants or Consulting Firms to develop and implement activities	♦ Strengthening of government function from 2011-2013 (PMU/RMU) for US$1.6 million. ♦ Consultants contracted for continuous improvement of the Program. ♦ Consultants and institutions contracted for the development of human resources. ♦ Institution or consultants contracted for research and technological development. ♦ Consultants contracted for the Water and Sanitation Information System (“*SIAS*”). ♦ Consultants contracted for social, cultural, and anthropological support.	♦ No. of contracts with consultants or institutions for the development of activities or paths of intervention. ♦ No. of people capacitated for the PMU/RMU in the Program.	♦ PAPT (Program of Water for All) contracts or assignments for the PAPT specialists in the program PMU/RMU. ♦ Signed contracts with the consultants or institutions for the development of activities or paths of intervention. ♦ Results of the pilot project that include a non-conventional sanitation solution. ♦ Report of the results of capacity building of personnel of the PMU/RMU for the Program. ♦ Report of the results of Water and Sanitation Information System (“*SIAS*”). ♦ Report of social, cultural, and anthropological support. ♦ PMU Report of Program follow-up and evaluation.	♦ Commitments by the sector institutions to participate according to sectoral guidelines. ♦ Sectoral and regional policy for the intervention in W&S in rural Amazon areas. ♦ Sectoral and regional policy for the intervention in W&S in rural Amazon areas.

CHAPTER-II

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: *Direccion National de Saneamiento*).
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: *Programa Agua Para Todos*).
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: *Ministerio de Vivienda, Construcción y Saneamiento*) 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: *Viceministerio de Construcción y Saneamiento*).

The National Sanitation Directorate (DNS:*Direccion Nacional de Saneamiento*) 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: *Sistema Nacional de Inversión Pública*).

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 Program). 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: *Dirección General de Programación Multianual de MEF*) of the Ministry of Economy and Finances (MEF: *Ministerio de Economía y Finanzas*) 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 establised 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: *Ministerio de Salud*), through the Environmental Health General Department (DIGESA: *Dirección General de Salud Ambiental*), 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 Program will be implemented.

2.3.4 Ministry of Education

The Ministry of Education (MINEDU: *Ministerio de Educació*n), 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: *Unidadesde Gestión Educatival Local*) 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: *Ministerio de Ambiente*) 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, established 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 parties to be involved 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 2.3.11-1: Matrix of Involved Parties

GROUPS	INTERESTS	PROBLEMS IDENTIFIED	ESTRATEGY TO SOLVE THE PROBLEM
Ministry of Housing, Construction and Sanitation	Welfare of the population	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	Contribute to the population's welfare and improve quality of life in developing countries	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	Reduce the demand for attention to sickness on the part of the health establishments	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	Favor the social inclusion of the traditional Amazon 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	Conserve the quality of the environment	Insufficient knowledge for the conservation and sustainable use of natural resources.	Incorporating environmental subject matter into formal education and public communication

GROUPS	INTERESTS	PROBLEMS IDENTIFIED	STRATEGY TO SOLVE THE PROBLEM
Regional Governments	Provide technical and financial support to local governments in the provision of sanitation services.	Insufficient budget for regional governments to be able to support all the districts in their jurisdiction for participation 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	Provide basic sanitation for the locality's population, improving the community's conditions of life.	Limited capacity to provide technical assistance and supervise the JASS. Low availability of resources for co-financing projects in localities within their jurisdiction.	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 which are viable and assure 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.	Limited willingness-to-pay for sanitation services due to the low valuing of such services.	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)	Adequately administrate and operate the water and sanitation systems.	Lack of local capacities and limited technical assistance on the part of the municipalities for AOM. Insufficient resources to cover the costs of AOM.	The Program expects this to be resolved through the social intervention activities in the entire cycle of the project.

Source: JICA Study Team (2010)

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 DNS of the MVCS for a project identification and formulation. The pre-investment study at the *Perfil* level required by the 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 MEF 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 to 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 (*Perfil* 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

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 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><td></td><td colspan="3">Water supply</td><td colspan="3">Sanitation</td></tr>
<tr><td></td><td>2005</td><td>2010</td><td>2015</td><td>2005</td><td>2010</td><td>2015</td></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 MINSA 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 MVCS for the urban area and the MINSA 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: *Servicio Nacional de Abastecimiento de Agua*

Potable y Alcantarillado) was created, which remaining under MVCS, had affiliatedc companies in the departments. The rural sector continued to be under the MINSA.

In the nineties, SENAPA subsidiaries were transferred to the municipalities and the MINSA 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 MVCS 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-Vivienda. 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-vivienda, 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 organizational 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 No. 29338 ▪ 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-III

DIAGNOSIS OF THE EXISTING SITUATION

CHAPTER 3 DIAGNOSIS OF THE EXISTING SITUATION

3.1 Population in the Program and its Characteristics

The Amazon forest area in Peru 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 (meter above the sea level), 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: *Instituto Nacional de Estadistica e Informática*) 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 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 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 3.1.1-2: private households, the number of rural households per each region is presented, with a total of 228,484 households.

Table 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 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 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 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 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 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 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 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 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 3.1.3-1.

Table 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 3.1.3-2 and Table 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 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 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 3.1.4-1, are located in the regions of San Martín (7 localities) and Amazonas (31 localities).

Table 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 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 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 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 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 MINSA, 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 3.1.5-1, as a summary of the information in Appendix 3.

(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 3, 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 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)

(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: *Encuesta Demográfica de Salud Familiar*) have taken 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 *(ENDES Contiuya 2004-2006)*
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]

(ENDES Contiuya 2004-2006)

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
Area 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.
Source: JICA Study Team (2010)

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 3.1.5-2.

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

Table 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 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. Sewage treatment coverage in the sample localities is 10.0% which is the highest percentage of coverage among the localities in the Madre de Dios Region (33.3%). 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 3.1.6-2 shows the different sanitation coverage by house connection, cesspits/latrines, and sewage treatment according to natural and geographic regions.

Table 3.1.6-2: Sanitation Services Coverage, 2007

Administrative Region	Distribution Network				Blind Pit/Latrine				Treatment (*)			
	Low Forest	High Forest	Front Forest	Average (Adm. Region)	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%	-	-	28.6%	14.3%
San Martín	4.6%	3.4%	1.5%	3.6%	54.6%	63.0%	70.3%	60.4%	16.7%	14.3%	-	13.3%
Madre de Dios	9.6%	12.6%	-	9.8%	41.8%	40.9%	61.5%	59.7%	33.3%	-	-	33.3%
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%**	**6.9%**	**8.0%**	**22.2%**	**10.0%**

Source: JICA Study Team (2010) based on XI National census of Population and VI of Housing 2007.
(*) Percentage calculated with respect to the sample localities

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 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 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[4] Poverty Map classifies twenty-five (25) regions at five (5) levels according to the Deficiency Index, which has been developed independently (see Table 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.

[4] FONCODES: *Fondo de Cooperacion para el Desarrollo Social* (Social Development Cooperation Fund)

Table 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 3.1.7-3 shows a summary of these social indicators in the five (5) regions of the Program scope.

Table 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)[5] 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.

5 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: *Encuesta Nacional de Hogares*), 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 3.1.7-4.

Table 3.1.7-4: Average Monthly per Capita Expenditure, 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 [6] 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 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.

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

ii) At Provincial Level

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

For the formulation of the Feasibility Study for the Program for Water Supply and Sanitation for Amazon Areas, 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.

Table 3.2.1-1 shows the final distribution of sample localities by administrative and geographical regions (conglomerates). The procedure for the selection and total size of the sample is explained in the chapter corresponding to the supporting study of each conglomerate.

Table 3.2.1-1: Final Allocation of Sample Localities

Administrative Region	C-1	C-2		Total
	Low Forest	High Forest	Front Forest	
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 (100%)**

Source: JICA Study Team (2010)

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 Table 3.3.1-1 below.

Table 3.3.1-1: Population of the Sample Localities

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 Table 3.3.1-2 below.

Table 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 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 3.3.1-4: Percentage of Households

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 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 3.3.21-6.

Table 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 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 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 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 Table 3.3.1-10.

Table 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.

Table 3.3.1–11 shows the level of education of inhabitants older than 14 years old in the localities of the Program. Most of the population (52.7%) has primary schooling and 9.0% has no formal education. Four percent of the population has higher university education (completed or uncompleted). The proportion of Conglomerate C-2 that does not have formal education is greater than that of Conglomerate C-1.

Table 3.3.1-11-1: Level of Education in Localities in the Program Sample

Level of Education	Low Forest		C-1	High Forest		Front Forest		C-2	Total
	Men	Women		Men	Women	Men	Women		
Without level	4.4%	10.0%	7.2%	7.5%	21.5%	3.9%	21.8%	13.8%	9.0%
Preschool education	0.1%	0.2%	0.2%	0.1%	0.2%	0.0%	0.4%	0.1%	0.2%
Primary	48.6%	47.2%	49.3%	63.9%	58.4%	64.4%	57.3%	61.4%	52.7%
Secondary	39.9%	27.3%	35.0%	26.2%	17.9%	26.1%	18.9%	22.5%	31.5%
Non-university higher education, complete	2.0%	4.1%	2.3%	0.7%	0.8%	1.6%	0.8%	0.7%	1.9%
Non-university higher education, incomplete	2.2%	4.6%	2.6%	0.8%	0.7%	1.8%	0.8%	0.7%	2.1%
University higher education, complete	1.5%	3.8%	1.9%	0.4%	0.4%	1.0%	0.0%	0.4%	1.5%
University higher education, incomplete	1.2%	2.8%	1.4%	0.5%	0.2%	1.2%	0.0%	0.4%	1.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

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

(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 by 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 3.3.1-11-2: 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%	0	8%
Clay Road	1	7 %	10	67 %	-	-	-	-	0	-
Trail	3	21 %	-	-	-	-	0	-	0	-
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 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 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 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 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.

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%

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.

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 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.

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 3.3.1-15.

Table 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 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 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.

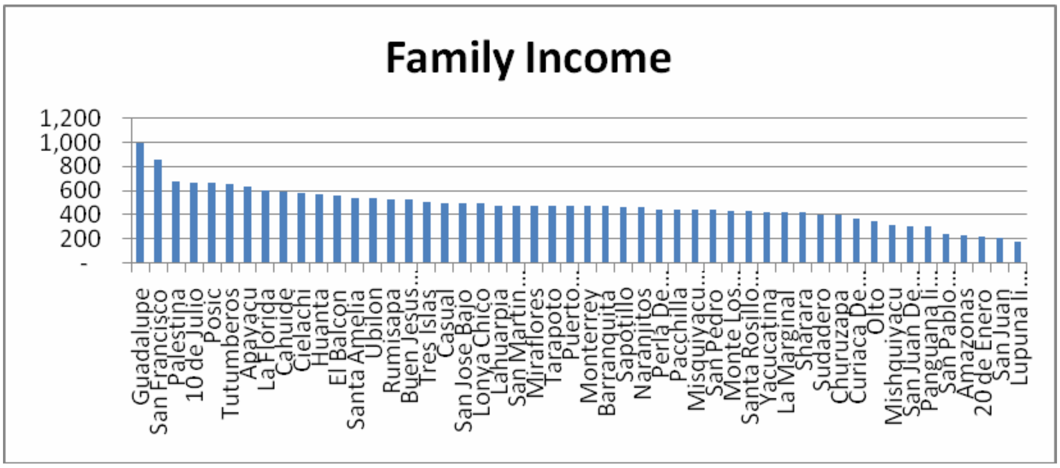
Table 3.3.1-16: Average Family Income by Geographical Region

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 3.3.1-17.

Table 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 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 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 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 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 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 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 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 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 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/quenched/ brick	29%		62%		75%		46%	
Wood	69%		12%		15%		43%	
Mud-wall/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 3.3.1- 23.

Table 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: *Direccion de Saneamiento Basico Rural*) of the MINSA (since 1962), 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 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 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 3.3.2-1 (A) Summary of Existing Water Supply Systems in the Sample Localities- Part A

N°	Region	Locality	Natural Region	Houses			Supply System				Water-Intake Facilities			Conveyance facilities			Suction				Riser pipe			Treatment							
				Total N° 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	Sand trap		Settler		Pre filter		Slow Filter	
																								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	Electropump 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	Electropump 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	Electropump 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	Electropump 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	Electropump 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 System

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

Source: JICA Study Team (2010)

Table 3.3.2-1 (B) 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", 11/2", 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 resticion)	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 bacteriological
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

Source: JICA Study Team (2010)

ii) Observations

The existent water supply infrastructures at the Program's sample localities consist of several types as listed in Table 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 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 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 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 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 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 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 29 localities under the Low Forest category, superficial water is predominant at 52%. The remaining 48% is underground water, which is mostly through hand-dug wells or tube wells.

In the 12) localities under the High Forest category, superficial water sources (rivers, ponds, lakes, etc.) provide water for 62% of the total population while underground water provides for the remaining 38% of the population.

In the nine localities under the Front Forest category, the use of superficial water (rivers and streams) is similar to that of springs or underground water, both at 50%.

Table 3.3.2-4: Water Sources of the Sample Localities

Source	Low Forest		High Forest		Front Forest	
	Total	%	Total	%	Total	%
Superficial	16	52%	8	62%	5	50%
Underground	15	48%	5	38%	5	50%
- Spring	3		4		5	
-Well (Tubular or Hand-dug)	12		1		0	
Total	**31**	**100 %**	**13**	**100%**	**10**	**100%**

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

The results shown in Table 3.3.2–4 indicate that there are four localities with two water supply sources (superficial and underground).

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 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 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 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 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 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 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 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 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 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 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 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													
				Miraflores	Tutumberos	Guadalupe	Puerto Naranjitos	Naranjitos	Misquiyacu Bajo	San Jose Bajo	Casual	El Balcon	Ubilon		Cielachi	Lonya Chico	Olto y San Juan
	Water Source			M1	M1	M1	M1	M1	M1	M1	M1	M1	M 1	M2	M1	M1	M2
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
2	Color	15	U.C.	**15**	10	**20**	**65**	10	**30**	0	**95**	**120**	10	**50**	12	**70**	**25**
3	Temperature		° 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
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
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
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											
14	Nitrite	3	ppm NO2			0.13											
15	Magnesium					0.19											
16	Potassium					1.53											
17	Chloride	<250	ppm CL-			5											
18	Calcium		ppm CaCo3														
19	Sulfate	250	ppm SO4			2											
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
21	Iron	0.3	ppm Fe			0.005											
22	Manganese	0.1	ppm Mn			0.002											
23	Arsenic	0.01	ppm As				0	0	0		0						
24	Total coliformes		NMP/100ml.	**52**	**320**	**198**	**236**	**182**	**65**	**14**	**75**	**376**	**48**	**272**	**424**	**240**	**448**
25	Coliformes fecales	0	UF/100ml	**44**	**280**	**106**	**170**	**10**	**60**	**4**	**24**	**340**	**3**	**168**	**248**	**10**	**360**
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

N°	Parameter	San Martin																
		Lahuarpia	Perla de Cascayunga		Posic		Barranquita			La Florida	Monte de los Olivos	Rumisapa	Pacchilla	Churuzapa	La Marginal	Palestina	Mishquiyacu	Sapotillo
	Water Source	M1	M1	M2	M1	M2	M1	M2	M3	M1	M1	M1	M1	M1	M1	M1	M1	M1
1	Turbidity	**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	**50**	**40**	10	10	10	**40**	**40**	5	<1		<1	<1	-	-	<1	1	<1
3	Temperature									-	-	-	-	-	-			
4	Odor									-	-	-	-	-	-	-		
5	Taste									-	-	-	-	-	-	-		
6	Conductivity	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	60	280	94	136	7.2	182	208	232	122	-	39	39	92	-	716	26	21
8	Ph	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									-	-	-	-	-	-	-		
11	Hardness									-	-	-	-	-	-	-		
12	Residual Color									-	-	-	-	-	-	-		
13	Nitrate	< 0.01	0.11	0.22	1.75	< 0.01	0.72	1.02	0.66	-		-	-	-	-	1.5	<0.023	
14	Nitrite	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-		-	-	-	-	-		
15	Magnesium	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	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	2	1.1	6.8	21.8	2.4	1	0.1	< 0.1	4	<1	<1	2	2	2	-	<1	<1
18	Calcium									12.1	32.5	2	1.4	8.8	8.8	-	0.3	0.4
19	Sulfate	2	11	3	2	10	2	4	4	-	2	-	-	-	14	130	5	5
20	Aluminum									**0.35**	0.14	0.02	0.1	**0.41**	**0.41**	-	<0.01	<0.01
21	Iron	**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	< 0.004	< 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									<0.005	<0.005	<0.005	<0.005	<0.005	<0,005	-	<0.005	<0.005
24	Total coliformes	**1.1 x 10³**	**< 1.1**	**< 1.1**	**3**	**3.2 x10²**	**10**	**1.2 x 10**	**1 x 10**						-	-		
25	Coliformes fecales	**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														-	-		
	Situacion de fuentes de abastecimiento	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					
				Santa Rosillo	Yacucatina	Tres Islas			Sudadero	Monterrey		San Martin de Mojaral	San Francisco	10 de Julio	San Pedro	Sharara	Curiaca
				28	29	30	30	30	31	32	32	33	34	35	36	37	38
	Water Source			M1	M1	M1	M2	M3	M1	M 1	M2	M1	M1	M1	M1	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
2	Color	15	U.C.	<1	<1	**30**	10	**>150**		**20**	10	**20**	12	**54**	**20**	15	8
3	Temperature		° 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
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
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
9	Salinity		%	-								0	0.1	0.1	0.4	0	0.1
10	Alkalinity		ppm CaCo3	-								36	128	8	60	17	18
11	Hardness		ppm CaCo3	-								28	80	8	360	15	24
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
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
15	Magnesium			12.7	9.1	1.05	1.1	1.38	0.27	0.13	0.09	-				-	-
16	Potassium			-	8.6	.47	.14	.44	0.16	0.03	0.05	-				-	-
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
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
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
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
23	Arsenic	0.01	ppm As	-	<0.005							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**
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

N°	Parameters	Loreto																
		Cahuide		San Juan de Puritan	Amazonas	20 de Enero	San Pablo de Cuyana		Tarapoto		Panguana	Lupuna II Zona		Apayacu	Buen Jesus de Paz		Huanta	Santa Amelia
		39	39	40	41	42	43	43	44	44	45	46	46	47	48	48	49	50
	Water Source	M1	M2	M1	M1	M1	M1	M2	M1	M2		M1	M2	M1	M1	M2	M1	M1
1	Turbidity	**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	4.08	13	**47**	**90**	**98**	4.06	13	4.08	13		13	**98**	**53**	**69**	**97**	**50**	**52**
3	Temperature																	
4	Odor																	
5	Taste																	
6	Conductivity	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	0.03					0.03		0.05									
8	Ph	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																	
10	Alkalinity	10					7		20									
11	Hardness	40					40		60									
12	Residual Color																	
13	Nitrate	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	0.02					0.01		0.01									
15	Magnesium	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	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	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																	
19	Sulfate	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																	
21	Iron	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	1.1					0.08		<1,10									
23	Arsenic														0	0	0	
24	Total coliformes																	
25	Coliformes fecales						**2**		**4**									
26	Aerobic Bacteria																	
	Situacion de fuentes de abastecimiento	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 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 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 3.3.2-1 (Summary of the Existing Water Supply Systems in the 50 Sample Localities) and the data of Table 3.3.2-3 (Conditions of the Infrastructure of the Potable Water Systems); especially the home connections. From all those data, Table 3.3.2-11 was elaborated, where the current conditions that affect the coverage establish in Table 3.3.2-10

Table 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 3.3.2-10 (Coverage of Water Supply Services in the Sample Localities) has been corrected with the data from Table 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 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 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 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 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 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 rio 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 rio 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 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 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 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 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 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 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 3.3.2-15 and Table 3.3.2-17, the percentages of sanitation coverage by latrines have been estimated. Table 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 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 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 3.3.2-19

Table 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 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 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 3.3.2-19 that match the addition of "fair" and "poor" and the obtained results are:

Table 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 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 79%. 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 3.3.3-1

Table 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	14	10	8	**32**
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 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 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 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 collecte d d for the service, since it is inadequ ate	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 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 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[7] 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 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 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)

[7] ¨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 Central Objective of the Program

The Central Program Objective is to decrease the prevalence of infectious intestinal diseases (*EDA*'s) in the rural population in the regions of Loreto, Madre de Dios, San Martin, Amazonas, and Ucayali.

3.4.3 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-IV

FORMULATION AND EVALUATION

CHAPTER 4 FORMULATION AND EVALUATION

4.1 Conglomerate Criteria

The 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.

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 the following two (2) conglomerates:

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

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

C-2, because the localities in Conglomerate C-1 have not drawn much attention for the development than those in Conglomerate C-2..

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

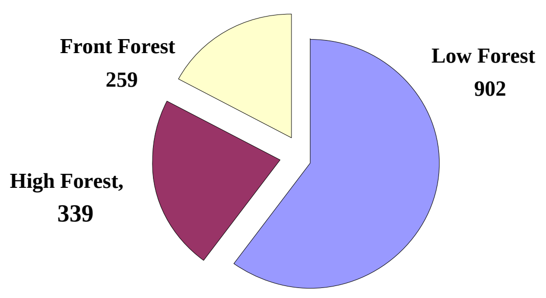
Table 4.1-1: Locality Distribution by Conglomerate

Administrative Region	Conglomerate C-1		Conglomerate C-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 C-2 consists of 339 localities in the High Forest and 259 in the Front Forest. The largest number of localities in the Conglomerate C-2 is situated in San Martin and Amazonas regions, which represent 58.4% and 37.8%, respectively of the total of localities in the Conglomerate C-2.

Figure 4.1-1: Distribution of Localities



Source: JICA Study Team (2010)

(2) Locality Size (Population and Household)

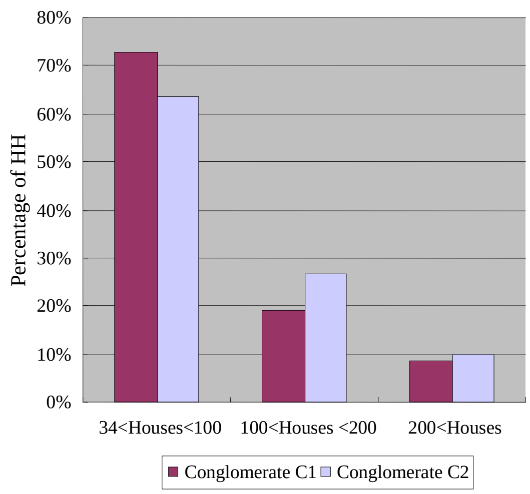
The majority of the localities have less than 100 households in each locality, which represent an approximate population between 200 and 400. Table 4.1-2 shows a 72.6% of localities in the Low Forest (Conglomerate C-1) with households less than 100; 61.9% of localities in High Forest and 65.3% of localities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

Table 4.1-2: Locality Size by Conglomerate

Size of Localities Range	Conglomerate C-1		Conglomerate C-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 4.1-2: Locality Size by Conglomerate



Source: JICA Study Team (2010)

(3) Coverage of water supply and sanitation services

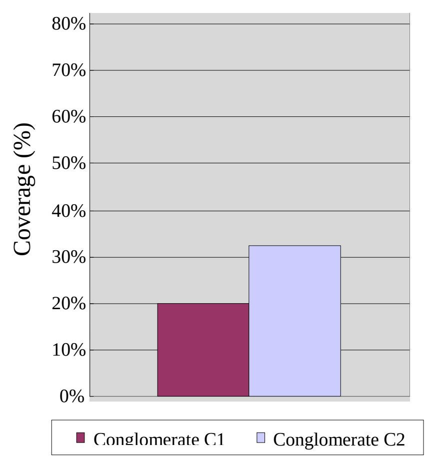
Regarding the current coverage of potable water supply services through house connections and public taps, a low coverage of 7% in the Low Forest (Conglomerate C-1) and a higher coverage in the Conglomerate C-2 % are observed; i.e. in the High Forest (13%) and in Front Forest (47%), as presented in Table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

Table 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 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 3.3.2-17 (that shows the coverage based on physical number of facilities available without consideration of present conditions) has been adjusted using the conditions shown in Table 3.3.2-15.

As a result, effective coverage was obtained and shown in Table 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 C-1 is much lower than that of the Conglomerate C-2.

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

Administrative Region	Conglomerate C-1			Conglomerate C-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

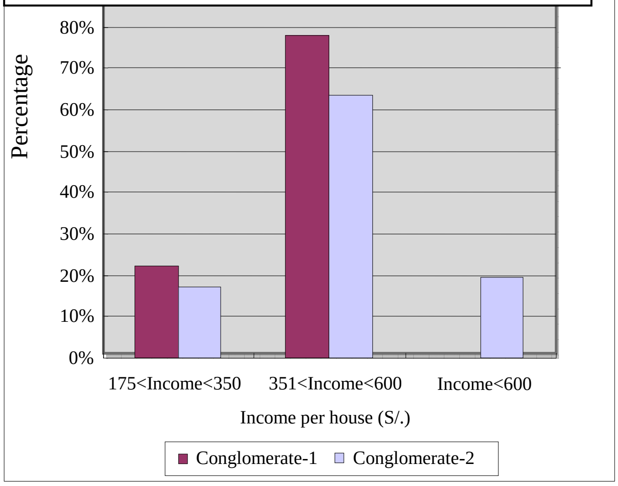
It is observed that the average family income per month in the three (3) geographic regions ranges from S/. 350 to S/.600. Since there are not clear differences in family income among the three (3) geographic regions, this variable will not be a criterion for the formation of conglomerates. The results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

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

Income Range (I.R) (S/.)	Conglomerate C-1	Conglomerate C-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

Figure 4.1-4: Income per Family



Source: JICA Study Team (2010)

(5) Per-Capita-Cost

As explained in previous paragraphs, the principal variable used to decide conglomerate formation was the location 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 water supply and sanitation in each natural region. A detailed explanation of the calculation methodology and conclusions are described 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 water and sanitation projects in the Program depends on the design periods of the components and system elements, which are functions 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. The following target years[1] 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 this 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 considerations 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 (*Plan Nacional de Saneamiento 2006-201*) 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 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 communities in each stage of the Program implementation.

[1] Maximum recommended design period: Project of Design Regulations for Water and Sanitation Infrastructure for sewerage in rural localities, including sewerage networks, is 20 years

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*)[2]. In order to apply these, it will be necessary to keep the following in mind: geographic location, climatic conditions, topography zone, accessibility to the 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 beneficiaries, 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 *(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: *Ministerio de Vivienda, Construction y Saneamiento*) and the various Cooperation Agencies[3] 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 virtually not possible to obtain such information as water consumption in the past, 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 4.3.2-1.

[2] 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.

[3] Minutes from Work Meeting with MVCS, DNS, BID, BIRF y JICA (06.03.2009)

Table 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 drinking and cooking.

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 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 National Institute for Statistics and Information: INEI (*Instiuto Nacional de Estadistica e Informatica*) 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 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 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[4] 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 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

[4] National Census of Population and Housing 1940,1961,1972,1981,1993 y 2007-INEI and Appendix 4 – Future Population

Table 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 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 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 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 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 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; i.e. Conglomerate C-1 consists of the localities in the Low Forest, and Conglomerate C-2 consists of the localities in the High Forest and Front Forest. Table 4.3.3-8 shows the population projections per conglomerate until the year 2030.

Table 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 by either the house connection and the public tap in the Program localities has been obtained from the data of the INEI Census of 2007. The INEI information does not indicate such information about the present conditions 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 3.3.2-11. The results of the approximation with the adjustments are shown in Table 4.3.4-1.

Table 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 3.1.6-1: Coverage of Water Services with Connections – 2007
(2) From Table 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 C-1: 7% (Low Forest)
2) Conglomerate C-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 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 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 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 5 (Appendix 5: Demand by Regions)

Table 4.3.4-3: Projected Coverage for Potable Water, by Population and Households

Year	Conglomerate C-1						Conglomerate C-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 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 4.3.4-4.

Table 4.3.4-4: Water Coverage for the Design Period

Potable Water	Year	Population	Coverage (%)	Served Population (inhab.)	Incremental Served Population (inhab.)
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)

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 includes 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 collected in the field works for the pre-investment studies at the *Perfil* level of in 50 sample localities (this Feasibility Study).

Table 4.3.5-1: Sanitation Coverage - Latrines 2007

<table>
<tr><th>Description</th><th>Front Forest</th><th>High Forest</th><th>Low Forest</th><th>Total</th></tr>
<tr><td>Blind pits or latrines installations – 2007 Census -(1)</td><td>64.1%</td><td>74.4%</td><td>64.9%</td><td>66.8%</td></tr>
<tr><td>Well or latrines status -(2)</td><td>0%</td><td>17%</td><td>3.0%</td><td>6%</td></tr>
<tr><td rowspan="2">Coverage of latrines and blind shafts-2007 Census – Adjusted -[(1)x(2)]</td><td>0%</td><td>127%</td><td rowspan="2">1.9%</td><td rowspan="2">4%</td></tr>
<tr><td colspan="2">6.4%</td></tr>
</table>

JICA Study Team (2010)

(1) From Table 3.1.6-3: Coverage of Sanitation Services Census 2007

(2) From Table 3.2.2-14: Conditions of Latrines in the Program's sample localities

Table 4.3.5-2: Sanitation Coverage – Sewerage Systems 2007

<table>
<tr><th>Description</th><th>Front Forest</th><th>High Forest</th><th>Low Forest</th><th>Total</th></tr>
<tr><td>Sewerage installation – 2007 Census 2007 -(1)</td><td>19.1%</td><td>7.9%</td><td>3.3%</td><td>7.2%</td></tr>
<tr><td>Status of sewerage systems -(2)</td><td>67.0%</td><td>100%</td><td>50.0%</td><td>67.0%</td></tr>
<tr><td rowspan="2">Sewerage Coverage – 2007 Census – Adjusted -[(1)x(2)]</td><td>12.8%</td><td>7.9%</td><td rowspan="2">1.7%</td><td rowspan="2">4.8%</td></tr>
<tr><td colspan="2">10.3%</td></tr>
</table>

JICA Study Team (2010)
(1) From Table 3.1.6-3: Coverage of Sanitation Services Census 2007
(2) From Table 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 C-1: 1.7% (Low Forest)
2) Conglomerate C-2: 10.3% (High Forest and Front Forest)

(2) Latrines/Septic Tanks

1) Conglomerate C-1: 1.9% (Low Forest)
2) Conglomerate C-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 of the Program. It is envisaged that an 80% coverage level is to be attained in the year 2020.

Table 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 the program implementation.

The calculation of the sanitation coverage has been carried out for each of the five (5) administrative regions. This calculation is shown in Appendix 5 (Demand by Regions).

Table 4.3.5-3: Projected Coverage for Sanitation, by Population and Households

Year	Conglomerate C-1						Conglomerate C-2						Total					
	Population (inhab)	Coverage (%)	Served Population (inhab.)	Incremental Served Population	Served Houselhold (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 Houselhold (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 4.3.5-3, the proposed coverage from 2011 until 2020 will allow the Program to provide sanitation facilities to an incremental population of 542,210 inhabitants by the end of program execution period (10 years) and for as shown in Table 4.3.5-4.

Table 4.3.5-4: 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**
Total					**542,210**

Source: JICA Study Team (2010)

4.4 Supply Analysis

The supply analysis was made independently each for water supply 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 existing potable water facilities/systems was determined. The result shows that even in the "without project" situations supply capacity does exist, the implication of which is that there are potable water supply systems/facilities 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 infrastructures for water supply. However, the lack of adequate operation and maintenance results in many of the facilities of the systems not fulfilling their full 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 3.3.2-11). This indicates that 26%, approximately, of the systems are in poor state and 32%, in bad conditions. This poor situation affects the operability of the systems, restricting the effective access to water service by population. The current status could be even worse if it is taken into consideration that the water that reaches the houses or public taps has not be disinfected due to lack of chlorination 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 shall 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 4.4.1-1 shows the current supply of the water systems by conglomerate.

Table 4.4.1-1: Current Potable Water Supply by Conglomerate

Year	Conglomerate		Total
	C1	C2	
2007	7%	12%	10%

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 estimated 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 4.4.2-1 shows the percentages of sanitation supply in the year 2007 by conglomerate.

Table 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 C-1 and 9.3% in Conglomerate C-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 C-1 and 1.6% coverage in Conglomerate C-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 4.5.1-1: Supply-Demand Balance of Water Supply by Conglomerate

Year	Conglomerate C-1		Conglomerate C-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**
2021	-20%	89,025	-20%	62,666	-20%	151,691
2022	-19%	87,521	-19%	62,006	-19%	149,527
2023	-19%	85,966	-19%	61,307	-19%	147,273
2024	-18%	84,360	-18%	60,568	-18%	144,928
2025	-18%	82,704	-18%	59,788	-18%	142,492
2026	-17%	80,997	-17%	58,965	-17%	139,961
2027	-16%	79,239	-16%	58,098	-16%	137,336
2028	-16%	77,430	-16%	57,185	-16%	134,615
2029	-15%	75,570	-15%	56,227	-15%	131,796
2030	**-15%**	**74,250**	**-15%**	**55,395**	**-15%**	**129,645**

Source: JICA Study Team (2010)

Table 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 Feasibility 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 C-1 and 10.3% in Conglomerate C-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 C-1 and 6.4%, in Conglomerate C-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 Feasibility 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 4.5.2-1: Supply-Demand Balance of Sanitation by Conglomerate

Year	Conglomerate C-1		Conglomerate C-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 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 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 limited in volume and/or coverage; 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 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 prepare 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 period of the sanitation systems is the responsibility of the service providers.

The general objective of the PAPT is to provide the populations with improved 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 various 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) and Regional Project Management Unit (RMU) 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 Personnel

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 for Program execution shall be reviewed by the PMU during the implementation stage of the Program, based on the points of view 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). All this for 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[5].

Based on the above-referenced analysis and assessments, the operating consultants (OC) shall design the processes of programming, follow up and monitoring for the implementation of the Program led by the PMU and RMU. 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 Item 4.20 of the present Feasibility Study.

[5] Meeting Minutes for the Work Meeting of MVCS, BID, BIRF, and JICA (06.03.2009)

Likewise, the flow chart of programming, monitoring and evaluation procedures proposed in this Feasibility 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 consultants, supervisors) 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) Requirements to be Determined by PMU/RMU

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 Feasibility 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 under the direction of the PMU and RMU.

(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 is 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 consultants) shall select/design the facilities and the other consulting group (design evaluators/supervising consultants) 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 Feasibility 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 sufficient capacity of technical evaluation so that the PMU is able to countercheck the selection of technical solutions by the operating consultants and the design evaluators / supervising consultants, from the sustainability point of view. For this purpose it may be recommended that a technical adviser be invited to participate with the support of the prospective financer.

4.8 Description of Technical Alternatives

4.8.1 General Considerations and Criteria for the Selection of Technical Alternatives

(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[6] 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 (43.7% of the total)[7].

Due to the aforementioned conditions in the Program's area, in particular in the Low Forest region (Conglomerate C-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

[6] Minutes of the Working meeting among VMVCS, DNS, BID, BIRF and JICA (06 march 2009)
[7] 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*"[8].

[8] 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[9] elaborated by OPS[10]/CEPIS[11], 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 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 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.

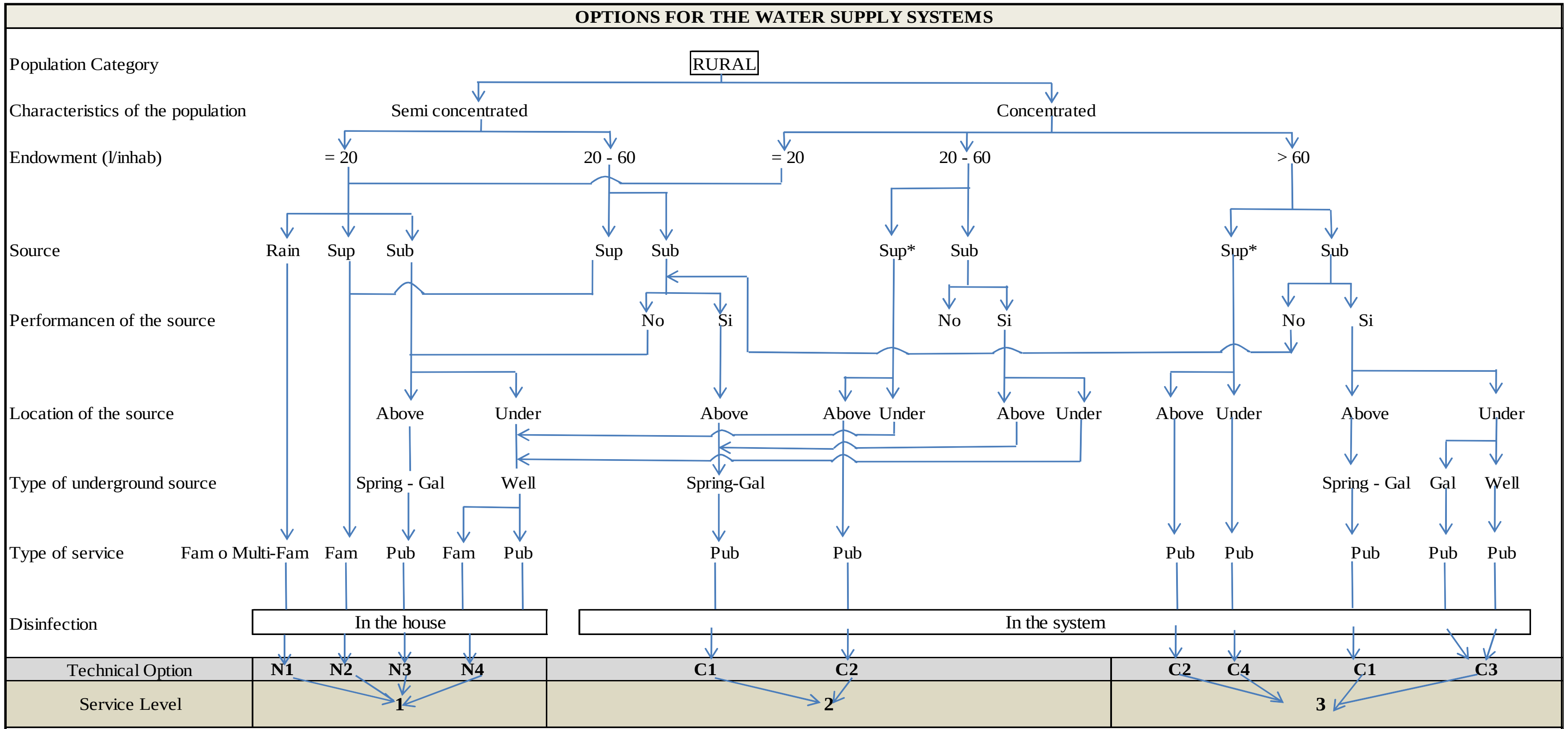
The “conventional” systems provide a public water supply at household level, through house connections, using water distribution network. On the other hand, the “non-conventional” systems consist of individual and multi-family solutions; and demand transportation. These systems are, for instance: rain water collection, superficial water – table filters, spring protection and well with manual pumps. The characteristics of these water supply systems are summarized in Table 4.8.2-2.

[9] Considerations for the Selection of the Technical Option and Level Service in Water Supply Systems - OPS/CEPIS. Lima, 2006

[10] Pan American Organization of Health (*Organization Panamericana de la Salud*)

[11] Pan American Center for Sanitation Engineering (*Centro Panamericano para la Ingeniería Sanitaria y Ambiental*)

Figure 4.8.2-1: 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: Undergrounc 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 4.8.2-1: Identification of Technical Solutions – Potable Water Supply

<table>
<tr><th colspan="5" rowspan="2">Method of Water Acquisition</th><th colspan="2">Water Source</th><th colspan="2">Treatment</th><th rowspan="2">Distribution Methods</th></tr>
<tr><th>Clean or Turbid</th><th>Possible Water Source</th><th>Filtration</th><th>Disinfection</th></tr>
<tr><td rowspan="2">1</td><td colspan="3" rowspan="2">Gravity System</td><td>G-W/O-T</td><td>Clean</td><td>Spring</td><td>Non</td><td rowspan="4">Chlorination (boiling) (note-1)</td><td rowspan="4">Home, Public taps</td></tr>
<tr><td>G-W-T</td><td>Turbid</td><td>River, Stream, Lake</td><td>Sedimentation, Slow sand-filter</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Non-Gravity System</td><td rowspan="2">Motorized Pump</td><td rowspan="2">- Public Elec. Grid,
- Solar Gen.
- Petrol-driven Gen..</td><td>P-W/O-T</td><td>Clean</td><td>Tube well, dug well</td><td>Non</td></tr>
<tr><td>P-W-T</td><td>Turbid</td><td>Tube well, Dug well, River, Stream, Lake</td><td>Slow sand-filter</td></tr>
<tr><td colspan="2" rowspan="2">Manual Pump + (Elevated) Tank</td><td>P-M</td><td>Clean</td><td>Tube well, Dug well</td><td>non</td><td rowspan="2">Boiling, (Chlorination) (note-2)</td><td rowspan="2">Public tap at source</td></tr>
<tr><td>P-M-T</td><td>Turbid</td><td>Tube well, Dug well</td><td>Home sand-filter</td></tr>
<tr><td rowspan="2">3</td><td colspan="3" rowspan="2">Individual Solution
• Protection of water source,
• Rain water,
• Hand-dug or Tube well with hand pump</td><td rowspan="2">I-S</td><td>Clean</td><td>Spring, Stream, Rain</td><td>Non</td><td rowspan="2">Boiling, (Chlorination) (note-2)</td><td rowspan="2">Water fetching</td></tr>
<tr><td>Turbid</td><td>River, stream, Lake, Pond</td><td>Home sand-filter</td></tr>
<tr><td>4</td><td colspan="3">Other options</td><td></td><td colspan="5">As to be identified as appropriate in the field</td></tr>
<tr><td colspan="10">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.</td></tr>
</table>

Source: JICA Study Team (2010)

Table 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[12].	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)

[12] ‘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 sanitation 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 meeting13, 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

[13] 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

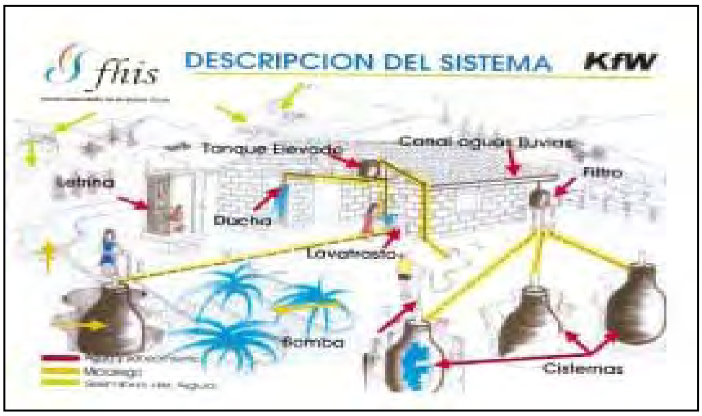
v) Regional and National Experiences of Water supply with non-conventional Systems

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[14]), 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 4.5 to 5.0 m^3 for the storage of water for dry seasons. This

14 Soluciones Innovadoras para el suministro de agua en comunidades rurales dispersas en Honduras-Programa de Agua y Saneamiento. 2003

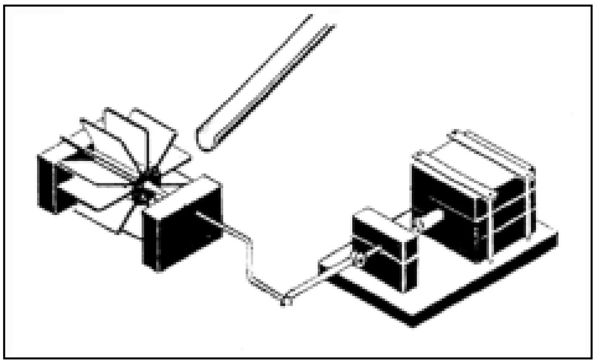
"technology is applicable in those places where other type of water sources are not available".

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.

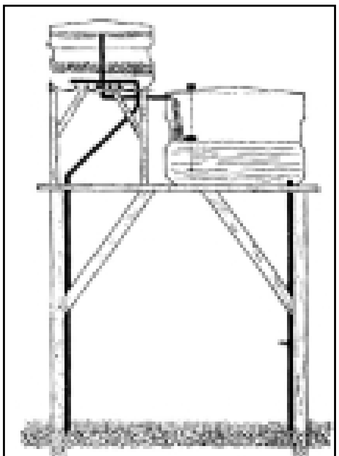
An appropriate technology for water impulsion is the **Wooden Pump**[15] for eater, which p umps the water from one place to another with no type of effort and faster, using the water itself as its energy source. The system consists of: a) a basic hydraulic impulsion pump, which is activated by a rod-crank 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.



In-reservoir Filter

This system or technical option is recommendable to purify the water in volumes over 500 liters, so it may be fully used. A pump is required to raise the water up to the filter.

[15] Programa de las Naciones Unidad para el Desarrollo. Tecnologìas en la Erradicación de la Pobreza (1987)

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[16], CARE Perú[17], FONCODES y DIGESA[18], 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.

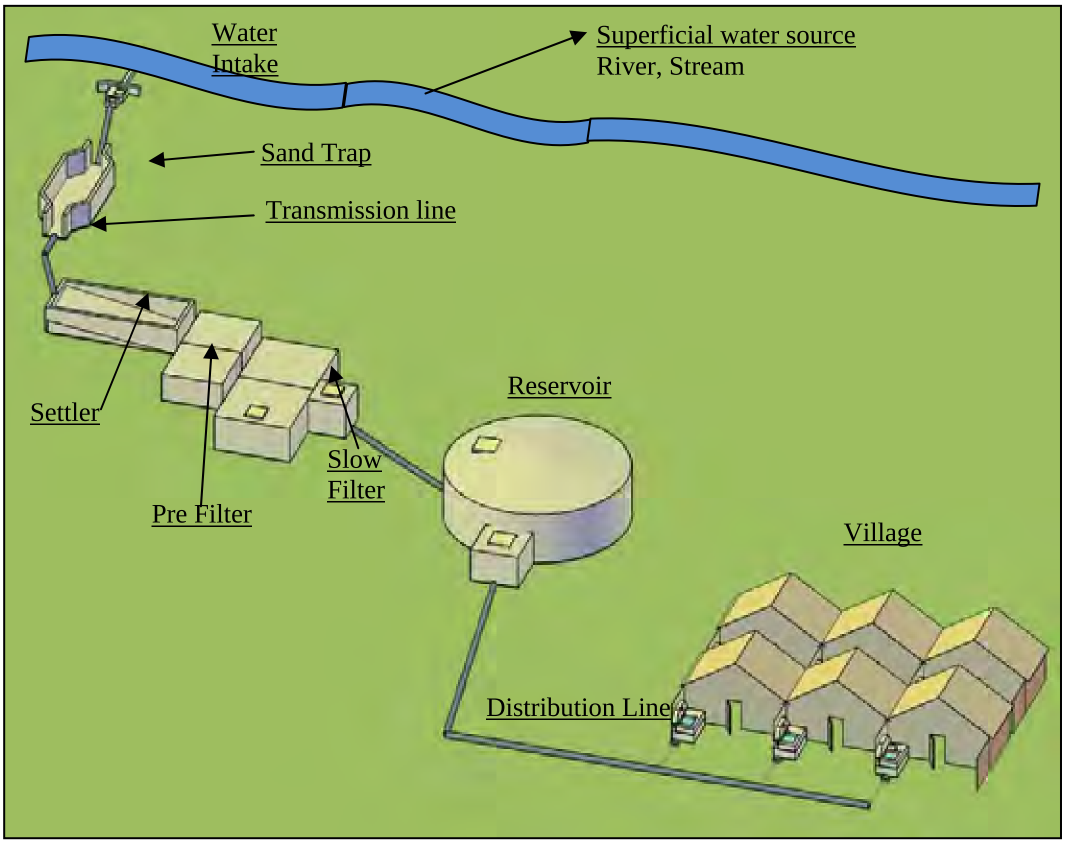
The existing experiences in the regions of the Program's Área for these type of unconventional supply solutions will allow for a better acceptance of these systems among the populations in which these solution shall be implemented.

vi) Figures of Potable Water Supply

The following figures present the supply systems proposed for the 50 sample localities of the Program.

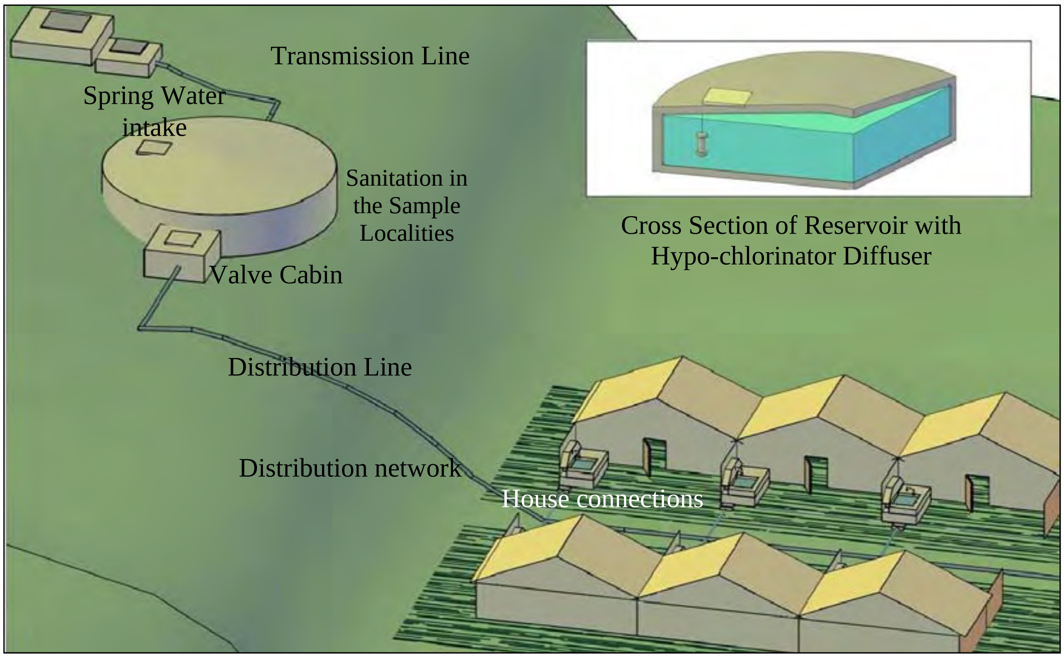
[16] ADRA Peru: Adventist Development and Relief Agency - Perú
[17] Cooperative for Assistance and Relief Everywhere - Peru
[18] Dirección General de Salud Ambiental.

Figure 4.8.2-2: Supply System by Gravity with Treatment



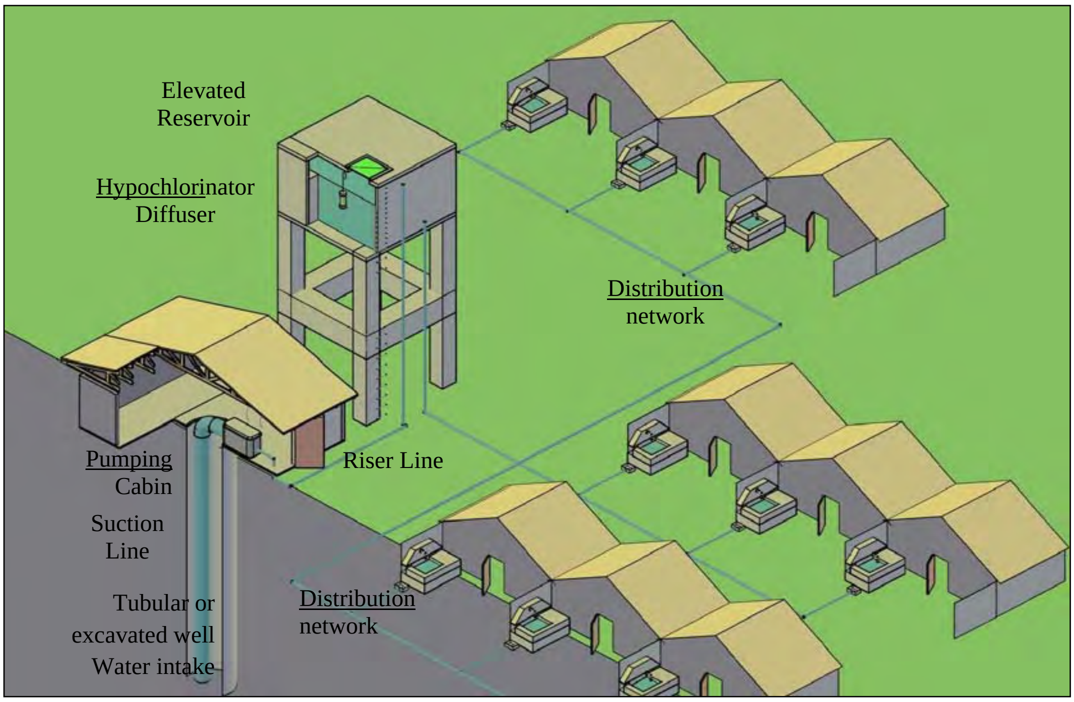
Source: JICA Study Team (2010)

Figure 4.8.2-3: Supply System by Gravity without Treatment



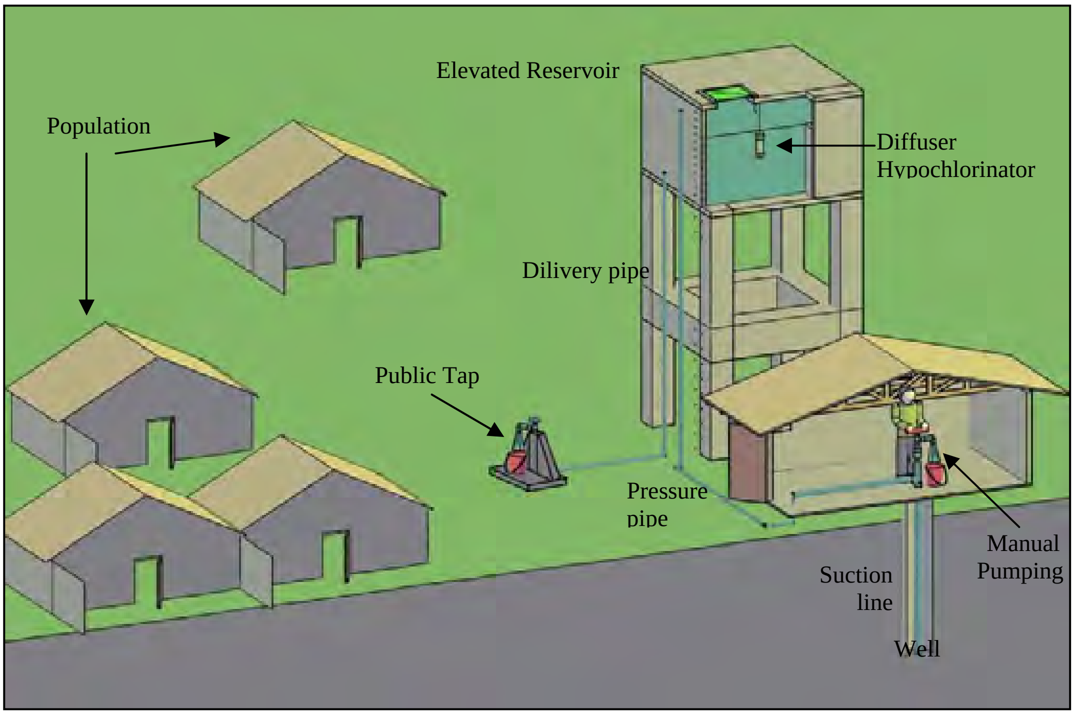
Source: JICA Study Team (2010)

Figure 4.8.2-4: Supply System by Pumping with Treatment



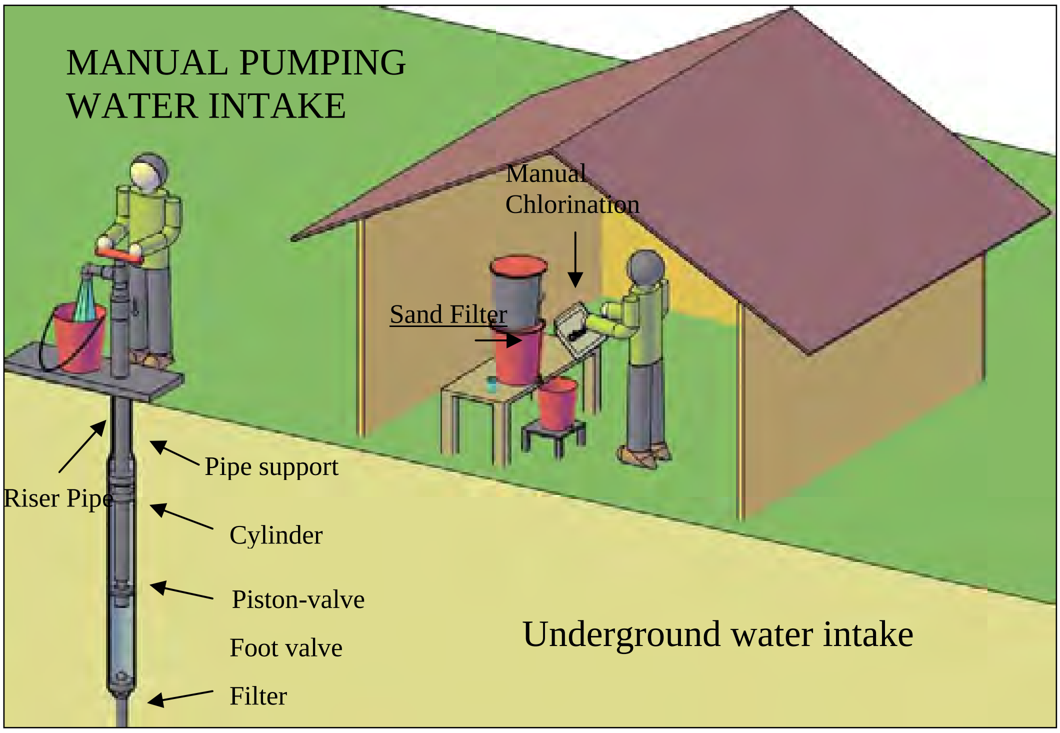
Source: JICA Study Team (2010)

Figure 4.8.2-5: Supply System by Manual Pumping – Reservoir and Public Tap



Source: JICA Study Team (2010)

Figure 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.

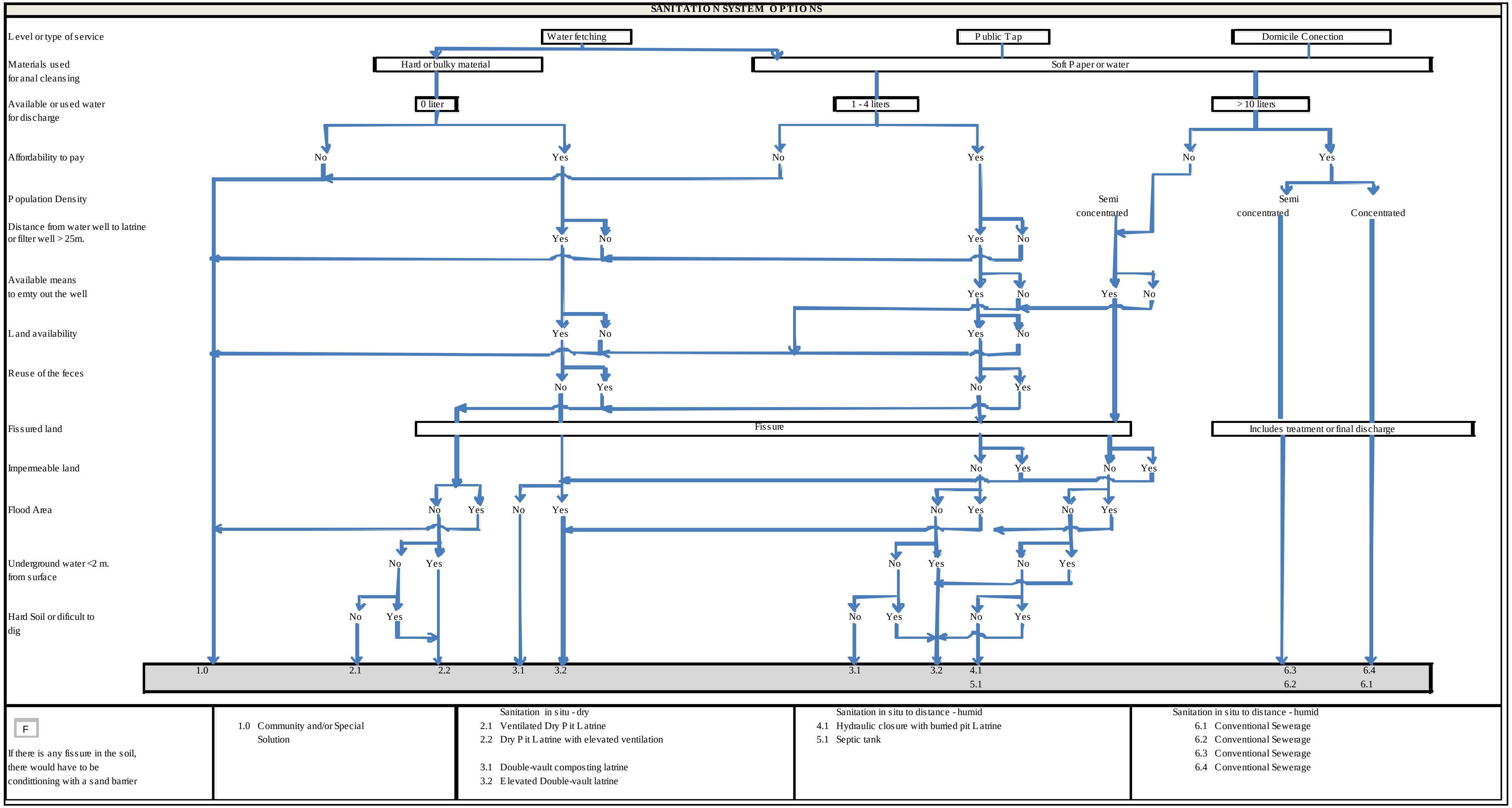
The design of sewerage networks and treatment units shall be carried out according to the current norms, such as the National Construction Regulations and the Design Norm Project for Water and Sanitation Infrastructure for Rural Population Centers.

Possible application of sanitation system/facilities are shown in the Table 4.8.2-3.

For the selection of the technical solutions the document[19] 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.

[19] 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 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 C-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 C-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[20]. 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,

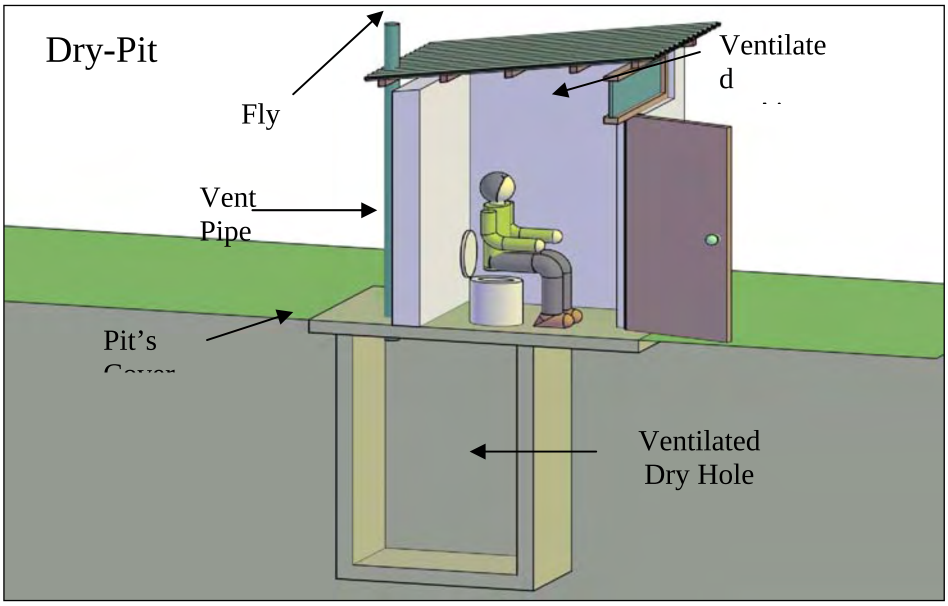
[20] Latrines in Flood Areas – Pan American Health Organization – Lima, 2005

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

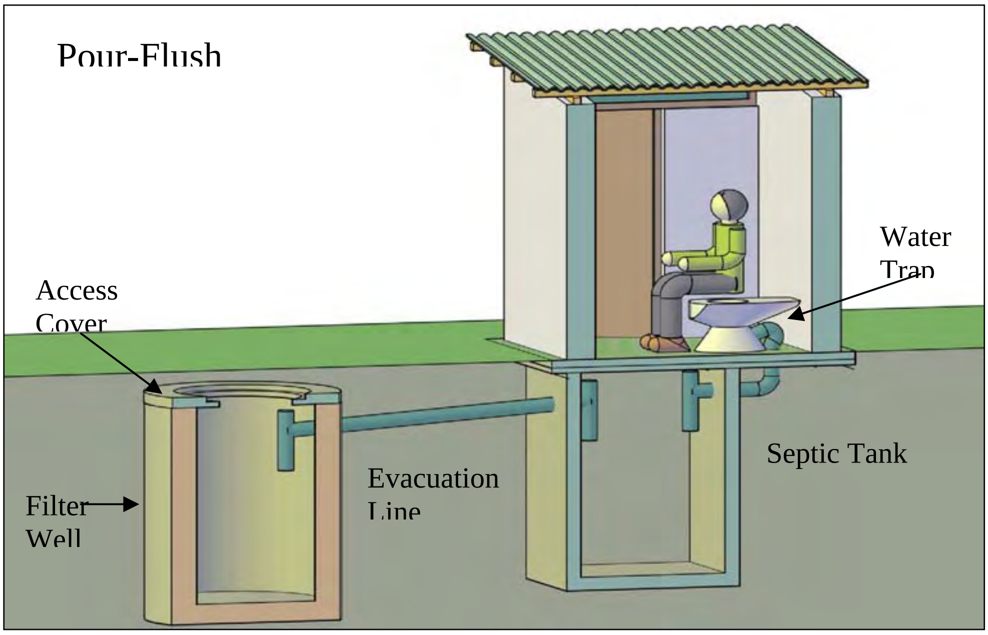
In the following figures, the technical solutions for sanitation for the 50 sample localities of the Program are presented.

Figure 4.8.2-8: Ventilated Dry-Pit Latrine



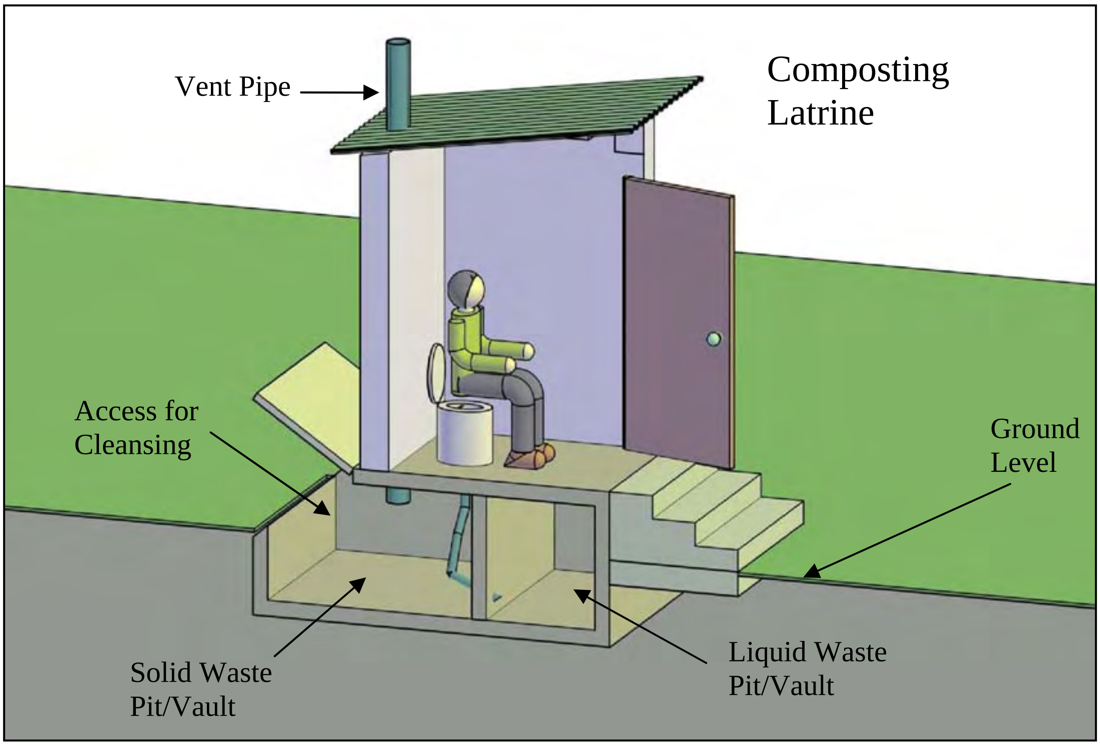
Source: JICA Study Team (2010)

Figure 4.8.2-9: Pour-Flush Latrine



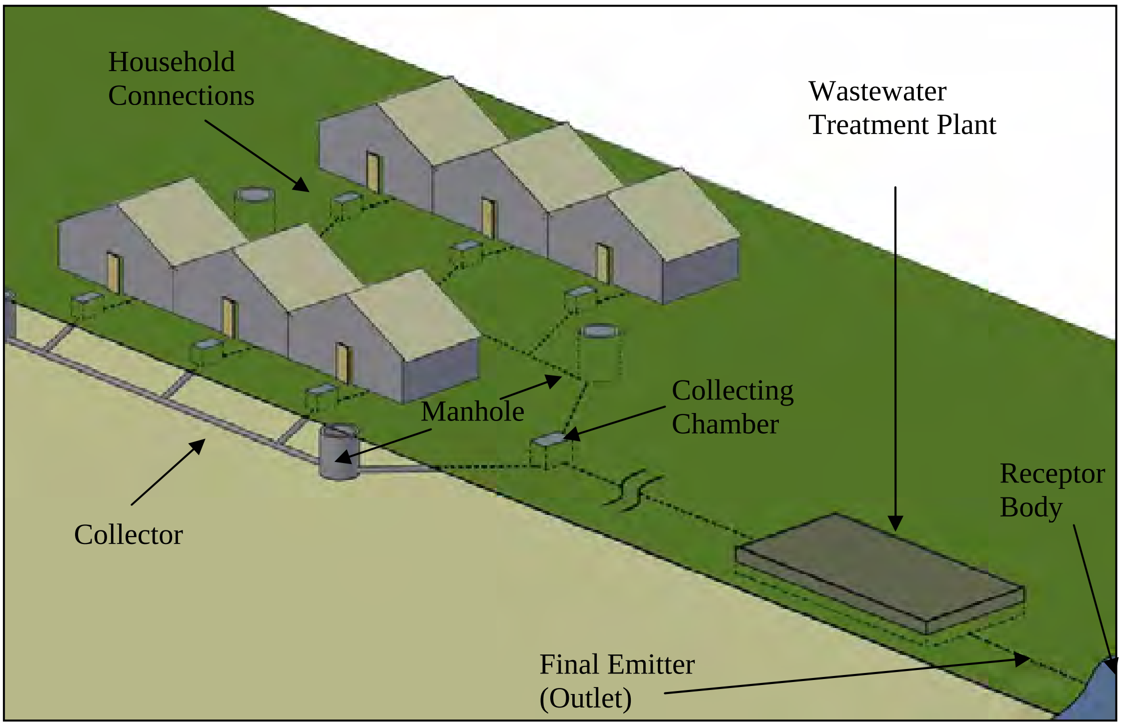
Source: JICA Study Team (2010)

Figure 4.8.2-10: Composting Latrine



Source: JICA Study Team (2010)

Figure 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 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 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: Water Intake		Conduction Line					Cistern		Pumping System						Treatment		Reservoir					Disinfection System		Aduction			Distribution			Connections				SANITATION: Type			Treatment	Diam.	Long.	Number of facilities/connections
					Upgrade/ Expansion	New	Diam.	Long.		Otros		Vol.	Material	Caseta de Bombeo	Pump	Diameter of the Impulsion	Lenght of the Impulsion Pipe	Energy	Condition			Type	Apoyado	Elevado	Vol.	Material			Diameter	Length		Diameter	Lenght		Type	Number	Otros				Intervencion				
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/01und(N),S-	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=02und	-	-	-		-	-	-	-	-	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)	(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), S-L/01	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)	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: 7und.	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 (U)		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=7und.	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=7und.	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 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 4.8.3-2 may vary in the universe of the 1,490 localities, being values obtained from a sample of 40 localities. Likewise, the water supply systems proposed do not exclude other systems like pumping and treatment systems that may be suitable to the particularities of each locality in the Program.

Table 4.8.3-2: Proposed Water Supply Systems for the 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	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 (2010)

i) Conglomerate C-1

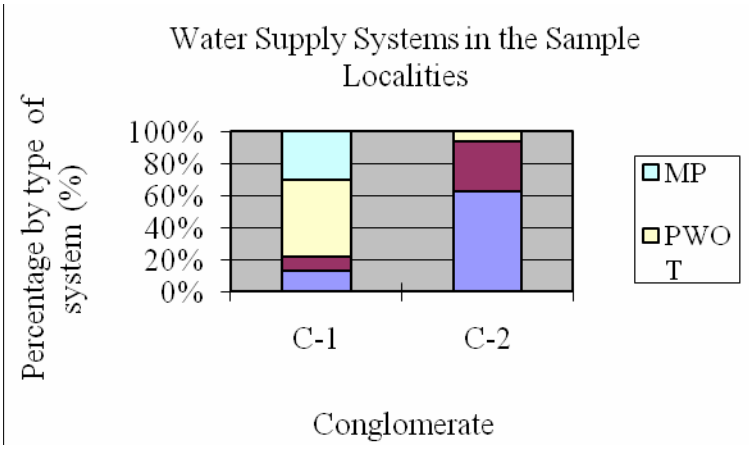
Table 4.8.3-2 shows that out of the total of twenty-three(23) localities in Conglomerate C-1, eleven (11) will have a pumping system without treatment and seven (7) a manual pump system. The other five (5) localities will have gravity systems: three (3) G-W-T systems and two (2) G-WO-T systems. It is evident that the pumping option is predominant in the Conglomerate C-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 C-2

On the other hand, the majority of the proposed technical solutions for the Conglomerate C-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 C-2, in comparison with the case of the area of the Conglomerate C-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



Source: JICA Study Team (2010)

(2) Sanitation Systems

Table 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 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.

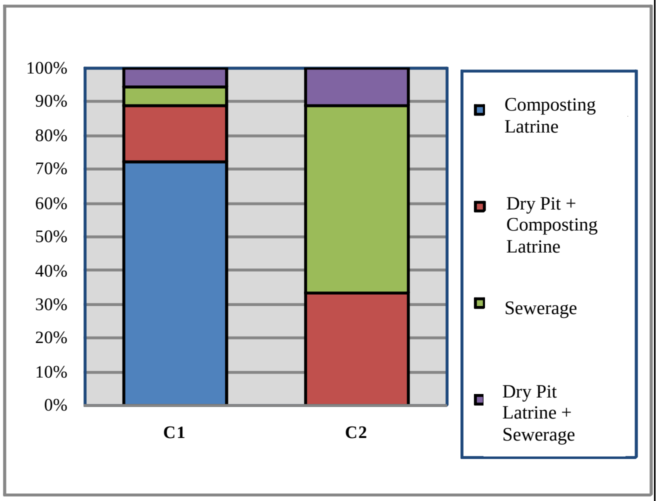
Table 4.8.3-3: Proposed Sanitation Systems/Facilities for the Sample Localities

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 C-1

Figure 4.8.3-2: Proposed Sanitation Systems/Facilities for the Sample Localities



Among the twenty-three (23) localities in Conglomerate C-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 C-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 C-2

In the areas of the Conglomerate C-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 4.8.3-4.

Table 4.8.3-4: Reasons for the Selection of Sewerage System in the Conglomerate C-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 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.

4.8.4 Program Goals – First Phase

Based on the Program costs for the three phases indicated in Item 4.10 of the present Feasibility Study, Table 4.8.4-1 shows the goals that will be met with the implementation of the first phase for the two conglomerates. Program implementation in this phase is foreseen in 162 localities that are distributed in three regions, namely: Amazonas, Loreto, and San Martin, as shown in Table 4.10.5-1.

Table 4.8.4-1: Physical Goals for the Water and Sanitation Program in the Rural Amazon – First Phase (2010 -2013)

Description	Amazonas		Loreto		San Martin		Total	
	C-1	C-2	C-1	C-2	C-1	C-2	C-1	C-2
1. No. of localities with a water supply system (improvement, expansion and new system)	24	9	65	1		63	89	73
2. No. of localities with a sanitation system (new system and improvement of sewerage system)	24	9	65	1		63	89	73
3. No. of contractors for works (water supply and sanitation)	1		2		2		5	
4. No. of Executing Boards (NN.EE)	12	4	33	1		31	45	36
5. No. of trained staff from the district municipality	2	0	2	0		2	4	2
6. No. of community organization and/or JASS	24	9	65	1		63	89	73
7. No. of trained people from the community organization and/or JASS	72	27	195	3		189	267	219
8. No. of individual consultants for the Soft Component	12	4	32	1		32	44	37
9. No. of localities with Initial Diagnosis and Baseline	24	9	65	1		63	89	73
10. No. of individual consultants for the preparation of Initial Diagnosis	1		3			3	4	3
11. No. of district municipalities for strengthening of management	1		3			3	4	3
12. No. of water supply and sanitation project *perfils*	24	9	65	1		63	89	73
13. No. of project files (detail designs)	24	9	65	1	0	63	89	73
14. No. of operating consultants (preparation of *perfils* + detail designs)	1		1		1		3	
15. No. of supervising consultants (*perfils* + detail designs)	1						1	
16. No. of consulting firms for the supervision of works (contractors)	1						1	
17. No. of individual consultants for the supervision of works (NN.EE)	6	2	21			21	27	23
18. No. of trained staff from the regional PMUs	6		8		8		22	
19. No. of trained staff in the PMU	12						12	
20. No. of pilot projects for the development of technical alternatives	1						1	
21. No. of socio-cultural anthropological support studies	1						1	

Source: JICA Study Team (2010)

4.9 Components of the Program

The previous *Perfil* Study for the Program proposed four interrelated components within the Program, keeping in mind the integral implementation model in accordance to the Sector's policies and strategies of the MVCS for small localities in the rural area. In other words, the Program will give equal importance to the development/rehabilitation of infrastructure (design and construction of installations); capacity building activities (soft component) for sustainable administration, operation and maintenance to be undertaken by each community and district municipality, and hygiene education in each locality and municipality.

In the present Feasibility Study, the conformation of two (2) conglomerates has been proposed, based on the results of the diagnosis performed, followed by the specific studies at the *Perfil* level of the 50 sample localities in the Program. For this proposal, the present Feasibility Study considered also the analysis of the management capacity of the sanitation services in the localities, the analysis of the executing unit's capacity for the Program's implementation and the lessons learned from the experience of the National Program of Rural Water and Sanitation (PRONASAR: *Programa Nacional de Agua y Saneamiento Rural*) in the rural area[21].

On the basis all above considerations, the present Feasibility Study proposes that the Program should consist of the following four (4) components:

1) Component-1: Projects Implementation for Conglomerate C-1
2) Component-2: Projects Implementation for Conglomerate C-2
3) Component-3: Administration Activities of the Program
4) Component-4: Strengthening of Government Function

In accordance to one of the policies of the Program: the integrated implementation model, each conglomerate will consist of: i) Infrastructure works of potable water and sanitation; ii) Capacity building activities (Soft-component) for municipalities, community organizations and communities, and iii) Consultancy services.

4.9.1 Infrastructure of Potable Water and Sanitation Works (in Component 1 and Component 2)

Development of infrastructure for water supply and sanitation for each one of the localities is proposed. This includes the construction of new water supply and sanitation facilities or the rehabilitation and/or extension of existing water supply and sanitation facilities. The type of facilities and technology to be used and detailed specifications of the facilities will be decided by each *perfil* study at the pre-investment stage of each project. These decisions will be made through a participatory approach, involving concerned parties, such as beneficiaries and district municipalities, in the pre-investment stage, during the formulation of the perfil, and confirmed or reformulated during the development of the detail design in the investment stage in which the consultant will participate as the facilitator.

[21] Minutes from Work Meeting with MVCS, DNS, BID, BIRF y JICA (06.March.2009)

4.9.2 Capacity building - Soft-component for organization, planning, and administration of the sanitation services and hygiene education for the municipalities, community organizations, and community (in Component 1 and Component 2)

The capacity building was proposed in order to achieve sustainable development of the water supply and sanitation sub-projects. The target group should be the beneficiaries, the members of the community organizations and district municipalities. capacities will be enhanced for organizing, planning, promoting, developing and supervising the sanitation services.

The capacity-building also includes health and hygiene education activities in order to realize sustainable use of facilities through promoting health-hygiene practices for the prevention of water-borne diseases; and also include adequate use of services, resource preservation, and environmental awareness.

Among the activities foreseen, the beneficiaries, community organizations and district municipalities shall be responsible for participating in the capacity-building programs to be facilitated by the operating consultants, as this is a part of their role during Program implementation in the localities.

Capacity-building activities include, but not limited to, the following:

1) To strengthen or activate the water user's associations (such as community organizations) at each locality during the pre-investment stage, in which the consultant will participate.
2) During the investment or execution stage, with the participation of the contractor.
    i) To provide the beneficiaries and the community organizations with technical knowledge and training, in order to achieve sustainable administration, operation and maintenance (AOM) of the water supply and sanitation facilities.
    ii) To provide the beneficiaries with hygiene education, in order to foster hygiene awareness among the population.
    iii) To provide the district municipalities with technical knowledge and training, in order to enhance their capabilities for monitoring and supervising the water supply and sanitation services in the localities; and for supporting the localities when needed.
3) To provide the localities and the district municipalities with monitoring and follow-up activities in the post-execution stage, always with the participation of the contractor, in order to bring the enhanced capacities to a level of conventional practices.

4.9.3 Consultancy Services

Consultancy services are proposed as part of the implementation of Component-1, Component-2, and Component-4. These will be contracted by the PMU, whose tasks and responsibilities are described in Item 4.20.3 of this report.

4.9.4 Administration of the Program (Component 3)

This Program component is an activity aimed at the management and implementation of the Program through the PMU, which is to be created within the Agua para Todos Program (PAPT) and the RMU.

Its functions include:

1) To assigned the necessary specialists for the implementation and management of the Program.
2) To procure the necessary equipment and material for the management of the Program
3) To manage the annual budget for the operation of the Program.

This unit shall monitor the Program in the different stages of the Project cycle, coordinate actions with the other actors from the public sector, keep relations with the financing organization, procure the consultants and contractors form the private sector, administrate their contracts, budget for its resources, monitor the progress, and evaluate the results of the Program, in relation to the expected benefits. They shall also issue periodical reports on the physical and financial progress, in order to comply with regulations of the Peruvian government and the financing organization.

In order to strengthen the management capacity of the PMU for the Rural Amazon Area and of the RMU, capacity-building activities for the PMU staff and their support staff will be included in the terms of reference of the Consultant, who will act as the operators, as part of his obligations.

4.9.5 Strengthening of Government Function (Component 4)[22]

With the end goal of facilitating program implementation, the incorporation of a fourth component has been proposed, which include, among other objectives, the following: facilitating and giving support to execution strategies; contributing to the strengthening of the sector's regulatory framework and the development of human resources; research and technological development; studies of social-cultural-anthropological support in view of the diversity of ethnicities and linguistic families in the rural communities in the Amazon; and the management of the Water and Sanitation Information System ("SIAS") on what is incumbent in the Program at the local, regional, and national levels.

A series of assumptions has been made for the design of the program execution diagram including, among others, the following: existence of consultant firms and supervisors; human resources (from the branches of engineering and social sciences) present in different regions – in sufficient quantity and quality to move forward with implementation –; and the

[22] DNS Proposal via by means of Memo 685-2010-VIVIENDA/VMCS-DNS from 15.06.2010

commitment of the municipalities in order to give technical assistance and supervise the fulfillment of JASS, among others, once the projects are finished in the communities.

If lessons learned in other rural sanitation implementations have been taken into account in the program design, it is necessary that this component brings about and generates conditions so that the mentioned success factors for the Program exist at expected times. For that reason, each of the lines of implementation in the present component has been proposed, as described below:

1) Development of human resources
2) Research and technical development
3) Studies of social-cultural-anthropological support in view of the diversity of ethnicities and linguistic families in the rural Amazon communities.

These activities will be undertaken by the Consultants and/or specialized organizations contracted with the PMU

The detailed explanation of the lines of implementation and activities, as well as the budget breakdown, are presented in Appendix 6.

4.10 Costs

4.10.1 Methodology for the calculation of the Program costs.[1]

The investment costs and operation and maintenance costs for the Program have been estimated based on the costs actually budgeted (calculated) in the *Perfil Studies* of each project of the sample localities. Thereafter, the projects (localities) representing similar characteristics were grouped for the extrapolation of the cost estimation from the sample level to the Program level. This variety of characteristics consists of the different types of systems/facilities, the types of works (i.e. new construction, improvement and/or rehabilitation and expansion), and the population size of the selected sample localities. And therefore, the simple methodology shall be adopted so that the Program costs can be calculated based on the costs of the said *Perfil Studies*.

Given that information regarding the population (or the number of households) in all of the Program localities should be available, the Program cost can be estimated through the multiplication of population of the Program level by the "per capita-cost" to be calculated from the budgeted cost of the *Perfils* for the sample localities. In other words, the investment costs for infrastructure construction works for the Program will result from the application of the 'per-capita-cost' of each group mentioned above, to the benefitted population in the design horizon of the projects (20 years).

4.10.2 Costs of the Projects for the Sample Localities

(1) "Without Project" Situation

The costs of the "without project" situation are defined as those costs necessary for the optimization of the existing systems that seeks to improve the current conditions of the water supply and sanitation services. Such costs were evaluated in the 50 sample localities.

i) Potable Water

In the twenty-eight (28) localities that have operating water supply systems, the existing water supply facilities require either partial or complete renewal, reconstruction, or replacement of existing infrastructure (water intake, transmission lines, treatment facilities, reservoirs, and household connections); or the construction of complementary crude water treatment units, as the case may be (captured in rivers or streams); or at least for the disinfection of crude water coming from or brought from the springs or underground waters. Therefore, under the conditions explained above, it has been determined that the optimization of the existing systems is not feasible in all of the

[1] The costs have been calculated in *Nuevos Soles* with prices current for May 2010. The exchange rate used is USD 1.0 = S/. 2.84 = JPY 91.7; and S/.1.0 = JPY 32.3.

localities. Consequently, the investment costs in the “without-project situation” are practically null.

Likewise, according to the analysis of the diagnosis in the 50 *Perfils*, three (3) localities have dug-wells built without technical considerations, which will be replaced with new potable water supply systems, and the nineteen (19) remaining localities do not have facilities for potable water services.

With respect to the operation and maintenance in the ”without project” situation, it has been identified that twenty-eight (28) sample localities have water systems in an operative state (seven (7) in the Front Forest, ten (10) in the High Forest, and eleven (11) in the Low Forest); two (2) localities in the Low Forest have manual pumps built without technical consideration, and nineteen (19) localities do not have potable water services (two (2) in the Front Forest, two (2) in the High Forest, and fifteen (15) in the Low Forest). It has also been identified that disinfection is applied to the water systems in operation because of lack of materials and qualified personnel.

With the background information described, it has been identified that the twenty-eight (28) water systems incur operation and maintenance costs in the “without project” situation, the costs consist of skilled labor, tools for the maintenance tasks, and administrative costs. The costs are being covered by the municipality, the community organization, or the inhabitants themselves. For the localities that do not have water services, the families incur economic costs determined by the value of the time it takes to carry water in buckets from the rivers, irrigation channels, or springs, as well as the cost of boiling the water at home before consuming it, and the health costs caused by water-borne diseases (diarrheic and parasitic), principally in children under 5 years of age.

ii) Sanitation

In the case of sanitation, in the ”without project” situation, there are sewerage systems installed in seven (7) sample localities, of which five (5) are in operation state and two (2) are not in operation; twenty-nine (29) localities have latrines, and in fourteen (14) localities, the people defecate in the outdoors. The operation and maintenance costs in the “without project” situation will result from the use of ashes, detergent with bleach and kerosene. Also, there are economic costs for society caused by the contamination of the environment and of the water sources, and the proliferation of disease-transmitting insects, among other things. Quantification of those in uniform monetary units is not feasible in the present Feasibility Study, due to insufficient information available.

(2) “With Project” Situation

The costs in the “with-project situation” consist of the initial investment costs and future investments (for house connections), and, as the case may be, for the replacement of the equipment/facilities for infrastructure for potable water as well as sanitation. Also, the costs consist of new works and/or the improvement and expansion of potable water systems depending on the type of water source and the technical solution selected. For sanitation these costs consist of the costs of construction of a new system for the disposal of excreta, which may be individual (one latrine per family), or in some exceptions, of a collective nature (sewerage systems and waste water treatment facility). The analysis of these aspects is described in Item 4.8 of the present Feasibility Study.

i) Costs of Investment in Infrastructure[2]

The main components of the costs of investment in potable water are: water intake (including wells), transmission and/or riser pipes, reservoirs, distribution networks, and house-connections (including a sink inside the house and a percolation pit) and/or public taps; In sanitation: latrines in the case of individual solutions, and in some localities, house-connections, sewerage networks, and infrastructure for the treatment of residual waters. The costs of environmental mitigation that are generated during the execution of the works are included in the costs of the works.

For the calculation of the costs of total investment in infrastructure, a cascading percentage was applied to the direct costs of the works, for the general costs (between 20 and 25%) and profit (8%). The percentage of general costs was calculated by grouping localities by natural regions and by access route. Likewise, costs were calculated for the preparation of the detailed design, the manual for capacity building (soft-component), and for the supervision of the construction works, each of which represent 11% of the total cost of the works; the 19% general sales tax (*IGV or* VAT) was applied to the total of all of these costs.

In each of the pre-investment studies at the *Perfil* level of the projects in the selected sample localities, the investment costs presented are a summary of the itemized costs. The itemized costs were calculated using the respective engineering analysis for the technical alternative selected for each system or service, based on the pre-design of the infrastructure and on the results of the field survey works (land topography survey; geo-technical studies; analysis of physical quality, chemistry and bacteriology of the water sources).

The itemized budgets of the works include all of the items and quantities of the project independently each for potable water and sanitation. The calculation was made separately for the charter fees of land- or water- transport of materials (cement, steel, aggregates and etc.), pipe-material and manual pumping equipment to the places where the works shall be executed.

[2] Includes the preparation of the detailed design and supervision of the works.

ii) Investment Costs for Soft-component

Taking into consideration the integrated implementation model, the policies and strategies for small localities in the rural areas[3], a cost calculation has been made for the capacity building to the technical unit at the district municipality level, the strengthening and/or the creation of the community organization and hygiene education programs, including the capacity building in the different stages of the execution of the project cycle (promotion, pre-investment, investment, and post-execution).

The investment costs for the 50 selected sample localities are shown by conglomerate in Table 4.10.2-1, Table 4.10.2-2, Table 4.10.2-3 and Table 4.10.2-4.

[3] Meeting Notes for work meeting with MVCS, BID, BIRF y JICA (06.03.2009)

Table 4.10.2-1: Investment Costs for Water Supply in the Localities of Conglomerate C-1 (Nuevos Soles, May 2009)

N°	Region	Locality	Benefitted Pop. (inhab.)		Natural Region	Conglomerate	Technical System		Total Infrastructure Cost (Nuevos Soles)						Social Implementation Cost (Nuevos Soles)			Total Cost of Water Investment (Infra. Cost + Social Int. Cost)
			Year 1	Year 20			System Type	nplementation Type	Direct Cost of Works (D.C.)	General Expenditures and Utilities	VAT (19 %)	Cost of Design and Works Supervision	VAT (19 %)	Total Cost	Sub Total	VAT (19 %)	Total Cost	
1	Amazonas	Tutumberos	218	238	Low Forest	C-1	G-W-T	Imp & Exp	100,570	31,177	25,032	25,691	4,881	187,350	59,608	11,326	70,934	258,283
2	Amazonas	Guadalupe	338	418	Low Forest	C-1	G-W-T	Imp & Exp	369,082	114,415	91,865	94,282	17,914	687,558	59,378	11,282	70,660	758,218
3	San Martin	Rumisapa	898	1,072	Low Forest	C-1	G-W-O-T	Imp & Exp	227,633	75,119	57,523	77,202	14,668	452,145	58,964	11,203	70,167	522,311
4	San Martin	Churuzapa - La Marginal	678	950	Low Forest	C-1	G-W-T	Imp & Exp	413,906	136,589	104,594	140,376	26,671	822,137	157,201	29,868	187,069	1,009,206
5	San Martin																	
6	San Martin	Nueva Palestina	236	315	Low Forest	C-1	P-W-O-T	Imp & Exp	162,898	53,756	41,164	49,831	9,468	317,118	73,999	14,060	88,058	405,176
7	San Martin	Misquiyacu	490	495	Low Forest	C-1	G-W-O-T	Imp & Exp	279,022	92,077	70,509	85,353	16,217	543,177	72,622	13,798	86,420	629,597
8	San Martin	Yacucatina *	194	210	Low Forest	C-1	P-W-O-T	Imp & Exp	141,383	46,656	35,728	43,249	8,217	275,234	71,570	13,598	85,168	360,402
9	M. de Dios	Tres Islas	228	263	Low Forest	C-1	P-W-O-T	New	447,093	129,657	109,582	126,885	24,108	837,325	67,837	12,889	80,726	918,051
10	M. de Dios	Sudadero	248	293	Low Forest	C-1	P-W-O-T	Imp & Exp	241,813	70,126	59,268	68,626	13,039	452,872	59,443	11,294	70,737	523,609
11	M. de Dios	Monterrey*	160	190	Low Forest	C-1	P-W-O-T	Imp & Exp	321,176	93,141	78,720	91,150	17,318	601,505	55,417	10,529	65,946	667,450
12	Ucayali	San Martin de *	120	124	Low Forest	C-1	P-W-O-T	Imp & Exp	93,712	26,239	22,791	37,485	7,122	187,348	58,779	11,168	69,946	257,295
13	Ucayali	San Francisco	1658	2,798	Low Forest	C-1	P-W-O-T	Imp & Exp	401,887	112,528	97,739	160,755	30,543	803,453	87,756	16,674	104,430	907,883
14	Ucayali	10 de Julio*	97	100	Low Forest	C-1	MP	New	103,817	29,069	25,248	41,527	7,890	207,550	53,337	10,134	63,470	271,021
15	Ucayali	San Pedro*	159	164	Low Forest	C-1	MP	New	128,523	35,986	31,257	51,409	9,768	256,943	74,422	14,140	88,562	345,505
16	Ucayali	Sharara	360	429	Low Forest	C-1	P-W-O-T	New	280,057	78,416	68,110	112,023	21,284	559,889	64,614	12,277	76,891	636,780
17	Ucayali	Curiaca	528	666	Low Forest	C-1	P-W-O-T	New	315,947	88,465	76,838	126,379	24,012	631,640	63,326	12,032	75,358	706,998
18	Loreto	Cahuide	525	591	Low Forest	C-1	P-W-O-T	New	365,059	113,168	90,863	103,536	19,672	692,299	63,583	12,081	75,663	767,962
19	Loreto	San Juan de	475	568	Low Forest	C-1	P-W-O-T	New	347,001	109,305	86,698	111,795	21,241	676,040	60,262	11,450	71,712	747,752
20	Loreto	Amazonas	390	466	Low Forest	C-1	MP	New	220,268	69,385	55,034	70,965	13,483	429,135	55,990	10,638	66,628	495,763
21	Loreto	20 de Enero	250	300	Low Forest	C-1	MP	New	149,227	47,006	37,284	48,077	9,135	290,729	52,821	10,036	62,857	353,586
22	Loreto	San Pablo de Cuyana	210	237	Low Forest	C-1	P-W-O-T	New	222,023	68,827	55,262	62,969	11,964	421,045	61,280	11,643	72,924	493,969
23	Loreto	Tarapoto	242	272	Low Forest	C-1	P-W-O-T	New	274,203	85,003	68,249	77,768	14,776	519,999	68,461	13,008	81,468	601,467
24	Loreto	Panguana	409	446	Low Forest	C-1	MP	New	256,237	79,433	63,777	72,673	13,808	485,928	63,100	11,989	75,089	561,016
25	Loreto	Lupuna	328	369	Low Forest	C-1	MP	New	211,601	65,596	52,667	60,013	11,402	401,280	59,257	11,259	70,516	471,796
26	Loreto	Apayacu	251	314	Low Forest	C-1	MP	New	137,825	45,482	34,828	44,544	8,463	271,143	52,324	9,942	62,265	333,408
27	Loreto	Buen Jesús de Paz	357	448	Low Forest	C-1	MP	New	207,003	68,311	52,310	66,901	12,711	407,237	52,203	9,919	62,121	469,358
28	Loreto	Huanta	759	950	Low Forest	C-1	P-W-O-T	New	481,871	159,017	121,769	155,736	29,590	947,982	62,636	11,901	74,536	1,022,519
29	Loreto	Santa Amelia	258	323	Low Forest	C-1	MP	New	170,120	56,140	42,989	54,981	10,446	334,677	51,076	9,704	60,780	395,457

Source: JICA Study Team (2010); * localities with less than 200 inhabitants

Table 4.10.2-2: Investment Costs for Water Supply in the Localities of Conglomerate C-2 (Nuevos Soles, May 2009)

N°	Region	Locality	Benefitted Population (inhab.)		Natural Region	Conglo-merate	Technical System		Total Infrastructure Cost (Nuevos Soles)						Social Implementation Cost (Nuevos Soles)			Total Cost of Water Investment (Infra. Cost + Social Int. Cost)
			Year 1	Year 20			System Type	Implementation Type	Direct Cost of Works (D.C.)	General Expenditures and Utilities	VAT (19 %)	Cost of Design and Works Supervision	VAT (19 %)	Total Cost	Sub Total	VAT (19 %)	Total Cost	
1	Amazonas	Miraflores*	187	215	Front Forest	C-2	GST	Imp & Exp	118,570	36,757	29,512	30,289	5,755	220,882	58,228	11,063	69,291	290,174
2	Amazonas	Puerto Naranjitos	663	864	High Forest	C-2	GCT	Imp & Exp	324,807	100,690	80,845	82,972	15,765	605,079	73,758	14,014	87,772	692,851
3	Amazonas	Naranjitos	926	1131	High Forest	C-2	GCT	Imp & Exp	208,138	64,523	51,805	53,169	10,102	387,737	63,072	11,984	75,055	462,792
4	Amazonas	Misquiyacu Bajo	257	308	High Forest	C-2	GCT	Imp & Exp	179,764	55,727	44,743	45,921	8,725	334,880	69,618	13,227	82,846	417,726
5	Amazonas	San José Bajo	367	447	High Forest	C-2	GST	Imp & Exp	38,273	11,865	9,526	9,777	1,858	71,298	56,540	10,743	67,282	138,580
6	Amazonas	Casual	224	276	High Forest	C-2	GCT	New	416,803	129,209	103,742	106,472	20,230	776,457	58,688	11,151	69,839	846,296
7	Amazonas	El Balcón*	137	176	Front Forest	C-2	GCT	New	232,482	72,069	57,865	59,388	11,284	433,087	68,123	12,943	81,067	514,154
8	Amazonas	Ubillon*	179	211	Front Forest	C-2	GCT	Imp & Exp	172,150	56,810	43,502	53,348	10,136	335,946	68,123	12,943	81,067	417,012
9	Amazonas	Cielachi	200	234	Front Forest	C-2	GCT	Imp & Exp	72,759	24,011	18,386	22,547	4,284	141,987	68,353	12,987	81,340	223,328
10	Amazonas	Lonya Chico	458	478	Front Forest	C-2	GCT	Imp & Exp	133,816	44,159	33,815	41,468	7,879	261,138	70,883	13,468	84,351	345,489
11	Amazonas	San Juan*	183	191	Front Forest	C-2	GCT	Imp & Exp	66,975	22,102	16,925	20,755	3,943	130,700	58,228	11,063	69,291	199,992
12	Amazonas	Olto	658	686	Front Forest	C-2	GCT	Imp & Exp	193,919	63,993	49,003	60,094	11,418	378,428	63,863	12,134	75,997	454,425
13	San Martin	Lahuarpia	944	1377	High Forest	C-2	GCT	Imp & Exp	505,015	141,404	122,820	114,416	21,739	905,393	73,671	13,997	87,668	993,062
14	San Martin	Perla de Cascayunga*	187	233	High Forest	C-2	GST	New	160,130	44,836	38,944	36,279	6,893	287,082	65,970	12,534	78,505	365,586
15	San Martin	Posic	1516	2858	High Forest	C-2	BST	Imp & Exp	479,535	134,270	116,623	108,643	20,642	859,714	70,606	13,415	84,021	943,735
16	San Martin	Barranquita	358	520	Front Forest	C-2	GCT	Imp & Exp	184,664	51,706	44,910	41,838	7,949	331,067	60,630	11,520	72,150	403,217
17	San Martin	La Florida	253	291	High Forest	C-2	GCT	Imp & Exp	149,627	49,377	37,811	50,746	9,642	297,203	66,396	12,615	79,011	376,214
18	San Martin	Monte de los Oli	267	402	Front Forest	C-2	GST	Imp & Exp	91,450	30,179	23,110	31,137	5,916	181,792	60,137	11,426	71,562	253,354
19	San Martin	Pacchilla	538	607	High Forest	C-2	GST	Imp & Exp	213,396	70,421	53,925	72,657	13,805	424,203	67,815	12,885	80,700	504,903
20	San Martin	Sapotillo	254	353	High Forest	C-2	GST	New	182,345	60,174	46,079	55,779	10,598	354,975	74,422	14,140	88,562	443,537
21	San Martin	Sta Rosillo	478	534	High Forest	C-2	GST	Imp & Exp	355,772	117,405	89,904	108,831	20,678	692,588	71,382	13,563	84,944	777,533

Source: JICA Study Team (2010); * localities with less than 200 inhabitants

Table 4.10.2-3: Investment Costs for Sanitation in the Localities of Conglomerate C-1 (Nuevos Soles, May 2009)

N°	Region	Locality	Benef. Pop. (inhab.)	Natural Region	Conglom erate	Technical System		Total Infrastructure Cost (Nuevos Soles)						Social Implementation Cost (Nuevos Soles)			Total Cost of Water Investment (Infra. Cost + Social Int. Cost)
			Year 1			System Type	Implementation Type	Direct Cost of Works (D.C.)	Genl. Expenditures & Utilities	VAT (19 %)	Cost of Design and Works	VAT (19 %)	Total Cost	Sub Total	VAT (19 %)	Total Cost	
1	Amazonas	Tutumberos	218	Low Forest	C-1	Ventilated Dry Pit Latrine	New	32,356	10,030	8,053	8,265	1,570	60,275	26,122	4,963	31,085	91,360
2	Amazonas	Guadalupe	338	Low Forest	C-1	Ventilated Dry Pit Latrine	New	44,454	13,781	11,064	11,356	2,158	82,812	25,892	4,919	30,811	113,623
3	San Martin	Rumisapa	898	Low Forest	C-1												
4	San Martin	Churuzapa - La Marginal	678	Low Forest	C-1	Ventilated Dry Pit Latrine	New	67,710	22,344	17,110	22,964	4,363	134,491	20,643	3,922	24,565	159,056
5	San Martin					Composting Latrines	New	120,634	39,809	30,484	40,913	7,773	239,615	20,643	3,922	24,565	264,179
6	San Martin	Nueva Palestina	236	Low Forest	C-1	Ventilated Dry Pit Latrine	New	65,293	21,547	16,499	19,973	3,795	127,107	18,500	3,515	22,015	149,121
7	San Martin	Misquiyacu	490	Low Forest	C-1	Ventilated Dry Pit Latrine	New	4,177	1,378	1,055	1,278	243	8,131	3,112	591	3,704	11,834
						Sewerage & Waste Water Treatment Plant	Imp & Exp	213,232	70,367	53,884	65,228	12,393	415,104	28,011	5,322	33,333	448,437
8	San Martin	Yacucatina	194	Low Forest	C-1	Ventilated Dry Pit Latrine	New	27,675	9,133	6,993	8,466	1,608	53,875	17,892	3,400	21,292	75,167
9	M. de Dios	Tres Islas	228	Low Forest	C-1	Ventilated Dry Pit Latrine	New	57,227	16,596	14,026	16,241	3,086	107,175	27,123	5,153	32,277	139,452
10	M. de Dios	Sudadero	248	Low Forest	C-1	Ventilated Dry Pit Latrine	New	57,381	16,640	14,064	16,285	3,094	107,464	24,723	4,697	29,420	136,884
11	M. de Dios	Monterrey	160	Low Forest	C-1	Sewerage & Waste Water Treatment Plant	Imp & Exp	184,105	53,390	45,124	52,249	9,927	344,796	27,300	5,187	32,487	377,282
12	Ucayali	San Martin de Mojaral	120	Low Forest	C-1	Composting Latrines	New	60,648	16,981	14,750	24,259	4,609	121,247	24,163	4,591	28,755	150,001
13	Ucayali	San Francisco	1658	Low Forest	C-1	Ventilated Dry Pit Latrine	New	32,183	9,011	7,827	12,873	2,446	64,339	3,343	635	3,978	68,317
						Composting Latrines	New	423,203	118,497	102,923	169,281	32,163	846,067	44,410	8,438	52,847	898,914
14	Ucayali	10 de Julio	97	Low Forest	C-1	Composting Latrines	New	43,633	12,217	10,611	17,453	3,316	87,230	21,837	4,149	25,986	113,216
15	Ucayali	San Pedro	159	Low Forest	C-1	Composting Latrines	New	69,387	19,428	16,875	27,755	5,273	138,719	18,605	3,535	22,141	160,859
16	Ucayali	Sharara	360	Low Forest	C-1	Composting Latrines	New	183,344	51,336	44,589	73,338	13,934	366,542	29,489	5,603	35,091	401,633
17	Ucayali	Curiaca	528	Low Forest	C-1	Composting Latrines	New	186,672	52,268	45,399	74,669	14,187	373,194	28,201	5,358	33,559	406,753
18	Loreto	Cahuide	525	Low Forest	C-1	Ventilated Dry Pit Latrine	New	96,937	30,050	24,128	27,493	5,224	183,831	33,634	6,391	40,025	223,856
						Composting Latrines	New	5,323	1,650	1,325	1,510	287	10,094	2,532	481	3,013	13,106
19	Loreto	San Juan de Puritania	475	Low Forest	C-1	Ventilated Dry Pit Latrine	New	90,628	28,548	22,643	29,198	5,548	176,565	26,647	5,063	31,710	208,275
20	Loreto	Amazonas	390	Low Forest	C-1	Composting Latrines	New	133,202	41,958	33,280	42,914	8,154	259,508	25,579	4,860	30,440	289,948
21	Loreto	20 de Enero	250	Low Forest	C-1	Composting Latrines	New	104,882	33,038	26,205	33,790	6,420	204,335	22,976	4,365	27,341	231,676
22	Loreto	San Pablo de Cuyana	210	Low Forest	C-1	Ventilated Dry Pit Latrine	New	58,348	18,088	14,523	16,548	3,144	110,651	34,167	6,492	40,659	151,310
23	Loreto	Tarapoto	242	Low Forest	C-1	Ventilated Dry Pit Latrine	New	56,934	17,650	14,171	16,147	3,068	107,970	30,097	5,719	35,816	143,785
24	Loreto	Panguana	409	Low Forest	C-1	Composting Latrines	New	162,701	50,437	40,496	46,144	8,767	308,546	35,683	6,780	42,463	351,009
25	Loreto	Lupuna	328	Low Forest	C-1	Composting Latrines	New	156,931	48,649	39,060	44,508	8,457	297,604	33,195	6,307	39,502	337,106
26	Loreto	Apayacu	251	Low Forest	C-1	Composting Latrines	New	114,476	37,777	28,928	36,997	7,030	225,208	23,787	4,520	28,307	253,515
27	Loreto	Buen Jesús de Paz	357	Low Forest	C-1	Composting Latrines	New	145,334	47,960	36,726	46,971	8,924	285,915	23,868	4,535	28,403	314,318
28	Loreto	Huanta	759	Low Forest	C-1	Composting Latrines	New	309,204	102,037	78,136	99,932	18,987	608,295	29,777	5,658	35,434	643,729
29	Loreto	Santa Amelia	258	Low Forest	C-1	Composting Latrines	New	119,944	39,581	30,310	38,765	7,365	235,965	22,660	4,305	26,966	262,930

ource: JICA Study Team (2010); * localities with less than 200 inhabitants

Table 4.10.2-4: Investment Costs for Sanitation in the Localities of ConglomerateC-2 (Nuevos Soles, May 2009)

N°	Region	Locality	Population to be Served (inhab.)		Natural Region	Conglomerate	Technical System		Total Infrastructure Cost (Nuevos Soles)						Social Implementation Cost (Nuevos Soles)			Total Cost of Water Investment (Infra. Cost + Social Int. Cost)
			Year 1	Year 20			System Type	Implementation Type	Direct Cost of Works (D.C.)	General Expenditures and Utilities	VAT (19 %)	Cost of Design and Works Supervision	VAT (19 %)	Total Cost	Sub Total	VAT (19 %)	Total Cost	
1	Amazonas	Miraflores*	187	215	Front Forest	C-2	Ventilated Pit Latrine	New	30,571	9,477	7,609	7,809	1,484	56,951	24,742	4,701	29,443	86,394
2	Amazonas	Puerto Naranjitos	663	864	High Forest	C-2	Sewerage and Waste Water Treatment Plant (Imhoff Tank and Drying Bed)	New	313,127	97,069	77,937	79,988	15,198	583,319	32,851	6,242	39,092	622,411
3	Amazonas	Naranjitos	926	1131	High Forest	C-2	Sewerage and Waste Water Treatment Plant (Oxidation Pond)	New	648,654	201,083	161,450	165,699	31,483	1,208,369	32,059	6,091	38,150	1,246,519
							Ventilated Pit Latrine	New	15,995	4,959	3,981	4,086	776	29,797	3,723	707	4,430	34,228
4	Amazonas	Misquiyacu Bajo	257	308	High Forest	C-2	Ventilated Pit Latrine	New	41,802	12,959	10,404	10,678	2,029	77,872	28,711	5,455	34,166	112,037
5	Amazonas	San José Bajo	367	447	High Forest	C-2	Ventilated Pit Latrine	New	57,315	17,768	14,266	14,641	2,782	106,771	25,527	4,850	30,377	137,148
6	Amazonas	Casual	224	276	High Forest	C-2	Ventilated Pit Latrine	New	33,342	10,336	8,299	8,517	1,618	62,112	25,202	4,788	29,990	92,102
7	Amazonas	El Balcón*	137	176	Front Forest	C-2	Ventilated Pit Latrine	New	21,488	6,661	5,348	5,489	1,043	40,029	27,216	5,171	32,386	72,416
8	Amazonas	Ubillon*	179	211	Front Forest	C-2	Sewerage and Waste Water Treatment Plant (Septic Tank & Percolation Pits)	Imp & Exp	71,121	23,470	17,972	22,040	4,188	138,789	27,216	5,171	32,386	171,176
9	Amazonas	Cielachi	200	234	Front Forest	C-2	Ventilated Pit Latrine	New	32,971	10,880	8,332	10,217	1,941	64,341	27,446	5,215	32,660	97,001
10	Amazonas	Lonya Chico	458	478	Front Forest	C-2	Sewerage and Waste Water Treatment Plant (Imhoff Tank and Drying Bed)	Imp & Exp	150,802	49,765	38,108	46,732	8,879	294,285	29,976	5,695	35,671	329,956
11	Amazonas	San Juan*	183	191	Front Forest	C-2	Ventilated Pit Latrine	New	27,132	8,953	6,856	8,408	1,597	52,947	24,742	4,701	29,443	82,389
12	Amazonas	Olto	658	686	Front Forest	C-2	Sewerage and Waste Water Treatment Plant (Imhoff Tank and Drying Bed)	Imp & Exp	202,640	66,871	51,207	62,796	11,931	395,446	30,377	5,772	36,148	431,595
13	San Martin	Lahuarpia	944	1377	High Forest	C-2	Ventilated Pit Latrine	New	129,793	36,342	31,566	29,406	5,587	232,693	26,663	5,066	31,729	264,422
							Composting Latrines	New	56,569	15,839	13,758	12,816	2,435	101,418	11,427	2,171	13,598	115,016
14	San Martin	Perla de Cascayunga*	187	233	High Forest	C-2	Ventilated Pit Latrine	New	22,787	6,380	5,542	5,163	981	40,852	7,826	1,487	9,313	50,166
							Composting Latrines	New	55,789	15,621	13,568	12,639	2,401	100,018	19,161	3,641	22,802	122,820
15	San Martin	Posic	1516	2858	High Forest	C-2	Sewerage and Waste Water Treatment Plant (Imhoff Tank and Drying Bed)	Imp & Exp	407,218	114,021	99,035	92,259	17,529	730,063	70,606	13,415	84,021	814,084
16	San Martin	Barranquita	358	520	Front Forest	C-2	Ventilated Pit Latrine	New	19,293	5,402	4,692	4,371	831	34,589	4,423	840	5,263	39,852
							Composting Latrines	New	95,063	26,618	23,119	21,538	4,092	170,430	21,592	4,103	25,695	196,125
17	San Martin	La Florida	253	291	High Forest	C-2	Ventilated Pit Latrine	New	39,699	13,101	10,032	13,464	2,558	78,854	25,947	4,930	30,877	109,731
18	San Martin	Monte de los Olivos	267	402	Front Forest	C-2	Ventilated Pit Latrine	New	34,970	11,540	8,837	11,906	2,262	69,515	32,045	6,089	38,134	107,649
19	San Martin	Pacchilla	538	607	High Forest	C-2	Ventilated Pit Latrine	New	86,862	28,665	21,950	29,575	5,619	172,671	35,269	6,701	41,970	214,642
20	San Martin	Sapotillo	254	353	High Forest	C-2	Ventilated Pit Latrine	New	43,673	14,412	11,036	13,360	2,538	85,020	18,605	3,535	22,140	107,160
21	San Martin	Sta Rosillo	478	534	High Forest	C-2	Ventilated Pit Latrine	New	84,632	27,929	21,387	25,889	4,919	164,755	30,592	5,813	36,405	201,160

ource: JICA Study Team (2010); * localities with less than 200 inhabitants

iii) Costs of Administration, Operation, and Maintenance of Potable Water

In the “with project” situation, the costs of administration, operation and maintenance of the potable water systems shall consist of the cost of skilled labor, electricity, fuel (petroleum), chlorine for disinfecting the water, tools and materials for maintenance, and the administrative costs that will fall on the community organization.

iv) Costs of Sanitation Operation and Maintenance

The costs of maintenance of the individual solutions (latrines) are inexpensive, as they are comprised of skilled labor for the maintenance works on the family’s part, the ashes or lime that are added to counteract the foul odors and reduce the humidity of the feces; these being added weekly to dry pit latrines and daily to compost latrines. In the case of sewerage systems, the costs are comprised of labor, tools and materials for maintenance (O&M), as well as administrative expenses that the JASS will incur.

Table 4.10.2-5 and Table 4.10.2-6 show the costs of O&M by system type for the 40 selected sample localities. These costs were obtained from the *Perfils* of the sample localities, in market prices. In the case of sanitation, the O&M costs are presented for the sample localities where the existing systems will be improved.

As regards to the costs of latrine maintenance, these vary according to the type of latrine to be installed in each locality under the Program. Therefore, these vary between S/. 2,500 and S/. 4,000 per year. These amounts are not necessarily to be paid in cash by the families since some items, such as labor and materials, have been calculated just for the purposes of economic evaluation.

Table 4.10.2-5: O&M Cost for Potable Water for Conglomerate C-1 (Nuevos Soles, May 2009)

Nº	Region	Locality	Water				Sanitation			
			Technical System		Without Project	With Project	Technical System		Without Project	With Project
			System Type	Implementation Type	O&M Cost (S/. Year)	O&M Cost (S/. Year)	System Type	Inter-vention Type	O&M Cost (S/. Year)	O&M Cost (S/. Year)
1	Amazonas	Tutumberos	G-W-T	Imp & Expan	2,079	2,729	Ventilated Pit Latrine	New	0	0
2	Amazonas	Guadalupe	G-W-T	Imp & Expan	2,885	4,150	Ventilated Pit Latrine	New	0	0
3	San Martin	Rumisapa	G-W-O-T	Imp & Expan	6,575	8,368				
4	San Martin	Churuzapa - La Marginal	G-W-T	Imp & Expan	5075	7770	Ventilated Pit Latrine	New	0	0
5	San Martin						Composting Latrines	New	0	0
6	San Martin	Nueva Palestina	P-W-O-T	Imp & Expan	3,607	5,033	Ventilated Pit Latrine	New	0	0
7	San Martin	Misquiyacu	G-W-O-T	Imp & Expan	3,972	5,313	Ventilated Pit Latrine	New	0	0
							Sewerage and Waste Water Treatment Plant (Imhoff Tank and Drying Bed)	Imp & Expan	0	3,943
8	San Martin	Yacucatina	P-W-O-T	Imp & Expan	0	3,483	Ventilated Pit Latrine	New	0	0
9	M. de Dios	Tres Islas	P-W-O-T	New	0	5,828	Ventilated Pit Latrine	New	0	0
10	M. de Dios	Sudadero	P-W-O-T	Imp & Expan	3,162	6,239	Ventilated Pit Latrine	New	0	0
11	M. de Dios	Monterrey	P-W-O-T	Imp & Expan	4,190	9,667	Sewerage and Waste Water Treatment Plant (Septic Tank & Percolation Pits)	Imp & Expan	1,571	3,625
12	Ucayali	San Martin de Mojaral	P-W-O-T	Imp & Expan	0	5,069	Composting Latrines	New	0	0
13	Ucayali	San Francisco	P-W-O-T	Imp & Expan	5,679	19,221	Ventilated Pit Latrine	New	0	0
							Composting Latrines	New	0	0
14	Ucayali	10 de Julio	MP	New	0	1,644	Composting Latrines	New	0	0
15	Ucayali	San Pedro	MP	New	0	5,922	Composting Latrines	New	0	0
16	Ucayali	Sharara	P-W-O-T	New	0	10,825	Composting Latrines	New	0	0
17	Ucayali	Curiaca	P-W-O-T	New	0	9,194	Composting Latrines	New	0	0
18	Loreto	Cahuide	P-W-O-T	New	2,320	4,433	Ventilated Pit Latrine	New	0	0
							Composting Latrines	New	0	0
19	Loreto	San Juan de Puritania	P-W-O-T	New	0	4,288	Ventilated Pit Latrine	New	0	0
20	Loreto	Amazonas	MP	New	0	5,980	Composting Latrines	New	0	0
21	Loreto	20 de Enero	MP	New	0	3,693	Composting Latrines	New	0	0
22	Loreto	San Pablo de Cuyana	P-W-O-T	New	1,043	4,177	Ventilated Pit Latrine	New	0	0
23	Loreto	Tarapoto	P-W-O-T	New	0	3,693	Ventilated Pit Latrine	New	0	0
24	Loreto	Panguana	MP	New	1,382	6,215	Composting Latrines	New	0	0
25	Loreto	Lupuna	MP	New	1,392	4,535	Composting Latrines	New	0	0
26	Loreto	Apayacu	MP	New	0	2,749	Composting Latrines	New	0	0
27	Loreto	Buen Jesús de Paz	MP	New	0	3,587	Composting Latrines	New	0	0
28	Loreto	Huanta	P-W-O-T	New	0	7,591	Composting Latrines	New	0	0
29	Loreto	Santa Amelia	MP	New	0	4,684	Composting Latrines	New	0	0

ource: JICA Study Team (2010)

Table 4.10.2-6: O&M Cost for Potable Water for Conglomerate C-2 (Nuevos Soles, May 2009)

Nº	Region	Locality	Water				Sanitation			
			Technical System		Without Project	With Project	Technical System		Without Project	With Project
			System Type	Implementation Type	O&M Cost (S/. Year)	O&M Cost (S/. Year)	System Type	Inter-vention Type	O&M Cost (S/. Year)	O&M Cost (S/. Year)
1	Amazonas	Miraflores	G-W-O-T	Imp & Expan	2,006	2,398	Ventilated Pit Latrines	New	0	0
2	Amazonas	Puerto Naranjitos	G-W-T	Imp & Expan	7,521	8,064	Sewerage and Waste Water Treatment Plant (Imhoff Tank and Drying Bed)	New	0	4,494
3	Amazonas	Naranjitos	G-W-T	Imp & Expan	9,630	9,239	Sewerage and Waste Water Treatment Plant (Oxidation Pond)	New	0	6,739
							Ventilated Pit Latrines	New	0	0
4	Amazonas	Misquiyacu Bajo	G-W-T	Imp & Expan	3,756	4,994	Ventilated Pit Latrines	New	0	0
5	Amazonas	San José Bajo	G-W-O-T	Imp & Expan	2,458	2,956	Ventilated Pit Latrines	New	0	0
6	Amazonas	Casual	G-W-T	New	0	2,797	Ventilated Pit Latrines	New	0	0
7	Amazonas	El Balcón	G-W-T	New	0	1,605	Ventilated Pit Latrines	New	0	0
8	Amazonas	Ubillon	G-W-T	Imp & Expan	0	2,737	Sewerage and Waste Water Treatment Plant (Septic Tank & Percolation Pits)	Imp & Expan	0	2,028
9	Amazonas	Cielachi	G-W-T	Imp & Expan	480	2,749	Ventilated Pit Latrines	New	0	0
10	Amazonas	Lonya Chico	G-W-T	Imp & Expan	4,180	5,686	Sewerage and Waste Water Treatment Plant (Imhoff Tank and Drying Bed)	Imp & Expan	0	2,443
11	Amazonas	San Juan	G-W-T	Imp & Expan	1,302	2,710	Ventilated Pit Latrines	New	0	0
12	Amazonas	Olto	G-W-T	Imp & Expan	6,203	5,948	Sewerage and Waste Water Treatment Plant (Imhoff Tank and Drying Bed)	Imp & Expan	0	5,214
13	San Martin	Lahuarpia	G-W-T	Imp & Expan	2,448	6,293	Ventilated Pit Latrines	New	0	0
							Composting Latrines	New	0	0
14	San Martin	Perla de Cascayunga	G-W-O-T	New	0	4,832	Ventilated Pit Latrines	New	0	0
							Composting Latrines	New	0	0
15	San Martin	Posic	P-W-O-T	Imp & Expan	19,456	30,828	Sewerage and Waste Water Treatment Plant (Imhoff Tank and Drying Bed)	Imp & Expan	0	14,340
16	San Martin	Barranquita	G-W-T	Imp & Expan	876	6,925	Ventilated Pit Latrines	New	0	0
							Composting Latrines	New	0	0
17	San Martin	La Florida	G-W-T	Imp & Expan	4,147	4,507	Ventilated Pit Latrines	New	0	0
18	San Martin	Monte de los Olivos	G-W-O-T	Imp & Expan	0	2,871	Ventilated Pit Latrines	New	0	0
19	San Martin	Pacchilla	G-W-O-T	Imp & Expan	1,884	3,761	Ventilated Pit Latrines	New	0	0
20	San Martin	Sapotillo	G-W-O-T	New	0	2,525	Ventilated Pit Latrines	New	0	0
21	San Martin	Sta Rosillo	G-W-O-T	Imp & Expan	1,223	4,720	Ventilated Pit Latrines	New	0	0

Source: JICA Study Team (2010)

(3) Incremental Costs

The incremental costs result from the difference between the “with project” and “without project” situations. This difference will be comprised of the investment costs for the potable water and sanitation infrastructure and the soft-component costs for each of the projects in the period between 2010 and 2030, as well as the corresponding costs of administration, operation, and maintenance, that result from the implementation of said infrastructure. The year 2009 is the base year for calculating the incremental cost of operation and maintenance of the potable water and sanitation system. With the purpose for the project evaluation, it is assumed that the costs for the year 2009 will remain constant in the years to come in the case that the Program is not implemented.

Therefore the incremental annual cost in each of the projects was calculated as a difference with respect to the base year, from 2009 to 2011, and this last value will remain constant until the year 2030 (the end of the evaluation period for the projects).

For the economic evaluation of the water and sanitation projects, the costs expressed at market prices were converted into costs expressed at social prices or efficiency prices. In that sense, the correction factors estimated and suggested by the National Sanitation Department (DNS) were applied; these are attached in Appendix 8: Economic Evaluation Methodology and Social Evaluation Costs Processing.

4.10.3 Costs of Investment of the Program

(1) Direct Costs of Potable Water Infrastructure for Conglomerates 1 and 2

This is referred to the direct cost of the water and sanitation facilities for each one of the sample localities. The composition of the direct cost is indicated in Appendix 7- Investment Budgets of the Selected Technical Option of each locality. The main components of the investment cost in water supply are for the following: intake facility (including wells), transmission and/or riser pipe, treatment, reservoir, distribution network, house connections (including a sink inside the house and a percolation pit) and/or public taps. The house connection, which includes the sink, forms part of the investment, according to the recommendations of the “Intervention Policies and Strategies in Small Localities in the Rural Scope” agreed upon in March 2009 by the MVCS and by cooperating international organizations in the Sanitation Sector (Appendix 7).

To calculate the per capita cost, indirect costs (overheads and profit), intangibles (technical and supervision) and the costs of social component were excluded.

i) Criteria for cost estimation

a) Population to be considered for the cost estimation

The direct per-capita cost of the investment depends on the number of beneficiaries. The main water supply infrastructure of the sample localities was designed to satisfy a horizon of 20 years (design period). Therefore, the population to be served at the 20th year was considered for the investment cost estimation. The cost estimation for house connections and sinks was separately calculated considering the population of the first year of operation (initial investment). Therefore, for calculating these per-capita costs the following criteria were used.

1) Investment costs for the construction of main facilities: intake facility (including wells), transmission and/or riser pipe, treatment, reservoir, distribution network: benefitted population by the 20th year.
2) Investment costs for the installation of house connections and sinks: population of year one (2011), as initial investment.

b) Size of population in a locality

The majority of the localities in the rural Amazon have less than 100 households, these representing 72.6% of the total in the Low Forest (Conglomerate C-1), 63.4% in the High Forest and Front Forest (Conglomerate C-2), and an average of 68.9% for both Conglomerates (C1 + C2), as shown in Table 4.10.2-2.

This number of 100 households in a locality was used as the threshold for the sub-grouping of the localities for the calculation of the per-capita-cost estimation, as it has been found that per-capita-costs are greater in localities with smaller population than in ones with larger populations. Therefore, localities have been separated into two groups according to their population in order to estimate the proper per-capita-costs: a group with populations less than 100 households, and the other group with larger populations.

As the number of average inhabitants per household is 4.3 persons per household, a population 430 was considered to be the threshold for the sub-grouping of the localities.

ii) Parameters

The costs of all of the types of water supply systems, and the type of works (i.e. new construction or improvement and/or rehabilitation and extension) were budgeted in the sample localities. These costs were considered for the per-capita cost estimation. The costs budgeted in localities with populations under 200 inhabitants (10 localities) were excluded, due to the fact that the investment costs estimated in the *Perfils* of these localities were higher than those of the localities with populations over 200 inhabitants; Therefore, the costs for smaller localities may distort the pre-capita costs to be calculated for the Program, by elevating the corresponding investment. The locality of San Jose Bajo was also excluded since most of the works will be focused on restoring or installing new house connections and a lesser amount to improve the main facilities. The locality of Tres Islas was also excluded since its population is widely dispersed and the per-capita cost is too high. Therefore, the calculation of the per-capita cost of the Program was based in 22 sample localities for Conglomerate C-1 and 15 localities for Conglomerate C-2.

a) System type

1) G-W-T : Gravity system with treatment
2) G-W-O-T : Gravity system without treatment
3) P-W-O-T : Motorized pumping system without treatment
4) MP : Manual pump system/facility

b) Type of Works

1) New construction
2) Improvement, rehabilitation; renovation and/or extension

iii) Methodology of Per-capita-cost estimation - Water Supply System Infrastructure

Methodology of the per-capita cost estimation was as follows:

1) The direct per-capita-costs were calculated for each system according to system type, type of works to be executed (new construction, improvement, rehabilitation and expansion, and population size in the localities.

2) For the per-capita-cost calculation of each system, the estimated population at 2030 was used as the denominator, because the design horizon of the main infrastructure of the projects of 20 years was adopted for the design of system capacity (water intake, transmission lines, treatment facilities, reservoirs, and distribution networks) as mentioned above.

   The costs of house connections and sinks were also considered for calculating the per-capita-cost, as this forms part of the Program investments. In this case, the population of the first year (start of project operation) was considered as the denominator, because the number of houses in the first year determines the quantity of household connections and sinks.

The sum of these per-capita costs (main facilities and household connections and sinks) makes the average direct per-capita cost for the sample localities. In Table 4.10.3-1 and Table 4.10.3-2 the average direct per-capita costs are shown for each system type and implementation type, and grouped according to the size of the population and conglomerate.

From the values obtained as per-capita costs for the different type of systems, except for MP (hand pump), the followings are observed:

- The costs for new works are, in most of the cases (localities and systems), higher than the costs for works of improvement and expansion.
- The costs for new works are higher in some localities due to some special characteristics; for examples, in Casual (C-2) the systems include a transmission line of 4.7 Km, and in the locality of Tarapoto the proposed infrastructure includes a ground water pumping system with a power generator for electricity.
- The costs for the works of improvement and expansion of the systems are higher in some localities because they include special rehabilitation works; such as the case of Guadalupe, where there is a 10 km transmission line; and the case of Sudadero, where the water source has to be changed to other localities, the distribution networks and house connections are to be expanded and improved because its rehabilitation is not feasible due to those having been installed without the corresponding technical criteria and sinks not having been installed in the houses. In such sense, the costs for the locality of Sudadero are considered as for the construction of a new system because 92% of the costs are aimed at the construction of new facilities or the improvement of existing facilities.

Table 4.10.3-1: Calculation of the Direct Per-capita Cost – Water Supply System – Gravity with and without Treatment (GWT and GWOT)
(Nuevos Soles by May 2009)

Type of System	Conglo merate	Population Size (inhab.)	Type of Work	Region	Sample Locality	Benefitted Population (inhab.)		Direct Per-capita Cost (Nuevos Soles)	Average Direct Per-capita Cost (Nuevos Soles)
						Year 1st	Year 20th		
Gravity with Treatment (GWT)	C-1	200 <inhab <=430	Improvement and Expansion	Amazonas	Tutumberos	218	234	428	663
				Amazonas	Guadalupe	338	418	899	
		430<inhab <2000	Improvement and Expansion	San Martin	Churuzapa - La Marginal	678	950	481	481
	C-2	200<inhab <=430	New	Amazonas	Casual	224	276	1,535	1,535
			Improvement and Expansion	Amazonas	Cielachi	200	234	318	459
				San Martin	La Florida	254	291	533	
				Amazonas	Misquiyacu Bajo	257	308	591	
				San Martin	Barranquita	358	520	396	
		430<inha <2000	Improvement and Expansion	Amazonas	Lonya Chico	458	478	281	325
				Amazonas	Olto	658	686	285	
				Amazonas	Puerto Naranjitos	663	864	399	
				San Martin	Lahuarpia	944	1377	440	
				Amazonas	Naranjitos	926	1131	222	
Gravity without Treatment (GWOT))	C-1	430<inhab <2000	Improvement and Expansion	San Martin	Misquiyacu	490	495	537	388
				San Martin	Rumisapa	898	1,072	240	
	C-2	200<inhab <=430	New	San Martin	Sapotillo	254	353	594	594
			Improvement and Expansion	San Martin	Monte de los Olivos	267	402	260	260
		430<inhab <2000	New	San Martin	Sta Rosillo	478	534	685	685
			Improvement and Expansion	San Martin	Pacchilla	537	607	366	366

Source: JICA Study Team (2010) and Annex 5 – Investment Costs for Projects in Sample Localities

Table 4.10.3-2: Calculation of the Direct Per-capita Cost – Water Supply System – Pumping with Treatment –PWT and Maunal Pumping – MP
(Nuevos Soles by May 2009)

Type of System	Conglomerate	Population Size (inhab.)	Type of Work	Region	Sample Locality	Benefitted Population (inhab.)		Direct Per-capita Cost (Nuevos Soles)	Average Direct Per-capita Cost (Nuevos Soles)
						Year 1st	Year 20th		
Pumping with Treatment (PWT)	C-1	200<inhab <=430	New	Loreto	San Pablo de Cuyana	210	237	978	886
				Loreto	Tarapoto	242	272	1,038	
				Ucayali	Sharara	360	429	678	
				M. de Dios	Sudadero	248	293	850	
			Improvement and Expansion	San Martin	Nueva Palestina	236	315	574	574
		430<inhab <2000	New	Loreto	San Juan de Puritania	475	568	783	614
				Loreto	Cahuide	525	591	638	
				Ucayali	Curiaca	528	666	496	
				Loreto	Huanta	759	950	539	
			Improvement and Expansion	Ucayali	San Francisco	1,658	2,798	341	341
	C-2	430<inhab <2000	Improvement and Expansion	San Martin	Posic	1,516	2,858	228	228
Manual Pumping (MP)	C-1	200<inhab <=430	New	Loreto	20 de Enero	250	300	497	677
				Loreto	Apayacu	251	314	439	
				Loreto	Santa Amelia	258	323	1199	
				Loreto	Lupuna	328	369	573	
		430<inhab <2000	New	Loreto	Buen Jesus de Paz	357	448	915	654
				Loreto	Amazonas	390	466	473	
				Loreto	Panguana	409	446	575	

Source: JICA Study Team (2010) and Annex 5 – Investment Costs for Projects in Sample Localities

3) To obtain the average per-capita-costs for the localities of the Program the per-capita-costs of each system and type of work in the selected localities were used. It is observed that in Conglomerate C-1 the predominant system types are PWOT (45%) and then MP (32%); and the construction of new systems is the work type with the greater percentage (68%). In Conglomerate C-2 the most dominant type of system is GWT (68%) and the type of work with the greater percentage is the improvement, renovation and expansion of existing facilities.

4) The sample localities were then grouped in accordance to the type of facility, type of works such as GST-new, GST-rehabilitation/extension and so on; and percentage within the sample localities were calculated for each group. The total projected population for the year 2030 (year 20) was used as the benefitting population for this calculation.

5) The average population of each group of localities (less than 430 inhabitants and more than 430 inhabitants) was calculated based on the total projected population in the year of 2030 for each group.

6) The direct costs of the total investment for each conglomerate of the Program have been calculated for each type of water supply system, type of work and population size. These amounts are the product of the average per-capita cost (type of system, type of work and population size) multiplied by the average population of each group of localities, estimated for year 2030.

7) To obtain the per-capita cost of each group of localities (less than 430 inhab. and more that 430 inhab.) by conglomerate, the total direct cost of investment was divided by the estimated population for year 2030. Likewise, the representative direct per-capita cost of each conglomerate was obtained by dividing the average total investment the conglomerate between the estimated population for year 2030 (year 20th).

Detailed calculation sheets for per-capita-costs for each conglomerate are shown in Table 4.10.3-3 and Table 4.10.3-4.

Table 4.10.3-3: Per-capita-cost Estimation – Water Supply System of Conglomerate C-1 (Nuevos Soles at May 2009 exchange rate)

Conglomerate C-1 Water Supply Facility													
											Total Population (year 2030)[2]		**493,946 hab.**
											Population (<430 inhab.)		**157,181 hab.**
											Population (>430 inhab.)		**336,765 hab.**
Type of System	**Sample Localities = 22[1]**						**All localities (Program)**				**Direct Investment Cost for Population Size[2] (Nuevos Soles)**		
	Nº of Localities				**Average per-capita-cost (soles/capita)[3]**		**Nº of Localities**		**Average population per locality（2030)**				
	N°	**%**	**N°**	**%**									
	Pop<430 inhab.		**Pop > 430 inhab.**		**Pop<430 inhab.**	**Pop>430 inhab.**	**Pop<430 inhab.**	**Pop> 430 inhab.**	**Pop<430 inhab.**	**Pop>430 inhab.**	**Pop<430 inhab.**	**Pop>430 inhab.**	**Total**
GWOT-New	-	0%	-	0%	-	-	-	-			-	-	-
GWOT-Imp/Exp	-	0%	2	18%	-	388	-	73			-	23,757,240	23,757,240
GWT-New	-	0%	-	0%	-	0	-	-			-	-	-
GWT-Imp/Exp	2	18%	1	9%	663	481	89	37	321	836	18,947,455	14,725,815	33,673,270
PWOT-New	4	36%	4	36%	886	614	178	147			50,640,860	75,190,440	125,831,300
PWOT-Imp/Exp	1	9%	1	9%	574	341	44	37			8,201,990	10,439,715	18,641,705
MP	4	36%	3	27%	677	654	178	110			38,695,104	60,066,630	98,761,734
Total	**11**	**100%**	**11**	**100%**	**-**	**-**	**489**	**403**	**-**	**-**	**116,485,410**	**184,179,840**	**300,665,250**
Average Direct Per-capita-cost (PCC) (Soles/inhabitant)											**741**	**547**	**609**

1/: Localities with populations over 200 inhab. are considered. The locality of Tres Islas was excluded
2/: Costs and total projected population for the year 2030 for the estimation of per-capita-cost only.
3/. Obtained from Table 4.10.3-1 and Table 4.10-2
Source: JICA Study Team (2010)

Table 4.10.3-4: Per-capita-cost Estimation – Water Supply System of Conglomerate C-2 (Nuevos Soles at May 2009 exchange rate)

Conglomerate C-2 Water Supply Facility											Total Population (year 2030)[2]		367,829 hab.
											Population (<430 inhab.)		81,064 hab.
											Population (>430 inhab.)		286,765 hab.
Type of System	Sample Localities = 15[1]						All localities (Program)				Direct Investment Cost for Population Size [2] (Nuevos Soles)		
	Nº of Localities				Average per-capita-cost (soles/capita)[3]		Nº of Localities		Average population per locality（2030)				
	N°	%	N°	%									
	Pop<430 inhab.		Pop > 430 inhab.		Pop<430 inhab.	Pop>430 inhab.	Pop<430 inhab.	Pop> 430 inhab.	Pop<430 inhab.	Pop>430 inhab.	Pop<430 inhab.	Pop>430 inhab.	Total
GWOT-New	1	14%	1	13%	594	685	37	42			6,878,859	24,554,253	31,433,113
GWOT-Imp/Exp	1	14%	1	13%	260	366	37	42			3,010,949	13,119,499	16,130,447
GWT-New	1	14%	-	0%	1,535	-	37	0			17,776,177	-	17,776,177
GWT-Imp/Exp	4	57%	5	63%	459	325	149	208	311	861	21,261,929	58,249,141	79,511,069
PWOT-New	-	0%	-	0%	-	-	-	-			-	-	-
PWOT-Imp/Exp	-	0%	1	13%	-	228	-	42			-	8,172,803	8,172,803
MP	-	0%	-	0%	-	-	-	-			-	-	-
Total	**7**	**100%**	**8**	**100%**	**-**	**-**	**261**	**332**	**-**	**-**	**48,927,914**	**104,095,695**	**153,023,609**
Average Direct Per-capita-cost (PCC) (Soles/inhabitant)											**604**	**363**	**416**

1/: Localities with populations greater than 200 are considered.
2/: Costs and total projected population for the year 2030 for the estimation of per-capita-cost only.
3/. Obtained from Table 4.10.3-1 and Table 4.10-2
Source: JICA Study Team (2010)

iv) Direct Per-capita-cost for the water supply system

Summaries of the direct per-capita cost calculations are shown below in Table 4.10.3-5. The per-capita-costs varied from 228 to 1,535 soles/capita. The maximum per-capita-cost (1,535 soles) [4] appeared for the construction of a new gravity system with treatment (GWT) in a locality with a population under 430 inhabitants in Conglomerate C-2, while the minimum per-capita-cost (228 soles) appeared for the rehabilitation/extension of pumping without treatment (PWOT) systems in a localities of such Conglomerate C-2.

The direct per-capita costs, by system type, work type and population size, for the implementation of new water supply projects (new facilities) presented higher values (between 1.55 and 3.34 times) than those of improvement, rehabilitation and/or expansion. Likewise, the projects in small localities, with less than 430 inhabitants had higher costs that those for the localities with populations over 430 inhabitants

Table 4.10.3-5: Average Direct Per-capita-cost in Sample Localities (Nuevos Soles at May 2009 exchange rate)

Facility Type	Conglomerate C-1		Conglomerate C-2	
	Pop<430	Pop>430	Pop<430	Pob>430
GWOT-New	-	-	594	685
GWOT-Imp/Exp	-	388	260	366
GWT-New	-	-	1,535	-
GWT-Imp/Exp	663	481	459	325
PWOT-New	886	614	-	-
PWOT-Imp/Exp	574	341	-	228
MP	677	654	-	-

Note: The per-capita costs are based on the Tables N° 4 .10.3-1 and N° 4.10.3-2.
Source: JICA Study Team (2010)

In Table 4.10.3-5, the direct per capita costs of the localities that were not included for the cost estimation for the Program were not included; nevertheless, direct per-capita costs have been estimated for the pumping-with-treatment (PWT) and collection of rainwater, as shown in Appendix 7.

In Table 4.10.3-6 the average direct per-capita costs are shown by population size and conglomerate. These values were obtained with the adjusted average for per-capita costs of the works of improvement, rehabilitation, and expansion, with the new works. As already mentioned in previous paragraphs, the most prevalent water supply system proposed for Conglomerate C-1 were the pumping-without-treatment (45%) and the manual pumps (32%), these most often being new works (68%), while the most frequently-used system in Conglomerate C-2 were the gravity-with-treatment (68%).

[4] This cost is from the Casual locality, whose system has a conveyance pipe of 4.7 km.

It can also be observed that smaller localities showed higher average per-capita cost (1.66 to 1.34 times higher than in bigger localities.

Table 4.10.3-6: Average Direct Per-capita-cost by Population Size and Conglomerate-Sample Localities

(Nuevos Soles at May 2009 exchange rate)

Population Size	Conglomerate C-1		Conglomerate C-2	
	Pop<430	Pop>430	Pop<430	Pop>430
Per-capita cost (Soles/capita)	**741**	**547**	**604**	**363**
	(134%)	(100%)	(166%)	(100%)

1/: These averages are based on Tables N° 4.10.3-1 y N° 4.10.3-2.
Source: JICA Study Team (2010)

It is important to point out that, according to the calculations carried out for the sample localities, the average direct per-capita cost for the installation of house connections and sinks was S/. 116/inhabitant in Conglomerate C-1 and S/. 102/inhabitant in Conglomerate C-2, which represents 19.1% and 24.5% of the total average direct per-capita cost, respectively, as it was indicated in Appendix 5. Therefore, it has been necessary to break down these costs for the calculation of the total direct per-capita cost of water supply infrastructure shown in Table 4.10.3-7.

Table 4.10.3-7: Average Per-capita-costs by Conglomerate – Sample Localities

(Nuevos Soles at May 2009 exchange rate)

Conglomerate	Conglomerate C-1	Conglomerate C-2
Main Infrastructure	493	314
House Connections and sinks	116	102
Per-Capita Cost (Soles/inhabitant)	**609**	**416**
	146%	100%

1/: These averages are based on Tables N° 4.10.3-3y N° 4.10.3-4 and Appendix 5.
Source: JICA Study Team (2010)

v) Direct Per-Capita Cost for the Program - the water supply system infrastructure

Once the per-capita-costs of each system proposed in each sample locality have been established, the total direct costs for any type of system, any type of work or any size-group of population will be in direct proportion to the number of the localities where the corresponding facility and type of work is proposed. The other parameters (such as, for example, the number of localities and their average size) shall be constants as long as the population served are within their range of population group (less than or greater than 430 in habitants).

Therefore, once the parameters mentioned above have been calculated, it will only be necessary to calculate the total direct cost that will be applicable for any population size. The average per-capita costs for each conglomerate, shown in Table 4.10.3-7 may be used for the calculation of the total cost of each conglomerate and, consequently, of the Program.

In Chapter 4.3, the incremental populations to be benefitted by the Program within the design horizon of the Program's projects (year 20) and towards the completion of the program's execution period (year 10) were calculated to be approximately 409,300 inhabitants and 344,900 inhabitants, respectively, for Conglomerate C-1; and approximately 294,800 inhabitants and 230,100 inhabitants, respectively, for Conglomerate C- 2. The total population benefitted by the construction of the main facilities was calculated to be approximately 704,100 inhabitants in the 1,500 localities of the Program Area. Therefore, the different direct costs for water supply infrastructure will benefit the population within the design horizon and within the execution period of the Program as shown in Table 4.10.3-7.

Table 4.10.3-8: Direct Cost of Water Supply Infrastructure - 1,500 Localities

Conglomerate	Incremental population to be served by the program in 2030 1/ (inhab.)	Direct Per-capita-cost (Soles/capita) 3/	Total (Thousands of Nuevos Soles)
C-1	409,300 1/	493	200,148
	344,900 2/	116	41,388
C-2	294,800 1/	314	92,606
	230,100 2/	102	23,449

1/ Population for the design horizon of principle facilities
2/ End of Program execution (year 10)
3/ Differentiated in main works and house-connections and sinks and Table 4.1.3-7
Source: JICA Study Team (2010)

(2) Direct Cost of Sanitation Infrastructure for Conglomerate C-1 and C-2

i) Criteria for cost estimation

a) Design Horizon

Individual latrines for each household were considered as a sanitation solution in sample localities. The number of the individual latrines to be constructed in a locality should correspond to the number of households of the first year of Program execution (2011), except in those localities where the improvement and rehabilitation of existing systems (four localities) or the construction of new sewerage and residual water treatment facilities (two localities) have been considered.

b) Population to be considered for the cost estimation

The number of the individual latrines to be constructed in sample localities was decided to correspond to the number of households of the first year of project operation or Program execution, as mentioned above. In other words, the population for the calculation of the per-capita-cost should be that of the first year of operation (2011).

Similarly, the population of year 20th (2030) of the sample localities' was used to calculate the per-capita cost for works of rehabilitation of the existing sewerage and residual water treatment systems, and the population of year one (2011) was considered for the per-capita costs of the house-connections,.

ii) Parameters

The cost of all the facility/system types that were identified in the sample localities were taken into account for the per-capita-cost estimation.

1) Dry pit latrine
2) Flush-pour latrine
3) Composting latrine
4) Sewerage and residual water treatment (rehabilitation only) and expansion (in two sample localities)

iii) Methodology – Sanitation Facility/System infrastructure cost estimation

Similar to the case of water supply infrastructure cost estimation, the methodology for the sanitation facility/system is as follows.

1) The average per-capita-costs were calculated for each type of latrine based on the population of the first year (start of project operation). In the case of sewerage, which is considered in some localities of the sample, the calculation of the per-capita cost of the main infrastructure (sewers, outfall and treatment plant) was made using the estimated population of year 20^{th} (2030) as the denominator; and, for the house connections the population of year 2011 was considered. The sum of the two per-capita costs (main infrastructure and house connections) is the direct per-capita cost of each case in the sample localities.

   In Table 4.10.3-9, Table 4.10.3-10, Table 4.10.3-11 and Table 4.10.3-12, the direct per-capita costs for each type of system are presented by locality and an average per-capita cost of each type of system is presented by conglomerate.

Table 4.10.3-9: Calculation of the Direct Per-capita Cost for Sanitation – Latrines Conglomerate C-1

(Nuevos Soles as of May 2009)

Conglomerate	Pop. Size (inhab.)	Latrine Type	Region	Sample Locality	Benefited Population – Year 1 (inhab.)	Direct Per-capita Cost (Nuevos Soles	Average Direct Per-capita Cost (Nuevos Soles)
C-1	200< inhab <=430	Ventilated Dry Pit Latrine	Loreto	San Pablo de Cuyana	210	235	186
			Amazonas	Tutumberos	218	147	
			San Martin	Nueva Palestina	236	264	
			M. de Dios	Tres Islas	228	184	
			M. de Dios	Sudadero	248	162	
			Amazonas	Guadalupe	338	131	
			San Martin	Churuzapa	426	156	
			Loreto	Tarapoto	242	206	
		Compost-ing Latrine	Loreto	20 de Enero	250	368	384
			Loreto	Apayacu	251	444	
			Loreto	Buen Jesus de Paz	357	268	
			Loreto	Santa Amelia	258	450	
			Loreto	Lupuna	328	405	
			Ucayali	Sharara	360	454	
			Loreto	Amazonas	390	326	
			Loreto	Panguana	409	358	
	430 <inhab <2000	Ventilated Dry-pit Latrine	Loreto	San Juan de Puritania	475	174	164
			San Martin	Misquiyacu	26	163	
			Loreto	Cahuide (*)	511	175	
			Ucayali	San Francisco (*)	215	144	
		Compost-ing Latrine	Loreto	Cahuide (*)	14	339	361
			Ucayali	Curiaca	528	321	
			San Martin	La Marginal	252	473	
			Loreto	Huanta	759	389	
			Ucayali	San Francisco (*)	1,443	283	

(*) Two types of latrines will installed in these localities

Source: JICA Study Team (2010) and Appendix 5- Investment Costs of the Projects of the Sample Localities

Table 4.10.3-10: Calculation of the Direct Per-capita Cost for Sanitation – Latrines Conglomerate C-2

(Nuevos Soles as of May 2009)

Conglomerate	Pop. size (inhab.)	Latrine Type	Region	Sample Locality	Benefited Population – Year 1 (inhab.)	Direct Per-capita Cost (Nuevos Soles	Average Direct Per-capita Cost (Nuevos Soles)
C-2	200< inhab <=430	Ventilated Dry-pit Latrine	Amazonas	Cielachi	200	157	151
			Amazonas	Casual	224	150	
			San Martin	La Florida	253	148	
			San Martin	Sapotillo	254	171	
			Amazonas	Misquiyacu Bajo	257	164	
			San Martin	Monte de los Olivos	267	122	
			San Martin	Barranquita (*)	129	146	
			Amazonas	San Jose Bajo	367	153	
		Composting Latrine	San Martin	Barranquita (*)	229	402	402
	430< inhab <2000	Ventilated Dry-pit Latrine	San Martin	Sta Rosillo	478	162	149
			San Martin	Pacchilla	538	150	
			Amazonas	Naranjitos	123	128	
			San Martin	Lahuarpia (*)	810	155	
		Composting Latrine	San Martin	Lahuarpia	134	406	406

Two types of latrines will installed in these localities
Source: JICA Study Team (2010) and y Appendix 5- Investment Costs of the Projects of the Sample Localities

Table 4.10.3-11: Calculation of the Direct Per-capita Cost for Sanitation – Pour-flush Latrine Conglomerate C-1 and C-2

(Nuevos Soles as of May 2009)

Conglomerate	Pop. size (inhab.)	Latrine Type	Region	Sample Locality	Benefited Population – Year 1 (inhab.)	Direct Per-capita Cost (Nuevos Soles	Average Direct Per-capita Cost (Nuevos Soles)
C-1	200< inhab <=430	Pour-flush	M. D. Dios	Sudadero	248	562	562
	430< inhab <2000	Pour-flush	San Martin	Churuzapa	426	551	533
			San Martin	Misquiyacu	26	516	
C-2	200< inhab <=430	Pour-flush	San Martin	Sapotillo	254	572	572
	430< inhab <2000	Pour-flush	San Martin	Sta Rosillo	478	521	521

Source: JICA Study Team (2010) and y Appendix 5- Investment Costs of the Projects of the Sample Localities

Table 4.10.3-12: Calculation of the Direct Per-capita Cost for Sewerage – Conglomerates C-1 and C-2

(Nuevos Soles as of May 2009)

Conglomerate	Pop. Size (inhab.)	Inter-vention Type	Region	Sample Locality	Benefited Population (inhab.)		Direct Per-capita Cost (Nuevos Soles)	Average Direct Per-capita Cost (Nuevos Soles)
					Year 1	Year 20		
C-1	200< inhab <=430	Improve-ment and Expansion	San Martin	Misquiyacu	490	495	611	611
C-2/	430< inhab <2000	New	Amazonas	Puerto Naranjitos	420	547	637	654[1]
			Amazonas	Naranjitos	822	984	671	
		Improve-ment and Expansion/	Amazonas	Lonya Chico	458	478	602	597[1]
			Amazonas	Olto	540	686	517	
			San Martin	Posic	1,440	2,715	672	

1/the average the direct per-capita cost between the construction of new facilities and improvement and rehabilitation of existing facilities is S/ 620 / inhabitant

Source: JICA Study Team (2010) and Appendix 5- Investment Costs of the Projects of the Sample Localities

From the values obtained as direct per-capita costs of the different types of systems, it is observed that:

- The direct per-capita costs of composting latrines are higher than the costs for ventilated dry pit latrines (2.07 times higher).
- The per-capita costs for pour-flush latrines with septic tanks are presented in Table 4.10.3-11. These costs are considerably higher (50%) than those for composting latrines since they include a septic tank for the treatment of fecal matter. These latrines may be installed in both conglomerates provided that the benefited population does not accept the ventilated dry pit latrine.
- The per-capita costs for sewerage systems are higher than those for pour-flush latrines.

2) To estimate the overall cost at the Program level, the per-capita-costs of each facility type proposed in the sample localities were used. The number (quantity) of localities allocated to each group of facility type at the Program level is in proportion to the number of times each facility type is proposed for the sample localities. The total estimated population of 2011 was used for this calculation. Based on the diagnosis, 2% of the localities of Conglomerate C-1, where a sewerage system will be installed, and 5% for Conglomerate C-2.

3) Also, average population densities were calculated based on the total projected population of the year 2011.

4) The total direct costs of the sanitation systems by type of latrine were calculated by multiplying the per-capita-cost by the number of localities and the average projected population in each locality for the year 2011.

5) The average per-capita-cost in the localities and conglomerates were calculated by dividing the total direct cost of each facility by the population of the year 2011.

6) The detailed calculation sheets for cost-per-capita per conglomerate are shown in Tables N° 4.10.3-13 and N° 4.10.3-14.

iv) Per-capita Cost for sanitation systems (latrines)

In Conglomerate C-1, the per-capita cost of the installation of each latrine varies from 179 soles/inhabitant, for a dry pit latrine to 375 soles for a composting latrine.

Table 4.10.3-13: Per-capita Cost Calculation – Sanitation System/Facility for Conglomerate C-1
(Nuevos Soles as of May 2009 exchange rate)

<table>
<tr><th colspan="5">Conglomerate C-1, Sanitation Facilities</th><th colspan="2">Population (2011)[2]= 397,443 (inhab.)</th></tr>
<tr><th rowspan="3">Latrine Type</th><th colspan="3">Sample Localities[1]</th><th colspan="2">Target Localities</th><th rowspan="2">Direct Cost (for pop=2011)</th></tr>
<tr><th colspan="2">Number of Localities</th><th>Direct Per-capita Cost[3]</th><th>Locality</th><th rowspan="2">Average Pop/loc (inhab.)</th></tr>
<tr><th>Nº</th><th>(%)</th><th>(Nuevos Soles)</th><th>N°</th><th>(Nuevos Soles)</th></tr>
<tr><td>Dry- pit latrine</td><td>10</td><td>45%</td><td>179</td><td>398</td><td rowspan="3">455</td><td>32,337,401</td></tr>
<tr><td>Pour-flush Latrine</td><td>0</td><td>0%</td><td>0</td><td>0</td><td>-</td></tr>
<tr><td>Composting Latrine</td><td>12</td><td>55%</td><td>375</td><td>477</td><td>81,295,143</td></tr>
<tr><td>Total</td><td>22</td><td>100%</td><td>-</td><td>875</td><td>455</td><td>113,632,544</td></tr>
<tr><td colspan="6">Average Direct Per-capita Cost</td><td>286</td></tr>
</table>

1/: The localities with populations over 200 inhabitants have been considered- the Locality of Misquiyacu has been excluded.
2/: The estimated population of year 2011 (98% of the total) was used only for the estimation of the per-capita cost.
3. Obtained form Table 4.10.3-9
Source: JICA Study Team (2010)

In Conglomerate C-2, the per-capita cost of sanitation is 153 soles/capita for the ventilated dry pit latrine and 404 soles/inhabitant for the composting latrine, as shown in Table 4.10.3-14.

Table 4.10.3-14: Per-capita Cost Calculation - Sanitation System/Facility for Conglomerate C-2

(Nuevos Soles as of May 2009 exchange rate)

Conglomerate C-2, Sanitation Facilities						Population (2011)[2]= 257,767 hab.
Latrine Type	Sample Localities[1]			Localities of the Program		Direct Cost (for pop=2011)
	Number of Localities		Direct Per-capita Cost[3]	Locality	Average Pop/loc	
	N°	(%)	(Nuevos Soles)	N°	(inhab.)	(Nuevos Soles)
Dry-pit latrine	11	92%	153	517	458	36,151,864
Pour-flush Latrine	0		0	0		-
Composting Latrine	1	8%	404	47		8,678,166
Total	**12**	100%	-	**564**		**44,830,030**
Average Direct Per-capita						**174**

1/: The localities with populations over 200 inhabitants have been considered. 4 localities were excluded
2/: estimated population of year 2011 (98% of the total) was used only for the estimation of the per-capita cost.
3/: Obtained form Table 4.10.3-10
Source: JICA Study Team (2010)

In case that some localities is reluctant to accept ventilated dry-pit latrines due to unfavorable previous experiences, there are other options for the disposal of waste. These options, such as the installation of pour-flush latrines with septic tanks and percolation pit for the final disposal of the waste waters, shall be evaluated in the *perfil* study. As it can be observed in Table 4.10.3-10, these latrines are more expensive than the ventilated dry-pit latrines and the composting latrines.

In that sense, the presented allocation of the types of latrines for Conglomerate C-1 (Table 4.10.3-9) and for Conglomerate C-2 (Table 4.10.3-10) has been modified replacing the ventilated dry-pit latrines by pour-flush latrines in four localities of Conglomerate C-1 and two localities of Conglomerate C-2, with the purpose of obtaining a new value from the calculation of the average direct per-capita cost of each conglomerate, as shown in Table 4.10.3-15 and Table 4.10.3-16.

As can be seen, these average direct per-capita costs are higher by 46% for Conglomerate C-1 and 125 % for Conglomerate C-2 in relation to the average direct per-capita costs not including pour-flush latrines.

On the other hand, costs have been estimated for composting latrines and pour-flush latrines with pre-fabricated components (continuous composting latrines and latrines with bio-digesters to replace septic tanks), whose average direct costs are greater than the costs of the composting latrines and the pour-flush latrines by an average of 23.8% and 70%, respectively. (See Appendix 7)

Table 4.10.3-15: Modified Per-capita Cost Calculation - Sanitation System/Facility for Conglomerate C-1

(Nuevos Soles as of May 2009 exchange rate)

Conglomerate C-1, Sanitation Facilities						**Population (2011)[2]: 397,443 hab.**
Latrine Type	**Sample Localities[1]**			**Localities of the Program**		**Direct Cost (for pop=2011)**
	Number of Localities		**Direct Per-capita Cost[3]**	**Locality**	**Average Pop/loc**	
	N°	**(%)**	**(Nuevos Soles)**	**N°**	**(inhab.)**	(Nuevos Soles)
Dry-pit latrine	2	9%	179	239	455	6,467,480
Pour-flush Latrine	8	36%	543	159		78,476,911
Composting Latrine	12	55%	375	477		81,295,143
Total	**22**	**100%**	**-**	**875**	**455**	**166,239,534**
Costo Directo Per cápita Promedio (CPC) (Soles/habitante)						**418**

1/:The localities with populations over 200 inhabitants have been considered- the Locality of Misquiyacu has been excluded.
2/: The estimated population of year 2011 (98% of the total) was used only for the estimation of the per-capita cost.
3. Obtained form Table 4.10.3-9 and Table 4.10.3-10
Source: JICA Study Team (2010)

Table 4.10.3-16: Modified Per-capita Cost Calculation - Sanitation System/Facility for Conglomerate C-2

(Nuevos Soles as of May 2009 exchange rate)

Conglomerate C-2, Sanitation Facilities						**Population (2011) 2/= 257,767 hab.**
Latrine Type	**Sample Localities[1]**			**Localities of the Program**		**Direct Cost (for pop=2011)**
	Number of Localities		**Direct Per-capita Cost[3]**	**Locality**	**Average Pop/loc**	
	N°	**(%)**	**(Soles/inhab.)**	**N°**	**(hab.)**	**(Nuevos Soles)**
Dry-pit latrine	4	33%	153	423	458	13,146,132
Pour-flush Latrine	6	50%	546	94		70,370,473
Composting Latrine	2	17%	404	47		17,356,332
Total	**12**	100%	**-**	**564**		**100,872,937**
Average Direct Per-capita Cost						**391**

1/: The localities with populations over 200 inhabitants have been considered. 4 localities were excluded
2/: estimated population of year 2011 (98% of the total) was used only for the estimation of the per-capita cost.
3/: Obtained form Table 4.10.3-10 and Table 4.10.3-11
Source: JICA Study Team (2010)

v) Program Direct Cost for the Sanitation facilities/systems

As explained above, for per-capita-cost calculation of water supply system/facilities, the direct cost of the Program was obtained by multiplying the benefitted population by the average direct per-capita cost obtained from the results of the sample localities and modified with the inclusion of pour-flush latrines, septic tanks and percolation pits for the final disposal of the waste waters. Likewise, for 2% of the localities of Conglomerate C-1 and 5% of the localities of Conglomerate C-2, a sewerage system would be installed or improved. The direct per-capita costs for sewerage shown in Table 4.10.3-12 of this the present Feasibility Study would be used in order to calculate the direct cost of such facility, for the corresponding conglomerates.

It is important to point out that, according to the calculations carried out for the selected sample localities, the average direct per-capita cost for the installation of house connections was S/.95/inhabitant for Conglomerate C-1 and S/.180/inhabitant for Conglomerate C-2, which represent 15.6% and 29.1 % of the total direct per-capita cost, of the system type, respectively, as shown in Appendix 5.

The direct cost of the sanitation system/facilities at the Program level are as follows:

Table 4.10.3-17: Direct Cost of Sanitation Infrastructure - 1,500 Localities

Conglomerate	Facility Type	Incremental Population to be Benefitted by the Program by year 2020 (inhab.)	Direct Per-capita Cost (Soles/inhab.)	Total (Thousands of Nuevos Soles)
C-1	Latrines	331,828	418	138,704
	Sewerage (main facilities) 1/	8,013	516	4,135
	Sewerage (Connections)	6,772	95	643
C-2	Latrines	193,434	391	75,633
	Sewerage (main facilities) 1/	13,283	440	5,845
	Sewerage (Connections)	10,181	180	1,833

1/ the percentage of incremental population is by year 2030
Source: JICA Study Team (2010)

(3) Indirect Costs of Water and Sanitation Infrastructure – Conglomerates C-1 and C-2

The indirect costs of the water and sanitation infrastructure consist of the indirect general expenditures of the contractor, direct general expenditures associated with the execution of works, and the financial expenditures and insurance. These costs have been determined within the costs of the projects in the sample localities, and they result in an average of 23% of the total direct expenditure for infrastructure. It was determined that 8% of direct costs correspond to contractor profits. The analysis of general expenses, which groups four to six water supply and sanitation projects (localities), is attached in Appendix 7. This approach of grouping localities was applied based on the proximity of such localities, which was verified during the field works conducted in the sample localities in this Feasibility Study.

In case the chosen implementation modality is execution through core executors (NN.EE.: *Núcleos Ejectores:*), these shall consist of elected inhabitants of each populated center and/or community and of one member of the municipality. The NN.EE., with the support of a resident engineer and professional and administrative staff, will administrate the resources transferred by the Program, which will allow them to procure the materials, contract the labor and rent equipment/tools necessary for the construction of the facilities. In this option, the general expenses will be 15% of the direct costs. The profit of 8% from the direct costs is excluded.

(4) Soft-component Costs for Conglomerate C-1 and C-2

The implementation of the soft component, to be undertaken by individual consultants, will be carried out based on the soft component file that will be designed before the implementation. Its details are described in item 4.20.3. The activities will be executed in parallel with the production of technical files and the execution of construction works in the investment stage of the Program, and during a year period during the post-execution stage. Said activities are to be implemented in an intermittent manner for follow-up and monitoring, especially of the community organizations and the management units of the municipalities. The soft component costs consist of the following:

i) Professional fees and charges of the experts and administrative support staff expressed in man/months (M/M), which include the basic salary of the personnel and other social benefits, vacations, sick leave, and insurance.
ii) The direct costs for the soft-component activities include: campaigns for hygiene education for the population; materials and/or inputs for capacity-building, hygiene education, and promotion workshops; communication costs; vehicle and office expenses; office rental; costs related to preparing reports, manuals, guides, and documents for the soft component; costs of processing data; travel allowances; domestic and local transportation (land and/or water); and office rental. It is assumed that these costs are part of the administration by the Regional Management Units.

The soft-component implementation costs for the investment and post-investment stage, including the initial planning of the activities, promotion and sensitization campaign during the pre-investment stage of each conglomerate are presented in Table 4.10.3-18 and Table 4.10.3-19.

Table 4.10.3-18: Soft Component Costs for Conglomerate C-1
(Thousands of Currency Units as of May 2010 exchange rate)

Components	1st Phase		2nd Phase		3rd Phase		Total	
	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles
A. Professional Fees and charges	2,033	5,772	8,301	23,568	10,271	29,160	20,606	58,500
Total (A) 1/	**2,033**	**5,772**	**8,301**	**23,568**	**10,271**	**29,160**	**20,606**	**58,500**

1/ VAT is not included
Source: JICA Study Team (2010)- Detailed Budget for soft component implementation in Appendix 7.

Table 4.10.3-19: Soft-component Costs for Conglomerate C-2
(Thousands of Currency Units as of May 2010 exchange rate)

Components	1st Phase		2nd Phase		3rd Phase		Total	
	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles
A. Professional Fees and charges	1,657	4,704	7,968	22,620	4,024	11,424	13,648	38,748
Total (A) 1/	**1,657**	**4,704**	**7,968**	**22,620**	**4,024**	**11,424**	**13,648**	**38,748**

1/ VAT is not included
Source: JICA Study Team (2010)- Detailed Budget for soft-component implementation in Appendix 7.

(5) Program Consultancy Costs (consulting firms and individual consultants) for conglomerates C-1 and C-2

The details regarding the Program's consultancy service activities are specified in Item 4.20.3. The activities are summarized by stage as follows:

1) Pre-cycle Stage: Diagnosis (Individual Consultants)
   - Initial diagnosis and baseline survey
2) Pre-investment Stage: Preparation of the individual *Perfils* (operating consultants-firms)
   - Preparation of individual *Perfils* - Formulation and evaluation of projects
3) Investment Stage: Preparation of the detailed design (operating consultants-firms)
   - Field work
   - Engineering (detailed design and tendering documents)
4) Investment Stage: Supervision of works (consulting firms and/or individual consultants)
   - Supervision of works

The costs of these services consist of the following items:

i) Fees for professional personnel and administrative support personnel expressed in man-months (M/M), that shall include the basic salary for personnel, general costs of the consulting firm (financial expenditures, social security, and other social benefits, vacations, sick leave, and insurance) and the fees for the consulting firm (operating consultants and supervising firms).

For the case of individual consultants, only the fees for the professional and administrative staff, expressed in man-months (M/M), are considered.

ii) Direct costs for *Perfil* preparation and detailed designs on the basis of field works such as topographic surveys, geological studies, hydro-geological studies, land registry or redesign of existing systems, water quality tests, socio-economic surveys, soft-component promotion workshops, and the supervision of the works by the contractors or NN.EE. Likewise, the airfare, transportation/communication costs, per diem, lodging, vehicle and office supply costs, office rental, costs involved in preparing reports, manuals, guides, and documents for soft component, data processing costs, and costs of employing local personnel, per diem for local personnel, domestic and local transport, and office rental.

The costs of the services provided by the individual consultants for the development of the initial diagnosis and the baseline are shown in Table 4.10-3-20.

Table 4.10.3-20: Cost of the Preparation of the Initial Diagnosis of the Program's Projects in Conglomerate C-1 and C-2

(Thousands Currency Units as of May 2010 exchange rate)

Components	1st Phase		2nd Phase		3rd Phase		Total	
	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles
A. Professional Fees and Charges	178	504	780	2,214	685	1,944	1,642	4,662
Total (A) 1/	178	504	780	2,214	685	1,944	1,642	4,662

1/ VAT is not included
Source: JICA Study Team (2010)- Detailed Budget for Initial Diagnosis Preparation in Appendix 7

The costs of the services provided by the OC for the development of the individual *Perfils* and the detailed designs of the projects are shown in Table 4.10.3-21.

Table 4.10.3-21: **Cost of the Preparation of the *Perfils* and Technical Files of the Program's Projects in Conglomerate C-1 and C-2**

(Thousands of Currency Units as of May 2010 exchange rate)

Components	1st Phase		2nd Phase		3rd Phase		Total	
	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles
A. Professional Fees and Charges	2,269	6,442	10,251	29,103	8,629	24,498	21,149	60,042
B-1. Direct and Indirect Costs	710	2,015	1,455	4,130	1,004	2,849	3,168	8,995
B-2. Direct Costs (Field work)	2,375	6,744	10,089	28,642	8,828	25,062	21,292	60,448
Total (A)+(B1)+(B2) 1/	**5,354**	**15,201**	**21,795**	**61,875**	**18,460**	**52,409**	**45,609**	**129,485**

1/ VAT is not included
Source: JICA Study Team (2010)- Detailed Budget for *Perfils* Preparation in Appendix 7

In case the works are executed by contractors, supervision of works will be conducted by engaging the services of consulting firms. The costs of the services to be provided by the consulting firms for the supervision of works and liquidation of projects are shown in Table 4.10.3-22.

In case the works are executed by core executors, supervision of works will be conducted by engaging individual contractors which will be assigned with one or two projects each. The costs of the services provided by the individual consultants for the supervision of works and liquidation of projects are shown in Table 4.10.3-23.

Table 4.10.3-22: Costs of Supervision of Works of the Program's Projects of Conglomerates C-1 and C-2 (Consulting Firms)

(Thousands of Currency Units as of May 2010 exchange rate)

Components	1st Phase		2nd Phase		3rd Phase		Total	
	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles
A. Professional Fees and Charges	1,753	4,976	7,725	21,931	6,751	19,167	16,229	46,074
B-1. Direct and Indirect Costs	430	1,220	660	1,873	479	1,360	1,568	4,453
Total (A)+(B1) 1/	**2,182**	**6,196**	**8,385**	**23,804**	**7,230**	**20,527**	**17,797**	**50,527**

1/ VAT is not included
Source: JICA Study Team (2010)- Detailed Budget for Project Files Preparation in Appendix 7

Table 4.10.3-23: Costs of Supervision of Works of the Program's Projects of Conglomerates C-1 and C-2 (Individual Consultants)

(Thousands of Currency Units as of May 2010 exchange rate)

Components	1st Phase		2nd Phase		3rd Phase		Total	
	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles
A. Professional Fees and Charges	1,057	3,000	4,644	13,185	4,070	11,556	9,771	27,741
Total (A) 1/	**1,057**	**3,000**	**4,644**	**13,185**	**4,070**	**11,556**	**9,771**	**27,741**

1/ VAT is not included
Source: JICA Study Team (2010)- Detailed Budget for Supervision of Works in Appendix 7

(6) Costs of Consultancy of the Program (Supervising Consultants) for Conglomerates C-1 and C-2

1) Pre-investment Stage – Review of the individual *Perfils*

2) Investment Stage – Review of the detailed designs and soft-component Implementation design (project files).

3) The first phase includes the consulting costs for the systematization of the soft component intervention, information and project monitoring system, as well as the development of a Water and Sanitation Information System – SIAS (*Sistema de Información de Agua y Saneamiento*), wihin the competences of the Program at the local, regional, and national levels.

The cost of the services of the supervising consultants to carry out the supervision of the *Perfils* and project files (social and engineering designs) is shown in Table 4.10.3-24.

Table 4.10.3-24: Costs of the Supervising Consultant – Project *Perfils* for Program Conglomerates C-1 and C-2

(Thousands of Currency Units as of May 2010 exchange rate)

Components	1st Phase		2nd Phase		3rd Phase		Total	
	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles
A. Professional Fees and charges	1,637	4,647	5,643	16,021	5,003	14,204	12,283	34,871
B-1. Direct and Indirect Costs	549	1,560	740	2,101	735	2,086	2,025	5,748
Total (A)+(B1)+(B2)	**2,186**	**6,207**	**6,383**	**18,122**	**5,738**	**16,290**	**14,307**	**40,619**

1/ VAT is not included
Source: JICA Study Team (2010) - Detailed Budget for the Supervising Consultant in Appendix 7

(7) Administration Costs for the Program PMU – PAPT – Component 4

This cost item includes costs for management, monitoring, and evaluation of the Program in all of the phases of the projects' cycle and the execution phases carried out by the PMU-PAPT and the regional PMUs. Furnishing and purchase of equipment for the PMU – PAPT and RMU were also considered (acquisition of vehicles, computing equipment, and other); as well as the contracting of audits of the Program.

The estimated cost is 8.3% of the costs of water and sanitation infrastructure, soft-component implementation, and consultant services (diagnosis, *Perfils*, detailed design, supervision of works and soft-component).

(8) Costs of the Strengthening of the Government's Function – Component 4

This component includes the lines of implementation and activities for the strengthening of the government's functions, with the objective to facilitate and support the execution strategies. These are expected to contribute to the strengthening of the sanitation sector's regulatory framework and to the development of human resources, as well as to research and technological development, socio-cultural anthropological studies in the face of the ethnic and linguistic diversity of the rural communities of the Amazon area.

The estimated budget for the development of the component's activities through individual consultants and/or consulting firms, amounts to S/. 3,120,000 (USD 1,099), the breakdown of which is presented in Table 4.10.3-25.

Table 4.10.3-25: Cost of Consultancy Services for the Strengthening of the Government's Function – Program

(Thousands of Currency Units as of May 2010 exchange rate)

Line of Implementation / Activity	Cost (S/.)	Cost (USD)
1.Human Resource Development	1,410	497
2.1 Inception of the Operation Staff to the Program.	600	212
2.2 Capacity-building and Formation of Professionals.	810	285
2.Research and Technological Development	1,500	528
2.3 Pilot Project for the Development of Technical Alternatives for Water Supply and Sanitation in the Amazon Area		528
3. Socio-Cultural Anthropological Support Studies	210	74
3.1 Socio-cultural anthropological support studies in face of the ethnic and linguistic diversity of the communities in the rural Amazon area	210	74
TOTAL	**3,120**	**1,099**

Source: JICA Study Team (2010)

4.10.4 Total Program Cost

The total cost of the Program, including all components and items described in the preceding sections, amounts to S/. 1,338 million (JPY 43,210 million = USD 471.21 million), as presented in Table 4.10.4-1. The exchange rates used were indicated in the second page of the present report.
The implementation of the Program, as proposed in Item 4.20 of the present Feasibility Study, is foreseen to be carried out in three (3) overlapping phases (as shown in the specified item), each one with an average period of four (4) years and a total of ten (10) years for all the phases during the period of year 2010-2020.

The required investment in each phase of the Program is related to the number of Program localities to be included in the projects. Accordingly, the costs are distributed as follows: 11% for the first phase (162 localities), 48% for the second phase (713 localities) and 42% for the third phase (625 localities).

Table 4.10.4-1 shows a summary of the Program costs, which are made up of the following:

- Component 1 (Conglomerate C-1) : 49.4% (USD 232,905 thousand)
- Component 2 (Conglomerate C-2) : 27.9% (USD 131,638 thousand)
- Component 3 : 6.4% (USD 30,336 thousand)
- Component 4 : 0.2% (USD 1,099 thousand)

- VAT (19%) : 16.0% (USD 75,236 thousand)

In the same way, the composition of the total Program investment is grouped at the sub-component level as follows:

- Water and sanitation infrastructure : 60.9%.
- Soft component : 8.7%.
- Initial diagnosis : 0.4%
- Development of *Perfils* and detailed design of works : 11.5%.
- Supervision of works (Contractor) : 4.5%.
- Supervision of works (NN.EE) : 2.5%
- Supervision of *Perfils* and detailed designs : 3.6%.
- Program administration : 7.7%.
- Strengthening of the government function : 0.3%

Table 4.10.4-1: Total Cost of Water and Sanitation Program for the Rural Amazon Area
(Thousands of Currency Units as of May 2010 exchange rate)

Item	Description	Total			
		Nuevos Soles	JPY	USD	%
1)	**Component 1 – Conglomerate C-1**	**661,221**	**21,357,423**	**232,905**	**49.4%**
1.1	Water Infrastructure	283,051	9,142,559	99,701	21.2%
1.2	Sanitation Infrastructure	167,947	5,424,698	59,157	12.6%
1.3	Soft Component	58,500	1,889,550	20,606	4.4%
1.4	Initial Diagnosis and Baseline	2,808	90,698	989	0.2%
1.5	*Perfils* and Detailed Design of Works (Water and Sanitation)	77,483	2,502,712	27,292	5.8%
1.6	Supervision of Works (Water and Sanitation – Works Contractors)	30,399	981,879	10,708	2.3%
1.7	Supervision of Works (Water and Sanitation – Core Executors)	16,667	538,333	5,871	1.2%
1.8	Supervision of *Perfils* and Detailed Design (Water and Sanitation)	24,365	786,992	8,582	1.8%
2)	**Component 2 – Conglomerate C-2**	**373,720**	**12,071,171**	**131,638**	**27.9%**
2.1	Water Infrastructure	136,018	4,393,368	47,910	10.2%
2.2	Sanitation Infrastructure	97,643	3,153,883	34,393	7.3%
2.3	Soft Component Implementation (Implementation Stage)	38,748	1,251,560	13,648	2.9%
2.4	Initial Diagnosis and Baseline	1,854	59,884	653	0.1%
2.5	*Perfils* and Detailed Design of Works (Water and Sanitation)	52,002	1,679,651	18,317	3.9%
2.6	Supervision of Works (Water and Sanitation – Works Contractors)	20,128	650,132	7,090	1.5%
2.7	Supervision of Works (Water and Sanitation – Core Executors)	11,074	357,693	3,901	0.8%
2.8	Supervision of *Perfils* and Detailed Design (Water and Sanitation)	16,254	525,001	5,725	1.2%
3)	**Component 3**	**86,125**	**2,781,825**	**30,336**	**6.4%**
3.1	Program Administration	86,125	2,781,825	30,336	6.4%
4)	**Component 4**	**3,120**	**100,776**	**1,099**	**0.2%**
4.1	Strengthening of the Government Function	3,120	100,776	1,099	
5)	**VAT (19%)**	**213,595**	**6,899,127**	**75,236**	**16.0%**
Total		**1,337,781**	**43,210,322**	**471,214**	**100%**

Source: JICA Study Team (2010);

Table 4.10.4-2: **Total Cost by Phase of Water and Sanitation Program for the Rural Amazon**
(Thousands of Price Units at May 2009 exchange rate)

Ítem	Descripción	Total			1st Phase (2010-2013)			2nd Phase (2013-2017)			3rd Phase (2016-2020)		
		Nuevos Soles	JPY	USD	Nuevos Soles	JPY	USD	Nuevos Soles	JPY	USD	Nuevos Soles	JPY	USD
1)	**Component 1- Conglomerate C-1**	**661,221**	**21,357,423**	**232,905**	**69,649**	**2,249,666**	**24,533**	**264,578**	**8,545,854**	**93,194**	**326,994**	**10,561,903**	**115,179**
1.1	Water Infrastructure	283,051	9,142,559	99,701	29,349	947,958	10,338	113,277	3,658,844	39,900	140,426	4,535,757	49,463
1.2	Sanitation Infrastructure	167,947	5,424,698	59,157	17,414	562,473	6,134	67,212	2,170,957	23,675	83,321	2,691,269	29,349
1.3	Soft component implementation	58,500	1,889,550	20,606	5,772	186,436	2,033	23,568	761,246	8,301	29,160	941,868	10,271
1.4	Initial Diagnosis and Baseline	2,808	90,698	989	270	8,721	95	1,134	36,628	399	1,404	45,349	495
1.5	*Perfils* and Detailed design of works (Water and Sanitation)	77,483	2,502,712	27,292	8,326	268,929	2,933	31,321	1,011,666	11,032	37,836	1,222,117	13,327
1.6	Supervision of Works (Water and Sanitation – Works Contractors)	30,399	981,879	10,708	3,442	111,178	1,212	12,136	391,978	4,275	14,821	478,723	5,221
1.7	Supervision of Works (Water and Sanitation – Core Executors)	16,667	538,333	5,871	1,667	53,833	587	6,704	216,530	2,361	8,296	267,970	2,922
1.8	Supervision of Perfils and Detailed Design (Water and Sanitation)	24,365	786,992	8,582	3,410	110,138	1,201	9,226	298,004	3,250	11,729	378,850	4,131
2)	**Component 2- Conglomerate C-2**	**373,720**	**12,071,171**	**131,638**	**48,631**	**1,570,797**	**17,130**	**217,118**	**7,012,910**	**76,477**	**107,971**	**3,487,463**	**38,031**
2.1	Water Infrastructure	136,018	4,393,368	47,910	17,426	562,845	6,138	79,061	2,553,682	27,848	39,531	1,276,841	13,924
2.2	Sanitation Infrastructure	97,643	3,153,883	34,393	12,509	404,041	4,406	56,756	1,833,228	19,992	28,378	916,614	9,996
2.3	Soft component implementation	38,748	1,251,560	13,648	4,704	151,939	1,657	22,620	730,626	7,968	11,424	368,995	4,024
2.4	Initial Diagnosis and Baseline	1,854	59,884	653	234	7,558	82	1,080	34,884	380	540	17,442	190
2.5	*Perfils* and Detailed design of works (Water and Sanitation)	52,002	1,679,651	18,317	6,875	222,067	2,422	30,554	986,904	10,762	14,572	470,680	5,133
2.6	Supervision of Works (Water and Sanitation – Works Contractors)	20,128	650,132	7,090	2,754	88,943	970	11,669	376,902	4,110	5,705	184,287	2,010
2.7	Supervision of Works (Water and Sanitation – Core Executors)	11,074	357,693	3,901	1,333	43,067	470	6,481	209,352	2,283	3,259	105,274	1,148
2.8	Supervision of Perfils and Detailed Design (Water and Sanitation)	16,254	525,001	5,725	2,797	90,338	985	8,896	287,332	3,133	4,561	147,331	1,607
3)	**Component 3**	**86,125**	**2,781,825**	**30,336**	**9,843**	**317,927**	**3,467**	**40,085**	**1,294,753**	**14,119**	**36,196**	**1,169,145**	**12,750**
3.1	Program Administration	86,125	2,781,825	30,336	9,843	317,927	3,467	40,085	1,294,753	14,119	36,196	1,169,145	12,750
4)	**Component 4**	**3,120**	**100,776**	**1,099**	**3,120**	**100,776**	**1,099**						
4.1	Strengthening of the Government Function	3,120	100,776	1,099	3,120	100,776	1,099						
5)	**VAT (19%)**	**213,595**	**6,899,127**	**75,236**	**24,936**	**805,442**	**8,783**	**99,138**	**3,202,168**	**34,920**	**89,521**	**2,891,517**	**31,532**
Total General		**1,337,781**	**43,210,322**	**471,214**	**156,180**	**5,044,608**	**55,012**	**620,919**	**20,055,685**	**218,710**	**560,682**	**18,110,028**	**197,492**

Source: JICA Study Team (2010); and Direct Cost of Water and Sanitation Facilities in Appendix 7.

Cost of the Program’s First Phase

4.10.5 Program Cost (First Phase)

The costs of the first phase of the Program amount to S/. 156.18 million (JPY 5.045 billion = USD 55.01 million). It will be executed in 162 localities of the regions of Amazonas, Loreto and San Martin, according to the prioritization described in Item 4.20 of the present Feasibility Study. Its details are shown in Table 4.10.5-1.

Table 4.10.5-1: Localities of the First Phase of the Program, by Region

Region	District	Selva Baja C-1	C-2			Program Total
			Selva Alta	Ceja de Selva	Total	
Amazonas	Imaza	24	8	1	9	33 (20%)
Loreto	Balsapuerto	19	1		20	66 (41%)
	Nauta	26			26	
	San Juan Bautista	20			20	
San Martin	Moyobamba		26	13	39	63 (39%)
	Nueva Cajamarca		17	2	19	
	Sauce		5		5	
Total Localities		**89**	**57**	**16**	**73**	**162 (100%)**

Source: JICA Study Team (2010)

The details of the costs by conglomerate, component and/or activity and region are shown in Table 4.10.5-2. The summary of the cost distribution by region, including Component 3 (Program Administration) and Component 4 (Strengthening of the Government Function), is as follows:

1) Amazonas : S/. 29,787 thousand (USD 10,492 thousand)
2) Loreto : S/. 61,097 thousand (USD 21,520 thousand)
3) San Martín : S/. 49,871 thousand (USD 17,566 thousand)
4) Component 3 : S/. 9,843 thousand (USD 3,467 thousand)
5) Component 4 : S/. 3,120 thousand (USD 1,099 thousand)

Table 4.10.5-2: Total Cost of the First Phase of the Water and Sanitation Program for the Rural Amazon Area (2010-2013)

(Thousands of Price Units at May 2009 exchange rate)

Description	Conglomerate C-1								Conglomerate C-2								Total	
	Amazonas		Loreto		San Martin		Total		Amazonas		Loreto		San Martin		Total			
	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD
Water and Sanitation Works (Contractors)	6,715	2,365	18,187	6,406			24,902	8,771	1,965	692	218	77	13,757	4,846	15,941	5,615	40,843	14,386
Water and Sanitation Works (Core Executors)	5,895	2,076	15,966	5,624			21,861	7,700	1,725	608	192	68	12,077	4,254	13,994	4,929	35,854	12,629
Soft Component	1,556	548	4,216	1,485			5,772	2,033	580	204	64	23	4,060	1,430	4,704	1,657	10,476	3,690
Initial Diagnosis and Baseline	73	26	197	69			270	95	29	10	3	1	202	71	234	82	504	178
Perfils and Detailed Design of Works (Water and Sanitation)	2,434	857	5,892	2075			8,326	2,933	913	321	91	32	5,872	2,068	6,875	2,422	15,201	5,354
Supervision of Works (Water and Sanitation) – Contractor	928	327	2,514	885			3,442	1,212	339	120	38	13	2,376	837	2,754	970	6,196	2,182
Supervision of Works (Water and Sanitation) – Core Executor	449	158	1,217	429			1,667	587	164	58	18	6	1,151	405	1,333	470	3,000	1,057
Supervision of *Perfils* and Detailed Design of Works (Water and Sanitation)	920	324	2,490	877			3,410	1,201	345	121	38	13	2,414	850	2,797	985	6,207	2,186
Total (VAT not inc.)	**18,970**	**6,682**	**50,679**	**17,851**			**69,649**	**24,533**	**6,061**	**2,135**	**663**	**233**	**41,908**	**14,762**	**48,631**	**17,130**	**118,281**	**41,663**
Program Administration (Component 3)																	9,843	3,467
Strengthening of the Government Function (Component 4)																	3,120	1,099
VAT(19%)	**3,604**	**1,270**	**9,629**	**3,392**			**13,233**	**4,661**	**1,152**	**406**	**126**	**44**	**7,963**	**2,805**	**9,240**	**3,255**	**24,936**	**8,783**
Total	**22,574**	**7,952**	**60,308**	**21,243**			**82,882**	**29,194**	**7,212**	**2,540**	**789**	**278**	**49,871**	**17,566**	**57,871**	**20,384**	**156,180**	**55,012**

Source: JICA Study Team (2010)

(1) Price Escalation and Contingencies

Considering that the first phase of the Program shall begin in 2011 and works shall be put into practice starting in 2012, a percentage of the adjustment for possible price escalation has been considered in order to convet the estimated program cost to the future cost that may escalate due to possible increasing of the market prices during the implementation; because the program cost was estimated with a constant value of currency to the market prices.

On the other hand, a percentage has also been foreseen to cover the possible physical contingencies that may occur during the implementation of works of water and sanitation infrastructure, which shall go entail a higher investment cost value than that which was initially planned in the Feasibility Study.

The previously mentioned items should be considered for the financing of the first phase of the Program, whose values are shown in Table 4.10.5-3.

Table 4.10.5-3: Total Program Cost with Price Scaling and Physical Contingencies – First Phase
(Expressed in Thousands of Units)

Description	Nuevos Soles	JPY	USD
Total Program Cost (First Phase) 1/	156,180	5,044,608	55,012
Price Escalation 1/	3,471	112,123	1,223
Physical Contingencies 1/	1,816	58,656	640
Total	**161,467**	**5,215,387**	**56,874**

1/ Costs include VAT

4.11 Benefits

4.11.1 General Overview

The program will implement water and sanitation projects in 1,500 localities in the five (5) regions of the Rural Amazon, benefitting 777,869 inhabitants with supply of clean water and 610,540 inhabitants with the installation of sanitation systems.

In the first phase of the Program, water and sanitation projects will be implemented in 162 localities (89 of Conglomerate C-1 and 73 of Conglomerate C-2) in three regions of the Amazon Area: Amazonas (33 localities), Loreto (66 localities) and San Martin (63 localities). Approximately 84,500 inhabitants will benefit from the water supply and 66,000 inhabitants from the installation of sanitation systems.

The execution of these projects will contribute to the reduction of poverty through improved quality of life and health, and in some localities that do not currently have safe water in their homes or nearby; the program will free up resources by saving time and labor in drawing water and treating it before use.

Among the sizable benefits of the Program is the enhanced capacity on the part of the district municipalities to supervise sanitation services in localities within their scope, as well as the strengthening or creation of community organizations for the administration, operation, and maintenance of water supply and sanitation facilities. District municipalities will gain significant institutional capacity to oversee the sector performance and provide technical assistance to the communities when necessary. The beneficiaries will also receive hygiene education. This will not only help ensure effective and sustained use of the facilities but will also help to prevent infectious and diarrheic diseases among the beneficiaries.

Another benefit is the temporary employment that the Program will generate during the project construction phase, mostly for unskilled labor in the localities in the Program scope. The beneficiary could receive a total or partial payment for the unskilled labor, which would provide a significant stimulus to the local economy.

4.11.2 Non-quantifiable benefits

The communities will benefit from the overall sanitation improvement, which will contribute to an improved quality of life, with important non-quantifiable benefits.

For the water projects in the Program, the services and development of hygiene habits and hygiene education for the beneficiaries contribute to the reduction of the prevalence of parasitic and intestinal diseases. The benefits derived from health improvements are difficult to quantify, but they have been included in the project evaluation as an approximation in monetary terms, due to the possible reduction of the incidence of diarrheic diseases in children younger than 5 years old.

It also should be pointed out that having access to safe water and sanitation in a rural community offers a sense of security among inhabitants. This may be a point of subjective gain, but even so it is not insignificant.

The program will also develop the occupational skills of district municipalities and community organizations in the localities. This activity will enhance the skills of district municipalities' personnel to interact effectively with the community organizations and strengthen community-municipality linkages, which would lead to positive effects for other rural development activities.

4.11.3 Economic Benefits

(1) Benefits in "without-project" situation

The benefits in "without-project" situation are considered as nil in the thirty-eight (38) sample localities[5], due to the fact that the execution of water systems is not foreseeable, nor is the improvement of service quality.

[5] The localities of Churuzapa and La Marginal have one common water supply system

(2) Benefits in "with-project" situation

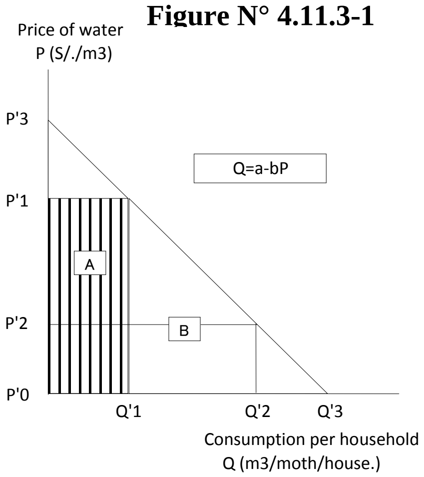
i) Water Supply Projects

Social benefits for the water supply portion of the Program come from the following concepts: i) benefits incurred from the increased consumption of a higher quality water, and the freeing of resources for the economy through the abandonment of the current water source, and ii) the benefits incurred from saving on health costs.

a) Benefits from liberation of resources and incremental consumption

The Program's water projects will generate increased consumption of water and increased quality (or incremental benefits) and the freeing of resources from abandoning the current water source or water supply (or non-incremental benefits). Estimation of these benefits is derived from the demand curve, whose demand function is shown in Figure N° 4.11.3-1.

Figure N° 4.11.3-1



1) Non-incremental: Benefits derived from the freeing of resources for the economy by replacing or abandoning the existing source or system (Area A in Figure N° 4.11.3-1).
2) Incremental: Benefits derived from incremental consumption resulting from implementation of Program projects (Area B in Figure N° 4.11.3-1).

To estimate the demand curve, the first point (P1, Q1) is defined by estimating the alternate cost of water, or the social value of time used in water transport, as well as the quantity of water each household consumes on average in respective localities. The second point (P2, Q2) is determined from the willingness to pay for each marginal unit of water consumed, this point being the average consumption used to carry out projections of demand and price or water fee, estimated from the willingness to pay identified through socio-economic studies in the localities. These two points will be used to obtain the demand function and calculate the saturation consumption (Q3) in each of the Program projects.

b) Benefits generated by health improvements

The lack of quality water for human consumption makes inhabitants vulnerable to intestinal diseases caused by water consumption. Among the most serious are the acute diarrheic diseases (ADD's). According to MINSA statistics, ADD's are one of three main causes of infant death in children less than five (5) years in Peru. It is estimated that in areas where there is no access to water and sanitation services, combined with poor hygiene habits, between 10 and 12 per cent have episodes of diarrheic infections each year. This grave situation is made worse by the already grave situation of chronic malnutrition in the country.

An investigative report from the University del Pacifico[6] shows that approximately 11.5% of children less than six (6) years of age suffered at least one episode of diarrhea in the two weeks preceding the interview.

According to the Continuous Family Health Demographic Survey (*ENDES*), between 2004 and 2006, the prevalence of ADD infections was greater in rural areas of the jungle (Program regions) and the mountains, as shown in Table 4.11.3-1.

Table 4.11.3-1: Prevalence of Diarrhea in children under 5 years old 2004-2006

Department/Natural Region	Percentage with Diarrhea (%)	Treatment		
		Health 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
San Martin	22.9	33.4	58.2	8.4
Ucayali	26.9	39.4	79.0	3.8
Average	23.4	40.6	62.6	7.8
Natural Region				
Lima Metropolitan	12.4	46.5	86.7	9.7
Resto Costa	12.6	29.7	76.2	11.1
Sierra	13.9	45.1	67.2	9.9
Selva	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)- ENDES Continua 2004-2006

Infectious diseases generate costs in economic resources for both families and the State. The state spends economic resources in order to respond to said diseases through health establishments. In light of this information, costs saved by reducing episodes of ADD's are estimated in monetary terms in this Feasibility Study, and they have been used for the cost-benefit analysis for the water projects in the Program.

For the monetary estimation of costs saved (preventive costs) for each ADD episode, two (2) relevant studies have been used as reference. These are: i) "Extra costs for the lack of water infrastructure: An Empirical Approximation," carried out by the Center of Investigation at the University del Pacifico in the Villa María del Triunfo district

[6] Source: "Extra costs for the lack of water infrastructure: An empirical approximation," J Bonifaz y G. Aragón. Center of Investigation Center for Investigation at the University del Pacífico. December 2008.

(Metropolitan Lima) and ii) "The economic burden of acute diarrheic disease in children less than three years old in mountain and jungle localities in Peru," by economist José Carlos Arca Vera[7].

A significant cost difference is observed per ADD episode between both studies and the scope of the investigation. In the case of the Villa María del Triunfo district, the average cost per ADD episode assumed by the family and the State is 26.3 Soles/episode, with a total value for the State varying between 4 Soles (without dehydration) and 60 Soles (when outpatient treatment is required).

In another study, the estimate cost per ADD episode is 15 Soles for the family and 7 Soles for the State. For the Program's water projects, the JICA Study Team proposes adopting an average of the costs per ADD episode (preventive costs) determined in said studies, as shown in Table 4.11.3-2.

Due to the fact that a cost/savings details is not available for the calculation per ADD episode in the country, adjustments will not be made for taxes or other distortions or market imperfections. On the other hand, calculating conservatively, the Feasibility Study will use the frequency of eight (8) episodes of ADD per year, unlike the MINSA statistics which consider a frequency of 10 to 12 episodes per year. This is due to the fact that the percentage of the prevalence of ADD´s in the jungle region (the Project scope) is double that of Metropolitan Lima, as can be observed in Table 4.11.3-1, and it is deduced that the frequency of ADD episodes is greater than the MINSA average at the national level.

Table 4.11.3-2: Calculation of Health-cost-saving Benefits

Total Population in Year 1 of Project Operation (inhab.)	Po
Population of children under 5 years of age (%)	r
Population of children under 5 years of age (inhab., year 1) 1/	A=Po x r
Number of diarrheic episodes per child in one year	8
Total cost per ADD episode (Soles 2009) *1	**Cost (S/.)**
on the part of the family	20.8
on the part of the State	5.5
Total cost per ADD episode per child (Soles/case)	**26.30**
Total Annual Cost of ADD's (Soles)	**Ax8x26.30**

1/The number of children will be calculated for each locality
Source: Self-produced by the JICA Study Team (2010).

In agreement with the methodology mentioned in the previous paragraphs, the total economic benefit (benefits coming from the freeing up of resources and from the incremental consumption and the health costs saved) has been calculated for each of the water projects in the Program sample, grouped by conglomerates; these results are

[2] Economic Faculty Magazine from the National University of San Marcos (Spanish: *Universidad Nacional Mayor de San Marcos, UNMSM*), Year X, Nº 28, October – December 2005.

shown in Table 4.11.3-3 y 4.11.3-4. In Appendix 9, further supporting data and benefits breakdown for the economic evaluation of the water supply and sanitation projects for the rural Amazon area are presented.

Table 4.11.3-3: Gross Economic Benefits of the Projects of Conglomerate C-1/ (1/2)

Locality	**Tutumberos**	**Guadalupe**	**Rumisapa**	**Churuzapa/La Marginal**	**Palestina**	**Misquiyacu**	**Sudadero**	**San Francisco**	**Sharara**	**Curiaca**
Average Population(inhab.)	**228**	**378**	**985**	**1,340**	**276**	**519**	**271**	**2,228**	**395**	**597**
Year	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**
1	30,003	78,759	92,992	111,522	25,169	111,515	102,509	134,406	77,338	124,785
2	30,003	80,571	94,181	115,940	26,748	111,515	102,509	139,904	77,338	126,913
3	30,003	82,384	95,370	120,358	28,328	111,515	104,080	145,402	78,075	127,976
4	30,003	84,196	97,154	124,776	29,908	111,515	104,080	150,351	78,811	129,040
5	30,964	86,009	98,343	130,298	31,488	111,515	105,650	155,849	79,548	130,104
6	30,964	87,821	99,532	134,716	33,068	111,515	107,221	161,347	79,548	131,168
7	30,964	89,634	100,721	139,134	34,647	111,515	107,221	166,296	80,285	132,231
8	31,925	91,446	102,504	144,657	36,227	113,138	108,792	171,794	81,021	134,359
9	31,925	93,259	103,693	149,075	37,807	113,138	108,792	177,292	81,758	135,423
10	31,925	93,259	104,882	153,493	39,387	113,138	108,792	182,790	82,494	136,486
11	31,925	95,071	106,666	157,911	42,546	113,138	110,363	187,739	82,494	137,550
12	32,886	96,884	107,855	162,329	44,126	113,138	110,363	193,237	83,231	138,614
13	32,886	98,696	109,043	166,747	45,706	113,138	111,934	198,735	83,968	139,678
14	32,886	100,509	110,232	171,165	47,285	113,138	113,504	203,683	84,704	141,805
15	32,886	102,321	112,016	175,583	48,865	113,138	113,504	209,182	84,704	142,869
16	33,847	104,133	113,205	181,105	50,445	113,138	115,075	214,680	85,441	143,933
17	33,847	105,946	114,394	185,523	52,025	113,138	115,075	219,628	85,441	144,996
18	33,847	107,758	116,177	191,046	53,605	113,138	116,646	225,126	85,441	146,060
19	33,847	109,571	117,366	194,360	55,184	113,138	116,646	230,624	85,441	147,124
20	34,808	111,383	118,555	199,882	56,764	113,138	116,646	235,573	85,441	149,251

Source: JICA Study Team (2010) and Breakdown of Benefits in Appendix 9

Table 4.11.3-3: Gross Economic Benefits of the Projects of Conglomerate C-1 / (2/2)

Locality	Cahuide	San Juan de Puritana	Amazonas	20 de Enero	San Pablo de Cuyana	Tarapoto	Panguana	Lupuna	Apayacu	Buen Jesus de Paz	Huanta	Santa Amelia
Average Populat. (inhab.)	**558**	**522**	**429**	**275**	**224**	**257**	**428**	**349**	**283**	**403**	**855**	**291**
Year	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**
1	88,407	81,882	58,217	43,099	63,378	68,261	66,317	58,157	36,307	68,564	136,941	55,385
2	89,047	81,882	58,801	43,722	63,378	68,261	66,317	58,781	36,778	68,564	138,303	56,204
3	89,686	82,722	59,384	43,722	64,339	68,261	66,962	58,781	37,250	69,336	139,664	56,204
4	89,686	83,561	59,968	44,345	64,339	69,258	66,962	59,405	37,722	70,107	141,026	57,022
5	90,326	84,401	59,968	44,345	64,339	69,258	66,962	59,405	37,722	70,878	142,388	57,841
6	90,965	85,240	60,552	44,967	65,300	70,255	67,607	60,030	38,194	71,649	143,749	57,841
7	90,965	85,240	61,135	44,967	65,300	70,255	67,607	60,030	38,665	72,420	145,111	58,660
8	91,605	86,080	61,719	45,590	65,300	70,255	67,607	60,030	39,137	72,420	146,473	59,479
9	92,245	86,919	61,719	45,590	66,260	70,255	68,252	60,654	39,137	73,191	147,835	59,479
10	92,884	87,759	62,302	46,212	66,260	71,253	68,252	60,654	39,609	73,962	149,196	60,297
11	92,884	88,598	62,886	46,212	66,260	71,253	68,252	61,278	40,081	74,733	150,558	61,116
12	93,524	88,598	63,469	46,835	67,221	71,253	68,896	61,278	40,552	75,504	151,920	61,116
13	93,524	89,438	63,469	46,835	67,221	72,250	68,896	61,902	40,552	75,504	153,281	61,935
14	94,163	90,277	64,053	47,458	67,221	72,250	69,541	61,902	41,024	76,275	154,643	62,753
15	94,803	91,117	64,636	47,458	68,181	72,250	69,541	62,526	41,496	77,046	156,005	62,753
16	95,443	91,956	64,636	48,080	68,181	73,247	69,541	62,526	41,496	77,817	157,366	63,572
17	95,443	91,956	64,636	48,080	68,181	73,247	69,541	62,526	41,968	78,588	158,728	64,391
18	96,082	92,796	64,636	48,703	69,142	74,245	70,186	62,526	42,439	79,360	160,090	64,391
19	96,082	93,635	64,636	48,703	69,142	74,245	70,186	62,526	42,911	79,360	161,451	65,210
20	96,722	94,475	64,636	49,326	69,142	74,245	70,831	62,526	42,911	80,131	162,813	66,028

Source: JICA Study Team (2010) and Breakdown of Benefits in Appendix 9

Table 4.11.3-4: Gross Economic Benefits of the Projects of Conglomerate C-2

Locality	Puerto Naranjitos	Naranjitos	Misqui-yacu Bajo	Casual	Cielachi	Lonya Chico	Olto	La Huarpia	Posic	Barran quita	La Florida	Monte de Los Olivos	Pacchilla	Sapotillo	Sta Rosillo
Average Population (inhab.)	**764**	**1,029**	**283**	**283**	**217**	**468**	**672**	**1,161**	**2,187**	**439**	**272**	**335**	**573**	**304**	**506**
Year	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**	**Total Gross Benefit (S/. Year)**
1	106,738	173,278	42,963	114,139	25,872	93,921	111,152	115,899	95,527	38,326	36,201	22,046	63,485	60,683	77,153
2	108,894	175,978	45,626	116,071	26,765	94,973	111,152	123,850	110,915	40,639	36,201	24,214	65,439	61,478	77,153
3	111,051	180,027	48,290	118,002	26,765	94,973	111,152	133,390	125,204	41,796	37,447	25,298	65,439	62,273	78,010
4	113,207	182,727	50,954	118,002	26,765	94,973	112,071	141,340	137,295	44,109	37,447	26,381	66,416	63,068	78,866
5	115,364	185,426	50,954	119,934	27,658	94,973	112,071	152,470	152,683	46,422	38,694	27,465	66,416	64,657	78,866
6	127,225	194,875	53,617	121,865	29,444	96,025	112,991	160,420	166,972	48,736	38,694	29,633	68,370	65,452	79,722
7	130,460	197,574	56,281	123,796	29,444	96,025	112,991	168,370	186,757	49,892	38,694	30,716	69,347	66,247	80,579
8	132,617	201,624	58,945	123,796	30,337	96,025	112,991	176,320	202,145	52,206	39,941	31,800	69,347	67,042	80,579
9	134,773	204,323	58,945	125,728	30,337	96,025	113,911	185,860	219,731	55,675	39,941	32,884	70,324	68,632	81,435
10	136,930	207,023	61,608	127,659	30,337	97,077	113,911	193,810	236,219	57,989	41,187	35,052	71,300	69,427	82,292
11	139,087	211,072	64,272	127,659	31,230	97,077	114,831	203,350	253,805	60,302	41,187	36,135	72,277	70,222	83,148
12	142,322	213,772	66,936	129,590	31,230	97,077	114,831	212,890	273,590	62,615	42,434	37,219	73,254	71,017	83,148
13	144,478	216,472	66,936	131,522	31,230	98,129	114,831	220,840	292,275	63,772	42,434	38,303	73,254	72,607	84,005
14	146,635	219,171	69,599	133,453	32,122	98,129	115,750	228,790	314,258	66,085	42,434	40,470	75,208	73,402	84,861
15	148,791	223,220	72,263	133,453	32,122	98,129	115,750	236,740	334,043	68,398	43,680	41,554	75,208	74,197	84,861
16	150,948	225,920	72,263	135,385	32,122	99,181	115,750	244,690	354,927	70,712	43,680	42,638	76,185	74,992	85,717
17	154,183	228,620	74,927	137,316	33,015	99,181	116,670	254,230	378,009	71,868	44,927	43,722	76,185	76,581	86,574
18	156,339	231,319	77,590	137,316	33,015	99,181	116,670	263,770	399,992	74,182	44,927	44,805	78,139	77,376	86,574
19	158,496	235,369	77,590	139,247	33,015	99,181	117,590	271,720	423,074	77,651	44,927	46,973	79,116	78,171	87,430
20	160,653	238,068	80,254	141,179	33,908	100,233	117,590	281,260	447,256	79,965	46,174	48,057	79,116	78,966	88,287

Source: JICA Study Team (2010)

ii) Sanitation Projects

It is not possible to quantify the economic benefits of sanitation projects in monetary terms; therefore, the social evaluation will be by means of the cost effectiveness method.

4.12 Social Evaluation

4.12.1 Social Evaluation Methodology

For social evaluation different methodologies of analysis will be applied to the water projects and the sanitation projects in each locality in the Program scope, as explained below:

(1) Water Supply Projects

The cost-benefit methodology was applied for water supply projects. Net present value (NPV) and internal rate of return (IRR) will be used as profitability indicators. The social discount rate of 11% will be used for the actualization of costs and benefits; this rate was established by the MEF as a minimum rate of return for projects.

As presented earlier, the most important steps to follow for the identification of social costs and benefits are:

1) The comparison between “with-project” and “without-project” situations
2) The distinction between the costs , the incremental benefits and the health savings benefits (preventive costs)
3) The conversion of the costs and benefits from market prices to social prices

Through this process, a social cash flow was established in each sample locality to identify the net social benefits for each project evaluation period.

(2) Sanitation projects

The cost-effectiveness methodology was used to evaluate the Program’s sanitation projects. The per-capita social costs are calculated for various types of sanitation facilities according to the geographic characteristics of each of the localities.

4.12.2 General Considerations

The following is a list of the preconditions and assumptions for the analysis:

1) 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; the design horizon for the sewerage projects is 20 years.
2) Cost-Benefit analysis will be used for water projects while Cost-Effectiveness analysis will be applied for sanitation projects.
3) Social evaluation at the Program level is based on net per-capita benefits (gross benefits minus incremental O&M costs) deduced from the social cash flow charts for the 37 selected sample localities (22 localities from Conglomerate C-1 and 15 localities from Conglomerate C-2).
4) Cost savings generated by health improvements are quantified in monetary terms and were added to the project benefits.
5) A social discount rate of 11.0% will be used for the calculation of NPV.
6) All costs are expressed in social prices, and factors suggested by the DNS were used to

convert from market prices to social prices (See Appendix 5).

7) Social evaluation for water projects will be carried out for each conglomerate of the Program with the goal of evaluating the economic viability of each for the corresponding phase and for the entire Program.
8) The proposed cutoff lines for the various types of facilities in the sanitation projects were determined by calculating the per-capita cost of the total infrastructure, without including soft-component implementation costs. This value will be compared with the CEI´s (CEI: Cost-Effectiveness Index) in the sample localities, leaving out the soft-component implementation costs. The referential values or “preliminary cut-off lines” are shown in Appendix 10.

4.12.3 Economic Evaluation of Sample Localities

(1) Water Projects

In agreement with the incremental costs and economic benefits calculated in Section 4.11.3, the economic evaluation was made of each of the projects selected, obtaining the social cash, in order to calculate the NPV and IRR for each project as well as a sum at the conglomerate level. The cash flows for the 2 conglomerates at the level of the sample localities are presented in Table 4.12.3-1 and Table 4.12.3-2.

The results of the economic evaluation show us that at the conglomerate level (C-1 and C-2), the water projects are viable from the economic point of view (social). The NPV for the 23 sample localities of Conglomerate C-1 at the social discount rate of 11.0% is positive S/. 3.1 million, while the IRR is 15.0%. For Conglomerate C-2 which comprises 15 sample localities, the NPV is positive S/. 4.3 million while the IRR is 19.1%.

Table 4.12.3-1: Results from Economic Analysis of Water Projects for Conglomerate C-1 / (1/3)

(Monetary units at May 2009 exchange rates)

Year	Sample Localities													
	Tutumberos		Guadalupe		Rumisapa		Churuzapa-La Marginal		Palestina		Misquiyacu		Sudadero	
	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value
0	-218,002	-218,002	-628,796	-628,796	-453,271	-453,271	-785,758	-785,758	-317,342	-317,342	-484,637	-484,637	-441,747	-441,747
1	29,562	26,636	78,133	70,398	92,009	82,900	107,540	96,894	23,983	21,609	110,406	99,476	99,987	90,088
2	29,562	24,004	79,166	64,283	91,376	74,198	105,106	85,346	24,116	19,582	110,406	89,650	99,987	81,189
3	29,561	21,639	80,978	59,276	92,557	67,752	110,837	81,133	25,617	18,752	110,406	80,817	101,556	74,339
4	29,560	19,480	82,791	54,559	93,421	61,564	115,124	75,867	27,133	17,881	110,398	72,752	101,556	66,925
5	29,666	17,622	84,603	50,254	95,509	56,732	119,063	70,723	28,650	17,018	110,398	65,576	97,459	57,891
6	30,520	16,328	86,416	46,232	96,689	51,729	124,794	66,765	30,166	16,139	110,398	59,063	102,952	55,079
7	30,519	14,710	88,228	42,526	97,870	47,173	126,699	61,069	31,683	15,271	110,398	53,212	104,694	50,463
8	30,625	13,291	90,041	39,078	98,734	42,851	133,020	57,731	33,199	14,409	109,355	47,460	104,521	45,362
9	31,478	12,308	91,853	35,915	100,822	39,421	138,760	54,255	34,716	13,574	112,013	43,797	106,263	41,549
10	31,477	11,080	92,632	32,607	102,002	35,905	143,038	50,349	14,347	5,050	112,013	39,429	102,340	36,024
11	31,477	9,978	93,666	29,692	102,866	32,609	147,325	46,702	37,930	12,024	112,005	35,505	106,090	33,631
12	31,583	9,033	95,478	27,307	104,954	30,017	151,612	43,361	40,829	11,677	112,005	32,033	107,832	30,840
13	32,436	8,369	97,291	25,101	106,135	27,383	154,447	39,847	42,346	10,925	112,005	28,897	107,659	27,776
14	32,436	7,525	99,103	22,992	107,315	24,897	160,177	37,161	43,862	10,176	111,996	25,983	109,229	25,341
15	32,435	6,779	100,916	21,091	108,179	22,609	164,465	34,373	45,379	9,484	111,996	23,407	107,047	22,373
16	32,541	6,118	102,728	19,313	110,267	20,730	168,413	31,662	46,895	8,816	111,996	21,055	110,798	20,830
17	33,395	5,644	104,540	17,667	111,447	18,835	174,134	29,429	48,412	8,182	111,996	18,927	112,540	19,019
18	33,394	5,076	106,353	16,166	112,312	17,071	177,275	26,946	49,928	7,589	111,996	17,023	112,367	17,080
19	33,393	4,575	108,165	14,819	114,399	15,673	183,909	25,196	51,429	7,046	111,996	15,344	114,109	15,633
20	33,500	4,120	109,978	13,527	115,580	14,216	186,111	22,892	52,946	6,512	111,996	13,776	114,109	14,035
IRR/NPV	12.8%	26,312	12.6%	74,007	20.7%	330,994	15.1%	251,941	8.2%	-65,626	22.4%	398,546	22.7%	383,719

Source: JICA Study Team (2010)

Table 4.12.3-1: Results from Economic Analysis of Water Projects for Conglomerate C-1 / (2/3)

(Monetary units at May 2009 exchange rates)

Year	Sample Localities															
	San Francisco		Sharara		Curiaca		Cahuide		San Juan de Puritana		Amazonas		20 de Enero		San Pablo de Cuyana	
	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value
0	-746,330	-746,330	-531,579	-531,579	-583,476	-583,476	-648,253	-648,253	-617,106	-617,106	-402,856	-402,856	-286,730	-286,730	-420,010	-420,010
1	122,069	109,984	67,909	61,186	116,829	105,263	86,396	77,843	78,063	70,335	54,428	49,040	40,597	36,578	60,575	54,578
2	124,178	100,832	67,909	55,142	118,231	96,003	86,133	69,940	78,063	63,387	54,959	44,627	41,185	33,442	60,575	49,187
3	129,076	94,483	68,252	49,961	119,490	87,467	86,754	63,504	77,847	56,984	55,490	40,619	41,150	30,122	60,570	44,337
4	133,763	88,150	68,876	45,389	120,470	79,390	87,638	57,753	78,640	51,824	56,021	36,918	41,738	27,505	61,487	40,520
5	138,382	82,199	69,499	41,282	121,450	72,141	87,374	51,900	79,433	47,183	56,021	33,277	41,738	24,792	61,487	36,523
6	143,280	76,655	69,778	37,331	122,430	65,500	87,995	47,078	80,226	42,921	56,552	30,255	42,326	22,644	61,481	32,892
7	147,968	71,320	70,122	33,799	123,410	59,484	88,879	42,840	81,235	39,155	57,083	27,514	42,291	20,384	62,398	30,076
8	152,587	66,223	70,746	30,704	125,091	54,289	88,616	38,459	81,019	35,162	57,614	25,005	42,879	18,609	62,398	27,081
9	157,485	61,577	71,369	27,905	126,350	49,403	89,237	34,892	81,812	31,989	57,614	22,527	42,879	16,766	62,392	24,395
10	162,383	57,159	71,992	25,341	127,329	44,820	89,858	31,630	82,605	29,077	58,145	20,467	43,467	15,300	63,310	22,285
11	161,328	51,141	52,802	16,738	107,481	34,072	63,327	20,075	54,166	17,171	2,097	665	-222	-70	36,538	11,583
12	171,689	49,103	72,615	20,768	129,290	36,977	90,479	25,877	84,407	24,140	59,207	16,933	44,020	12,590	63,304	18,105
13	176,587	45,560	73,239	18,896	130,270	33,610	91,363	23,572	84,191	21,721	59,207	15,275	44,020	11,357	64,221	16,569
14	181,274	42,056	73,862	17,136	131,951	30,613	91,100	21,135	84,984	19,716	59,738	13,859	44,608	10,349	64,221	14,899
15	185,894	38,852	74,141	15,496	133,210	27,841	91,721	19,170	85,777	17,927	60,269	12,596	44,573	9,316	64,215	13,421
16	190,792	35,869	74,485	14,003	134,190	25,228	92,342	17,360	86,570	16,275	60,269	11,331	36,803	6,919	65,132	12,245
17	195,479	33,036	74,485	12,588	135,170	22,844	93,226	15,755	87,579	14,801	60,269	10,185	45,161	7,632	65,132	11,007
18	200,098	30,415	74,485	11,322	136,150	20,695	92,962	14,130	87,363	13,279	60,269	9,161	45,749	6,954	65,127	9,899
19	204,996	28,085	74,485	10,204	137,130	18,787	93,846	12,857	88,156	12,077	60,269	8,257	45,714	6,263	66,044	9,048
20	209,683	25,791	74,764	9,196	138,810	17,074	93,583	11,511	88,949	10,941	60,269	7,413	46,336	5,699	66,044	8,123
IRR/ NPV	18.4%	442,158	11.6%	22,807	20.3%	398,022	12.1%	49,026	11.5%	18,961	12.2%	33,069	12.9%	36,420	13.4%	66,765

Source: JICA Study Team (2010)

Table 4.12.3-1: Results from Economic Analysis of Water Projects for Conglomerate C-1 / (3/3)

(Monetary units at May 2009 exchange rates)

Year	Sample Localities														Total (Samples)	
	Tarapoto		Panguana		Lupuna		Apayacu		Buen Jesus de Paz		Huanta		Santa Amelia			
	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value
0	-509,260	-509,260	-474,041	-474,041	-399,014	-399,014	-279,749	-279,749	-390,472	-390,472	-848,133	-848,133	-329,827	-329,827	-10,796,390	-10,796,390
1	64,895	58,471	63,298	57,031	56,219	50,653	34,511	31,094	66,243	59,685	130,453	117,538	52,363	47,179	1,636,468	1,474,458
2	64,895	52,695	63,298	51,398	56,818	46,136	34,960	28,388	66,213	53,765	130,173	105,701	53,142	43,151	1,640,451	1,332,047
3	64,895	47,503	63,905	46,778	56,818	41,590	35,409	25,920	66,956	49,011	131,450	96,222	53,103	38,871	1,662,677	1,217,079
4	64,887	42,760	63,905	42,113	57,416	37,837	35,858	23,631	67,698	44,613	132,727	87,467	53,882	35,508	1,684,989	1,110,408
5	65,834	39,105	63,905	37,959	57,416	34,105	35,836	21,286	68,440	40,653	134,005	79,599	54,662	32,469	1,700,829	1,010,293
6	65,826	35,217	64,512	34,514	58,015	31,038	36,285	19,412	69,182	37,012	135,282	72,376	54,622	29,223	1,729,726	925,404
7	66,773	32,185	64,512	31,095	58,015	27,963	36,734	17,706	69,924	33,703	136,559	65,821	55,402	26,704	1,751,396	844,173
8	66,773	28,979	64,512	27,998	58,015	25,179	37,183	16,138	69,895	30,334	137,836	59,821	56,181	24,383	1,770,839	768,544
9	66,773	26,108	65,118	25,461	58,614	22,918	37,161	14,530	70,637	27,619	139,113	54,393	56,142	21,951	1,798,600	703,253
10	66,764	23,501	65,118	22,922	58,614	20,632	37,610	13,239	71,379	25,125	140,390	49,417	56,921	20,036	1,793,735	631,395
11	67,712	21,465	65,118	20,643	59,213	18,771	-5,795	-1,837	24,133	7,650	87,621	27,776	21,024	6,665	1,427,902	452,645
12	67,712	19,366	65,725	18,797	59,213	16,935	38,508	11,013	72,863	20,839	142,944	40,882	57,661	16,491	1,863,931	533,084
13	67,703	17,467	65,725	16,957	18,556	4,787	38,485	9,929	72,834	18,791	144,222	37,209	58,440	15,078	1,841,381	475,076
14	68,650	15,927	66,332	15,389	59,812	13,876	38,934	9,033	73,576	17,070	145,499	33,756	59,220	13,739	1,907,880	442,628
15	68,650	14,348	66,332	13,863	60,411	12,626	39,384	8,231	74,318	15,532	146,776	30,676	59,180	12,369	1,925,267	402,381
16	68,642	12,905	66,332	12,470	60,411	11,357	33,500	6,298	66,699	12,539	148,053	27,834	52,619	9,892	1,920,476	361,050
17	69,589	11,761	66,332	11,210	60,386	10,205	39,810	6,728	75,802	12,811	149,330	25,237	60,739	10,265	1,974,954	333,767
18	69,581	10,576	66,939	10,175	56,352	8,565	40,259	6,119	76,544	11,635	150,607	22,892	60,700	9,226	1,986,809	301,995
19	70,528	9,662	66,939	9,171	60,361	8,269	40,708	5,577	76,515	10,483	151,884	20,808	61,479	8,423	2,016,455	276,254
20	70,528	8,675	67,546	8,308	60,361	7,424	40,686	5,004	77,257	9,503	153,162	18,839	62,259	7,658	2,034,455	250,238
IRR/ NPV	11.6%	19,416	12.3%	40,212	13.0%	51,856	10.9%	-2,310	16.4%	147,901	14.8%	226,131	15.3%	99,453	15.0%	3,049,781

Source: JICA Study Team (2010)

Table 4.12.3-2: Results from Economic Analysis of Water Projects for Conglomerate C-2 / (1/2)

(Monetary units at May 2009 exchange rates)

Year	Sample Localities															
	Puerto Naranjitos		Naranjitos		Misquiyacu Bajo		Casual		Cielachi		Lonya Chico		Olto		La Huarpia	
	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value	Net Flow	Net Present Value
0	-576,302	-576,302	-386,598	-386,598	-354,153	-354,153	-698,795	-698,795	-190,406	-190,406	-290,008	-290,008	-332,117	-332,117	-831,039	-831,039
1	106,430	95,894	172,904	155,787	42,472	38,267	112,531	101,390	24,623	22,186	92,754	83,572	111,093	|	107,062	96,463
2	106,851	86,763	174,214	141,462	44,095	35,805	113,676	92,305	25,043	20,335	92,929	75,458	111,091	90,206	113,757	92,370
3	108,999	79,787	177,562	129,975	46,757	34,226	115,605	84,623	25,515	18,677	93,804	68,665	111,089	81,317	124,533	91,158
4	111,145	73,244	180,941	119,240	49,420	32,568	116,388	76,700	25,514	16,814	93,803	61,816	111,267	73,325	129,972	85,652
5	113,292	67,296	183,630	109,076	50,457	29,971	117,533	69,815	25,933	15,404	93,802	55,718	112,006	66,531	143,584	85,289
6	117,337	62,775	189,596	101,434	53,118	28,418	119,463	63,913	27,241	14,574	93,977	50,278	112,184	60,018	151,526	81,066
7	127,467	61,439	195,736	94,345	55,780	26,886	121,393	58,511	28,186	13,586	94,852	45,718	112,922	54,428	159,467	76,863
8	130,476	56,627	199,085	86,403	58,443	25,364	122,176	53,024	28,605	12,414	94,850	41,165	112,921	49,008	166,161	72,114
9	132,622	51,855	202,463	79,163	58,441	22,850	123,320	48,218	29,077	11,369	94,849	37,086	113,098	44,221	176,938	69,183
10	134,770	47,439	205,152	72,213	61,103	21,508	125,250	44,088	29,076	10,235	95,024	33,449	113,837	40,071	183,624	64,636
11	136,916	43,402	208,500	66,094	63,765	20,214	126,034	39,953	29,495	9,350	95,899	30,400	114,014	36,143	193,154	61,230
12	139,277	39,833	211,879	60,598	66,427	18,998	127,178	36,373	29,967	8,571	95,898	27,427	114,754	32,820	203,930	58,324
13	142,287	36,710	214,568	55,359	66,425	17,138	129,108	33,310	29,967	7,731	96,072	24,787	114,752	29,606	211,872	54,663
14	144,433	33,509	217,256	50,404	68,048	15,787	131,037	30,401	30,385	7,049	96,947	22,492	114,930	26,664	219,813	50,997
15	146,581	30,635	220,605	46,106	70,710	14,778	131,821	27,551	30,858	6,449	96,945	20,262	115,668	24,175	227,755	47,601
16	148,727	27,961	223,983	42,109	71,748	13,489	132,966	24,998	30,856	5,801	97,120	18,259	115,667	21,745	234,459	44,078
17	151,088	25,534	226,673	38,308	73,371	12,400	134,895	22,797	31,276	5,286	97,995	16,561	115,844	19,578	243,999	41,236
18	154,098	23,423	229,361	34,863	76,032	11,557	135,678	20,623	31,747	4,826	97,994	14,895	116,583	17,721	254,785	38,727
19	156,245	21,406	232,710	31,881	77,070	10,559	136,823	18,745	31,747	4,349	97,993	13,425	116,760	15,996	261,489	35,824
20	158,392	19,482	236,088	29,039	78,693	9,679	138,753	17,067	32,166	3,956	98,168	12,075	117,500	14,452	272,275	33,490
IRR/ NPV	20.0%	408,712	46.3%	1,157,260	14.1%	86,309	16.3%	265,607	13.1%	28,554	32.2%	463,497	33.5%	465,909	17.2%	449,926

Source: JICA Study Team (2010)

Table 4.12.3-2: Results from Economic Analysis of Water Projects for Conglomerate C-2 / (2/2)

(Monetary units at May 2009 exchange rates)

Year	Sample Localities														Total (Sample)	
	Posic		Barranquita		La Florida		Monte de Los Olivos		Pacchilla		Sapotillo		Sta Rosillo			
	Net Flow	Valor Actual	Flujo Neto	Valor Actual Neto	Flujo Neto	Valor Actual Neto	Flujo Neto	Valor Actual Neto	Flujo Neto	Valor Actual Neto	Flujo Neto	Valor Actual Neto	Flujo Neto	Valor Actual Neto	Flujo Neto	Valor Actual Neto
0	-779,868	-779,868	-328,515	-328,515	-319,914	-319,914	-214,234	-214,234	-420,849	-420,849	-345,818	-345,818	-659,233	-659,233	-6,727,851	-6,727,851
1	88,022	79,307	33,312	30,014	36,032	32,465	19,731	17,778	61,770	55,655	58,571	52,772	75,228	67,780	1,142,535	1,029,424
2	91,558	74,345	33,999	27,607	36,032	29,258	20,753	16,851	61,279	49,758	58,191	47,251	74,562	60,544	1,158,030	940,320
3	106,637	78,059	35,965	26,326	36,646	26,825	22,315	16,335	63,724	46,646	58,954	43,154	75,402	55,194	1,203,507	880,967
4	120,369	79,323	37,463	24,688	37,276	24,565	23,351	15,388	63,479	41,833	59,717	39,353	76,242	50,244	1,236,347	814,753
5	133,174	79,105	39,773	23,625	37,889	22,506	24,388	14,486	64,701	38,432	60,138	35,722	76,876	45,664	1,277,177	758,643
6	148,254	79,316	42,082	22,514	38,520	20,608	25,935	13,875	64,210	34,352	62,037	33,190	77,066	41,230	1,322,545	707,562
7	163,693	78,900	44,049	21,231	38,520	18,567	27,497	13,254	66,410	32,009	62,800	30,269	77,907	37,551	1,376,676	663,558
8	182,395	79,160	45,547	19,767	39,133	16,984	28,534	12,384	67,632	29,352	63,556	27,583	77,890	33,804	1,417,404	615,153
9	198,233	77,509	48,200	18,846	39,763	15,548	29,571	11,562	67,387	26,348	63,978	25,015	78,731	30,784	1,456,671	569,558
10	215,503	75,857	51,321	18,065	40,377	14,213	31,118	10,954	68,363	24,064	65,876	23,189	79,571	28,009	1,499,966	527,988
11	232,183	73,602	53,630	17,001	41,007	12,999	32,680	10,360	69,340	21,981	66,639	21,125	80,411	25,490	1,543,668	489,343
12	250,210	71,560	55,940	15,999	41,621	11,903	33,717	9,643	70,317	20,111	67,402	19,277	80,395	22,993	1,588,913	454,429
13	269,671	69,575	57,906	14,940	42,251	10,901	34,754	8,967	71,539	18,457	67,824	17,499	81,235	20,959	1,630,229	420,599
14	288,987	67,045	59,405	13,782	42,251	9,802	36,300	8,422	71,048	16,483	69,716	16,174	82,075	19,041	1,672,632	388,051
15	310,385	64,871	61,714	12,898	42,864	8,959	37,863	7,913	73,493	15,360	70,479	14,730	82,059	17,150	1,719,800	359,438
16	330,351	62,106	64,024	12,036	43,495	8,177	38,900	7,313	73,248	13,771	71,241	13,393	82,899	15,585	1,759,685	330,821
17	351,663	59,431	65,990	11,152	44,108	7,454	39,937	6,749	74,470	12,585	71,663	12,111	83,740	14,152	1,806,712	305,334
18	374,409	56,910	67,488	10,258	44,738	6,800	41,020	6,235	73,979	11,245	73,562	11,181	84,379	12,826	1,855,855	282,090
19	396,565	54,329	70,138	9,609	44,738	6,129	42,661	5,845	76,179	10,436	74,324	10,182	84,569	11,586	1,900,013	260,302
20	419,817	51,637	73,259	9,011	45,352	5,578	44,272	5,445	77,401	9,520	75,081	9,235	85,409	10,505	1,952,624	240,173
IRR/ NPV	18.7%	632,080	12.2%	30,856	10.6%	-9,672	11.3%	5,524	14.6%	107,550	17.2%	156,589	10.1%	-38,140	19.0%	4,310,655

Source: JICA Study Team (2010)

(2) Sanitation Projects

In the projects in the Program sample, various types of solutions have been evaluated that could be applied to the Program localities; nevertheless, as a result of the economic evaluation of sample localities, two types of latrines have been selected—composting latrines in Conglomerate C-1 and dry pit latrines in Conglomerates C-1 and C-2—and as an exception in some localities, systems of sewerage and corresponding waste water treatment, which represent between 2 and 5% of the total Program localities. The average of the CEI indicators (*ICE* in Spanish), or incremental costs per capita at social costs, are calculated for the three types based on the sample localities.

The CEI[8] averages for the types of latrines mentioned were 740 Soles for composting latrines in Conglomerate C-1, 563 Soles for the dry pit latrines system in Conglomerates C-1, and 452 Soles for the dry pit latrines system in Conglomerate C-2. CEI averages were 808 Soles for sewerage improvement and expansion, including residual water treatment (S/ 501 for intake and connections and S/ 307 for treatment plant), and 1,077 Soles for new works (771 Soles for intake and connections and between 254 and 307 Soles for treatment plant). The following tables show the calculation of CEI for the two types of latrines and the sewerage system.

[8] Includes the soft-component costs, as well as the economic costs of operation and maintenance and the replacement of dry-pit latrines.

Table 4.12.3-3: Results of Economic Evaluation for Composting Latrines

(Monetary units at May 2009 exchange rates)

Year	Conglomerate C-1												Total
	La Marginal	San Fransisco	Sharara	Curiaca	Panguana	Lupuna	Apayacu	Huanta	Santa Amelia	Amazonas	20 de Enero	Buen Jesus de Paz	
0	223,638	738,593	332,812	336,364	294,011	282,267	210,331.55	530,176	217,735.14	235,174	187,998	259,792	3,848,893
1	5,262	8,508	5,803	5,967	2,878	2,878	5,531.79	15,848	6,019.42	7,134	5,669	7,018	78,516
2	7,292	26,096	5,803	9,902	2,878	4,659	7,529.94	9,936	8,224.24	8,933	7,388	7,101	105,743
3	7,380	26,507	7,921	8,061	4,781	2,913	7,600.79	10,039	6,173.19	9,032	5,768	9,201	105,376
4	7,467	24,969	7,988	8,125	2,913	4,694	7,671.65	10,141	8,378.02	9,131	7,487	9,284	108,249
5	7,555	27,289	8,056	8,188	2,913	2,913	7,742.50	10,243	8,454.90	7,432	5,868	9,368	106,021
6	7,643	25,793	6,006	8,252	4,816	4,729	7,813.36	10,345	6,403.85	9,230	7,587	9,451	108,069
7	9,760	28,071	8,123	8,315	2,948	2,948	7,884.22	10,448	8,608.68	9,329	5,967	9,535	111,937
8	7,906	26,576	8,191	10,346	2,948	2,948	7,955.07	10,550	8,685.57	9,428	7,686	7,603	110,822
9	7,993	28,894	8,258	8,506	4,851	4,763	8,025.93	10,652	6,634.52	7,729	6,066	9,702	112,075
10	8,081	27,399	8,325	8,569	2,982	2,982	8,096.78	10,754	8,839.34	9,528	7,785	9,786	113,130
PCV	267,284	879,249	375,422	385,132	314,304	303,732	254,048	595,710	261,929	285,778	227,111	310,465	4,460,165
APS	273	1,668	377	561	418	338	266	804	274	408	262	379	6,026
Density (inhab,/house-hold)	4.26	6.20	4.70	6.19	5.47	4.67	4.52	5.13	5.03	5.53	5.00	5.80	5.21
CEI (Soles/inhab.)	979	527	997	687	752	900	955	741	958	700	867	820	740

PCV: Present Cost Value

APS: Average Population Served

CEI: Cost-Effectiveness Index

Source: JICA Study Team (2010)

Table 4.12.3-4: Results of Economic Evaluation for Dry Pit Latrines

(Monetary units at May 2009 exchange rates)

Year	Conglomerate C-1											Total
	Tutumberos	Guadalupe	Churuzapa	Palestina	Misquiyacu	Tres Islas	Sudadero	Cahuide	San Juan de Puritana	San Pablo de Cuyana	Tarapoto	
0	78,768	100,373	135,320	126,797	10,198	117,679	115,238	198,837	174,112	128,337	121,571	1,307,230
1	2,389	3,724	8,598	5,151	506	956	1,118	2,987	7,499	1,333	1,577	35,837
2	2,389	4,675	16,101	6,253	506	1,661	1,118	3,861	6,759	1,333	1,577	46,232
3	2,389	4,724	15,724	6,334	506	966	1,880	3,888	6,928	2,252	1,577	47,167
4	2,389	4,772	15,980	6,416	506	966	1,127	3,041	6,303	1,355	2,509	45,363
5	30,694	42,384	52,885	44,903	2,363	50,309	51,560	3,915	76,609	56,101	54,060	465,784
6	2,433	4,869	17,634	7,189	506	975	1,899	93,716	5,223	1,377	2,536	138,356
7	2,433	4,917	17,625	7,271	506	1,689	1,146	3,942	4,203	1,377	1,632	46,741
8	3,397	4,966	18,600	7,353	506	985	1,908	4,816	4,280	2,274	1,632	50,715
9	2,476	5,014	18,574	7,435	506	1,699	1,156	3,997	3,894	2,297	2,536	49,583
10	2,476	4,111	19,041	7,516	506	1,013	1,156	4,871	3,541	1,399	1,659	47,288
PCV	110,182	149,807	249,497	188,109	14,278	153,870	153,121	269,201	250,479	170,228	163,585	1,872,357
APS	223	357	470	255	26.00	236	259	541	497	217	249	3,328
Density	4.00	4.40	4.26	3.93	4.26	4.50	5.37	5.23	6.20	4.13	4.76	4.64
CEI (Soles/inhab.)	494	420	531	739	549	652	592	498	504	786	657	563

APS: Average Population Served

Year	Conglomerate C-2											Total
	Naranjitos	Misquiyacu Bajo	San Jose	Casual	Cielache	La Huarpia	La Florida	Monte de Olivos	Pacchilla	Sapotillo	Santa Rosillo	
0	28,411	92,782	117,182	79,316	83,615	315,854	95,311	91,408	178,775	91,554	173,622	1,347,830
1	1,260	2,997	3,719	2,476	1,989	2,906	4,999	1,234	2,243	5,315	6,051	35,189
2	1,260	3,989	4,644	2,520	1,989	5,861	4,999	2,973	3,576	6,052	6,909	44,771
3	1,260	4,032	4,681	2,563	3,026	5,908	5,755	2,178	2,318	6,134	6,958	44,814
4	2,256	4,076	4,718	2,563	2,025	7,084	5,086	2,215	2,984	6,216	7,008	46,231
5	14,480	38,450	53,186	31,583	31,210	109,770	22,417	22,763	2,355	28,276	105,662	460,154
6	1,303	4,119	4,791	2,650	3,063	6,634	5,174	1,224	49,139	6,788	7,057	91,942
7	1,303	4,163	4,828	2,693	2,062	6,127	5,174	3,149	3,790	6,870	7,915	48,074
8	2,299	4,206	4,865	3,496	3,100	6,174	6,222	2,794	2,467	6,951	7,964	50,539
9	1,347	3,258	4,902	2,737	2,099	6,222	5,262	2,831	3,481	7,115	8,013	47,265
10	1,347	4,249	5,864	2,780	2,099	6,834	6,309	3,738	3,171	7,197	8,062	51,649
PCV	44,891	135,974	173,375	112,177	114,626	411,374	136,971	117,299	220,402	141,885	274,104	1,883,077
APS	129	269	392	236	210	1,047	262	299.00	555	278	492	4,166
Density	4.30	3.70	3.70	3.90	3.90	4.49	4.70	5.74	4.42	4.13	4.25	4.29
CEI (Soles/inhab.)	349	505	443	475	546	393	523	392	397	511	558	452

Source: JICA Study Team (2010)

Table 4.12.3-5: Results of Economic Evaluation for Sewerage System and Treatment Plant

(Monetary units at May 2009 exchange rates)

Sewerage System

Year	Localities							
	Puerto Naranjitos	Naranjitos	Lonya Chico	Olto	Posic	Misquiyacu	Total 1/	Total 2/
0	340,582.76	668,020	121,695	190,954	383,118	175,174	1,008,603	870,941
1	1,377.80	2,020	917.90	1,730.64	5,623	1,767	3,397	10,038
2	2,434.10	3,924	3,703.80	1,730.64	12,462	1,767	6,358	19,663
3	2,434.10	3,924	921.90	2,787.62	12,462	1,767	6,358	17,938
4	3,490.30	3,924	923.90	1,730.64	12,462	1,770	7,415	16,887
5	108,645.20	3,924	925.90	1,730.64	13,032	1,770	112,570	17,458
6	2,434.10	3,924	3,711.80	2,787.62	13,032	1,770	6,358	21,301
7	3,490.30	3,924	929.90	1,730.64	13,032	1,770	7,415	17,462
8	3,490.30	3,924	931.90	2,787.62	13,602	1,773	7,415	19,095
9	3,490.30	3,924	933.90	1,730.64	14,172	1,773	7,415	18,609
10	2,434.10	3,924	3,719.80	34,497.17	14,172	1,773	6,358	54,162
11	3,490.30	3,924	938.00	2,787.62	14,172	4,650	7,415	22,547
12	3,490.30	3,924	940.00	1,730.64	14,742	1,776	7,415	19,189
13	3,490.30	3,924	3,727.70	1,730.64	14,742	1,776	7,415	21,976
14	3,490.30	3,924	945.80	2,787.62	15,312	1,779	7,415	20,825
15	2,434.10	3,924	947.90	1,730.64	15,882	1,779	6,358	20,340
16	3,490.30	3,924	3,733.80	1,730.64	15,882	1,779	7,415	23,126
17	3,490.30	3,924	951.90	2,787.62	16,452	1,779	7,415	21,971
18	3,490.30	3,924	953.90	1,730.64	16,452	1,779	7,415	20,916
19	2,434.10	3,924	955.90	2,787.62	17,022	1,779	6,358	22,544
20	3,490.30	3,924	3,741.80	1,730.64	17,591	1,779	7,415	24,843
PCV (Nuevos Soles)	425,946	697,555	193,806.24	218,977	485,231	190,193	1,123,501	1,029,823
APS (inhab.)	555	903	315	384	890	465	1,458	2,054
CEI (Soles/inhab.)	767	772	615	570	546	409	771	501

APS: Average Population Served
1/ New Works
2/ Works of Improvement and Expansion

Waste Water Treatment

Year	Puerto Naranjitos	Naranjitos	Lonya Chico	Olto	Posic	Misquiyacu	Total 1/	Total 2/
0	172,657	322,675	151,498	165,375	318,017	194,763	1,006,968	1,324,985
1	1,404	1,805	1,195	1,404	7,085	1,649	7,457	14,542
2	1,404	1,805	1,198	1,404	7,085	1,649	7,460	14,545
3	1,404	1,805	1,200	1,404	7,085	1,649	7,463	14,547
4	1,404	1,805	1,203	1,404	7,085	1,652	7,468	14,553
5	1,404	1,805	1,206	1,404	7,085	1,652	7,471	14,556
6	1,404	1,805	1,208	1,404	7,085	1,652	7,474	14,558
7	1,404	1,805	1,211	1,404	7,085	1,652	7,476	14,561
8	1,404	1,805	1,213	1,404	7,085	1,655	7,482	14,567
9	1,404	1,805	1,216	1,404	7,085	1,655	7,484	14,569
10	1,404	1,805	1,219	1,404	7,085	1,655	7,487	14,572
11	1,404	1,805	1,221	1,404	7,085	1,658	7,493	14,577
12	1,404	1,805	1,224	1,404	7,085	1,658	7,495	14,580
13	1,404	1,805	1,229	1,404	7,085	1,658	7,500	14,585
14	1,404	1,805	1,231	1,404	7,085	1,661	7,506	14,591
15	1,404	1,805	1,234	1,404	7,085	1,661	7,509	14,593
16	1,404	1,805	1,237	1,404	7,085	1,661	7,511	14,596
17	1,404	1,805	1,239	1,404	7,085	1,664	7,517	14,602
18	1,404	1,805	1,242	1,404	7,085	1,664	7,519	14,604
19	1,404	1,805	1,245	1,404	7,085	1,664	7,522	14,607
20	1,404	1,805	1,247	1,404	7,085	1,664	7,525	14,609
PCV (Nuevos Soles)	183,838	337,049	161,149	176,555	374,436	207,935	1,066,526	1,440,962
APS (inhab.)	781	1,038	468	672	2,187	519	3,478	5,665
CEI (Soles/inhab.)	235	325	344	263	171	401	307	254

APS: Average Population Served
1/ New treatment plant works
2/ New treatment plant works without Posic (has an PS of over 2000 inhab.)
Source: JICA Study Team (2010)

4.12.4 Economic Evaluation at the Program Level and by Phases

(1) Water Supply Projects

As mentioned earlier, based on the net per-capita benefits in the sample localities, economic benefits have been quantified for each conglomerate and by phase of execution (3 phases). These result from the product of those per-capita benefits and the incremental population served, including the existing population served, who will benefit from a greater consumption of quality water that will be available in their households, compared to the current situation.

Also, investment costs corrected to social prices have been discounted, and the details for their calculation to market prices are presented in Items 4.10.3 and 4.10.4 of the present Feasibility Study.
The investment phases of the Program's project are as follows:

1) First Phase (2010- 2013): the projects that are executed in year 2013 will generate benefits until the year 2032 (the last year of the evaluation period)

2) Second Phase (2013-2016): the projects that are executed in year 2016 will generate benefits until the year 2035 (the last year of the evaluation period)

3) Third Phase (2016-2020): the projects that are executed in year 2020 will generate benefits until the year 2039 (the last year of the evaluation period)

The cash flows for each conglomerate and phase have been prepared in accordance with the description above, for the purpose of conducting economic evaluation at the Program level and by execution phase.

The cash flows for Conglomerate C-1, by phase and in general, are shown in, Table 4.12.4-1, Table 4.12.4-2, Table 4.12.4-3 and Table 4.12.4-4. The cash flows for Conglomerate C-2, by phase and in general, are shown in Table 4.12.4-5, Table 4.12.4-6, Table 4.12.4-7 and Table 4.12.4-8.

Table 4.12.4-1: Cash Flow for Conglomerate C-1 – First Phase (2010 – 2013)

(Monetary units at May 2009 exchange rates) 1/

Year		Net Flow of 23 Samples (S/.)	Net Flow of Per-capita Benefits (S/.)	Investment Cost (S/.)			Net Benefits (Total Gross Benefits – Operation and Maintenance Cots										Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
				Phase 1	Phase 2	Phase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020			
							Incremental Benefitted Population (inhab.)												
				-42,415,692			10,992	19,785	13,190										
0	2010			-10,603,923													-10,603,923	-10,603,923	-10,603,923
1	2011	1,636,469	135	-11,709,542			1,488,394										-10,221,148	-9,209,254	-10,221,148
2	2012	1,656,929	137	-12,593,977			1,507,003	2,679,110									-8,407,865	-6,827,186	-8,407,865
3	2013	1,679,637	139	-11,930,626			1,527,657	2,712,605	1,786,073								-5,904,291	-4,321,941	-5,904,291
4	2014	1,701,723	141				1,547,744	2,749,782	1,808,404								6,105,930	4,023,808	6,105,930
5	2015	1,724,837	143				1,568,766	2,785,940	1,833,188								6,187,894	3,675,609	6,187,894
6	2016	1,749,096	145				1,590,831	2,823,779	1,857,293								6,271,903	3,355,468	6,271,903
7	2017	1,767,650	146				1,607,706	2,863,496	1,882,520								6,353,721	3,062,493	6,353,721
8	2018	1,794,765	149				1,632,368	2,893,870	1,908,997								6,435,235	2,792,892	6,435,235
9	2019	1,815,560	150				1,651,280	2,938,262	1,929,247								6,518,789	2,548,847	6,518,789
10	2020	1,835,755	152				1,669,648	2,972,305	1,958,841								6,600,794	2,323,480	6,600,794
11	2021	1,858,790	154				1,690,599	3,005,367	1,981,536								6,677,503	2,116,768	6,677,503
12	2022	1,880,737	156				1,710,560	3,043,078	2,003,578								6,757,217	1,932,564	6,757,217
13	2023	1,901,929	157				1,729,835	3,079,008	2,028,719								6,837,562	1,764,091	6,837,562
14	2024	1,925,666	159				1,751,424	3,113,703	2,052,672								6,917,799	1,604,929	6,917,799
15	2025	1,946,779	161				1,770,626	3,152,563	2,075,802								6,998,991	1,462,789	6,998,991
16	2026	1,955,760	162				1,778,795	3,187,128	2,101,708								7,067,631	1,328,715	7,067,631
17	2027	1,988,825	165				1,808,868	3,201,831	2,124,752								7,135,451	1,205,891	7,135,451
18	2028	2,013,782	167				1,831,567	3,255,963	2,134,554								7,222,083	1,097,757	7,222,083
19	2029	2,030,676	168				1,846,932	3,296,820	2,170,642								7,314,394	1,002,072	7,314,394
20	2030	2,053,455	170				1,867,650	3,324,477	2,197,880								7,390,007 *1	908,971 *2	16,341,079
																	Social NPV	6,088,126 *3	13.4%
																	Social IRR	13.4% *4	
1	2031							3,361,770	2,216,318								5,578,088	619,168	687,201
2	2032								2,241,180								2,241,180	224,118	276,007
															Future Benefits		7,819,269 *5	843,286 *6	963,208

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)
Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)
1/ Costs were updated for May 2010 prices
Source: JICA Study Team (2010)

Table 4.12.4-2: Cash Flow for Conglomerate C-1 – Second Phase (2013-2016)

(Monetary units at May 2009 exchange rates) [1/]

Year		Net Flow of 23 Samples (S/.)	Net Flow of Per-capita Benefits (S/.)	Investment Cost (S/.)			Net Benefits (Total Gross Benefits – Operation and Maintenance Cots										Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
				Phase 1	Phase 2	Phase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020			
							Incremental Benefitted Population (inhab.)												
					-161,133,262				26,898	44,831	44,831	62,763							
0	2010																0	0	0
1	2011	1,636,469	135														0	0	0
2	2012	1,656,929	137														0	0	0
3	2013	1,679,637	139		-18,818,835				3,642,385								-15,176,450	-11,109,161	-15,176,450
4	2014	1,701,723	141		-52,849,260				3,687,924	6,070,642							-43,090,694	-28,396,767	-43,090,694
5	2015	1,724,837	143		-52,849,260				3,738,468	6,146,540	6,070,642						-36,893,610	-21,914,804	-36,893,610
6	2016	1,749,096	145		-54,652,932				3,787,626	6,230,780	6,146,540	8,498,899					-29,989,087	-16,044,162	-29,989,087
7	2017	1,767,650	146						3,839,071	6,312,710	6,230,780	8,605,156					24,987,717	12,044,080	24,987,717
8	2018	1,794,765	149						3,893,067	6,398,451	6,312,710	8,723,092					25,327,321	10,992,057	25,327,321
9	2019	1,815,560	150						3,934,363	6,488,445	6,398,451	8,837,795					25,659,054	10,032,690	25,659,054
10	2020	1,835,755	152						3,994,716	6,557,272	6,488,445	8,957,832					25,998,264	9,151,389	25,998,264
11	2021	1,858,790	154						4,040,998	6,657,859	6,557,272	9,083,823					26,339,953	8,349,765	26,339,953
12	2022	1,880,737	156						4,085,949	6,734,997	6,657,859	9,180,181					26,658,986	7,624,470	26,658,986
13	2023	1,901,929	157						4,137,219	6,809,914	6,734,997	9,321,003					27,003,134	6,966,809	27,003,134
14	2024	1,925,666	159						4,186,067	6,895,365	6,809,914	9,428,996					27,320,343	6,338,320	27,320,343
15	2025	1,946,779	161						4,233,237	6,976,779	6,895,365	9,533,880					27,639,260	5,776,605	27,639,260
16	2026	1,955,760	162						4,286,068	7,055,394	6,976,779	9,653,511					27,971,752	5,258,689	27,971,752
17	2027	1,988,825	165						4,333,061	7,143,447	7,055,394	9,767,490					28,299,393	4,782,597	28,299,393
18	2028	2,013,782	167						4,353,051	7,221,768	7,143,447	9,877,552					28,595,818	4,346,564	28,595,818
19	2029	2,030,676	168						4,426,646	7,255,085	7,221,768	10,000,826					28,904,325	3,959,893	28,904,325
20	2030	2,053,455	170						4,482,193	7,377,744	7,255,085	10,110,476					29,225,498 *1	3,594,736 *2	179,321,615
																	Social NPV	32,575,878 *3	16.8%
																	Social IRR	16.8% *4	
1	2031							0	4,519,795	7,470,322	7,377,744	10,157,119					29,524,980	3,277,273	3,637,373
2	2032								4,570,497	7,532,992	7,470,322	10,328,841					29,902,651	2,990,265	3,682,593
3	2033									7,617,494	7,532,992	10,458,451					25,608,937	2,304,804	3,148,640
4	2034										7,617,494	10,546,189					18,163,683	1,471,258	2,232,562
5	2035											10,664,492					10,664,492	778,508	1,310,619
														Future Benefits			113,864,743 *5	10,822,108 *6	14,011,786

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)
Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)
1/ Costs were updated for May 2010 prices
Source: JICA Study Team (2010)

Table 4.12.4-3: Cash Flow for Conglomerate C-1 – Third Phase (2016-2020)

(Monetary units at May 2009 exchange rates) 1/

Year		Net Flow of 23 Samples (S/.)	Net Flow of Per-capita Benefits (S/.)	Investment Cost (S/.)			Net Benefits (Total Gross Benefits – Operation and Maintenance Cots										Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
				Phase 1	Phase 2	Phase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020			
							Incremental Benefitted Population (inhab.)												
						-199,124,167						22,230	66,690	55,575	55,575	22,230			
0	2010																0	0	0
1	2011	1,636,469	135														0	0	0
2	2012	1,656,929	137														0	0	0
3	2013	1,679,637	139														0	0	0
4	2014	1,701,723	141														0	0	0
5	2015	1,724,837	143														0	0	0
6	2016	1,749,096	145			-22,148,399						3,010,236					-19,138,163	-10,238,917	-19,138,163
7	2017	1,767,650	146			-66,445,197						3,047,871	9,030,707				-54,366,619	-26,204,710	-54,366,619
8	2018	1,794,765	149			-65,327,206						3,089,643	9,143,613	7,525,589			-45,568,360	-19,776,668	-45,568,360
9	2019	1,815,560	150			-65,327,206						3,130,270	9,268,929	7,619,678	7,525,589		-37,782,740	-14,773,052	-37,782,740
10	2020	1,835,755	152			-2,235,982						3,172,786	9,390,809	7,724,107	7,619,678	3,010,236	28,681,633	10,095,935	28,681,633
11	2021	1,858,790	154									3,217,411	9,518,357	7,825,674	7,724,107	3,047,871	31,333,421	9,932,694	31,333,421
12	2022	1,880,737	156									3,251,540	9,652,232	7,931,964	7,825,674	3,089,643	31,751,053	9,080,801	31,751,053
13	2023	1,901,929	157									3,301,418	9,754,619	8,043,527	7,931,964	3,130,270	32,161,798	8,297,744	32,161,798
14	2024	1,925,666	159									3,339,668	9,904,254	8,128,849	8,043,527	3,172,786	32,589,084	7,560,667	32,589,084
15	2025	1,946,779	161									3,376,817	10,019,005	8,253,545	8,128,849	3,217,411	32,995,626	6,896,086	32,995,626
16	2026	1,955,760	162									3,419,189	10,130,451	8,349,170	8,253,545	3,251,540	33,403,895	6,279,932	33,403,895
17	2027	1,988,825	165									3,459,560	10,257,568	8,442,042	8,349,170	3,301,418	33,809,758	5,713,849	33,809,758
18	2028	2,013,782	167									3,498,543	10,378,679	8,547,973	8,442,042	3,339,668	34,206,906	5,199,450	34,206,906
19	2029	2,030,676	168									3,542,205	10,495,628	8,648,899	8,547,973	3,376,817	34,611,523	4,741,779	34,611,523
20	2030	2,053,455	170									3,581,042	10,626,615	8,746,357	8,648,899	3,419,189	35,022,103 *1	4,307,719 *2	434,982,318
																	Social NPV	27,959,386 *3	19.1%
																	Social IRR	19.1% *4	
1	2031							0	0	0	0	3,597,563	10,743,126	8,855,513	8,746,357	3,459,560	35,402,118	3,929,635	4,361,415
2	2032								0	0	0	3,658,385	10,792,689	8,952,605	8,855,513	3,498,543	35,757,734	3,575,773	4,403,662
3	2033									0	0	3,704,292	10,975,156	8,993,907	8,952,605	3,542,205	36,168,165	3,255,135	4,446,906
4	2034										0	3,735,368	11,112,876	9,145,963	8,993,907	3,581,042	36,569,156	2,962,102	4,494,843
5	2035											3,777,270	11,206,104	9,260,730	9,145,963	3,597,563	36,987,629	2,700,097	4,545,618
6	2036												11,331,810	9,338,420	9,260,730	3,658,385	33,589,344	2,216,897	4,143,732
7	2037													9,443,175	9,338,420	3,704,292	22,485,886	1,326,667	2,752,422
8	2038														9,443,175	3,735,368	13,178,543	698,463	1,609,361
9	2039															3,777,270	3,777,270	181,309	463,706
												Future Benefits					253,915,846 *5	20,846,078 *6	31,221,664

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)
Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)

1/ Costs were updated for May 2010 prices
Source: JICA Study Team (2010)

Table 4.12.4-4: Cash Flow for Conglomerate C-1 – Phases (1+2+3), (2010-2020)

(Monetary units at May 2009 exchange rates) 1/

Year		Net Flow of 23 Samples (S/.)	Net Flow of Per-capita Benefits (S/.)	Investment Cost (S/.)			Net Benefits (Total Gross Benefits – Operation and Maintenance Cots										Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
				Phase 1	Phase 2	Phase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020			
							Incremental Benefitted Population (inhab.)												
				-42,415,692	-161,133,262	-199,124,167	10,992	19,785	40,088	44,831	44,831	84,993	66,690	55,575	55,575	22,230			
0	2010			-10,603,923													-10,603,923	-10,603,923	-10,603,923
1	2011	1,636,469	135	-11,709,542			1,488,394										-10,221,148	-9,209,254	-10,221,148
2	2012	1,656,929	137	-12,593,977			1,507,003	2,679,110									-8,407,865	-6,827,186	-8,407,865
3	2013	1,679,637	139	-11,930,626	-18,818,835		1,527,657	2,712,605	5,428,458								-21,080,740	-15,431,102	-21,080,740
4	2014	1,701,723	141		-52,849,260		1,547,744	2,749,782	5,496,328	6,070,642							-36,984,764	-24,372,959	-36,984,764
5	2015	1,724,837	143		-52,849,260		1,568,766	2,785,940	5,571,656	6,146,540	6,070,642						-30,705,716	-18,239,195	-30,705,716
6	2016	1,749,096	145		-54,652,932	-22,148,399	1,590,831	2,823,779	5,644,920	6,230,780	6,146,540	11,509,134					-42,855,347	-22,927,611	-42,855,347
7	2017	1,767,650	146			-66,445,197	1,607,706	2,863,496	5,721,590	6,312,710	6,230,780	11,653,027	9,030,707				-23,025,181	-11,098,137	-23,025,181
8	2018	1,794,765	149			-65,327,206	1,632,368	2,893,870	5,802,064	6,398,451	6,312,710	11,812,735	9,143,613	7,525,589			-13,805,805	-5,991,719	-13,805,805
9	2019	1,815,560	150			-65,327,206	1,651,280	2,938,262	5,863,610	6,488,445	6,398,451	11,968,064	9,268,929	7,619,678	7,525,589		-5,604,897	-2,191,515	-5,604,897
10	2020	1,835,755	152			-2,235,982	1,669,648	2,972,305	5,953,557	6,557,272	6,488,445	12,130,617	9,390,809	7,724,107	7,619,678	3,010,236	61,280,692	21,570,803	61,280,692
11	2021	1,858,790	154				1,690,599	3,005,367	6,022,535	6,657,859	6,557,272	12,301,234	9,518,357	7,825,674	7,724,107	3,047,871	64,350,876	20,399,228	64,350,876
12	2022	1,880,737	156				1,710,560	3,043,078	6,089,527	6,734,997	6,657,859	12,431,720	9,652,232	7,931,964	7,825,674	3,089,643	65,167,256	18,637,835	65,167,256
13	2023	1,901,929	157				1,729,835	3,079,008	6,165,938	6,809,914	6,734,997	12,622,421	9,754,619	8,043,527	7,931,964	3,130,270	66,002,494	17,028,643	66,002,494
14	2024	1,925,666	159				1,751,424	3,113,703	6,238,739	6,895,365	6,809,914	12,768,665	9,904,254	8,128,849	8,043,527	3,172,786	66,827,225	15,503,916	66,827,225
15	2025	1,946,779	161				1,770,626	3,152,563	6,309,039	6,976,779	6,895,365	12,910,697	10,019,005	8,253,545	8,128,849	3,217,411	67,633,878	14,135,480	67,633,878
16	2026	1,955,760	162				1,778,795	3,187,128	6,387,776	7,055,394	6,976,779	13,072,700	10,130,451	8,349,170	8,253,545	3,251,540	68,443,278	12,867,336	68,443,278
17	2027	1,988,825	165				1,808,868	3,201,831	6,457,813	7,143,447	7,055,394	13,227,050	10,257,568	8,442,042	8,349,170	3,301,418	69,244,602	11,702,338	69,244,602
18	2028	2,013,782	167				1,831,567	3,255,963	6,487,605	7,221,768	7,143,447	13,376,095	10,378,679	8,547,973	8,442,042	3,339,668	70,024,807	10,643,771	70,024,807
19	2029	2,030,676	168				1,846,932	3,296,820	6,597,288	7,255,085	7,221,768	13,543,031	10,495,628	8,648,899	8,547,973	3,376,817	70,830,241	9,703,743	70,830,241
20	2030	2,053,455	170				1,867,650	3,324,477	6,680,073	7,377,744	7,255,085	13,691,518	10,626,615	8,746,357	8,648,899	3,419,189	71,637,608 *1	8,811,426 *2	630,645,012
																	Social NPV	66,623,390 *3	7.0%
																	Social IRR	17.0% *4	
1	2031							3,361,770	6,736,113	7,470,322	7,377,744	13,754,682	10,743,126	8,855,513	8,746,357	3,459,560	70,505,187	7,826,076	8,685,989
2	2032								6,811,677	7,532,992	7,470,322	13,987,226	10,792,689	8,952,605	8,855,513	3,498,543	67,901,566	6,790,157	8,362,262
3	2033									7,617,494	7,532,992	14,162,742	10,975,156	8,993,907	8,952,605	3,542,205	61,777,102	5,559,939	7,595,545
4	2034										7,617,494	14,281,557	11,112,876	9,145,963	8,993,907	3,581,042	54,732,839	4,433,360	6,727,405
5	2035											14,441,762	11,206,104	9,260,730	9,145,963	3,597,563	47,652,121	3,478,605	5,856,237
6	2036												11,331,810	9,338,420	9,260,730	3,658,385	33,589,344	2,216,897	4,143,732
7	2037													9,443,175	9,338,420	3,704,292	22,485,886	1,326,667	2,752,422
8	2038														9,443,175	3,735,368	13,178,543	698,463	1,609,361
9	2039															3,777,270	3,777,270	181,309	463,706
												Future Benefits					375,599,857 *5	32,511,472 *6	46,196,659

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)
Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)
1/ Costs were updated for May 2010 prices

Source: JICA Study Team (2010)

Table 4.12.4-5: Cash Flow for Conglomerate C-2 – First Phase (2010 – 2013)
(Monetary units at May 2009 exchange rates) [1/]

Year		Net Flow of 23 Samples (S/.)	Net Flow of Per-capita Benefits (S/.)	Investment Cost (S/.)			Net Benefits (Total Gross Benefits – Operation and Maintenance Cots										Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
				Phase 1	Phase 2	Phase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020			
							Incremental Benefitted Population (inhab.)												
				-27,563,923			10,147	18,265	12,176										
0	2010			-6,890,981													-6,890,981	-6,890,981	-6,890,981
1	2011	1,148,762	121	-7,841,435			1,232,643										-6,608,792	-5,954,522	-6,608,792
2	2012	1,189,430	126	-8,601,743			1,276,280	2,218,757									-5,106,706	-4,146,645	-5,106,706
3	2013	1,229,535	130	-8,031,489			1,319,313	2,297,304	1,479,172								-2,935,700	-2,148,932	-2,935,700
4	2014	1,263,848	134				1,356,133	2,374,764	1,531,536								5,262,433	3,467,943	5,262,433
5	2015	1,304,087	138				1,399,310	2,441,039	1,583,176								5,423,525	3,221,574	5,423,525
6	2016	1,363,251	144				1,462,793	2,518,758	1,627,359								5,608,910	3,000,767	5,608,910
7	2017	1,406,643	149				1,509,354	2,633,028	1,679,172								5,821,553	2,805,989	5,821,553
8	2018	1,444,979	153				1,550,490	2,716,837	1,755,352								6,022,678	2,613,842	6,022,678
9	2019	1,487,587	157				1,596,209	2,790,881	1,811,224								6,198,314	2,423,541	6,198,314
10	2020	1,530,104	162				1,641,830	2,873,176	1,860,587								6,375,593	2,244,209	6,375,593
11	2021	1,574,261	166				1,689,211	2,955,293	1,915,451								6,559,955	2,079,506	6,559,955
12	2022	1,620,320	171				1,738,634	3,040,580	1,970,196								6,749,409	1,930,331	6,749,409
13	2023	1,659,280	175				1,780,438	3,129,541	2,027,053								6,937,032	1,789,754	6,937,032
14	2024	1,707,706	181				1,832,401	3,204,788	2,086,361								7,123,549	1,652,663	7,123,549
15	2025	1,750,066	185				1,877,853	3,298,321	2,136,525								7,312,700	1,528,354	7,312,700
16	2026	1,792,563	190				1,923,453	3,380,136	2,198,881								7,502,470	1,410,464	7,502,470
17	2027	1,843,247	195				1,977,839	3,462,215	2,253,424								7,693,478	1,300,198	7,693,478
18	2028	1,888,281	200				2,026,160	3,560,110	2,308,144								7,894,414	1,199,951	7,894,414
19	2029	1,935,942	205				2,077,302	3,647,088	2,373,406								8,097,797	1,109,398	8,097,797
20	2030	1,987,704	210				2,132,844	3,739,143	2,431,392								8,303,379 *1	1,021,316 *2	18,482,979
																	Social NPV	16,617,501 *3	28.5%
																	Social IRR	28.5% *4	
1	2031							3,839,119	2,492,762								6,331,881	702,839	780,065
2	2032								2,559,413								2,559,413	255,941	315,199
														Beneficios Futuros			8,891,293 *5	958,780 *6	1,095,264

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)
Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)
1/ Costs were updated for May 2010 prices
Source: JICA Study Team (2010)

Table 4.12.4-6: Cash Flow for Conglomerate C-2 – Second Phase (2013-2016)

(Monetary units at May 2009 exchange rates) 1/

Year		Net Flow of 23 Samples (S/.)	Net Flow of Per-capita Benefits (S/.)	Investment Cost (S/.)			Net Benefits (Total Gross Benefits – Operation and Maintenance Cots										Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
				Phase 1	Phase 2	Phase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020			
							Incremental Benefitted Population (inhab.)												
					-123,040,235				29,190	48,650	48,650	68,110							
0	2010																		
1	2011	1,148,762	121																
2	2012	1,189,430	126																
3	2013	1,229,535	130		-21,190,087				3,545,959								-17,644,127	-12,915,501	-17,644,127
4	2014	1,263,848	134		-39,418,152				3,671,491	5,909,932							-29,836,729	-19,662,405	-29,836,729
5	2015	1,304,087	138		-39,418,152				3,795,285	6,119,151	5,909,932						-23,593,783	-14,014,707	-23,593,783
6	2016	1,363,251	144		-41,240,853				3,901,204	6,325,475	6,119,151	8,273,905					-16,621,117	-8,892,298	-16,621,117
7	2017	1,406,643	149						4,025,412	6,502,006	6,325,475	8,566,812					25,419,706	12,252,298	25,419,706
8	2018	1,444,979	153						4,208,035	6,709,020	6,502,006	8,855,666					26,274,728	11,403,232	26,274,728
9	2019	1,487,587	157						4,341,976	7,013,392	6,709,020	9,102,809					27,167,198	10,622,374	27,167,198
10	2020	1,530,104	162						4,460,312	7,236,627	7,013,392	9,392,629				0	28,102,960	9,892,242	28,102,960
11	2021	1,574,261	166						4,591,834	7,433,854	7,236,627	9,818,749				0	29,081,064	9,218,697	29,081,064
12	2022	1,620,320	171						4,723,072	7,653,057	7,433,854	10,131,278				0	29,941,260	8,563,200	29,941,260
13	2023	1,659,280	175						4,859,374	7,871,786	7,653,057	10,407,395				0	30,791,612	7,944,236	30,791,612
14	2024	1,707,706	181						5,001,550	8,098,957	7,871,786	10,714,279				0	31,686,572	7,351,285	31,686,572
15	2025	1,750,066	185						5,121,807	8,335,916	8,098,957	11,020,500				0	32,577,181	6,808,631	32,577,181
16	2026	1,792,563	190						5,271,290	8,536,346	8,335,916	11,338,539				0	33,482,091	6,294,633	33,482,091
17	2027	1,843,247	195						5,402,044	8,785,483	8,536,346	11,670,282				0	34,394,155	5,812,612	34,394,155
18	2028	1,888,281	200						5,533,221	9,003,406	8,785,483	11,950,884				0	35,272,994	5,361,495	35,272,994
19	2029	1,935,942	205						5,689,673	9,222,035	9,003,406	12,299,676				0	36,214,791	4,961,426	36,214,791
20	2030	1,987,704	210						5,828,680	9,482,788	9,222,035	12,604,769				0	37,138,273 *1	4,568,008 *2	234,474,940
																	Social NPV	69,748,885 *3	23.6%
																	Social IRR	23.6% *4	
1	2031								5,975,799	9,714,467	9,482,788	12,910,849	0	0	0	0	38,083,904	4,227,313	4,691,802
2	2032								6,135,578	9,959,665	9,714,467	13,275,904	0	0	0	0	39,085,614	3,908,561	4,813,499
3	2033									10,225,963	9,959,665	13,600,254	0	0	0	0	33,785,882	3,040,729	4,154,002
4	2034										10,225,963	13,943,532	0	0	0	0	24,169,495	1,957,729	2,970,757
5	2035											14,316,349	0	0	0	0	14,316,349	1,045,093	1,759,417
														Future Benefits			149,441,244 *5	14,179,427 *6	18,389,477

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)

Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)

1/ Costs were updated for May 2010 prices

Source: JICA Study Team (2010)

Table 4.12.4-7: Cash Flow for Conglomerate C-2 – Third Phase (2016-2020)

(Monetary units at May 2009 exchange rates) 1/

Year		Net Flow of 23 Samples (S/.)	Net Flow of Per-capita Benefits (S/.)	Investment Cost (S/.) Phase 1	Phase 2	Phase 3	Net Benefits (Total Gross Benefits – Operation and Maintenance Cots) 2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
							Incremental Benefitted Population (inhab.)												
						61,521,473						9,730	29,190	24,325	24,325	9,730			
0	2010																		
1	2011	1,148,762	121																
2	2012	1,189,430	126																
3	2013	1,229,535	130														0	0	0
4	2014	1,263,848	134														0	0	0
5	2015	1,304,087	138														0	0	0
6	2016	1,363,251	144			-10,139,571						1,181,986					-8,957,585	-4,792,308	-8,957,585
7	2017	1,406,643	149			-20,165,135						1,223,830	3,545,959				-15,395,346	-7,420,557	-15,395,346
8	2018	1,444,979	153			-19,709,506						1,265,095	3,671,491	2,954,966			-11,817,955	-5,128,992	-11,817,955
9	2019	1,487,587	157			-19,709,506						1,300,401	3,795,285	3,059,576	2,954,966		-8,599,278	-3,362,318	-8,599,278
10	2020	1,530,104	162			-911,350						1,341,804	3,901,204	3,162,738	3,059,576	1,181,986	11,735,957	4,131,057	11,735,957
11	2021	1,574,261	166									1,402,678	4,025,412	3,251,003	3,162,738	1,223,830	13,065,662	4,141,815	13,065,662
12	2022	1,620,320	171									1,447,325	4,208,035	3,354,510	3,251,003	1,265,095	13,525,969	3,868,427	13,525,969
13	2023	1,659,280	175									1,486,771	4,341,976	3,506,696	3,354,510	1,300,401	13,990,355	3,609,511	13,990,355
14	2024	1,707,706	181									1,530,611	4,460,312	3,618,314	3,506,696	1,341,804	14,457,737	3,354,195	14,457,737
15	2025	1,750,066	185									1,574,357	4,591,834	3,716,927	3,618,314	1,402,678	14,904,110	3,114,959	14,904,110
16	2026	1,792,563	190									1,619,791	4,723,072	3,826,528	3,716,927	1,447,325	15,333,644	2,882,725	15,333,644
17	2027	1,843,247	195									1,667,183	4,859,374	3,935,893	3,826,528	1,486,771	15,775,749	2,666,102	15,775,749
18	2028	1,888,281	200									1,707,269	5,001,550	4,049,478	3,935,893	1,530,611	16,224,801	2,466,170	16,224,801
19	2029	1,935,942	205									1,757,097	5,121,807	4,167,958	4,049,478	1,574,357	16,670,698	2,283,886	16,670,698
20	2030	1,987,704	210									1,800,681	5,271,290	4,268,173	4,167,958	1,619,791	17,127,893 *1	2,106,731 *2	225,647,802
																	Social NPV	24,662,489 *3	25.8%
																	Social IRR	25.8% *4	
1	2031							0	0	0	0	1,844,407	5,402,044	4,392,741	4,268,173	1,667,183	17,574,548	1,950,775	2,165,122
2	2032								0	0	0	1,896,558	5,533,221	4,501,703	4,392,741	1,707,269	18,031,493	1,803,149	2,220,627
3	2033									0	0	1,942,893	5,689,673	4,611,018	4,501,703	1,757,097	18,502,384	1,665,215	2,274,883
4	2034										0	1,991,933	5,828,680	4,741,394	4,611,018	1,800,681	18,973,706	1,536,870	2,332,125
5	2035											2,045,193	5,975,799	4,857,233	4,741,394	1,844,407	19,464,027	1,420,874	2,392,044
6	2036												6,135,578	4,979,833	4,857,233	1,896,558	17,869,202	1,179,367	2,204,425
7	2037													5,112,982	4,979,833	1,942,893	12,035,708	710,107	1,473,251
8	2038														5,112,982	1,991,933	7,104,915	376,560	867,651
9	2039															2,045,193	2,045,193	98,169	251,072
													Future Benefits				131,601,175 *5	10,741,087 *6	16,181,199

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)
Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)
1/ Costs were updated for May 2010 prices

Source: JICA Study Team (2010)

Table 4.12.4-8: Cash Flow for Conglomerate C-2 – Phases (1+2+3), (2010-2020)

(Monetary units at May 2009 exchange rates) 1/

Year		Net Flow of 23 Samples (S/.)	Net Flow of Per-capita Benefits (S/.)	Investment Cost (S/.)			Net Benefits (Total Gross Benefits – Operation and Maintenance Cots										Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
				Phase 1	Phase 2	Phase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020			
							Incremental Benefitted Population (inhab.)												
				-27,563,923	-123,040,235	-61,521,473	10,147	18,265	41,366	48,650	48,650	77,840	29,190	24,325	24,325	9,730			
0	2010			-6,890,981													-6,890,981	-6,890,981	-6,890,981
1	2011	1,148,762	121.5	-7,841,435			1,232,643										-6,608,792	-5,954,522	-6,608,792
2	2012	1,189,430	125.8	-8,601,743			1,276,280	2,218,757									-5,106,706	-4,146,645	-5,106,706
3	2013	1,229,535	130.0	-8,031,489	-21,190,087		1,319,313	2,297,304	5,025,131								-20,579,827	-15,064,434	-20,579,827
4	2014	1,263,848	133.6		-39,418,152		1,356,133	2,374,764	5,203,027	5,909,932							-24,574,296	-16,194,461	-24,574,296
5	2015	1,304,087	137.9		-39,418,152		1,399,310	2,441,039	5,378,461	6,119,151	5,909,932						-18,170,258	-10,793,133	-18,170,258
6	2016	1,363,251	144.2		-41,240,853	-10,139,571	1,462,793	2,518,758	5,528,563	6,325,475	6,119,151	9,455,891					-19,969,792	-10,683,839	-19,969,792
7	2017	1,406,643	148.7			-20,165,135	1,509,354	2,633,028	5,704,584	6,502,006	6,325,475	9,790,642	3,545,959				14,249,171	6,868,100	14,249,171
8	2018	1,444,979	152.8			-19,709,506	1,550,490	2,716,837	5,963,387	6,709,020	6,502,006	10,120,761	3,671,491	2,954,966			18,882,709	8,195,095	18,882,709
9	2019	1,487,587	157.3			-19,709,506	1,596,209	2,790,881	6,153,201	7,013,392	6,709,020	10,403,210	3,795,285	3,059,576	2,954,966		23,169,491	9,059,271	23,169,491
10	2020	1,530,104	161.8			-911,350	1,641,830	2,873,176	6,320,900	7,236,627	7,013,392	10,734,433	3,901,204	3,162,738	3,059,576	1,181,986	46,214,511	16,267,508	46,214,511
11	2021	1,574,261	166.5				1,689,211	2,955,293	6,507,285	7,433,854	7,236,627	11,221,427	4,025,412	3,251,003	3,162,738	1,223,830	48,706,681	15,440,018	48,706,681
12	2022	1,620,320	171.3				1,738,634	3,040,580	6,693,267	7,653,057	7,433,854	11,578,604	4,208,035	3,354,510	3,251,003	1,265,095	50,216,639	14,361,959	50,216,639
13	2023	1,659,280	175.5				1,780,438	3,129,541	6,886,427	7,871,786	7,653,057	11,894,166	4,341,976	3,506,696	3,354,510	1,300,401	51,718,999	13,343,502	51,718,999
14	2024	1,707,706	180.6				1,832,401	3,204,788	7,087,910	8,098,957	7,871,786	12,244,891	4,460,312	3,618,314	3,506,696	1,341,804	53,267,859	12,358,143	53,267,859
15	2025	1,750,066	185.1				1,877,853	3,298,321	7,258,333	8,335,916	8,098,957	12,594,858	4,591,834	3,716,927	3,618,314	1,402,678	54,793,991	11,451,944	54,793,991
16	2026	1,792,563	189.6				1,923,453	3,380,136	7,470,171	8,536,346	8,335,916	12,958,331	4,723,072	3,826,528	3,716,927	1,447,325	56,318,204	10,587,822	56,318,204
17	2027	1,843,247	194.9				1,977,839	3,462,215	7,655,468	8,785,483	8,536,346	13,337,466	4,859,374	3,935,893	3,826,528	1,486,771	57,863,382	9,778,912	57,863,382
18	2028	1,888,281	199.7				2,026,160	3,560,110	7,841,365	9,003,406	8,785,483	13,658,153	5,001,550	4,049,478	3,935,893	1,530,611	59,392,209	9,027,616	59,392,209
19	2029	1,935,942	204.7				2,077,302	3,647,088	8,063,080	9,222,035	9,003,406	14,056,773	5,121,807	4,167,958	4,049,478	1,574,357	60,983,285	8,354,710	60,983,285
20	2030	1,987,704	210.2				2,132,844	3,739,143	8,260,072	9,482,788	9,222,035	14,405,450	5,271,290	4,268,173	4,167,958	1,619,791	62,569,545 *1	7,696,054 *2	478,605,721
																	Social NPV	111,028,876 *3	22.9%
																	Social IRR	22.9% *4	
1	2031							3,839,119	8,468,561	9,714,467	9,482,788	14,755,256	5,402,044	4,392,741	4,268,173	1,667,183	61,990,333	6,880,927	7,636,989
2	2032								8,694,990	9,959,665	9,714,467	15,172,462	5,533,221	4,501,703	4,392,741	1,707,269	59,676,519	5,967,652	7,349,325
3	2033									10,225,963	9,959,665	15,543,147	5,689,673	4,611,018	4,501,703	1,757,097	52,288,266	4,705,944	6,428,885
4	2034										10,225,963	15,935,465	5,828,680	4,741,394	4,611,018	1,800,681	43,143,201	3,494,599	5,302,882
5	2035											16,361,541	5,975,799	4,857,233	4,741,394	1,844,407	33,780,375	2,465,967	4,151,460
6	2036												6,135,578	4,979,833	4,857,233	1,896,558	17,869,202	1,179,367	2,204,425
7	2037													5,112,982	4,979,833	1,942,893	12,035,708	710,107	1,473,251
8	2038														5,112,982	1,991,933	7,104,915	376,560	867,651
9	2039															2,045,193	2,045,193	98,169	251,072
													Future Benefits				289,933,712 *5	25,879,293 *6	35,665,940

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)

Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)

1/ Costs were updated for May 2010 prices

Source: JICA Study Team (2010)

As a result of the economic evaluation, the NPV for Conglomerate C-1 at a social discount rate of 11.0% is positive S/. 66.6 million, while the IRR is 17.0%. The evaluation indicators show the following results by phase:

1) First Phase : NPV= S/. 6.1 million, IRR = 13.4%

2) Second Phase : NPV = S/. 32.6 million, IRR = 16.8%

3) Third Phase : NPV = S/. 27.9 million, IRR = 19.1%

For Conglomerate C-2, the NPV is S/. 111.0 million while the IRR is 22.9%. The evaluation indicators show the following results by phase:

1) First Phase : NPV= S/. 16.6 million, IRR = 28.5%

2) Second Phase : NPV = S/. 69.7 million, IRR = 23.6%

3) Third Phase : NPV = S/. 24.7 million, IRR = 25.8%

Adding the total benefits and costs of the two conglomerates into a single cash flow, including the program administration costs (Component 3) and the strengthening of the government’s function (Component 4) shows that the Water and Sanitation Program for the Rural Amazon is viable from the social point of view, reflecting the value that the families assign to the costs of the Program. In this sense, the NPV of the Program is positive S/. 142.5 million while the IRR is 17.6% as shown in Table 4.12.4-12. Table 4.12.4-9, Table 4.12.4-10, Table 4.12.4-11 and Table 4.12.4-12 show the evaluation indicators by phase of the Program with the following results:

1) First Phase : NPV = S/. 15.3 million, IRR = 14.1%

2) Second Phase : NPV = S/. 85.7 million, IRR = 18.2%

3) Third Phase : NPV = S/. 41.5 million, IRR = 19.1 %

Table 4.12.4-9: Cash Flow Chart for All of Program: Conglomerates C-1 + Conglomerate C-2 – First Phase (2010–2013)

(Monetary units at May 2009 exchange rates) 1/

Year		Investment Cost (S/.)			Net Benefits (Total Gross Benefits – Operation and Maintenance Cots										Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
		Phase 1	Phase 2	Phase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020			
					Incremental Benefitted Population (inhab.)												
		-86,755,190			21,139	38,049	25,366										
0	2010	-19,632,772													-19,632,772	-19,632,772	-19,632,772
1	2011	-21,688,846			2,721,037										-18,967,808	-17,089,995	-18,967,808
2	2012	-23,333,589			2,783,283	4,897,867									-15,652,439	-12,709,780	-15,652,439
3	2013	-22,099,983			2,846,970	5,009,910	3,265,245								-10,977,859	-8,035,793	-10,977,859
4	2014				2,903,877	5,124,546	3,339,940								11,368,363	7,491,751	11,368,363
5	2015				2,968,076	5,226,979	3,416,364								11,611,419	6,897,183	11,611,419
6	2016				3,053,624	5,342,537	3,484,653								11,880,814	6,356,235	11,880,814
7	2017				3,117,059	5,496,523	3,561,691								12,175,274	5,868,482	12,175,274
8	2018				3,182,857	5,610,707	3,664,349								12,457,913	5,406,734	12,457,913
9	2019				3,247,489	5,729,143	3,740,471								12,717,104	4,972,388	12,717,104
10	2020				3,311,478	5,845,481	3,819,429								12,976,388	4,567,688	12,976,388
11	2021				3,379,810	5,960,660	3,896,987								13,237,458	4,196,274	13,237,458
12	2022				3,449,194	6,083,658	3,973,774								13,506,626	3,862,895	13,506,626
13	2023				3,510,273	6,208,549	4,055,772								13,774,594	3,553,845	13,774,594
14	2024				3,583,824	6,318,491	4,139,033								14,041,348	3,257,593	14,041,348
15	2025				3,648,480	6,450,884	4,212,327								14,311,691	2,991,143	14,311,691
16	2026				3,702,248	6,567,264	4,300,589								14,570,101	2,739,179	14,570,101
17	2027				3,786,707	6,664,046	4,378,176								14,828,929	2,506,089	14,828,929
18	2028				3,857,727	6,816,073	4,442,698								15,116,497	2,297,708	15,116,497
19	2029				3,924,234	6,943,908	4,544,048								15,412,190	2,111,470	15,412,190
20	2030				4,000,494	7,063,620	4,629,272								15,693,386 *1	1,930,287 *2	34,824,058
															Social NPV	15,340,671 *3	14.1%
															Social IRR	14.1% *4	
1	2031					7,200,889	4,709,080								11,909,969	1,322,007	1,467,266
2	2032						4,800,593								4,800,593	480,059	591,206
													Future Benefits		16,710,562 *5	1,802,066 *6	2,058,472

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)
Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)
1/ Costs were updated for May 2010 prices

Source: JICA Study Team (2010)

Table 4.12.4-10: Cash Flow Chart for All of Program: Conglomerates C-1 + Conglomerate C-2 – Second Phase (2013–2016)

(Monetary units at May 2009 exchange rates) 1/

Year		Investment Cost (S/.)			Net Benefits (Total Gross Benefits – Operation and Maintenance Cots										Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
		Phase 1	Phase 2	Phase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020			
					Incremental Benefitted Population (inhab.)												
			-300,203,476				56,088	93,481	93,481	130,873							
0	2010																
1	2011																
2	2012																
3	2013		-46,600,543				7,188,344								-39,412,199	-28,849,730	-39,412,199
4	2014		-98,859,034				7,359,415	11,980,574							-79,519,045	-52,403,051	-79,519,045
5	2015		-98,859,034				7,533,753	12,265,692	11,980,574						-67,079,016	-39,844,935	-67,079,016
6	2016		-102,485,407				7,688,830	12,556,255	12,265,692	16,772,803					-53,201,827	-28,462,977	-53,201,827
7	2017						7,864,483	12,814,717	12,556,255	17,171,968					50,407,423	24,296,378	50,407,423
8	2018						8,101,102	13,107,472	12,814,717	17,578,758					51,602,048	22,395,289	51,602,048
9	2019						8,276,339	13,501,837	13,107,472	17,940,604					52,826,252	20,655,064	52,826,252
10	2020						8,455,028	13,793,899	13,501,837	18,350,460					54,101,224	19,043,631	54,101,224
11	2021						8,632,833	14,091,713	13,793,899	18,902,572					55,421,016	17,568,462	55,421,016
12	2022						8,809,020	14,388,054	14,091,713	19,311,459					56,600,246	16,187,670	56,600,246
13	2023						8,996,593	14,681,700	14,388,054	19,728,398					57,794,746	14,911,044	57,794,746
14	2024						9,187,617	14,994,322	14,681,700	20,143,276					59,006,915	13,689,604	59,006,915
15	2025						9,355,044	15,312,695	14,994,322	20,554,380					60,216,441	12,585,236	60,216,441
16	2026						9,557,358	15,591,740	15,312,695	20,992,051					61,453,843	11,553,323	61,453,843
17	2027						9,735,105	15,928,930	15,591,740	21,437,773					62,693,547	10,595,210	62,693,547
18	2028						9,886,272	16,225,175	15,928,930	21,828,436					63,868,813	9,708,060	63,868,813
19	2029						10,116,319	16,477,120	16,225,175	22,300,502					65,119,116	8,921,319	65,119,116
20	2030						10,310,873	16,860,532	16,477,120	22,715,245					66,363,770 *1	8,162,744 *2	413,796,555
															Social NPV	85,713,876 *3	18.2%
															Social IRR	18.2% *4	
1	2031					0	10,495,594	17,184,789	16,860,532	23,067,968	0	0	0	0	67,608,884	7,504,586	8,329,174
2	2032						10,706,074	17,492,657	17,184,789	23,604,745	0	0	0	0	68,988,266	6,898,827	8,496,092
3	2033							17,843,457	17,492,657	24,058,704	0	0	0	0	59,394,819	5,345,534	7,302,642
4	2034								17,843,457	24,489,720	0	0	0	0	42,333,178	3,428,987	5,203,319
5	2035									24,980,840	0	0	0	0	24,980,840	1,823,601	3,070,036
												Future Benefits			263,305,987 *5	25,001,535 *6	32,401,263

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)
Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)
1/ Costs were updated for May 2010 prices

Source: JICA Study Team (2010)

Table 4.12.4-11: Cash Flow Chart for All Programs: Conglomerates C-1 + Conglomerate C-2 – Third Phase (2016–2020)

(Monetary units at May 2009 exchange rates) 1/

Year		Investment Cost (S/.) Phase 1	Phase 2	Phase 3	Net Benefits (Total Gross Benefits – Operation and Maintenance Cots 2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
					Incremental Benefitted Population (inhab.												
		0	0	-277,950,134						31,960	95,880	79,900	79,900	31,960			
0	2010																
1	2011																
2	2012																
3	2013																
4	2014																
5	2015																
6	2016			-38,327,652						4,192,222					-34,135,430	-18,262,455	-34,135,430
7	2017			-92,650,014						4,271,701	12,576,666				-75,801,646	-36,536,393	-75,801,646
8	2018			-91,076,394						4,354,738	12,815,104	10,480,555			-63,425,996	-27,526,882	-63,425,996
9	2019			-91,076,394						4,430,671	13,064,214	10,679,254	10,480,555		-52,421,700	-20,496,885	-52,421,700
10	2020			-3,147,333						4,514,590	13,292,013	10,886,845	10,679,254	4,192,222	40,417,591	14,226,992	40,417,591
11	2021									4,620,089	13,543,769	11,076,677	10,886,845	4,271,701	44,399,082	14,074,509	44,399,082
12	2022									4,698,865	13,860,267	11,286,474	11,076,677	4,354,738	45,277,022	12,949,228	45,277,022
13	2023									4,788,189	14,096,596	11,550,223	11,286,474	4,430,671	46,152,152	11,907,255	46,152,152
14	2024									4,870,280	14,364,566	11,747,163	11,550,223	4,514,590	47,046,821	10,914,862	47,046,821
15	2025									4,951,174	14,610,839	11,970,472	11,747,163	4,620,089	47,899,736	10,011,045	47,899,736
16	2026									5,038,981	14,853,522	12,175,699	11,970,472	4,698,865	48,737,539	9,162,657	48,737,539
17	2027									5,126,743	15,116,942	12,377,935	12,175,699	4,788,189	49,585,508	8,379,951	49,585,508
18	2028									5,205,812	15,380,229	12,597,452	12,377,935	4,870,280	50,431,707	7,665,619	50,431,707
19	2029									5,299,302	15,617,435	12,816,857	12,597,452	4,951,174	51,282,220	7,025,664	51,282,220
20	2030									5,381,723	15,897,905	13,014,529	12,816,857	5,038,981	52,149,996 *1	6,414,449 *2	660,630,120
															Social NPV	41,496,782 *3	19.1%
															Social IRR	19.1% *4	
1	2031					0	0	0	0	5,441,970	16,145,170	13,248,254	13,014,529	5,126,743	52,976,667	5,880,410	6,526,537
2	2032						0	0	0	5,554,943	16,325,910	13,454,309	13,248,254	5,205,812	53,789,227	5,378,923	6,624,289
3	2033							0	0	5,647,185	16,664,829	13,604,925	13,454,309	5,299,302	54,670,549	4,920,349	6,721,789
4	2034								0	5,727,301	16,941,556	13,887,357	13,604,925	5,381,723	55,542,862	4,498,972	6,826,968
5	2035									5,822,463	17,181,903	14,117,963	13,887,357	5,441,970	56,451,656	4,120,971	6,937,661
6	2036										17,467,388	14,318,252	14,117,963	5,554,943	51,458,546	3,396,264	6,348,157
7	2037											14,556,156	14,318,252	5,647,185	34,521,594	2,036,774	4,225,672
8	2038												14,556,156	5,727,301	20,283,457	1,075,023	2,477,012
9	2039													5,822,463	5,822,463	279,478	714,778
												Future Benefits			385,517,021 *5	31,587,164 *6	47,402,864

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)
Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)
1/ Costs were updated for May 2010 prices

Source: JICA Study Team (2010)

Table 4.12.4-12: Cash Flow Chart for All of Program: Conglomerates C-1 + Conglomerate C-2 – Phases (1+2+3), (2010-2020)

(Monetary units at May 2009 exchange rates) 1/

Year		Investment Cost (S/.)			Net Benefits (Total Gross Benefits – Operation and Maintenance Cots										Net Flow (S/.)	Present Value of Net Flow (S/.)	Net Flow including Future Benefits (S/.)
		Phase 1	Phase 2	Phase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020			
					Incremental Benefitted Population (inhab.)												
		-86,755,190	-346,804,019	-316,277,785	21,139	38,049	81,455	93,481	93,481	162,833	95,880	79,900	79,900	31,960			
0	2010	-19,632,772	0	0											-19,632,772	-19,632,772	-19,632,772
1	2011	-21,688,846	0	0	2,721,037										-18,967,808	-17,089,995	-18,967,808
2	2012	-23,333,589	0	0	2,783,283	4,897,867									-15,652,439	-12,709,780	-15,652,439
3	2013	-22,099,983	-46,600,543	0	2,846,970	5,009,910	10,453,589								-50,390,058	-36,885,522	-50,390,058
4	2014	0	-98,859,034	0	2,903,877	5,124,546	10,699,355	11,980,574							-68,150,682	-44,911,299	-68,150,682
5	2015	0	-98,859,034	0	2,968,076	5,226,979	10,950,118	12,265,692	11,980,574						-55,467,596	-32,947,752	-55,467,596
6	2016	0	-102,485,407	-38,327,652	3,053,624	5,342,537	11,173,483	12,556,255	12,265,692	20,965,025					-75,456,443	-40,369,197	-75,456,443
7	2017	0	0	-92,650,014	3,117,059	5,496,523	11,426,174	12,814,717	12,556,255	21,443,670	12,576,666				-13,218,949	-6,371,533	-13,218,949
8	2018	0	0	-91,076,394	3,182,857	5,610,707	11,765,451	13,107,472	12,814,717	21,933,496	12,815,104	10,480,555			633,965	275,141	633,965
9	2019	0	0	-91,076,394	3,247,489	5,729,143	12,016,811	13,501,837	13,107,472	22,371,274	13,064,214	10,679,254	10,480,555	0	13,121,655	5,130,567	13,121,655
10	2020	0	0	-3,147,333	3,311,478	5,845,481	12,274,457	13,793,899	13,501,837	22,865,050	13,292,013	10,886,845	10,679,254	4,192,222	107,495,202	37,838,311	107,495,202
11	2021	0	0	0	3,379,810	5,960,660	12,529,820	14,091,713	13,793,899	23,522,661	13,543,769	11,076,677	10,886,845	4,271,701	113,057,557	35,839,245	113,057,557
12	2022	0	0	0	3,449,194	6,083,658	12,782,794	14,388,054	14,091,713	24,010,324	13,860,267	11,286,474	11,076,677	4,354,738	115,383,894	32,999,794	115,383,894
13	2023	0	0	0	3,510,273	6,208,549	13,052,365	14,681,700	14,388,054	24,516,587	14,096,596	11,550,223	11,286,474	4,430,671	117,721,492	30,372,145	117,721,492
14	2024	0	0	0	3,583,824	6,318,491	13,326,650	14,994,322	14,681,700	25,013,555	14,364,566	11,747,163	11,550,223	4,514,590	120,095,084	27,862,059	120,095,084
15	2025	0	0	0	3,648,480	6,450,884	13,567,371	15,312,695	14,994,322	25,505,554	14,610,839	11,970,472	11,747,163	4,620,089	122,427,868	25,587,424	122,427,868
16	2026	0	0	0	3,702,248	6,567,264	13,857,947	15,591,740	15,312,695	26,031,031	14,853,522	12,175,699	11,970,472	4,698,865	124,761,483	23,455,159	124,761,483
17	2027	0	0	0	3,786,707	6,664,046	14,113,281	15,928,930	15,591,740	26,564,516	15,116,942	12,377,935	12,175,699	4,788,189	127,107,984	21,481,249	127,107,984
18	2028	0	0	0	3,857,727	6,816,073	14,328,970	16,225,175	15,928,930	27,034,248	15,380,229	12,597,452	12,377,935	4,870,280	129,417,017	19,671,387	129,417,017
19	2029	0	0	0	3,924,234	6,943,908	14,660,368	16,477,120	16,225,175	27,599,803	15,617,435	12,816,857	12,597,452	4,951,174	131,813,526	18,058,453	131,813,526
20	2030	0	0	0	4,000,494	7,063,620	14,940,145	16,860,532	16,477,120	28,096,968	15,897,905	13,014,529	12,816,857	5,038,981	134,207,153 *1	16,507,480 *2	1,109,250,733
															Social NPV	142,551,329 *3	17.6%
															Social IRR	17.6% *4	
1	2031					7,200,889	15,204,675	17,184,789	16,860,532	28,509,938	16,145,170	13,248,254	13,014,529	5,126,743	132,495,520	14,707,003	16,322,977
2	2032						15,506,667	17,492,657	17,184,789	29,159,688	16,325,910	13,454,309	13,248,254	5,205,812	127,578,085	12,757,809	15,711,587
3	2033							17,843,457	17,492,657	29,705,890	16,664,829	13,604,925	13,454,309	5,299,302	114,065,368	10,265,883	14,024,431
4	2034								17,843,457	30,217,021	16,941,556	13,887,357	13,604,925	5,381,723	97,876,040	7,927,959	12,030,287
5	2035									30,803,303	17,181,903	14,117,963	13,887,357	5,441,970	81,432,496	5,944,572	10,007,697
6	2036										17,467,388	14,318,252	14,117,963	5,554,943	51,458,546	3,396,264	6,348,157
7	2037											14,556,156	14,318,252	5,647,185	34,521,594	2,036,774	4,225,672
8	2038												14,556,156	5,727,301	20,283,457	1,075,023	2,477,012
9	2039													5,822,463	5,822,463	279,478	714,778
												Future Benefits			665,533,569 *5	58,390,765 *6	81,862,599

Social NPV (*3) calculated by adding *2 and *6 (updated in 2030)
Social IRR (*4) calculated by adding *1 y *5 (updated in 2030)
1/ Costs were updated for May 2010 prices

Source: JICA Study Team (2010)

Table 4.12.4-13 below shows the summary of the results of the economic evaluations of the sample localities and the Program projects of all three phases.

Table 4.12.4-13: Summary of the Economic Evaluations for the Water Supply Projects

Indicator	Sample Localities			Program Fase (1+2+3)		
	Proyectos de Agua Potable					
	C-1	C-2	Total	C-1	C-2	Total
NTV (S/.thausand)	3,049,781	4,310,655	7,360,436	66,595,510	111,028,876	142,551,329
IRR (%)	15.0	19.0	16.6	17.0	22.9	17.6

Source: JICA Study Team (2010)

(2) Sanitation Projects

The average CEI values at social prices for different types of sanitation facilities and conglomerates are calculated based on the sample localities (See Table 4.12.4-14).

These CEIs at private prices, excluding the costs for the soft component, O&M and replacement of latrines (dry-pit latrine case) would have to be compared with reference per-capita cost values or preliminary cut-off lines calculated for the different types of facilities under the Program. (See Table 4.12-4-15, Table 4.12-4-16 and Appendix 10.)

Table 4.12.4-14: Average CEI Values at Social Price for Sanitation Projects
(Monetary units at May 2009 exchange rates)

Type of Facility	CEI (Soles/inhabitant)		
	Conglomerate C-1	Conglomerate C-2	Program
Ventilated Dry Pit Latrine	563	452	501
Composting Latrine	740	762	741
Sewerage (New Works)		771	771
Sewerage (Works of Improvement and Expansion)	409	529	501
Treatment	401	290	307

Source: JICA Study Team (2010)

Table 4.12.4-15: Average CEI Values at Market Price, or Per-capita Cost for Sanitation Projects
(Monetary units at May 2009 exchange rates)

Type of Facility	CEI (Soles/inhabitant)		
	Conglomerado C-1	Conglomerado C-2	Programa
Ventilated Dry Pit Latrine	114	95	105
Composting Latrine	245	245 1/	245

1/ Cost similar to C-1

Source: JICA Study Team (2010)

Table 4.12.4-16: Reference Per-capita Cost Values or Preliminary Cut-off Lines at Market Price

(Monetary units at May 2009 exchange rates)

Type of Facility	Per-capita Cost (USD/hab.)
Ventilated Dry Pit Latrine Conglomerate C-1	137
Ventilated Dry Pit Latrine Conglomerate C-2	104
Ventilated Dry Pit Latrine Conglomerate C-1 and Conglomerate C-2	118
Composting Latrine Conglomerate C-1 and Conglomerate C-2	283
Pour-flush Latrine Conglomerate C-1 and Conglomerate C-2	377

Values taken at the upper limit of the 99 % confidential interval of the samples

Source: JICA Study Team (2010)

4.13 Private Evaluation

The private evaluation of the water supply and sanitation projects shall consider that the service renderers (JASS or community organizations) shall operate in a situation of economic balance, for which they have to generate their own resources with the purpose of covering the costs for administration, O&M and investments.

For the evaluation of each project under the Program's conglomerates, from the private standpoint, the cash income and incremental costs that the water and sanitation services will require is determined considering the "with-project" situation.

To evaluate if each project is profitable from the private point of view, the long-term average unit cost expressed in Soles (S/.) per 1000 liters or cubic meters were calculated, which includes the O&M costs as well as the initial investment and the future investment during the evaluation period of each project. In this case, the long-term average unit costs multiplied by the average estimated consumption of each locality results in a family fee per each locality. In conglomerate C-1, the fee would be of S/. 76 /month in average while that of conglomerate C-2 would be S/. 56 /month in average. Consequently, implementation would not be viable considering the size and type of population.

Therefore, it is concluded that the Program's projects are not profitable from the private point of view, due to the fact that the family fees only cover the administration, O&M costs, as well as the partial fund for the replacement of pumping equipment.

On the other hand, the average cost that covers O&M costs was calculated as well as the fund for the replacement of equipment, especially for the pumping system without treatment (PWOT), pumping system with treatment (PWT) and manual pumping (MP) water supply systems. In this case, according to the average estimated consumption, the family fee resulted in S/. 7.58 /month in average for conglomerate C-1 and S/. 5.58 /month in average for conglomerate C-2. This is therefore deemed viable for implementation as explained in the sustainability analysis.

For the cases of water supply through a PWOT and MP system, mainly present in Conglomerate C-1, the family fee considers a partial contribution of the user to cover the costs of equipment replacement (pumps).

Part of costs for equipment replacement shall be covered by the corresponding district municipalities of the localities in the Program's conglomerates, as a direct subsidy to poor areas. This proposal is compatible with the sanitation sector's policies, which establish that the fees should cover at least the O&M and replacement of equipment in the rural areas.

Table 4.13-1 shows the income and costs for each conglomerate.

Table 4.13-1: Income and O&M Costs
(Monetary units at May 2009 exchange rates)

No.	Region	Locality	Conglomerate	Type of System	Number of Users	O&M Family Fee (Soles)	Annual Income (Soles)	Water O&M Cost (Soles)	Sewer. O&M Cost (Soles))	Balance (Soles)
Conglomerate C-1										
1	Amazonas	Tutumberos	C-1	GCT	55	4.05	2,673	2,729	0	-56
2	Amazonas	Guadalupe	C-1	GCT	77	4.19	3,872	4,150	0	-278
3	San Martin	Rumisapa	C-1	GST	225	4.93	13,311	8,368	0	4,943
4	San Martin	Churuzapa y la Marginal	C-1	GCT	159	4.08	7,785	7,770	0	15
5	San Martin	Palestina	C-1	BST	60	7.71	5,549	5,033	0	516
6	San Martin	Misquiyacu	C-1	GST	121	6.38	9,264	5,313	3,943	7
7	Madre de Dios	Sudadero	C-1	BST	52	12.21	7,617	6,239	0	1,378
8	Ucayali	San Francisco	C-1	BST	267	6.56	21,030	19,222	0	1,809
9	Ucayali	Sharara	C-1	BST	77	11.29	10,428	10,825	0	-397
10	Ucayali	Curiaca	C-1	BST	85	9.13	9,309	9,194	0	115
11	Loreto	Cahuide	C-1	BST	100	5.81	6,972	4,433	0	2,539
12	Loreto	San Juan de Puritana	C-1	BST	77	5.95	5,497	4,288	0	1,210
13	Loreto	Amazonas	C-1	BM	70	8.46	7,103	5,980	0	1,123
14	Loreto	20 de Enero	C-1	BM	53	9.31	5,918	3,693	0	2,226
15	Loreto	San Pablo de Cuyana	C-1	BM	57	7.47	5,107	4,177	0	930
16	Loreto	Tarapoto	C-1	BM	51	12.24	7,490	3,693	0	3,797
17	Loreto	Panguana	C-1	BM	75	9.43	8,487	6,215	0	2,272
18	Loreto	Lupuna	C-1	BM	70	8.02	6,740	4,535	0	2,205
19	Loreto	Apayacu	C-1	BM	56	5.96	4,004	2,749	0	1,254
20	Loreto	Buen Jesús de Paz	C-1	BM	66	7.12	5,638	3,587	0	2,051
21	Loreto	Huanta	C-1	BST	152	4.92	8,977	7,591	0	1,386
22	Loreto	Santa Amelia	C-1	BM	52	11.11	6,935	4,684	0	2,251
Conglomerate C-2										
1	Amazonas	Puerto Naranjitos	C-2	GCT	166	6.17	12,291	8,064	4,494	-268
2	Amazonas	Naranjitos	C-2	GCT	215	6.60	17,028	9,239	6,739	1,050
3	Amazonas	Misquiyacu Bajo	C-2	GCT	69	5.88	4,869	4,994	0	-125
4	Amazonas	San Jose Bajo	C-2	GST	99	2.30	2,732	2,956	0	-224
5	Amazonas	Casual	C-2	GCT	57	3.80	2,599	2,797	0	-198
6	Amazonas	Cielachi	C-2	GCT	51	4.50	2,754	2,749	0	5
7	Amazonas	Lonya Chico	C-2	GCT	117	5.80	8,143	5,686	2,443	14
8	Amazonas	Olto	C-2	GCT	169	5.80	11,762	5,948	5,214	600
9	San Martin	La Huarpia	C-2	GCT	211	4.67	11,824	6,294	0	5,531
10	San Martin	Posic	C-2	BST	353	10.26	43,454	30,828	14,340	-1,714
11	San Martin	Barranquita	C-2	GCT	76	7.28	6,639	6,925	0	-285
12	San Martin	La Florida	C-2	GCT	54	8.21	5,320	4,507	0	813
13	San Martin	Monte de Los Olivos	C-2	GST	46	7.98	4,405	2,871	0	1,534
14	San Martin	Pacchilla	C-2	GST	121	3.72	5,401	3,761	0	1,640
15	San Martin	Sapotillo	C-2	GST	59	2.49	1,763	2,525	0	-762
16	San Martin	Sta Rosillo	C-2	GST	113	3.81	5,166	4,720	0	447

Source: JICA Study Team (2010)

4.14 Sensitivity Analysis

For the *Perfils* of sample localities, sensitivity analysis was undertaken to identify to what extent the uncertain factors affect social profitability of the projects. Three variation factors (increase or decrease) were used for this purpose; i) variation in investment costs, ii) variation in the costs of operation and maintenance, and iii) variation in the benefits.

The sensitivity analysis at the Program level follows the same analytical criteria. In light of this, the projects of Conglomerate C-1 maintain their profitability with a 16% increase in the investment costs while the projects of Conglomerate C-2 are economically viable with an increase in investment costs of up to 62%. For the variation of benefits, the projects in Conglomerate C-1 maintain their profitability with a 14% decrease in net benefits per capita, and those in Conglomerate C-2 maintain project profitability with a decrease in benefits of up to 39%.

A similar behavior is seen for the Program (the sum of the two conglomerates), which includes the costs of Component 3 and Component 4; the profitability is maintained up to a 21% increase in investment costs and a 18% decrease in benefits. The results of the sensitivity analysis are shown in Table 4.14-1 and Table 4.14-2:

Table 4.14-1: Variation 1- Increases in Investment Costs – First Phase
(Monetary units at May 2010 exchange rates)

Conglomerate C-1		Conglomerate C-2		Program	
Increase	**NPV (S/.)**	**Increase**	**NPV (S/.)**	**Increase**	**NPV (S/.)**
Base	6,088,126	Base	16,617,501	Base	15,340,671
4%	4,483,576	10%	13,935,523	5%	11,625,747
7%	3,280,163	20%	11,253,545	10%	7,910,823
10%	2,076,751	30%	8,571,567	15%	4,195,898
13%	873,338	40%	5,889,589	18%	1,966,944
16%	-129,505	50%	3,207,611	21%	-262,011
		62%	-10,763		

Source: JICA Study Team (2010)

Table 4.14-2: Variation 2- Decreases in Benefits –First Phase
(Monetary units at May 2010 exchange rates)

Conglomerate C-1		Conglomerate C-2		Program	
Decrease	**NPV (S/.)**	**Decrease**	**NPV (S/.)**	**Decrease**	**NPV (S/.)**
Base	6,088,126	Base	16,617,501	Base	15,340,671
5%	3,778,032	5%	14,445,637	5%	10,858,713
7%	2,853,995	10%	12,273,773	7%	8,169,539
9%	1,929,957	15%	10,101,909	10%	5,480,364
11%	1,005,920	25%	5,758,181	15%	3,687,581
14%	-380,137	35%	1,414,453	16%	-794,377
		39%	-323,039		

Source: JICA Study Team (2010)

4.15 Risk Analysis

Once the Program´s viability has been declared, the respective pre-investment studies at the *Perfil* level will be carried out for each water and sanitation project in each conglomerate, before starting the investment stage of the Program, in order to design and evaluate the viability of each project. Because that the Program consists of numbers of projects in localities where the Feasibility Study did not investigate yet, various uncertainties should be involved, which may induce economical risks although the Feasibility Study has confirmed the economical viability at the Program level.

The risk analysis was conducted to assess a risk level by determining the probability of "success or failure" of the Program's projects for the first phase. This economic risks were evaluated through the probabilities of occurrence of the NPV that are the function of variables which will depend on various situations when the actual design and/or implementation take place.

For this probability calculation, the MS Excel complementary software "Crystal Ball" was used. This software allows the analysis of risks and/or uncertainties associated with random variations of the factors identified as variables in the model, utilizing the Monte Carlo Simulation.

As the variable for this study, (a) benefits of the projects, (b) investiment costs of the projects, (3) operation and maintenance costs of the projects were selected; because those are the main factors that are most infulencial for the benefit of the Program that is expressed by NPV.The assumed ranges of variation of those variables are as follows:

- Project benefits : +/- 30% of the average value
- Investment costs : +/- 30% of the average value
- Operation and maintenance costs : +/- 30% of the average value

About 10,000 iterations of the calculation was carried out, obtaining with a reasonable expectation the most probable statistical behavior of the Net Present Value for Benefits, Investments, and Operation and Maintenance Costs. This resulted in an average (mean value) NPV of S/. 15,811,359 with a standard error of the mean as S/. 74,332. Table 4.15-1 shows the main indicators of the simulation results, such as median, standard deviation, variance, and variability coefficient. The results of the risk analysis carried out for each variable (benefits, investments and O&M costs) are presented in Appendix 11. A summery of the output of the probabilities are as follows.

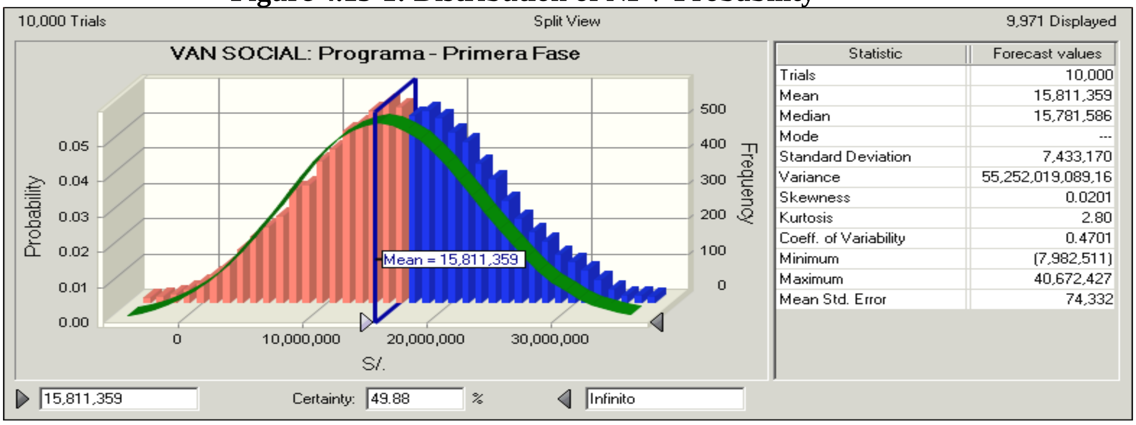
- NPV > S/.15,811,359 (Average(μ)) 49.9%
- NPV > S/. 8,378,189 (u-s) 84.1%
- NPV > S/. 945,019 (u-2s) 97.7%
- NPV > S/. -6,488,151 (u-3s) 99.9%

The results reached show that the project maintains its social profitability with the probability of more than 97.7% in the face of risks of a decrease in benefits of up to +/- 30%, and an increase in investments and O&M costs of up to +/- 30%.

Table 4.15-1: Simulation Results

Number of Simulations (nos.)	10,000
Average Value of Simulation (μ) (S/.)	15,811,359
Median(S/.)	15,781,586
Mode(S/.)	---
Standard Deviation of Simulation (s) (S/.)	7,433,170
Variance of Simulation	5.53E+13
Skewness	0.0201
Kurtosis	2.80
Coefficient of Variation	0.4701
Minimum Value of Simulation (S/.)	(7,982,511)
Maximum Value of Simulation (S/.)	40,672,427
Range Difference (S/.)	48,654,938
Standard Error of the Mean	74,332

Figure 4.15-1: Distribution of NPV Probability



VAN Social = Social NPV
Source: JICA Study Team (2010), Output of the 'Crystal Ball' software

4.16 Sustainability Analysis

The sustainability of the projects executed in the framework of the Program relates to various factors, which on the whole will guarantee the expected benefits after the execution of the projects; and which are the ones that have been used to sustain the viability of the Program. Such factors are derived from the economic value of the resources freed by the access to a potable water system through eliminating or reducing the time it takes to fetch the water; from the value assigned to the consumer's surplus, according to the willingness to pay identified at the field surveys; and from the health benefits resulting from the reduction of the incidence of waterborne diseases.

(1) Sustainability of the services

Those systems that represent acceptable conditions in terms of the service status, where coverage and service quality are at an acceptable level, have been defined as sustainable. The committee responsible for administration, operation and maintenance (AOM) is capable, the users express their satisfaction with the services and give support to the committee for AOM, and the families pay a fee for the service[9].

(2) Sustainability in basic rural sanitation and the demand driven approach

The sustainability concept in basic rural sanitation has various meanings, and the proposals of strategies to achieve sustainable services are diverse as well. Most of them are based in the principles of the International Conference about Water and Environment, held in Dublin in 1992. These principles emerged at the end of the “International Decade of the Potable Water and Environmental Sanitation”, when the international community started to recognize that the water and sanitation unit consumption should focus more in the users’ demand and participation as a base for sustainability. In that sense, the principles considered that:

1) Water is an economic and social good and it shall be administrated as such.

2) Water shall be administrated at the lowest appropriate level, with the users’ implementation in the planning and execution of the projects. Taking as a reference the definition of water and sanitation sustainability as “the maintenance of an acceptable level of water supply service throughout the useful lifetime or design lifetime of the water supply system”, and considering the Dublin principles, the Water and Sanitation Program, PNUD/World Bank proposed the demand driven approach as an strategy to improve the sustainability of the services (Sara J. et. al., 1998).

The World Health Organization (WHO, 1995) defines a sustainable system as that the system works efficiently, has a surplus monetary benefit (if possible), operates to its full capacity and produces sanitary and socio-economic benefits in a permanent manner. Furthermore, the WHO states that the key elements for sustainability are related to the creation and maintenance of conditions that assure the technical, financial and social success of the projects.[10]

With these concepts defined, it is noted that one of the main factors to assure the systems’ sustainability is the existence of the affordability- and willingness-to-pay the fees of the families benefited by the project, The influence of the following aspects should also be considered:

[9] Evaluation of Rural Populated Centers With Water and Sanitation Services, carried out the year 2001 by the COWATER International Inc. consulting firm for the Peruvian Government request.

[10] “Sustainability Study in 104 rural water systems” PAS – BIRF, with the collaboration of Oscar Castillo and Rafael Vera. The study was carried out within the 1999’s first semester, in coordination with the Water and Sanitation Sectorial Committee members, mainly: CARE, ADEAS at Cusco, ADEC at Piura, ITDG, APRISABAC, SUM CANADÁ and FONCODES.

4.16.1 Institutional Arrangements

The Program estimates that within the existent institutional framework of the sanitation sector, the necessary institutional arrangements will have been made so that all the Program's stages can be executed, from pre-investment, investment, and operation and maintenance, which includes the administration of improved and /or restored or built water and sanitation systems, which will be in charge of the community organizations. These arrangements involve the participation of the following entities to be involved with the Program:

1) DNS: As the Program's formulating unit, this entity is committed since the *Perfil's* formulation stage, and the revision of the Feasibility Study, as well as, by proposing a specific framework for the sustainability of the sanitation services in the rural Amazon area, encouraging the participation of the community organizations (JASS or Committees) that will be created and/or strengthen as part of the activities of the Program's execution.

2) PAPT: It is constituted and designated as the executing unit of the Program, by mandate of the disposition that approves its operational manual. It shall be organized to support the tasks of coordination, monitoring and administration of contracts that the execution of the Program will require, since by delegation of powers it is the PAPT's duty to declare the "viability" of the projects so they may proceed to the stage of execution or investment. The PAPT shall create a specific team to perform its duties as the management unit for the Program. The strengthening and training of the personnel for the programming, execution and monitoring of the Program in all the stages has been planed as one of the activities of Component 3 of the Program .

3) JICA: It will participate as the financing entity of the external resources of the Program, which will be co-financed with the national government and with the contribution of local municipalities and beneficiaries. JICA has financed the Program's *perfil* studies and the present Feasibility Study.

4) Municipalities: The participation of the local governments is required in the implementation process of the Program and for the supervision and technical assistance to the community organizations that will be formed and/or fortified for the systems administration. In case that the municipality itself will be in charge of the administration, as the regulatory framework indicates, this municipality should constitute the project management unit with this specific task and this unit should be in charge of its accounts.

5) Community Organizations: They will be in charge of the administration, operation and maintenance of the sanitation services.

4.16.2 Regulatory framework

For the pre-investment stage of the project 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 PAPT.

For the execution stage of the Program the following documents are applicable: i) Loan agreement between the MVCS and JICA, ii) Guidelines of acquisitions for ODA loans from Japan iii) Guidelines for contracting consulting for 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 current regulations[11], which establishes that in the rural area, the community organizations are to be in charge of administrating operating and maintaining the sanitation services, while the district municipalities, among other functions will supervise, control and provide technical assistance to such community organizations The norm also indicates that in such ambit, the compensation that the users give for the sanitation services in the rural area shall be denominated "family fee", which shall cover at least the costs of administration, operation and maintenance of the sanitation services, the replacement of parts and restoration of the facility.

It was also mentioned that the municipalities organizational law (*Ley Organica de Municipalidades,* Ley Nº 27972*)*, in its article 80º defines as one of the functions of the provincial municipalities, the provision of rural sanitation services when these cannot be Provided by the district municipalities or rural populated centers; and among the district municipalities functions, to provide rural sanitation services.

Consequently, the Program's actions and the required institutional arrangements that are supported by the current regulatory framework for the execution and operation stage of each one of the projects.

4.16.3 Management Capacity

> "*A system will be sustainable when the capacities at a community level and the access to a suitable technology in a healthy territory in terms of water are conjugated in an efficient way considering the potentials and limitations that the legal and institutional framework generates*"[12].

The rural experience in Honduras, mentioned here, also indicates

> "*The appropriation or sense of ownership of the system is strongly influenced by the management mechanisms, in general terms the maintenance is the plumber's (operator) responsibility, and the*

[11] Art. 169º de la Ley N° 26338, TUO de la Ley General de Servicios de Saneamiento, por DS 023-2005-VIVIENDA, y Arts. 4º y 183-A° de la Ley N° 26338, modificada por DS 031-2008-VIVIENDA

[12] Sustainability analysis of 43 water systems in the rural area of Honduras. Rural Aqueducts Studies 2004 (PAS, COSUDE)

community participates of the construction works based on specific contribution percentages in labor, which causes the importance given to the system by the population to diminish as time passes by."

Those experiences correspond with the ones already lived in the country, so in order to generate an adequate management capacity, it has been planned to establish a complete social implementation program that seeks to support the local governments, the community organizations, and the community's population, in the creation and strengthening of capacities in community organization, planning and management, and administration, operation and maintenance of the services; as well as in the modification of the population's habits and hygiene practices, through sanitary education.

In each locality a series of activities are being considered, such as:

- Meetings with local authorities
- Workshops for the organization of the community organizations for service administration
- Training in water management
- Promotion of community participation where the importance and valuation of water will be emphasized
- Organization for community self-management; and
- A sanitary education program from the pre-execution stage throughout the execution and post-execution stages.

The component of social implementation for sustainability is transversal to the whole project cycle, and shall be understood as a formative process that seeks to promote a democratic and participative learning, linking theory with practice, action – reflection – action and local prominence; Moreover, significant learning that favors the local appropriation process, will be sought to be generated particularly in women, as well as the promotion of a social co-responsibility regarding the contribution of the government and the community and the practice of their civic rights and duties.

The experience of the last two years has demonstrated that the sustainability of the water and sanitation services, is not only a matter of well-designed facilities with a low or zero cost for the population; its valuation and/or social profitability, guides us to incorporate the social aspects to the works, with efficiency, regarding the organization's strengthening and the local capacity building.

The challenge of accomplishing the sustainability of the project and therefore assure its long-term profitability, has caused an increasing search of strengthening of the social component; the development of capacities through capacity-building and/or educational programs is a part of the institutional approach in the framework of the fight against poverty; such approach considers that an active, complete and committed participation of the population will help to promote the sense of ownership and the sustainability of the services. With that purpose, it is decisive to consider the endogenous capacities of the community, their knowledge, believes and values so that these can be strengthened and become tools for their development; therefore, preparing them to assure an adequate administration, operation and maintenance of the system, throughout the target period of the project.

4.16.4 Coverage of the administration, operation and maintenance costs

The legal norms indicate that the family fees to be paid in retribution for the services shall cover at least the administration, operation and maintenance costs, as well as the costs of replacement of parts and rehabilitation of the facilities, in order to make these services self sustainable after receiving the subsidy to the investment.

However, with the information gathered in the socio-economic surveys carried out in the sample localities of the Program regarding the fees the future users would pay, and considering the costs of operation of the projected facilities operation, in many cases is not possible to comply strictly with these regulations, mostly due to the little value this population currently gives to potable water consumption, but also because of the poverty level that persists in the area and the low family incomes[13].

It is pertinent to consider the recommendations of the World Bank, which in its recent publication “Guidance Notes on Services for the Urban Poor – A Practical Guide for Improving Water Supply and Sanitation Services”, august 2009, recommends:

[13] See paragraph 3.3.1 of the present feasibility study.

The general subsidies to the operations and investments in general works usually benefit the rich more than the poor, unless the rates are structured to assure that only the poor will be benefit with the subsidies. In general, subsidies shall be directed to the poor and should be limited and temporary. To subsidize investment and/or connections in poor neighborhoods is better than subsidizing the monthly consumption, since the first has a directed scope and also a limited time, and generally it is enough to assure that the poor get connected and stay connected. Many studies show that the poor have willingness to pay fees that cover the total cost for the water supply systems operation and maintenance.

Appling this rate not only promotes the financial viability of the services; but also helps the poor to become legitimate users and have a more authorized voice..If the subsidies to consumption are going to be kept for an undefined period of time, the financial source should be reliable and it should not jeopardize the financial viability of the public service.
…
A total or partial subsidy to the investments can be justified in the poor urban communities as long as the user can afford to pay fees that cover the operation and maintenance costs (O&M). There are many cases that prove that poor people have willingness pay and also affordability to pay at least a part of the water supply investment cost, that is why the subsidies do not need to cover the total cost of the capital and neither should it be assumed that these will be necessary in all the cases. There are real benefits associated to asking the users to contribute with something, even if it is symbolic, to the investment cost, because this motivates them to an active commitment in the planning process.

This is why, following the recommendations of the World Bank and the sector's policies for the fight against poverty, in this Program the possibility of applying subsidies to the operation and maintenance of the systems is not considered, but it is only considered for the investment or the replacement of equipment and materials

Tables Nº 4.16.4-1 and 4.16.4-2 show the projected administration, operation and maintenance (AOM) costs for the localities of the sample, classified per conglomerate and by region, indicating the type of system proposed for water supply and if a sewerage system is included (included only in some localities). The tables also indicate the family fee, the possible annual collection and the surplus or deficit resulting from the collection of this fee, its comparison with the average family income, and with the current fee in the cases where a potable water system is available.

In the localities of Conglomerate C-1, which are all in the Low Forest region and whose proposed water supply systems are mostly by pumping, with electric-mechanic gear that works with electricity, power generators or manual pumps, the proposed water service family fees vary from S/ 4.05 to S/ 12.24 per month and the percentage relation with the family income varies between 0.6 y 2.6%.

C1	Fee	Income	Relation
Maximum	12.24	476	2.6%
Minimum	4.05	662	0.6%

In Conglomerate 2, whose systems are by gravity with or without a treatment process (except the locality of Posic, whose existing and proposed system is “pumping without treatment” (well)), the family fee for the water service varies between S/. 2.30 and S/. 10.26 per month and the percentage relation with the family income varies between 0.4% and 1.6%.

C2	Fee	Income	Relation
Maximum	10.26	660	1.6%
Minimum	2.30	528	0.4%

Table 4.16.4 -1: Potable Water Administration, Operation and Maintenance Costs – Conglomerate C-1

N°	**Locality**	**Average Population** (Year 1 to Year 20)	**Type of System**	**Type of Work**	**Cost of O&M Water** (Soles)	**Cost of O&M Sewerage.** (Soles)	**Users Number**	**Family Fee** (Soles/month)	**Family Income** (Nuevos Soles)	**Relation Fee/ Income**
1	Tutumberos	226	GWT	R – I	2,729		55	4.05	662	0.6%
2	Guadalupe	378	GWT	R – I	4,150		77	4.19	995	0.4%
3	Rumisapa	985	GWOT	I - E	8,368		225	4.93	527	0.9%
4	Churuzapa y la Marginal	814	GWT	I - E	7,770		159	4.08	408	1.0%
5	Palestina	276	PWOT	I - E	5,033		60	7.71	671	1.1%
6	Misquiyacu	519	GWOT	I - E	5,313	3943	121	6.38	309	2.1%
7	Tres Islas	276	PWOT	C	5,828		57	8.09	503	1.6%
8	Sudadero	305	PWOT	I	6,239		52	12.21	403	3.0%
9	San Francisco	2,228	PWOT	R - E	19,222		267	6.56	860	0.8%
10	Sharara	395	PWOT	C	10,825		77	11.29	417	2.7%
11	Curiaca	597	PWOT	C	9,194		85	9.13	363	2.5%
12	Cahuide	558	PWOT	C	4,433		100	5.81	591	1.0%
13	San Juan de Puritana	522	PWOT	C	4,288		77	5.95	305	2.0%
14	Amazonas	428	MP	C	5,980		70	8.46	230	3.7%
15	20 de Enero	269	MP	C	3,693		53	9.31	213	4.4%
16	San Pablo	224	MP	C	4,177		57	7.47	235	3.2%
17	Tarapoto	257	MP	C	3,693		51	12.24	476	2.6%
18	Panguana	428	MP	C	6,215		75	9.43	303	3.1%
19	Lupuna	349	MP	C	4,535		70	8.02	175	4.6%
20	Apayacu	283	MP	C	2,749		56	5.96	532	1.1%
21	Buen Jesus de Paz	403	MP	C	3,587		66	7.12	522	1.4%
22	Huanta	855	PWOT	C	7,591		152	4.92	570	0.9%
23	Santa Amelia	291	MP	C	4,684		52	11.11	542	2.1%

G-W-T: Gravity with Treatment P-WO-T: Pumping without Treatment R: Rehabilitation E: Expansion
G-WO-T: Gravity without Treatment MP: Manual Pump M: Improvement C: Construction

Source: JICA Study Team(2010)

Table 4.16.4-2: Potable Water Administration, Operation and Maintenance Costs – Conglomerate C-2

N°	Locality	Average Population (Year 1 to Year 20)	Type of System	Type of Work	Cost of O&M Water (Soles)	Cost of O&M Sewerage. (Soles)	Users Number	Family Fee (Soles/month)	Family Income (Nuevos Soles)	Relation Fee/ Income
1	Puerto Naranjitos	781	GWT	I - E	8,064	4,494	166	6.17	481	1.3%
2	Naranjitos	1,038	GWT	I - E	9,239	6,739	215	6.60	465	1.4%
3	Misquiyacu Bajo	283	GWT	I - E	4,994	0	69	5.88	444	1.3%
4	San Jose Bajo	411	GWOT	I - E	2,956	0	99	2.30	528	0.4%
5	Casual	250	GWT	C	2,797	0	57	3.80	491	0.8%
6	Cielachi	222	GWT	I - E	2,749	0	51	4.50	583	0.8%
7	Lonya Chico	468	GWT	I - E	5,686	2,443	117	5.80	542	1.1%
8	Olto	672	GWT	I - E	5,948	5,214	169	5.80	349	1.7%
9	La Huarpia	1,161	GWT	I - E	6,294	0	211	4.67	478	1.0%
10	Posic	2,188	PWOT	I - E	30,828	14,340	353	10.26	660	1.6%
11	Barranquita	492	GWT	I - E	6,925	0	76	7.28	468	1.6%
12	La Florida	272	GWT	I - E	4,507	0	54	8.21	601	1.4%
13	Monte de Los Olivos	335	GWOT	I - E	2,871	0	46	7.98	436	1.8%
14	Pacchilla	572	GWOT	I - E	3,761	0	121	3.72	446	0.8%
15	Sapotillo	304	GWOT	C	2,525	0	59	2.49	468	0.5%
16	Sta Rosillo	506	GWOT	I - E	4,720	0	113	3.81	431	0.9%

G-W-T: Gravity with Treatment | P-WO-T: Pumping without Treatment | R: Rehabilitation | E: Expansion
G-WO-T: Gravity without Treatment | MP: Manual Pump | M: Improvement | C: Construction

Source: JICA Study Team (2010)

From this information, derived from the results of the *Perfils* of the sample projects, it can be noted that the AOM costs will be covered by the family fees calculated for the water system, whose average costs are shown in Tables Nº 4.16.4-3 and Nº 4.16.4-4.

Table 4.16.4-3: Conglomerate C-1 AOM Average Costs

Type of System	Average Cost of O&M Water (Soles)	Average Cost of O&M Sewerage (Soles)	Average Number of Users	Average of Family Fee (Soles/month)	Average of Family Income (Soles)	Relation Fee/ Income
MP	4,368		61	8.79	359	2.5%
PWOT	8,072		103	7.96	520	1.5%
GWT	4,883		97	4.11	688	0.6%
GWOT	6,841	3,943	173	5.66	418	1.4%

Source: JICA Study Team (2010)

Table 4.16.4-4: Conglomerate C-2 AOM Average Costs

Type of System	Average Cost of O&M Water (Soles)	Average Cost of O&M Sewerage (Soles)	Average Number of Users	Average of Family Fee (Soles/month)	Average of Family Income (Soles)	Relation Fee/ Income
MP	-	-	-	-	-	-
PWOT	30,828	14,340	353	10.26	660	1.6%
GWT	5,720	4,723	119	5.87	490	1.2%
GWOT	3,367		88	4.06	462	0.9%

Source: JICA Study Team (2010)

The costs of operation and maintenance of the sanitation systems have not been included in the family fees since those systems are based on individual solutions that will be maintain by the users and will not affect the cash flow of the community organization. However, it is convenient to consider what the World Bank published on March 2008, mentioning sanitation benefits, with concepts that are not being quantified in the economic evaluation of each locality's projects:

Sanitation saves money

A better sanitation increases the elementary school registrations, reduces diseases, allows children to miss fewer school days, increases productivity among adults, brings security to women and diminishes the contamination of water sources.

It is estimated that the cost of environmental and sanitary degradation due to the lack of water and sanitation services exceeds 1% of the GDP in Colombia, 0.6% in Túnez and 1.4% in Bangladesh. The lack of sanitation causes economic losses of as much as or even higher than US$9,000 million per year in Camboya, Indonesia, Filipinas and Viet Nam together, sustains a new WSP study called *Economic Impacts of Sanitation in Southeast Asia* (pdf).

Sanitation is a neglected aspect of development in the countries that lack of resources. The most devastating effect of the lack of sanitation are the increasing of risk of getting an infectious disease and die at an early age, which as a whole represent more than US$ 4,800 million or US$12 per capita per year, according to the study.

The access to sanitation, good hygiene practices and potable water could save the life of 1,5 million of children per year.

The lack of sanitation also contributes considerably to the contamination of the water, increases the cost of having potable water within the households and having the availability of fish in rivers and lakes.

Source: ***Economic Impacts of Sanitation in Southeast Asia***, World Bank, March 20, 2008
Permanent URL for this page: *http://go.worldbank.org/CPFI4GTE90*

4.16.5 Participation of the Beneficiaries

Since the establishment of the process to select the localities that will participate in the Program, one of the set requirements is that the locality had expressed their willingness to participate in the Program, and that as a consequence that decision the respective community organization has been constituted. This organization, which shall be formed by the community, will be in charge of administrating, operating and maintaining the systems, which they will receive from the District Municipality with that purpose. Likewise, the District Municipality will receive the constructed facilities from the National Government, through the PAPT, to be responsible for their administration. The verification of the existence of this willingness is reflected in the creation of these community organizations in all of the localities of the sample, except in one where the municipality will assume the administration. The summary with the data of the creation of each community organization was shown at Table 3.3.1- 24.

At the operation stage, it is the municipality's responsibility to watch over the services sustainability, to provide technical assistance and supervise the management of the community organizations within its jurisdiction, which is why it should support them with technical and administrative advice, and if necessary it could even contribute to their funds in case of emergencies, especially for the replacement of pumping gear or other types of equipment that might be used for the water intake or the treatment process.

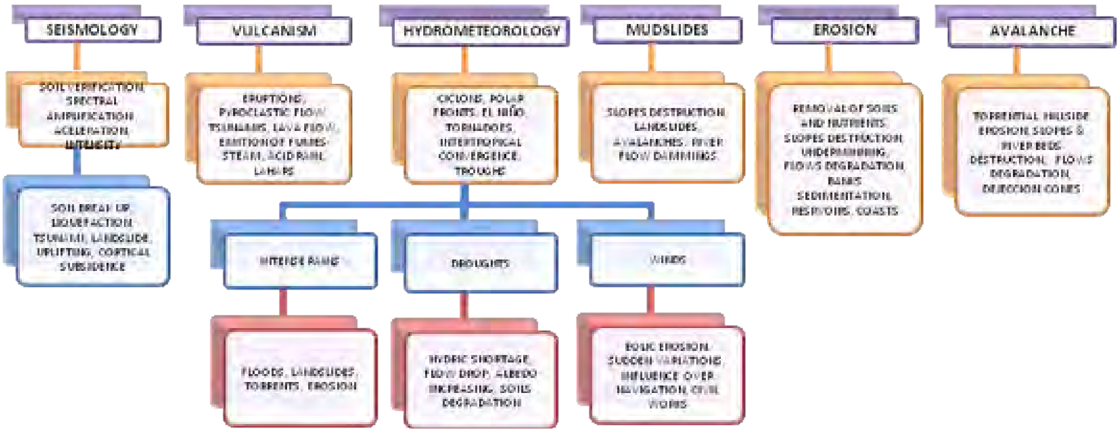
The strengthening and capacity building to the community organization and the community is also planned for the different stages of the Program, as well as the Hygiene Education Component, as it is describe in each *Perfil* Studies of each locality's project,

After the analysis of the factors that have an effect on the sustainability of the water and sanitation systems and considering the measures and activities that will be implemented in each one of the projects that are part of the Program, it is concluded that these systems will be sustainable during the useful life or design period of the projected facilities

4.16.6 Vulnerability of the Program

The Water Supply and Sanitation Improvement Program for the Rural Amazon Area consist in the execution of activities pertaining to social implementation and the construction or improvement of facilities to provide people with water and sanitation services to the population of the Amazon Area. All of these components are exposed to some degree of risk in face of eventual dangers, especially natural threats.

The Natural Threats



(Source: Mora, 1995)

The National Institute of Civil Defense (INDECI: *Instituto Nacional de Defensa Civil*), is the central governing and conducting organization in charge of the organization of the population, and coordination, planning and control of Civil Defense Activities. INDECI's objective is to avoid or mitigate the loss of human lives, material goods and the deterioration of the environment as a consequence of the manifestation of natural or technological dangers in any area of the national territory, which may become an emergency or disaster threatening the sustainable development of the country. Some of its functions are to provide emergency attention giving immediate support to the populations affected by disasters and to lead and conduct the necessary activities to generate calmness in the population.

The vulnerability is the degree of weakness or exposure to an element or group of elements when facing a natural or anthropic danger of a specific magnitude. Is the facility with which an element (infrastructure, house, productive activities, organization level, alert systems and Political institutional development, among others), may suffer human or material damages. The following vulnerability types have been established: environmental and ecological, physical, economic, social, educational, cultural and ideological, political and institutional, and scientific and technological.[14]

The risk management, whose sense is the anticipated reduction of the losses that disasters could generate in the future; it is defined as the process to identify, analyze and quantify the probabilities of losses that a disaster may cause, in order to implement the corresponding measures to prevent, correct and reduce such losses.. It is INDECI's role to apply the non-structural measures that pertain to the action plans for territorial organization, awareness-raising and planning for the reduction of risks in the geographical and sectoral scope of the Program.

The structural measures are part of the engineering designs of each project, in which the possibility of important threats have been considered, which are 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 that are adequate and when applied reduce the vulnerability.

Other types of natural threats such as hurricanes and volcanoes have not been considered, nor forest fires due to its low incidence in the area. The case of drought has not been considered either due to the small volumes of water required for each project, neither the ones of socio-natural origin, which are unlikely since they are produce by the combination of purely natural effects with the implementation of human actions, which turn the threat into a disasters, or that unnecessarily aggravate them.

However, the Program is exposed to the risk of the recurrence of conflicts originated from the social demands of the Amazon population, the same that reached a critical peak on June 2009, and that caused many fatalities among policemen and villagers. In the event of a similar situation, the implementation plan shall be reconsidered to avoid the areas in conflict, in order to protect the safety of the personnel in charge of the Program's actions. Possible delays may occur.

There are factors in this area that contribute to the social discontent, such as poverty, lack of safety, dependence, illiteracy, social disparity, unemployment, inflation, debt and environmental degradation. In the rural areas, poverty promotes deforestation and unsustainable agricultural practices. Poor people have less access to resources that can help

[14] Basic Manual for the Risk Estimation, INDECI

them recover from material loses and it is less likely for them to have any savings, insurance or credit access that may allow them to finance the cost of reconstruction. [15]

[15] Indu Abraham, 2005, "Vulnerability of the Most Vulnerable", Inter-American Bank of Development.

4.17 Initial Environmental Examination

4.17.1 Introduction

The environmental impact assessment (EIA) has now fully been recognized as an important preventive tool for the preservation of natural resources and environmental protection. This environmental management tool is understood as a process of analysis for integration of the environment and the Program. The integration may offer advantages to both of the environment and the Program, though often only be evident in a long period of time. The advantage may be translated into savings in investment cost of works through encouraging more sophisticated designs being integrated with the environment; and also greater social acceptance of projects of the Program.

In other words, environmental impact assessments, prior to the implementation that may arise significant environmental impacts, will mainly aim at the incorporation of the recommendations into the Program; the recommendation that may be proposed based on the consideration of the significant, elements, characteristics and process of biophysical and socio-economical aspects due to the project implementation. Thereby, the EIA will facilitate the decision on whether implementation should be recommended without conditions, or be recommended with conditions or rejected.

Probably, the most significant characteristic, from the socio-environmental point of view, is the appearance of a new and non-native eco-system to the designated place, which implies the modification of the previous eco-system. This artificial change will cause changes of other natural systems connected with it.

On the other hand, the overall program objective is to improve health and quality of life of rural populations of the five (5) Amazon departments: Amazonas, San Martin, Loreto, Madre de Dios and Ucayali, through improvement of water supply and sanitation conditions.

The Program will reduce the waterborne diseases of the population of the Amazon rural area, particularly the episodes of intestinal infectious diseases in children under five (5) years of age within the Program scope of 1,500 localities. For this reason, the scope of the Project has socio-economic relevance, as services of water supply and sewerage shall favor inhabitants of diverse localities and their activities in the area of local influence, as with other populations that will be served by these future services, without affecting local development.

It is again emphasized that the environmental impact assessment (EIA) of the Program is directed to having the basic objectives of identifying, predicting, and interpreting the beneficial and/or adverse impacts that may be considered to manifest themselves at the implementation stage of the project; thereby the environmental considerations resulted from the environmental assessment are to be incorporated into the planning, design and execution of the works of the Program.

For that reason, the fundamental objective of the environmental evaluation is to incorporate environmental considerations into the planning, formulation, and execution of the Program works, by means of the development of Environmental Impact Declarations (in Spanish, *DIA = Declaraciones de Impacto Ambiental*) applied to each one of the Program´s projects, with an emphasis on evaluating environmental impacts during the construction and operation stages; as well as proposing control measurements and their respective implementation that counteract the adverse environmental impacts and reinforce favorable impacts, oriented to the population´s well-being.

For these reasons, in order to define preventative measures of mitigation and environmental control, a large part of the test carried out in the study is oriented towards applying the methodologies of identifying and evaluating environmental impacts, which has permitted the establishment of potential environmental impacts, for which corrective measures shall be established in order to avoid the deterioration of the environment in the zone of study (departments of Amazonas, San Martín, Loreto, Madre de Dios and Ucayali).

4.17.2 Legal Environmental Framework

The article No. 25 of the General Environmental Law (*Ley General del Ambiente Ley N° 28611*) establishes the definitions and the areas for the studies for EIA (environmental impact assessment). The law indicates that the studies are the environmental management tools that should include the descriptions of the proposed activities and foreseeable direct or indirect influences against the physical and social environment, in short and long terms. Detailed regulations are defined by the Law of the National System of Environmental Impact Evaluation (SNEIA: *Ley del Sistema Nacional de Evaluación de Impacto Ambiental* N° 27446).

The Ministry of the Environment (MINAM: *Ministerio del Ambiente*) has been established to manage environmental policy formulation and to be in the position of the general supervisor over environmental policy, in accordance with the Legislative Decree N° 1013 (*Decreto Legislativo* N° 1013: Legislative decree that approves the Law of Creation, Organization, and Function of the Ministry of the Environment.)

Under the aforementioned general laws/regulations, sectorial regulations are provided by each sector. In accordance with this, each environmental impact assessment study is to be performed within a sector. Environmental impact studies will have to be examined by a governing organization within the sector.

Programs or projects that involve various sectors need to conduct environmental impact studies under the laws and regulations of the MINAM and it is the MINAM the responsible for the evaluation of the environmental impact studies for such multi-sectorial programs and/or projects.

4.17.3 Institutional Aspect

The Office of Environment (OMA: *Oficina del Medio Ambiente*) has been formed under the VMCS (Vice-ministry of Construction and Sanitation) of MVCS (Ministry of Housing, Construction and Sanitation). The OMA is the agency responsible for conducting the System of Evaluation of Environmental Impact (SEIA), at national level for the sanitation sector; and to formulate and implement policy guidelines, standards, plans, programs, projects, research and environmental initiatives of the sanitation sector.

The final proposal of "the Guideline to Environmental Assessment" is in the process of validation and is awaiting approval as a ministerial resolution.

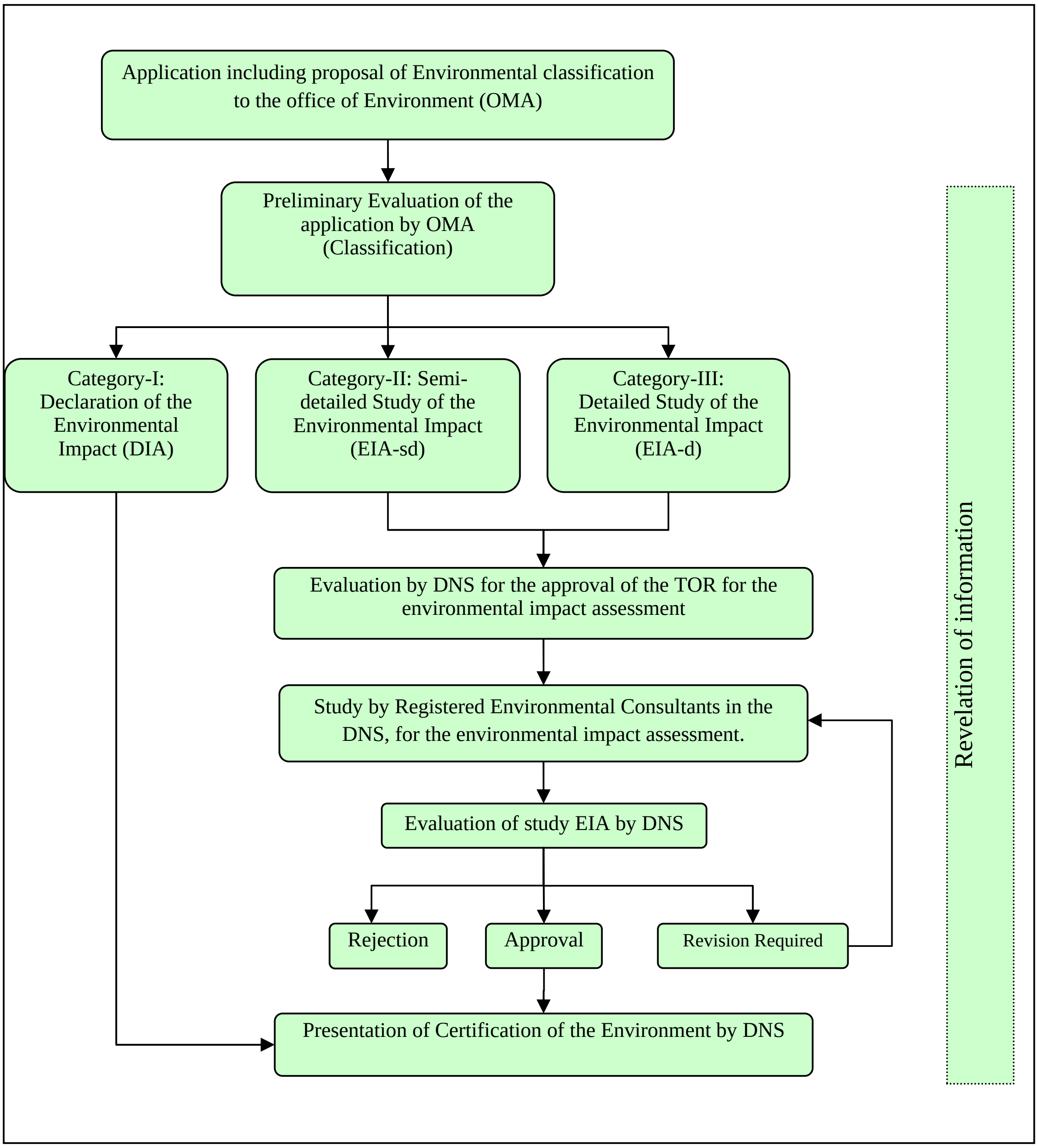
4.17.4 Procedures of Environmental Impact Assessment

According to the information from the OMA, the outline of the procedures of the environmental impact assessments is as follows. However, because the guidelines are currently in the process of formulation, the environmental impact assessment procedures have not yet been formally defined.

1) To submit the application for approval, including proposal of environmental classification is submitted to the OMA.
2) The OMA will evaluate the application and classify it into one of the following three categories:
   - Category-I: Declaration of the environmental impact (DIA)
   - Category-II: Semi-detailed study of the environmental impact (EIA-sd)
   - Category-III: Detailed study of the environmental impact (EIA-d)
3) A project classified as Category-I, will be given a declaration of environment impact (DIA). Thereafter, the project needs no further environmental impact studies.
4) On the other hand, a project classified as Category-II (EIA-sd) or Category-III (EIA-d), will need further semi-detail or detail environmental impact studies for approval.
5) Environmental impact studies for the projects classified as Category-II or –III are to be conducted by environmental consultants, who are registered with DNS as authorized consultants.

The flow chart showing the procedure is shown in the Figure N° 4.17.4-1.

Figure 4.17.4-1: Evaluation Procedure for Environmental Impact



Source: JICA Study Team (2010) based on the information from the OMA

4.17.5 Initial Environmental Examination (IEE)

The initial environmental examination will be described hereafter based on the guideline designated by JICA [16] (2004 then-JBIC).

(1) Categorization

The guideline categorizes the proposed project into the following three groups. It should be noted that a project categorized 'Category-A' will need an environmental impact assessment report.

Table 4.17.5-1: Categories

Category-A:
If it is likely to have significant adverse impact on the environment, a proposed project is classified as Category-A. A project with complicated or unprecedented impacts which are difficult to assess is also classified as Category-A. The impact of Category-A projects may affect an area broader than the sites or facilities subject to physical construction. Category-A, in principle, includes projects in sensitive sectors (i.e., sectors that are liable to cause adverse environmental impact) or with sensitive characteristics (i.e., characteristics that are liable to cause adverse environmental impact) and projects located in or near sensitive areas. Borrowers and related parties shall submit Environmental Impact Assessment (EIA) reports for Category A projects.
Category-B:
If its potential adverse environmental impact is less adverse than that of Category-A projects, a proposed project is classified as Category-B. Typically, impacts are site-specific, few of them are irreversible and in most cases normal mitigation measures can be designed more readily. If an EIA procedure has been conducted, the EIA report may be referred to, but this is not a mandatory requirement.
Category-C:
If it is likely to have minimal or non-adverse environmental impact, a proposed project is classified as Category-C. For projects in this category, environmental reviews will not proceed beyond screening.
Source: Guidelines for Confirmation of Environmental and Social Considerations (JBIC, April 2002)

(2) Screening

The guideline indicates the items to be examined for the categorization (screening). The Feasibility Study evaluated the possible impacts, in accordance with the items as shown in the Table 4.17.5-2.

[16] The JICA guideline is referred because this project (Program) is meant to be implemented with funding from JICA.

Table 4.17.5-2: Screening- Categorization

	Issues to be Evaluated (Based on the guideline)	Results	Rank
1.	Does the program have possibilities of causing serious adverse and/or un-desirable impacts on the environment?	Not anticipated	3
2.	Is the program one that has no precedent examples to evaluate/estimate possible impacts on the environment?	Many experiences of projects in the past; environmental evaluation is possible	3
3.	Do the physical impacts made within the project site spread to areas outside of the project site?	Each project will be of small scale. No widespread impacts beyond the project site will be expected.	3
4.	Does the Program include the following issues?		
	A. Is the Program categorized in the 'Sensitive Sectors' List of the guidelines?	No sectors listed in the guideline are included.	3
	B. Does the Program involve the following characteristics?		
	(1) Large-scale involuntary resettlement	Not included	3
	(2) Large-scale groundwater pumping	Not included	3
	(3) Large-scale land reclamation, land development and land clearing	Not included	3
	(4) Large-scale logging (forest clearing)	Not included	3
	C. Are the Projects in the following areas or their vicinity?		
	(1) National parks, nationally-designated protected areas (Coastal areas, wetlands, areas for ethnic minorities or indigenous people and cultural heritage, etc. designated by the national government)	National Parks, Reservation zones, Protected Forests are located in the areas. Ethnic minorities or indigenous people are present.	1
	(2) Are the projects areas considered to require careful consideration by the country or locality?		
	(Natural environment)		
	A. Primary forests or natural forests in tropical areas	In the project site: no. Around project site: possible	2
	B. Habitats with important ecological values	In the project site: no. Around project site: possible	2
	C. Habitats of rare species requiring protection under domestic legislation, international treaties, etc.	In the project site: no. Around project site: possible	2
	D. Areas in danger of large-scale salt accumulation or soil erosion	Not anticipated	3
	E. Areas with a remarkable tendency towards desertification	Not anticipated	3
	F. Others	Not anticipated	3
	(Social Environment)		
	A. Areas with unique archaeological, historical or cultural value	Not anticipated	3
	B. Areas inhabited by ethnic minorities, indigenous people or nomadic people with traditional ways of life and other areas with special social value	Areas where ethnic minorities or indigenous people inhabit	1
	C. Others	Not anticipated	3
Rank: 1=Relevant, 2=Possibly relevant, 3=Irrelevant;			

Source: JICA Study Team (2010) based on the Guideline (JBIC, April 2002)

In the target areas, there are nationally-designated protected areas such as national reserves, reservation zones, protected forests designated by the national system of natural areas protected by the government (*Sistema Nacional de Areas Naturales Protegidas por el Estado*). And, particularly in the Low Forest (*Selva Baja*), primary rain forests prevail; rare species may exist; and a number of ethnic minorities inhabit the land.

However, considering the nature and the characteristics of the projects for rural water supply and sanitation improvement, none of such large scale adverse impacts onto the environment can be anticipated; neither complicated or unprecedented impacts which are difficult to assess. Impacts that may affect an area beyond the sites or facilities subject to physical construction have not been foreseen, either. Therefore, and in agreement with the Office N° 126-2009-DGPNIGA/DVMGA/MINAM issued on November,13th of 2009 as attached, “that under the protection of the article 32° of the environmental impact national system law regulations; the MVCS could consider the preparation of only one environmental impact assessment”, in the understanding that significant environmental impacts will not be generated, not being necessary the elaboration of an strategic environmental impact assessment.

The DNS indicated, through its Office Memorandum No. 076-2010-VIVIENDA/VMCS-DNS issued in January 13, 2010 as attached, the procedure to follow for the environmental evaluation of the water and sanitation program during the pre-investment stage and the program implementation. Based on the indicated procedure, the environmental description form for the Programs has been prepared, as attached in Appendix 12.

During the Program’s implementation stage (presentation of the project’s EIAs), the systematization of the projects in each conglomerate is recommended, for which the following classifications shall be considered: i) natural protected areas and community reservations, ii) accessibility of the populated center or villages and iii) proximity among the localities (See Appendix 12).

(3) Identification of possible impacts and mitigation measures

Possible impacts on the environment and its mitigation measures are evaluated mainly in accordance to the guidelines. The summary of evaluations is shown in the Table 4.17.5-3 below.

Table 4.17.5-3: 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* Studies; D: Conceivable impacts are not anticipated or negligible; (+): Positive impacts are anticipated					

Source: JICA Study Team (2010)

(4) Initial Environmental Examination

i) Impacts on Social Environments

The program will be implemented based on the demand-driven approach.

Before the decision of project implementation in a locality is made, close and intimate consultations with the people living there will be conducted by a consultant team during the pre-investment stage, to confirm their requirement and demand through the social mobilization. Various issues may be anticipated, such as those regarding land use, local conflict of interest, water rights and so on. Those issues will be identified during the mobilization stage and shall be resolved, in order to minimize possible impacts on social environments. If such issues should not be resolved, there will be a no-project option.

On the other hand, the project should allow better quality of life by providing the beneficiaries with potable water. It will reduce waterborne diseases; it may create extra time for women and children, by freeing them from daily work of water-fetching; and, further, it may strengthen the institutional and organizational capability through the activities of the community organization.

Considering the above, the program will have positive impacts on the social environment.

ii) Impacts on the Natural Environment

The target localities are located within the Amazon river basin. This area is well known as an area rich in rainforest. Deforestation may be a subject of discussion, when constructions of any type are to be implemented in such rainforest areas.

In principle, the projects are to be implemented in localities of small scale with a population between 200 and 2,000. There will be no large scale facilities that may cause considerable scale of disturbance of natural condition: because most facilities will be constructed in inhabited areas. There may be small-scale disturbance against the ecosystem, landscape, etc. However, the design will have to be made so that environmental impact remains minimal within the areas where facilities are to be constructed.

Compared with the expected benefits from the implementation of the water supply and sanitation projects, adverse impacts on the natural environment will be minimal.

iii) Pollution

During the construction stage, there may be noise, vibration or accidents. Those would be temporary phenomena that would not last for long. Installation of latrines or drainage systems will minimize contamination of the natural environment and will lead to improved living conditions. No significant and lasting pollution is to be anticipated.

iv) Alternative Options

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.

v) Conclusions and Recommendation

There may be environmental impacts due to the implementation of the Program. However, the Program has been designed so that the social and environmental negative impacts should be minimal. On the other hand, the benefits from the Program for the inhabitants of the target area will be significant. 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).”

However, needless to say, maximum care shall be taken for the environmental consideration; not only when the *Perfil* Studies are conducted, but also throughout the project cycle.

Figure 4.17.5-1: Map of Protected Natural Areas

Source: National Institute of Natural Resources (*Instituo Nacional de Recursos Naturales*)

Table 4.17.5-4: National System of Natural Areas Protected by the Government

MINISTERIO DE AGRICULTURA
INSTITUTO NACIONAL DE RECURSOS NATURALES
INTENDENCIA DE AREAS NATURALES PROTEGIDAS

INRENA

SISTEMA NACIONAL DE AREAS NATURALES PROTEGIDAS POR EL ESTADO - SINANPE

CATEGORIAS	BASE LEGAL	FECHA	UBICACIÓN POLITICA	EXTENSION ha	ha / CATEGORIA
PARQUES NACIONALES (12)					**7967119,02**
CUTERVO	LEY Nº28860	05.08.06	CAJAMARCA	8214,23	
TINGO MARIA	LEY Nº15574	14.05.65	HUANUCO	4777,00	
MANU	D.S.Nº644-73-AG	29.05.73	CUSCO y MADRE DE DIOS	1716295,22	
HUASCARAN	D.S.Nº0622-75-AG	01.07.75	ANCASH	340000,00	
CERROS DE AMOTAPE	D.S.Nº0800-75-AG	22.07.75	TUMBES y PIURA	151561,27	
RIO ABISEO	D.S.Nº064-83-AG	11.08.83	SAN MARTIN	274520,00	
YANACHAGA CHEMILLEN	D.S.Nº068-86-AG	29.08.86	PASCO	122000,00	
BAHUAJA SONENE	D.S.Nº048-2000-AG	04.09.00	MADRE DE DIOS y PUNO	1091416,00	
CORDILLERA AZUL	D.S.Nº031-2001-AG	21.05.01	SAN MARTIN, LORETO, UCAYALI y HUANUCO	1353190,84	
OTISHI	D.S Nº003-2003-AG	14.01.03	JUNIN Y CUSCO	305973,05	
ALTO PURUS	D.S Nº040-2004-AG	20.11.04	UCAYALI Y MADRE DE DIOS	2510694,41	
ICHIGKAT MUJA - CORDILLERA DEL CONDOR	D.S Nº 023-2007-AG	10.08.07	AMAZONAS	88477,00	
SANTUARIOS NACIONALES (7)					**263982,06**
HUAYLLAY	D.S.Nº0750-74-AG	07.08.74	PASCO	6815,00	
CALIPUY	D.S.Nº004-81-AA	08.01.81	LA LIBERTAD	4500,00	
LAGUNAS DE MEJIA	D.S.Nº015-84-AG	24.02.84	AREQUIPA	690,60	
AMPAY	D.S.Nº042-87-AG	23.07.87	APURIMAC	3635,50	
MANGLARES DE TUMBES	D.S.Nº018-88-AG	02.03.88	TUMBES	2972,00	
TABACONAS NAMBALLE	D.S.Nº051-88-AG	20.05.88	CAJAMARCA	29500,00	
MEGANTONI	D.S.Nº030-2004-AG	18.08.04	CUSCO	215868,96	
SANTUARIOS HISTORICOS (4)					**41279,38**
CHACAMARCA	D.S.Nº0750-74-AG	07.08.74	JUNIN	2500,00	
PAMPA DE AYACUCHO	D.S.Nº119-80-AA	14.08.80	AYACUCHO	300,00	
MACHUPICCHU	D.S.Nº001-81-AA	08.01.81	CUSCO	32592,00	
BOSQUE DE POMAC	D.S.Nº034-2001-AG	01.06.01	LAMBAYEQUE	5887,38	
RESERVAS NACIONALES (11)					**3298711,97**
PAMPA GALERAS BARBARA D' ACHILLE	R.S.Nº157-A	18.05.67	AYACUCHO	6500,00	
JUNIN	D.S.Nº0750-74-AG	07.08.74	JUNIN y PASCO	53000,00	
PARACAS	D.S.Nº1281-75-AG	25.09.75	ICA	335000,00	
LACHAY	D.S.Nº310-77-AG	21.06.77	LIMA	5070,00	
TITICACA	D.S.Nº185-78-AA	31.10.78	PUNO	36180,00	
SALINAS Y AGUADA BLANCA	D.S.Nº070-79-AA	09.08.79	AREQUIPA y MOQUEGUA	366936,00	
CALIPUY	D.S.Nº004-81-AA	08.01.81	LA LIBERTAD	64000,00	
PACAYA SAMIRIA	D.S.Nº016-82-AG	04.02.82	LORETO	2080000,00	
TAMBOPATA	D.S.Nº048-2000-AG	04.09.00	MADRE DE DIOS	274690,00	
ALLPAHUAYO MISHANA	D.S.Nº002-2004-AG	16.01.04	LORETO	58069,25	
TUMBES	D.S.Nº046-2006-AG	11.07.06	TUMBES	19266,72	
REFUGIO DE VIDA SILVESTRE (2)					**8591,91**
LAQUIPAMPA	D.S. Nº045-2006-AG	11.07.06	LAMBAYEQUE	8328,64	
LOS PANTANOS DE VILLA	D.S. Nº055-2006-AG	1.09.06	LIMA	263,27	
RESERVA PAISAJISTICA (2)					**651818,48**
NOR YAUYOS COCHAS	D.S.Nº033-2001-AG	01.05.01	LIMA y JUNIN	221268,48	
SUB CUENCA DEL COTAHUASI	D.S.Nº027-2005-AG	27.05.05	AREQUIPA	430550,00	
RESERVAS COMUNALES (7)					**1753868,63**
YANESHA	R.S.Nº0193-88-AG-DGFF	28.04.88	PASCO	34744,70	
EL SIRA	D.S.Nº037-2001-AG	22.06.01	HUANUCO, PASCO y UCAYALI	616413,41	
AMARAKAERI	D.S.Nº031-2002-AG	09.05.02	MADRE DE DIOS y CUSCO	402335,62	
MACHIGUENGA	D.S Nº003-2003-AG	14.01.03	CUSCO	218905,63	
ASHANINKA	D.S Nº003-2003-AG	14.01.03	JUNIN Y CUSCO	184468,38	
PURUS	D.S Nº040-2004-AG	20.11.04	UCAYALI Y MADRE DE DIOS	202033,21	
TUNTANAIN	D.S Nº 023-2007-AG	10.08.07	AMAZONAS	94967,68	
BOSQUES DE PROTECCION (6)					**389986,99**
A.B. CANAL NUEVO IMPERIAL	R.S.Nº0007-80-AA/DGFF	19.05.80	LIMA	18,11	
PUQUIO SANTA ROSA	R.S.Nº0434-82-AG/DGFF	02.09.82	LA LIBERTAD	72,50	
PUI PUI	R.S.Nº0042-85-AG/DGFF	31.01.85	JUNIN	60000,00	
SAN MATIAS SAN CARLOS	R.S.Nº0101-87-AG/DGFF	20.03.87	PASCO	145818,00	
PAGAIBAMBA	R.S.Nº0222-87-AG/DGFF	19.06.87	CAJAMARCA	2078,38	
ALTO MAYO	R.S.Nº0293-87-AG/DGFF	23.07.87	SAN MARTIN	182000,00	
COTOS DE CAZA (2)					**124735,00**
EL ANGOLO	R.S.Nº0264-75-AG	01.07.75	PIURA	65000,00	
SUNCHUBAMBA	R.M.Nº00462-77-AG	22.04.77	CAJAMARCA	59735,00	
ZONAS RESERVADAS (10)					**3543286,40**
CHANCAYBAÑOS	D.S.Nº001.96-AG	14.02.96	CAJAMARCA	2628,00	
GÜEPPI	D.S.Nº003-97-AG	03.04.97	LORETO	625971,00	
SANTIAGO COMAINA	D.S Nº 023-2007-AG	10.08.07	AMAZONAS y LORETO	398449,44	
CORDILLERA DE COLAN	R.M.Nº0213-2002-AG	01.03.02	AMAZONAS	64114,74	
CORDILLERA HUAYHUASH	R.M.Nº1173-2002-AG	24.12.02	ANCASH, HUANUCO Y LIMA	67589,76	
PAMPA HERMOSA	R.M.Nº0275-2005-AG	12.03.05	JUNIN	9575,09	
PUCACURO	R.M.Nº0411-2005-AG	21.04.05	LORETO	637918,80	
AYMARA LUPACA	D.S.Nº003-2006-AG	21.01.06	PUNO	258452,37	
SIERRA DEL DIVISOR	R.M. Nº283-2006-AG	11.04.06	LORETO Y UCAYALI	1478311,39	
HUMEDALES DE PUERTO VIEJO	R.M. Nº 064-2008-AG	31.01.08	LIMA	275,81	
AREAS NATURALES PROTEGIDAS (63)				**18043379,84**	**18043379,84**
SUPERFICIE DEL PERU (ha)				**128521560,00**	**128521560,00**
% DEL PERU PROTEGIDO					**14,04**
AREAS DE CONSERVACION REGIONAL (3)					**150833,16**
ACR CORDILLERA ESCALERA	D.S.Nº 045-2005-AG	25.12.05	SAN MARTIN	149870,00	
ACR HUMEDALES DE VENTANILLA	D.S. Nº 074-2006-AG	20.12.06	LIMA	275,45	
ACR ALBUFERA DE MEDIO MUNDO	D.S. Nº 006-2007-AG	25.01.07	LIMA	687,71	
AREAS DE CONSERVACION PRIVADA (11)					**89295,30**
ACP CHAPARRI	R.M. Nº 134-2001-AG	27.12.01	LAMBAYEQUE	34412,00	
ACP CAÑONCILLO	R.M. Nº 0804-2004-AG	22.09.04	LA LIBERTAD	1310,90	
ACP PACLLON	R.M. Nº 908-2005-AG	15.12.05	ANCASH	12896,56	
ACP HUAYLLAPA	R.M. Nº 909-2005-AG	15.12.05	LIMA	21106,57	
ACP SAGRADA FAMILIA	R.M. Nº 1437-2006-AG	25.11.06	PASCO	75,80	
ACP HUIQUILLA	R.M. Nº 1458-2006-AG	01.12.06	AMAZONAS	1140,54	
ACP SAN ANTONIO	R.M. Nº 227-2007-AG	10.03.07	AMAZONAS	357,39	
ACP ABRA MALAGA	R.M. Nº 229-2007-AG	10.03.07	CUSCO	1053,00	
ACP JIRISHANCA	R.M. Nº 346-2007-AG	25.03.07	HUANUCO	12172,91	
ACP ABRA PATRICIA - ALTO NIEVA	R.M. Nº 621-2007-AG	18.10.07	AMAZONAS	1415,74	
ACP BOSQUE NUBLADO	R.M. Nº 032-2008-AG	17.01.08	CUSCO	3353,88	
SUPERFICIE TOTAL ANPS					**18283508,30**
% PERU PROTEGIDO TOTAL					**14,23**

Actualizado a enero 2008

Source: National Institute of Natural Resources (*Instituo Nacional de Recursos Naturales*)

4.18 Implementation Model and Project Cycle

4.18.1 Implementation Model

The projects of the Program will be implemented by the regional management units (RMUs) of the Water Supply and Sanitation Program for the Rural Amazon Area, and coordinated at the central level by the rural sanitation operational unit, which will act as the Program Management Unit (PMU), and is under the Water for All Program (PAPT).

In accordance with its policy of economic stimulation, the government has been implementing measures to maintain the dynamism of the economy through the promotion of employment and investment in basic public service infrastructure. The experience of FONCODES regarding the participation of the core executors (NN.EE.) for the implementation of public investment projects will be the basis of this modality of works execution. These organizations (NN.EE.) are granted legal capacity to contract and intervene in all the necessary actions for the execution of projects, subject to the norms that regulate the activities of the private sector.

The ability of the Ministry of Housing, Construction and Sanitation to execute works through the modality of core executors (NN.EE.) is regulated within the framework of the procedure established by the *Decreto de Urgencia* N° 085-2010-PCM[17].

The following table summarizes the participation of each concerned party according to the execution modality through core executors.

Table 4.18.1-1 Implementation Model (NN.EE.)

Project Cycle / Work Items	Pre-Cycle	Pre-Investment		Investment			Post-Investment
		Perfil	Soft Component	Project-Files (Detailed Design)	Execution of Works	Soft Component	Soft Component
Pre-investment Study, Detailed Design		Operating Consultant		Operating Consultant			
Execution of Works, Capacity Strengthening, NNEE Method			Individual Consultant		NNEE	Individual Consultant	Individual Consultant
Supervision		Supervising Consultant		Supervising Consultant	Individual Consultant	RMU/1	RMU/1
Program Management Regional Level	RMU	RMU		RMU	RMU	RMU	RMU
Program Management Central Level	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT

/1 Follow up and monitoring,

Source: JICA Study Team (2010)

[17] **Article 1. - Objective**
The purpose of the present norm is to dictate extraordinary and urgent measures for the regional and local governments to allocate resources during the 2009 and 2010 fiscal years in order to finance the execution of public infrastructure investment and maintenance projects through core executors, in the framework of the plan of economic stimulation to diminish the effects of the external economic crisis in the country. The entities of the national government will have the ability to apply such measures within their area of competence.

The execution modality through contractors is summarized in the following table:

Table 4.18.1-2 Implementation Model (Contractors)

Project Cycle / Work Items	Pre-Cycle	Pre-Investment		Investment			Post-Investment
		Perfil	Soft Component	Project-Files (Detailed Design)	Execution of Works	Soft Component	Soft Component
Pre-investment Study, Detailed Design		Operating Consultant		Operating Consultant			
Execution of Works, Capacity Strengthening, NNEE Method			Individual Consultant		Works Contractor	Individual Consultant	Individual Consultant
Supervision		Supervising Consultant		Supervising Consultant	Consulting Firm	RMU/1	RMU/1
Program Management Regional Level	RMU	RMU		RMU	RMU	RMU	RMU
Program Management Central Level	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT	PMU/PAPT

/1 Follow up and monitoring; Source: JICA Study Team (2010)

The Feasibility Study recommended that the Program should be implemented in three phases, which shall be organized depending on the resources that the MEF assigns to the MVCS and the Regional Governments and on the availability of external resources to be used with JICA.

It is recommended that Actors should be contracted for a period that covers the implementation stage of the Program, seeking an adecuate scale and having the following considerations in mind:

- Localities with common access routes or within a common basin shall be grouped together, which will allow contracted parties to optimize their resources for the efficient implementation of the works to be executed by them;
- Execution through the core executors, where simple technologies that NN.EE, may implement as appropriate; and where projects which are considered not attractive for contractors to participate;

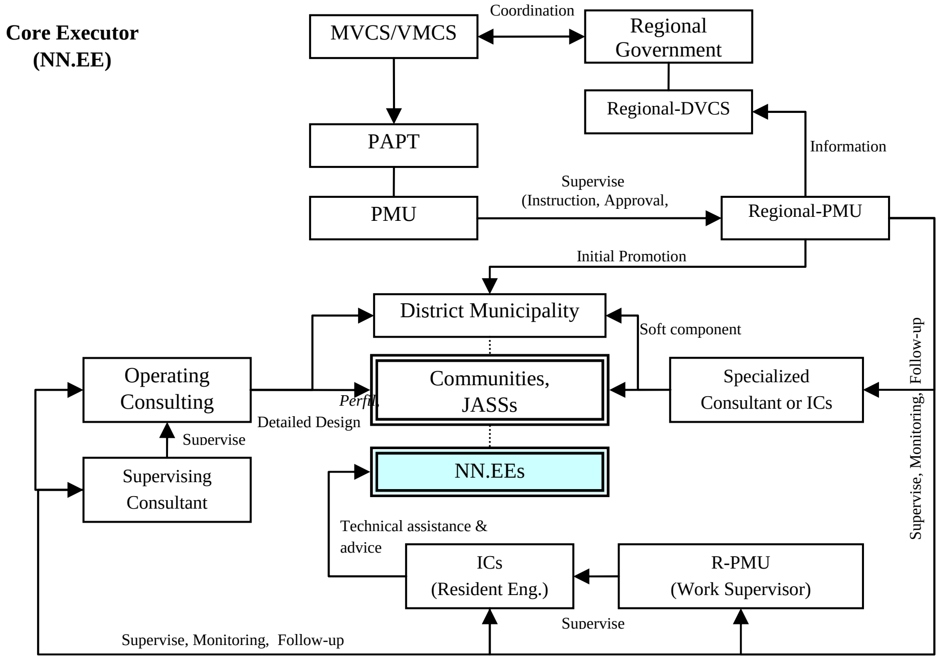
The outline described has been designed to require the management of the least number of contracts on the part of the PMU in the development stages of the *Perfil* and Technical Files (Detailed Design), and for this reason the proposal groups compatible processes wherever possible (*Perfil*, technical files).

The Individual Consultants shall parcitipate in intervention in the stages for works, hygiene education, capacity building for management, and strengthening of capacities of the district municipalities in the investment and post-investment stages.

The contracting processes for individual consultancies and their administration will be managed by the RMU.

A diagram of the relations between the actors that participate in the implementation in Components 1 and 2 is shown below, according to the proposed implementation mode:

Figure 4.18.1-1: Implementation Model and Responsibilities – Core Executors

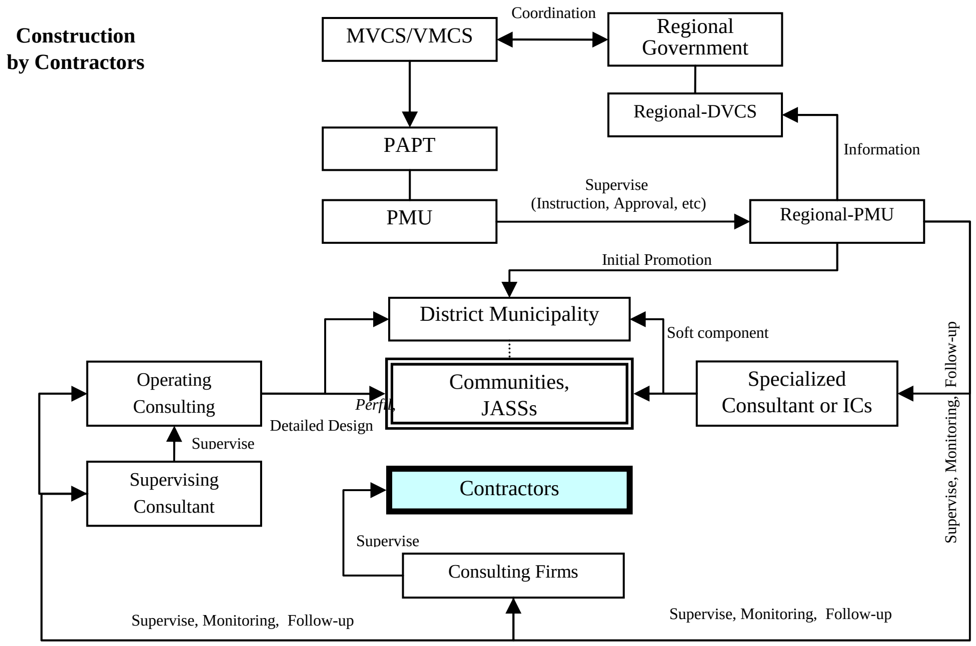


IC: Individual Consultant
DVCS: Department of housing, construction and Sanitation

Source: Prepared by PAPT (Oficio N° 685-2010-VIVIENDA/VMCS-DNS del 15.06.2010)
(Original in Spanish, translated by JICA Study Team (2010).

Source: Prepared by PAPT (Oficio N° 685-2010-VIVIENDA/VMCS-DNS del 15.06.2010).

Figure 4.18.1-2: Implementation Model and Responsibilities - Contractor of Works



IC: Individual Consultant

DVCS: Department of housing, construction and Sanitation

Source: Prepared by PAPT (Oficio N° 685-2010-VIVIENDA/VMCS-DNS del 15.06.2010)
(Original in Spanish, translated by JICA Study Team (2010).

Source: Prepared by PAPT (Oficio N° 685-2010-VIVIENDA/VMCS-DNS del 15.06.2010).

4.18.2 Conceptual Framework of the Soft Component Implementation

(1) Basis for the implementation of the soft component

The Program involves gathering of information on the socio-economic and cultural characteristics, conditions and needs of the Amazon communities where the projects will be implemented. The Program shall also recognize the population's traditional knowledge, customs, beliefs and values related to water and sanitation. In the soft component implementation stage, processes of strengthening and/or improving those traditions will be considered rather than forcing them to accept new concepts and/or practices. Thus, the Program intends to utilize tradition as instrument of community development. The implementation of the soft component will consider an inter-cultural approach.

Through the methodologies of democratic and participatory learning processes, the soft component will provide occasions for both men and women with gender equity conditions to exercise their right to participate in activities, make decisions and share responsibilities related to water and sanitation services, in every stage of the project cycle. This component also intends to strengthen and develop the population's capacities in order to assume such responsibilities.

(2) Principles of the Soft Component (capacity-building)

The soft component strategy shall consider the following essential principles:

a) Community participation and co-financing

The participation of the population is essential for the sustainability of the project.

This will not only assure the fulfillment of the counterpart's responsibilities for the execution of the project (contributions could be financial, involuntary labor, materials, etc.), and for the administration and O&M, but will also permit the social teams of the Program to know the expectations and preferences of the population, regarding the level of service they require.

b) Use of suitable technologies

The application of suitable technologies, which are low-cost, simple to operate and maintain, and with intensive use of labor and local resources, will be promoted. The nature, area and success conditions of the technologies will be discussed with the community and the municipality. Although the technology component that the community may choose is crucial, the soft component (capacity building) will seek to reinforce all the aspects that affect the project's sustainability.

c) Strengthening of local capacities

Strengthening of local capacities will be carried out in a transverse manner during all the project cycle. It will promote a sense of ownership, a culture of preservation of the facilities, and a sense of social responsibility towards the contribution of the state and the community. Likewise, appropriate practices of use and maintenance of the service and the active participation of the community, particularly of women as well as health and environmental care, will be promoted in all the cycles of the project.

Three inter-related aspects will be tackled:

1) Training on the project's technical aspects:
This technical training will be provided in the aspects of organization, planning and community management, construction and supervision of work, administration, and O&M of the services.

2) Hygiene education
The Program will promote healthy hygiene practices in families for prevention of diseases and health promotion, through appropriate use of the services and the preservation of water and environment as resources.

3) Transverse training
It tackles the subjects that shall be presented during the entire educational process to favor the empowerment process, namely, community commitment and participation, community leadership and strengthening, civic rights exercise, gender equity and environmental care.

This covers the strengthening of community based organizations (CBO) in their role in contributing to the sustainable management of the potable water and sanitation services and the local development in general.

This also includes the strengthening of the local governments' capacities for the promotion and supervision of the sanitation services.

d) Health promotion

There is enough evidence to support the importance of hygiene education programs on water and sanitation projects. The water and sanitation investments were proven to be too costly but has limited impact on people's health if they are not accompanied with hygiene education programs. Moreover, consensus on hygiene sanitary education has been universally established. This way, the Millennium Development Goals (MDG), referred to the potable water supply for the communities, indicate as an indispensable condition the sustained implementation of hygiene education programs. A healthy community is the result of a process that requires conviction and strong policy support, as well as significant participation and action of the population.

In search of this objective, a capacity-building program in hygiene education will be proposed. Such program will be associated with the sanitation services from the pre-cycle stage until the post-execution stage, committing the participation of the district or provincial institutions and other public organizations related to the sanitation sector (district municipalities, MINSA, MINEDU, etc.). The content should permit the fulfillment of the local population's commitment, specific training in the rational use of the resource, protection of the infrastructure, suitable management of the services and awareness of the importance of the drinkable water quality, among others.

e) Pedagogical Approach

The pedagogical approach on water and sanitation is based on the principles of adult education, starting on the acknowledgment of the existence of own knowledge in the communities, product of experience and the knowledge passed on from generation to generation as a result of a harmonic relation with nature, production and daily life.

The training reinforces positive knowledge and brings about learning of new knowledge, skills development and personal and collective attitudes through easy handling and understanding, designed accordingly with the socio-economic and cultural realities in the community.

The community training process seeks that participants achieve the development of capacities to manage their projects and to administrate, operate and maintain the improved or built facility, with the purpose of improving their hygiene habits, to value, use and take care of the services and to protect the environment.

The pedagogical approach of community training aims to promote participants to be causers of their own process through the development of organized practical activities with the support of the Social Team.

f) Environmental Protection

As human beings we interact with the environment and we are indissolubly part of it. The use of the environment is vital for the life of the human beings; therefore, the rational use of resources will be promoted so that these can also be used by future generations. This will produce impact on the environment, the positive effects of which will be promoted while its negative effects will be avoided or controlled, in order to protect the sustainability of natural resources.

4.18.3 Prioritization for Implementation

(1) Prioritization of Target Areas (Administrative Regions)

The program includes five administrative regions that are located in the vast rainforest (*Selva*) geographical region, consisting of three sub-geographical regions: Front Forest, High Forest and Low Forest.

The natural conditions of Low Forest (Conglomerate C-1) are quite different from the other two geographical regions and are not necessarily favorable for the implementation of the Program, due to the difficult access to many localities, flat topographic conditions, large flood-prone areas during the rainy season, and areas considered to be poor based on the poverty map[18], especially in the region of Loreto. About 60% of the total Program localities are located in the Low Forest region.

There has not been as many projects implemented in the past in the Low Forest as compared to those to be implemented under the Program. There is no sufficient sectorial experience on the execution of investment programs for potable water and sanitation in this zone. In that sense, the Low Forest region is prioritized for Program implementation due to the reasons mentioned above. The implementation strategy of the Program in the Low Forest and in the other two geographical regions should take the following aspects into account:

1) A step-by-step implementation approach should be considered, taking into account that the experience and results of the preceding projects should be reflected in the implementation of subsequent projects.
2) Implementation shall be carried out by administrative region in one or two regions as maximum and at the district level. The Program shall not be implemented simultaneously in the five administrative regions, which would render the project administration extremely difficult.
3) The projects will be selected according to priority based on eligibility criteria, which should correspond to economic, financial and technical parameters.
4) At the same time, such project shall be prioritized as those with access roads being available, considering conventional technical solutions to be applied, easy AOM (administration, operation and maintenance) to be implemented and strong demands from the beneficiaries.
5) The beneficiaries shall manifest that they agree with the requirements of the Program.

(2) Guideline for Selection of Localities

At the pre-cycle stage, the Program information will be disseminated by the RMU to the relevant district municipalities and localities in the area, according to the area's

[18] FONCODES 2006 Poverty Map and Technical Report "Poverty in Peru¨ Technical Report by the INEI

prioritization. At this stage, interested localities that fulfill the Program's requirements shall express their interest to the district municipality. The district municipality, on receipt of such application from the localities, shall pre-select the localities to be included in the program.

The guidelines for the selection of localities in the pre-cycle stage are as follows:

a) Selection of municipalities

The municipality shall:

1) Express its involvement in the Program by means of an agreement with the municipal council, which shall address local agreement through a participatory process involving the communities.
2) Express their commitment to participate throughout the effective lifetime of the project by assigning personnel and/or economic resources and/or materials to their respective technical unit. In that way, they will undertake their role and field of work in the administration of water and sanitation services, whose infrastructure within their jurisdiction will be constructed or improved.

b) Selection of Localities

The following guidelines will be applied for the selection of localities:

1) Coverage deficit for water and sanitation services at the district level
2) Poverty level of the population, considering the percentage of poor population, according to the FONCODES Poverty Map and the INEI Technical Report
3) Localities whose potable water services are not incorporated with urban areas.
4) Localities that are not included in other investment programs with international financial cooperation or that have investment projects to be implemented in the short term through regional or local financing
5) Localities with agreements to assume responsibility on the AOM of the sanitation services by means of a communal organization voluntarily elected by the community.

c) Formation of the projects packages

In order to form contract packages for the work's execution, the RMUs (Regional Project Management Units) shall group the localities already selected, according to such parameters as the access conditions to the localities, territorial conditions within the same administrative districts or provinces where the localities belong to, or the water sources conditions where a number of localities may depend on the same water source within the same micro basin, or others.

4.18.4 Project Cycle

The project cycle of the Water and Sanitation Program for the Rural Amazon is divided into four stages: (1) pre-cycle, (2) pre-investment, (3) investment or execution, and (4) post-execution.

(1) Pre-cycle Stage

At this stage, the responsibility lies on the DNS of the MVCS and on the PAPT, through the regional project management units (RMUs) under the PAPT, which will act as the PMU (Program Management Unit), and the RMUs of the Program, with the participation of regional governments and district municipalities (local governments).

During this stage:

1) The PMU, through each RMU, will prioritize and select the localities based on the eligibility criteria for the implementation of the Program, in accordance with the principles and policies of the water and sanitation sectors established in the National Sanitation Plan; as well as with the soft component policies and strategies for small localities in the rural areas[19], agreed between the MVCS/DNS and the cooperation agencies.

2) The RMU will disseminate the information of the Program to the respective regional governments, district municipalities and the localities.

3) Localities will express their interest to their local governments.

4) The local governments will inform the PMU-RMU of their interest to participate, expressing their needs of attention in writing. Based on this information, the PMU-RMU will prepare a list of selected localities, as well as of district municipalities.

Once the RMU submits the lists of selected localities for each regional area, the PMU will begin the tender process to select and employ the operating consultant and supervising consultant for the preparations of *Perfil* and detailed design reports; the consulting firm for the supervision of works; and the specialized consulting firm for the soft component implementation. The RMU will conduct the process of selection and employment of individual consultants for the initial diagnosis and supervision of works; resident engineers for the works; and professional consulting specialists for the development of the social component and capacity building in management of water and sanitation services.

[19] Minutes from Work Meeting with VMCS, DNS, BID, BIRF y JICA (06.03.2009)

(2) Pre-investment Stage

At this stage of the project cycle, the operating consultant will verify the requests from the localities and develop the projects' *Perfils* for the selected localities, including the baseline and the Declaration of Environmental Impact (*Declaración de Impacto Ambiental-DIA*). The locality and the municipality will be actively involved in the decision-making for the selection of the technical option and type of facility, and the commitment for AOM.

Also, the individual consultants, specialized in soft component intervention, will provide technical assistance to the locality for the creation and/or proposal of strengthening of the community organization and the management capacities of the involved district municipalities.

The supervising consultant will evaluate the *Perfils* and will prepare the Technical Report of the projects to be declared "viable" by the PAPT. The projects declared viable shall be endorsed by the locality and the municipality as a sign of conformity and acceptance.

Following the statement of viability by the PAPT, the *Perfils* will be registered in the bank of projects of the SNIP. Subsequently, the process will move forward to the signing of the convention of co-financing" (agreements between the locality, local government and the PAPT), in order to forecast the corresponding budget for the implementation of the project. It is understood that the regional governments, in response to the request of MEF, have agreed to participate in the Program for the co-financing of the projects wherever necessary.

(3) Investment or Execution Stage

At this stage, the operating consultant will develop the detailed designs of the projects, adhering to the parameters with which the viability of each one of them was granted. The detailed designs will be evaluated by the supervising consultant for its subsequent approval by the PMU. The environmental certification of the projects, to be granted by DNS, shall be included.

The individual consultants will develop the plan for the strengthening of capacities in the areas of organization, planning, community development and management of the water and sanitation services for the municipalities and community organizations, as well as the hygiene education program for the population. The social supervisor to be employed by the RMU will approve the design for the implementation of the soft component.

After the approval of the detailed design deliverables and the corresponding budget assignments, a convention of co-financing addenda will be endorsed (Tripartite Agreement agreed upon by the locality, district municipality, and PAPT), leading to a final agreement for the execution of the works and the implementation of the aforementioned capacity building on management and hygiene education; for the municipality and the community organizations.

With the budget and the technical project file, the tendering process will begin and contractors will be procured for the construction of the water and sanitation project works in the localities. Once the contractors and the PMU sign the contracts, the construction works will commence under the supervision of the technical team of the works supervising firm during the execution stage of the project. The individual consultants (soft component implementation) will coordinate with the community and contractor to optimize the contribution of the community agreed for the projects, if it should be the case.

At the same time, the individual consultants for the soft component implementation will initiate the implementation activities for capacity building on organization, planning and community administration, AOM of the water and sanitation services and hygiene education. This team will start the implementation of the capacity building activities at three levels: (1) municipality's management unit, (2) community organization, and (3) the benefitted population.

In the case opting for the Core Executor intervention model, the RMU team shall carry out the notification and awareness training for the population regarding the advantages of this model, so that the representatives of the Core Executor —including a President, Secretary, Treasurer—may be elected in a General Assembly, and an Observer appointed by the District Municipality; the RMU shall also contract an On-site Project Manager to direct and assist the Core Executor, and a Works Supervisor to supervise the work of the On-site Project Manager.

(4) Post-investment

At this stage, intermittent follow-up activities in localities and community organizations will be undertaken by municipal management units and individual consultants in charge of the soft component and post-investment management, for the re-strengthening of the capacities of the community organizations. This firm will also evaluate the application of operational and administrative management tools in these community organizations and the actions of supervision on the part of the municipality, with the aim of assuring the sustainability of newly improved or constructed services.

In the same way, evaluation and strengthening of the actions on hygiene education for the benefiting population will take place. The purposes of the evaluation are to corroborate the adequate use of sanitation services and strengthen a payment culture in the population, as well as to assure the good use of potable water and environmental responsibility. For the follow-up and supervision of the aforementioned activities, the RMU will have a post-investment social supervisor as part of its staff.

4.19 Organization and Management for Implementation

Having learned from the programs executed in the rural areas in recent years, the proposed implementation model for the Water and Sanitation Program in the Rural Amazon Area has a vision different from that of the projects executed in the urban areas, given that rural areas have special characteristics, such as:

1) The community itself is in charge of the management of sanitation services, through the community people who have no past experiences on most parts of the works;

2) The localities of the Program are widely dispersed, and accessibility to the localities will be the main logistical issue to be solved by the entities in charge of project implementation of these services;

3) Consulting firms rarely have experience in this type of work, and consequently there is not enough qualified personnel in the country for the implementation of a program requiring massive execution like the present one, where construction of the infrastructure is as important as the soft component (capacity building of the population and local governments); and

4) The technical solutions should be appropriate for the characteristics of the rural area; and true participation of the community in their proposal, selection and implementation should be an indispensable requirement for the sustainability of the services.

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

(1) Core Actors (Regular organization/group)
  1) Ministry of Housing, Construction and Sanitation (MVCS)
  2) District Municipalities
  3) Organized Communities (Core Executor and JASS)
  4) Regional Government and Provincial Municipality

(2) Contracted Actors (to be employed for implementation):
  1) Operating Consultant
  2) Supervising Consultant
  3) Consulting Firm for the Supervision of Works
  4) Individual Consultants Specialized in implementation of the soft component.
  5) Works Contractors
  6) Individual Consultants (supervision of works and resident engineers)

The main functions of the actors to be involved in the Program are as follows:

(1) Core Actors

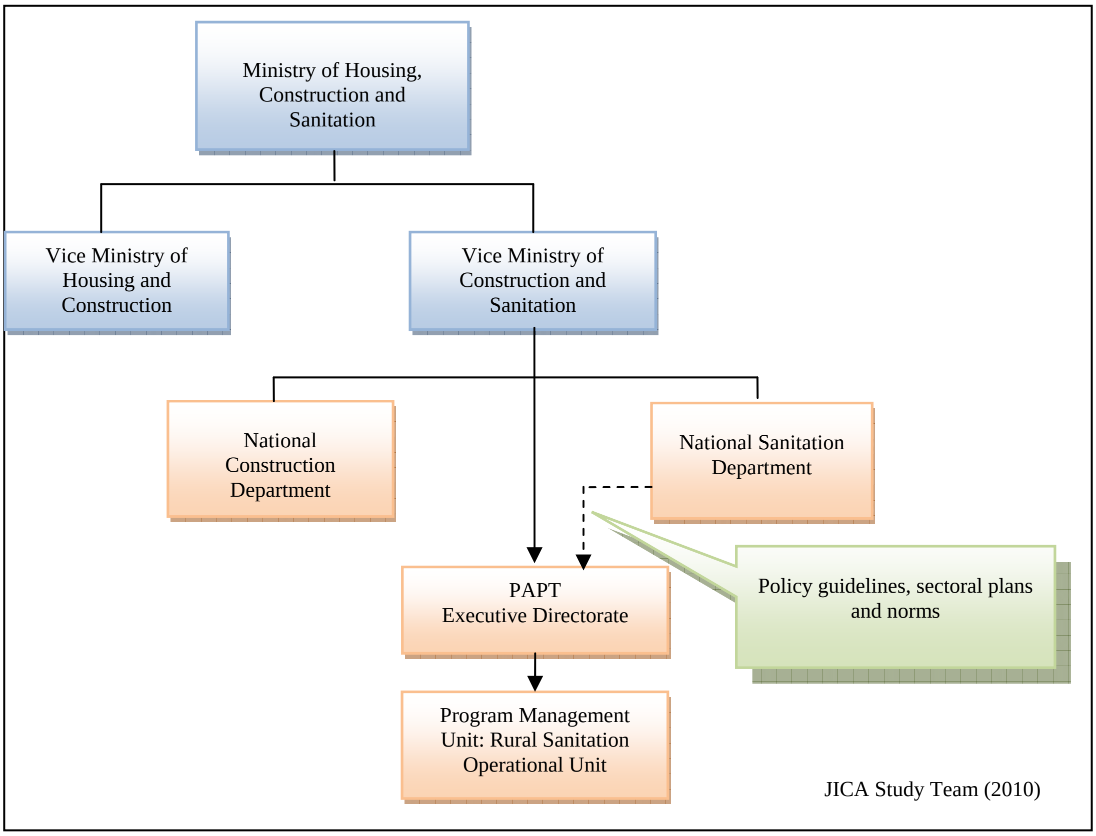
MCVS, which is responsible for the implementation of the Water Supply and Sanitation Program for the Rural Amazon Area, leads the list of core actors

a) MVCS

MCVS plans, formulates, conducts, coordinates and evaluates the policies and strategies in matters related to housing, urbanism, construction and basic sanitation, in harmony with the general government's policy and the country's development plans.

i) Vice Ministry of Construction and Sanitation (VMCS)
The Vice Ministry's role is to propose, implement and supervise the application of the sector's policies in coordination with the Minister. Moreover, it directs the activities of the organizations of the ministry, of the sectoral and multi-sectoral committees, and the projects within. The Vice Ministry should also be capable in formulating and adopting general policies on matters of infrastructure and sanitation, in accordance with the directives established by the Minister.

Figure 4.19-1 Organization of the Ministry for the Program



ii) National Sanitation Department (*DNS)*

MVCS establishes the sector´s policies and strategies through the *DNS.*

iii) Programa Agua Para Todos (PAPT)

The PAPT belongs to the VMCS. It acts as the executing agency for investment projects for the implementation of MVCS sanitation policies at the national level. The general objective of the PAPT is to contribute to increasing the population´s access to sustainable sanitation services, through coordination of the actions for formulation, execution, and financing of public investment in sanitation programs and projects (RM No. 087-2009 VIVIENDA, 2009-02-21). It also serves as the executing unit of the Program through the PMU.

iv) PMU of the Water and Sanitation Program for the Rural Amazon Area

This unit of the PAPT will be in charge of conducting the Water and Sanitation Program. The Rural Sanitation Operational Unit, which belongs to the organizational structure of the PAPT, will act as the PMU of the Program. The main functions of the PMU are: (i) to execute and conduct the Program (implementation); (ii) to report to DNS, PAPT, VMCS and JICA about the Program progress; (iii) to evaluate and monitor the execution of all the Program's components; and (iv) to supervise the execution of the soft component and the capacity-building activities.

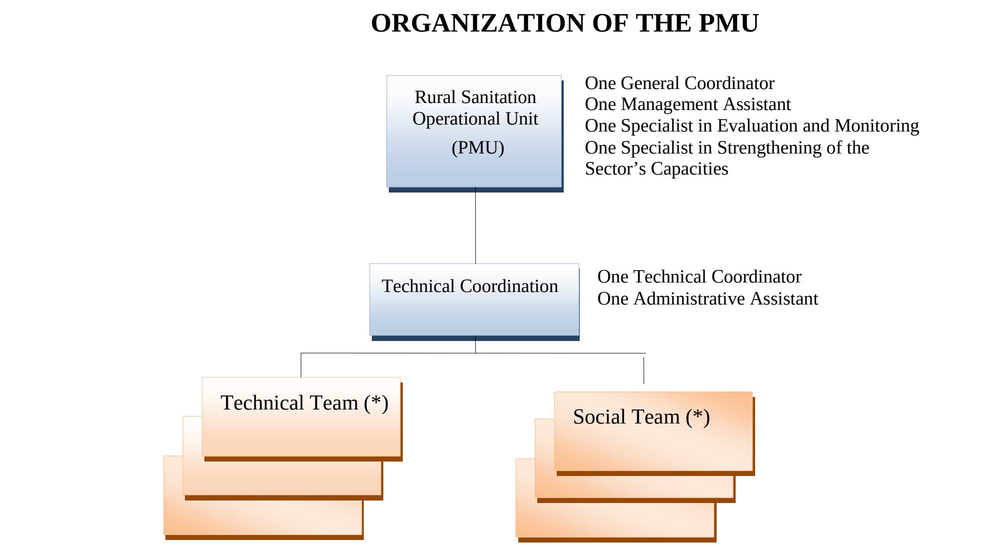
The PMU will also be responsible for the implementation of the implementation scheme and, therefore, for assuring its viability. Thus, it should have sufficient autonomy to be able to endorse the necessary agreements, on behalf of the MVCS and the PAPT, as well as the respective contracts with the operating consultant, the supervising consultant, the consulting firm to be in charge of the supervision of works, the specialized individual consultants to be in charge of the soft component implementation, the contractors, core executors, and individual consultants. (work supervisors and resident engineers)

The PMU will also be in charge of following up, monitoring, and evaluating the work of the operating consultant, supervising consultant, the consulting firm in charge of the supervision of works, and the contractors or core executors in charge of the construction works. Even when it is the technical team of the PMU who finally approves the *Perfil,* detailed designs, execution and liquidation of works, the firms representing the contracted actors have civil and criminal responsibilities on any hidden vices in the technical documents that support the investments (*Perfils*, detail designs) and/or the executed Works. In which case, the PMU shall file the corresponding complaints and execute the penalties stipulated in the contract.

The PMU will conduct procurement processes of Operational Consultant, Consultant Supervisor, Consulting Firm for supervision of works, and Contractors for construction works..

The Rural Operating Unit PAPT (Program Management Unit) will be organized as follows:

Figure 4.19-2: Organization of the PMU - Rural Amazon Area



(*) technical and social teams for the supervision of contracts

(JICA Study Team (20190))

1) General Coordinator
The General Coordinator's Office will be responsible for the administrative aspects of the Program and will its obligations include planning, directing and supervising the execution of all the Program's components.

2) Technical Team
The Technical Team will be in charge of monitoring and evaluating the Program. It will also approve every technical aspect related to the construction of infrastructure under the Program.

3) Social Team
The Social Team will be in charge of monitoring and evaluating the Program's soft component. It will approve every aspect related to social promotion, hygiene education for the community and capacity-building for the strengthening of the communities and municipality authorized to manage the sanitation services.

4) Procurement Specialist

5) Legal Advisor

6) Administrative Assistant

v) Regional Management Unit (RMU)

The RMU shall be responsible for the management of the projects under the Program in the regional area. The RMU shall also monitor the activities of core actors of its responsible area (regional governments, municipalities, core executors, JASSs, communities); and motivate these actors for timely participation to the Program/projects, in accordance with the scheduling and the agreements signed.

Within this framework, the PAPT and the PMU at the central level will monitor and follow up the processes and activities of the Program. For this purpose, the RMU shall have the appropriate numbers of staff with acceptable experience and qualifications to participate in the Program.

The RMU is constituted by the following team members:

1) Regional Coordinator
2) Technical Specialist
3) Social Specialist
4) Project Evaluator
5) Administrator
6) Logistics Operator
7) Project Liquidator

b) Regional Government

The regional governments will participate in the Program by co-financing the projects, in order for the selected municipalities to fulfill their responsibilities established by the Program, in accordance with the policies of the sanitation sector. Likewise, the regional governments are expected to provide the municipalities with technical assistance, with the purpose of facilitating the fulfillment of the municipalities’ responsibilities. Such responsibilities involve assisting the communities in sustainable AOM of the water and sanitation, to be provided through the Program.

c) Local Government (District Municipality)

The local governments should select and prioritize the communities, co-finance (if affordable) the projects and participate in the execution of the projects throughout the entire project cycle, specifically during the pre-execution, execution and post-execution stages. The local governments should also participate in the soft component activities for capacity building in order for them to supervise the AOM activities of the communities and provide technical advice to the communities within their jurisdiction, assuming its role and responsibility for the services is through a council agreement. In addition, each local government shall sign the Annex SNIP – 13 with PAPT for the agreement of the project implementation within its district.

d) Sanitation Services Administrative Board (community organization, or JASS)

The Sanitation Services Administrative Board is a local organization that represents the community and is in charge of the AOM of the sanitation services in its locality. It may be a JASS or any other form of organization. It shall be made up of five members. Its general functions are to administrate, operate and maintain the water supply and sanitation system.

This board is also responsible for proposing the water and sanitation family fee, to be approved by the community. The fee is collected monthly from the users, as well as other contributions that may be generated and constitute extraordinary income for the financing of the board's activities, as the service administrator in the community. This community organization participates during the Program implementation together with the population in coordination with the district municipality in the capacity building processes for the management of sanitation services and hygiene education.

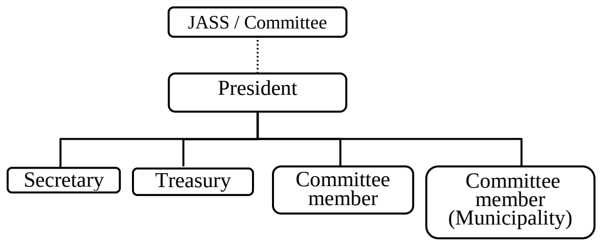


Figure 4.19-3 Organization of the Community Organization

It shall be decided in an assembly of users if the core executor will become the JASS or if new members should be elected for the fulfillment of its functions.

e) Community

The community shall participate during the formulation and execution of the Project. Once the construction of the facilities is concluded, the AOM of the system will be in charge of the JASS. The population will contribute with a monthly fee in cash (or for a different period). This fee will cover at least the AOM costs of the services.

With regard to their participation throughout the project cycle, the community should (i) be informed in order to promote the demand prior to accepting the technical option and the level of service, with their full awareness that there is a correlation between the proposed technology and their capacity and commitment to pay the family fee for the AOM, (ii) proceed with the election of the administrative board, (iii) participate during the execution and pay a family fee on a regular basis, and (iv) attend to the capacity building and hygiene education activities, until the post-execution phase.

(2) Contracted Actors

a) Operating Consultant

The implementation of the pre-investment stage and the detailed design stage of the projects included in the Program will be conducted by a consulting firm selected and contracted by the PMU, which shall be called the operating consultant .

The main activities to be carried out by the operating consultant are: (i) development of Project *Perfils*, (ii) development of detailed designs (including technical and environmental aspects) and (iii) prepare proposal, in coordination with the Regional-PMU, for the implementation mode of ’with NN.EE.” or “with Contractors” for each project.

b) Supervising Consultant

The supervising consultant shall be a consulting firm to be selected and contracted by the PMU and responsible for supervising the operating consultant.

The supervising consultant will participate in two stages; i.e., (i) First, in the pre-investment stage, he shall be in charge of supervising, evaluating and approving the *Perfils* and, (ii) Second, he shall supervise, evaluate and approve the project files (detailed design including technical and environmental matters) that the operating consultant formulated. He shall verify the viability of the technical, economic, environmental, and social aspects of the *Perfils* and project files to be proposed and prepared by the operating consultant.

Experience indicates that special attention should be drawn to the scope of this type of contracts. The indicators to be used to evaluate his performance shall be well-defined.

c) Consulting Firm for the Supervision of Works

For the stage of execution of construction works to be executed by the contractors, the supervision shall be conducted by a consulting firm selected and contracted by the PMU.

The main activity to be performed by the consulting firm is the technical supervision of the construction works and the liquidation of the corresponding contract for the handing over of the facilities to the municipalities and JASS.

d) Individual Consultants Specialized in Soft Component Implementation

The activities of the soft component in the pre-investment, investment and post-investment stages will be conducted through individual consultants contracted by the PMU

The main activities to be performed by this actor are as follows:

1. Project promotion in communities at the very beginning stage, assistance for the formation of the JASS and the social activities in the community during the development of the *Perfil* and the Project File (Detailed Design);
2. Preparation of the soft component implementation documents; and
3. Implementation of the soft component: (a) in the project execution stage, implementation of the capacity building and hygiene education for the communities, JASSs and municipalities; and (b) in the post-execution stage, monitoring and following-up the activities of the community, JASSs and municipalities for reinforcement of soft component activities given in the execution stage

e) Modality of Execution through Contractors

<u>Contractor:</u> For contracting the contractors, the Operating Consultant will prepare the documents for the tender process. This process will be carried out by the PMU with the participation of the technical team of the RMU who will administrate the contract. The PMU will sign the contract with the successful contractor. It is recommended that the contractors to be selected should 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 a reasonable period.

f) Modality of Execution through Core Executors

Any institution or organization that represents its organized group can form a “core executor”, and receive the funding for the execution of its proposed public investment projects (PIP) or maintenance of infrastructure (MI). The core executor is formed by no less than one hundred people who live in a fixed rural or urban locality categorized with a status of poverty or extreme poverty. For the participation of a core executor to this Program, it shall sign an agreement with the Ministry of Housing, Construction and Sanitation through the PAPT/Regional PMU.

The core executor is represented by:

(1) President

(2) Secretary

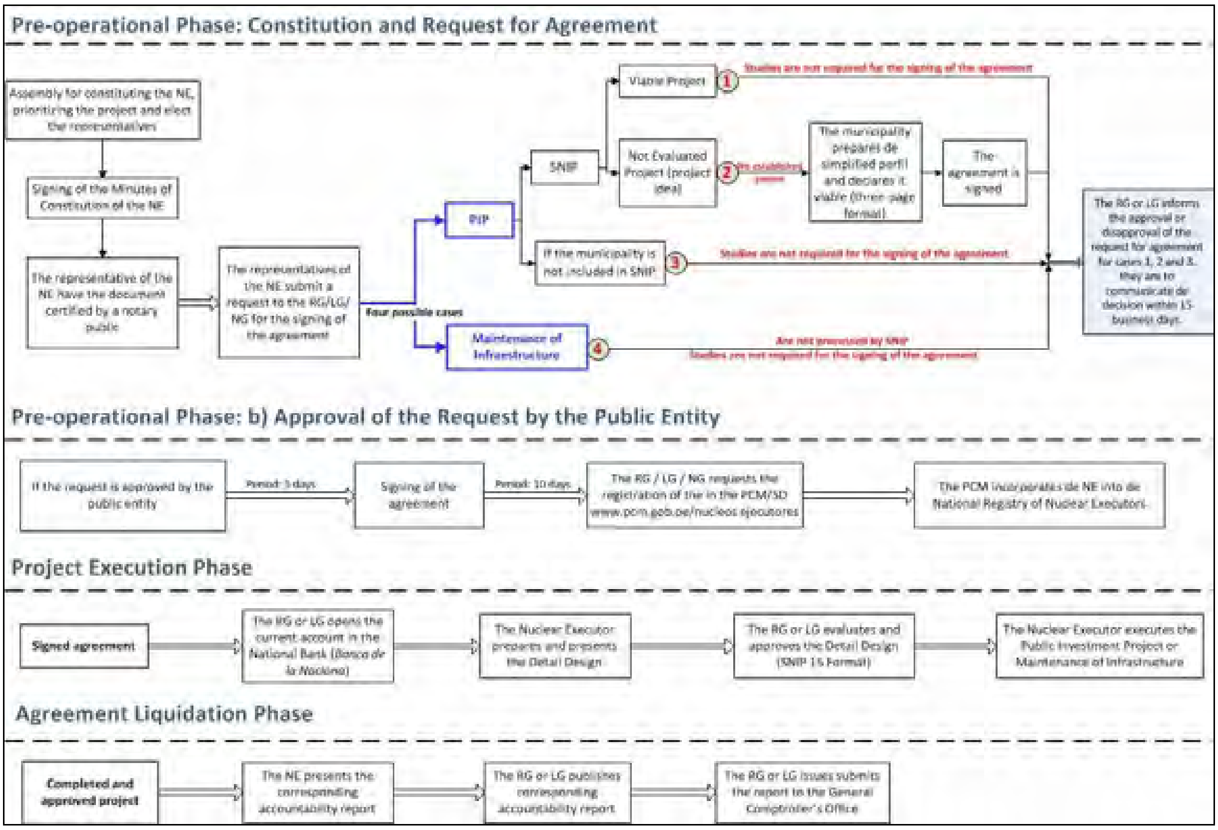
(3) Treasurer

(4) Observer (from the district municipality)

The core executors, referred to by the Decreto de Urgencia Nº 085-2009, will have a temporary nature only for the proposed works, and the legal capacity to conduct any necessary action, prior to or during the execution of the works or the maintenance of the infrastructure.

The core executors are allowed to participate in administrative procedures and legal processes (through their representatives), following the norms of the private sector.

Figure 4.19-4 Development Flow of the Core Executors according to D.U. N° 085-2009-PCM



Source: PCM (*Presidencia del Consejo de Ministros*: Presidencial council of Ministries)

Under this execution modality, the following staff shall be employed:

1) <u>Resident Engineer</u>: in charge of the technical assistance to the core executor and responsible for the technical quality of the work.

2) <u>Work Supervisor</u>: in charge of the technical supervision of the works' execution. He shall not undertake more than three projects under the Program.

Table 4.19.1-1: Implementation Organization – Actors and Responsibilities

PAPT (The Executing Agency) Rural Operative Unit – PMU – Rural Amazon
1. To act as the Executing Agency 2. To coordinate with MEF and the Japanese International Cooperation Agency (JICA) as required 3. To prepare the financial statements required by the JICA 4. To provide JICA, DNS and/or other concerned institutions with necessary information 5. To coordinate the relevant organizations in relation to the execution of the Program 6. To manage the financial resource for the execution of the Program. 7. To make the transaction of payments to firms that are to be contracted for the implementation of the program, based on the declaration /request of PMU, in accordance with general regulations on the PAPT 8. To report the Program progress to JICA and DNS 9. To execute transfers to the core executors for the execution of works.
General Coordination
1. To be responsible for the administration of the Program 2. To develop the strategic plan of the Program in coordination with DNS 3. To elaborate the operation plan of the Program 4. To request the PAPT for the withdrawal of loan funds and to provide justification, as directed by the JICA 5. To solve the issues for the execution of the Program as the final decision making 6. To coordinate with the relevant governmental organizations, to fulfill the smooth execution of the Program 7. To fulfill the contractual conditions in the loan agreement with JICA in executing the Program 8. To present the Program to public and private organizations 9. To delegate and to attend to the opportunities involving the diffusion of the Program
Technical Coordination
1. To coordinate along with the soft component, the procurement processes of the operating consultant, supervising consultant, and individual consultants. 2. To approve the studies, terms of reference of the operators and individual consultants, technical specifications for materials and equipment, and everything necessary for Program implementation. 3. To approve the annual operating plan and plan for program acquisitions 4. To approve the *Perfils* and project files (detailed design).
Soft Component Coordination
1. To coordinate along with the technical coordination, the procurement processes of the Operating Consultant, Supervising Consultant, and Individual Consultants. 2. To approve the studies, terms of reference of the operators and individual consultants, capacity building manuals and soft component instruments, and everything necessary for Program implementation.
Regional PMU- Rural Amazon Area
General Functions
1. To manage the execution of the Program in the region. 2. To fulfill the strategies and procedures to be established in the operations manual. 3. To evaluate and to monitor the execution of all Program components. 4. To approve the payment and to issue the 'payment authorization' to the PAPT. 5. To report the progress of the Program to JICA and DNS, through the PAPT. **6.** To validate the selection of localities selected through the participation of social promoters that verify and confirm the participation of all of the authorities, population, and leaders before the official public announcements for the contracting of the Operating Consultant, Supervising Consultant, and Individual Consultants.
Operating Consultant
1. To evaluate the Project *Perfils* and perform follow-up as to the viability of all of the projects. 2. To formulate the technical files of all projects in their scope of implementation. 3. To provide soft component assistance for the formation of JASS and to lead community participation in this stage of the project.
Supervising Consultant
1. To evaluate and approve the *Perfils* prepared by the operating consultant. 2. To evaluate and issue technical approval of the technical files (detailed design) prepared by the operating consultant, as being solely responsible for their approval.
Consulting Firm for the Supervision of Works/Individual Consultants
1. Supervise technical aspects (quality and control of progress) of the Program works that shall be implemented by the contractor / core executor, based on the Field Operations Manual and Project files prepared by the operating consultant and approved by the PMU. 2. Facilitate participation by the communities/JASS in construction works.

Table 4.19.1-1: Implementation Organization – Actors and Responsibilities

Executors of Works
1. Core Executors: Mode of execution of works in which the community is organized and sustained by a regulation (DU N°085-2009-PCM) and can receive transfers of funds and execute the work on their own accord, under the technical assistance of a Resident Engineer and a Works Supervisor (both Individual Consultants contracted by the Program). 2. Works Contractor: Mode in which a contractor is selected for execution of a set of works under a singular contract (between 10 and 20 works), assuming the risk of their execution; Supervised by individual consultants contracted for such a task.
Soft Component
1. Soft Component Specialist for Pre-Investment, Investment and Post-investment: Individual consultants contracted by the RMU to execute activities on hygiene education, capacity building of the JASS, community and municipalities in the management of the services, and enhancing the capacitaty of system O&M. 2. Monitoring and follow-up of Investment and Post-Investment: Individual Consultants contracted by the Regional PMU to do follow-up and supervision of soft component actions and to evaluate their impact on the target population.
Regional Government
1. To receive progress information on major stages of projects. 2. To provide support to local governments with project co-financing. It is hoped to provide necessary assistance to the local government.
District Government
1. To lead the district consultation meeting for the prioritization of the Project. 2. To sign an agreement with the PAPT. 3. To sign on a three-party agreement on co-financing for the works through assigning officer/s to the project. 4. To assign resources for the prioritized water projects and sanitation as part of co-financing. 5. To organize the community organization with the consultant, and to promote the JASS associations . 6. To organize and facilitate capacity building programs together with the consultant. 7. To participate in the process of qualification for fortification of the management. 8. To supervise the community organization, and to offer technical advice. 9. To act as a kind of counterpart of the consultant in supervising the construction works. 10. To sign Acts of Work Liquidation. 11. To register the potable water system and the population served by the sanitation system.
Locality
1. To define the demand, technical option, service level; and to decide the commitment of payment for AOM of the facilities. 2. To determine the willingness to participate in the co-financing of the Project, by means of any type of contribution, such as providing unskilled labor works, accommodations to the contractors, land-lots as a stock yards and/or so on. 3. To form the community organization. 4. To attend to the community qualification and sanitary education, until the post-execution stage. 5. To pay the family fee for water throughout the lifetime of the facility.

Source: JICA Study Team (2010)

4.20 Implementation Plan

4.20.1 Sequence of the Loan Program

Figure 4.20.1-1 shows the standard sequence of a loan program implementation. The processes are divided into four main categories as follows:

1) Preparation of the Loan Request
2) Donor's (JICA) Appraisal and Loan Agreement
3) Program Implementation
4) Completion of the Program

Each process is explained as follows:

(1) Preparation of the Loan Request

After completion of the Feasibility Study, the National Directorate of Sanitation (DNS: *Dirección Nacional de Saneamiento*), the Office of Investments Programming (OPI: *Oficina de Programación de Inversiones*) of the Ministry of Housing, Construction and Sanitation (MVCS: *Ministerio de Vivienda, Construcción y Saneamiento*) and the General Directorate of Multiannual Programming (DGPM: *Dirección General de Programación Multianual*) of Ministry of Economy and Finance (MEF: *Ministerio de Economía y Finanzas)* will have to confirm the feasibility of the Program, declaring its viability and authorizing the conglomerates. Thereafter, a loan application has to be prepared for JICA's appraisal. It is understood that MEF will be in charge of the preparation of the loan application to be submitted to an international organization, and in charge of monitoring the Program's implementation, from a financial point of view. For the case of this Water Supply and Sanitation Project in Rural Amazon Areas, JICA is the prospective financing agency.

(2) Donor's Appraisal and Loan Agreement

In response to the loan request, JICA will dispatch an appraisal mission to assess the necessity, feasibility, readiness conditions and so on. They will also examine the Program from the viewpoint of whether the proposed program is suitable as a Japanese-assisted loan program, in accordance with the policy set forth by the Government of Japan. Upon confirmation of all these aspects, a loan negotiation will be conducted between the donor (JICA) and MEF, along with PAPT, who will act as the executing agency of the Program and is thus in charge of initiating further processes for the implementation of the Program. The loan agreement shall be signed by MEF and JICA.

(3) Program's Implementation

It is proposed that the PAPT should establish the PMU for the Program's execution and management. The PMU will hold a tendering procedure to select qualified firms for performing the consulting services as operating consultants, supervising consultants, and work supervising firms. The individual consultants for the soft component implementation shall be contracted by the RMU.

For the Program's implementation, it is envisioned that the so called 'Design –Bidding– Build method' will be adopted, as it is widely applied by international donors for similar projects. In this method, the executing unit is responsible for the design works, including the soft component, due to the characteristics of the Program.

Subsequently, the contractors (construction company) selected through a tendering process will execute the construction works based on the drawings and technical specifications, as planned in the reports prepared by the executing unit through the operating consultant. The execution of works through core executors have also been foreseen as described in Item 4.18. In such case, the PMU will engage in contract with individual consultants for the supervision of works.

i) Individual *Perfils*, Detailed Design and Tendering

The operating consultant will carry out individual *Perfils*, in accordance with SNIP 05A, detailed designs (project files) including investigation work, preparation of detailed design drawings of the water supply and sanitation system, cost estimates and pre-qualification and tendering procedure.

At the same time, the RMU and individual consultants specialized in soft component implementation shall prepare the soft component implementation files (plans) for capacity building in AOM of the water and sanitation services for the municipalities, community organizations; as well as for the hygiene education activities aimed at the population.

The supervising consultant will be employed for the evaluation of the Individual *Perfils* and detailed designs of works produced by the operating consultant.

ii) Implementation of construction works and soft component

The Feasibility Study recommends a public competitive bidding for the tendering processes for the construction works. Although most of the works are composed of small-scale projects, which basically involve soil removal and pipe installation with no special techniques, sufficient capability for management of construction procedures in multiple localities shall be required.

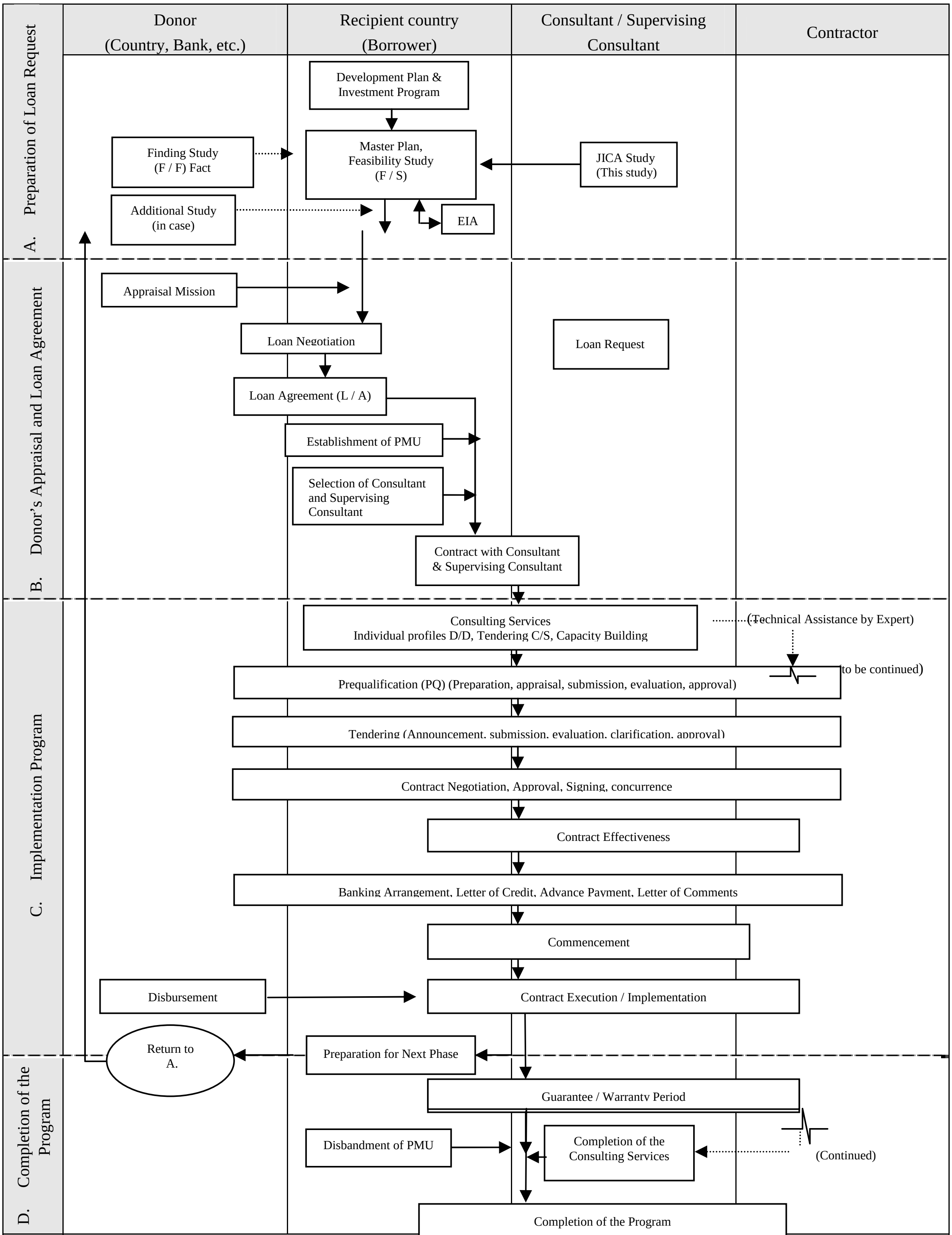
During the implementation period, the designated supervising consulting firm will carry out supervision of construction works based on JICA and FIDIC guidelines, as well as the Law of Public Procurement of the Republic of Peru, as long as it does not contradict the regulations of JICA, in case the works are executed by contractors. If the works are executed by core executors, the procedure shall be developed according to D.U N° 085-2009-PCM, the supervision of works will be undertaken by an individual consultant while the technical advice to be rendered and administration of resources of core executor by a resident engineer.

The capacity building programs for the municipalities and community organization, as well as the hygiene education programs will also be implemented during this period in each locality of the Program, by the individual consultants specialized in soft component implementation. The monitoring and follow-up will be undertaken by the RMU.

(4) Completion of the Program

After completion of the implementation, a guarantee period (defects liability period for design and hidden faults in the works) will commence. Throughout the entire implementation period including the monitoring period, the capacity building, such as strengthening of district municipalities, social promotion of communities and training of the community organizations (soft component), will be provided by individual consultants specialized in soft component implementation to ensure sustainable management and reliable water supply and sanitation system and services.

Figure 4.20-1 Sequence of the Loan Program Implementation



Note:	Supervising Consultant will be in charge of evaluating the design of individual profiles and the detailed design by the Consultant.

Source: JICA Study Team, (2010)

4.20.2 Implementation Plan

(1) Implementation Plan based on Phased Implementation

A considerable amount of capital investment will be required for the implementation of subprojects in 1,500 localities. Therefore, the Feasibility Study recommends the application of a phased implementation plan where a stepwise approach is adopted, rather than the single phased plan where all the 1,500 localities should be implemented in a single phase.

It is also recommended that projects in conglomerates C1 and C-2 should not be separately implemented, considering the final objective of the Program, and efficiency of actual implementation.

To formulate the implementation plan of the Program, the following strategies are considered:

1) A stepwise implementation shall be considered with the *Selva Baja* (Front Forest) as a priority in order for the experiences of the preceding projects to be reflected in the succeeding projects. For this purpose, “Phased-implementation plan” including a “Pilot Program” stage was recommended.
2) Implementation shall be first carried out in three administrative regions at the most, and not in all five (5) regions simultaneously. Hence, attention may be concentrated on regions undergoing implementation.
3) The localities (projects) shall be prioritized based on the levels of deficit of potable water and sanitation and the poverty at the district level, as well as the access roads available.
4) All the experiences from preceding projects in the selected localities should be reflected in the succeeding projects, such as those with difficult access conditions, non-conventional solutions and/or challenging AOM for sustainability.

To manage the implementation of the Program, not only the strategy above should be taken into account, but also the capability/availability of the PMU and the RMUs, the work teams of the Operating Consultant, Supervising Consultants and Works Supervising Firm, the individual consultants specialized in the soft component, and the works contractors.

Furthermore, the following conditions were considered for the formulation of the implementation plan.

1) Field surveys, such as topographic surveys, geological surveys and existing facilities inventory surveys shall be implemented in the dry season.
2) The contractors shall operate in several sites simultaneously.
3) Construction of intake and transmission pipelines close to water sources shall be conducted during the dry season.
4) The soft component should be implemented simultaneously in each locality

Having examined five alternatives as explained in Appendix 13, the Feasibility Study recommends that the Program be implemented in three phases, as shown in Table 4.20.2-3. Each phase will last approximately four years. The last year of each phase will overlap with the first year of the next phase, accumulating a period of ten years.

(2) Proposal of Pilot Program as the Phase-1 and Prioritization of Localities

The Program has been designed for 1,500 localities of the rural Amazon's five administrative regions, based on the field survey of 50 sample localities. A number of uncertain factors will be involved during the implementation stage of the Program, taking into account that the target areas include the Low Forest, where a few similar projects have been implemented so far.

This Feasibility Study therefore strongly recommends that the first phase should be implemented under the status of "Pilot Program", in order to examine the working sequence of the Program, the practicability of the designed organizational structure of the relevant units such as PAPT, PMU, and others. It is also intended to examine the applicability of technical options, social implementation methodology and its possible impacts as well as to review investment cost that has been proposed based on the *Perfil* studies in 50 sample localities, which are extrapolated to 1,500 localities.

According to the distribution of localities by conglomerate and administrative region of the Program, it is observed that 1,303 localities representing 86.8% of the total (1,500) are located in the regions of Amazonas (315 localities), San Martin (512 localities) and Loreto (476 localities). In such sense, the location of the localities in these regions will be one of the criteria for the prioritization of localities for the first phase of the Program. The other criteria for the selection of localities will be as follows:

1. The localities shall belong to the same district
2. The levels of deficit of potable water and sanitation at the district level
3. Poverty levels at the district levels.
4. Population size at the district level

On the basis of these criteria, the average deficit rates for potable water and sanitation and the poverty rates at the district level were obtained.

The districts that have the highest rates resulting from these variables, used as the criteria of selection, will be included in the first phase of the Program. The prioritized districts in the three administrative regions are shown in Table 4.20.2-1. It can be noted that in the region of Amazonas, one district has been selected out of a total of 48; in Loreto, three have been selected out of a total of 51; and in San Martin, three have been selected out of a total of 75.

From this information, the localities have been distributed by administrative and geographical regions (conglomerates), of which 33 are located in the region of Amazonas, 66 are in Loreto and 63 in San Martin. Also, 89 localities are located in the Low Forest (conglomerate C-1), 57 localities in the High Forest (conglomerate C-2) and 16 localities in the Front Forest (conglomerate C-2), as shown Table 4.20.2-2. The list of localities by administrative and geographic region is attached in Appendix 2.

In conclusion, in the first phase of execution (pilot program) 162 projects will be implemented, of which 89 belong to conglomerate C-1 and 73 to conglomerate C-2.

Table 4.20.2-1: Prioritized Districts for the First Phase of the Water and Sanitation Program for the Rural Amazon Area

Region	District	Total Population (inhab.) 2007	% Water Supply Déficit	% Sanitation Deficit	% Total Poverty Incidence	% Average Index
Amazonas	Imaza	21,409	83.32%	96.92%	78.10%	135.0
Loreto	San Juan Bautista	102,076	77.27%	60.98%	44.10%	212.1
	Balsapuerto	13,868	97.74%	98.87%	94.60%	126.8
	Nauta	28,681	81.33%	82.35%	61.20%	117.6
San Martín	Nueva Cajamarca	35,718	73.15%	79.24%	58.50%	121.1
	Sauce	10,598	95.66%	92.54%	83.00%	77.9
	Moyobamba	65,048	40.83%	53.64%	51.20%	72.9

Source: JICA Study Team, (2010)- Results of the 2007 Census –INEI and Poverty Map 2007 – INEI

Table 4.20.2-2: Prioritized Districts for the First Phase of the Water and Sanitation Program for the Rural Amazon Area

<table>
<tr><th rowspan="2">Region</th><th rowspan="2">Province</th><th rowspan="2">District 1/</th><th rowspan="2">% Average Index 2/</th><th>Conglomerate C-1</th><th colspan="2">Conglomerate C-2</th><th rowspan="2">Total</th></tr>
<tr><th>Selva Baja</th><th>Selva Alta</th><th>Ceja de Selva</th></tr>
<tr><td>Amazonas</td><td>Bagua</td><td>Imaza</td><td>135.0</td><td>24</td><td>8</td><td>1</td><td>33</td></tr>
<tr><td rowspan="3">Loreto</td><td>Loreto</td><td>Nauta</td><td>117.6</td><td>26</td><td></td><td></td><td rowspan="3">66</td></tr>
<tr><td>Maynas</td><td>San Juan Bautista</td><td>212.1</td><td>20</td><td></td><td></td></tr>
<tr><td>Alto Amazonas</td><td>Balsapuerto</td><td>126.8</td><td>19</td><td>1</td><td></td></tr>
<tr><td rowspan="3">San Martin</td><td>Moyobamba</td><td>Moyobamba</td><td>72.9</td><td></td><td>26</td><td>13</td><td rowspan="3">63</td></tr>
<tr><td>Rioja</td><td>Nueva Cajamarca</td><td>121.1</td><td></td><td>17</td><td>2</td></tr>
<tr><td>San Martin</td><td>Sauce</td><td>77.9</td><td></td><td>5</td><td></td></tr>
<tr><td colspan="4">Total</td><td>89</td><td>57</td><td>16</td><td>162</td></tr>
</table>

1/ Total number of districts: 7 (1 in Amazonas, 3 in Loreto and 3 in San Martin)
2/ Average of service deficit in water and sanitation, population size and total poverty incidence
Source: JICA Study Team, (2010)- Results of the 2007 Census –INEI and Poverty Map 2007 – INEI

(3) Program Implementation Plan in Phases

The Feasibility Study recommends that the Program should be implemented by phases (Phased implementation) to cope with various uncertainties that may be encountered during the execution of the Program. For the first instance, the pilot program stage was recommended in the previous section.

For the execution of a Program with a large scale of investment cost with a financial arrangement from an external financial agency, it should be also considered that such financing agencies in many cases impose a corresponding penalty to be paid for the late disbursement of scheduled ODA loans as “commitment charges”. This penalty may cause a serious issue for the government if the progress of the Program should delay after obtaining the fund of considerable amount of budget for all the projects of the Program from a foreign ODA funding agency; as this has been experienced in another preceding program.

Therefore, the present Feasibility Study recommends that step-wise financial arrangement shall be made, rather than obtaining a bulk of fund for the implementation of all the Program scope.

(4) Assumptions considered for the implementation schedule

The Program shall employ contractors with experience in these types of works because the Program deals with 1,500 localities to be executed over a period of 10 years. These contractors shall be capable of managing a bulk of small-scale construction works in rural areas. For planning purposes, it is assumed that each contractor should handle between 30 and 50 localities per contract. Moreover, the alternative implementation plans shall be managed assuming that each contract of 30 to 50 localities shall have the base unit period, e.g. the “basic implementation period.” In the case where contractors do not exist, there is an option to execute the works through the core executors.

The basic implementation period, starting from the preparation of the individual *Perfils* with soft component preparation and ending at the completion of implementation, include the 12 month defects liability period, and the period of soft component monitoring and follow-up. It is estimated that the total period will be approximately 50 months (4.2 years), based on the estimated period of each implementation step as shown in Table 4.20.2-3.

Table 4.20.2-3: Implementation Plan and Estimated Program Period

	Basic Implementation Step	Estimated Period
i)	Initial Diagnostic and Baseline	2-3 months
ii)	Preparation of Individual *Perfils*, Soft-component preparation This shall be conducted with one sub-consultant as subletting works for 50 localities.	5 months
iii)	Evaluation and Approval of *Perfils* above This shall be conducted with the Supervising Consultant.	1 month
iv)	Detailed Design (works) including Preparation of Tender Documents. The soft-component detailed design shall be made in a parallel fashion. This shall be carried out by the Operating Consultant for each region and the individual consultants specialized in soft component implementation.	5-6 months
v)	Evaluation and Approval of Detailed Design This shall be conducted with the Supervising Consultant	2 months
vi)	Procedure for Prequalification of Contractors This shall be conducted by the PMU and Regional PMU for the Prequalification procedure before tendering.	3 months
vii)	Procedure for Tendering and Negotiation of Contracts (Works Contractors). This should be carried out by the PMU and Regional PMU. Appointing of core executors. This should be done with the technical assistance of the Regional PMU.	3-4 months
viii)	Construction of works by Contractors or core executors, Soft Component Implementation by Individual Consultants, Supervision of works (Consultant Firm or Individual Consultant). Each works contract (Contractors) shall include localities close to the same district. core executors for each locality.	12 months
ix)	Defect Liability Period for hidden defects. Monitoring and follow-up for soft-component implementation (post-investment).	7-12 months
	Total	(40-48) ~50 months

Note: Estimated period for basic implementation period (50 months) and for each stage is worked out with conditions shown in table above. Source: JICA Study Team, (2010)

The implementation period of a project for construction in one locality is estimated to be three months for a small size locality (less than 100 households) and a maximum of five months for a middle size locality (more than 200 households). One contract shall consist of multiple projects including small and middle size localities. The contractor shall complete multiple projects under one contract within a maximum period of 12 months. This same period is valid if the core executors execute the works.

(5) Proposed Allocation of Localities for each Phase

The allocation of the localities for each phase was proposed taking into consideration: (i) a reasonable sub-program scale (amount of investment) for the pilot program in the first phase, whose localities were selected based on the selection criteria described in item (2), and (ii) a distribution that includes each conglomerate (geographical region); and (iii) composition of localities in a singular administrative region that belong to the same district; as follows;

- In the first phase as the pilot program, 162 localities were allocated as a reasonable scale, based on the amount of investment. Among these, 89 localities are in Conglomerate C-1 while 73 localities are part of Conglomerate C-2. This allocation of localities is proportional, but slightly higher, than the total distribution of localities in the Program.
- For the second and third phases, the same prioritization criteria will be used to select the localities, including the other administrative regions. Likewise, the localities shall be distributed in proportion to each conglomerate.

As a result, the Program may be implemented in the following manner:

- In Amazonas, San Martin and Loreto (three administrative regions), during the first phase, which is justified as discussed in item (2);
- In Amazonas, San Martin, Ucayali and Loreto (four administrative regions), during the second phase; and
- In San Martin, Madre de Dios and Loreto (three administrative Regions) during the third phase,

In other words:

- Projects (localities) in Amazonas region may be implemented in the first and second phases (two phases),
- Projects in San Martin and Loreto Region, in three phases,
- Projects in Madre de Dios in the third phase, and
- Projects in Ucayali in the second phase

The selection of localities may vary according to the prioritization criteria.

The allocation of localities for each phase is shown in Tables N° 4.20.2-4.

Table 4.20.2-4 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	24	9	33	65	217	282	0	0	0	89	226	315
San Martin	0	63	63	33	119	152	130	167	297	163	349	512
Madre de Dios	0	0	0	0	0	0	40	4	44	40	4	44
Ucayali	0	0	0	139	14	153	0	0	0	139	14	153
Loreto	65	1	66	126	0	126	280	4	284	471	5	476
Total	**89**	**73**	**162**	**363**	**350**	**713**	**450**	**175**	**625**	**902**	**598**	**1,500**

Source: JICA Study Team, (2010)

The period of each phase is subject to change depending on the time duration needed for the loan agreement, duration of loan agreements and/or the timing of the program commencement. It is assumed here that the loan for the 2nd phase will be signed right after the completion of the construction works and implementation of the soft component in the localities of lot No. 1 of the 1st phase. The loan for the 3rd phase will be signed similarly, just after the completion of the construction works and implementation of the soft component in the localities of lot No.1 of the 2nd phase.

The follow-up activities for soft component implementation (strengthening and capacity-building) shall continue intermittently for seven (7) to twelve (12) months after the execution of works.

4.20.3 Consulting Services

The main consulting services for program implementation are classified in two groups: (1) Engineering services for infrastructure, (2) Soft component implementation, and (3) Activities for strengthening government functions (Design Evaluation and others)

(1) Engineering Services

i) Pre-investment stage - Individual *Perfil Studies* (Operating Consultant)

- Review of previous studies and plans
- Collection of data and information
- Determination of scope of works through participatory approach
- Conduction of field surveys such as topographic and geological surveys, inventory of existing facilities, water quality tests, socio-economic surveys, etc.
- Determination of design criteria
- Formulation of the *Perfil Studies* for the installation of water supply and sanitation facilities, according to the requirements of *Anexo SNIP 05A*, including the soft component according to item (2)-i)
- Coordination with the supervising consultants and PMU for approval of individual *Profiles* in accordance with *Anexo SNIP 05A*
- Capacity building of the PMU so they may conduct the processes of programming, follow up and monitoring of the above-mentioned activities, from the beginning until the implementation of the Program.

In the three phases of the Program implementation, about 162 *Perfil* Studies will be conducted in the first phase, 713 *Perfil* Studies in the second phase, and 625 *Perfil* Studies in the third phase. The *Perfils* prepared as a part of the Feasibility Study will be reviewed.

These contracted works for the individual *Perfils* shall be finished within a maximum of six months, including the evaluation on the part of the supervising consultants and the approval and declaration of project viability on the part of the PMU-PAPT. It has been proposed that the supervising consultants shall evaluate the individual *Perfils* within one month.

ii) Investment Stage (1)- Detailed Design (Project Files) Services (Operating Consultant)

Following the approval or declaration of viability of the *Perfil Studies* by the PMU, based on the report of evaluation by the supervising consultant, the project cycle will continue and the execution stage will start. In this stage the detailed design of the facilities/systems shall be conducted by the operating consultant. The tasks include:

- Review of previous studies and plans (Individual *Perfil* studies) and consolidation of the technical options proposed in the pre-investment stage.
- Collection of data and updating of information,
- Determination of scope of works through the participatory approach,
- Conduction of field surveys such as topographic and geological surveys, hydrological and hydro-geological surveys, inventory of existing facilities, water quality tests, etc.
- Determination of design criteria
- Preparation of the project detailed design of the water supply and sanitation facilities, which includes the project description, technical specifications, drawings for works execution, cost estimation, reference contract price, work schedule, disbursement schedule, formula for cost adjustment due to market price fluctuation, and the qualification of contractor for the works, according to the norms of procurement of the Peruvian Government and the donor (JICA). The project file also includes the environmental impact assessment according to the classification given by the Office of the Environment (OMA: *Oficina del Medio Ambiente)* of the MVCS. For obtaining the Certificate of Inexistence of Archaeological Remains (CIRA), the Directive that establishes especial procedures for the implementation of the *Decreto Supremo* N° 009-2009-ED will be considered, which was issued by the INC through the *Resolución Directoral Nacional* N° 1207/INC.
- Definition of sizes and costs of tender packages (execution by works contractors)
- Coordination with PMU and the supervising consultant for evaluation and approval of design documents and cost estimates, in accordance with the norms of procurement of the Peruvian government and the donor (JICA).

iii) Investment Stage (2) – Selection of contractors or formation of core executors and the supervision of construction

The supervision of construction works shall be executed during the investment stage of the project. The major activities required at this stage are as follows:

a) Selection of Contractors
   - Preparation of pre-qualification (PQ) documents
   - PQ procedure and evaluation
   - Preparation of tender documents (execution of works by contractors).

b) Supervision of Construction (consulting Firms or an individual consultants for the supervision of works,) The major activities at this stage are as follows:

- Supervision of construction works
- Technical and management support for the Project
- EIA monitoring.

(2) Social Implementation Services (Individual Consultants specialized in Soft component implementation)

The present Feasibility Study recommends that the aspects of planning and design of the soft component implementation shall be undertaken by the PMU/RMU, taking into consideration the proposed integrated approach to the improvement of the rural water supply and sanitation, where such approach involves integration of the construction of facilities/systems and the soft component implementation. The initial promotion shall be carried out by the regional PMU. The envisioned activities of the said individual consultants will be as follows:

i) Pre-investment Stage

- Conducting of social preparation to motivate the benefited community
- Formation or re-activation of the community organizations,
- Support for selection of facility type and service level, and
- Also facilitation for the decision of (additional) co-financing and the type of co-financing,
- It shall include the proposal for the strengthening of the capacities of the municipalities and community organizations in the areas of organization, administration, operation and maintenance of the water and sanitation services in charge of the municipalities (management unit) and community organization and for hygiene education to the population.
- Others

ii) Investment Stage - Detailed Design period

- Follow-up of locality's preparation for receiving project implementation
- A file shall be prepared for the implementation of the capacity strengthening to the municipalities and community organization, in the areas of organization, administration, operation and maintenance of the water and sanitation services and for the hygiene education to the population, including the capacity-building plans to be developed parallel to the execution of works and the post-investment stage.
- Others

iii) Investment or Execution Stage (ii) – Construction period for works

- Supervision of the implementation of the capacity-building programs for the district municipalities (management units) and community organizations in the areas of administration, operation and maintenance (AOM) of the potable water and sanitation services.

- Development of the hygiene education program for the benefited population of each locality.
- Implementation of the capacity building programs for the district municipality to support localities by monitoring them and giving them technical advice for the community programming, rational water usage, assistance to leaders and members of the communities.
- Others

iv) Post-Execution Stage

- Supervision of the follow up activities for AOM, hygiene education, municipality training during the defect liability period, to be in charge of the contractor.
- Monitoring on technical aspects

(3) Design Evaluation (Supervising Consultant)

The supervising consultants shall be assigned under the PMU, which will be organized by the PAPT. The consultant shall support the PMU in the Program implementation, in the following aspects:

i) Evaluation of Individual *Perfils*

- Supervision of development and evaluation of individual *Perfils* to be prepared by the operating consultant, including soft component implementation activities for the approval by the PMU/PAPT, as well as in obtaining project viability.

ii) Evaluation of Project Files (Detailed Designs)

- Supervision of development and evaluation of technical works files and their detailed designs for projects to be prepared by the operating consultant, as well as the file or design for the soft component implementation, described in item (2).

The present Feasibility Study proposes the contracting of the supervising consultant under the direction of the PMU/PAPT, given that the Program shall be implemented under the “outsourcing model”. This is similar to many other projects that require the supervision of other consultants for the evaluation of *Perfils* and the development of project files and works.

It is also forseen that the Supervising Consultant shall provide services for the systematization of implementation in each of the localities and shall develop an information and monitoring system of the projects and Program, as well as a water and sanitation information system

(*SIAS*) for the Program at the local, regional, and national levels. These activities shall be carried out in the first phase.

4.20.4 Strengthening of Government Functions

The development of implementation guideline of the Program and Component-4 Activities—Strengthening of Government Function in the Program—shall be carried out by individual consultants or consulting firms engaged in contract with the PMU-PAPT. The activities are the following:

(1) Development of Human Resources

- Orientation of operating personnel for the Program
- Capacity-building and building of professionals

(2) Research and Technological Development

- Pilot Project for the development of technical options for water and sanitation in Amazon zones.

(3) Study of Social-Cultural-Anthropological Support

- Studies of Social-Cultural-Anthropological Support in view of the diversity of ethnicities and linguistic families in rural Amazon communities.

4.20.5 Construction Works and Soft Component Implementation

(1) Contract Packaging

The present Feasibility Study recommends that construction works and soft-component implementation works of the Program shall be grouped into multiple packages for construction works, taking into account workable package sizes for and the availability of capable contractors for implementing tasks.

If it is considered that between 30 and a maximum of 50 projects (localities) shall be included in one contract package, each contractor should manage a maximum number of these projects, taking into consideration (1) minimizing the frequency of the tendering procedures for the contractor procurements, (2) reasonable progress to complete the Program within about 10 years, (3) envisaged managing capacity of the PAPT, (PMU), (4) the financial and organizational capacities of the Consultants, and (5) the fact that the construction costs, including the soft component, of rural water supply and sanitation facilities may be less two hundred thousand USD per project or per locality.

As a result, the present Feasibility Study proposes the total of thirty-two (32) contract packages, consisting of four (4) packages in the 1st phase, fifteen (15) in the 2nd phase and thirteen (13) in 3rd phase. This number shall decrease by 50% in the case where 50% of works shall be carried out by means of core executors.

(2) Non-workable Period

The rainy season shall be considered non-workable, since construction works cannot possibly be carried out smoothly and/or satisfactorily during this time. Not only progress but also quality control will be difficult.

(3) Major Construction Equipment

The construction facilities to be included in the program are categorized as follows:

- Intake/Reservoir : Civil Works
- Conduction and Distribution Tubes : Civil Works
- Manual or Perforated Pits : Civil Works
- Intra-household connections : Civil Works (support through unskilled labor)
- Pumping system : Mechanical / Electrical Works
- Latrines : Civil Works (support through unskilled labor)

From the items above, it is expected that type of construction equipment for general civil works will be limited, since there are no extensive works such as large land reclamation, deep well drilling, road construction works, construction of large pumping station, extension of middle voltage transmission cables, etc. in this project. Major types of construction equipment to be included in the project plans are as follows:

1) Excavator
2) Crane
3) Dump truck
4) Normal truck with crane equipment
5) Concrete mixer (Barrel mixer)

The aforementioned types of equipment are commonly used in Peru. However this equipment will only be used if it is able to be transported to the site.

(4) Availability of Materials

In the local market, materials for civil works such as aggregate, cement, blocks, bricks, reinforcement steel, wood, water pipes, pipe fittings and fuel are available at main cities and/or towns in the 5 regions.

Materials for Mechanical and electric works also are available in Peru.

Materials will be used under the condition that they are available and easy to maintain and operate. Therefore, the use of imported materials is not recommended.

(5) Transportation Route to the Site

The materials and equipment will be transported to the sites from main cities/towns of the regions. It should be noted that one of major characteristics of the Program to be executed in the rural Amazon areas is the difficult access conditions to sites. Transport is especially difficult in regions like Loreto and Ucayali, where water transportation is required to reach many of the localities. This difficulty of transportation shall have the effect of a cost increase of the program.

(6) Capability of Contractors

The Program requires capable contractors (construction and engineering company associated with an experience NGO specialized in social work) who shall conduct the projects in the rural Amazon localities smoothly and on time as scheduled. The contractors for the Program shall have enough capability in managing the many sub-contractors and specialized personnel who shall undertake smaller scale projects of water supply and sanitation, as well as the soft component implementation simultaneously; the main contractors shall have capability to execute the works and implement the soft component in each locality, for which the total contract amount may exceed several millions of dollars (USD). In the five (5) Amazon regions, however, numbers of such capable private contractors and NGOs are limited; therefore, the Program shall consider involving capable contractors from major cities of Peru such as Lima or others, and/or from foreign countries.

It is inevitable that by preparing a considerable budget within a reasonable range, the Program shall attract such capable contractors as the ones mentioned above to work in remote rural Amazon localities. It should be also noted that with only the small scale locally-based contractors, the Program may not achieve its ambitious target.

(7) Labor Force

The construction itself consists mainly of common civil works such as earth works (excavation, backfilling), pipe installation, and concrete structuring work.

The skilled workers necessary for the pipe connection work and for quality control of the works, are not available in the Amazon area (5 regions), because such workers are not usually required in these regions. The Program expects that the contractors will deploy such skilled workers from their own sources. On the other hand, unskilled workers are available in the sites and the Program encourages the contractors to employ such local people as unskilled labor.

4.21 Financing

In order to finance the Water and Sanitation Program for Rural Amazon Area, the Study Team has foreseen to use resources from the Japan International Cooperation Agency (JICA). The agreement for cooperation is to be arranged by the Peruvian Government. These resources will be mainly used for the execution of the upgrade and/or rehabilitation, extension and construction of water supply and sanitation service infrastructure in the 1,500 localities of the Program, as well as for the implementation of soft component activities and consultant's services for the development of pre-investment studies, technical files or detailed designs, soft component files, advice for the tendering, supervision of works and of soft component implementation, the activities on Program administration, and strengthening of the government functions for the PMU of the PAPT and the RMUs (Regional PMU). These are foreseen in Components 1, 2, 3 and 4 of the Program costs.

(2) JICA Financing

JICA defines the upper limit rates (percentages) for financing to a project in a country depending on its GNI per capita of the country. In the case for Peru, up to eighty five (85%) percent of the total project costs will be the subject of the financing from JICA, unless the amount of such JICA financing should exceed the eligible part of financing by JICA.

Non-eligible parts of JICA's financing will generally include: costs for taxes of any kinds, costs for land acquisition or compensation, and costs for administration of the executing agency.

The financial conditions of JICA's loan will be as follows:

1) Interest rate: 0.65% annual
2) Charges for undisbursed balances commission: 0.10%
3) Charges for the extension of disbursement periods: 0.20%
4) Period of debt repayment: 40 years
5) Grace Period: ten years

(3) Financing Evaluation by Peruvian Government (PG)

The relevant Peruvian parties informed that the Program should be implemented in several phases; i.e. the Program should be financed in steps instead of one-time financing to the whole Program.

Such advice considers the execution capacity of the PMU-PAPT to carry out the Program's projects and the experience of similar projects/programs in the sanitation sector. Also a delay in implementation of the Program could generate financial costs of the undisbursed balances and the charges of a possible extension, if total funding is agreed with the JICA for all phases of the Program.

Therefore, the relevant authorities of the Peruvian Government (DNS) proposed a loan request to JICA for an amount of USD 35 million of the total cost of the program's first phase. The amount is equivalent to approximately USD 35 million. The balance of the resources (USD 20.0 million) will be covered through national resources allocated to the project, which are made up of the allocated budget of MVCS and the regional governments of Amazonas, Loreto and San Martin. The district municipalities will be able to participate by covering the operational costs of the municipality's Management Unit for the technical assistance to be provided to the JASS. Thereby, its participation has not been included in the financing outline of the investment. Also, the benefitting community could provide an additional contribution through unskilled labor for the installation of water connections and sinks and of sanitary latrines.

The amounts of JICA financing could be increased in the following phases of the Program's execution, taking into account that the upper limit rate for Peruvian financing is 85%.

(4) Financing Outline of the Program

On the basis of the aforementioned consideration, the financing outline for the three (3) phases of the Program's execution is presented below in Tables 4.21-1, 4.21-2, and 4.21-3, with a summary in Table 4.21-4.

Table 4.21-1: Financing Outline for the Water Supply and Sanitation Program for Rural Amazon Area – First Phase (2010-2013)

(thousands of USD)

Item	Description	Total Program Cost	1st Phase									
			Total Cost	(%)	Financing				National Contribution			
					JICA	(%)	PG	(%)	MVCS	(%)	Regional Government	(%)
1)	**Component 1- Conglomerate C-1**	**232,905**	**24,533**	**11%**	**19,801**	**81%**	**4,732**	**19%**	**1,946**	**41%**	**2,786**	**59%**
1.1	Water Infrastructure	99,701	10,338	10%	7,376	71%	2,962	29%	1,218	41%	1,743	59%
1.2	Sanitation Infrastructure	59,157	6,134	10%	4,364	71%	1,770	29%	728	41%	1,042	59%
1.3	Soft-Component	20,606	2,033	10%	2,033	100%						
1.4	Initial Diagnosis and Baseline	989	95	10%	95	100%						
1.5	*Perfiles* and Detailed Designs of works (Water and Sanitation)	27,292	2,933	11%	2,933	100%						
1.6	Supervision of works (Water and Sanitation) – Contractors	10,708	1,212	11%	1,212	100%						
1.7	Supervision of works (Water and Sanitation) – NN.EE.	5,871	587	10%	587	100%						
1.8	Supervision of *Perfiles* and Detailed Designs (Water and Sanitation)	8,582	1,201	14%	1,201	100%						
2)	**Component 2- Conglomerate C-2**	**131,638**	**17,130**	**13%**	**14,100**	**82%**	**3,030**	**18%**	**1,246**	**41%**	**1,783**	**59%**
2.1	Water Infrastructure	47,910	6,138	13%	4,379	71%	1,759	29%	723	41%	1,035	59%
2.2	Sanitation Infrastructure	34,393	4,406	13%	3,135	71%	1,271	29%	523	41%	748	59%
2.3	Soft-Component	13,648	1,657	12%	1,657	100%						
2.4	Initial Diagnosis and Baseline	653	82	13%	82	100%						
2.5	*Perfiles* and Detailed Designs of works (Water and Sanitation)	18,317	2,422	13%	2,422	100%						
2.6	Supervision of works (Water and Sanitation) – Contractors	7,090	970	14%	970	100%						
2.7	Supervision of works (Water and Sanitation) – NN.EE.	3,901	470	12%	470	100%						
2.8	Supervision of *Perfiles* and Detailed Designs (Water and Sanitation)	5,725	985	17%	985	100%						
3)	**Component 3**	**30,336**	**3,467**	**11%**	**0**	**0%**	**3,467**	**100%**	**1,734**	**50%**	**1,734**	**50%**
3.1	Program Administration	30,336	3,467	11%	0	0%	3,467	100%	1,734	50%	1,734	50%
4)	**Component 4**	**1,099**	**1,099**	**100%**	**1,099**	**100%**	0	**0%**				
	Strengthening of Government Function	1,099	1,099	100%	1,099	100%	0	0%				
5)	**VAT (19%)**	**75,236**	**8,783**	**12%**	**0**	**0%**	**8,783**	**100%**	**7,586**	**86%**	**1,197**	**14%**
Grand Total		**471,214**	**55,012**	**12%**	**35,000**	**64%**	**20,012**	**36%**	**12,512**	**63%**	**7,500**	**37%**

Source: JICA Study Team (2010)

It is noted that for the first phase of the Program's execution, the JICA loan amounts to USD 35 million, representing 64% of the total Program cost. The balance of 23% would be covered by investments from the budget statement of MVCS (USD 12.51 million), and 13% of the regional governments (USD 7.50 million) for the period 2010-2013.

The contributions of the regional governments are as follows:

1) Regional Government of Amazonas : USD 1,556 thousand
2) Regional Government of Loreto : USD 2,941 thousand
3) Regional Government of San Martín : USD 3,003 thousand

(5) Price Scaling and Contingencies

This aspect, which is included in the financing plan for the Program's first phase, is indicated in Item 4.10.5 of the present Feasibility Study. The amounts are shown in Table 4.21-2.

(6) Interests during Construction and Commissions Charged

Interests during construction of works (grace period) and the commissions for unpaid balances also form part of the financing plan. These amounts are shown in Table 4.21-2.

Table 4.21-2: Financial Scheme for the Program – First Phase (2010-2013)
(Expressed in Thousands of Monetary Units)

Description	Nuevos Soles	JPY	USD
Total Program Cost 1/	**156,180**	**5,044,608**	**55,012**
Price Scaling 1/	3,471	112,123	1,223
Physical Contingencies 1/	1,816	58,656	640
Total I	**161,467**	**5,215,387**	**56,874**
Interest during Construction	2,483	80,190	874
Commission for unpaid balances	497	16,049	175
Grand Total	**164,447**	**5,311,626**	**57,924**

1/ Includes VAT
Source: JICA Study Team

The interest costs during construction and the commission for unpaid balances shall be covered by the MVCS. Likewise, an amount shall be included in the planned budget to cover the possible sums due to price scaling and physical contingencies of the execution of the first phase of the Program.

Table 4.21-3: Financing Outline for the Water Supply and Sanitation Program for Rural Amazon Area – Second Phase (2013-2017)

(thousands of dollars)

Item	Description	Total Program Cost	2nd Phase									
			Total Cost	(%)	Financing				National Contribution			
					JICA	(%)	PG	(%)	MVCS	(%)	Regional Government	(%)
1)	**Component 1- Conglomerate C-1**	**232,905**	**93,194**	**40%**	**80,479**	**86%**	**12,715**	**14%**	**636**	**5%**	**12,079**	**95%**
1.1	Water Infrastructure	99,701	39,900	40%	31,920	80%	7,980	20%	399	5%	7,581	95%
1.2	Sanitation Infrastructure	59,157	23,675	40%	18,940	80%	4,735	20%	237	5%	4,498	95%
1.3	Soft-Component	20,606	8,301	40%	8,301	100%						
1.4	Initial Diagnosis and Baseline	989	399	40%	399	100%						
1.5	*Perfiles* and Detailed Designs of works (Water and Sanitation)	27,292	11,032	40%	11,032	100%						
1.6	Supervision of works (Water and Sanitation) – Contractors	10,708	4,275	40%	4,275	100%						
1.7	Supervision of works (Water and Sanitation) – NN.EE.	5,871	2,361	40%	2,361	100%						
1.8	Supervision of *Perfiles* and Detailed Designs (Water and Sanitation)	8,582	3,250	38%	3,250	100%						
2)	**Component 2- Conglomerate C-2**	**131,638**	**76,477**	**58%**	**66,909**	**87%**	**9,568**	**13%**	**478**	**5%**	**9,090**	**95%**
2.1	Water Infrastructure	47,910	27,848	58%	22,279	80%	5,570	20%	278	5%	5,291	95%
2.2	Sanitation Infrastructure	34,393	19,992	58%	15,993	80%	3,998	20%	200	5%	3,798	95%
2.3	Soft-Component	13,648	7,968	58%	7,968	100%						
2.4	Initial Diagnosis and Baseline	653	380	58%	380	100%						
2.5	*Perfiles* and Detailed Designs of works (Water and Sanitation)	18,317	10,762	59%	10,762	100%						
2.6	Supervision of works (Water and Sanitation) – Contractors	7,090	4,110	58%	4,110	100%						
2.7	Supervision of works (Water and Sanitation) – NN.EE.	3,901	2,283	59%	2,283	100%						
2.8	Supervision of *Perfiles* and Detailed Designs (Water and Sanitation)	5,725	3,133	55%	3,133	100%						
3)	**Component 3**	**30,336**	**14,119**	**47%**	**0**	**0%**	**14,119**	**100%**	**6,636**	**47%**	**7,483**	**53%**
3.1	Program Administration	30,336	14,119	47%	0	0%	14,119	100%	6,636	47%	7,483	53%
4)	**Component 4**	**1,099**	**0**	**0%**	**0**							
	Strengthening of the Government Function	1,099	0	0%	0							
5)	**VAT (19%)**	**75,236**	**34,920**	**46%**	**0**	**0%**	**34,920**	**100%**	**29,476**	**84%**	**5,444**	**16%**
Grand Total		**471,214**	**218,710**	**46%**	**147,387**	**67%**	**71,322**	**33%**	**37,226**	**52%**	**34,096**	**48%**

1/ Includes Strengthening of PMU-PAPT; Source: JICA Study Team (2010)

For the second and third phase of the Program, the loan amount of JICA funding shall remain the same percentage, as can be observed in Tables 4.21-3 and 4.21-4.

Table 4.21-4: Financing Outline for the Water Supply and Sanitation Program for Rural Amazon Area – Third Phase (2016-2020)
(thousands of dollars)

Item	Description	Total Program Cost	3rd Phase									
			Total Cost	(%)	Financing				National Contribution			
					JICA	(%)	PG	(%)	MVCS	(%)	Regional Government	(%)
1)	**Component 1- Conglomerate C-1**	**232,905**	**115,179**	**49%**	**99,417**	**86%**	**15,762**	**14%**	**788**	**5%**	**14,974**	**95%**
1.1	Water Infrastructure	99,701	49,463	50%	39,570	80%	9,893	20%	495	5%	9,398	95%
1.2	Sanitation Infrastructure	59,157	29,349	50%	23,479	80%	5,870	20%	293	5%	5,576	95%
1.3	Soft-Component	20,606	10,271	50%	10,271	100%						
1.4	Initial Diagnosis and Baseline	989	495	50%	495	100%						
1.5	*Perfiles* and Detailed Designs of works (Water and Sanitation)	27,292	13,327	49%	13,327	100%						
1.6	Supervision of works (Water and Sanitation) – Contractors	10,708	5,221	49%	5,221	100%						
1.7	Supervision of works (Water and Sanitation) – NN.EE.	5,871	2,922	50%	2,922	100%						
1.8	Supervision of *Perfiles* and Detailed Designs (Water and Sanitation)	8,582	4,131	48%	4,131	100%						
2)	**Component 2- Conglomerate C-2**	**131,638**	**38,031**	**29%**	**33,247**	**87%**	**4,784**	**13%**	**239**	**5%**	**4,545**	**95%**
2.1	Water Infrastructure	47,910	13,924	29%	11,139	80%	2,785	20%	139	5%	2,646	95%
2.2	Sanitation Infrastructure	34,393	9,996	29%	7,997	80%	1,999	20%	100	5%	1,899	95%
2.3	Soft-Component	13,648	4,024	29%	4,024	100%						
2.4	Initial Diagnosis and Baseline	653	190	29%	190	100%						
2.5	*Perfiles* and Detailed Designs of works (Water and Sanitation)	18,317	5,133	28%	5,133	100%						
2.6	Supervision of works (Water and Sanitation) – Contractors	7,090	2,010	28%	2,010	100%						
2.7	Supervision of works (Water and Sanitation) – NN.EE.	3,901	1,148	29%	1,148	100%						
2.8	Supervision of *Perfiles* and Detailed Designs (Water and Sanitation)	5,725	1,607	28%	1,607	100%						
3)	**Component 3**	**30,336**	**12,750**	**42%**	**0**	**0%**	**12,750**	**100%**	**5,992**	**47%**	**6,757**	**53%**
3.1	Program Administration	30,336	12,750	42%	0	0%	12,750	100%	5,992	47%	6,757	53%
4)	**Component 4**	**1,099**	**0**	**0%**	**0**							
	Strengthening of the Government Function	1,099	0	0%	0							
5)	**VAT (19%)**	**75,236**	**31,532**	**42%**	**0**	**0%**	**31,532**	**100%**	**26,540**	**84%**	**4,993**	**16%**
Grand Total		**471,214**	**197,492**	**42%**	**132,664**	**67%**	**64,828**	**33%**	**33,560**	**52%**	**31,269**	**48%**

Source: JICA Study Team (2010)

Table 4.21-5 presents the financing outline for the three phases of the Program’s execution. The financing of the involved parties will be as follows:

1) JICA : 67% (USD 315.0 million)
2) MVCS : 18 % (USD 83.3 million)
3) Regional Governments : 15% (USD 72.8 million)

The contribution of the regional governments will be as follows:

1) Regional Government of Amazonas : USD 14,117 thousand
2) Regional Government of Loreto : USD 26,536 thousand
3) Regional Government of San Martín : USD 21,611 thousand
4) Regional Government of Ucayali : USD 8,036 thousand
5) Regional Government of Madre de Dios : USD 2,565 thousand

Table 4.21-5: Financing Outline for the Water Supply and Sanitation Program for Rural Amazon Area – Three phases (2010-2020)
(thousands of dollars)

Item	Description	Total Program Cost	Phase (1+2+3)									
			Total Cost	(%)	Financing				National Contribution			
					JICA	(%)	PG	(%)	MVCS	(%)	Regional Government	(%)
1)	**Component 1- Conglomerate C-1**	**232,905**	**232,905**	**100%**	**199,696**	**86%**	**33,209**	**14%**	**3,370**	**10%**	**29,839**	**90%**
1.1	Water Infrastructure	99,701	99,701	100%	78,866	79%	20,834	21%	2,112	10%	18,722	90%
1.2	Sanitation Infrastructure	59,157	59,157	100%	46,782	79%	12,375	21%	1,258	10%	11,116	90%
1.3	Soft-Component	20,606	20,606	100%	20,606	100%	0	0%				
1.4	Initial Diagnosis and Baseline	989	989	100%	989	100%						
1.5	*Perfiles* and Detailed Designs of works (Water and Sanitation)	27,292	27,292	100%	27,292	100%	0	0%				
1.6	Supervision of works (Water and Sanitation) – Contractors	10,708	10,708	100%	10,708	100%	0	0%				
1.7	Supervision of works (Water and Sanitation) – NN.EE.	5,871	5,871	100%	5,871	100%	0	0%				
1.8	Supervision of *Perfiles* and Detailed Designs (Water and Sanitation)	8,582	8,582	100%	8,582	100%	0	0%				
2)	**Component 2- Conglomerate C-2**	**131,638**	**131,638**	100%	**114,256**	**87%**	**17,382**	**13%**	**1,964**	**11%**	**15,418**	**89%**
2.1	Water Infrastructure	47,910	47,910	100%	37,797	79%	10,113	21%	1,141	11%	8,972	89%
2.2	Sanitation Infrastructure	34,393	34,393	100%	27,125	79%	7,269	21%	823	11%	6,446	89%
2.3	Soft-Component	13,648	13,648	100%	13,648	100%	0	0%				
2.4	Initial Diagnosis and Baseline	653	653	100%	653	100%						
2.5	*Perfiles* and Detailed Designs of works (Water and Sanitation)	18,317	18,317	100%	18,317	100%	0	0%				
2.6	Supervision of works (Water and Sanitation) – Contractors	7,090	7,090	100%	7,090	100%	0	0%				
2.7	Supervision of works (Water and Sanitation) – NN.EE.	3,901	3,901	100%	3,901	100%	0	0%				
2.8	Supervision of *Perfiles* and Detailed Designs (Water and Sanitation)	5,725	5,725	100%	5,725	100%	0	0%				
3)	**Component 3**	**30,336**	**30,336**	**100%**	**0**	**0%**	**30,336**	**100%**	**14,362**	**47%**	**15,974**	**53%**
3.1	Program Administration	30,336	30,336	100%	0	0%	30,336	100%	14,362	47%	15,974	53%
4)	**Component 4**	**1,099**	**1,099**	**100%**	**1,099**							
	Strengthening of the Government Function	1,099	1,099	100%	1,099							
5)	**VAT (19%)**	**75,236**	**75,236**	**100%**	**0**	**0%**	**75,236**	**100%**	**63,602**	**85%**	**11,633.9**	**15%**
Grand Total		**471,214**	**471,214**	100%	**315,051**	**67%**	**156,163**	**33%**	**83,298**	**53%**	**72,865**	**47%**

Source: JICA Study Team (2010)

4.22 Logical Framework

Logic Framework Matrix for Water and Sanitation Program for the Rural Amazon – Components 1 and 2

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 of incidents involving intestinal infectious diseases (ADDs) in the population of the rural Amazon area, from the current 23.9% 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 implementation, 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: 162 localities with W&S services by 2013. -2nd implementation phase: 713 localities with W&S services by 2017 -3rd implementation phase: 625 localities with W&S services by 2020.	♦ % of coverage of water service for human consumption within the implementation area. ♦ Nº of localities with continuous water service for human consumption no less than 12 hours ♦ Nº of systems that applied disinfection to the water supply service for human consumption.	♦ 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.
2. The population in the implementation area, with access to a system of excreta	♦ To increase by 80% the sanitation coverage (latrines) in the intervened localities by 2020.	♦ % of sanitation coverage (latrines) in the intervened localities	♦ Final Report of the Liquidation of the Works ♦ Results report of the Ex Post	♦ Population's participation in the Project's

OBJECTIVES	AIMS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
disposal in suitable conditions.	♦ 70% of families of the total of the localities have suitable practices of sanitary excreta disposal, by 2020	♦ % of families that properly use the latrines	Evaluation. ♦ Results reports of the Program's Impact Evaluation	implementation.
3. Improve the hygiene habits of the population in the rural localities with implementation	♦ 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.
4. The community organizations (JASS) in the implementation 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.

OBJECTIVES	AIMS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
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 implementation ♦ Nº of hours of water service ♦ Nº of supervision 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' commitment with respect to their participation in the implementation of W&S services

OBJECTIVES	AIMS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
ACTIVITIES:				
I. Development of Initial Diagnosis and Baseline	I. Initial Diagnosis and Baseline for US $ 1.9 million.	♦ Nº of initial diagnosis of localities and situation of the W&S services.		
II. Development of *Perfils* and detailed design files 1. Development of pre-investment studies 2. Development of detailed designs	II. Pre-investment studies (*Perfils*) and detailed designs for US $ 54.3. million ♦ 1,500 *Perfils* ♦ 1,500 detailed designs	♦ 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 implementation in rural Amazon areas
III. Evaluation of *Perfils* and detailed design files 1. Evaluation of pre-investment studies 2. Evaluation of detailed designs	III. Evaluation and approval of pre-investment studies and detailed designs for USD 10.9 million ♦ 1,500 *Perfils* 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
IV. Water storage and sanitation, Conglomerates 1 and 2 1. Rehabilitation, improvement, and expansion of existing water systems 2. Construction of new water systems 3. Installation of household latrines	IV. W&S infrastructure for USD 286.9 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
	V. Soft-component implementation for		♦ Final report of capacity-	♦ Participation by the population in the capacity-building workshops for hygiene education

OBJECTIVES	AIMS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
V. 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 implementation	USD 40.7 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	♦ 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	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 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
VI. Supervision of works	VI. Supervision of the works USD 40.6 million	♦ Item III and IV		

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 Individual Contractors 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 and Regional PMU are functioning as of 2011-2020 for USD 36.5 million ♦ Individual Consultants for the Diagnostic and Baseline ♦ Operating Consultants contracted ♦ Supervising Consultants contracted by year ♦ Consulting Firm for Works Supervision ♦ Individual Consultants Specialized in Soft Component Implementation ♦ Individual Consultants for Works Supervision ♦ Executing Contractors contracted by year ♦ Forming of core executors ♦ Annual Operative Plan for Program approved ♦ 6 reports on follow-up and evaluation of Program per year ♦ 162 works concluded and operating in the year 2013 ♦ 713 works concluded and operating in the year 2015 ♦ 625 works concluded and operating in the year 2020	♦ Number of consultant contracts per year ♦ Number of contracts to be execute per year ♦ Number of contracts with Executing Contractors per year ♦ Number of follow-up and evaluation reports per year ♦ Number of works concluded and operative by the year 2013 ♦ Number of works concluded and operative by the year 2015 ♦ Number 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 consultants ♦ Contracts signed by the Contractors of Works ♦ Document proving the formation of the core executors ♦ 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 implementation in W&S in the rural Amazon area

COMPONENT 4 (Strengthening of the Government Function)

OBJECTIVES	AIMS	INDICATORS	VERIFICATION MEANS	ASSUMPTIONS
RESULTS: I. Strengthening of Government Function 1. Program Executing Unit and Regional Units strengthened. 2. Contracting of Consultants or Consultant Firms to develop and implement activities	♦ Strengthening of Government function from 2011-2013 (PMU/RMU) for USD 1.3 million. ♦ Consultants contracted for continuous improvement of the Program. ♦ Consultants and institutions contracted for the development of human resources. ♦ Institution or consultants contracted for research and technological development. ♦ Consultants contracted for the Water and Sanitation Information System ("*SIAS*"). ♦ Consultants contracted to provide social, cultural, and anthropological support.	♦ Number of contracts from consultants or institutions for the development activities or paths of implementation. ♦ Number of personnel of the PMU/RMU whose capacity are enhanced by the Program.	♦ PAPT (Program of Water for All) Contracts or assignments for the PAPT of specialists in the program PMU/RMU. ♦ Signed contracts for the consultants or institutions for the development of activities or paths of implementation. ♦ Results of the pilot project that include a non-conventional sanitation solution. ♦ Report on the results of capacity enhancement for personnel of the PMU/RMU under the Program. ♦ Report on the results of Water and Sanitation Information System ("*SIAS*"). ♦ Report on social, cultural, and anthropological support. ♦ PMU Report on Program follow-up and evaluation.	♦ Commitments by the sector institutions to participate according to sectorial guidelines. ♦ Sectorial and Regional Policy for the implementation in water and sanitation in rural Amazon areas. ♦ Sectorial and Regional Policy for the implementation in water and sanitation in rural Amazon areas.

Note: The Logical Framework for the first phase is presented in Appendix 14.

4.23 Baseline of the Program

The principal indicators that shall serve to establish the baseline to measure Program impact can be obtained from two different sources, which are described below.

(1) From the Demographic Survey of Family Health (ENDES)

The Demographic Survey of Family Health (ENDES) has been carried out in Peru since 1986, in the framework of the worldwide program of the Demographic and Health Surveys, currently known as DHS+, from which the following is obtained:

- Percentage of children less than 5 years old with diarrhea (in the last 15 days)

The survey gives the percentage that corresponds to each department, thereby the Program can obtain the indicators showing the average of the five (5) that correspond to the project.
The adjusted average of the departments corresponds to each conglomerate in proportion to the localities in each department, divided by the total localities in the conglomerate.

(2) From the survey carried out by the Program in the sample localities

The result is given as an average for each natural region, for each indicator.
The results from the Low Forest correspond with Conglomerate C-1. Corresponding with Conglomerate C-2 is the adjusted average in proportion to the number of people surveyed in each region, divided by the total number of people surveyed in the conglomerate for each one of the following indicators:

- Percentage of children under 5 years of age that have had diarrhea in the last 15 days. 1/
- Percentage of families with one member that has had diarrhea in the last few days
- Percentage of diarrheic diseases that have most frequently affected the families
- Percentage of families with a member that has adequate practices of hand-washing
- Percentage of homes with access to a safe source of water
- Percentage of homes with access to an effective sanitation service
- Percentage of localities that administrate, operate and maintain the water supply system appropriately
- Percentage of localities that have a JASS or another similar community organization
- Percentage of families that pay the monthly fee for the water service
- Percentage of water supply systems in which continuous disinfection is being applied
- Percentage of water supply systems in which daily chlorination of the water is being applied
- Percentage de localities with a water supply systems working with no problems
- Percentage of families that fetch water from outside the house
- Average time/person used for the water fetching (not including frequency) - minutes
- Average number of hours per day the homes are supplied with water - hours/day

- Percentage of homes with water supply during all the year
- Percentage of families satisfied with the management of the COMMUNITY ORGANIZATION
- Percentage of homes that consider acceptable the operation of the water supply
- % of families satisfied with the quality of the water from the system
- % of families satisfied with the sanitation systems
- % of latrines that do not have an bad odors
- % of clean latrines
- % of families that use containers with lids to store water in the home
- % homes that use some type of water treatment

Table 4.23-1 shows the values obtained according to the criteria described for the parameters. Nevertheless, upon implementation of the Program, in each locality its own values shall be obtained that the impact of the project will be measured.

Table 4.23-1: Baseline for the Evaluation of Impact

Concept	Indicators		
	Conglomerate C-1	Conglomerate C-2	Program
Main indicators			
% of children under 5 years of age that have had diarrhea in the last 15 days. 1/	23.9%	21.8%	23.4%
% of families with one member that has had diarrhea in the last few days	45.6%	31.8%	40.5%
% of diarrheic diseases that have most frequently affected the families	33.0%	24.6%	29.8%
% of families with a member that has adequate practices of hand-washing	85.7%	86.4%	86.0%
% of homes with access to a safe source of water	7.0%	12.0%	9%
% of homes with access to an effective sanitation service	4.0%	6.4%	4.0%
% of localities that administrate, operate and maintain the water supply system appropriately	0.0%	0.0%	0%
Local capacities /Interviews to Sanitation Services Administrative Boards			
% of localities that have a JASS or another similar community organization	32.1%	57.1%	46.6%
% of families that pay the monthly fee for the water service	-	-	
% of water supply systems in which continuous disinfection is being applied	0.0%	0.0%	0%
% of water supply systems in which daily chlorination of the water is being applied	9.1%	13.3%	11.0%
% de localities with a water supply systems working with no problems	0.0%	0.0%	0%
Water and sanitation service/Home interviews			
% of families that fetch water from outside the house	68.6%	23.4%	33.9%
Average time/person used for the water fetching (not including frequency) - minutes	17.6	12.0	13.5
Average number of hours per day the homes are supplied with water - hours/day	6.9	12.2	10.8
% of homes with water supply during all the year	0%	0%	0%
% of families satisfied with the management of the COMMUNITY ORGANIZATION	19.4%	27.7%	25.5%
% of homes that consider acceptable the operation of the water supply	44.2%	54.3%	51.2%
% of families satisfied with the quality of the water form the system	16.3%	27.7%	24.9%
% of families satisfied with the sanitation systems	0%	0%	0%
Hygiene practices in the population/home interviews			
% of latrines that do not have an bad odors	69.0%	31.8%	44.5%
% of clean latrines	0.0%	0.0%	0%
Handling of the water in the home(home interviews)			
% of families that use containers with lids to store water in the home	89.5%	87.6%	88.6%
% homes that use some type of water treatment	44.3%	41.7%	43.0%

1/ ADD in the 5 regions- ENDES 2004 -2006

4.24 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, (902 localities)
- Conglomerate C-2: Localities located in the High Forest and in the Front Forest (598 localities)

(3) The Water Supply and Sanitation Improvement Project in Rural Amazon Area will have four (4) components:

- Component 1: Conglomerate C-1
- Component 2: Conglomerate C-2
- Component 3: Program Administration
- Component 4: Strengthening of the Government's Function

(4) The total Program cost for the three (3) components amounts to S/. 1.38 billion (JPY 43.21 billion, USD 471.2 million). Its execution is scheduled in three phases, each one with an execution time of four (4) years approximately, during the period 2010 -2020. <u>Costs are: S/. 156.2 million (USD 55.0 million) for the first phase</u>, S/. 634.9 million (USD 223.6 million) for the second phase and S /. 560.7 million (USD 197.5 million) for the third phase.

(5) The first phase is planned to be executed in 162 localities, of which, 89 are located in the Low Forest (C-1), 57 in the High Forest (C-2) and 52 in the Front Forest (C-2). The localities in this phase are located in the regions of Amazonas, Loreto and San Martín.

(6) The Feasibility Study concludes that Conglomerate C-1 and C-2, constituted by the water supply projects, are viable in their three implementation phases, from the technical, economical and environmental standpoints.

(7) For the sanitation Project, reference values or cutoff lines, considered to be reasonable according to the proposed technical options, have been proposed in market prices.

(8) The economic evaluation of the program was carried out based on the results of the economic evaluation of the water supply projects of conglomerates C-1 and C-2, for the three phases, resulting in an NPV of S/. 142.6 million and an IRR of 17.6%. Therefore, the Feasibility Study concludes that the Program is viable from the technical and economic points of view. It shall be noted that the economic indicators of the first phase of the Program have an NPV of S/. 15.3 million and an IRR of 14.1%.

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

(10) The projects of the Program will be implemented by the RMUs of the Water Supply and Sanitation Improvement Program in the Rural Amazon Area, and coordinated at the central level by the Rural Sanitation Operational Unit, which will act as the PMU, located within the Water for All Program (PAPT). The Program will place equal importance to the execution of infrastructure works (design and construction of facilities) and activities for the strengthening and/or creation of capacities in the organization, planning, promotion, development and management of sanitation services, as well as in hygiene education in each locality and municipality. This will contribute in creating awareness of the benefits of the project and generating demand for the services.

(11) The construction of the water supply and sanitation facilities will be carried out by contractors selected through a tender process, or by core executors.

(12) The proposed organization for the implementation of the Program is headed by the PMU in the PAPT and the RMU. The PMU and RMU will be subject to strengthening, and implementation by qualified staff, as part of the activities of Component 4 of the Program.

(13) 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 assessing the applicability of the proposed program and the improvements needed for the following phases. In the first phase, 162 prioritized water supply and sanitation projects should be implemented (89 localities of Conglomerate C-1 and 73 localities of Conglomerate C-2); in the second phase, 713 projects (363 localities of Conglomerate C-1 and 350 localities of Conglomerate C-2); in the third phase, 625 projects (450 localities of Conglomerate C-1 and 175 localities of Conglomerate C-2).

(14) For the financing of the Program, the use of resources from a financial cooperation extended by the Japanese Government through JICA, upon its coordination with the Peruvian Government, is foreseen. According to this understanding, the financing outline for the phased implementation of the Program was proposed. For the first phase, the financing scheme expected is 64% from JICA (USD 35.0 million), and 36% (USD 20.0 million) from national counterpart funds (63% by the MVCS and 37% of co-financing by the regional governments of Amazonas, Loreto and San Martín). JICA's contributions will remain constant, taking into consideration the limit of 85% designated for projects in Peru. For the three phases of the Program, the financing outline is as follows: 67% by JICA; 18% by the MVCS; and 15% by the regional governments of Amazonas, Loreto, San Martin, Ucayali and Madre de Dios.

(15) The Feasibility Study recommends to confirm the viability of the first phase of the Water Supply and Sanitation Improvement Project for the Rural Amazon Area, with its two conglomerates, on the basis of the results of the present Feasibility Study. The Feasibility Study shows that each conglomerate (Conglomerate C-1 and Conglomerate C-2) and the Program as a whole are socially profitable and sustainable, Moreover, the projects that comprise the Program are consistent with the policy guidelines of the sanitation sector.